Kentucky Council on Postsecondary Education

Engineering Sector Analysis in Kentucky – Labor Market Information, Program Demand Gap Analysis, & Migration Analysis

April 2020

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Acknowledgements

This study was prepared for the Kentucky Council on Postsecondary Education to assess the effectiveness of Kentucky institutions in meeting workforce demand in the engineering sector. The study identifies opportunities for new academic and workforce programming based on analysis of engineering sector jobs, wages, and worker migration trends. Emsi gratefully acknowledges the excellent support of the DXtera Institute for making this study possible. Special thanks go to the Kentucky Council on Postsecondary Education, for approving the study and providing requested information, and the Strada Education Network, for data collection on insights of Kentucky alumni. Any errors in the report are the responsibility of Emsi and not of any of the above-mentioned parties.

Key Takeaways

ENVIRONMENTAL SCAN

- Kentucky job growth is projected to be slower than the U.S. over the next decade (15% and 23%, respectively).
- The Central WPR and Kentuckiana LWA lead the state in terms of jobs and are projected to grow slightly over the next decade.
- The Local Government industry subsector supported the most jobs in Kentucky in 2019 and it is expected to remain the top regional employer.
- A variety of manufacturing industry subsectors, which are large employers of engineers, are within the top 15 in the state in terms of employment concentration compared to the U.S. and are projected to gain in concentration over the next decade.
- The Manufacturing industry sector faces the largest unemployment in Kentucky, and at a much higher rate compared to the U.S.
- Population growth in Kentucky is projected to be slower than the U.S. over the next 10 years (6% and 11%, respectively). Notably, the population of the East WPR is projected to decline by 10%.
- Kentucky adults (25 years and above) hold lower educational attainments compared to the U.S., with 48% holding a high school diploma or less compared to 41% of U.S. adults.
- Significantly fewer White, non-Hispanic and slightly fewer Black, non-Hispanic adults in Kentucky have a postsecondary education compared to those groups across the U.S.
- Socioeconomic indicators vary by county across Kentucky. McCreary County has the lowest median household income in the state ($19,264), compared to the state average of $46,535 and the county with the highest median household income (Oldham County with $92,237).

OCCUPATIONAL OVERVIEW

- Kentucky engineering jobs are growing slightly faster than engineering jobs in the U.S. (28% compared to 27%).
- Central WPR and Kentuckiana LWA lead the state in terms of engineering jobs and are projected to add more over the next decade.
- Only the East WPR is projected to decline in engineering job over the next decade.
- Industrial engineers, mechanical engineers, and civil engineers account for around half of all engineering jobs in Kentucky.
- While Central WPR and Kentuckiana LWA generally support the most engineers in the state, the South WPR has a higher concentration of industrial engineers compared to other type of engineers.
- The Kentuckiana LWA has the most mechanical engineers and the Central WPR the most industrial engineers.
- The Engineering Services industry employed the most engineers in the state, although many engineers are also employed in government industries and a variety of manufacturing industries.
- Engineering Services is the top industry employing engineers in the Central WPR, Kentuckiana LWA, and West WPR.
- The State Government industry is the top industry employing engineers in the East and South WPRs, although the South WPR also holds a niche in automobile parts manufacturing industries requiring engineers.
- The Federal government (both civilian and military) industry is the top industry employing engineers in the West WPR.

JOB POSTINGS & DEMOGRAPHIC ANALYSIS

- Employers post the most for industrial engineers.
- Top job titles for industrial engineers are process engineers, quality assurance engineers, and project engineers.
- Top employers looking for industrial engineers are General Electric, BAE Systems, and Lockheed Martin.
- Industrial engineers, the largest engineering occupation in the state, has the most workers in the 45 to 54 years age band, indicating a graying out of their workforce

in the near future. Electrical engineers and architectural & engineering managers also have many workers on the verge of graying out.

PROGRAM DEMAND GAP ANALYSIS

- The Manufacturing Engineering Technology program looks to be an area of expansion at the bachelor's and graduate degree award levels. This is the case at the state-level, as well as for each region. Demand for the program is primarily driven by job openings for industrial engineers.
- Other bachelor's and graduate degree level areas of potential expansion and/or continued support across the state are General Engineering Technology, General Civil Engineering, and Industrial Engineering.
- While the Quality Control & Safety Technologies program looks to be an area of expansion in the state and in each region at the certificate and associate degree levels, it should first be carefully considered given its demand is primarily driven by an occupation not directly related to engineering or requiring high levels of postsecondary education.
- The Central WPR has a need for expanding its bachelor's and graduate degree level programs in Manufacturing Engineering.
- The East WPR has a lower need for programs training for engineering occupations across all award levels compared to the other regions in Kentucky, although it does have a niche Aerospace, Aeronautical, & Astronaut/Space Engineering program whose graduates likely find employment outside the region or state.
- The Kentuckiana LWA has unique opportunities for bachelor's and graduate degree level program expansions in General Computer Engineering.
- The South WPR produces too many certificate and associate degree level graduates in Electrical & Electronic Engineering Technologies, given the number of regional job openings for occupations related to the program.
- Job openings for industrial engineers in the South WPR are driving demand for bachelor's and graduate degree level programs in Quality Control Technology and Manufacturing Engineering Technology programs.
- The West WPR follows the state in terms of its need to expand bachelor's and graduate degree level programs in Manufacturing Engineering Technology. However, the region currently produces too many graduates in Electromechanical &

Instrumentation & Maintenance Technologies, given the number of regional job openings for occupations related to the program.

MIGRATION ANALYSIS

Profile Analytics

- According to Emsi's Profiles Analytics data, around 54% of alumni from Kentucky's engineering programs remain in Kentucky, slightly fewer compared to all majors.
- More Kentucky engineering alumni stay in the state (54%), compared to the portion of engineering alumni in the U.S. staying in their state (43%).
- Tennessee, Texas, Indiana, Ohio, and Florida are the top states where the Kentucky engineering alumni are moving.
- Kentucky's wages are fairly competitive to the states where engineering alumni are migrating, except for the wages in Texas and the wages for architectural & engineering managers.
- Cummins, Boeing, and General Electric are top out-of-state employers of Kentucky engineering alumni.
- Purdue University, the University of Cincinnati, and Indiana University Southeast are top non-Kentucky educators of Kentucky's engineers.

Consumer Insight

- According to Strada's Consumer Insight data, Kentucky STEMH bachelor's degree graduates are more likely to leave the state compared to the other award levels.
- Fewer Kentucky bachelor's degree STEM graduates would study the same major compared to graduates in the U.S.
- More Kentucky bachelor's degree STEM graduates would attend the same school compared to graduates in the U.S.
- Kentucky STEMH bachelor's degree graduates seem to not value their educations – namely in terms of the degree's cost and its ability to create an attractive candidate – as much as Kentucky alumni at different award levels and non-Kentucky alumni in general.
- Bachelor's degree STEM graduates in Kentucky, compared to the U.S., are more likely to **"strongly agree"** to recommending their educational path to other people.

- Kentucky institutions' academic advising and teaching & instruction are rated more favorably than institutions in the U.S.
- On the other hand, Kentucky institutions' extracurricular activities and courses offered are weighted more towards **"poor" and "fair"** compared to U.S. ratings.
- Kentucky bachelor's degree STEM graduates ranked the helpfulness of their courses in their career lower than those in the U.S., with "somewhat helpful" being the highest rating – 28% compared to 33%, respectively.
- With that said, Kentucky bachelor's degree STEM graduates ranked "very helpful" the highest when it comes to the helpfulness of the major in their careers. Although the ranking is lower than that in the U.S., results indicate that the majors of the graduates have an impact on their working lives.
- The top reasons Kentucky bachelor's degree STEM graduates choose a major is to: get a good job/make money, advance their careers, and advance their knowledge.
- Close location to home, reputation of the school or program, availability of specific programs, and availability of scholarships are top factors why Kentucky bachelor's degree STEM graduates choose a school.

Executive Summary

INTRODUCTION

The Council on Postsecondary Education (Council) is charged with guiding the reform efforts envisioned by state policy leaders in the Kentucky Postsecondary Education Improvement Act of 1997 and is Kentucky's statewide postsecondary and adult education coordinating agency. Its mission is to strengthen the state's workforce, economy, and quality of life. The Council does this by guiding the continuous improvement and efficient operation of a high-quality, diverse, innovative, accessible, and affordable system of postsecondary education in the commonwealth of Kentucky.

To gain better insight into economic conditions and workforce trends, specifically within three targeted sectors, the Council partnered with Emsi, a labor market analytics firm serving higher education, economic and workforce development, talent acquisition, and site selection. In this report, Emsi focuses on the Engineering sector by providing an overview of engineering occupations and industries through traditional labor market information and a job postings analysis, conducting a program demand gap analysis of Kentucky institutions' engineering program offerings, and analyzing migration patterns and other qualitative characteristics that help explain why Kentucky engineering alumni stay in or migrate out of

Figure 1: Kentucky's WPRs and the Kentuckiana LWA

Source: Regions provided by the Council.

the state. Emsi also provides an environmental scan of the state's economy to provide context for the Engineering sector.[1]

Data around the Engineering sector are provided for the state and, where pertinent, by region (Figure 1). The regions are based on Kentucky's Workforce Planning Regions (WPRs).[2] In addition, data for the city of Louisville and its surrounding counties, which comprise the Kentuckiana Local Workforce Area (LWA), are shown distinct from the Central WPR.

ENVIRONMENTAL SCAN

The environmental scan provides key information on the economic and social structure of Kentucky and its WPRs. By providing data across Kentucky as a whole, the data provide context for Engineering within the state. For example, beyond just the Engineering sector, the data:

- Reveal whether there are industries that may be overlooked as a result of recent economic growth;
- Identify the top occupations within driving industries; and
- Provide the Council a deeper understanding of state and regional population characteristics and the socioeconomic background of current and future postsecondary students.

Total Jobs

Figure 2 displays the historical and projected job change, by percent, for the state and the U.S. between 2009 and 2029, with 2009 serving as the base year. Kentucky's job declines in the years following the 2008 Recession were similar to that of the U.S. But after 2013, the state's job growth was less than that of the U.S. Using Emsi's job projections, job growth from 2009 to 2029 in Kentucky and the U.S. is expected to be 15% and 23%, respectively.

Figure 3 refers to the number of jobs by Kentucky region. The Central WPR and Kentuckiana LWA lead the state in terms of the majority of jobs and are both projected to grow slightly over the next decade. The South WPR also has a slightly upward projection of expected growth. The East WPR and the West WPR, however, appear to be regions where growth will remain fairly flat over the next decade.

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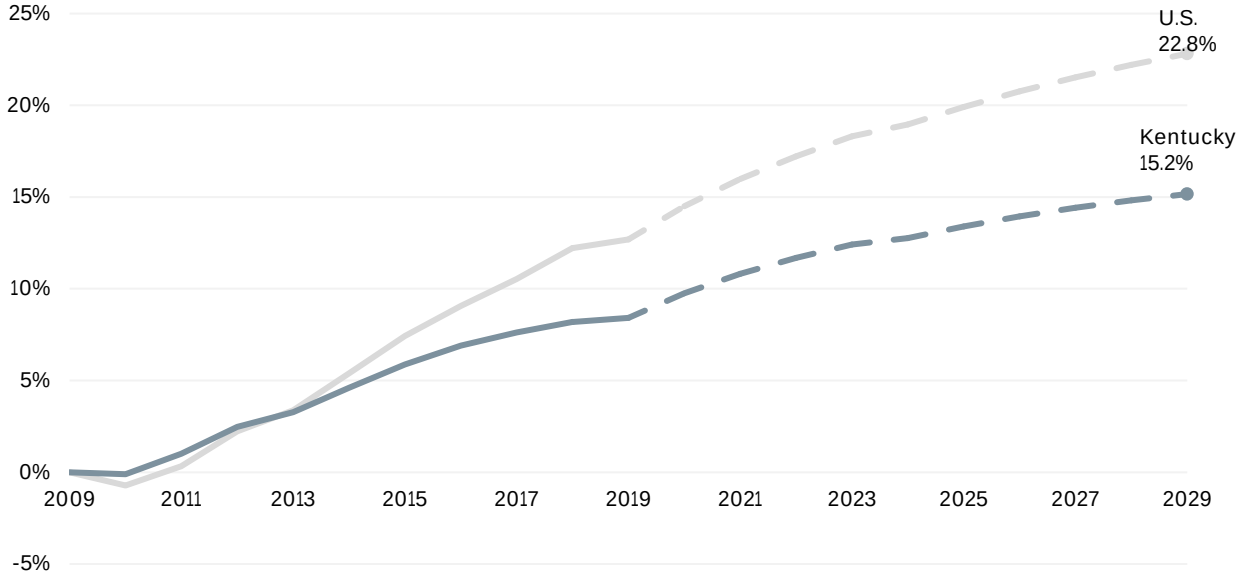
1 The environmental scan is presented first in the executive summary so as to provide context for the engineering sector, although it is purposefully presented last amongst the chapters in the main body of the report.

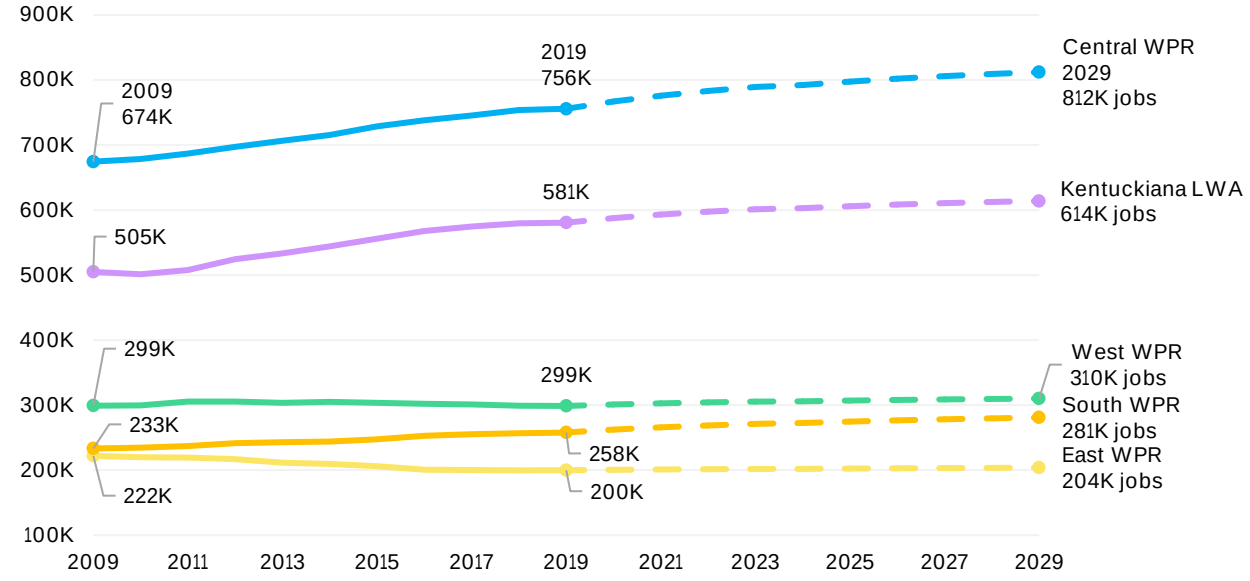
2 Source: https://kystats.ky.gov/Reports/ShowReports?ReportId=Map_LWAWIB&publishDate=20170401.

Figure 2: Percent Job Change in Kentucky and the U.S., 2009 to 2029



Source: Emsi Employees & Self-Employed 2019.4.

Figure 3: Historical and Projected Jobs in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



Source: Emsi Employees & Self-Employed 2019.4.

Industry Composition

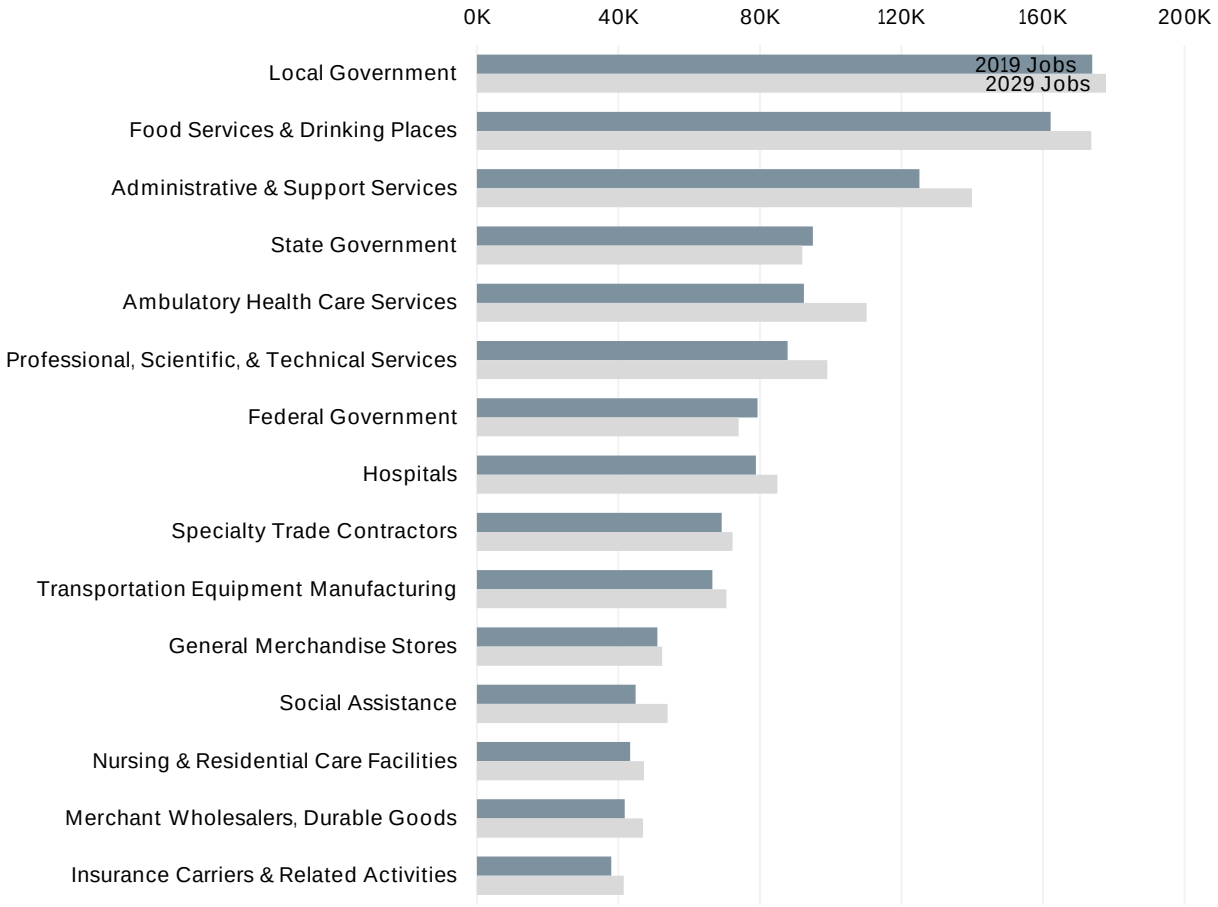
Evaluating current and future employment by the industries supporting jobs in the state provides information on its economic diversity. For the analysis in this section, Emsi has aggregated jobs by industries using the North American Industry Classification System

(NAICS). In Emsi data, all establishments in the main NAICS hierarchy (i.e. non-government industries) are private sector only.

Largest Employers

Kentucky supported 2.1 million jobs in 2019, and by 2029, the state is projected to add 131,960 new jobs, for a 6% job increase. The Local Government industry subsector supported the most jobs in Kentucky in 2019 (173,860 jobs), and it is expected to remain the top regional employer (Figure 4). The Professional, Scientific, & Technical Services industry subsector, which includes the Engineering Services industry, ranks sixth in the state in terms of jobs and is projected to grow over the next decade.

Figure 4: Jobs in Kentucky's Top 15 Industry Subsectors, 2019 and 2029



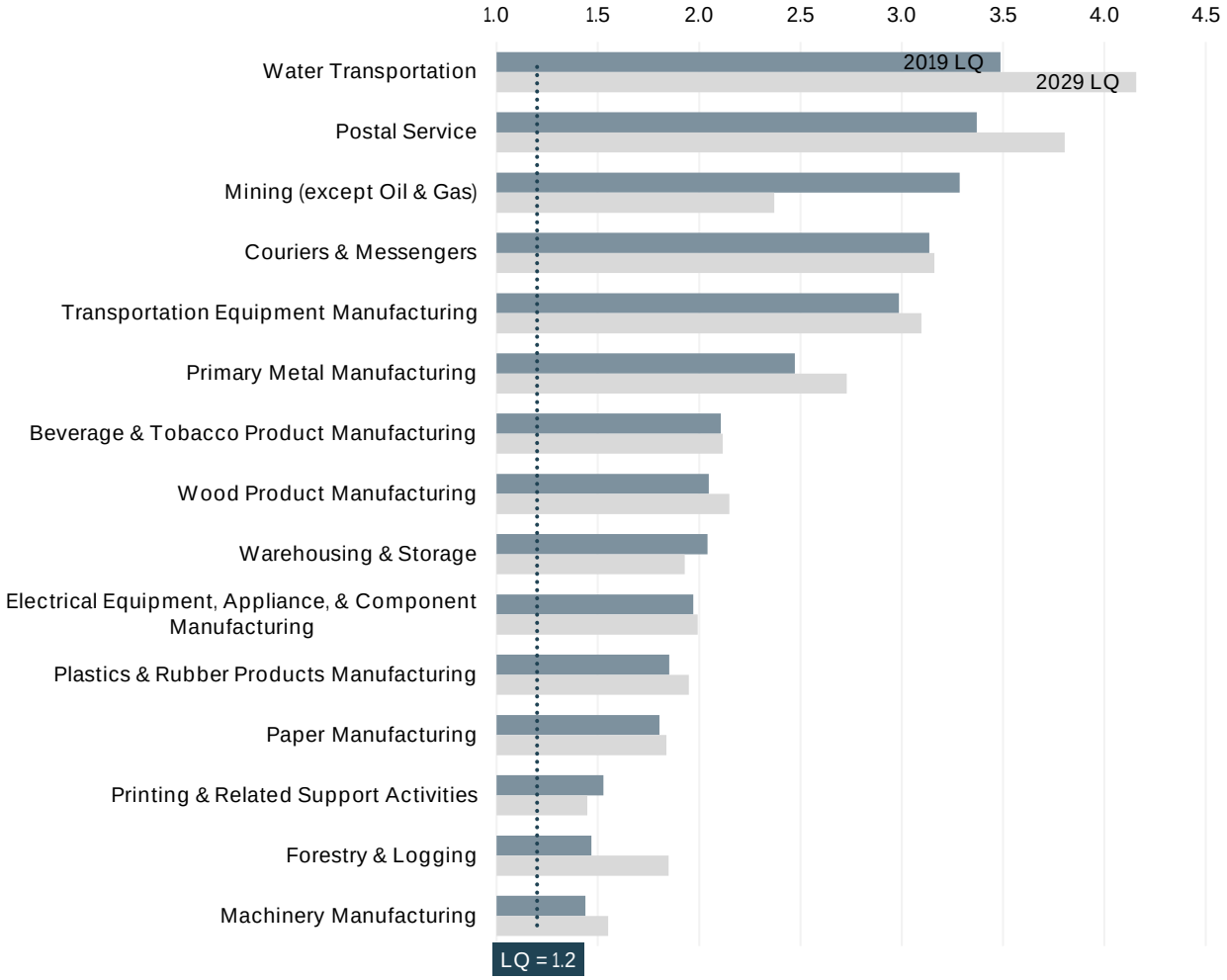
Source: Employees & Self-Employed 2019.4.

Employment Concentration

The employment concentration of the state's industry subsectors is measured by a location quotient (LQ). The top-ranked industry subsector is Water Transportation, with an LQ of 3.5 in 2019. The industry subsector with the largest percent decline in LQ is Mining (except Oil

& Gas), with a 28% decrease from an LQ of 3.3 to an LQ of 2.4. Despite the few subsectors projected to decline, all the state's top 15 industry subsectors will remain above the 1.2 high-LQ threshold, as indicated by the dotted line in Figure 5. A variety of manufacturing industry subsectors, which are large employers of engineers, appear in the figure and are expected to gain in concentration over the next decade.

Figure 5: Employment Concentrations (LQs) of Kentucky's Top 15 Industry Subsectors, 2019 and 2029



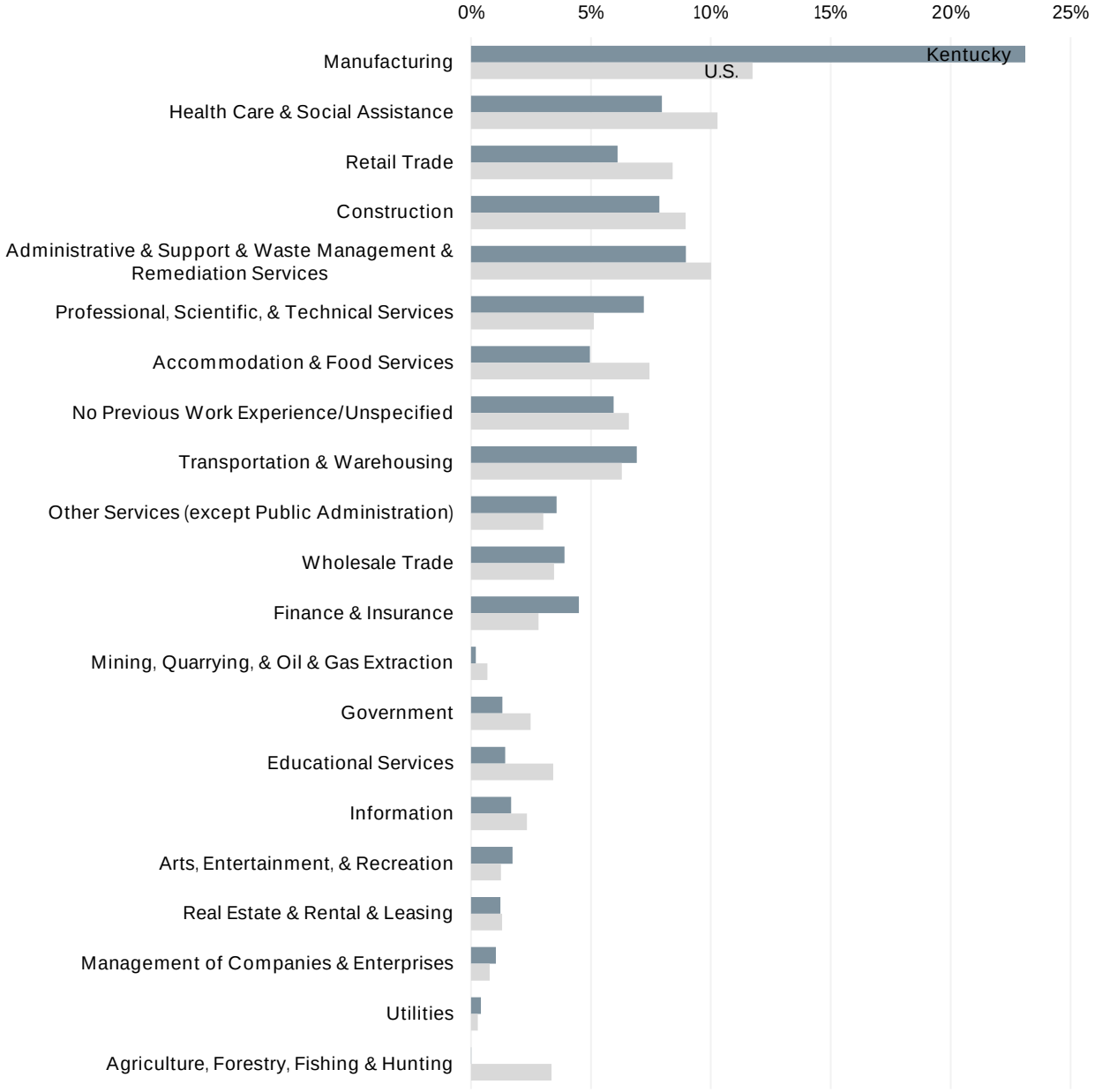
Source: Employees & Self-Employed 2019.4.

Unemployment

Emsi industry- and occupation-specific unemployment estimates are derived from several federal sources. Emsi final industry and occupation data, as well as state-specific data, are also used. Figure 6 shows the percentage of Kentucky residents unemployed in each

industry sector compared to the U.S. As shown in the figure, nine out of 21 industry sectors see higher unemployment in Kentucky compared to the U.S. The Manufacturing industry sector faces the largest unemployment in Kentucky, and at a much higher rate compared to the U.S. The Professional, Scientific, & Technical Service industry sector, which again includes the Engineering Services industry, ranks sixth in terms of unemployment and faces a higher percentage of unemployment compared to the U.S.

Figure 6: Monthly Unemployed Workers by Industry Sector in Kentucky with National Comparison

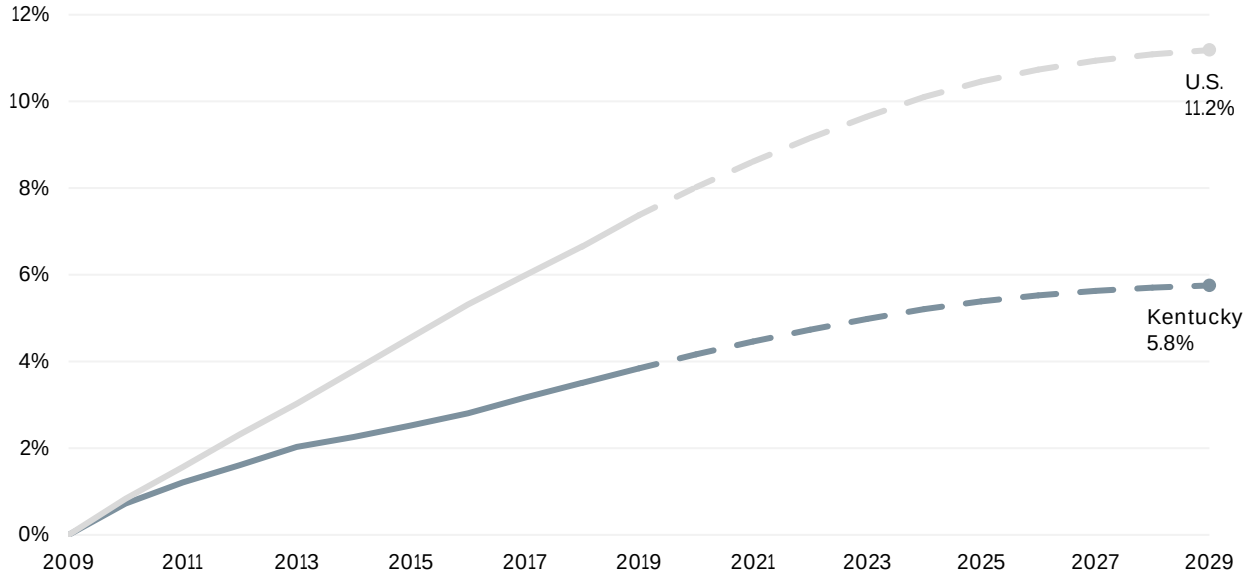


Source: Emsi Total Unemployment (July 2019).

Population Demographics

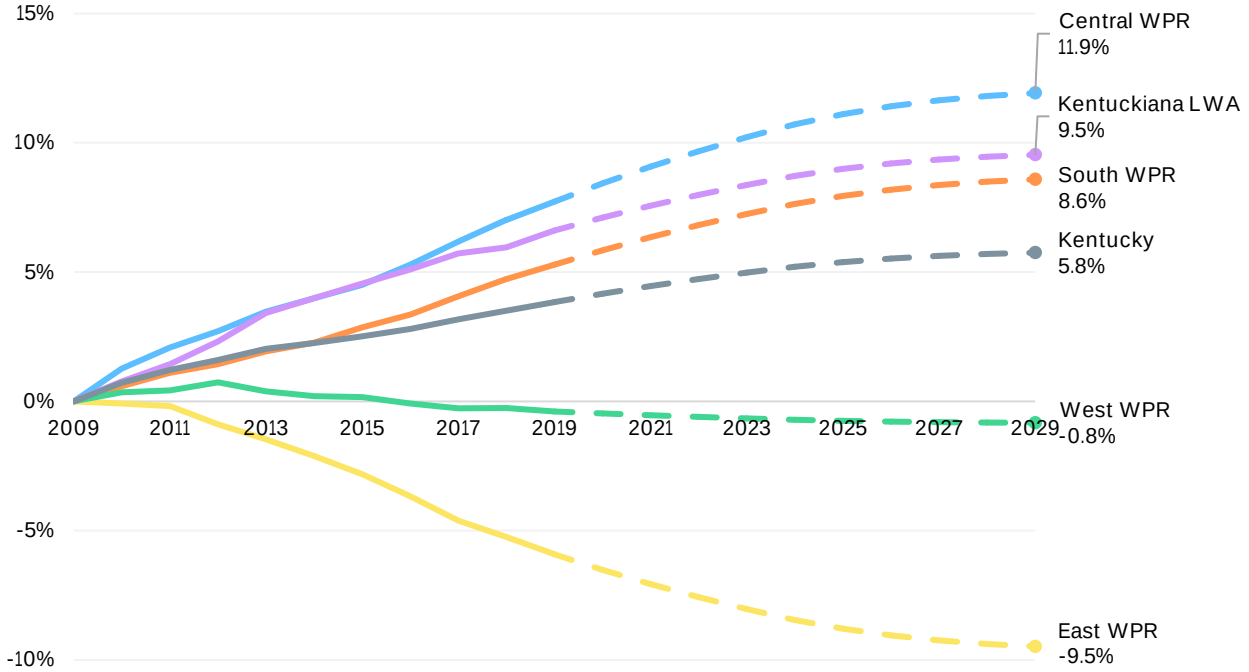
Historical and projected changes in the state population are presented in the following figures. In 2009, 4.3 million people lived in Kentucky, and 4.6 million people are projected to live in the state by 2029. Using 2009 as the base year, this reflects a 6% growth rate (Figure 7). The U.S. population is projected to increase by 11% over the same 20-year period. Figure 8 displays similar information, but for the Kentucky's WPRs and the Kentuckiana LWA. As shown, the East WPR is projected to decline quite significantly (10%) in population over the next decade. The West WPR is projected to slightly decline, while the Central and South WPRs and the Kentuckiana LWA are projected to large percentage growths.

Figure 7: Percent Population Change in Kentucky and the U.S., 2009 to 2029



Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Figure 8: Percent Population Change in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029

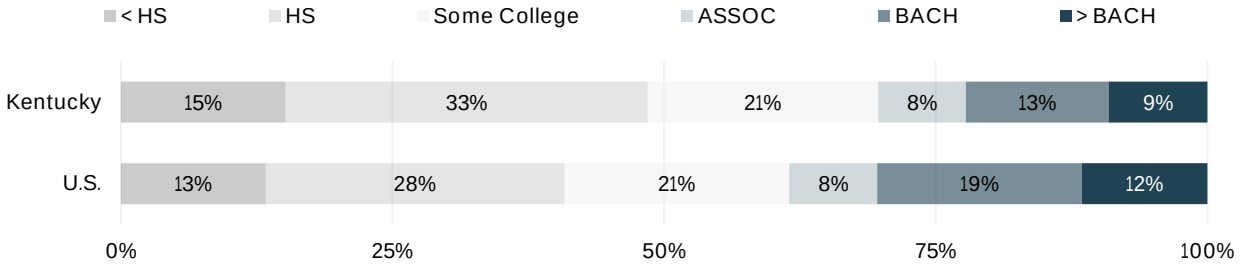


Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Educational Attainment

Educational attainment data are useful for targeting specific population groups with less than or greater than average education levels. Figure 9 displays the highest educational attainments of Kentucky's adults, without reference to gender and the major race and ethnic groups. Comparative to the U.S., Kentucky has lower educational attainments. In the state, 48% of adults have a high school diploma or less, which is more than the national average (41%). While similar percentages of the Kentucky population compared to the U.S. have some college or associate degree educational attainments (21% and 8%, respectively), six percent fewer Kentucky adults hold a bachelor's degree.

Figure 9: Highest Educational Attainments of Adults in Kentucky and the U.S.



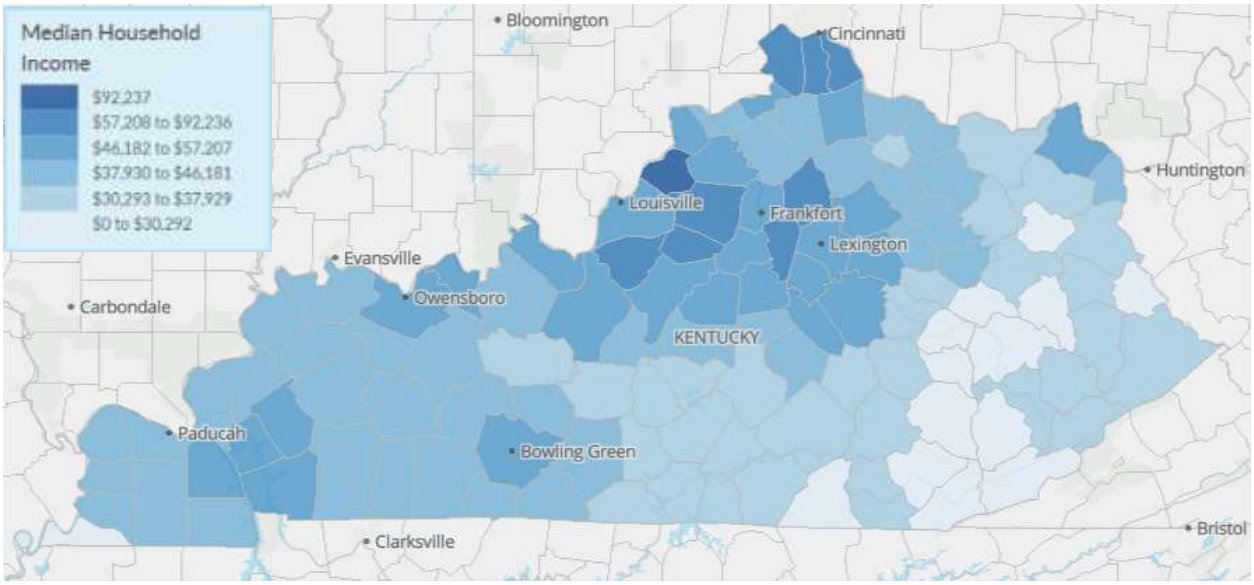
Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

Fifty-one percent of adults in the White, non-Hispanic group, the largest population group in Kentucky, have a postsecondary education, compared to 64% of these adults across the U.S. Another 51% of adults in the Black, non-Hispanic category, the second largest population group in Kentucky, show some level of attainment, which is somewhat less than the U.S. (53%). Across all groups, these data suggest that there are many opportunities to increase the educational attainments of the state's adults.

Socioeconomic Indicators

The data in this section show several of the region's socioeconomic indicators. The percentages of per capita income represent the share of people below the federal poverty income threshold, which varies by family size and composition. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. Detailed rates on children, who are under 18 years, and seniors, who are over 65 years, are also shown.

Figure 10: Median Household Incomes of Counties in Kentucky



Source: Emsi demographics data, U.S. Census Bureau.

Figure 10 visualizes the median household income across each county in Kentucky. It highlights the counties' socioeconomic differences, with the East WPR facing some of the lowest household incomes. Table 1 displays the counties with the top five highest and lowest median household incomes, along with per capita income and poverty. For perspective, the median household income of Kentucky is $46,535. McCreary County, which sees the lowest median household income at $19,264, also has considerably higher poverty rates compared to the state.

Table 1: Income, Unemployment, and Poverty Characteristics for Kentucky Counties with the Top 5 Highest and Lowest Median Household Incomes

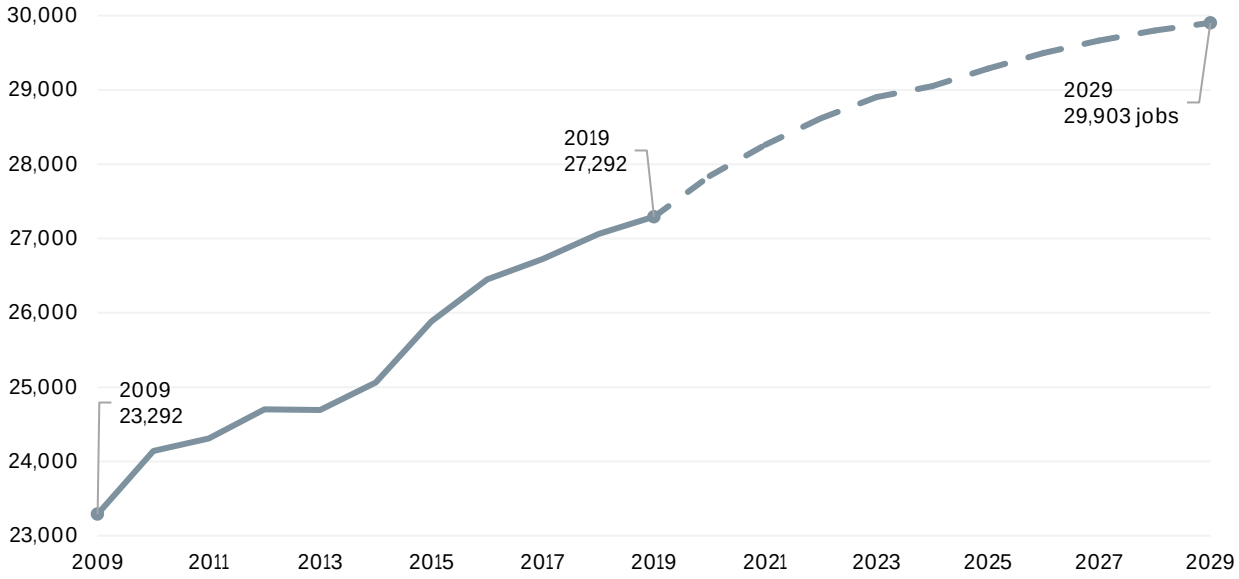
	TOP 5 HIGHEST MEDIAN HOUSEHOLD INCOMES			% POVERTY		
COUNTY	MEDIAN HOUSEHOLD INCOME	PERCENTILE RANK IN KY	PER CAPITA INCOME	FAMILIES	CHILDREN	SENIORS
Oldham	$92,237	100%	$38,063	4.0%	7.2%	3.7%
Boone	$72,731	99%	$33,553	6.0%	10.6%	5.2%
Spencer	$68,916	98%	$30,779	7.3%	8.3%	9.6%
Scott	$65,598	97%	$30,702	8.6%	16.1%	7.1%
Shelby	$63,171	97%	$30,240	8.4%	17.1%	7.2%
	TOP 5 LOWEST MEDIAN HOUSEHOLD INCOMES			% POVERTY		
McCreary	$19,264	0%	$11,492	36.7%	49.5%	3.7%
Wolfe	$21,999	1%	$13,533	33.0%	45.3%	19.3%
Owsley	$22,736	2%	$16,582	31.4%	34.9%	31.7%
Lee	$23,297	3%	$16,489	30.4%	43.8%	22.1%
Bell	$23,558	3%	$14,754	31.9%	49.3%	20.9%
Kentucky	$46,535	--	$25,888	13.8%	24.7%	11.1%

Source: American Community Survey five-year estimates from the U.S. Census Bureau data API.

OCCUPATIONAL OVERVIEW

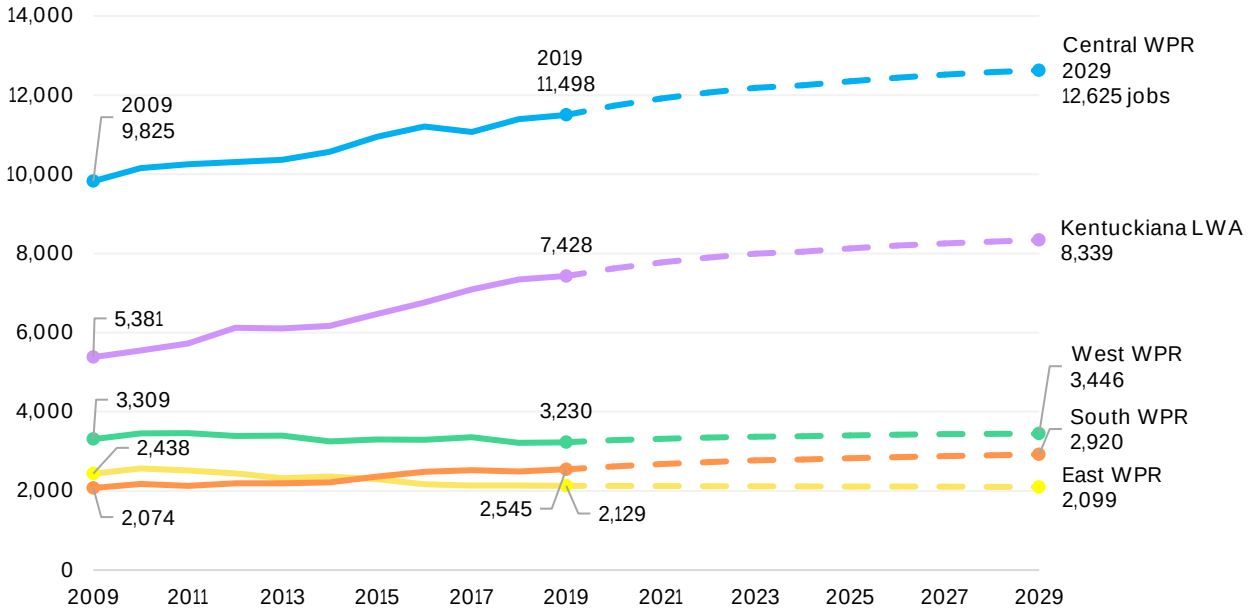
Job counts and the changes in jobs over time provide insight into Kentucky as an attractive region for engineers and companies looking to hire engineers. Figure 12 shows statewide jobs for engineers from 2009 to 2029. As shown, Kentucky supported around 23,290 engineering jobs in 2009. By 2019, that number increased to around 27,290 jobs, for a 17% job growth. For context, the job growth for engineers in the U.S. between 2009 and 2019 was 16%. As shown in Figure 13, the Central WPR supported the state's largest share of engineers, with the Kentuckiana WPR following in second. By 2029, the state is projected to add around another 2,610 engineering jobs, for a 10% 10-year job growth. At a regional level, the Kentuckiana LWA and South WPR are projected to add more engineering jobs over the next decade relative to the state, whereas the East WPR is the only region projected to decline in engineering jobs.

Figure 12: Historical and Projected Jobs for Engineers in Kentucky, 2009 to 2029



Source: Emsi Employees & Self-Employed 2019.4.

Figure 13: Historical and Projected Jobs for Engineers in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029

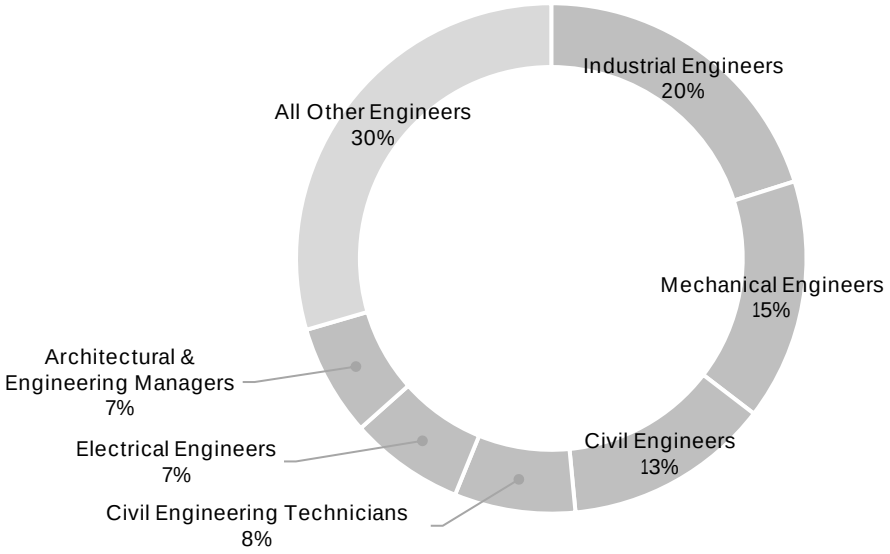


Source: Emsi Employees & Self-Employed 2019.4.

Across all engineers, the state supported the most jobs for industrial engineers (5,490 jobs in 2019), followed by mechanical engineers (4,173 jobs in 2019) and civil engineers (3,571 jobs in 2019). These three occupations, alone, accounted for about half of all engineers in Kentucky (Figure 14). Figure 15 provides a regional breakdown of 2019 jobs for the

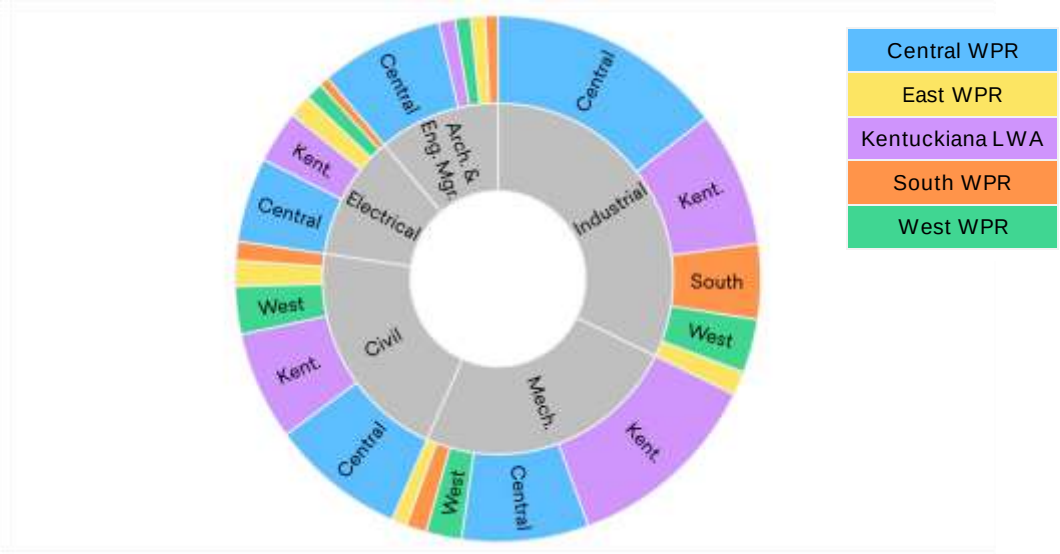
architectural & engineering managers occupation and civil, electrical, industrial, and mechanical engineer occupations. Data show that the Central WPR and the Kentuckiana LWA supported the state's largest share of engineers, across all the types of engineers. However, there appears to be more jobs for industrial engineer occupations in the South WPR, compared to the region's employment trends within the engineering occupations and across all five regions.

Figure 14: Kentucky's Top Engineer Occupations by 2019 Jobs



Source: Employees & Self-Employed 2019.4.

Figure 15: Breakdown of 2019 Jobs for a Selection of Kentucky's Engineer Occupations by the WPRs and the Kentuckiana LWA

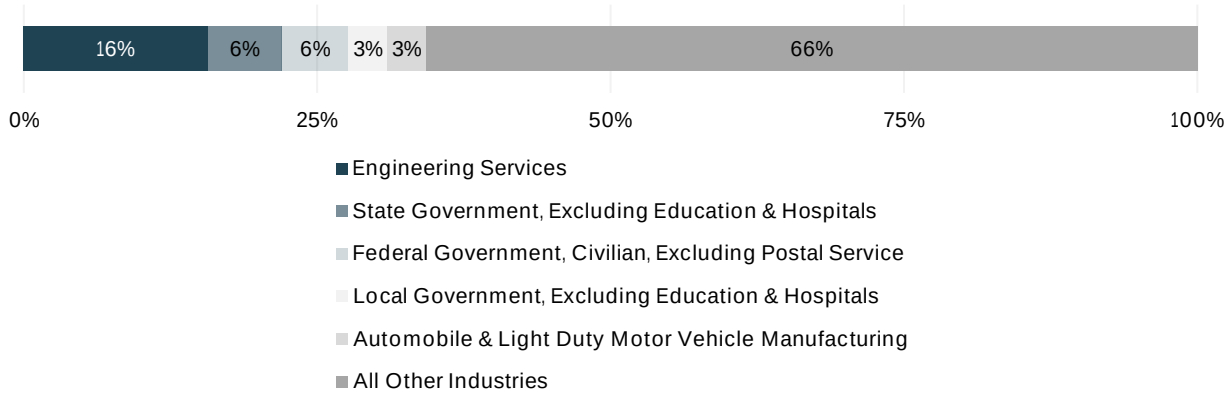


Source: Employees & Self-Employed 2019.4.

With the engineering occupations in mind, we can now turn to engineering industries. Engineers appear in a variety of industries; in other words, while there is an Engineering Services industry, engineers also work in other industries such as in manufacturing or even government-owned agencies.

As seen in Figure 16, the Engineering Services industry employed around 4,286 engineers in 2019, or around 16% of all engineers. Engineers are also employed in government (local, state, and federal) and a wide variety of manufacturing industries. Civil engineers and technicians, mechanical engineers, and electrical engineers are the top occupations within the Engineering Services industry.

Figure 16: Top Five Industries in Kentucky that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

By region, Engineering Services is the top industry employing engineers in the Central WPR, Kentuckiana LWA, and West WPR, whereas the State Government industry employs the most engineers in the East and South WPRs. The Federal Government (both civilian and military) employ many engineers in the West WPR. The South WPR seems to have a niche in a couple automobile parts manufacturing industries requiring engineers.

JOB POSTINGS & DEMOGRAPHIC ANALYSIS

Job postings are online advertisements for jobs, posted by companies trying to attract applicants. Analyzing job postings for information on the labor market can yield valuable insight, such as the companies that are posting jobs, where those jobs are located, and greater specificity in job titles. In addition, job postings have virtually no lag time, as they can be collected from sites soon after being posted.

The job posting analysis reflects five of Kentucky's top engineering occupations – civil engineers, electrical engineers, industrial engineers, and mechanical engineers. It represents

job postings in Kentucky from September 2016 to September 2019. Industrial engineers are the most in-demand by Kentucky employers, particularly in the Central WPR and Kentuckiana LWA. Examples of top industrial engineer job titles are process engineers, quality assurance engineers, and project engineers. Top employers looking for industrial engineers are General Electric, BAE Systems, and Lockheed Martin.

Also included for the five engineering occupations is demographic information by occupation – age, race/ethnicity, gender, and educational attainment. In terms of demographics, civil engineers are the youngest, with the highest number of workers in the 25 to 34 years age band. Mechanical engineers are fairly evenly split across the three age bands encompassing age 25 to 54 years. The other three occupations – especially industrial engineers – have the most workers in the 45 to 54 years age band, indicating a graying out of their workforce in the near future. Workers in the engineering occupations are predominantly male. Industrial engineers have the most gender diversity, with 19% of workers female.

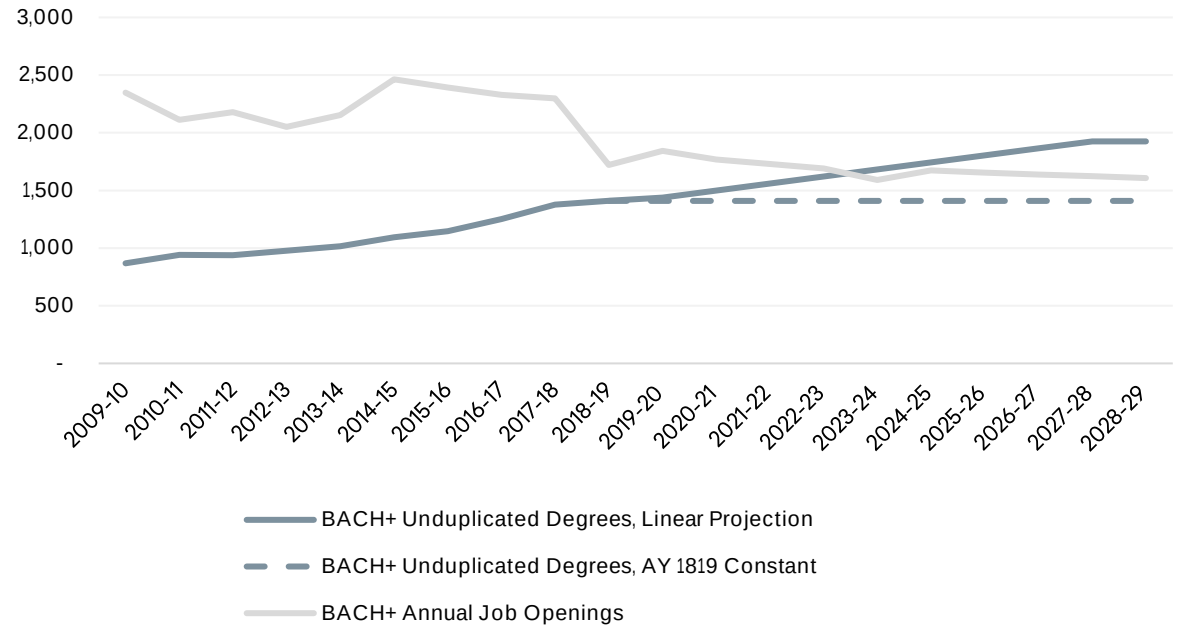
PROGRAM DEMAND GAP ANALYSIS

Knowing now how engineers are employed in the state and its regions, the program demand gap analysis offers a better understanding of the connection between engineering jobs and educational institutions, answering the following question:

> *Where are there misalignments between the workforce demand and the supply of college and university completers?*

Before we get into the detailed analysis, Figure 17 provides a high-level view across Kentucky's bachelor's degree and above (BACH+) historical and projected unduplicated degrees and annual job openings. Future Engineering BACH+ unduplicated degrees were projected using two different methods. Regardless of how they are projected, there will be a gap until at least 2023. If degrees are completed at the average pace from the past 10 years, then degree completion will never match demand.

Figure 17: High-Level Overview of Kentucky's Engineering BACH+ Historical and Projected Degrees and Annual Job Openings



Source: Emsi's Employees & Self-Employed 2019.4 and http://cpe.ky.gov/data/degrees.html.

This section outlines at a more detailed level the deficit of Kentucky's program completions to the workforce (gap), as well as the oversupply of completions to the workforce (surplus). Results are provided for the state and each region by combined award level and for each award level.[3]

Kentucky

Table 2 provides program recommendations based on combining Kentucky's engineering programs into two categories – certificate and associate degree combined (CERT+) and bachelor's, master's, and doctoral degrees combined (BACH+). In the table, a subset of the programs appears in four quadrants based on specific action items. Note that this categorization of the programs into the quadrants is designed to initiate conversations

3 Results at the individual award levels consider demand at that award level and one below. This is to consider that those with a bachelor's degree, for example, can still compete for the same occupation against those with a master's degree. However, for the combined award level analyses, we only consider the demand at the respective award level so as to not duplicate demand when summing across the award levels.

around the programs. Figure 18 provides support for the BACH+ program recommendations by displaying the BACH+ programs with a gap.

As seen in the table, the Manufacturing Engineering Technology/Technician (BACH+) and Quality Control & Safety Technologies/Technicians, Other (CERT+) programs look to be areas of expansion. Both of these programs are discussed in more detail below. A combination of BACH+ and CERT+ programs, such as Civil Engineering, General and Industrial Engineering, appear to be performing well in terms of high levels of demand and supply. The institutions should maintain focus on the success of these programs. A number of programs – such as Quality Control Technology/Technician (BACH+) and Mining Technology/Technician (CERT+) should be reconsidered for discontinuation or consolidation based on the labor market perspective.

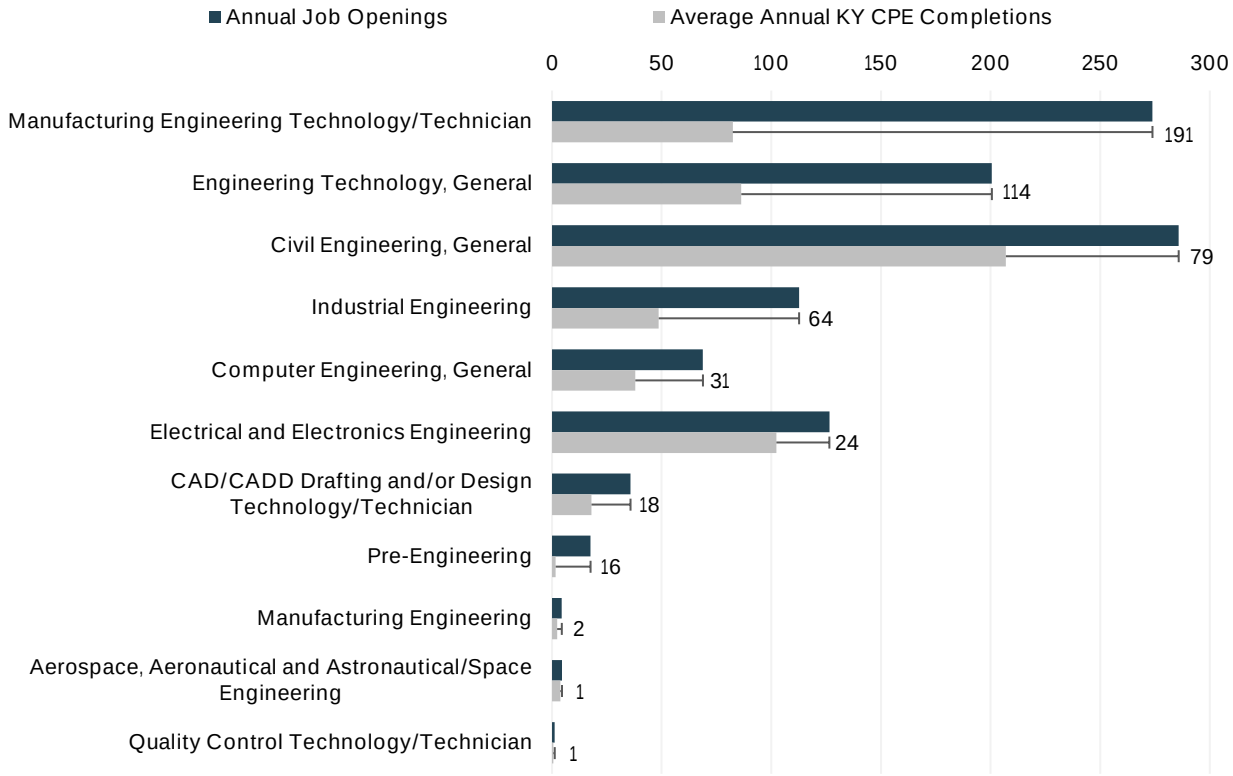
Table 2: Kentucky Program Recommendations

HIGH DEMAND, LOW SUPPLY	HIGH DEMAND, HIGH SUPPLY
How can we expand these program opportunities?	*How can we maintain focus on program quality & student success?*
Manufacturing Engineering Technology (BACH+)	Civil Engineering (BACH+)
Quality Control & Safety (CERT+)	Drafting & Design (CERT+)
Engineering Technology (BACH+)	Electrical & Electronics Engineering (BACH+)
	Industrial Engineering (BACH+)
	Manufacturing Engineering Technology (CERT+)
LOW DEMAND, LOW SUPPLY	**LOW DEMAND, HIGH SUPPLY**
Should we discontinue these programs?	*Can we consolidate or reduce enrollment in these programs?*
Electrical, Electronic & Communications Engineering (CERT+)	Chemical Engineering (BACH+)
Plastics & Polymer Engineering (CERT+)	Electrical & Electronic Engineering (CERT+)
Mechatronics, Robotics, & Automation Engineering (CERT+)	Mining Technology (CERT+)
Quality Control (BACH+)	Electromechanical & Instrumentation (CERT+)
Computer Engineering Technology (BACH+)	Mechanical Engineering (BACH+)
Drafting/Design Engineering (BACH+)	

Source: Emsi program demand gap model.

When looking at each individual award level, there is a large gap between job openings for the Quality Control & Safety Technologies/Technicians, Other program and program completions at the certificate and associate degree levels. Results indicate a need for a statewide program expansion. However, the program gap is largely driven by the number of job openings for the inspectors, testers, sorters, samplers, & weighers occupation, an occupation not directly related to engineering. Moreover, a certificate level of education seems appropriate for the occupation, but an associate degree may over qualify a program completer for such an occupation. On the other hand, there is a large surplus between program completers in the certificate and associate degree level Electrical & Electronic Engineering Technologies/Technicians, Other program and statewide job openings. With only one mapped occupation, electrical & electronics engineering technicians, the programs' demand is very limited, considering Kentucky's labor market. Perhaps students are finding successful employment after program completion, but it appears as though they are not all finding jobs in the electrical & electronics engineering technician occupation. A review of the programs' alumni job outcomes is recommended for the benefit of current students in the programs.

Figure 18: Kentucky's BACH+ Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

The state's largest bachelor's degree level gap is in the Manufacturing Engineering Technology/Technician program, primarily driven by the high labor market demand for the industrial engineer occupation. It is recommended that the institutions' Manufacturing Engineering Technology/Technician programs undergo expansions and that students in Kentucky's Mechanical Engineering and Chemical Engineering programs (which have relatively large surpluses) view employment in the industrial engineer occupation as career opportunities.

Large numbers of statewide job openings for the industrial engineer and civil engineer occupations are driving the gaps for graduate degree level programs. At the master's degree level, the largest gap is in the Engineering Technology, General program, which maps to more than a dozen different types of engineers. However, job openings for the industrial engineer and civil engineer occupations together account for about half of the program's total number of job openings. As such, Kentucky's institutions should be educating and training master's degree level students for employment opportunities in industrial manufacturing. The largest doctoral degree level gap is in the Civil Engineering, General program, but results indicate that no further program development is required at this time.

Central Workforce Planning Region

Table 3 provides CERT+ and BACH+ program recommendations for the Central WPR, and Figure 19 displays the top 10 BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician program (BACH+) is an area to consider for expansion, whereas the Civil Engineering, General and Computer Engineering, General programs (both BACH+) should maintain their success. Several programs appear in the lower quadrants, such as the Energy Management & Systems Technology/Technician (CERT+) and Bioengineering & Biomedical Engineering (BACH+) programs, indicating they should be carefully considered for continuation and/or for consolidation.

At the individual award levels, in the Central WPR, the Kentucky Community and Technical College System (KCTCS) plays an important role by providing the region with certificate and associate degree level programs of study. Across both award levels, the largest programs, in terms of completions, are from two programs, both at the certificate level: Electrical & Electronic Engineering Technologies/Technicians, Other and Manufacturing Engineering Technology/Technician. However, the greatest engineering employment opportunities in the Central WPR for the two award levels are for the inspectors, testers, sorters, samplers, & weighers occupation, trained for by the Quality Control Technology/Technician program but, as discussed above, not directly related to engineering.

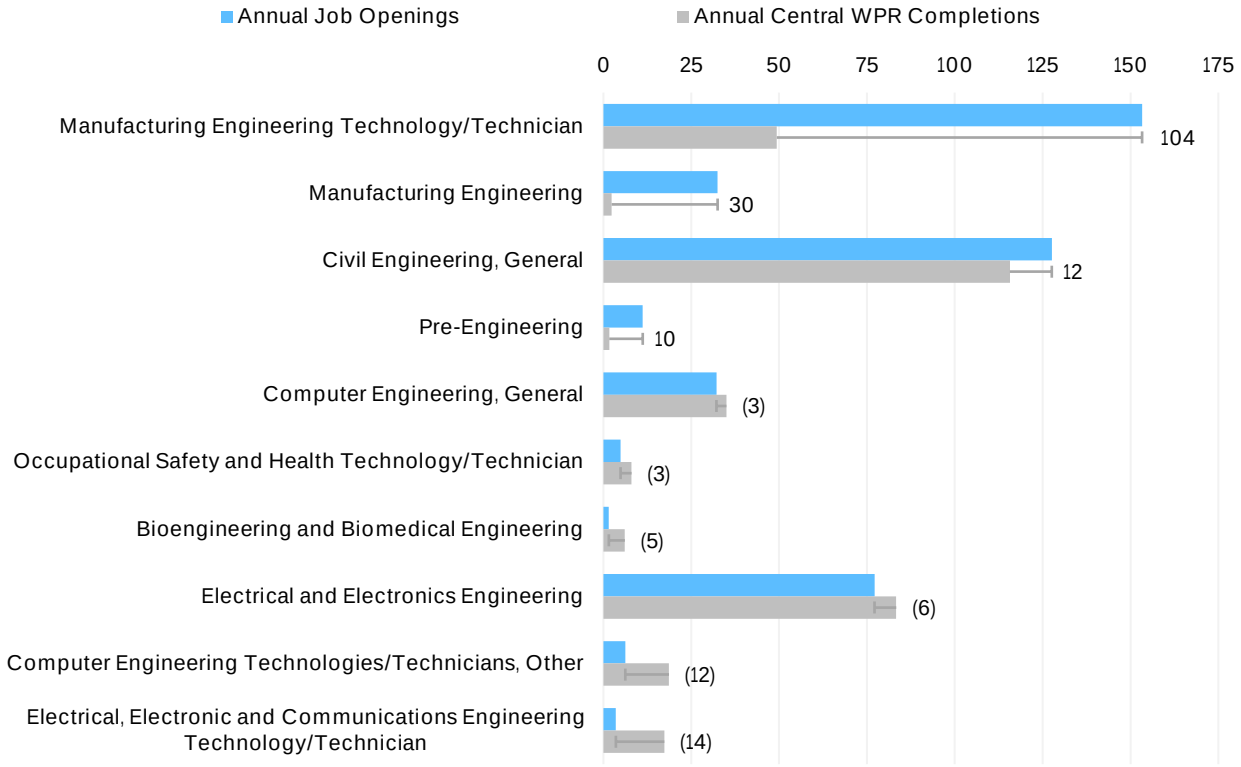
Table 3: Central WPR Program Recommendations

HIGH DEMAND, LOW SUPPLY	HIGH DEMAND, HIGH SUPPLY
How can we expand these program opportunities?	*How can we maintain focus on program quality & student success?*
Manufacturing Engineering (BACH+)	Civil Engineering (BACH+)
Quality Control (CERT+)	Computer Engineering (BACH+)
	Manufacturing Engineering Technology (BACH+)
LOW DEMAND, LOW SUPPLY	**LOW DEMAND, HIGH SUPPLY**
Should we discontinue these programs?	*Can we consolidate or reduce enrollment in these programs?*
Bioengineering & Biomedical Engineering (BACH+)	Chemical Engineering (BACH+)
Engineering, Other (CERT+)	Drafting & Design (CERT+)
Environmental Engineering (CERT+)	Electrical & Electronics Engineering (CERT+, BACH+)
Mechatronics, Robotics, & Automation Engineering (CERT+)	Energy Management & Systems (CERT+)
Occupational Safety & Health (BACH+)	Industrial Safety (BACH+)
Surveying (CERT+)	Mechanical Engineering (BACH+)
	Manufacturing Engineering Technology (CERT+)

Source: Emsi program demand gap model.

The region's high demand for the industrial engineer occupation explains the large gap of Northern Kentucky University and Association of Independent Kentucky Colleges & Universities (AIKCU) bachelor's degree level Manufacturing Engineering Technology/Technician programs, as well as the large gap of University of Kentucky's master's degree level Manufacturing Engineering program. The region's doctoral degree level engineering programs are only offered by the University of Kentucky. At the individual award level, it looks like the university could increase its enrollment in and completions for the Civil Engineering, General; Electrical & Electronics Engineering; and Mechanical Engineering programs. However, when looking across BACH+, only Civil Engineering, General has a gap, meaning the university should carefully consider which award level it offers the programs.

Figure 19: Top 10 Gaps and Surpluses for the Central WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

East Workforce Planning Region

Table 4 provides CERT+ and BACH+ program recommendations for the East WPR, and Figure 20 displays the BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician (BACH+) program is an area to consider for expansion, and no programs appear in the top right quadrant around both high demand and high supply. More programs appear in the lower quadrants, such as the Plastics & Polymer Engineering Technology/Technician (CERT+) and Engineering Technology, General (BACH+) programs, indicating they should be carefully considered for continuation and/or for consolidation. Given low engineering employment opportunities in the East WPR, program completers may be leaving the region or even the state to work in engineering occupations.

At the individual award levels, the KCTCS again plays an important role in Kentucky's East WPR region by providing almost all the engineering programs' certificate and associate degree level program completions. The largest programs, in terms of completions at both award levels, are from the certificate level Drafting & Design Technology/Technician,

Table 4: East WPR Program Recommendations

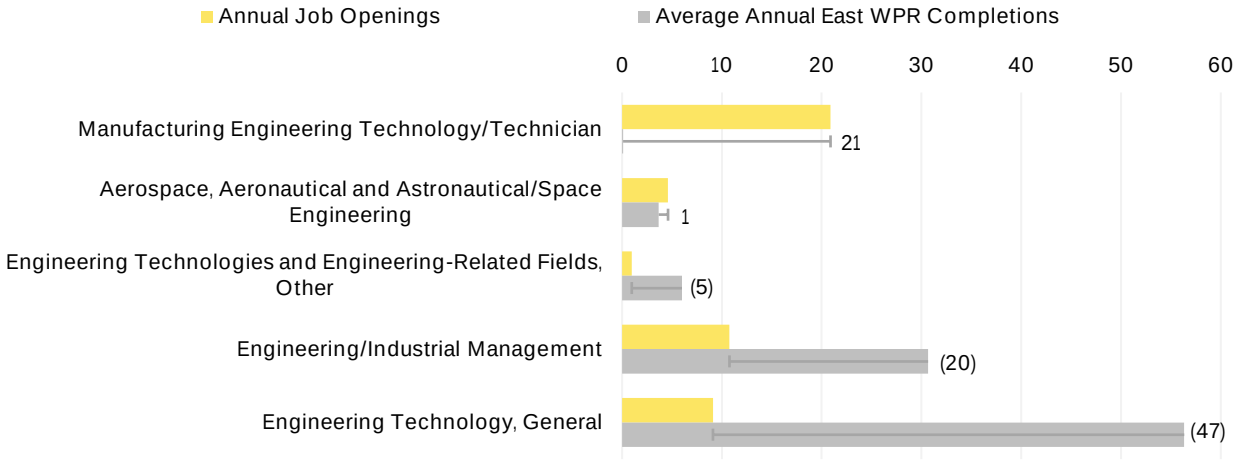
HIGH DEMAND, LOW SUPPLY	HIGH DEMAND, HIGH SUPPLY
How can we expand these program opportunities? Manufacturing Engineering Technology (BACH+) Quality Control & Safety (CERT+)	*How can we maintain focus on program quality & student success?*
LOW DEMAND, LOW SUPPLY	**LOW DEMAND, HIGH SUPPLY**
Should we discontinue these programs? Aerospace, Aeronautical & Astronautical/Space Engineering (BACH+) Plastics & Polymer Engineering (CERT+)	*Can we consolidate or reduce enrollment in these programs?* Drafting & Design (CERT+) Electrical & Electronic Engineering (CERT+) Engineering Technology (BACH+) Engineering/Industrial Management (BACH+)

Source: Emsi program demand gap model.

General program and the Electrical & Electronic Engineering Technologies/Technicians, Other program. However, similar to the Central WPR, the greatest employment opportunities for the two award levels are for the inspectors, testers, sorters, samplers, & weighers occupation.

There are relatively fewer employment opportunities for engineers in the East WPR at the bachelor's and master's degree levels (Figure 20), compared to Kentucky's other regions, but the programs offered by Morehead State University appear to be filling the region's projected labor market demand. Only the Manufacturing Engineering Technology/Technician program faces a somewhat large gap, primarily driven by industrial and mechanical engineer occupations. The university's Aerospace, Aeronautical & Astronautical/Space Engineering program is unique among all the state's engineering programs. There is relatively low demand in the region, but considering it is a fairly niche program, completers could be finding employment in other areas of Kentucky.

Figure 20: Gaps and Surpluses for the East WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

Kentuckiana Local Workforce Area

Table 5 provides CERT+ and BACH+ program recommendations for the Kentuckiana LWA, and Figure 21 displays the BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician (BACH+) program is an area to consider for expansion, whereas the Civil Engineering and Computer Engineering (both BACH+) programs should maintain their success. Several programs appear in the lower quadrants, such as the Energy Management & Systems (CERT+) and Bioengineering & Biomedical Engineering (BACH+) programs, indicating they should be carefully considered for continuation and/or for consolidation.

In terms of individual award levels, at the certificate level, results show a need for more completers from the region's drafting programs, and less of a demand for students seeking employment in the electrical & electronics engineering technician occupation. Kentucky's AIKCU institutions provide the Kentuckiana LWA with the majority of the region's associate degree level engineering completers. No further program developments are recommended at this time for the associate degree award level.

The region's high demand for industrial engineer and civil engineer occupations explains the large gaps of University of Louisville's bachelor's degree level Industrial Engineering and Civil Engineering, General programs. AIKCU institutions' Computer Engineering, General programs also see high levels of demand. However, there are less than five annual completions from the AIKCU institutions' programs. A program expansion may be warranted, seeing that the University of Kentucky is the only other institution in the state with completions in the program at the bachelor's degree level (35 annual completions). The

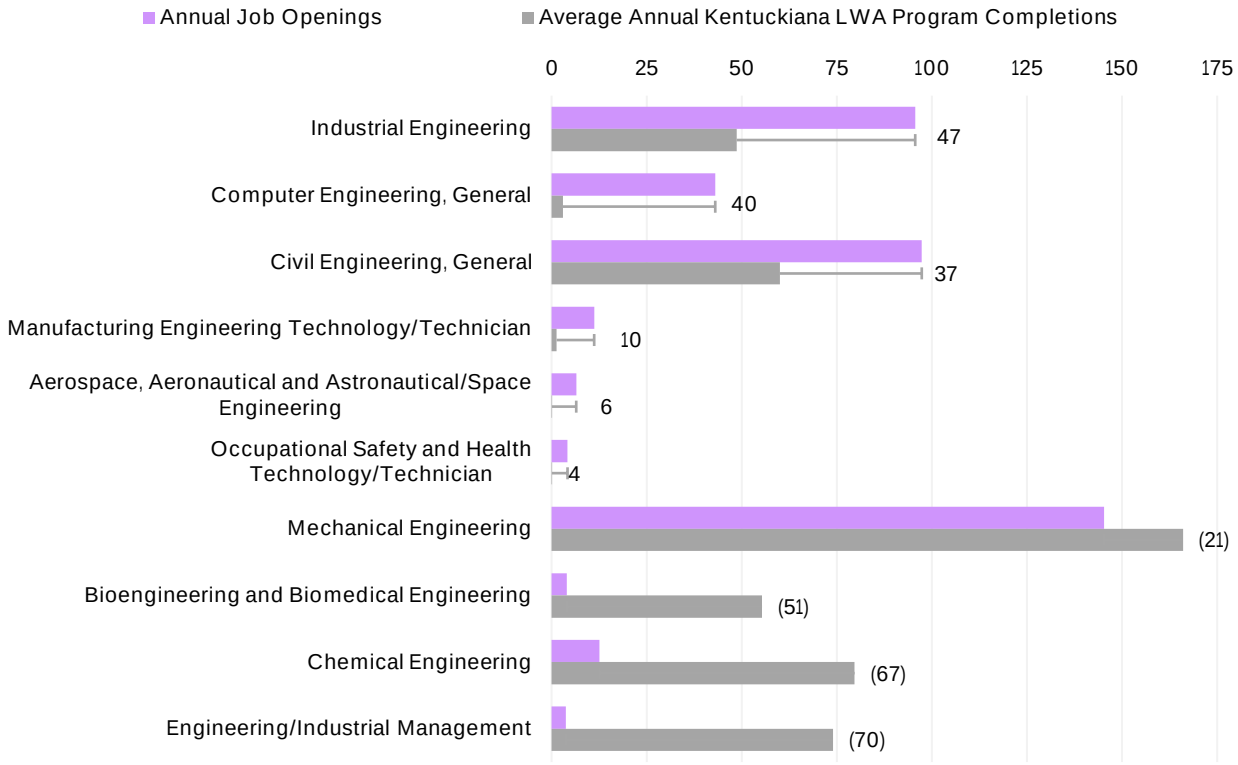
Table 5: Kentuckiana LWA Program Recommendations

HIGH DEMAND, LOW SUPPLY	HIGH DEMAND, HIGH SUPPLY
How can we expand these program opportunities?	*How can we maintain focus on program quality & student success?*
Computer Engineering (BACH+) Drafting & Design (CERT+)	Architectural Drafting & CAD/CADD (CERT+) Industrial Engineering (BACH+) Manufacturing Engineering Technology (CERT+) Mechanical Engineering (BACH+)
LOW DEMAND, LOW SUPPLY	**LOW DEMAND, HIGH SUPPLY**
Should we discontinue these programs?	*Can we consolidate or reduce enrollment in these programs?*
Aerospace, Aeronautical & Astronautical/Space Engineering (BACH+) Electromechanical Engineering (CERT+) Occupational Safety & Health (BACH+)	Bioengineering & Biomedical Engineering (BACH+) Chemical Engineering (BACH+) Electrical & Electronic Engineering (CERT+) Engineering/Industrial Management (BACH+) Occupational Safety & Health (CERT+)

Source: Emsi program demand gap model.

Kentuckiana LWA supports about 2,000 jobs for the mechanical engineer occupation. There is a gap for the program at the master's degree level, so a master's degree level expansion of University of Louisville's program could be beneficial to mechanical engineers seeking additional skills and technical training. However, the university should also carefully consider its Mechanical Engineering program offerings at the bachelor's and doctoral levels considering there is a surplus for the program when considering the BACH+ award level.

Figure 21: Gaps and Surpluses for the Kentuckiana LWA's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

South Workforce Planning Region

Table 6 provides CERT+ and BACH+ program recommendations for the South WPR, and Figure 22 displays the BACH+ gaps and surpluses. Only the Drafting & Design Technology/Technician, General (CERT+) program is recommended for expansion, although it would only need to be a slight expansion to fill the demand of five annual openings. The Manufacturing Engineering Technology/Technician (BACH+) program should maintain its success. More programs appear in the lower quadrants than in the upper quadrants, such as the Electrical & Electronic Engineering Technologies/Technicians, Other (CERT+) and Engineering, Other (BACH+) programs, indicating they should be carefully considered for continuation and/or for consolidation.

At the individual award level, between the South WPR's certificate and associate degree award levels, the largest program by far is the Electrical & Electronic Engineering Technologies/Technicians, Other program, with almost 160 average annual completions. However, the region does not have a comparable number of job openings for electrical &

Table 6: South WPR Program Recommendations

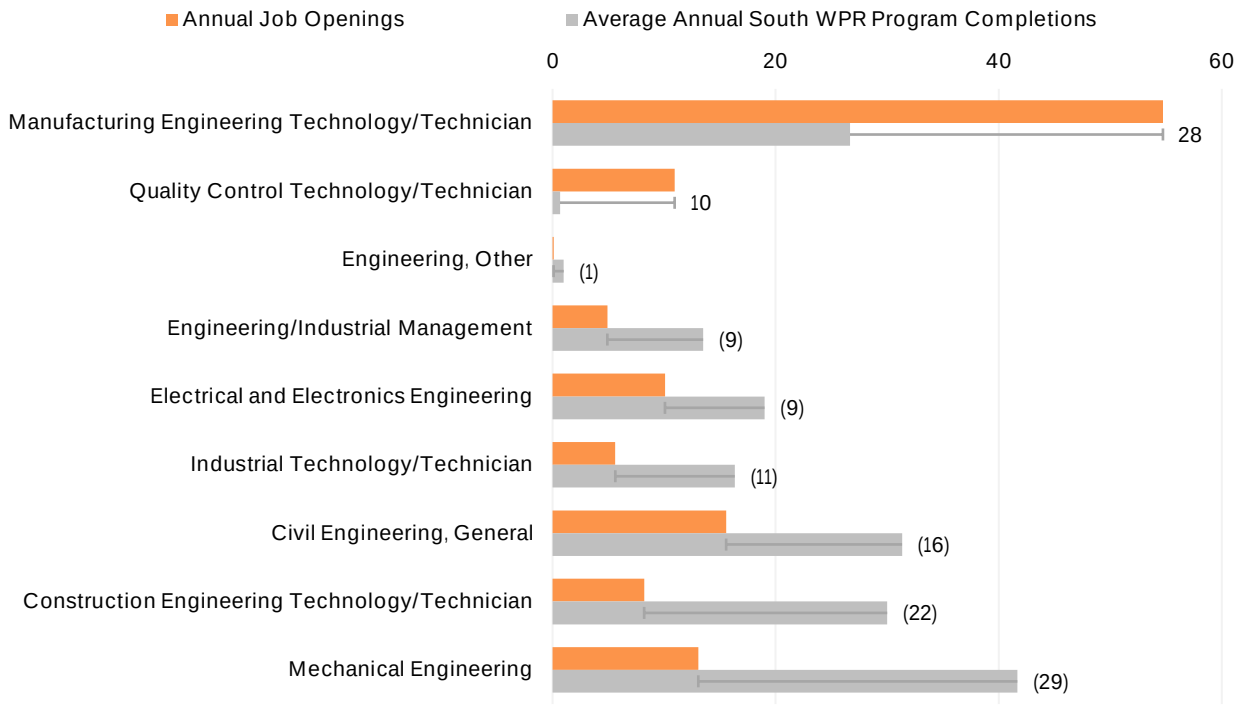
HIGH DEMAND, LOW SUPPLY	HIGH DEMAND, HIGH SUPPLY
How can we expand these program opportunities?	*How can we maintain focus on program quality & student success?*
Drafting & Design (CERT+)	Manufacturing Engineering Technology (BACH+)
LOW DEMAND, LOW SUPPLY	**LOW DEMAND, HIGH SUPPLY**
Should we discontinue these programs?	*Can we consolidate or reduce enrollment in these programs?*
Electromechanical Engineering Technology (CERT+)	Civil Engineering (BACH+)
Engineering, Other (BACH+)	Construction Engineering Technology (BACH+)
Plastics & Polymer Engineering Technology (CERT+)	Electrical & Electronic Engineering Technology (CERT+)
	Manufacturing Engineering Technology (CERT+)
	Mechanical Engineering (BACH+)

Source: Emsi program demand gap model.

electronics engineering technicians, the occupation mapped to it. A review of the programs' employment outcomes is recommended.

At the bachelor's and master's degree levels, Western Kentucky University is the only institution in the state with program completions. As in other regions, the South WPR's high demand for industrial engineers is the occupation in the most demand across the award levels, primarily for the Manufacturing Engineering Technology/Technician and Quality Control Technology/Technician programs. The university's bachelor's degree level Construction Engineering Technology/Technician program is unique among all the state's engineering programs but is not recommended for further program development, given regional and statewide occupational data.

Figure 22: Gaps and Surpluses for the South WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

West Workforce Planning Region

Table 7 provides CERT+ and BACH+ program recommendations for the West WPR, and Figure 23 displays the BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician program again appears as an opportunity for expansion at the BACH+ level. The Engineering Technology, General (BACH+) program is the only program in the upper right quadrant around maintaining success. More programs appear in the lower quadrants than in the upper quadrants, such as the Civil Engineering Technology/Technician (CERT+) and Occupational Safety & Health Technology/Technician (BACH+) programs, indicating they should be carefully considered for continuation and/or for consolidation.

At the individual award level, between the West WPR's certificate and associate degree programs, the Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other program is the largest, with 72 average annual completions at the certificate level and another 17 average annual completions at the associate degree level. However, the greatest engineering employment opportunities across the two award levels in the West WPR are for the inspectors, testers, sorters, samplers, &

weighers occupation. A review of the Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other program's employment outcomes is recommended.

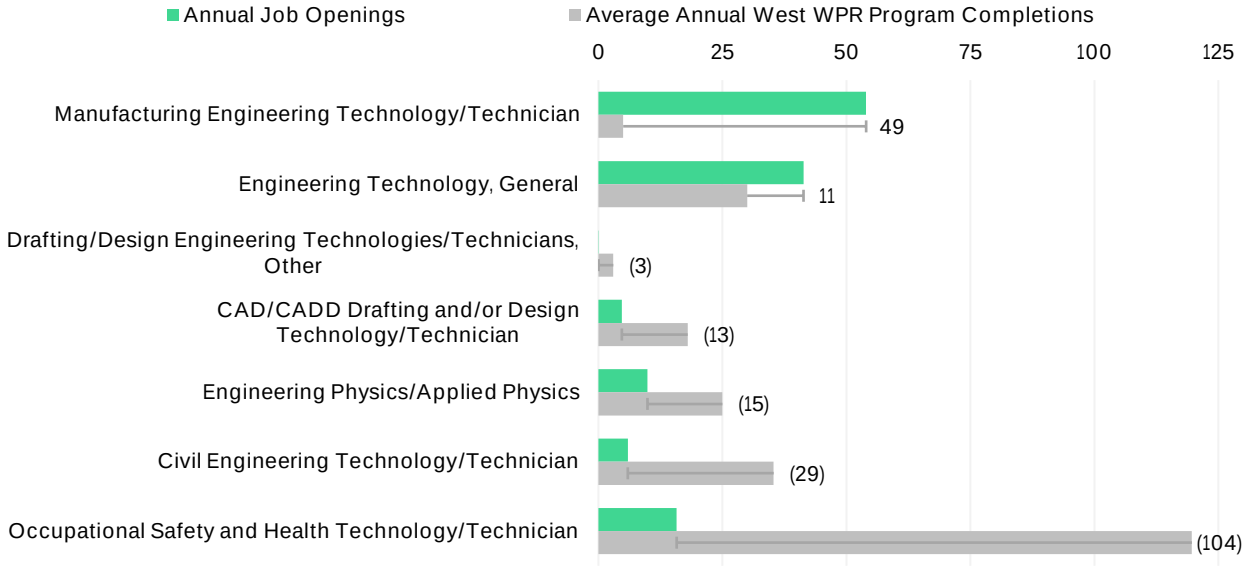
At the bachelor's and master's degree levels, Murray State University is the only institution with program completions. As in other regions, the West WPR's high demand for the industrial engineer occupation plays a role in several programs with large gaps, as well as its demand for civil and mechanical engineer occupations. The university's bachelor's degree level Occupational Safety & Health Technology/Technician program is unique among all the state's engineering programs but is not recommended for further program development, given regional and statewide occupational data.

Table 7: West WPR Program Recommendations

HIGH DEMAND, LOW SUPPLY	HIGH DEMAND, HIGH SUPPLY
How can we expand these program opportunities?	*How can we maintain focus on program quality & student success?*
Quality Control (CERT+)	Engineering Technology, General (BACH+)
Manufacturing Engineering Technology (BACH+)	
LOW DEMAND, LOW SUPPLY	**LOW DEMAND, HIGH SUPPLY**
Should we discontinue these programs?	*Can we consolidate or reduce enrollment in these programs?*
Civil Engineering Technology (CERT+)	Civil Engineering Technology (BACH+)
Drafting/Design Engineering Technology (BACH+)	Electrical & Electronic Engineering Technology (CERT+)
Industrial Technology (CERT+)	Electromechanical & Instrumentation & Maintenance Technologies (CERT+)
	Mining Technology (CERT+)
	Occupational Safety & Health (BACH+)

Source: Emsi program demand gap model.

Figure 23: Gaps and Surpluses for the West WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

MIGRATION ANALYSIS

Profile Analytics

Kentucky supports tens of thousands of engineering jobs, for those with a certificate level of education to those with a doctoral degree. Traditional labor market information (LMI) shows us how many engineers are employed in Kentucky and its WPRs or Kentuckiana LWA (Chapter 2). However, using LMI, it is a challenge to understand more about the people who successfully find jobs as engineers. Where did these engineers receive their degrees? For Kentucky's educational institutions, it would also be valuable to know how many engineering alumni found in-state jobs, or if they left the state, where engineering alumni are currently working. Furthermore, which companies are employing the state's engineers? To assist in answering these questions, we use Emsi's Profile Analytics database, which provides access to more than 120 million professional worker profiles, filterable by education history, specific employers, job titles, industries, skills, and more.

As displayed in Table 8, around 54% of alumni from Kentucky's engineering programs remain in Kentucky. Compared with all of the institutions' alumni (56% remaining in-state), it appears as if slightly more Kentucky engineering alumni migrate out of the state compared to all programs' alumni. However, when compared to looking across the U.S., more Kentucky engineering alumni stay in Kentucky compared to engineering alumni of other states staying in their state (43% remaining in-state).

The top states where the Kentucky engineering alumni move to are Tennessee, Texas, Indiana, Ohio, and Florida. Wages in Texas are consistently higher than in Kentucky across the top engineering occupations, but Kentucky's wages seem otherwise fairly competitive with mid-range rankings compared to the other states. The exceptions are for the architectural & engineering managers occupation and the architectural & civil drafters occupation, which Kentucky ranks last in terms of wages. A few of the out-of-state employers of Kentucky engineering alumni are Cummins, Inc; The Boeing Company; and the General Electric Company. Of course, not all engineers working in Kentucky attended a Kentucky institution. Top institutions providing engineering talent to Kentucky are Purdue University, University of Cincinnati, and Indiana University Southeast.

Table 8: In-State and Out-of-State Migration of Kentucky's Engineering Alumni* by Sector, with State Comparison of All Alumni

	KY ENGINEERING ALUMNI			ALL KY ALUMNI		
SECTOR	PROFILES	% IN-STATE	% OUT-OF-STATE	PROFILES	% IN-STATE	% OUT-OF-STATE
State University	22,045	51%	49%	477,491	56%	44%
KCTCS	2,384	68%	32%	67,634	68%	32%
AIKCU	1,220	72%	28%	57,111	65%	35%
KY Institutions	26,835	54%	46%	748,030	56%	44%
	U.S. ENGINEERING ALUMNI			ALL U.S. ALUMNI		
U.S. Comparison	3,710,527	43%	57%	94,180,933	44%	56%

* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.
Source: Emsi Profile Analytics.

Consumer Insight

The Strada-Gallup Education Consumer Survey (referred to as Consumer Insight throughout the analysis) is the largest database of education consumer insights in the nation. The survey provides greater insight into people's perceptions of higher education. For this analysis, we used the survey to assemble more information on Kentucky's science, technology, engineering, mathematics, and healthcare (STEMH) majors, emphasizing their programs of study, highest award levels, and current occupations.[4] In addition, we look at qualitative

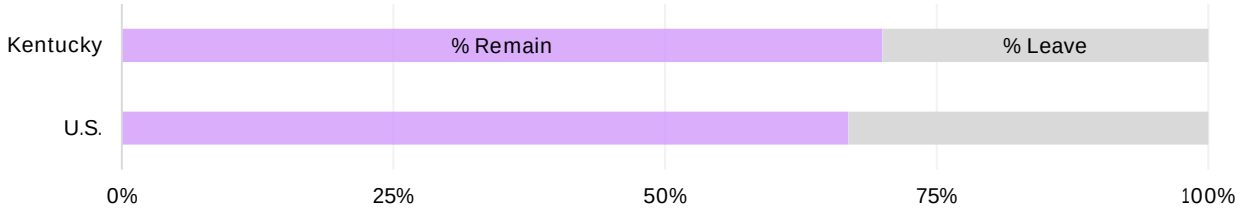
4 The sample size for engineering majors in Kentucky was too small for analysis; therefore, this section focuses on STEMH across the associate, bachelor's, and graduate degree levels. Considering health is a large portion of STEMH yet isn't directly related to engineering, we also provide figures on just STEM at the bachelor's degree level.

responses of STEMH and STEM graduates of Kentucky institutions, which is valuable to the state's educational providers seeking to improve their programs.

Health professions & related majors reflect the most STEMH respondents, although engineering majors rank second for bachelor's degree respondents from Kentucky institutions. This information is helpful when interpreting the results of STEMH figures. Engineering majors are ranked first when looking at bachelor's degree STEM graduates.

Kentucky STEMH graduates are somewhat more likely to remain in Kentucky than respondents from other states. This holds true for Kentucky STEM bachelor's degree graduates (Figure 24). However, Kentucky STEMH bachelor's degree graduates are more likely to leave the state compared to the other award levels, and at a slightly higher rate than STEMH graduates from other states.

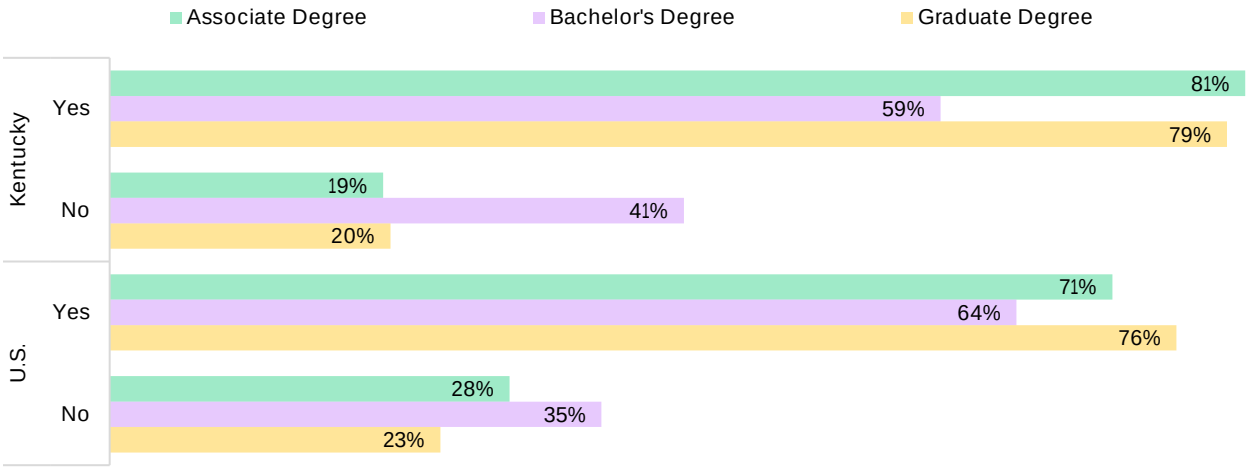
Figure 24: Bachelor's Degree STEM Graduates from Public Institutions in Kentucky and the U.S. Remaining in the State



The Kentucky total is 210. The U.S. total is 12,641.
Source: Strada Consumer Insights.

The Consumer Insights data provide "Hindsight Indicators" to determine the likelihood of respondents repeating parts of their educational experience – in this case, study the same major or attend the same school. Kentucky STEMH graduates at the associate and graduate degree levels said "yes" to studying the same major at a higher rate than graduates from across the U.S., although only 59% of Kentucky bachelor's degree STEMH graduates said "yes" compared to 64% across the U.S. (Figure 25). Similar patterns emerge on whether the respondents would attend the same school, although this time a higher percentage of Kentucky bachelor's degree STEMH graduates said "yes" compared to STEMH graduates from across the U.S. The same patterns emerge for STEM bachelor's degree graduates, with fewer Kentucky graduates saying "yes" to studying the same major compared to graduates across the U.S., but more Kentucky graduates saying they would attend the same school (Figure 26).

Figure 25: Response of STEMH Graduates of Public Institutions to "If You Had to Do It All Over Again, Would You Study the Same Major/Course"



Source: Strada Consumer Insights.

Figure 26: Response of Bachelor's Degree STEM Graduates of Public Institutions to "If You Had to Do It All Over Again, Would You Attend the Same School"

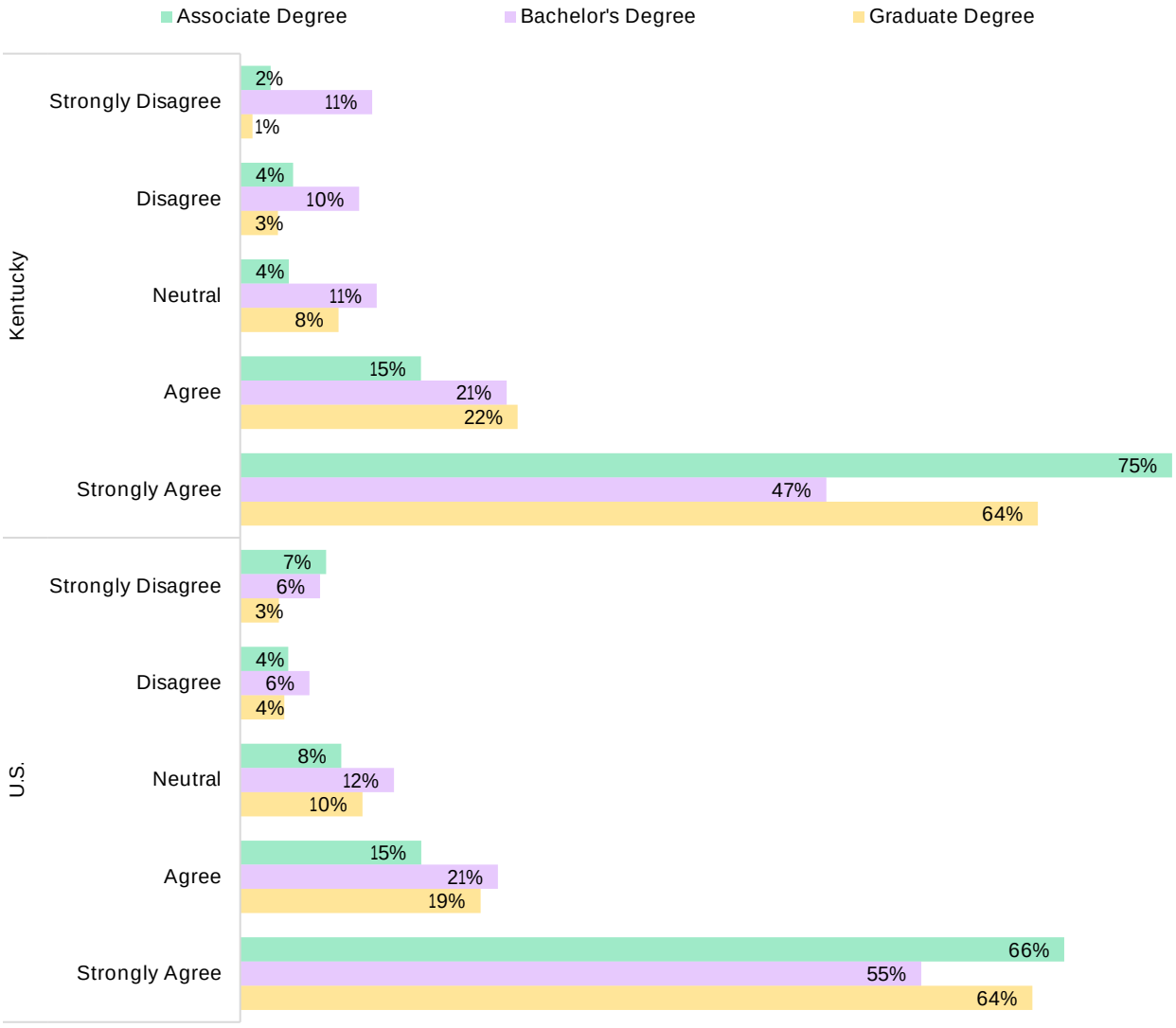
Source: Strada Consumer Insights.

We also look at "Value Indicators" to provide inference on how respondents rate the value of their Kentucky STEMH education, again compared against STEMH graduates from across the U.S. In general, Kentucky STEMH associate and graduate degree respondents "strongly agreed" more than respondents from across the U.S., whereas a smaller percentage of Kentucky STEMH bachelor's degree graduates "strongly agreed' compared to national respondents (Figure 27). This indicates that Kentucky STEMH bachelor's degree graduates may not have valued their education – namely in terms of worth the cost and creating an attractive candidate – as much as both Kentucky alumni at different award levels and non-Kentucky alumni in general. Bachelor's and graduate degree STEMH graduates do not really feel the need for further education to advance their career, whereas it is an almost even split for associate degree graduates.

When looking at just bachelor's degree STEM graduates, we see similar patterns of U.S. comparison as when looking at bachelor's degree STEMH graduates. However, it is still clear

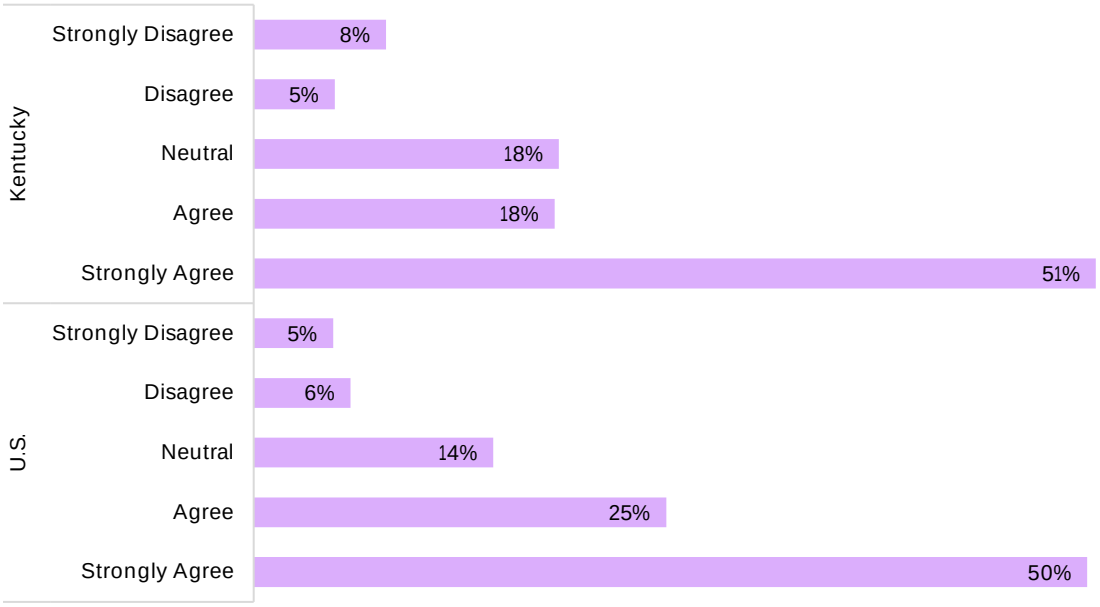
to see that "strongly agree" is by far the top choice across the various categories. The exception is around the courses students took during their education, but in that case, "agree" was rated quite favorably. In addition, bachelor's degree STEM graduates were more likely to "strongly agree" compared to graduates across the U.S. to recommending their educational path to people (Figure 28).

Figure 27: Response of STEMH Graduates of Public Institutions to "Your Highest Level of Education was Worth the Cost"



Source: Strada Consumer Insights.

Figure 28: Response of Bachelor's Degree STEM Graduates of Public Institutions to "You Would Recommend the Educational Path You Took to People Like You"

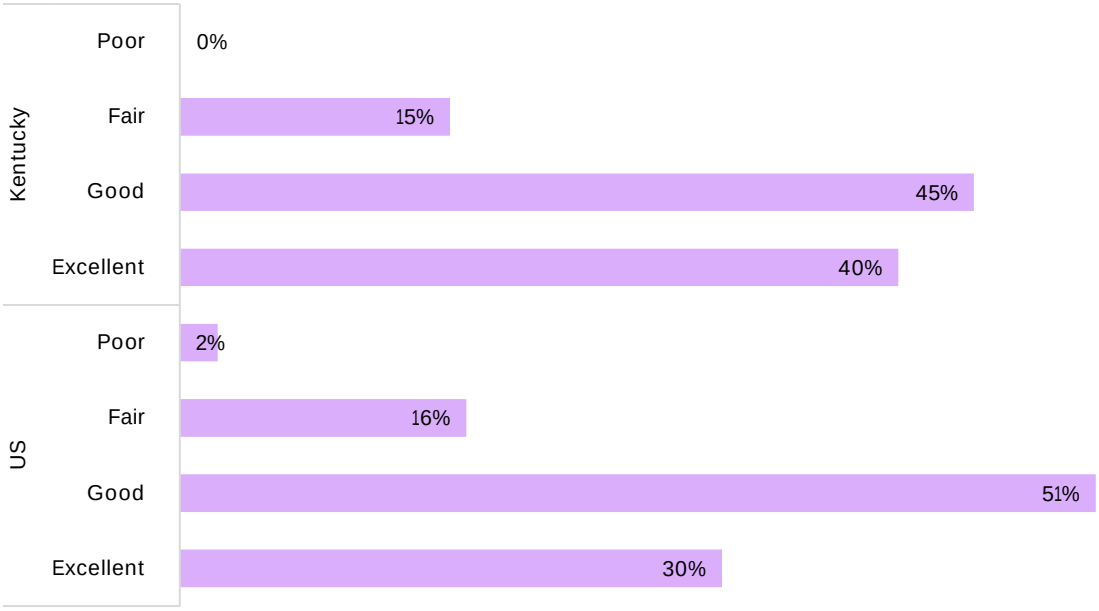


Source: Strada Consumer Insights.

Similar to "Value Indicators", we also look at "Quality Indicators",[5] or how bachelor's degree respondents rate the quality of their Kentucky STEM education, again compared against bachelor's degree STEM graduates from across the U.S. In general, Kentucky STEM bachelor's degree respondents rated Kentucky institutions "good" more than respondents from across the U.S. More specifically, Kentucky institutions' academic advising and teaching & instruction were rated more favorably than across the U.S (Figure 29). On the other hand, their extracurricular activities and courses offered were weighted more towards "poor" and "fair" ratings. Kentucky institutions' career advising, applied learning, and faculty and staff commitment to helping students were comparable to U.S. ratings.

5 Quality indicators only available for bachelor's degree STEM graduates.

Figure 29: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Teaching and Instruction"

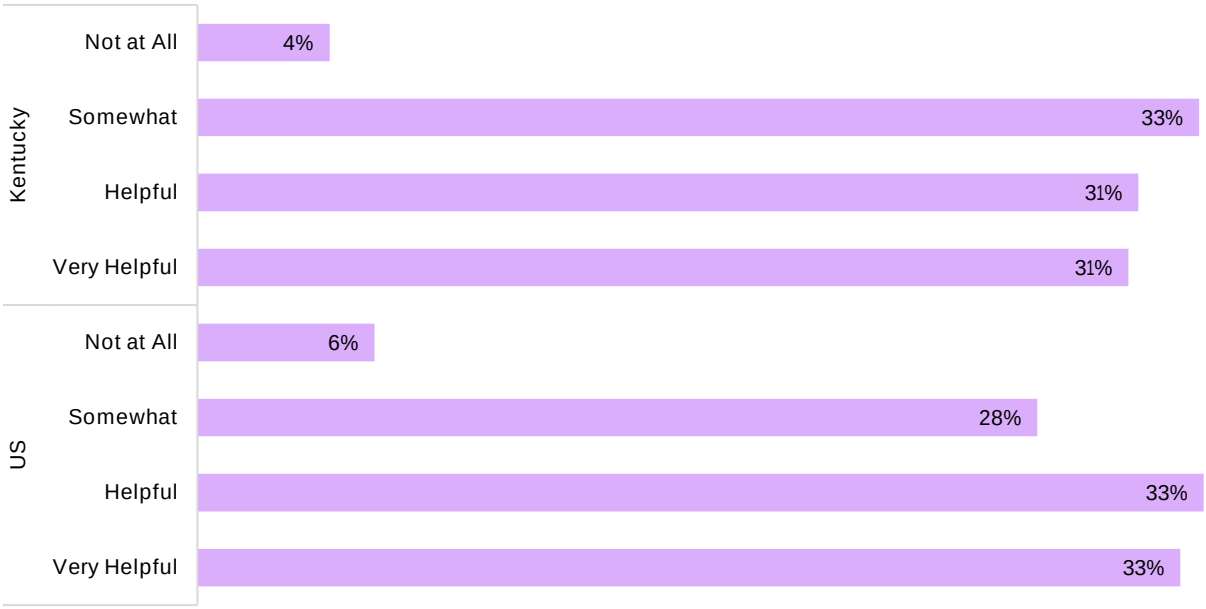


Source: Strada Consumer Insights.

Similar trends as we saw with the "Quality Indicators" appear in the "Helpful Elements" responses, with Kentucky STEMH bachelor's degree respondents again being generally more conservative in their responses. However, Kentucky STEMH associate and graduate degree graduates generally outperform the U.S. comparison when it comes to finding the Kentucky institutions helpful in various aspects of their career. For example, 65% of Kentucky STEMH associate degree graduates found their major/field of study to be very helpful in their career, compared to only 50% at the national level. Similarly, for the Kentucky STEMH graduate degree respondents, 44% said the people they met had been very helpful in their career, compared to 35% at the national level.

When looking at just bachelor's degree STEM graduates, we still see conservativism in responses, especially compared to U.S. responses, with quite similar trends as bachelor's degree STEMH graduates. This is especially true for the helpfulness of the courses they took, with "somewhat helpful" being the highest-ranking rating for Kentucky graduates (Figure 30). With that said, Kentucky bachelor's degree STEM graduates ranked "very helpful" the highest when it comes to the helpfulness of the major in their career. Although lower than across the U.S., it indicates that the major of a graduate has an impact on their working life.

Figure 30: Response of Bachelor's Degree STEM Graduates of Public Institutions to "How Helpful Have the Courses You Took Been to You So Far in Your Career"



Source: Strada Consumer Insights.

The final area of the Consumer Insights analysis was around "Motivation Indicators" to identify the top motivations for why STEMH majors in Kentucky and across the U.S. pursued their degree and chose a particular school. The analysis found that the top motivation for pursuing a degree across all Kentucky STEMH award levels was to get a good job/make money. Kentucky associate degree STEMH graduates also seem to prefer when the school offers specific programs, and those from a Kentucky graduate degree STEMH program often choose the degree to advance their career. In terms of why respondents chose their school, the data demonstrates that the top motivator for Kentucky STEMH graduates is due to a close location. Other top motivators on school choice are good reputation of school and the school offers specific programs.

The top choice is the same for bachelor's degree STEM graduates – most pursue a degree to get a good job/make money and most choose a school given its close location to home. Other top reasons for pursuing a degree are due to specific programs the school offers and because students want to advance not just their career, but also their knowledge. In terms of school choice, reputation of the school or program, availability of specific programs, and scholarship availability are all top factors for bachelor's degree STEM graduates.

CHAPTER 1:

Introduction

The Council on Postsecondary Education (Council) is charged with guiding the reform efforts envisioned by state policy leaders in the Kentucky Postsecondary Education Improvement Act of 1997 and is Kentucky's statewide postsecondary and adult education coordinating agency. Its mission is to strengthen the state's workforce, economy, and quality of life. The Council does this by guiding the continuous improvement and efficient operation of a high-quality, diverse, innovative, accessible, and affordable system of postsecondary education in the commonwealth of Kentucky. Among its many responsibilities, the Council:

- Develops and implements a strategic agenda and accountability system for postsecondary education that includes measures of educational attainment, effectiveness, and efficiency;
- Defines and approves all academic programs at public institutions; and
- Coordinates statewide efforts to improve college readiness, access to postsecondary education, and student success, including statewide transfer agreements, adult learner initiatives, and postsecondary work related to college and career readiness.

An efficient labor market requires a seamless flow of skilled workers, the postsecondary educational institutions that educate and train them, and the employers that hire them. One factor behind workforce misalignment stems from when the needs of the employers evolve differently than the programs that train their workers. These misalignments may happen at different times and for different reasons:

- Employer training becomes more tailored and comprehensive;
- Businesses come and go, and certain educational programs become more or less pertinent to a specific region;
- Rapid advances in technology and business create curriculum needs that few educational institutions possess; and
- As economic conditions shift, businesses have different hiring requirements of their employees.

In light of these dynamics, an up-to-date understanding of the Kentucky economy and the demand for skilled labor is vital to the planning efforts of statewide colleges and universities seeking to adapt their program offerings to the requirements of an ever-changing workforce.

To gain better insight into economic conditions and workforce trends, specifically within three targeted sectors, the Council partnered with Emsi, a labor market analytics firm serving higher education, economic and workforce development, talent acquisition, and site selection. In this report, Emsi focuses on the Engineering sector by providing an overview of engineering occupations and industries through traditional labor market information and a job postings analysis, conducting a program demand gap analysis of Kentucky institutions' engineering program offerings, and analyzing migration patterns and other qualitative characteristics that help explain why Kentucky engineering alumni stay in or migrate out of the state. Emsi also provides an environmental scan of the state's economy so as to provide context for the Engineering sector.

CHAPTER 2:

Occupational Overview

The occupational overview provides key information on employment opportunities for engineers in Kentucky and its Workforce Planning Regions (WPRs). The counties included in the Central, East, South, and West WPRs are determined by the Kentucky Center for Education & Workforce Statistics and provided by the Council (Figure 2.1).[6] In addition, data for the city of Louisville and its surrounding counties, which comprise the Kentuckiana Local Workforce Area (LWA), are shown distinct from the Central WPR. Identifying the areas of employment for engineers in Kentucky and its five workforce regions is an important task for several reasons. The data:

- Identify where Kentucky's engineers are working, with regards to geography;
- Give the Council a deeper understanding of state and regional job trends for engineers; and
- Help the Council understand where the state's colleges and universities should logically target their efforts, considering engineering program development.

This chapter provides an overview of past, current, and future jobs for engineers in the state and its regions, compares the state's and county's share of jobs for engineers relative to a typical region, and identifies the industries employing engineers at the state and regional levels. Tables and figures, in some cases, also present data at the national level.

TOTAL JOBS

Job counts and the changes in jobs over time provide insight into Kentucky as an attractive region for engineers and companies looking to hire engineers. Figure 2.2 shows statewide jobs for engineers from 2009 to 2029, and Figure 2.3 presents data on jobs for engineers in Kentucky for the same time period, highlighting the state's job change using 2009 as a base year. As shown in Figure 2.2, Kentucky supported around 23,290 engineering jobs in 2009. By 2019, that number increased to around 27,290 jobs, for a 17.2% job growth. For context, the job growth for engineers in the U.S. between 2009 and 2019 was 16.0%. As shown in Figure

6 Source: https://kystats.ky.gov/Reports/ShowReports?ReportId=Map_LWAWIB&publishDate=20170401.

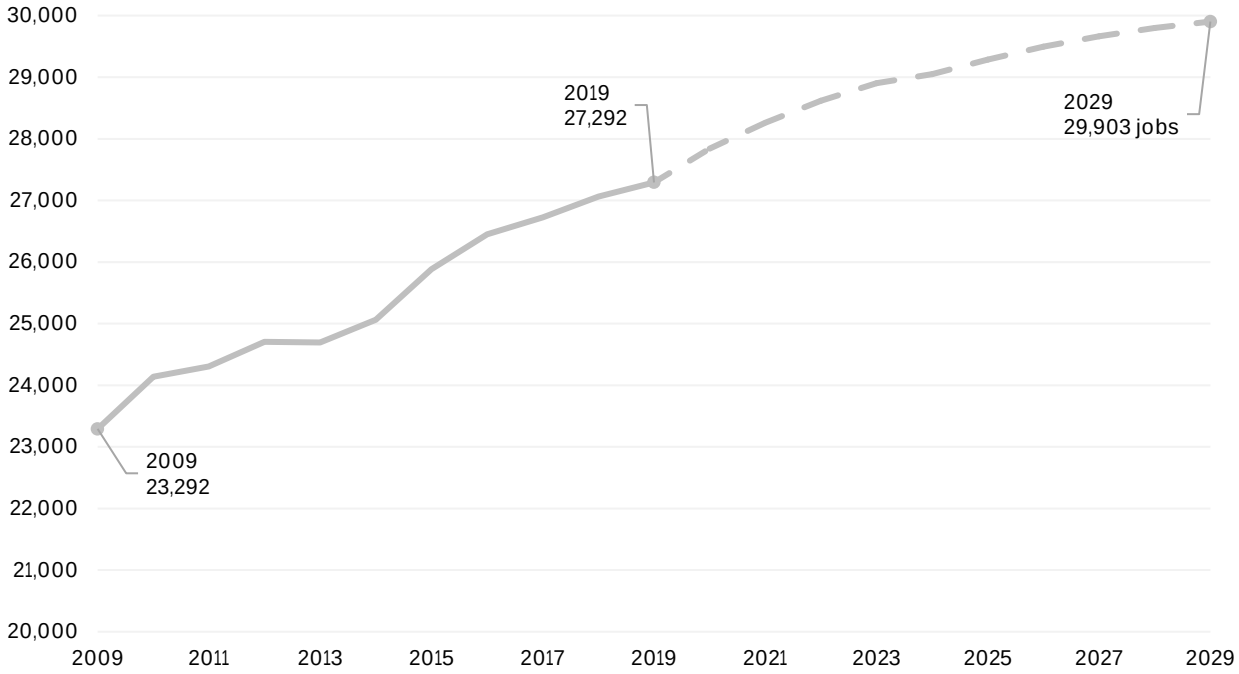
2.4, the Central WPR supported the state's largest share of engineers, with the Kentuckiana WPR following in second. By 2029, the state is projected to add around another 2,610 engineering jobs, for a 9.6% 10-year job growth. At a regional level, the Kentuckiana LWA and South WPR are projected to add more engineering jobs over the next decade relative to the state (Figure 2.5).

The occupations identified as engineers appear in Table 2.1. Across all engineers, the state supported the most jobs for industrial engineers (5,490 jobs in 2019), followed by mechanical engineers (4,173 jobs in 2019) and civil engineers (3,571 jobs in 2019). These three occupations, alone, accounted for about half of all engineers in Kentucky (Figure 2.6). Additional information for the state's 10 largest engineering occupations are shown in Figure 2.7, and Figure 2.8 provides a regional breakdown of 2019 jobs for architectural & engineering managers and civil, electrical, industrial, and mechanical engineers. Regional occupational data for the most represented engineers, by 2019 jobs, are shown in Tables 2.2 to 2.6 and Figures 2.9 to 2.13. Data show that the Central WPR and the Kentuckiana LWA supported the state's largest share of engineers, across all the types of engineers. However, there appears to be more jobs for industrial engineers in the South WPR, compared to the region's employment trends within the engineering occupations and across all five regions.

Figure 2.1: Kentucky's WPRs and the Kentuckiana LWA

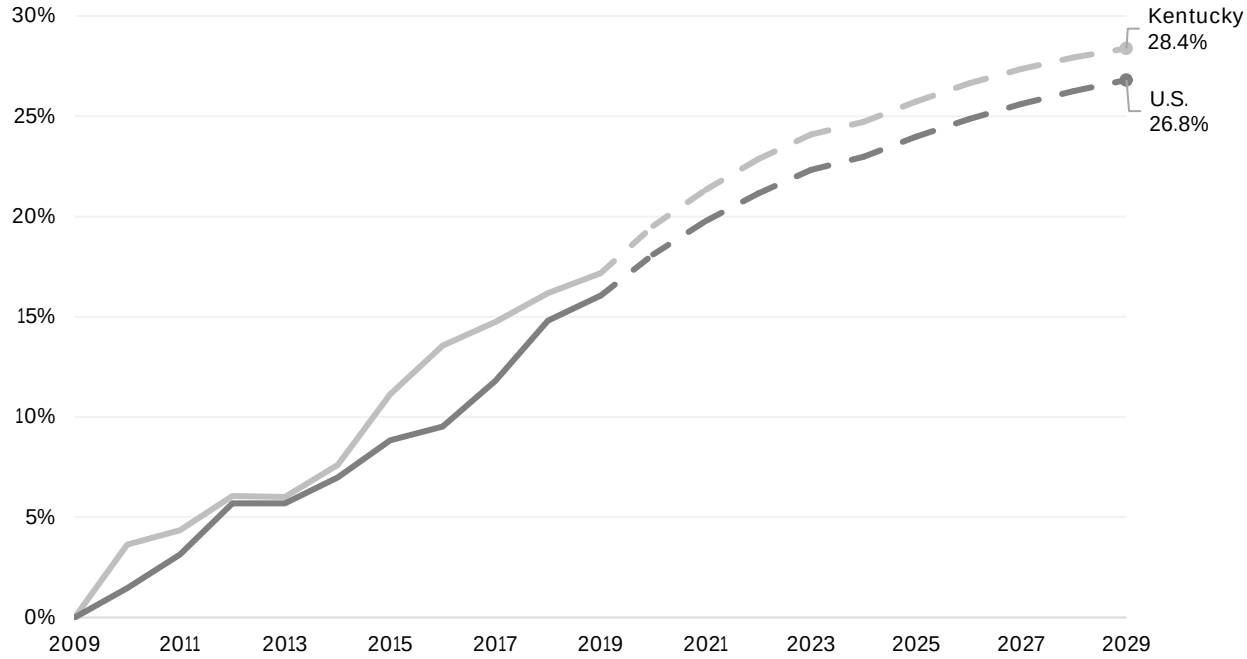
Source: Regions provided by the Council.

Figure 2.2: Historical and Projected Jobs for Engineers in Kentucky, 2009 to 2029



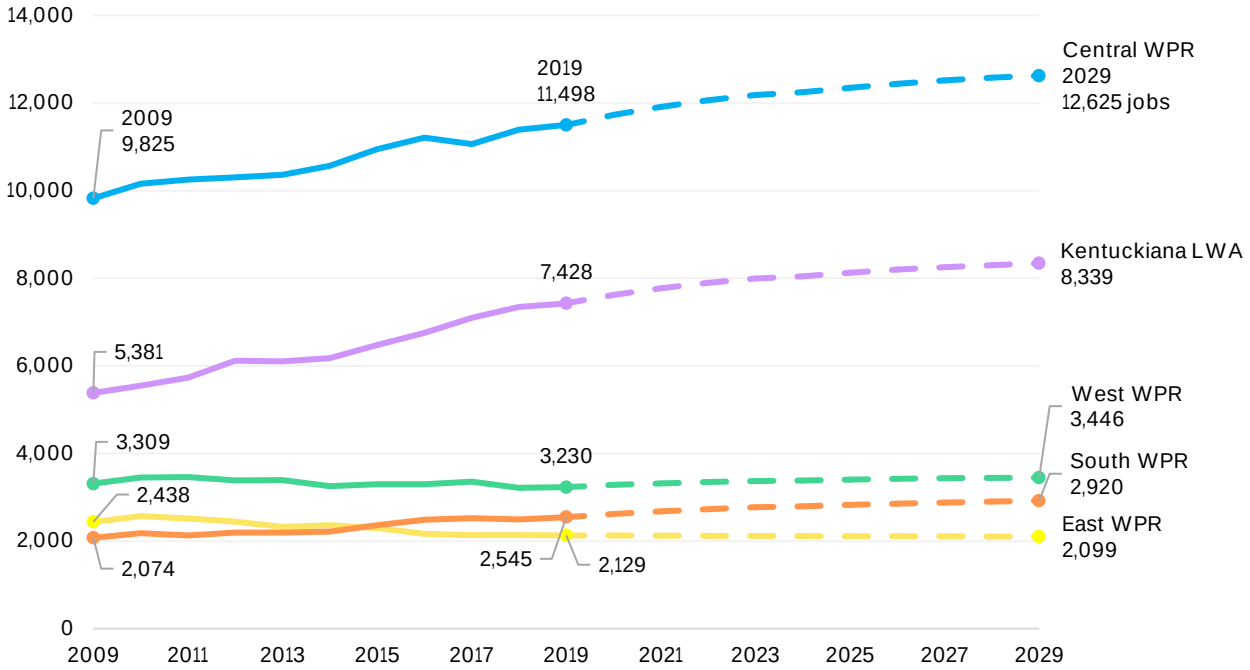
Source: Emsi Employees & Self-Employed 2019.4.

Figure 2.3: Percent Job Change for Engineers in Kentucky and the U.S., 2009 to 2029



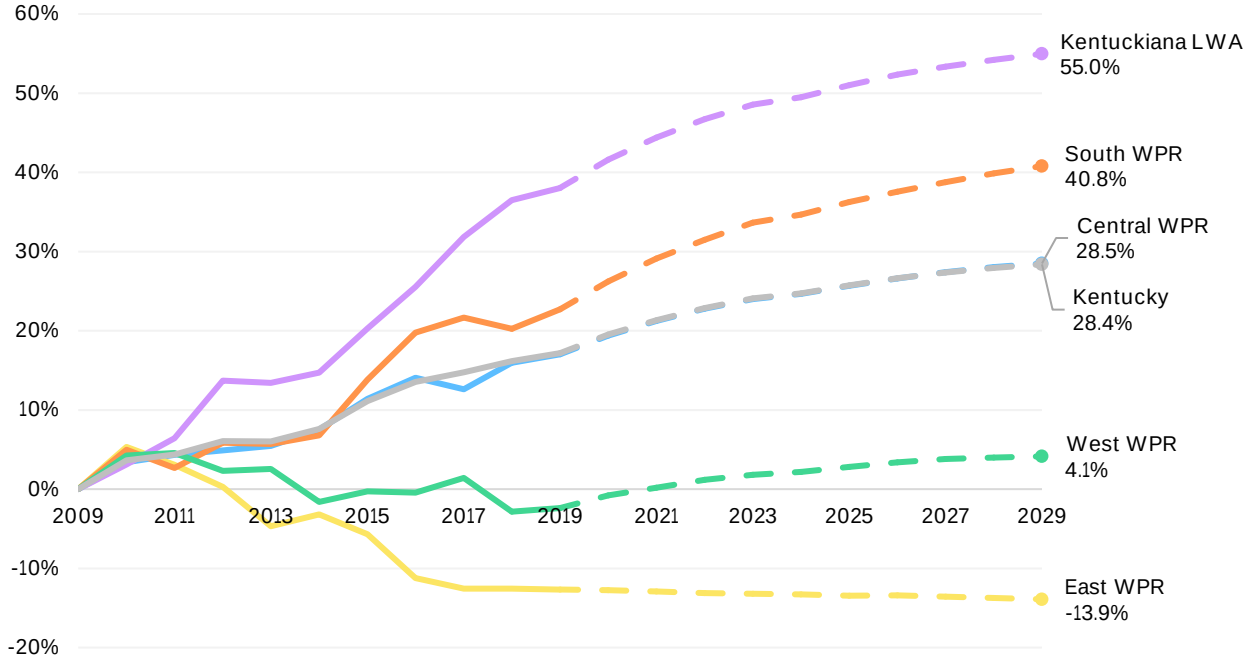
Source: Emsi Employees & Self-Employed 2019.4.

Figure 2.4: Historical and Projected Jobs for Engineers in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



Source: Emsi Employees & Self-Employed 2019.4.

Figure 2.5: Percent Job Change for Engineers in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



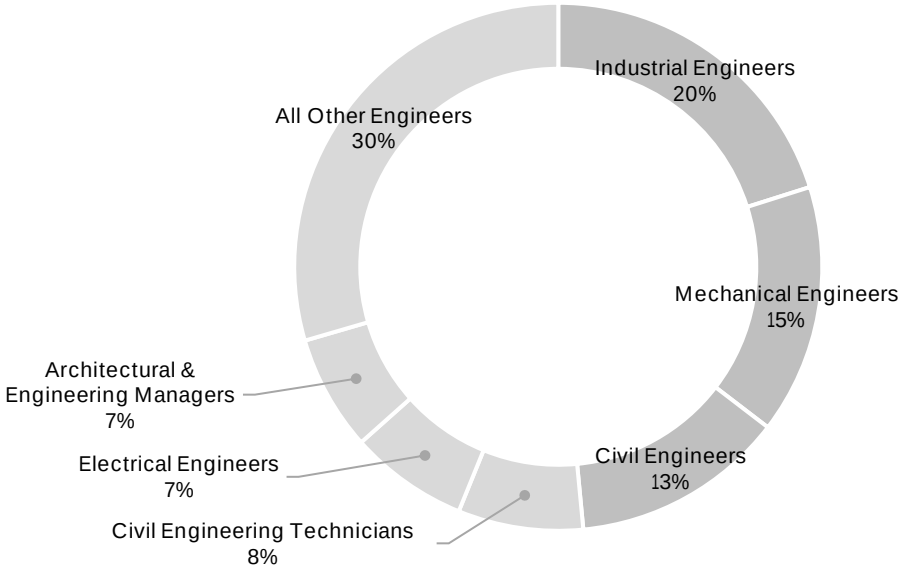
Source: Emsi Employees & Self-Employed 2019.4.

Table 2.1: Jobs, Annual Job Openings, and Median Hourly Wages of Engineer Occupations in Kentucky, 2019 to 2029

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
17-2112	Industrial Engineers	5,490	6,288	798	15%	465	$36.73
17-2141	Mechanical Engineers	4,173	4,687	514	12%	333	$40.80
17-2051	Civil Engineers	3,571	3,780	209	6%	298	$38.39
17-3022	Civil Engineering Technicians	2,093	2,096	3	0%	190	$22.13
11-9041	Architectural & Engineering Managers	1,983	2,159	176	9%	152	$41.70
17-2071	Electrical Engineers	1,929	2,108	179	9%	160	$55.13
17-2199	Engineers, All Other	1,091	1,156	65	6%	107	$29.91
17-3026	Industrial Engineering Technicians	1,065	1,175	110	10%	110	$24.91
17-3023	Electrical & Electronics Engineering Technicians	1,036	1,164	128	12%	86	$37.69
17-3029	Engineering Technicians, Except Drafters, All Other	740	792	52	7%	73	$27.85
17-3027	Mechanical Engineering Techs.	684	763	79	12%	56	$38.08
17-2072	Electronics Engineers, Except Computer	652	705	53	8%	65	$23.99
17-2081	Environmental Engineers	448	505	57	13%	38	$36.32
17-2041	Chemical Engineers	391	410	19	5%	29	$45.84
17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	276	305	29	11%	23	$35.09
17-2061	Computer Hardware Engineers	260	285	25	10%	21	$40.79
17-2131	Materials Engineers	240	268	28	12%	22	$35.21
17-2011	Aerospace Engineers	232	286	54	23%	21	$49.51
17-2121	Marine Engineers & Naval Architects	149	159	10	7%	11	$40.36
17-3025	Environmental Engineering Techs.	148	160	12	8%	16	$22.23
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	145	111	(34)	(23%)	10	$44.77
17-2161	Nuclear Engineers	129	136	7	5%	11	$42.38
17-3024	Electro-Mechanical Technicians	117	129	12	10%	10	$33.73
17-2031	Biomedical Engineers	94	104	10	11%	8	$60.95
17-2171	Petroleum Engineers	86	100	14	16%	10	$22.96
17-2021	Agricultural Engineers	70	67	(3)	(4%)	4	$29.96
17-3021	Aerospace Engineering & Operations Technicians	4	7	3	75%	1	$29.26
Total		27,292	29,903	2,611	10%	2,327	--

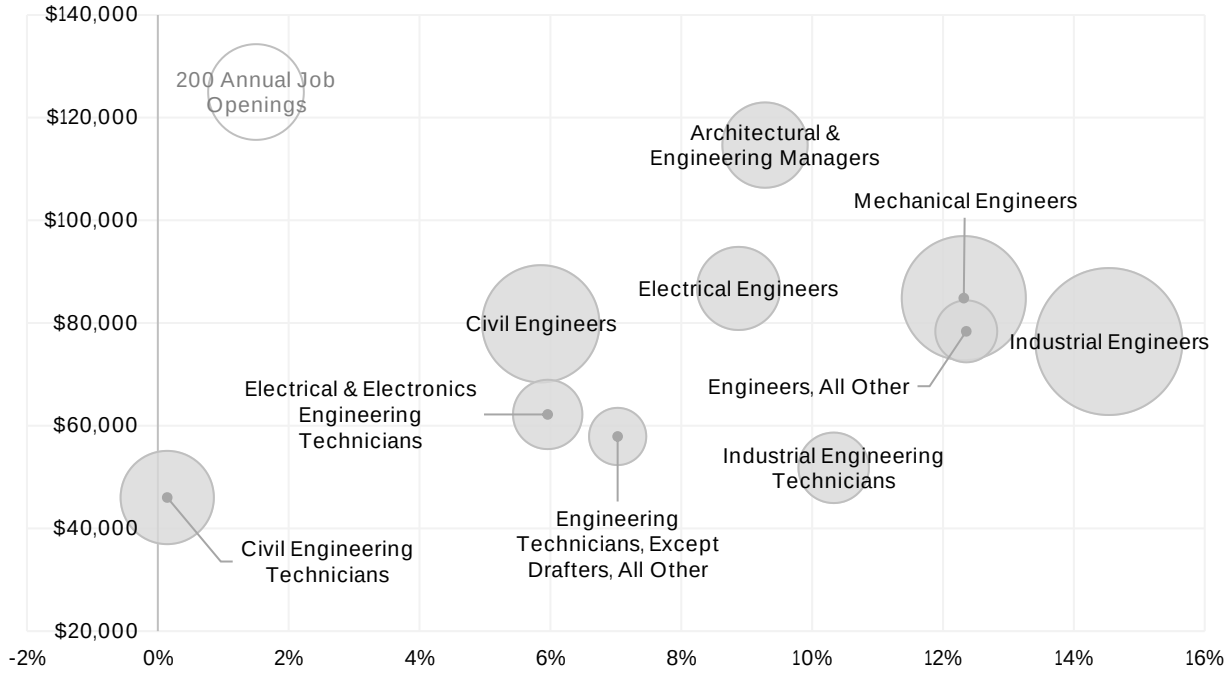
Numbers may not sum due to rounding. Highlighted occupations are shown in more detail in the following figure.
Source: Employees & Self-Employed 2019.4.

Figure 2.6: Kentucky's Top Engineer Occupations by 2019 Jobs



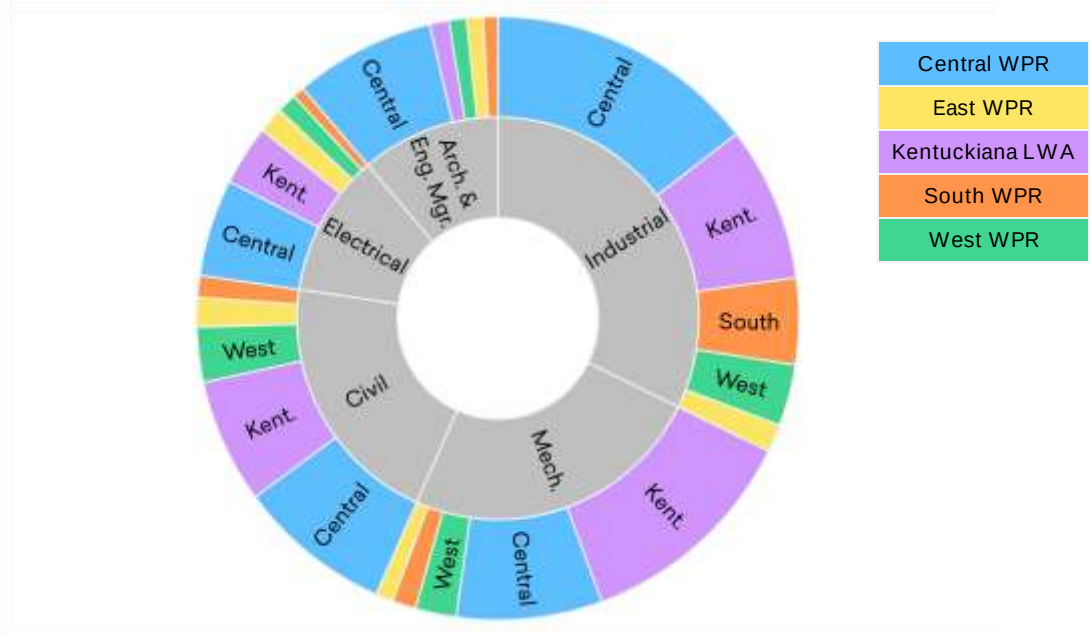
Source: Employees & Self-Employed 2019.4.

Figure 2.7: Job Change and Median Annual Wages of Engineer Occupations* in Kentucky with Projected Average Annual Job Openings, 2019 to 2029



* Engineers include the 10 largest occupations, by 2019 jobs.
Annual wages consider 2,080 working hours in a year.
Source: Employees & Self-Employed 2019.4.

Figure 2.8: Breakdown of 2019 Jobs for a Selection of Kentucky's Engineer Occupations by the WPRs and the Kentuckiana LWA



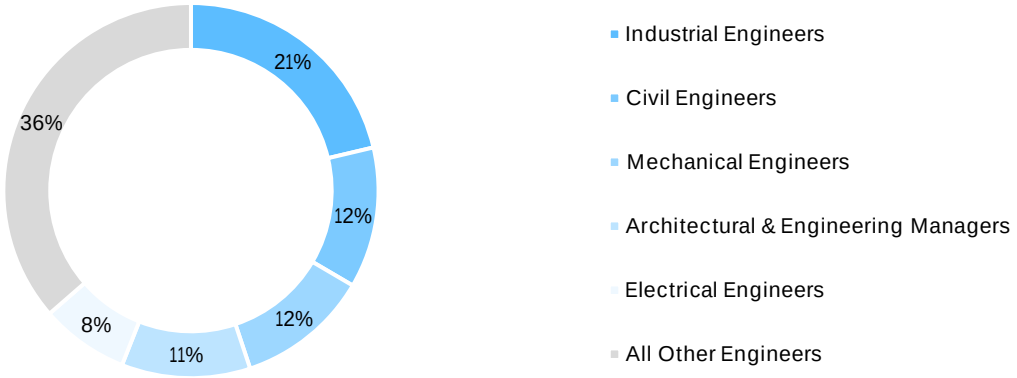
Source: Employees & Self-Employed 2019.4.

Table 2.2: Jobs, Annual Job Openings, and Median Annual Wages of Engineer Occupations in the Central WPR, 2019 to 2029

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN ANNUAL WAGE
17-2112	Industrial Engineers	2,449	2,783	334	14%	205	$37.65
17-2051	Civil Engineers	1,396	1,505	109	8%	117	$39.00
17-2141	Mechanical Engineers	1,316	1,485	169	13%	106	$40.14
11-9041	Architectural & Engineering Managers	1,277	1,358	81	6%	100	$56.29
17-2071	Electrical Engineers	875	951	76	9%	66	$39.75
17-3022	Civil Engineering Technicians	797	818	21	3%	74	$22.92
17-3026	Industrial Engineering Technicians	607	658	51	8%	60	$24.36
17-3023	Electrical & Electronics Engineering Technicians	405	434	29	7%	41	$28.91
17-2199	Engineers, All Other	374	432	58	16%	32	$37.40
17-3029	Engineering Technicians, Except Drafters, All Other	316	336	20	6%	31	$24.80
17-2072	Electronics Engineers, Except Computer	290	322	32	11%	23	$37.56
17-3027	Mechanical Engineering Technicians	250	269	19	8%	25	$23.36
17-2081	Environmental Engineers	198	227	29	15%	17	$35.20
17-2041	Chemical Engineers	176	181	5	3%	13	$47.76
17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	136	152	16	12%	11	$41.37
All Other Engineers		636	715	80	13%	58	--
Total		11,498	12,625	1,127	10%	978	--

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 2.9: The Central WPR's Top Five Engineer Occupations by 2019 Jobs



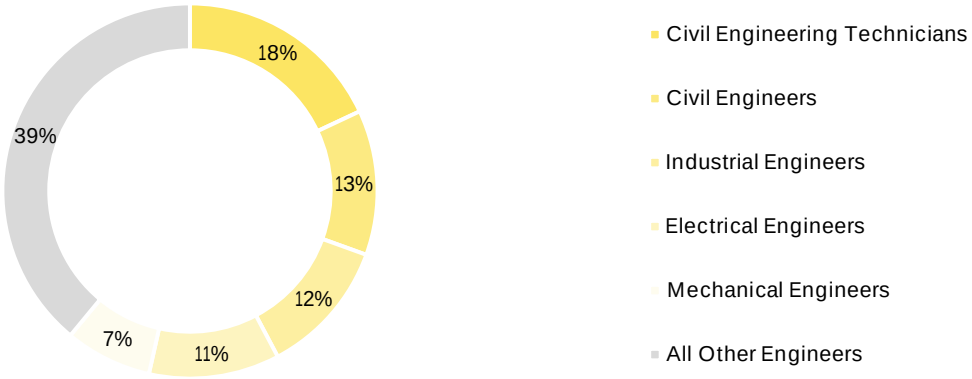
Source: Employees & Self-Employed 2019.4.

Table 2.3: Jobs, Annual Job Openings, and Median Annual Wages of Engineer Occupations in the East WPR, 2019 to 2029

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN ANNUAL WAGE
17-3022	Civil Engineering Technicians	384	362	(22)	(6%)	32	$21.86
17-2051	Civil Engineers	266	273	7	3%	21	$36.97
17-2112	Industrial Engineers	249	280	31	12%	21	$33.14
17-2071	Electrical Engineers	240	248	8	3%	17	$37.94
17-2141	Mechanical Engineers	159	158	(1)	(1%)	12	$38.70
11-9041	Architectural & Engineering Managers	150	150	0	0%	11	$49.09
17-2199	Engineers, All Other	110	100	(10)	(9%)	7	$30.70
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	89	47	(42)	(47%)	5	$46.66
17-3023	Electrical & Electronics Engineering Technicians	63	65	2	3%	6	$28.66
17-2072	Electronics Engineers, Except Computer	62	65	3	5%	5	$36.02
17-3026	Industrial Engineering Technicians	60	57	(3)	(5%)	6	$22.63
17-3029	Engineering Technicians, Except Drafters, All Other	57	54	(3)	(5%)	5	$27.96
17-2031	Biomedical Engineers	44	46	2	5%	3	$38.64
17-3027	Mechanical Engineering Technicians	39	31	(8)	(21%)	3	$29.04
17-2061	Computer Hardware Engineers	34	36	2	6%	3	$40.03
All Other Engineers		122	126	4	3%	10	--
Total		2,129	2,099	(30)	(1%)	166	--

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 2.10: The East WPR's Top Five Engineer Occupations by 2019 Jobs



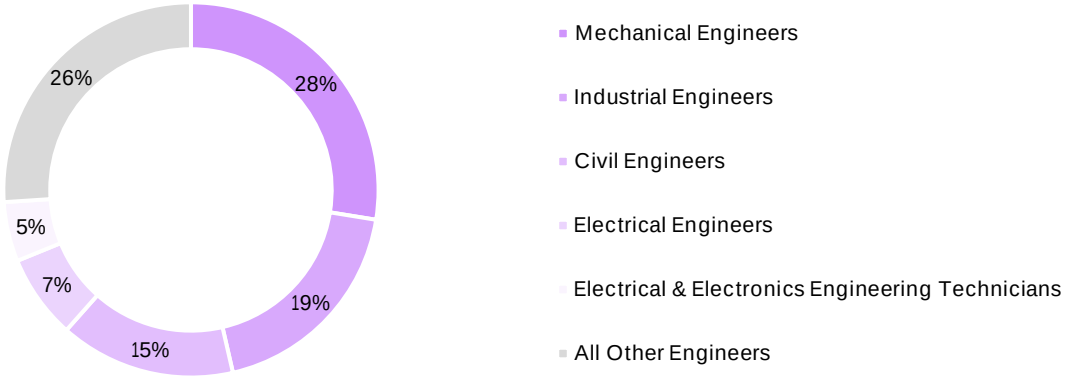
Source: Employees & Self-Employed 2019.4.

Table 2.4: Jobs, Annual Job Openings, and Median Annual Wages of Engineer Occupations in the Kentuckiana LWA, 2019 to 2029

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN ANNUAL WAGE
17-2141	Mechanical Engineers	2,046	2,273	227	11%	159	$41.60
17-2112	Industrial Engineers	1,401	1,609	208	15%	119	$35.29
17-2051	Civil Engineers	1,125	1,257	132	12%	99	$39.66
17-2071	Electrical Engineers	540	598	58	11%	42	$44.28
17-3023	Electrical & Electronics Engineering Technicians	381	403	22	6%	36	$29.42
17-3022	Civil Engineering Technicians	262	282	20	8%	26	$21.45
17-3027	Mechanical Engineering Technicians	216	240	24	11%	22	$24.95
17-2199	Engineers, All Other	204	246	42	21%	19	$41.13
17-3029	Engineering Technicians, Except Drafters, All Other	191	212	21	11%	19	$29.01
11-9041	Architectural & Engineering Managers	172	224	52	30%	19	$49.77
17-2072	Electronics Engineers, Except Computer	144	162	18	13%	12	$45.54
17-3026	Industrial Engineering Technicians	107	123	16	15%	12	$25.21
17-2061	Computer Hardware Engineers	99	115	16	16%	8	$31.43
17-2081	Environmental Engineers	94	103	9	10%	7	$41.18
17-2041	Chemical Engineers	84	87	3	4%	6	$50.11
All Other Engineers		362	404	43	12%	32	--
Total		7,428	8,339	911	12%	636	--

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 2.11: The Kentuckiana LWA's Top Five Engineer Occupations by 2019 Jobs



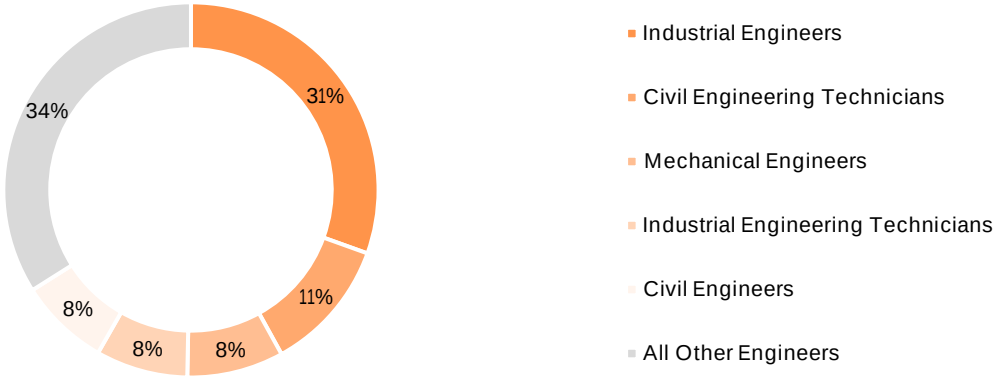
Source: Employees & Self-Employed 2019.4.

Table 2.5: Jobs, Annual Job Openings, and Median Annual Wages of Engineer Occupations in the South WPR, 2019 to 2029

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN ANNUAL WAGE
17-2112	Industrial Engineers	776	917	141	18%	70	$36.25
17-3022	Civil Engineering Technicians	292	288	(4)	(1%)	25	$21.41
17-2141	Mechanical Engineers	212	282	70	33%	23	$33.65
17-3026	Industrial Engineering Technicians	202	233	31	15%	22	$22.85
17-2051	Civil Engineers	198	211	13	7%	16	$34.62
17-2199	Engineers, All Other	161	176	15	9%	12	$33.66
11-9041	Architectural & Engineering Managers	130	157	27	21%	13	$49.68
17-3027	Mechanical Engineering Technicians	108	120	12	11%	11	$30.17
17-2071	Electrical Engineers	103	119	16	16%	9	$38.18
17-2072	Electronics Engineers, Except Computer	72	80	8	11%	6	$33.93
17-2081	Environmental Engineers	64	72	8	13%	5	$37.93
17-3029	Engineering Technicians, Except Drafters, All Other	62	73	11	18%	7	$26.72
17-3023	Electrical & Electronics Engineering Technicians	62	70	8	13%	7	$27.88
17-2041	Chemical Engineers	28	31	3	11%	2	$34.79
17-2131	Materials Engineers	21	26	5	24%	2	$25.76
All Other Engineers		54	64	10	18%	5	--
Total		2,545	2,920	375	15%	236	--

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 2.12: The South WPR's Top Five Engineer Occupations by 2019 Jobs



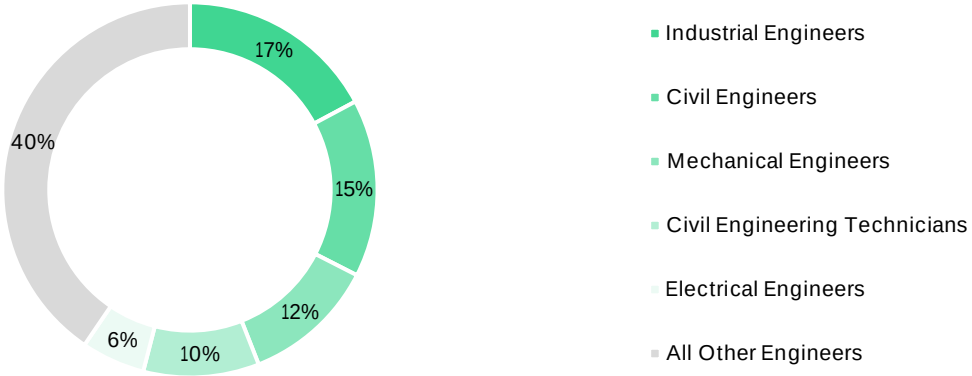
Source: Employees & Self-Employed 2019.4.

Table 2.6: Jobs, Annual Job Openings, and Median Annual Wages of Engineer Occupations in the West WPR, 2019 to 2029

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN ANNUAL WAGE
17-2112	Industrial Engineers	555	635	80	14%	47	$39.56
17-2051	Civil Engineers	495	474	(21)	(4%)	39	$37.77
17-2141	Mechanical Engineers	372	416	44	12%	29	$40.20
17-3022	Civil Engineering Technicians	323	328	5	2%	31	$22.28
17-2071	Electrical Engineers	177	195	18	10%	14	$45.36
17-2199	Engineers, All Other	171	188	17	10%	14	$45.14
17-3023	Electrical & Electronics Engineering Technicians	163	160	(3)	(2%)	15	$32.70
11-9041	Architectural & Engineering Managers	160	180	20	13%	14	$55.86
17-3029	Engineering Technicians, Except Drafters, All Other	104	104	0	0%	10	$26.63
17-2011	Aerospace Engineers	97	114	17	18%	8	$47.83
17-2072	Electronics Engineers, Except Computer	94	104	10	11%	8	$36.21
17-3026	Industrial Engineering Technicians	87	97	10	11%	9	$25.50
17-2041	Chemical Engineers	72	76	4	6%	5	$46.47
17-2121	Marine Engineers & Naval Architects	72	74	2	3%	5	$43.53
17-2131	Materials Engineers	50	53	3	6%	4	$40.08
All Other Engineers		237	247	10	4%	21	--
Total		3,230	3,446	216	7%	273	--

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 2.13: The West WPR's Top Five Engineer Occupations by 2019 Jobs



Source: Employees & Self-Employed 2019.4.

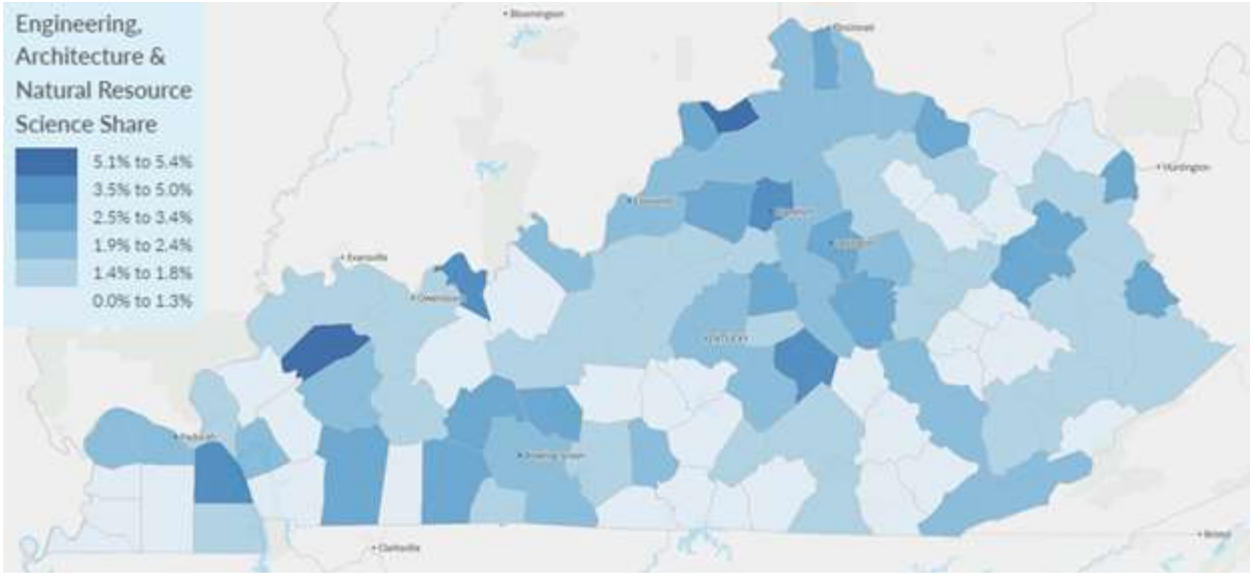
OCCUPATIONAL DIVERSITY

Evaluating employment by how the state supports jobs in occupational groups provides information on its economic diversity. Understanding the mix of jobs present in Kentucky is also important for drawing connections to the industries and companies that are in-demand and, by extension, the educational programs offered by the state's institutions. Grouping occupations according to function can help to:

- Broadly characterize the economic roles an occupation plays in its region;
- Provide insight into the economic relationships and similarities a place has with other regions;
- Identify factors that make regions comparatively better fits for certain economic activities; and
- Speak to the broader economic and demographic forces that are likely to impact a region's economic prospects.

Kentucky had an occupational diversity ranking of 25 in 2019, which was in the 53rd percentile among U.S. states and the District of Columbia (Table 2.7). When occupations are organized into functional groups, the state supported 45,829 jobs in the Engineering, Architecture, & Natural Resource Science Occupation Cluster, which accounted for 2.2% of all jobs in Kentucky in 2019. A typical region in the U.S. supported 2.4% such jobs in 2019. At the county

Figure 2.14: Share of Engineering, Architecture, & Natural Resource Science Jobs by County in Kentucky



Source: Employees & Self-Employed 2019.4.

level, no one region in the state has a large concentration of jobs in the occupation cluster, but the East and Central WPRs appear to have fewer jobs in the occupation cluster (Figure 2.14). Webster County ranked highest, in terms of its share of jobs in Engineering, Architecture, & Natural Resource Science, with 5.4% of its 2019 jobs in the occupation cluster (Table 2.7), and Caldwell County ranked lowest in the state, with 0.7% of its 2019 jobs in the occupation cluster (Table 2.8). Figure 2.15 shows the Kentucky counties with the five highest and lowest shares of 2019 jobs in the Engineering, Architecture, & Natural Resource Science Occupation Cluster, highlighting the region in which the county is located.

Table 2.7: Job Shares in the Engineering, Architecture, & Natural Resource Science Occupation Cluster for the 10 Highest Ranked Counties in Kentucky

COUNTY	2019 JOBS IN OCCUPATION CLUSTER	% JOBS IN OCCUPATION CLUSTER	TYPICAL % JOBS IN OCCUPATION CLUSTER	DIVERSITY RANK, ALL OCCUPATIONS	DIVERSITY RANK PERCENTILE, ALL OCCUPATIONS
Webster County	199	5.4%	2.4%	470 / 3,142	85.1%
Carroll County	375	5.1%	2.4%	1,287 / 3,142	59.1%
Franklin County	1,357	4.0%	2.4%	127 / 3,142	96.0%
Hancock County	173	4.0%	2.4%	3,088 / 3,142	1.7%
Lincoln County	183	3.6%	2.4%	1,000 / 3,142	68.2%
Marshall County	434	3.5%	2.4%	1,825 / 3,142	41.9%
Mason County	284	3.1%	2.4%	654 / 3,142	79.2%
Martin County	78	3.0%	2.4%	586 / 3,142	81.4%
Elliott Count	33	3.0%	2.4%	1,394 / 3,142	55.7%
Morgan County	99	3.0%	2.4%	678 / 3,142	78.4%
Kentucky	45,829	2.2%	2.4%	25 / 51	52.9%

Source: Employees & Self-Employed 2019.4.

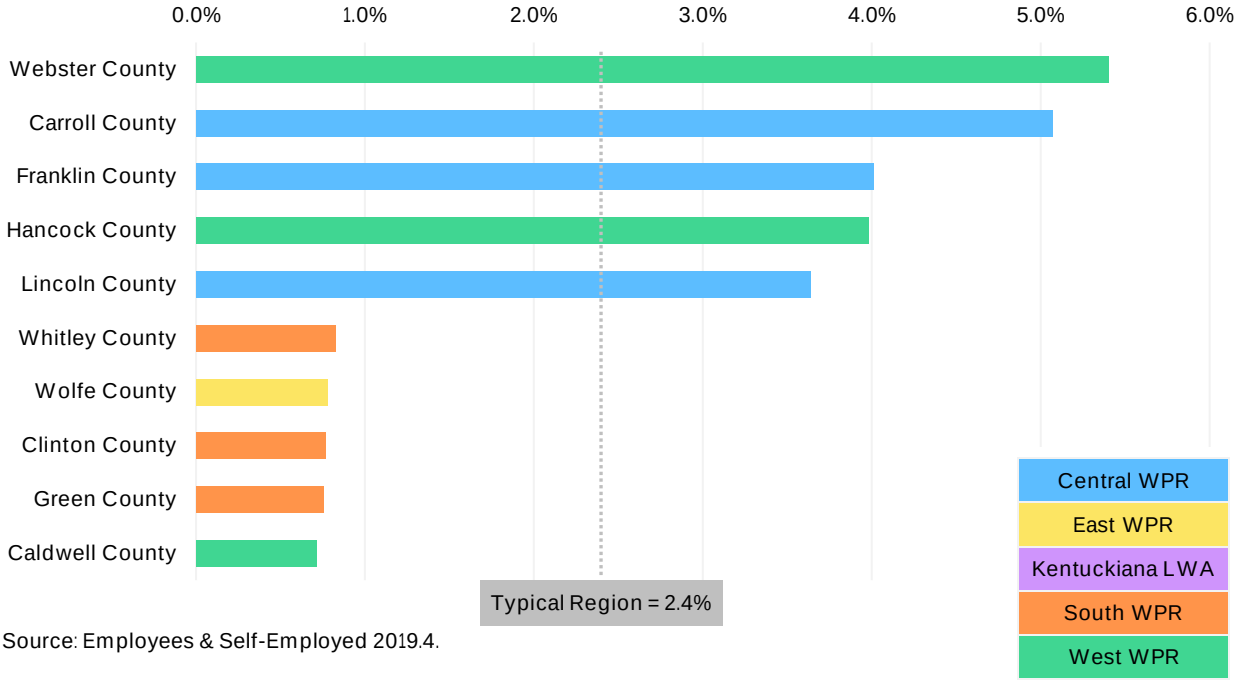
Table 2.8: Job Shares in the Engineering, Architecture, & Natural Resource Science Occupation Cluster for the 10 Lowest Ranked Counties in Kentucky

COUNTY	2019 JOBS IN OCCUPATION CLUSTER	% JOBS IN OCCUPATION CLUSTER	TYPICAL % JOBS IN OCCUPATION CLUSTER	DIVERSITY RANK, ALL OCCUPATIONS	DIVERSITY RANK PERCENTILE, ALL OCCUPATIONS
Caldwell County	34	0.7%	2.4%	2,872 / 3,142	8.6%
Green County	17	0.8%	2.4%	2,819 / 3,142	10.3%
Clinton County	33	0.8%	2.4%	3,011 / 3,142	4.2%
Wolfe County	11	0.8%	2.4%	1,847 / 3,142	41.2%
Whitley County	114	0.8%	2.4%	213 / 3,142	93.3%
Laurel County	260	0.9%	2.4%	2,623 / 3,142	16.5%
Hickman County	12	0.9%	2.4%	2,830 / 3,142	9.9%

COUNTY	2019 JOBS IN OCCUPATION CLUSTER	% JOBS IN OCCUPATION CLUSTER	TYPICAL % JOBS IN OCCUPATION CLUSTER	DIVERSITY RANK, ALL OCCUPATIONS	DIVERSITY RANK PERCENTILE, ALL OCCUPATIONS
Owsley County	8	1.0%	2.4%	1,132 / 3,142	64.0%
Taylor County	128	1.0%	2.4%	2,607 / 3,142	17.0%
Breckinridge County	42	1.0%	2.4%	2,402 / 3,142	23.6%
Kentucky	45,829	2.2%	2.4%	25 / 51	52.9%

Source: Employees & Self-Employed 2019.4.

Figure 2.15: Job Shares in the Engineering, Architecture, & Natural Resource Science Occupation Cluster for the Five Highest and Lowest Ranked Counties in Kentucky



Source: Employees & Self-Employed 2019.4.

TOP INDUSTRIES

With the engineering occupations in mind, we can now turn to engineering industries. Engineers appear in a variety of industries; in other words, while there is an Engineering Services industry, engineers also work in other industries such as in manufacturing or even government-owned agencies. To identify the top industries employing engineers in Kentucky, we use inverse staffing patterns from the National Occupational Employment Statistics program, projections from the National Industry-Occupation Employment Matrix, and Emsi's proprietary employment data. Results are provided according to the North American Industry Classification System (NAICS) at the five-digit NAICS code level. In Emsi

data, all establishments in the main NAICS hierarchy are private sector only. For example, jobs in Engineering Services are not associated with the local, state, or federal governments.

As seen in Table 2.9, the Engineering Services industry employed around 4,286 engineers in 2019, or around 16% of all engineers. Engineers are also employed in government (local, state, and federal) and a wide variety of manufacturing industries. Given that the Engineering Services industry employs by far the most engineers, Table 2.10 provides a breakdown of engineer occupations within the industry. Civil engineers and technicians, mechanical engineers, and electrical engineers are the top occupations within the Engineering Services industry.

Tables 2.11 to 2.20 and Figures 2.17 to 2.21 provide the same information, but by region. Engineering Services is the top industry employing engineers in the Central WPR, Kentuckiana LWA, and West WPR, whereas the State Government industry employs the most engineers in the East and South WPRs. The Federal Government (both civilian and military) employ many engineers in the West WPR. The South WPR seems to have a niche in a couple automobile parts manufacturing industries requiring engineers.

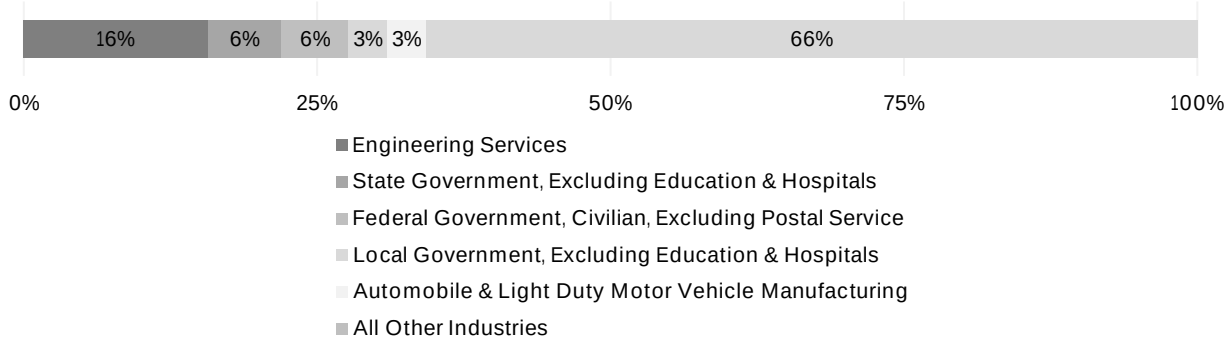
Table 2.9: Industries in Kentucky that Employ the Largest Share of Engineers

NAICS CODE	NAICS TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
54133	Engineering Services	4,286	4,805	520	12%	15.7%
90299	State Government, Excluding Education & Hospitals	1,707	1,682	(24)	(1%)	6.3%
90119	Federal Government, Civilian, Excluding Postal Service	1,566	1,487	(79)	(5%)	5.7%
90399	Local Government, Excluding Education & Hospitals	910	946	36	4%	3.3%
33611	Automobile & Light Duty Motor Vehicle Manufacturing	882	1,089	207	23%	3.2%
55111	Management of Companies & Enterprises	757	730	(27)	(4%)	2.8%
33641	Aerospace Product & Parts Manufacturing	637	769	133	21%	2.3%
56132	Temporary Help Services	597	620	24	4%	2.2%
33639	Other Motor Vehicle Parts Manufacturing	521	597	76	15%	1.9%
90120	Federal Government, Military	514	491	(23)	(5%)	1.9%
33636	Motor Vehicle Seating & Interior Trim Manufacturing	483	665	182	38%	1.8%
54161	Management Consulting Services	434	603	169	39%	1.6%
33637	Motor Vehicle Metal Stamping	421	491	70	17%	1.5%
54151	Computer Systems Design & Related Services	412	482	71	17%	1.5%
54171	Research & Development in the Physical, Engineering, & Life Sciences	397	569	172	43%	1.5%

NAICS CODE	NAICS TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
All Other Industries		12,769	13,875	1,106	9%	46.8%
Total		27,292	29,903	2,611	10%	100.0%

Source: Employees & Self-Employed 2019.4.

Figure 2.16: Top Five Industries in Kentucky that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

Table 2.10: Ten Most Represented Occupations in Engineering Services in Kentucky

SOC CODE	SOC TITLE	2019 JOBS	10-YEAR JOB CHANGE	% OF TOTAL JOBS IN INDUSTRY	MEDIAN HOURLY WAGE	TYPICAL ENTRY LEVEL EDUCATION
17-2051	Civil Engineers	1,499	148	17.0%	$38.39	BACH
17-3022	Civil Engineering Technicians	709	16	8.0%	$22.13	ASSOC
17-2141	Mechanical Engineers	491	104	5.6%	$40.80	BACH
17-2071	Electrical Engineers	337	67	3.8%	$41.70	BACH
17-3011	Architectural & Civil Drafters	324	29	3.7%	$23.02	ASSOC
11-9041	Architectural & Engineering Managers	310	35	3.5%	$55.13	BACH
17-1022	Surveyors	235	4	2.7%	$25.34	BACH
11-1021	General & Operations Managers	227	28	2.6%	$33.73	BACH
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical, & Executive	212	(7)	2.4%	$15.38	HS/GED
43-9061	Office Clerks, General	178	(3)	2.0%	$13.11	HS/GED

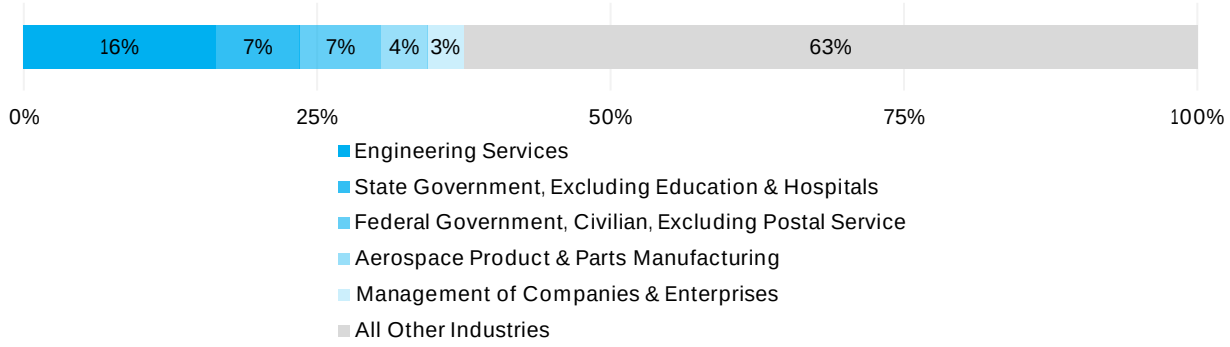
Source: Employees & Self-Employed 2019.4.

Table 2.11: Industries in the Central WPR that Employ the Largest Share of Engineers

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
54133	Engineering Services	1,883	2,132	249	13%	16.4%
90299	State Government, Excluding Education & Hospitals	821	836	15	2%	7.1%
90119	Federal Government, Civilian, Excluding Postal Service	798	746	(52)	(7%)	6.9%
33641	Aerospace Product & Parts Manufacturing	449	539	90	20%	3.9%
55111	Management of Companies & Enterprises	357	303	(54)	(15%)	3.1%
90399	Local Government, Excluding Education & Hospitals	331	348	17	5%	2.9%
33411	Computer & Peripheral Equipment Manufacturing	250	114	(135)	(54%)	2.2%
33633	Motor Vehicle Steering & Suspension Components (except Spring) Manufacturing	228	199	(28)	(12%)	2.0%
56132	Temporary Help Services	226	212	(14)	(6%)	2.0%
33611	Automobile & Light Duty Motor Vehicle Manufacturing	224	252	28	12%	1.9%
54171	Research & Development in the Physical, Engineering, & Life Sciences	202	323	120	59%	1.8%
33531	Electrical Equipment Manufacturing	194	257	64	33%	1.7%
33341	Ventilation, Heating, Air-Conditioning, & Commercial Refrigeration Equipment Manufacturing	193	170	(23)	(12%)	1.7%
54161	Management Consulting Services	189	272	83	44%	1.6%
54151	Computer Systems Design & Related Services	180	193	13	7%	1.6%
All Other Industries		4,974	5,728	755	15%	43.3%
Total		11,498	12,625	1,127	10%	100.0%

Source: Employees & Self-Employed 2019.4.

Figure 2.17: Top Five Industries in the Central WPR that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

Table 2.12: Ten Most Represented Occupations in Engineering Services in the Central WPR

SOC CODE	SOC TITLE	2019 JOBS	10-YEAR JOB CHANGE	% OF TOTAL JOBS IN INDUSTRY	MEDIAN HOURLY WAGE	TYPICAL ENTRY LEVEL EDUCATION
17-2051	Civil Engineers	593	72	15.5%	$39.00	BACH
17-3022	Civil Engineering Technicians	294	16	7.7%	$22.92	ASSOC
11-9041	Architectural & Engineering Managers	216	22	5.7%	$56.29	BACH
17-2141	Mechanical Engineers	189	38	4.9%	$40.14	BACH
17-2071	Electrical Engineers	153	29	4.0%	$39.75	BACH
17-3011	Architectural & Civil Drafters	128	16	3.3%	$23.92	ASSOC
17-1022	Surveyors	102	2	2.7%	$29.36	BACH
11-1021	General & Operations Managers	96	10	2.5%	$34.68	BACH
17-2112	Industrial Engineers	89	28	2.3%	$37.65	BACH
17-3031	Surveying & Mapping Technicians	89	5	2.3%	$16.11	HS/GED

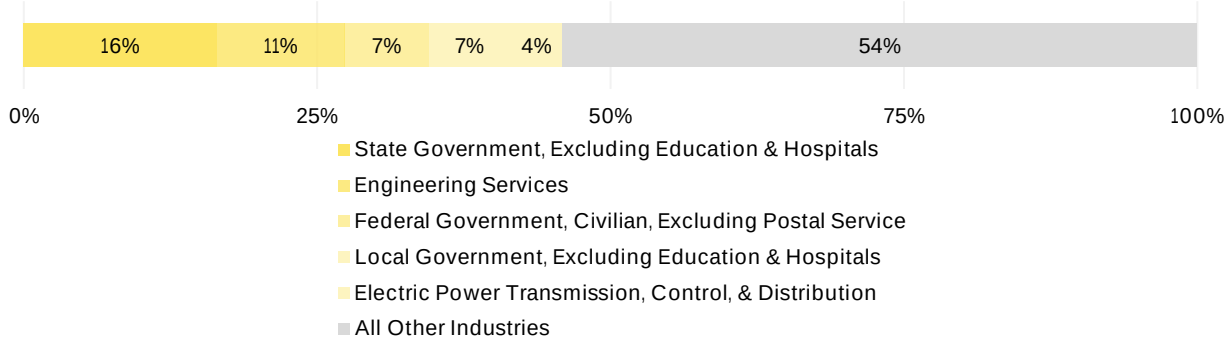
Source: Employees & Self-Employed 2019.4.

Table 2.13: Industries in the East WPR that Employ the Largest Share of Engineers

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
90299	State Government, Excluding Education & Hospitals	351	366	16	5%	16.5%
54133	Engineering Services	231	204	(27)	(12%)	10.9%
90119	Federal Government, Civilian, Excluding Postal Service	153	127	(26)	(17%)	7.2%
90399	Local Government, Excluding Education & Hospitals	147	149	2	1%	6.9%
22112	Electric Power Transmission, Control, & Distribution	96	93	(3)	(3%)	4.5%
21211	Coal Mining	94	44	(50)	(53%)	4.4%
33361	Engine, Turbine, & Power Transmission Equipment Manufacturing	83	51	(32)	(39%)	3.9%
33451	Navigational, Measuring, Electromedical, & Control Instruments Manufacturing	73	96	23	32%	3.4%
54171	Research & Development in the Physical, Engineering, & Life Sciences	69	77	8	12%	3.2%
54138	Testing Laboratories	60	47	(13)	(22%)	2.8%
33637	Motor Vehicle Metal Stamping	37	38	1	2%	1.7%
51731	Wired & Wireless Telecommunications Carriers	37	37	0	1%	1.7%
33639	Other Motor Vehicle Parts Manufacturing	33	47	14	44%	1.5%
32411	Petroleum Refineries	31	47	16	53%	1.4%
33911	Medical Equipment & Supplies Manufacturing	27	34	6	24%	1.3%
All Other Industries		609	643	34	6%	28.6%
Total		2,129	2,099	(30)	(1%)	100.0%

Source: Employees & Self-Employed 2019.4.

Figure 2.18: Top Five Industries in the East WPR that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

Table 2.14: Ten Most Represented Occupations in Engineering Services in the East WPR

SOC CODE	SOC TITLE	2019 JOBS	10-YEAR JOB CHANGE	% OF TOTAL JOBS IN INDUSTRY	MEDIAN HOURLY WAGE	TYPICAL ENTRY LEVEL EDUCATION
17-2051	Civil Engineers	66	(2)	17.1%	$36.97	BACH
17-3022	Civil Engineering Technicians	53	(28)	13.7%	$21.86	ASSOC
17-2071	Electrical Engineers	35	4	8.9%	$37.94	BACH
17-1022	Surveyors	27	(11)	6.8%	$20.73	BACH
17-2141	Mechanical Engineers	18	(1)	4.6%	$38.70	BACH
17-3031	Surveying & Mapping Technicians	15	(8)	3.9%	$14.24	HS/GED
11-9041	Architectural & Engineering Managers	15	1	3.8%	$49.09	BACH
17-3013	Mechanical Drafters	11	1	2.9%	$39.18	ASSOC
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical, & Executive	8	(2)	2.2%	$13.86	HS/GED
17-3011	Architectural & Civil Drafters	7	(2)	1.8%	$21.46	ASSOC

Source: Employees & Self-Employed 2019.4.

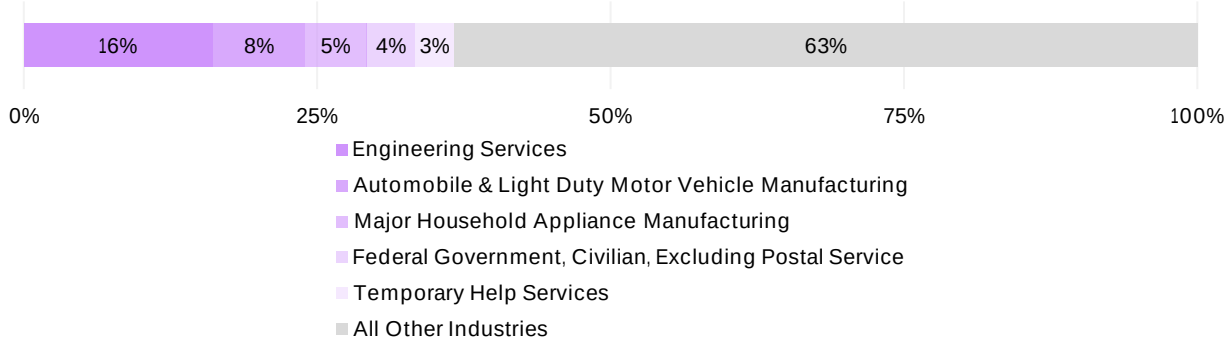
Table 2.15: Industries in the Kentuckiana LWA that Employ the Largest Share of Engineers

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
54133	Engineering Services	1,196	1,537	341	28%	16.1%
33611	Automobile & Light Duty Motor Vehicle Manufacturing	584	759	175	30%	7.9%
33522	Major Household Appliance Manufacturing	390	436	45	12%	5.3%
90119	Federal Government, Civilian, Excluding Postal Service	306	327	20	7%	4.1%
56132	Temporary Help Services	248	269	20	8%	3.3%
55111	Management of Companies & Enterprises	248	274	26	10%	3.3%
33636	Motor Vehicle Seating & Interior Trim Manufacturing	207	268	61	29%	2.8%
90399	Local Government, Excluding Education & Hospitals	202	213	11	6%	2.7%
90299	State Government, Excluding Education & Hospitals	184	143	(40)	(22%)	2.5%
33392	Material Handling Equipment Manufacturing	172	216	44	25%	2.3%
54151	Computer Systems Design & Related Services	154	198	44	28%	2.1%
54161	Management Consulting Services	139	158	19	13%	1.9%
33639	Other Motor Vehicle Parts Manufacturing	139	139	(0)	(0%)	1.9%
33399	All Other General Purpose Machinery Manufacturing	138	182	45	32%	1.9%

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
23622	Commercial & Institutional Building Construction	88	87	(1)	(2%)	1.2%
All Other Industries		3,032	3,134	103	3%	40.8%
Total		7,428	8,339	911	12%	100.0%

Source: Employees & Self-Employed 2019.4.

Figure 2.19: Top Five Industries in the Kentuckiana LWA that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

Table 2.16: Ten Most Represented Occupations in Engineering Services in the Kentuckiana LWA

SOC CODE	SOC TITLE	2019 JOBS	10-YEAR JOB CHANGE	% OF TOTAL JOBS IN INDUSTRY	MEDIAN HOURLY WAGE	TYPICAL ENTRY LEVEL EDUCATION
17-2051	Civil Engineers	524	121	20.7%	$39.66	BACH
17-2141	Mechanical Engineers	223	67	8.8%	$41.60	BACH
17-3022	Civil Engineering Technicians	135	28	5.3%	$21.45	ASSOC
17-3011	Architectural & Civil Drafters	114	27	4.5%	$24.54	ASSOC
17-2071	Electrical Engineers	86	33	3.4%	$44.28	BACH
11-1021	General & Operations Managers	60	16	2.4%	$37.94	BACH
47-4011	Construction & Building Inspectors	57	13	2.3%	$27.09	HS/GED
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical, & Executive	48	8	1.9%	$17.46	HS/GED
17-1011	Architects, Except Landscape & Naval	48	5	1.9%	$32.74	BACH
15-1132	Software Developers, Applications	44	15	1.8%	$39.73	BACH

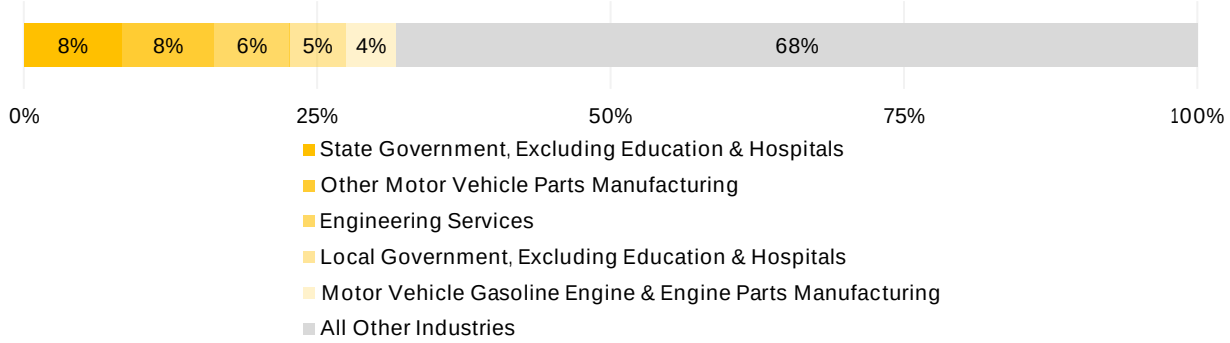
Source: Employees & Self-Employed 2019.4.

Table 2.17: Industries in the South WPR that Employ the Largest Share of Engineers

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
90299	State Government, Excluding Education & Hospitals	212	204	(8)	(4%)	8.3%
33639	Other Motor Vehicle Parts Manufacturing	201	252	51	25%	7.9%
54133	Engineering Services	163	172	9	5%	6.4%
90399	Local Government, Excluding Education & Hospitals	123	133	10	8%	4.8%
33631	Motor Vehicle Gasoline Engine & Engine Parts Manufacturing	109	110	1	1%	4.3%
55111	Management of Companies & Enterprises	103	103	0	0%	4.1%
33632	Motor Vehicle Electrical & Electronic Equipment Manufacturing	94	96	2	2%	3.7%
33611	Automobile & Light Duty Motor Vehicle Manufacturing	79	86	7	9%	3.1%
90119	Federal Government, Civilian, Excluding Postal Service	78	75	(3)	(3%)	3.1%
33636	Motor Vehicle Seating & Interior Trim Manufacturing	76	119	42	55%	3.0%
33152	Nonferrous Metal Foundries	61	56	(5)	(9%)	2.4%
33637	Motor Vehicle Metal Stamping	59	87	27	46%	2.3%
33634	Motor Vehicle Brake System Manufacturing	58	79	21	35%	2.3%
33211	Forging & Stamping	51	72	21	41%	2.0%
32619	Other Plastics Product Manufacturing	49	53	4	8%	1.9%
All Other Industries		1,029	1,224	195	19%	40.4%
Total		2,545	2,920	375	15%	100.0%

Source: Employees & Self-Employed 2019.4.

Figure 2.20: Top Five Industries in the South WPR that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

Table 2.18: Ten Most Represented Occupations in Engineering Services in the South WPR

SOC CODE	SOC TITLE	2019 JOBS	10-YEAR JOB CHANGE	% OF TOTAL JOBS IN INDUSTRY	MEDIAN HOURLY WAGE	TYPICAL ENTRY LEVEL EDUCATION
17-3022	Civil Engineering Technicians	57	1	19.5%	$21.41	ASSOC
17-2051	Civil Engineers	46	2	15.5%	$34.62	BACH
17-1022	Surveyors	21	0	7.0%	$18.17	BACH
17-3011	Architectural & Civil Drafters	18	0	6.0%	$19.47	ASSOC
17-3031	Surveying & Mapping Technicians	9	0	3.0%	$16.43	HS/GED
11-9041	Architectural & Engineering Managers	9	0	2.9%	$49.68	BACH
17-2141	Mechanical Engineers	8	1	2.7%	$33.65	BACH
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical, & Executive	8	(1)	2.7%	$13.98	HS/GED
17-2112	Industrial Engineers	8	2	2.6%	$36.25	BACH
17-2199	Engineers, All Other	8	0	2.6%	$33.66	BACH

Source: Employees & Self-Employed 2019.4.

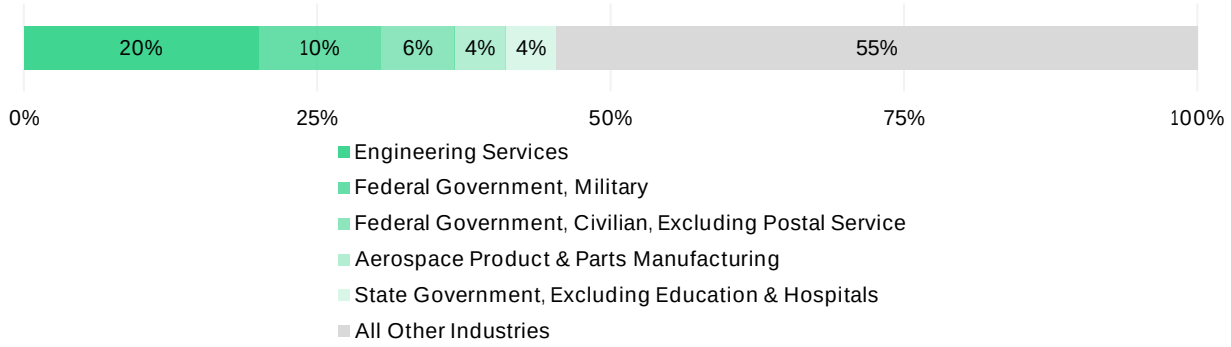
Table 2.19: Industries in the West WPR that Employ the Largest Share of Engineers

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
54133	Engineering Services	646	668	22	3%	20.0%
90120	Federal Government, Military	337	340	3	1%	10.4%
90119	Federal Government, Civilian, Excluding Postal Service	202	168	(34)	(17%)	6.3%
33641	Aerospace Product & Parts Manufacturing	141	180	39	27%	4.4%
90299	State Government, Excluding Education & Hospitals	138	133	(5)	(4%)	4.3%
33361	Engine, Turbine, & Power Transmission Equipment Manufacturing	116	107	(9)	(8%)	3.6%
90399	Local Government, Excluding Education & Hospitals	108	103	(5)	(5%)	3.3%
33131	Alumina & Aluminum Production & Processing	96	94	(1)	(1%)	3.0%
32521	Resin & Synthetic Rubber Manufacturing	89	87	(2)	(2%)	2.8%
33637	Motor Vehicle Metal Stamping	66	93	27	40%	2.0%
33311	Agricultural Implement Manufacturing	58	100	41	71%	1.8%
33441	Semiconductor & Other Electronic Component Manufacturing	51	50	(1)	(2%)	1.6%
56132	Temporary Help Services	49	62	13	26%	1.5%
33351	Metalworking Machinery Manufacturing	44	60	16	35%	1.4%

NAICS CODE	NAICS TITLE	2018 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE	% OCCUPATIONS IN INDUSTRY
33633	Motor Vehicle Steering & Suspension Components (except Spring) Manufacturing	41	59	18	44%	1.3%
All Other Industries		1,046	1,142	96	9%	32.4%
Total		3,230	3,446	216	7%	100.0%

Source: Employees & Self-Employed 2019.4.

Figure 2.21: Top Five Industries in the West WPR that Employ the Largest Share of Engineers



Source: Employees & Self-Employed 2019.4.

Table 2.20: Ten Most Represented Occupations in Engineering Services in the West WPR

SOC CODE	SOC TITLE	2019 JOBS	10-YEAR JOB CHANGE	% OF TOTAL JOBS IN INDUSTRY	MEDIAN HOURLY WAGE	TYPICAL ENTRY LEVEL EDUCATION
17-2051	Civil Engineers	210	(18)	14.0%	$37.77	BACH
17-3022	Civil Engineering Technicians	138	17	9.3%	$22.28	ASSOC
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical, & Executive	60	(7)	4.0%	$14.16	HS/GED
11-1021	General & Operations Managers	49	6	3.3%	$31.73	BACH
43-9061	Office Clerks, General	46	(10)	3.1%	$13.09	HS/GED
17-3011	Architectural & Civil Drafters	45	(8)	3.0%	$22.67	ASSOC
17-2071	Electrical Engineers	42	6	2.8%	$45.36	BACH
17-1022	Surveyors	40	7	2.7%	$24.12	BACH
11-9041	Architectural & Engineering Managers	34	2	2.3%	$55.86	BACH
17-2141	Mechanical Engineers	34	5	2.3%	$40.20	BACH

Source: Employees & Self-Employed 2019.4.

CHAPTER 3:

Job Postings & Demographic Analysis

Job postings are online advertisements for jobs, posted by companies trying to attract applicants. Analyzing job postings for information on the labor market can yield valuable insight, such as skills that employers are requesting, the companies that are posting jobs, where those jobs are located, and greater specificity in job titles. In addition, job postings also have virtually no lag time, as they can be collected from sites soon after being posted. However, not all jobs are posted online, and in some cases, companies post far more positions than they intend to hire in an effort to cast a broad net for talent. Many factors can influence the number of postings that appear on the web for a particular job or company, including:

- Fluctuating prices of job postings;
- Building waiting lists of potential hires should positions become vacant;
- The hiring of new employees immediately or in six months;
- Postings left online after positions have been filled; and
- Duplicate postings for a given position.

It can be helpful to think of the job postings analysis as a measure of the intentions of those who post jobs. For Kentucky's educational institutions, job postings indicate what is currently in demand across statewide or regional employers, including emerging needs. As such, job postings information can be used to help tailor program curricula so that graduates will be competitive in the job market. The sources collect about 100 million job postings per month from more than 90,000 companies. Emsi de-duplicates these postings down to approximately 8 million unique job postings per month. In the process, geographies are assigned to the postings as well as company names, job locations, skills, and so on.

The following tables and figures show job postings related to five of Kentucky's top engineering occupations. The tables present data on unique job postings and posting intensity. Posting intensity is the ratio between total and unique job postings and can be seen as an indication of the intensity or effort by the poster to advertise and fill the position in question. Unique job postings are the number of posts for the job title, city, or company for the posting duration. Job postings include advertisements in Kentucky from September

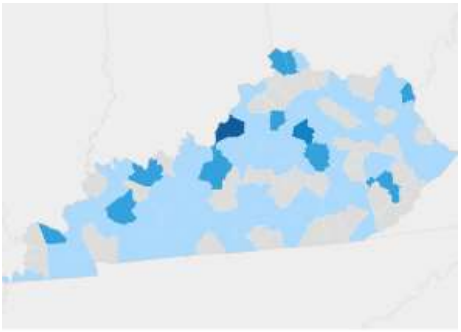
2016 to September 2019. Also included in the following tables and figures are demographic information by occupation – age, race/ethnicity, gender, and educational attainment.

Industrial engineers are the most in-demand of Kentucky employers, particularly in the Central WPR and Kentuckiana LWA. Examples of top industrial engineer job titles are process engineers, quality assurance engineers, and project engineers. Top employers looking for industrial engineers are General Electric, BAE Systems, and Lockheed Martin.

In terms of demographics, civil engineers are the youngest, with the highest number of workers in the 25 to 34 years age band. Mechanical engineers are fairly evenly split across the three age bands encompassing age 25 to 54 years. The other three occupations have the most workers in the 45 to 54 years age band, indicating a graying out of their workforce in the near future. Workers in the engineering occupations are predominantly male. Industrial engineers have the most gender diversity, with 19% of workers female.

CIVIL ENGINEERS

1,945	4 : 1	33 days
Unique Postings 8,375 Total Postings	Posting Intensity State Average: 4 : 1	Median Posting Duration State Average: 28 days



County	Unique Postings
Jefferson County	634
Fayette County	388
Franklin County	99
Not reported	58
Hardin County	51

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.1: Top Job Titles for Civil Engineers in Kentucky Job Postings

JOB TITLE	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Civil Engineers	281	4 : 1	30 days
Structural Engineers	197	3 : 1	35 days
Project Engineers (Architecture & Engineering)	182	3 : 1	30 days
Bridge Engineers	123	7 : 1	17 days

JOB TITLE	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Transportation Engineers	102	4 : 1	33 days
Geotechnical Engineers	94	5 : 1	47 days
Construction Engineers	89	7 : 1	35 days
Construction Materials Technicians	73	10 : 1	58 days
Field Engineers (Architecture & Engineering)	71	4 : 1	38 days
Water Resource Engineers	67	4 : 1	38 days
Design Engineers (Architecture & Engineering)	55	3 : 1	33 days
Engineering Interns	50	5 : 1	38 days
Engineering Co-ops	37	4 : 1	43 days
Engineers In Training (EIT)	27	2 : 1	30 days
Traffic Engineers	24	4 : 1	60 days

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.2: Top Cities for Civil Engineers in Kentucky Job Postings

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Louisville, KY	627	4 : 1	35 days
Lexington, KY	382	4 : 1	48 days
Frankfort, KY	99	3 : 1	13 days
Richmond, KY	47	5 : 1	39 days
Paducah, KY	44	3 : 1	31 days
Elizabethtown, KY	39	10 : 1	40 days
Madisonville, KY	38	8 : 1	30 days
Hazard, KY	36	11 : 1	55 days
Owensboro, KY	31	5 : 1	23 days
Covington, KY	27	2 : 1	19 days
Springfield, KY	26	13 : 1	58 days
Bowling Green, KY	23	2 : 1	25 days
Burlington, KY	23	13 : 1	59 days
London, KY	22	2 : 1	11 days
Ashland, KY	18	9 : 1	42 days

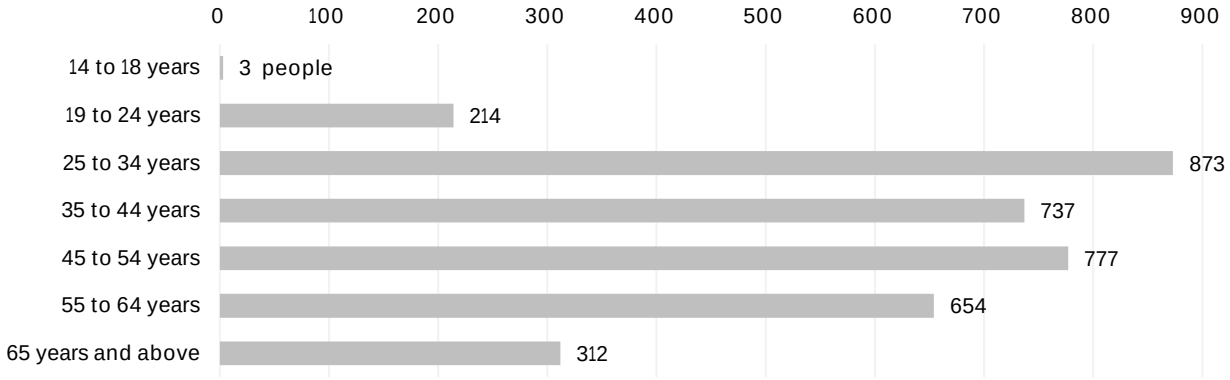
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.3: Top Companies Posting for Civil Engineers in Kentucky Job Postings

COMPANY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Army National Guard	187	9 : 1	45 days
Stantec, Inc.	148	4 : 1	61 days
HDR Engineering, Inc.	131	2 : 1	29 days
United States Department of the Army	83	7 : 1	29 days
Aecom	70	5 : 1	33 days
Commonwealth of Kentucky	62	4 : 1	25 days
National Guard	50	15 : 1	58 days
Bechtel Corporation	30	3 : 1	50 days
Pla CDM Smith, Inc.	27	3 : 1	116 days
Tetra Tech, Inc.	27	4 : 1	49 days

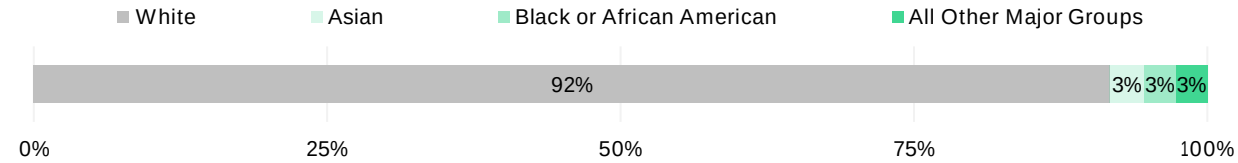
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Figure 3.1: Kentucky's Civil Engineers by Age Group



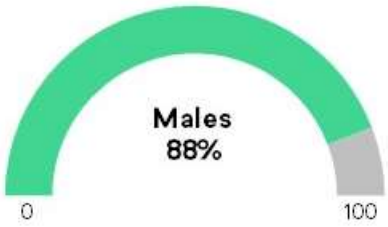
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.2: Kentucky's Civil Engineers by Major Race and Ethnicity Group



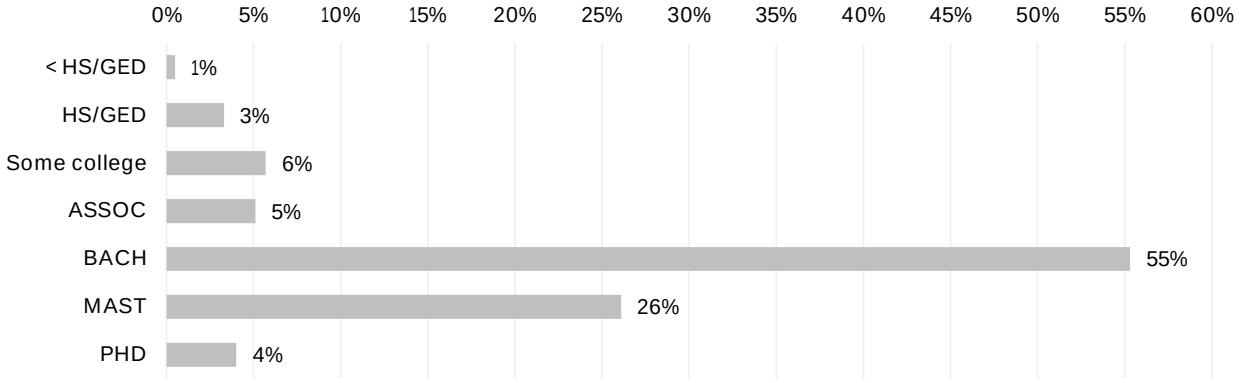
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.3: Kentucky's Civil Engineers by Gender



Source: Emsi Employees & Self-Employed 2019.4.

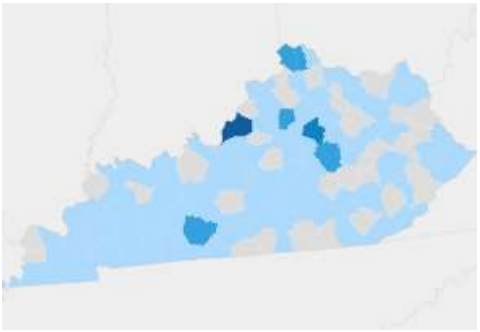
Figure 3.4: Kentucky's Civil Engineers by Highest Educational Attainment



Source: Emsi Employees & Self-Employed 2019.4.

ELECTRICAL ENGINEERS

2,242	4 : 1	33 days
Unique Postings 9,041 Total Postings	Posting Intensity State Average: 4 : 1	Median Posting Duration State Average: 28 days



County	Unique Postings
Jefferson County	630
Fayette County	375
Franklin County	148
Boone County	103
Madison County	96

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.4: Top Job Titles for Electrical Engineers in Kentucky Job Postings

JOB TITLE	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Senior Electrical Engineers	373	5 : 1	34 days
Design Engineers (Architecture & Engineering)	169	3 : 1	33 days
Controls Engineers	151	3 : 1	40 days
Field Engineers (Architecture & Engineering)	149	3 : 1	26 days
Electrical Engineers	145	5 : 1	31 days
Power Systems Engineers	86	3 : 1	30 days
Service Engineers	76	3 : 1	2 days
Entry Level Electrical Engineers	69	5 : 1	46 days
Systems Engineers (Architecture & Engineering)	63	5 : 1	41 days
Project Engineers (Architecture & Engineering)	60	4 : 1	48 days
Engineering Interns	52	4 : 1	41 days
Engineering Co-ops	51	4 : 1	39 days
PLC Engineers	43	3 : 1	32 days
Plant Engineers	40	5 : 1	52 days
Lead Electrical Engineers	40	8 : 1	41 days

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.5: Top Cities for Electrical Engineers in Kentucky Job Postings

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Louisville, KY	616	4 : 1	35 days
Lexington, KY	367	5 : 1	36 days
Frankfort, KY	148	3 : 1	19 days
Richmond, KY	91	8 : 1	51 days
Bowling Green, KY	73	3 : 1	29 days
Florence, KY	68	2 : 1	25 days
Owensboro, KY	42	8 : 1	32 days
Harrodsburg, KY	34	5 : 1	53 days
Lewisport, KY	29	4 : 1	42 days
Erlanger, KY	28	3 : 1	41 days
Winchester, KY	28	4 : 1	33 days
Paducah, KY	27	6 : 1	29 days
Simpsonville, KY	26	4 : 1	35 days
Wheatcroft, KY	26	1 : 1	25 days

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Ashland, KY	24	3 : 1	43 days

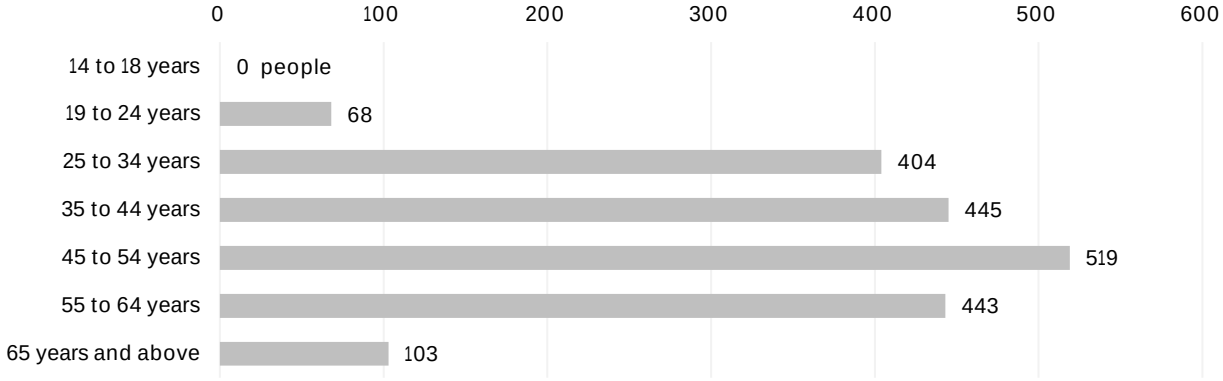
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.6: Top Companies Posting for Electrical Engineers in Kentucky Job Postings

COMPANY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
E.ON UK PLC	127	4 : 1	37 days
General Electric Company	75	4 : 1	33 days
Leidos Holdings, Inc.	55	3 : 1	7 days
Raytheon Company	53	5 : 1	47 days
Lockheed Martin Corporation	45	12 : 1	50 days
Lexmark International, Inc.	43	4 : 1	33 days
Elekta	41	1 : 1	2 days
Fieldco	40	2 : 1	57 days
Wells Engineering	34	1 : 1	25 days
Bechtel Corporation	34	11 : 1	58 days

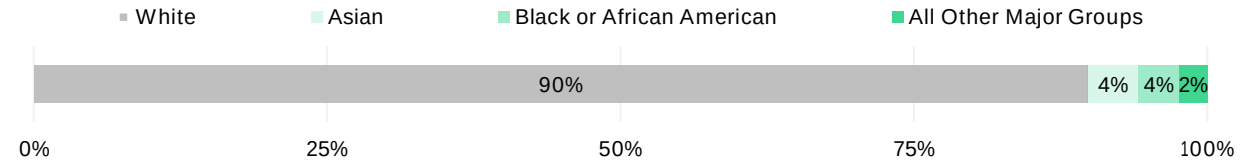
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Figure 3.5: Kentucky's Electrical Engineers by Age Group



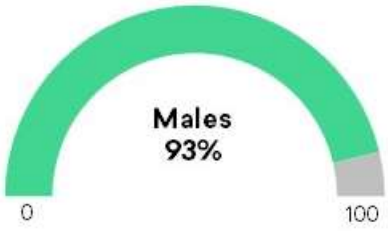
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.6: Kentucky's Electrical Engineers by the Major Race and Ethnicity Groups



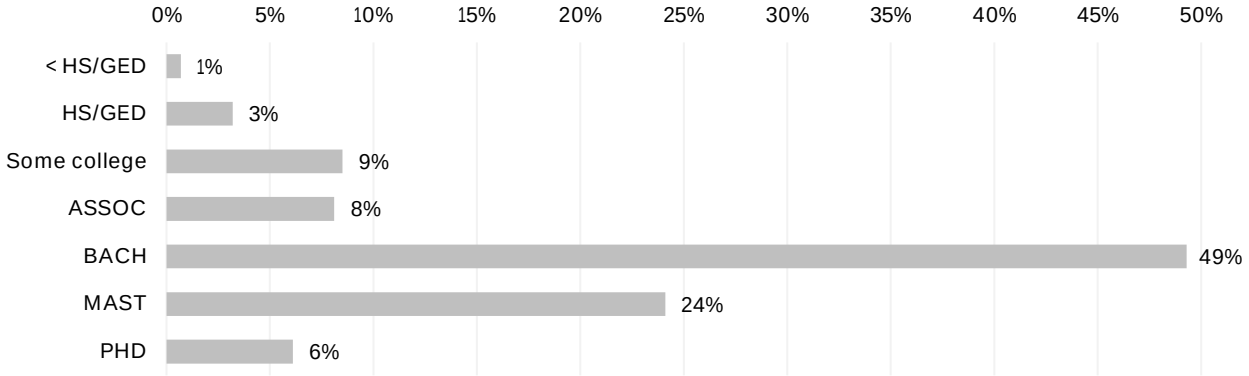
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.7: Kentucky's Electrical Engineers by Gender



Source: Emsi Employees & Self-Employed 2019.4.

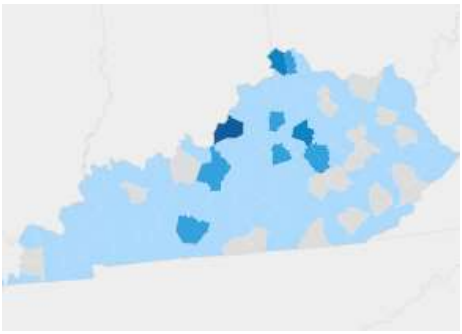
Figure 3.8: Kentucky's Electrical Engineers by Highest Educational Attainment



Source: Emsi Employees & Self-Employed 2019.4.

INDUSTRIAL ENGINEERS

8,627	4 : 1	37 days
Unique Postings 37,857 Total Postings	Posting Intensity State Average: 4 : 1	Median Posting Duration State Average: 28 days



County	Unique Postings
Jefferson County	2,333
Fayette County	878
Boone County	658
Warren County	402
Franklin County	369

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.7: Top Job Titles for Industrial Engineers in Kentucky Job Postings

JOB TITLE	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Process Engineers	978	5 : 1	36 days
Quality Assurance Engineers	877	6 : 1	37 days
Quality Engineers	806	6 : 1	35 days
Manufacturing Engineers	423	6 : 1	37 days
Project Engineers	337	5 : 1	34 days
Industrial Engineers	311	5 : 1	45 days
Engineering Co-ops	294	6 : 1	40 days
Controls Engineers	259	7 : 1	42 days
Design Engineers	243	5 : 1	49 days
Product Engineers	251	6 : 1	34 days
Continuous Improvement Engineers	166	5 : 1	43 days
Plant Engineers	165	8 : 1	35 days
Automation Engineers	130	5 : 1	42 days
Packaging Engineers	110	7 : 1	50 days
User Experience Designers	151	3 : 1	26 days

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.8: Top Cities for Industrial Engineers in Kentucky Job Postings

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Louisville, KY	2,299	5 : 1	42 days
Lexington, KY	837	4 : 1	34 days
Bowling Green, KY	402	5 : 1	37 days
Florence, KY	400	5 : 1	40 days
Frankfort, KY	369	3 : 1	28 days
Elizabethtown, KY	276	5 : 1	45 days
Erlanger, KY	221	5 : 1	48 days
Harrodsburg, KY	207	7 : 1	57 days
Richmond, KY	195	5 : 1	36 days
Georgetown, KY	155	3 : 1	30 days
Hopkinsville, KY	144	4 : 1	36 days
Hebron, KY	143	5 : 1	52 days
Owensboro, KY	123	5 : 1	33 days
Shelbyville, KY	97	3 : 1	38 days

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Winchester, KY	91	5 : 1	53 days

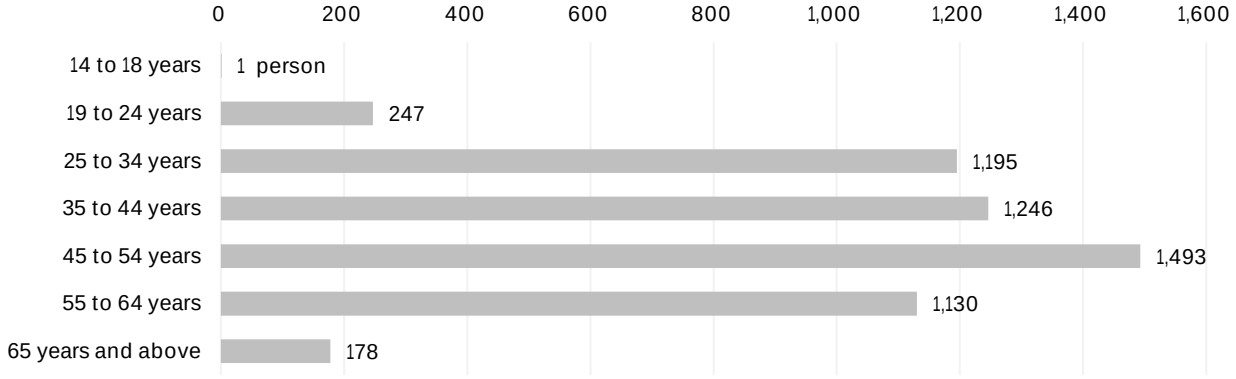
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.9: Top Companies Posting for Industrial Engineers in Kentucky Job Postings

COMPANY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
GE Appliances, Inc.	283	5 : 1	54 days
United Parcel Service, Inc.	179	9 : 1	31 days
BAE SYSTEMS PLC	166	6 : 1	64 days
General Electric Company	166	4 : 1	43 days
Lockheed Martin Corporation	158	6 : 1	45 days
MEGGITT PLC	129	5 : 1	48 days
Metalsa, S.A. De C.V.	105	3 : 1	69 days
Corning Incorporated	100	9 : 1	57 days
Humana, Inc.	96	8 : 1	46 days
Ingenium Corporation	87	2 : 1	32 days

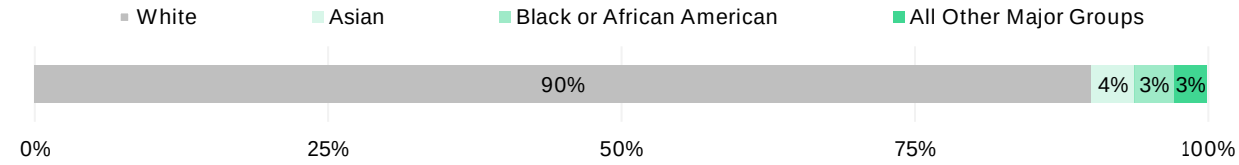
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Figure 3.9: Kentucky's Industrial Engineers by Age Group



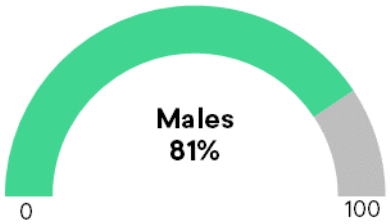
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.10: Kentucky's Industrial Engineers by Major Race and Ethnicity Group



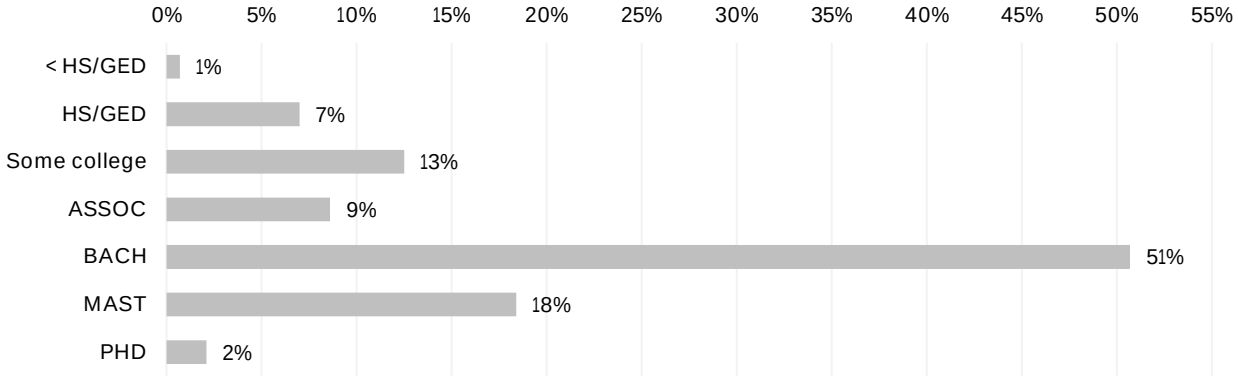
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.11: Kentucky's Industrial Engineers by Gender



Source: Emsi Employees & Self-Employed 2019.4.

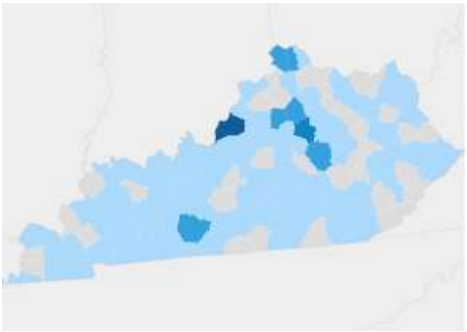
Figure 3.12: Kentucky's Industrial Engineers by Highest Educational Attainment



Source: Emsi Employees & Self-Employed 2019.4.

MECHANICAL ENGINEERS

2,657	4 : 1	34 days
Unique Postings 10,192 Total Postings	Posting Intensity State Average: 4 : 1	Median Posting Duration State Average: 28 days



County	Unique Postings
Jefferson County	741
Fayette County	476
Franklin County	195
Boone County	115
Not reported	110

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.10: Top Job Titles for Mechanical Engineers in Kentucky Job Postings

JOB TITLE	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Mechanical Engineers	579	5 : 1	34 days
Design Engineers (Architecture & Engineering)	402	4 : 1	37 days
Service Engineers	169	3 : 1	20 days
Project Engineers (Architecture & Engineering)	133	3 : 1	35 days
Artists	69	1 : 1	37 days
Product Engineers	52	3 : 1	31 days
Construction Engineers	51	6 : 1	15 days
Systems Engineers (Architecture & Engineering)	49	6 : 1	36 days
Field Engineers (Architecture & Engineering)	41	5 : 1	34 days
Product Development Engineers	39	3 : 1	32 days
Tooling Engineers	38	4 : 1	36 days
Engineering Co-ops	35	3 : 1	34 days
Manufacturing Engineers	30	3 : 1	32 days
Computer Aided Design (CAD) Designers	26	4 : 1	54 days
Technical Services Engineers	26	5 : 1	48 days

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.11: Top Cities for Mechanical Engineers in Kentucky Job Postings

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Louisville, KY	733	4 : 1	36 days
Lexington, KY	450	4 : 1	36 days
Frankfort, KY	195	3 : 1	26 days
Georgetown, KY	90	3 : 1	34 days
Bowling Green, KY	72	6 : 1	32 days
Richmond, KY	72	10 : 1	54 days
Erlanger, KY	64	3 : 1	36 days
Florence, KY	63	3 : 1	39 days
Harrodsburg, KY	52	4 : 1	50 days
Owensboro, KY	52	7 : 1	51 days
Hebron, KY	42	4 : 1	49 days
Covington, KY	30	3 : 1	22 days
Lexington-Fayette, KY	26	1 : 1	10 days
London, KY	24	1 : 1	14 days

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Kansas, KY	23	2 : 1	65 days

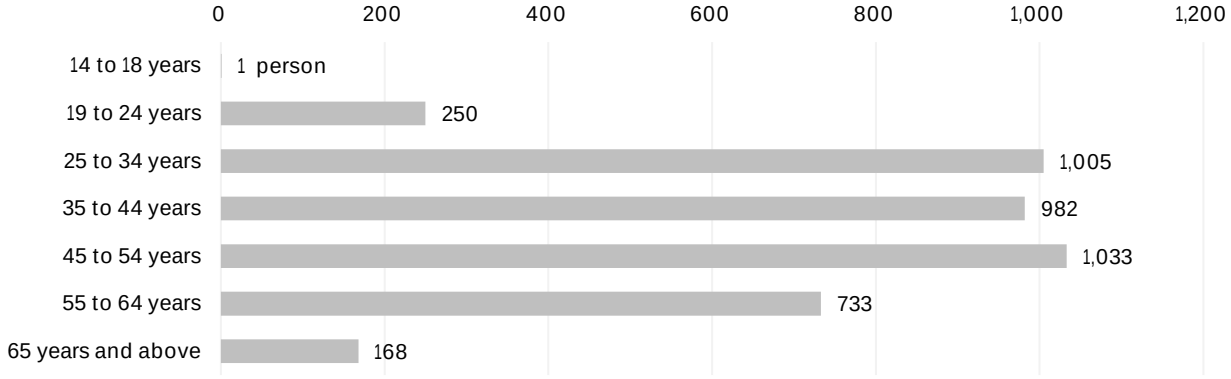
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.12: Top Companies Posting for Mechanical Engineers in Kentucky Job Postings

COMPANY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
General Electric Company	111	4 : 1	45 days
Lockheed Martin Corporation	104	6 : 1	44 days
GE Appliances, Inc.	79	4 : 1	71 days
HomeAdvisor, Inc.	69	1 : 1	37 days
FieldCo	54	3 : 1	36 days
Army National Guard	46	6 : 1	13 days
Bechtel Corporation	44	9 : 1	59 days
Lexmark International, Inc.	34	3 : 1	45 days
Elekta	34	1 : 1	2 days
MEGGITT PLC	33	4 : 1	48 days

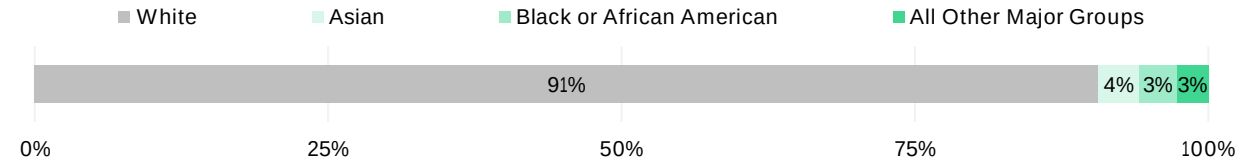
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Figure 3.13: Kentucky's Mechanical Engineers by Age Group



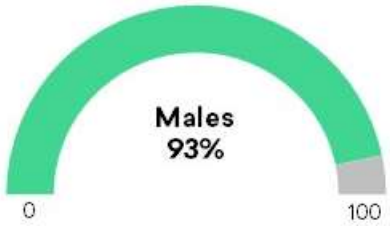
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.14: Kentucky's Mechanical Engineers by Major Race and Ethnicity Group



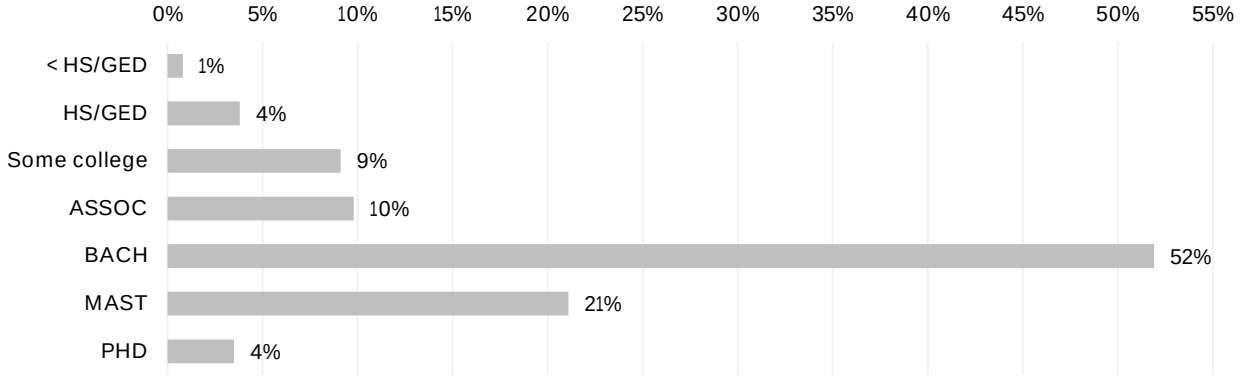
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.15: Kentucky's Mechanical Engineers by Gender



Source: Emsi Employees & Self-Employed 2019.4.

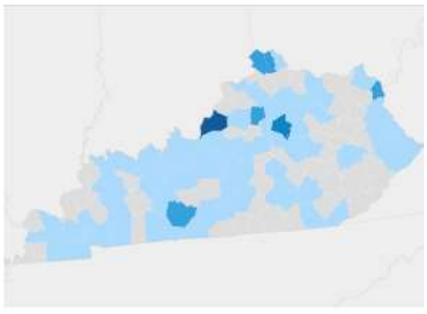
Figure 3.16: Kentucky's Mechanical Engineers by Highest Educational Attainment



Source: Emsi Employees & Self-Employed 2019.4.

ARCHITECTURAL & ENGINEERING MANAGERS

1,691	3 : 1	35 days
Unique Postings 5,735 Total Postings	Posting Intensity State Average: 4 : 1	Median Posting Duration State Average: 28 days



County	Unique Postings
Jefferson County	600
Fayette County	352
Franklin County	83
Warren County	68
Boone County	64

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.13: Top Job Titles for Architectural & Engineering Managers in Kentucky Job Postings

JOB TITLE	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Engineering Managers	210	3 : 1	31 days
Project Managers (Management)	175	3 : 1	35 days
Directors of Engineering	96	4 : 1	36 days
Product Managers (Management)	90	5 : 1	51 days
Program Managers (Management)	85	3 : 1	33 days
Project Managers (Computer & Mathematical)	59	3 : 1	15 days
Chief Engineers (Management)	45	5 : 1	45 days
Research & Development (R&D) Managers	45	3 : 1	41 days
Manufacturing Engineers	37	4 : 1	32 days
Design Managers (Management)	35	4 : 1	51 days
Project Managers (Architecture & Engineering)	34	2 : 1	38 days
Design Engineers (Architecture & Engineering)	28	3 : 1	44 days
Maintenance Managers (Installation, Maintenance, & Repair)	28	2 : 1	31 days
Project Engineers (Architecture & Engineering)	26	3 : 1	21 days
Maintenance Assistants	26	3 : 1	29 days

Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.14: Top Cities for Architectural & Engineering Managers in Kentucky Job Postings

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Louisville, KY	593	4 : 1	37 days
Lexington, KY	344	4 : 1	51 days
Frankfort, KY	83	2 : 1	24 days
Bowling Green, KY	68	3 : 1	33 days
Erlanger, KY	46	4 : 1	44 days
Ashland, KY	41	3 : 1	69 days
Florence, KY	34	5 : 1	40 days
London, KY	24	2 : 1	26 days
Elizabethtown, KY	22	3 : 1	21 days
Hebron, KY	21	3 : 1	45 days
Paducah, KY	21	3 : 1	18 days
Georgetown, KY	17	4 : 1	60 days
Owensboro, KY	16	2 : 1	33 days
Shelbyville, KY	16	3 : 1	29 days

CITY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
New, KY	14	1 : 1	8 days

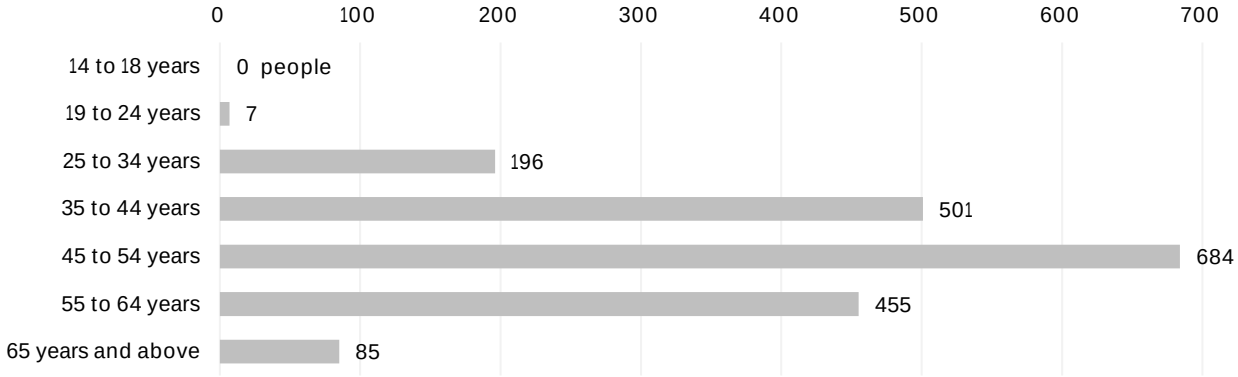
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Table 3.15: Top Companies Posting for Architectural & Engineering Managers in Kentucky Job Postings

COMPANY	UNIQUE POSTINGS	POSTING INTENSITY	MEDIAN POSTING DURATION
Oracle Corporation	139	4 : 1	65 days
Middough, Inc.	37	3 : 1	69 days
HDR Engineering, Inc.	33	2 : 1	42 days
GE Appliances, Inc.	32	5 : 1	77 days
Siemens AG	30	5 : 1	23 days
COMPASS GROUP PLC	28	2 : 1	42 days
Humana, Inc.	22	8 : 1	51 days
Lockheed Martin Corporation	21	6 : 1	44 days
Stantec, Inc.	20	4 : 1	103 days
General Electric Company	17	3 : 1	42 days

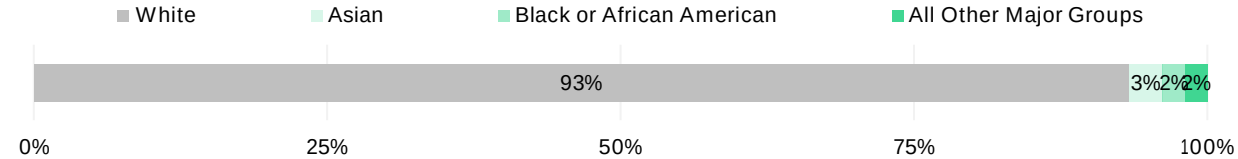
Source: Emsi Job Posting Analytics September 2016 to September 2019.

Figure 3.17: Kentucky's Architectural & Engineering Managers by Age Group



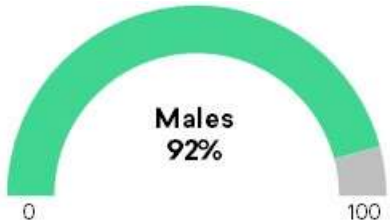
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.18: Kentucky's Architectural & Engineering Managers by Major Race and Ethnicity Group



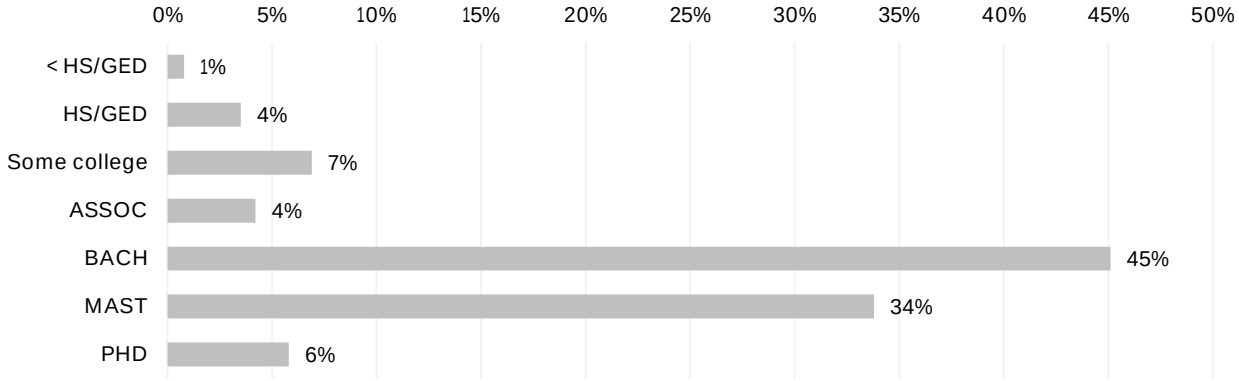
Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.19: Kentucky's Architectural & Engineering Managers by Gender



Source: Emsi Employees & Self-Employed 2019.4.

Figure 3.20: Kentucky's Architectural & Engineering Managers by Highest Educational Attainment



Source: Emsi Employees & Self-Employed 2019.4.

CHAPTER 4:

Program Demand Gap Analysis

Knowing how engineers are employed in the state and its regions, the program demand gap analysis offers a better understanding of the connection between engineering jobs and educational institutions, answering the following question:

> *Where are there misalignments between the workforce demand and the supply of college and university completers?*

This chapter outlines the deficit of Kentucky's program completions to the workforce (gap), as well as the oversupply of completions to the workforce (surplus). The specific engineering occupations directly related or mapped to the programs with a large gap and surplus are also displayed. Results are provided for the state and each region by award level. Before providing and discussing the results, we will go over the interpretation of the results.

INTERPRETATION

The terms used in the analysis are as follows:

Gap Represents a deficit, or when there are more job openings in an occupation than there are completions. If left unaddressed, a gap may lead to missed opportunities for economic growth and put stress on local businesses to find the necessary talent elsewhere. Significant gaps translate into higher human resources costs and decreased efficiencies in the economic system. They also provide an opportunity for postsecondary educational institutions to develop new programs and/or strengthen their current programs.

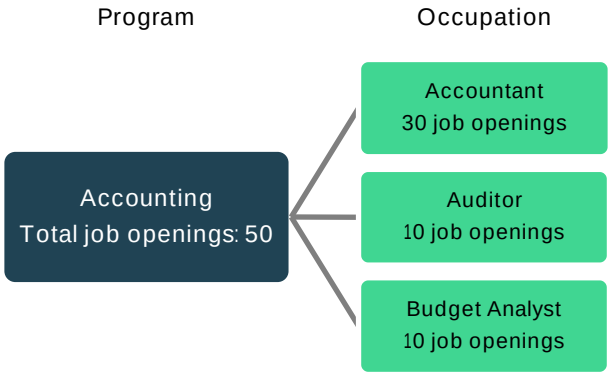
Surplus Represents an oversupply, or when there are more completions than there are job openings in an occupation. If left unaddressed, significant surpluses may lead to higher unemployment rates or higher attrition rates—the college or university could be educating a workforce that is leaving the state or region after program completion because of a lack of job opportunities.

When reviewing the results of the analysis, consider that not all gaps or surpluses indicate necessary program adjustments. Due to labor market inefficiencies, it is common for most programs to face a certain level of gap or surplus. This means only the largest gaps or

surpluses should be reviewed or further developed. In the following sections, the program gaps and surpluses are discussed by award level and presented as figures and tables.

The figures show the gap between job demand and the supply of program completions. An explanation of job demand is warranted here, and a more detailed description can be found in Appendix 4. A program's job demand is measured as its total number of annual job openings, on average, from 2019 to 2029. The total is calculated as the sum of state or regional job openings for each occupation mapped to the program, as illustrated in Figure 4.1.

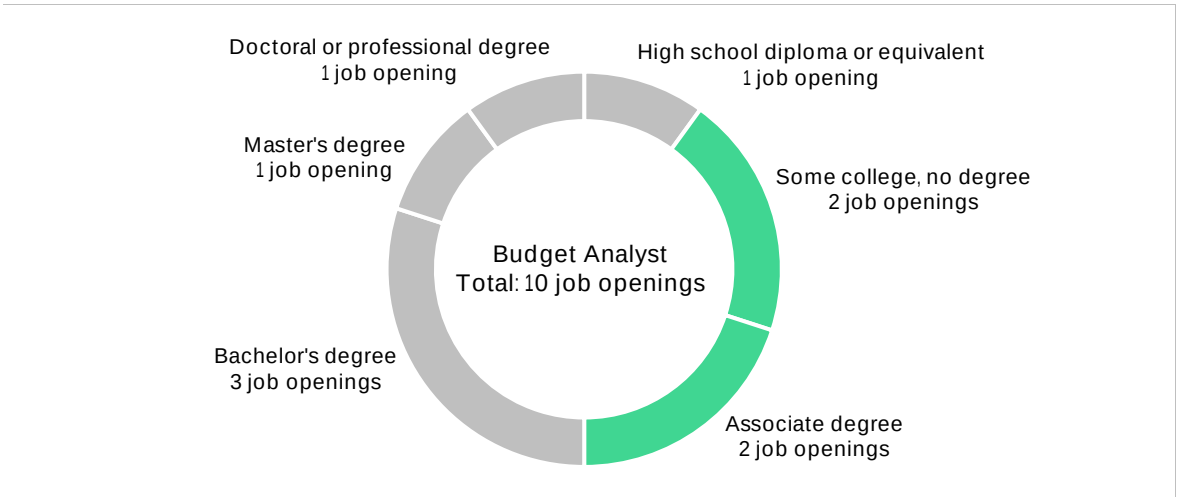
Figure 4.1: Example of One Program Mapped to Three Occupations



Furthermore, an occupation's job openings are not a gross measure of job openings available in the state or region. For every occupation, job openings have been weighted by the program's award level and one level below and account for the highest educational attainments of those employed in the position.[7] The educational attainments in this chapter are for adults less than 34 years, which better reflect the institutions' student populations. Figure 4.2 illustrates how this methodology applies to an occupation's total job openings. For example, four job openings or 40% of total job openings are available to budget analysts at the associate degree level, seeing that there are a total of 10 job openings, 20% of those working in the occupation have an associate degree level of education, and another 20% have some college education and no degree.

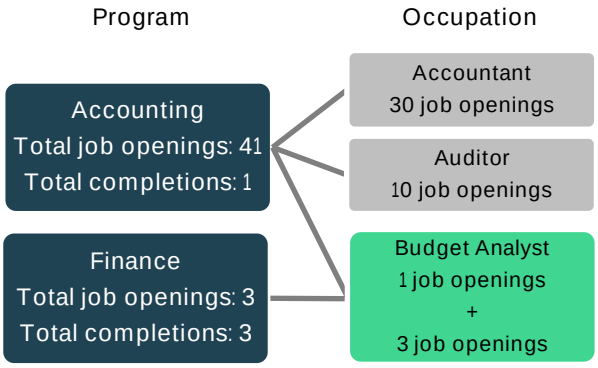
7 Results at the individual award levels consider demand at that award level and one below. This is to consider that those with a bachelor's degree, for example, can still compete for the same occupation against those with a master's degree. However, for the combined award level analyses, we only consider the demand at the respective award level so as to not duplicate demand when summing across the award levels.

Figure 4.2: Example of an Occupation's Weighted Job Openings by Award Level



Finally, job openings are de-duplicated and scaled across programs when an occupation is mapped to more than one program. As illustrated in Figure 4.3, budget analysts, which have four total job openings, are mapped to two programs. However, the Finance program is three-times the size of the Accounting program, measured in terms of completions. Thus, one job opening is portioned to the Accounting program and three job openings to the Finance program.

Figure 4.3: Example of Two Programs with One Shared Occupation



Supply is shown as the average number of program completions statewide and in the region by award level. The analysis considers certificates and associate, bachelor's, master's, and doctoral degrees. Completion data are sourced from the Council data portal[8] and reported as a three-year average of fiscal years (FYs) 2016-17 to 2018-19. Certificates are reported as

8 Source: https://dataportal.cpe.ky.gov/EnrollmentAndGraduationSummary.aspx.

undergraduate awards of less than one year, between one and two years, and as diplomas between one and two years. Associate and bachelor's degrees are reported as such, and master's degrees include post-baccalaureate certificates and institutionally defined graduate students. Doctoral degrees are defined as doctoral degree research/scholars. Other award categories, such as undergraduate certificates between two and four years and post-master's certificates, are found in the data portal, but the awards do not include programs related to engineering. The gap, then, is the difference between job openings and program completions.

A great amount of data is presented in the tables appearing in this chapter. The first set shows the gaps and surpluses across all the engineering programs offered by Kentucky's institutions. The tables include the Classification of Instructional Program (CIP) code and title, as well as the programs' institutional sectors or state university name:

- Association of Independent Kentucky Colleges & Universities (AIKCU);
- Eastern Kentucky University (EKU);
- Kentucky Community & Technical College System (KCTCS);
- Morehead State University (Moore);
- Murray State University (Murray);
- Northern Kentucky University (NKU);
- University of Kentucky (UK);
- University of Louisville (UofL); and
- Western Kentucky University (WKU).

The tables also include the average annual number of projected job openings associated with the program (which have been de-duplicated using the process outlined in Appendix 4), the average annual number of program completions from the state or region, and the gap or surplus. The programs' median hourly wage rates are specific to Kentucky or to the region under analysis.

The second set of tables identify the occupations mapped to the programs with a large gap or surplus, by award level, and show detailed occupational data. The tables include the CIP code, CIP title, and occupations mapped to the engineering program, by their Standard Occupational Classification (SOC) codes and titles. The state and regional job counts, by occupation, are shown for 2019 and 2029, with the change in jobs and average annual job openings for those years. The occupations' median hourly wage rates are specific to the state or region.

Important Note

This analysis is intended to serve as a starting point for the Council as it discusses statewide workforce needs. A deficit (gap) or oversupply (surplus) of workers in a particular occupation category represents a potential problem for Kentucky, making it important for each program and occupation group to be evaluated on a case-by-case basis. The purpose of this analysis is, therefore, to initiate the conversation on evaluating program effectiveness. Once evaluated internally within the member institutions, specific implications may be considered for programs with substantial gaps or surpluses.

It must be noted that our analysis does have its limitations in that only the education supply pipeline is considered. This is due to data availability at the regional and institutional levels. However, other sources—unemployed workers, industry trained pipelines, workers migrating to the state, and job changers from other occupational categories—can also be a source of skilled workers. These types of considerations are useful when evaluating specific types of occupations. Publicly available data sources are limited in accounting for this, and consequently these labor sources are unavailable for Emsi analysis. Primary data collection methods (i.e., interviews and surveys) are among the only ways to obtain information on the other sources for skilled workers.

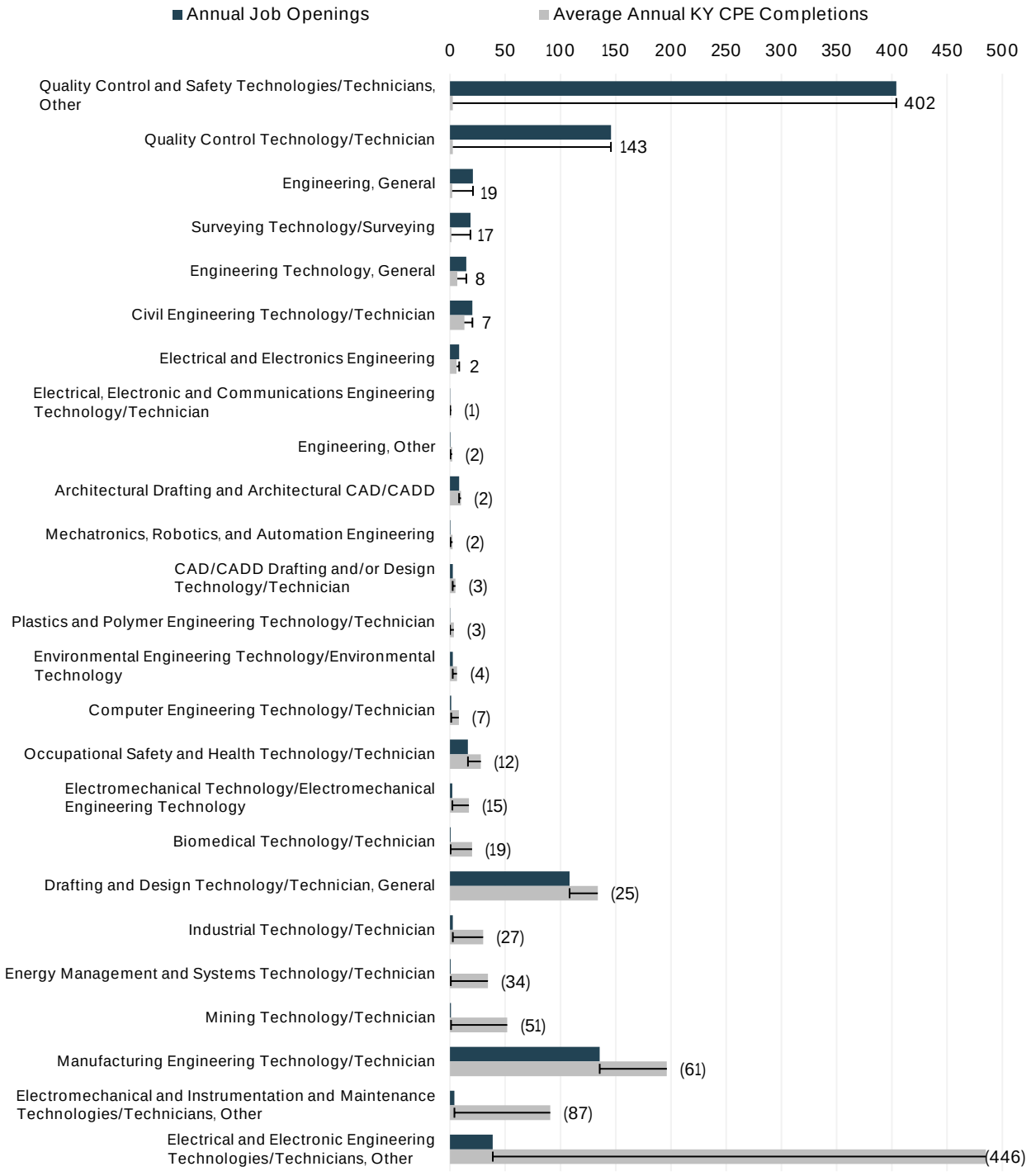
KENTUCKY

Combined Level Analysis

Figure 4.4 and Figure 4.5 display program demand gap analysis results based on combining Kentucky's engineering programs into two categories – certificate and associate degree combined (CERT+) and bachelor's, master's, and doctoral degrees combined (BACH+). As seen in the figures, the Manufacturing Engineering Technology/Technician (BACH+) and Quality Control & Safety Technologies/Technicians, Other (CERT+) programs look to be areas of expansion. Both of these programs are discussed in more detail below. A combination of BACH+ and CERT+ programs, such as Civil Engineering, General and Industrial Engineering, appear to be performing well in terms of high levels of demand and supply. The institutions should maintain focus on the success of these programs. A number of programs – such as Quality Control Technology/Technician (BACH+) and Mining

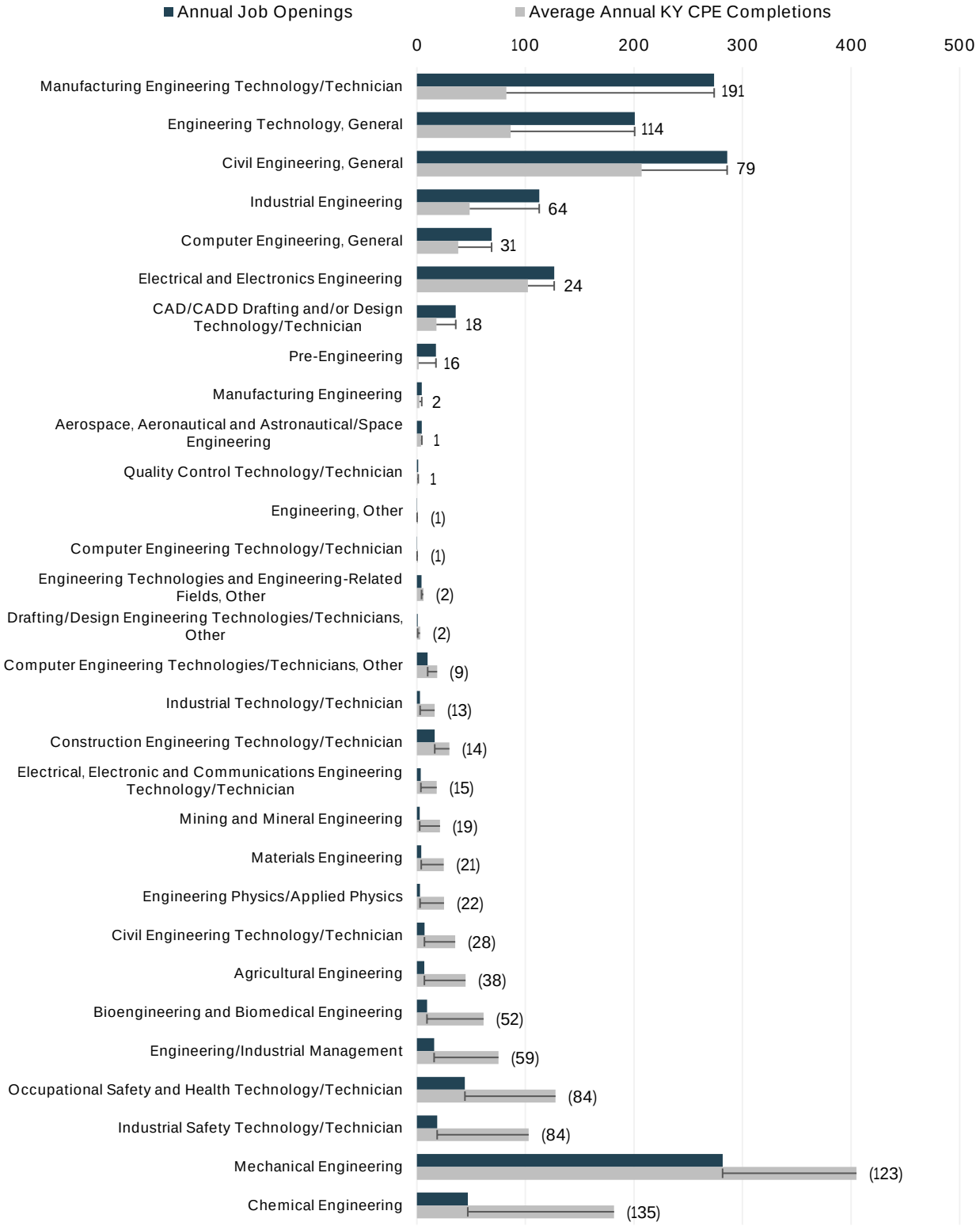
Technology/Technician (CERT+) should be reconsidered for discontinuation or consolidation based on the labor market perspective.

Figure 4.4: Kentucky's CERT+ Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

Figure 4.5: Kentucky's BACH+ Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

Certificate Level Analysis

The largest certificate level gap, at 861 job openings, is in the Quality Control & Safety Technologies/Technicians, Other program (Figure 4.6). Within the program, Kentucky's institutions have less than five average annual completions, and the program's occupations have about 850 statewide job openings, which accounts for the large program gap. All the award level's program gaps and surpluses are shown in Table 4.1. No other programs have a large gap, and the Electrical & Electronic Engineering Technologies/Technicians, Other program has the largest surplus of program completions, as indicated by the highlighted rows in the table. The occupations mapped to the large gap and surplus programs are shown in Tables 4.2 and 4.3, respectively.

Results indicate a need for an expansion of the state's Quality Control & Safety Technologies/Technicians, Other programs and an outcomes analysis for the state's Electrical & Electronic Engineering Technologies/Technicians, Other programs.[9] For the former, Kentucky supports about 11,000 jobs for the inspectors, testers, sorters, samplers, & weighers occupation, with about 850 projected average annual job openings from 2019 to 2029. A certificate level of education seems appropriate for the occupation, and its median annual wage rate is $17.53 or $36,462 annually, considering 2,080 working hours in a year.[10] For context, Kentucky's state minimum wage is $7.25 per hour,[11] and the state's living wage is $10.82 for a household with one working adult and no children.[12] Electrical & electronics engineering technicians are the only occupation mapped to the Electrical & Electronic Engineering Technologies/Technicians, Other program. Seeing that there are about 1,500 statewide jobs for the occupation and about 50 projected average annual job openings, a statewide program evaluation is recommended at this time. Students may be finding successful employment after program completion, but it appears as though they are not all finding jobs in the electrical & electronics engineering technician occupation. The programs' re-evaluations should emphasize students' employment outcomes.

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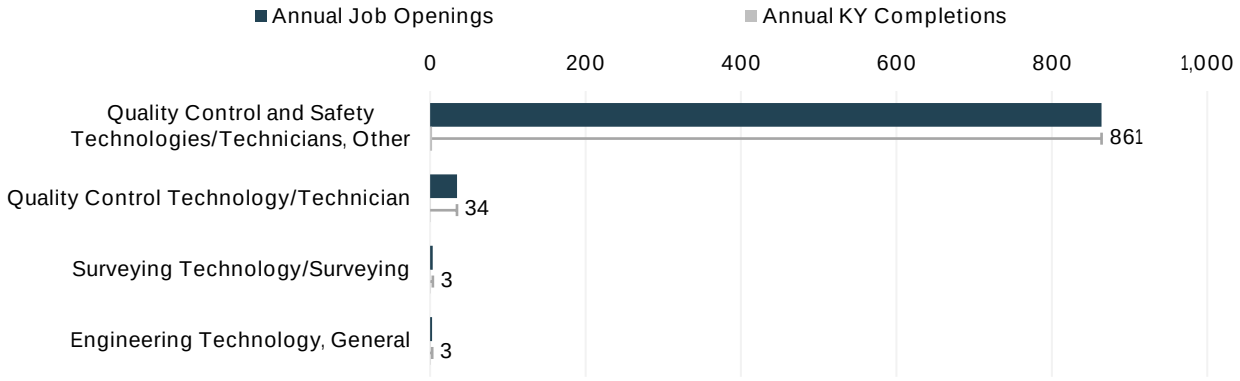
9 Further research must be conducted before making a final determination, such as top employer identification within the state and its regions; business surveys to verify the data; resume analysis to determine trending skills for individuals with similar educations; industry recommendations on curriculum development; and analysis of the strengths, weaknesses, and capacities of similar programs available at Kentucky's higher education institutions.

10 Annual wages in this report consider 2,080 working hours in a year.

11 Kentucky adopts the federal minimum wage rate, and effective July 1, 2009, the federal minimum wage is $7.25 per hour. Source: Kentucky General Assembly, Kentucky Revised Statutes.

12 Living wage calculations provided by Dr. Amy K. Glasmeier and the Massachusetts Institute of Technology. See Appendix 5.

Figure 4.6: Kentucky's Certificate Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

Table 4.1: Gaps and Surpluses for Kentucky's Certificate Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0799	Quality Control & Safety Technologies/Technicians, Other	KCTCS	864	3	861	$17.80
15.0702	Quality Control Technology/Technician	KCTCS	35	0	34	$17.80
15.1102	Surveying Technology/Surveying	EKU	4	0	3	$24.28
15.0000	Engineering Technology, General	KCTCS	3	0	3	$23.38
14.4201	Mechatronics, Robotics, & Automation Engineering	KCTCS	0	0	(0)	$47.22
15.1302	CAD/CADD Drafting &/or Design Technology/Technician	NKU	3	5	(2)	$24.39
15.0607	Plastics & Polymer Engineering Technology/Technician	KCTCS	0	4	(3)	$27.85
15.0701	Occupational Safety & Health Technology/Technician	KCTCS	24	28	(4)	$28.87
15.0401	Biomedical Technology/Technician	KCTCS	0	5	(5)	$27.85
15.0403	Electromechanical Technology/Electromechanical Engineering Technology	KCTCS	3	17	(14)	$27.41
15.0503	Energy Management & Systems Technology/Technician	KCTCS	1	24	(24)	$27.85
15.0613	Manufacturing Engineering Technology/Technician	KCTCS	52	64	(12)	--
		WKU	81	100	(19)	--
		Total	133	164	(31)	$38.47
15.1301	Drafting & Design Technology/Technician, General	KCTCS	72	112	(40)	$24.39

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0901	Mining Technology/Technician	KCTCS	1	48	(46)	$27.85
15.0499	Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other	KCTCS	5	72	(68)	$22.96
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	43	409	(365)	$29.91

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.2: Occupations Mapped to Kentucky's Certificate Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
QUALITY CONTROL & SAFETY TECHNOLOGIES/TECHNICIANS, OTHER (CIP CODE 15.0799)						
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	11,705	11,135	(570)	855	$17.53
11-3051	Industrial Production Managers	3,826	4,064	238	9	$43.36

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.3: Occupations Mapped to Kentucky's Certificate Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ELECTRICAL & ELECTRONIC ENGINEERING TECHN./TECHS, OTHER (CIP CODE 15.0399.KCTCS)						
17-3023	Electrical & Electronics Engineering Technicians	1,091	1,156	65	43	$29.91

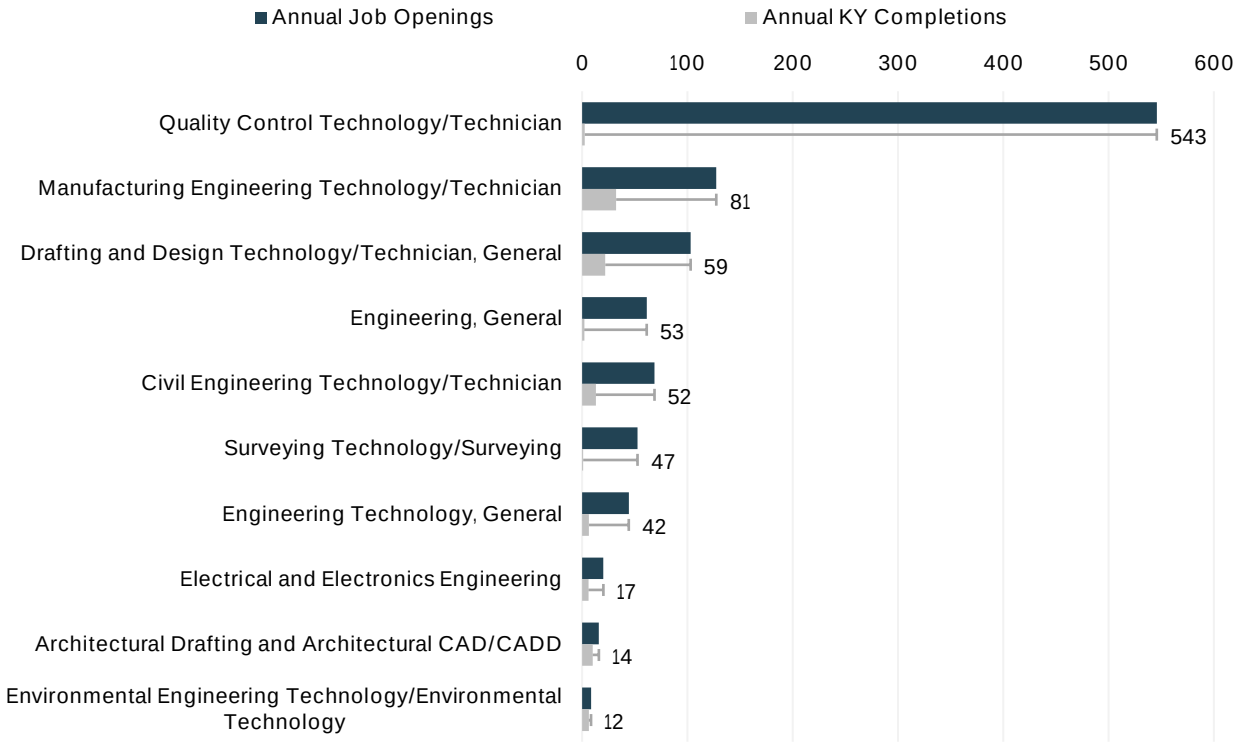
Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Associate Degree Level Analysis

The largest associate degree level gap, at 543 job openings, is in the Quality Control Technology/Technician program (Figure 4.7). Within the program, Kentucky's institutions have less than five average annual completions, and the program's occupations have about 550 statewide job openings, which accounts for the large program gap. All the award level's program gaps and surpluses are shown in Table 4.4. No other programs have a large gap or surplus of program completions.

The occupations mapped to the Quality Control Technology/Technician program are shown in Table 4.5. As discussed in the previous section, the state supports a substantial number of jobs and job openings for the inspectors, testers, sorters, samplers, & weighers occupation, and the occupation's median wage rate is well above minimum wage[13] and the state's living wage for a household with one working adult and no children.[14] However, an associate degree level of education may over qualify a program completer seeking employment as an inspector, tester, sorter, sampler, & weigher. It is recommended that Kentucky's institutions assess students' employment outcomes before expanding the state's associate degree level Quality Control Technology/Technician programs.[15]

Figure 4.7: Kentucky's Associate Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

13 Kentucky adopts the federal minimum wage rate, and effective July 1, 2009, the federal minimum wage is $7.25 per hour. Source: Kentucky General Assembly, Kentucky Revised Statutes.

14 Living wage calculations provided by Dr. Amy K. Glasmeier and the Massachusetts Institute of Technology. See Appendix 5.

15 As stated previously, further research must be conducted before making a final determination. Emsi is available to conduct this research; see your Emsi contact for details.

Table 4.4: Gaps and Surpluses for Kentucky's Associate Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0702	Quality Control Technology/Technician	KCTCS	546	3	543	$17.61
15.0613	Manufacturing Engineering Technology/Technician	AIKCU	71	18	53	--
		KCTCS	56	14	42	--
		Total	127	32	95	$38.50
15.1301	Drafting & Design Technology/Technician, General	KCTCS	103	22	81	$24.60
14.0101	Engineering, General	AIKCU	61	2	59	$38.93
15.0201	Civil Engineering Technology/Technician	KCTCS	58	11	47	--
		MURRAY	11	2	9	--
		Total	69	13	56	$22.13
15.1102	Surveying Technology/Surveying	KCTCS	53	1	52	$19.70
15.0000	Engineering Technology, General	AIKCU	20	3	17	--
		MORE	14	2	12	--
		KCTCS	10	2	9	--
		Total	44	7	38	$23.05
14.1001	Electrical & Electronics Engineering	AIKCU	20	6	14	$42.65
15.1303	Architectural Drafting & Architectural CAD/CADD	KCTCS	16	10	6	$23.02
15.0507	Environmental Engineering Technology/Environmental Technology	KCTCS	8	6	2	$22.23
15.0303	Electrical, Electronic & Communications Engineering Technology/Technician	AIKCU	1	1	0	$27.83
14.9999	Engineering, Other	EKU	1	2	(1)	$47.51
14.4201	Mechatronics, Robotics, & Automation Engineering	KCTCS	1	2	(1)	$47.51
15.0901	Mining Technology/Technician	KCTCS	0	4	(4)	$27.85
15.1201	Computer Engineering Technology/Technician	AIKCU	4	8	(4)	$29.91
15.0503	Energy Management & Systems Technology/Technician	KCTCS	1	10	(9)	$27.85
15.0401	Biomedical Technology/Technician	KCTCS	1	6	(5)	--
		AIKCU	1	9	(8)	--

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
		Total	2	15	(13)	$27.85
15.0499	Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other	KCTCS	4	18	(15)	$22.96
		MURRAY	1	2	(1)	--
15.0612	Industrial Technology/Technician	EKU	8	28	(20)	--
		Total	9	30	(21)	$26.02
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	36	76	(41)	$29.91

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.5: Occupations Mapped to Kentucky's Associate Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
QUALITY CONTROL TECHNOLOGY/TECHNICIAN (CIP CODE 15.0702)						
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	11,705	11,135	(570)	544	$17.53
11-3051	Industrial Production Managers	3,826	4,064	238	2	$43.36

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

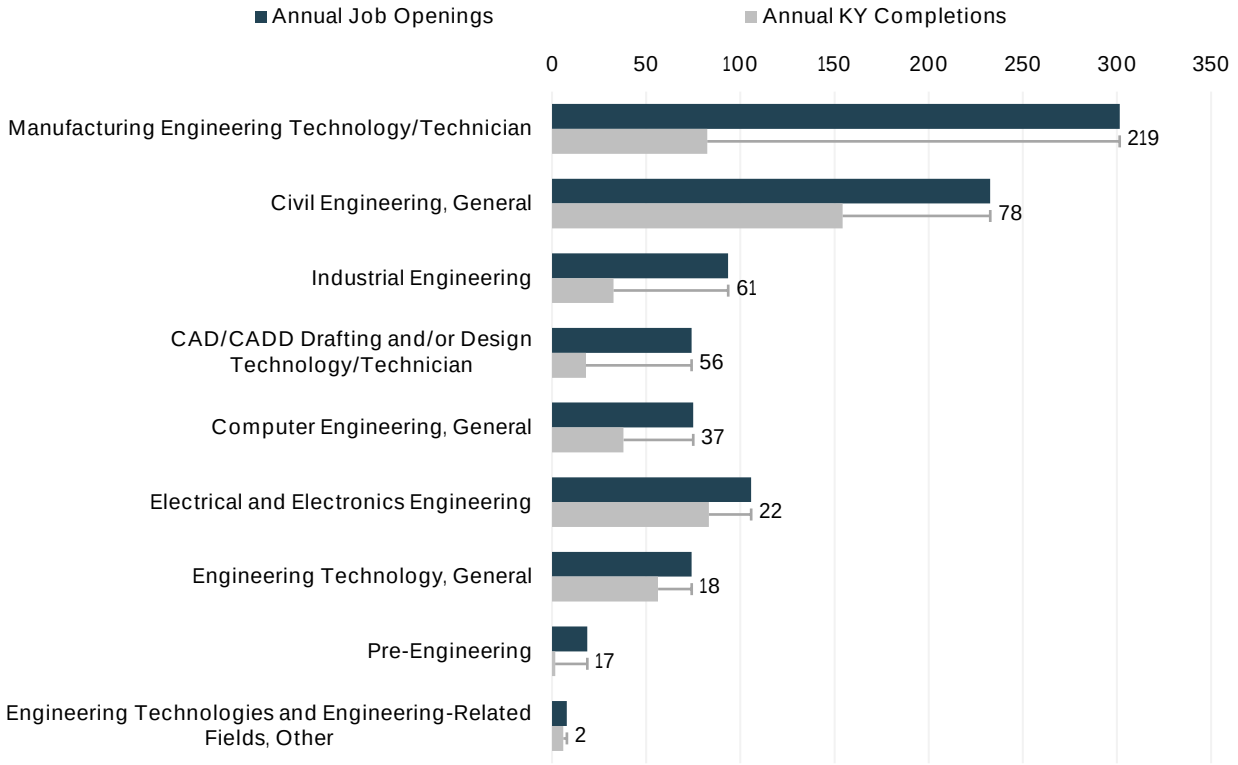
Bachelor's Degree *Level Analysis*

The largest bachelor's degree level gap, at 219 job openings, is in the Manufacturing Engineering Technology/Technician program (Figure 4.8). Within the program, Kentucky's institutions, on average, annually award about 80 degrees, and the program's occupations have about 300 statewide job openings, which accounts for the large program gap. All the award level's program gaps and surpluses are shown in Table 4.6, and two programs have a large surplus of program completions, as indicated by the highlighted rows in the table.

The occupations mapped to the Manufacturing Engineering Technology/Technician program are shown in Table 4.7, and the occupations mapped to the programs with a large surplus, Mechanical Engineering and Chemical Engineering, are shown in Table 4.8. Given the projected labor market demand in the state for the industrial engineer occupation, it is recommended that the institutions' Manufacturing Engineering Technology/Technician programs undergo expansions and that students in Kentucky's Mechanical Engineering and

Chemical Engineering programs view employment in the industrial engineer occupation as career opportunities.[16]

Figure 4.8: Kentucky's Bachelor's Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

Table 4.6: Gaps and Surpluses for Kentucky's Bachelor's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0613	Manufacturing Engineering Technology/Technician	NKU	126	34	91	--
		WKU	98	27	71	--
		AIKCU	60	16	43	--
		MURRAY	18	5	13	--
		MORE	0	0	0	--
		Total	301	82	219	$37.36
14.0801	Civil Engineering, General	UK	134	89	45	--

16 As stated previously, further research must be conducted before making a final determination. Emsi is available to conduct this research; see your Emsi contact for details.

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
		UofL	52	34	17	--
		WKU	47	31	16	--
		Total	233	154	78	$39.61
14.3501	Industrial Engineering	UofL	94	33	61	$37.24
15.1302	CAD/CADD Drafting &/or Design Technology/Technician	MURRAY	74	18	56	$25.16
14.0901	Computer Engineering, General	UK	69	35	34	--
		AIKCU	6	3	3	--
		Total	75	38	37	$39.93
14.1001	Electrical & Electronics Engineering	UK	82	64	17	--
		WKU	24	19	5	--
		Total	106	83	22	$41.49
15.0000	Engineering Technology, General	MORE	74	56	18	$24.88
14.0102	Pre-Engineering	AIKCU	19	2	17	$39.24
15.9999	Engineering Technologies & Engineering-Related Fields, Other	MORE	8	6	2	$24.88
14.0201	Aerospace, Aeronautical & Astronautical/Space Engineering	AIKCU	0	0	0	$41.10
15.1201	Computer Engineering Technology/Technician	AIKCU	0	1	(1)	$29.91
14.9999	Engineering, Other	AIKCU	0	1	(1)	$48.82
15.1001	Construction Engineering Technology/Technician	WKU	28	30	(2)	$23.67
15.1399	Drafting/Design Engineering Technologies/Technicians, Other	MURRAY	1	3	(2)	$26.25
15.1299	Computer Engineering Technologies/Technicians, Other	EKU	13	19	(5)	$31.24
15.0612	Industrial Technology/Technician	WKU	5	16	(11)	$25.96
15.0303	Electrical, Electronic & Communications Engineering Technology/Technician	NKU	6	17	(11)	--
		AIKCU	0	1	(1)	--
		Total	7	18	(12)	$28.45
14.2101	Mining & Mineral Engineering	UK	2	15	(13)	$52.39
14.1801	Materials Engineering	UK	3	17	(15)	$44.90
14.1201	Engineering Physics/Applied Physics	MURRAY	3	25	(22)	$48.82

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0201	Civil Engineering Technology/Technician	MURRAY	13	35	(23)	$22.13
15.1501	Engineering/Industrial Management	EKU	3	12	(9)	--
		MORE	4	18	(14)	--
		Total	7	29	(23)	$47.39
14.0301	Agricultural Engineering	UK	5	36	(30)	$42.90
14.0501	Bioengineering & Biomedical Engineering	UK	0	0	(0)	--
		UofL	5	38	(33)	--
		Total	5	38	(33)	$47.16
15.0701	Occupational Safety & Health Technology/Technician	MURRAY	31	85	(54)	$34.49
15.0703	Industrial Safety Technology/Technician	EKU	34	103	(69)	$25.96
14.1901	Mechanical Engineering	WKU	29	42	(13)	--
		UofL	84	120	(37)	--
		UK	123	176	(54)	--
		Total	235	338	(103)	$42.60
14.0701	Chemical Engineering	UofL	15	60	(45)	--
		UK	24	95	(71)	--
		Total	39	155	(116)	$43.80

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.7: Occupations Mapped to Kentucky's Bachelor's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MANUFACTURING ENGINEERING TECHNOLOGY/TECHNICIAN (CIP CODE 15.0613)						
17-2112	Industrial Engineers	5,490	6,288	798	229	$36.73
17-2141	Mechanical Engineers	4,173	4,687	514	45	$40.80
17-3023	Electrical & Electronics Engineering Technicians	1,091	1,156	65	17	$29.91
11-9041	Architectural & Engineering Managers	1,929	2,108	179	6	$55.13
17-2199	Engineers, All Other	1,036	1,164	128	4	$37.69

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.8: Occupations Mapped to Kentucky's Bachelor's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
CHEMICAL ENGINEERING (CIP CODE 14.0701)						
17-2131	Materials Engineers	240	268	28	13	$35.21
11-9041	Architectural & Engineering Managers	1,929	2,108	179	12	$55.13
17-2041	Chemical Engineers	391	410	19	7	$45.84
17-2199	Engineers, All Other	1,036	1,164	128	7	$37.69
MECHANICAL ENGINEERING (CIP CODE 14.1901)						
17-2141	Mechanical Engineers	4,173	4,687	514	183	$40.80
11-9041	Architectural & Engineering Managers	1,929	2,108	179	27	$55.13
17-2199	Engineers, All Other	1,036	1,164	128	15	$37.69
17-2011	Aerospace Engineers	232	286	54	10	$49.51

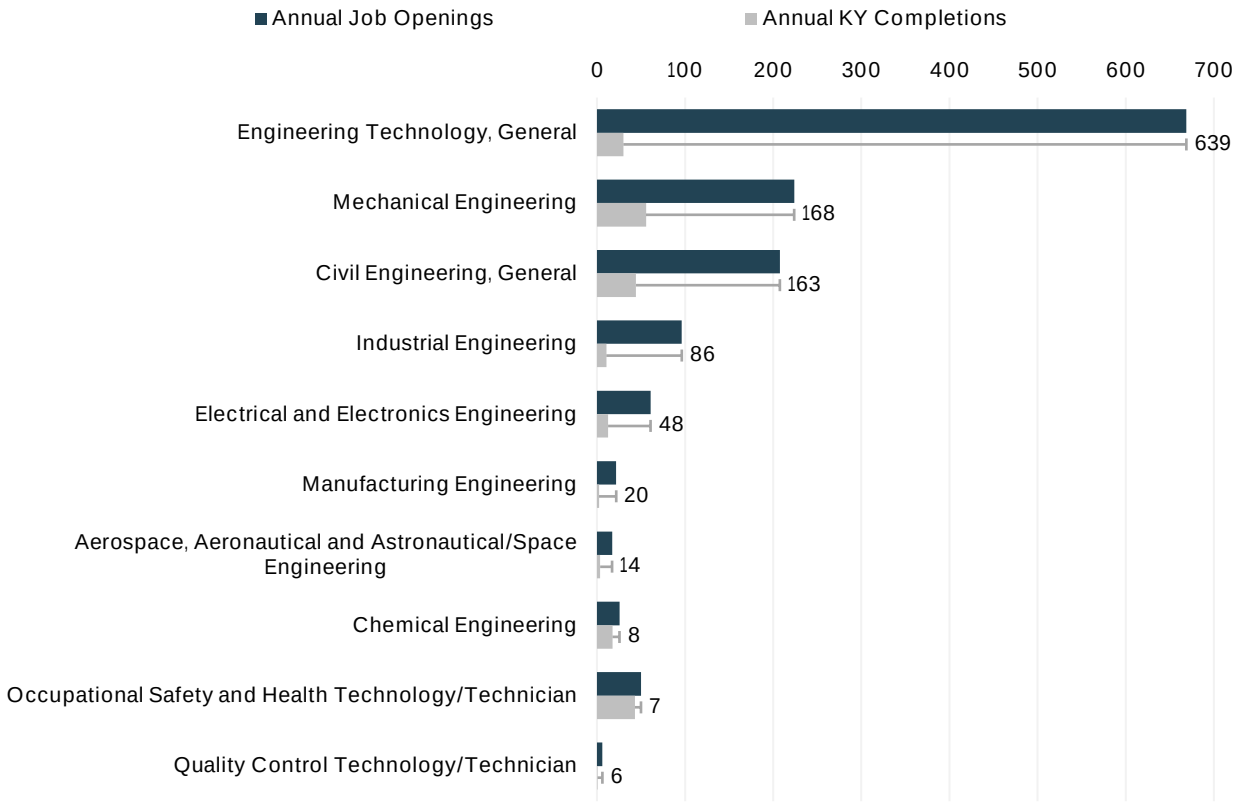
Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Master's Degree Level Analysis

The largest master's degree level gap, at 639 job openings, is in the Engineering Technology, General program (Figure 4.9), and no programs at this award level have a large surplus of program completions (Table 4.9). The Engineering Technology, General program maps to more than a dozen different types of engineers, as shown in Table 4.10, but job openings for the industrial engineer and civil engineer occupations together account for about half of the program's total job openings. Like the results in the previous section, it is recommended that Kentucky's institutions educate and train master's degree level students for employment opportunities in industrial manufacturing.[17]

17 As stated previously, further research must be conducted before making a final determination. Emsi is available to conduct this research; see your Emsi contact for details.

Figure 4.9: Kentucky's Master's Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

Table 4.9: Gaps and Surpluses for Kentucky's Master's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0000	Engineering Technology, General	MURRAY	669	30	639	$39.00
14.1901	Mechanical Engineering	UofL	169	42	127	--
		UK	55	14	41	--
		Total	224	56	168	$42.52
14.0801	Civil Engineering, General	UofL	108	23	85	--
		UK	100	21	79	--
		Total	208	44	163	$40.34
14.3501	Industrial Engineering	UofL	96	11	86	$37.65
14.1001	Electrical & Electronics Engineering	UK	61	13	48	$42.23
14.3601	Manufacturing Engineering	UK	22	2	20	$37.65
14.0201	Aerospace, Aeronautical & Astronautical/Space Engineering	MORE	17	4	14	$41.83

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0701	Chemical Engineering	UofL	24	17	7	--
		UK	1	1	0	--
		Total	26	18	8	$44.16
15.0701	Occupational Safety & Health Technology/Technician	MURRAY	41	35	6	--
		EKU	9	8	1	--
		AIKCU	0	0	0	--
		Total	50	43	7	$32.62
15.0702	Quality Control Technology/Technician	WKU	6	1	6	$37.80
14.1801	Materials Engineering	UK	1	2	0	$46.40
14.2101	Mining & Mineral Engineering	UK	2	4	(2)	$53.22
14.0301	Agricultural Engineering	UK	4	7	(3)	$50.49
14.0501	Bioengineering & Biomedical Engineering	UK	2	4	(2)	--
		UofL	10	17	(7)	--
		Total	12	21	(9)	$50.05
15.1501	Engineering/Industrial Management	MORE	9	13	(4)	--
		WKU	9	14	(4)	--
		EKU	13	19	(6)	--
		Total	32	46	(14)	$51.08

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.10: Occupations Mapped to Kentucky's Master's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ENGINEERING TECHNOLOGY, GENERAL (CIP CODE 15.0000)						
17-2112	Industrial Engineers	5,490	6,288	798	257	$36.73
17-2051	Civil Engineers	3,571	3,780	210	101	$38.39
17-2141	Mechanical Engineers	4,173	4,687	514	91	$40.80
17-2071	Electrical Engineers	1,983	2,159	175	85	$41.70
17-2072	Electronics Engineers, Except Computer	684	763	80	29	$38.08
11-9041	Architectural & Engineering Managers	1,929	2,108	179	14	$55.13

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
17-2061	Computer Hardware Engineers	276	305	29	12	$35.09
17-2199	Engineers, All Other	1,036	1,164	128	11	$37.69
17-2131	Materials Engineers	240	268	28	11	$35.21
17-2081	Environmental Engineers	448	505	57	10	$36.32
17-2121	Marine Engineers & Naval Architects	149	159	10	9	$40.36
17-2041	Chemical Engineers	391	410	19	9	$45.84
17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	260	285	25	7	$40.79
17-2161	Nuclear Engineers	129	136	7	6	$42.38
17-2011	Aerospace Engineers	232	286	54	5	$49.51
17-2031	Biomedical Engineers	117	129	12	4	$33.73
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	145	111	(34)	3	$44.77
17-2021	Agricultural Engineers	70	67	(3)	3	$29.96
17-2171	Petroleum Engineers	94	104	10	2	$60.95

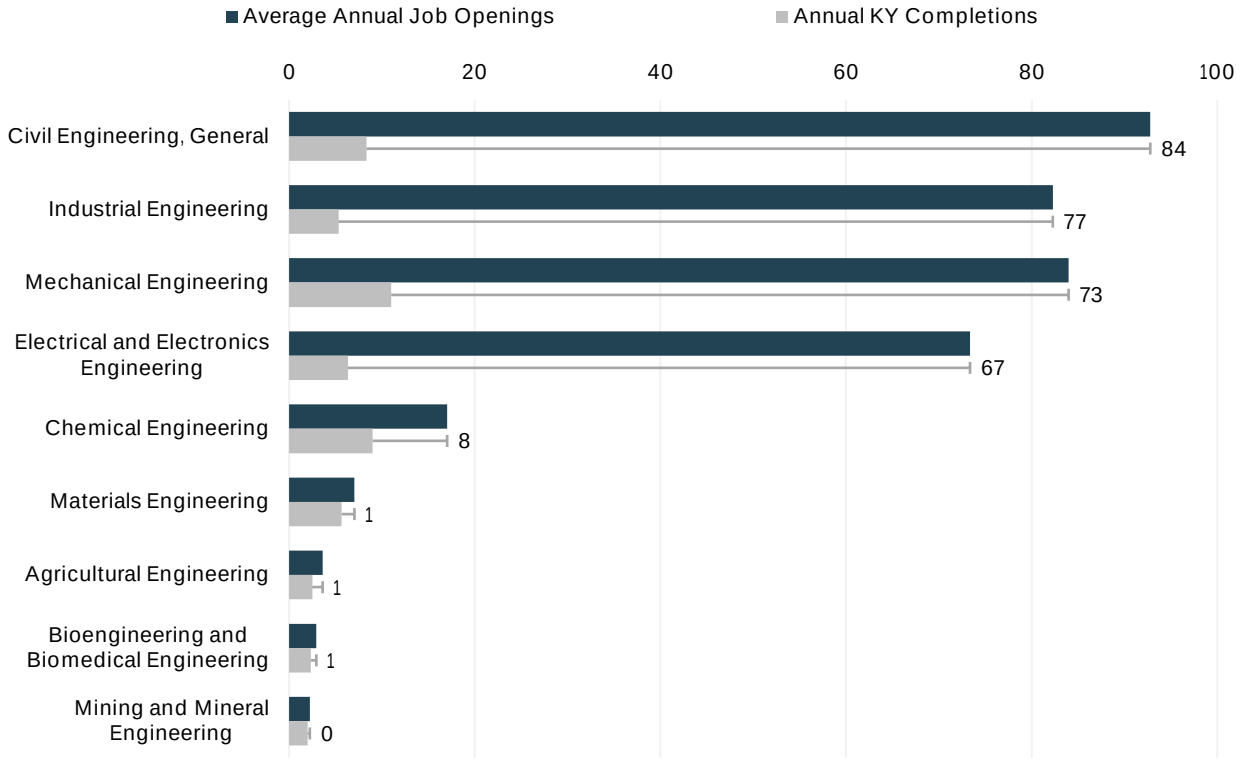
Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Doctoral Degree Level Analysis

The largest doctoral degree level gap program is Civil Engineering, General, which has a gap of 84 job openings, and no programs at this award level have a surplus of program completions, as shown in Figure 4.10 and Table 4.11. The results indicate that no further program development is required at this time.[18]

18 As stated previously, further research must be conducted before making a final determination. Emsi is available to conduct this research; see your Emsi contact for details.

Figure 4.10: Gaps and Surpluses for Kentucky's Doctoral Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.11: Gaps and Surpluses for Kentucky's Doctoral Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
		UK	63	6	57	--
14.0801	Civil Engineering, General	UofL	30	3	27	--
		Total	93	8	84	$40.04
14.3501	Industrial Engineering	UofL	82	5	77	$37.81
		UK	56	7	49	--
14.1901	Mechanical Engineering	UofL	28	4	24	--
		Total	84	11	73	$42.75
14.1001	Electrical & Electronics Engineering	UK	73	6	67	$42.02
		UK	11	6	5	--
14.0701	Chemical Engineering	UofL	6	3	3	--
		Total	17	9	8	$46.51
14.1801	Materials Engineering	UK	7	6	1	$49.74

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0301	Agricultural Engineering	UK	4	3	1	$45.72
14.0501	Bioengineering & Biomedical Engineering	UK	3	2	1	$49.13
14.2101	Mining & Mineral Engineering	UK	2	2	0	$53.18

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

CENTRAL WORKFORCE PLANNING REGION

Figure 4.11 and Figure 4.12 display the CERT+ and BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician program (BACH+) is an area to consider for expansion, whereas the Civil Engineering, General and Computer Engineering, General programs (both BACH+) should maintain their success. Several programs, such as the Energy Management & Systems Technology/Technician (CERT+) and Bioengineering & Biomedical Engineering (BACH+) programs, should be carefully considered for continuation and/or for consolidation.

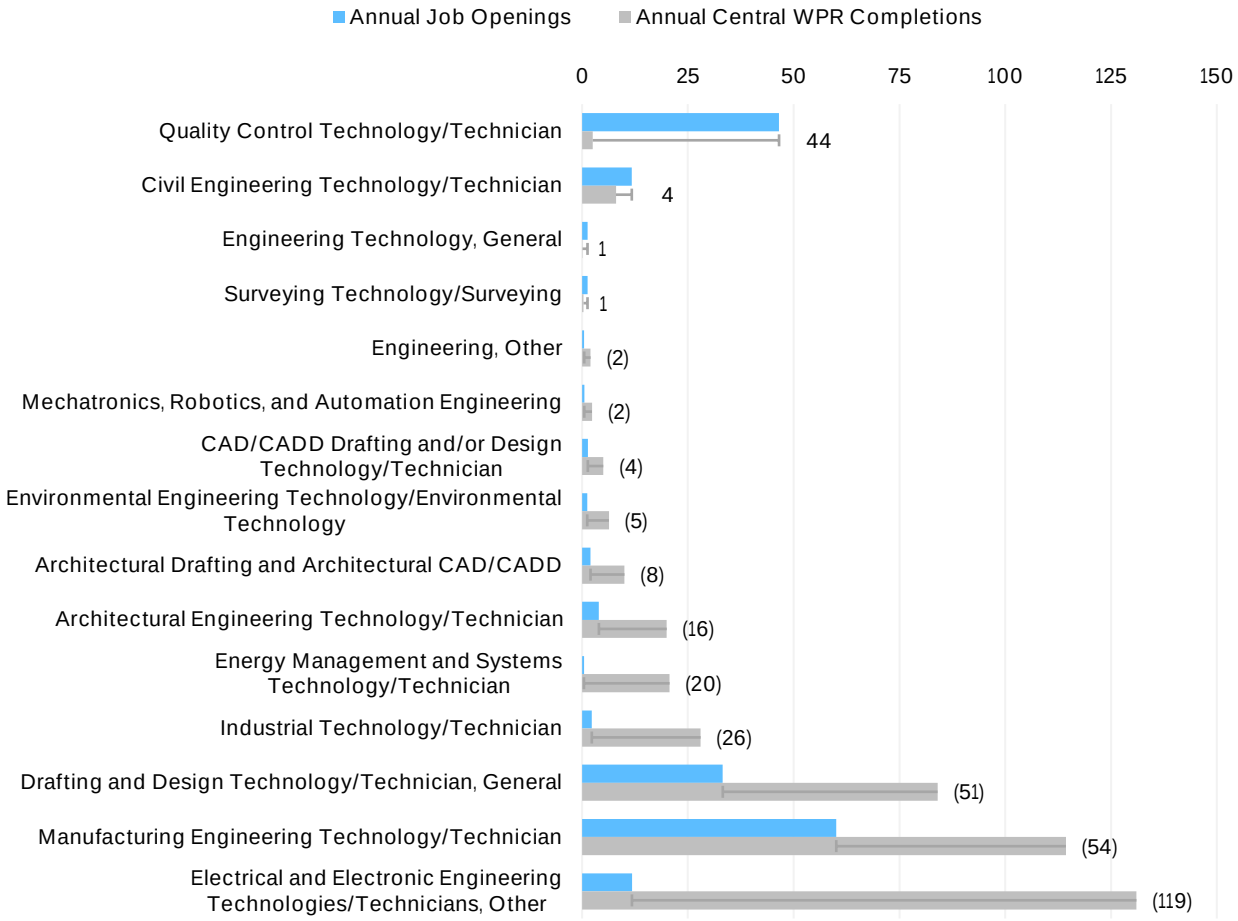
At the individual award levels, in the Central WPR, the Kentucky Community and Technical College System (KCTCS) plays an important role by providing the region with certificate and associate degree level programs of study. Across both award levels, the largest programs, in terms of completions, are from two programs, both at the certificate level: Electrical & Electronic Engineering Technologies/Technicians, Other and Manufacturing Engineering Technology/Technician. However, the greatest engineering employment opportunities in the Central WPR for the two award levels are for the inspectors, testers, sorters, samplers, & weighers occupation, trained for by the Quality Control Technology/Technician program but, as discussed above, not directly related to engineering.

The region's high demand for the industrial engineer occupation explains the large gap of Northern Kentucky University and Association of Independent Kentucky Colleges & Universities (AIKCU) bachelor's degree level Manufacturing Engineering Technology/Technician programs, as well as the large gap of University of Kentucky's master's degree level Manufacturing Engineering program. The region's doctoral degree level engineering programs are only offered by the University of Kentucky. At the individual award level, it looks like the university could increase its enrollment in and completions for the Civil Engineering, General; Electrical & Electronics Engineering; and Mechanical Engineering programs. However, when looking across BACH+, only Civil Engineering,

General has a gap, meaning the university should carefully consider which award level it offers the programs.

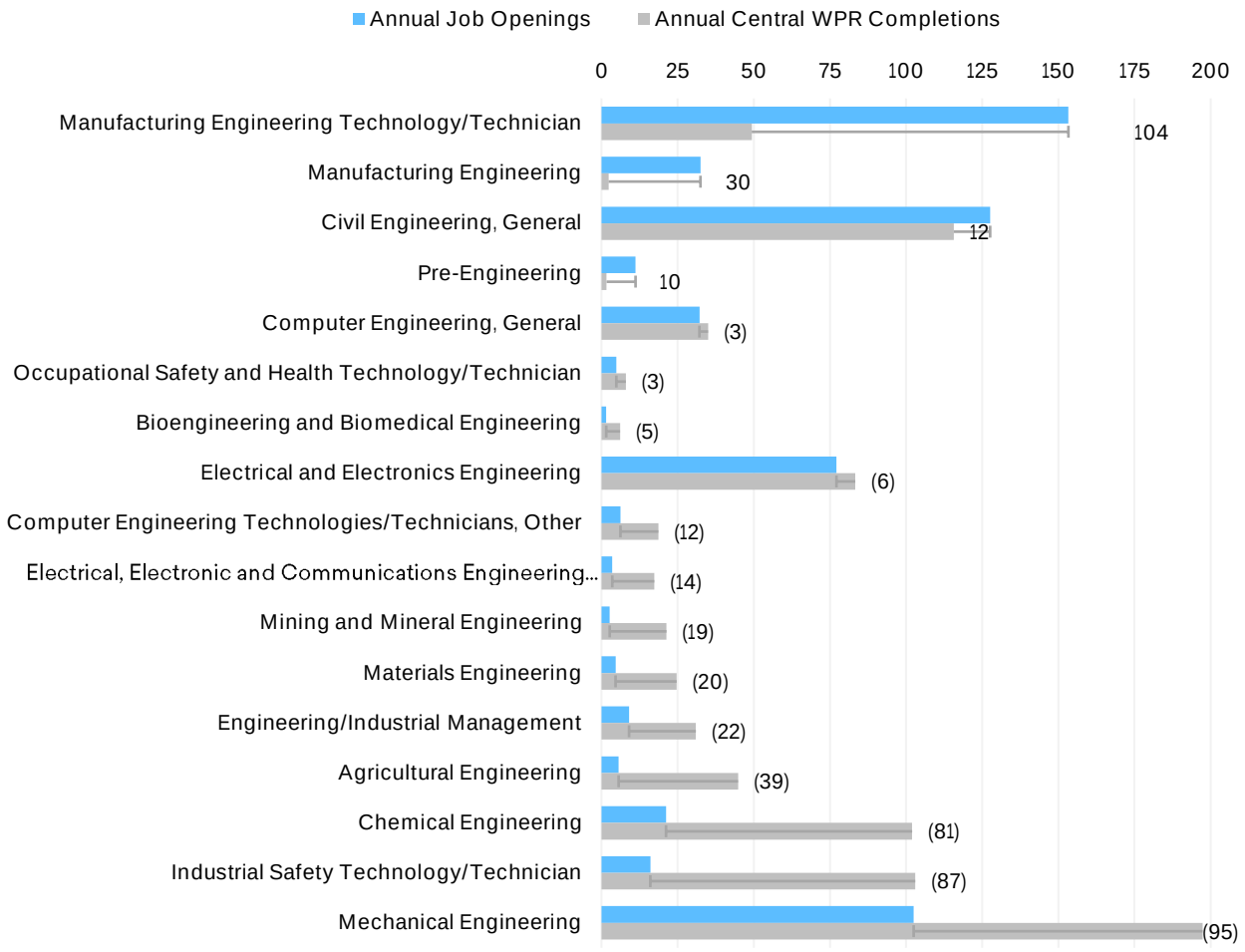
Combined Level Analysis

Figure 4.11: Gaps and Surpluses for the Central WPR's CERT+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

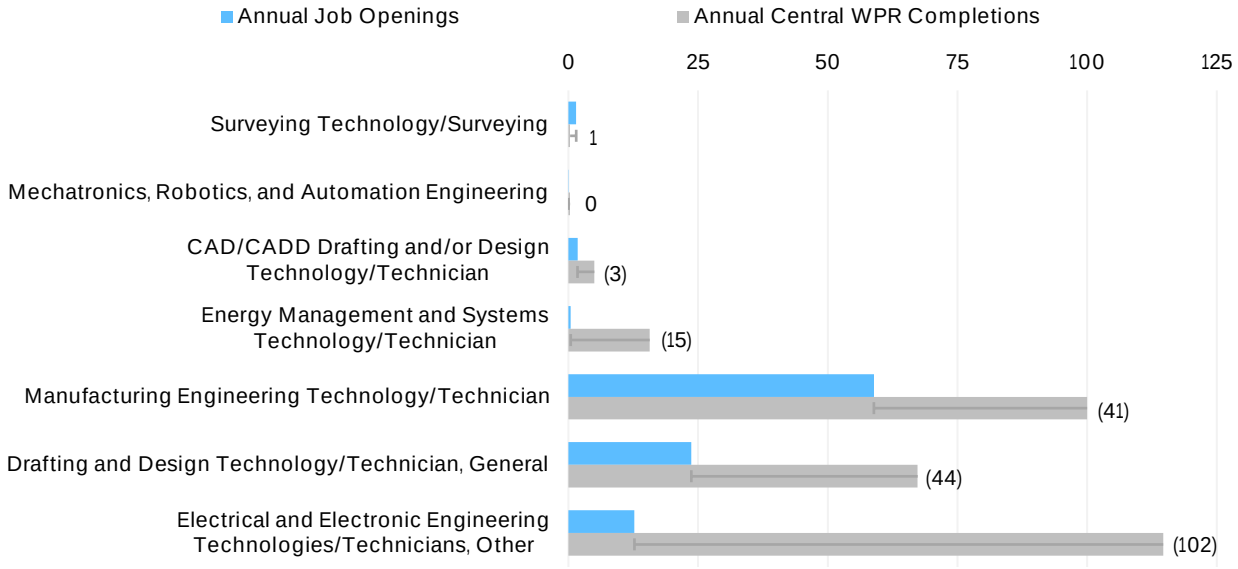
Figure 4.12: Gaps and Surpluses for the Central WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

Certificate Level Analysis

Figure 4.13: Gaps and Surpluses for the Central WPR's Certificate Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.12: Gaps and Surpluses for the Central WPR's Certificate Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL CENTRAL COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.1102	Surveying Technology/Surveying	EKU	2	0	1	$25.91
14.4201	Mechatronics, Robotics, & Automation Engineering	KCTCS	0	0	0	$49.99
15.1302	CAD/CADD Drafting &/or Design Technology/Technician	NKU	2	5	(3)	$24.86
15.0503	Energy Management & Systems Technology/Technician	KCTCS	0	16	(15)	$24.80
15.0613	Manufacturing Engineering Technology/Technician	KCTCS	59	100	(41)	$38.55
15.1301	Drafting & Design Technology/Technician, General	KCTCS	24	67	(44)	$24.86
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	13	115	(102)	$28.91

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

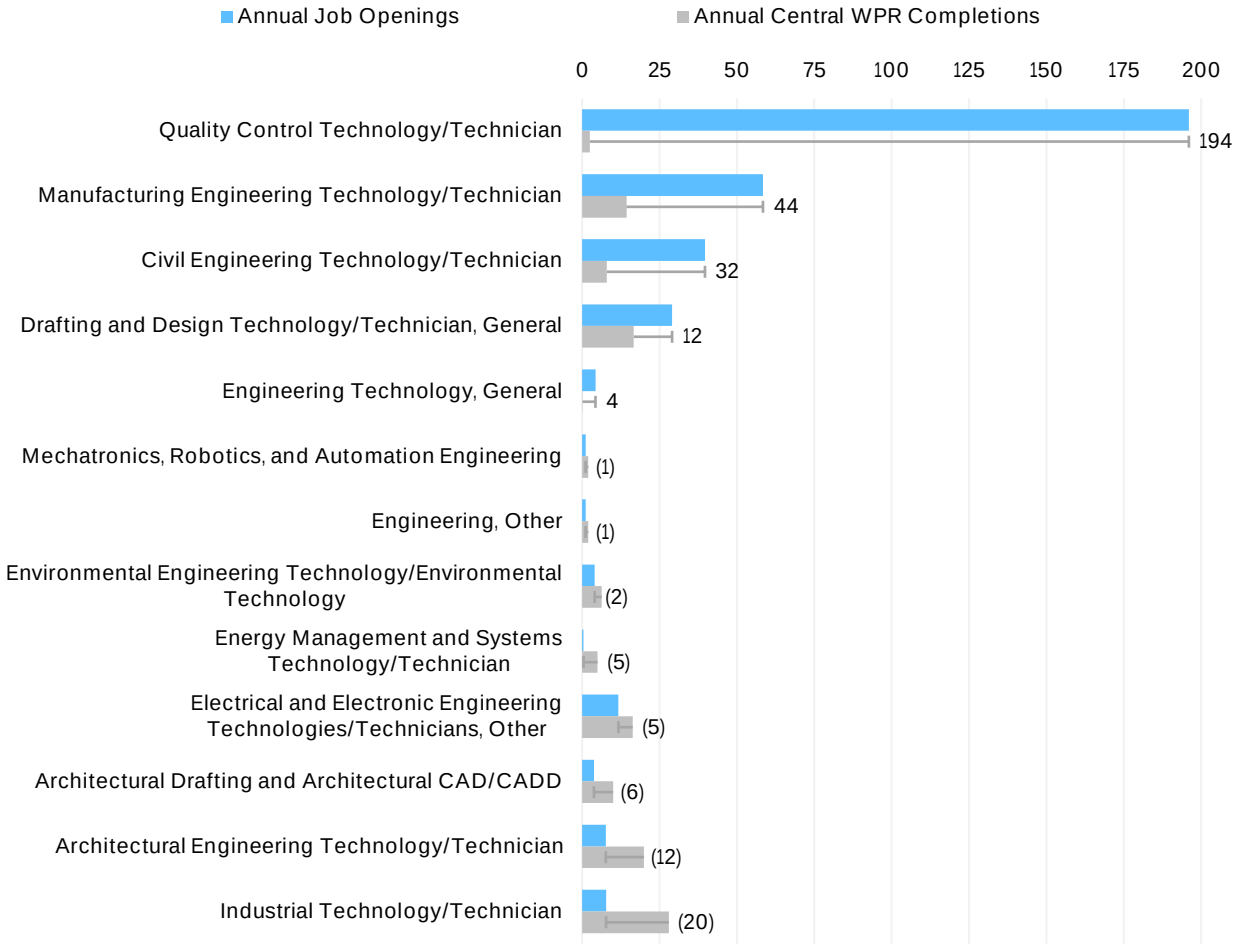
Table 4.13: Occupations Mapped to the Central WPR's Certificate Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ELECTRICAL & ELECTRONIC ENGINEERING TECHN./TECHS, OTHER (CIP CODE 15.0399)						
17-3023	Electrical & Electronics Engineering Technicians	405	434	29	13	$28.91

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Associate Degree Level Analysis

Figure 4.14: Gaps and Surpluses for the Central WPR's Associate Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.14: Gaps and Surpluses for the Central WPR's Associate Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL CENTRAL COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0702	Quality Control Technology/Technician	KCTCS	196	3	194	$18.07
15.0613	Manufacturing Engineering Technology/Technician	KCTCS	58	14	44	$38.48
15.0201	Civil Engineering Technology/Technician	KCTCS	40	8	32	$22.92
15.1301	Drafting & Design Technology/Technician, General	KCTCS	29	17	12	$25.23
15.0000	Engineering Technology, General	KCTCS	4	0	4	$23.69
14.4201	Mechatronics, Robotics, & Automation Engineering	KCTCS	1	2	(1)	$50.71
14.9999	Engineering, Other	EKU	1	2	(1)	$50.71
15.0507	Environmental Engineering Technology/Environmental Technology	KCTCS	4	6	(2)	$26.61
15.0503	Energy Management & Systems Technology/Technician	KCTCS	0	5	(5)	$24.80
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	12	16	(5)	$28.91
15.1303	Architectural Drafting & Architectural CAD/CADD	KCTCS	4	10	(6)	$23.92
15.0101	Architectural Engineering Technology/Technician	NKU	8	20	(12)	$23.92
15.0612	Industrial Technology/Technician	EKU	8	28	(20)	$24.50

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

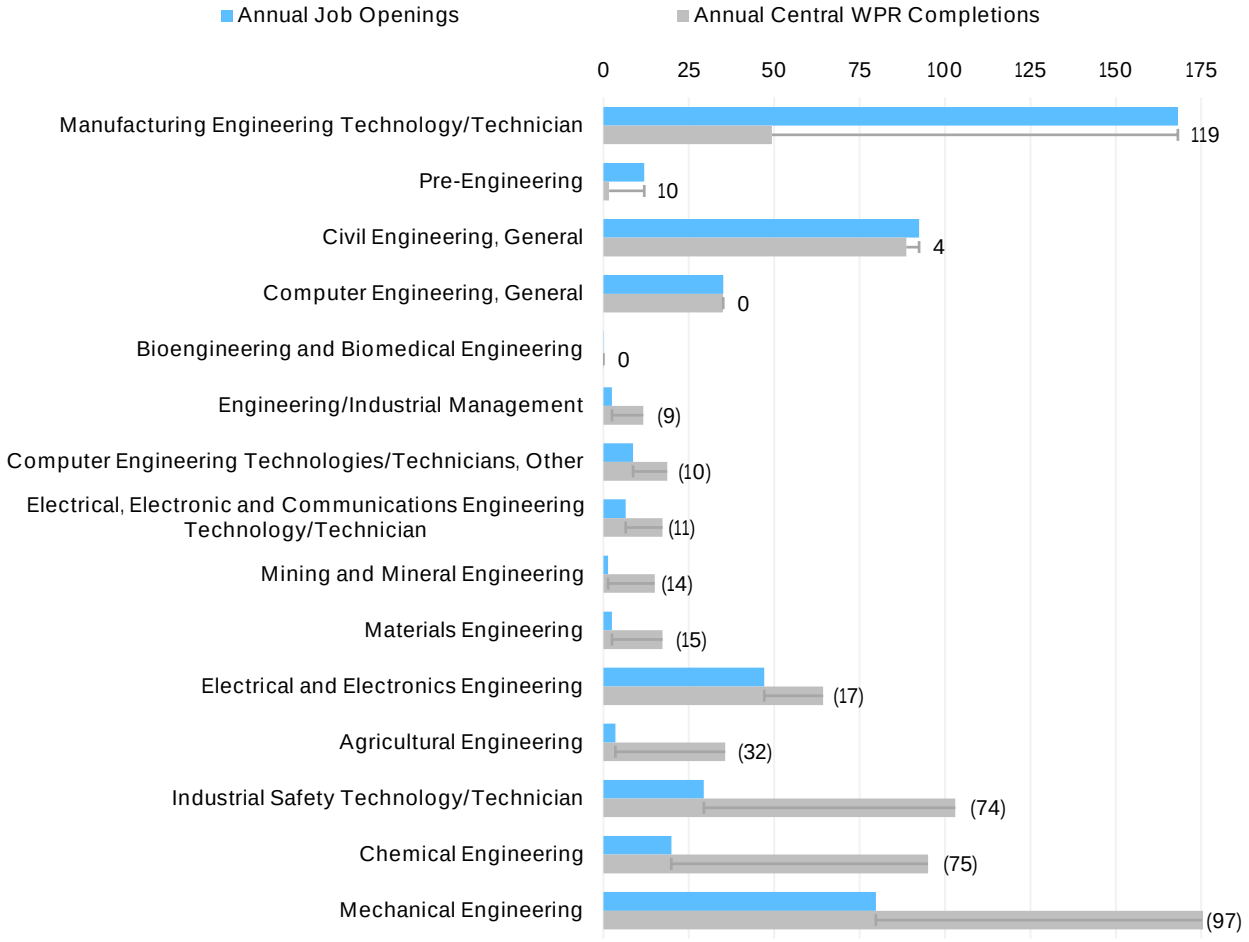
Table 4.15: Occupations Mapped to the Central WPR's Associate Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
QUALITY CONTROL TECHNOLOGY/TECHNICIAN (CIP CODE 15.0702)						
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	4,134	4,005	(129)	195	$17.89
11-3051	Industrial Production Managers	1,785	1,892	107	1	$42.07

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Bachelor's Degree *Level Analysis*

Figure 4.15: Gaps and Surpluses for the Central WPR's Bachelor's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.16: Gaps and Surpluses for the Central WPR's Bachelor's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL CENTRAL COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0613	Manufacturing Engineering Technology/Technician	NKU	117	34	83	--
		AIKCU	51	15	36	--
		Total	168	49	119	$37.90
14.0102	Pre-Engineering	AIKCU	12	2	10	$38.96
14.0801	Civil Engineering, General	UK	92	89	4	$40.47

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL CENTRAL COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0901	Computer Engineering, General	UK	35	35	0	$41.17
14.0501	Bioengineering & Biomedical Engineering	UK	0	0	0	$48.07
15.1501	Engineering/Industrial Management	EKU	2	12	(9)	$47.58
15.1299	Computer Engineering Technologies/Technicians, Other	EKU	9	19	(10)	$29.52
15.0303	Electrical, Electronic & Communications Engineering Technology/Technician	NKU	7	17	(11)	$26.10
14.2101	Mining & Mineral Engineering	UK	1	15	(14)	$55.07
14.1801	Materials Engineering	UK	2	17	(15)	$48.48
14.1001	Electrical & Electronics Engineering	UK	47	64	(17)	$41.07
14.0301	Agricultural Engineering	UK	3	36	(32)	$56.04
15.0703	Industrial Safety Technology/Technician	EKU	29	103	(74)	$24.48
14.0701	Chemical Engineering	UK	20	95	(75)	$46.81
14.1901	Mechanical Engineering	UK	80	176	(97)	$43.18

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.17: Occupations Mapped to the Central WPR's Bachelor's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MANUFACTURING ENGINEERING TECHNOLOGY/TECHNICIAN (CIP CODE 15.0613)						
17-2112	Industrial Engineers	2,449	2,783	333	139	$37.65
17-2141	Mechanical Engineers	1,316	1,485	169	16	$40.14
17-3023	Electrical & Electronics Engineering Technicians	405	434	29	8	$28.91
11-9041	Architectural & Engineering Managers	1,277	1,358	81	4	$56.29
17-2199	Engineers, All Other	374	432	58	1	$37.40

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

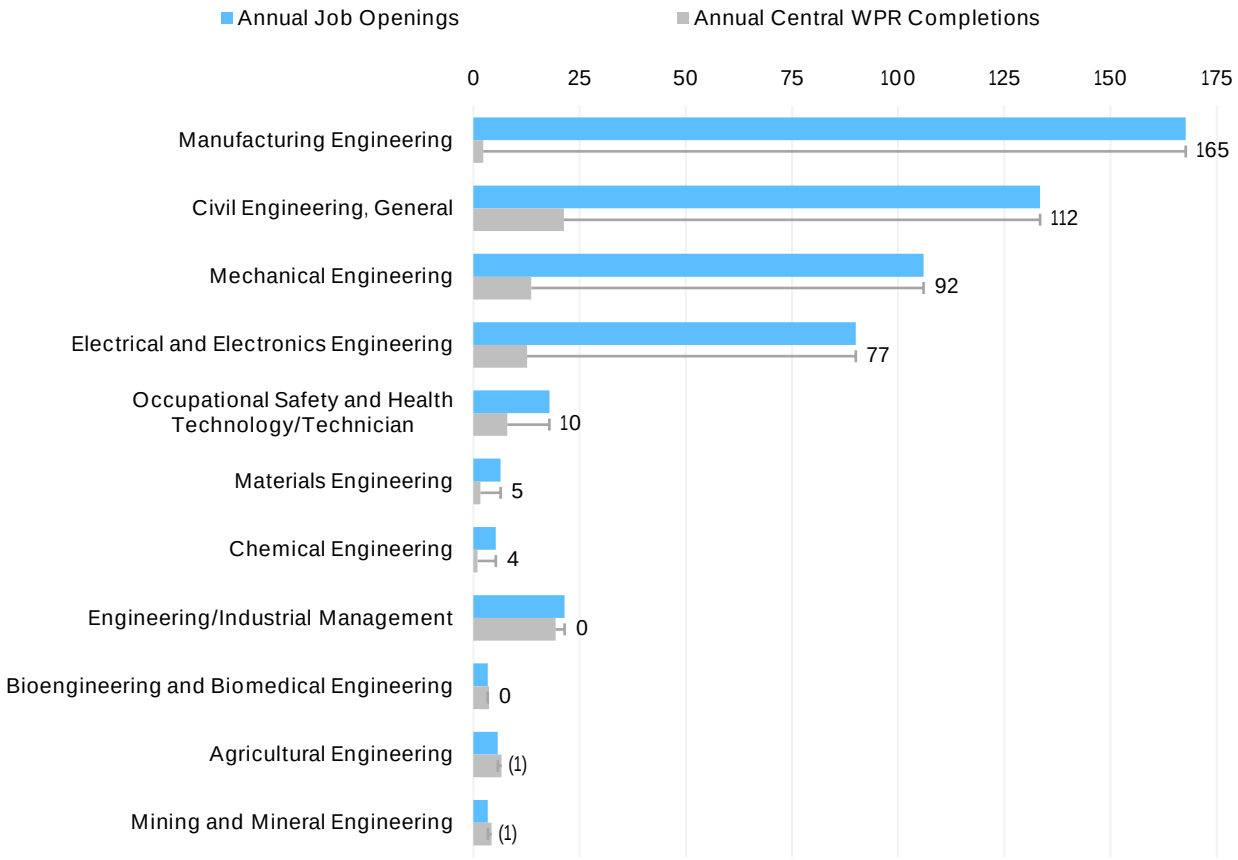
Table 4.18: Occupations Mapped to the Central WPR's Bachelor's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MECHANICAL ENGINEERING (CIP CODE 14.1901)						
17-2141	Mechanical Engineers	1,316	1,485	169	56	$40.14
11-9041	Architectural & Engineering Managers	1,277	1,358	81	15	$56.29
17-2199	Engineers, All Other	374	432	58	5	$37.40
17-2011	Aerospace Engineers	81	107	26	4	$45.82

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Master's Degree Level Analysis

Figure 4.16: Gaps and Surpluses for the Central WPR's Master's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.19: Gaps and Surpluses for the Central WPR's Master's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL CENTRAL COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.3601	Manufacturing Engineering	UK	168	2	165	$37.84
14.0801	Civil Engineering, General	UK	133	21	112	$41.06
14.1901	Mechanical Engineering	UK	106	14	92	$41.75
14.1001	Electrical & Electronics Engineering	UK	90	13	77	$41.14
15.0701	Occupational Safety & Health Technology/Technician	EKU	18	8	10	$35.50
14.1801	Materials Engineering	UK	6	2	5	$41.43
14.0701	Chemical Engineering	UK	5	1	4	$42.30
15.1501	Engineering/Industrial Management	EKU	21	19	2	$51.69
14.0501	Bioengineering & Biomedical Engineering	UK	3	4	0	$51.64
14.0301	Agricultural Engineering	UK	6	7	(1)	$56.08
14.2101	Mining & Mineral Engineering	UK	3	4	(1)	$55.56

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.20: Occupations Mapped to the Central WPR's Master's Degree Level Engineering Programs with a Large Gap

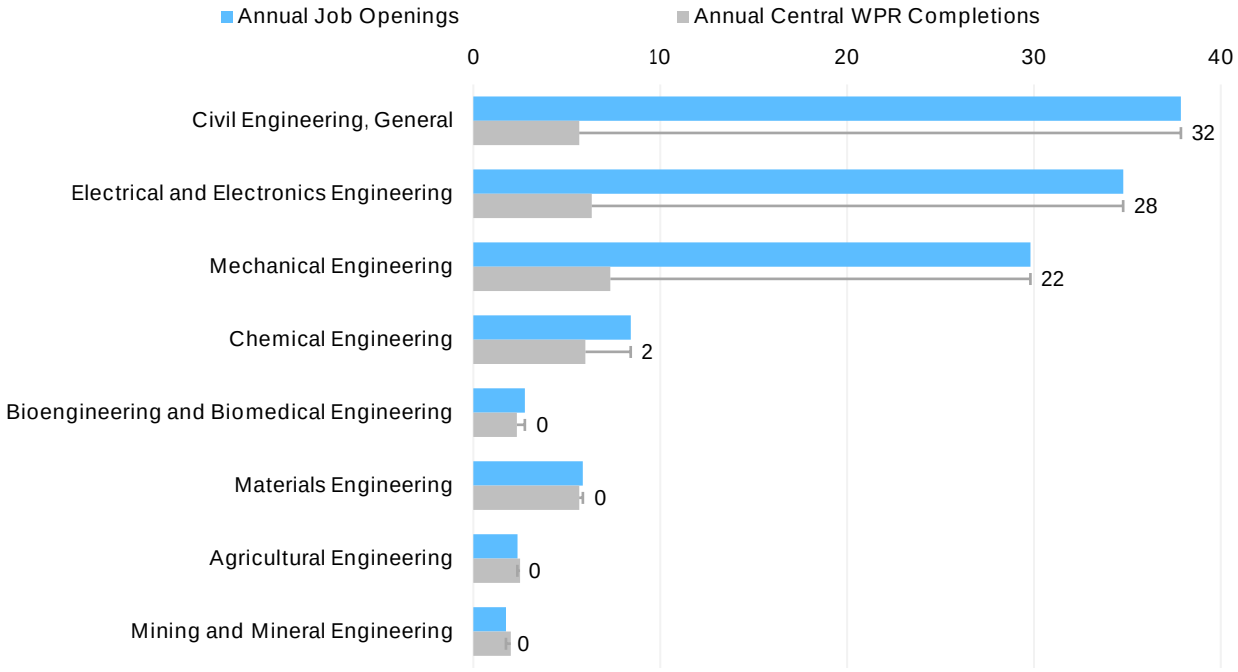
SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MANUFACTURING ENGINEERING (CIP CODE 14.3601)						
17-2112	Industrial Engineers	2,449	2,783	333	165	$37.65
11-9041	Architectural & Engineering Managers	1,277	1,358	81	2	$56.29
17-2199	Engineers, All Other	374	432	58	1	$37.40
CIVIL ENGINEERING, GENERAL (CIP CODE 14.0801)						
17-2051	Civil Engineers	1,396	1,505	109	98	$39.00
11-9041	Architectural & Engineering Managers	1,277	1,358	81	16	$56.29
17-2199	Engineers, All Other	374	432	58	9	$37.40
17-2081	Environmental Engineers	198	227	29	7	$35.20
17-2171	Petroleum Engineers	33	36	3	2	$61.81
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	16	18	2	1	$41.54
MECHANICAL ENGINEERING (CIP CODE 14.1901)						

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
17-2141	Mechanical Engineers	1,316	1,485	169	86	$40.14
11-9041	Architectural & Engineering Managers	1,277	1,358	81	10	$56.29
17-2199	Engineers, All Other	374	432	58	6	$37.40
17-2011	Aerospace Engineers	81	107	26	4	$45.82
ELECTRICAL AND ELECTRONICS ENGINEERING (CIP CODE 14.1001)						
17-2071	Electrical Engineers	875	951	76	53	$39.75
17-2072	Electronics Engineers, Except Computer	290	322	32	19	$37.56
11-9041	Architectural & Engineering Managers	1,277	1,358	81	10	$56.29
17-2199	Engineers, All Other	374	432	58	6	$37.40
17-2011	Aerospace Engineers	81	107	26	3	$45.82

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Doctoral Degree Level Analysis

Figure 4.17: Gaps and Surpluses for the Central WPR's Doctoral Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.21: Gaps and Surpluses for the Central WPR's Doctoral Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL CENTRAL COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0801	Civil Engineering, General	UK	38	6	32	$41.04
14.1001	Electrical & Electronics Engineering	UK	35	6	28	$41.93
14.1901	Mechanical Engineering	UK	30	7	22	$43.55
14.0701	Chemical Engineering	UK	8	6	2	$49.68
14.0501	Bioengineering & Biomedical Engineering	UK	3	2	0	$48.94
14.1801	Materials Engineering	UK	6	6	0	$52.69
14.0301	Agricultural Engineering	UK	2	3	0	$56.10
14.2101	Mining & Mineral Engineering	UK	2	2	0	$55.60

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.22: Occupations Mapped to the Central WPR's Doctoral Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
CIVIL ENGINEERING, GENERAL (CIP CODE 14.0801)						
17-2051	Civil Engineers	1,396	1,505	109	27	$39.00
11-9041	Architectural & Engineering Managers	1,277	1,358	81	5	$56.29
17-2081	Environmental Engineers	198	227	29	4	$35.20
17-2199	Engineers, All Other	374	432	58	1	$37.40
17-2171	Petroleum Engineers	33	36	3	1	$61.81
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	16	18	2	0	$41.54
ELECTRICAL AND ELECTRONICS ENGINEERING (CIP CODE 14.1001)						
17-2071	Electrical Engineers	875	951	76	20	$39.75
17-2072	Electronics Engineers, Except Computer	290	322	32	7	$37.56
11-9041	Architectural & Engineering Managers	1,277	1,358	81	5	$56.29
17-2199	Engineers, All Other	374	432	58	1	$37.40
17-2011	Aerospace Engineers	81	107	26	1	$45.82
MECHANICAL ENGINEERING (CIP CODE 14.1901)						

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
17-2141	Mechanical Engineers	1,316	1,485	169	21	$40.14
11-9041	Architectural & Engineering Managers	1,277	1,358	81	6	$56.29
17-2199	Engineers, All Other	374	432	58	2	$37.40
17-2011	Aerospace Engineers	81	107	26	1	$45.82

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

EAST WORKFORCE PLANNING REGION

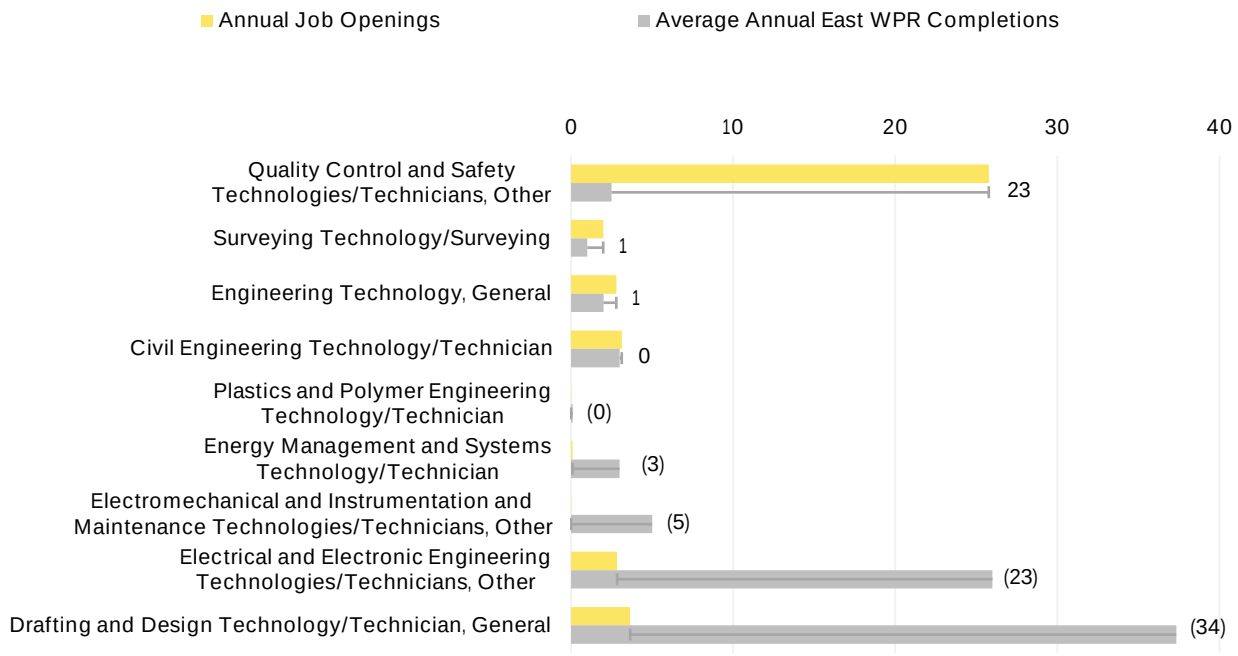
Figure 4.18 and Figure 4.19 display the CERT+ and BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician (BACH+) program is an area to consider for expansion. The Plastics & Polymer Engineering Technology/Technician (CERT+) and Engineering Technology, General (BACH+) programs should be carefully considered for continuation and/or for consolidation. Given low engineering employment opportunities in the East WPR, program completers may be leaving the region or even the state to work in engineering occupations.

At the individual award levels, the KCTCS again plays an important role in Kentucky's East WPR region by providing almost all the engineering programs' certificate and associate degree level program completions. The largest programs, in terms of completions at both award levels, are from the certificate level Drafting & Design Technology/Technician, General program and the Electrical & Electronic Engineering Technologies/Technicians, Other program. However, similar to the Central WPR, the greatest employment opportunities for the two award levels are for the inspectors, testers, sorters, samplers, & weighers occupation.

There are relatively fewer employment opportunities for engineers in the East WPR at the bachelor's and master's degree levels, compared to Kentucky's other regions, but the programs offered by Morehead State University appear to be filling the region's projected labor market demand. Only the Manufacturing Engineering Technology/Technician program faces a somewhat large gap, primarily driven by industrial and mechanical engineer occupations. The university's Aerospace, Aeronautical & Astronautical/Space Engineering program is unique among all the state's engineering programs. There is relatively low demand in the region, but considering it is a fairly niche program, completers could be finding employment in other areas of Kentucky.

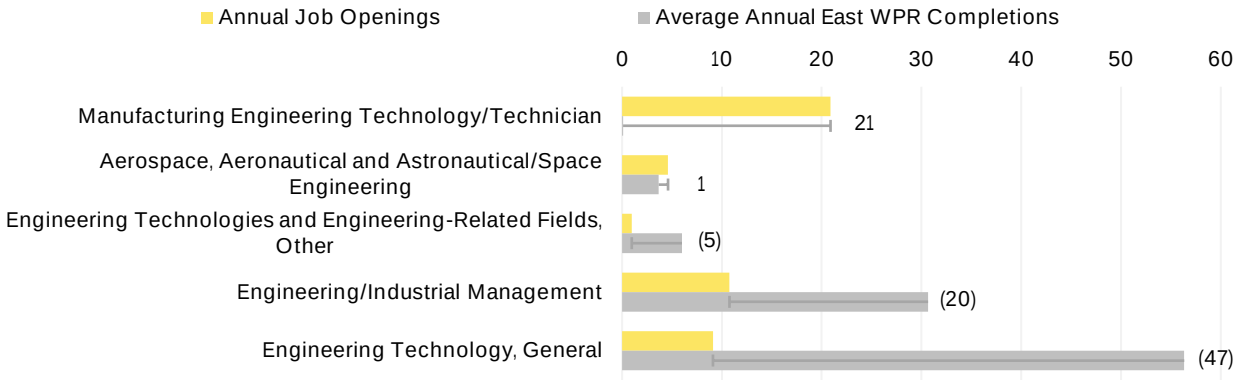
Combined Level Analysis

Figure 4.18: Gaps and Surpluses for the East WPR's CERT+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

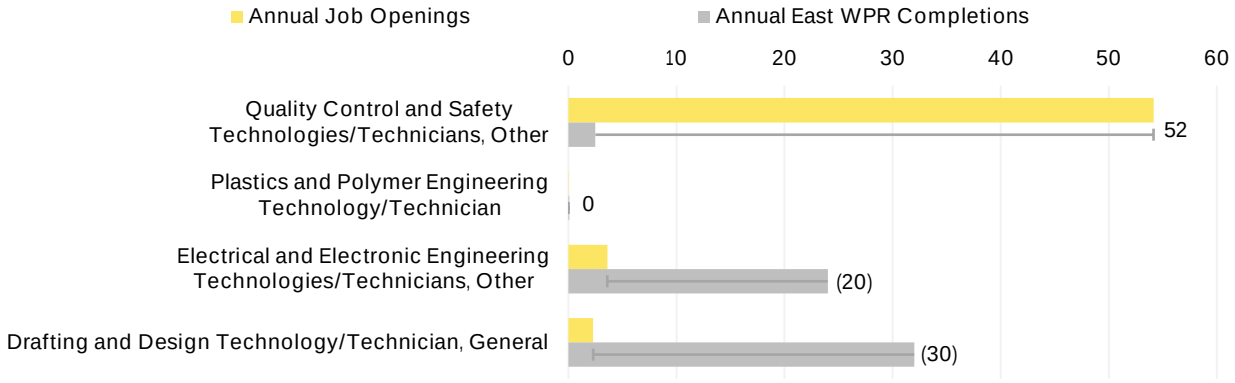
Figure 4.19: Gaps and Surpluses for the East WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

Certificate Level Analysis

Figure 4.20: Gaps and Surpluses for the East WPR's Certificate Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.23: Gaps and Surpluses for the East WPR's Certificate Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL EAST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0799	Quality Control & Safety Technologies/Technicians, Other	KCTCS	54	3	52	$19.95
15.0607	Plastics & Polymer Engineering Technology/Technician	KCTCS	0	0	0	$27.96
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	4	24	(20)	$28.66
15.1301	Drafting & Design Technology/Technician, General	KCTCS	2	32	(30)	$30.03

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.24: Occupations Mapped to the East WPR's Certificate Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
QUALITY CONTROL & SAFETY TECHNOLOGIES/TECHNICIANS, OTHER (CIP CODE 15.0799)						
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	634	572	(61)	48	$17.23
11-3051	Industrial Production Managers	217	216	(2)	6	$40.28

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

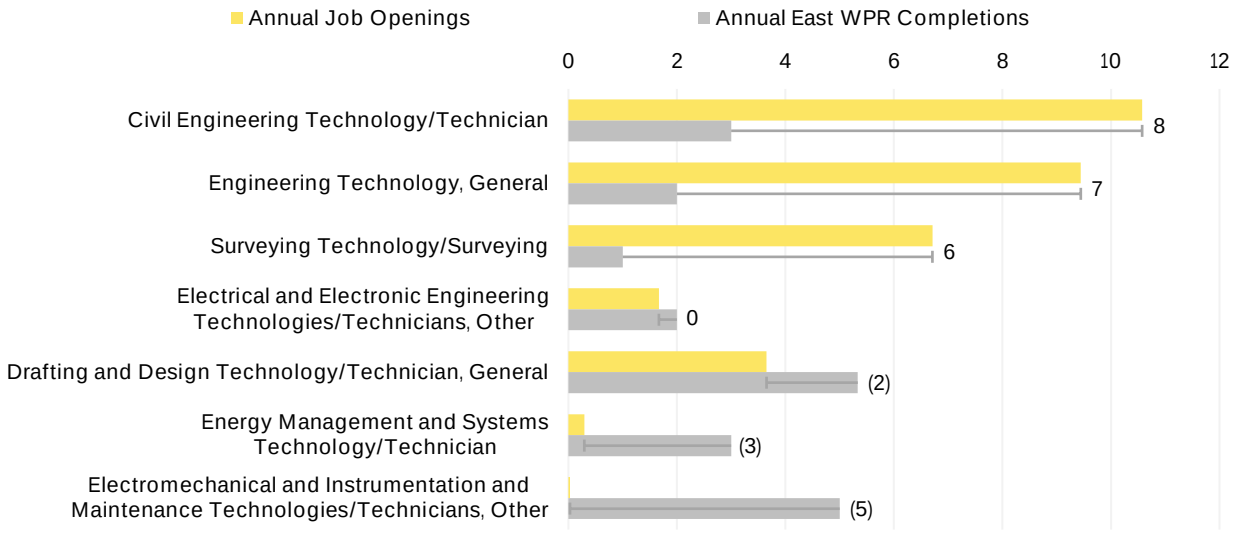
Table 4.25: Occupations Mapped to the East WPR's Certificate Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
DRAFTING & DESIGN TECHNOLOGY/TECHNICIAN, GENERAL (CIP CODE 15.1301)						
17-3013	Mechanical Drafters	33	35	2	1	$39.18
17-3011	Architectural & Civil Drafters	20	22	1	1	$21.46
17-3012	Electrical & Electronics Drafters	6	6	(0)	0	$20.22
17-3019	Drafters, All Other	5	5	1	0	$14.82
ELECTRICAL & ELECTRONIC ENGINEERING TECHN./TECHS, OTHER (CIP CODE 15.0399)						
17-3023	Electrical & Electronics Engineering Technicians	63	65	3	4	$28.67

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Associate Degree Level Analysis

Figure 4.21: Gaps and Surpluses for the East WPR's Associate Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.26: Gaps and Surpluses for the East WPR's Associate Degree Level Engineering Programs

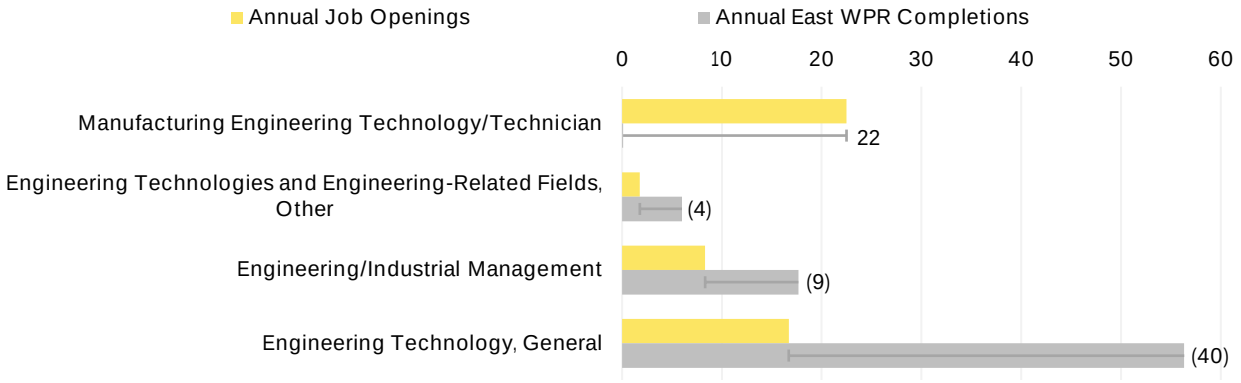
CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL EAST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0201	Civil Engineering Technology/Technician	KCTCS	11	3	8	$21.86
15.0000	Engineering Technology, General	MORE	9	2	7	$23.43

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL EAST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.1102	Surveying Technology/Surveying	KCTCS	7	1	6	$15.77
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	2	2	0	$28.66
15.1301	Drafting & Design Technology/Technician, General	KCTCS	4	5	(2)	$30.03
15.0503	Energy Management & Systems Technology/Technician	KCTCS	0	3	(3)	$27.96
15.0499	Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other	KCTCS	0	5	(5)	$20.74

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Bachelor's Degree Level Analysis

Figure 4.22: Gaps and Surpluses for the East WPR's Bachelor's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.27: Gaps and Surpluses for the East WPR's Bachelor's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL EAST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0613	Manufacturing Engineering Technology/Technician	MORE	22	0	22	$35.13
15.9999	Engineering Technologies & Engineering-Related Fields, Other	MORE	2	6	(4)	$23.78
15.1501	Engineering/Industrial Management	MORE	8	18	(9)	$46.95
15.0000	Engineering Technology, General	MORE	17	56	(40)	$23.78

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.28: Occupations Mapped to the East WPR's Bachelor's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MANUFACTURING ENGINEERING TECHNOLOGY/TECHNICIAN (CIP CODE 15.0613)						
17-2112	Industrial Engineers	249	280	30	14	$33.14
17-2141	Mechanical Engineers	159	158	(1)	8	$38.70
11-9041	Architectural & Engineering Managers	150	150	(0)	0	$49.09
17-2199	Engineers, All Other	110	100	(9)	0	$30.70
17-3023	Electrical & Electronics Engineering Technicians	63	65	3	0	$28.67

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

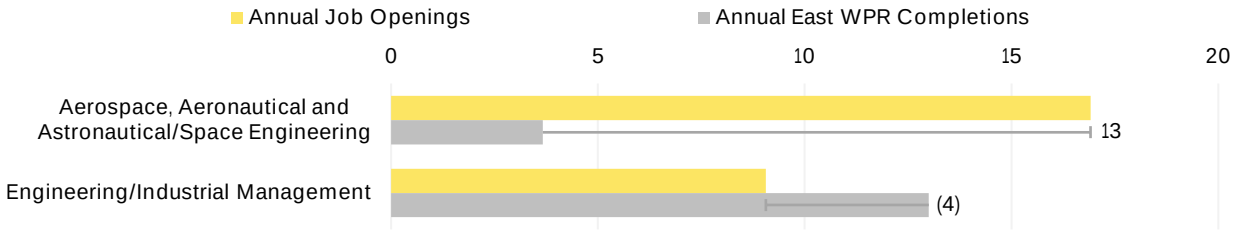
Table 4.29: Occupations Mapped to the East WPR's Bachelor's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ENGINEERING TECHNOLOGY, GENERAL (CIP CODE 15.0000)						
17-3022	Civil Engineering Technicians	384	362	(21)	10	$21.86
17-3023	Electrical & Electronics Engineering Technicians	63	65	3	2	$28.67
17-3026	Industrial Engineering Technicians	60	57	(3)	2	$22.63
17-3029	Engineering Technicians, Except Drafters, All Other	57	54	(3)	2	$27.96
17-3027	Mechanical Engineering Technicians	39	31	(8)	1	$29.04
17-3021	Aerospace Engineering & Operations Technicians	1	1	0	0	$29.00
17-3024	Electro-Mechanical Technicians	1	1	(0)	0	$20.74

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Master's Degree Level Analysis

Figure 4.23: Gaps and Surpluses for the East WPR's Master's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.30: Gaps and Surpluses for the East WPR's Master's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL EAST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0201	Aerospace, Aeronautical & Astronautical/Space Engineering	MORE	17	4	13	$38.72
15.1501	Engineering/Industrial Management	MORE	9	13	(4)	$47.54

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

KENTUCKIANA LOCAL WORKFORCE AREA

Figure 4.24 and Figure 4.25 display the CERT+ and BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician (BACH+) program is an area to consider for expansion, whereas the Civil Engineering and Computer Engineering (both BACH+) programs should maintain their success. Several programs, such as the Energy Management & Systems (CERT+) and Bioengineering & Biomedical Engineering (BACH+) programs, should be carefully considered for continuation and/or for consolidation.

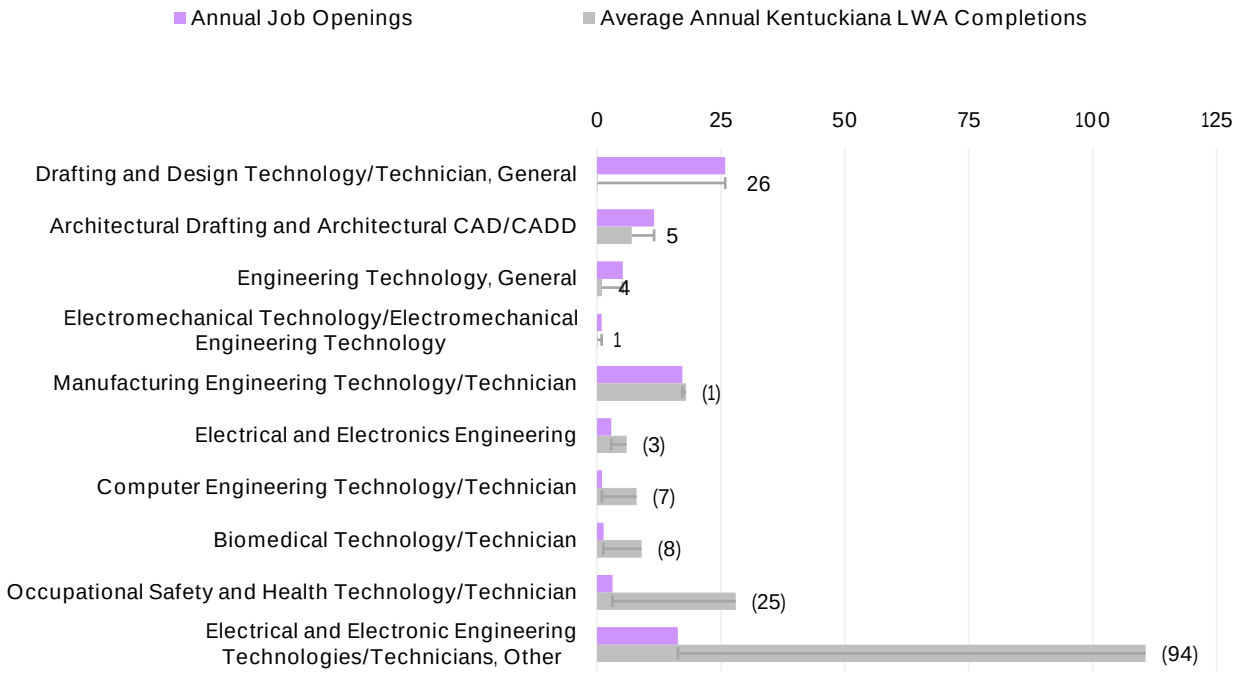
In terms of individual award levels, at the certificate level, results show a need for more completers from the region's drafting programs, and less of a demand for students seeking employment in the electrical & electronics engineering technician occupation. Kentucky's AIKCU institutions provide the Kentuckiana LWA with the majority of the region's associate degree level engineering completers. No further program developments are recommended at this time for the associate degree award level.

The region's high demand for industrial engineer and civil engineer occupations explains the large gaps of University of Louisville's bachelor's degree level Industrial Engineering and Civil Engineering, General programs. AIKCU institutions' Computer Engineering, General programs also see high levels of demand. However, there are less than five annual

completions from the AIKCU institutions' programs. A program expansion may be warranted, seeing that the University of Kentucky is the only other institution in the state with completions in the program at the bachelor's degree level (35 annual completions). The Kentuckiana LWA supports about 2,000 jobs for the mechanical engineer occupation. There is a gap for the program at the master's degree level, so a master's degree level expansion of University of Louisville's program could be beneficial to mechanical engineers seeking additional skills and technical training. However, the university should also carefully consider its Mechanical Engineering program offerings at the bachelor's and doctoral levels considering there is a surplus for the program when considering the BACH+ award level.

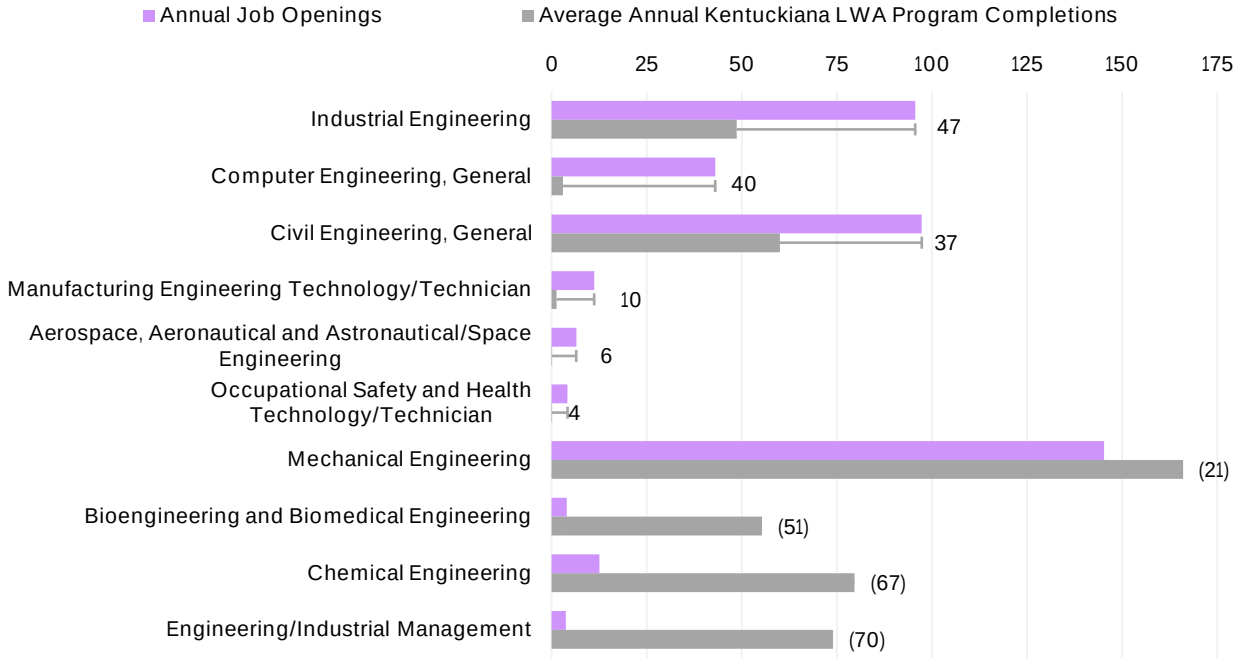
Combined Level Analysis

Figure 4.24: Gaps and Surpluses for the Kentuckiana LWA's CERT+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

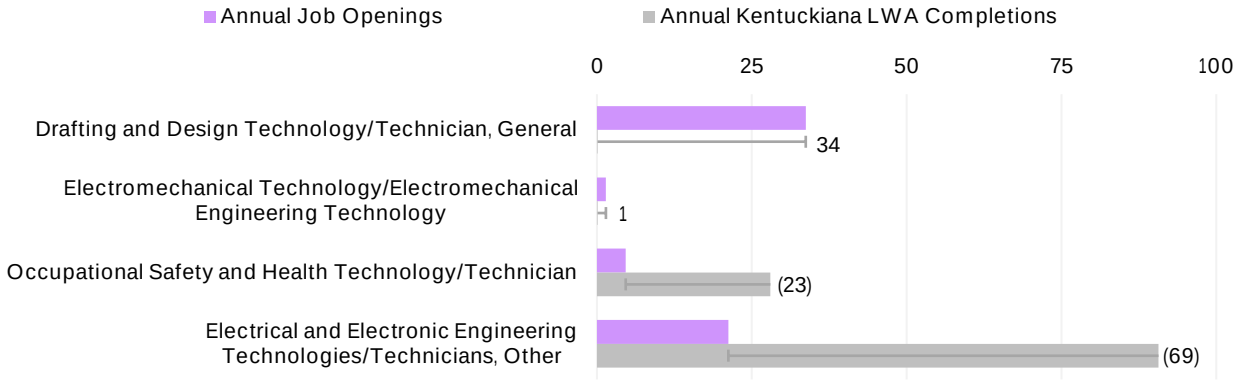
Figure 4.25: Gaps and Surpluses for the Kentuckiana LWA's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

Certificate Level Analysis

Figure 4.26: Gaps and Surpluses for the Kentuckiana LWA's Certificate Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.31: Gaps and Surpluses for the Kentuckiana LWA's Certificate Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KENT COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.1301	Drafting & Design Technology/Technician, General	KCTCS	34	0	34	$25.00

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KENT COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0403	Electromechanical Technology/Electromechanical Engineering Technology	KCTCS	1	0	1	$22.94
15.0701	Occupational Safety & Health Technology/Technician	KCTCS	5	28	(23)	$27.44
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	21	91	(69)	$29.42

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

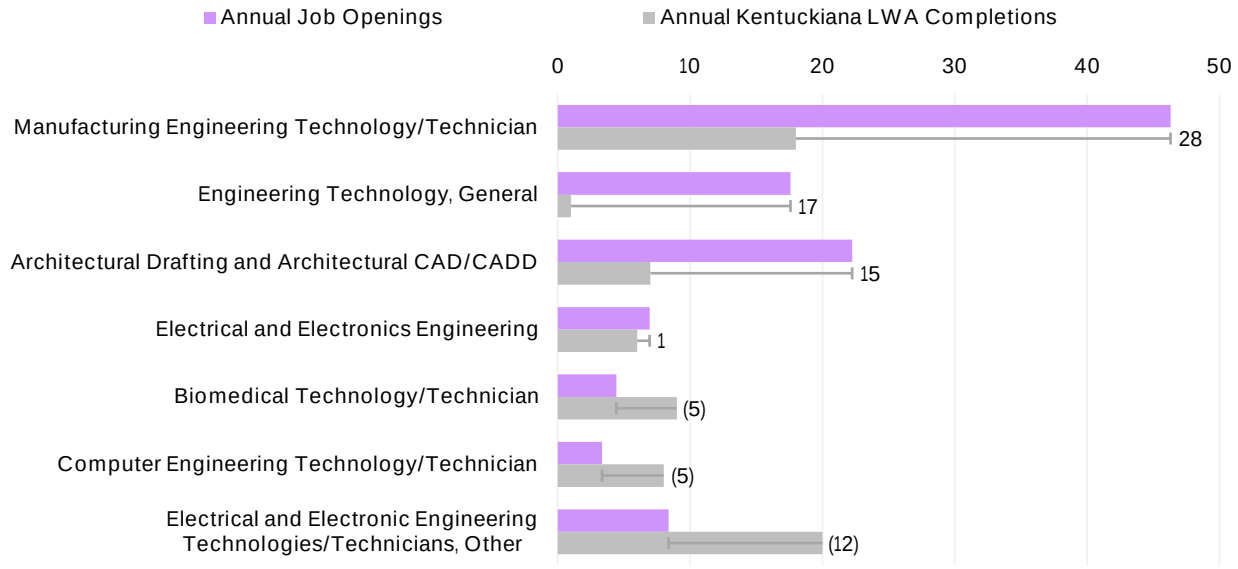
Table 4.32: Occupations Mapped to the Kentuckiana LWA's Certificate Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ELECTRICAL & ELECTRONIC ENGINEERING TECHN./TECHS, OTHER (CIP CODE 15.0399)						
17-3023	Electrical & Electronics Engineering Technicians	381	403	22	21	$29.42

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Associate Degree Level Analysis

Figure 4.27: The Kentuckiana LWA's Associate Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

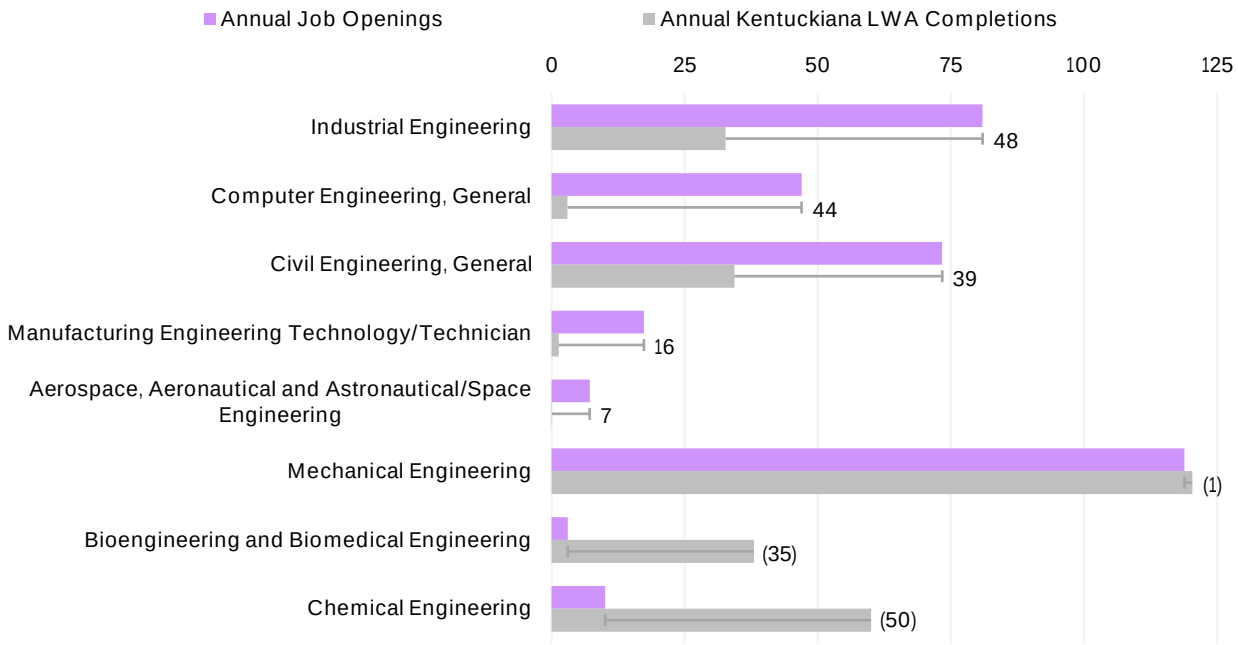
Table 4.33: Gaps and Surpluses for the Kentuckiana LWA's Associate Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KENT COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0613	Manufacturing Engineering Technology/Technician	AIKCU	46	18	28	$37.71
15.0000	Engineering Technology, General	KCTCS	18	1	17	$22.27
15.1303	Architectural Drafting & Architectural CAD/CADD	AIKCU	22	7	15	$24.54
14.1001	Electrical & Electronics Engineering	AIKCU	7	6	1	$44.78
15.0401	Biomedical Technology/Technician	AIKCU	4	9	(5)	$29.01
15.1201	Computer Engineering Technology/Technician	AIKCU	3	8	(5)	$29.42
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	8	20	(12)	$29.42

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Bachelor's Degree Level Analysis

Figure 4.28: Gaps and Surpluses for the Kentuckiana LWA's Bachelor's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.34: Gaps and Surpluses for the Kentuckiana LWA's Bachelor's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KENT COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.3501	Industrial Engineering	UofL	81	33	48	$35.50
14.0901	Computer Engineering, General	AIKCU	47	3	44	$41.59
14.0801	Civil Engineering, General	UofL	73	34	39	$40.38
15.0613	Manufacturing Engineering Technology/Technician	AIKCU	17	1	16	$31.46
14.0201	Aerospace, Aeronautical & Astronautical/Space Engineering	AIKCU	7	0	7	$45.25
14.1901	Mechanical Engineering	UofL	119	120	(1)	$42.06
14.0501	Bioengineering & Biomedical Engineering	UofL	3	38	(35)	$43.23
14.0701	Chemical Engineering	UofL	10	60	(50)	$43.84

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.35: Occupations Mapped to the Kentuckiana LWA's Bachelor's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
INDUSTRIAL ENGINEERING (CIP CODE 14.3501.UofL)						
17-2112	Industrial Engineers	1,401	1,609	208	80	$35.29
11-9041	Architectural & Engineering Managers	172	224	52	1	$49.77
COMPUTER ENGINEERING, GENERAL (CIP CODE 14.0901.AIKCU)						
17-2071	Electrical Engineers	540	598	57	25	$44.28
15-1132	Software Developers, Applications	3,398	4,223	825	13	$39.73
17-2061	Computer Hardware Engineers	99	115	16	5	$31.43
15-1133	Software Developers, Systems Software	852	1,001	150	3	$42.96
15-1143	Computer Network Architects	501	542	41	1	$40.59
17-2199	Engineers, All Other	204	246	41	0	$41.13
11-9041	Architectural & Engineering Managers	172	224	52	0	$49.77
CIVIL ENGINEERING, GENERAL (CIP CODE 14.0801.UofL)						
17-2051	Civil Engineers	1,125	1,257	131	65	$39.66
17-2081	Environmental Engineers	94	103	9	4	$41.18

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
17-2199	Engineers, All Other	204	246	41	2	$41.13
17-2171	Petroleum Engineers	27	30	4	1	$59.41
11-9041	Architectural & Engineering Managers	172	224	52	1	$49.77
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	4	6	2	0	$47.44

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

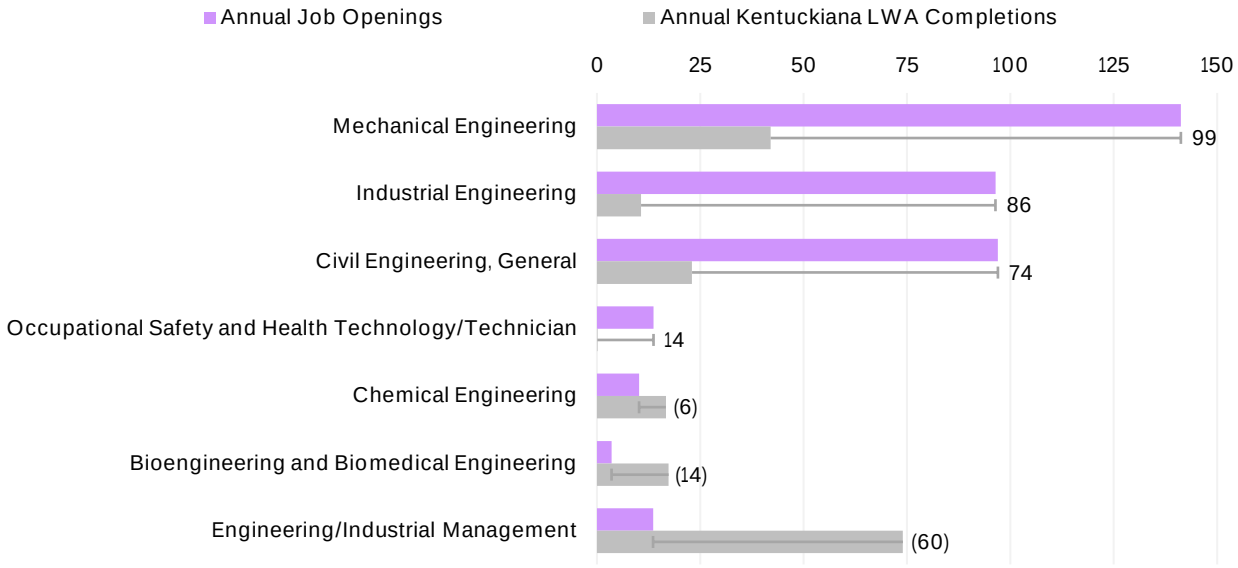
Table 4.36: Occupations Mapped to the Kentuckiana LWA's Bachelor's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
CHEMICAL ENGINEERING (CIP CODE 14.0701)						
17-2131	Materials Engineers	42	49	7	3	$35.85
17-2199	Engineers, All Other	204	246	41	3	$41.13
17-2041	Chemical Engineers	84	87	3	2	$50.11
11-9041	Architectural & Engineering Managers	172	224	52	2	$49.77

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Master's Degree Level Analysis

Figure 4.29: Gaps and Surpluses for the Kentuckiana LWA's Master's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.37: Gaps and Surpluses for the Kentuckiana LWA's Master's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KENT COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.1901	Mechanical Engineering	UofL	141	42	99	$41.98
14.3501	Industrial Engineering	UofL	96	11	86	$35.41
14.0801	Civil Engineering, General	UofL	97	23	74	$40.43
15.0701	Occupational Safety & Health Technology/Technician	AIKCU	14	0	14	$32.91
14.0701	Chemical Engineering	UofL	10	17	(6)	$43.17
14.0501	Bioengineering & Biomedical Engineering	UofL	4	17	(14)	$42.29
15.1501	Engineering/Industrial Management	UofL	14	74	(60)	$47.29

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.38: Occupations Mapped to the Kentuckiana LWA's Master's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MECHANICAL ENGINEERING (CIP CODE 14.1901)						
17-2141	Mechanical Engineers	2,046	2,273	227	129	$41.60
17-2199	Engineers, All Other	204	246	41	7	$41.13
11-9041	Architectural & Engineering Managers	172	224	52	3	$49.77
17-2011	Aerospace Engineers	16	25	9	2	$58.17
INDUSTRIAL ENGINEERING (CIP CODE 14.3501)						
17-2112	Industrial Engineers	1,401	1,609	208	96	$35.29
11-9041	Architectural & Engineering Managers	172	224	52	1	$49.77
CIVIL ENGINEERING, GENERAL (CIP CODE 14.0801)						
17-2051	Civil Engineers	1,125	1,257	131	83	$39.66
17-2081	Environmental Engineers	94	103	9	6	$41.18
17-2199	Engineers, All Other	204	246	41	4	$41.13
17-2171	Petroleum Engineers	27	30	4	2	$59.41
11-9041	Architectural & Engineering Managers	172	224	52	2	$49.77
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	4	6	2	1	$47.44

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

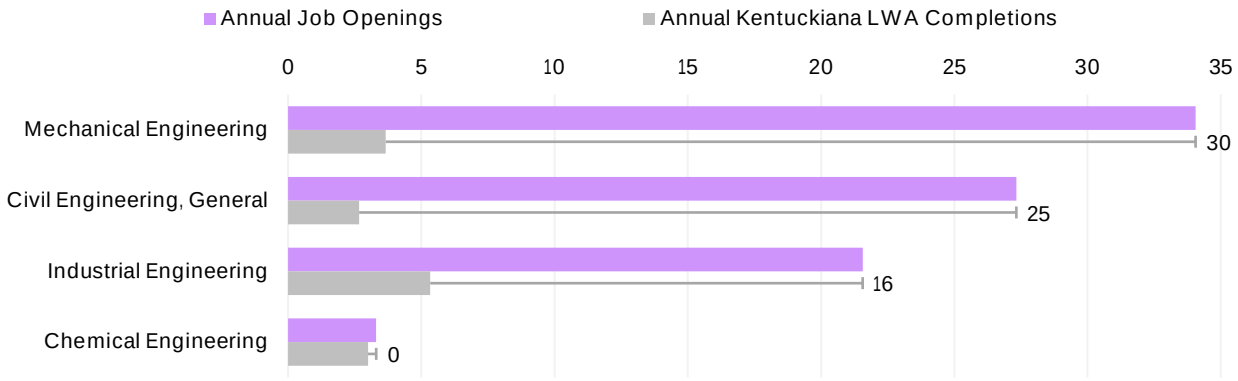
Table 4.39: Occupations Mapped to the Kentuckiana LWA's Master's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ENGINEERING/INDUSTRIAL MANAGEMENT (CIP CODE 15.1501)						
11-3051	Industrial Production Managers	756	805	49	8	$45.36
11-9041	Architectural & Engineering Managers	172	224	52	6	$49.77

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Doctoral Degree Level Analysis

Figure 4.30: Gaps and Surpluses for the Kentuckiana LWA's Doctoral Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.40: Gaps and Surpluses for the Kentuckiana LWA's Doctoral Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KENT COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.1901	Mechanical Engineering	UofL	34	4	30	$42.19
14.0801	Civil Engineering, General	UofL	27	3	25	$40.56
14.3501	Industrial Engineering	UofL	22	5	16	$36.50
14.0701	Chemical Engineering	UofL	3	3	0	$43.38

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

SOUTH WORKFORCE PLANNING REGION

Figure 4.31 and Figure 4.32 display the CERT+ and BACH+ gaps and surpluses. Only the Drafting & Design Technology/Technician, General (CERT+) program is recommended for expansion, although it would only need to be a slight expansion to fill the demand of five annual openings. The Manufacturing Engineering Technology/Technician (BACH+) program should maintain its success. Some programs, such as the Electrical & Electronic Engineering Technologies/Technicians, Other (CERT+) and Engineering, Other (BACH+) programs, should be carefully considered for continuation and/or for consolidation.

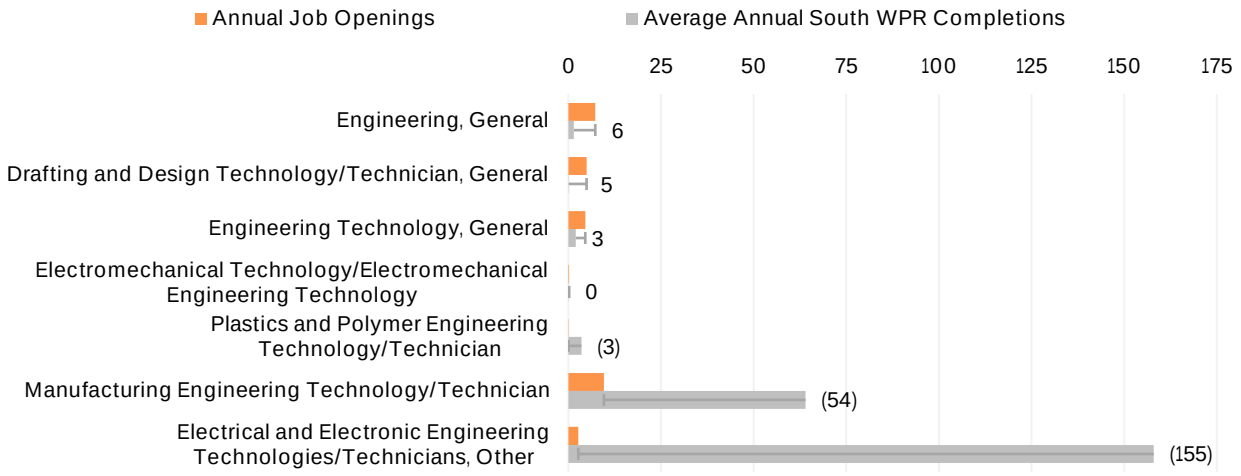
At the individual award level, between the South WPR's certificate and associate degree award levels, the largest program by far is the Electrical & Electronic Engineering

Technologies/Technicians, Other program, with almost 160 average annual completions. However, the region does not have a comparable number of job openings for electrical & electronics engineering technicians, the occupation mapped to it. A review of the programs' employment outcomes is recommended.

At the bachelor's and master's degree levels, Western Kentucky University is the only institution in the state with program completions. As in other regions, the South WPR's high demand for industrial engineers is the occupation in the most demand across the award levels, primarily for the Manufacturing Engineering Technology/Technician and Quality Control Technology/Technician programs. The university's bachelor's degree level Construction Engineering Technology/Technician program is unique among all the state's engineering programs but is not recommended for further program development, given regional and statewide occupational data.

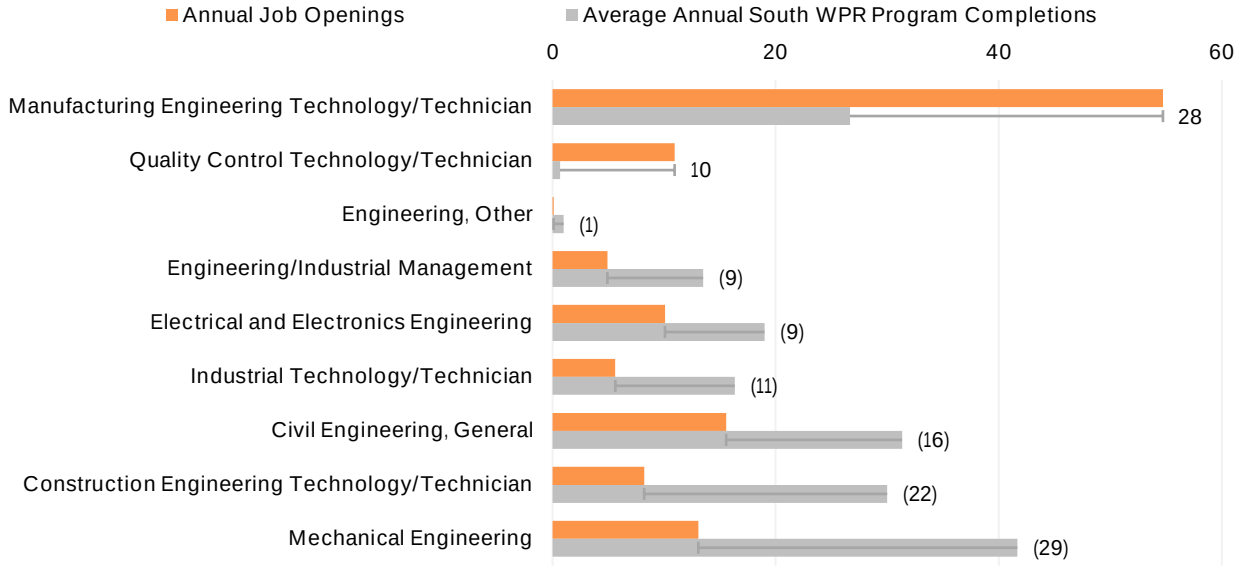
Combined Level Analysis

Figure 4.31: Gaps and Surpluses for the South WPR's CERT+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

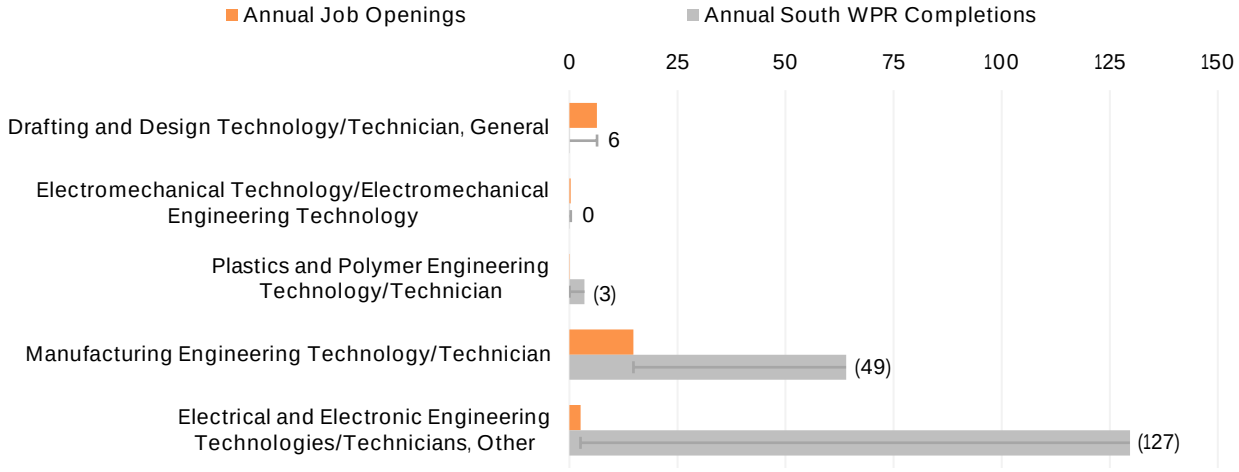
Figure 4.32: Gaps and Surpluses for the South WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

Certificate Level Analysis

Figure 4.33: Gaps and Surpluses for the South WPR's Certificate Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.41: Gaps and Surpluses for the South WPR's Certificate Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL SOUTH COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.1301	Drafting & Design Technology/Technician, General	KCTCS	6	0	6	$20.95

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL SOUTH COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0403	Electromechanical Technology/Electromechanical Engineering Technology	KCTCS	0	0	0	$22.51
15.0607	Plastics & Polymer Engineering Technology/Technician	KCTCS	0	4	(3)	$26.72
15.0613	Manufacturing Engineering Technology/Technician	WKU	15	64	(49)	$35.63
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	3	130	(127)	$27.88

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

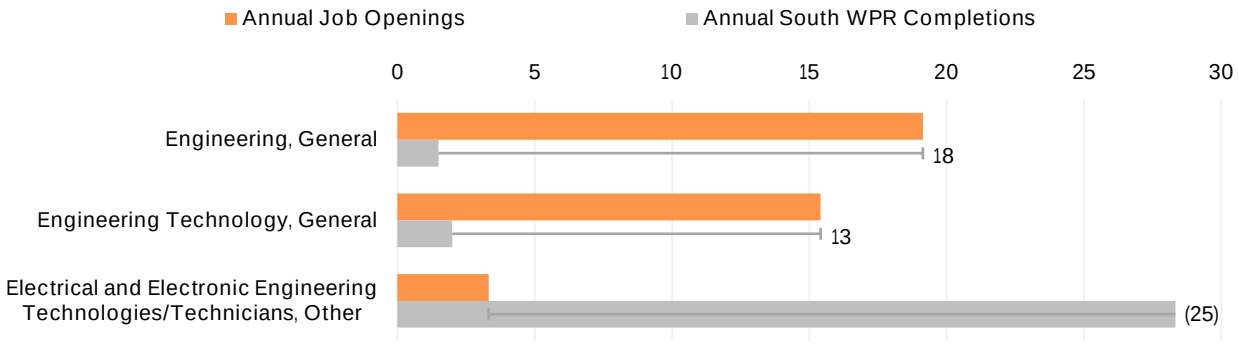
Table 4.42: Occupations Mapped to the South WPR's Certificate Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ELECTRICAL & ELECTRONIC ENGINEERING TECHN./TECHS, OTHER (CIP CODE 15.0399)						
17-3023	Electrical & Electronics Engineering Technicians	62	70	8	3	$27.88

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Associate Degree Level Analysis

Figure 4.34: Gaps and Surpluses for the South WPR's Associate Degree Level Engineering Programs



Source: Emsi program demand gap model.

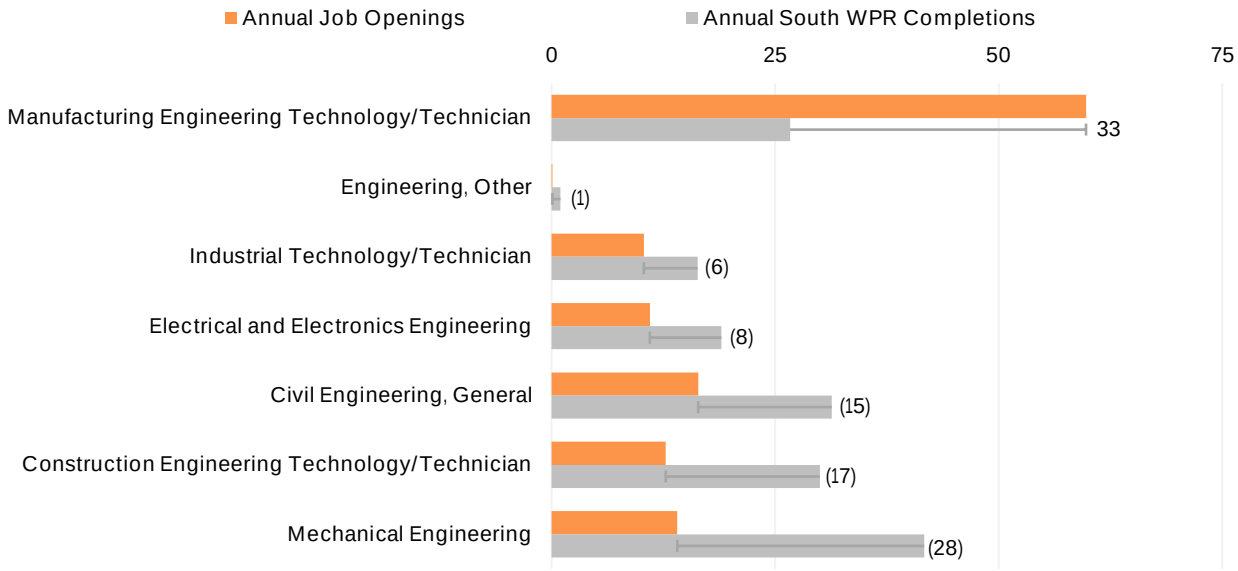
Table 4.43: Gaps and Surpluses for the South WPR's Associate Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL SOUTH COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0101	Engineering, General	AIKCU	19	2	18	$36.17
15.0000	Engineering Technology, General	KCTCS	15	2	13	$22.02
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	3	28	(25)	$27.88

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Bachelor's Degree Level Analysis

Figure 4.35: Gaps and Surpluses for the South WPR's Bachelor's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.44: Gaps and Surpluses for the South WPR's Bachelor's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL SOUTH COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0613	Manufacturing Engineering Technology/Technician	WKU	60	27	33	$35.95
14.9999	Engineering, Other	AIKCU	0	1	(1)	$42.66
15.0612	Industrial Technology/Technician	WKU	10	16	(6)	$23.78

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL SOUTH COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.1001	Electrical & Electronics Engineering	WKU	11	19	(8)	$37.64
14.0801	Civil Engineering, General	WKU	16	31	(15)	$37.30
15.1001	Construction Engineering Technology/Technician	WKU	13	30	(17)	$22.21
14.1901	Mechanical Engineering	WKU	14	42	(28)	$36.58

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.45: Occupations Mapped to the South WPR's Bachelor's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MANUFACTURING ENGINEERING TECHNOLOGY/TECHNICIAN (CIP CODE 15.0613)						
17-2112	Industrial Engineers	776	917	141	49	$36.25
17-2141	Mechanical Engineers	212	282	70	6	$33.65
17-3023	Electrical & Electronics Engineering Technicians	62	70	8	2	$27.88
11-9041	Architectural & Engineering Managers	130	157	27	2	$49.68
17-2199	Engineers, All Other	161	176	15	1	$33.66

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

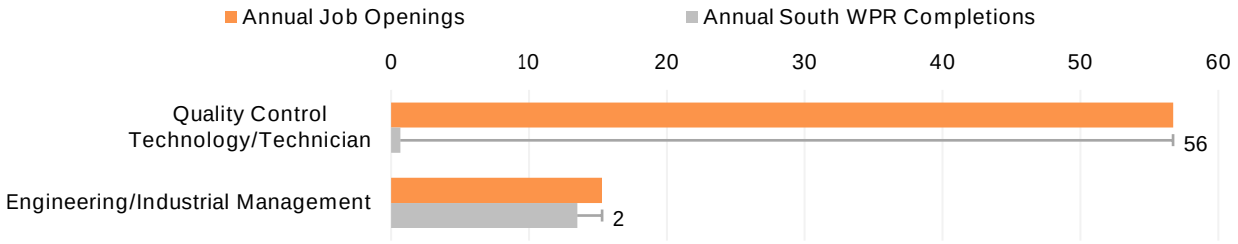
Table 4.46: Occupations Mapped to the South WPR's Bachelor's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MECHANICAL ENGINEERING (CIP CODE 14.1901)						
17-2141	Mechanical Engineers	212	282	70	10	$33.65
11-9041	Architectural & Engineering Managers	130	157	27	2	$49.68
17-2199	Engineers, All Other	161	176	15	2	$33.66
17-2011	Aerospace Engineers	6	8	2	0	$45.12

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Master's Degree Level Analysis

Figure 4.36: Gaps and Surpluses for the South WPR's Master's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.47: Gaps and Surpluses for the South WPR's Master's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL SOUTH COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0702	Quality Control Technology/Technician	WKU	57	1	56	$36.39
15.1501	Engineering/Industrial Management	WKU	15	14	2	$46.94

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.48: Occupations Mapped to the South WPR's Master's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
QUALITY CONTROL TECHNOLOGY/TECHNICIAN (CIP CODE 15.0702)						
17-2112	Industrial Engineers	776	917	141	56	$36.25
11-9041	Architectural & Engineering Managers	130	157	27	1	$49.68
11-3051	Industrial Production Managers	513	574	61	0	$40.95

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

WEST WORKFORCE PLANNING REGION

Figure 4.37 and Figure 4.38 display the CERT+ and BACH+ gaps and surpluses. The Manufacturing Engineering Technology/Technician program again appears as an opportunity for expansion at the BACH+ level. The Engineering Technology, General (BACH+) program is the only program recommended for maintaining success. Some programs, such as the Civil Engineering Technology/Technician (CERT+) and Occupational

Safety & Health Technology/Technician (BACH+) programs, should be carefully considered for continuation and/or for consolidation.

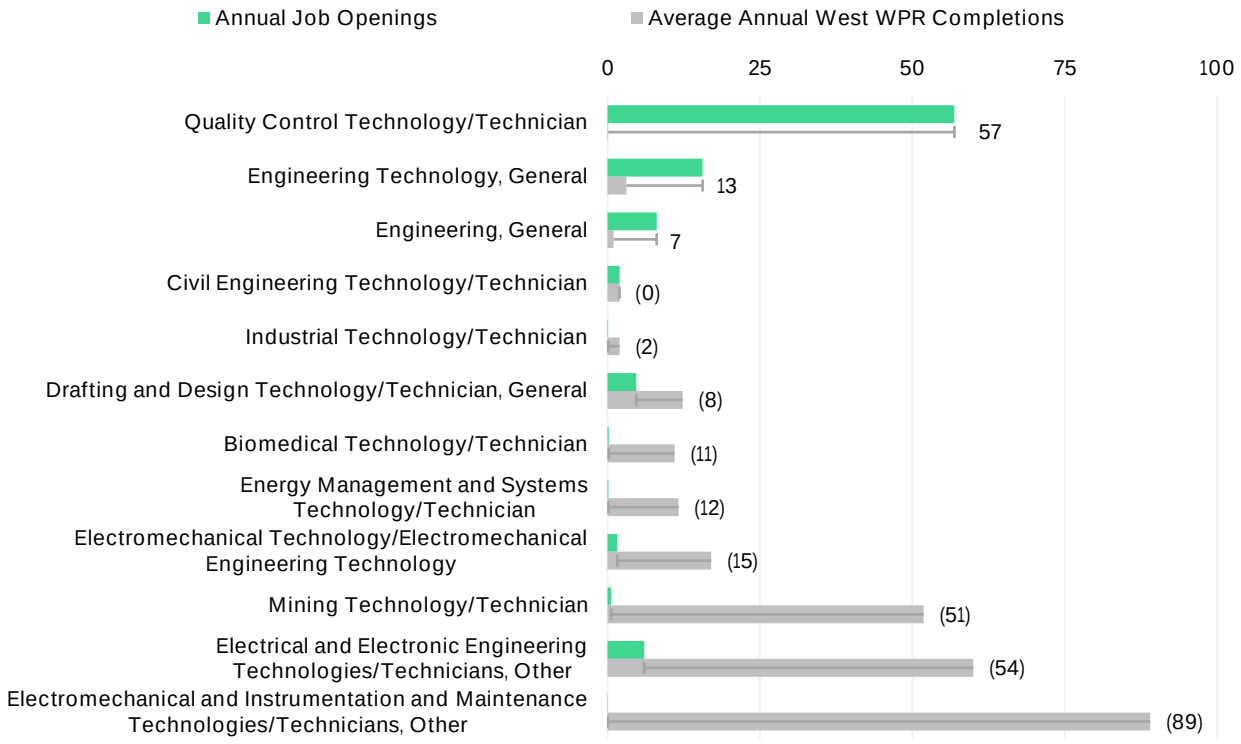
At the individual award level, between the West WPR's certificate and associate degree programs, the Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other program is the largest, with 72 average annual completions at the certificate level and another 17 average annual completions at the associate degree level. However, the greatest engineering employment opportunities across the two award levels in the West WPR are for the inspectors, testers, sorters, samplers, & weighers occupation. A review of the Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other program's employment outcomes is recommended.

At the bachelor's and master's degree levels, Murray State University is the only institution with program completions. As in other regions, the West WPR's high demand for the industrial engineer occupation plays a role in several programs with large gaps, as well as its demand for civil and mechanical engineer occupations. The university's bachelor's degree level Occupational Safety & Health Technology/Technician program is unique among all the

state's engineering programs but is not recommended for further program development, given regional and statewide occupational data.

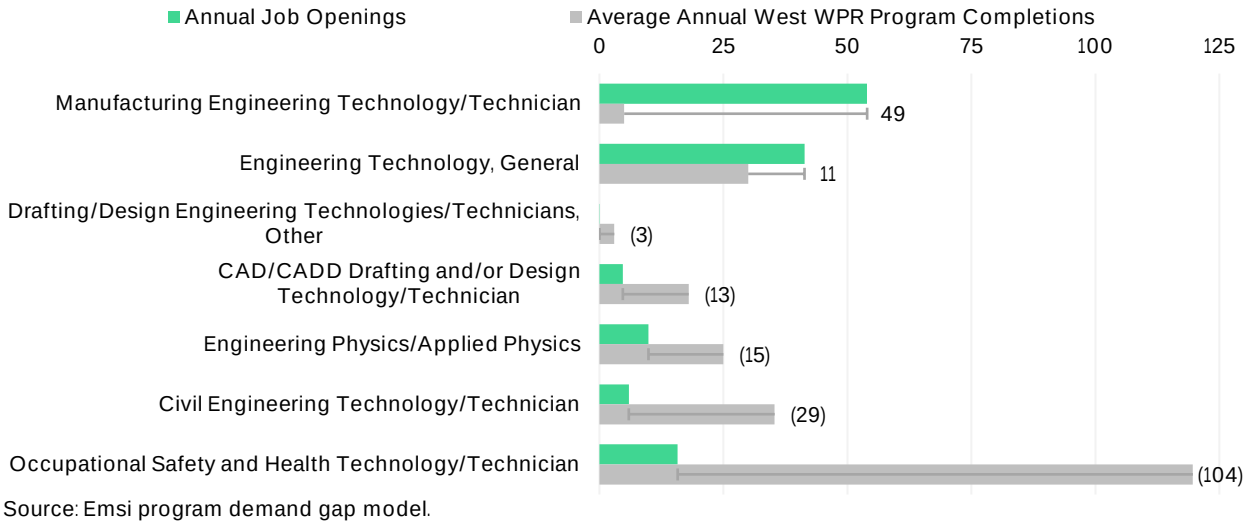
Combined Level Analysis

Figure 4.37: Gaps and Surpluses for the West WPR's CERT+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

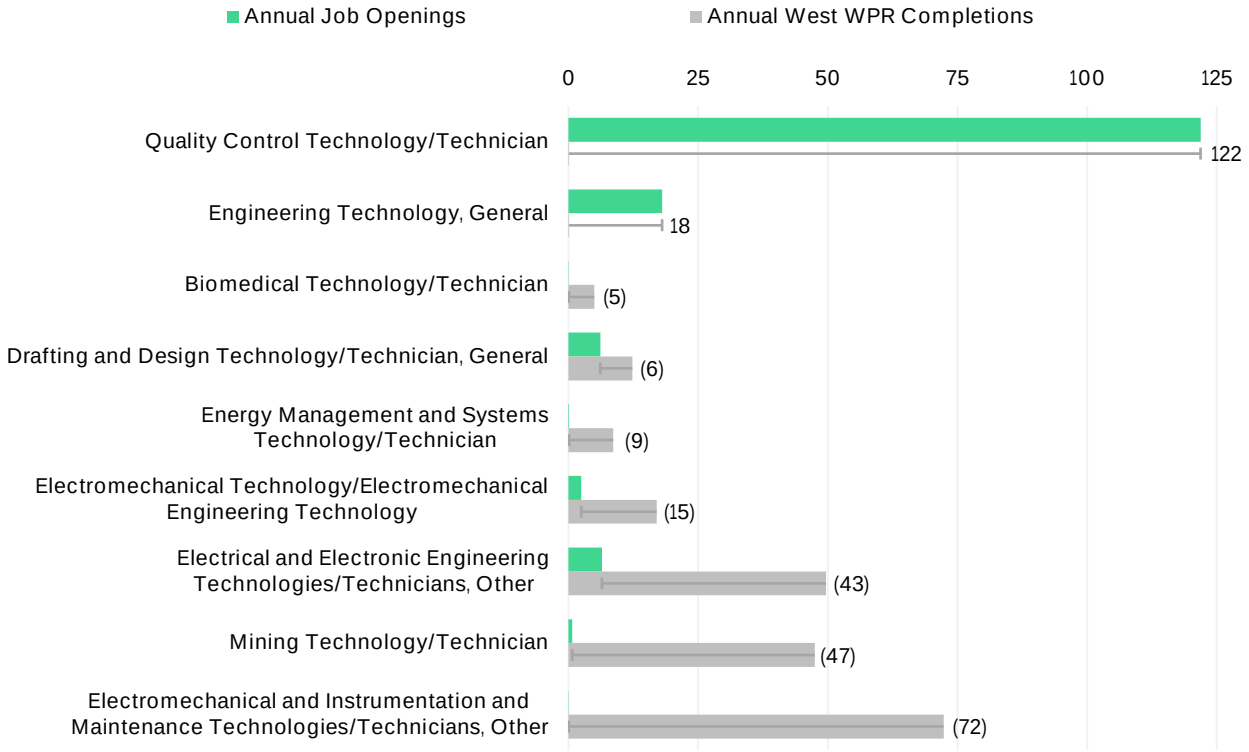
Figure 4.38: Gaps and Surpluses for the West WPR's BACH+ Degree Level Engineering Programs



Source: Emsi program demand gap model.

Certificate Level Analysis

Figure 4.39: Gaps and Surpluses for the West WPR's Certificate Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.49: Gaps and Surpluses for the West WPR's Certificate Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL WEST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0702	Quality Control Technology/Technician	KCTCS	122	0	122	$18.81
15.0000	Engineering Technology, General	KCTCS	18	0	18	$22.29
15.0401	Biomedical Technology/Technician	KCTCS	0	5	(5)	$26.63
15.1301	Drafting & Design Technology/Technician, General	KCTCS	6	12	(6)	$23.63
15.0503	Energy Management & Systems Technology/Technician	KCTCS	0	9	(9)	$26.63
15.0403	Electromechanical Technology/Electromechanical Engineering Technology	KCTCS	2	17	(15)	$32.00
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	6	50	(43)	$32.70

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL WEST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0901	Mining Technology/Technician	KCTCS	1	48	(47)	$26.63
15.0499	Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other	KCTCS	0	72	(72)	$23.89

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.50: Occupations Mapped to the West WPR's Certificate Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
QUALITY CONTROL TECHNOLOGY/TECHNICIAN (CIP CODE 15.0702)						
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	1,615	1,527	(88)	122	$18.79
11-3051	Industrial Production Managers	523	541	19	0	$47.98

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

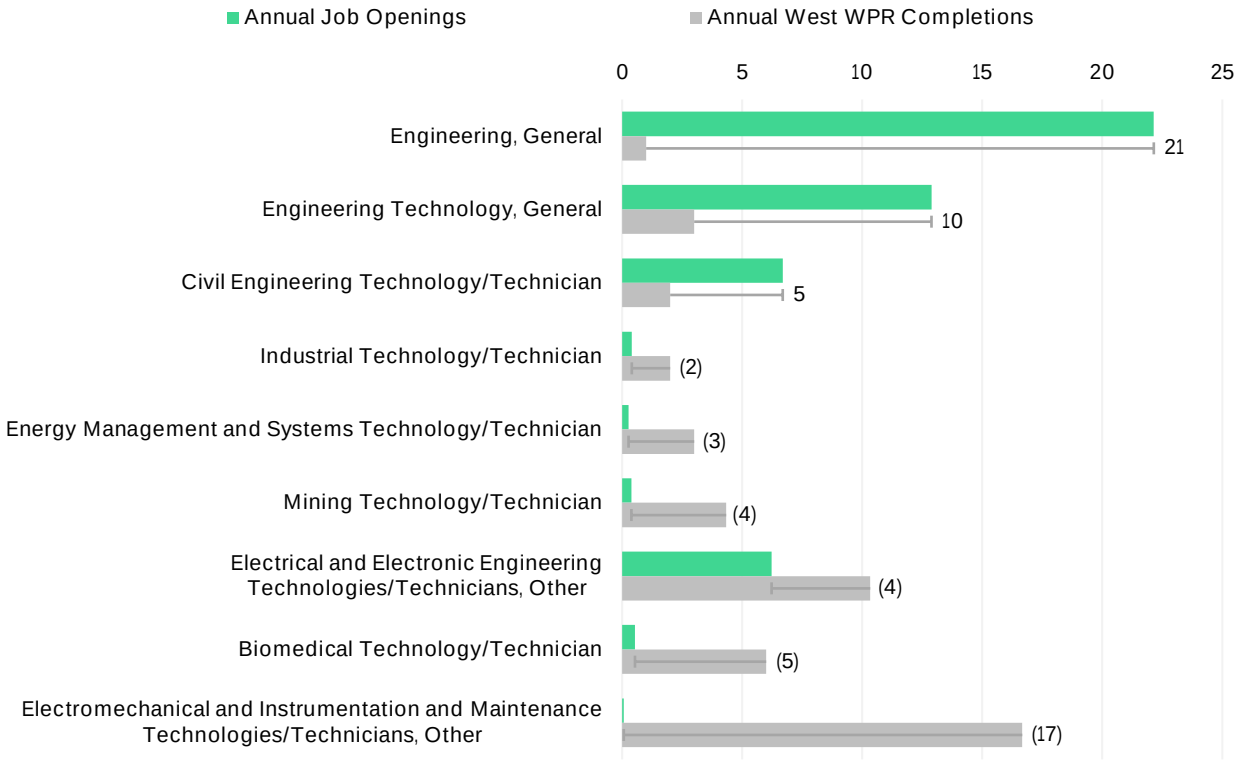
Table 4.51: Occupations Mapped to the West WPR's Certificate Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ELECTROMECH. & INSTRUMENTATION & MAINT. TECHN./TECHS, OTHER (CIP CODE 15.0499)						
17-3024	Electro-Mechanical Technicians	1	2	0	0	$23.89
MINING TECHNOLOGY/TECHNICIAN (CIP CODE 15.0901)						
17-3029	Engineering Technicians, Except Drafters, All Other	104	104	(1)	1	$26.63
ELECTRICAL & ELECTRONIC ENGINEERING TECHN./TECHS, OTHER (CIP CODE 15.0399)						
17-3023	Electrical & Electronics Engineering Technicians	163	160	(3)	6	$32.70

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Associate Degree Level Analysis

Figure 4.40: Gaps and Surpluses for the West WPR's Associate Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.52: Gaps and Surpluses for the West WPR's Associate Degree Level Engineering Programs

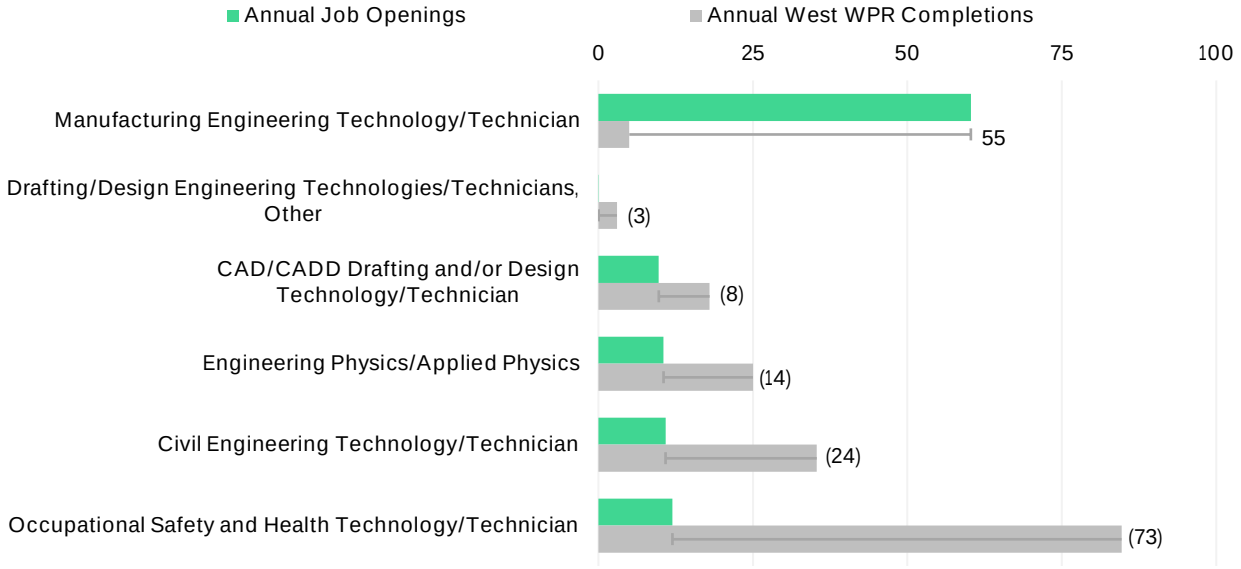
CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
14.0101	Engineering, General	AIKCU	22	1	21	$41.64
15.0000	Engineering Technology, General	AIKCU	13	3	10	$23.98
15.0201	Civil Engineering Technology/Technician	MURRAY	7	2	5	$22.28
15.0612	Industrial Technology/Technician	MURRAY	0	2	(2)	$26.00
15.0503	Energy Management & Systems Technology/Technician	KCTCS	0	3	(3)	$26.63
15.0901	Mining Technology/Technician	KCTCS	0	4	(4)	$26.63
15.0399	Electrical & Electronic Engineering Technologies/Technicians, Other	KCTCS	6	10	(4)	$32.70
15.0401	Biomedical Technology/Technician	KCTCS	1	6	(5)	$26.63

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL KY COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0499	Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other	KCTCS	0	17	(17)	$23.89

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Bachelor's Degree Level Analysis

Figure 4.41: Gaps and Surpluses for the West WPR's Bachelor's Degree Level Engineering Programs



Source: Emsi program demand gap model.

Table 4.53: Gaps and Surpluses for the West WPR's Bachelor's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL WEST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0613	Manufacturing Engineering Technology/Technician	MURRAY	60	5	55	$39.61
15.1399	Drafting/Design Engineering Technologies/Technicians, Other	MURRAY	0	3	(3)	$27.68
15.1302	CAD/CADD Drafting &/or Design Technology/Technician	MURRAY	10	18	(8)	$23.62
14.1201	Engineering Physics/Applied Physics	MURRAY	11	25	(14)	$51.92
15.0201	Civil Engineering Technology/Technician	MURRAY	11	35	(24)	$22.28

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL WEST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0701	Occupational Safety & Health Technology/Technician	MURRAY	12	85	(73)	$34.89

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.54: Occupations Mapped to the West WPR's Bachelor's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
MANUFACTURING ENGINEERING TECHNOLOGY/TECHNICIAN (CIP CODE 15.0613)						
17-2112	Industrial Engineers	555	635	80	33	$39.56
17-2141	Mechanical Engineers	372	416	44	20	$40.20
17-3023	Electrical & Electronics Engineering Technicians	163	160	(3)	5	$32.70
11-9041	Architectural & Engineering Managers	160	180	20	1	$55.86
17-2199	Engineers, All Other	171	188	17	1	$45.14

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

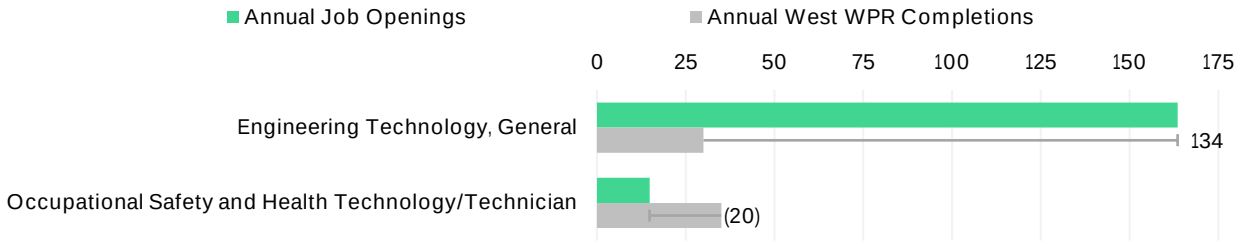
Table 4.55: Occupations Mapped to the West WPR's Bachelor's Degree Level Engineering Programs with a Large Surplus

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
OCCUPATIONAL SAFETY & HEALTH TECHNOLOGY/TECHNICIAN (CIP CODE 15.0701)						
29-9011	Occupational Health & Safety Specialists	371	363	(8)	10	$32.75
17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	40	42	2	2	$44.11

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Master's Degree Level Analysis

Figure 4.42: Kentucky's Master's Degree Level Engineering Programs with a Gap



Source: Emsi program demand gap model.

Table 4.56: Gaps and Surpluses for the West WPR's Master's Degree Level Engineering Programs

CIP CODE	CIP TITLE	SECTOR	ANNUAL JOB OPENINGS	ANNUAL WEST COMPLETIONS	GAP OR SURPLUS	MEDIAN HOURLY WAGE
15.0000	Engineering Technology, General	MURRAY	164	30	134	$42.01
15.0701	Occupational Safety & Health Technology/Technician	MURRAY	15	35	(20)	$33.82

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

Table 4.57: Occupations Mapped to Kentucky's Master's Degree Level Engineering Programs with a Large Gap

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
ENGINEERING TECHNOLOGY, GENERAL (CIP CODE 15.0000)						
17-2112	Industrial Engineers	555	635	80	38	$39.56
17-2051	Civil Engineers	495	474	(21)	33	$37.77
17-2141	Mechanical Engineers	372	416	44	24	$40.20
11-9041	Architectural & Engineering Managers	160	180	20	12	$55.86
17-2071	Electrical Engineers	177	195	17	11	$45.36
17-2199	Engineers, All Other	171	188	17	10	$45.14
17-2011	Aerospace Engineers	97	114	17	7	$47.83
17-2072	Electronics Engineers, Except Computer	94	104	10	6	$36.21
17-2041	Chemical Engineers	72	76	4	4	$46.47
17-2121	Marine Engineers & Naval Architects	72	74	2	4	$43.53
17-2131	Materials Engineers	50	53	3	3	$40.08
17-2081	Environmental Engineers	45	49	4	3	$41.18

SOC CODE	SOC TITLE	2019 JOBS	2029 JOBS	JOB CHANGE	ANNUAL JOB OPENINGS	MEDIAN HOURLY WAGE
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	33	37	4	3	$42.82
17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	40	42	2	1	$44.11
17-2031	Biomedical Engineers	15	16	1	1	$41.72
17-2171	Petroleum Engineers	12	13	1	1	$62.84
17-2061	Computer Hardware Engineers	11	15	4	1	$35.21
17-2161	Nuclear Engineers	11	10	(1)	1	$42.76
17-2021	Agricultural Engineers	0	0	0	0	$29.96

Numbers may not sum due to rounding.
Source: Emsi program demand gap model.

CHAPTER 5:

Migration Analysis

PROFILE ANALYTICS

Kentucky support tens of thousands of engineering jobs, for those with a certificate level of education to those with a doctoral degree. Traditional labor market information (LMI) shows us, for example, how many industrial engineers are employed in Kentucky and its WPRs or Kentuckiana LWA (Chapter 2). However, using LMI, it is a challenge to understand more about the people who successfully find jobs as, in this example, industrial engineers. Where did these engineers receive their degrees? Did they start working as industrial engineers immediately after graduation? For Kentucky's educational institutions, it would also be valuable to know how many engineering alumni found in-state jobs, or if they left the state, where engineering alumni are currently working. Furthermore, which companies are employing the state's engineers?

To assist in answering these questions, we use Emsi's Profile Analytics database, which provides access to more than 120 million professional worker profiles, filterable by education history, specific employers, job titles, industries, skills, and more. The database contains an aggregate set of profiles from the open web, including all the major professional profile sites. The following tables and figures provide more information on Kentucky's engineering alumni, including the states they are moving to and the companies attracting them.

As shown in Table 5.1, around 54% of alumni from Kentucky's engineering programs remain in Kentucky. Compared with all of the institutions' alumni (56% remaining in-state), it appears as if slightly more Kentucky engineering alumni migrate out of the state compared to all programs' alumni. However, more Kentucky engineering alumni stay in Kentucky compared to the engineering alumni of other states in the U.S. who remain in-state (43% remain in-state). In fact, the portion of Kentucky engineering alumni remaining in-state is comparable to the engineering alumni in Tennessee (54%) and Ohio (55%), as shown in Table 5.2.

The top states where the Kentucky engineering alumni move to are Tennessee, Texas, Indiana, Ohio, and Florida (Table 5.3). Table 5.4 displays 2019 wage data across top engineering occupations in the states to which Kentucky alumni move. Wages in Texas are consistently higher than in Kentucky across the top engineering occupations, but Kentucky's wages seem otherwise fairly competitive with mid-range rankings compared to the other

states. The exceptions are the architectural & engineering managers occupation and the architectural & civil drafters occupation, which Kentucky ranks last in terms of wages. Compared to 2009 wages for Kentucky engineers (Table 5.5), wages have for the most become more competitive compared to other states over the past 10 years. A few of the out-of-state employers of Kentucky engineering alumni are Cummins, Boeing, and General Electric (Table 5.6). Of course, not all engineers working in Kentucky attended a Kentucky institution. As shown in Table 5.7, top institutions providing engineering talent to Kentucky are Purdue University, the University of Cincinnati, and Indiana University Southeast.

Table 5.1: In-State and Out-of-State Migration of Kentucky's Engineering Alumni* by Sector, with State Comparison of All Alumni and National Comparison

	ENGINEERING ALUMNI			ALL ALUMNI		
SECTOR	PROFILES	% IN-STATE	% OUT-OF-STATE	PROFILES	% IN-STATE	% OUT-OF-STATE
State University	22,045	51%	49%	477,491	56%	44%
KCTCS	2,384	68%	32%	67,634	68%	32%
AIKCU	1,220	72%	28%	57,111	65%	35%
Kentucky	26,835	54%	46%	748,030	56%	44%
U.S.	3,710,527	43%	57%	94,180,933	44%	56%

* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.
Source: Emsi Profile Analytics.

Table 5.2: In-State and Out-of-State Migration of Engineering Alumni* in Kentucky and Surrounding States, with State Comparison of All Alumni and National Comparison

	ENGINEERING ALUMNI			ALL ALUMNI		
STATE	PROFILES	% IN-STATE	% OUT-OF-STATE	PROFILES	% IN-STATE	% OUT-OF-STATE
Illinois	159,843	45%	55%	4,092,255	56%	44%
Ohio	136,182	55%	45%	3,058,242	56%	44%
Indiana	93,672	38%	62%	1,629,367	49%	51%
Virginia	74,986	41%	59%	1,875,767	40%	60%
Missouri	60,789	52%	48%	1,613,788	52%	48%
Tennessee	49,008	54%	46%	1,224,767	56%	44%
Kentucky	26,835	54%	46%	748,030	56%	44%
West Virginia	17,167	27%	73%	457,568	22%	78%
U.S.	3,710,527	43%	57%	94,180,933	44%	56%

* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in the state.
Source: Emsi Profile Analytics.

Table 5.3: Top States Attracting Kentucky Engineering Alumni by Sector

STATE	PROFILES	% PROFILES
STATE UNIVERSITY		
Tennessee	1,396	6%
Texas	1,020	5%
Indiana	883	4%
Ohio	869	4%
Florida	704	3%
AIKCU		
Indiana	66	5%
Florida	37	3%
Tennessee	29	2%
Texas	29	2%
Ohio	20	2%

STATE	PROFILES	% PROFILES
KCTCS		
Tennessee	138	6%
Ohio	95	4%
Indiana	81	3%
West Virginia	44	2%
Wisconsin	41	2%
KY INSTITUTIONS		
Tennessee	1,627	6%
Texas	1,129	4%
Indiana	1,073	4%
Ohio	1,037	4%
Florida	835	3%

Source: Emsi Profile Analytics.

Table 5.4: Top Occupations of Kentucky Engineering Alumni with Top State 2019 Salaries

	2019 MEDIAN ANNUAL WAGE					
OCCUPATION	KY	IN	OH	FL	TN	TX
STATE UNIVERSITY						
Industrial Engineers (n = 1,358)†	$76,406	$71,496	$80,679	$73,671	$80,721	$102,281
Mechanical Engineers (n = 1,033)	$84,861	$77,569	$77,467	$83,006	$83,566	$94,544
Engineers, All Other (n = 802)	$78,392	$70,629	$89,795	$77,813	$75,737	$109,737
Architectural & Engineering Managers (n = 796)	$114,665	$116,343	$128,574	$124,396	$119,372	$154,152
Electrical Engineers (n = 618)	$86,745	$81,221	$83,806	$90,464	$90,924	$99,625
KCTCS						
Industrial Engineers (n = 61)	$76,406	$71,496	$80,679	$73,671	$80,721	$102,281
Mechanical Engineers (n = 40)	$84,861	$77,569	$77,467	$83,006	$83,566	$94,544
Electrical Engineers (n = 26)	$86,745	$81,221	$83,806	$90,464	$90,924	$99,625
Engineers, All Other (n = 23)	$78,392	$70,629	$89,795	$77,813	$75,737	$109,737
Architectural and Civil Drafters (n = 17)	$47,883	$51,179	$51,340	$53,305	$49,893	$53,316
AIKCU						
Mechanical Engineers (n = 35)	$84,861	$77,569	$77,467	$83,006	$83,566	$94,544

	2019 MEDIAN ANNUAL WAGE					
OCCUPATION	KY	IN	OH	FL	TN	TX
Industrial Engineers (n = 34)	$76,406	$71,496	$80,679	$73,671	$80,721	$102,281
Architectural & Engineering Managers (n = 15)	$114,665	$116,343	$128,574	$124,396	$119,372	$154,152
Engineers, All Other (n = 13)	$78,392	$70,629	$89,795	$77,813	$75,737	$109,737
Architectural and Civil Drafters (n = 11)	$47,883	$51,179	$51,340	$53,305	$49,893	$53,316
KY INSTITUTIONS						
Industrial Engineers (n = 1,477)	$76,406	$71,496	$80,679	$73,671	$80,721	$102,281
Mechanical Engineers (n = 1,139)	$84,861	$77,569	$77,467	$83,006	$83,566	$94,544
Engineers, All Other (n = 849)	$78,392	$70,629	$89,795	$77,813	$75,737	$109,737
Architectural & Engineering Managers (n = 838)	$114,665	$116,343	$128,574	$124,396	$119,372	$154,152
Electrical Engineers (n = 658)	$86,745	$81,221	$83,806	$90,464	$90,924	$99,625

* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.
† The number in parentheses represents the number of engineering alumni from Kentucky institutions in the U.S.
Source: Emsi Profile Analytics and Employees & Self-Employed 2019.4.

Table 5.5: Top Occupations of Kentucky Engineering Alumni with Top State 2009 Salaries

	2009 MEDIAN ANNUAL WAGE					
OCCUPATION	KY	IN	OH	FL	TN	TX
KY INSTITUTIONS						
Industrial Engineers (n = 1,477)	$66,556	$69,081	$70,814	$66,720	$67,999	$80,394
Mechanical Engineers (n = 1,139)	$68,185	$68,201	$66,346	$72,062	$69,179	$83,568
Engineers, All Other (n = 849)	$73,205	$69,215	$81,729	$88,065	$86,227	$95,125
Architectural & Engineering Managers (n = 838)	$94,556	$93,765	$104,780	$109,989	$89,131	$127,474
Electrical Engineers (n = 658)	$73,004	$74,437	$70,988	$75,954	$82,278	$88,160

* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.
† The number in parentheses represents the number of engineering alumni from Kentucky institutions in the U.S.
Source: Emsi Profile Analytics and Employees & Self-Employed 2019.4.

Table 5.6: Top Out-of-State Employers Attracting Kentucky Engineering Alumni by Sector

COMPANY	PROFILES	% PROFILES
STATE UNIVERSITY		
Cummins, Inc.	91	0.4%
Army	61	0.3%
The Boeing Company	46	0.2%
Marathon Petroleum Corporation	44	0.2%
General Electric Company	43	0.2%
AIKCU		
Amazon.com, Inc.	5	0.4%
Charter Communications, Inc.	3	0.2%
Absa	3	0.2%
Air Force	3	0.2%
Opportunity Space LLC	2	0.2%

STATE	PROFILES	% PROFILES
KCTCS		
Army	7	0.3%
Norton Healthcare, Inc.	4	0.2%
Lowe's Companies, Inc.	4	0.2%
Vectren Corporation	3	0.1%
Tecomet Inc.	3	0.1%
KY INSTITUTIONS		
Cummins, Inc.	92	0.3%
Army	72	0.3%
Amazon.com, Inc.	51	0.2%
The Boeing Company	48	0.2%
Air Force	47	0.2%

* Based on students completing an engineering program (CIP codes 14 and 15) from an educational institution in Kentucky.
Source: Emsi Profile Analytics.

Table 5.7: Top 10 Non-Kentucky Institutions Providing Talent to Kentucky

INSTITUTION	PROFILES
Purdue University *Industrial Engineers (223)* *Mechanical Engineers (146)* *Architectural & Engineering Managers (112)*	785
University of Cincinnati *Industrial Engineers (100)* *Mechanical Engineers (53)* *Architectural & Engineering Managers (52)*	383
Indiana University Southeast *Industrial Engineers (44)* *Architectural & Engineering Managers (29)* *Mechanical Engineers (11)*	154
Indiana Wesleyan University *Industrial Engineers (58)* *Architectural & Engineering Managers (24)* *Electrical Engineers (12)*	142
Ivy Tech Community College of Indiana *Industrial Engineers (35)* *Mechanical Engineers (20)* *Architectural & Engineering Managers (17)*	141

INSTITUTION	PROFILES
University of Phoenix *Industrial Engineers (34)* *Architectural & Engineering Managers (21)* *Mechanical Engineers (12)*	130
Georgia Institute of Technology *Industrial Engineers (29)* *Mechanical Engineers (26)* *Architectural & Engineering Managers (19)*	124
Ohio State University *Industrial Engineers (30)* *Mechanical Engineers (23)* *Architectural & Engineering Managers (18)*	123
Tennessee Technological University *Industrial Engineers (29)* *Architectural & Engineering Managers (28)* *Mechanical Engineers (17)*	121
Rose-Hulman Institute of Technology *Industrial Engineers (24)* *Engineers, All Other (17)* *Mechanical Engineers (15)*	103

* Based on workers employed in an engineering occupation in Kentucky from a non-Kentucky institution.
Source: Emsi Profile Analytics.

CONSUMER INSIGHTS

The Strada-Gallup Education Consumer Survey is the largest database of education consumer insights in the nation and has collected more than 330,000 responses from people living in the U.S. The survey provides greater insight into people's perceptions of higher education. With about 10,000 responses recorded each month, the survey's database represents all demographic groups in the 50 states and the District of Columbia from the 50 largest metropolitan areas. To date, the database captures 4,941 people living in Kentucky.

The following tables and figures provide more information on Kentucky institutions' alumni, emphasizing their programs of study, highest award levels, and current occupations. In addition, we look at qualitative responses of graduates of Kentucky institutions, which is valuable to the state's educational providers seeking to improve their programs.

Note that the sample size for engineering majors in Kentucky was too small for analysis; therefore, this section focuses instead on science, technology, engineering, mathematics, and health (STEMH). STEMH data is available, for the most part, at the associate, bachelor's, and graduate degree levels. However, considering health is a large portion of STEMH yet

isn't directly related to engineering, we also provide figures on just STEM. Again, given sample size issues, STEM data is available at just the bachelor's degree level.

Education and Employment Information

Table 5.8 and Figure 5.1 provide the distribution of STEMH majors captured in the Consumer Insights data. As displayed, health professions & related majors reflect the most respondents, although engineering majors rank second for bachelor's degree respondents from Kentucky institutions. This information is helpful when interpreting the results of subsequent STEMH tables and figures. Figure 5.1 provides the distribution of the top 10 majors for Kentucky STEM bachelor's degree graduates, with engineering ranking first.

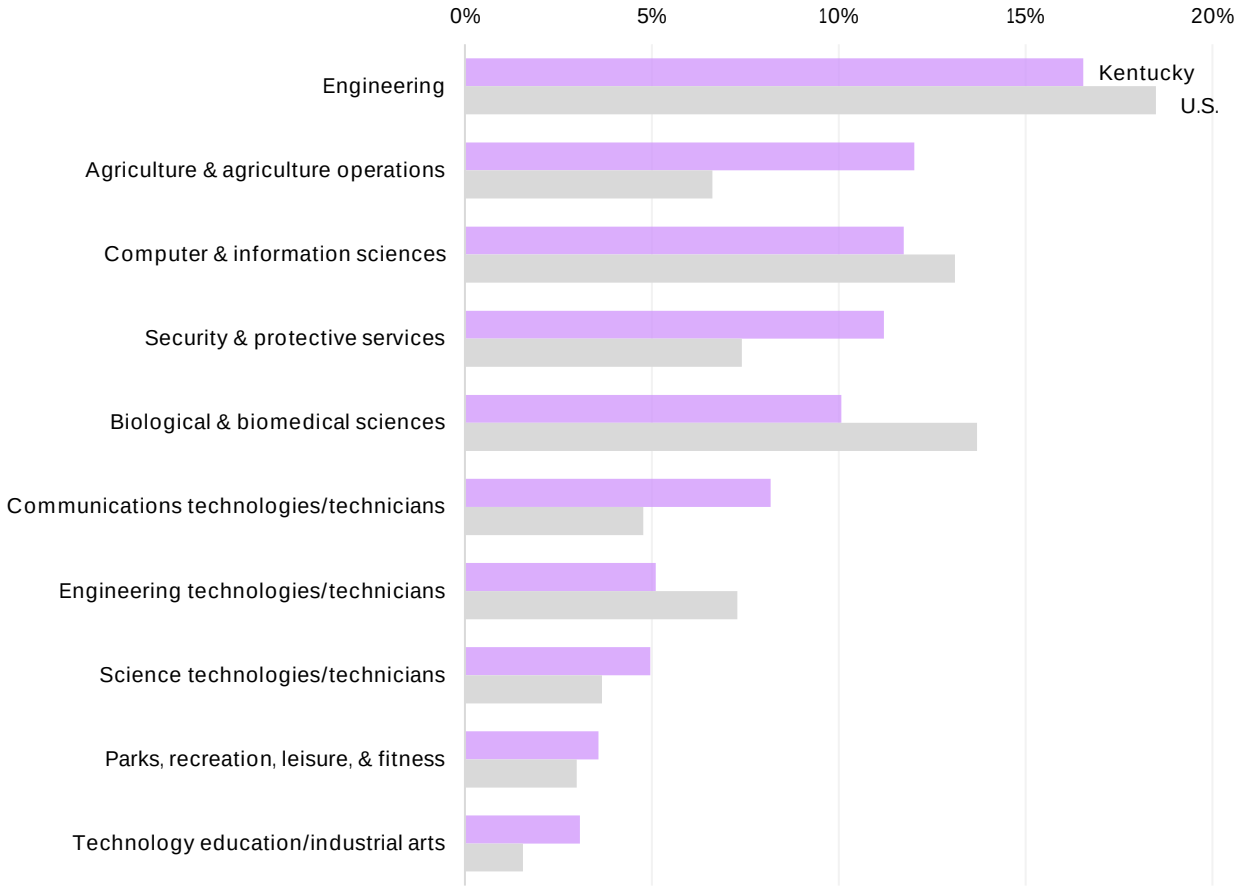
Kentucky STEMH graduates are somewhat more likely to remain in Kentucky than respondents from other states (Figure 5.2). This holds true for Kentucky STEM bachelor's degree graduates (Figure 5.3). However, Kentucky STEMH bachelor's degree graduates are more likely to leave the state compared to the other award levels, and at a slightly higher rate than STEMH graduates from other states (Figure 5.4).

Table 5.8: Distribution of STEMH Majors in Kentucky and the U.S. by Bachelor's and Associate Degree Award Levels

	KY BACH		U.S. BACH		KY ASSOC		U.S. ASSOC	
MAJOR	FREQ	KY	FREQ	KY	FREQ	KY	FREQ	KY
Health Professions & Related	53	18%	3,095	18%	97	68%	4,729	52%
Engineering	38	13%	2,577	15%	--	0%	--	0%
Agriculture & Agriculture Operations	27	9%	922	5%	--	0%	--	0%
Computer & Information Sciences	27	9%	1,827	10%	5	3%	1,208	13%
Security & Protective Services	25	9%	1,033	6%	--	0%	--	0%
Biological & Biomedical Sciences	23	8%	1,910	11%	--	0%	--	0%
Communications Technologies/Technicians	19	6%	664	4%	--	0%	--	0%
Engineering Technologies/Technicians	12	4%	1,016	6%	15	10%	1,379	15%
Science Technologies/Technicians	11	4%	512	3%	--	0%	--	0%
Health-Related Knowledge & Skills	10	4%	379	2%	--	0%	--	0%
Parks, Recreation, Leisure, & Fitness	8	3%	417	2%	--	0%	--	0%
Technology Education/Industrial Arts	7	2%	216	1%	14	10%	1,191	13%
Construction Trades	6	2%	333	2%	--	0%	--	0%
Physical Sciences	6	2%	649	4%	--	0%	--	0%
Mathematics & Statistics	5	2%	587	3%	--	0%	--	0%
Natural Resources & Conservation	5	2%	480	3%	--	0%	--	0%
Architecture & Related Services	4	1%	509	3%	--	0%	--	0%
Mechanic & Repair Technologies/Technician	2	1%	114	1%	13	9%	566	6%
Military Technologies	1	<1%	8	<1%	--	0%	--	0%
Library Science	--	0%	18	<1%	--	0%	--	0%
Precision Production	--	0%	15	<1%	--	0%	--	0%
Transportation & Materials Moving	--	0%	134	1%	--	0%	--	0%
Total	291	100%	17,413	100%	144	100%	9,073	100%

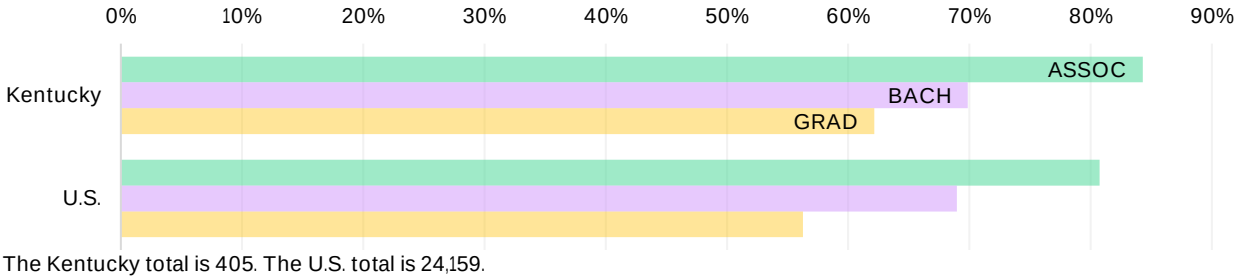
Numbers may not sum due to rounding.
Source: Strada Consumer Insights.

Figure 5.1: Distribution of the Top 10 Bachelor's Degree Level STEM Majors in Kentucky with U.S. Comparison



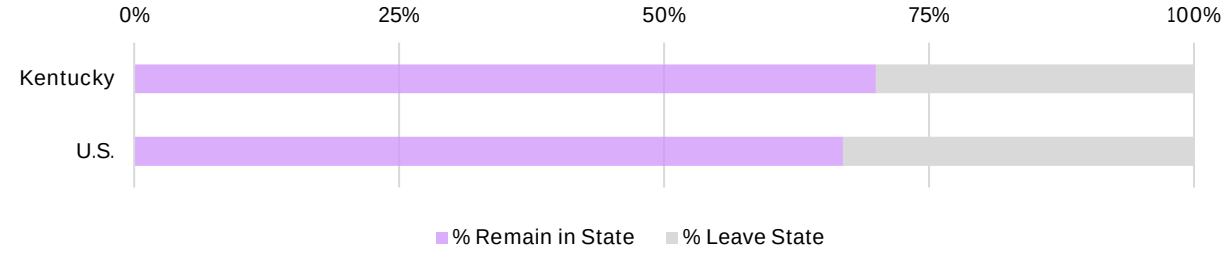
Source: Strada Consumer Insights.

Figure 5.2: STEMH Graduates from Public Institutions in Kentucky and the U.S. Remaining in the State



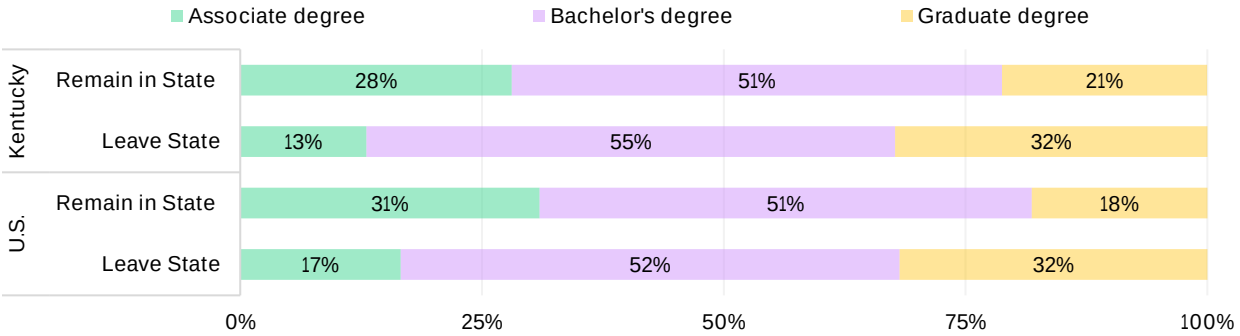
The Kentucky total is 405. The U.S. total is 24,159.
Source: Strada Consumer Insights.

Figure 5.3: Bachelor's Degree STEM Graduates from Public Institutions in Kentucky and the U.S. Remaining in the State



The Kentucky total is 210. The U.S. total is 12,641.
Source: Strada Consumer Insights.

Figure 5.4: STEMH Graduates by Award Level from Public Institutions in Kentucky Remaining in and Leaving the State with U.S. Comparison



The Kentucky, Remain in State total is 397. The Kentucky, Leave State total is 173. The U.S., Remain in State total is 22,262. The U.S., Leave State total is 10,736.
Source: Strada Consumer Insights.

Table 5.9: Occupation Categories of STEMH Graduates Remaining in and Leaving Kentucky with U.S. Comparison

	REMAIN IN KY		LEAVE KY	REMAIN IN THE U.S. STATE		LEAVE THE U.S. STATE
MAJOR	FREQ	%	FREQ	FREQ	%	FREQ
Architecture or Engineering	29	9%	13	1,651	9%	1,035
Arts, Design, Entertainment, & Media	3	1%	-	229	0%	144
Office & Administrative Support Worker	8	2%	2	530	1%	186
Community & Social Services	6	2%	-	230	0%	60
Computer & Mathematical	15	5%	9	1,567	6%	840
Construction or Mining Worker	11	3%	3	515	2%	162
Education, Training, & Library	32	10%	9	1,060	6%	583
Farming, Fishing, or Forestry Worker	6	2%	2	352	1%	166
Business, Financial, Insurance, Real Estate	11	3%	3	844	2%	443
Healthcare	83	26%	38	4,670	26%	1,933
Installation, Maintenance, or Repair Worker	14	4%	-	594	0%	154
Legal	2	1%	2	111	1%	50
Life, Physical, & Social Sciences	2	1%	-	395	0%	241
Manager, Executive, or Official	22	7%	22	1,492	15%	828
Manufacturing or Production Worker	9	3%	3	451	2%	142
Military	--	0%	1	52	1%	82
Sales Worker	8	3%	12	633	8%	331
Personal Care & Service Worker	5	2%	2	327	1%	104
Security & Protective Services	10	3%	5	409	4%	141
Building & Grounds Cleaning & Maintenance Worker	3	1%	2	116	1%	37
Food Preparation or Service	--	0%	-	191	0%	62
Small Business Owner	3	1%	1	302	1%	150
Transportation Worker	7	2%	2	245	1%	134
Other Job Category	19	6%	9	1,162	6%	652
Don't Know	1	<1%	0	44	0%	21
Refused to Answer	4	1%	4	315	2%	139
Total	313	100%	145	18,489	100%	8,818

Source: Strada Consumer Insights.

Table 5.10: Occupation Categories of Bachelor's Degree STEM Graduates Remaining in and Leaving Kentucky with U.S. Comparison

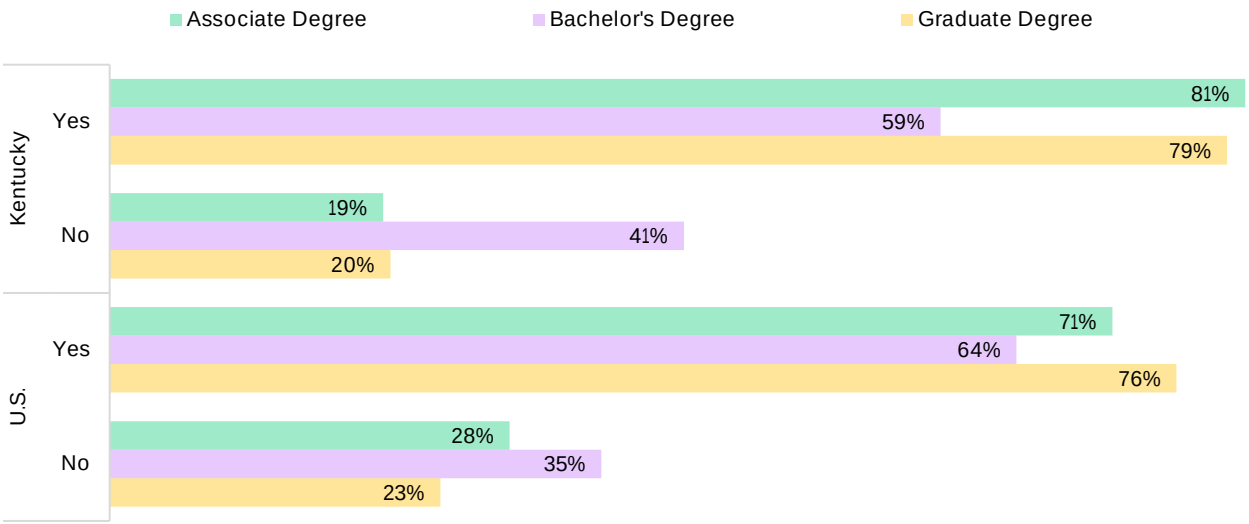
	REMAIN IN KY		LEAVE KY	REMAIN IN THE U.S. STATE		LEAVE THE U.S. STATE
MAJOR	FREQ	%	FREQ	FREQ	%	FREQ
Architecture or Engineering	19	14%	7	1,086	14%	616
Arts, Design, Entertainment, & Media	1	1%	-	138	2%	91
Office & Administrative Support Worker	1	1%	1	208	3%	79
Community & Social Services	2	2%	-	116	1%	35
Computer & Mathematical	8	6%	2	953	12%	442
Construction or Mining Worker	6	4%	3	280	4%	100
Education, Training, & Library	11	8%	1	374	5%	161
Farming, Fishing, or Forestry Worker	4	3%	1	245	3%	105
Business, Financial, Insurance, Real Estate	8	6%	1	537	7%	259
Healthcare	5	4%	2	408	5%	164
Installation, Maintenance, or Repair Worker	5	4%	-	143	2%	56
Legal	2	1%	-	57	1%	16
Life, Physical, & Social Sciences	2	1%	-	212	3%	88
Manager, Executive, or Official	16	12%	8	818	11%	457
Manufacturing or Production Worker	4	3%	2	193	2%	79
Military	-	0%	1	32	0%	48
Sales Worker	7	6%	10	372	5%	217
Personal Care & Service Worker	3	2%	1	135	2%	47
Security & Protective Services	7	5%	4	306	4%	110
Building & Grounds Cleaning & Maintenance Worker	-	0%	0	47	1%	21
Food Preparation or Service	-	0%	-	81	1%	29
Small Business Owner	2	1%	1	156	2%	76
Transportation Worker	3	2%	-	100	1%	76
Other Job Category	13	10%	3	628	8%	307
Don't Know	1	1%	0	21	0%	5
Refused to Answer	2	1%	3	135	2%	62
Total	131	100%	53	7,781	100%	3,746

Source: Strada Consumer Insights.

Hindsight Indicators

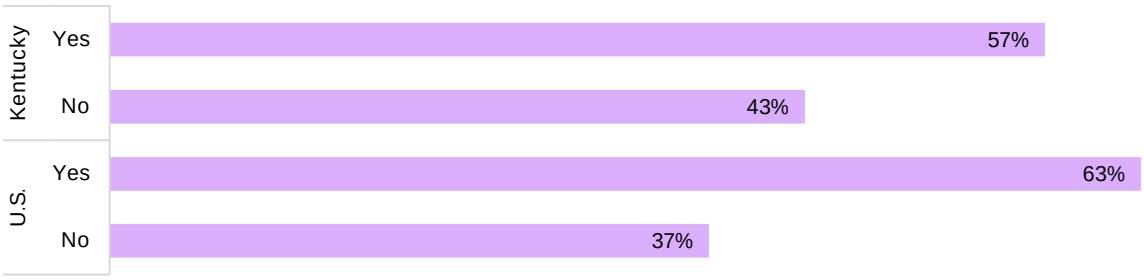
The next four figures provide a reflection of STEMH graduates and STEM bachelor's degree graduates on whether they would study the same major or attend the same school if provided the choice to do it all over again. Kentucky STEMH graduates at the associate and graduate degree levels said "yes" to studying the same major at a higher rate than graduates from across the U.S., although only 59% of Kentucky bachelor's degree STEMH graduates said "yes" compared to 64% across the U.S. Similar patterns emerge in Figure 5.7 on whether the respondents would attend the same school, although this time a higher percentage of Kentucky bachelor's degree STEMH graduates said "yes" compared to STEMH graduates from across the U.S. The same patterns emerge for STEM bachelor's degree graduates (Figure 5.6 and Figure 5.8), with fewer Kentucky graduates saying "yes" to studying the same major compared to graduates across the U.S., but more Kentucky graduates saying they would attend the same school.

Figure 5.5: Response of STEMH Graduates of Public Institutions to "If You Had to Do It All Over Again, Would You Study the Same Major/Course"



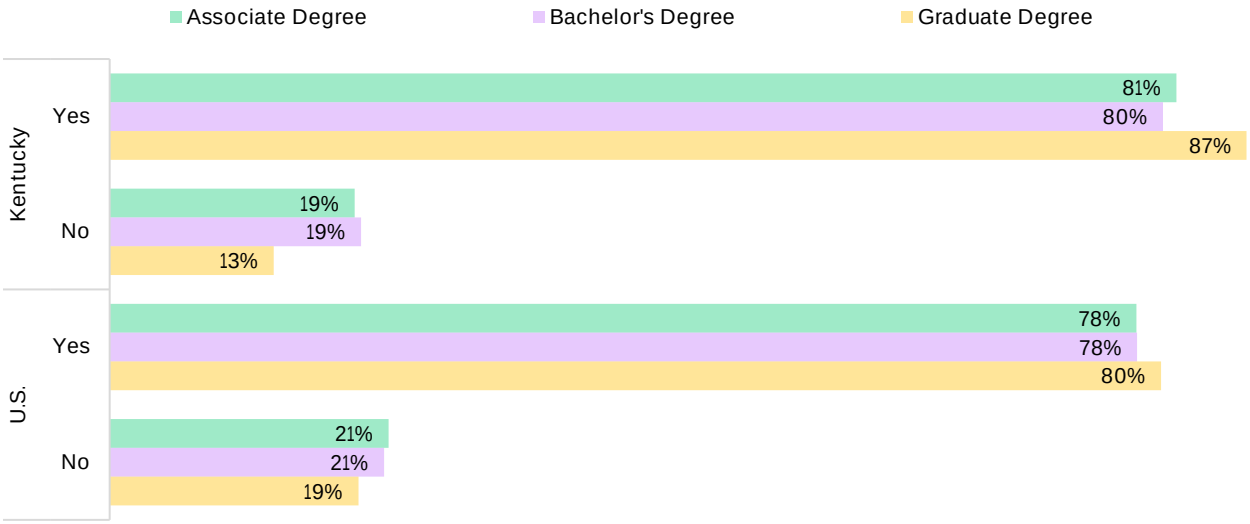
Source: Strada Consumer Insights.

Figure 5.6: Response of Bachelor's Degree STEM Graduates of Public Institutions to "If You Had to Do It All Over Again, Would You Study the Same Major/Course"



Source: Strada Consumer Insights.

Figure 5.7: Response of STEMH Graduates of Public Institutions to "If You Had to Do It All Over Again, Would You Attend the Same School"



Source: Strada Consumer Insights.

Figure 5.8: Response of Bachelor's Degree STEM Graduates of Public Institutions to "If You Had to Do It All Over Again, Would You Attend the Same School"

Source: Strada Consumer Insights.

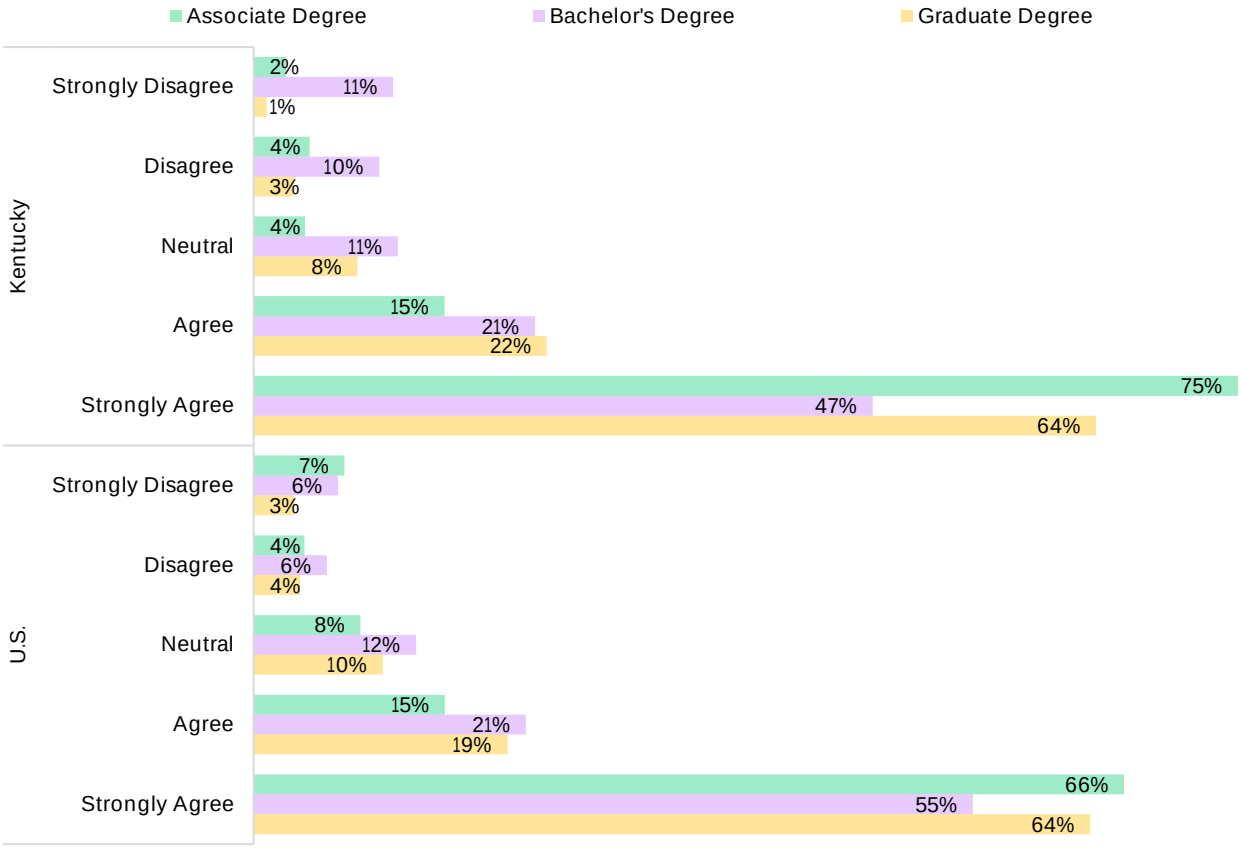
Value Indicators

The next several figures provide inference on how respondents rate the value of their Kentucky education, again compared against graduates from across the U.S. In general, Kentucky STEMH associate and graduate degree respondents "strongly agreed" more than respondents from across the U.S., whereas a smaller percentage of Kentucky STEMH bachelor's degree graduates "strongly agreed' compared to national respondents. This indicates that Kentucky STEMH bachelor's degree graduates may not have valued their education – namely in terms of worth the cost and creating an attractive candidate – as much as both Kentucky alumni at different award levels and non-Kentucky alumni in general. Bachelor's and graduate degree STEMH graduates do not really feel the need for further education to advance their career, whereas it is an almost even split for associate degree graduates (Figure 5.18).

When looking at just bachelor's degree STEM graduates, we see very similar patterns as when looking at bachelor's degree STEMH graduates. However, it is also clear to see that "strongly agree" is by far the top choice across the various categories. The exception is around the courses students took during their education, but in that case, "agree" was also rated quite favorably. In addition, bachelor's degree STEM graduates were more likely to "strongly agree" compared to graduates across the U.S. to recommending their educational path to people (Figure 5.17).[19]

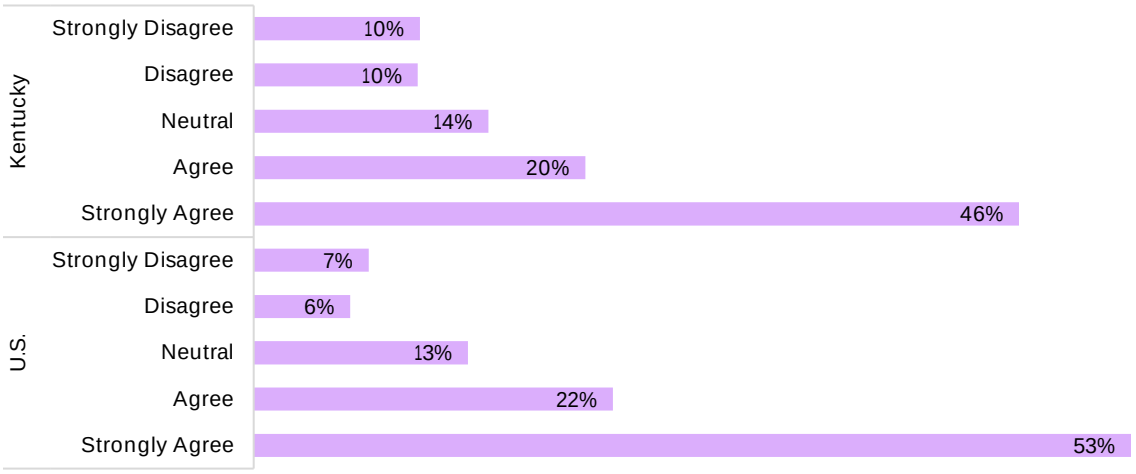
19 Data on educational path recommendations only available for bachelor's degree STEM graduates.

Figure 5.9: Response of STEMH Graduates of Public Institutions to "Your Highest Level of Education was Worth the Cost"



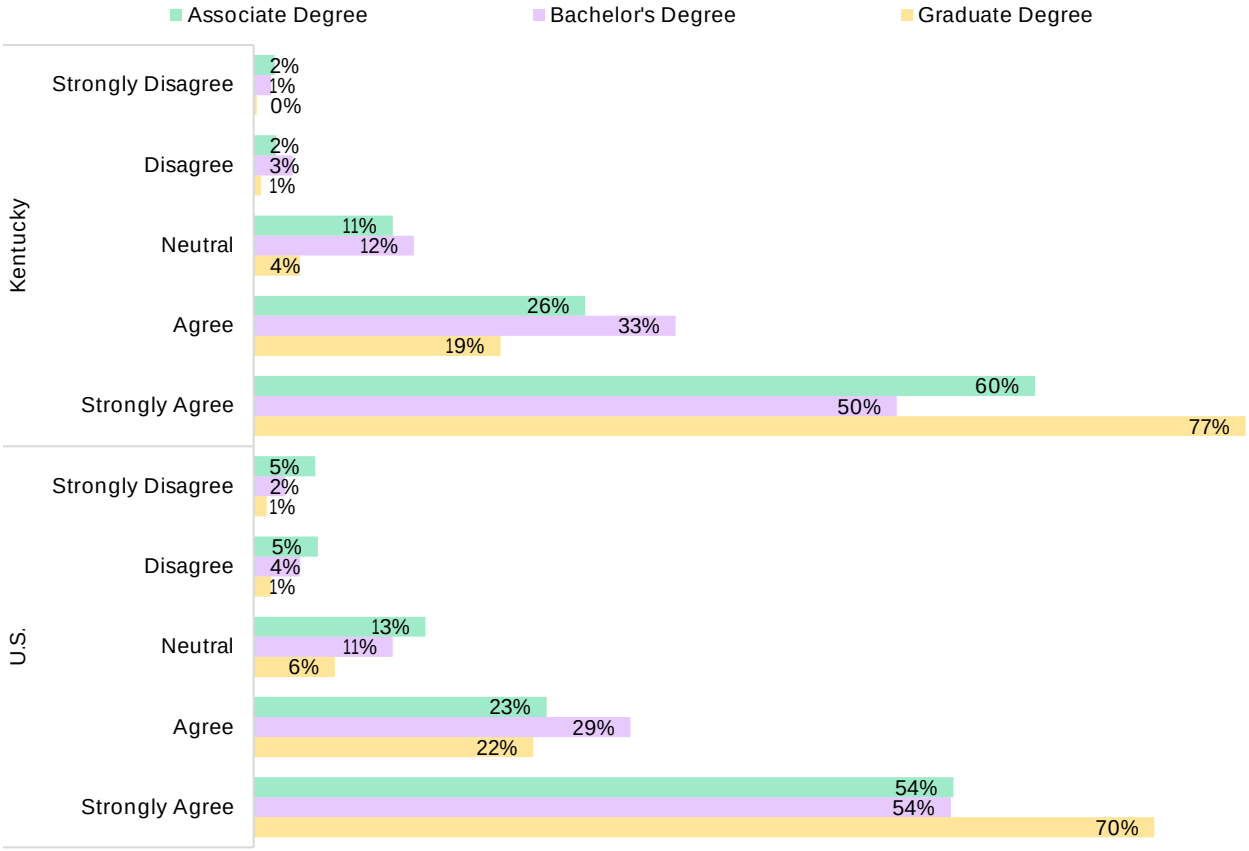
Source: Strada Consumer Insights.

Figure 5.10: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Your Highest Level of Education was Worth the Cost"



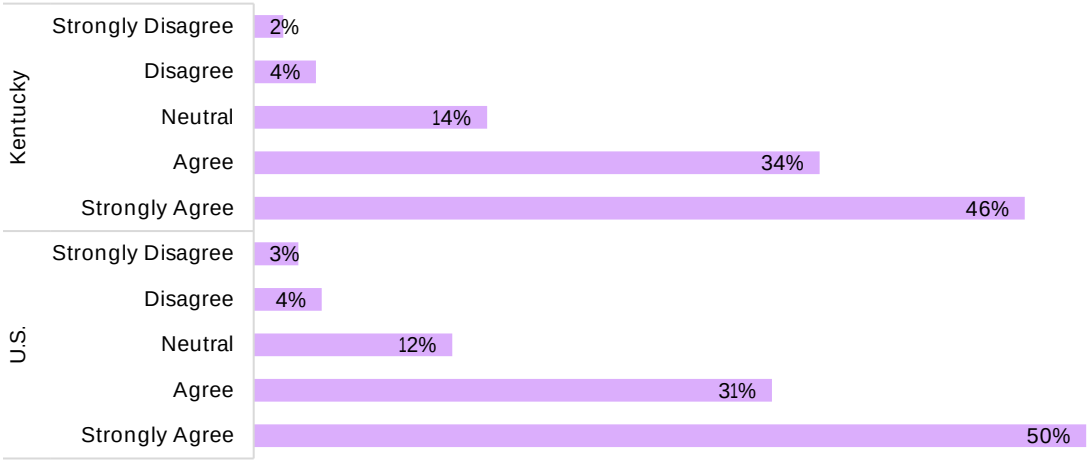
Source: Strada Consumer Insights.

Figure 5.11: Response of STEMH Graduates of Public Institutions to "Educational Experiences Make You an Attractive Candidate to Potential Employers"



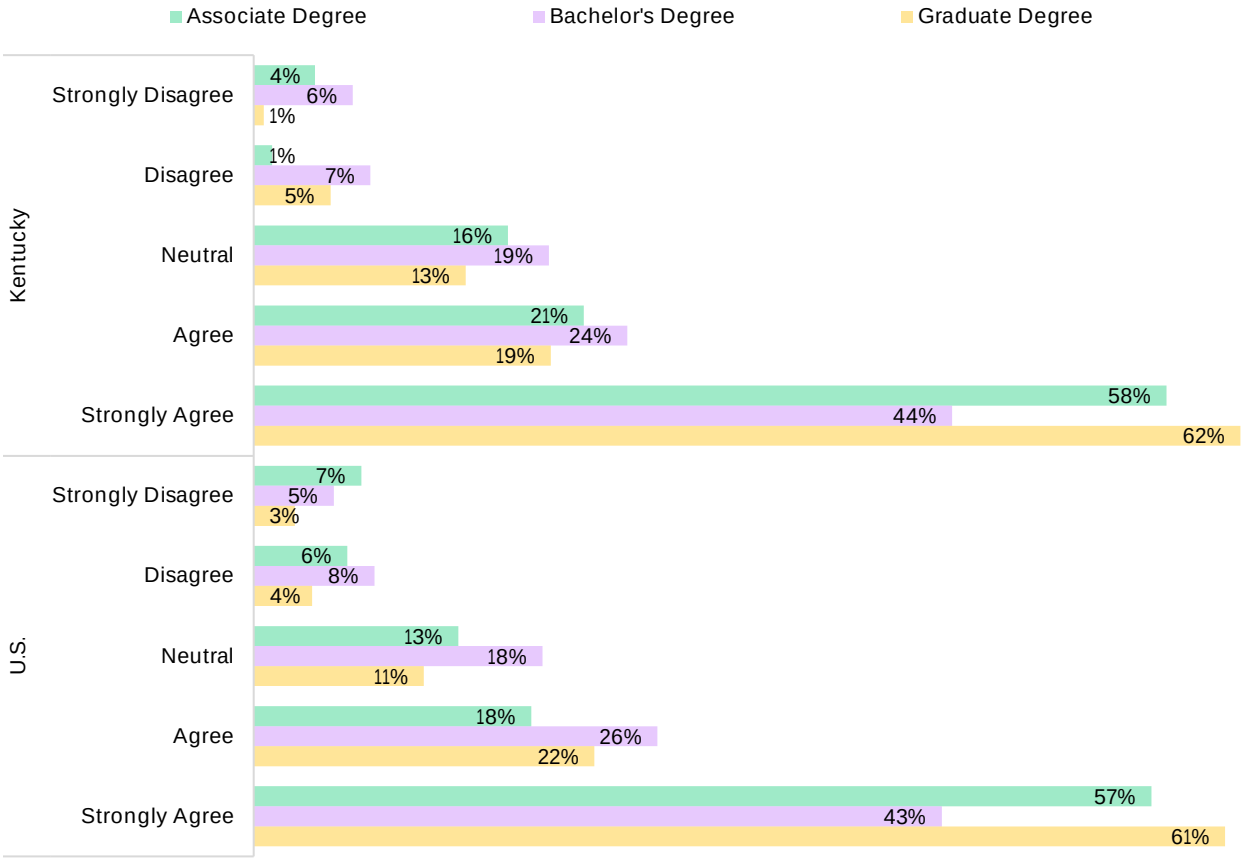
Source: Strada Consumer Insights.

Figure 5.12: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Educational Experiences Make You an Attractive Candidate to Potential Employers"



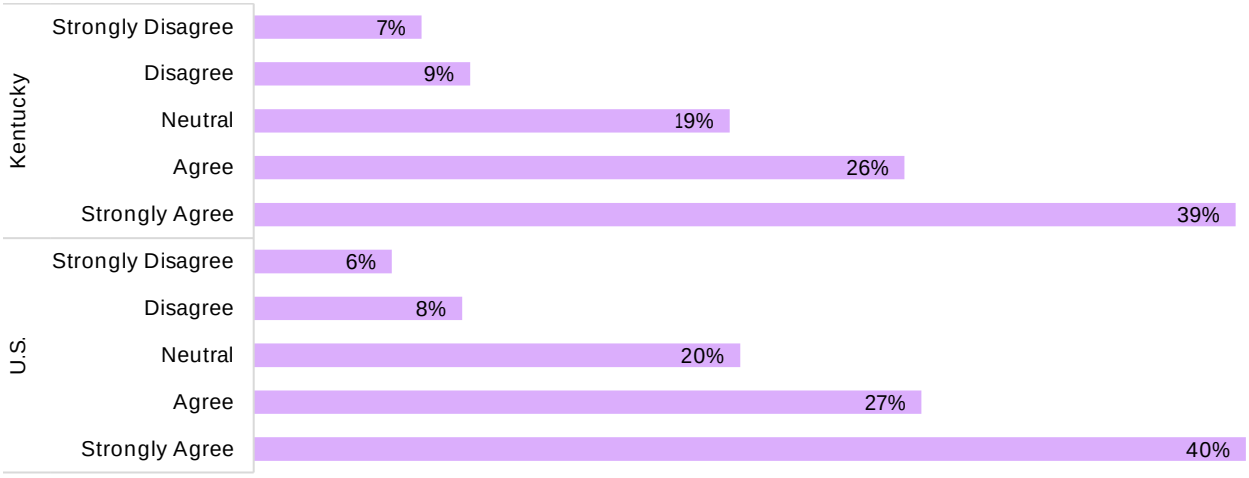
Source: Strada Consumer Insights.

Figure 5.13: Response of STEMH Graduates of Public Institutions to "Learned Important Skills in Your Education That You Use in Your Day to Day Life"



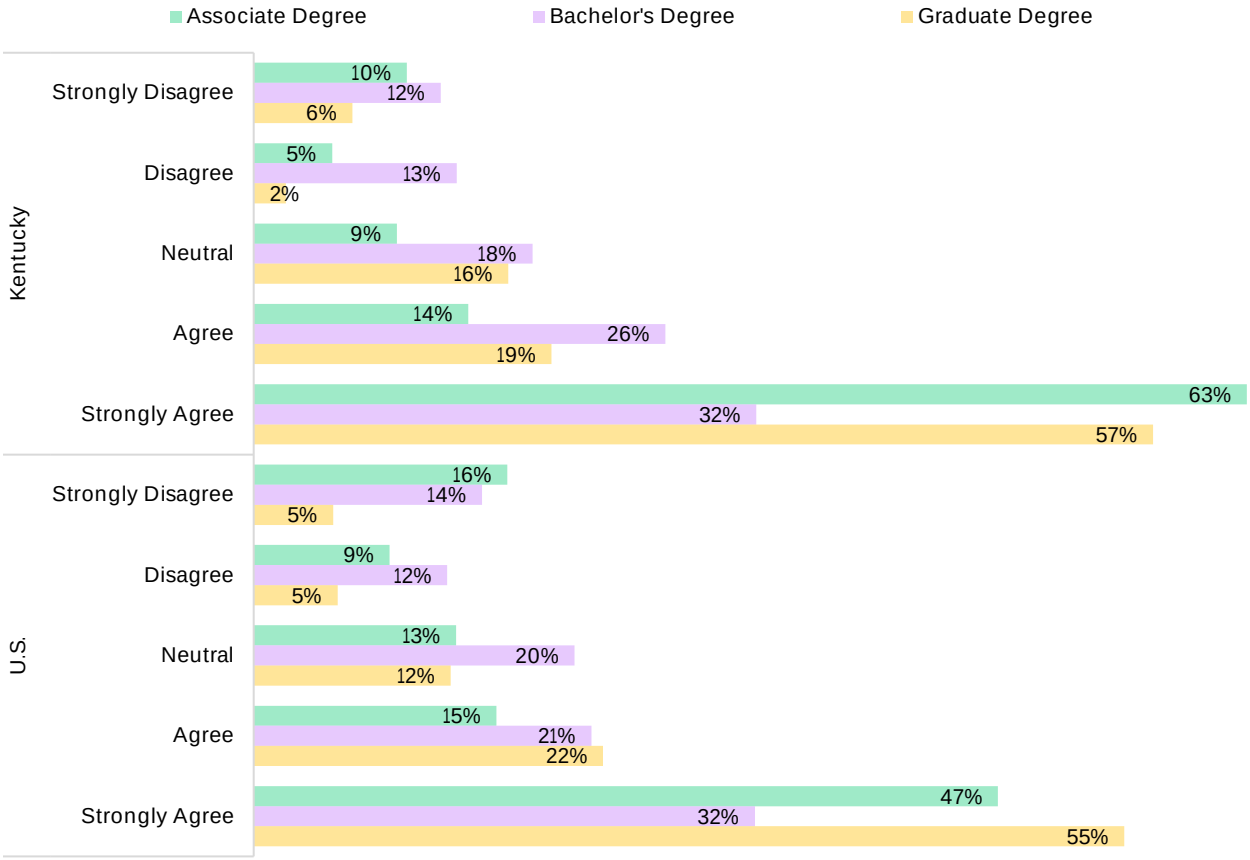
Source: Strada Consumer Insights.

Figure 5.14: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Learned Important Skills in Your Education That You Use in Your Day to Day Life"



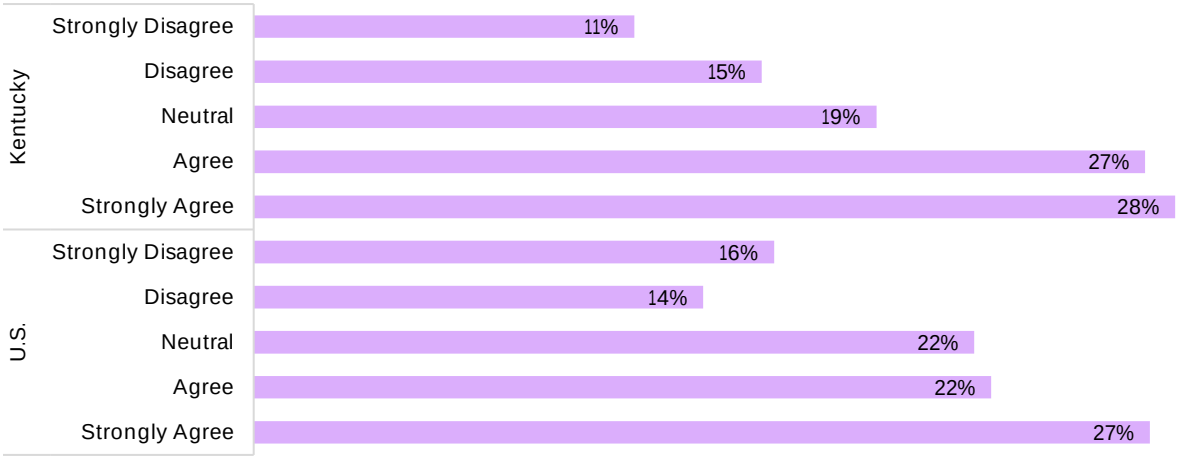
Source: Strada Consumer Insights.

Figure 5.15: Response of STEMH Graduates of Public Institutions to "The Courses You Took During Your Education are Directly Relevant to What You Do at Work"



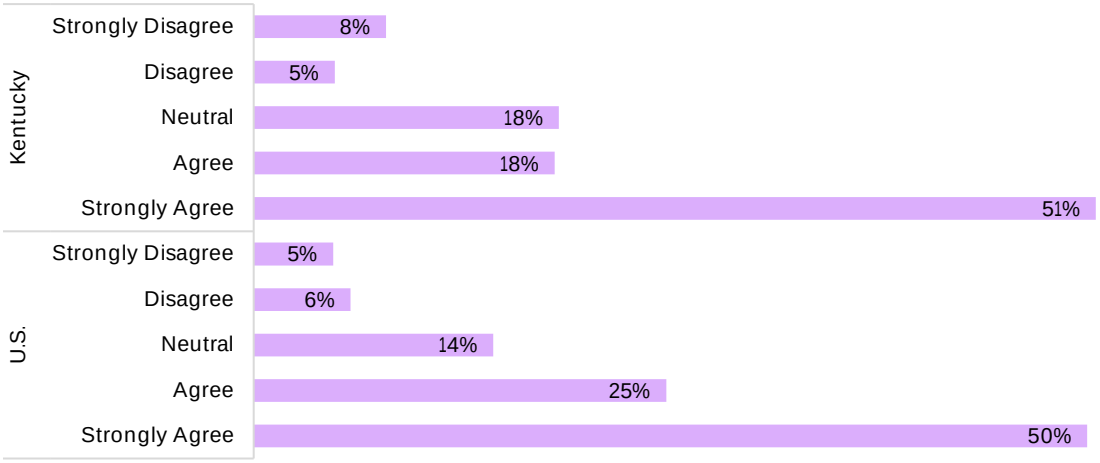
Source: Strada Consumer Insights.

Figure 5.16: Response of Bachelor's Degree STEM Graduates of Public Institutions to "The Courses You Took During Your Education are Directly Relevant to What You Do at Work"



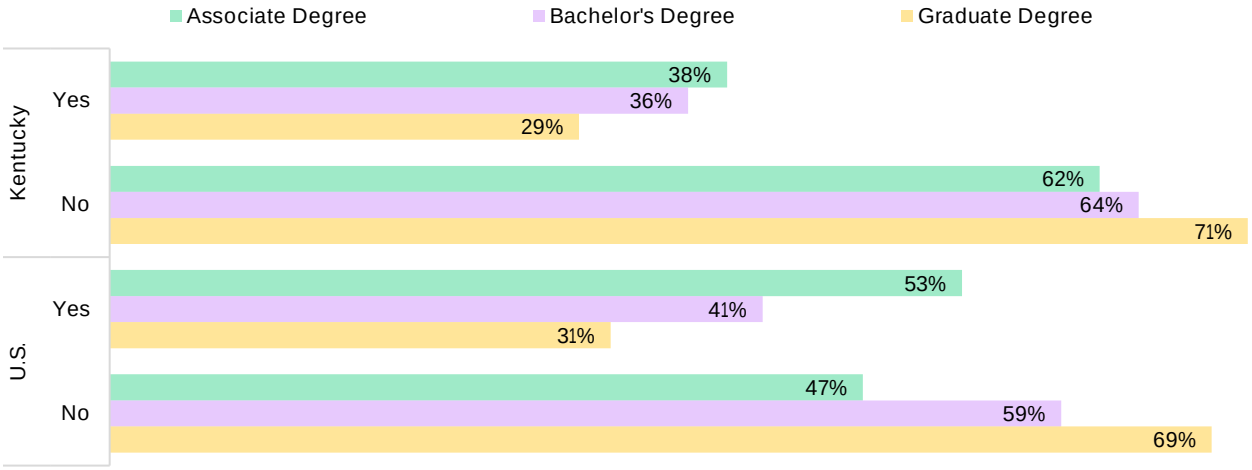
Source: Strada Consumer Insights.

Figure 5.17: Response of Bachelor's Degree STEM Graduates of Public Institutions to "You Would Recommend the Educational Path You Took to People Like You"



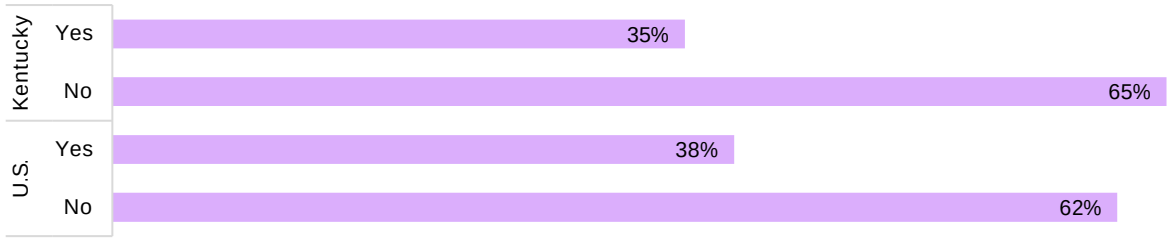
Source: Strada Consumer Insights.

Figure 5.18: Response of STEMH Graduates of Public Institutions to "Do You Feel As If You Need to Obtain Additional Education In Order to Advance in Your Career"



Source: Strada Consumer Insights.

Figure 5.19: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Do You Feel As If You Need to Obtain Additional Education In Order to Advance in Your Career"

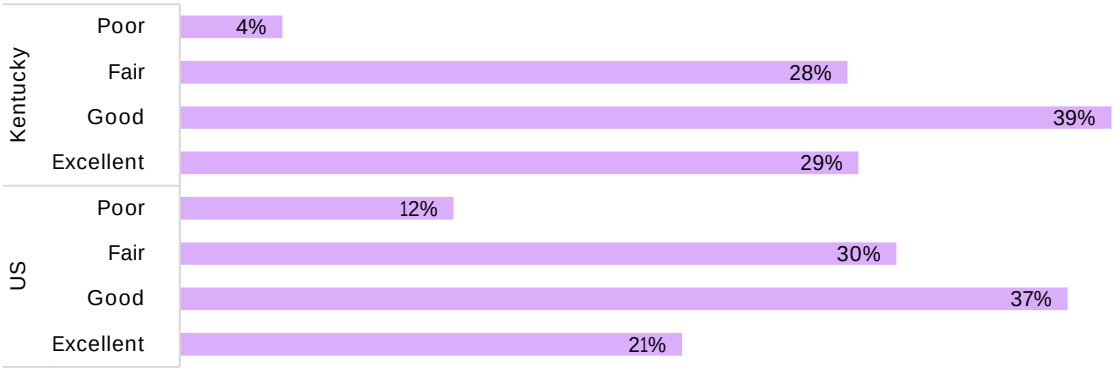


Source: Strada Consumer Insights.

Quality Indicators[20]

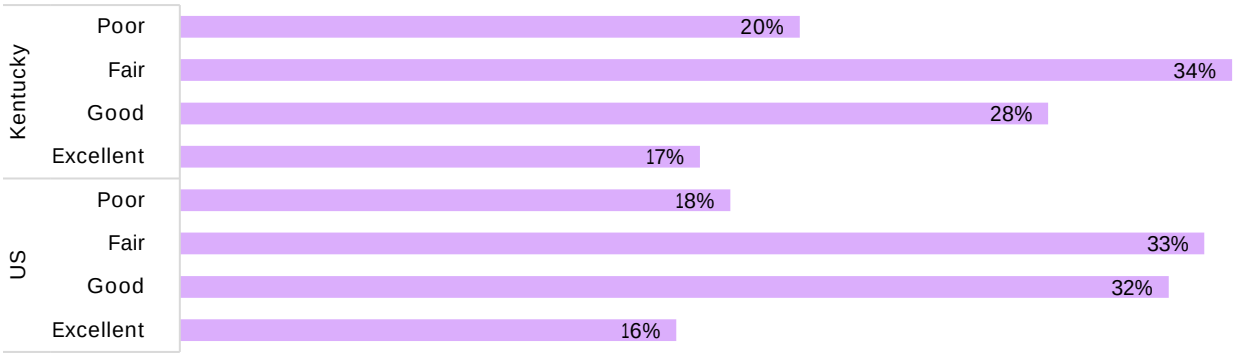
The next seven figures provide inference on how bachelor's degree respondents rate the quality of their Kentucky STEM education, again compared against bachelor's degree STEM graduates from across the U.S. In general, Kentucky STEM bachelor's degree respondents rated Kentucky institutions "good" more than respondents from across the U.S. More specifically, Kentucky institutions' academic advising and teaching & instruction were rated more favorably than across the U.S. On the other hand, their extracurricular activities and courses offered were weighted more towards "poor" and "fair" ratings. Kentucky institutions' career advising, applied learning, and faculty and staff commitment to helping students were comparable against U.S. ratings.

Figure 5.20: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Academic Advising"



Source: Strada Consumer Insights.

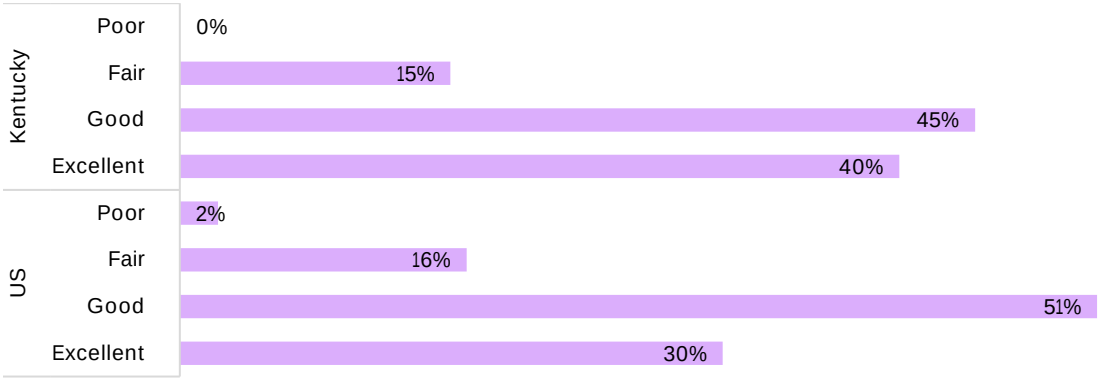
Figure 5.21: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Career Advising"



Source: Strada Consumer Insights.

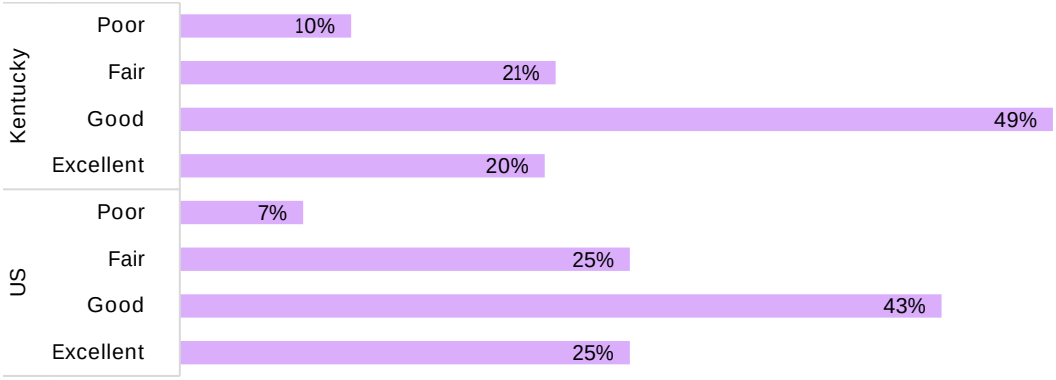
20 Quality indicators only available for bachelor's degree STEM graduates.

Figure 5.22: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Teaching and Instruction"



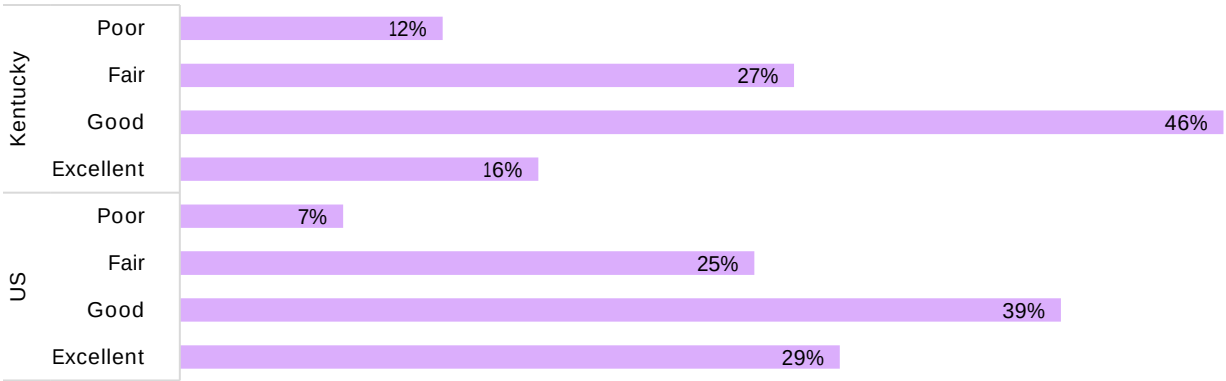
Source: Strada Consumer Insights.

Figure 5.23: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Applied Learning"



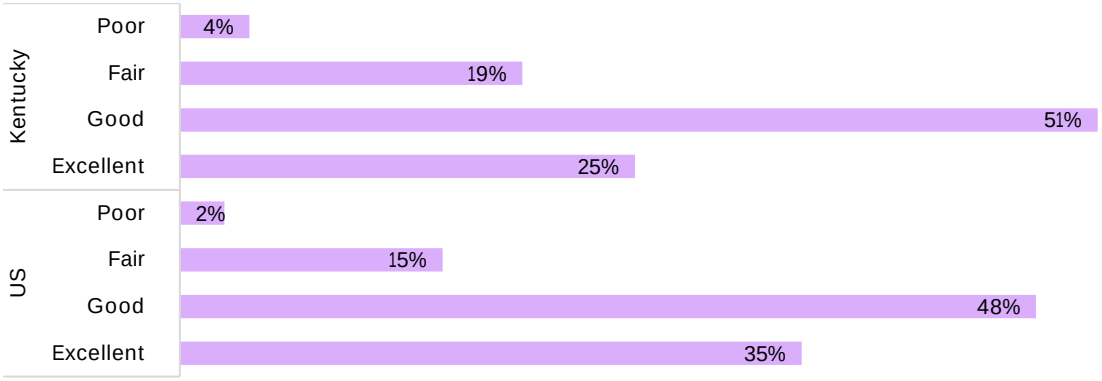
Source: Strada Consumer Insights.

Figure 5.24: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Extracurricular Activities"



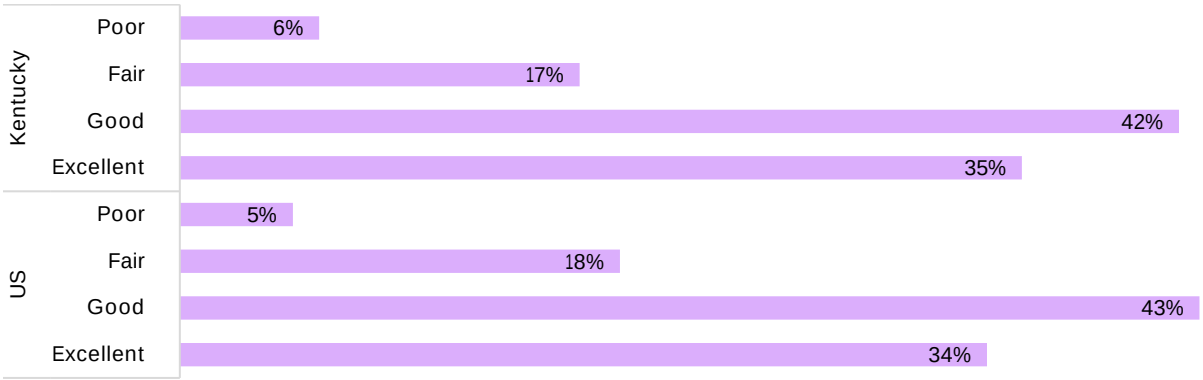
Source: Strada Consumer Insights.

Figure 5.25: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Courses Offered"



Source: Strada Consumer Insights.

Figure 5.26: Response of Bachelor's Degree STEM Graduates of Public Institutions to "Quality of Faculty and Staff Commitment to Helping Students"



Source: Strada Consumer Insights.

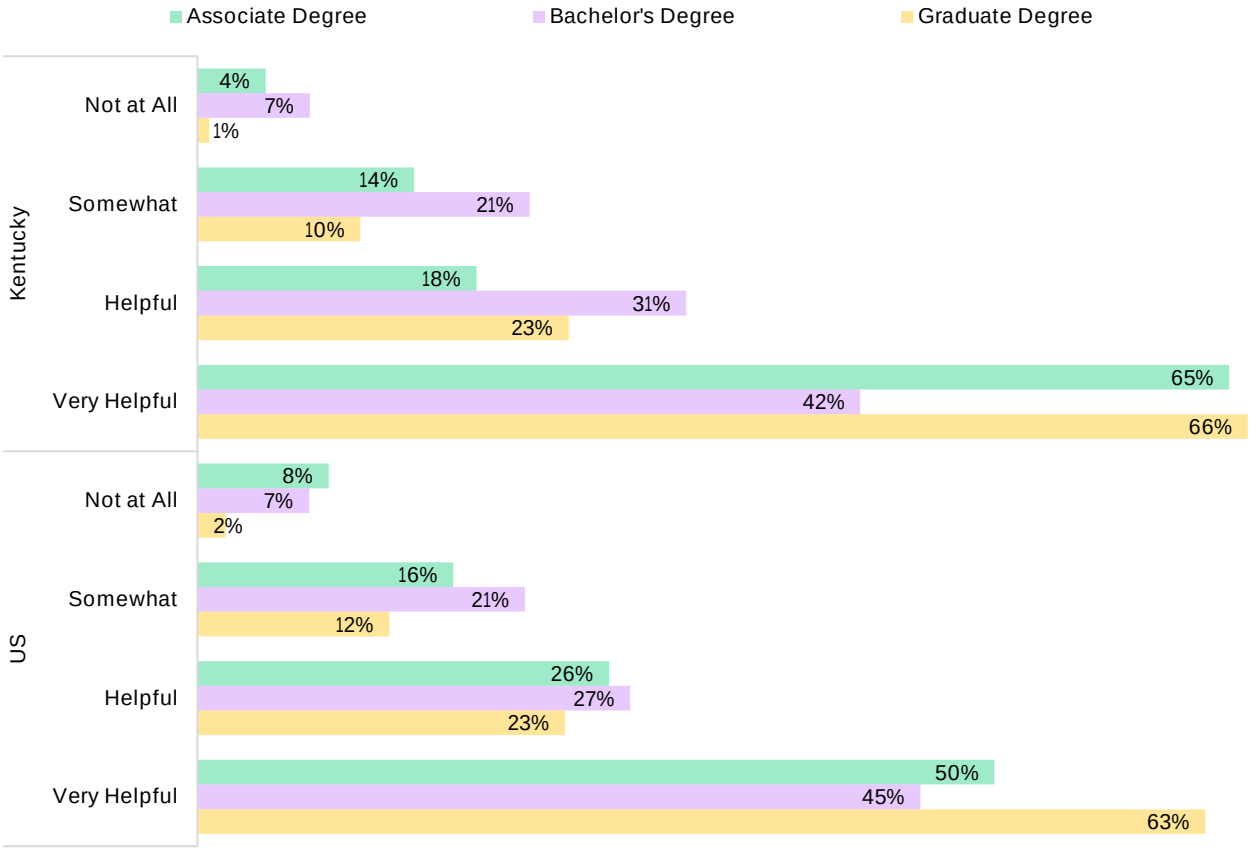
Helpful Elements

Similar trends as we saw under the Quality Indicators subsection appear in this subsection, with Kentucky STEMH bachelor's degree respondents again being generally more conservative in their responses. However, Kentucky STEMH associate and graduate degree graduates generally outperform the U.S. comparison when it comes to finding the Kentucky institutions helpful in various aspects of their career. For example, 65% of Kentucky STEMH associate degree graduates found their major/field of study to be very helpful in their career, compared to only 50% at the national level (Figure 5.27). Similarly, for the Kentucky STEMH graduate degree respondents, 44% said the people they met had been very helpful in their career, compared to 35% at the national level (Figure 5.29).

When looking at just bachelor's degree STEM graduates, we still see conservativism in responses, especially compared to U.S. responses, with quite similar trends as bachelor's

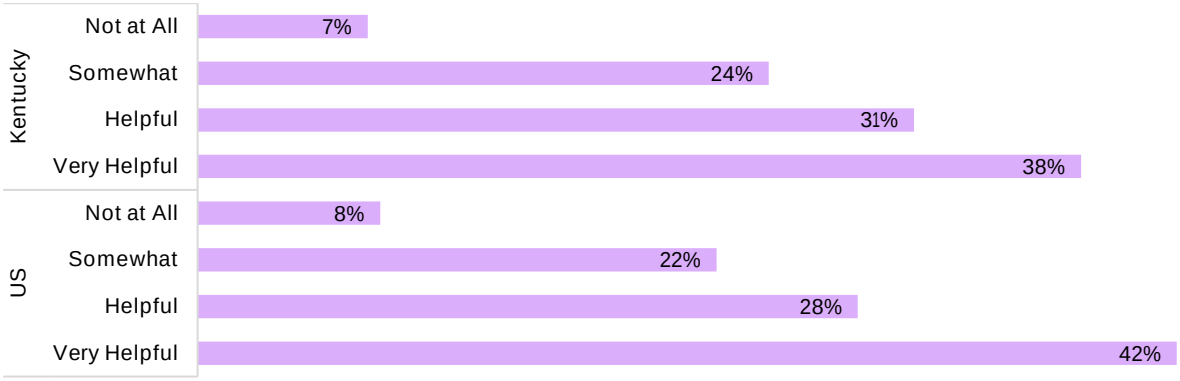
degree STEMH graduates. This is especially true for the helpfulness of the courses they took, with "somewhat helpful" being the highest-ranking rating for Kentucky graduates (Figure 5.34). With that said, Kentucky bachelor's degree STEM graduates ranked "very helpful" the highest when it comes to the helpfulness of the major in their career (Figure 5.28). Although lower than across the U.S., it indicates that the major of a graduate has an impact on their working life.

Figure 5.27: Response of STEMH Graduates of Public Institutions to "How Helpful Has Your Major/Field of Study Been to You So Far in Your Career"



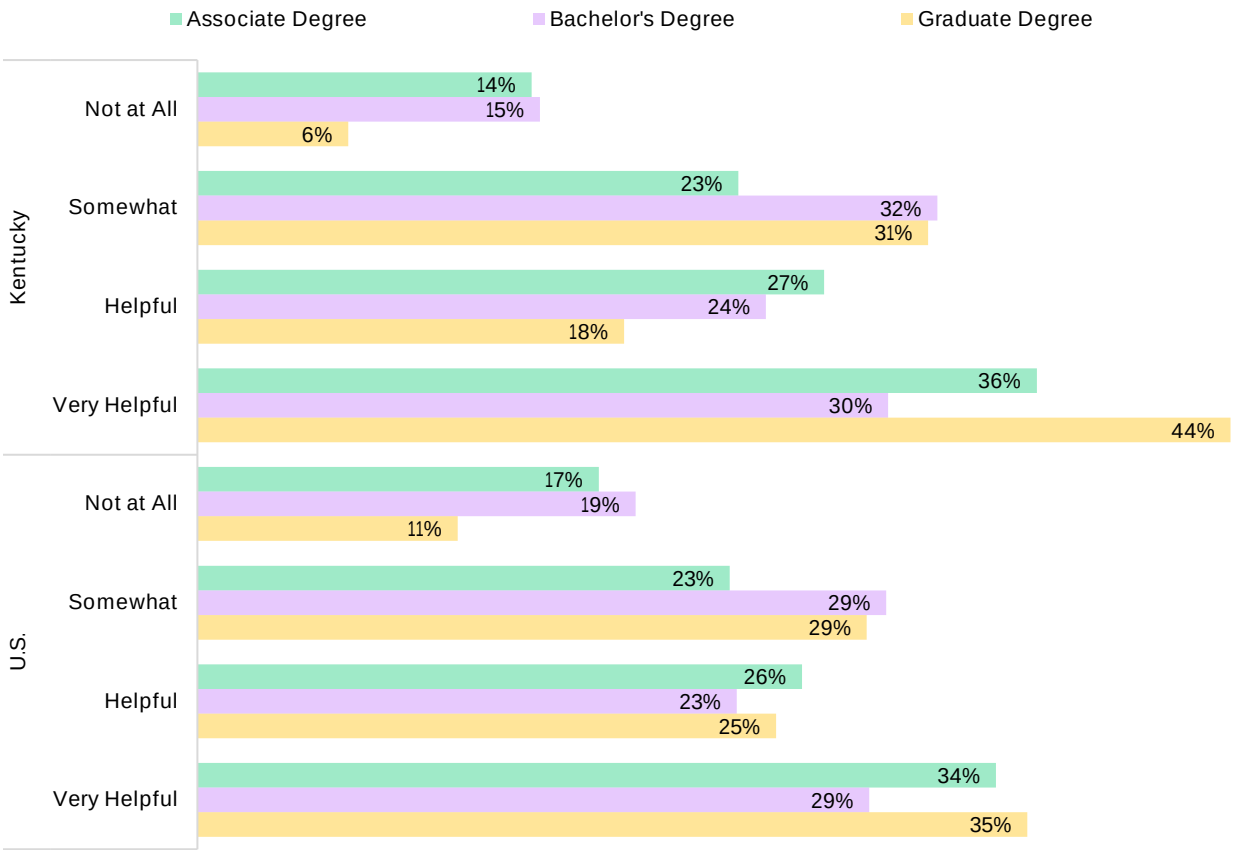
Source: Strada Consumer Insights.

Figure 5.28: Response of Bachelor's Degree STEM Graduates of Public Institutions to "How Helpful Has Your Major/Field of Study Been to You So Far in Your Career"



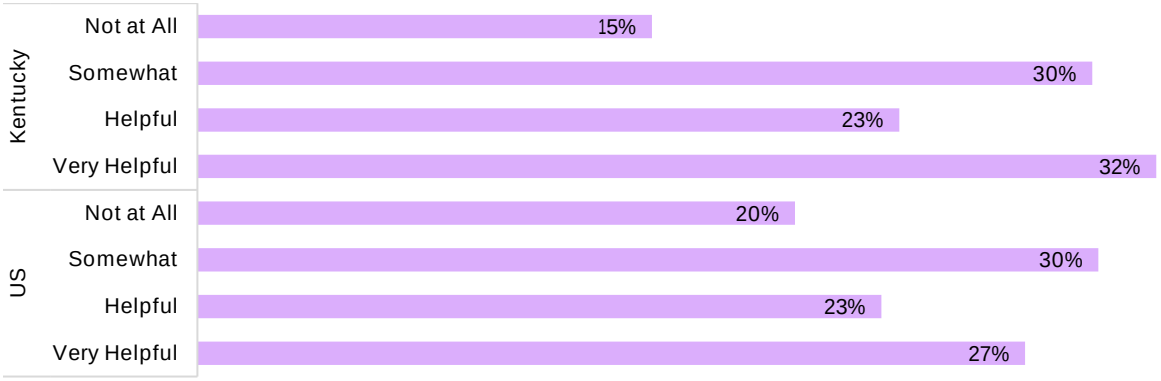
Source: Strada Consumer Insights.

Figure 5.29: Response of STEMH Graduates of Public Institutions to "How Helpful Have the People You Met Been to You So Far in Your Career"



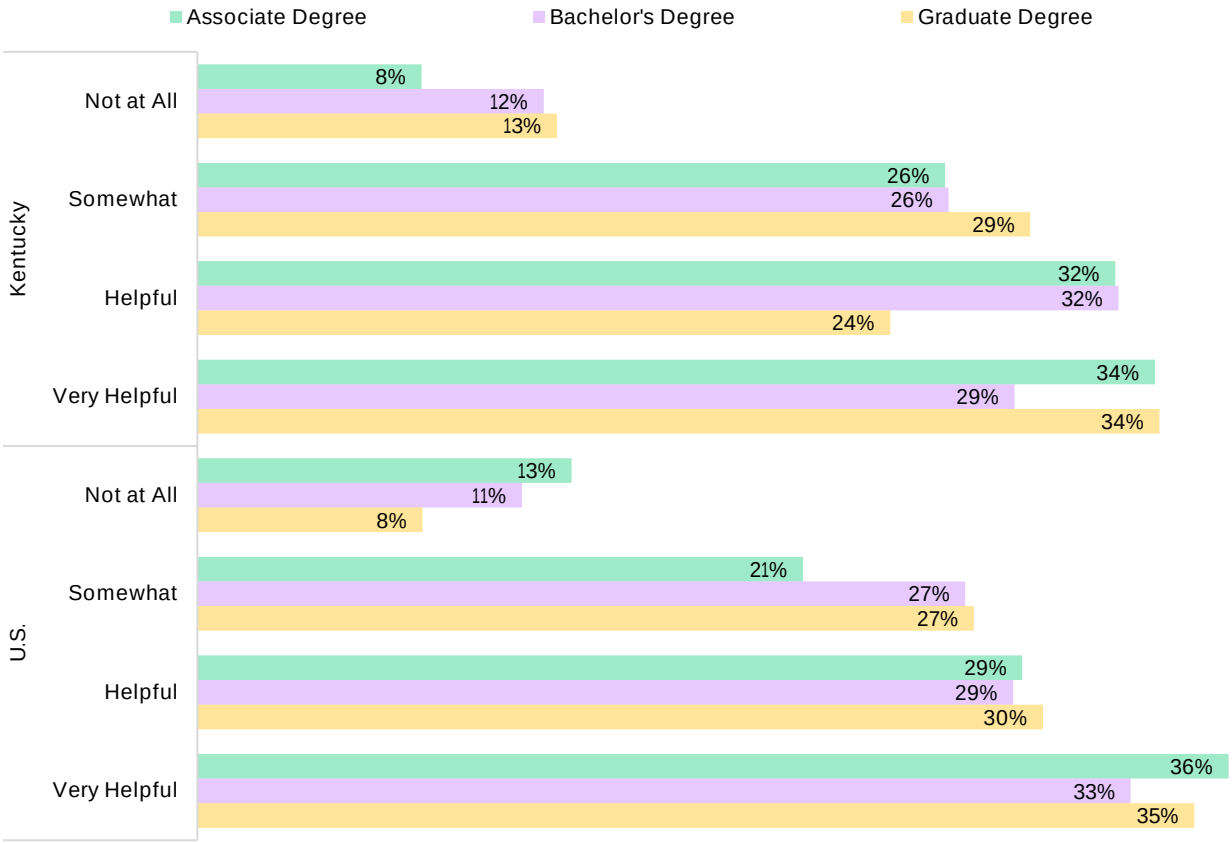
Source: Strada Consumer Insights.

Figure 5.30: Response of Bachelor's Degree STEM Graduates of Public Institutions to "How Helpful Have the People You Met Been to You So Far in Your Career"



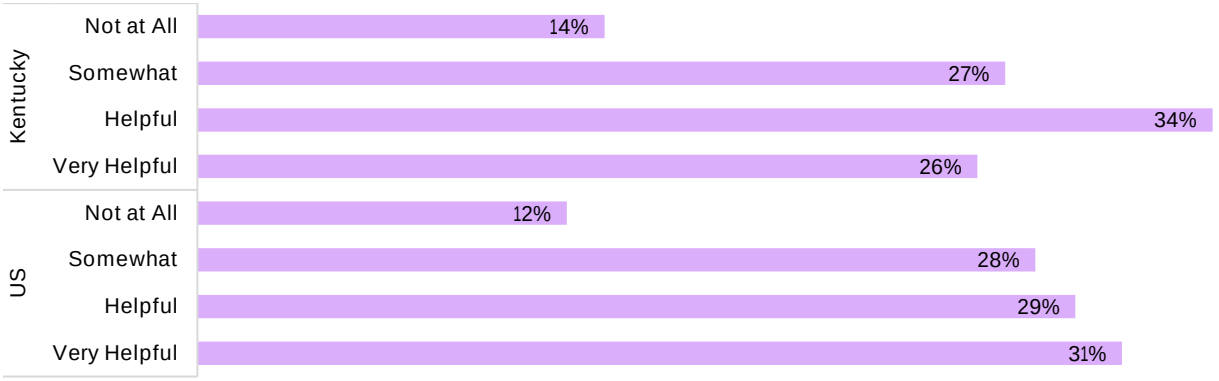
Source: Strada Consumer Insights.

Figure 5.31: Response of STEMH Graduates of Public Institutions to "How Helpful Has the Reputation of the School or Program Been to You So Far in Your Career"



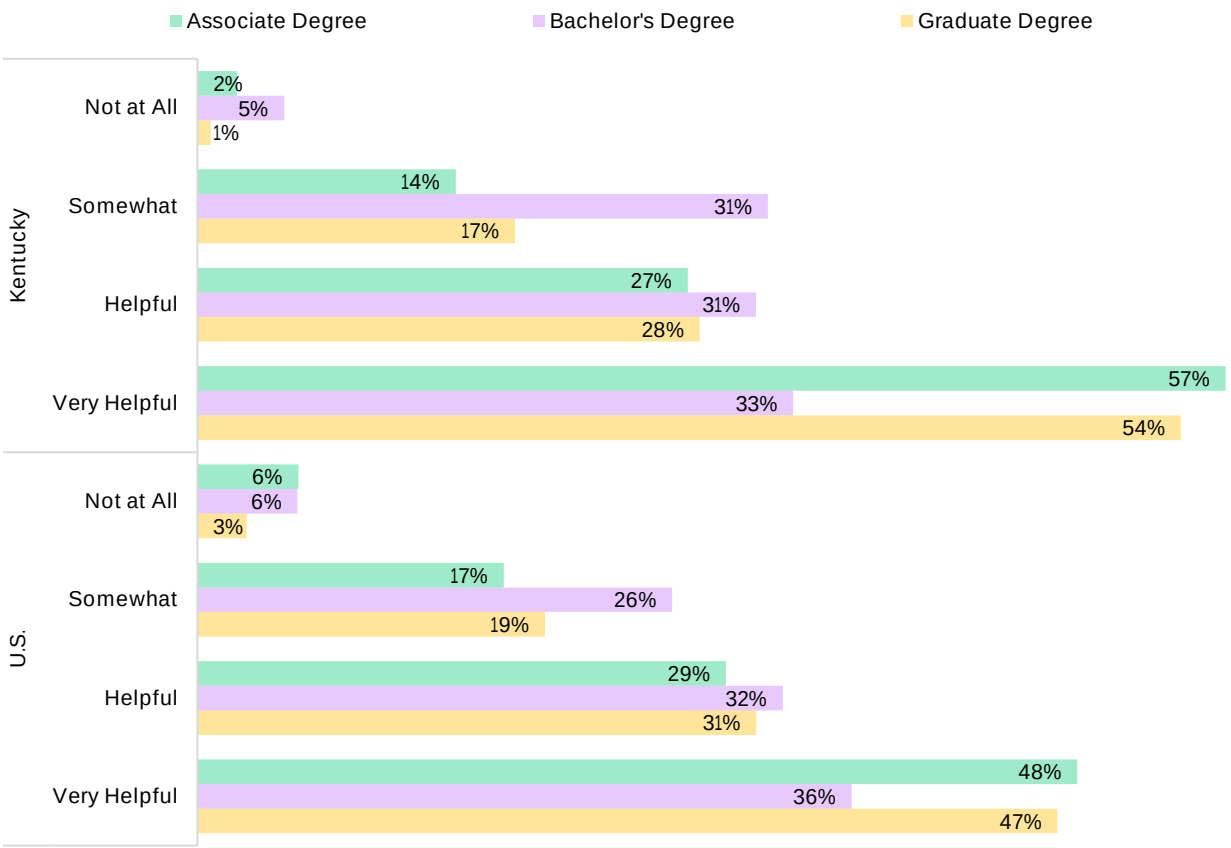
Source: Strada Consumer Insights.

Figure 5.32: Response of Bachelor's Degree STEM Graduates of Public Institutions to "How Helpful Has the Reputation of the School You Attended Been to You So Far in Your Career"



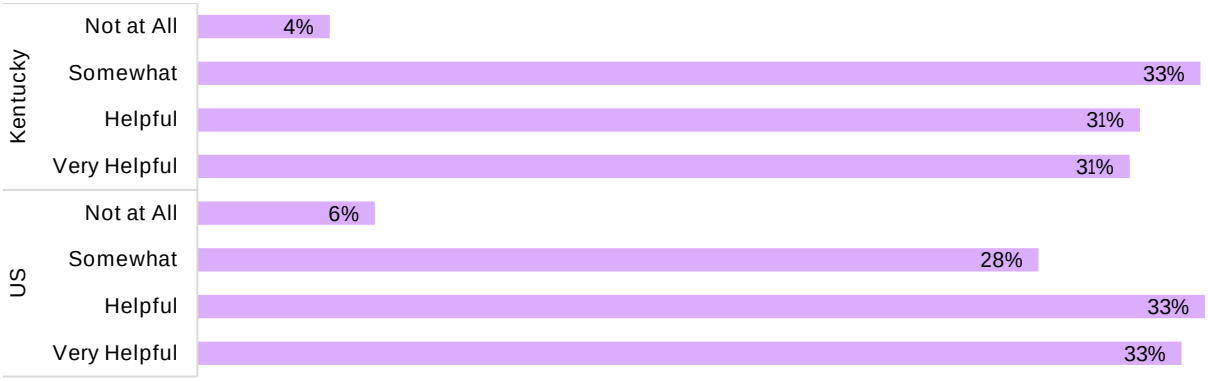
Source: Strada Consumer Insights.

Figure 5.33: Response of STEMH Graduates of Public Institutions to "How Helpful Have the Courses You Took Been to You So Far in Your Career"



Source: Strada Consumer Insights.

Figure 5.34: Response of Bachelor's Degree STEM Graduates of Public Institutions to "How Helpful Have the Courses You Took Been to You So Far in Your Career"



Source: Strada Consumer Insights.

Motivation Indicators

The next six tables identify the top motivations for why STEMH and STEM majors in Kentucky and across the U.S. pursued their degree and chose a particular school. As displayed in Table 5.11, the top motivation for pursuing a degree across all Kentucky STEMH award levels was to get a good job/make money. Kentucky associate degree STEMH graduates also seem to prefer when the school offers specific programs, and those from a Kentucky graduate degree STEMH program often choose the degree to advance their career. Table 5.14, on the other hand, demonstrates the top motivator for Kentucky STEMH graduates to choose their school is due to a close location. Other top motivators on school choice are good reputation of school and the school offers specific programs.

The top choice is the same for bachelor's degree STEM graduates – most pursue a degree to get a good job/make money (Table 5.13) and most choose a school given its close location to home (Table 5.16). Other top reasons for pursuing a degree are due to specific programs the school offers and because students want to advance not just their career, but also their knowledge. In terms of school choice, reputation of the school or program, availability of specific programs, and scholarship availability are all top factors for bachelor's degree STEM graduates.

Table 5.11: Motivation for Pursuing a Degree as Reported by STEMH Majors in Kentucky

	ASSOC		BACH		GRAD	
RESPONSE	FREQ	%	FREQ	%	FREQ	%
Get good job/make money/better pay	30	25%	81	33%	42	30%
School offered specific programs they wanted	28	23%	32	13%	18	13%
Advance knowledge/like to learn	25	21%	28	12%	15	10%
Advance career	10	9%	27	11%	34	24%
Family influence/first to graduate	4	3%	14	6%	3	2%
Other (list)	4	3%	14	6%	2	2%
What I wanted to do/bored/something to do	6	5%	13	5%	4	3%
What is expected/thing to do	--	0%	13	5%	3	2%
Price - it was affordable	4	4%	8	3%	6	5%
Received a scholarship/financial aid	--	0%	4	2%	5	3%
Friends/family go there	--	0%	2	1%	--	0%
Good reputation of school or program	--	0%	2	1%	3	2%
Received a recommendation from a friend	--	0%	2	1%	--	0%
School was a good fit for the respondent	--	0%	2	1%	1	0%
Convenience (general, non-specific)	--	0%	1	0%	--	0%
Don't know	--	0%	1	0%	--	0%
Liked the athletics or other extracurriculars	--	0%	1	1%	--	0%
Change in career	2	2%	--	0%	3	2%
Location (close to home, in the same town	1	1%	--	0%	--	0%
Location (general)	2	1%	--	0%	--	0%
School offered online options/night classes	6	5%	--	0%	2	1%
Total	123	100%	245	100%	142	100%

Numbers may not sum due to rounding.
Source: Strada Consumer Insights.

Table 5.12: Motivation for Pursuing a Degree as Reported by STEMH Majors in the U.S.

	ASSOC		BACH		GRAD	
RESPONSE	FREQ	%	FREQ	%	FREQ	%
Get good job/make money/better pay	2,200	29%	4,901	34%	1,897	25%
School offered specific programs they wanted	1,350	18%	1,873	13%	1,631	22%
Advance knowledge/like to learn	1,056	14%	1,829	13%	956	13%

	ASSOC		BACH		GRAD	
RESPONSE	FREQ	%	FREQ	%	FREQ	%
Advance career	643	8%	1,659	11%	1,446	19%
What is expected/thing to do	192	3%	1,322	9%	77	1%
Family influence/first to graduate	213	3%	827	6%	104	1%
Other (list)	393	5%	681	5%	366	5%
What I wanted to do/bored/something to do	235	3%	473	3%	275	4%
Price - it was affordable	382	5%	263	2%	160	2%
Received a scholarship/financial aid	114	2%	145	1%	104	1%
Change in career	201	3%	120	1%	174	2%
Received a recommendation from a friend	46	1%	92	1%	35	<1%
Don't know	37	<1%	54	<1%	18	<1%
Good reputation of school or program	27	<1%	53	<1%	27	<1%
Friends/family go there	12	<1%	45	<1%	12	<1%
Liked the athletics or other extracurriculars	10	<1%	46	<1%	2	<1%
School was a good fit for the respondent	19	<1%	34	<1%	62	1%
No reason	31	<1%	27	<1%	8	<1%
Convenience (general, non-specific)	34	<1%	21	<1%	6	<1%
School offered online options/night classes	253	3%	20	<1%	19	<1%
Applied/acceptance/recruited	17	<1%	17	<1%	11	<1%
Location (far from home, out of state)	2	<1%	16	<1%	1	<1%
Location (close to home, in the same town	43	1%	10	<1%	10	<1%
Location (general)	10	<1%	11	<1%	15	<1%
To avoid being drafted	4	<1%	10	<1%	1	<1%
Didn't like college/quit college early	41	1%	8	<1%	4	<1%
Refused to answer	7	<1%	5	<1%	8	<1%
Liked size of school	4	<1%	5	<1%	--	0%
Liked the students/faculty/staff at the school	1	<1%	3	<1%	5	<1%
Liked the mission of the school	2	<1%	1	<1%	13	<1%
Total	7,581	100%	14,572	100%	7,446	100%

Numbers may not sum due to rounding.
Source: Strada Consumer Insights.

Table 5.13: Motivation for Pursuing a Degree as Reported by Bachelor's Degree STEM Majors

	KY BACH		U.S. BACH	
RESPONSE	FREQ	%	FREQ	%
Get good job/make money/better pay	68		4,028	
School offered specific programs they wanted	26		1,440	
Advance knowledge/like to learn	20		1,496	
Advance career	20		1,210	
Other (list)	13		552	
What is expected/thing to do	12		1,187	
Family influence/first to graduate	11		720	
What I wanted to do/bored/something to do	9		404	
Price - it was affordable	5		208	
Received a scholarship/financial aid	3		131	
School was a good fit for the respondent	2		30	
Good reputation of school or program	2		44	
Received a recommendation from a friend	2		72	
Friends/family go there	2		39	
Liked the athletics or other extracurriculars	1		43	
Convenience (general, non-specific)	1		16	
Don't Know	0		45	
Applied/acceptance/recruited	-		14	
Change in career	-		101	
Didn't like college/quit college early	-		4	
Liked size of school	-		3	
Location (close to home, in the same town	-		8	
Location (far from home, out of state)	-		11	
Location (general)	-		9	
No reason	-		26	
Refused	-		6	
School offered online options/night classes	-		17	
To avoid being drafted	-		10	
Total	198		11,877	

Numbers may not sum due to rounding.
Source: Strada Consumer Insights.

Table 5.14: Motivation for Choosing a Particular School as Reported by STEMH Majors in Kentucky

	ASSOC		BACH		GRAD	
RESPONSE	FREQ	%	FREQ	%	FREQ	%
Location (close to home, in the same town)	50	40%	71	29%	25	18%
Good reputation of school or program	6	5%	26	11%	20	14%
Received a scholarship/financial aid	3	2%	23	9%	9	7%
School offered specific programs they wanted	12	10%	22	9%	26	18%
Location (general)	9	8%	20	8%	11	8%
Price - it was affordable	9	8%	15	6%	8	6%
Other (list)	4	3%	13	5%	1	1%
Get good job/make money/better pay	4	3%	11	4%	3	2%
School was a good fit for the respondent	--	0%	7	3%	9	7%
Friends/family go there	--	0%	7	3%	3	2%
Convenience (general, non-specific)	10	8%	6	2%	3	2%
Liked the athletics or other extracurriculars	--	0%	5	2%	--	0%
Location (far from home, out of state)	--	0%	4	2%	2	1%
Family influence/first to graduate	1	1%	3	1%	--	0%
Don't know	--	0%	3	1%	--	0%
What I wanted to do/bored/something to do	--	0%	2	1%	--	0%
School offered online options/night classes	3	2%	2	1%	--	0%
Advance knowledge/like to learn	6	5%	2	1%	6	4%
Liked size of school	--	0%	1	1%	--	0%
No reason	--	0%	1	<1%	1	1%
Received a recommendation from a friend	2	1%	1	<1%	3	2%
Liked the students/faculty/staff at the school	--	0%	--	0%	2	2%
Applied/acceptance/recruited	--	0%	--	0%	3	2%
Advance career	3	2%	--	0%	5	3%
Change in career	1	1%	--	0%	--	0%
Total	123	100%	245	100%	142	100%

Numbers may not sum due to rounding.
Source: Strada Consumer Insights.

Table 5.15: Motivation for Choosing a Particular School as Reported by STEMH Majors in the U.S.

	ASSOC		BACH		GRAD	
RESPONSE	FREQ	%	FREQ	%	FREQ	%
Location (close to home, in the same town)	2,185	29%	2,932	20%	970	13%
Good reputation of school or program	510	7%	2,107	14%	1,351	18%
School offered specific programs they wanted	943	12%	1,790	12%	1,034	14%
Price - it was affordable	671	9%	1,378	9%	532	7%
Location (general)	692	9%	1,215	8%	551	7%
Received a scholarship/financial aid	179	2%	739	5%	516	7%
Other (list)	339	4%	687	5%	346	5%
School was a good fit for the respondent	91	1%	518	4%	323	4%
Friends/family go there	71	1%	463	3%	99	1%
Convenience (general, non-specific)	325	4%	402	3%	235	3%
Get good job/make money/better pay	393	5%	396	3%	264	4%
Advance knowledge/like to learn	356	5%	369	3%	205	3%
Applied/acceptance/recruited	89	1%	266	2%	242	3%
Family influence/first to graduate	74	1%	212	1%	42	1%
School offered online options/night classes	133	2%	194	1%	152	2%
Liked the athletics or other extracurriculars	20	<1%	151	1%	28	<1%
Advance career	194	3%	141	1%	186	3%
Received a recommendation from a friend	123	2%	132	1%	82	1%
Location (far from home, out of state)	5	<1%	83	1%	17	<1%
What I wanted to do/bored/something to do	50	1%	79	1%	43	1%
Liked size of school	12	<1%	77	1%	17	<1%
What is expected/thing to do	42	1%	71	<1%	30	<1%
Don't know	11	<1%	46	<1%	14	<1%
Change in career	50	1%	32	<1%	22	<1%
Liked the students/faculty/staff at the school	9	<1%	32	<1%	116	2%
No reason	6	<1%	27	<1%	7	<1%
Liked the mission of the school	2	<1%	17	<1%	12	<1%
Refused to answer	3	<1%	15	<1%	8	<1%
To avoid being drafted	1	<1%	1	<1%	1	<1%
Didn't like college/quit college early	2	<1%	1	<1%	1	<1%
Total	7,581	100%	14,572	100%	7,446	100%

Source: Strada Consumer Insights.

Table 5.16: Motivation for Choosing a School as Reported by Bachelor's Degree STEM Majors

	KY BACH		U.S. BACH	
RESPONSE	FREQ	%	FREQ	%
Location (close to home, in the same town)	52		2,359	
Good reputation of school or program	23		1,757	
School offered specific programs they wanted	21		1,454	
Received a scholarship/financial aid	20		638	
Location (general)	16		991	
Other (list)	12		562	
Get good job/make money/better pay	10		321	
Price - it was affordable	9		1,155	
Friends/family go there	6		375	
Convenience (general, non-specific)	6		276	
Liked the athletics or other extracurriculars	5		135	
School was a good fit for the respondent	4		442	
Don't Know	3		43	
Location (far from home, out of state)	2		65	
What I wanted to do/bored/something to do	2		72	
School offered online options/night classes	2		104	
Liked size of school	1		70	
Family influence/first to graduate	1		181	
Advance knowledge/like to learn	1		299	
No reason	1		20	
What is expected/thing to do	0		56	
Liked the students/faculty/staff at the school	0		28	
Advance career	-		108	
Applied/acceptance/recruited	-		216	
Change in career	-		24	
Liked the mission of the school	-		14	
Received a recommendation from a friend	-		99	
Refused	-		13	
Total	198		11,877	

Numbers may not sum due to rounding.
Source: Strada Consumer Insights.

CHAPTER 6:

Environmental Scan

The environmental scan provides key information on the economic and social structure of Kentucky and its Workforce Planning Regions (WPRs). The counties included in the Central, East, South, and West WPRs are determined by the Kentucky Center for Education & Workforce Statistics and provided by the Council (Figure 6.1).[21] In addition, data for the city of Louisville and its surrounding counties, which comprise the Kentuckiana Local Workforce Area (LWA), are shown separate from the Central WPR. Identifying the economic conditions of Kentucky and its five workforce regions is an important task for several reasons. The data:

- Help the Council understand where the state's colleges and universities should logically target their efforts with regards to program development;
- Reveal whether there are industries that may be overlooked as a result of recent economic growth;

Figure 6.1: Kentucky's WPRs and the Kentuckiana LWA

Source: Regions provided by the Council.

21 Source: https://kystats.ky.gov/Reports/ShowReports?ReportId=Map_LWAWIB&publishDate=20170401.

- Identify the top occupations within driving industries; and
- Give the Council a deeper understanding of state and regional population characteristics and the socioeconomic background of current and future postsecondary students.

To these ends, this chapter provides an overview of total jobs and jobs within state and regional industries, unemployed workers in Kentucky, statewide and regional commuting patterns, population demographics and socioeconomic indicators of the state, and the highest educational attainments of state and regional adult residents. Tables and figures present data at the state level and, in some cases, for the county, regional, and national levels.

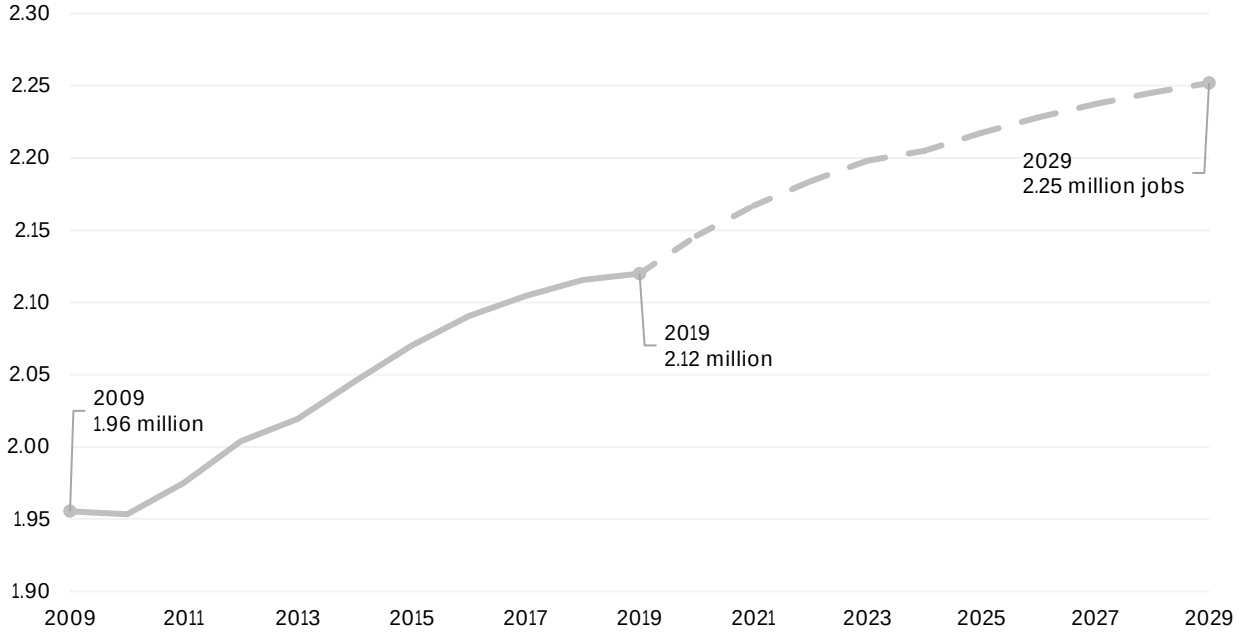
TOTAL JOBS

Job counts and the changes in jobs over time provide insight into Kentucky as an attractive region for job seekers, employers, and economic developers. Figure 6.2 shows statewide jobs from 2009 to 2029. In addition, Figures 6.3 and 6.4 present data on jobs in Kentucky for the same time period but highlight the state's job change, using 2009 as a base year and showing year-over-year job change, respectively. As shown in Figure 6.2, Kentucky supported 2.0 million jobs in 2009. By 2019, that number increased to 2.1 million jobs, for an 8.4% job growth. Kentucky is projected to add another 131,960 jobs by 2029, for a 6.2% job growth.

Figure 6.3 displays the historical and projected job change, by percent, for the state and the U.S. between 2009 and 2029, with 2009 serving as the base year. Kentucky's job declines in the years following the 2008 Recession were similar to that of the U.S. But after 2013, the state's job growth was less than that of the U.S. Using Emsi's job projections, job growth from 2009 to 2029 in Kentucky and the U.S. is expected to be 15.2% and 22.8%, respectively.

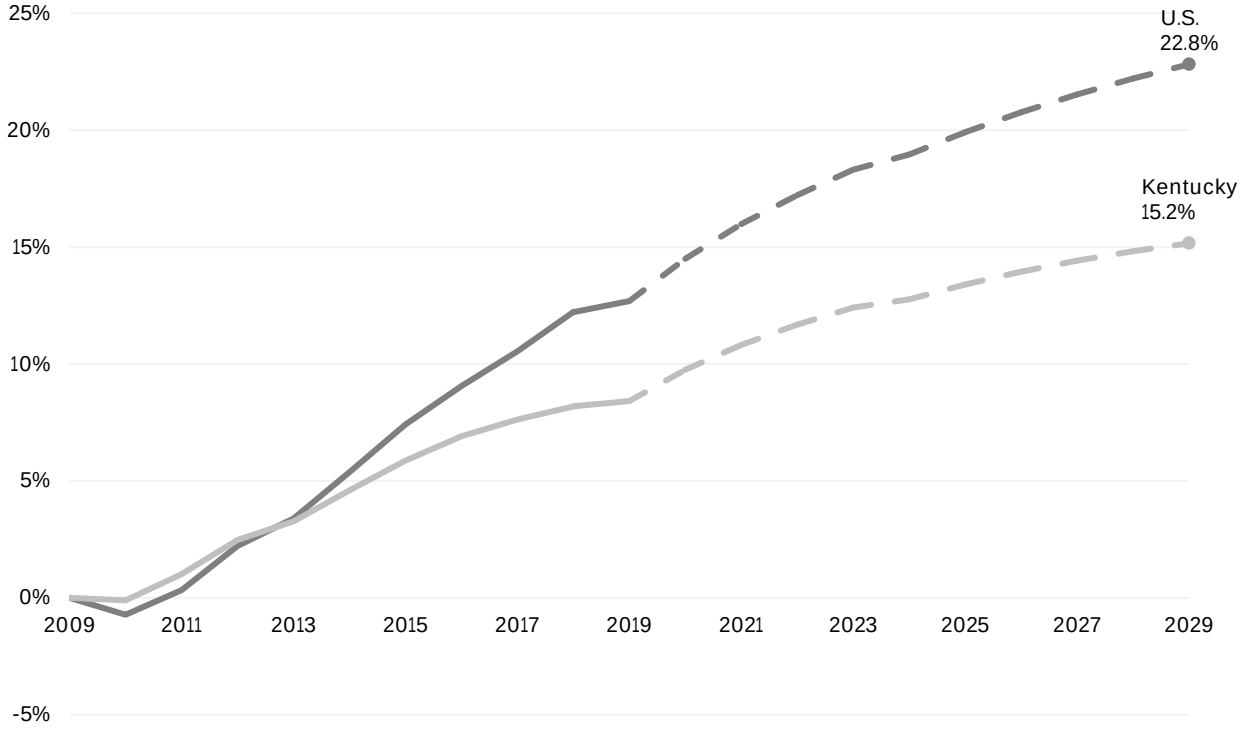
The regions' year-over-year job changes follow similar patterns (Figure 6.4). With the 2008 Recession, jobs decreased by about four percent, but year-over-year job change has remained positive since 2010 in Kentucky and the U.S. Jobs in the state are projected to increase by 1.2% between 2019 and 2020, and jobs in the U.S. are projected to increase by 1.6%. Figures 6.5, 6.6, and 6.7 show job changes for the Central, East, South, and West WPRs, as well as the Kentuckiana LWA.

Figure 6.2: Historical and Projected Jobs (in millions) in Kentucky, 2009 to 2029



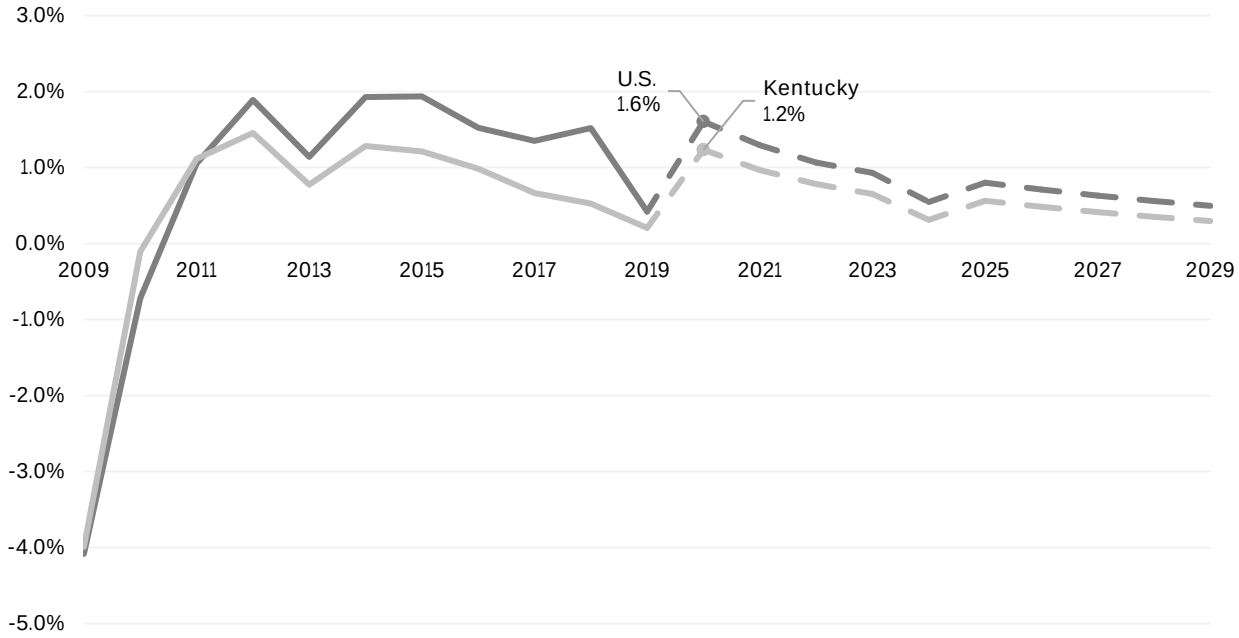
Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.3: Percent Job Change in Kentucky and the U.S., 2009 to 2029



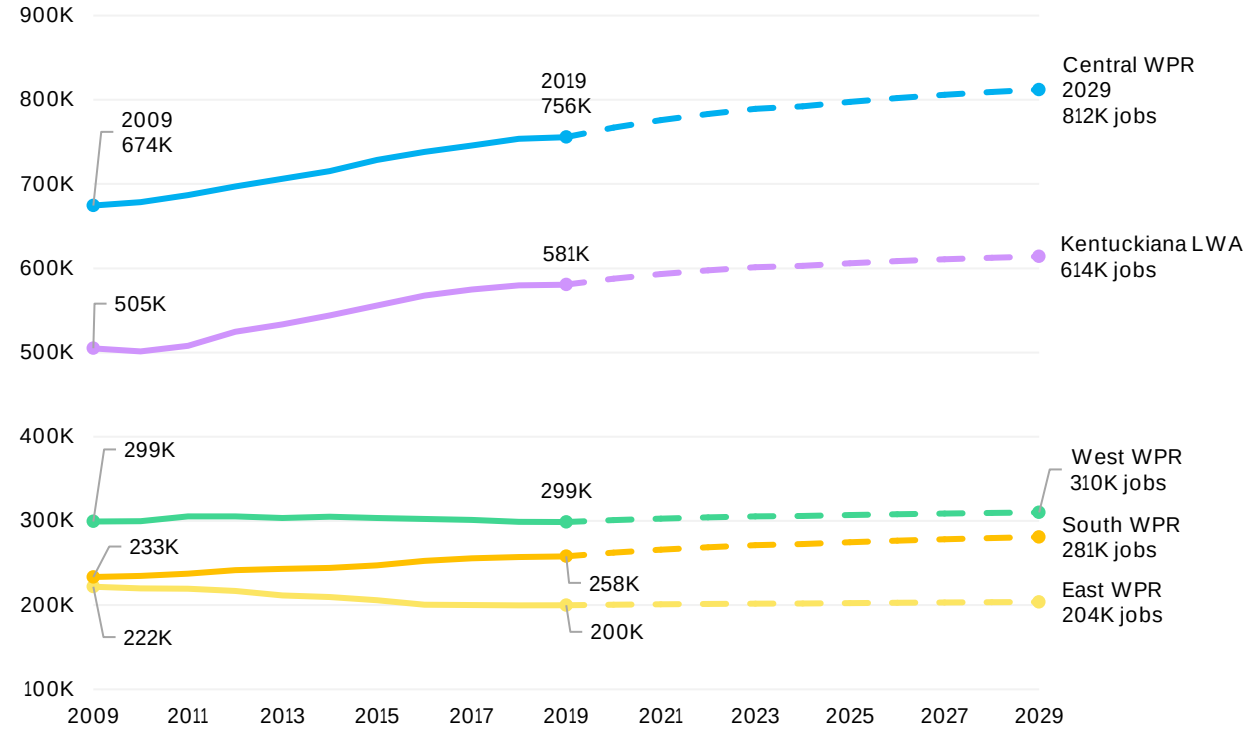
Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.4: Annual Percent Job Change in Kentucky and the U.S., 2009 to 2029



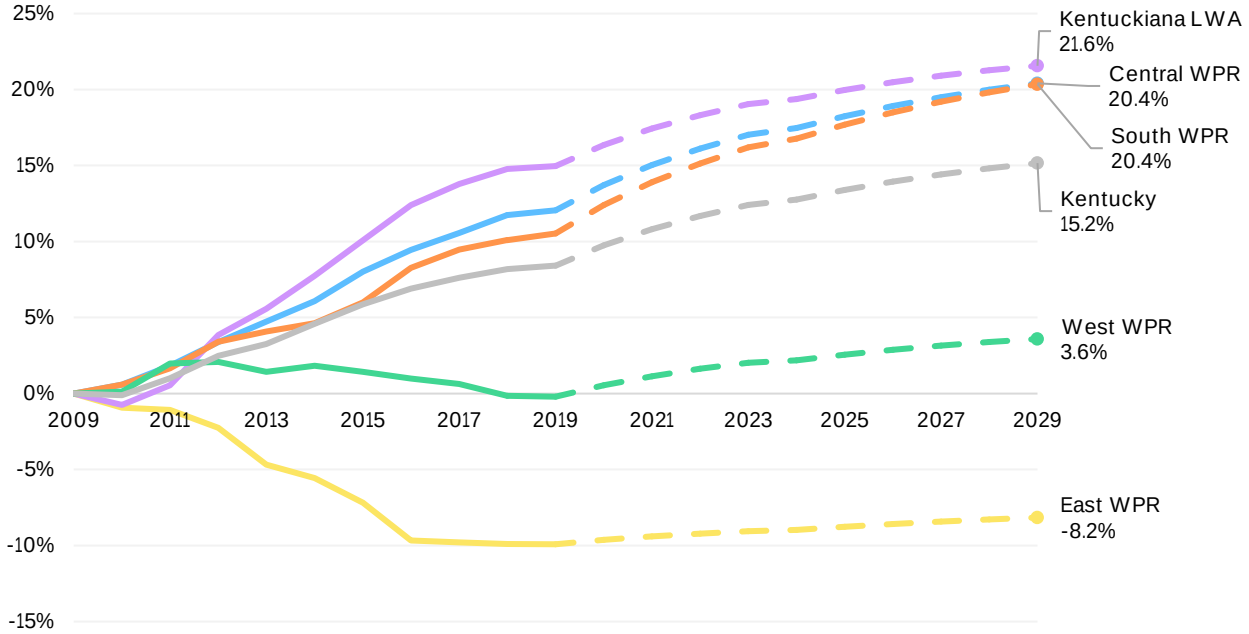
Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.5: Historical and Projected Jobs in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



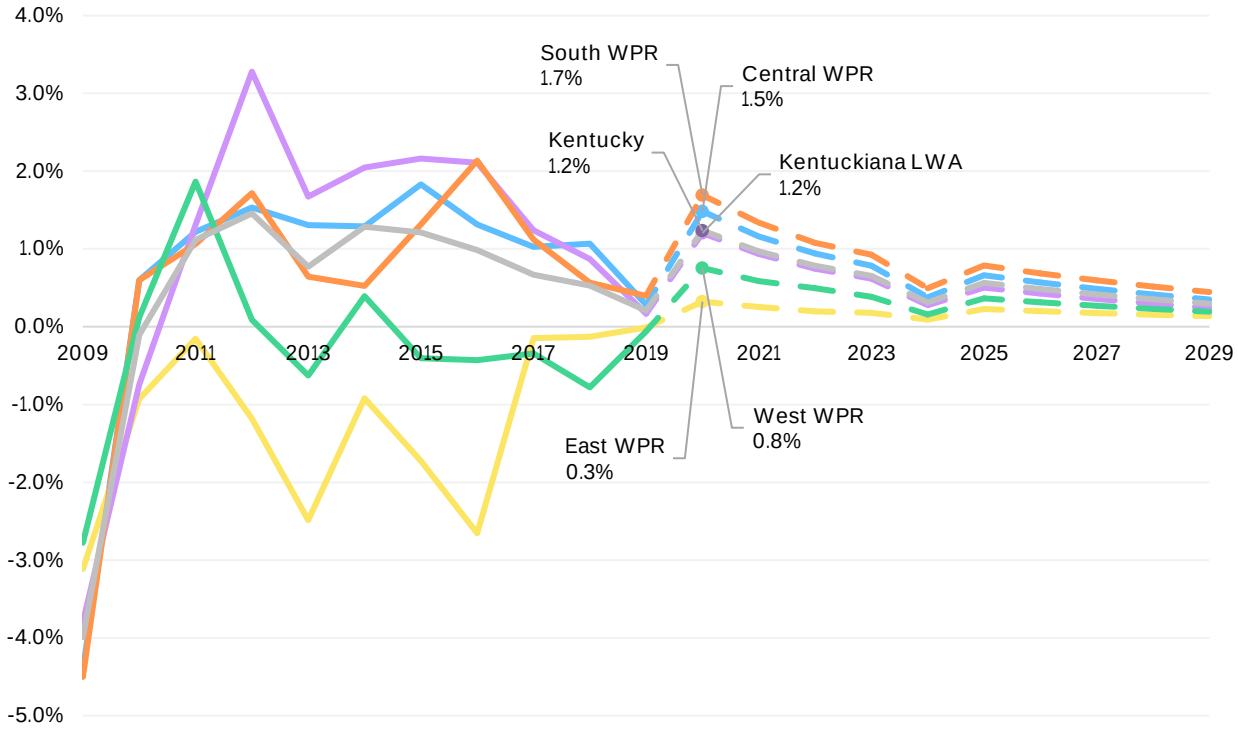
Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.6: Percent Job Change in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.7: Annual Percent Job Change in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



Source: Emsi Employees & Self-Employed 2019.4.

INDUSTRY COMPOSITION

Evaluating current and future employment by the industries supporting jobs in the state provides information on its economic diversity. Understanding the mix of industries present in Kentucky is also important for drawing connections to the occupations and companies that are in-demand. By extension, students are likely to find employment in the largest industries.

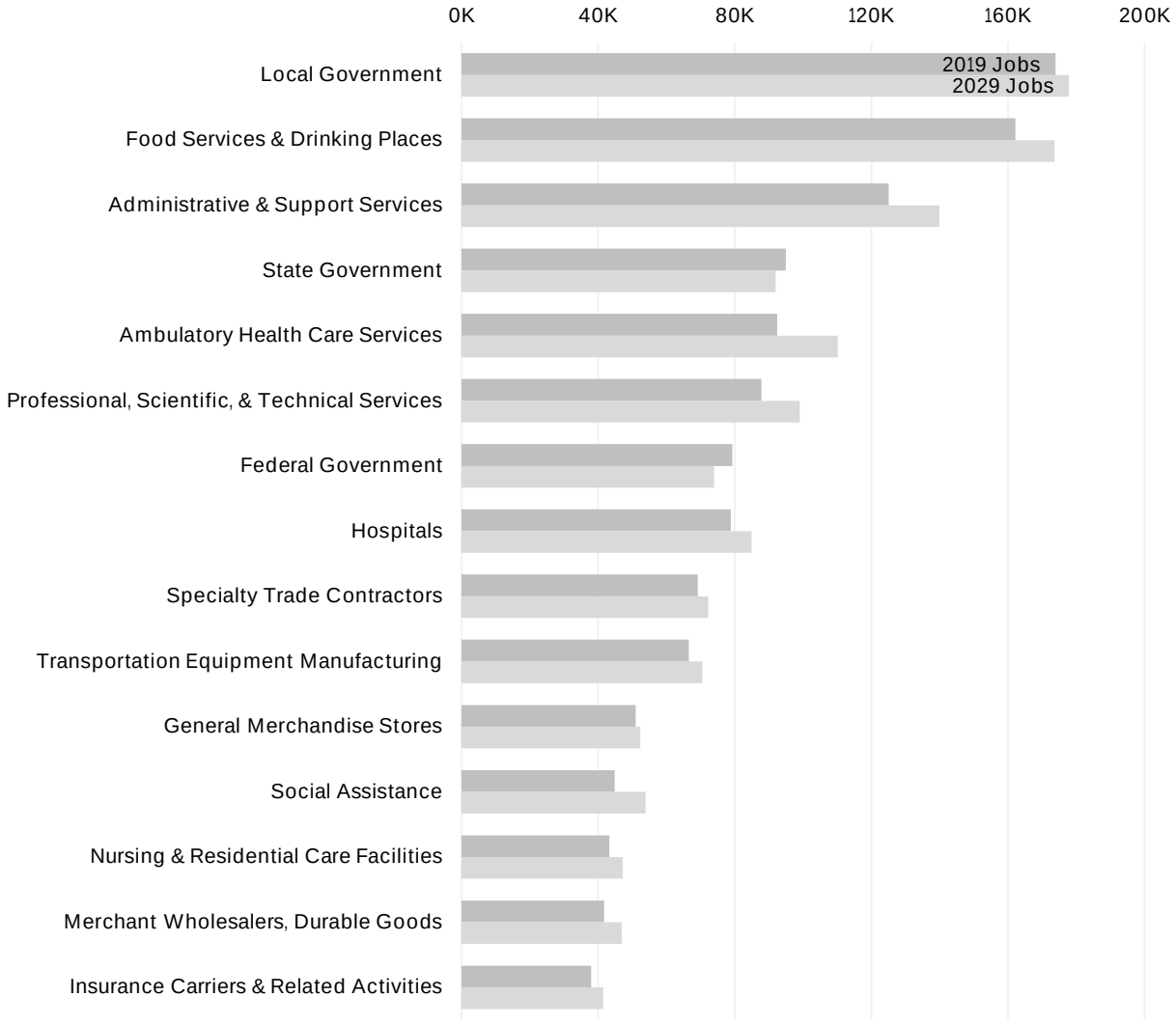
For the analysis in this section, Emsi has aggregated jobs by industries using the North American Industry Classification System (NAICS), and the industries are reported at the three-digit NAICS code level, referred to as industry subsectors. In Emsi data, all establishments in the main NAICS hierarchy (i.e. non-government industries) are private sector only. For example, jobs in Ambulatory Health Care Services and Educational Services are not associated with the local, state, or federal governments. Public sector jobs, such as public-school teachers and city firefighters, are in Local Government, whereas college professors and forest firefighters are commonly employed by State Government. Finally, jobs for mail carriers and transportation security screeners are almost exclusively employed by Federal Government.

Largest Employers

As stated in the previous section, Kentucky supported 2.1 million jobs in 2019, and by 2029, the state is projected to add 131,960 new jobs, for a 6.2% job increase. Figure 6.8 presents the 15 largest industry subsectors in the state, by their 2019 job counts, and also shows the industry subsectors' projected change over the next decade.

As shown, the Local Government industry subsector supported the most jobs in Kentucky in 2019 (173,860 jobs), and it is expected to remain the top regional employer. Food Services & Drinking Places and Administrative & Support Services were the next largest in terms of jobs, supporting 162,150 and 125,070 jobs in 2019, respectively. As for growth, Ambulatory Health Care Services is projected to add the most jobs of the top 15 industry subsectors, with a 10-year increase of 19.3% or 17,810 new jobs.

Figure 6.8: Jobs in Kentucky's Top 15 Industry Subsectors, 2019 and 2029

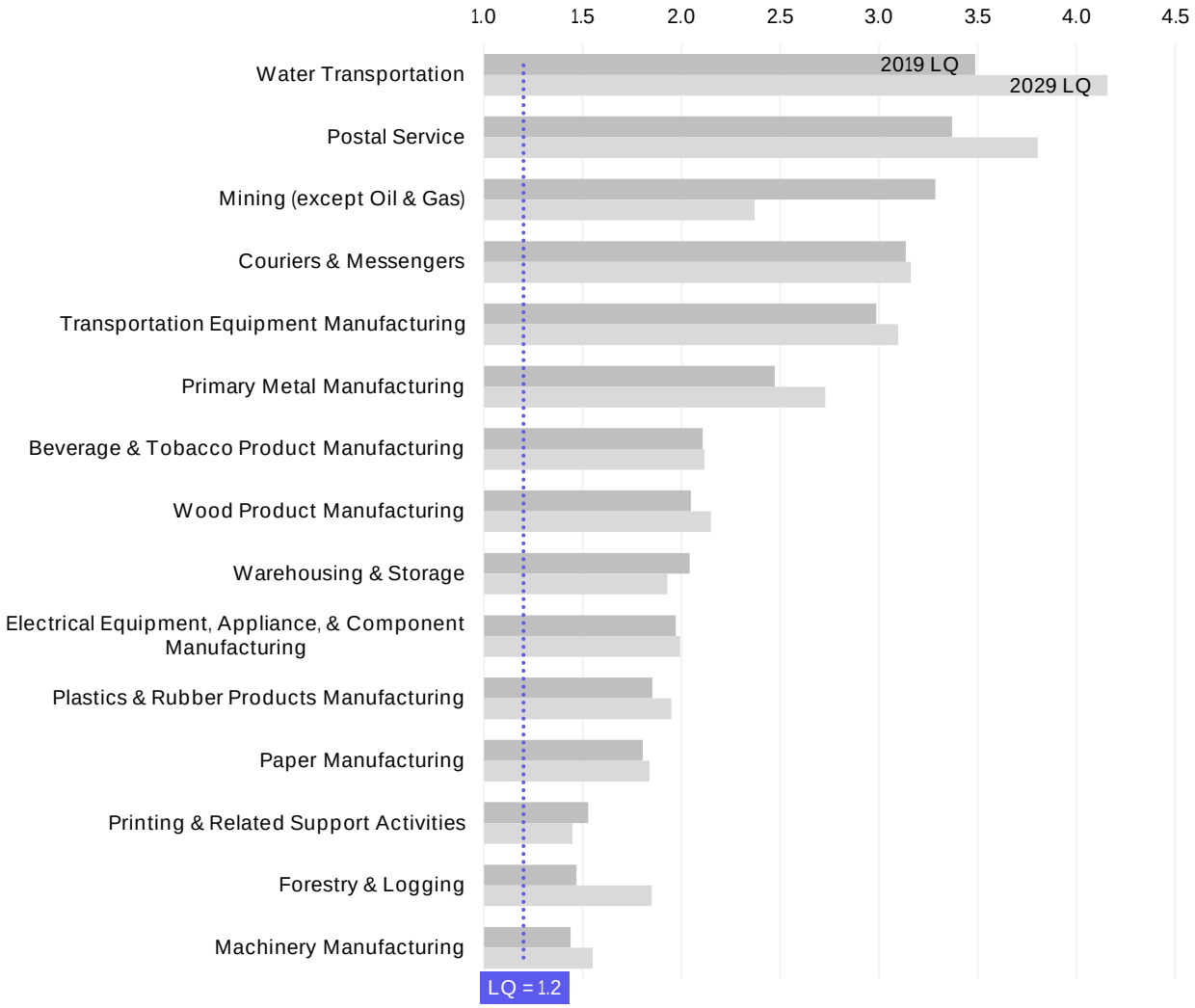


Source: Employees & Self-Employed 2019.4.

Employment Concentration

The employment concentration of the state's industry subsectors is measured by a location quotient (LQ). LQs are used to assess competitiveness by comparing the concentration of employment in an industry in Kentucky against the employment concentration for that same industry in the U.S. An LQ equal to 1.0 means that the percentage of total employment comprised by an industry in the state matches the percentage of total employment of that industry in the nation. An LQ greater than 1.0 means that the industry has a greater employment share relative to that of the U.S. High LQs, which are typically greater than 1.2, are an indication that Kentucky has a comparative advantage or specialization in an industry.

Figure 6.9: Employment Concentrations (LQs) of Kentucky's Top 15 Industry Subsectors, 2019 and 2029



Source: Employees & Self-Employed 2019.4.

Figure 6.9 shows the industry subsectors in Kentucky with the 15 highest LQs. The top-ranked industry subsectors are Water Transportation, with an LQ of 3.5 in 2019, followed by Postal Service, with an LQ of 3.4 in 2019. The two industry subsectors are expected to increase in employment concentration between 2019 and 2029 and will maintain their high employment concentrations in the state, with 2029 LQs about four times the U.S. share of jobs in those industry subsectors. As for 10-year growth, Forestry & Logging is projected to have the largest percent increase in LQ among the top 15 industry subsectors in the figure (25.9%) and will have a statewide LQ of 1.8. On the other hand, three industry subsectors are expected to drop in LQ between 2019 and 2029. The industry subsector with the largest percent decline is Mining (except Oil & Gas), with a 27.9% decrease from an LQ of 3.3 to an

LQ of 2.4. Despite the declines, all the state's top 15 industry subsectors will remain above the 1.2 high-LQ threshold, as indicated by the dotted line in the figure.

Highest Earners

Industry earnings are defined as total wages, salaries, supplements (such as additional employee benefits), and proprietor income. Workers in various industry subsectors see different average wages, so identifying Kentucky's top industries by their earnings is another method of evaluating an industry's strength. Table 6.1 shows the state's top 15 industry subsectors in descending order of 2018 earnings, as well as additional jobs data.

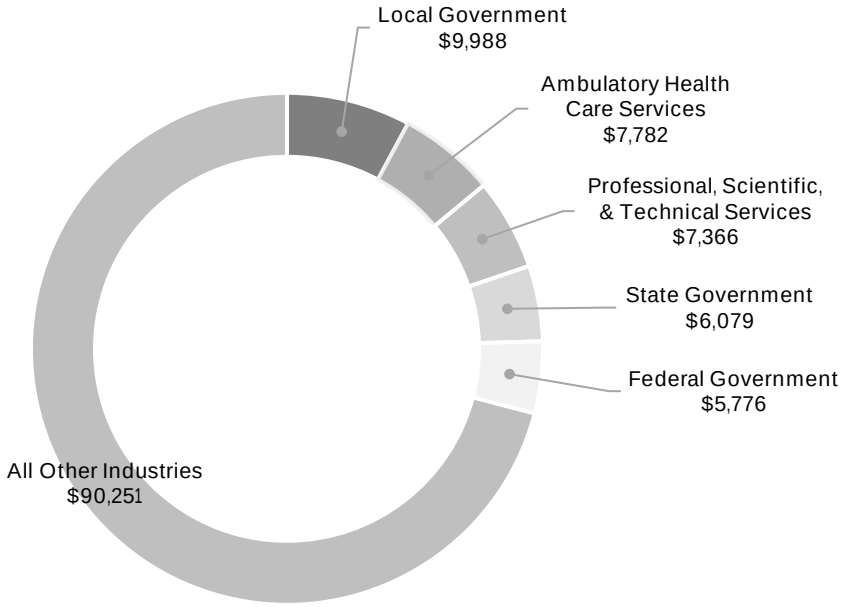
Local Government had the highest earnings in Kentucky ($10.0 billion), which accounted for eight percent of the state's total earnings ($127.2 billion). The next largest industry subsectors were Ambulatory Health Care Services, bringing in six percent of Kentucky's total earnings, followed by Professional, Scientific, & Technical Services, also with six percent of the state's total earnings. It could be argued that no one industry subsector accounted for a relatively large share of statewide earnings, as illustrated in Figure 6.10, an indication of Kentucky's economic diversity.

Table 6.1: Industry Subsector Earnings in Kentucky

NAICS TITLE	2018 EARNINGS (MILLIONS)	% EARNINGS	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE
Local Government	$9,988	7.8%	173,860	177,817	3,957	2.3%
Ambulatory Health Care Services	$7,782	6.1%	92,379	110,188	17,809	19.3%
Professional, Scientific, & Technical Services	$7,366	5.8%	87,830	98,981	11,151	12.7%
State Government	$6,079	4.8%	94,986	91,941	(3,045)	(3.2%)
Federal Government	$5,776	4.5%	79,291	73,976	(5,315)	(6.7%)
Hospitals	$5,239	4.1%	78,811	84,936	6,125	7.8%
Transportation Equipment Manufacturing	$5,221	4.1%	66,566	70,543	3,977	6.0%
Administrative & Support Services	$4,906	3.9%	125,066	139,854	14,788	11.8%
Specialty Trade Contractors	$4,246	3.3%	69,206	72,249	3,043	4.4%
Insurance Carriers & Related Activities	$3,677	2.9%	37,937	41,548	3,611	9.5%
Merchant Wholesalers, Durable Goods	$3,334	2.6%	41,775	46,890	5,115	12.2%
Food Services & Drinking Places	$3,242	2.5%	162,154	173,635	11,481	7.1%
Real Estate	$2,749	2.2%	17,753	18,808	1,055	5.9%
Management of Companies & Enterprises	$2,620	2.1%	19,997	19,762	(235)	(1.2%)
Credit Intermediation & Related Activities	$2,442	1.9%	33,971	35,050	1,079	3.2%
Couriers & Messengers	$2,291	1.5%	31,799	35,223	3,424	10.8%
Merchant Wholesalers, Nondurable Goods	$2,163	3.3%	29,967	30,790	823	2.7%
Truck Transportation	$2,038	1.2%	27,217	28,725	1,508	5.5%
Food Manufacturing	$1,733	1.6%	28,538	29,831	1,293	4.5%
Securities, Commodity Contracts, & Other Financial Investments & Related Activities	$1,684	0.9%	7,773	9,477	1,704	21.9%
Nursing & Residential Care Facilities	$1,666	0.9%	43,288	47,246	3,958	9.1%
Machinery Manufacturing	$1,537	1.2%	21,019	22,464	1,445	6.9%
Fabricated Metal Product Manufacturing	$1,518	1.2%	22,361	24,330	1,969	8.8%
Motor Vehicle & Parts Dealers	$1,515	1.2%	28,566	30,695	2,129	7.5%
Warehousing & Storage	$1,510	0.9%	30,793	35,859	5,066	16.5%
All Other Industries	$34,992	27.4%	667,043	701,083	34,039	5.1%
Total	$127,241	100.0%	2,119,945	2,251,900	131,954	6.2%

Source: Employees & Self-Employed 2019.4.

Figure 6.10: Kentucky's Top Five Industry Subsectors by Earnings (millions)



Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 6.11: Regional Earnings of Kentucky's Top Five Industry Subsectors

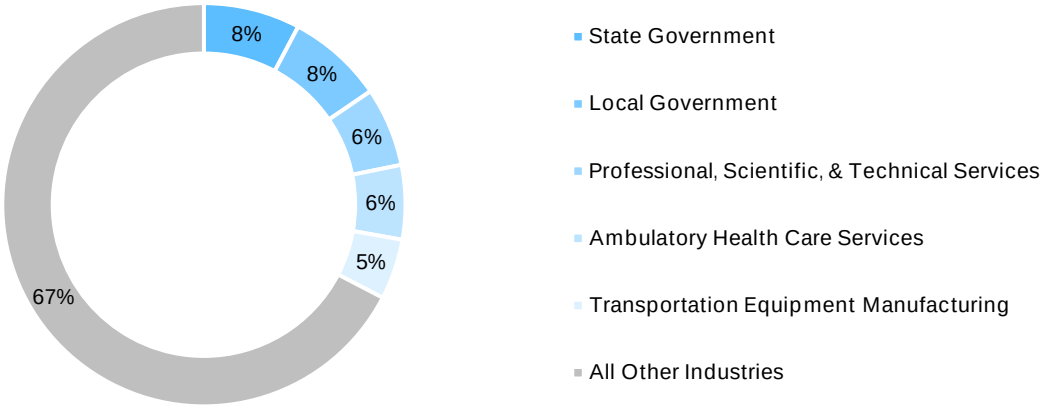
Source: Employees & Self-Employed 2019.4.

Table 6.2: Industry Subsector Earnings in the Central WPR

NAICS TITLE	2018 EARNINGS (MILLIONS)	% 2018 EARNINGS	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE
State Government	$3,585	7.8%	51,307	51,484	177	0.3%
Local Government	$3,574	7.7%	60,515	63,550	3,035	5.0%
Professional, Scientific, & Technical Services	$2,936	6.3%	33,035	38,036	5,001	15.1%
Ambulatory Health Care Services	$2,755	6.0%	30,230	37,237	7,007	23.2%
Transportation Equipment Manufacturing	$2,244	4.9%	27,528	28,167	639	2.3%
Federal Government	$2,085	4.5%	25,131	20,910	(4,221)	-16.8%
Administrative & Support Services	$1,876	4.1%	44,764	48,231	3,467	7.7%
Specialty Trade Contractors	$1,526	3.3%	24,529	26,350	1,821	7.4%
Food Services & Drinking Places	$1,252	2.7%	62,513	68,337	5,824	9.3%
Hospitals	$1,248	2.7%	20,531	22,199	1,668	8.1%
Merchant Wholesalers, Durable Goods	$1,235	2.7%	14,952	17,693	2,741	18.3%
Management of Companies & Enterprises	$1,087	2.4%	7,783	6,959	(824)	-10.6%
Real Estate	$1,070	2.3%	6,700	7,277	577	8.6%
Credit Intermediation & Related Activities	$859	1.9%	11,581	12,039	458	4.0%
Machinery Manufacturing	$814	1.8%	10,009	10,323	314	3.1%
All Other Industries	$18,106	39.1%	324,668	353,337	28,670	8.8%
Total	$46,254	100.0%	755,776	812,131	56,354	7.5%

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 6.12: Top Five Industry Subsectors by Percent Earnings in the Central WPR



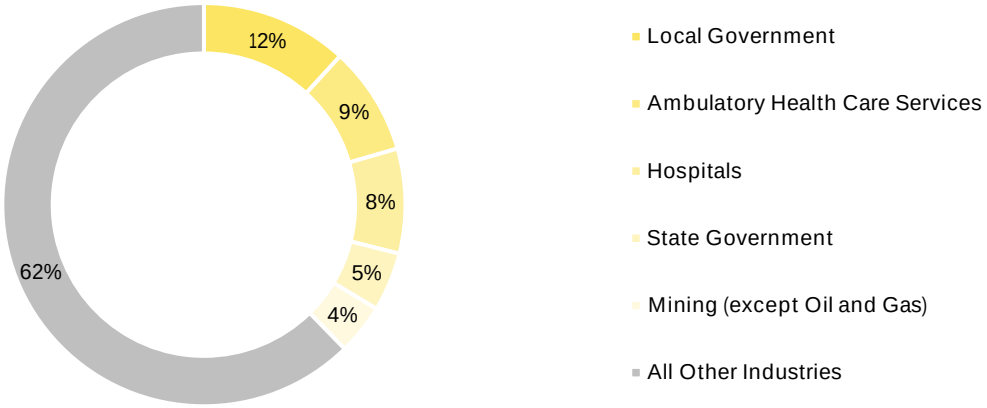
Source: Employees & Self-Employed 2019.4.

Table 6.3: Industry Subsector Earnings in the East WPR

NAICS TITLE	2018 EARNINGS ($ MILLIONS)	% 2018 EARNINGS	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE
Local Government	$1,234	11.8%	26,182	25,447	(735)	(2.8%)
Ambulatory Health Care Services	$908	8.7%	12,590	14,650	2,060	16.4%
Hospitals	$878	8.4%	12,742	13,435	693	5.4%
State Government	$494	4.7%	10,206	9,553	(653)	(6.4%)
Mining (except Oil & Gas)	$423	4.0%	4,323	2,427	(1,896)	(43.9%)
Professional, Scientific, & Technical Services	$390	3.7%	5,360	5,387	27	0.5%
Administrative & Support Services	$289	2.8%	6,897	7,804	907	13.2%
Federal Government	$288	2.8%	4,514	4,060	(454)	(10.1%)
Specialty Trade Contractors	$286	2.7%	5,510	5,513	3	0.1%
Food Services & Drinking Places	$266	2.5%	15,188	15,830	642	4.2%
Nursing & Residential Care Facilities	$227	2.2%	6,409	6,907	498	7.8%
Credit Intermediation & Related Activities	$211	2.0%	3,723	3,404	(319)	(8.6%)
General Merchandise Stores	$207	2.0%	7,234	7,087	(147)	(2.0%)
Petroleum & Coal Products Manufacturing	$185	1.8%	904	1,084	180	19.9%
Food Manufacturing	$165	1.6%	2,947	2,825	(122)	(4.1%)
All Other Industries	$3,995	38.2%	75,124	78,338	3,218	4.3%
Total	$10,445	100.0%	199,855	203,753	3,902	2.0%

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 6.13: Top Five Industry Subsectors by Percent Earnings in the East WPR



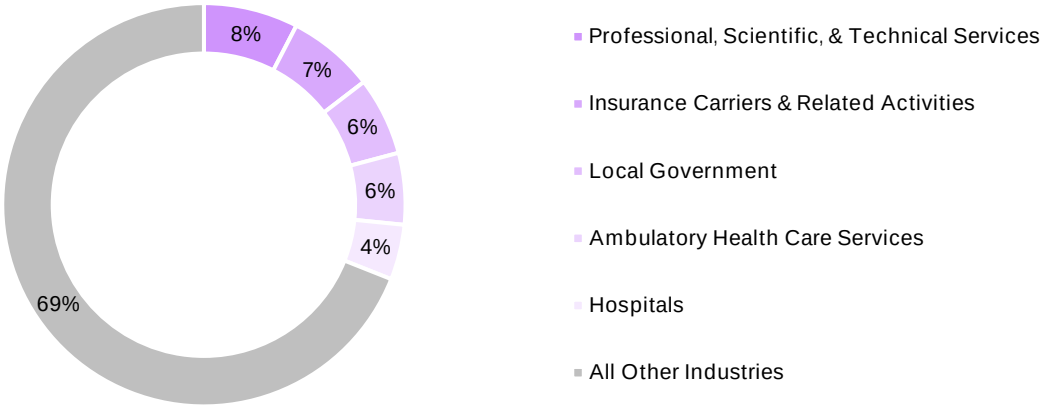
Source: Employees & Self-Employed 2019.4.

Table 6.4: Industry Subsector Earnings in the Kentuckiana LWA

NAICS TITLE	2018 EARNINGS ($ MILLIONS)	% 2018 EARNINGS	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE
Professional, Scientific, & Technical Services	$3,059	7.6%	31,540	34,866	3,326	10.5%
Insurance Carriers & Related Activities	$2,817	7.0%	25,585	28,462	2,877	11.2%
Local Government	$2,531	6.3%	35,563	37,423	1,860	5.2%
Ambulatory Health Care Services	$2,317	5.7%	25,478	28,644	3,166	12.4%
Hospitals	$1,785	4.4%	23,896	26,293	2,397	10.0%
Couriers & Messengers	$1,737	4.3%	20,304	20,756	452	2.2%
Transportation Equipment Manufacturing	$1,709	4.2%	19,335	21,058	1,723	8.9%
Administrative & Support Services	$1,690	4.2%	39,461	42,445	2,984	7.6%
Specialty Trade Contractors	$1,439	3.6%	20,284	21,324	1,040	5.1%
Merchant Wholesalers, Durable Goods	$1,430	3.5%	15,186	16,117	931	6.1%
Management of Companies & Enterprises	$1,187	2.9%	7,991	8,642	651	8.1%
State Government	$1,102	2.7%	15,431	14,198	(1,233)	-8.0%
Real Estate	$1,045	2.6%	6,238	6,224	(14)	-0.2%
Food Services & Drinking Places	$1,004	2.5%	43,681	46,093	2,412	5.5%
Federal Government	$822	2.0%	10,469	10,769	300	2.9%
All Other Industries	$14,651	36.3%	240,195	250,631	10,437	4.3%
Total	$40,325	100.0%	580,636	613,946	33,309	5.7%

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 6.14: Top Five Industry Subsectors by Percent Earnings in the Kentuckiana LWA



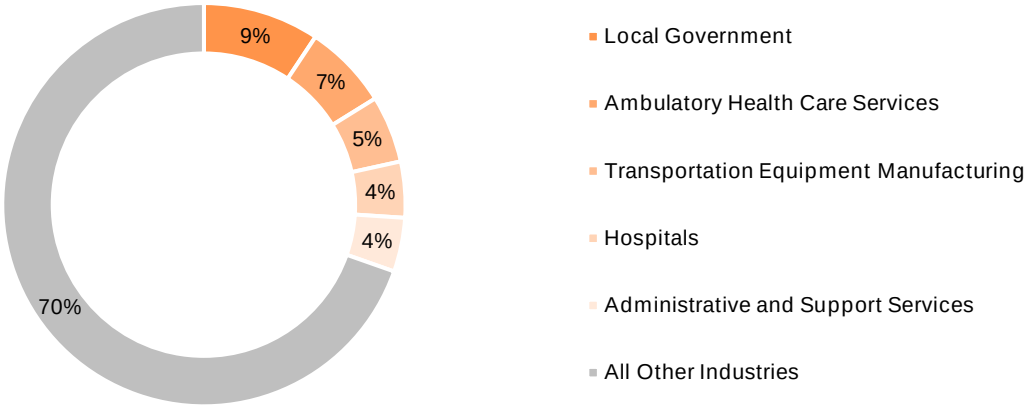
Source: Employees & Self-Employed 2019.4.

Table 6.5: Industry Subsector Earnings in the South WPR

NAICS TITLE	2018 EARNINGS ($ MILLIONS)	% 2018 EARNINGS	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE
Local Government	$1,243	9.3%	25,063	25,389	326	1.3%
Ambulatory Health Care Services	$909	6.8%	11,801	14,530	2,729	23.1%
Transportation Equipment Manufacturing	$717	5.4%	10,921	11,892	971	8.9%
Hospitals	$598	4.5%	10,681	11,847	1,166	10.9%
Administrative & Support Services	$577	4.3%	15,590	19,858	4,268	27.4%
Specialty Trade Contractors	$449	3.4%	8,327	8,822	495	5.9%
State Government	$442	3.3%	8,574	8,010	(564)	-6.6%
Professional, Scientific, & Technical Services	$392	2.9%	6,142	7,020	878	14.3%
Food Services & Drinking Places	$361	2.7%	20,107	22,122	2,015	10.0%
Truck Transportation	$351	2.6%	4,107	4,428	321	7.8%
Food Manufacturing	$292	2.2%	5,170	5,447	277	5.4%
Fabricated Metal Product Manufacturing	$282	2.1%	4,581	5,730	1,149	25.1%
Animal Production & Aquaculture	$250	1.9%	580	565	(15)	-2.6%
Plastics & Rubber Products Manufacturing	$250	1.9%	4,285	4,633	348	8.1%
Real Estate	$245	1.8%	1,615	1,728	113	7.0%
All Other Industries	$5,958	44.7%	120,424	128,866	8,438	7.0%
Total	$13,315	100.0%	257,968	280,887	22,915	8.9%

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 6.15: Top Five Industry Subsectors by Percent Earnings in the South WPR



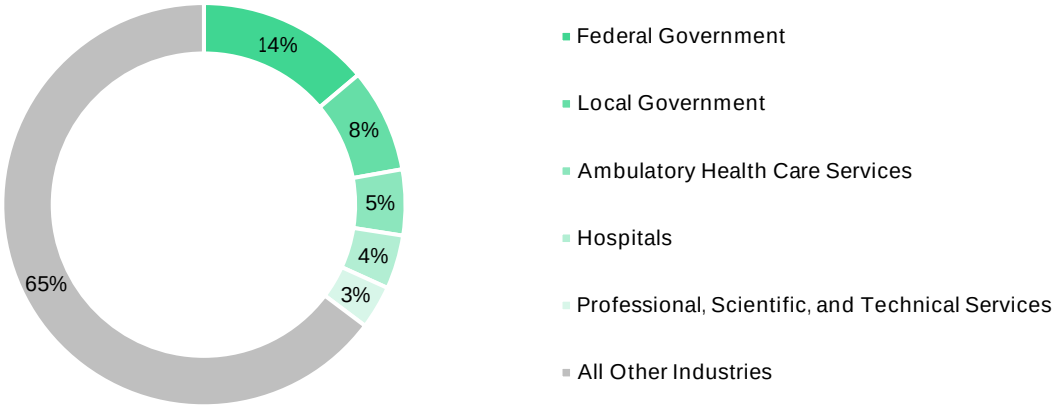
Numbers may not sum due to rounding. Source: Employees & Self-Employed 2019.4.

Table 6.6: Industry Subsector Earnings in the West WPR

NAICS TITLE	2018 EARNINGS ($ MILLIONS)	% 2018 EARNINGS	2019 JOBS	2029 JOBS	JOB CHANGE	% JOB CHANGE
Federal Government	$2,343	13.9%	34,431	33,321	(1,110)	(3.2%)
Local Government	$1,406	8.3%	26,418	25,757	(661)	(2.5%)
Ambulatory Health Care Services	$892	5.3%	11,228	13,537	2,309	20.6%
Hospitals	$730	4.3%	10,943	11,140	197	1.8%
Professional, Scientific, & Technical Services	$589	3.5%	7,661	8,756	1,095	14.3%
Specialty Trade Contractors	$546	3.2%	9,090	9,063	(27)	(0.3%)
Food Manufacturing	$488	2.9%	8,732	9,418	686	7.9%
Administrative & Support Services	$475	2.8%	12,907	15,125	2,218	17.2%
Primary Metal Manufacturing	$461	2.7%	4,745	4,541	(204)	(4.3%)
State Government	$455	2.7%	9,444	8,676	(768)	(8.1%)
Transportation Equipment Manufacturing	$434	2.6%	6,483	6,683	200	3.1%
Credit Intermediation & Related Activities	$385	2.3%	5,853	6,712	859	14.7%
Food Services & Drinking Places	$359	2.1%	20,312	20,964	652	3.2%
Chemical Manufacturing	$339	2.0%	3,074	3,074	0	0.0%
Merchant Wholesalers, Durable Goods	$298	1.8%	4,205	4,474	269	6.4%
All Other Industries	$6,702	39.7%	123,175	128,827	5,652	4.6%
Total	$16,902	100.0%	298,700	310,067	11,367	3.8%

Numbers may not sum due to rounding.
Source: Employees & Self-Employed 2019.4.

Figure 6.16: Top Five Industry Subsectors by Percent Earnings in the West WPR



Numbers may not sum due to rounding. Source: Employees & Self-Employed 2019.4.

Industry Diversity

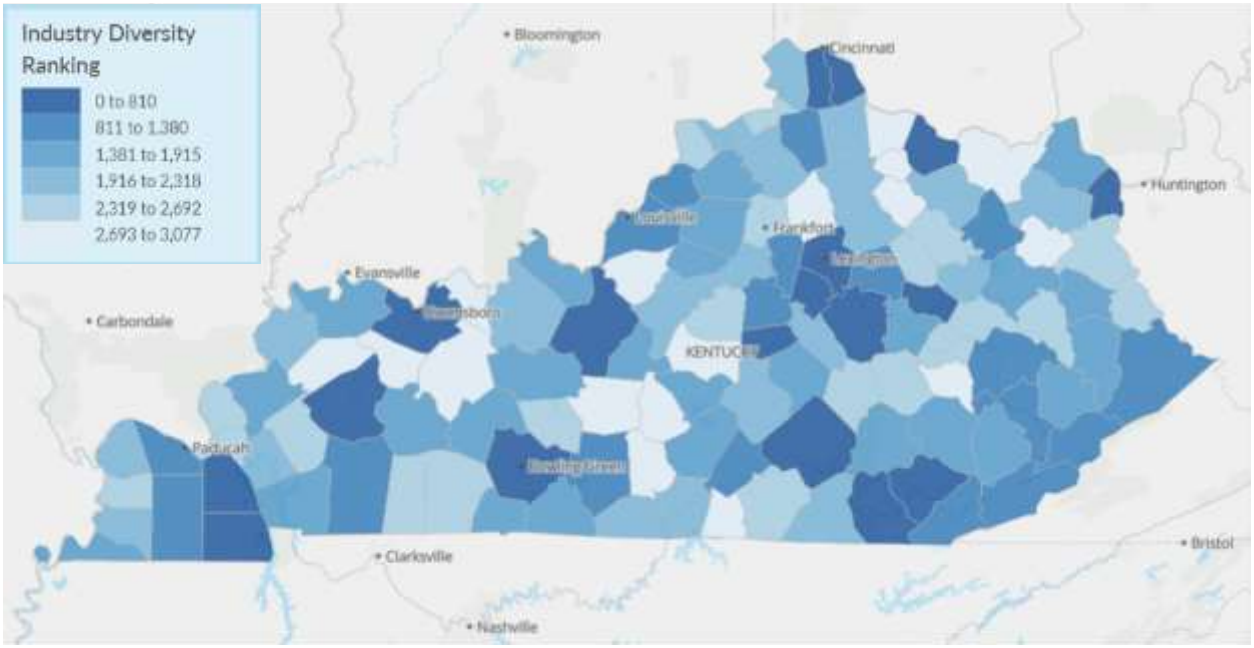
Emsi's definition of economic diversity and its ranking methodology come from C2ER.[22] These measures help quantify how jobs are distributed across groups of industries in Kentucky, compared to a typical region in the U.S. A region with high diversity can signal economic stability and more easily withstand economic pressures, whereas a region with low diversity can signal economic instability. Unlike the previous sections, in which industries are classified by their NAICS codes, industries in this section are grouped into clusters that are broadly similar on factors such as business inputs, outputs, and the technological or skill requirements necessary to perform the work customary to the industries. Grouping industries according to function can help to:

- Broadly characterize the economic roles an industry plays in its region;
- Provide insight into the economic relationships and similarities a place has with other regions;
- Identify factors that make regions comparatively better fits for certain economic activities; and
- Speak to the broader economic and demographic forces that are likely to impact a region's economic prospects.

As shown in Table 6.7, Kentucky has an industry diversity ranking of 35, which is in the 33rd percentile among the 50 states and the District of Columbia. Several counties in the state have high percentile ranks, as indicated by the choropleth map in Figure 6.17. Hancock County is among the least diverse counties in the U.S. (Table 6.8). Industry diversity means that regional employment is distributed more evenly between the 12 industry clusters compared to a typical MSA in the U.S. The table also identifies the largest industry cluster in each county and the state. In Kentucky, the Distributive Services industry cluster accounts for the greatest share of total employment. The cluster is comprised of Utilities (NAICS 22); Wholesale Trade (NAICS 42); Transportation & Warehousing (NAICS 48-49); Wired Telecommunication Carriers (NAICS 517110); Satellite Telecommunications (NAICS 517410); and Data Processing, Hosting, & Related Services (NAICS 518).

22 C2ER refers to the Council for Community & Economic Research.

Figure 6.17: Kentucky Counties by Industry Diversity Rankings



Source: Employees & Self-Employed 2019.4.

Table 6.7: Industry Diversity Rankings of the 10 Most Diverse Counties in Kentucky

COUNTY	INDUSTRY DIVERSITY RANK	INDUSTRY DIVERSITY PERCENTILE	LARGEST INDUSTRY CLUSTER	% JOBS IN INDUSTRY CLUSTER	TYPICAL % JOBS IN INDUSTRY CLUSTER
Fayette County	76	97.6%	Healthcare	8.4%	5.0%
Warren County	102	96.8%	Capital-Intensive Manufacturing	13.0%	5.3%
Boyle County	145	95.4%	Capital-Intensive Manufacturing	9.6%	5.3%
Knox County	190	94.0%	Capital-Intensive Manufacturing	10.5%	5.3%
Kenton County	212	93.3%	Healthcare	8.1%	5.0%
Madison County	237	92.5%	Higher Education	11.4%	3.3%
Hardin County	291	90.8%	Government	10.7%	3.2%
Mason County	295	90.6%	Capital-Intensive Manufacturing	8.9%	5.3%
Boyd County	312	90.1%	Healthcare	10.8%	5.0%
Campbell County	378	88.0%	Higher Education	7.2%	3.3%
Kentucky	35	33.3%	Distributive Services	10.0%	8.3%

Source: Employees & Self-Employed 2019.4.

Table 6.8: Industry Diversity Rankings of the 10 Least Diverse Counties in Kentucky

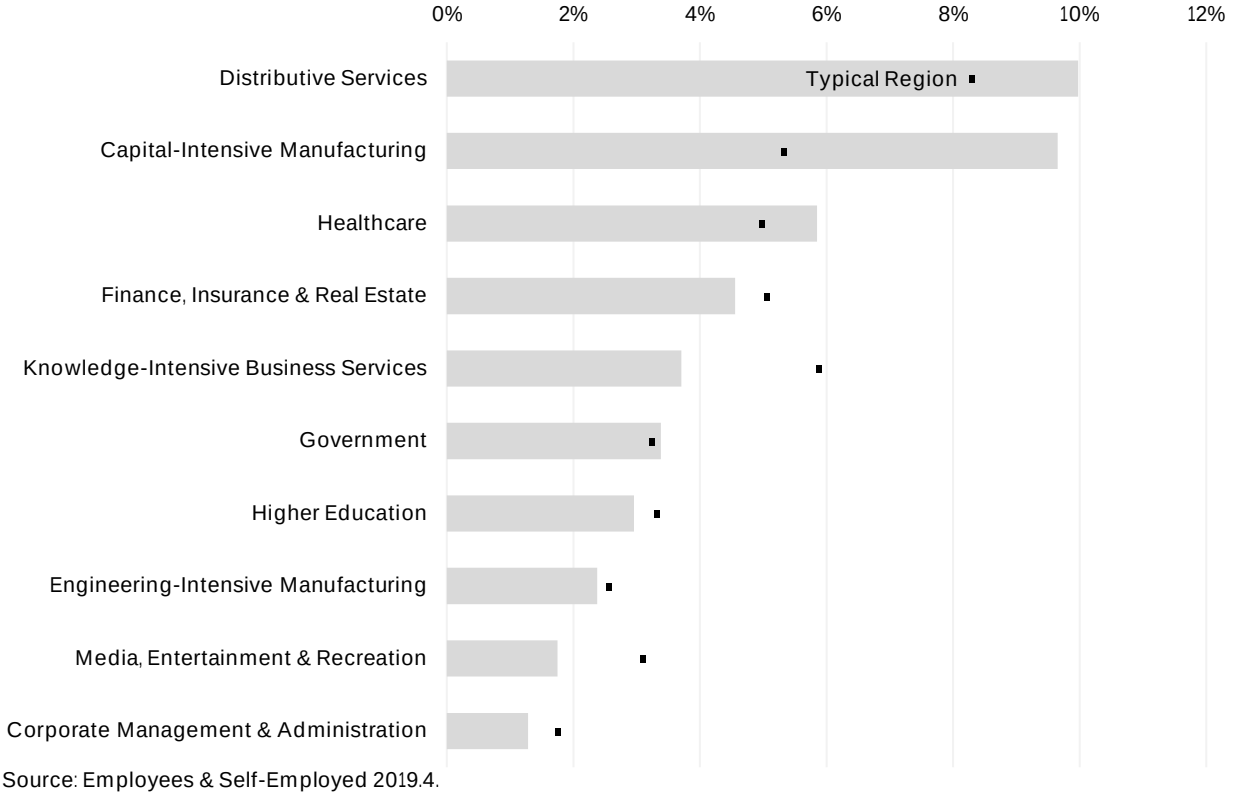
COUNTY	INDUSTRY DIVERSITY RANK	INDUSTRY DIVERSITY PERCENTILE	LARGEST INDUSTRY CLUSTER	% JOBS IN INDUSTRY CLUSTER	TYPICAL % JOBS IN INDUSTRY CLUSTER
Hancock County	3,077	2.1%	Capital-Intensive Manufacturing	61.8%	5.3%
Robertson County	2,980	5.2%	Healthcare	19.3%	5.0%
Elliott County	2,965	5.6%	Government	29.5%	3.2%
Hart County	2,905	7.5%	Capital-Intensive Manufacturing	43.8%	5.3%
McLean County	2,887	8.1%	Agriculture & Natural Resource Extraction	28.8%	1.6%
Bullitt County	2,860	9.0%	Distributive Services	32.8%	8.3%
Nicholas County	2,832	9.9%	Healthcare	7.9%	5.0%
Scott County	2,821	10.2%	Capital-Intensive Manufacturing	37.3%	5.3%
Green County	2,816	10.4%	Healthcare	14.8%	5.0%
Marion County	2,755	12.3%	Capital-Intensive Manufacturing	41.1%	5.3%
Kentucky	35	33.3%	Distributive Services	10.0%	8.3%

Source: Employees & Self-Employed 2019.4.

Furthermore, Figure 6.18 shows the employment shares of the 11 functional industry clusters in Kentucky, with a dot representing the industry cluster's typical share of employment in the

U.S. In an effort to focus on the economic base of the region, non-functional industries or industries that often serve local populations, such as retail, trade, personal services, doctor's offices, local government, and construction, are excluded from the diversity analysis. Distributive Services employs the largest share of people in the region (10.0%), followed by jobs in Capital-Intensive Manufacturing (9.7%). A typical region in the U.S. employs 8.2% and 5.3% of its people in the two industry clusters, respectively.

Figure 6.18: Industry Diversity of Kentucky by Industry Cluster with Comparison to a Typical Region



Source: Employees & Self-Employed 2019.4.

OCCUPATIONS OF REGIONAL RESIDENTS

This section combines occupational data with employment information on Kentucky residents. Essentially, the data identify the occupational groups that the state's programs should be targeting based upon the jobs of its residents. The final results, which appear in Tables 6.9 and 6.10, show which occupational groups are undersupplied or oversupplied by the state's residents, respectively. As for the source of the data, the number of jobs within an occupation is based on Emsi's industry data and staffing patterns, and Emsi uses data from LEHD Origin-Destination Employment Statistics (LODES) to determine how many Kentucky residents are employed in the state's occupations. Specifically, the LODES originate from

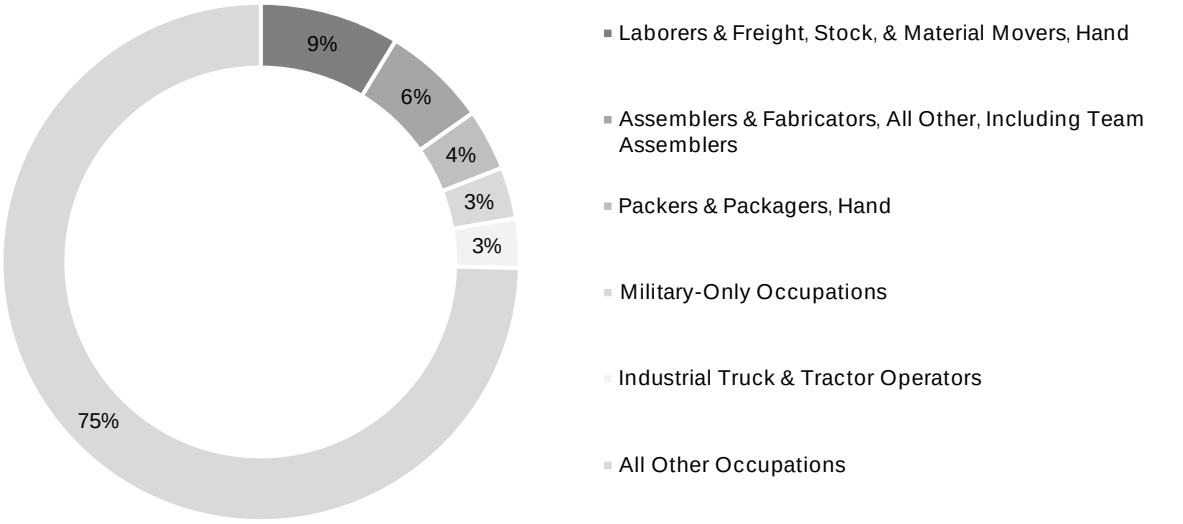
Origin and Destination (OD) data, Regional Area Characteristics (RAC), and Workforce Area Characteristics (WAC).

Table 6.9: Top 15 Occupations by Net In-Commuters for Jobs in Kentucky

SOC CODE	SOC TITLE	2019 NET IN-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
53-7062	Laborers & Freight, Stock, & Material Movers, Hand	2,753	57,955	60,708	65,859	5,151
51-2098	Assemblers & Fabricators, All Other, Including Team Assemblers	2,064	57,485	59,549	56,635	(2,914)
53-7064	Packers & Packagers, Hand	1,210	13,638	14,848	15,897	1,049
55-9999	Military-Only Occupations	1,015	21,363	22,378	21,371	(1,007)
53-7051	Industrial Truck & Tractor Operators	974	13,024	13,998	15,309	1,311
53-3033	Light Truck or Delivery Services Drivers	761	16,145	16,906	19,044	2,138
51-9111	Packaging & Filling Machine Operators & Tenders	572	9,591	10,163	10,580	417
35-2014	Cooks, Restaurant	448	19,767	20,215	21,700	1,485
49-3011	Aircraft Mechanics & Service Technicians	436	3,782	4,218	4,403	185
43-5081	Stock Clerks & Order Fillers	364	30,079	30,443	32,030	1,587
53-1048	First-line Supervisors of Transportation & Material Moving Workers, Except Aircraft Cargo Handling Supervisors	320	7,349	7,669	8,404	735
53-2011	Airline Pilots, Copilots, & Flight Engineers	301	3,126	3,427	2,758	(669)
43-4171	Receptionists & Information Clerks	272	17,091	17,363	18,523	1,160
43-5011	Cargo & Freight Agents	269	2,798	3,067	3,450	383
45-2092	Farmworkers & Laborers, Crop, Nursery, & Greenhouse	260	5,513	5,773	6,354	581

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.19: Top Five Occupations by Net In-Commuters for Jobs in Kentucky



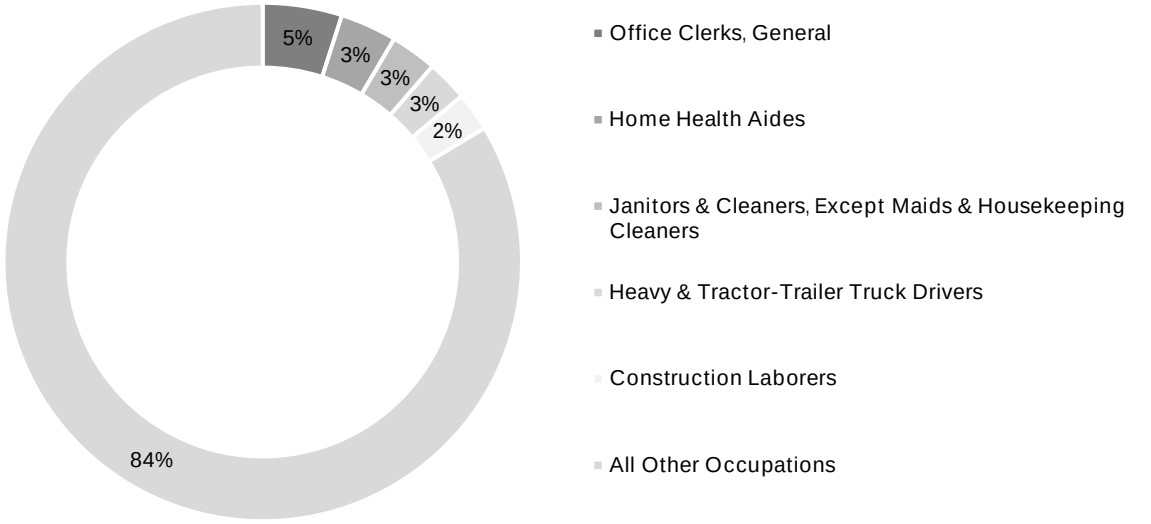
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.10: Top 15 Occupations by Net Out-Commuters for Jobs in Kentucky

SOC CODE	SOC TITLE	2019 NET OUT-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
43-9061	Office Clerks, General	(763)	42,291	41,528	41,732	204
31-1011	Home Health Aides	(545)	4,145	3,600	5,104	1,504
37-2011	Janitors & Cleaners, Except Maids & Housekeeping Cleaners	(447)	31,527	31,080	34,445	3,365
53-3032	Heavy & Tractor-Trailer Truck Drivers	(396)	29,849	29,453	32,057	2,604
47-2061	Construction Laborers	(372)	16,998	16,626	17,968	1,342
29-2061	Licensed Practical & Licensed Vocational Nurses	(365)	10,445	10,080	10,632	552
47-2073	Operating Engineers & Other Construction Equipment Operators	(335)	5,755	5,420	5,663	243
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical, & Executive	(334)	30,383	30,049	29,049	(1,000)
35-3022	Counter Attendants, Cafeteria, Food Concession, & Coffee Shop	(287)	2,918	2,631	2,938	307
15-1121	Computer Systems Analysts	(280)	4,917	4,637	5,066	429
41-3021	Insurance Sales Agents	(278)	10,462	10,184	10,956	772
25-9041	Teacher Assistants	(271)	17,392	17,121	17,950	829
51-4072	Molding, Coremaking, & Casting Machine Setters, Operators, & Tenders, Metal & Plastic	(265)	3,431	3,166	3,109	(57)
13-1199	Business Operations Specialists, All Other	(261)	10,316	10,055	10,935	880
13-1161	Market Research Analysts & Marketing Specialists	(246)	5,325	5,079	6,335	1,256

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.20: Top Five Occupations by Net Out-Commuters for Jobs in Kentucky



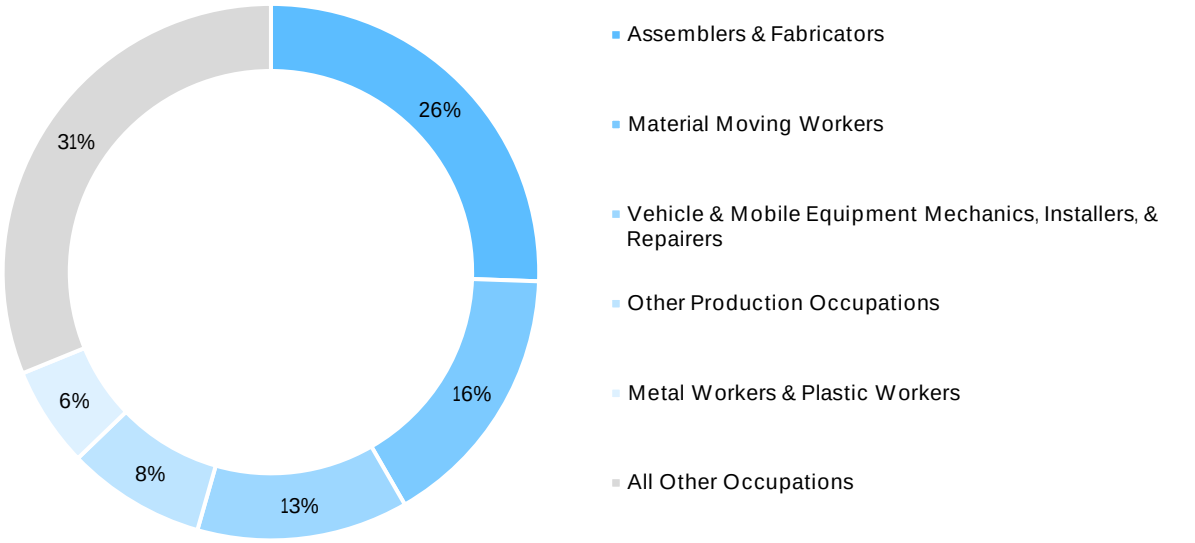
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.11: Top 15 Occupational Groups by Net In-Commuters for Jobs in the Central WPR

SOC CODE	SOC TITLE	2019 NET IN-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
51-2000	Assemblers & Fabricators	1,325	27,245	28,570	26,017	(2,553)
53-7000	Material Moving Workers	837	34,752	35,589	40,417	4,828
49-3000	Vehicle & Mobile Equipment Mechanics, Installers, & Repairers	661	10,204	10,865	11,814	949
51-9000	Other Production Occupations	434	17,848	18,282	19,119	837
51-4000	Metal Workers & Plastic Workers	314	14,683	14,997	15,695	698
45-2000	Agricultural Workers	265	4,804	5,069	5,221	152
47-5000	Extraction Workers	165	620	785	821	36
25-9000	Other Education, Training, & Library Occupations	155	9,295	9,450	9,860	410
53-2000	Air Transportation Workers	125	1,835	1,960	1,048	(912)
11-9000	Other Management Occupations	117	17,866	17,983	18,491	508
51-6000	Textile, Apparel, & Furnishings Workers	85	3,061	3,146	3,195	49
47-3000	Helpers, Construction Trades	85	1,024	1,109	1,245	136
25-4000	Librarians, Curators, & Archivists	83	1,666	1,749	1,854	105
39-7000	Tour & Travel Guides	63	371	434	551	117
53-6000	Other Transportation Workers	61	1,933	1,994	2,191	197

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.21: Top Five Occupational Groups by Net In-Commuters for Jobs in the Central WPR



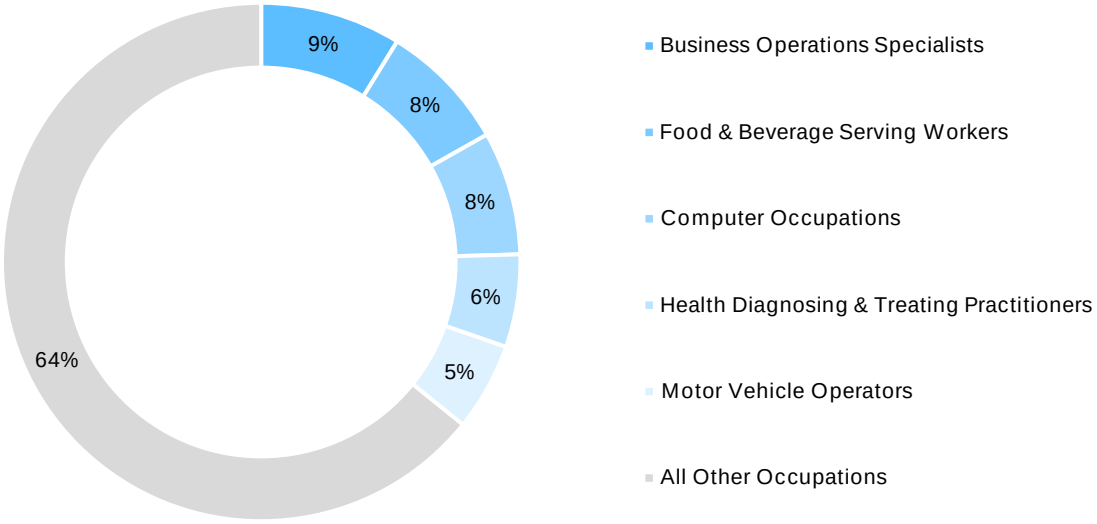
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.12: Top 15 Occupational Groups by Net Out-Commuters for Jobs in the Central WPR

SOC CODE	SOC TITLE	2019 NET OUT-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
13-1000	Business Operations Specialists	(1,998)	20,621	18,623	20,386	1,763
35-3000	Food & Beverage Serving Workers	(1,823)	41,413	39,590	43,836	4,246
15-1100	Computer Occupations	(1,751)	13,533	11,782	12,821	1,039
29-1000	Health Diagnosing & Treating Practitioners	(1,315)	26,976	25,661	29,548	3,887
53-3000	Motor Vehicle Operators	(1,246)	21,878	20,632	23,416	2,784
43-9000	Other Office & Administrative Support Workers	(1,005)	20,095	19,090	19,309	219
43-3000	Financial Clerks	(894)	14,697	13,803	14,479	676
33-9000	Other Protective Service Workers	(775)	6,100	5,325	5,814	489
41-3000	Sales Representatives, Services	(676)	9,207	8,531	9,379	848
13-2000	Financial Specialists	(666)	12,997	12,331	13,121	790
35-9000	Other Food Preparation & Serving Related Workers	(663)	4,735	4,072	4,439	367
11-3000	Operations Specialties Managers	(642)	8,643	8,001	8,813	812
37-2000	Building Cleaning & Pest Control Workers	(540)	17,991	17,451	19,483	2,032
43-5000	Material Recording, Scheduling, Dispatching, & Distributing Workers	(503)	22,230	21,727	23,640	1,913

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.22: Top Five Occupational Groups by Net Out-Commuters for Jobs in the Central WPR



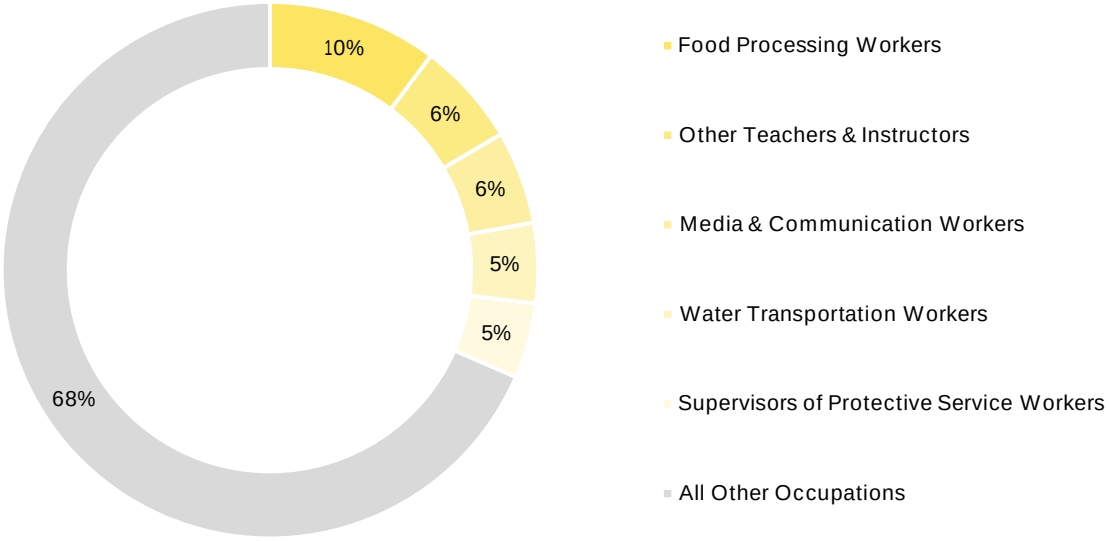
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.13: Top 15 Occupational Groups by Net In-Commuters for Jobs in the East WPR

SOC CODE	SOC TITLE	2019 NET IN-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	JOBS	CHANGE
51-3000	Food Processing Workers	186	1,289	1,475	1,482	7
25-3000	Other Teachers & Instructors	114	1,088	1,202	1,209	7
27-3000	Media & Communication Workers	102	359	461	488	27
53-5000	Water Transportation Workers	88	109	197	243	46
33-1000	Supervisors of Protective Service Workers	82	367	449	435	(14)
19-1000	Life Scientists	75	173	248	244	(4)
23-2000	Legal Support Workers	70	352	422	416	(6)
39-3000	Entertainment Attendants & Related Workers	67	265	332	373	41
27-4000	Media & Communication Equipment Workers	66	122	188	188	0
17-3000	Drafters, Engineering Technicians, & Mapping Technicians	66	702	768	736	(32)
39-4000	Funeral Service Workers	64	267	331	333	2
19-4000	Life, Physical, & Social Science Technicians	64	137	201	200	(1)
23-1000	Lawyers, Judges, & Related Workers	58	874	932	924	(8)
41-9000	Other Sales & Related Workers	54	704	758	770	12
53-6000	Other Transportation Workers	54	254	308	312	4

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.23: Top Five Occupational Groups by Net In-Commuters for Jobs in the East WPR



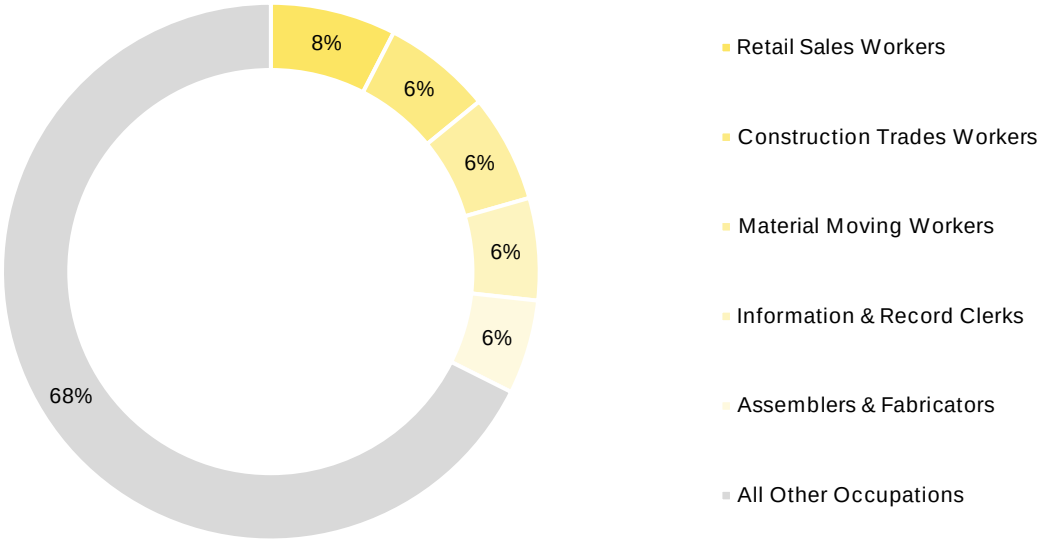
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.14: Top 15 Occupational Groups by Net Out-Commuters for Jobs in the East WPR

SOC CODE	SOC TITLE	2019 NET OUT-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
41-2000	Retail Sales Workers	(1,788)	15,676	13,888	13,604	(284)
47-2000	Construction Trades Workers	(1,550)	9,636	8,086	8,052	(34)
53-7000	Material Moving Workers	(1,533)	7,617	6,084	6,082	(2)
43-4000	Information & Record Clerks	(1,455)	7,379	5,924	6,025	101
51-2000	Assemblers & Fabricators	(1,341)	3,949	2,608	2,531	(77)
43-9000	Other Office & Administrative Support Workers	(1,003)	5,269	4,266	4,135	(131)
53-3000	Motor Vehicle Operators	(979)	7,713	6,734	6,504	(230)
35-3000	Food & Beverage Serving Workers	(906)	11,455	10,549	11,118	569
43-5000	Material Recording, Scheduling, Dispatching, & Distributing Workers	(848)	5,756	4,908	4,726	(182)
55-9000	Military-only occupations	(819)	1,771	952	939	(13)
43-6000	Secretaries & Administrative Assistants	(730)	5,355	4,625	4,399	(226)
39-9000	Other Personal Care & Service Workers	(694)	6,349	5,655	6,827	1,172
29-1000	Health Diagnosing & Treating Practitioners	(666)	10,624	9,958	10,963	1,005
51-9000	Other Production Occupations	(650)	3,610	2,960	3,096	136
49-9000	Other Installation, Maintenance, & Repair Occupations	(645)	5,622	4,977	4,924	(53)

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.24: Top Five Occupational Groups by Net Out-Commuters for Jobs in the East WPR



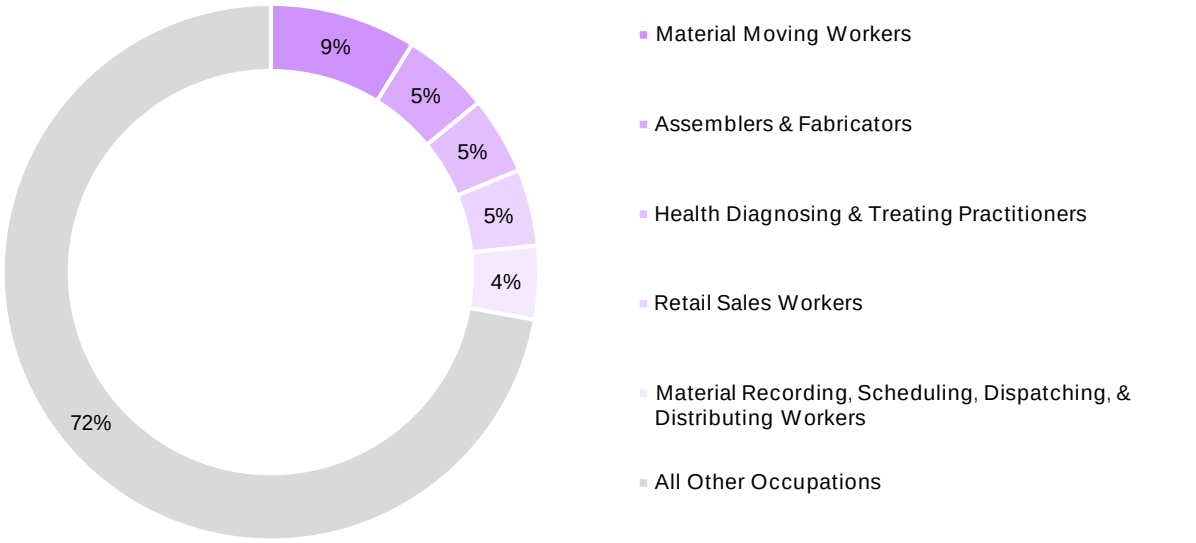
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.15: Top 15 Occupational Groups by Net In-Commuters for Jobs in the Kentuckiana LWA

SOC CODE	SOC TITLE	2019 NET IN-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
53-7000	Material Moving Workers	5,611	27,601	33,212	35,418	2,206
51-2000	Assemblers & Fabricators	3,343	14,964	18,307	18,462	155
29-1000	Health Diagnosing & Treating Practitioners	2,978	19,988	22,966	25,575	2,609
41-2000	Retail Sales Workers	2,940	26,146	29,086	29,458	372
43-5000	Material Recording, Scheduling, Dispatching, & Distributing Workers	2,813	15,607	18,420	19,039	619
35-3000	Food & Beverage Serving Workers	2,789	24,697	27,486	29,481	1,995
43-4000	Information & Record Clerks	2,772	23,227	25,999	26,945	946
13-1000	Business Operations Specialists	2,493	16,325	18,818	20,504	1,686
47-2000	Construction Trades Workers	2,118	15,354	17,472	18,191	719
15-1100	Computer Occupations	1,997	12,679	14,676	16,692	2,016
53-3000	Motor Vehicle Operators	1,901	17,572	19,473	20,795	1,322
49-9000	Other Installation, Maintenance, & Repair Occupations	1,578	11,584	13,162	13,986	824
43-9000	Other Office & Administrative Support Workers	1,509	14,639	16,148	16,312	164
11-1000	Top Executives	1,493	9,630	11,123	11,753	630
51-9000	Other Production Occupations	1,443	10,883	12,326	12,141	(185)

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.25: Top Five Occupational Groups by Net In-Commuters for Jobs in the Kentuckiana LWA



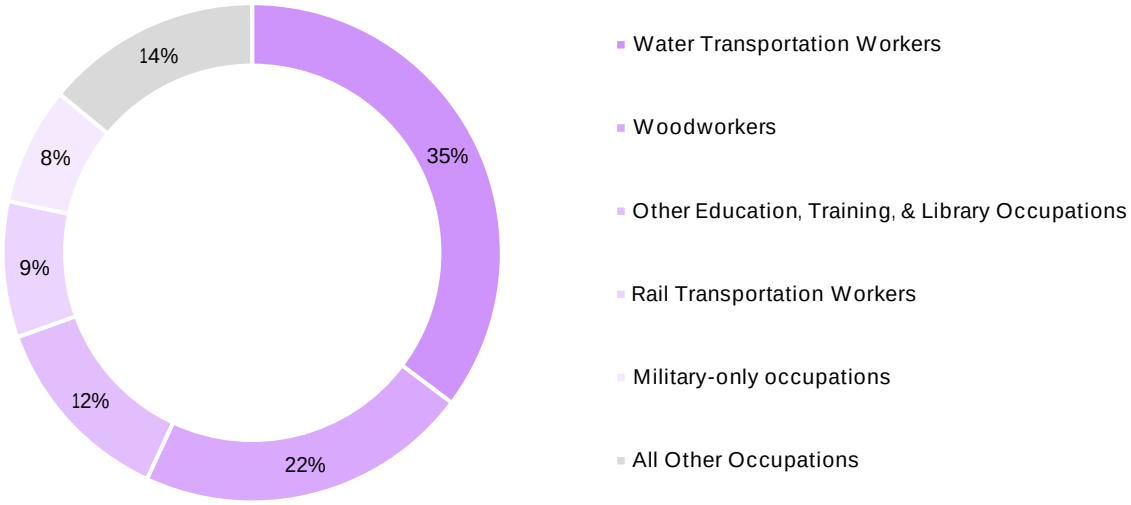
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.16: Top 15 Occupational Groups by Net Out-Commuters for Jobs in the Kentuckiana LWA

SOC CODE	SOC TITLE	2019 NET OUT-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
53-5000	Water Transportation Workers	(244)	619	375	369	(6)
51-7000	Woodworkers	(150)	529	379	412	33
25-9000	Other Education, Training, & Library Occupations	(87)	3,858	3,771	4,020	249
53-4000	Rail Transportation Workers	(61)	361	300	292	(8)
55-9000	Military-only occupations	(53)	1,745	1,692	1,822	130
39-4000	Funeral Service Workers	(30)	201	171	196	25
39-7000	Tour & Travel Guides	(22)	99	77	93	16
29-9000	Other Healthcare Practitioners & Technical Occupations	(21)	459	438	496	58
25-4000	Librarians, Curators, & Archivists	(20)	463	443	478	35
43-2000	Communications Equipment Operators	(4)	302	298	270	(28)

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.26: Top Five Occupational Groups by Net Out-Commuters for Jobs in the Kentuckiana LWA



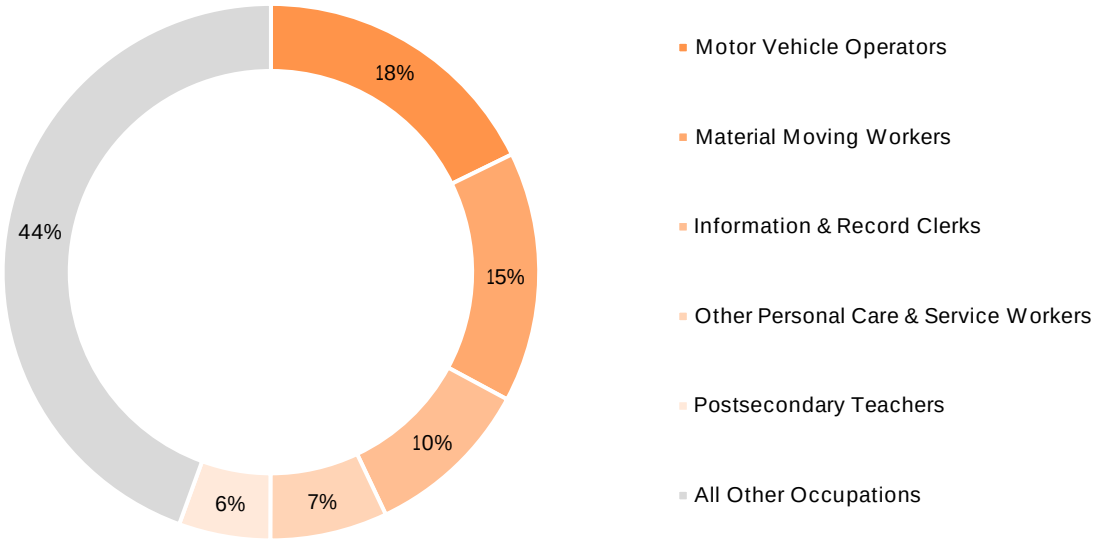
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.17: Top 15 Occupational Groups by Net In-Commuters for Jobs in the South WPR

SOC CODE	SOC TITLE	2019 NET IN-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
53-3000	Motor Vehicle Operators	454	9,666	10,120	10,863	743
53-7000	Material Moving Workers	386	12,550	12,936	13,363	427
43-4000	Information & Record Clerks	258	10,052	10,310	12,176	1,866
39-9000	Other Personal Care & Service Workers	181	7,653	7,834	9,568	1,734
25-1000	Postsecondary Teachers	141	2,266	2,407	2,494	87
53-1000	Supervisors of Transportation & Material Moving Workers	139	1,109	1,248	1,271	23
53-6000	Other Transportation Workers	105	545	650	739	89
45-2000	Agricultural Workers	93	1,604	1,697	1,880	183
49-3000	Vehicle & Mobile Equipment Mechanics, Installers, & Repairers	85	3,614	3,699	4,111	412
27-3000	Media & Communication Workers	62	633	695	737	42
43-3000	Financial Clerks	59	5,148	5,207	5,599	392
27-4000	Media & Communication Equipment Workers	47	221	268	289	21
43-2000	Communications Equipment Operators	43	241	284	292	8
47-5000	Extraction Workers	38	202	240	231	(9)
23-2000	Legal Support Workers	38	321	359	403	44

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.27: Top Five Occupational Groups by Net In-Commuters for Jobs in the South WPR



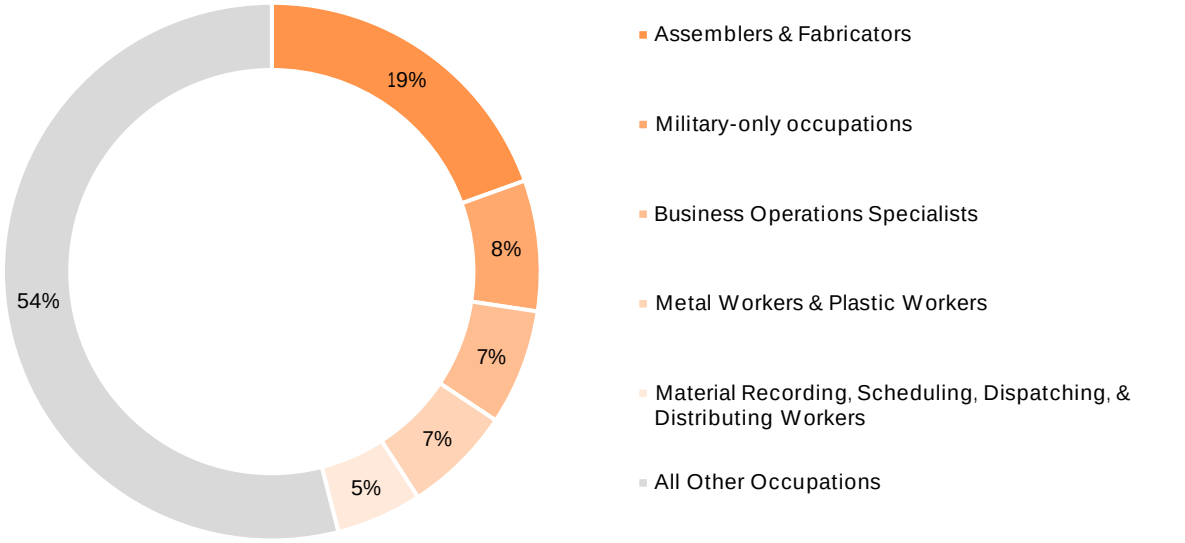
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.18: Top 15 Occupational Groups by Net Out-Commuters for Jobs in the South WPR

SOC CODE	SOC TITLE	2019 NET OUT-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
51-2000	Assemblers & Fabricators	(1,227)	8,537	7,310	7,106	(204)
55-9000	Military-only occupations	(495)	1,460	965	1,029	64
13-1000	Business Operations Specialists	(438)	4,247	3,809	4,480	671
51-4000	Metal Workers & Plastic Workers	(410)	7,727	7,317	8,138	821
43-5000	Material Recording, Scheduling, Dispatching, & Distributing Workers	(325)	7,226	6,901	7,202	301
35-3000	Food & Beverage Serving Workers	(266)	12,989	12,723	14,196	1,473
41-4000	Sales Representatives, Wholesale & Manufacturing	(206)	1,973	1,767	2,062	295
43-6000	Secretaries & Administrative Assistants	(189)	5,001	4,812	4,864	52
11-1000	Top Executives	(183)	3,888	3,705	4,152	447
11-3000	Operations Specialties Managers	(164)	2,079	1,915	2,211	296
25-2000	Preschool, Primary, Secondary, & Special Education School Teachers	(154)	7,869	7,715	7,917	202
15-1100	Computer Occupations	(154)	2,413	2,259	2,661	402
51-1000	Supervisors of Production Workers	(136)	2,050	1,914	2,112	198
33-3000	Law Enforcement Workers	(135)	2,149	2,014	2,005	(9)
17-2000	Engineers	(125)	1,805	1,680	1,969	289

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.28: Top Five Occupational Groups by Net Out-Commuters for Jobs in the South WPR



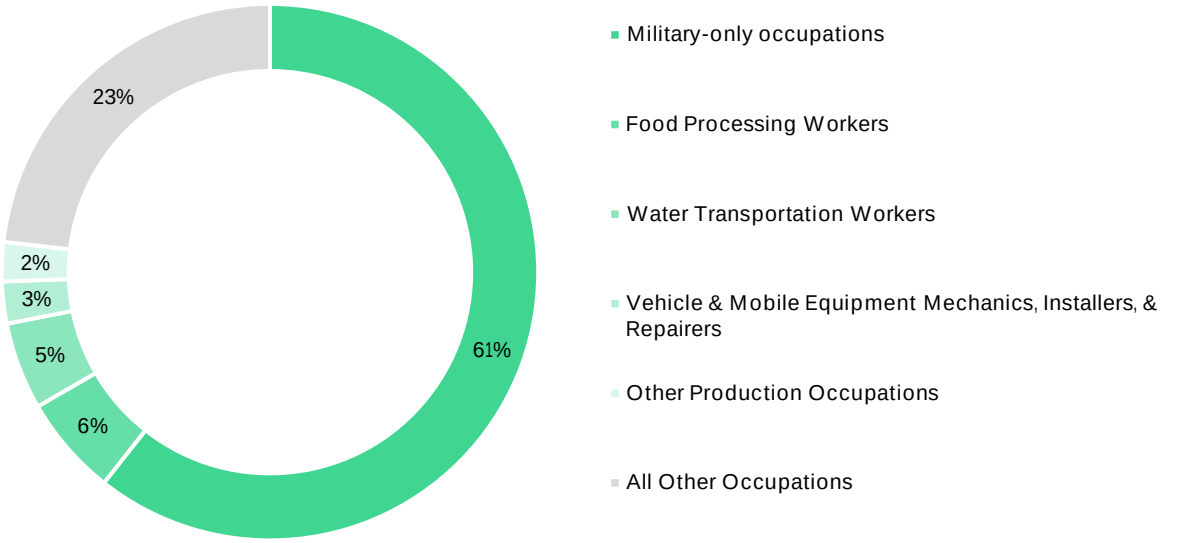
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.19: Top 15 Occupational Groups by Net In-Commuters for Jobs in the West WPR

SOC CODE	SOC TITLE	2019 NET IN-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
55-9000	Military-only occupations	2,543	12,109	14,652	14,773	121
51-3000	Food Processing Workers	253	3,218	3,471	3,700	229
53-5000	Water Transportation Workers	221	2,067	2,288	2,915	627
49-3000	Vehicle & Mobile Equipment Mechanics, Installers, & Repairers	106	5,289	5,395	5,452	57
51-9000	Other Production Occupations	99	8,296	8,395	8,599	204
53-2000	Air Transportation Workers	95	1,171	1,266	1,254	(12)
33-3000	Law Enforcement Workers	91	3,343	3,434	3,233	(201)
53-3000	Motor Vehicle Operators	89	9,213	9,302	9,776	474
41-9000	Other Sales & Related Workers	87	999	1,086	1,136	50
43-3000	Financial Clerks	84	6,044	6,128	6,275	147
25-3000	Other Teachers & Instructors	44	1,693	1,737	1,817	80
47-3000	Helpers, Construction Trades	44	290	334	339	5
51-7000	Woodworkers	44	831	875	889	14
45-2000	Agricultural Workers	43	2,528	2,571	2,905	334
19-1000	Life Scientists	41	246	287	307	20

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.29: Top Five Occupational Groups by Net In-Commuters for Jobs in the West WPR



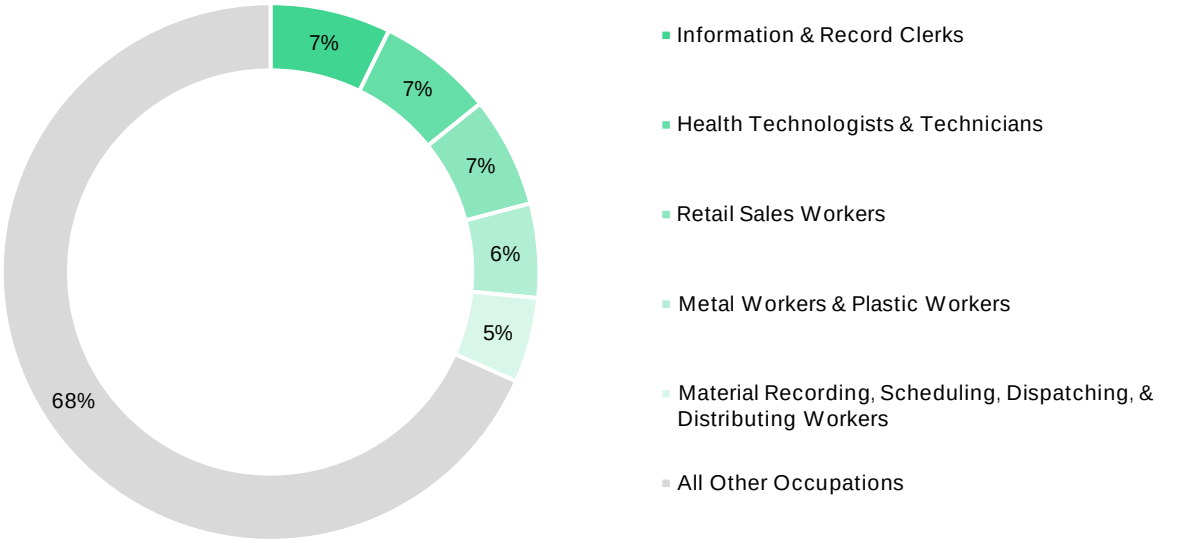
Source: Emsi Employees & Self-Employed 2019.4.

Table 6.20: Top 15 Occupational Groups by Net Out-Commuters for Jobs in Kentucky's West WPR

SOC CODE	SOC TITLE	2019 NET OUT-COMMUTERS	2019 RESIDENT WORKERS	2019 JOBS	2029 JOBS	JOB CHANGE
43-4000	Information & Record Clerks	(556)	8,897	8,341	8,877	536
29-2000	Health Technologists & Technicians	(534)	6,175	5,641	6,008	367
41-2000	Retail Sales Workers	(510)	16,887	16,377	16,705	328
51-4000	Metal Workers & Plastic Workers	(434)	6,527	6,093	6,367	274
43-5000	Material Recording, Scheduling, Dispatching, & Distributing Workers	(392)	7,454	7,062	7,245	183
29-1000	Health Diagnosing & Treating Practitioners	(343)	11,476	11,133	11,755	622
35-3000	Food & Beverage Serving Workers	(331)	14,854	14,523	15,114	591
51-2000	Assemblers & Fabricators	(310)	6,802	6,492	6,193	(299)
41-3000	Sales Representatives, Services	(309)	2,290	1,981	2,273	292
11-1000	Top Executives	(261)	4,541	4,280	4,606	326
35-2000	Cooks & Food Preparation Workers	(248)	6,085	5,837	5,840	3
43-6000	Secretaries & Administrative Assistants	(231)	5,496	5,265	5,079	(186)
31-1000	Nursing, Psychiatric, & Home Health Aides	(225)	4,331	4,106	4,128	22
15-1100	Computer Occupations	(207)	2,754	2,547	3,007	460
13-1000	Business Operations Specialists	(206)	5,731	5,525	5,997	472

Source: Emsi Employees & Self-Employed 2019.4.

Figure 6.30: Top Five Occupational Groups by Net Out-Commuters for Jobs in Kentucky's West WPR



Source: Emsi Employees & Self-Employed 2019.4.

UNEMPLOYMENT

Unemployment data identify areas in which skills may not match with the state's current employment opportunities or where colleges and universities could provide appropriate training programs best suited to transitioning unemployed workers into in-demand occupations. The tables and figures in this section present total monthly unemployment in Kentucky as the number of people unemployed by two-digit industry sectors and by two-digit occupational groups.[23]

Emsi industry- and occupation-specific unemployment estimates are derived from several federal sources. They are Characteristics of the Insured Unemployed (CIU) at the Department of Labor, Employment, & Training Administration; Local Area Unemployment Statistics (LAUS) from the Bureau of Labor Statistics (BLS); and the Current Population Survey (CPS) at the Census. Emsi final industry and occupation data, as well as state-specific data, are also used. The numbers and percentages reflect monthly estimates (July 2019) and follow the same methodology as federal statistical agencies. The unemployment rate is not provided because it is difficult to accurately determine the size of the labor force in an

23 Industry data reported elsewhere in the analysis are at the three-digit NAICS code level, referred to as industry subsectors. Occupation data reported elsewhere are also at a more detailed level, simply referred to as occupations at the six-digit SOC code level.

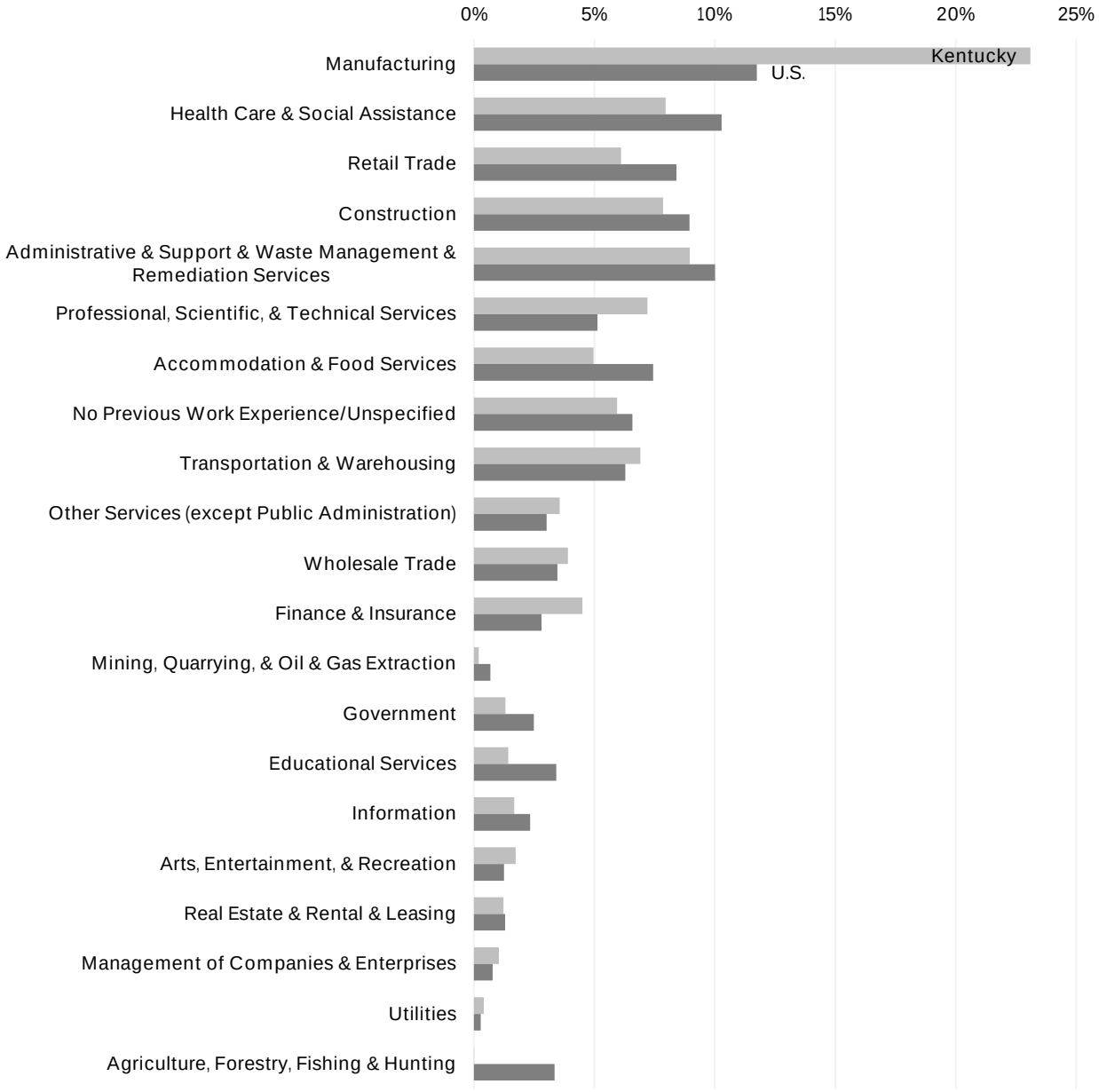
industry or occupation every month. In this section, rather than the unemployment rate, the percent of all unemployed workers in Kentucky and U.S. are provided.

Table 6.21: Monthly Unemployed Workers by Industry Sector in Kentucky with National Comparison

NAICS CODE	NAICS TITLE	KY UNEMPLOYED	KY % UNEMPLOYED	U.S. % UNEMPLOYED
31	Manufacturing	28,997	23.1%	11.7%
62	Health Care & Social Assistance	10,131	8.0%	10.3%
44	Retail Trade	8,376	6.1%	8.4%
23	Construction	8,055	7.9%	9.0%
56	Administrative & Support & Waste Management & Remediation Services	7,702	9.0%	10.0%
54	Professional, Scientific, & Technical Services	5,821	7.2%	5.1%
72	Accommodation & Food Services	5,797	5.0%	7.4%
99	No Previous Work Experience/Unspecified	5,231	5.9%	6.6%
48	Transportation & Warehousing	4,404	6.9%	6.3%
81	Other Services (except Public Administration)	3,385	3.6%	3.0%
42	Wholesale Trade	3,358	3.9%	3.5%
52	Finance & Insurance	2,978	4.5%	2.8%
21	Mining, Quarrying, & Oil & Gas Extraction	2,618	0.2%	0.7%
90	Government	2,413	1.3%	2.5%
61	Educational Services	1,880	1.4%	3.4%
51	Information	1,494	1.7%	2.3%
71	Arts, Entertainment, & Recreation	1,422	1.7%	1.3%
53	Real Estate & Rental & Leasing	1,090	1.2%	1.3%
55	Management of Companies & Enterprises	746	1.0%	0.8%
22	Utilities	545	0.4%	0.3%
11	Agriculture, Forestry, Fishing & Hunting	61	<0.1%	3.4%

Source: Emsi Total Unemployment (July 2019).

Figure 6.31: Monthly Unemployed Workers by Industry Sector in Kentucky with National Comparison



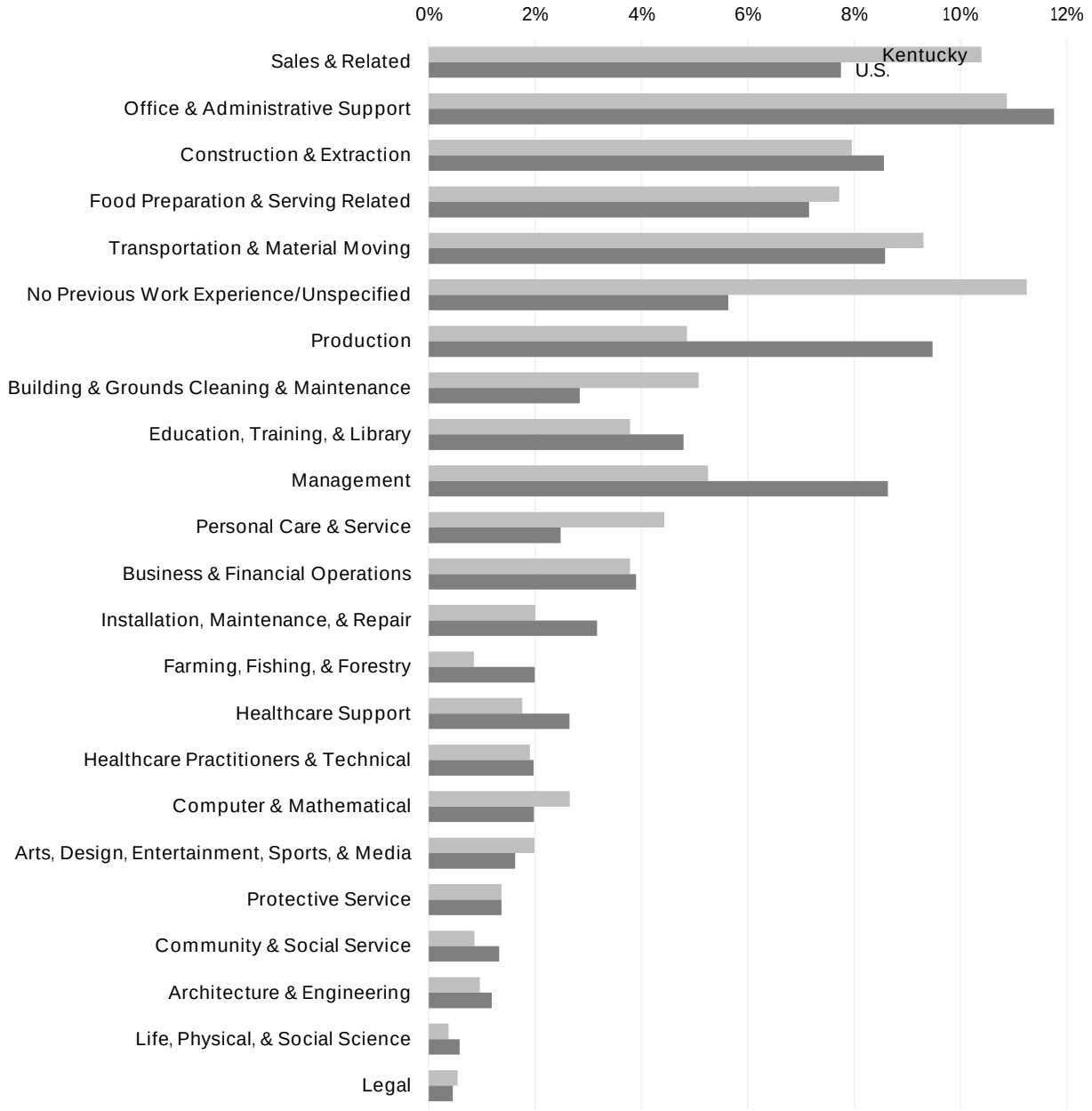
Source: Emsi Total Unemployment (July 2019).

Table 6.22: Monthly Unemployed Workers by Occupational Group in Kentucky with National Comparison

SOC CODE	SOC TITLE	KY UNEMPLOYED	KY % UNEMPLOYED	U.S. % UNEMPLOYED
41-0000	Sales & Related	11,360	10.4%	7.7%
43-0000	Office & Administrative Support	11,134	10.9%	11.8%
47-0000	Construction & Extraction	9,608	8.0%	8.6%
35-0000	Food Preparation & Serving Related	9,076	7.7%	7.1%
53-0000	Transportation & Material Moving	8,574	9.3%	8.6%
99-0000	No Previous Work Experience/Unspecified	8,412	11.2%	5.6%
51-0000	Production	6,244	4.9%	9.5%
37-0000	Building & Grounds Cleaning & Maintenance	5,901	5.1%	2.8%
25-0000	Education, Training, & Library	5,580	3.8%	4.8%
11-0000	Management	5,458	5.3%	8.6%
39-0000	Personal Care & Service	4,591	4.4%	2.5%
13-0000	Business & Financial Operations	3,075	3.8%	3.9%
49-0000	Installation, Maintenance, & Repair	2,349	2.0%	3.2%
45-0000	Farming, Fishing, & Forestry	2,336	0.9%	2.0%
31-0000	Healthcare Support	2,266	1.8%	2.6%
29-0000	Healthcare Practitioners & Technical	2,263	1.9%	2.0%
15-0000	Computer & Mathematical	1,690	2.7%	2.0%
27-0000	Arts, Design, Entertainment, Sports, & Media	1,683	2.0%	1.6%
33-0000	Protective Service	1,573	1.4%	1.4%
21-0000	Community & Social Service	1,129	0.9%	1.3%
17-0000	Architecture & Engineering	934	1.0%	1.2%
19-0000	Life, Physical, & Social Science	516	0.4%	0.6%
23-0000	Legal	515	0.5%	0.5%

Source: Emsi Total Unemployment (July 2019).

Figure 6.32: Unemployed Workers by Occupational Group in Kentucky with National Comparison



Source: Emsi Total Unemployment (July 2019).

POPULATION DEMOGRAPHICS

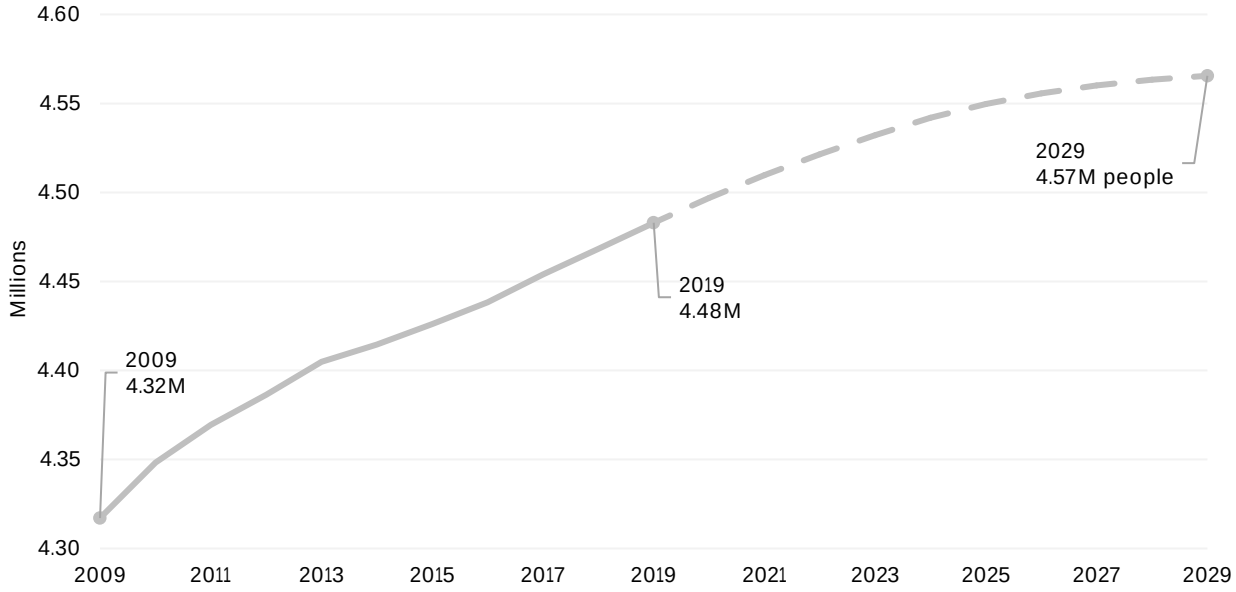
Population demographics can also be used to anticipate the future demands of a regional labor market. For example, it is important to know if employers are adding new jobs because they need more workers or if there is a significant need for workers to fill vacancies left by

retirees and those changing careers. Emsi's job openings reflect both job growth and replacement needs.

In this section, population data for the regions, state, and U.S. are shown, as well as race/ethnicity data for people 25 years and above living in Kentucky. The data are based on Emsi's demographic data and publicly available sources from state and federal agencies, including annual population estimates and population projections from the U.S. Census Bureau and birth and mortality rates from the U.S. Health Department. Demographic information relies on the annual results of the American Community Survey.

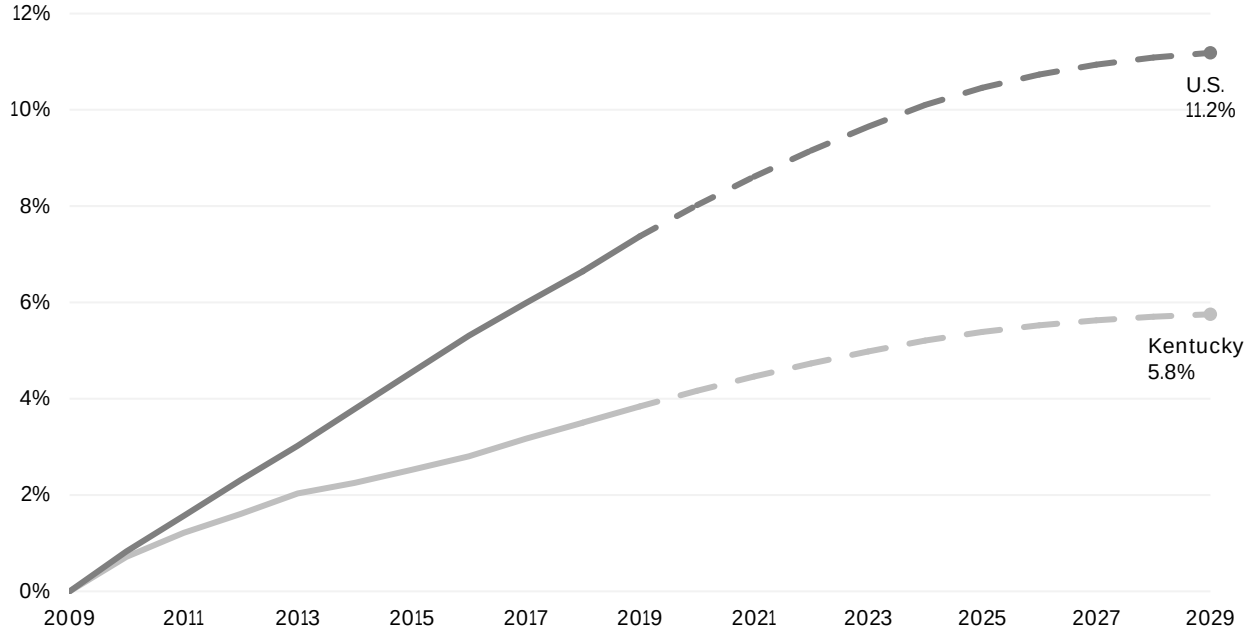
Historical and projected changes in the state population are presented in the following figures. In 2009, 4.3 million people lived in Kentucky, and 4.6 million people are projected to live in the state by 2029 (Figure 6.33). Using 2009 as the base year, this reflects a 5.8% growth rate (Figure 6.34). The U.S. population is projected to increase by 11.2% over the same 20-year period. Figure 6.35 shows the year-over-year changes in population, by percent, for the state and U.S., with projected growth rates for each of 0.3% and 0.6% from 2019 to 2020, respectively. Figures 6.36 through 6.38 display similar information, but for the Kentucky's WPRs and the Kentuckiana LWA.

Figure 6.33: Historical and Projected Population (millions) in Kentucky, 2009 to 2029



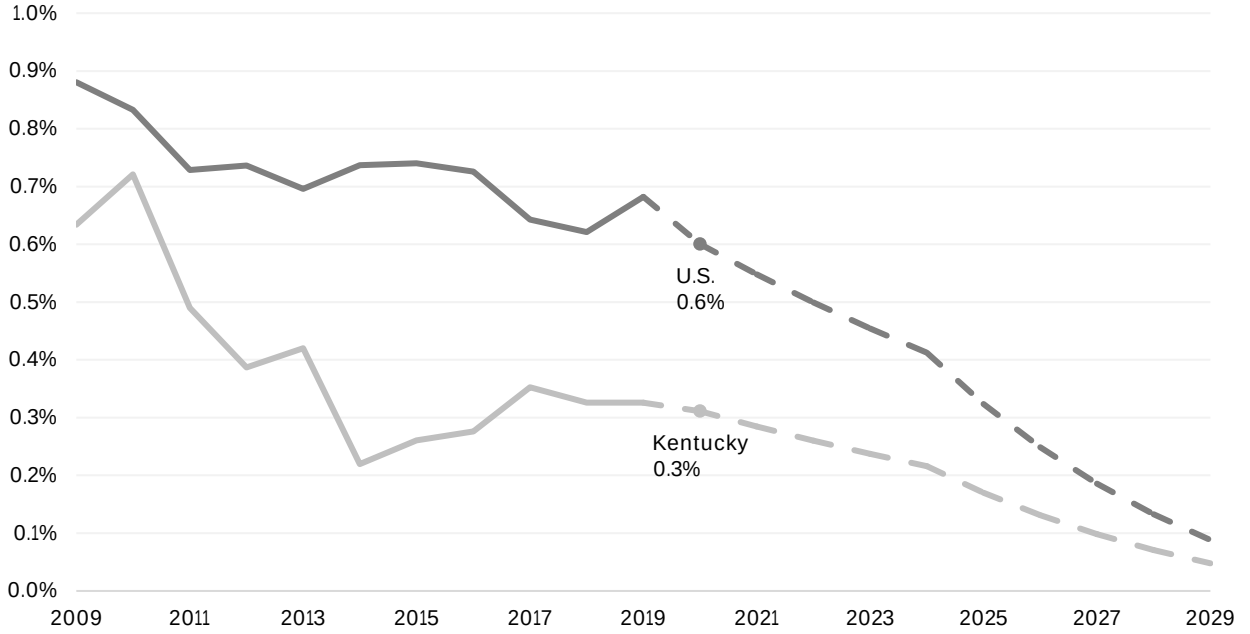
Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Figure 6.34: Percent Population Change in Kentucky and the U.S., 2009 to 2029



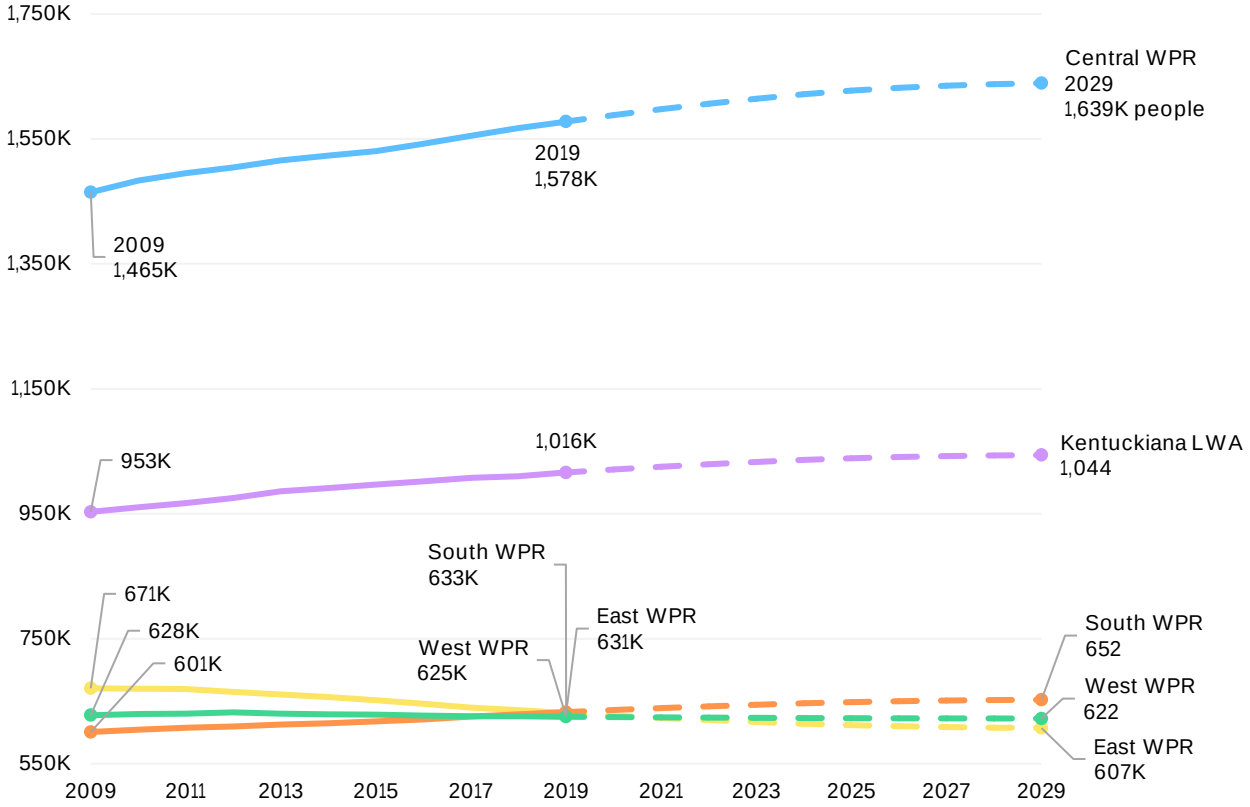
Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Figure 6.35: Annual Percent Population Change in Kentucky and the U.S., 2009 to 2029



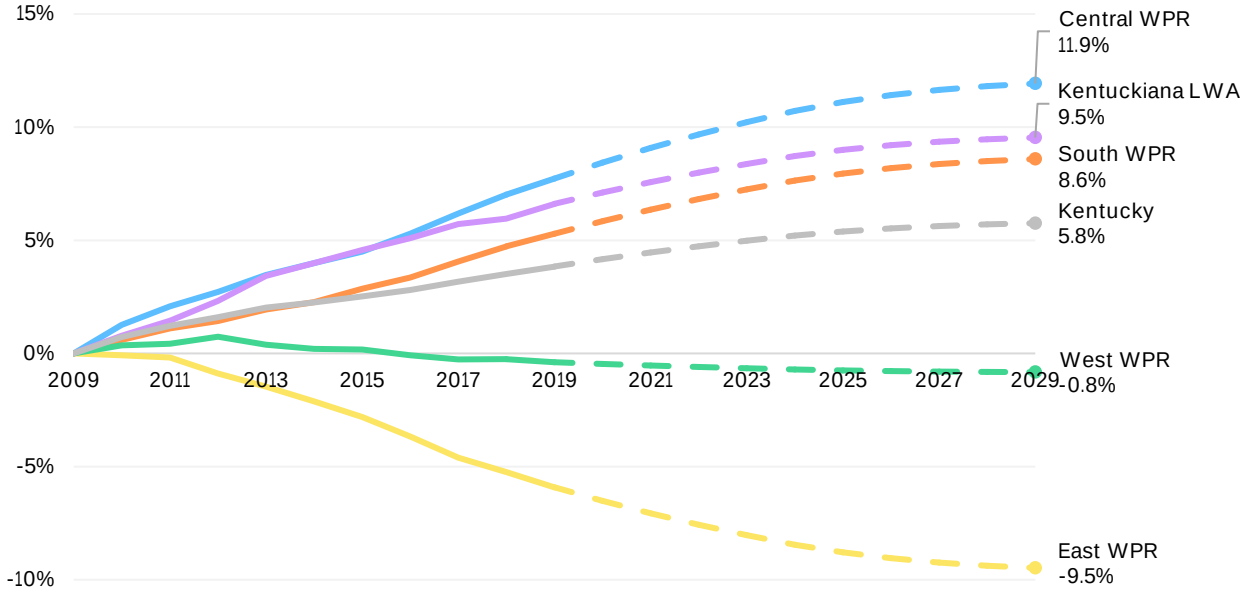
Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Figure 6.36: Historical and Projected Population (millions) in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



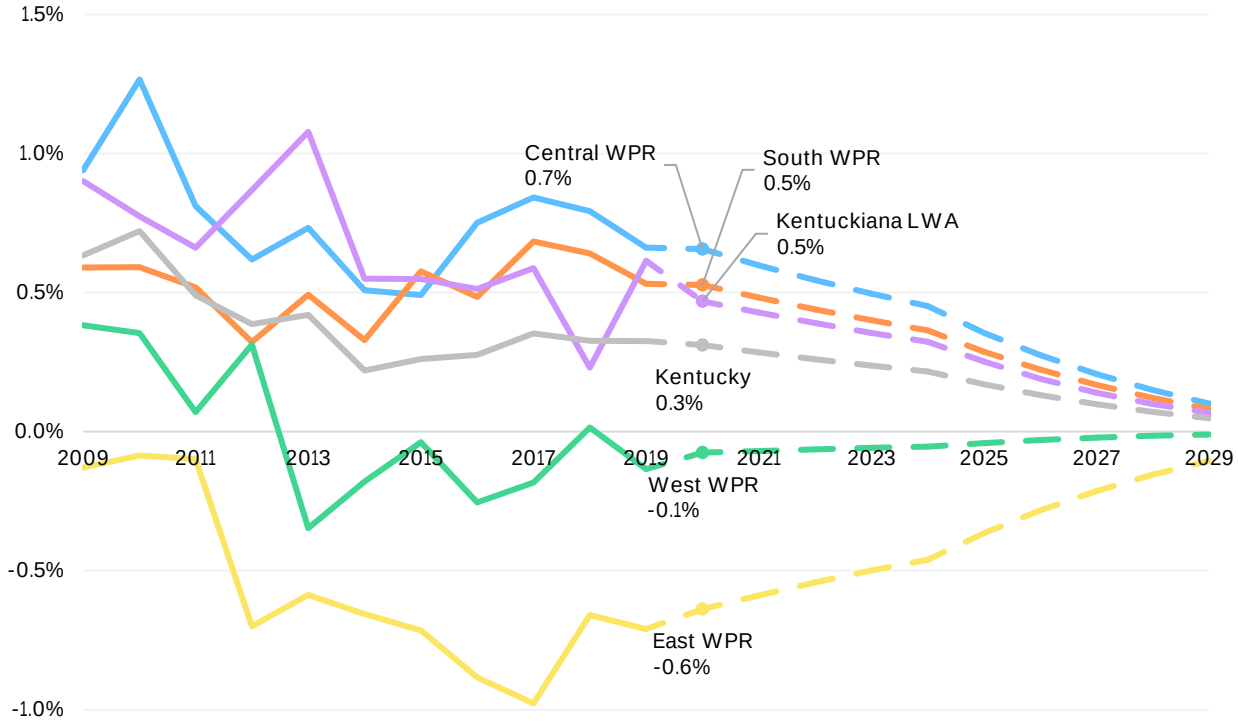
Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Figure 6.37: Percent Population Change in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

Figure 6.38: Annual Percent Population Change in Kentucky's WPRs and the Kentuckiana LWA, 2009 to 2029



Source: Emsi demographics data, U.S. Census Bureau, U.S. Health Department.

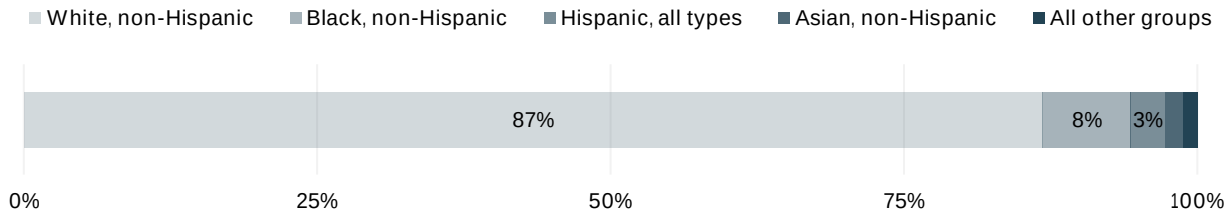
Table 6.23 and Figure 6.39 present additional data on the state's population, emphasizing people 25 years and above, referred to as adults, by the Census' seven major race and ethnic groups. As shown in the table, 3.1 million adults lived in Kentucky in 2019. About 87% of the region's adults were White, non-Hispanic. Eight percent were Black, non-Hispanic; three percent were Hispanic, all types; and two percent of the region's adults were Asian, non-Hispanic, the next largest groups.

Table 6.23: Adults in Kentucky by Major Race and Ethnic Group

GROUP	ADULTS	% ADULTS
White, non-Hispanic	2,653,667	86.8%
Black, non-Hispanic	230,592	7.5%
Hispanic, all types	88,456	2.9%
Asian, non-Hispanic	46,854	1.5%
Two or more races, non-Hispanic	28,691	0.9%
American Indian or Alaskan Native, non-Hispanic	7,053	0.2%
Native Hawaiian or Pacific Islander, non-Hispanic	1,718	0.1%
Total	3,057,032	100.0%

Source: Emsi demographics data, U.S. Census Bureau, American Community Survey.

Figure 6.39: Adults in Kentucky by Major Race and Ethnic Group



Source: Emsi demographics data, U.S. Census Bureau, American Community Survey.

EDUCATIONAL ATTAINMENT

Educational attainment data are useful for targeting specific population groups with less than or greater than average education levels. The population and educational attainment numbers in this section are based on Emsi's demographic data and publicly available sources from state and federal agencies. Sources include annual population estimates and population projections from the U.S. Census Bureau and birth and mortality rates from the U.S. Health Department. In addition, demographic information relies on the annual results of the American Community Survey. Educational attainment data cover the population in

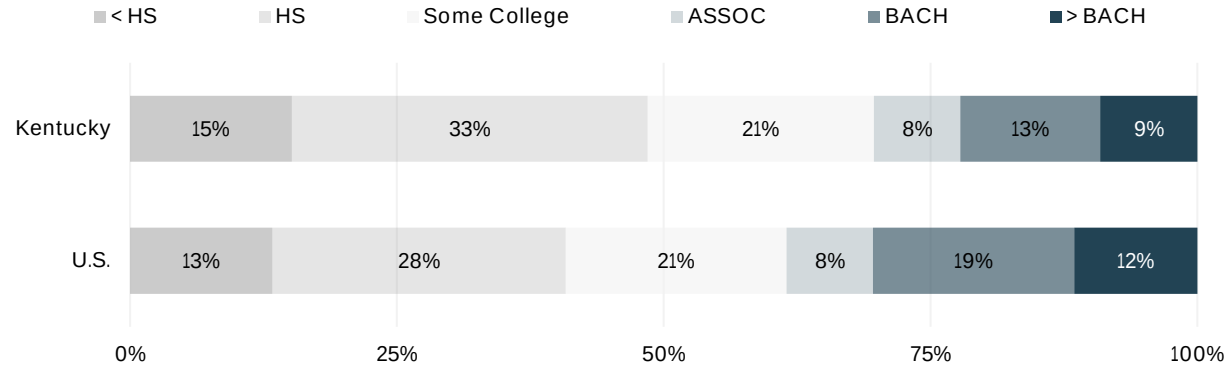
Kentucky 25 years and above, referred to as adults, and indicate the highest award level achieved.

Demographic information is presented by gender and the major race and ethnic groups, and educational attainment data are broken out according to the following award categories:

- Less than a high school diploma (<HS);
- High school diploma or equivalent (HS);
- Some college;[24]
- Associate degree (Assoc);
- Bachelor's degree (Bach);
- Greater than a bachelor's degree (>Bach).

Figure 6.40 displays the highest educational attainments of Kentucky's adults, without reference to gender and the major race and ethnic groups. National data is also presented for context. In the state, 48% of adults have a high school diploma or less, which is more than the national average (41%). Out of all the award categories in the figure, the people who are most likely to seek education and training from postsecondary institutions are those in the "Less than High School Diploma," "High School Diploma," and "Some College" categories. Together, these categories total 69% of the state's adults.

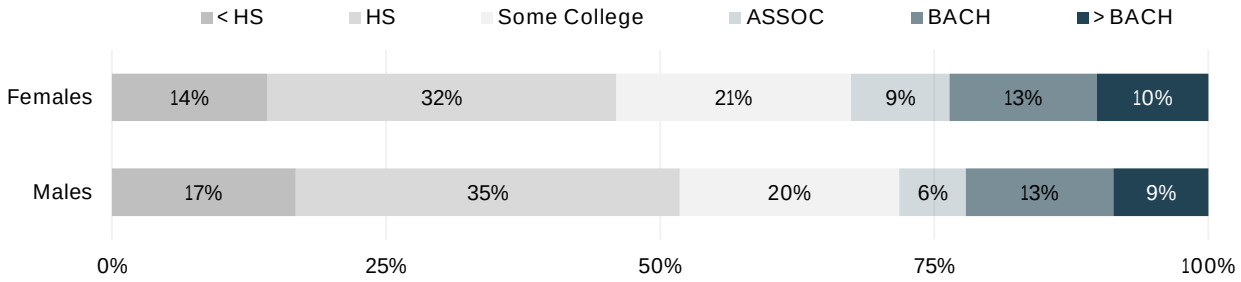
Figure 6.40: Highest Educational Attainments of Adults in Kentucky and the U.S.



Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

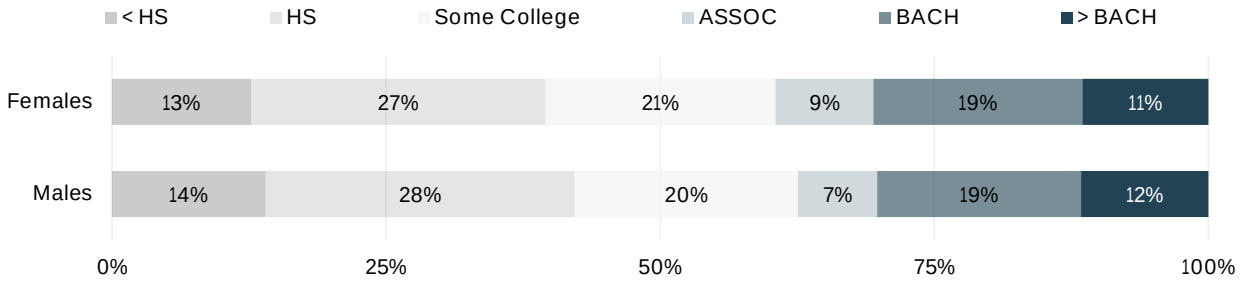
24 The "Some College" category includes individuals who attended college but did not successfully obtain a degree and individuals who have received a postsecondary vocational award or professional certification but did not receive an associate or bachelor's degree. Based on data limitations, it can be considered a proxy for those who have achieved a certificate. While some entities do estimate certificate attainment, such as the Lumina Foundation, we have not included it separately so as to be consistent amongst Emsi data sources.

Figure 6.41: Highest Educational Attainments of Adults in Kentucky by Gender



Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

Figure 6.42: Highest Educational Attainments of Adults in the U.S. by Gender

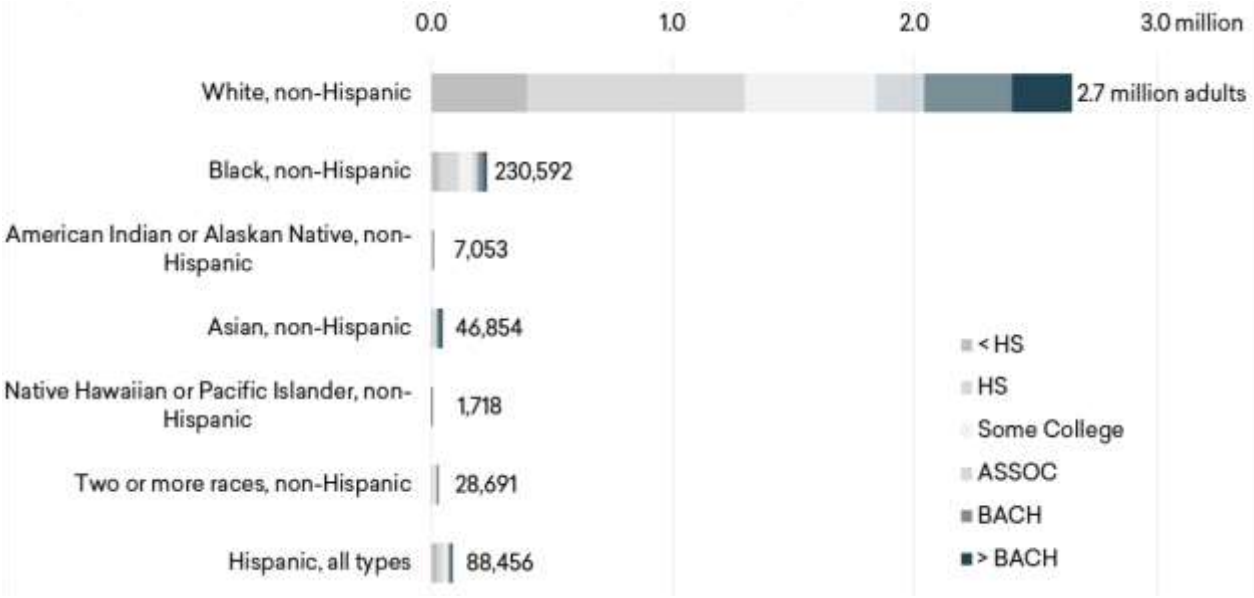


Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

Between female and male adults in Kentucky, there is little variation in the distribution of their award categories. Twenty-one percent of the state's female adults and 20% of the state's male adults have some college education but no degree. Thirteen percent of both female and male adults in the state have a bachelor's degree as their highest award level. This information appears in Figure 6.41. Figure 6.42 also shows educational attainment by gender, but for the U.S., where both males and females hold higher levels of education than Kentucky.

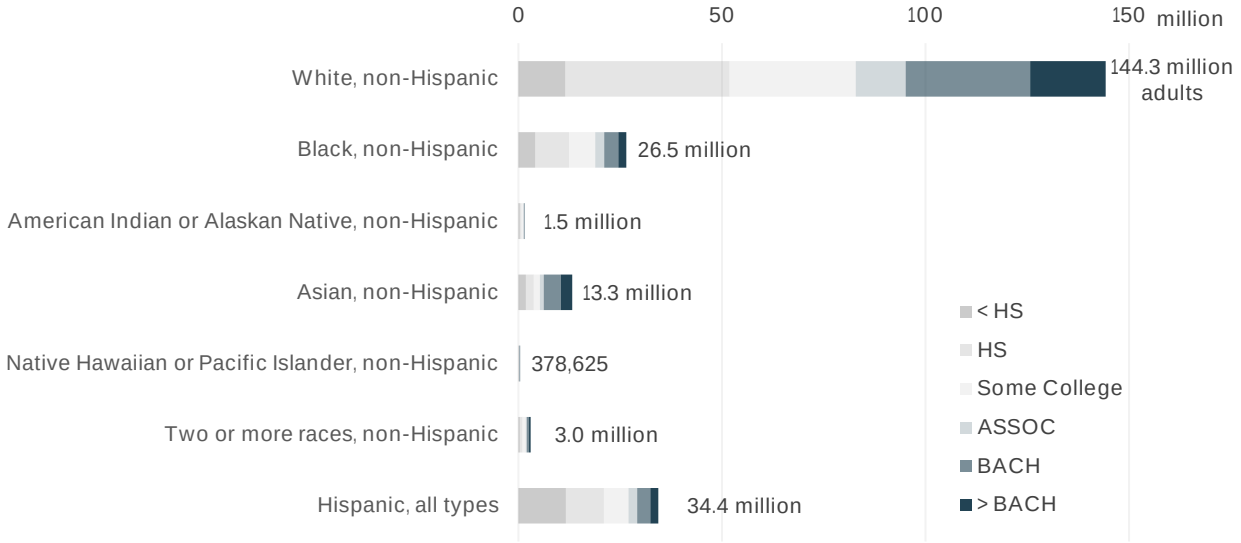
Figures 6.43 through 6.46 display the highest educational attainments of Kentucky's adults and U.S. adults by their major race and ethnic groups, in absolute and relative values, respectively. As shown in Figure 6.45, Asian, non-Hispanic adults have the highest percentage of adults with a postsecondary education (68%) among all the groups. However, the group accounts for a relatively small portion of the state's adults, as shown in Figure 6.43. Fifty-one percent of adults in the White, non-Hispanic group, the largest of the groups, have a postsecondary education. Across all groups, these data suggest that there are many opportunities to increase the educational attainments of the state's adults, whether such actions involve outreach to local high schools or supporting community college students who plan to transfer into a bachelor's degree level program.

Figure 6.43: Highest Educational Attainments of Adults in Kentucky by Major Race and Ethnic Group



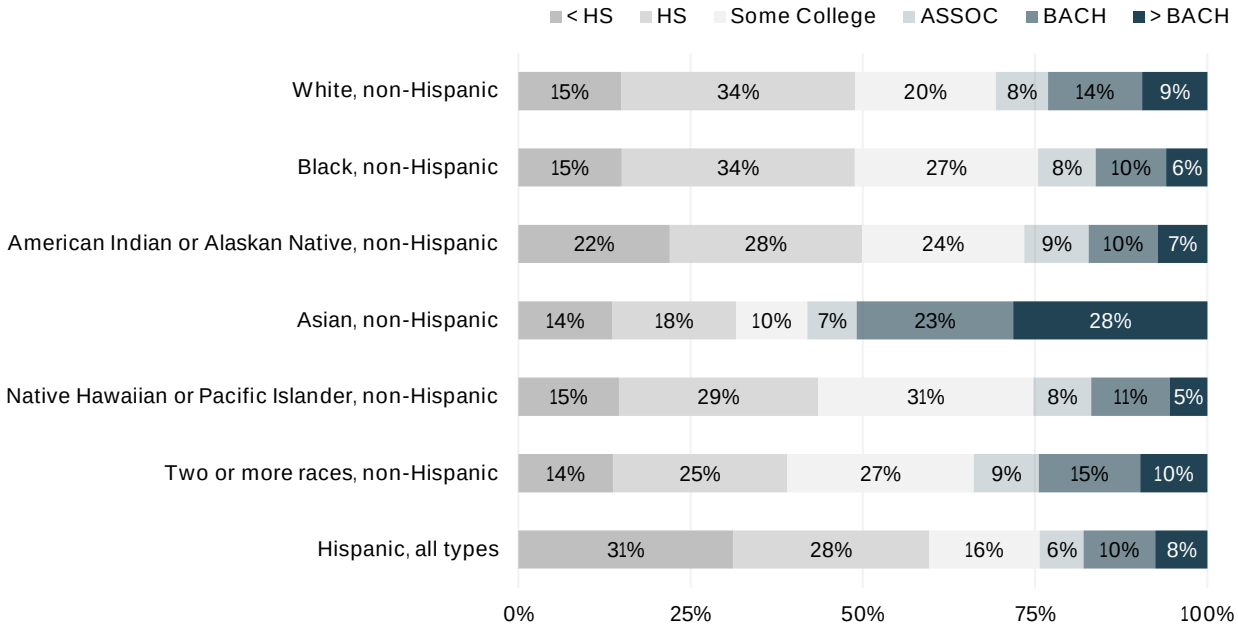
Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

Figure 6.44: Highest Educational Attainments of Adults in the U.S. by Major Race and Ethnic Group



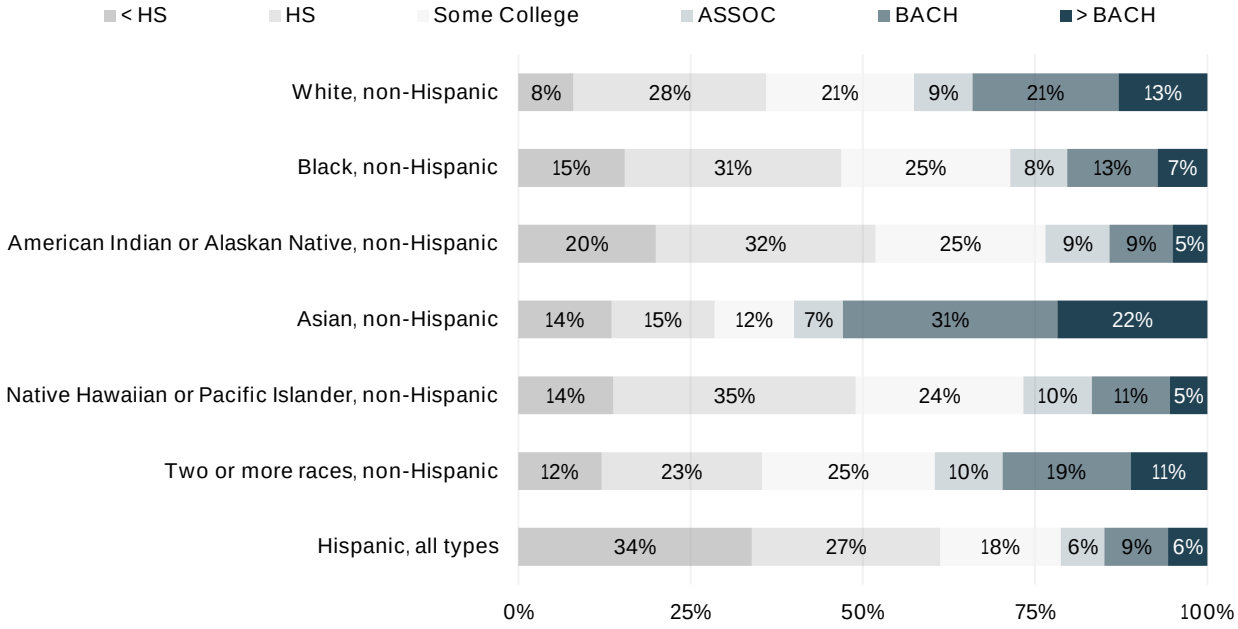
Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

Figure 6.45: Highest Educational Attainments of Adults in Kentucky by Major Race and Ethnic Group



Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

Figure 6.46: Highest Educational Attainments of Adults in the U.S. by Major Race and Ethnic Group

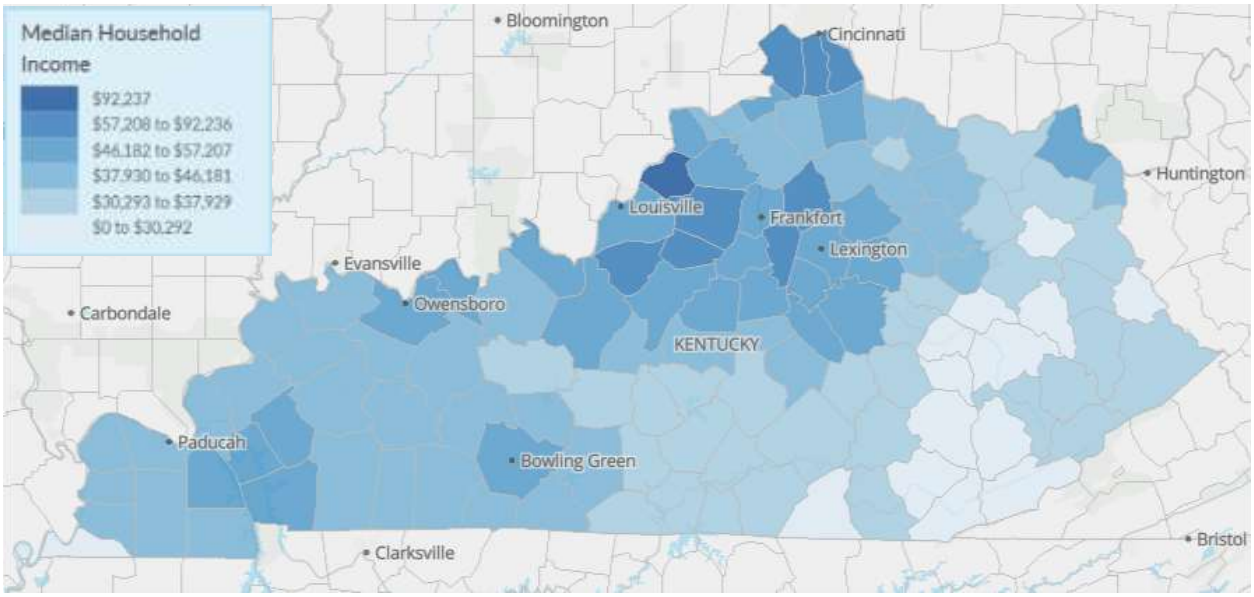


Numbers may not sum due to rounding.
Source: Emsi demographics data and U.S. Census Bureau, American Community Survey.

SOCIOECONOMIC INDICATORS

The data in this section show several of the region's socioeconomic indicators. Household income, reported as a median annual value, includes the income of all individuals in a household, 15 years and over, whether they are related to the householder or not. Per capita income is calculated as the mean income for every person in the county divided by the aggregate income of the total population. Finally, data on poverty are also presented in this section. The percentages represent the share of people below the federal poverty income threshold, which varies by family size and composition. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. Detailed rates on children, who are under 18 years, and seniors, who are over 65 years, are also shown. The data come directly from American Community Survey five-year estimates.

Figure 6.47: Median Household Incomes of Counties in Kentucky



Source: Emsi demographics data, U.S. Census Bureau.

The counties comprising Kentucky are shown in Figure 6.47, and Tables 6.24 and 6.25 highlights their socioeconomic differences, with the former table displaying the counties with highest median household incomes and the latter table displaying the counties with the lowest. Median household income, per capita income, and poverty levels are shown in the table, in descending order of the counties' median household incomes. Oldham County has the highest median household income ($92,237), and McCreary County the lowest ($19,264). For perspective, the median household income of Kentucky is $46,535. McCreary County also has a considerably higher poverty rate in comparison to the state.

Table 6.24: Income, Unemployment, and Poverty Characteristics for Kentucky Counties with the 15 Highest Median Household Incomes

FIPS CODE	COUNTY	MEDIAN HOUSEHOLD INCOME	PERCENTILE RANK IN KY	PER CAPITA INCOME	% POVERTY*		
					FAMILIES	CHILDREN	SENIORS
21185	Oldham	$92,237	100%	$38,063	4.0%	7.2%	3.7%
21015	Boone	$72,731	99%	$33,553	6.0%	10.6%	5.2%
21215	Spencer	$68,916	98%	$30,779	7.3%	8.3%	9.6%
21209	Scott	$65,598	97%	$30,702	8.6%	16.1%	7.1%
21211	Shelby	$63,171	97%	$30,240	8.4%	17.1%	7.2%
21239	Woodford	$60,604	96%	$31,208	10.3%	28.1%	5.2%
21029	Bullitt	$59,917	95%	$26,643	7.5%	12.7%	9.3%
21117	Kenton	$58,674	94%	$30,195	9.9%	19.5%	8.0%
21037	Campbell	$57,208	93%	$31,065	9.5%	19.2%	12.2%
21113	Jessamine	$55,450	92%	$28,195	14.9%	26.5%	6.6%
21179	Nelson	$55,182	92%	$28,156	8.0%	14.2%	9.7%
21163	Meade	$53,732	91%	$25,119	9.7%	16.7%	10.1%
21073	Franklin	$53,539	90%	$28,001	9.6%	19.4%	5.0%
21067	Fayette	$53,013	89%	$31,653	12.1%	22.9%	8.0%
21111	Jefferson	$52,237	88%	$31,039	10.5%	22.0%	8.2%
Kentucky		$46,535	--	$25,888	13.8%	24.7%	11.1%

* Children are under 18 years and seniors are over 65 years. Poverty rate reflects the percentage of people whose income was below the poverty level within the 12 months preceding the data collection period.

Source: American Community Survey five-year estimates from the U.S. Census Bureau data API.

Table 6.25: Income, Unemployment, and Poverty Characteristics for Kentucky Counties with the 15 Lowest Median Household Incomes

FIPS CODE	COUNTY	MEDIAN HOUSEHOLD INCOME	PERCENTILE RANK IN KY	PER CAPITA INCOME	% POVERTY*		
					FAMILIES	CHILDREN	SENIORS
21147	McCreary	$19,264	0%	$11,492	36.7%	49.5%	19.8%
21237	Wolfe	$21,999	1%	$13,533	33.0%	45.3%	19.3%
21189	Owsley	$22,736	2%	$16,582	31.4%	34.9%	31.7%
21129	Lee	$23,297	3%	$16,489	30.4%	43.8%	22.1%
21013	Bell	$23,558	3%	$14,754	31.9%	49.3%	20.9%
21095	Harlan	$24,451	4%	$15,457	32.3%	44.5%	21.5%
21051	Clay	$24,596	5%	$15,388	34.5%	52.2%	29.4%
21025	Breathitt	$25,861	6%	$16,875	28.5%	48.3%	16.3%
21121	Knox	$26,061	7%	$15,869	29.5%	45.1%	22.1%
21131	Leslie	$27,861	8%	$15,112	26.7%	37.2%	28.5%
21075	Fulton	$28,274	8%	$18,111	20.8%	37.0%	14.1%
21063	Elliott	$29,043	9%	$13,436	28.6%	45.5%	29.6%
21159	Martin	$29,239	10%	$14,914	27.0%	33.7%	14.8%
21153	Magoffin	$29,578	11%	$17,279	25.3%	37.4%	22.9%
21133	Letcher	$30,293	12%	$18,085	26.3%	42.6%	13.8%
Kentucky		$46,535	--	$25,888	13.8%	24.7%	11.1%

* Children are under 18 years and seniors are over 65 years. Poverty rate reflects the percentage of people whose income was below the poverty level within the 12 months preceding the data collection period.

Source: American Community Survey five-year estimates from the U.S. Census Bureau data API.

APPENDIX 1: Glossary of Terms

Gap represents a deficit, or when there are more job openings in a particular occupation than there are completions from higher education institutions in the county, region, state, etc. If left unaddressed, a gap may lead to missed opportunities for economic growth and put stress on local businesses to find the necessary talent elsewhere. Significant gaps translate into higher human resources costs and decreased efficiencies in the economic system. They also provide an opportunity for educational institutions to develop new programs and/or strengthen their current programs.

Industry Jobs Emsi industry data have various sources depending on the class of worker. Emsi primarily uses the QCEW (Quarterly Census of Employment and Wages), with supplemental estimates from County Business Patterns. Non-QCEW employee data are based on a number of sources including QCEW, Current Employment Statistics, County Business Patterns, Bureau of Economic Analysis (BEA) State and Local Personal Income reports, the National Industry-Occupation Employment Matrix (NIOEM), the American Community Survey (ACS), and Railroad Retirement Board statistics. Self-Employed class of worker data are primarily based on the ACS, Nonemployer Statistics, and BEA State and Local Personal Income Reports. The Extended Proprietor class of worker is not included in the analysis. Projections for QCEW and non-QCEW Employees are informed by NIOEM and long-term industry projections published by individual states.

IPEDS The Integrated Postsecondary Education Data System (IPEDS) aggregates interrelated surveys conducted annually by the U.S. Department of Education's National Center for Education Statistics (NCES). IPEDS gathers information from every educational institution in the U.S. that participates in the federal student financial aid programs authorized by Title IV of the Higher Education Act of 1965. These educational institutions include research universities, state colleges and universities, private religious and liberal arts colleges, for-profit institutions, community and technical colleges, non-degree-granting institutions such as beauty colleges, and others.

Job Openings Job openings are a combination of job growth, which occurs when an employer experiences greater demand for its products and hires new employees to increase production, and replacement needs, which occurs when employees leave the workforce or change occupations. Throughout the program demand gap analysis, they represent the average number of projected openings between 2019 and 2029. Job openings are calculated for each occupation mapped to a program and are de-duplicated across programs mapped to the same occupation using Emsi's weighting methodology. For each award level, the number of openings is reported for that educational level and one education level below it.

Location Quotient (LQ) A comparative statistic used to calculate the relative employment concentration of an industry or occupation against the employment of the industry in a larger geographic region (i.e. a region's LQ relative to the U.S.). Industries with a higher location quotient (usually greater than 1.2) indicate that the smaller geographic region has a comparative advantage or specialization in the production of that good or service or has a high degree of specialization within its workforce.

NAICS The North American Industry Classification System (NAICS) organizes North American business establishments to better collect, analyze, and publish statistical data related to the business economy. NAICS is intended to classify an establishment's activity regardless of its ownership (public or private sector) or legal form of organization (proprietorship, partnership, corporation, for-profit, nonprofit, etc.). However, due to the realities of available data, Emsi treats establishments with public and private sector ownership differently. In Emsi data, all establishments in the main NAICS hierarchy are private sector only. Jobs in Educational Services and Ambulatory Health Care Service, for example, are not associated with local, state, or federal government jobs. Jobs for public school teachers and city firefighters are in Local Government, whereas college professors and forest firefighters are commonly employed by State Government. Mail carriers and transportation security screeners are examples of jobs in Federal Government. Thus, Emsi does not use the standard NAICS classification, which is similar to Current Employment Statistics (CES), Occupational Employment Statistics (OES), and BEA data sources.

Program Completions For the program demand gap analysis, program completions are the average number of students, over a three-year period, who receive an award or degree for a program of study, as reported to the Council data portal. An average over three years is used to control for upward or downward spikes in completions in any one year.

SOC The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of about 775 detailed occupations according to their occupational definition. To facilitate classification, detailed occupations are combined to form about 450 broad occupations, about 95 minor groups, and 23 major groups. Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together. There are a few minor differences between Emsi and standard SOC codes. Primarily, Emsi does not use detailed SOC codes for military occupations due to lack of good data and aggregates the occupations into one code, 55-9999. And, Emsi uses a single aggregate code (25-1099) for all postsecondary teachers due to lack of solid data and to remain consistent with the NIOEM, which uses a similar code. Emsi currently uses the OES's SOC 2017.

Surplus Represents an oversupply, or when there are more completers from regional educational institutions than there are job openings in a particular occupation. If left unaddressed, significant surpluses may lead to higher unemployment rates or higher attrition rates—the institution could be educating a workforce that is leaving the region after program completion because of a lack of job opportunities. In the tables, values in parentheses represent a surplus.

APPENDIX 2: About Emsi Labor Market Data

LABOR MARKET INFORMATION

Traditional labor market information (LMI) helps us to identify those occupations with good jobs and projected growth in the coming decade. This provides a robust, market-driven foundation upon which to build out programmatic recommendations. Emsi's data then allows us to map these occupations back to programs that train for them, and to extrapolate other occupational outcomes for potential graduates. Emsi data are used to calculate the projected number of annual job openings from 2019 to 2029. These projections account for openings due to job growth and openings due to replacement needs, such as when an employee retires or leaves the position. To capture a complete picture of industry employment, Emsi gathers and integrates economic, labor market, demographic, and educational data from over 40 government and private-sector sources. In doing so, Emsi creates a comprehensive and current database that includes both published data and detailed estimates, with full coverage of the U.S.

More specifically, Emsi combines covered employment data from the Quarterly Census of Employment and Wages (QCEW-produced by the Department of Labor) with total employment data in Regional Economic Information System (REIS-published by the BEA). The data are augmented with County Business Patterns (CBP) and Non-Employer Statistics (NES) published by the Census Bureau. Job projections are based on the latest-available Emsi industry data, 15-year past local trends in each industry, growth rates in statewide and, where available, sub-state area industry projections published by individual state agencies and, in part, growth rates in national projections from the Bureau of Labor Statistics (BLS).

Through this combination of data sources, Emsi is able to fill gaps in individual sources (such as suppressions), yielding a composite database that leverages the strengths of all its sources. Finally, Emsi's database is updated quarterly, providing the most up-to-date integrated information possible.

APPENDIX 3: Program to Occupation Map

Table A4.1 displays the crosswalk between engineering programs (by CIP codes) and engineering occupations (by SOC codes) that Emsi used to complete the program demand gap analysis. Also listed are the adjustment factors which are applied to the annual job openings for each occupation in each program, described in Appendix 4, for the statewide analysis.

Table A3.1: Program to Occupation Map with Employment Adjustment Factors

			% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
CIP TITLE & CODE	SOC CODE	SOC TITLE	CERT	ASSOC	BACH	MAST	PHD
Engineering, General (CIP 14.0101)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2011	Aerospace Engineers	8	8	61	86	31
	17-2021	Agricultural Engineers	4	8	64	86	31
	17-2031	Biomedical Engineers	4	8	64	86	31
	17-2041	Chemical Engineers	11	10	68	82	21
	17-2051	Civil Engineers	11	11	66	84	23
	17-2061	Computer Hardware Engineers	16	17	56	73	28
	17-2071	Electrical Engineers	10	12	59	80	30
	17-2072	Electronics Engineers, Except Computer	10	12	59	80	30
	17-2081	Environmental Engineers	10	8	62	83	28
	17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	13	13	70	81	17
	17-2112	Industrial Engineers	13	13	70	81	17
	17-2121	Marine Engineers & Naval Architects	13	14	70	81	15
	17-2131	Materials Engineers	10	11	67	80	23
	17-2141	Mechanical Engineers	11	13	69	82	20
	17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	9	7	68	86	23
	17-2161	Nuclear Engineers	10	11	62	81	28
	17-2171	Petroleum Engineers	9	7	68	86	23
	17-2199	Engineers, All Other	10	11	62	81	28
Pre-Engineering (CIP 14.0102)	11-9041	Architectural & Engineering Managers	7	7	57	86	36

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
	17-2011	Aerospace Engineers	8	8	61	86	31
	17-2021	Agricultural Engineers	4	8	64	86	31
	17-2031	Biomedical Engineers	4	8	64	86	31
	17-2041	Chemical Engineers	11	10	68	82	21
	17-2051	Civil Engineers	11	11	66	84	23
	17-2061	Computer Hardware Engineers	16	17	56	73	28
	17-2071	Electrical Engineers	10	12	59	80	30
	17-2072	Electronics Engineers, Except Computer	10	12	59	80	30
	17-2081	Environmental Engineers	10	8	62	83	28
	17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	13	13	70	81	17
	17-2112	Industrial Engineers	13	13	70	81	17
	17-2121	Marine Engineers & Naval Architects	13	14	70	81	15
	17-2131	Materials Engineers	10	11	67	80	23
	17-2141	Mechanical Engineers	11	13	69	82	20
	17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	9	7	68	86	23
	17-2161	Nuclear Engineers	10	11	62	81	28
	17-2171	Petroleum Engineers	9	7	68	86	23
	17-2199	Engineers, All Other	10	11	62	81	28
Aerospace, Aeronautical & Astronautical/Space Engineering (CIP 14.0201)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2011	Aerospace Engineers	8	8	61	86	31
	17-2072	Electronics Engineers, Except Computer	10	12	59	80	30
	17-2141	Mechanical Engineers	11	13	69	82	20
	17-3021	Aerospace Engineering & Operations Technicians	59	54	35	22	3
Agricultural Engineering (CIP 14.0301)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2021	Agricultural Engineers	4	8	64	86	31
Bioengineering & Biomedical Engineering (CIP 14.0501)	11-9041	Architectural & Engineering Managers	7	7	57	86	36

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
	17-2031	Biomedical Engineers	4	8	64	86	31
Chemical Engineering (CIP 14.0701)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2041	Chemical Engineers	11	10	68	82	21
	17-2131	Materials Engineers	10	11	67	80	23
	17-2199	Engineers, All Other	10	11	62	81	28
Civil Engineering, General (CIP 14.0801)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2051	Civil Engineers	11	11	66	84	23
	17-2081	Environmental Engineers	10	8	62	83	28
	17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	9	7	68	86	23
	17-2171	Petroleum Engineers	9	7	68	86	23
	17-2199	Engineers, All Other	10	11	62	81	28
Computer Engineering, General (CIP 14.0901)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	15-1132	Software Developers, Applications	9	11	60	84	30
	15-1133	Software Developers, Systems Software	9	11	60	84	30
	15-1143	Computer Network Architects	26	36	59	56	15
	17-2061	Computer Hardware Engineers	16	17	56	73	28
	17-2071	Electrical Engineers	10	12	59	80	30
	17-2199	Engineers, All Other	10	11	62	81	28
Electrical & Electronics Engineering (CIP 14.1001)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2011	Aerospace Engineers	8	8	61	86	31
	17-2071	Electrical Engineers	10	12	59	80	30
	17-2072	Electronics Engineers, Except Computer	10	12	59	80	30
	17-2199	Engineers, All Other	10	11	62	81	28
Engineering Physics/Applied Physics (CIP 14.1201)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2199	Engineers, All Other	10	11	62	81	28
Materials Engineering (CIP 14.1801)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2131	Materials Engineers	10	11	67	80	23
Mechanical Engineering (CIP	11-9041	Architectural & Engineering	7	7	57	86	36

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
14.1901)		Managers					
	17-2011	Aerospace Engineers	8	8	61	86	31
	17-2141	Mechanical Engineers	11	13	69	82	20
	17-2199	Engineers, All Other	10	11	62	81	28
Mining & Mineral Engineering (CIP 14.2101)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	9	7	68	86	23
Industrial Engineering (CIP 14.3501)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2112	Industrial Engineers	13	13	70	81	17
Manufacturing Engineering (CIP 14.3601)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2112	Industrial Engineers	13	13	70	81	17
	17-2199	Engineers, All Other	10	11	62	81	28
Mechatronics, Robotics, & Automation Engineering (CIP 14.4201)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2199	Engineers, All Other	10	11	62	81	28
Engineering, Other (CIP 14.9999)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2199	Engineers, All Other	10	11	62	81	28
Engineering Technology, General (CIP 15.0000)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2011	Aerospace Engineers	8	8	61	86	31
	17-2021	Agricultural Engineers	4	8	64	86	31
	17-2031	Biomedical Engineers	4	8	64	86	31
	17-2041	Chemical Engineers	11	10	68	82	21
	17-2051	Civil Engineers	11	11	66	84	23
	17-2061	Computer Hardware Engineers	16	17	56	73	28
	17-2071	Electrical Engineers	10	12	59	80	30
	17-2072	Electronics Engineers, Except Computer	10	12	59	80	30
	17-2081	Environmental Engineers	10	8	62	83	28
	17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	13	13	70	81	17
	17-2112	Industrial Engineers	13	13	70	81	17

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
	17-2121	Marine Engineers & Naval Architects	13	14	70	81	15
	17-2131	Materials Engineers	10	11	67	80	23
	17-2141	Mechanical Engineers	11	13	69	82	20
	17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	9	7	68	86	23
	17-2161	Nuclear Engineers	10	11	62	81	28
	17-2171	Petroleum Engineers	9	7	68	86	23
	17-2199	Engineers, All Other	10	11	62	81	28
Civil Engineering Technology/Technician (CIP 15.0201)	17-3022	Civil Engineering Technicians	59	54	35	22	3
Electrical, Electronic & Communications Engineering Technology/Technician (CIP 15.0303)	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
	17-3024	Electro-Mechanical Technicians	59	54	35	22	3
	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Electrical & Electronic Engineering Technologies/Technicians, Other (CIP 15.0399)	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
Biomedical Technology/Technician (CIP 15.0401)	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Electromechanical Technology/Electromechanical Engineering Technology (CIP 15.0403)	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
	17-3024	Electro-Mechanical Technicians	59	54	35	22	3
	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Electromechanical & Instrumentation & Maintenance Technologies/Technicians, Other (CIP 15.0499)	17-3024	Electro-Mechanical Technicians	59	54	35	22	3
Energy Management & Systems Technology/Technician (CIP 15.0503)	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Environmental Engineering Technology/Environmental Technology (CIP 15.0507)	17-3025	Environmental Engineering Technicians	59	54	35	22	3

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
Plastics & Polymer Engineering Technology/Technician (CIP 15.0607)	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Industrial Technology/Technician (CIP 15.0612)	17-3026	Industrial Engineering Technicians	59	54	35	22	3
	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Manufacturing Engineering Technology/Technician (CIP 15.0613)	11-9041	Architectural & Engineering Managers	7	7	57	86	36
	17-2112	Industrial Engineers	13	13	70	81	17
	17-2141	Mechanical Engineers	11	13	69	82	20
	17-2199	Engineers, All Other	10	11	62	81	28
	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
Occupational Safety & Health Technology/Technician (CIP 15.0701)	17-2111	Health & Safety Engineers, Except Mining Safety Engineers & Inspectors	13	13	70	81	17
	29-9011	Occupational Health & Safety Specialists	26	22	48	67	24
Quality Control Technology/Technician (CIP 15.0702)	11-3051	Industrial Production Managers	38	28	48	50	10
	51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	64	39	24	16	2
Industrial Safety Technology/Technician (CIP 15.0703)	17-3026	Industrial Engineering Technicians	59	54	35	22	3
	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Quality Control & Safety Technologies/Technicians, Other (CIP 15.0799)	11-3051	Industrial Production Managers	38	28	48	50	10
	51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	64	39	24	16	2
Mining Technology/Technician (CIP 15.0901)	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Construction Engineering Technology/Technician (CIP 15.1001)	11-9021	Construction Managers	39	27	50	47	5
	17-3011	Architectural & Civil Drafters	36	57	58	33	6
	17-3022	Civil Engineering Technicians	59	54	35	22	3
Surveying Technology/Surveying (CIP 15.1102)	17-1021	Cartographers & Photogrammetrists	18	21	70	76	12

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
	17-1022	Surveyors	18	21	70	76	12
	17-3031	Surveying & Mapping Technicians	65	52	28	11	1
Computer Engineering Technology/Technician (CIP 15.1201)	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
Computer Engineering Technologies/Technicians, Other (CIP 15.1299)	15-1121	Computer Systems Analysts	13	15	64	80	23
	15-1131	Computer Programmers	20	22	61	71	19
	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3
Drafting & Design Technology/Technician, General (CIP 15.1301)	17-3011	Architectural & Civil Drafters	36	57	58	33	6
	17-3012	Electrical & Electronics Drafters	36	57	58	33	6
	17-3013	Mechanical Drafters	36	57	58	33	6
	17-3019	Drafters, All Other	36	57	58	33	6
CAD/CADD Drafting &/or Design Technology/Technician (CIP 15.1302)	17-3011	Architectural & Civil Drafters	36	57	58	33	6
	17-3012	Electrical & Electronics Drafters	36	57	58	33	6
	17-3013	Mechanical Drafters	36	57	58	33	6
	17-3019	Drafters, All Other	36	57	58	33	6
Architectural Drafting & Architectural CAD/CADD (CIP 15.1303)	17-3011	Architectural & Civil Drafters	36	57	58	33	6
Drafting/Design Engineering Technologies/Technicians, Other (CIP 15.1399)	17-3019	Drafters, All Other	36	57	58	33	6
Engineering/Industrial Management (CIP 15.1501)	11-3051	Industrial Production Managers	38	28	48	50	10
	11-9041	Architectural & Engineering Managers	7	7	57	86	36
Engineering Technologies & Engineering-Related Fields, Other (CIP 15.9999)	17-3021	Aerospace Engineering & Operations Technicians	59	54	35	22	3
	17-3022	Civil Engineering Technicians	59	54	35	22	3
	17-3023	Electrical & Electronics Engineering Technicians	59	54	35	22	3
	17-3024	Electro-Mechanical Technicians	59	54	35	22	3

CIP TITLE & CODE	SOC CODE	SOC TITLE	% WORKFORCE WITH EDUCATION LEVEL AND ONE LEVEL BELOW				
			CERT	ASSOC	BACH	MAST	PHD
	17-3026	Industrial Engineering Technicians	59	54	35	22	3
	17-3027	Mechanical Engineering Technicians	59	54	35	22	3
	17-3029	Engineering Technicians, Except Drafters, All Other	59	54	35	22	3

Source: Emsi program demand gap model.

APPENDIX 4: Methodology

This appendix focuses on describing and understanding the methodology used in the program demand gap analysis. This requires data on both occupation demand (e.g., annual job openings) and education supply (e.g., number of postsecondary degree completions). These are then compared through an education "gap" analysis to determine whether an education program is potentially producing a surplus or shortage of workforce talent relative to the number of job openings. In this way, it is possible to see how the institution's current programs are satisfying the region's workforce needs.

SUPPLY AND DEMAND MODEL

Emsi builds a model using demand-side data (average annual projected job openings) and supply-side data (postsecondary education output) to compare workforce demand with education supply. The purpose of this analysis is to find the difference or "gap" between the annual job openings for an occupation and the number of people completing postsecondary degrees for that occupation, whether at LSC or at another postsecondary institution in the region, making it possible to identify talent shortages or surpluses.

The first step involves the link between annual job openings for a SOC code and the number of completions for an education program, defined by its CIP code. The BLS provides information on the occupations that completers of specific CIP codes are more likely to enter. Specific connections have been refined through previous engagements with postsecondary institutions and state departments of labor. Some programs have direct occupational ties. For example, a physical therapist assistant is a specific occupation that requires specialized postsecondary training. In this case, one CIP code (Physical Therapy Technician/Assistant) maps to only one SOC code (physical therapist assistants). This provides an easy comparison of annual job openings for physical therapist assistants to the number of people completing the relevant program to see whether a talent shortage or surplus exists.

Unfortunately, this one-to-one mapping of a CIP code to a SOC code is not always the case. More often than not, an educational program maps to multiple occupations and an occupation maps to multiple educational programs at multiple award levels. For this reason, Emsi has pioneered a method of de-duplicating job openings, such that the potential sources of demand are not double represented for any occupation. The details of this process are outlined in this chapter, under "De-duplication of Annual Openings."

OCCUPATION DEMAND

Educational Level Adjustments

To capture occupation demand, Emsi uses a proprietary employment dataset that reflects total employment. Emsi uses the QCEW data source, which measures employment covered by unemployment insurance (UI). According to the BLS, "employment covered by these UI programs represents about 97% of all wage and salary civilian employment in the country." Through a proprietary process, Emsi removes BLS local area employment suppressions to yield the best employment data available at local levels, using Emsi's Employees & Self-Employed 2019.3 datarun.

In the datarun, Emsi calculates the number of regional job openings for the occupations that require different levels of education for entry-level positions.[25] The BLS also provides educational attainment data of current workers, ages 16 years to 34 years, for each SOC code, broken out by their highest level of education attained. The data are presented as the percentage of workers in the SOC code with educational attainment ranging from less than a high school diploma to a doctoral degree level of education. Using these data, Emsi adjusts the annual job opening estimates for each SOC code to only incorporate the percentage of workers that correspond with LSC's program offerings.

For example, as shown in Table A4.1, three occupations are mapped to Accounting: accountants, auditors, and budget analysts. Among accountants, the majority of job openings (80%) are available to program completers with a master's degree or bachelor's degree level of education, less so for auditors. The weighted average of job openings, in the last row of the table, is calculated for each program and at each award level where LSC has produced completions over the past three years. Not accounting for these dynamics in educational attainments would bias the programs' demands by over-counting potential job opportunities for the completers.[26]

25 See Appendix 1 for a description of the sources and processes of Emsi data.

26 Given the changing dynamics and need for more education in the existing workforce (i.e., skills-biased technology change in many occupations and industry sectors), this assumption is considered conservative.

Table A4.1: Example of Educational Level Adjustments for a Program

PROGRAM	OCCUPATION	ASSOC AND ONE LEVEL BELOW	BACH AND ONE LEVEL BELOW	MAST AND ONE LEVEL BELOW	PHD AND ONE LEVEL BELOW
Accounting	Accountant	10%	65%	80%	25%
	Auditor	5%	70%	75%	20%
	Budget analyst	15%	70%	80%	30%
Weighted average		10%	68%	78%	25%

De-Duplication of Annual Openings

Most programs are designed to train people for multiple occupational types, many of which are simultaneously linked with other educational programs. This presents a complexity when comparing supply and demand for any one program. For instance, the Accounting program is mapped to three different occupations: accountants, auditors, and budget analysts. If we focus on one of the occupations for this list—accountants—it is also mapped to three different educational programs, for example, Business, Medical Office Administration, and Commerce.

To ensure that double counting does not occur, it is necessary to either realign the program groupings to eliminate the mapping of occupations to multiple programs or to determine what proportion of job openings should be compared with program completions. Emsi takes the second approach in this analysis, which has the advantage of maintaining program titles and descriptions in roughly the same format of the completion data originally delivered to Emsi. Emsi also uses a formula that favors programs with the largest completions, attributing a greater proportion of job openings to programs with a large number of completions by award level. This method utilizes the assumption that the higher output programs are likely feeding a higher degree of demand in Kentucky.[27] Appendix 4 contains the detailed mapping of each CIP code to all relevant occupations, by their six-digit SOC codes. A result of de-duplication is that in a region where a unique program, Commercial & Advertising Art for example, is larger than Graphic Design, it is assumed that completers of the Commercial & Advertising Art program will be offered a proportional, therefore larger number of job openings than students from the Graphic Design program.

Emsi also provides an alternative program demand gap analysis, which does not de-duplicate the average number of projected annual job openings based on the size of each

27 Note this adjustment is performed on a program-by-program basis without consideration of individual colleges or training providers. Therefore, a single program offered at one large institution has no advantage over a group of similar programs offered at several smaller educational providers given that the aggregate output of the smaller schools is near the output of the single larger school.

program. Rather, the total number of job openings available for completers at each award level for each program is provided without further modification. Due to this modification, these numbers have not been de-duplicated, unlike the job openings shown in Chapter 3. As a result, job openings overstate the occupational demand for all postsecondary program completers. While these figures have not been provided in this analysis, they are available upon request.

APPENDIX 5: Living Wage

As shown in the following table, the living wage is the hourly rate that an individual must earn to support his or her family as a sole income provider working full-time or 2,080 hours annually. Part-time is defined as less than 35 hours per week of work. State minimum wage rates are the same for all individuals, regardless of the number of dependents in the household. Values are reported per adult in the household. The poverty rate is typically reported as gross annual income and has been adjusted to an hourly wage rate.

Table A5.1: Living Wage Calculations for Kentucky

ADULTS IN HOUSEHOLD	CHILDREN IN HOUSEHOLD	LIVING WAGE	POVERTY WAGE	MINIMUM WAGE
One adult	No children	$11.48	$5.84	$7.25
	One child	$23.42	$7.91	$7.25
	Two children	$27.02	$9.99	$7.25
	Three children	$33.37	$12.07	$7.25
Two adults, one working	No children	$18.68	$7.91	$7.25
	One child	$22.57	$9.99	$7.25
	Two children	$25.01	$12.07	$7.25
	Three children	$28.04	$14.14	$7.25
Two adults, one working part-time	One child	$25.07	--	--
Two adults	No children	$9.34	$3.96	$7.25
	One child	$12.79	$5.00	$7.25
	Two children	$14.78	$6.03	$7.25
	Three children	$17.07	$7.07	$7.25

Source: Dr. Amy K. Glasmeier and the Massachusetts Institute of Technology, http://livingwage.mit.edu. Minimum wage provided by the U.S. Department of Labor.