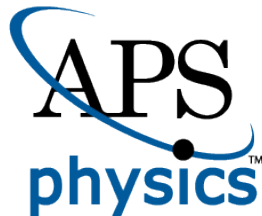


STEM AND THE AMERICAN WORKFORCE

**AN INCLUSIVE ANALYSIS OF THE
JOBS, GDP AND OUTPUT POWERED BY
SCIENCE AND ENGINEERING**



Produced with support from the David and Lucile Packard Foundation and the Rita Allen Foundation.

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STEM and the American Workforce

An Inclusive Analysis of the Jobs, GDP and Output Powered by Science and Engineering

You've heard it before: STEM jobs—that is, jobs in science, technology, engineering and math-related fields—are the future. The future of the U.S. economy. The future path to a child's success. The future of U.S. competitiveness on the world stage.

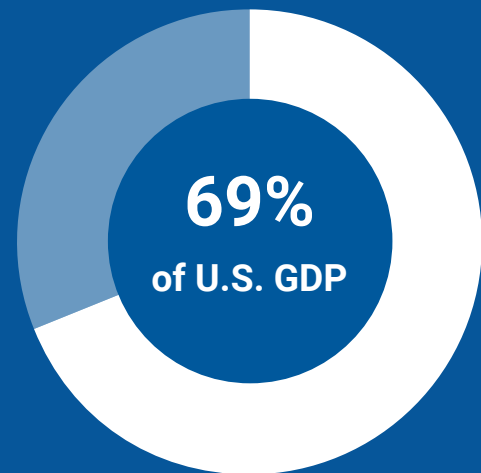
But what is a STEM job? Is it a doctor? A Silicon Valley programmer? A NASA scientist? What sort of education path is needed for a STEM career? A bachelor's degree? A Ph.D.? A vocational-technical training certificate?

Researchers in government, academia, nonprofit organizations and the private sector have all attempted to answer this question. Many of these previous attempts painted interesting pictures, but questions remain. This analysis takes an inclusive view of STEM. It considers all jobs that rely heavily on science, technology, engineering and math, regardless of the level of educational attainment required of the employee. To fully understand the impact of STEM on the economy and U.S. workforce, all STEM workers must be included—for example, this analysis recognizes that both the laboratory technician and the physician are critical to a patient's diagnosis.

This analysis finds that the vast majority of American economic activity is attributable to STEM. The American STEM workforce is not only composed of Silicon Valley coders and Ph.D. scientists, but also includes STEM professionals working in occupations that do not require a bachelor's degree. These licensed practical nurses, electricians, advanced manufacturing specialists, laboratory technicians, military communications systems managers and more make up the backbone of the STEM workforce. Across the board, regardless of educational attainment, U.S. STEM workers earn higher wages than their non-STEM peers and have a broad impact on the economy (Noonan, 2017).

AMERICA'S STEM ECONOMY

STEM supports...



2 out of 3
U.S. workers

\$2.3 trillion
in annual federal tax
revenue

In total, STEM supports two-thirds of U.S. jobs (67 percent), 69 percent of U.S. GDP and \$2.3 trillion in annual federal tax revenue.

This analysis finds that one-third of U.S. workers are direct STEM professionals, accounting for 39 percent of U.S. GDP. And since this analysis takes an inclusive view of STEM—one that does not discriminate based on an individual worker’s educational attainment—it also finds that 59 percent of America’s STEM workforce does not hold a bachelor’s degree. This cohort has a variety of post-secondary education and training, from associate’s degrees to technical certificates (Carnevale, Smith, & Melton, 2010). Further, the finding that the majority of U.S. STEM jobs do not require a bachelor’s degree illustrates the large range and diversity of STEM professions and why workers from all educational backgrounds have a stake in STEM.

The promise of a 21st century economy powered by STEM is here. And it’s being powered by previously unacknowledged STEM professionals. The key question is how the United States will sustain its existing STEM workforce while continuing to strengthen it for future success.

The Impact of STEM on the U.S. Economy

Support for science and engineering—from robust federal funding to private-sector investments—created a U.S. economy spurred by innovation. In turn, that innovation led to a rapid proliferation of jobs across the nation’s workforce (Becker, 2015). Across the industrialized world innovation has changed the way work is done and in particular has shifted the share of wages to skilled technical occupations (Piva & Vivarelli, 2018).

1 In this analysis, a comprehensive evaluation of U.S. industries and occupations was conducted using an IMPLAN model to account for the influence of the unsung STEM professionals across the U.S. economy. IMPLAN is an input-output (“IO”) model of national or regional economies that shows the transactions between households, different industries and the government. IMPLAN is traditionally used to determine the indirect effect on supply chains and the induced effect of household spending on an economy because of direct spending. Direct effects could be discrete events or policies, such as a festival or change in a state’s Medicaid program, or the more generalized spending on a sector to show its more generalized contribution to the economy, accounting for indirect and induced effects.



Today jobs in STEM represent a diverse pool of professions that reflect the breadth of tasks and skills needed to support today’s ever-evolving world. These occupations are characterized by a high level of complexity and an increasing reliance on advanced scientific and technological expertise. Much of the nation’s success is owed to individuals with varying levels of education working across industries ranging from biomedical research to mining, each doing STEM work every day. It is these jobs—and the people who do this work—that will support the prosperity of the country into the future.

To understand exactly how STEM impacts the U.S. economy this analysis prioritized the following:

1. Defining and identifying which U.S. jobs are STEM professions
2. Determining what direct percentage of total U.S. jobs employ STEM professionals
3. Calculating the indirect and induced impacts of those STEM professionals on the larger U.S. economy¹

To begin, in 2017, U.S. employment totaled 195.8 million. The U.S. Bureau of Labor Statistics' Standard Occupational Classifications database was used to define and identify which U.S. jobs employ STEM professionals. Each job category was evaluated against existing literature, descriptions from professional societies and other qualitative methods to determine whether the job function relied heavily on one or more STEM fields for its completion. All jobs that met these criteria—from agriculture to zoology—were included in the analysis. This definition allows for the inclusion of the full breadth of U.S. STEM professionals.

Direct STEM employment accounted for 64 million U.S. jobs in 2017, or 33 percent of the U.S. workforce. Further, the direct share of U.S. GDP attributed to that share of the workforce is \$7.7 trillion, or 39 percent (see Table 1).

Understanding the specific number of U.S. workers who are STEM professionals and their direct impact on the economy is significant—it tells us that STEM fields have an outsized influence. But the direct count is only part of

the story; to understand the full impact of STEM on the U.S. workforce and economy, we must consider the indirect and induced impacts of STEM employment as well. In other words, it is important to understand how many additional jobs are created in the economy due to STEM professionals.

Indirect and induced effects amplify the footprint of STEM across the nation's economy. These multipliers reflect the indirect employment generated by STEM industries (i.e. administrators or human resources professionals) and the induced employment that results from the economic activity of direct and indirect STEM employment, which supports jobs in industries such as real estate and tourism. In total STEM creates an outsized economic impact by supporting 67 percent of all U.S. jobs, 69 percent of the nation's GDP and \$2.3 trillion in federal tax revenue each year (see Table 2).

Table 1. Direct U.S. STEM Employment and Economic Activity

Metric	Direct STEM	Share of Economy	Total Impact of STEM
Employment	64,080,198 jobs	32.7%	130,294,110 jobs
GDP	\$7,659,763,587,061	39.3%	\$13,455,680,288,718

Table 2. Total Economic Impact of STEM on U.S. Employment, GDP and Tax Revenue

Metric	Direct/Indirect/Induced	Share of Economy
Employment	130,294,110 jobs	66.5%
GDP	\$13,455,680,288,718	69.1%
Federal Tax Revenues	\$2,393,085,107,704	69.1%
State and Local Tax Revenues	\$1,227,299,092,354	69.1%

Defining STEM Jobs

STEM jobs are found in a range of industries across the U.S. economy. These jobs exist in industries that are intuitively STEM-related, such as biotechnology, semiconductor manufacturing and chemical engineering. But STEM jobs also exist in sectors where science or math may seem less directly relevant.

Importantly, an inclusive analysis of STEM employment must count professional and technical support occupations across all STEM fields including medicine, agriculture, manufacturing and more (Langdon et al., 2011). These professions require high general knowledge of STEM disciplines and techniques and routinely require a higher level of on-the-job-training than other middle-skilled occupations (Rothwell, 2015). Including these jobs in the analysis allows for a better understanding of the breadth and scope of scientific work within and outside of STEM industries.

Identifying STEM jobs and their respective job sectors requires a careful examination of all occupations and industries. Through a sector-by-sector review of 819 occupations, this analysis identified 414 occupations that require a high level of STEM expertise. Previous studies to assess the breadth of the nation's STEM workforce used more restrictive criteria, resulting in a smaller snapshot of the STEM workforce and economy (Noonan, 2017; National Science Board, 2018; Pew Research Center, 2018).

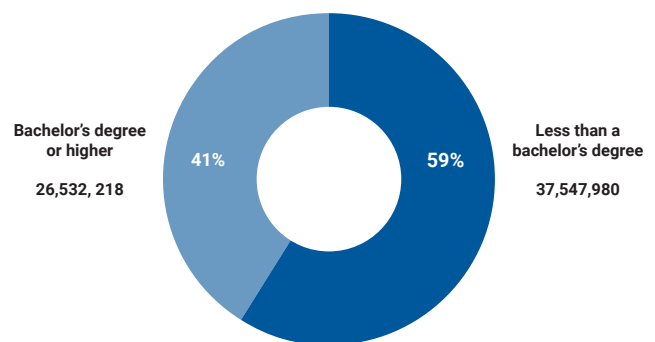
Of the 195.8 million jobs across 819 occupations this analysis identified 64 million, or 32.7 percent, as STEM professions.² 122 of the 536 industries evaluated have a STEM workforce large enough for them to be considered STEM-intensive industries.³ This

analysis finds the largest number of STEM professionals in the United States work in healthcare, real estate, finance, wholesale trade, scientific research and development services and the federal government.

Broadening and Diversifying the STEM Community

From political candidates calling for every kid to learn to code to the awe inspired by astronauts, Americans have a somewhat specific view of what it means to be a STEM professional, a view most often associated with a scientist in a laboratory or Silicon Valley engineer. And while those are obvious STEM jobs, those jobs do not comprise the majority of U.S. STEM professionals. In fact 59 percent of U.S. STEM jobs are held by individuals without a bachelor's degree (see Figure 1).

Figure 1. Direct STEM Employment by Education Level



This finding that the U.S. STEM workforce is comprised primarily of individuals without bachelor's degrees is significant. First, it illustrates that STEM careers are more common and more attainable than is often depicted in popular culture. It also paints a picture of a

2 There are different ways to count and classify jobs. Using the Bureau of Economic Analysis' definition for a job, we find that employment across all sectors of the economy totaled 195.8 million in 2017. In contrast, other attempts to calculate U.S. jobs have used definitions and job numbers from the Bureau of Labor Statistics (Carnevale, Smith, & Melton, 2010); National Academies of Sciences, 2017; Pew Research Center, 2018). The BLS only provides accounting for individual workers and does not include those who are self-employed, proprietors, or do not participate in social security, resulting in an undercounting of jobs across the economy. The BEA classification and data, on the other hand, allows for a more comprehensive view of the labor market.

3 To assess the classifications of industries across the U.S. as either STEM-intensive or not, we impose a categorization criterion based on the percentage of STEM employment within an industry's workforce. A threshold of 74.5% was used to classify a sector as a STEM sector. Here we infer that industries with a proportion of STEM jobs above this threshold are STEM-intensive and therefore should be classified, and in some cases reclassified, as STEM-intensive industries.

STEM workforce that looks much more like America. It is a workforce spread throughout the country, it includes both members of the labor movement and management and it is a diverse and inclusive population.

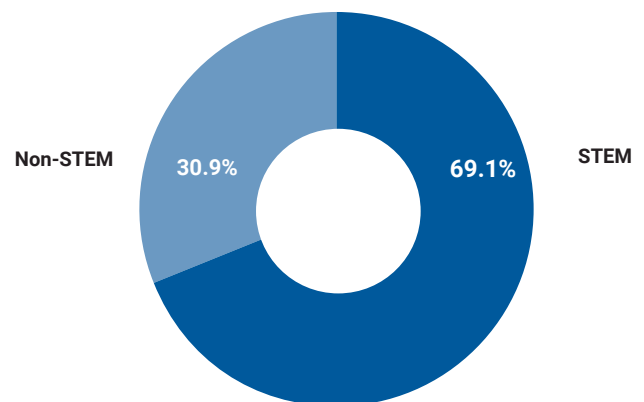
There are several pathways towards well-paid, productive and interesting STEM careers. While many of these professions require a bachelor's degree or more, a greater number do not (National Science Board, 2019). Unfortunately, the impression that participation in STEM requires at least a bachelor's degree has resulted in 27 percent of Americans interested in STEM choosing alternate career paths, citing the cost of post-secondary education and time required to obtain the necessary qualifications as among the reasons not to participate in STEM industries (Pew Research Center, 2018). With the nation inadequately prepared to address the estimated 3.4 million science and engineering worker shortage by 2022, it is increasingly important that the public is properly educated on the full range of science and engineering career pathways and that importance is given to all STEM careers (National Academies of Sciences, 2017).

With STEM being a part of the regular work of 414 occupations (as identified in this analysis) there are many opportunities for individuals interested in STEM to develop careers within the breadth of STEM disciplines. Community colleges, vocational schools, the military and four-year institutions continue to be premier avenues for individuals interested in joining the STEM workforce. Increasing partnerships between universities and community and technical colleges, which enroll 11 percent and 8 percent of all Black and Hispanic/Latino science and engineering degree recipients, respectively, also helps to increase diversity in the nation's STEM workforce (National Science Board, 2019). STEM jobs requiring at least a bachelor's degree tend to be clustered in select metropolitan areas, but those that require less than a bachelor's degree are prevalent throughout the country (Rothwell, 2013). This means individuals in rural communities may have as good an opportunity to become a STEM professional as their urban counterparts.

STEM Workers Earn More and Drive More of U.S. GDP

STEM professionals earn more on average than non-STEM workers, regardless of their level of education. This difference in wages is greatest for those with high school diplomas or less (Noonan, 2017). These higher wages translate to increased spending in industries such as real estate, tourism and entertainment. In 2017 STEM supported 69.1 percent of the total U.S. gross domestic product (see Figure 2).

Figure 2. Percent of U.S. GDP Supported by STEM vs. Non-STEM Employment in 2017



STEM's large impact on the nation's GDP is attributable to the economic activity of direct, indirect and induced employment, accounting for \$25 trillion in economic output and producing \$2.3 and \$1.2 trillion in federal and state tax revenues, respectively. Furthermore, GDP and knowledge generated by university research and STEM employment results in intellectual and economic spillover, leading to new jobs and support for neighboring states and regions (Becker, 2015).

Conclusion

The STEM economy is here. The vast majority of the U.S. workforce and GDP are supported by STEM. But the idea of what constitutes a STEM professional may be different than many assume, as 6 out of 10 U.S. STEM professionals do not hold a bachelor's degree.

STEM occupations that require less than a bachelor's degree help boost innovation anywhere from one-fourth to one-half as much as those that require a bachelor's degree. More effort is needed to highlight the breadth and scope of these professions in order to address the increasing demand for STEM professionals across the nation's workforce. These jobs exist across industries and go beyond the generation of science and engineering breakthroughs to how those advances are applied in a practical way to produce something of value (Rothwell, 2015).

The federal government and national scientific organizations have highlighted the need for an increased focus on the development of the nation's skilled-technical workforce, citing projected worker shortages and training needs for the jobs of the future (National Academies of Sciences, 2017; Office of Science and Technology Policy, 2018). Public, private and nonprofit institutions recognize the impact that STEM careers will have on the future success of the U.S. economy, underscoring the need for increased educational pathways for local governments and industries to promote STEM workforce development.

Underpinning the STEM workforce is the research, development and discovery taking place in academic, nonprofit and private-sector organizations. Continued robust federal support for research and science and engineering policies is needed to power the economies of local and regional communities across the United States and the nation as a whole.

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APPENDIX A.

Methodology

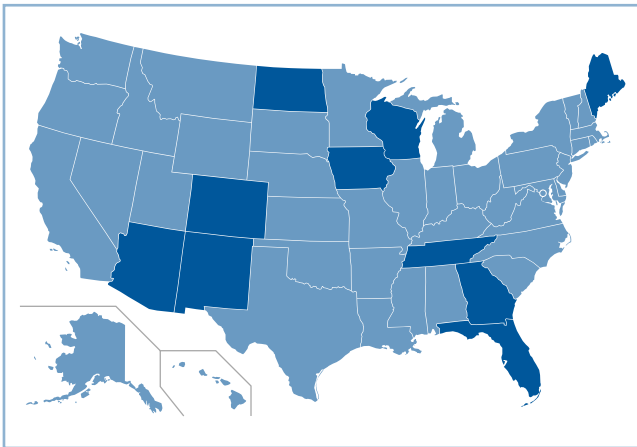
FTI Consulting, Inc. (“FTI”)¹ was engaged to assess the economic impact of science on the U.S. economy and for ten states.

The ten states were:

- | | |
|-------------|-----------------|
| 1. Arizona | 6. Maine |
| 2. Colorado | 7. New Mexico |
| 3. Florida | 8. North Dakota |
| 4. Georgia | 9. Tennessee |
| 5. Iowa | 10. Wisconsin |

Figure 1 maps the ten states. The ten states provide a diverse set of regional perspectives across the U.S., a range of different economies and population sizes, different types of agriculture and differing rates of urbanization.

Figure A-1. Map of the Ten Selected States



FTI undertook the following steps to conduct our analysis:

- Building the IMPLAN model for the U.S. and the ten selected states for 2017²
- Extracting and processing the IMPLAN data for employment, sales output, gross domestic product (“GDP”) and labor income for the U.S. and the ten select states for 2017

- Mapping the data for employment by economic sector into employment by occupation
- Mapping the data for employment by occupation into educational levels
- Reconciling the datasets to produce a single, consistent dataset mapping all jobs in the U.S. and the ten select states into a sector, an occupation and a level of education
- Determining which occupations qualify as direct “STEM jobs”
- Determining which industries qualify as “STEM industries” based on the preponderance of direct STEM jobs within them, therefore designating the entire sector (including non-STEM jobs) as a “STEM industry”
- Running these direct inputs through the IMPLAN model to determine the total economic and fiscal impact of STEM on the U.S. and the ten select states

The remainder of this section documents our inputs, data and assumptions for each of these steps.

Building the IMPLAN Model

IMPLAN is an input-output (“IO”) model of national or regional economies that shows the transactions between households, different industries and the government. IMPLAN is traditionally used to determine the indirect effect on supply chains and the induced effect of household spending on an economy because of direct spending. Direct effects could be discrete events or policies, such as a festival or change in a state’s Medicaid program, or the more generalized spending on a sector to show its more generalized contribution to the economy, accounting for indirect and induced effects.

¹ <https://www.fticonsulting.com/services/economic-consulting/economic-impact-analysis>

² The most recent data available when this project began

Extracting and Processing the IMPLAN Data

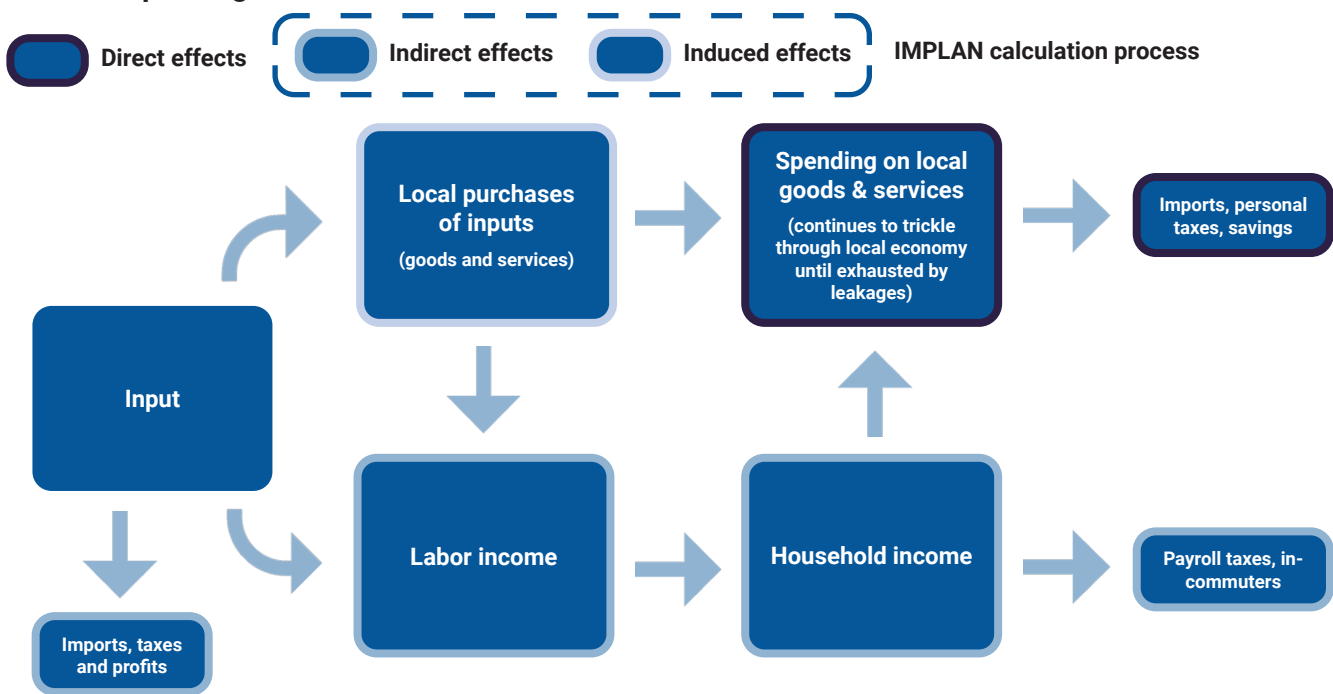
We used IMPLAN as the underlying model for the economic and fiscal impact analysis later in this project, though we also used IMPLAN as a source of data at the outset. IMPLAN provides estimates of the employment by sector for 536 sectors at the regional level.³ Federal sources like the Bureau of Economic Analysis (“BEA”),⁴ on the other hand, provide data for less than 100 sectors, allowing IMPLAN’s data to add depth and flexibility to the analysis.

IMPLAN model developers combine several data sources to make a robust estimate of employment for the 536 sectors in the model at the regional level.⁵ These include the Bureau of Labor Statistics (“BLS”)⁶ and its Quarterly Census of Employment and Wages (“QCEW”),⁷

the BEA and its Regional Economic Accounts (“REA”)⁸ and the U.S. Census Bureau⁹ and its County Business Patterns (“CBP”).¹⁰ They check these sources against each other and reconcile them with the National Income and Product Accounts (“NIPA”) to ensure consistency and quality with the data.

To illustrate, the IMPLAN model shows there were 195.8 million jobs in the U.S. economy in 2017, which is consistent with reference databases from the BEA and the BLS. Additionally, IMPLAN also shows jobs by sector, such as 94,000 jobs in oilseed farming. IMPLAN also provides the same information at the state level, such as Iowa having 2.08 million total jobs and 4,900 jobs specifically in the oilseed farming sector. This data was the foundation for our analysis.

Figure A-2. IMPLAN Calculation Processing Showing Direct Expenditures, Indirect Suppliers and Induced Spending



3 <https://implanhelp.zendesk.com/hc/en-us/articles/115002997573-536-Sector-Bridges-and-Conversions>

4 <https://www.bea.gov/>

5 <https://implanhelp.zendesk.com/hc/en-us/articles/115009674448-IMPLAN-Data-Sources>

6 <https://www.bls.gov/>

7 <https://www.bls.gov/cew/>

8 <https://www.bea.gov/data/economic-accounts/regional>

9 <https://www.census.gov/>

10 <https://www.census.gov/programs-surveys/cbp.html>

“BEA Jobs” Versus “BLS Jobs”

There are two contrasting definitions of a “job” in federal economic data:

- **“BEA Job”** – To the BEA, a job is a “task” or “roster slot” offered by an employer, not an employed worker. For instance, if a worker held two part-time jobs, then they count for two jobs in the BEA definition of a job. The BEA definition is a more comprehensive view of labor demand. The IMPLAN model and data, as well as most other economic models, use the BEA definition of employment for their calculations.
- **“BLS Job”** – To the BLS, a “job” is an employed worker. For instance, in the same example as before of a person holding two jobs, that only counts as one employed person or one “BLS job.”

Economists, members of the press and policymakers are oftentimes inconsistent with this matter in their terminology. For this research, we are formally defining a “job” or “employment” as the BEA definition.

This distinction is important because of one widely-quoted BLS report on the number of employed Americans. According to that report,¹¹ there are currently 152.3 million U.S. workers with a job. The monthly changes to this figure, such as an increase of 266,000 in “payroll employment” for November 2019, receives wide media attention.¹²

While the 152 million number from the BLS receives considerable media attention, it does not include several important categories of workers. For example, the BLS number does not include the self-employed, proprietors and partnerships, and it does not include workers not participating in Social Security (such as railroad workers). The BEA definition and data (along with the IMPLAN data) provide a more complete view of the labor market.

Mapping Employment by Sector into Occupations

To delineate the 195.8 million total U.S. jobs (as well as the jobs in the states) down to their occupations, we used a series of “industry-occupation matrices” from the BLS.¹³ An industry-occupation matrix shows the distribution of occupations within an economic sector/industry. For instance, according to the BLS, in the logging sector 44.0% of jobs are “logging equipment operators,” 17.0% are “truck drivers, heavy and tractor-trailer,” and 10.3% are “fallers,” with the remaining 28.7% of jobs going to a mixture of operations, administrative, sales and management jobs.

Using the BLS data, we were able to separate the employment by sector into 819 occupations. The industry-occupation matrices available from the BLS did not necessarily correspond exactly with the 536 industries in the IMPLAN model; we mapped between the definitions with the closest and most consistent match.

11 <https://fred.stlouisfed.org/series/PAYEMS>

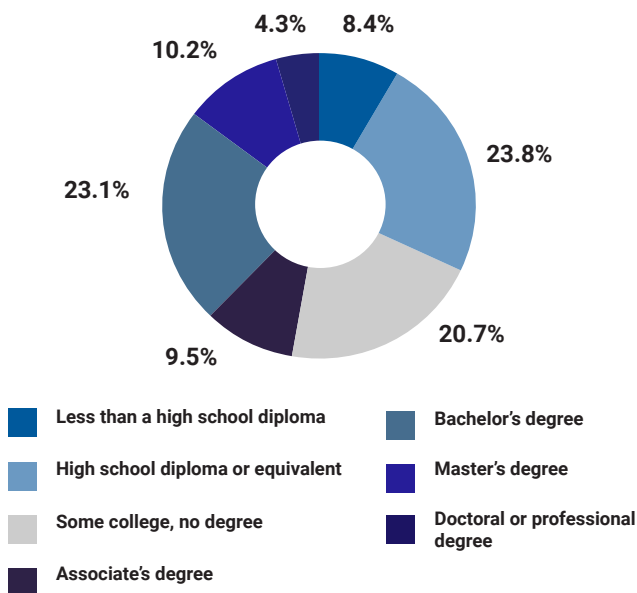
12 https://data.bls.gov/timeseries/CES0000000001?output_view=net_1mth

13 <https://www.bls.gov/emp/tables/industry-occupation-matrix-industry.htm>

Mapping Occupations into Educational Levels

We used BLS data to map occupations into education levels.¹⁴ This data divides a single occupation by the educational levels of its workers. For instance, 69.9% of chief executives have a bachelor’s degree or higher, while, across the general population, only 37.6% of American workers have a bachelor’s degree or higher according to the BLS.

Figure A-3. Distribution of Educational Attainment for All U.S. Workers Age 25 and Older



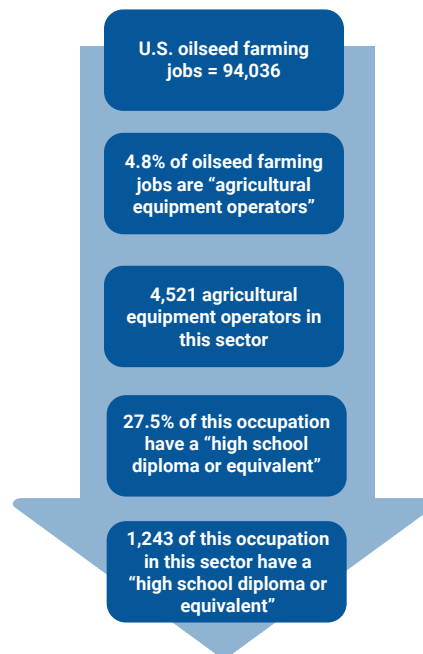
We repeated this process across all the 819 occupations for the seven levels of education presented in Figure 3. This data allows us to segment STEM employment by educational level across the economy.

Reconciling Jobs by Sector, Occupation and Educational Level

The above processes gave us two datasets: (1) occupations by sector and (2) educational levels by occupation. In order to reconcile and merge these datasets, we allocated the

occupations—tagged with their sectors—down to their educational levels using the data from the second dataset. Figure 4 provides an example of this process.

Figure A-4. Example of Creating the Joined Dataset for Jobs by Sector, Occupation and Education Level¹⁵



Qualification as a “STEM Job”

After tagging all 195.8 million U.S. jobs by their sector, occupation and education level, FTI worked with the authors to find the most sensible, credible and defensible way to describe a job as “STEM” or not. We decided that marking a job as STEM or not based on its occupation was the best approach. We worked through the list of 819 occupations with their definitions in hand before deciding 414 of the occupations qualified as “STEM jobs” while the remaining 405 occupations did not.

No jobs qualified as STEM based on either their economic sector or their educational levels alone. For the complete list of occupations designated as STEM or not, please see Appendix B.

¹⁴ <https://www.bls.gov/emp/tables/educational-attainment.htm>

¹⁵ $94,036 * 4.8% * 27.5% = 1,253$ jobs in the “oilseed farming” sector in the “agricultural equipment operators” occupation with a “high school diploma or equivalent”

Qualification as a “STEM Industry”

In addition to STEM jobs, we categorized several industries as “STEM industries.” We defined STEM industries based on their share of STEM jobs relative to the total number of jobs in that economic sector.

For example, some of the economic sectors with the highest share of STEM jobs relative to total jobs include light truck and utility vehicle manufacturing, automobile manufacturing and heavy-duty truck manufacturing (91.7% of the total jobs in these sectors are STEM jobs based on the occupational categorization in Appendix B). Because STEM jobs control these sectors so thoroughly, we created a second category for STEM industries and include the non-STEM jobs in these sectors (such as those in sales, administration or management) as adjacent to STEM.

After conferring with the authors, we set the threshold for a sector to qualify at 74.5%. Therefore, industries rounding up to 75% of

total jobs being STEM jobs would qualify as STEM industries.

Figure 5 shows the calculations for the three sectors just above and below the 74.5% threshold. For the sectors above the threshold, such as “offices of other health practitioners,” the sector has a total of 1.42 million jobs. Of those, 1.06 million jobs are direct STEM jobs based on the occupation-by-occupation analysis. Because “offices of other health practitioners” exceeds the 74.5% threshold, its other 363,020 jobs qualify as being in a STEM industry.

The first sector below the threshold is “travel trailer and camper manufacturing.” It does not qualify as a STEM industry, and only its direct STEM jobs—33,391 of them—qualify as STEM jobs in Figure 5.

FTI used the IMPLAN model to simulate the economic and fiscal impacts of STEM on the U.S. economy. FTI also used the IMPLAN model to simulate the economic and fiscal impacts on the ten select states.

Figure A-5. Threshold for STEM Industries Versus Not Qualifying as STEM Industries

Industry	Total Employment	STEM Employment	STEM Share of Employment	Above 74.5%?	Non-STEM Employment in STEM Industry
Copper rolling, drawing, extruding and alloying	28,417	21,177	74.5243%	YES	7,239
Nonferrous metal (exc aluminum) smelting and refining	8,549	6,371	74.5243%	YES	2,178
Offices of other health practitioners	1,424,599	1,061,579	74.5178%	YES	363,020
Travel trailer and camper manufacturing	44,844	33,391	74.4615%	NO	0
Motor vehicle body manufacturing	55,443	41,284	74.4615%	NO	0
Truck trailer manufacturing	36,150	26,918	74.4615%	NO	0

Simulating the Economic and Fiscal Impacts

Economic Impacts

FTI used IMPLAN to develop indirect and induced multipliers by sector and state across the economy. Using the direct STEM jobs as an input, FTI simulated the indirect and induced effects of STEM on all sectors.

STEM jobs are present in every sector of the economy. Consequently, caution to avoid any double counting of the direct impacts of STEM as part of the indirect or induced impacts is important. To do this, FTI adjusted the results of the “raw” IMPLAN simulations downwards based on data from the occupation-by-occupation analysis.

After simulating the sector-by-sector impact in IMPLAN, FTI multiplied the indirect and induced results by one minus the proportion of STEM jobs compared to total jobs for each sector. We essentially subtracted the direct STEM jobs from the indirect and induced results, preventing any double counting.

For instance, to walk through an example for a single sector, the U.S. oilseed farming sector has 94,036 jobs. Based on the occupation-by-occupation analysis, oilseed farming has 11,468 direct STEM jobs (or 12.2% of total sector employment). Simulating the multiplier in IMPLAN produced 26,716 indirect jobs and 22,591 induced jobs in oilseed farming. However, because IMPLAN does not know we need to subtract direct STEM jobs because we have already included them, we must adjust them out manually. We multiplied the 26,716 indirect jobs and 22,591 induced jobs by one minus 12.2% (or 87.8%), leaving only the non-STEM jobs for oilseed farming in the indirect and induced impacts.

This eventually leads to 11,468 direct STEM jobs, 23,458 indirect jobs¹⁶ and 19,836 induced jobs¹⁷ in oilseed farming. Adding those together produces a grand total of 54,761 oilseed jobs supported by STEM. For sectors with a result greater than 100% of total sector employment, we enforced a cap at 100% for the economic impact.

We assumed the proportional impact of STEM on employment would be the same for other economic metrics, such as on sales output, GDP or labor income. For instance, if the IMPLAN modeling intimated that 35% of the employment in a state is attributable to STEM, then we also reported 35% of GDP as attributable to STEM.

We followed the same procedures in the state-by-state analysis.

Fiscal Impacts

For the fiscal impacts, we used an effective rate of GDP based on historical data.

For federal tax revenues nationally and by state, we used data from the Internal Revenue Service (“IRS”).¹⁸ For state and local tax collections nationally and by state, we used data from the Tax Foundation.¹⁹

We created an effective rate of GDP for federal tax revenues by dividing the IRS data by GDP by state and nationally.²⁰ We used U.S. Census²¹ data for the population by state to multiply the per capita figures from the Tax Foundation into totals and then divided that by the same GDP data by state and nationally to create effective rates.

16 $26,716 * (1 - 12.2\%)$

17 $22,591 * (1 - 12.2\%)$

18 <https://www.irs.gov/statistics/soi-tax-stats-gross-collections-by-type-of-tax-and-state-irs-data-book-table-5>

19 <https://taxfoundation.org/state-local-tax-collections-per-capita-2019/>

20 From the BEA and its REA data

21 <https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html>

APPENDIX B. Occupations Considered and Not Considered STEM Jobs

ID	SOC ²²	Occupation	STEM = 1 ²³
1	11-1011	Chief executives	0
2	11-1021	General and operations managers	0
3	11-1031	Legislators	0
4	11-2011	Advertising and promotions managers	0
5	11-2021	Marketing managers	0
6	11-2022	Sales managers	0
7	11-2031	Public relations managers	0
8	11-3011	Administrative services managers	0
9	11-3021	Computer and information systems managers	1
10	11-3031	Financial managers	1
11	11-3051	Industrial production managers	1
12	11-3061	Purchasing managers	0
13	11-3071	Transportation, storage, and distribution managers	0
14	11-3111	Compensation and Benefits Managers	0
15	11-3121	Human Resources Managers	0
16	11-3131	Training and Development Managers	0
17	11-9013	Farmers, Ranchers, and Other Agricultural Managers	0
18	11-9021	Construction managers	0
19	11-9031	Education administrators, preschool and child care center/program	0
20	11-9032	Education administrators, elementary and secondary school	0
21	11-9033	Education administrators, postsecondary	0
22	11-9039	Education administrators, all other	0
23	11-9041	Engineering managers	1
24	11-9051	Food service managers	0
25	11-9061	Funeral directors	0
26	11-9071	Gaming managers	0
27	11-9081	Lodging managers	0
28	11-9111	Medical and health services managers	1
29	11-9121	Natural sciences managers	1
30	11-9131	Postmasters and mail superintendents	0
31	11-9141	Property, real estate, and community association managers	0

22 "Standard Occupational Classification," the federal government's classification of jobs into occupations, <https://www.bls.gov/soc/>

23 1 = STEM job, 0 = not a STEM job

ID	SOC	Occupation	STEM = 1
32	11-9151	Social and community service managers	0
33	11-9161	Emergency Management Directors	0
34	11-9199	Managers, all other	0
35	13-1011	Agents and business managers of artists, performers, and athletes	0
36	13-1021	Purchasing agents and buyers, farm products	0
37	13-1022	Wholesale and retail buyers, except farm products	0
38	13-1023	Purchasing agents, except wholesale, retail, and farm products	0
39	13-1031	Claims adjusters, examiners, and investigators	1
40	13-1032	Insurance appraisers, auto damage	0
41	13-1041	Compliance officers, except agriculture, construction, health and safety, and transportation	0
42	13-1051	Cost estimators	1
43	13-1071	Employment, recruitment, and placement specialists	0
44	13-1074	Farm Labor Contractors	0
45	13-1075	Labor Relations Specialists	0
46	13-1081	Logisticians	1
47	13-1111	Management analysts	1
48	13-1121	Meeting and convention planners	0
49	13-1131	Fundraisers	0
50	13-1141	Compensation, Benefits, and Job Analysis Specialists	1
51	13-1151	Training and Development Specialists	0
52	13-1161	Market Research Analysts and Marketing Specialists	1
53	13-1199	Business operations specialists, all other	1
54	13-2011	Accountants and auditors	1
55	13-2021	Appraisers and assessors of real estate	1
56	13-2031	Budget analysts	1
57	13-2041	Credit analysts	1
58	13-2051	Financial analysts	1
59	13-2052	Personal financial advisors	1
60	13-2053	Insurance underwriters	1
61	13-2061	Financial examiners	1
62	13-2071	Loan counselors	1
63	13-2072	Loan officers	1
64	13-2081	Tax examiners, collectors, and revenue agents	1
65	13-2082	Tax preparers	1
66	13-2099	Financial specialists, all other	1
67	15-1111	Computer and Information Research Scientists	1

ID	SOC	Occupation	STEM = 1
68	15-1121	Computer Systems Analysts	1
69	15-1122	Information Security Analysts	1
70	15-1131	Computer Programmers	1
71	15-1132	Software Developers, Applications	1
72	15-1133	Software Developers, Systems Software	1
73	15-1134	Web Developers	1
74	15-1141	Database Administrators	1
75	15-1142	Network and Computer Systems Administrators	1
76	15-1143	Computer Network Architects*	1
77	15-1151	Computer User Support Specialists	1
78	15-1152	Computer Network Support Specialists	1
79	15-1199	Computer Occupations, All Other	1
80	15-2011	Actuaries	1
81	15-2021	Mathematicians	1
82	15-2031	Operations research analysts	1
83	15-2041	Statisticians	1
84	15-2091	Mathematical technicians	1
85	15-2099	Mathematical scientists, all other	1
86	17-1011	Architects, except landscape and naval	1
87	17-1012	Landscape architects	0
88	17-1021	Cartographers and photogrammetrists	1
89	17-1022	Surveyors	1
90	17-2011	Aerospace engineers	1
91	17-2021	Agricultural engineers	1
92	17-2031	Biomedical engineers	1
93	17-2041	Chemical engineers	1
94	17-2051	Civil engineers	1
95	17-2061	Computer hardware engineers	1
96	17-2071	Electrical engineers	1
97	17-2072	Electronics engineers, except computer	1
98	17-2081	Environmental engineers	1
99	17-2111	Health and safety engineers, except mining safety engineers and inspectors	1
100	17-2112	Industrial engineers	1
101	17-2121	Marine engineers and naval architects	1
102	17-2131	Materials engineers	1
103	17-2141	Mechanical engineers	1
104	17-2151	Mining and geological engineers, including mining safety engineers	1
105	17-2161	Nuclear engineers	1
106	17-2171	Petroleum engineers	1
107	17-2199	Engineers, all other	1

ID	SOC	Occupation	STEM = 1
108	17-3011	Architectural and civil drafters	1
109	17-3012	Electrical and electronics drafters	1
110	17-3013	Mechanical drafters	1
111	17-3019	Drafters, all other	1
112	17-3021	Aerospace engineering and operations technicians	1
113	17-3022	Civil engineering technicians	1
114	17-3023	Electrical and electronic engineering technicians	1
115	17-3024	Electro-mechanical technicians	1
116	17-3025	Environmental engineering technicians	1
117	17-3026	Industrial engineering technicians	1
118	17-3027	Mechanical engineering technicians	1
119	17-3029	Engineering technicians, except drafters, all other	1
120	17-3031	Surveying and mapping technicians	1
121	19-1011	Animal scientists	1
122	19-1012	Food scientists and technologists	1
123	19-1013	Soil and plant scientists	1
124	19-1021	Biochemists and biophysicists	1
125	19-1022	Microbiologists	1
126	19-1023	Zoologists and wildlife biologists	1
127	19-1029	Biological scientists, all other	1
128	19-1031	Conservation scientists	1
129	19-1032	Foresters	1
130	19-1041	Epidemiologists	1
131	19-1042	Medical scientists, except epidemiologists	1
132	19-1099	Life scientists, all other	1
133	19-2011	Astronomers	1
134	19-2012	Physicists	1
135	19-2021	Atmospheric and space scientists	1
136	19-2031	Chemists	1
137	19-2032	Materials scientists	1
138	19-2041	Environmental scientists and specialists, including health	1
139	19-2042	Geoscientists, except hydrologists and geographers	1
140	19-2043	Hydrologists	1
141	19-2099	Physical scientists, all other	1
142	19-3011	Economists	1
143	19-3022	Survey researchers	1
144	19-3031	Clinical, counseling, and school psychologists	1
145	19-3032	Industrial-organizational psychologists	1
146	19-3039	Psychologists, all other	1
147	19-3041	Sociologists	1
148	19-3051	Urban and regional planners	1

ID	SOC	Occupation	STEM = 1
149	19-3091	Anthropologists and archeologists	1
150	19-3092	Geographers	1
151	19-3093	Historians	0
152	19-3094	Political scientists	0
153	19-3099	Social scientists and related workers, all other	1
154	19-4011	Agricultural and food science technicians	1
155	19-4021	Biological technicians	1
156	19-4031	Chemical technicians	1
157	19-4041	Geological and petroleum technicians	1
158	19-4051	Nuclear technicians	1
159	19-4061	Social science research assistants	1
160	19-4091	Environmental science and protection technicians, including health	1
161	19-4092	Forensic science technicians	1
162	19-4093	Forest and conservation technicians	1
163	19-4099	Life, physical, and social science technicians, all other	1
164	21-1011	Substance abuse and behavioral disorder counselors	1
165	21-1012	Educational, vocational, and school counselors	0
166	21-1013	Marriage and family therapists	0
167	21-1014	Mental health counselors	1
168	21-1015	Rehabilitation counselors	1
169	21-1019	Counselors, all other	0
170	21-1021	Child, family, and school social workers	0
171	21-1022	Medical and public health social workers	0
172	21-1023	Mental health and substance abuse social workers	0
173	21-1029	Social workers, all other	0
174	21-1091	Health educators	1
175	21-1092	Probation officers and correctional treatment specialists	0
176	21-1093	Social and human service assistants	0
177	21-1094	Community Health Workers	1
178	21-1099	Community and Social Service Specialists, All Other	0
179	21-2011	Clergy	0
180	21-2021	Directors, Religious Activities and Education	0
181	21-2099	Community and social service specialists, all other	0
182	23-1011	Lawyers	0
183	23-1012	Judicial Law Clerks	0
184	23-1021	Administrative law judges, adjudicators, and hearing officers	0
185	23-1022	Arbitrators, mediators, and conciliators	0
186	23-1023	Judges, magistrate judges, and magistrates	0
187	23-2011	Paralegals and legal assistants	0
188	23-2091	Court reporters	0
189	23-2093	Title examiners, abstractors, and searchers	0

ID	SOC	Occupation	STEM = 1
190	23-2099	Legal support workers, all other	0
191	25-1011	Business teachers, postsecondary	1
192	25-1021	Computer science teachers, postsecondary	1
193	25-1022	Mathematical science teachers, postsecondary	1
194	25-1031	Architecture teachers, postsecondary	1
195	25-1032	Engineering teachers, postsecondary	1
196	25-1041	Agricultural sciences teachers, postsecondary	1
197	25-1042	Biological science teachers, postsecondary	1
198	25-1043	Forestry and conservation science teachers, postsecondary	1
199	25-1051	Atmospheric, earth, marine, and space sciences teachers, postsecondary	1
200	25-1052	Chemistry teachers, postsecondary	1
201	25-1053	Environmental science teachers, postsecondary	1
202	25-1054	Physics teachers, postsecondary	1
203	25-1061	Anthropology and archeology teachers, postsecondary	0
204	25-1062	Area, ethnic, and cultural studies teachers, postsecondary	0
205	25-1063	Economics teachers, postsecondary	1
206	25-1064	Geography teachers, postsecondary	1
207	25-1065	Political science teachers, postsecondary	0
208	25-1066	Psychology teachers, postsecondary	1
209	25-1067	Sociology teachers, postsecondary	0
210	25-1069	Social sciences teachers, postsecondary, all other	1
211	25-1071	Health specialties teachers, postsecondary	1
212	25-1072	Nursing instructors and teachers, postsecondary	1
213	25-1081	Education teachers, postsecondary	0
214	25-1082	Library science teachers, postsecondary	0
215	25-1111	Criminal justice and law enforcement teachers, postsecondary	0
216	25-1112	Law teachers, postsecondary	0
217	25-1113	Social work teachers, postsecondary	0
218	25-1121	Art, drama, and music teachers, postsecondary	0
219	25-1122	Communications teachers, postsecondary	0
220	25-1123	English language and literature teachers, postsecondary	0
221	25-1124	Foreign language and literature teachers, postsecondary	0
222	25-1125	History teachers, postsecondary	0
223	25-1126	Philosophy and religion teachers, postsecondary	0
224	25-1191	Graduate teaching assistants	0
225	25-1192	Home economics teachers, postsecondary	0
226	25-1193	Recreation and fitness studies teachers, postsecondary	0
227	25-1194	Vocational education teachers, postsecondary	1
228	25-1199	Postsecondary teachers, all other	0
229	25-2011	Preschool teachers, except special education	0

ID	SOC	Occupation	STEM = 1
230	25-2012	Kindergarten teachers, except special education	0
231	25-2021	Elementary school teachers, except special education	0
232	25-2022	Middle school teachers, except special and vocational education	0
233	25-2023	Vocational education teachers, middle school	1
234	25-2031	Secondary school teachers, except special and vocational education	0
235	25-2032	Vocational education teachers, secondary school	1
236	25-2051	Special Education Teachers, Preschool	0
237	25-2052	Special Education Teachers, Kindergarten and Elementary School	0
238	25-2053	Special Education Teachers, Middle School	0
239	25-2054	Special Education Teachers, Secondary School	0
240	25-2059	Special Education Teachers, All Other	0
241	25-3011	Adult literacy, remedial education, and GED teachers and instructors	0
242	25-3021	Self-enrichment education teachers	0
243	25-3099	Teachers and instructors, all other	0
244	25-4011	Archivists	0
245	25-4012	Curators	0
246	25-4013	Museum technicians and conservators	1
247	25-4021	Librarians	0
248	25-4031	Library technicians	0
249	25-9011	Audio-visual collections specialists	0
250	25-9021	Farm and home management advisors	0
251	25-9031	Instructional coordinators	0
252	25-9041	Teacher assistants	0
253	25-9099	Education, training, and library workers, all other	0
254	27-1011	Art directors	0
255	27-1012	Craft artists	0
256	27-1013	Fine artists, including painters, sculptors, and illustrators	0
257	27-1014	Multi-media artists and animators	0
258	27-1019	Artists and related workers, all other	0
259	27-1021	Commercial and industrial designers	0
260	27-1022	Fashion designers	0
261	27-1023	Floral designers	0
262	27-1024	Graphic designers	0
263	27-1025	Interior designers	0
264	27-1026	Merchandise displayers and window trimmers	0
265	27-1027	Set and exhibit designers	0
266	27-1029	Designers, all other	0
267	27-2011	Actors	0
268	27-2012	Producers and directors	0
269	27-2021	Athletes and sports competitors	0
270	27-2022	Coaches and scouts	0

ID	SOC	Occupation	STEM = 1
271	27-2023	Umpires, referees, and other sports officials	0
272	27-2031	Dancers	0
273	27-2032	Choreographers	0
274	27-2041	Music directors and composers	0
275	27-2042	Musicians and singers	0
276	27-2099	Entertainers and performers, sports and related workers, all other	0
277	27-3011	Radio and television announcers	0
278	27-3012	Public address system and other announcers	0
279	27-3021	Broadcast news analysts	0
280	27-3022	Reporters and correspondents	0
281	27-3031	Public relations specialists	0
282	27-3041	Editors	0
283	27-3042	Technical writers	1
284	27-3043	Writers and authors	0
285	27-3091	Interpreters and translators	0
286	27-3099	Media and communication workers, all other	0
287	27-4011	Audio and video equipment technicians	1
288	27-4012	Broadcast technicians	1
289	27-4013	Radio operators	1
290	27-4014	Sound engineering technicians	1
291	27-4021	Photographers	1
292	27-4031	Camera operators, television, video, and motion picture	1
293	27-4032	Film and video editors	1
294	27-4099	Media and communication equipment workers, all other	1
295	29-1011	Chiropractors	1
296	29-1021	Dentists, general	1
297	29-1022	Oral and maxillofacial surgeons	1
298	29-1023	Orthodontists	1
299	29-1024	Prosthodontists	1
300	29-1029	Dentists, all other specialists	1
301	29-1031	Dietitians and nutritionists	1
302	29-1041	Optometrists	1
303	29-1051	Pharmacists	1
304	29-1061	Anesthesiologists	1
305	29-1062	Family and general practitioners	1
306	29-1063	Internists, general	1
307	29-1064	Obstetricians and gynecologists	1
308	29-1065	Pediatricians, general	1
309	29-1066	Psychiatrists	1
310	29-1067	Surgeons	1
311	29-1069	Physicians and surgeons, all other	1

ID	SOC	Occupation	STEM = 1
312	29-1071	Physician assistants	1
313	29-1081	Podiatrists	1
314	29-1122	Occupational therapists	1
315	29-1123	Physical therapists	1
316	29-1124	Radiation therapists	1
317	29-1125	Recreational therapists	1
318	29-1126	Respiratory therapists	1
319	29-1127	Speech-language pathologists	1
320	29-1128	Exercise Physiologist	1
321	29-1129	Therapists, all other	1
322	29-1131	Veterinarians	1
323	29-1141	Registered Nurses	1
324	29-1151	Nurse Anesthetists	1
325	29-1161	Nurse Midwives	1
326	29-1171	Nurse Practitioners	1
327	29-1181	Audiologists	1
328	29-1199	Health diagnosing and treating practitioners, all other	1
329	29-2011	Medical and clinical laboratory technologists	1
330	29-2012	Medical and clinical laboratory technicians	1
331	29-2021	Dental hygienists	1
332	29-2031	Cardiovascular technologists and technicians	1
333	29-2032	Diagnostic medical sonographers	1
334	29-2033	Nuclear medicine technologists	1
335	29-2034	Radiologic technologists and technicians	1
336	29-2035	Magnetic Resonance Imaging Technologists	1
337	29-2041	Emergency medical technicians and paramedics	1
338	29-2051	Dietetic technicians	1
339	29-2052	Pharmacy technicians	1
340	29-2053	Psychiatric technicians	1
341	29-2054	Respiratory therapy technicians	1
342	29-2055	Surgical technologists	1
343	29-2056	Veterinary technologists and technicians	1
344	29-2057	Ophthalmic Medical Technicians	1
345	29-2061	Licensed practical and licensed vocational nurses	1
346	29-2071	Medical records and health information technicians	1
347	29-2081	Opticians, dispensing	1
348	29-2091	Orthotists and prosthetists	1
349	29-2092	Hearing Aid Specialists	1
350	29-2099	Health technologists and technicians, all other	1
351	29-9011	Occupational health and safety specialists	1
352	29-9012	Occupational health and safety technicians	1

ID	SOC	Occupation	STEM = 1
353	29-9091	Athletic trainers	1
354	29-9092	Genetic Counselors	1
355	29-9099	Healthcare practitioners and technical workers, all other	1
356	31-1011	Home health aides	1
357	31-1013	Psychiatric aides	1
358	31-1014	Nursing Assistants	1
359	31-1015	Orderlies	1
360	31-2011	Occupational Therapy Assistants	1
361	31-2012	Occupational Therapy Aides	1
362	31-2021	Physical therapist assistants	1
363	31-2022	Physical therapist aides	1
364	31-9011	Massage therapists	1
365	31-9091	Dental assistants	1
366	31-9092	Medical assistants	1
367	31-9093	Medical equipment preparers	1
368	31-9094	Medical transcriptionists	1
369	31-9095	Pharmacy aides	1
370	31-9096	Veterinary assistants and laboratory animal caretakers	1
371	31-9097	Phlebotomists	1
372	31-9099	Healthcare support workers, all other	1
373	33-1011	First-line supervisors/managers of correctional officers	0
374	33-1012	First-line supervisors/managers of police and detectives	0
375	33-1021	First-line supervisors/managers of firefighting and prevention workers	0
376	33-1099	First-line supervisors/managers, protective service workers, all other	0
377	33-2011	Fire fighters	0
378	33-2021	Fire inspectors and investigators	1
379	33-2022	Forest fire inspectors and prevention specialists	1
380	33-3011	Bailiffs	0
381	33-3012	Correctional officers and jailers	0
382	33-3021	Detectives and criminal investigators	0
383	33-3031	Fish and game wardens	0
384	33-3041	Parking enforcement workers	0
385	33-3051	Police and sheriff's patrol officers	0
386	33-3052	Transit and railroad police	0
387	33-9011	Animal control workers	0
388	33-9021	Private detectives and investigators	0
389	33-9031	Gaming surveillance officers and gaming investigators	0
390	33-9032	Security guards	0
391	33-9091	Crossing guards	0
392	33-9092	Lifeguards, ski patrol, and other recreational protective service workers	0

ID	SOC	Occupation	STEM = 1
393	33-9093	Transportation Security Screeners*	0
394	33-9099	Protective service workers, all other	0
395	35-1011	Chefs and head cooks	0
396	35-1012	First-line supervisors/managers of food preparation and serving workers	0
397	35-2011	Cooks, fast food	0
398	35-2012	Cooks, institution and cafeteria	0
399	35-2013	Cooks, private household	0
400	35-2014	Cooks, restaurant	0
401	35-2015	Cooks, short order	0
402	35-2019	Cooks, all other	0
403	35-2021	Food preparation workers	0
404	35-3011	Bartenders	0
405	35-3021	Combined food preparation and serving workers, including fast food	0
406	35-3022	Counter attendants, cafeteria, food concession, and coffee shop	0
407	35-3031	Waiters and waitresses	0
408	35-3041	Food servers, non-restaurant	0
409	35-9011	Dining room and cafeteria attendants and bartender helpers	0
410	35-9021	Dishwashers	0
411	35-9031	Hosts and hostesses, restaurant, lounge, and coffee shop	0
412	35-9099	Food preparation and serving related workers, all other	0
413	37-1011	First-line supervisors/managers of housekeeping and janitorial workers	0
414	37-1012	First-line supervisors/managers of landscaping, lawn service, and groundskeeping workers	0
415	37-2011	Janitors and cleaners, except maids and housekeeping cleaners	0
416	37-2012	Maids and housekeeping cleaners	0
417	37-2019	Building cleaning workers, all other	0
418	37-2021	Pest control workers	0
419	37-3011	Landscaping and groundskeeping workers	0
420	37-3012	Pesticide handlers, sprayers, and applicators, vegetation	0
421	37-3013	Tree trimmers and pruners	0
422	37-3019	Grounds maintenance workers, all other	0
423	39-1011	Gaming supervisors	0
424	39-1012	Slot key persons	0
425	39-1021	First-line supervisors/managers of personal service workers	0
426	39-2011	Animal trainers	0
427	39-2021	Nonfarm animal caretakers	0
428	39-3011	Gaming dealers	0
429	39-3012	Gaming and sports book writers and runners	0
430	39-3019	Gaming service workers, all other	0
431	39-3021	Motion picture projectionists	0

ID	SOC	Occupation	STEM = 1
432	39-3031	Ushers, lobby attendants, and ticket takers	0
433	39-3091	Amusement and recreation attendants	0
434	39-3092	Costume attendants	0
435	39-3093	Locker room, coatroom, and dressing room attendants	0
436	39-3099	Entertainment attendants and related workers, all other	0
437	39-4011	Embalmers	1
438	39-4021	Funeral attendants	0
439	39-4031	Morticians, Undertakers, and Funeral Directors	1
440	39-5011	Barbers	0
441	39-5012	Hairdressers, hairstylists, and cosmetologists	0
442	39-5091	Makeup artists, theatrical and performance	0
443	39-5092	Manicurists and pedicurists	0
444	39-5093	Shampooers	0
445	39-5094	Skin care specialists	0
446	39-6011	Baggage porters and bellhops	0
447	39-6012	Concierges	0
448	39-7011	Tour Guides and Escorts	0
449	39-7012	Travel Guides	0
450	39-9011	Child care workers	0
451	39-9021	Personal and home care aides	0
452	39-9031	Fitness trainers and aerobics instructors	0
453	39-9032	Recreation workers	0
454	39-9041	Residential advisors	0
455	39-9099	Personal care and service workers, all other	0
456	41-1011	First-line supervisors/managers of retail sales workers	0
457	41-1012	First-line supervisors/managers of non-retail sales workers	0
458	41-2011	Cashiers	0
459	41-2012	Gaming change persons and booth cashiers	0
460	41-2021	Counter and rental clerks	0
461	41-2022	Parts salespersons	0
462	41-2031	Retail salespersons	0
463	41-3011	Advertising sales agents	0
464	41-3021	Insurance sales agents	0
465	41-3031	Securities, commodities, and financial services sales agents	0
466	41-3041	Travel agents	0
467	41-3099	Sales representatives, services, all other	0
468	41-4011	Sales representatives, wholesale and manufacturing, technical and scientific products	1
469	41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	0
470	41-9011	Demonstrators and product promoters	0

ID	SOC	Occupation	STEM = 1
471	41-9012	Models	0
472	41-9021	Real estate brokers	0
473	41-9022	Real estate sales agents	0
474	41-9031	Sales engineers	0
475	41-9041	Telemarketers	0
476	41-9091	Door-to-door sales workers, news and street vendors, and related workers	0
477	41-9099	Sales and related workers, all other	0
478	43-1011	First-line supervisors/managers of office and administrative support workers	0
479	43-2011	Switchboard operators, including answering service	1
480	43-2021	Telephone operators	1
481	43-2099	Communications equipment operators, all other	1
482	43-3011	Bill and account collectors	0
483	43-3021	Billing and posting clerks and machine operators	1
484	43-3031	Bookkeeping, accounting, and auditing clerks	1
485	43-3041	Gaming cage workers	0
486	43-3051	Payroll and timekeeping clerks	0
487	43-3061	Procurement clerks	0
488	43-3071	Tellers	0
489	43-3099	Financial Clerks, All Other	0
490	43-4011	Brokerage clerks	1
491	43-4021	Correspondence clerks	0
492	43-4031	Court, municipal, and license clerks	0
493	43-4041	Credit authorizers, checkers, and clerks	1
494	43-4051	Customer service representatives	0
495	43-4061	Eligibility interviewers, government programs	0
496	43-4071	File clerks	0
497	43-4081	Hotel, motel, and resort desk clerks	0
498	43-4111	Interviewers, except eligibility and loan	0
499	43-4121	Library assistants, clerical	0
500	43-4131	Loan interviewers and clerks	0
501	43-4141	New accounts clerks	0
502	43-4151	Order clerks	0
503	43-4161	Human resources assistants, except payroll and timekeeping	0
504	43-4171	Receptionists and information clerks	0
505	43-4181	Reservation and transportation ticket agents and travel clerks	0
506	43-4199	All other information and record clerks	0
507	43-5011	Cargo and freight agents	0
508	43-5021	Couriers and messengers	0
509	43-5031	Police, fire, and ambulance dispatchers	0

ID	SOC	Occupation	STEM = 1
510	43-5032	Dispatchers, except police, fire, and ambulance	0
511	43-5041	Meter readers, utilities	0
512	43-5051	Postal service clerks	0
513	43-5052	Postal service mail carriers	0
514	43-5053	Postal service mail sorters, processors, and processing machine operators	1
515	43-5061	Production, planning, and expediting clerks	0
516	43-5071	Shipping, receiving, and traffic clerks	0
517	43-5081	Stock clerks and order fillers	0
518	43-5111	Weights, measurers, checkers, and samplers, recordkeeping	1
519	43-6011	Executive secretaries and administrative assistants	0
520	43-6012	Legal secretaries	0
521	43-6013	Medical secretaries	1
522	43-6014	Secretaries, except legal, medical, and executive	0
523	43-9011	Computer operators	1
524	43-9021	Data entry	0
525	43-9022	Word processors and typists	0
526	43-9031	Desktop publishers	1
527	43-9041	Insurance claims and policy processing clerks	1
528	43-9051	Mail clerks and mail machine operators, except postal service	1
529	43-9061	Office clerks, general	0
530	43-9071	Office machine operators, except computer	1
531	43-9081	Proofreaders and copy markers	0
532	43-9111	Statistical assistants	1
533	43-9199	Office and administrative support workers, all other	0
534	45-1011	First-line supervisors/managers of farming, fishing, and forestry workers	0
535	45-2011	Agricultural Inspectors	1
536	45-2021	Animal breeders	1
537	45-2041	Graders and sorters, agricultural products	0
538	45-2091	Agricultural equipment operators	1
539	45-2092	Farmworkers and laborers, crop, nursery, and greenhouse	0
540	45-2093	Farmworkers, farm and ranch animals	0
541	45-2099	Agricultural workers, all other	0
542	45-3011	Fishers and related fishing workers	0
543	45-4011	Forest and conservation workers	0
544	45-4021	Fallers	0
545	45-4022	Logging equipment operators	1
546	45-4023	Log graders and scalers	0
547	45-4029	Logging workers, all other	0
548	47-1011	First-line supervisors/managers of construction trades and extraction workers	1

ID	SOC	Occupation	STEM = 1
549	47-2011	Boilermakers	1
550	47-2021	Brick-masons and block-masons	0
551	47-2022	Stonemasons	0
552	47-2031	Carpenters	0
553	47-2041	Carpet installers	0
554	47-2042	Floor layers, except carpet, wood, and hard tiles	0
555	47-2043	Floor sanders and finishers	0
556	47-2044	Tile and marble setters	0
557	47-2051	Cement masons and concrete finishers	0
558	47-2053	Terrazzo workers and finishers	0
559	47-2061	Construction laborers	0
560	47-2071	Paving, surfacing, and tamping equipment operators	0
561	47-2072	Pile-driver operators	0
562	47-2073	Operating engineers and other construction equipment operators	1
563	47-2081	Drywall and ceiling tile installers	0
564	47-2082	Tapers	0
565	47-2111	Electricians	1
566	47-2121	Glaziers	0
567	47-2131	Insulation workers, floor, ceiling, and wall	0
568	47-2132	Insulation workers, mechanical	1
569	47-2141	Painters, construction and maintenance	0
570	47-2142	Paperhangers	0
571	47-2151	Pipelayers	0
572	47-2152	Plumbers, pipefitters, and steamfitters	1
573	47-2161	Plasterers and stucco masons	0
574	47-2171	Reinforcing iron and rebar workers	0
575	47-2181	Roofers	0
576	47-2211	Sheet metal workers	0
577	47-2221	Structural iron and steel workers	0
578	47-2231	Solar Photovoltaic Installers	1
579	47-3011	Helpers—brick-masons, block-masons, stonemasons, and tile and marble setters	0
580	47-3012	Helpers—carpenters	0
581	47-3013	Helpers—electricians	1
582	47-3014	Helpers—painters, paperhangers, plasterers, and stucco masons	0
583	47-3015	Helpers—pipelayers, plumbers, pipefitters, and steamfitters	0
584	47-3016	Helpers—roofers	0
585	47-3019	Helpers, construction trades, all other	1
586	47-4011	Construction and building inspectors	1
587	47-4021	Elevator installers and repairers	1
588	47-4031	Fence erectors	0

ID	SOC	Occupation	STEM = 1
589	47-4041	Hazardous materials removal workers	1
590	47-4051	Highway maintenance workers	0
591	47-4061	Rail-track laying and maintenance equipment operators	1
592	47-4071	Septic tank servicers and sewer pipe cleaners	1
593	47-4091	Segmental pavers	0
594	47-4099	Construction and related workers, all other	1
595	47-5011	Derrick operators, oil and gas	1
596	47-5012	Rotary drill operators, oil and gas	1
597	47-5013	Service unit operators, oil, gas, and mining	1
598	47-5021	Earth drillers, except oil and gas	1
599	47-5031	Explosives workers, ordnance handling experts, and blasters	1
600	47-5041	Continuous mining machine operators	1
601	47-5042	Mine cutting and channeling machine operators	1
602	47-5049	Mining machine operators, all other	1
603	47-5051	Rock splitters, quarry	0
604	47-5061	Roof bolters, mining	0
605	47-5071	Roustabouts, oil and gas	0
606	47-5081	Helpers--extraction workers	1
607	47-5099	Extraction workers, all other	1
608	49-1011	First-line supervisors/managers of mechanics, installers, and repairers	1
609	49-2011	Computer, automated teller, and office machine repairers	1
610	49-2021	Radio mechanics	1
611	49-2022	Telecommunications equipment installers and repairers, except line installers	1
612	49-2091	Avionics technicians	1
613	49-2092	Electric motor, power tool, and related repairers	1
614	49-2093	Electrical and electronics installers and repairers, transportation equipment	1
615	49-2094	Electrical and electronics repairers, commercial and industrial equipment	1
616	49-2095	Electrical and electronics repairers, powerhouse, substation, and relay	1
617	49-2096	Electronic equipment installers and repairers, motor vehicles	1
618	49-2097	Electronic home entertainment equipment installers and repairers	1
619	49-2098	Security and fire alarm systems installers	1
620	49-3011	Aircraft mechanics and service technicians	1
621	49-3021	Automotive body and related repairers	1
622	49-3022	Automotive glass installers and repairers	1
623	49-3023	Automotive service technicians and mechanics	1
624	49-3031	Bus and truck mechanics and diesel engine specialists	1
625	49-3041	Farm equipment mechanics	1

ID	SOC	Occupation	STEM = 1
626	49-3042	Mobile heavy equipment mechanics, except engines	1
627	49-3043	Rail car repairers	1
628	49-3051	Motorboat mechanics	1
629	49-3052	Motorcycle mechanics	1
630	49-3053	Outdoor power equipment and other small engine mechanics	1
631	49-3091	Bicycle repairers	0
632	49-3092	Recreational vehicle service technicians	1
633	49-3093	Tire repairers and changers	0
634	49-9011	Mechanical door repairers	1
635	49-9012	Control and valve installers and repairers, except mechanical door	1
636	49-9021	Heating, air conditioning, and refrigeration mechanics and installers	1
637	49-9031	Home appliance repairers	1
638	49-9041	Industrial machinery mechanics	1
639	49-9043	Maintenance workers, machinery	1
640	49-9044	Millwrights	1
641	49-9045	Refractory materials repairers, except brick-masons	1
642	49-9051	Electrical power-line installers and repairers	1
643	49-9052	Telecommunications line installers and repairers	1
644	49-9061	Camera and photographic equipment repairers	1
645	49-9062	Medical equipment repairers	1
646	49-9063	Musical instrument repairers and tuners	1
647	49-9064	Watch repairers	1
648	49-9069	Precision instrument and equipment repairers, all other	1
649	49-9071	Maintenance and Repair Workers, General	1
650	49-9081	Wind Turbine Service Technicians	1
651	49-9091	Coin, vending, and amusement machine servicers and repairers	1
652	49-9092	Commercial divers	1
653	49-9093	Fabric menders, except garment	0
654	49-9094	Locksmiths and safe repairers	0
655	49-9095	Manufactured building and mobile home installers	0
656	49-9096	Riggers	0
657	49-9097	Signal and track switch repairers	1
658	49-9098	Helpers--installation, maintenance, and repair workers	1
659	49-9099	Installation, maintenance, and repair workers, all other	1
660	51-1011	First-line supervisors/managers of production and operating workers	1
661	51-2011	Aircraft structure, surfaces, rigging, and systems assemblers	1
662	51-2021	Coil winders, tapers, and finishers	1
663	51-2022	Electrical and electronic equipment assemblers	1
664	51-2023	Electromechanical equipment assemblers	1
665	51-2031	Engine and other machine assemblers	1
666	51-2041	Structural metal fabricators and fitters	1

ID	SOC	Occupation	STEM = 1
667	51-2091	Fiberglass laminators and fabricators	0
668	51-2092	Team assemblers	1
669	51-2093	Timing device assemblers, adjusters, and calibrators	1
670	51-2099	Assemblers and fabricators, all other	1
671	51-3011	Bakers	0
672	51-3021	Butchers and meat cutters	0
673	51-3022	Meat, poultry, and fish cutters and trimmers	0
674	51-3023	Slaughterers and meat packers	0
675	51-3091	Food and tobacco roasting, baking, and drying machine operators and tenders	0
676	51-3092	Food batch-makers	0
677	51-3093	Food cooking machine operators and tenders	0
678	51-3099	Food Processing Workers, All Other	0
679	51-4011	Computer-controlled machine tool operators, metal and plastic	1
680	51-4012	Numerical tool and process control programmers	1
681	51-4021	Extruding and drawing machine setters, operators, and tenders, metal and plastic	1
682	51-4022	Forging machine setters, operators, and tenders, metal and plastic	1
683	51-4023	Rolling machine setters, operators, and tenders, metal and plastic	1
684	51-4031	Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	1
685	51-4032	Drilling and boring machine tool setters, operators, and tenders, metal and plastic	1
686	51-4033	Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders, metal and plastic	1
687	51-4034	Lathe and turning machine tool setters, operators, and tenders, metal and plastic	1
688	51-4035	Milling machine setters, operators, and tenders, metal and plastic	1
689	51-4041	Machinists	1
690	51-4051	Metal-refining furnace operators and tenders	1
691	51-4052	Pourers and casters, metal	0
692	51-4061	Model makers, metal and plastic	1
693	51-4062	Patternmakers, metal and plastic	1
694	51-4071	Foundry mold and coremakers	1
695	51-4072	Molding, core-making, and casting machine setters, operators, and tenders, metal and plastic	1
696	51-4081	Multiple machine tool setters, operators, and tenders, metal and plastic	1
697	51-4111	Tool and die makers	1
698	51-4121	Welders, cutters, solderers, and brazers	1
699	51-4122	Welding, soldering, and brazing machine setters, operators, and tenders	1

ID	SOC	Occupation	STEM = 1
700	51-4191	Heat treating equipment setters, operators, and tenders, metal and plastic	1
701	51-4192	Lay-out workers, metal and plastic	0
702	51-4193	Plating and coating machine setters, operators, and tenders, metal and plastic	1
703	51-4194	Tool grinders, filers, and sharpeners	0
704	51-4199	Metal workers and plastic workers, all other	1
705	51-5111	Prepress Technicians and Workers	1
706	51-5112	Printing Press Operators	1
707	51-5113	Print Binding and Finishing Workers	0
708	51-6011	Laundry and dry-cleaning workers	0
709	51-6021	Pressers, textile, garment, and related materials	0
710	51-6031	Sewing machine operators	0
711	51-6041	Shoe and leather workers and repairers	0
712	51-6042	Shoe machine operators and tenders	0
713	51-6051	Sewers, hand	0
714	51-6052	Tailors, dressmakers, and custom sewers	0
715	51-6061	Textile bleaching and dyeing machine operators and tenders	0
716	51-6062	Textile cutting machine setters, operators, and tenders	0
717	51-6063	Textile knitting and weaving machine setters, operators, and tenders	0
718	51-6064	Textile winding, twisting, and drawing out machine setters, operators, and tenders	0
719	51-6091	Extruding and forming machine setters, operators, and tenders, synthetic and glass fibers	0
720	51-6092	Fabric and apparel patternmakers	0
721	51-6093	Upholsterers	0
722	51-6099	Textile, apparel, and furnishings workers, all other	0
723	51-7011	Cabinetmakers and bench carpenters	0
724	51-7021	Furniture finishers	0
725	51-7031	Model makers, wood	1
726	51-7032	Patternmakers, wood	1
727	51-7041	Sawing machine setters, operators, and tenders, wood	0
728	51-7042	Woodworking machine setters, operators, and tenders, except sawing	0
729	51-7099	Woodworkers, all other	0
730	51-8011	Nuclear power reactor operators	1
731	51-8012	Power distributors and dispatchers	1
732	51-8013	Power plant operators	1
733	51-8021	Stationary engineers and boiler operators	1
734	51-8031	Water and liquid waste treatment plant and system operators	1
735	51-8091	Chemical plant and system operators	1
736	51-8092	Gas plant operators	1
737	51-8093	Petroleum pump system operators, refinery operators, and gaugers	1

ID	SOC	Occupation	STEM = 1
738	51-8099	Plant and system operators, all other	1
739	51-9011	Chemical equipment operators and tenders	1
740	51-9012	Separating, filtering, clarifying, precipitating, and still machine setters, operators, and tenders	1
741	51-9021	Crushing, grinding, and polishing machine setters, operators, and tenders	1
742	51-9022	Grinding and polishing workers, hand	1
743	51-9023	Mixing and blending machine setters, operators, and tenders	1
744	51-9031	Cutters and trimmers, hand	1
745	51-9032	Cutting and slicing machine setters, operators, and tenders	1
746	51-9041	Extruding, forming, pressing, and compacting machine setters, operators, and tenders	1
747	51-9051	Furnace, kiln, oven, drier, and kettle operators and tenders	1
748	51-9061	Inspectors, testers, sorters, samplers, and weighers	1
749	51-9071	Jewelers and precious stone and metal workers	1
750	51-9081	Dental laboratory technicians	1
751	51-9082	Medical appliance technicians	1
752	51-9083	Ophthalmic laboratory technicians	1
753	51-9111	Packaging and filling machine operators and tenders	1
754	51-9121	Coating, painting, and spraying machine setters, operators, and tenders	0
755	51-9122	Painters, transportation equipment	0
756	51-9123	Painting, coating, and decorating workers	0
757	51-9141	Semiconductor processors	1
758	51-9151	Photographic Process Workers and Processing Machine Operators	1
759	51-9191	Cementing and gluing machine operators and tenders	1
760	51-9192	Cleaning, washing, and metal pickling equipment operators and tenders	0
761	51-9193	Cooling and freezing equipment operators and tenders	1
762	51-9194	Etchers and engravers	1
763	51-9195	Molders, shapers, and casters, except metal and plastic	0
764	51-9196	Paper goods machine setters, operators, and tenders	1
765	51-9197	Tire builders	1
766	51-9198	Helpers--production workers	0
767	51-9199	Production workers, all other	1
768	53-1011	Aircraft cargo handling supervisors	0
769	53-1021	First-line supervisors/managers of helpers, laborers, and material movers, hand	0
770	53-1031	First-line supervisors/managers of transportation and material-moving machine and vehicle operators	0
771	53-2011	Airline pilots, copilots, and flight engineers	1
772	53-2012	Commercial pilots	1

ID	SOC	Occupation	STEM = 1
773	53-2021	Air traffic controllers	1
774	53-2022	Airfield operations specialists	1
775	53-2031	Flight Attendants	0
776	53-3011	Ambulance drivers and attendants, except emergency medical technicians	0
777	53-3021	Bus drivers, transit and intercity	0
778	53-3022	Bus drivers, school	0
779	53-3031	Driver/sales workers	0
780	53-3032	Truck drivers, heavy and tractor-trailer	0
781	53-3033	Truck drivers, light or delivery services	0
782	53-3041	Taxi drivers and chauffeurs	0
783	53-3099	Motor vehicle operators, all other	0
784	53-4011	Locomotive engineers	0
785	53-4012	Locomotive firers	0
786	53-4013	Rail yard engineers, dinkey operators, and hostlers	0
787	53-4021	Railroad brake, signal, and switch operators	0
788	53-4031	Railroad conductors and yardmasters	0
789	53-4041	Subway and streetcar operators	0
790	53-4099	Rail transportation workers, all other	0
791	53-5011	Sailors and marine oilers	0
792	53-5021	Captains, mates, and pilots of water vessels	1
793	53-5022	Motorboat operators	0
794	53-5031	Ship engineers	1
795	53-6011	Bridge and lock tenders	0
796	53-6021	Parking lot attendants	0
797	53-6031	Service station attendants	0
798	53-6041	Traffic technicians	0
799	53-6051	Transportation inspectors	0
800	53-6061	Transportation Attendants, Except Flight Attendants	0
801	53-6099	Transportation workers, all other	0
802	53-7011	Conveyor operators and tenders	1
803	53-7021	Crane and tower operators	1
804	53-7031	Dredge operators	1
805	53-7032	Excavating and loading machine and dragline operators	1
806	53-7033	Loading machine operators, underground mining	1
807	53-7041	Hoist and winch operators	1
808	53-7051	Industrial truck and tractor operators	0
809	53-7061	Cleaners of vehicles and equipment	0
810	53-7062	Laborers and freight, stock, and material movers, hand	0
811	53-7063	Machine feeders and off-bearers	0
812	53-7064	Packers and packagers, hand	0

ID	SOC	Occupation	STEM = 1
813	53-7071	Gas compressor and gas pumping station operators	1
814	53-7072	Pump operators, except wellhead pumpers	1
815	53-7073	Wellhead pumpers	1
816	53-7081	Refuse and recyclable material collectors	0
817	53-7111	Shuttle car operators	0
818	53-7121	Tank car, truck, and ship loaders	0
819	53-7199	Material moving workers, all other	0

APPENDIX C. STEM Employment and Economic Activity

United States

The vast majority of U.S. employment is supported by STEM. 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

National Employment and Economic Activity Supported by STEM

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	64,080,198	16,241,639	49,972,273	130,294,110	66.5%
Output	\$14,389,210	\$5,329,079	\$5,467,062	\$25,185,351	74.0%
GDP	\$7,659,764	\$2,427,121	\$3,368,795	\$13,455,680	69.1%
Labor Income	\$4,924,579	\$1,275,061	\$2,191,758	\$8,391,397	70.5%

* Dollar amounts in millions (000000s)

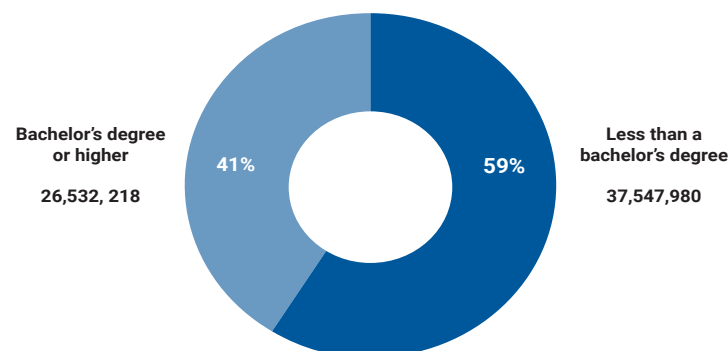
Tax Revenue Produced Through STEM Economic Activity

Metric	Total
Federal Tax Revenues	\$2,393,085
State and Local Tax Revenues	\$1,227,299

* Dollar amounts in millions (000000s)

STEM-supported employment generated \$2.3 trillion in federal tax revenues and \$1.2 trillion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the U.S.

National STEM Employment by Level of Education



In 2017 59 percent of U.S. STEM jobs were held by individuals with less than a bachelor's degree.

Arizona

The majority of Arizona’s employment, labor output and state GDP is supported by STEM, with 63 percent of Arizona jobs, 70 percent of Arizona’s output and 65 percent of Arizona’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Arizona

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	1,201,565	317,987	790,826	2,310,378	62.7%
Output	\$228,604,103	\$85,747,344	\$82,866,299	\$397,217,746	69.6%
GDP	\$122,067,793	\$38,311,566	\$50,184,308	\$210,563,666	64.8%
Labor Income	\$80,577,977	\$20,828,005	\$31,921,320	\$133,327,301	67.3%

* Dollar amounts in thousands (000s)

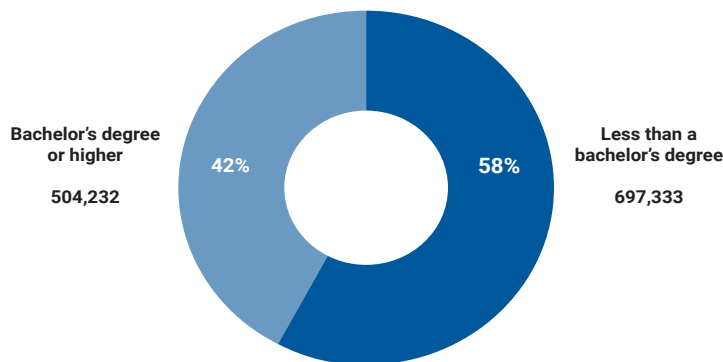
Tax Revenue Produced Through STEM Economic Activity in Arizona

Metric	Total
Federal Tax Revenues	\$29,963,159
State and Local Tax Revenues	\$18,112,025

* Dollar amounts in thousands (000s)

STEM-supported employment in Arizona generated \$30 billion in federal tax revenues and \$18 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Arizona



In Arizona, 58 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Colorado

The majority of Colorado’s employment, labor output and state GDP is supported by STEM, with 64 percent of Colorado jobs, 70 percent of Colorado’s output and 66 percent of Colorado’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Colorado

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	1,230,778	317,831	828,562	2,377,170	63.9%
Output	\$242,828,749	\$91,965,237	\$87,489,759	\$442,283,745	70.4%
GDP	\$138,465,445	\$42,584,328	\$53,267,232	\$234,317,005	66.4%
Labor Income	\$96,143,470	\$23,420,622	\$34,405,202	\$153,969,294	68.8%

* Dollar amounts in thousands (000s)

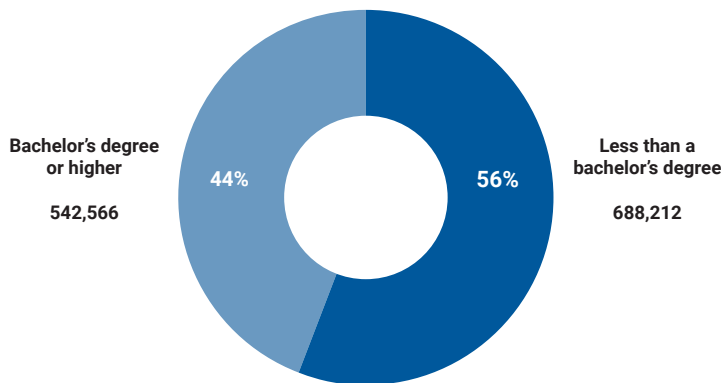
Tax Revenue Produced Through STEM Economic Activity in Colorado

Metric	Total
Federal Tax Revenues	\$38,968,255
State and Local Tax Revenues	\$18,940,959

* Dollar amounts in thousands (000s)

STEM-supported employment in Colorado generated \$38 billion in federal tax revenues and \$18 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Colorado



In Colorado, 56 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Florida

The majority of Florida’s employment, labor output, and state GDP is supported by STEM, with 59 percent of Florida jobs, 66 percent of Florida’s output and 62 percent of Florida’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Florida

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	3,652,925	995,409	2,411,981	7,060,315	59.4%
Output	\$652,866,343	\$253,232,721	\$239,323,552	\$1,118,422,616	66.0%
GDP	\$336,438,494	\$117,028,702	\$143,022,857	\$596,490,053	61.5%
Labor Income	\$223,938,682	\$60,534,084	\$91,278,313	\$375,751,079	64.2%

* Dollar amounts in thousands (000s)

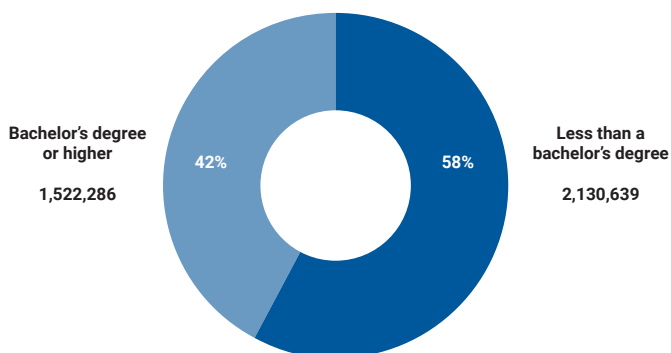
Tax Revenue Produced Through STEM Economic Activity in Florida

Metric	Total
Federal Tax Revenues	\$126,536,720
State and Local Tax Revenues	\$49,379,773

* Dollar amounts in thousands (000s)

STEM-supported employment in Florida generated \$126 billion in federal tax revenues and \$49 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Florida



In Florida, 58 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Georgia

The majority of Georgia’s employment, labor output and state GDP is supported by STEM, with 62 percent of Georgia jobs, 71 percent of Georgia’s output and 66 percent of Georgia’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Georgia

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	1,923,514	514,323	1,301,604	3,739,441	61.7%
Output	\$404,315,756	\$173,416,065	\$133,051,588	\$710,783,409	70.5%
GDP	\$214,267,681	\$82,276,751	\$78,159,718	\$374,704,151	66.2%
Labor Income	\$136,509,503	\$38,961,063	\$49,163,749	\$224,634,315	66.7%

* Dollar amounts in thousands (000s)

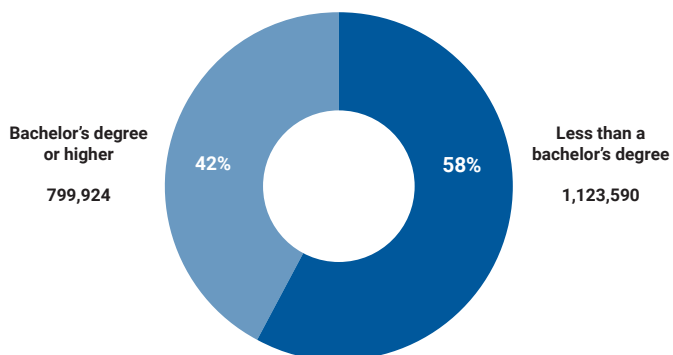
Tax Revenue Produced Through STEM Economic Activity in Georgia

Metric	Total
Federal Tax Revenues	\$61,425,589
State and Local Tax Revenues	\$28,362,608

* Dollar amounts in thousands (000s)

STEM-supported employment in Georgia generated \$61 billion in federal tax revenues and \$28 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Georgia



In Georgia, 58 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Iowa

The majority of Iowa’s employment, labor output and state GDP is supported by STEM, with 58 percent of Iowa jobs, 71 percent of Iowa’s output and 65 percent of Iowa’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Iowa

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	646,338	180,744	383,985	1,211,068	58.2%
Output	\$158,904,491	\$74,634,385	\$42,424,274	\$275,963,150	70.9%
GDP	\$74,647,158	\$27,218,104	\$22,872,566	\$124,737,828	65.4%
Labor Income	\$42,358,851	\$12,431,947	\$13,834,127	\$68,624,925	63.2%

* Dollar amounts in thousands (000s)

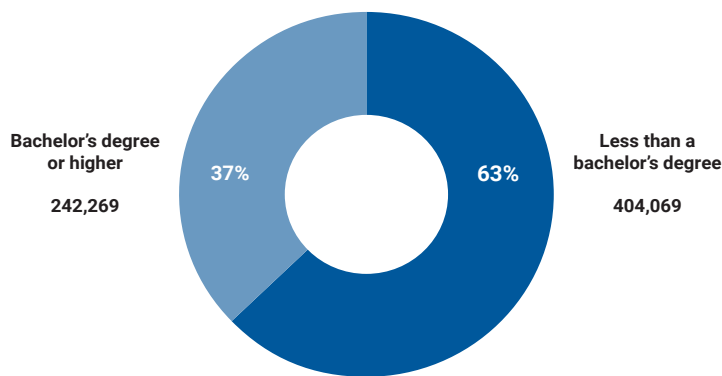
Tax Revenue Produced Through STEM Economic Activity in Iowa

Metric	Total
Federal Tax Revenues	\$16,426,682
State and Local Tax Revenues	\$11,297,954

* Dollar amounts in thousands (000s)

STEM-supported employment in Iowa generated \$16 billion in federal tax revenues and \$11 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Iowa



In Iowa, 63 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Maine

The majority of Maine’s employment, labor output and state GDP is supported by STEM, with 58 percent of Maine jobs, 66 percent of Maine’s output and 61 percent of Maine’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Maine

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	269,119	61,374	155,966	486,459	58.4%
Output	\$46,063,878	\$15,731,498	\$15,066,413	\$76,861,790	66.3%
GDP	\$23,067,508	\$6,200,121	\$8,725,921	\$37,993,550	60.9%
Labor Income	\$16,196,369	\$3,577,369	\$5,569,576	\$25,343,314	63.1%

* Dollar amounts in thousands (000s)

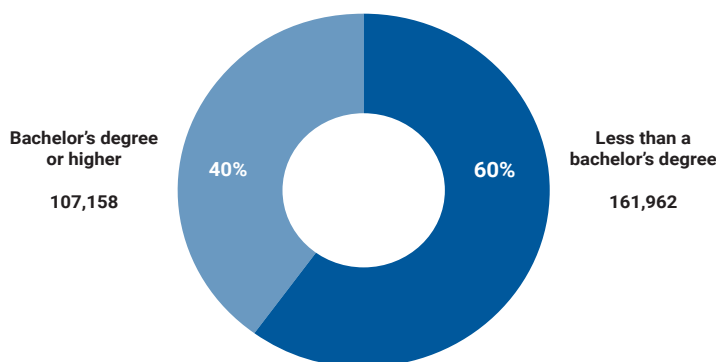
Tax Revenue Produced Through STEM Economic Activity in Maine

Metric	Total
Federal Tax Revenues	\$4,827,933
State and Local Tax Revenues	\$4,790,487

* Dollar amounts in thousands (000s)

STEM-supported employment in Maine generated \$4.8 billion in federal tax revenues and \$4.7 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Maine



In Maine, 60 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

New Mexico

The majority of New Mexico’s employment, labor output and state GDP is supported by STEM, with 56 percent of New Mexico jobs, 66 percent of New Mexico’s output and 60 percent of New Mexico’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in New Mexico

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	359,658	67,180	186,518	613,356	55.5%
Output	\$74,687,927	\$22,211,202	\$17,833,727	\$114,732,855	65.5%
GDP	\$43,458,148	\$8,409,407	\$10,186,614	\$62,054,169	60.4%
Labor Income	\$22,345,406	\$3,787,519	\$6,208,446	\$32,341,371	60.2%

* Dollar amounts in thousands (000s)

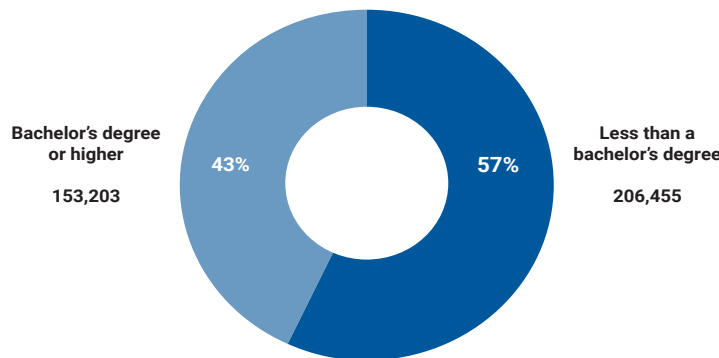
Tax Revenue Produced Through STEM Economic Activity in New Mexico

Metric	Total
Federal Tax Revenues	\$5,435,849
State and Local Tax Revenues	\$5,536,511

* Dollar amounts in thousands (000s)

STEM-supported employment in New Mexico generated \$5.4 billion in federal tax revenues and \$5.5 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in New Mexico



In New Mexico, 57 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

North Dakota

The majority of North Dakota’s employment, labor output and state GDP is supported by STEM, with 58 percent of North Dakota jobs, 65 percent of North Dakota’s output and 61 percent of North Dakota’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in North Dakota

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	191,286	41,538	102,303	335,126	57.8%
Output	\$42,265,135	\$13,567,971	\$11,640,787	\$67,473,893	65.4%
GDP	\$22,626,373	\$5,559,397	\$6,571,081	\$34,756,851	60.8%
Labor Income	\$13,624,718	\$2,904,695	\$4,158,143	\$20,687,555	61.3%

* Dollar amounts in thousands (000s)

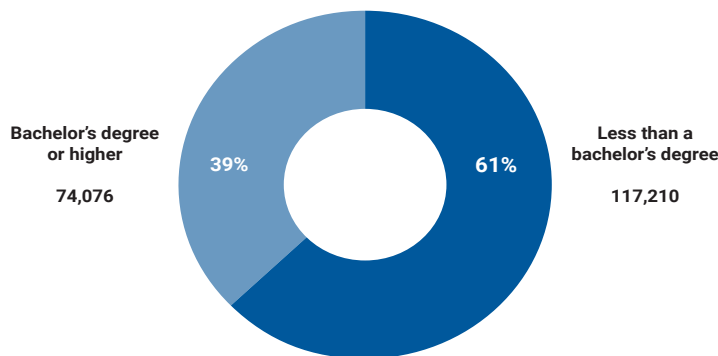
Tax Revenue Produced Through STEM Economic Activity in North Dakota

Metric	Total
Federal Tax Revenues	\$3,998,897
State and Local Tax Revenues	\$3,406,023

* Dollar amounts in thousands (000s)

STEM-supported employment in North Dakota generated \$4 billion in federal tax revenues and \$3.4 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in North Dakota



In North Dakota, 61 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Tennessee

The majority of Tennessee’s employment, labor output and state GDP is supported by STEM, with 60 percent of Tennessee jobs, 72 percent of Tennessee’s output and 65 percent of Tennessee’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Tennessee

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	1,281,601	320,909	805,189	2,407,700	60.4%
Output	\$304,094,682	\$105,208,885	\$83,063,686	\$492,367,253	71.9%
GDP	\$138,225,506	\$42,233,372	\$49,911,120	\$230,369,998	65.3%
Labor Income	\$95,234,749	\$23,012,029	\$33,943,600	\$152,190,378	66.6%

* Dollar amounts in thousands (000s)

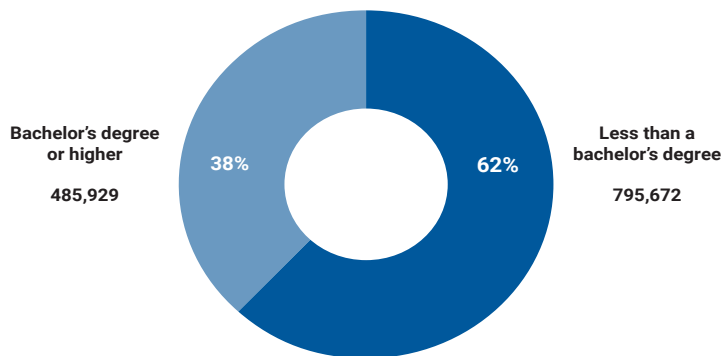
Tax Revenue Produced Through STEM Economic Activity in Tennessee

Metric	Total
Federal Tax Revenues	\$44,973,704
State and Local Tax Revenues	\$16,509,311

* Dollar amounts in thousands (000s)

STEM-supported employment in Tennessee generated \$45 billion in federal tax revenues and \$16 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Tennessee



In Tennessee, 62 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.

Wisconsin

The majority of Wisconsin’s employment, labor output and state GDP is supported by STEM, with 63 percent of Wisconsin jobs, 73 percent of Wisconsin’s output and 67 percent of Wisconsin’s GDP supported by STEM. These figures are in sync with the national picture, where 67 percent of U.S. jobs, 74 percent of U.S. output and 69 percent of U.S. GDP are supported by STEM.

Employment and Economic Activity Supported by STEM in Wisconsin

Metric	Direct STEM	Indirect	Induced	Total	Share of State Economy
Employment	1,247,104	326,569	766,008	2,339,682	63.2%
Output	\$279,665,049	\$110,171,203	\$78,061,628	\$467,897,880	73.3%
GDP	\$130,474,594	\$42,513,158	\$44,652,327	\$217,640,079	67.2%
Labor Income	\$83,559,127	\$22,336,326	\$28,942,209	\$134,837,662	67.7%

* Dollar amounts in thousands (000s)

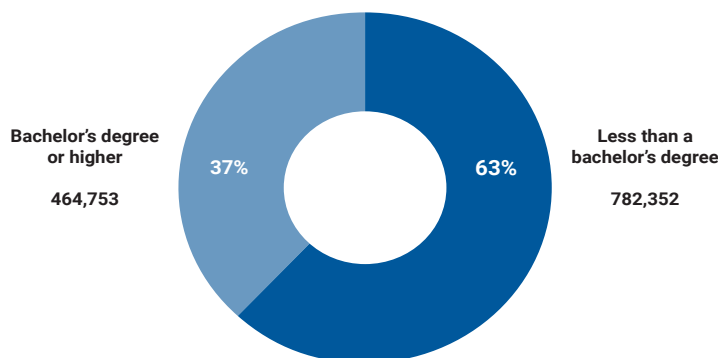
Tax Revenue Produced Through STEM Economic Activity in Wisconsin

Metric	Total
Federal Tax Revenues	\$34,916,472
State and Local Tax Revenues	\$20,664,658

* Dollar amounts in thousands (000s)

STEM-supported employment in Wisconsin generated \$34 billion in federal tax revenues and \$20 billion in state and local tax revenues—making STEM-supported economic activity the primary driver of tax revenue in the state.

STEM Employment by Level of Education in Wisconsin



In Wisconsin, 63 percent of STEM jobs are held by individuals without a bachelor's degree. This figure tracks with the national statistic of 59 percent of U.S. STEM professionals not holding a bachelor's degree.