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Tech Work in St. Louis: Past, Present, and Future

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TECH WORK IN ST. LOUIS PAST, PRESENT, AND FUTURE

2022 IT Labor Market Report for the St. Louis Metro

TechSTL.com





Tech Work in St. Louis: Past, Present, and Future

2022 IT Labor Market Report for the St. Louis Metro

Prepared for TechSTL, by Howard J. Wall, PhD, Director of the Center for Applied Economics at Lindenwood University, with Data Equity advisement from Cristina Garmendia, Principal at URBNRX



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Contents

Executive Summary	4
1. What is the Tech Sector?	6
Tech Occupations	6
Data Availability	7
2. Where is the Tech Sector?	9
3. Tech in St. Louis, 2014-2021.....	11
Annual Wages.....	14
5. Pandemic-Era Changes in IT and Computing1.....	17
6. Demographics and Tech.....	18
Women in St. Louis Tech	21
Race and Ethnicity in St. Louis Tech.....	22
Foreign-Born Workers in Tech	24
Tech and Disability Status	26
7. St. Louis Tech in 2030.....	27
Appendices: Occupation, Sector, and Industry Details	29

Executive Summary

Earlier this year, TechSTL commissioned Lindenwood University's Center for Applied Economics to produce the 2022 IT Labor Market Report in order to provide insight into the current state of the regional tech industry with a focus on the data economy.

One of the primary challenges of studying the tech sector is that it is not neatly tied to a single industry, good or service produced, or occupation. More and more jobs throughout the economy outside of tech companies are dependent upon technology and require tech skills. This report defines tech occupations as those that demonstrate the best fit between their

official Bureau of Labor Statistics descriptions and the tech process, a process in which scientific knowledge is used to produce goods or services, which encompasses 32 different occupations, spanning IT and Computing, Data and Analysis, Business and Finance, and Design. We compare the St. Louis Metro with national statistics throughout the report to give context to our findings.

In 2021, the St. Louis MSA had an estimated 85,890 tech workers, which is about 6.7 percent of its total workforce. Since 2014, the number of tech workers in St. Louis has grown by 20%. However, St. Louis cannot claim to be a tech hub until it exceeds the national share of tech workers to an overall workforce nationwide of 6.9%.

The tech workforce was one of the most resilient to the COVID-19 pandemic and was largely exempt from the severe drop in employment overall throughout the region. However, through that time, St. Louis continued to have an underrepresentation of higher-paid computer production occupations such as software developers and computer programmers, and an overrepresentation of lower-paid computer support occupations such as computer user support specialists.

What this means: As of 2021, there are 11,030 software developers who live in the St. Louis MSA. If St. Louis had its expected share of workers in this field, there would be nearly 1,100 more software developers working in St. Louis right now.

The average annual wage for a tech worker in the St. Louis MSA is \$88,900, which is 1.6 times the average annual wage for all workers in the region. By 2021, tech accounted for \$7.6 billion in wages or 10.7% of total wages regionally. These statistics may look great to St. Louis policymakers, but much of our tech talent knows that they could be getting higher pay elsewhere. St. Louis tech workers currently earn 90% of the annual national wage offered nationwide across

We found that for many metrics, St. Louis is below the national standard for attracting and retaining tech talent.

all tech occupations, with the most underpaid including computer hardware engineers and computer and information research scientists.

Nationally, as a whole, and relative to the overall workforce, tech workers are:

- (1)** more educated in that they are about twice as likely to have a bachelor's or graduate degree
- (2)** much more likely to be male
- (3)** somewhat whiter, less black, and a lot more Asian
- (4)** more likely to be foreign-born
- (5)** less likely to be disabled.

While regional-level data is not available for all the demographic categories, we highlight where St. Louis can compare.

- In St. Louis, one-third of the tech workforce are women, with the share of women in tech in St. Louis being slightly higher than the national share.
- There are no bright spots within the St. Louis tech sector for black workers. Black workers are greatly underrepresented in tech nationally, the underrepresentation is much worse in St. Louis, and it is present across all tech occupations. They comprise only 7.6 percent of the tech sector, but 16.8 percent of all workers in St. Louis.
- Asian-Americans are a small but mighty share of the region's overall population: they are well-represented in tech and comprise close to a third of our region's software developers.
- Foreign-born workers are essential to the tech workforce nationwide, with 21.4 percent of tech workers being foreign-born. While we do not know the numbers of St. Louis tech workers that are foreign-born, we know St. Louis attracts far fewer foreign-born than other parts of the country. Only 5.5% of our region's population are foreign-born, compared to 14.6% of the nation's population.

In the St. Louis MSA, the tech sector is expected to grow by 7.3% by 2030, compared to 7.7% nationally. We anticipate the tech sector to grow by 9,200 workers in the St. Louis region in this time frame. While most of this growth is expected to come in the form of software developers, data is projected to become increasingly important to businesses over the next few years. Data analysis occupations, as well as marketing research and management analysis, are projected to see very strong growth in percentage terms.

In Summary, the findings in this report confirm the necessity and urgency for improved data collection and advocacy for the St. Louis data economy. In order for the MSA to become a nationally recognized tech hub to attract and retain competitive tech talent, the St. Louis Metro will need to aggressively address the industry disparities in diverse representation, pay gaps, and occupational growth. Additional data collection and ongoing research will allow the region to report more comprehensively on these metrics, as well as expand into more targeted industry analyses like the Big 15 Emerging Technologies identified by TechSTL.

1. What is the Tech Sector?

Tech has almost as many definitions as it has people writing about it, so our first step is to be clear what we mean by “tech.” Define *tech* as a process in which scientific knowledge is used to produce goods or services, with scientific knowledge defined somewhat narrowly as mathematics, statistics, and computer science.¹ The *tech sector* is the group of people who use the tech process in their occupation. The tech sector, therefore, can be found throughout the economy wherever the tech process is being employed by people in tech occupations. Firms in sectors such as manufacturing, education, finance, retail, and construction all have a part of the tech sector within their operations.

Often, the tech sector is defined as the group of businesses in which technological products or services are provided. For example, *Investopedia* says that it is the group of firms “relating to the research, development, or distribution of technologically based goods and services.” Although industry-based definitions like this are common, they do not fit our present purposes particularly well. For one thing, under these definitions, any firm that produces a technological product would be considered a tech firm, regardless of how much tech as a process went into producing the good. Like any firm, significant portions of the activity of firms producing technological products have support staff in human resources, janitorial services, etc. Firm-based definitions of the tech sector exaggerate the amount of tech happening in some firms, while missing the amount of tech happening in other firms that produce non-technological goods and services.

Tech Occupations

The Bureau of Labor Statistics (BLS) categorizes occupations according to its 2018 Standard Occupational Classification (SOC) system, which places workers into 867 detailed occupations. To whittle down this list to create a tech sector, we judged occupations according to how well their BLS descriptions fit the broad definition of the tech process. Assisted by lists used elsewhere, we have selected the 32 detailed occupations listed in Table 1.1. Most obviously, the list includes almost every computer and mathematical occupation. But it also includes occupations from the broad categories in management, business and financial operations, and arts and media. We have grouped the occupations according to their purpose: IT and computing, data analysis, business and finance, and design. For reference, the BLS’s descriptions of these 32 occupations are provided by Appendix A.

To illustrate tech outside of computer and mathematics occupations, consider some occupations with different degrees of obviousness as being tech. According to the BLS, Financial and Investment Analysts “Conduct quantitative analyses of information involving investment programs or financial data of public or private institutions, including valuation of businesses.” This is a tech occupation because it analyzes formal financial and business data, often with very

¹ Most notably, this narrowing excludes bioscience, which is different enough from the mathematical and computer sciences to warrant a distinct biotech sector.

1.1. Tech Occupations and SOC Codes

Code	SOC Title	Code	SOC Title
IT and Computing		Data Analysis	
11-3021	Computer and Info Systems Managers	15-2031	Operations Research Analysts
15-1211	Computer Systems Analysts	15-2041	Statisticians
15-1212	Information Security Analysts	15-2051	Data Scientists
15-1221	Computer and Info Research Scientists	Business and Finance	
15-1231	Computer Network Support Specialists	11-2021	Marketing Managers
15-1232	Computer User Support Specialists	13-1081	Logisticians
15-1241	Computer Network Architects	13-1082	Project Management Specialists
15-1242	Database Administrators	13-1111	Management Analysts
15-1243	Database Architects	13-1161	Market Research Analysts & Marketing
15-1244	Network and Computer Systems Admins	13-1199	Business Operations Specialists, All Other
15-1251	Computer Programmers	13-2051	Financial and Investment Analysts
15-1252	Software Developers	13-2054	Financial Risk Specialists
15-1253	Software Quality Assurance Analysts & Testers	13-2099	Financial Specialists, All Other
15-1254	Web Developers	Design	
15-1255	Web and Digital Interface Designers	27-1014	Special Effects Artists and Animators
15-1299	Computer Occupations, All Other	27-1024	Graphic Designers
17-2061	Computer Hardware Engineers		
49-2011	Computer, ATM, and Office Machine Repairers		

2018 Standard Occupational Classification as of 2021. Note that earlier years of the 2018 system combined some occupations, such as 13-1082 and 13-1199. See Appendix A for abbreviated descriptions for these occupations.

sophisticated methodology. A less obvious tech occupation is Market Research Analysts and Marketing Specialists, who “(r)esearch conditions in local, regional, national, or online markets. Gather information to determine potential sales of a product or service, or plan a marketing or advertising campaign...” The data might not be as formal and the methods might not be as sophisticated as used by financial analysts, but the process is very similar, making it a tech occupation.

Note that simply using math or statistics was not enough to qualify as a tech occupation. It is also necessary that the math or statistics be applied to the production of goods and services. Mathematicians are not included on the grounds of being too fundamental or theoretical, while the actuaries are not included on the grounds of being removed from the production of tangible goods or services. Engineers of various types use math, obviously, but their job responsibilities are very broad and are not predominantly using the tech process as defined above.²

Data Availability

Because of changes in definitions over time and the availability of data due to privacy considerations, the analysis does not always include the 32 occupations listed in Table 1.1. Prior to 2019, the 2010 SOC codes were used by the BLS and other agencies. Computer and mathematical occupations have changed a great deal over a short period of time, and some didn't

² Take, for example, the definition of the job of an electrical engineer: “Research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use.” Technology is used and is even produced, but the tech process is not dominant.

even exist in 2010.³ It is, therefore, difficult to track the tech sector over time. As such, detailed analysis at the occupation level can only go back to 2019, which is still a challenge. There is more detail available for 2021 than for 2019 and 2020 because several tech occupations were split in two. For example, Database Administrators and Database Architects are now coded as separate occupations, as are Software Developers and Software Quality Assurance Analysts and Testers.

In Section 3, which explores the changes in the size of the St. Louis Tech sector back to 2014, only broad aggregates that line up the 2010 and 2018 SOC occupations are used. Section 4, which is a detailed snapshot of the tech sector in St. Louis for 2021, examines each of the 32 occupations in Table 1.1. Section 5 looks at the effects of the COVID pandemic and, because of changes in categories in the business and finance occupations, is limited to the 16 IT and Computing and the occupations available in 2019.

Section 6 examines demographic patterns within tech and takes data from the Census Bureau's American Community Survey (ACS). The set of occupations available depends on the level of disaggregation and the year. Although the national data for occupations by demographic groups is generally very similar to that used in the other sections, this is not true for MSA-level data. Data for MSA's is available for 13 detailed EEO occupations used by the Equal Employment Opportunity Commission. These occupations are based on the SOC codes, so most of the SOC occupations are subsumed into these 13 occupations.

³ Database Architects, Data Scientists, and Web and Digital Interface Designers, for example, were not listed as separate occupations in the 2010 SOC.

2. Where is the Tech Sector?

Once the tech sector is defined in terms of occupations, we can describe where the tech sector is found in terms of the prevalence of tech workers in the industries and sectors of the economy. The data to determine this information is not available for St. Louis, but it is reasonable to assume that an industry that uses lots of tech at the national level will also use lots of tech in St. Louis. Table 2.1 lists the 3-digit sectors of the U.S. economy in order of their techiness—the shares of their employees in tech occupations. The three techiest sectors are Information; Professional, Scientific, and Technical Services; and Management of Companies and Enterprises, each with more than a quarter of its workforce in tech occupations. These are, by far, the techiest sectors and only Finance and Insurance comes close to them. At the other extreme are five sectors with less than 2 percent of their workforce in tech. The bottom of the list is not terribly surprising and includes sectors mostly providing services directly to consumers.

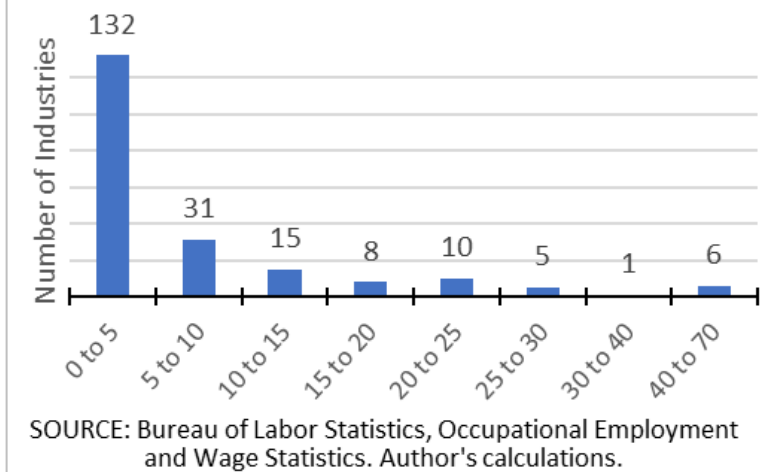
Table 2.1 also shows how important each sector is to tech by providing the number of tech employees in the sector along with the share of all tech employees in the sector. Professional, Scientific, Technical Services is, by far the most important sector for tech, largely because it includes two large and very techy industries, Computer Systems Design and Related Services and Management, Scientific, and Technical Consulting. The Finance and Insurance and Information Sectors are also important for tech, accounting for more than 10 percent of the total tech workforce. In total, there are seven sectors that accounted for at least 5 percent of tech, meaning that each had at least a half a million or so tech workers.

2.1. The Techiest 3-Digit Sectors, United States, 2021

NAICS 3-Digit Sector	Tech Share of Sector's Employees	Tech Employees	Sector's Share of All Tech Employees
Information	36.2%	995,290	10.3%
Professional, Scientific, and Technical Services	31.1%	2,987,140	31.0%
Management of Companies and Enterprises	27.2%	690,030	7.2%
Finance and Insurance	16.9%	1,021,000	10.6%
Utilities	8.9%	47,730	0.5%
Government (excl. schools, hospitals and the U.S. Postal Service)	8.7%	836,490	8.7%
Wholesale Trade	7.3%	402,980	4.2%
Admin. and Support and Waste Management and Remediation	5.6%	494,730	5.1%
Manufacturing	5.2%	623,890	6.5%
Other Services (except Public Administration)	4.5%	172,800	1.8%
Real Estate and Rental and Leasing	3.9%	82,710	0.9%
Educational Services	3.5%	430,630	4.5%
Construction	2.9%	215,300	2.2%
Mining, Quarrying, and Oil and Gas Extraction	2.8%	14,030	0.1%
Arts, Entertainment, and Recreation	2.3%	42,910	0.4%
Health Care and Social Assistance	1.5%	321,200	3.3%
Retail Trade	1.2%	183,560	1.9%
Transportation and Warehousing	0.7%	47,310	0.5%
Accommodation and Food Services	0.2%	28,620	0.3%
Agriculture, Forestry, Fishing and Hunting	0.2%	760	0.0%

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations

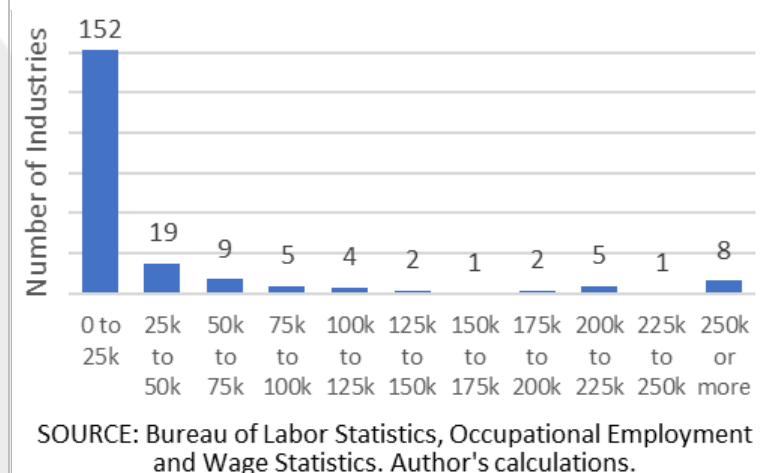
2.2. Frequency of Tech Shares of Industry Workforces



These broad sectors make general sense, but they hide the large differences across industries. When sectors are broken down by 4-digit industries, it is easier to see that tech is nearly absent from most industries, is integral to a good number of industries, and is dominant in a small number of industries. Figure 2.2 illustrates this extreme skew in techiness across industries: 132 out of 208 four 4-digit industries had less than 5 percent of their workforce in tech.

At the other extreme, there were six industries that had at least 40 percent of their employees in tech occupations. Computer Systems Design and Related Services and Software Publishers had, respectively 69 percent and 64 percent of their employees in tech. The remainder of the top six were similarly predictable as being extremely techy, but many of the industries with at least 15 percent of their workforces in tech would not usually be considered technology industries. Two of the techiest are Monetary Authorities-Central Bank and Advertising, Public Relations, and Related Services. Others are the Federal Executive Branch; Electronic Shopping and Mail-Order Houses, Grantmaking and Giving Services, and several manufacturing and communication industries. Appendix B lists the 50 techiest industries in the U.S. in 2021.

2.3. Frequency of Industry Numbers of Tech Workers



The distribution of tech across industries is also skewed, but some industries at the top of the distribution are there because of their sheer size. Computer Systems Design and Related Services is easily the most important industry for tech, with almost 1.6 million tech workers. The next three include two management industries and the Federal Executive Branch, with a combined 1.7 million tech workers. Other industries whose appearance high

on the list is due more to size than techiness include Credit Intermediation and Related Services, State Government, and Colleges, Universities, and Professional Schools. For reference, Appendix C provides the 50 industries with the most tech workers.

Refer to Appendix D, which provides the 10 largest industries for each of the 32 tech occupations. The spread of tech across disparate industries is even more noticeable looking at the largest industries in each of the tech occupations. For example, the largest industry for most computer occupations is Computer Systems Design and Related Services, but the rest of the occupations' top tens are across unrelated industries.

3. Tech in St. Louis, 2014-2021

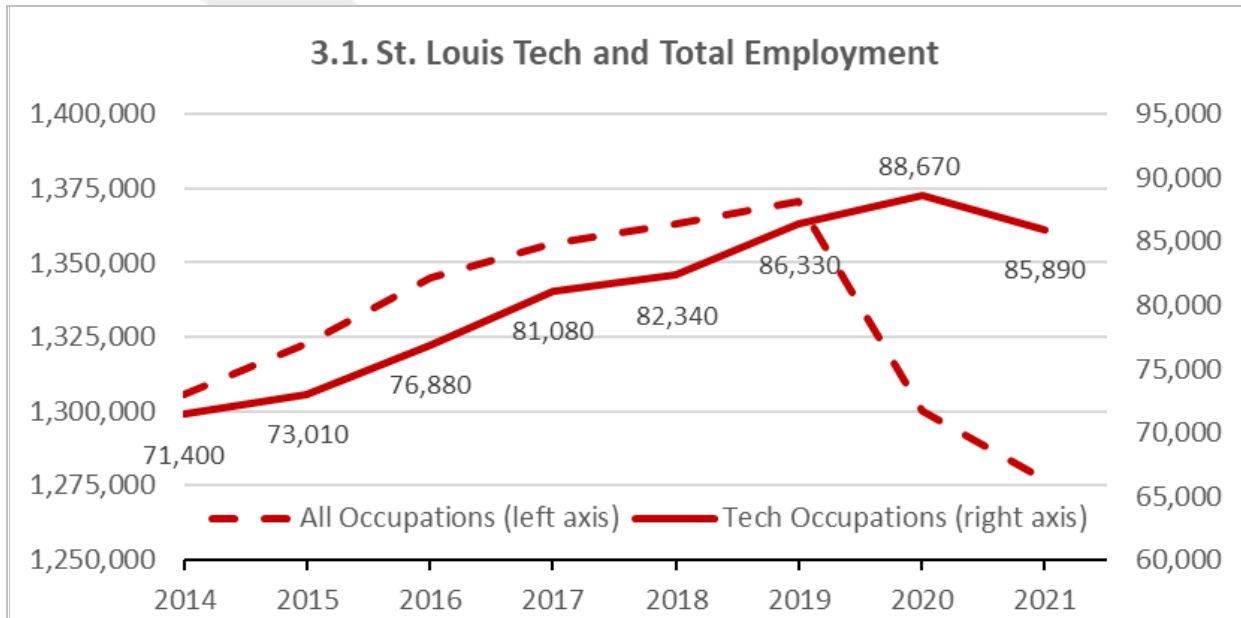
As already noted, there were nearly 10 million tech workers in the United States in 2021, accounting for about 6.9 percent of the total workforce. In the same year, the St. Louis MSA had an estimated 85,890 tech workers, which was about 6.7 percent of its total workforce.⁴ Tech's importance to the St. Louis economy has been growing over time, and the sector is 20 percent larger than it was in 2014, when it had 71,400 workers. As Figure 3.1 illustrates, the tech sector grew alongside total employment in St. Louis until 2019, although at a somewhat higher rate, as indicated by tech's steadily rising share of the total. By 2019, tech accounted for 6.3 percent of St. Louis employment, having risen from 5.5 percent in 2014 (see Figure 3.2). This difference might not seem large, but it was a significant change relative to the usual rate at which sectors change over time. These trends in tech mirrored those for the United States as a whole, with the tech share in St. Louis staying slightly above that of the U.S. until 2020.

Tech, like the rest of the economy, was jolted in 2020 as the COVID pandemic led to widespread interruptions. Average employment in St. Louis plunged by about 70,000 from its 2019 level, while tech employment actually rose by about 2,300, becoming 6.8 percent of the total. The gains in tech were lost in 2021, but tech employment was still close to its pre-pandemic level. As will be discussed in more detail later at the occupation level, the pandemic did not hit the tech sector nearly as hard as it hit the economy as a whole, in part because the demand for some tech occupations rose dramatically as firms became more technology dependent and more work went remote. The adjustments within tech and the rest of the economy during the pandemic meant that, for the first time, tech became slightly more important nationally than locally.

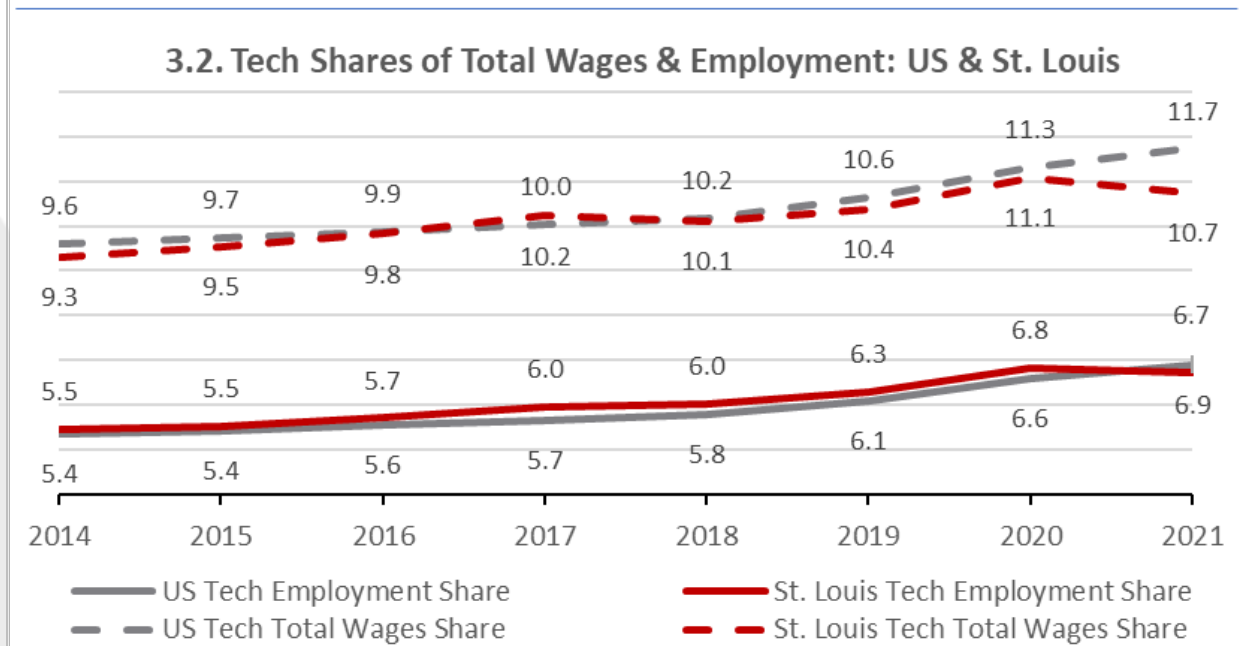
Another measure of the relative size of the tech sector is the share of total wages that are paid to those in tech occupations. In St. Louis and the U.S., average wages across tech occupations are higher than those in non-tech occupations. In 2021, the average tech wages in St. Louis and the U.S. were, respectively, 1.6 and 1.7 times the overall average wage. Specifically, the average annual tech wage in the U.S. was about \$99,100 and the average annual wage across all occupations was about \$58,260. The corresponding numbers for St. Louis were \$88,900 and \$55,700. Notice that the relative difference in wages between the U.S. and St. Louis was higher in tech than in the overall economy: The ratio of St. Louis to U.S. tech wages was 0.90, whereas

⁴ Note that all mentions of St. Louis from this point forward will mean the entire Metropolitan Statistical Area: Clinton, Jersey, Madison, Monroe, and St. Clair counties in Illinois; Franklin, Jefferson, Lincoln, St. Charles, St. Louis, and Warren counties in Missouri, the independent St. Louis city, and the city of Sullivan in Crawford county, Missouri.

the ratio for overall wages was 0.96. This mattered a lot across tech occupations, as will be explored in more detail in later sections.



SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.



SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.

By 2021, tech accounted for about \$7.6 billion in wages in St. Louis, or 10.7 percent of the total.

Because tech workers tend to be paid more than the average employee, the tech wage shares are higher than the tech employee shares for St. Louis and the U.S., as illustrated by Figure 3.2. By this measure, tech's importance to the St. Louis economy rose steadily starting in 2014, as it did for the national economy. By 2021, tech accounted for about \$7.6 billion in wages in St. Louis, or 10.7 percent of the total. The

combination of continually rising employment and average wages at the national level resulted in a notable divergence in the relative importance of tech at the national and local levels. It is too early to say anything definitive, but the long-term trends in working from home, which were juiced during the pandemic, probably explain some of the changes in St. Louis tech over the past two years. Given that some tech occupations are among those most suitable for remote work, much will depend on whether the region is a net recipient or net loser of tech workers reallocating themselves across the country.⁵

4. St. Louis Tech in 2021: Detailed Occupations

Employment

Although the tech sector's share of employment in St. Louis is very similar to that of the United States as a whole, the mix of tech occupations differs a great deal. Table 4.1 provides the number of tech workers for each of the tech occupations, along with its employment location quotient. The location quotient is the ratio of an occupation's shares in the St. Louis and U.S. tech sectors. If it is greater or less than 1, then the occupation is disproportionately large or small, respectively, in St. Louis. Note that the location quotient of 0.98 for all tech occupations in 2021 indicates that tech is slightly underrepresented in St. Louis relative to the rest of the country, as was shown in Figure 3.2.

Among the IT and computing occupations, which account for about 52% of tech in St. Louis, the largest, by far, is Software Developers with more than 11,000 workers. Despite its size locally, the occupation is underrepresented relative to the rest of the country. One thing to notice about the St. Louis tech sector is that there is a tendency for computer support occupations to be overrepresented and for computer production occupations to be underrepresented. Support occupations such as Computer User Support Specialists, Computer Network Support Specialists, Network and Computer Systems Administrators, and Computer Repairers all have location quotients well above 1. On the other hand, the location quotients are lower than 0.80 for producer occupations such as Computer Programmers; Computer Hardware Engineers;

⁵ See "How Many Jobs Can Be Done at Home," by J. Dingel and B. Neiman, NBER Working Paper 26948, April 2020.

Computer and Information Research Scientists; and Computer and Information Systems Managers. So, when it comes to IT and computing occupations, the St. Louis tech sector has a bias toward supporting the production of other goods and services rather than the production of computer goods and services.

Other general differences are consistent with differences in the mix of industries in St. Louis. Business and finance occupations make up about 43 percent of the tech sector in St. Louis. The three largest, Project Management Specialists, Business Operations Specialists, and Management Analysts, are also the most general ones found across industries. Finance and logistic occupations are overrepresented, while marketing occupations are underrepresented. Of the remaining occupations, Graphic Designers and Data Scientists are the two largest.

4.1. Tech Employees and Location Quotients by Detailed Occupation, St. Louis, 2021

Occupation	#	LQ	Occupation	#	LQ
IT and Computing			Data Analysis		
Software Developers	11,030	0.91	Data Scientists	1,490	1.59
Computer User Support Specialists	7,140	1.23	Operations Research Analysts	680	0.78
Computer Systems Analysts	4,480	1.00	Statisticians	220	0.79
Computer & Information Systems Managers	3,440	0.80	Business and Finance		
Network & Computer Systems	3,310	1.18	Project Management Specialists	8,690	1.32
Computer Occupations, All Other	3,200	0.98	Business Operations Specialists, All Other	6,770	0.74
Computer Network Support Specialists	2,340	1.50	Management Analysts	6,720	0.99
Computer Network Architects	2,010	1.35	Market Res. Analysts & Marketing	5,470	0.85
Software Quality Assur. Analysts & Testers	1,780	1.06	Financial & Investment Analysts	3,440	1.33
Information Security Analysts	1,150	0.83	Logisticians	1,880	1.12
Computer, ATM, & Office Machine	1,060	1.39	Marketing Managers	1,760	0.71
Web Developers	1,050	1.40	Financial Specialists, All Other	1,240	1.14
Computer Programmers	950	0.70	Financial Risk Specialists	660	1.37
Database Administrators	780	1.03	Design		
Computer Hardware Engineers	400	0.61	Graphic Designers	1,860	1.03
Web & Digital Interface Designers	360	0.49	Special Effects Artists & Animators	50	0.28
Database Architects	340	0.76	All Tech Occupations		
Computer & Information Research	140	0.51		85,890	0.98

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.

Annual Wages

For a region such as St. Louis looking to bolster its economy, the tech sector is alluring because it should continue to grow into the future, and it tends to provide much higher wages relative to the average. As already noted, in St. Louis, the average tech worker makes about 1.6 times the average wage in the region. As will be discussed later, this is partly due to the differences in levels of education between tech and non-tech occupations, as well as across tech occupations. But it is due also to the higher productivity and value-added in tech, all else constant. Table 4.2 provides the average wage levels in St. Louis for each of the tech occupations. It also provides for each occupation the wage relative to the national average, denoted as RW.

The average tech worker in St. Louis earned about \$89,000 in 2021, which was about 0.9 of what was earned by the average tech worker in the rest of the country. Underlying those numbers is a great deal of variation across tech occupations. There are six occupations with average pay above \$100,000. Five of those are in IT and computing along with four of the five with average pay below \$70,000. Notice that, excluding Computer Network Architects, these high-paid occupations are underrepresented in St. Louis in that their average location quotient is only 0.79. In other words, six of the seven highest-paid tech occupations are underpaid and relatively rare in St. Louis. The other end of the wage ranking is similarly disturbing for St. Louis. The computer support occupations that are overrepresented in St. Louis also tend to be among the lowest-paid tech occupations. It's not possible to assign causation between these two facts, but, given the high mobility of people in these occupations, it is probably not a coincidence. Nevertheless, there is general positive relationship between an occupation's relative wage and its location quotient, so high relative demand for an occupation seems to be translating into high relative wages.

Six of the seven highest-paid tech occupations are underpaid and relatively rare in St. Louis.

4.2. Tech Wage Levels and Relative Wages by Detailed Occupation, St. Louis, 2021

Occupation	\$/year	RW	Occupation	\$/year	RW
IT and Computing			Data Analysis		
Computer & Information Systems	142,900	0.88	Data Scientists	95,680	0.88
Database Architects	113,810	0.93	Statisticians	90,430	0.91
Computer Network Architects	111,880	0.93	Operations Research Analysts	85,990	0.90
Software Developers	101,370	0.84	Business and Finance		
Computer & Information Research	101,060	0.71	Marketing Managers	124,150	0.81
Information Security Analysts	97,980	0.87	Management Analysts	95,010	0.95
Computer Systems Analysts	94,320	0.92	Project Management Specialists	93,440	0.95
Network & Computer Systems Admins	93,470	1.02	Financial Risk Specialists	92,900	0.84
Computer Occupations, All Other	93,370	0.95	Financial & Investment Analysts	91,320	0.89
Database Administrators	92,350	0.96	Logisticians	82,270	1.04
Computer Hardware Engineers	87,930	0.65	Business Operations Specialists, All Other	80,020	1.01
Computer Programmers	82,500	0.85	Financial Specialists, All Other	73,880	0.92
Web Developers	82,350	1.01	Market Res. Analysts & Marketing	73,260	0.96
Computer Network Support Specialists	74,510	1.04	Design		
Web & Digital Interface Designers	68,180	0.71	Special Effects Artists & Animators	71,430	0.83
Software Quality Assur. Analysts & Testers	64,030	0.66	Graphic Designers	50,660	0.84
Computer User Support Specialists	59,360	1.03	All Tech Occupations		
Computer, ATM, & Office Machine	42,790	0.97			\$88,914 0.94

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.

The average wages cited in Table 4.2 illustrate the differences across tech occupations but hide the vast differences within them. But, as Table 4.3 summarizes, the spread of the wage distributions (measured as the ratio of the 90th and 10th percentile wages) are far from uniform. For five of the occupations, the breadth measure is above 3.5 while for another five it is below 2.3. There is no obvious pattern, either, as the breadth measure is not strongly related to the location quotient, the average wage, average education, or differences in the share of females. A likely explanation for the differences is that some occupations include much broader job types than others, along with a wide spread of education levels, so there will naturally be larger differences in wages within them.

4.3. Wage Distributions by Detailed Occupation, St. Louis, 2021

	10 th percentile	25 th percentile	Median	75 th percentile	90 th percentile	Spread ^a
IT and Computing						
Computer & Information Systems Managers	78,890	102,440	132,450	168,770	NA ^b	NA ^b
Web & Digital Interface Designers	32,830	41,340	61,320	80,280	118,580	3.61
Software Quality Assurance Analysts & Testers	32,940	33,020	49,080	83,220	112,200	3.41
Computer Network Support Specialists	38,170	48,290	61,550	86,010	129,740	3.40
Computer Programmers	38,340	54,940	80,120	99,560	125,180	3.26
Computer & Information Research Scientists	50,090	78,660	99,330	121,530	162,820	3.25
Computer Network Architects	53,460	75,410	103,110	131,910	168,470	3.15
Computer Hardware Engineers	47,950	61,330	78,300	118,410	131,590	2.74
Database Architects	61,970	78,430	118,930	131,730	168,790	2.72
Computer Occupations, All Other	48,690	74,400	96,600	109,470	131,020	2.69
Database Administrators	48,730	65,500	92,130	111,020	131,040	2.69
Web Developers	48,690	59,470	78,630	101,730	126,300	2.59
Computer User Support Specialists	33,850	45,480	57,780	73,190	86,840	2.57
Network & Computer Systems Administrators	53,130	62,780	96,390	124,200	131,040	2.47
Software Developers	61,050	77,000	99,880	129,640	147,690	2.42
Computer Systems Analysts	59,140	75,100	94,980	102,600	131,040	2.22
Information Security Analysts	61,140	77,110	98,860	124,950	131,340	2.15
Computer, ATM, & Office Machine Repairers	29,850	36,440	39,180	47,570	61,120	2.05
Data Analysis						
Operations Research Analysts	47,630	60,820	79,890	103,590	129,760	2.72
Data Scientists	58,100	70,170	93,640	124,200	131,200	2.26
Statisticians	61,440	77,620	86,490	99,720	121,530	1.98
Business and Finance						
Financial & Investment Analysts	48,120	60,900	78,980	103,670	184,240	3.83
Market Research Analysts & Marketing Specialists	35,230	44,610	61,710	91,340	125,260	3.56
Financial Risk Specialists	47,830	60,930	81,640	123,690	156,070	3.26
Marketing Managers	68,480	83,720	103,830	158,690	194,540	2.84
Management Analysts	50,030	63,970	81,770	111,500	142,060	2.84
Financial Specialists, All Other	40,800	53,450	63,040	86,490	114,190	2.80
Project Management Specialists	48,740	62,750	82,520	114,050	133,530	2.74
Business Operations Specialists, All Other	47,650	59,720	76,920	98,070	122,390	2.57
Logisticians	48,060	62,670	80,890	100,180	121,530	2.53
Design						
Special Effects Artists & Animators	42,060	62,070	63,660	80,570	130,970	3.11
Graphic Designers	30,000	37,780	47,770	61,710	76,920	2.56

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations. ^a Spread is the ratio of the 90th and 10th percentile wages. ^b Unavailable due to privacy concerns.

5. Pandemic-Era Changes in IT and Computing

The COVID pandemic wreaked havoc on the economies of the United States and St. Louis as government-imposed restrictions and private health precautions combined to alter both the level and composition of economic activity. As noted in Section 3, the tech sector was largely exempt from the severe drop in employment. Average monthly employment in St. Louis fell by about 70,000 in 2020, and by another 23,000 in 2021. The tech sector, in contrast, experienced a relative boom in 2020, with employment increasing by about 2,300 before falling by almost 2,800 in 2021. The dust still hasn't settled on these changes in that they are derived from the averages across months within the years, and the trends during the two halves of 2021 were pointing in different directions. A complete picture won't be available until mid 2023 when data for 2022 are released.

5.1. IT & Computing Employment Changes, St. Louis, 2019-21

	Change	St L %	US %
Computer User Support Specialists	1,230	20.8	1.1
Computer, ATM, & Office Machine Repairers	170	19.1	-12.0
Computer Network Architects	160	8.6	10.8
Computer Hardware Engineers	100	33.3	8.6
Computer & Information Research Scientists	-10	-6.7	0.2
Web Developers & Digital Interface	-100	-6.6	12.7
Computer and Info Systems Managers	-170	-4.7	11.8
Information Security Analysts	-430	-27.2	25.2
Computer Network Support Specialists	-550	-19.0	-5.0
Computer Occupations, All Other	-760	-19.2	-5.8
Database Administrators & Architects	-790	-41.4	8.6
Network & Computer Systems	-930	-21.9	-10.6
Software Developers & Software Quality	-950	-6.9	10.5
Computer Programmers	-1,130	-54.3	-23.5
Computer Systems Analysts	-1,900	-29.8	-14.2

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.

The variety of changes that occurred within the St. Louis tech sector during this period are reflective of the role of the sector in the local economy. Unfortunately, because of the changes in the coding of some business and finance occupations, we can't be sure about the changes in those occupations over time. For IT and computing, however, the occupations appear to be stable enough to use, and their employment changes from 2019 to 2021 are reported in Table 5.1. Overall, employment in IT and computing fell by almost 6,100, with broad declines across most of the occupations. Note, however, that the biggest declines tended to have occurred in 2021, the second

year of the pandemic. In fact, in the first year, the number of expanding occupations was about the same as the number of declining ones, and there was a net gain of 40 employees across all of IT and computing.

The general pattern was that support occupations that assist users and maintain computers, networks, and web sites fared relatively well, mostly during 2020, while producing occupations such as programmers fared relatively poorly, mostly during 2022. In other words, the pattern was driven by the sudden need to accommodate remote work and other work adjustments, along

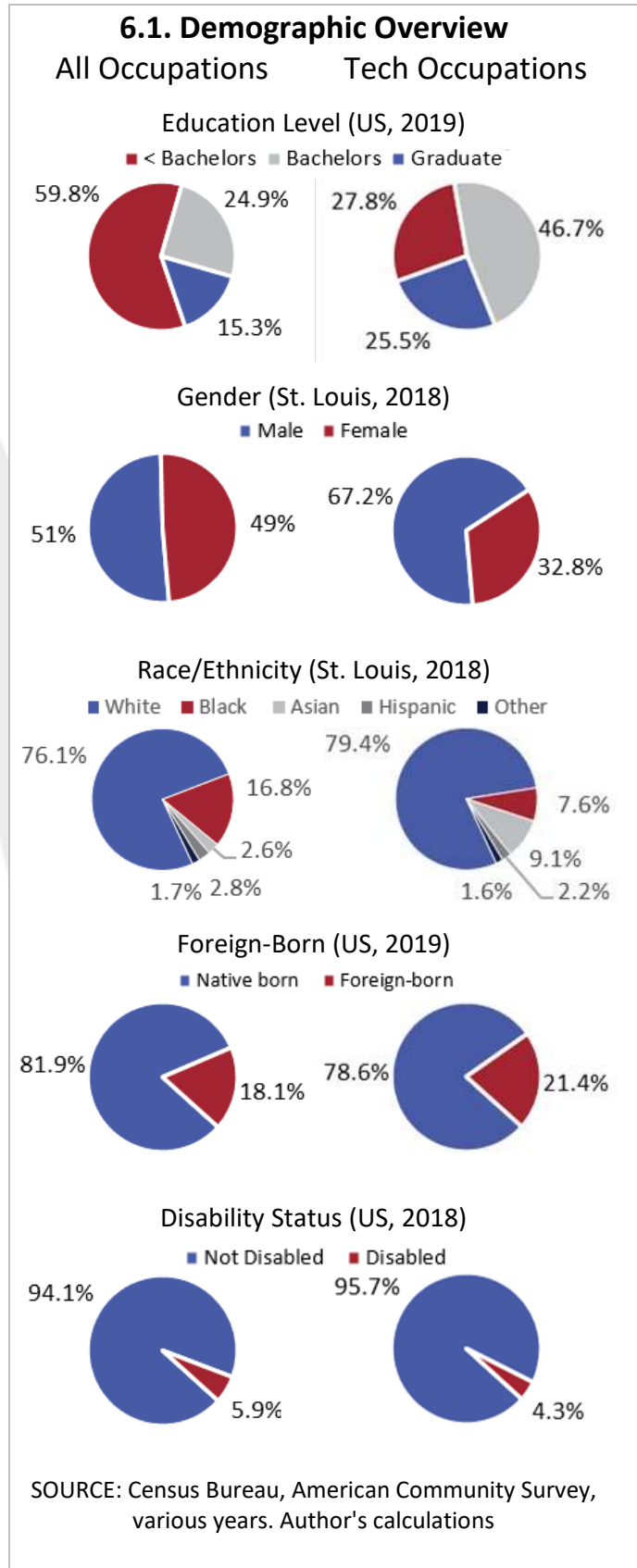
with the general decline in economic output and the decrease in demand for some technological goods.

Table 5.1 also shows the percentage changes St. Louis and the US. Notice that for all but the first three occupations listed, the change in St. Louis was worse than the change in the US. It is speculative at this stage, but this pattern with might be the result of the geographic reallocation of tech work as work from home became more widely accepted. IT workers providing hands-on support are more likely to be needed on-site, whereas many other IT and computing jobs can be done from anywhere in the country. If true, then the numbers are indicating that St. Louis has been losing in the geographic reallocation of IT and computing jobs unleashed by the pandemic.

6. Demographics and Tech

Previous sections have outlined what the tech sector is, what people in the sector do, where the tech sector is found among industries, and what the tech sector in St. Louis looks like. Because no picture of tech is complete without knowing who is and isn't in the tech sector, this section breaks tech down according to several interrelated demographic categories: Education, gender, race/ethnicity, foreign-born status, and disability status.

As mentioned in Section 1, the data come from the Census Bureau's American Community Survey, do not have the same occupations used in previous sections, and are not always available at



the MSA level. As a result, occupations by education and foreign-born status are closest to those in previous sections but are available only for the US; gender and race/ethnicity data are available for St. Louis, but only for EEO occupations; and data by disability status are available only for the U.S. using the EEO occupations.⁶

As a whole and relative to the overall workforce, tech workers are (1) more educated in that they are about twice as likely to have a bachelor's or graduate degree; (2) much more likely to be male; (3) somewhat whiter, less black, and a lot more Asian; (4) more likely to be foreign-born; and (5) less likely to be disabled.

Figure 6.1 provided a broad overview of the differences between the tech sector and the rest of the workforce using the data available for each category. As a whole and relative to the overall workforce, tech workers are (1) more educated in that they are about twice as likely to have a bachelor's or graduate degree; (2) much more likely to be male; (3) somewhat whiter, less black, and a lot more Asian; (4) more likely to be foreign-born; and (5) less likely to be disabled. These facts are related to each other, particularly through difference in education levels across various groups of people. As such, the discussion below begins with education and proceeds through the remaining demographic categories.

Education and Tech Occupations

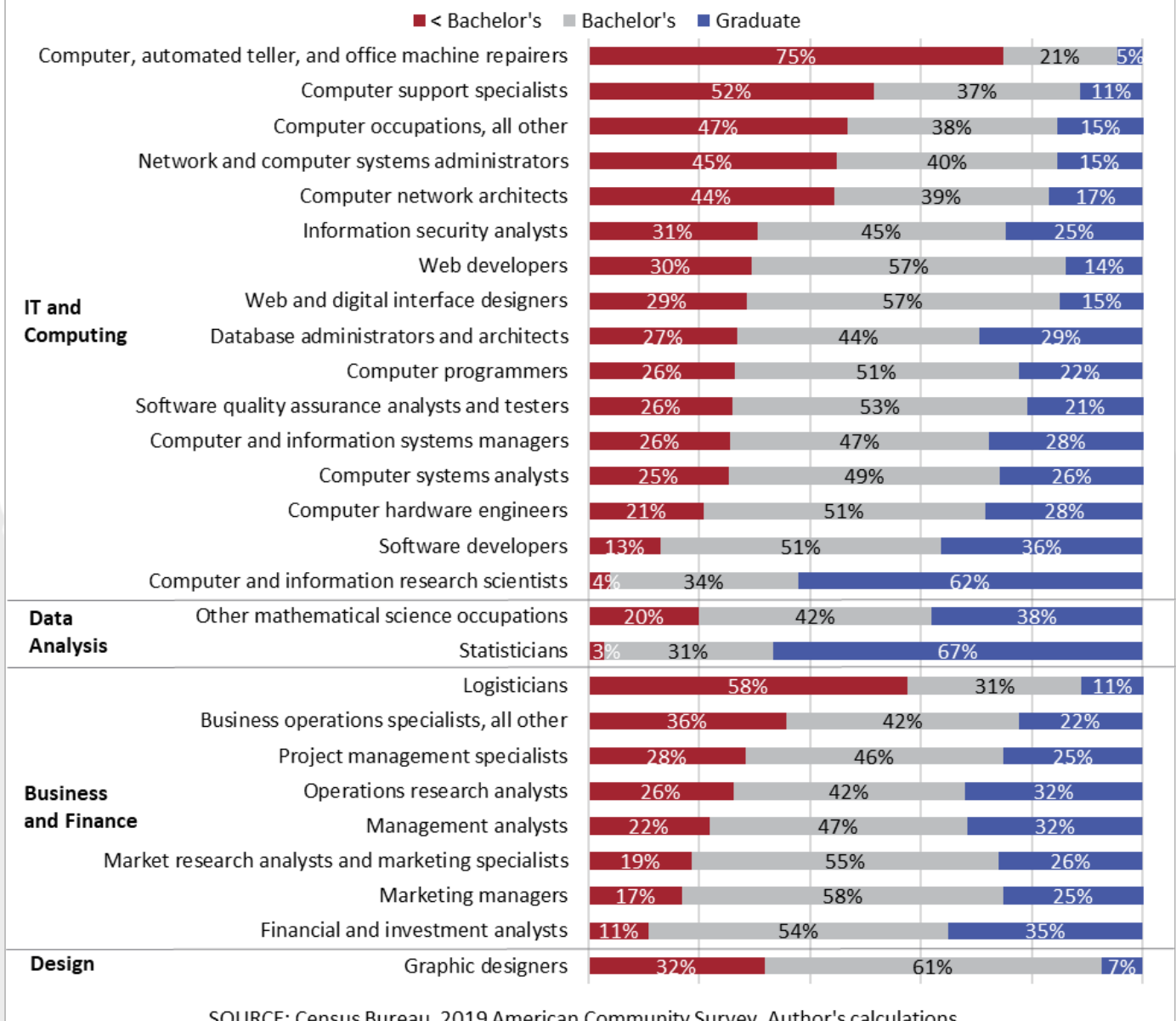
Given that the tech sector includes computer and math occupations, along with some management occupations, it is not surprising that people in the tech sector tend to have more education than the rest of the workforce. As illustrate in Figure 6.1, most of the workforce (60 percent) does not have a bachelor's or higher degree, a quarter have a bachelor's degree, and 15 percent have graduate degrees. In tech, on the other hand, almost half have bachelor's degrees and more than a quarter have graduate degrees. This pattern is by no means standard across tech occupations, however.

As Figure 6.2 shows, there are six tech occupations for which more than 40 percent of the workers do not have a bachelor's degree, two for which more than 60 percent have graduate degrees, and another five for which more than 30 percent have graduate degrees. Those occupations with the highest shares of graduate degrees are spread across mathematical and business

⁶ The EEO occupations from the Equal Employment Opportunity Commission are based on the SOC codes, but some of the SOC tech occupations are rolled into non-tech occupations (e.g., both management occupations) or are combined to create a larger tech occupation (e.g., Other computer occupations). As such, the numbers in those sections will not match the numbers in other sections, although the totals are not far off.

occupations. The occupations with the lowest shares of advanced degrees include computer support and other occupations such as logisticians and graphic designers who apply tech rather than create technological goods and services. In short, although the average level of education in tech is high, the absence of advanced degrees, or even a bachelor's degree, is not a barrier to entering the sector.

6.2. Education-Level Shares by Tech Occupation, United States, 2019



Women in St. Louis Tech

Women typically account for just under half of employment across all occupations in the United States (See Figure 6.1). In tech, however, they account for less than one-third of all workers. Women’s overall representation in St. Louis is slightly higher in both regards, but there are notable differences across tech occupations. Table 5.3 shows for each tech occupation the number of women workers, the female share, and the location quotient. Using the EEO categories, there were 27,400 female tech workers in St. Louis in 2018, who were about one-third of all tech workers. The location quotient of 1.02 for all tech occupations indicates that the share of women in tech in St. Louis was a little higher than it was for the U.S.

6.3. Female Tech Employees and Location Quotients by Occupation, St. Louis, 2018

	#	Share of Occup.	LQ
IT and Computing			
Other computer occupations	4,680	29.1%	1.15
Software and web developers,	4,480	24.2%	1.11
Computer and information research	2,805	33.9%	0.95
Computer and information systems	2,170	29.8%	1.05
Database and network administrators	1,035	18.7%	0.87
Computer hardware engineers	25	6.8%	0.45
Data Analysis			
Mathematical science occupations	920	32.2%	0.69
Business and Finance			
Management analysts	3,980	45.5%	1.08
Project management specialists	2,505	39.8%	0.96
Market research analysts and marketing	1,690	56.1%	0.96
Business ops specialists, all other	1,475	59.5%	1.11
Financial and investment analysts	1,060	41.4%	1.04
Logisticians	580	37.7%	1.08
All tech occupations	27,405	32.8%	1.02

SOURCE: Census Bureau, 2018 American Community Survey. Author's calculations. EEO occupations.

The two largest occupations for women tech workers in St. Louis are also the two largest tech occupations overall. In 2018, about 4,700 women were employed in Other computer occupations, while another 4,500 or so were employed as Software and web developers, programmers, and testers. Although lots of women in St. Louis worked in these occupations, they were still underrepresented even relative to the rest of tech in that their shares in these occupations were less than share of women in tech overall. Further, their location quotients indicate that their underrepresentation was not as bad as in the rest of the country. The third largest tech occupation for women in St. Louis was Management analysts, where their representation was almost as high

as in the local economy. And there were two where women were overrepresented: Market research analysts and marketing specialists, and Business operations specialists.

Note from the table the types of occupations for which women are most-underrepresented, even relative to the rest of tech. Including the two largest occupations, they are all computer occupations. There is a tendency for these occupations to have low location quotients also, indicating that the underrepresentation in St. Louis was worse than in the rest of the country. It is worth noting that education level is not a driver of female underrepresentation in various tech occupations. In fact, if you use national data and plot female shares of occupations and the share of the occupations with graduate degrees, you find that there is a positive relationship. Where

graduate degrees are more common you are more likely to see more women. The difference seems to be in the fields of study, not the levels of study.

Race and Ethnicity in St. Louis Tech

The racial composition of the St. Louis differs a great deal from that of the rest of the country. The region has traditionally received relatively few immigrants, so its resulting workforce is whiter and blacker than the country's (See Figure 6.1). Specifically, about three quarters of the St. Louis workforce is white, but only about 63 percent of the U.S. workforce is. Almost 17 percent of the St. Louis workforce is black, but only about 12 percent of the U.S. workforce is. These facts should be kept in mind when interpreting the data describing the racial composition of the St. Louis tech sector, particularly when comparing it to that of the rest of the country. This fact also matters when putting together the data. In individual tech occupations there can be so few Hispanic, Native American, Pacific Islanders, and other groups that they are simply bundled together in the occupation-level analysis below. To illustrate, note that even for Hispanic workers the estimates of the numbers in tech occupations are usually close to, or even less than, their margins of error.⁷

Table 6.4 provides data on the racial composition of the St. Louis tech sector by EEO occupation. It shows the absolute number of employees for each group/occupation combination, along with the group's share of the occupation in St. Louis. To compare local representation to national representation, the table also provides the location quotients for each group/occupation combination. The occupations are listed in decreasing order of their number of non-white workers.

Note that the share of non-white workers in St. Louis is lower in tech than it is in the rest of the workforce: 79.4 percent of tech is white alone, but 76.1 percent of the total workforce is. Because of the large share of white workers in general relative to the country, the location quotients are well above 1. Keeping this in mind, note how hugely underrepresented workers who are black or African American alone are in the St. Louis tech. They comprise only 7.6 percent of the tech sector but 16.8 percent of all workers in St. Louis. Nationally they are 7.7 percent of tech workers and 11.8 percent of all workers. More alarmingly, the location quotient for black workers in tech indicates that the black shares are about the same in St. Louis and the U.S., despite the black workforce being a much larger share of the St. Louis economy. So, not only are black workers underrepresented in tech in St. Louis, but this underrepresentation is significantly worse than what happens at the national level.

Asians, who are relatively small in numbers in St. Louis, make up 9.1 percent of its tech sector, which is about three- and one-half times the Asian share of the total workforce. Even so, Asians in tech are greatly underrepresented when compared to the U.S., where they make up about 16

⁷ The data from the ACS are based on a sample of the population, so there is statistical uncertainty about their accuracy. Once the data are sliced by MSA, detailed occupation, and ethnicity, the uncertainty—measured by the margin of error—can be large relative to the estimate. In short, the estimates are not much better than a roll of the dice.

percent of the workforce. Finally, Hispanics and others are a small share of the workforce and make up a somewhat smaller share of the St. Louis tech sector. About 4.5 percent of the St. Louis workforce is in this group, compared to almost 20 percent nationally. In tech, about 3.8 of the St. Louis workforce is in the group, whereas about 10 percent is in it nationally.

6.4. Employees and Location Quotients by Race/Ethnicity & Tech Occupation, St. Louis, 2018

Occupation	White alone	Share of Occup.	Location Quotient	Black or Afr.-Amer. alone	Share of Occup.	Location Quotient
IT and Computing						
Software & web developers, programmers, & testers	13,715	74.0	1.23	1,045	5.6	1.19
Other computer occupations	12,685	78.9	1.22	1,595	9.9	0.92
Computer and info research scientists and analysts	6,440	77.7	1.23	705	8.5	0.93
Computer and information systems managers	6,040	82.9	1.16	400	5.5	0.93
Database and network administrators and architects	4,505	81.2	1.20	300	5.4	0.65
Computer hardware engineers	315	85.1	1.54	25	6.8	0.87
Data Analysis						
Mathematical science occupations	2,270	79.4	1.20	265	9.3	1.01
Business and Finance						
Management analysts	7,170	82.0	1.12	780	8.9	1.20
Project management specialists	5,230	83.0	1.12	490	7.8	1.07
Market research analysts and marketing specialists	2,735	90.7	1.21	165	5.5	1.00
Financial and investment analysts	2,115	82.6	1.21	170	6.6	0.87
Business operations specialists, all other	1,875	75.6	1.16	250	10.1	0.91
Logisticians	1,300	84.4	1.34	150	9.7	0.64
Total, all occupations	1,114,520	76.1	1.21	246,545	16.8	1.42
All tech occupations	66,395	79.4	1.20	6,340	7.6	0.99
Occupation	Asian alone	Share of Occup.	Location Quotient	Hispanic and Other	Share of Occup.	Location Quotient
IT and Computing						
Software & web developers, programmers, & testers	3,115	16.8	0.63	660	3.6	0.43
Other computer occupations	1,270	7.9	0.68	525	3.3	0.26
Computer and info research scientists and analysts	685	8.3	0.47	455	5.5	0.54
Computer and information systems managers	580	8.0	0.57	275	3.8	0.44
Database and network administrators and architects	540	9.7	0.72	200	3.6	0.34
Computer hardware engineers	25	6.8	0.24	0	0.0	0.00
Data Analysis						
Mathematical science occupations	185	6.5	0.45	140	4.9	0.49
Business and Finance						
Management analysts	555	6.4	0.60	235	2.7	0.29
Project management specialists	335	5.3	0.68	240	3.8	0.35
Market research analysts and marketing specialists	55	1.8	0.21	60	2.0	0.19
Financial and investment analysts	165	6.4	0.44	105	4.1	0.43
Business operations specialists, all other	125	5.0	0.50	230	9.2	0.68
Logisticians	4	0.3	0.05	80	5.2	0.32
Total, all occupations	38,060	2.6	0.46	65,525	4.5	0.23
All tech occupations	7,639	9.1	0.58	3,205	3.8	0.37

SOURCE: Census Bureau, 2018 American Community Survey. Author's calculations. EEO occupations.

Within the tech sector, there is a great deal of variation across occupations in the representation of minority (non-white) workers. For example, the share of white workers is well below average for Software and web developers, the largest tech occupation. White workers typically have above-average representation in the non-computer occupations, such as the management and marketing.

There are no bright spots within the St. Louis tech sector for black workers. The group's overall location quotient is 1.42 because the share of the total workforce is about 42 percent larger in the region than it is nationally, controlling for size. Even so, the group's tech share is about the

same locally as it is nationally, as indicated by tech's location quotient of 0.99. The only occupation for which the location quotient comes within shouting distance of that for all occupations is Management analysts. Black workers are greatly underrepresented in tech nationally, the underrepresentation is much worse in St. Louis, and it is present across all tech occupations.

There are no bright spots within the St. Louis tech sector for black workers...

Black workers are greatly underrepresented in tech nationally, the underrepresentation is much worse in St. Louis, and it is present across all tech occupations.

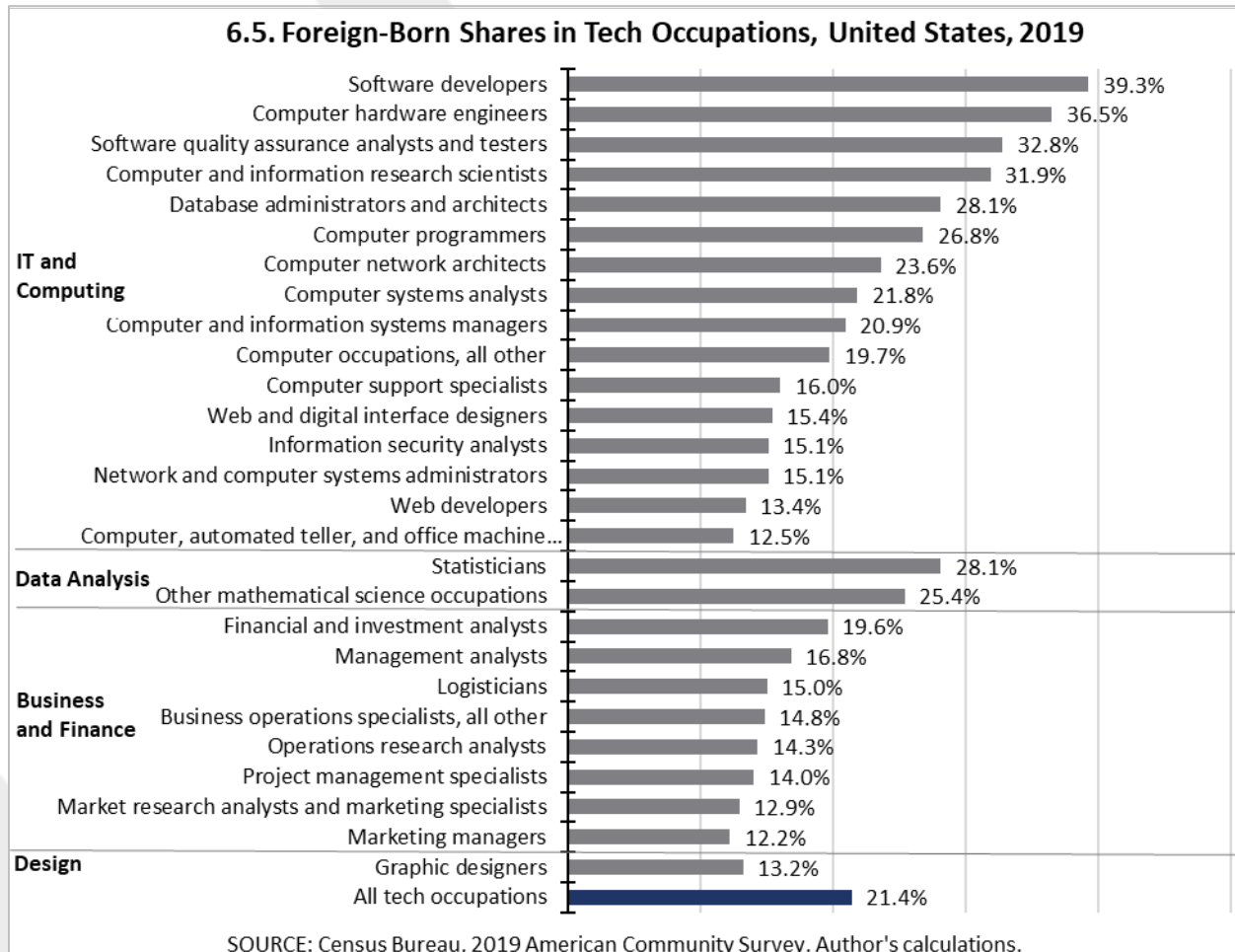
There is a pattern to the relative abundance of Asian workers in tech in St. Louis. By far, the highest share of Asians can be found among software and web developers, and there is a tendency for high shares in computer occupations. Relatively low shares are in marketing and management occupations. For the final group, Hispanics and Others, the numbers are, unfortunately, too small to detect a clear pattern across tech occupations.

Foreign-Born Workers in Tech

The foreign-born population is not nearly as present in the St. Louis economy as it is in the national economy. In 2019, for example, about 14.6 percent of the U.S. population was foreign born, whereas only about 5.5 percent of the St. Louis population was.⁸ This disparity has implications for the St. Louis tech sector given that foreign-born workers are disproportionately represented in national tech sector. Nationally, 21.4 percent of tech workers are foreign born.

⁸ How Does St. Louis-Area Immigration Differ from National Trends?, S. Bandyopadhyay and P. Grittayaphong, Federal Reserve Bank of St. Louis *Regional Economist*, January 2022.

As shown by Figure 6.5, which provides the shares of foreign-born workers across tech occupations in the US, the foreign-born are most present in the computer occupations underrepresented in St. Louis. Although we don't have occupation-level data for St. Louis, we do know that relative to the native-born, a foreign-born person in St. Louis is two- and one-half times as likely to have a degree in Computer and Information Science, more than twice as likely to have a degree in Mathematics and Statistics, and a bit less likely to have a degree in Business.⁹



The shares of foreign born in an occupation provided by Figure 6.5 are measures of how important foreign-born workers are within each tech occupation. Equally important for understanding the role of foreign-born workers is how important each of the occupations is for them. The answer is still computing in that, software and computing occupations account for a significant majority of foreign-born workers in the U.S. In fact, software developers alone account for nearly one in three foreign-born workers in the tech sector. Thus, the causality is not definitive, but it is safe to say that foreign-born workers will need to be a significant part of advancing the St. Louis tech sector beyond its current computer support orientation.

⁹ Bandyopadhyay and Grittayaphong, op cit.

Tech and Disability Status

The number of self-reported disabled workers in the United States is not insignificant. In 2017, there were more than 9 million employed across all occupations, comprising 5.9 percent of national employment. About 3 percent, or 284 thousand, worked in tech. Given that 5.7 percent of all workers were in tech that year, this represents a significant underrepresentation. On the other disabled workers were paid only 87 percent the average wage across all occupations, but 93 percent of the average wage within the tech sector.

6.6. Tech Occupations and Disability Status, United States, 2017

Occupation		Share of Employees occupation	Relative wage
IT and Computing			
Software developers, applications and systems	38,825	2.9	0.90
Computer support specialists	33,750	5.0	0.87
Computer occupations, all other	32,225	4.5	0.96
Computer and information systems managers	21,900	3.6	0.93
Computer systems analysts	19,850	3.7	0.89
Computer programmers	17,370	4.0	0.94
Computer, ATM, and office machine repairers	11,335	6.5	0.98
Network and computer systems administrators	10,020	4.6	0.91
Web developers	7,590	3.9	0.98
Data Analysis			
Operations research analysts	8,045	5.5	0.94
Business and Finance			
Management analysts	41,845	4.7	0.86
Business operations specialists, all other	17,270	5.4	0.99
Market research analysts and marketing	8,570	2.6	0.85
Financial analysts	8,230	3.7	0.83
Logisticians	7,485	5.1	1.03
Total across all occupations	9,085,980	5.9	0.87
Tech occupations (only those listed above)	284,310	4.3	0.93

SOURCE: Census Bureau, 2017 American Community Survey. Author's calculations.

The most common tech occupation for disabled tech workers is as Management analysts, but they are paid relatively less than average. The second largest occupation is Software developers, but disabled workers make up a relatively small share in the occupation. This is significant given that this is easily the largest of all tech occupations. The friendliest occupations in tech for disabled workers, with higher-than-average shares and relative wages, are Business operations specialists, Computer repairers, and Computer programmers.

7. St. Louis Tech in 2030

What does the future hold for the St. Louis tech sector? As the preceding sections have outlined, the St. Louis tech sector had several relatively successful years in terms of the number of jobs and the total amount of income generated for employees. Hidden under this success, however, was the substantial underrepresentation of African Americans and women, although women had been faring better locally than nationally. In addition, the lack of foreign-born workers coincided with the skew of St. Louis tech toward business, finance, and computer support rather than IT and computer production. The COVID pandemic upended all of the trends in tech, thereby creating both opportunities and challenges. The data so far suggest that the pandemic has skewed the local IT and computing occupations even more towards support over production.

Table 7.1 provides the tech occupation projections for 2020 to 2030 produced by the Missouri Economic Research and Information Center (MERIC), which are based on the methodology of the Employment Projections program of the U.S. Bureau of Labor Statistics. The projections were produced in 2021 and 2022, so they include the pandemic experience as part of the first two years of the 10-year projections. As such, significant portions of the projections are due to the low starting points resulting from the pandemic.

Notice that the projection for total employment across all occupations in St. Louis is just a notch below that for the US. We wouldn't normally expect growth in St. Louis and the U.S. to be this similar, much of it is recovery from the effects of the pandemic era rather than a long-term trend. Tech occupations are projected to grow more quickly than others for both St. Louis and the US.

7.1. Projected Tech Employment Growth by Occupation, St. Louis, 2020-30

Occupation	Change	StL%	US%	Occupation	Change	StL%	US%
IT & Computing				Data Analysis			
Software Developers & Software Quality Assurance Analysts & Testers	2,816	18.3	22.2	Operations Research Analysts	183	22.6	24.6
Computer User Support Specialists	782	12.4	8.9	Data Science & Math, Other	136	25.6	31.4
Computer & Info Systems Managers	367	9.9	10.9	Statisticians	76	32.8	35.4
Information Security Analysts	346	28.4	33.3	Business & Finance			
Computer Systems Analysts	257	4.4	7	Market Res Analysts & Marketing Spec	1,239	22.1	22.1
Web Dev. & Digital Interface Designers	247	12.5	12.8	Management Analysts	906	13.1	13.7
Computer Occupations, All Other	170	6.1	9.2	Project Management Specialists & Business Ops Specialists, All Other	573	4.7	5.6
Computer Network Support Specialists	143	6.9	7.5	Logisticians	441	30.9	29.5
Network & Computer Systems Administrators	120	4.0	5.4	Financial & Investment Analysts, Financial Risk Specialists, etc.	248	5.5	6.4
Database Administrators & Architects	111	5.3	7.8	Marketing Managers	127	8.5	10
Computer & Info. Research Scientists	51	27.4	21.9	Design			
Computer Hardware Engineers	10	3.9	1.5	Graphic designers	52	2.6	2.9
Computer Network Architects	3	0.2	5.5	Special effects artists & animators	50	9.9	15.8
Comp'r, ATM, & Office Machine Repair	-43	-4.2	-2.2	All tech occupations			
Computer Programmers	-244	-14.9	-9.9	Total, all occupations			
					9,167	10.7	12.3
					81,488	7.3	7.7

SOURCES: Employment Projections program, U.S. Bureau of Labor Statistics; Missouri Economic Research and Center Information; author's calculations.

The gap between local and national growth in tech is much wider than the overall growth gap, however.

The IT and computer occupations are projected to account for about 5,100 of the 9,200 or so of the increase in St. Louis tech workers. In terms of the number of people, Software Developers & Software Quality Assurance Analysts & Testers are projected to see the largest change, by far. It alone is projected to account for 55 percent of the change in IT and computing jobs, and 31 percent of the change in the total of tech jobs. Outside of IT and computing, the projections for Market Research Analysts and Marketing Specialists and Management Analysts are for a combined increase of about 2,150, or about 23 percent of the total change in tech.

The general picture is that more than half of the increase in St. Louis tech jobs between 2020 and 2030 are projected to come from just three occupations. For the most part, the percentage changes across occupations follow those for the country as a whole but are smaller. An underlying trend is that data, whether big or small, is projected to become increasingly important to businesses over the next few years. The three data analysis occupations, as well as marketing research and management analysis, are projected to see very strong growth in percentage terms.

Keep in mind that projections are not derived using crystal balls that peer through time. They simply combine current conditions and trends to project a data series into the future. One of the difficulties in making projections today is that many of the pre-pandemic trends are no longer in play. Work-from-home and other adaptations have hastened changes that probably would have taken years to have occurred otherwise. In addition, trends are not set in stone and can be changed by events outside of our control. Nevertheless, projections are valuable because they give a picture of what could happen if current trends continue. If policymakers and others don't like the results suggested by the projections, there might be things that can be done to change the trends for the better.

Appendices: Occupation, Sector, and Industry Details

Appendix A. Occupation Definitions, SOC 2018

SOC Code	SOC Title	SOC Definition
11-2021	Marketing Managers	Plan, direct, or coordinate marketing policies and programs, such as determining the demand for products and services offered by a firm and its competitors, and identify potential customers. Develop pricing strategies with the goal of maximizing the firm's profits or share of the market while ensuring the firm's customers are satisfied. Oversee product development or monitor trends that indicate the need for new products and services.
11-3021	Computer and Information Systems Managers	Plan, direct, or coordinate activities in such fields as electronic data processing, information systems, systems analysis, and computer programming.
13-1081	Logisticians	Analyze and coordinate the ongoing logistical functions of a firm or organization. Responsible for the entire life cycle of a product, including acquisition, distribution, internal allocation, delivery, and final disposal of resources
13-1082	Project Management Specialists	Analyze and coordinate the schedule, timeline, procurement, staffing, and budget of a product or service on a per project basis. Lead and guide the work of technical staff. May serve as a point of contact for the client or customer.
13-1111	Management Analysts	Conduct organizational studies and evaluations, design systems and procedures, conduct work simplification and measurement studies, and prepare operations and procedures manuals to assist management in operating more efficiently and effectively. Includes program analysts and management consultants.
13-1161	Market Research Analysts and Marketing Specialists	Research conditions in local, regional, national, or online markets. Gather information to determine potential sales of a product or service, or plan a marketing or advertising campaign. May gather information on competitors, prices, sales, and methods of marketing and distribution. May employ search marketing tactics, analyze web metrics, and develop recommendations to increase search engine ranking and visibility to target markets.
13-1199	Business Operations Specialists, All Other	All business operations specialists not listed separately.
13-2051	Financial and Investment Analysts	Conduct quantitative analyses of information involving investment programs or financial data of public or private institutions, including valuation of businesses.
13-2054	Financial Risk Specialists	Analyze and measure exposure to credit and market risk threatening the assets, earning capacity, or economic state of an organization. May make recommendations to limit risk.
13-2099	Financial Specialists, All Other	All financial specialists not listed separately.
15-1211	Computer Systems Analysts	Analyze science, engineering, business, and other data processing problems to develop and implement solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions, improve existing computer systems, and review computer system capabilities, workflow, and schedule limitations. May analyze or recommend commercially available software.
15-1212	Information Security Analysts	Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. Assess system vulnerabilities for security risks and propose and implement risk mitigation strategies. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses.
15-1221	Computer and Information Research Scientists	Conduct research into fundamental computer and information science as theorists, designers, or inventors. Develop solutions to problems in the field of computer hardware and software.

15-1231	Computer Network Support Specialists	Analyze, test, troubleshoot, and evaluate existing network systems, such as local area networks (LAN), wide area networks (WAN), cloud networks, servers, and other data communications networks. Perform network maintenance to ensure networks operate correctly with minimal interruption.
15-1232	Computer User Support Specialists	Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, via telephone, or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail, and operating systems.
15-1241	Computer Network Architects	Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning, including analysis of capacity needs for network infrastructures. May also design network and computer security measures. May research and recommend network and data communications hardware and software.
15-1242	Database Administrators	Administer, test, and implement computer databases, applying knowledge of database management systems. Coordinate changes to computer databases. Identify, investigate, and resolve database performance issues, database capacity, and database scalability. May plan, coordinate, and implement security measures to safeguard computer databases.
15-1243	Database Architects	Design strategies for enterprise databases, data warehouse systems, and multidimensional networks. Set standards for database operations, programming, query processes, and security. Model, design, and construct large relational databases or data warehouses. Create and optimize data models for warehouse infrastructure and workflow. Integrate new systems with existing warehouse structure and refine system performance and functionality.
15-1244	Network and Computer Systems Administrators	Install, configure, and maintain an organization's local area network (LAN), wide area network (WAN), data communications network, operating systems, and physical and virtual servers. Perform system monitoring and verify the integrity and availability of hardware, network, and server resources and systems. Review system and application logs and verify completion of scheduled jobs, including system backups. Analyze network and server resource consumption and control user access. Install and upgrade software and maintain software licenses. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software.
15-1251	Computer Programmers	Create, modify, and test the code and scripts that allow computer applications to run. Work from specifications drawn up by software and web developers or other individuals. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information.
15-1252	Software Developers	Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems, and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team.
15-1253	Software Quality Assurance Analysts and Testers	Develop and execute software tests to identify software problems and their causes. Test system modifications to prepare for implementation. Document software and application defects using a bug tracking system and report defects to software or web developers. Create and maintain databases of known defects. May participate in software design reviews to provide input on functional requirements, operational characteristics, product designs, and schedules.

15-1254	Web Developers	Develop and implement websites, web applications, application databases, and interactive web interfaces. Evaluate code to ensure that it is properly structured, meets industry standards, and is compatible with browsers and devices. Optimize website performance, scalability, and server-side code and processes. May develop website infrastructure and integrate websites with other computer applications.
15-1255	Web and Digital Interface Designers	Design digital user interfaces or websites. Develop and test layouts, interfaces, functionality, and navigation menus to ensure compatibility and usability across browsers or devices. May use web framework applications as well as client-side code and processes. May evaluate web design following web and accessibility standards, and may analyze web use metrics and optimize websites for marketability and search engine ranking. May design and test interfaces that facilitate the human-computer interaction and maximize the usability of digital devices, websites, and software with a focus on aesthetics and design. May create graphics used in websites and manage website content and links.
15-1299	Computer Occupations, All Other	All computer occupations not listed separately.
15-2031	Operations Research Analysts	Formulate and apply mathematical modeling and other optimizing methods to develop and interpret information that assists management with decision-making, policy formulation, or other managerial functions. May collect and analyze data and develop decision support software, services, or products. May develop and supply optimal time, cost, or logistics networks for program evaluation, review, or implementation.
15-2041	Statisticians	Develop or apply mathematical or statistical theory and methods to collect, organize, interpret, and summarize numerical data to provide usable information. May specialize in fields such as biostatistics, agricultural statistics, business statistics, or economic statistics. Includes mathematical and survey statisticians.
15-2051	Data Scientists	Develop and implement a set of techniques or analytics applications to transform raw data into meaningful information using data-oriented programming languages and visualization software. Apply data mining, data modeling, natural language processing, and machine learning to extract and analyze information from large structured and unstructured datasets. Visualize, interpret, and report data findings. May create dynamic data reports.
17-2061	Computer Hardware Engineers	Research, design, develop, or test computer or computer-related equipment for commercial, industrial, military, or scientific use. May supervise the manufacturing and installation of computer or computer-related equipment and components.
27-1014	Special Effects Artists and Animators	Create special effects or animations using film, video, computers, or other electronic tools and media for use in products, such as computer games, movies, music videos, and commercials.
27-1024	Graphic Designers	Design or create graphics to meet specific commercial or promotional needs, such as packaging, displays, or logos. May use a variety of mediums to achieve artistic or decorative effects.
49-2011	Computer, Automated Teller, and Office Machine Repairers	Repair, maintain, or install computers, word processing systems, automated teller machines, and electronic office machines, such as duplicating and fax machines.

Appendix B. Fifty Techiest 4-Digit Industries, United States, 2021

NAICS	NAICS Name	Share of Employees in Tech
541500	Computer Systems Design and Related Services	69.1
511200	Software Publishers	64.1
518200	Data Processing, Hosting, and Related Services	54.9
519100	Other Information Services	50.5
334100	Computer and Peripheral Equipment Manufacturing	40.8
541600	Management, Scientific, and Technical Consulting Services	40.2
521100	Monetary Authorities-Central Bank	39.2
541400	Specialized Design Services	28.0
551100	Management of Companies and Enterprises	27.2
541700	Scientific Research and Development Services	26.0
811200	Electronic and Precision Equipment Repair and Maintenance	25.7
541800	Advertising, Public Relations, and Related Services	25.7
515200	Cable and Other Subscription Programming	23.7
524100	Insurance Carriers	23.2
517000	Telecommunications	23.1
533100	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	22.7
423400	Professional and Commercial Equipment and Supplies Merchant Wholesalers	22.4
523000	Securities, Commodity Contracts, and Other Financial Investments and Related	22.3
525900	Other Investment Pools and Funds	21.6
334200	Communications Equipment Manufacturing	21.3
334500	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	20.8
999100	Federal Executive Branch (OES Designation)	20.2
611400	Business Schools and Computer and Management Training	18.5
813200	Grantmaking and Giving Services	18.4
511100	Newspaper, Periodical, Book, and Directory Publishers	18.3
512200	Sound Recording Industries	16.5
336400	Aerospace Product and Parts Manufacturing	16.0
561100	Office Administrative Services	15.8
334300	Audio and Video Equipment Manufacturing	15.7
522200	Nondepository Credit Intermediation	15.2
5220A1	Credit Intermediation and Related Activities (5221 And 5223 only)	14.9
541300	Architectural, Engineering, and Related Services	14.5
454100	Electronic Shopping and Mail-Order Houses	14.1
334400	Semiconductor and Other Electronic Component Manufacturing	14.1
813900	Business, Professional, Labor, Political, and Similar Organizations	13.5
611700	Educational Support Services	12.4
561500	Travel Arrangement and Reservation Services	12.3
221200	Natural Gas Distribution	12.3
512100	Motion Picture and Video Industries	11.9
334600	Manufacturing and Reproducing Magnetic and Optical Media	11.8
813300	Social Advocacy Organizations	11.6
541900	Other Professional, Scientific, and Technical Services	10.4
525100	Insurance and Employee Benefit Funds	10.1
524200	Agencies, Brokerages, and Other Insurance Related Activities	10.1
541200	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	10.0
424300	Apparel, Piece Goods, and Notions Merchant Wholesalers	9.9
237200	Land Subdivision	9.9
999200	State Government, excluding schools and hospitals (OES Designation)	9.8
333300	Commercial and Service Industry Machinery Manufacturing	9.0
425100	Wholesale Electronic Markets and Agents and Brokers	8.8

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.

Appendix C. Top Fifty 4-Digit Industries by Number of Tech Employees, United States, 2021

NAICS	NAICS Name	Number of Employees in Tech
541500	Computer Systems Design and Related Services	1,565,990
551100	Management of Companies and Enterprises	690,030
541600	Management, Scientific, and Technical Consulting Services	625,630
999100	Federal Executive Branch (OES Designation)	426,380
511200	Software Publishers	337,410
5220A1	Credit Intermediation and Related Activities (5221 And 5223 only)	297,320
561300	Employment Services	290,650
524100	Insurance Carriers	279,020
611300	Colleges, Universities, and Professional Schools	238,720
541300	Architectural, Engineering, and Related Services	218,940
999200	State Government, excluding schools and hospitals (OES Designation)	215,300
523000	Securities, Commodity Contracts, and Other Financial Investments and Related	213,920
518200	Data Processing, Hosting, and Related Services	207,840
541700	Scientific Research and Development Services	206,860
999300	Local Government, excluding schools and hospitals (OES Designation)	194,660
519100	Other Information Services	183,190
517000	Telecommunications	152,820
423400	Professional and Commercial Equipment and Supplies Merchant Wholesalers	149,880
622100	General Medical and Surgical Hospitals	131,860
524200	Agencies, Brokerages, and Other Insurance Related Activities	123,420
541800	Advertising, Public Relations, and Related Services	111,700
611100	Elementary and Secondary Schools	108,670
541200	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	100,740
522200	Nondepository Credit Intermediation	94,200
334500	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	82,930
541900	Other Professional, Scientific, and Technical Services	79,070
561100	Office Administrative Services	76,630
336400	Aerospace Product and Parts Manufacturing	75,380
4230A1	Merchant Wholesalers, Durable Goods (4232, 4233, 4235, 4236, 4237, 4239 only)	74,640
454100	Electronic Shopping and Mail-Order Houses	65,280
531000	Real Estate	64,730
334100	Computer and Peripheral Equipment Manufacturing	63,510
236200	Nonresidential Building Construction	61,340
238200	Building Equipment Contractors	55,160
813900	Business, Professional, Labor, Political, and Similar Organizations	55,110
561400	Business Support Services	53,460
334400	Semiconductor and Other Electronic Component Manufacturing	50,390
511100	Newspaper, Periodical, Book, and Directory Publishers	45,340
425100	Wholesale Electronic Markets and Agents and Brokers	41,710
541400	Specialized Design Services	37,950
541100	Legal Services	37,720
512100	Motion Picture and Video Industries	37,360
236100	Residential Building Construction	36,610
621100	Offices of Physicians	36,180
221100	Electric Power Generation, Transmission and Distribution	33,080
3330A1	Machinery Manufacturing (3331, 3332, 3334, and 3339 only)	33,040
443100	Electronics and Appliance Stores	31,910
4240A2	Merchant Wholesalers, Nondurable Goods (4242 and 4246 only)	31,390
611200	Junior Colleges	30,980
4240A1	Merchant Wholesalers, Nondurable Goods (4244 and 4248 only)	29,150

SOURCE: Bureau of Labor Statistics, Occupational Employment and Wage Statistics. Author's calculations.

Appendix D. Ten Largest 4-Digit Industries for Each Tech Occupation, United States, 2021

Code	SOC/NAICS TITLE	Employment
IT and Computing		
11-3021 Computer and Information Systems Managers		
541500	Computer Systems Design and Related Services	113,870
551100	Management of Companies and Enterprises	48,910
511200	Software Publishers	23,500
541600	Management, Scientific, and Technical Consulting	20,150
524100	Insurance Carriers	18,380
518200	Data Processing, Hosting, and Related Services	16,360
5220A1	Credit Intermediation and Related Activities	13,940
541700	Scientific Research and Development Services	13,750
519100	Other Information Services	13,300
611300	Colleges, Universities, and Professional Schools	12,300
15-1211 Computer Systems Analysts		
541500	Computer Systems Design and Related Services	129,500
551100	Management of Companies and Enterprises	55,960
524100	Insurance Carriers	28,730
5220A1	Credit Intermediation and Related Activities	21,860
622100	General Medical and Surgical Hospitals	19,690
561300	Employment Services	18,670
999300	Local Govt, excl schools & hospitals (OES Designation)	18,330
999200	State Govt, excl schools and hospitals (OES)	17,030
541600	Management, Scientific, and Technical Consulting	16,480
611300	Colleges, Universities, and Professional Schools	12,840
15-1212 Information Security Analysts		
541500	Computer Systems Design and Related Services	42,590
551100	Management of Companies and Enterprises	14,790
5220A1	Credit Intermediation and Related Activities	10,170
519100	Other Information Services	10,130
541600	Management, Scientific, and Technical Consulting	8,660
541700	Scientific Research and Development Services	6,190
524100	Insurance Carriers	5,820
561300	Employment Services	5,270
541300	Architectural, Engineering, and Related Services	4,730
518200	Data Processing, Hosting, and Related Services	4,700
15-1221 Computer and Information Research Scientists		
999100	Federal Executive Branch (OES Designation)	9,530
541500	Computer Systems Design and Related Services	6,500
541700	Scientific Research and Development Services	5,440
511200	Software Publishers	2,010
611300	Colleges, Universities, and Professional Schools	1,290
519100	Other Information Services	1,100
541300	Architectural, Engineering, and Related Services	740
334400	Semiconductor and Other Electronic Component	510
518200	Data Processing, Hosting, and Related Services	460
551100	Management of Companies and Enterprises	410
15-1231 Computer Network Support Specialists		
541500	Computer Systems Design and Related Services	33,800
517000	Telecommunications	23,900
551100	Management of Companies and Enterprises	9,670
611100	Elementary and Secondary Schools	9,110
611300	Colleges, Universities, and Professional Schools	6,820
999300	Local Govt, excl schools & hospitals (OES Designation)	6,310
561300	Employment Services	5,700
518200	Data Processing, Hosting, and Related Services	5,640
999200	State Govt, excl schools and hospitals (OES)	5,340
423400	Professional and Commercial Equipment Wholesalers	5,330
15-1232 Computer User Support Specialists		
541500	Computer Systems Design and Related Services	151,910
561300	Employment Services	42,550
551100	Management of Companies and Enterprises	34,420
611100	Elementary and Secondary Schools	32,050
511200	Software Publishers	26,940
611300	Colleges, Universities, and Professional Schools	25,020
423400	Professional and Commercial Equipment Wholesalers	21,500
518200	Data Processing, Hosting, and Related Services	19,340
999300	Local Govt, excl schools & hospitals (OES Designation)	19,160
999200	State Govt, excl schools and hospitals (OES)	18,330
15-1241 Computer Network Architects		
541500	Computer Systems Design and Related Services	45,980
517000	Telecommunications	14,820
551100	Management of Companies and Enterprises	14,820
561300	Employment Services	10,690
541600	Management, Scientific, and Technical Consulting	6,760
518200	Data Processing, Hosting, and Related Services	6,480
541300	Architectural, Engineering, and Related Services	5,170
5220A1	Credit Intermediation and Related Activities	4,540
611300	Colleges, Universities, and Professional Schools	4,470
541700	Scientific Research and Development Services	4,300
15-1242 Database Administrators		
541500	Computer Systems Design and Related Services	11,720
551100	Management of Companies and Enterprises	7,240
611300	Colleges, Universities, and Professional Schools	4,110
518200	Data Processing, Hosting, and Related Services	4,030
541600	Management, Scientific, and Technical Consulting	3,230
524100	Insurance Carriers	3,130
5220A1	Credit Intermediation and Related Activities	3,100
999300	Local Govt, excl schools & hospitals (OES Designation)	2,900
999200	State Govt, excl schools and hospitals (OES)	2,880
561300	Employment Services	2,750
15-1243 Database Architects		
541500	Computer Systems Design and Related Services	15,170
551100	Management of Companies and Enterprises	3,880
541600	Management, Scientific, and Technical Consulting	2,560
518200	Data Processing, Hosting, and Related Services	2,480
524100	Insurance Carriers	2,390
519100	Other Information Services	2,070
561300	Employment Services	1,920
511200	Software Publishers	1,880
5220A1	Credit Intermediation and Related Activities	1,450
423400	Professional and Commercial Equipment Wholesalers	1,270
15-1244 Network and Computer Systems Administrators		
541500	Computer Systems Design and Related Services	56,820
551100	Management of Companies and Enterprises	27,370
611300	Colleges, Universities, and Professional Schools	15,040
999300	Local Govt, excl schools & hospitals (OES Designation)	14,600
611100	Elementary and Secondary Schools	12,450
517000	Telecommunications	11,240
561300	Employment Services	11,190
5220A1	Credit Intermediation and Related Activities	10,030
518200	Data Processing, Hosting, and Related Services	9,480
541600	Management, Scientific, and Technical Consulting	8,470
15-1251 Computer Programmers		
541500	Computer Systems Design and Related Services	54,340
541700	Scientific Research and Development Services	10,410
511200	Software Publishers	8,700
611300	Colleges, Universities, and Professional Schools	7,550
551100	Management of Companies and Enterprises	6,380
541600	Management, Scientific, and Technical Consulting	4,800
999200	State Govt, excl schools and hospitals (OES)	4,210
518200	Data Processing, Hosting, and Related Services	4,150
524100	Insurance Carriers	3,570
999300	Local Govt, excl schools & hospitals (OES Designation)	3,450
15-1252 Software Developers		
541500	Computer Systems Design and Related Services	455,050
511200	Software Publishers	133,340
551100	Management of Companies and Enterprises	70,070
519100	Other Information Services	58,420
518200	Data Processing, Hosting, and Related Services	52,690

5220A1	Credit Intermediation and Related Activities	45,110	561300	Employment Services	1,200
541700	Scientific Research and Development Services	39,960	238200	Building Equipment Contractors	1,060
524100	Insurance Carriers	39,330	551100	Management of Companies and Enterprises	840
561300	Employment Services	37,000	611100	Elementary and Secondary Schools	810
541600	Management, Scientific, and Technical Consulting	36,900	Data Analysis		
15-1253 Software Quality Assurance Analysts and Testers			15-2031 Operations Research Analysts		
541500	Computer Systems Design and Related Services	63,670	541600	Management, Scientific, and Technical Consulting	11,510
511200	Software Publishers	16,240	551100	Management of Companies and Enterprises	9,550
561300	Employment Services	11,260	541500	Computer Systems Design and Related Services	8,970
551100	Management of Companies and Enterprises	10,880	5220A1	Credit Intermediation and Related Activities	7,700
518200	Data Processing, Hosting, and Related Services	7,800	524100	Insurance Carriers	7,400
524100	Insurance Carriers	6,800	999100	Federal Executive Branch (OES Designation)	5,470
519100	Other Information Services	6,760	541700	Scientific Research and Development Services	4,260
5220A1	Credit Intermediation and Related Activities	6,390	999200	State Govt, excl schools and hospitals (OES	3,660
541600	Management, Scientific, and Technical Consulting	5,690	522200	Nondepository Credit Intermediation	3,410
541700	Scientific Research and Development Services	3,880	523000	Securities, Commodity Contracts, and Other	3,190
15-1254 Web Developers			15-2041 Statisticians		
541500	Computer Systems Design and Related Services	17,750	541700	Scientific Research and Development Services	5,230
519100	Other Information Services	5,220	999100	Federal Executive Branch (OES Designation)	4,680
541800	Advertising, Public Relations, and Related Services	5,220	611300	Colleges, Universities, and Professional Schools	2,390
541600	Management, Scientific, and Technical Consulting	4,970	541600	Management, Scientific, and Technical Consulting	2,050
551100	Management of Companies and Enterprises	4,290	541500	Computer Systems Design and Related Services	2,030
511200	Software Publishers	3,390	999200	State Govt, excl schools and hospitals (OES	1,990
611300	Colleges, Universities, and Professional Schools	3,320	622100	General Medical and Surgical Hospitals	1,700
561300	Employment Services	2,960	551100	Management of Companies and Enterprises	1,480
518200	Data Processing, Hosting, and Related Services	2,830	524100	Insurance Carriers	1,210
454100	Electronic Shopping and Mail-Order Houses	2,790	541900	Other Professional, Scientific, and Technical Services	940
15-1255 Web and Digital Interface Designers			15-2051 Data Scientists		
541500	Computer Systems Design and Related Services	16,080	541500	Computer Systems Design and Related Services	16,620
511200	Software Publishers	12,390	551100	Management of Companies and Enterprises	12,570
541800	Advertising, Public Relations, and Related Services	4,320	541600	Management, Scientific, and Technical Consulting	7,270
519100	Other Information Services	4,140	541700	Scientific Research and Development Services	5,840
551100	Management of Companies and Enterprises	3,690	5220A1	Credit Intermediation and Related Activities	5,690
454100	Electronic Shopping and Mail-Order Houses	3,380	524100	Insurance Carriers	5,330
541600	Management, Scientific, and Technical Consulting	3,360	519100	Other Information Services	3,720
518200	Data Processing, Hosting, and Related Services	2,660	511200	Software Publishers	3,710
561300	Employment Services	2,530	522200	Nondepository Credit Intermediation	2,970
611300	Colleges, Universities, and Professional Schools	1,870	541900	Other Professional, Scientific, and Technical Services	2,940
15-1299 Computer Occupations, All Other			Business and Finance		
999100	Federal Executive Branch (OES Designation)	81,370	11-2021 Marketing Managers		
541500	Computer Systems Design and Related Services	80,220	551100	Management of Companies and Enterprises	40,110
551100	Management of Companies and Enterprises	15,990	541600	Management, Scientific, and Technical Consulting	21,630
541600	Management, Scientific, and Technical Consulting	13,260	541500	Computer Systems Design and Related Services	18,930
561300	Employment Services	12,950	5220A1	Credit Intermediation and Related Activities	9,360
518200	Data Processing, Hosting, and Related Services	12,350	519100	Other Information Services	9,340
611300	Colleges, Universities, and Professional Schools	9,390	541800	Advertising, Public Relations, and Related Services	8,980
511200	Software Publishers	9,090	511200	Software Publishers	8,420
524100	Insurance Carriers	7,110	524100	Insurance Carriers	7,530
519100	Other Information Services	6,950	541700	Scientific Research and Development Services	6,480
17-2061 Computer Hardware Engineers			523000	Securities, Commodity Contracts, and Other	6,010
541500	Computer Systems Design and Related Services	14,660	13-1081 Logisticians		
541700	Scientific Research and Development Services	13,360	999100	Federal Executive Branch (OES Designation)	32,140
334400	Semiconductor and Other Electronic Component	9,240	551100	Management of Companies and Enterprises	20,700
334100	Computer and Peripheral Equipment Manufacturing	6,030	541600	Management, Scientific, and Technical Consulting	14,390
999100	Federal Executive Branch (OES Designation)	4,930	336400	Aerospace Product and Parts Manufacturing	7,520
518200	Data Processing, Hosting, and Related Services	3,830	488500	Freight Transportation Arrangement	6,230
541300	Architectural, Engineering, and Related Services	3,530	541500	Computer Systems Design and Related Services	6,020
334500	Nav, Measuring, ... Instruments Manufacturing	2,810	541300	Architectural, Engineering, and Related Services	5,770
511200	Software Publishers	1,750	493100	Warehousing and Storage	4,330
517000	Telecommunications	1,430	484000	Truck Transportation	3,940
49-2011 Computer, Automated Teller, and Office Machine Repairers			541700	Scientific Research and Development Services	3,460
423400	Professional and Commercial Equipment Wholesalers	23,390	13-1082 Project Management Specialists		
443100	Electronics and Appliance Stores	22,640	541500	Computer Systems Design and Related Services	63,680
811200	Electronic and Precision Equip Repair and Maint	14,990	541300	Architectural, Engineering, and Related Services	61,000
541500	Computer Systems Design and Related Services	8,770	541600	Management, Scientific, and Technical Consulting	53,680
4530A1	Miscellaneous Store Retailers (4532 and 4533 only)	2,890	236200	Nonresidential Building Construction	49,170
425100	Wholesale Electronic Markets and Agents and Brokers	1,430			

551100	Management of Companies and Enterprises	38,940	531000	Real Estate	6,020
238200	Building Equipment Contractors	33,170	541200	Accounting, Tax Prep, Bookkeeping, and Payroll	5,700
561300	Employment Services	27,310	13-2054 Financial Risk Specialists		
236100	Residential Building Construction	24,680	5220A1	Credit Intermediation and Related Activities	12,370
541700	Scientific Research and Development Services	16,700	523000	Securities, Commodity Contracts, and Other	9,240
999300	Local Govt, excl schools & hospitals (OES Designation)	15,970	551100	Management of Companies and Enterprises	8,560
13-1111 Management Analysts			522200	Nondepository Credit Intermediation	4,120
541600	Management, Scientific, and Technical Consulting	191,330	524100	Insurance Carriers	4,030
999100	Federal Executive Branch (OES Designation)	66,590	524200	Agencies, Brokerages, and Other Insurance Related	2,600
999200	State Govt, excl schools and hospitals (OES	57,710	541600	Management, Scientific, and Technical Consulting	2,000
541500	Computer Systems Design and Related Services	51,150	541200	Accounting, Tax Prep, Bookkeeping, and Payroll	1,920
551100	Management of Companies and Enterprises	45,840	999300	Local Govt, excl schools & hospitals (OES Designation)	770
524100	Insurance Carriers	38,520	541500	Computer Systems Design and Related Services	730
541200	Accounting, Tax Prep, Bookkeeping, and Payroll	32,090	13-2099 Financial Specialists, All Other		
5220A1	Credit Intermediation and Related Activities	30,060	999100	Federal Executive Branch (OES Designation)	24,530
999300	Local Govt, excl schools & hospitals (OES Designation)	27,400	5220A1	Credit Intermediation and Related Activities	15,260
561300	Employment Services	20,260	551100	Management of Companies and Enterprises	11,630
13-1161 Market Research Analysts and Marketing Specialists			523000	Securities, Commodity Contracts, and Other	10,010
541600	Management, Scientific, and Technical Consulting	84,050	611300	Colleges, Universities, and Professional Schools	7,100
551100	Management of Companies and Enterprises	63,840	522200	Nondepository Credit Intermediation	5,710
541800	Advertising, Public Relations, and Related Services	36,140	999200	State Govt, excl schools and hospitals (OES	4,330
541500	Computer Systems Design and Related Services	35,700	541600	Management, Scientific, and Technical Consulting	3,780
519100	Other Information Services	20,580	622100	General Medical and Surgical Hospitals	3,750
511200	Software Publishers	20,140	812900	Other Personal Services	3,410
5220A1	Credit Intermediation and Related Activities	17,010	Design		
524200	Agencies, Brokerages, and Other Insurance Related	16,710	27-1014 Special Effects Artists and Animators		
531000	Real Estate	16,700	512100	Motion Picture and Video Industries	6,580
524100	Insurance Carriers	16,200	511200	Software Publishers	2,930
13-1199 Business Operations Specialists, All Other			541500	Computer Systems Design and Related Services	2,660
999100	Federal Executive Branch (OES Designation)	185,460	541400	Specialized Design Services	1,270
551100	Management of Companies and Enterprises	59,420	541800	Advertising, Public Relations, and Related Services	1,210
541600	Management, Scientific, and Technical Consulting	55,360	519100	Other Information Services	840
611300	Colleges, Universities, and Professional Schools	54,680	611300	Colleges, Universities, and Professional Schools	480
999200	State Govt, excl schools and hospitals (OES	47,390	515100	Radio and Television Broadcasting	460
999300	Local Govt, excl schools & hospitals (OES Designation)	34,430	541600	Management, Scientific, and Technical Consulting	460
561300	Employment Services	32,120	551100	Management of Companies and Enterprises	290
524100	Insurance Carriers	25,800	27-1024 Graphic Designers		
541500	Computer Systems Design and Related Services	25,210	541400	Specialized Design Services	22,710
611100	Elementary and Secondary Schools	22,030	541800	Advertising, Public Relations, and Related Services	22,510
13-2051 Financial and Investment Analysts			323100	Printing and Related Support Activities	17,470
523000	Securities, Commodity Contracts, and Other	74,650	511100	Newspaper, Periodical, Book, and Directory Publishers	12,200
551100	Management of Companies and Enterprises	37,700	541600	Management, Scientific, and Technical Consulting	10,550
5220A1	Credit Intermediation and Related Activities	26,010	339900	Other Miscellaneous Manufacturing	9,160
524100	Insurance Carriers	13,130	551100	Management of Companies and Enterprises	8,910
541600	Management, Scientific, and Technical Consulting	12,500	541500	Computer Systems Design and Related Services	5,980
522200	Nondepository Credit Intermediation	9,130	454100	Electronic Shopping and Mail-Order Houses	5,270
541500	Computer Systems Design and Related Services	8,330	611300	Colleges, Universities, and Professional Schools	4,080
611300	Colleges, Universities, and Professional Schools	6,370			

SOURCE: Bureau of Labor Statistics, OEWS.