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POSTSECONDARY EDUCATION AND STEM EMPLOYMENT IN THE UNITED STATES

An Analysis of National Trends with a Focus on the Natural Gas and Oil Industry

Matthew D. Baird,
Robert Bozick
and Mark Harris

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Preface

The American Petroleum Institute, which funded this report, is the only national trade association that represents all segments of the United States' innovation-driven oil and natural gas industry. The institute's more than 625 members—including large integrated companies, exploration and production, refining, marketing, pipeline, marine shipping and support businesses, and service and supply firms—provide most of the energy in the United States. The oil and natural gas industry supports 10.3 million U.S. jobs and 7.6 percent of the U.S. economy and, since 2000, has invested more than $3 trillion in U.S. capital projects to advance all forms of energy. Many of the individuals employed in the oil and natural gas industry work in the science, technology, engineering, and mathematics (STEM) sector, and the industry has great interest in understanding the relationship between STEM education and employment, including STEM employment. In addition to the millions of jobs already supported by the industry, IHS projects that between 2015 and 2035, nearly 1.9 million direct job opportunities will be available in the oil, natural gas, and petrochemical industries. This includes close to 707,000 job opportunities projected to be filled by blacks and Hispanics and more than 290,000 jobs projected to be filled by women.

In considering the future workforce needs of the oil and natural gas industry and how to attract and retain the best available talent, education and workforce training—STEM education in particular—are critical pieces to the projected industry growth that keeps the United States at a competitive advantage and that provides the energy all Americans depend on. This report analyzes the relationship between postsecondary education and STEM employment in the United States. In addition to being of interest to those in the oil and natural gas industry, this report should be of interest to policymakers, educators, researchers, and workforce professionals concerned with the relationship between STEM education and STEM employment, including the differences for women and for racial and ethnic minorities.

This research was sponsored by the American Petroleum Institute and undertaken jointly by RAND Labor and Population and RAND Education, units of the RAND Corporation. Both units at RAND have built an international reputation for conducting objective, high-quality, empirical research to support and improve policies and organizations around the world. For more information on RAND Labor and Population, visit www.rand.org/labor. For more information on RAND Education, visit www.rand.org/education. This research is part of RAND Labor and Population and RAND Education's collaborative efforts to promote workforce development at home and abroad by conducting cutting-edge research that helps public- and private-sector decisionmakers understand how to keep workers productive, knowledgeable, and engaged.

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Summary

This report aims to contribute new knowledge to understanding the role that postsecondary education—including bachelor's degrees, associate's degrees, and sub-baccalaureate credentialing programs—plays in meeting the increasing demands of the science, technology, engineering, and mathematics (STEM) workforce. At present, jobs that require STEM skills and training constitute 20 percent of all jobs in the U.S. economy (Rothwell, 2013). Current projections anticipate that the STEM economy will grow about 9 percent between 2014 and 2024—faster than the growth rate projected for all occupations (Noonan, 2017). With an expansion in the STEM economy and the growing demand for workers to fill STEM jobs, business leaders are putting pressure on—and, in some cases, investing in—universities, community colleges, and technical schools to develop programs that are tailored to specific STEM occupations, with an eye toward preparing students for high-growth jobs in their local communities (Tai, 2012).

To inform policy discussions on how best to expand and sustain the STEM school-to-work pipeline, we undertake three research objectives:

1. Document trends in STEM postsecondary degree attainment across the past decade.
2. Examine the relationship between attaining a STEM postsecondary degree and employment outcomes.
3. Explore whether attaining a license or certification improves employment outcomes beyond traditional postsecondary degrees.

To address our research objectives, we analyze data from three national data sources: the Integrated Postsecondary Education Data System (IPEDS), the American Community Survey (ACS), and the Current Population Survey (CPS). We summarize our findings for each of the research objectives in turn.

Trends in STEM Postsecondary Degree Attainment Between 2003 and 2015

We first analyze data from the U.S. Department of Education's IPEDS, which serves as an annual census of all Title IV postsecondary institutions that participate in the federal student financial aid program. Using IPEDS data from 2002–2003 through 2014–2015, we tallied the total number of postsecondary degrees awarded for STEM and non-STEM fields of study.

The number of overall bachelor's degrees and the number of bachelor's degrees in STEM fields increased substantially over the past decade. Between 2003 and 2015, the number of bachelor's degrees awarded in STEM increased from 469,923 to 680,890. With their increasing prevalence, STEM bachelor’s degrees account for about 36 percent of all bachelor’s degrees awarded annually.

While the number of associate’s degrees also increased over the past decade, the growth in the number of associate’s degrees awarded in non-STEM fields was more pronounced than the growth in the number of associate’s degrees awarded in STEM fields. Between 2003 and 2015, the number of associate’s degrees awarded in any field increased from 634,016 to 1,013,971. The number of STEM associate’s degrees awarded increased from 114,436 in 2003 to 142,929 in 2015.

Women earn more bachelor’s degrees overall but earn fewer STEM bachelor’s degrees than men, resulting in a large gender gap in the proportion of bachelor’s degrees that are STEM. In 2015, 31.1 percent of all bachelor’s degrees awarded to women were in STEM fields compared with 42.4 percent for men—a difference of 11.3 percentage points.

The share of bachelor’s degrees that are in STEM fields varies considerably by race/ethnicity. In 2015, Asians had the highest rate (50 percent of all bachelor’s degrees awarded to Asians were in STEM), while blacks had the lowest (30 percent of all bachelor’s degrees awarded to blacks were in STEM).

Relationship Among STEM Bachelor’s Degree Attainment, STEM Employment, and Employment Outcomes

Next, we analyze current employment status and wages and their relationship to STEM bachelor’s degrees and STEM jobs, as well as oil and natural gas majors and industry employment. To do so, we use the 2015 ACS, which is a large, nationally representative survey of the U.S. population administered by the U.S. Census Bureau.

Although having a STEM bachelor’s degree is associated with an increased likelihood of working in a STEM occupation, not all STEM bachelor’s degree holders work in such occupations. STEM bachelor’s degrees likely give graduates greater training in the skills needed in STEM jobs, as well as the ability to signal those skills to potential employers. We estimate that 40.5 percent of STEM bachelor’s graduates end up working in STEM occupations.

Although few of the total STEM bachelor’s degree recipients enter occupations in the oil and natural gas industry, holding a STEM bachelor’s degree is associated with an increase in the likelihood of working in the oil and natural gas industry. Of STEM bachelor’s degree recipients, 5 percent are employed in the oil and natural gas industry compared with 2.7 percent of non-STEM bachelor’s degree recipients.

There is a large increase in wages associated with having a STEM bachelor’s degree and with working in a STEM occupation. Those with bachelor’s degrees in STEM earn $37.67 per hour compared with $31.50 per hour earned by those with bachelor’s degrees in other fields.

Similarly, those employed in the STEM industry earn $31.98 per hour compared with $23.63 per hour earned by those employed in other industries.

Oil and natural gas industry jobs pay significantly higher hourly wages. The average wage in the oil and natural gas industry is $30.46 per hour compared with $25.47 per hour outside of the industry.

Women are less likely to work in STEM occupations than men, with or without a STEM bachelor's degree. Only around 30 percent of women with a STEM bachelor's degree work in a STEM occupation, while around 50 percent of men with a STEM bachelor's degree do. In fact, men with a non-STEM bachelor's degree are about as likely to work in a STEM occupation as women with a STEM bachelor's degree.

Women experience a larger increase than men in hourly wages, on average, for working in a STEM occupation. Among women, the difference in hourly wages between those working in STEM occupations and those working in other occupations is $10.37 (with the premium here benefiting those employed in STEM occupations). The difference for men, however, is $6.83 per hour.

Blacks and Hispanics are less likely to work in STEM jobs compared with whites, and when they do procure STEM jobs, they earn less than whites. Approximately 24 percent of black and Hispanic bachelor's degree recipients are employed in STEM jobs compared with 30.1 percent of white bachelor's degree recipients. Among bachelor's degree recipients employed in STEM jobs, whites earn $33.86 per hour, blacks earn $26.97 per hour, and Hispanics earn $24.22 per hour.

Despite an overall wage gap between men and women, there is greater wage parity in the oil and natural gas industry among those with a STEM bachelor's degree and those in a STEM occupation. For example, men with a STEM bachelor's degree in the overall economy earn about $7.42 more per hour than women with a STEM bachelor's degree, and in the oil and natural gas industry, the gap is $2.74 per hour.

Relationship Between License or Certification Attainment and Employment Outcomes

Lastly, we explore whether attaining a license or certification is associated with an improvement in employment outcomes beyond traditional academic degrees. To undertake our analysis, we use data from the 2015 CPS. Collected by the U.S. Census Bureau, the CPS is a nationally representative monthly survey of approximately 60,000 households across the United States.

Possessing a license or certification is associated with an increased probability of employment, but not necessarily higher wages. For example, among those with a high school diploma, 86.0 percent of those with a certification or license are employed, while 66.5 percent of those without a license or certification are employed.

The benefits of holding a license or certification are strongest for those lacking a high school diploma, women, and Hispanics. For example, with respect to hourly wages, women receive a $10.10 per hour *benefit* from having a license or certification, while men experience a $2.11 per hour *penalty* from having such credentials. These findings suggest that license or certification receipt is a possible avenue for improving employment outcomes for traditionally underrepresented groups.

The benefits associated with licenses and certifications, however, were mostly for overall employment and employment in STEM jobs and were not as strong for jobs in the oil and natural gas industry.

Conclusion

As the economy becomes increasingly reliant on workers with strong quantitative and analytical skills, there is a growing need for policymakers to identify efficient ways to prepare all youth—including those not continuing on to college—for careers in STEM. Our study indicates that the receipt of a bachelor's degree in a STEM field and the attainment of a license or certification (in any field) are important educational milestones that support success in the STEM labor market. However, in both absolute and relative numbers, women and racial or ethnic minorities are less likely to earn these critical degrees and to enter STEM employment. Without stronger support for these traditionally underrepresented groups, the STEM economy in general and the oil and natural gas industry in particular may fail to optimize the pool of potential workers that it needs to sustain growth and innovation.

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Abbreviations

ACS	American Community Survey
API	American Petroleum Institute
CIP	Classification of Instructional Programs
CPS	Current Population Survey
IPEDS	Integrated Postsecondary Education Data System
O*NET	Occupational Information Network
ONG	oil and natural gas
SOC	Standard Occupational Classification
STEM	science, technology, engineering, and mathematics

Chapter One

Introduction

Over the past few decades, a consistent theme of U.S. education policy reform discussions is that schools need to improve and expand their training capacities in math and science (Milgram and Stotsky, 2013). These discussions have been driven, in part, by an economy that is increasingly fueled by technological innovation and a corresponding demand for workers with advanced quantitative and analytic skills who can test and implement solutions via the scientific method (Katz and Margo, 2014; Bresnahan, Brynjolfsson, and Hitt, 2002). At present, jobs that require science, technology, engineering, and mathematics (STEM) skills and training constitute 20 percent of all jobs in the U.S. economy (Rothwell, 2013). Current projections anticipate that the STEM economy will grow about 9 percent between 2014 and 2024—faster than the growth rate projected for all occupations (Noonan, 2017). With an expansion in the STEM economy and the growing demand for workers to fill STEM jobs, business leaders are putting pressure on—and, in some cases, investing in—universities, community colleges, and technical schools to develop programs that are tailored to specific STEM occupations, with an eye toward preparing students for high-growth jobs in their local communities (Tai, 2012).

For the past three decades in the United States, education policy has maintained a focus on promoting four-year college enrollment leading to a bachelor's degree as a universal educational imperative (Rosenbaum, 2001), largely at the expense of helping colleges improve the employment prospects of those not seeking bachelor's degrees (Stone and Lewis, 2012). The pressure to simultaneously improve STEM readiness alongside the broader focus on increasing four-year college graduation rates has raised attention on the role of bachelor's degree programs in the school-to-STEM job pipeline. The role of associate's degrees, occupational certifications, and occupational licenses in the STEM economy has been largely ignored.[1] This oversight leaves an incomplete view of the linkages between schools and labor markets, because a substantial number of jobs available to workers with sub-baccalaureate degrees require STEM skills and training. A recent report by the Brookings Institution refers to this sub-baccalaureate segment of the labor market as the "second STEM" or "hidden STEM" economy: "These workers today are less likely to be involved in invention, but they are critical to the implementation of new ideas, and advise researchers on feasibility of design options, cost estimates, and other practical aspects of technological development" (Rothwell, 2013). It is estimated that nearly half of all STEM jobs

[1] An important exception is Carnevale, Rose, and Cheah (2013), which shows that associate's degrees in STEM fields earn more on average than several groups of bachelor's degree majors. Some newer research finds wage premiums associated with obtaining a certification or license but does not specifically look at the STEM labor market (Dadgar and Trimble, 2015).

do not require a four-year degree and that a third of all STEM jobs are in blue-collar occupations (Rothwell, 2013). To date, little is known about the educational preparation of workers entering this segment of the economy (Bozick, Srinivasan, and Gottfried, 2017).

Running along these considerations, there is an underrepresentation of women and racial/ethnic minorities, both in STEM postsecondary education and in employment in STEM jobs. Women and racial/ethnic minorities are less likely to pursue STEM majors upon enrolling in college (Gottfried and Bozick, 2016); less likely to graduate with majors in STEM fields (Arcidiacono, Aucejo, and Hotz, 2016); and more likely to, conditional on starting as STEM majors, switch out of STEM majors prior to graduation (Baird, Buchinsky, and Sovero, 2016). Without a careful consideration of these gender and racial/ethnic disparities and their sources, such disparities are likely to persist and potentially impede economic growth.

The combination of these emerging trends—the overall growth in STEM job opportunities, the increasing need for skilled STEM workers for jobs that do not require bachelor's degrees, and persistent gender and racial/ethnic disparities in STEM degree attainment—suggests a need for new ideas and policies for supporting educational initiatives that can enhance innovation across the domestic economy and that can maintain U.S. competitiveness globally. Such policy directions require a careful assessment of the current state of the school-to-work pipeline in STEM. With that need in mind, we use an array of national data sets to provide new information on the relationship between postsecondary education and employment in the STEM economy.

This research was funded by the American Petroleum Institute (API), a national trade association that represents all aspects of America's oil and natural gas (ONG) industry and more than 625 member companies. The ONG industry is one that can directly benefit from improved understanding and implementation of pipelines from STEM training to STEM employment in the industry. The ONG industry is a major source of jobs in the United States and is expected to continue to employ many individuals in the future (Petak et al., 2017). In fact, IHS projects that between 2015 and 2035, nearly 1.9 million direct job opportunities will be available in the oil, natural gas, and petrochemical industries (IHS, 2016). This includes close to 707,000 job opportunities projected to be filled by blacks and Hispanics and more than 290,000 jobs projected to be filled by women. Many of these jobs will require STEM skills. The industry thus has a pressing need to attract and retain a well-trained workforce that can execute technical tasks that often require STEM knowledge and skills. This report is intended to inform strategies and policies for the ONG industry in particular, as well as the broader STEM workforce.

Objectives of This Report

This report aims to contribute new knowledge to our understanding of the role that postsecondary education—including bachelor's degrees, associate's degrees, and sub-baccalaureate credentialing programs—plays in meeting the needs of the STEM labor market. Specifically, we address three research objectives:

1. Document trends in STEM postsecondary degree attainment across the past decade.
2. Examine the relationship between attaining a STEM postsecondary degree and employment outcomes.
3. Explore whether attaining a license or certification improves employment outcomes beyond traditional postsecondary degrees.

To accomplish Objective 1, we tabulate the receipt of postsecondary degrees in STEM fields over the past decade. This allows for an examination of change and continuity in the supply of recent graduates who have educational credentials in STEM fields. This descriptive portrait—shown in Chapter Two—provides a foundation for the rest of the report.

Next, we examine whether recipients of bachelor's degrees in STEM fields are more likely to secure STEM jobs and to earn higher wages than their peers with bachelor's degrees in non-STEM fields (Objective 2). To do so, we estimate the relationship between STEM degree attainment and an array of employment outcomes using standard multivariate techniques to eliminate the potentially confounding effects of sociodemographic characteristics of college graduates (e.g., age, gender, and geographic location) relative to nongraduates. In this analysis, we focus our attention on different STEM majors and whether certain majors yield better employment outcomes than others. We also look at the overall wage levels and the wage premiums for working in a STEM occupation, and how this varies across gender and race/ethnicity, to understand the competing incentives that might help inform disparities in the STEM training-to-employment pipeline. The findings from these multivariate analyses are presented in Chapter Three. Although our analysis is not causal, it highlights the extent to which postsecondary preparation can improve the employment prospects of graduates and, by extension, support employers' demands for workers with advanced skills and training in STEM areas.

Lastly, we explore the role that licenses and certifications play in supporting employment in STEM jobs (Objective 3). Though not new, licenses and certifications have been growing in popularity as an alternative to traditional postsecondary degrees for workers seeking jobs in certain fields. In response to this emerging trend, federal data collection agencies have developed new approaches for ensuring that national studies are consistently measuring the receipt of licenses and certifications. We draw on these new metrics to explore whether earning a license or certification conveys any added benefit in the STEM labor market beyond traditional associate's degrees and bachelor's degrees. We show the findings from this exploratory analysis in Chapter Four.

In each of our analytical chapters (Chapters Two through Four), we first present overall trends and relationships and then disaggregate these trends and relationships by gender and race/ethnicity. In this report, we use the race/ethnicity classifications used in the national data sources we analyzed for this effort. Specifically, we disaggregate by non-Hispanic white ("white"); non-Hispanic black ("black"); "Hispanic" (any race); "Asian," which includes Pacific

Islanders and Hawaiians; and American Indians. We do not report numbers or trends for the categories for other or multiple races/ethnicities, both because the counts are very low compared with the other groups (and thus less stable) and because they are poorly defined conglomerations of racial/ethnic groups.

In evaluating break-outs by gender and race/ethnicity, we highlight key demographic differences that shape the contours of the contemporary STEM school-to-work pipeline. We also evaluate trends for the ONG industry—a mainstay of the domestic STEM economy. The U.S. Department of Energy projects increased production, consumption, and prices of ONG for the coming decades (U.S. Energy Information Administration, 2017). Although retiring baby boomers pose challenges for employers across the economy, the situation is particularly salient in the ONG industry because there was a surge of hiring in the early 1970s and 1980s (Torpey, 2013). As these workers are now retiring, employers need to replace them. Coinciding with these retirements is the increasing levels of skill required to operate emerging forms of technologies that are characteristic of this sector. Such changes have created new challenges for the industry, along with new opportunities for postsecondary institutions. Our analysis is designed to inform employers, practitioners, educators, and policymakers grappling with how best to adapt to these changes.[2]

Data and Definitions

Data

To address our research objectives, we analyze data from three national data sources: the Integrated Postsecondary Education Data System (IPEDS), the American Community Survey (ACS), and the Current Population Survey (CPS). To address Objective 1, we use data from IPEDS, collected by the U.S. Department of Education's National Center for Education. IPEDS serves as an annual census of Title IV postsecondary institutions. Data from IPEDS include annual survey reports from every college, university, and technical and vocational institution that participates in the federal student financial aid program. In this annual survey, schools are asked to report the number of degrees they award, what kind, and to whom. Using IPEDS data from 2002–2003 through 2014–2015, we tabulate degree receipt totals to document time trends in the awarding of degrees directly related to STEM jobs.

To address Objective 2, we use data from the ACS. Conducted by the U.S. Census Bureau, the ACS is an annual cross-sectional survey of more than 2 million households. The ACS was designed and implemented so that up-to-date sociodemographic information is collected on the

[2] While we do not discuss these at length in the body of the report, we additionally report in Appendix D disaggregated trends by census region, ONG subindustries, and the intersection of race/ethnicity and gender (e.g., black men, black women, Hispanic men).

U.S. population in a timely, efficient manner every year and not just during the federally mandated decennial census. The ACS is well suited to address our second research objective because it contains information on postsecondary degree receipt, including field of study, as well as current employment information. Additionally, as the largest repeated survey of Americans, the size of the sample permits us to "drill down" and document employment outcomes for graduates in specific degree fields. We focus our analysis on those in the ACS who reported possession of a bachelor's degree. To discern whether holding a bachelor's degree in a STEM field is associated with favorable employment outcomes, we use data from the most recent year available, the 2015 ACS public-use microdata samples.

Lastly, to address Objective 3, we use data from the CPS. Conducted by the Census Bureau, the CPS is a nationally representative monthly survey of approximately 60,000 households across the United States that provides a wide range of information on population characteristics and the state of the U.S. labor force. The CPS is the data source used to calculate the nation's unemployment rate; as such, it is the gold standard for collecting data on employment outcomes. In 2015, the CPS was the first to collect items constructed by the Interagency Working Group on Expanded Measures of Enrollment and Attainment, a federally commissioned group tasked with developing and validating measures of the participation in and credentialing of education and training for work, including metrics that measure the attainment of nondegree credentials, such as industry-recognized certifications and occupational licenses. We use data from the 2015 CPS to explore whether these licenses and certifications improve employment outcomes beyond traditional postsecondary degrees. Unlike the ACS, the CPS does not collect information on field of study. Thus, we are not able to disaggregate STEM-focused licenses and certifications from non-STEM ones.

Measuring Degree Attainment

Across our analyses, we focus on four types of degrees or credentials: associate's degrees, bachelor's degrees, licenses, and certifications. *Bachelor's degrees* (baccalaureate or equivalent degree, as determined by the U.S. Department of Education) normally require at least four but not more than five years of full-time equivalent college-level work. *Associate's degrees* normally require at least two but less than four years of full-time-equivalent college work. *Licenses* are awarded by a governmental licensing agency based on predetermined criteria that may include some combination of degree attainment, certifications, educational certifications, assessments (including state-administered exams), apprenticeship programs, or work experience. *Certifications* are awarded by a nongovernmental certification body to individuals who demonstrate that they have acquired the designated knowledge, skills, and abilities to perform a specific job. One of the key differences between a certification and a license is that a license conveys a legal authority to work in an occupation whereas a certification does not.

Among bachelor's degree holders and associate's degree holders, we are able to identify their field of study or major using pre-assigned codes—the Classification of Instructional Programs

(CIP) for the IPEDS and the Census Bureau's classification for the ACS. Developed by the U.S. Department of Education, the CIP taxonomy provides a systematic framework for organizing and categorizing degrees across institutions. We use the Census Bureau's definition of STEM majors and crosswalk these onto the CIP codes that IPEDS used. Appendix A lists the academic majors classified as STEM. API, the sponsor of this research, also decided on college major groupings of interest used throughout this report. We look at the following seven groups of academic majors:

- ONG
- ONG-related
- other STEM
- business, communications, and public policy
- professional
- social science
- other.

The first group, *ONG*, contains the majors geological and geophysical engineering, petroleum engineering, geology and earth science, and geosciences. *ONG-related* majors include such majors as computer science, chemical and mechanical engineering, and geology. Examples of *other STEM* majors are soil science, biological engineering, applied mathematics, and materials science. *Business, communications, and public policy* includes, for example, journalism, accounting, and public administration. *Professional* majors include education, library science, and nursing, among others. *Social science* includes such majors as sociology, economics, humanities, and history. *Other* contains all remaining majors, such as criminal justice, culinary arts, and court reporting. Appendix A lists the majors and their associated codes for each of the seven groups, as defined by the Census Bureau.

Measuring Employment

In our analyses that link degree completion with employment and wages, we look at three employment outcomes: employment in any occupation, employment in a STEM occupation, and employment in the ONG industry. For wages, we look at the premium (or penalty) for the following groups: those with STEM bachelor's degrees, those possessing licenses or certifications, those working in the ONG industry, and those working in a STEM occupation.

Overall employment is based on an individual's employment status in the week prior to the administration of the survey. Individuals who report being employed in the survey are assigned an occupation and industry code via taxonomies maintained by the Census Bureau. With these taxonomies, we are able to identify STEM occupations and jobs in the ONG industry.

We classify jobs as STEM or non-STEM using a classification scheme created by the Brookings Institution with the support of the U.S. Department of Labor's Employment and Training Administration using Occupational Information Network (O*NET) codes assigned to sample members' current jobs. The Brookings Institution classification scheme is based on

O*NET codes for 736 occupations for which the degree of knowledge in STEM was qualitatively assessed by workers in those occupations. Each occupation is given a knowledge score ranging from 1 (low) to 7 (high) that separately indicates the knowledge required in each of the four STEM fields (science, technology, engineering, and mathematics) to perform the job. Occupations with a knowledge score of at least 1.5 standard deviations above the mean in at least one STEM field were classified as STEM jobs. More-detailed information on the methodology used to classify occupations is available in the Brookings report (Rothwell, 2013).[3] Brookings used Standard Occupational Classification (SOC) codes to classify occupations, whereas the CPS and ACS use Census Bureau classifications. We crosswalk these SOC codes to the Census Bureau codes. Appendix B lists the Census Bureau occupation codes that are thus classified as high-scoring STEM occupations.

To identify jobs in the ONG industry, API provided a list of industries (given the Census Bureau codification of industries) that would be included. Note that, in our analyses, we exclude service station employees and construction workers, which are sometimes included in the definition of the ONG industry.[4] Industries in the group are listed in Appendix B.

Roadmap for the Report

We begin our analysis in Chapter Two with our tabulations of degree totals using IPEDS to address Objective 1. Next, in Chapter Three, we analyze the ACS to address Objective 2, and in Chapter Four, we analyze the CPS to address Objective 3. The report concludes with a short summary of the findings in Chapter Five, followed by appendixes that include a list of STEM majors used in our analyses (Appendix A), a list of STEM jobs used in our analyses (Appendix B), and an overview of our statistical approach (Appendix C). Appendix D lists additional tables that are relevant but discussed to a lesser extent in this report.

[3] The Brookings Institution classified jobs two ways: jobs that require knowledge in a *single* STEM field and jobs that require knowledge across *multiple* STEM fields. We use the former classification for our analysis because it allows us to include a greater number of occupations held by those without bachelor's degrees.

[4] To be consistent with other API employment reports, we omit service station employees. Additionally, we omit the construction industry even though it is considered an investment industry in the broader ONG-related field. We do so because there are so many construction workers relative to other ONG industry workers (about two-thirds of all ONG workers when included) that their inclusion could potentially lead to this report's results being driven by construction workers and not overall by more-core ONG occupations that directly require STEM knowledge and skills. In addition, we are unable to separate construction workers whose work contributes to the oil and gas industry and all other construction workers; the latter group is likely far greater than the former group. Furthermore, the overall construction industry is much larger than all other oil and gas subindustries.

Chapter Two

Trends in STEM Postsecondary Degree Attainment

In this chapter, we document trends in STEM postsecondary degree attainment over the past decade. As noted, to accomplish this, we analyze data from the IPEDS. Using data from 2002–2003 through 2014–2015, we tally the total number of postsecondary degrees awarded for STEM and non-STEM fields of study.[5] We then make key comparisons by gender and by race/ethnicity. Our analysis includes only schools in the United States; Puerto Rico and other U.S. jurisdictions are excluded.[6]

Note that, when we tabulate the total number of degrees, those with double majors are counted only once. However, double majors are counted separately when disaggregating by STEM classification. For example, a student graduating with a bachelor's degree with a double major in biology and English would count as having earned only a single bachelor's degree when tabulating total degrees. However, he or she would appear twice when disaggregating total degrees by STEM classification: once as a STEM bachelor's degree (for the biology degree) and once as a non-STEM bachelor's degree (for the English degree). For interpretative purposes, we present our findings in figures in the main report, but we provide tables with the full numbers in Appendix D.

Overall Trends

First, we look at the total number of postsecondary degrees awarded in the United States, both overall and then separately by bachelor's degrees and associate's degrees. Time trends for these totals are shown in Figure 2.1.

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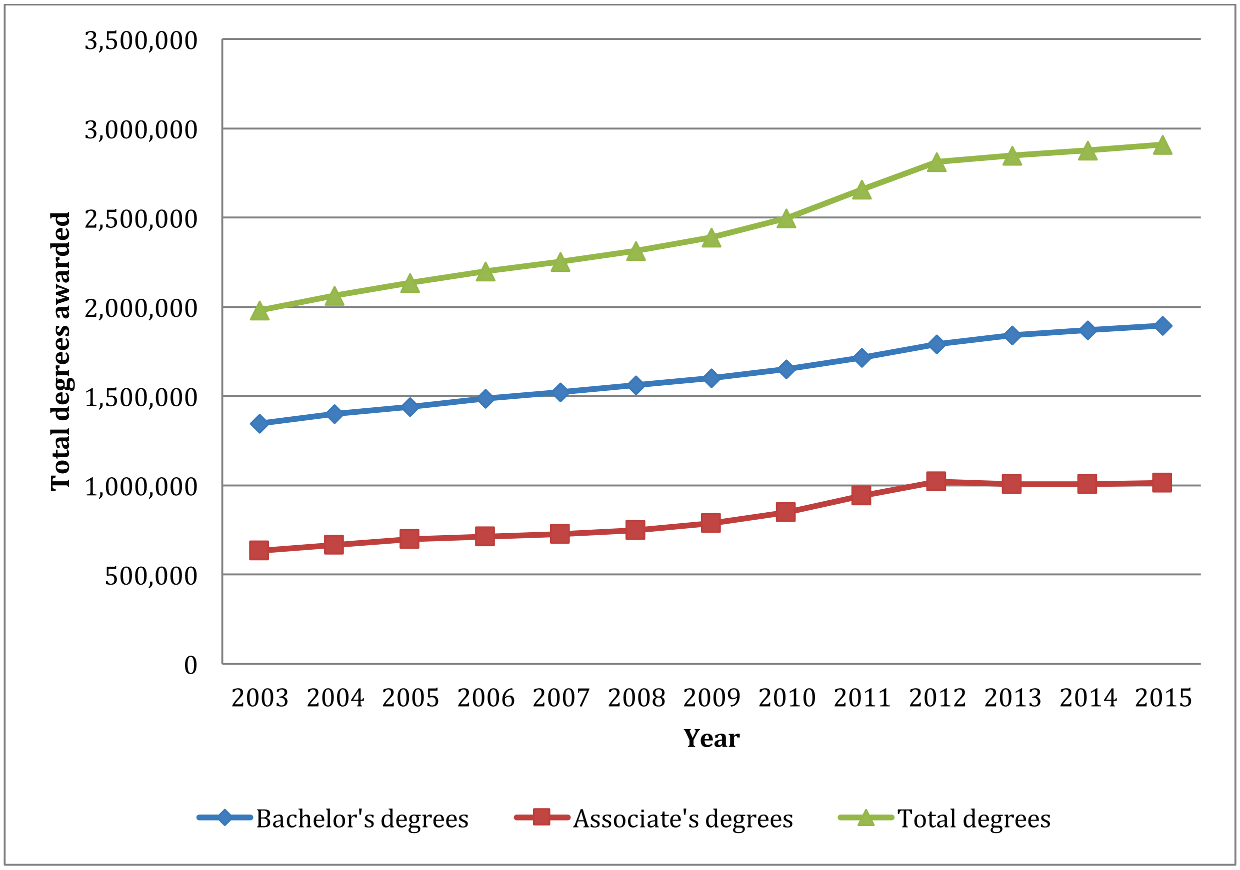
[5] We begin our time series in 2002–2003 because it provides a reasonable period to observe changes in degree attainment and because it allows for comparisons with estimates from previous API reports that also use 2002–2003 to anchor time trends.

[6] A large number of engineers graduate from schools in Puerto Rico and migrate to the U.S. mainland for employment. Though, comparatively, this represents a smaller proportion of all Hispanic STEM workers, their exclusion from our analysis may slightly understate the supply of Hispanic STEM graduates who are available for employment in the United States.

Figure 2.1: Total Number of Postsecondary Degrees Awarded, 2003–2015

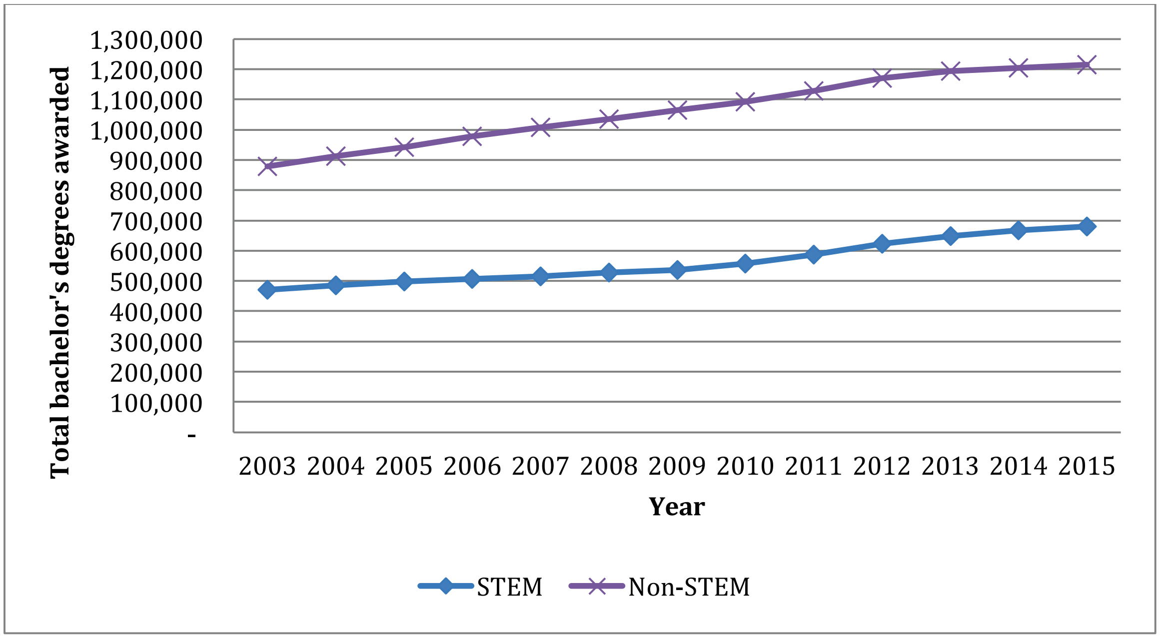


SOURCE: Authors' analysis of IPEDS data.

Across the 12 years, there was a 47-percent increase in the total number of bachelor's degrees awarded, from 1.3 million in 2003 to 1.9 million in 2015. Although there was an increase in both types of degrees awarded, the growth was somewhat more pronounced among bachelor's degrees (which increased by 60 percent) than among associate's degrees (which increased by 40 percent). Bachelor's degrees were at their highest levels in this observed time series in 2015, while associate's degrees peaked in 2012 and have been stable since then. During that school year, approximately 1.9 million bachelor's degrees were awarded and 1 million associate's degrees were awarded.

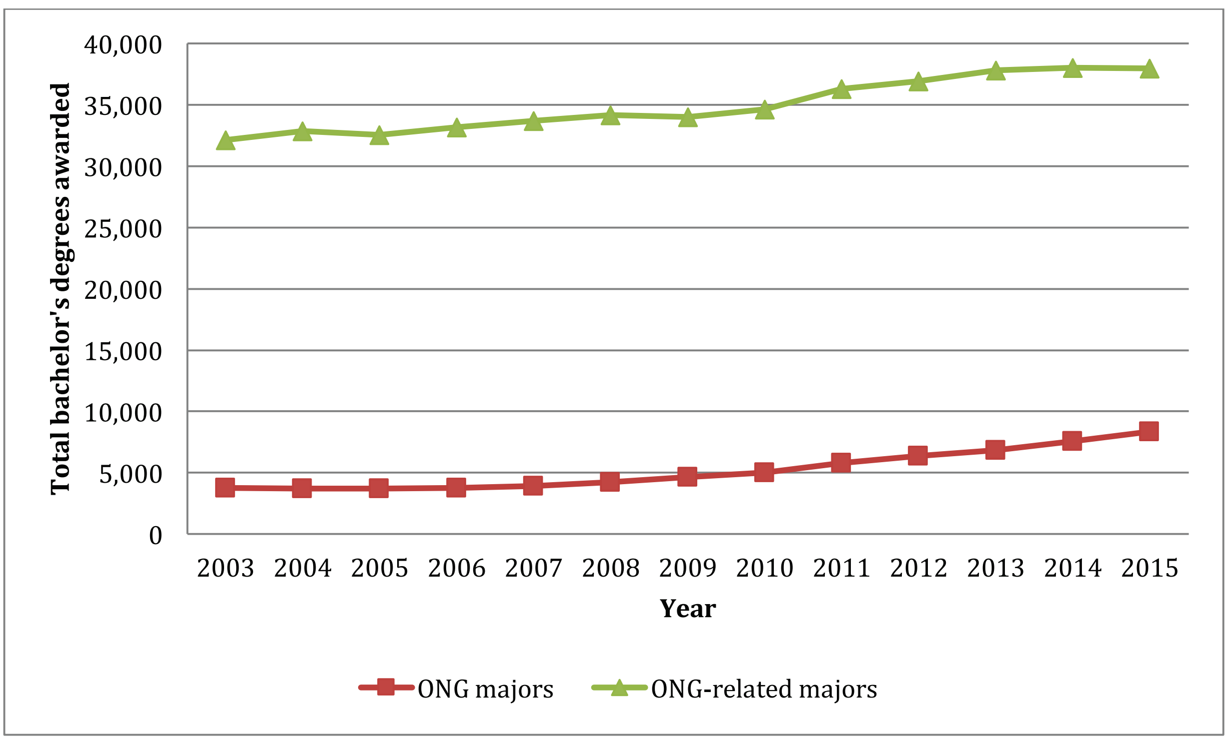
In Figure 2.2, we focus on bachelor's degrees, showing total awards separately by degrees in STEM majors (blue line) and degrees in non-STEM majors (purple line). Recall that, for our analysis, we use the Census Bureau's definition of STEM majors, which includes a broad array, such as computer science, life sciences, earth sciences, social science, and engineering. (See Appendix A for the majors classified as STEM.) Additionally, we plot trend lines for two key subsets of STEM degrees in Figure 2.3: ONG-specific degrees (red line) and ONG-related degrees (green line).

Figure 2.2: Total Number of Bachelor's Degrees Awarded in STEM and Non-STEM Majors, 2003–2015



SOURCE: Authors' analysis of IPEDS data.

Figure 2.3: Total Number of Bachelor's Degrees Awarded in Oil and Natural Gas Majors, 2003–2015



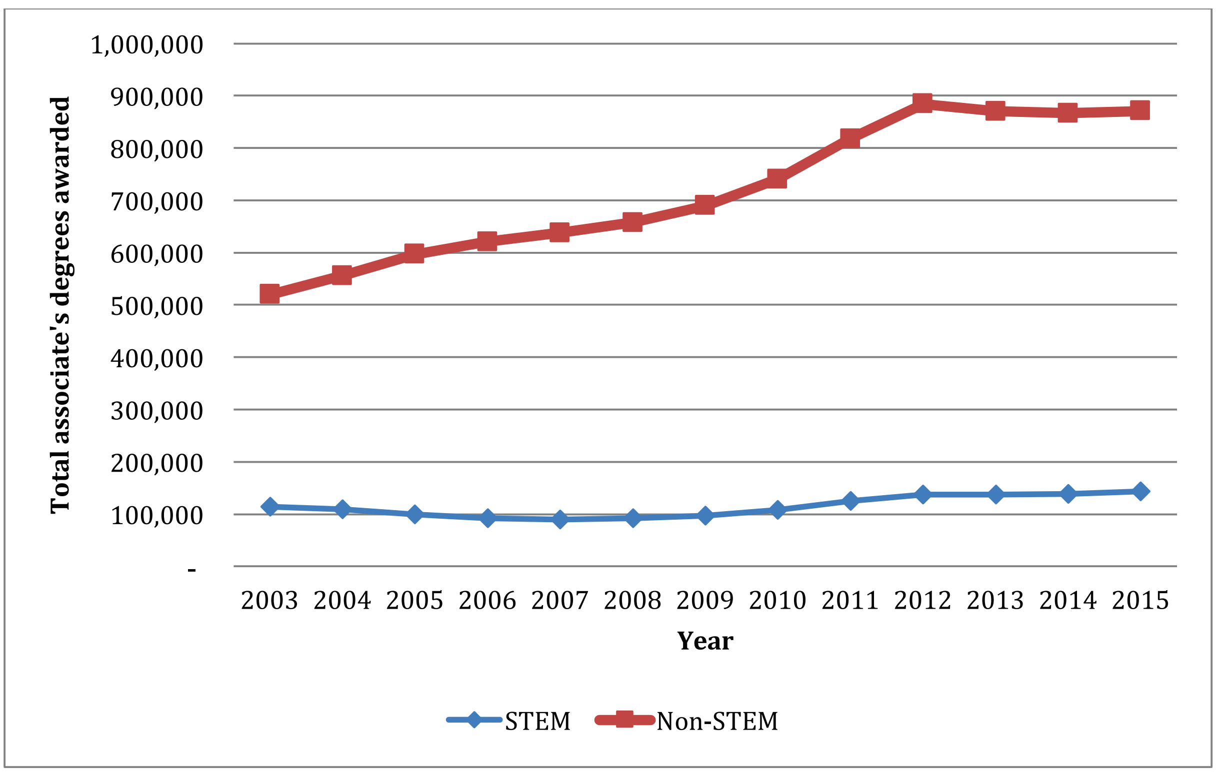
SOURCE: Authors' analysis of IPEDS data.

There was substantial growth across the decade in overall bachelor's degrees awarded, for both STEM and non-STEM degrees. The proportion of bachelor's degrees that are in STEM majors has increased slightly, from around 34.8 percent in 2003 to 35.9 percent in 2015. In 2015, 680,890 STEM bachelor's degrees were awarded.

Across the time series, totals for ONG degrees remained relatively low but also increased. There was growth in the number of degrees awarded in ONG majors: ONG-specific degrees rose by 122 percent (from 3,754 degrees awarded in 2003 to 8,341 degrees awarded in 2015), while ONG-related degrees rose by 18 percent (from 32,129 degrees awarded in 2003 to 37,964 degrees awarded in 2015).

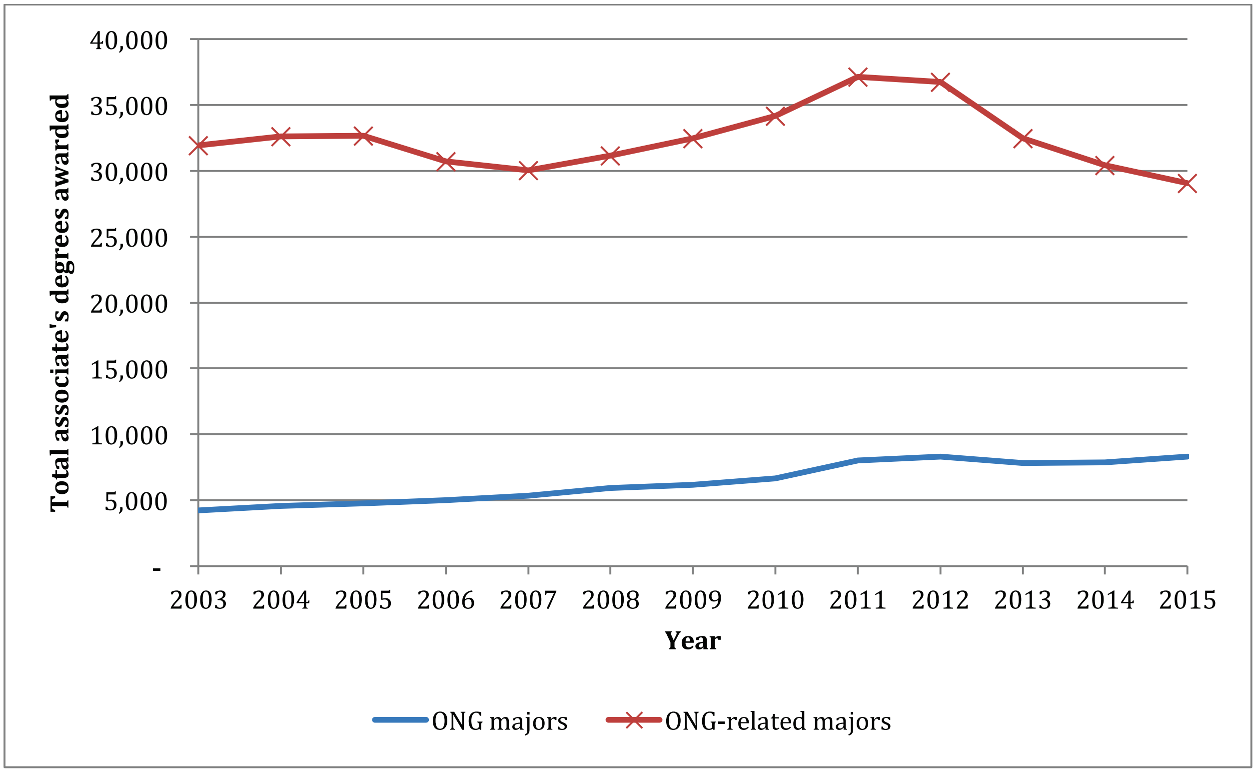
To document parallel trends in the production of associate's degrees, we first look at STEM versus non-STEM degrees in Figure 2.4. We find that non-STEM associate's degrees are attained in much higher levels than STEM associate's degrees, and the overall growth observed in associate degree attainment is being driven by non-STEM associate's degrees. There was a modest, but noticeable, increase in the number of STEM associate's degrees awarded between the first and last year of the time series, with 114,436 graduates in 2003 and 142,929 in 2015. In Figure 2.5, we look at ONG (blue) and ONG-related (red) degrees.

Figure 2.4: Total Number of Associate's Degrees Awarded in STEM and Non-STEM Majors, 2003–2015



SOURCE: Authors' analysis of IPEDS data.

Figure 2.5: Total Number of Associate's Degrees Awarded in Oil and Natural Gas Majors, 2003–2015



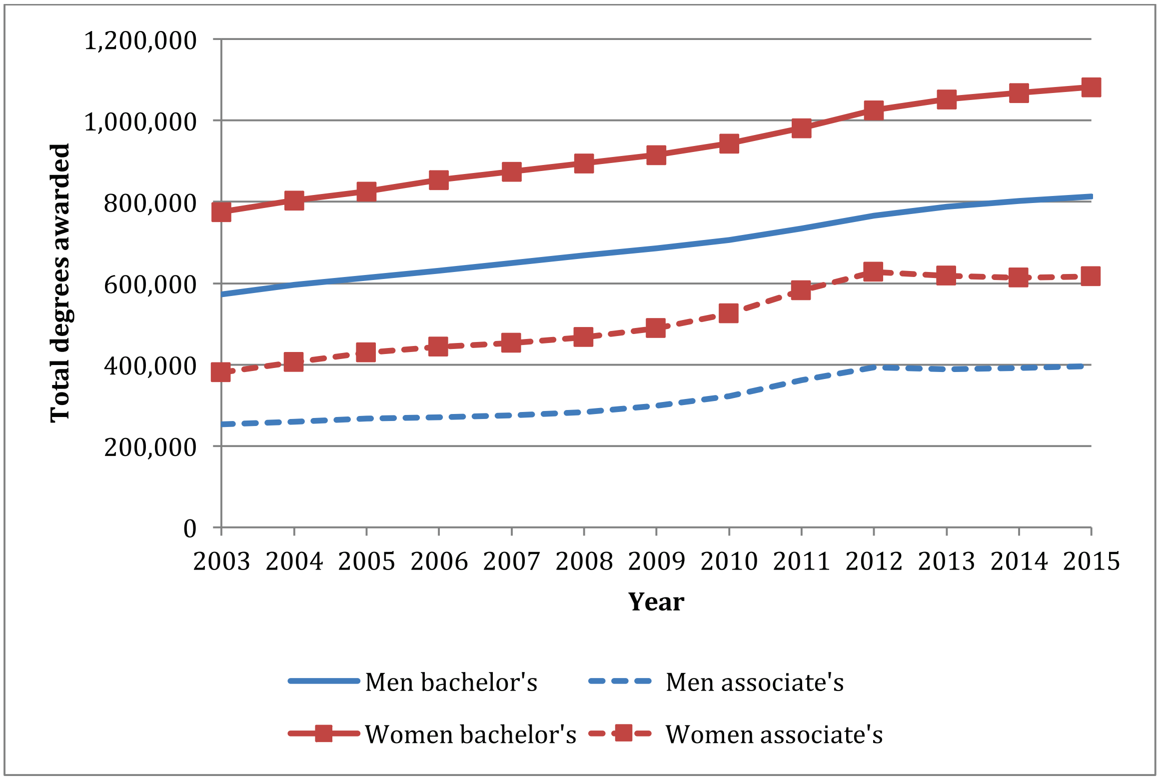
SOURCE: Authors' analysis of IPEDS data.

Associate's degrees related to the ONG industry have shown somewhat cyclical behavior over the time span, while the ONG-specific majors have shown a more steady increase, albeit from a smaller starting point. Across the time series, an average of 6,380 ONG-specific degrees were awarded annually, and 32,430 ONG-related degrees were awarded annually.

Trends by Gender

To understand potential differences in the supply of workers with degrees that position them for STEM jobs, we first disaggregate by gender. In Figure 2.6, we show trends in the total number of degrees awarded. This figure is akin to Figure 2.1 but with separate trend lines for women and for men.

Figure 2.6: Total Number of Postsecondary Degrees Awarded, by Gender, 2003–2015

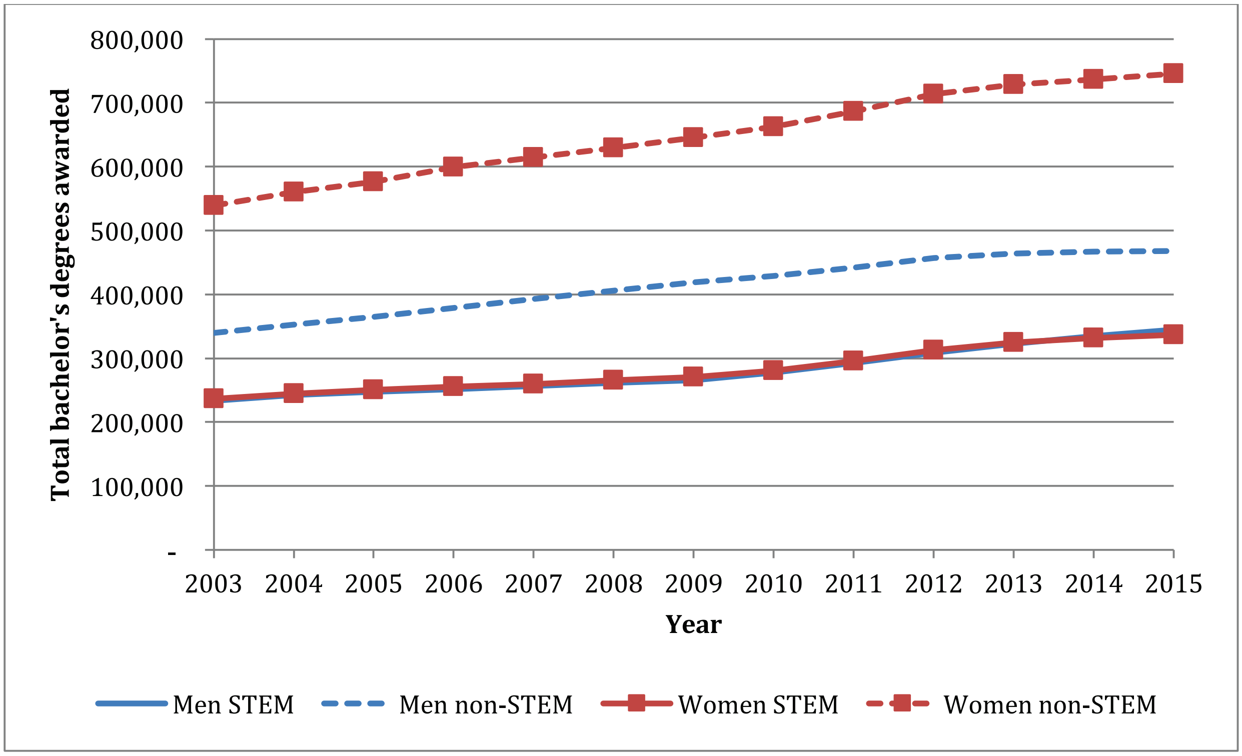


SOURCE: Authors' analysis of IPEDS data.

Women hold an advantage over men in terms of overall degrees awarded in both degree types (bachelor's and associate's). In fact, in the first six years of the time series, women earned almost as many bachelor's degrees as men earned *total* degrees. The female advantage in degree attainment has expanded over time. In 2003, women earned about 330,000 more postsecondary degrees than men (775,553 bachelor's and 380,565 associate's degrees for women versus 573,258 bachelor's and 253,451 associate's degrees for men). In 2015, this annual difference grew to about 490,000 (1,082,265 bachelor's and 617,358 associate's degrees for women versus 812,669 bachelor's and 396,613 associate's degrees for men).

We next focus on differences in STEM degree attainment by gender. In Figure 2.7, we show time trends in the total number of bachelor's degrees awarded in STEM fields. Note that the trend lines for STEM degrees among men and non-STEM degrees among women are nearly identical.

Figure 2.7: Total Number of Bachelor's Degrees Awarded in STEM and Non-STEM Majors, by Gender, 2003–2015

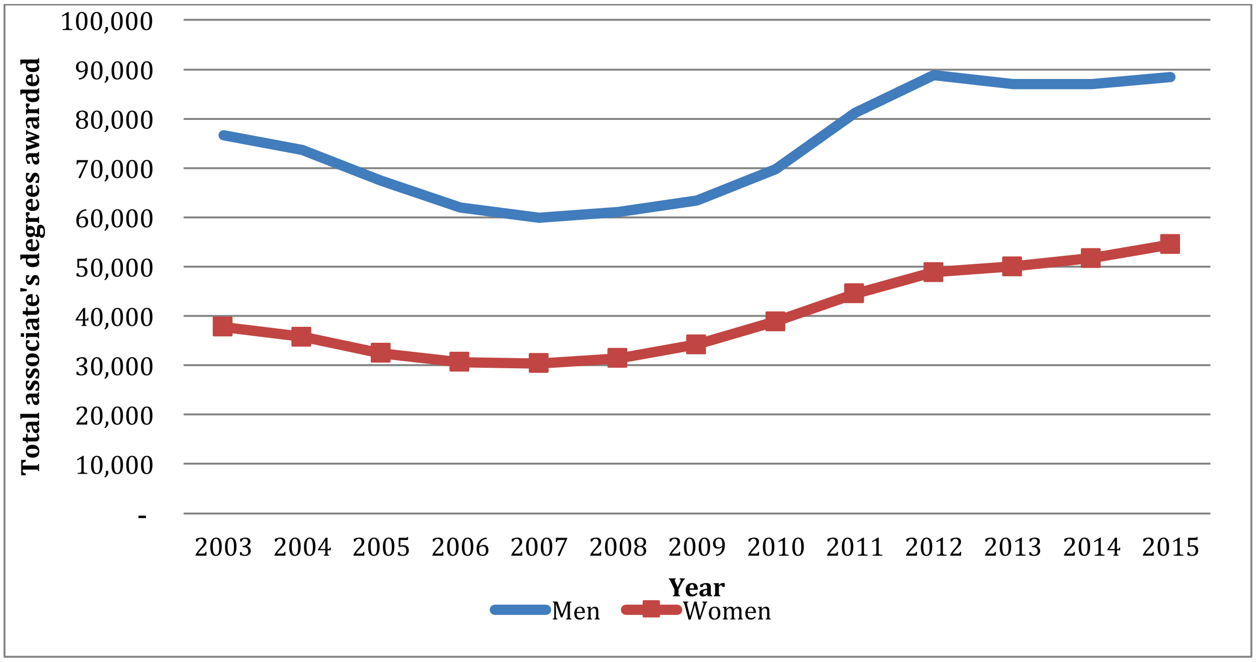


SOURCE: Authors' analysis of IPEDS data.

Although women hold an advantage in total number of bachelor's degrees awarded, men and women attain almost exactly the same number of STEM bachelor's degrees annually, which means that, of all bachelor's degrees that are STEM, men are attaining a higher proportion (42.4 percent for men, 31.1 percent for women). This advantage in favor of men has grown slightly over time. In 2003, women earned 236,611, or 30.5 percent, of their bachelor's degrees in STEM fields; men earned 233,312, or 40.7 percent, of their bachelor's degrees in STEM fields. In 2015, women earned 336,541 STEM bachelor's degrees (31.1 percent), and men earned 344,349 STEM bachelor's degrees (42.4 percent). Thus, although women are earning more STEM degrees in recent years, they earned a smaller percentage, and the growth has been smaller over these years than for men.

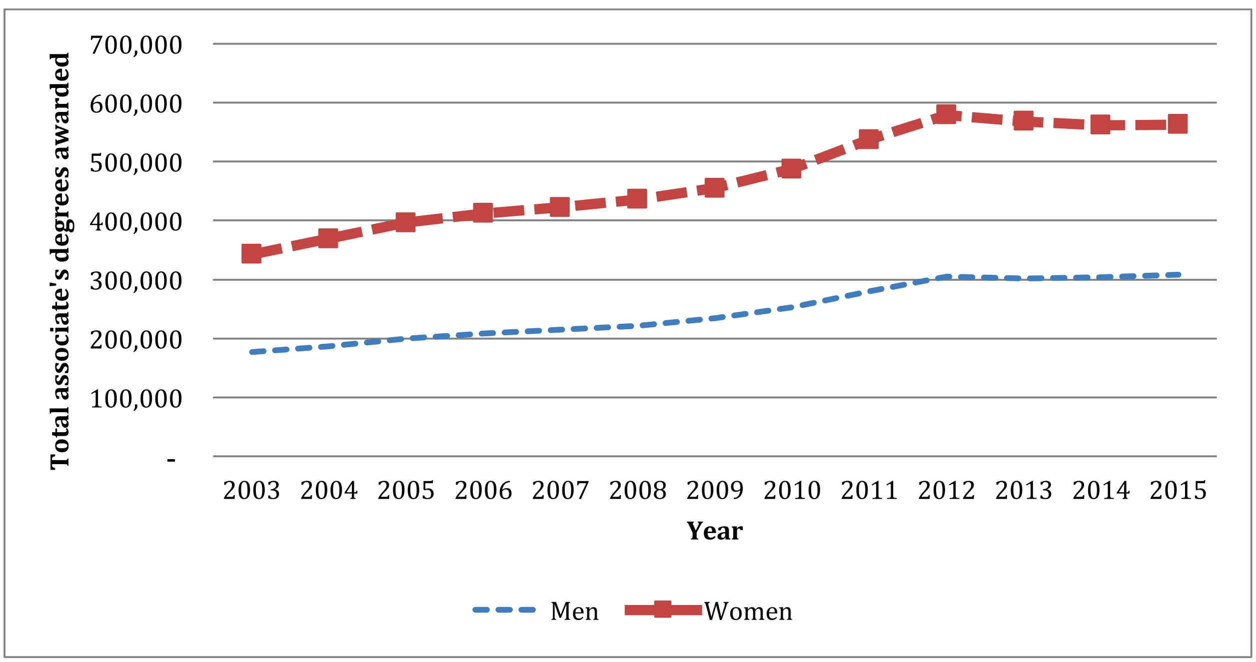
Figures 2.8 and 2.9 show the trends for associate's degrees. Although women and men earned about the same number of STEM bachelor's degrees, men earned substantially more STEM associate's degrees than women. Moreover, the number of degrees has increased over time for both: The number of STEM associate's degrees awarded has increased from 76,677 in 2003 to 88,422 in 2015 among men and from 37,759 in 2003 to 54,507 among women.

Figure 2.8: Total Number of Associate's Degrees Awarded in STEM Majors, by Gender, 2003–2015



SOURCE: Authors' analysis of IPEDS data.

Figure 2.9: Total Number of Associate's Degrees Awarded in Non-STEM Majors, by Gender, 2003–2015

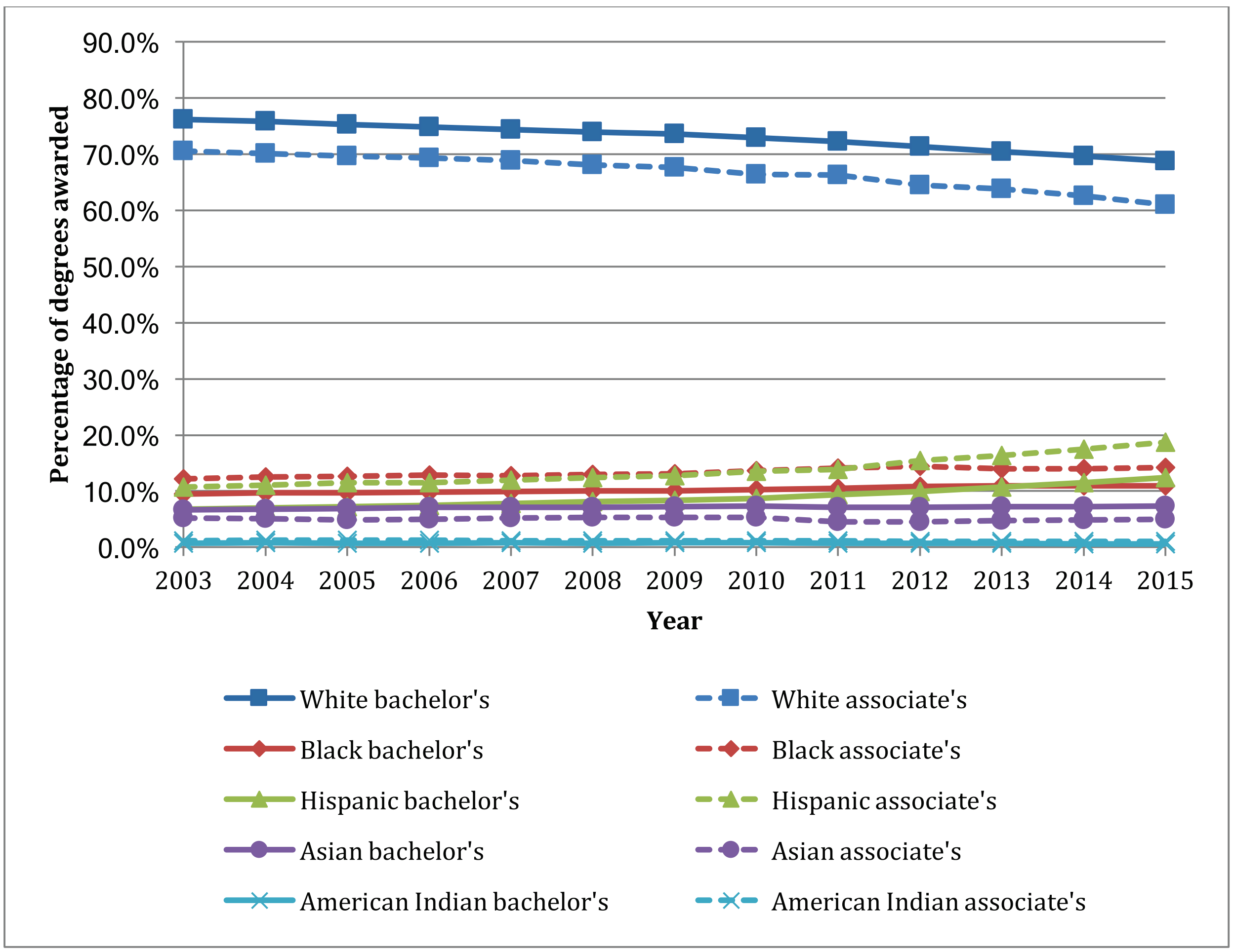


SOURCE: Authors' analysis of IPEDS data.

Trends by Race/Ethnicity

Next, we look at degree attainment by race/ethnicity. We use the five major race/ethnicity groups provided by the U.S. Census Bureau: white, black, Hispanic, Asian, and American Indian. Following the same approach used to disaggregate trends by gender, we first show overall degrees awarded, overall bachelor's degrees awarded, and overall associate's degrees awarded for each race/ethnicity group. To discern differences in racial/ethnic composition apart from the absolute size of the different groups, we show the percentage of degrees awarded to each group. We first show overall time trends for bachelor's degrees and associate's degrees in Figure 2.10. (Total degree numbers are reported in Tables D.10 and D.11 in Appendix D.)

Figure 2.10: Percentage of Postsecondary Degrees Awarded, by Race/Ethnicity, 2003–2015

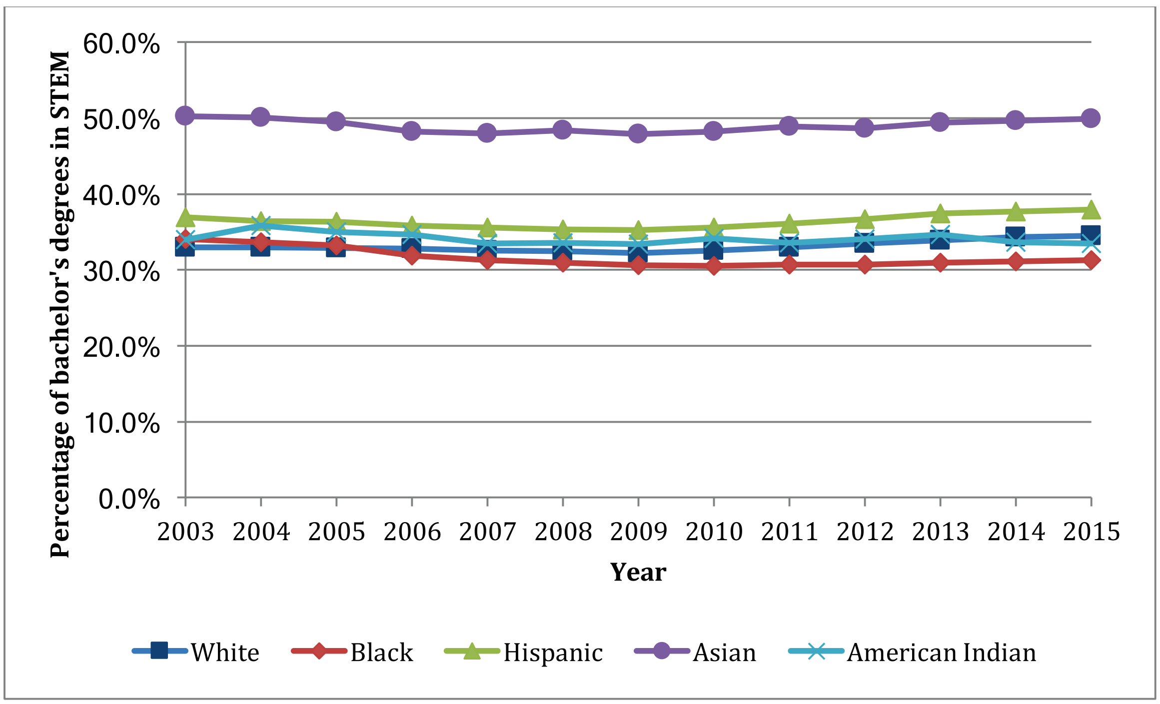


SOURCE: Authors' analysis of IPEDS data.

In 2015, most postsecondary degrees (both bachelor's and associate's degrees) were awarded to whites, followed by Hispanics, blacks, Asians, and American Indians. Among minority groups, the largest increase in degree attainment is observed for Hispanics: In 2003, Hispanics constituted 6.3 percent of all bachelor's degree recipients, and in 2015, Hispanics accounted for 10.9 percent of all bachelor's degree recipients.

Figure 2.11 shows the percentage of all bachelor's degrees awarded in STEM majors, by race/ethnicity. The counts are presented in Table D.12. The ratios of degrees that are STEM are relatively stable over time but differ in levels. Although Asians earn the fewest number of bachelor's degrees, they have the highest percentage of bachelor's degree holders that graduate in a STEM major. Hispanics have the next-highest rate of STEM bachelor's degree recipients out of all bachelor's graduates; blacks have the lowest rates, at around 30 percent.

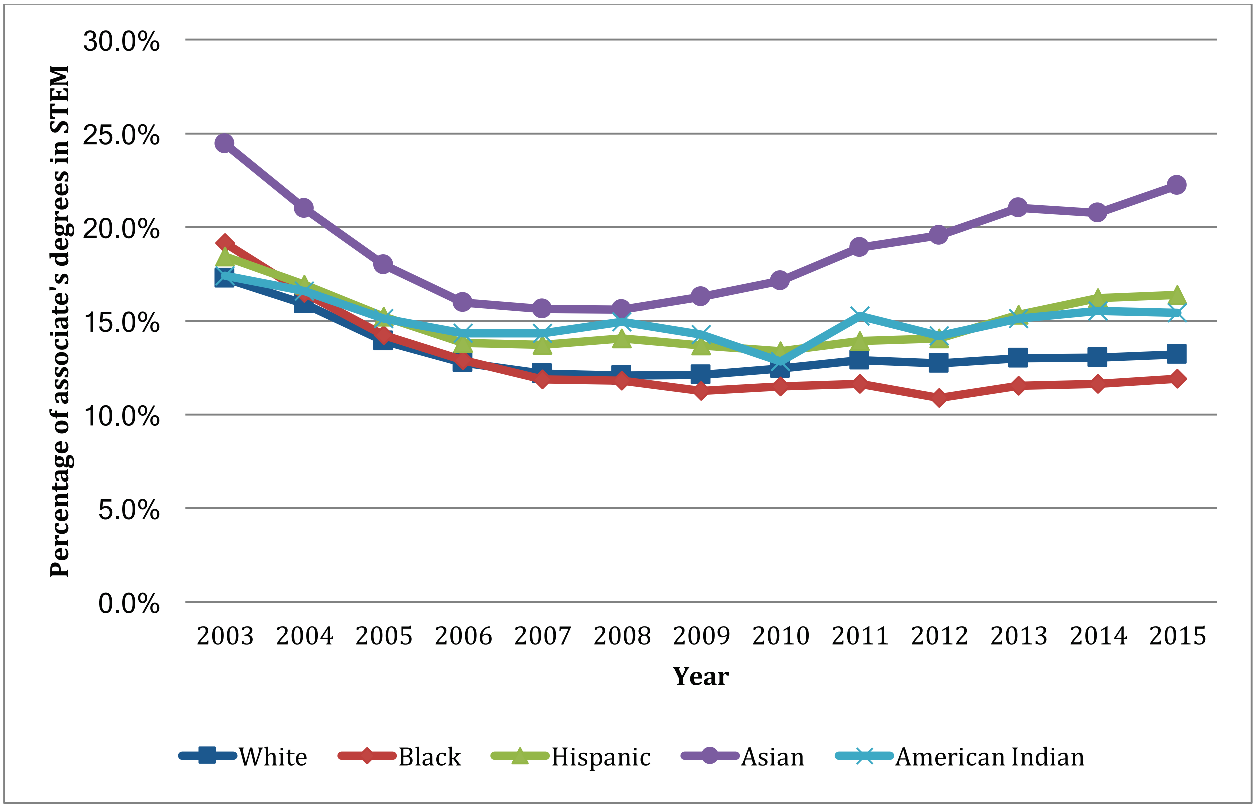
Figure 2.11: Percentage of Bachelor's Degrees Awarded in STEM Majors, by Race/Ethnicity, 2003–2015



SOURCE: Authors' analysis of IPEDS data.

Figure 2.12 shows the percentage of associate's degrees awarded that are in STEM majors, by race/ethnicity. Asians yield the highest rate of associate's degrees in STEM, while blacks yield the lowest rate. There was a decline for all groups between 2003 and 2008. Following that period, rates for Asians, Hispanics, and American Indians rebounded somewhat, while rates for blacks and whites largely held steady.

Figure 2.12: Percentage of Associate's Degrees Awarded in STEM Majors, by Race/Ethnicity, 2003–2015



SOURCE: Authors' analysis of IPEDS data.

Summary

In this chapter, we examined trends in postsecondary degree attainment between the 2002–2003 school year and the 2014–2015 school year. Notable trends include the following.

The number of overall bachelor's degrees and the number of bachelor's degrees in STEM fields increased substantially over the past decade. Between 2003 and 2015, the number of bachelor's degrees awarded in STEM increased from 469,923 degrees to 680,890 degrees. With their increasing prevalence, STEM bachelor's degrees account for about 36 percent of all bachelor's degrees awarded annually.

While the number of associate's degrees also increased over the past decade, the growth in the number of associate's degrees awarded in non-STEM fields was more pronounced than the growth in the number of associate's degrees awarded in STEM fields. Between 2003 and 2015, the number of associate's degrees awarded in any field increased from 634,016 to 1,013,971. The number of STEM associate's degrees awarded increased from 114,436 in 2003 to 142,929 in 2015.

Women earn more bachelor's degrees overall but earn fewer STEM bachelor's degrees than men, resulting in a large gender gap in the proportion of bachelor's degrees that are STEM. In 2015, 31.1 percent of all bachelor's degrees awarded to women were in STEM fields compared with 42.4 percent for men—a difference of 11.3 percentage points.

The share of bachelor's degrees that are in STEM fields varies considerably by race/ethnicity. In 2015, Asians had the highest rate (50 percent of all bachelor's degrees awarded to Asians were in STEM), while blacks had the lowest (30 percent of all bachelor's degrees awarded to blacks were in STEM).

Chapter Three

Relationship Among STEM Bachelor's Degree Attainment, STEM Employment, and Employment Outcomes

In this chapter, we look at employment outcomes—current employment status and wages—and their relationship to STEM bachelor's degrees and STEM jobs. To do so, we use the 2015 ACS, which is a large, nationally representative survey of the U.S. population. We use a regression-adjusted approach that controls for demographic and other variables, thus allowing us to interpret differences as if holding all else equal. It is important to control for these factors so that differences in outcomes among groups are not due to compositional differences in the groups, such as the age or education level, because these are well-documented predictors of labor market outcomes. Appendix C describes the methodology and the control variables used in more detail.

Relationship Between STEM Degree Attainment and Employment Status

We first look at the overall trends for all U.S. adults holding bachelor's degrees, presented in Table 3.1. The first row examines current employment status in any occupation. An individual can be labeled as not employed because he or she is either unemployed or out of the labor force (e.g., not employed and not looking for work, on maternity leave, has a disability that prevents employment). Of those aged 18–65 in the United States, 72.2 percent were employed in 2015, after controlling for demographic and other characteristics (as shown in the first column). The next columns look at the subsample of bachelor's degree graduates and compare STEM and non-STEM graduates. The employment rate for either group is substantially higher than the overall employment rate. The employment ratio is slightly higher for STEM graduates; while the difference is statistically different, it is small in magnitude at 0.3 percentage points. Note that because of rounding at higher levels of precision, the presented columns may not be exactly equal to the presented difference, which is true of all tables in this report.

Table 3.1: Employment Status, Overall

Outcome	Overall	Bachelor's Graduates	Type of Bachelor's Degree: STEM	Type of Bachelor's Degree: Non-STEM	Difference	Sample Size
Employed in any occupation	72.2%	83.0%	83.2%	83.0%	0.3**	1,709,004
Employed in a STEM occupation	21.6%	29.4%	40.5%	27.9%	12.6***	1,709,004
Employed in the ONG industry	3.2%	2.9%	5.0%	2.7%	2.3***	1,709,004

SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

We next look at the outcome of working in a STEM occupation. We find that, overall, 21.6 percent of the working-age population works in a STEM occupation. That rate increases for bachelor's graduates, and the likelihood of STEM bachelor's degree holders to work in STEM is much higher than non-STEM bachelor's holders or non-bachelor's graduates, as we would expect. Despite the much higher likelihood, we find that only 40.5 percent of all STEM bachelor's graduates end up working in a STEM occupation. This is not necessarily a sign of inefficiency in the labor market—given variation in wages and non-wage benefits, for many STEM graduates, a non-STEM job may be the best fit (see Carnevale et al., 2013)—but points to a substantial source of STEM human capital that is not currently being engaged in STEM jobs.

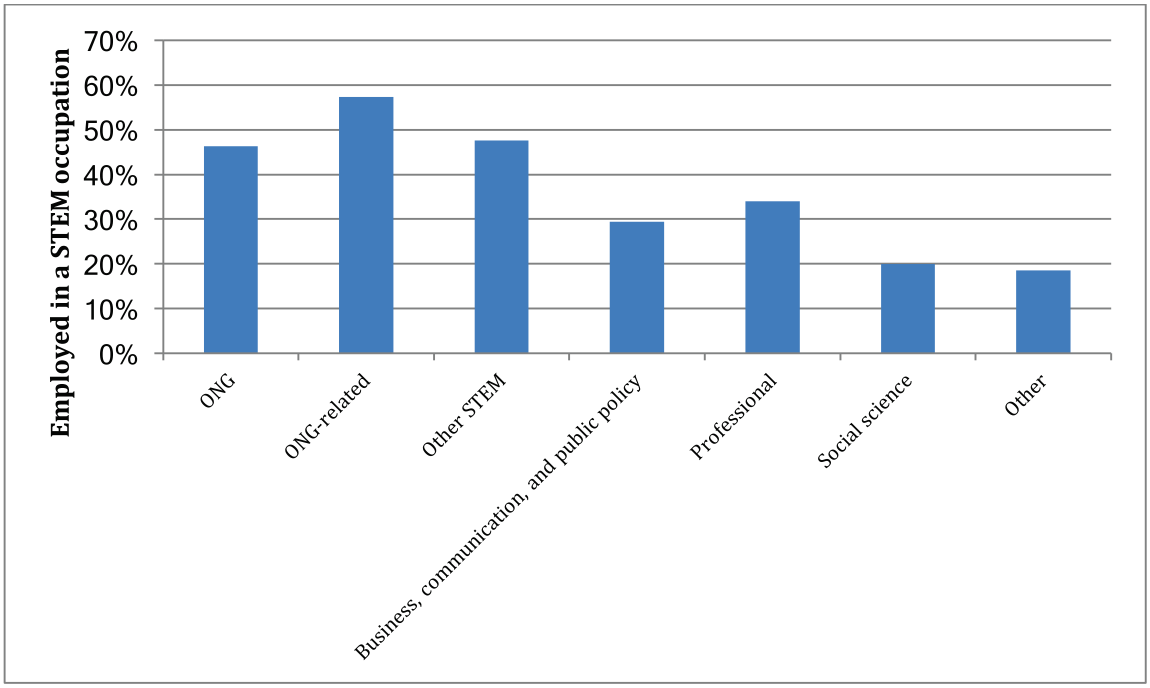
We also find that 3.2 percent of the working-age population is employed in the ONG industry. The ratio is considerably higher among STEM bachelor's holders, at 5.0 percent, almost double the rate as non-STEM bachelor's holders.

Employment Outcomes by Bachelor's Major Group

We next turn our attention to employment status by major, the classifications of which are discussed in Chapter One and detailed in Appendix A. The full results are in Table 3.4 later in this chapter.

Figure 3.1 shows that graduates in ONG-related, other STEM, and ONG majors are much more likely to work in STEM occupations than graduates in all other majors; of course, this is to be expected. Meanwhile, those in the social science and other categories are the least likely to be employed in a STEM occupation. Graduates in ONG-related majors and other STEM majors have the highest premium for working in a STEM occupation when compared with graduates in all other majors.

Figure 3.1: Employment in a STEM Occupation, by Bachelor's Major Group

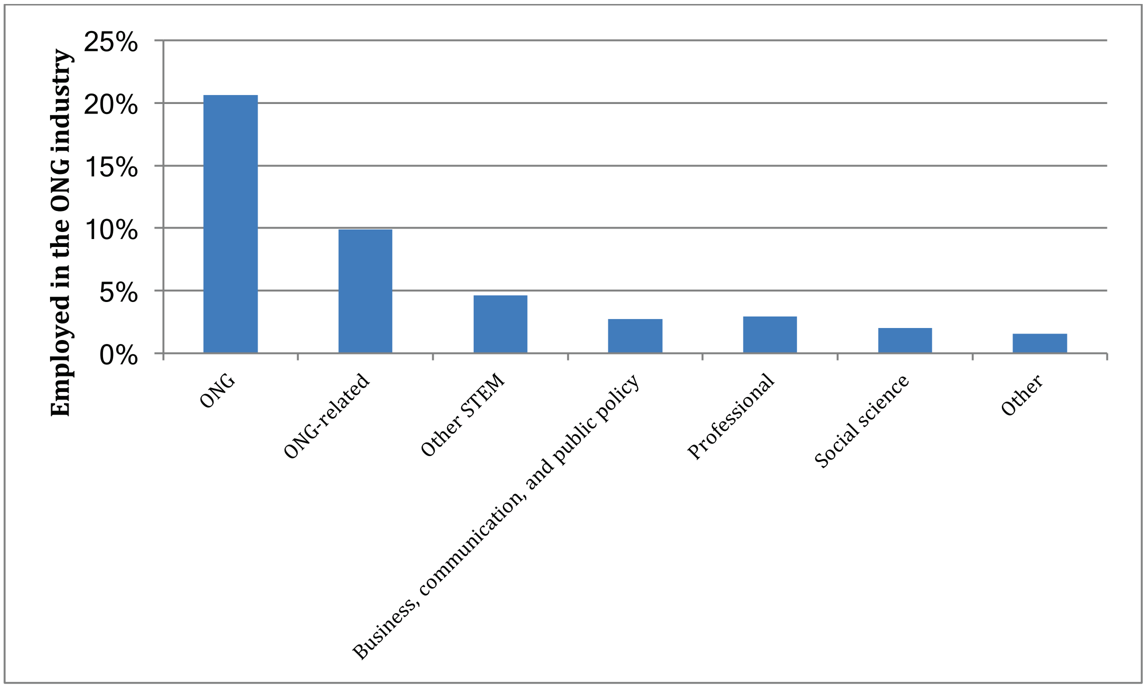


SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

There are also substantial differences in the likelihood of entering into the ONG industry depending on major. Figure 3.2 shows this graphically. As expected, those in ONG majors are much more likely to work in the ONG industry: 20.6 percent of graduates in ONG majors work in that industry, compared with 3.4 percent of all other bachelor's degree holders, making those with ONG majors almost seven times as likely to work in that field (see Table 3.4 later in this chapter). Graduates in the other STEM category have almost a 5-percent likelihood of going into the ONG industry, compared with 3.2 percent of bachelor's degree holders overall; this provides evidence of the ONG industry's need for STEM workers, because STEM bachelor's graduates are more likely to work in ONG than non-STEM graduates.

Figure 3.2: Employment in the Oil and Natural Gas Industry, by Bachelor's Major Group



SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

Employment Outcomes by Gender

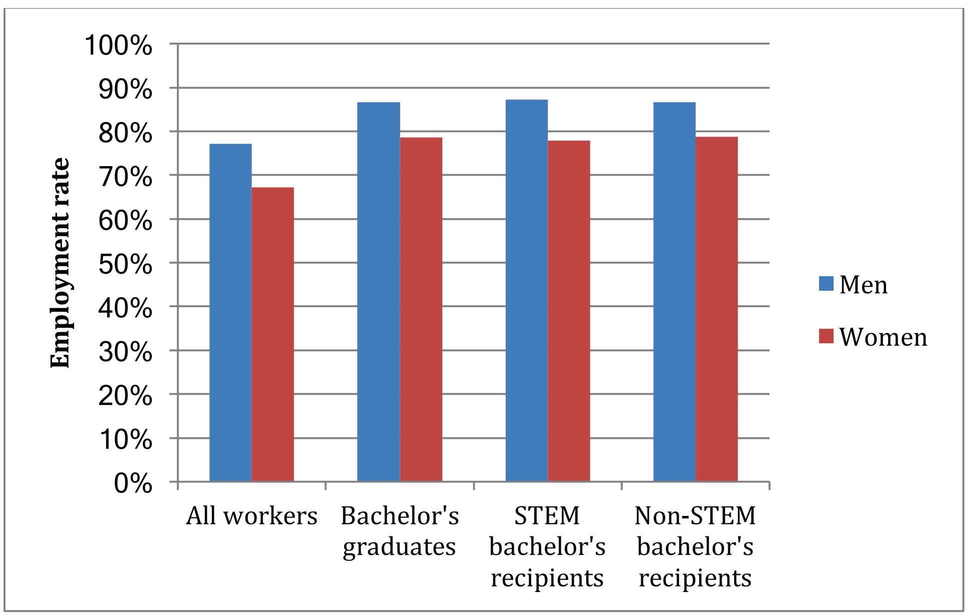
Table 3.2 presents the trends by gender. There are some stark differences, in both the levels and the differences. Across the board, men are more likely than women to be currently employed in any occupation. And as noted earlier, in terms of raw numbers, there are slightly more male STEM bachelor's degree holders despite men having fewer overall bachelor's degrees than women. While there is a small positive increase for men in the overall likelihood of working if they have a STEM degree versus a non-STEM degree (0.6 percent), there is a corresponding *decrease* for women (−0.8 percent). Figure 3.3 represents the data on employment status graphically.

Table 3.2: Employment Status, by Gender

	Overall	Bachelor's Graduates	Type of Bachelor's Degree: STEM	Type of Bachelor's Degree: Non-STEM	Difference	Sample Size
Employed in any occupation						
Men	77.2%	86.7%	87.2%	86.6%	0.6***	851,338
Women	67.2%	78.6%	77.9%	78.7%	−0.8***	857,666
Employed in a STEM occupation						
Men	27.7%	33.1%	49.1%	30.7%	18.4***	851,338
Women	14.9%	24.3%	29.7%	23.7%	6.0***	857,666
Employed in the ONG industry						
Men	4.8%	4.1%	7.2%	3.7%	3.6***	851,338
Women	1.4%	1.5%	2.3%	1.4%	0.9***	857,666

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 3.3: Employment Status, by Gender

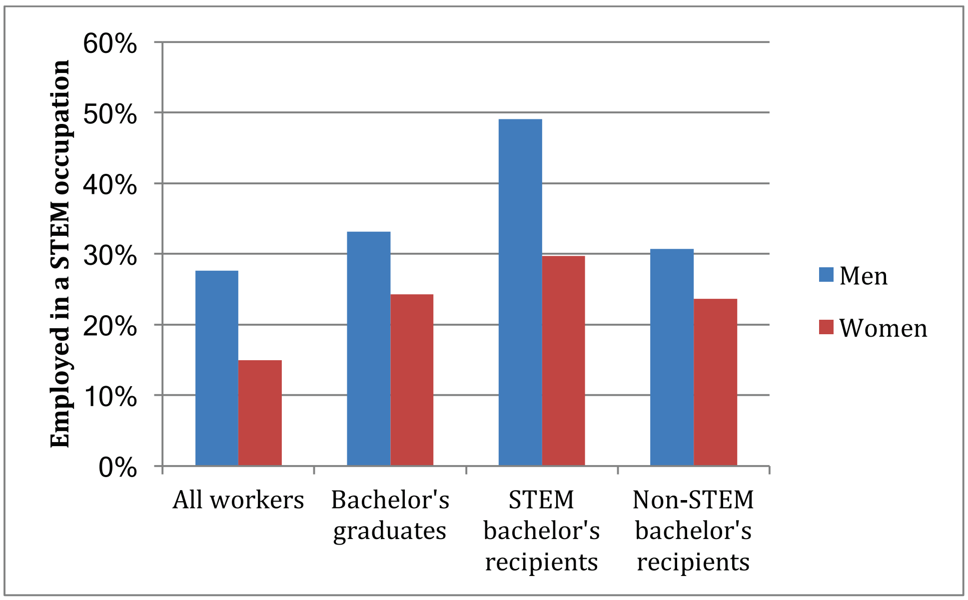


SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

The results for STEM employment for men versus women are even more striking (Figure 3.4). Men are significantly more likely than women to work in a STEM occupation overall, and men who receive a STEM degree are much more likely than women who receive such a degree to work in a STEM occupation (49.1 percent for men and 29.7 percent for women). Interestingly, men with a non-STEM degree have a slightly higher likelihood of working in a STEM occupation (30.7 percent) than women with a STEM degree (29.7 percent). The true size of this gap is highlighted by the proportion of men with a STEM degree who work in a STEM occupation, as described.

Figure 3.4: Employment in a STEM Occupation, by Gender

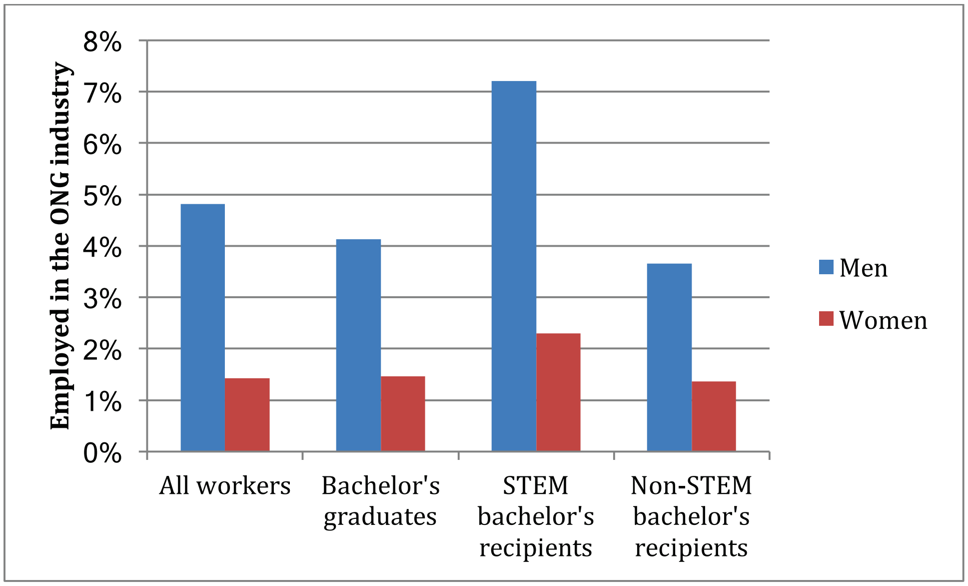


SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

Men are more than three times as likely as women to work in the ONG industry (Figure 3.5), and men with a STEM degree see a larger increase in the likelihood of working (overall, in STEM occupations, and in the ONG industry) than women with a STEM degree. For men, having a STEM degree increases the percentage working in the ONG industry by 3.6 percentage points; for women, there is an increase as well, but it is substantively negligible (0.9 percentage points).

Figure 3.5: Employment in the Oil and Natural Gas Industry, by Gender



SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

Overall, while we do not explore the reasons here, we do find that women are less likely to get STEM degrees, work in STEM occupations, and work in the ONG industry, and the likelihood that having a STEM degree leads to working in a STEM occupation, working in the ONG industry, and even working overall is smaller for women.

Employment Outcomes by Race/Ethnicity

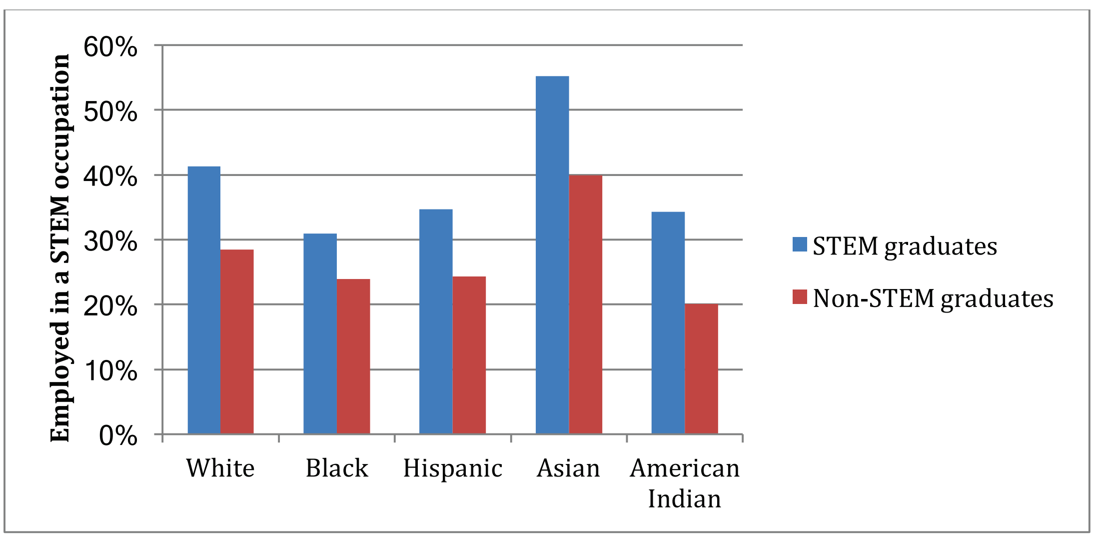
We next look at how the trends differ by race/ethnicity. These results are presented in Table 3.3 and Figure 3.6. With respect to overall employment, American Indians and blacks have the lowest rates of employment, and whites, Asians, and Hispanics have the highest rates of employment. However, the rates are much closer among bachelor's graduates. Asian and white graduates, conditional on graduating with a STEM degree, are the most likely to be employed in a STEM occupation. Similar to the gap between men and women, white and Asian non-STEM bachelor's graduates are about as likely to work in STEM as black STEM bachelor's graduates, emphasizing the size of the gap.

Table 3.3: Employment Status, by Race/Ethnicity

	Overall	Bachelor's Graduates	Type of Bachelor's Degree		Difference	Sample
			STEM	Non-STEM		
Employed in any occupation						
White	73.9%	83.4%	83.5%	83.4%	0.1	1,158,795
Black	64.6%	81.5%	81.9%	81.4%	0.5	174,616
Hispanic	71.5%	82.4%	82.3%	82.4%	−0.1	237,837
Asian	74.6%	79.5%	80.9%	78.9%	2.0***	91,521
American Indian	57.1%	79.9%	79.9%	79.9%	0.0	16,180
Employed in a STEM occupation						
White	23.9%	30.1%	41.3%	28.4%	12.9***	1,158,795
Black	13.3%	24.4%	30.9%	23.9%	7.1***	174,616
Hispanic	14.9%	24.9%	34.7%	24.3%	10.4***	237,837
Asian	32.9%	44.5%	55.2%	40.0%	15.2***	91,521
American Indian	15.8%	20.8%	34.3%	20.1%	14.3***	16,180
Employed in the ONG industry						
White	3.6%	3.2%	5.5%	2.8%	2.6***	1,158,795
Black	2.2%	1.7%	3.1%	1.6%	1.5***	174,616
Hispanic	2.9%	3.2%	4.7%	3.1%	1.6***	237,837
Asian	2.4%	2.5%	3.7%	2.1%	1.6***	91,521
American Indian	2.2%	1.8%	3.7%	1.7%	2.0*	16,180

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 3.6: STEM and Non-STEM Graduates Employed in a STEM Occupation, by Race/Ethnicity



SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

Overall, whites are the most likely to work in the ONG industry, at 3.6 percent. Next are Hispanics at 2.9 percent. White workers also have the biggest gap, at 2.6 percentage points, between STEM graduates and non-STEM graduates working in the ONG industry.

There are substantial differences in the trends across races. Black workers translate a STEM degree to a STEM occupation at 30.9 percent, while white workers do so at 41.3 percent. The STEM occupation rate of blacks with STEM degrees mirrors that of whites with non-STEM degrees (28.4 percent). This analysis does not examine what might be the underlying causes.

Employment Outcomes for Additional Subgroups

We also examined employment data on additional subgroups. Table 3.4 shows the employment trends by bachelor's major groups (e.g., ONG, other STEM, social science). Results on additional subgroups can be found in Appendix D. Table D.16 examines the trends for the various subindustries in the ONG industry (and Appendix B lists the industries in each group). There is substantial variation across these subindustries. Table D.17 presents the results across census regions. There is considerable heterogeneity across the regions, especially in the employment trends in the ONG industry, with the West South Central region having a much higher likelihood of working in that industry. Table D.18 examines the same trends for race/ethnicity by gender. This reinforces our earlier findings that gender differences for STEM occupations are stronger than race/ethnicity differences, although both persist. In fact, the race/ethnicity group among men that has the lowest rate of STEM graduates working in STEM occupations (black graduates) is higher than the rates for all but one of the race/ethnicity groups among women (Asian graduates). Similar gender differences dominate ONG employment, with all race/ethnicity groups among men overall far outpacing the likelihood of any of the race/ethnicity groups among women to work in ONG.

Table 3.4: Employment Status, by Bachelor's Major Group

Major Group	Type of Bachelor's Degree: Specified Degree	Type of Bachelor's Degree: Other Degree	Difference	Sample Size
Employed in any occupation				
ONG	82.1%	83.0%	−0.9	2,244
ONG-related	83.9%	83.0%	1.0***	44,569
Other STEM	83.9%	82.9%	1.0***	80,510
Business, communications, and public policy	83.1%	83.0%	0.1	134,919
Other	82.8%	83.1%	−0.3	22,410
Professional	84.3%	82.8%	1.5***	103,348
Social science	81.4%	83.6%	−2.2***	142,649
Employed in a STEM occupation				
ONG	46.3%	32.4%	13.9***	2,244
ONG-related	57.3%	30.1%	27.2***	44,569
Other STEM	47.6%	29.8%	17.8***	80,510
Business, communications, and public policy	29.5%	33.5%	−4.1***	134,919
Other	18.6%	33.2%	−14.6***	22,410
Professional	34.0%	32.1%	1.9***	103,348
Social science	19.9%	36.9%	−16.9***	142,649
Employed in the ONG industry				
ONG	20.6%	3.4%	17.2***	2,244
ONG related	9.9%	2.9%	7.0***	44,569
Other STEM	4.7%	3.3%	1.4***	80,510
Business, communications, and public policy	2.8%	3.8%	−1.0***	134,919
Other	1.6%	3.6%	−2.0***	22,410
Professional	2.9%	3.6%	−0.7***	103,348
Social science	2.0%	4.0%	−2.0***	142,649

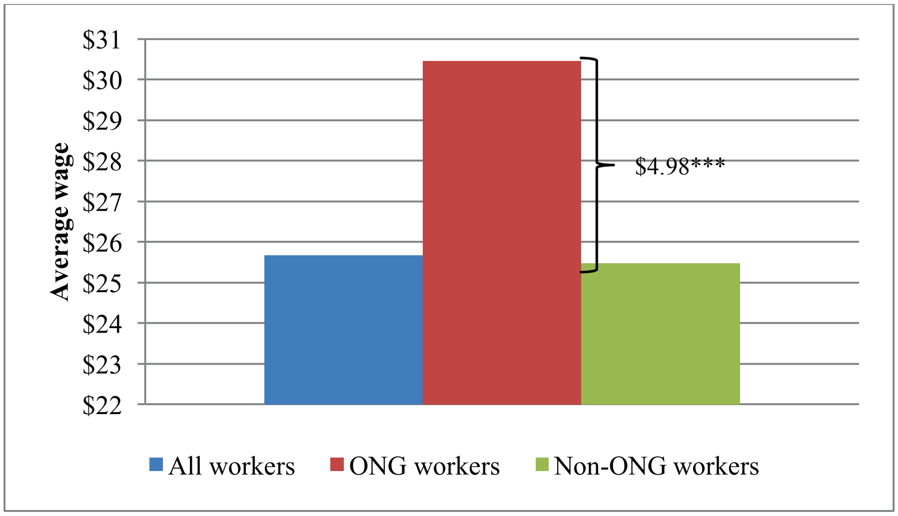
SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The Relationship Between STEM Bachelor's Degree Attainment and Wages

We next examine hourly wages earned by bachelor's degree recipients. In the ACS, wages are calculated by dividing the variable that measures wages and salary income over the past 12 months by the number of weeks worked in the past year (the midpoint of the spans, such as 47–50 weeks, is entered as 48.5), divided by the typical number of hours worked per week. Given the existence of outliers (especially because of the manual division of reported hours worked), we censor the wage variable by setting the wage of all individuals above the 99.99th percentile wage at equal to the 99.99th percentile. Similar to the findings shown in this chapter thus far, all estimates are produced using regression procedures that control for gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence. The methodology for these regressions is found in Appendix C.

We first look at overall wages. Figure 3.7 shows the relationships for the overall sample. Table D.19 in Appendix D presents the underlying numbers. We find that the regression-adjusted overall wage is $25.67 per hour for all workers in the economy. For a worker who worked 50 weeks and 40 hours per week, this would be equivalent to $51,340 per year. We find that ONG workers earn $4.98 per hour more, on average, than non-ONG workers, controlling for demographic characteristics. The remaining tables and figures follow the same structure.

Figure 3.7: Hourly Wages Overall, in the Oil and Natural Gas Industry, and Not in the Oil and Natural Gas Industry

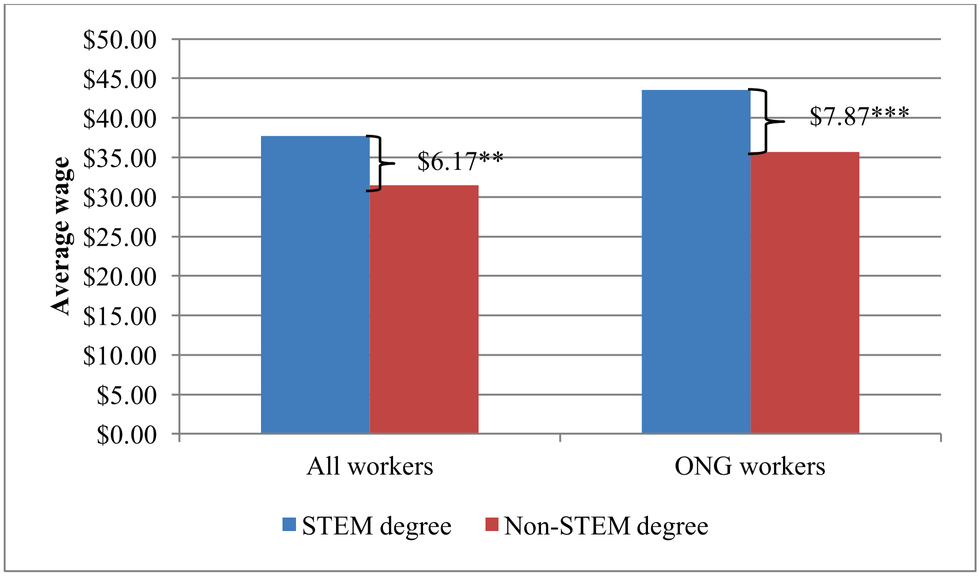


SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

We next look at how STEM degrees affect wages, shown in Figure 3.8 (see Table D.20 in Appendix D for details). First, note that both STEM and non-STEM bachelor's graduates earn more on average than the overall economy average of $25.67 per hour. For those with bachelor's degrees, there is a $6.17 per hour return for a STEM degree versus a non-STEM degree. The return is larger for workers in the ONG industry at $7.87 more per hour. There is a positive return, conditional on having a college degree, to having a degree in a STEM field.

Figure 3.8: Hourly Wages Overall and in the Oil and Natural Gas Industry, by STEM or Non-STEM Bachelor's Degree



SOURCE: Authors' analysis of ACS data.

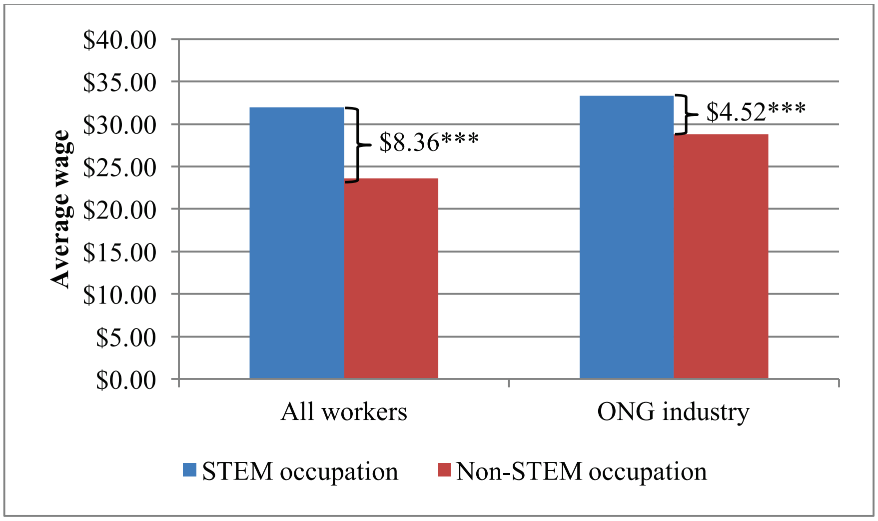
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 3.9 examines the premium for having a STEM occupation (Table D.21 provides the numbers). Note that STEM occupations, which were defined in Chapter One, need not require a STEM degree or even a college degree; rather, that label reflects the kinds of tasks being performed (e.g., biological scientists, urban and regional planners, veterinarians, and small engine mechanics). As was shown in Table 3.1, we estimate that just more than 20 percent of individuals are working in STEM occupations. Because we estimate that 72.2 percent of all individuals are working, this means that approximately 30 percent of all individuals working are working in STEM occupations. Understanding the return to working in a STEM occupation and how that differs across gender and race/ethnicity can help shape our understanding of the advantages and disadvantages across these groups and potentially offer evidence for gaps in STEM employment.

We find that the average wages of STEM occupation workers are higher than those of non-STEM occupation workers among all industries ($31.98 per hour) and in the ONG industry ($33.34 per hour). We find that there is again a positive and large wage premium overall, at $8.36 per hour, for working in a STEM occupation. This is even larger than the return for attaining a STEM degree. While the return is still positive within ONG at $4.52 per hour, the additional pay increase for working in a STEM occupation is smaller within that industry.

However, this is driven by higher non-STEM occupation wages in ONG ($28.82 per hour versus $23.63 per hour) rather than lower STEM occupation wages ($33.34 per hour in ONG versus $31.98 per hour overall).

Figure 3.9: Hourly Wages Overall and in the Oil and Natural Gas Industry, by STEM or Non-STEM Occupation



SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Wage Outcomes by Bachelor's Major Group

The wage premiums differ across the groups of majors, as shown in Table 3.5 and Figure 3.10. Rows labeled *all industries* show the overall wages for individuals with the specified bachelor's degrees versus those with other bachelor's degrees. The difference compares how much higher the wage is for those with the specified degrees versus those with other bachelor's degrees, holding all else equal. The rows labeled *ONG industry* present the same information but only for individuals who end up working in the ONG industry—to show how wages for different majors compare within that industry.

Graduates with bachelor's degrees in ONG majors earn the highest wages, on average, whether they work in the ONG industry or not ($42.16 per hour overall, $65.34 per hour in the ONG industry). This translates into them having the highest difference between ONG degrees and all other majors, at $8.46 per hour. The ONG-related and other STEM categories have the next-highest differences. The lowest wages are for the group of majors labeled as other. Appendix A lists the majors within each group.

Wages in the ONG industry are higher than outside of the industry, and this remains true in most major groups. For example, for individuals with ONG-related degrees, the average wage is $44.21 per hour for those working in the ONG industry, as opposed to $38.42 per hour overall. This is not just true for ONG-specific and ONG-related majors. Across every major category except professional (which mostly comprises education- and health-related degrees), individuals who work in the ONG industry earn more.

Table 3.5: Hourly Wages Overall and in the Oil and Natural Gas Industry, by Bachelor's Major Group

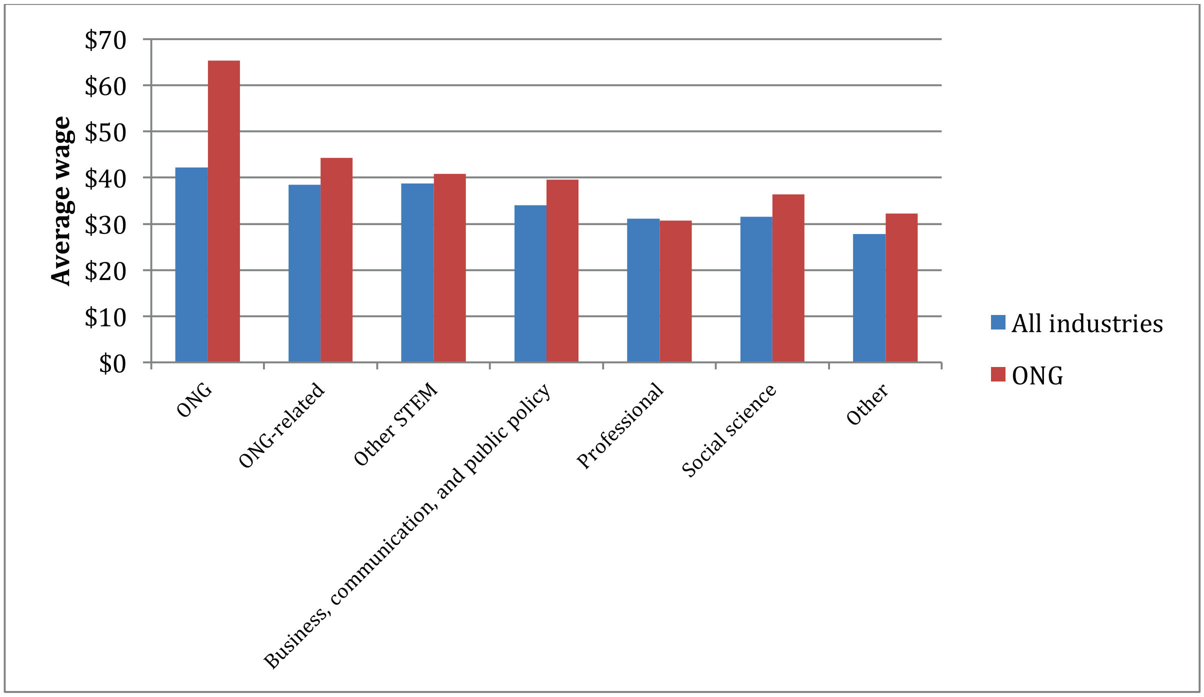
	Type of Bachelor's Degree			
	Specified Degree	Other Degree	Difference	Sample with Specified Degree
ONG				
All industries	$42.16	$33.69	$8.46***	1,905
ONG industry	$65.34	$38.27	$27.07***	476
ONG-related				
All industries	$38.42	$33.27	$5.15***	36,196
ONG industry	$44.21	$37.71	$6.50***	4,631
Other STEM				
All industries	$38.78	$32.84	$5.94***	68,183
ONG industry	$40.80	$37.78	$3.02*	3,675
Business, communication, and public policy				
All industries	$34.07	$33.60	$0.46*	112,900
ONG industry	$39.58	$38.35	$1.22	3,614
Professional				
All industries	$31.09	$34.33	−$3.24***	83,428
ONG industry	$30.76	$39.28	−$8.52***	1,865
Social science				
All industries	$31.51	$34.48	−$2.97***	113,998
ONG industry	$36.38	$39.15	−$2.77	2,015
Other				
All industries	$27.74	$34.05	−$6.31***	18,908
ONG industry	$32.25	$38.80	−$6.55***	293

SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 3.10: Hourly Wages Overall and in the Oil and Natural Gas Industry, by Bachelor's Major Group



SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

Wage Outcomes by Gender

Table 3.6 examines the returns by gender. On average, men have higher wages than women, even after controlling for the observable factors.[7] This is true both overall ($28.42 per hour versus $22.56 per hour) and within the ONG industry ($32.88 per hour versus $27.43 per hour). Women earn less in all other industries (both relative to men and relative to ONG), yielding a slightly larger premium for women working in ONG jobs over women in non-ONG jobs than men enjoy for working in ONG jobs over men in non-ONG jobs.

[7] All wage regressions that are not evaluations by subindustry do not control for industry or occupation, which would also affect the difference in wages between men and women.

Table 3.6: Hourly Wages, by Oil and Natural Gas or Non–Oil and Natural Gas Industry and Gender

		Type of Industry			
	Overall	ONG	Non-ONG	Difference	Sample
Men	$28.42	$32.88	$28.14	$4.74***	645,668
Women	$22.56	$27.43	$22.47	$4.96***	587,147

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The premium for a STEM degree is substantially higher for men across all industries (Table 3.7), but women have a higher wage premium for STEM degrees within ONG. That the wage bonus for having a STEM degree is so much higher for men than women may contribute to why women are less likely to attain a STEM bachelor's degree. We again see both higher wages and greater parity in the ONG industry than in all industries taken together.

Table 3.7: Hourly Wages, by STEM or Non-STEM Bachelor's Degree and Gender

	Type of Bachelor's Degree			
	STEM	Non-STEM	Difference	Sample
All industries				
Men	$40.83	$33.00	$7.83***	212,528
Women	$33.41	$29.59	$3.83***	225,963
ONG industry				
Men	$45.03	$37.13	$7.91***	12,215
Women	$42.29	$33.44	$8.85***	4,354

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Women have a significantly higher return for working in STEM occupations than men do (Table 3.8), whether overall or in the ONG industry. This seems to be driven by the fact that women in STEM occupations have average wages only a little less than men in STEM occupations, whereas women in non-STEM occupations have substantially lower average wages than men in such occupations, yielding a larger wage premium. Indeed, among those in STEM occupations, the wage parity between men and women seems the closest, with women's average about 94 percent that of men ($31.10 per hour compared with $33.18 per hour). Contrast this with the about 78.5-percent ratio for non-STEM occupations. Workers in the ONG industry again earn higher wages, whether men or women and whether having a STEM or non-STEM degree, than on average.

Table 3.8: Hourly Wages, by STEM or Non-STEM Occupation and Gender

	Type of Occupation			
	STEM	Non-STEM	Difference	Sample
All industries				
Men	$33.18	$26.35	$6.83***	641,675
Women	$31.10	$20.73	$10.37***	586,589
ONG industry				
Men	$34.62	$31.57	$3.04***	39,111
Women	$33.36	$24.49	$8.87***	10,697

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

These two results (the increased wage parity in STEM occupations between men and women and the decreased wage parity among STEM bachelor's graduates between men and women) may be partially driven by the results shown in Table 3.2—that only 29.7 percent of women with STEM degrees end up in the higher-paying STEM occupations, while 49.1 percent of men with STEM degrees work in those jobs. That is to say, if both men and women get a wage increase for working in STEM jobs but women are less likely to go from STEM majors to STEM jobs, then we expect to see more wage disparity between men and women among STEM-major graduates (more men will go to the higher-paying STEM jobs) than between men and women among those working in STEM occupations (which preconditions on already working in the higher-paying occupations).

Wage Outcomes by Race/Ethnicity

Table 3.9 presents hourly wages by race/ethnicity. Asians and then whites have the highest overall wages. The wage difference between ONG industry workers and non-ONG industry workers is around $5 per hour for most racial groups, with the exception of Asians.

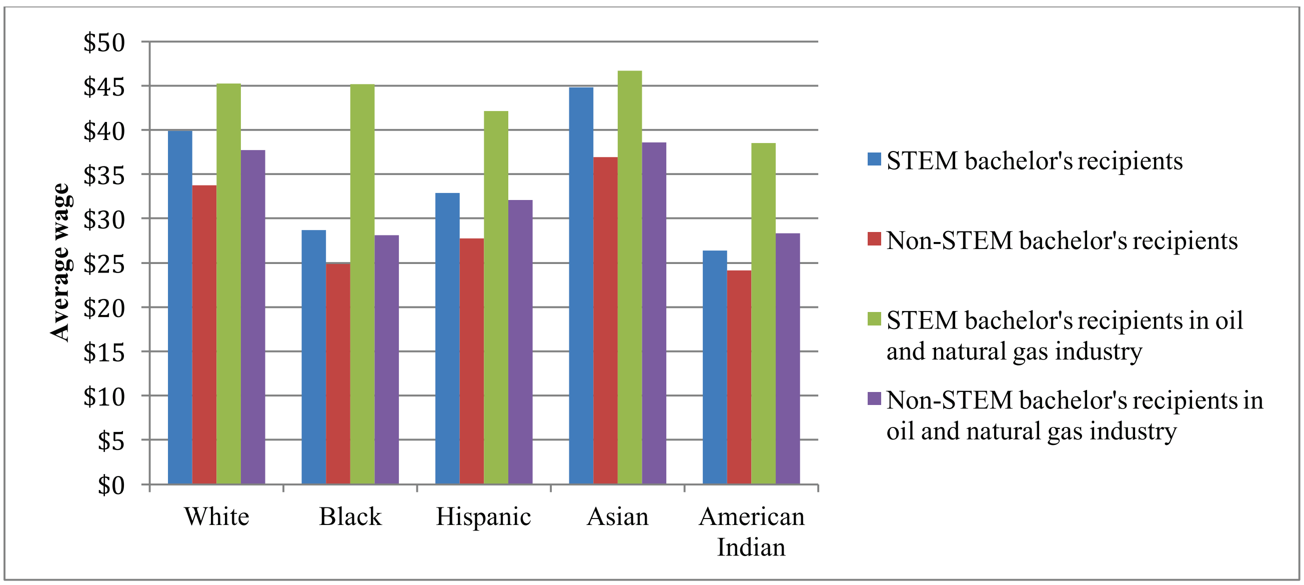
Table 3.9: Hourly Wages, by Oil and Natural Gas or Non–Oil and Natural Gas Industry and Race/Ethnicity

		Type of Industry			
	Overall	ONG	Non-ONG	Difference	Sample Size
White	$27.97	$32.58	$27.77	$4.82***	851,559
Black	$20.31	$24.87	$20.18	$4.69***	114,014
Hispanic	$18.88	$23.72	$18.69	$5.03***	167,872
Asian	$32.06	$34.49	$31.98	$2.50***	68,395
American Indian	$19.57	$24.19	$19.42	$4.77***	9,631

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

There is heterogeneity in the returns for attaining a STEM degree, as highlighted in Figure 3.11. All racial groups have statistically significant returns for a STEM degree versus a non-STEM degree, but that ranges from $2.20 per hour (American Indians) to $7.89 (Asians). The wage premiums for a STEM degree tend to be higher within the ONG industry across races, although there are differences. Black workers are estimated to have a $17.05 per hour wage premium for STEM degree recipients working in the ONG industry, although this is based on only a few hundred observations and may be driven by a few large wages. The full numbers are shown in Table 3.10.

Figure 3.11: Hourly Wages, by STEM or Non-STEM Bachelor's Degree, Oil and Natural Gas or Non–Oil and Natural Gas Industry, and Race/Ethnicity



SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

Table 3.10: Hourly Wages, by STEM or Non-STEM Bachelor's Degree and Race/Ethnicity

	Type of Bachelor's Degree			
	STEM	Non-STEM	Difference	Sample
All industries				
White	$39.86	$33.72	$6.14***	331,575
Black	$28.70	$24.83	$3.87***	27,392
Hispanic	$32.91	$27.74	$5.17***	30,070
Asian	$44.79	$36.90	$7.89***	40,244
American Indian	$26.36	$24.16	$2.20	1,393
ONG industry				
White	$45.26	$37.73	$7.53***	13,252
Black	$45.15	$28.10	$17.05**	607
Hispanic	$42.11	$32.09	$10.02***	1,107
Asian	$46.69	$38.61	$8.08***	1,313
American Indian	$38.51	$28.30	$10.20	42

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

There is also heterogeneity in the returns for working in a STEM occupation (Table 3.11). The wage premium is positive for all races but highest for Asians ($14.17 per hour) and lowest for American Indians ($5.98 per hour), showing a correlation between the returns for attaining a STEM degree by race and the returns for working in a STEM occupation by race. The wage premium for STEM occupations also varies within the ONG industry—higher for blacks ($8.75 per hour) than for whites ($3.07 per hour), for example. However, the wage differences across earnings are not overcome by STEM occupation premiums—for example, the average wage for whites in non-STEM occupations ($25.80 per hour overall and $31.48 per hour in ONG) in some cases exceeds the average wage for blacks, Hispanics, and American Indians in STEM occupations ($26.97 per hour, $24.22 per hour, and $24.43 per hour overall and $31.26 per hour, $28.43 per hour, and $30.22 per hour in ONG for those respective racial/ethnic groups), despite the large STEM occupation premiums.

Table 3.11: Hourly Wages, by STEM or Non-STEM Occupation and Race/Ethnicity

	Type of Occupation			
	STEM	Non-STEM	Difference	Sample
All industries				
White	$33.86	$25.80	$8.06***	848,573
Black	$26.97	$19.08	$7.89***	113,469
Hispanic	$24.22	$17.79	$6.42***	167,226
Asian	$40.91	$26.74	$14.17***	68,235
American Indian	$24.43	$18.46	$5.98***	9,598
ONG industry				
White	$34.55	$31.48	$3.07***	37,437
Black	$31.26	$22.51	$8.75***	3,247
Hispanic	$28.43	$21.83	$6.60***	6,166
Asian	$38.02	$30.60	$7.42***	1,919
American Indian	$30.22	$20.50	$9.72***	311

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Wage Outcomes by Additional Subgroups

In addition, we look at wage returns for ONG subindustries (see Table D.22, Table D.23, and Figure D.1 in Appendix D). For overall wages, midstream workers have the highest average wages (see Appendix B for details on how API defines the industry groupings). The wage premium for having a STEM degree is by far the highest for downstream and midstream workers; those with STEM degrees in those sectors earn around $60 per hour on average. Each subindustry has a positive premium for STEM occupations, and that premium is again large for downstream and midstream sectors.

Table D.24, Table D.25, Table D.26, and Figure D.2 present the wage results by census region. As with employment across census regions, there is substantial variation in wages. While overall wages and ONG wages tend to be correlated across regions, there are outliers. For example, in the West South Central region, overall average wages are among the lower average wages but have the highest wages in the ONG industry, even exceeding bachelor's graduate wages in the region.

We also investigate the wage trends for gender by race/ethnicity, reported in Table D.27, Table D.28, and Table D.29. We see that across all groups, the ONG industry continues to pay higher wages, and that wage increase is relatively constant across the groups, even though the average wages are substantially different. We again see that gender seems to have the stronger effect than race/ethnicity, with the overall wage increase from having a STEM major being higher for men for each of the race/ethnicity groups. Within the ONG industry, the wage increase from having a STEM major continues to be closer to parity between men and women and across races.

Summary

In this chapter, we focused primarily on the relationship between STEM bachelor's degrees and STEM employment outcomes. We document several important findings.

Although having a STEM bachelor's degree is associated with an increased likelihood of working in a STEM occupation, not all STEM bachelor's degree holders work in such occupations. STEM bachelor's degrees likely give graduates greater training in the skills needed in STEM jobs, as well as the ability to signal those skills to potential employers. We estimate that 40.5 percent of STEM bachelor's graduates end up working in STEM occupations.

Although few of the total STEM bachelor's degree recipients enter occupations in the ONG industry, holding a STEM bachelor's degree is associated with an increase in the likelihood of working in the ONG industry. Of STEM bachelor's degree recipients, 5 percent are employed in the ONG industry compared with 2.7 percent of non-STEM bachelor's degree recipients.

There is a large increase in wages associated with having a STEM degree and with working in a STEM occupation. Those with bachelor's degrees in STEM earn $37.67 per hour compared with $31.50 per hour earned by those with bachelor's degrees in other fields. Similarly, those employed in the STEM industry earn $31.98 per hour compared with $23.63 per hour earned by those employed in other industries.

ONG industry jobs pay significantly higher hourly wages. The average wage in the ONG industry is $30.46 per hour compared with $25.47 per hour outside of the industry.

Women are less likely to work in STEM occupations than men, with or without a STEM degree. Only around 30 percent of women with a STEM bachelor's degree work in a STEM occupation, while around 50 percent of men with a STEM bachelor's degree do. In fact, men with a non-STEM bachelor's degree are about as likely to work in a STEM occupation as women with a STEM bachelor's degree.

Women experience a larger increase than men in hourly wages, on average, for working in a STEM occupation. Among women, the difference in hourly wages between those working in STEM occupations and those working in other occupations is $10.37 (with the premium here benefiting those employed in STEM occupations). The difference for men, however, is $6.83 per hour.

Blacks and Hispanics are less likely to work in STEM jobs compared with whites, and when they do procure STEM jobs, they earn less than whites. Approximately 24 percent of black and Hispanic bachelor's degree recipients are employed in STEM jobs compared with 30.1 percent of white bachelor's degree recipients. Among bachelor's degree recipients employed in STEM jobs, whites earn $33.86 per hour, blacks earn $26.97 per hour, and Hispanics earn $24.22 per hour.

Despite an overall wage gap between men and women, there is greater wage parity in the ONG industry among those with a STEM bachelor's degree and those in a STEM

occupation. For example, men with a STEM bachelor's degree in the overall economy earn about $7.42 more per hour than women with a STEM bachelor's degree, and in the ONG industry, that gap is $2.74 per hour.

Chapter Four

Relationship Between Postsecondary Licenses or Certifications and Employment Outcomes

In this chapter, we explore whether acquiring a license or certification is associated with an improvement in employment outcomes beyond traditional academic degrees. As defined explicitly by the U.S. Bureau of Labor Statistics (2017):

- *Licenses* are credentials awarded by a governmental licensing agency based on pre-determined criteria that may include some combination of degree attainment, certifications, educational certifications, assessments, apprenticeship programs, or work experience. Examples include cosmetology licenses, teaching licenses, and electrician's licenses.
- *Certifications* are credentials awarded by a nongovernmental certification body to individuals who demonstrate that they have acquired the designated knowledge, skills, and abilities to perform a specific job. Examples include information technology certifications (e.g., network support, programming) and project management professional certifications.

The key difference between a license and a certification is that a license conveys a legal authority to work in an occupation, whereas a certification does not. In our analysis, we cannot distinguish between licenses and certifications empirically, so we evaluate the average contribution of one, the other, or both to our outcomes of interest.

To undertake our analysis, we use data from the 2015 CPS monthly outgoing rotation group file, which provides a wide range of information on population characteristics and the state of the U.S. labor force. The 2015 CPS is one of the first federal data collection efforts to include direct measures of license or certification receipt. We restrict our analysis to individuals in the traditional working-age population (ages 18 to 65) for a final sample of 222,791 adults. Using the CPS, we estimate that 21.8 percent of working-age adults have a license or certification. Similar to our analysis of STEM majors in Chapter Three with the ACS, in this chapter, we use a regression-adjusted approach that controls for demographic and other variables, thus allowing us to interpret differences as if holding all else equal. For more detail on the methodology and the control variables, see Appendix C. Where appropriate, we highlight findings for those with only a high school diploma and/or an associate's degree, because there is increasing policy interest in the value of licenses and certifications in the sub-baccalaureate labor market.

One limitation that readers should keep in mind is that there is substantial heterogeneity in the time, efforts, and resources it takes to earn different licenses and certifications, as well as substantial heterogeneity in the competencies these credentials convey. For example, some certification programs mirror associate's degrees in their requirements, while certain licenses require simply the passage of a single examination. Although there is still much to learn about how such heterogeneity in licenses and certifications supports the needs of the STEM labor market, our analysis provides a first look—albeit simplistic—at understanding the role of these emerging credentials.

The Relationship Between Licenses or Certifications and Employment Status

Employment Outcomes by Education Level

We first look at trends in current employment status for all working-age U.S. adults by highest level of education (Table 4.1). Because the other tables are of a similar format, we will explain this table in detail as an orientation to guide in interpretation. We show comparisons between license or certification holders and nonholders sequentially for each of our three key measures of employment: employment in any occupation, employment in a STEM occupation, and employment in the ONG industry.

Table 4.1: Employment Status, by License or Certification Status and Education Level

		Has License or Certification			
	Overall	**Yes**	**No**	**Difference**	**Sample Size**
Employed in any occupation					
Less than a high school diploma	54.2%	80.6%	52.9%	27.7***	22,135
High school diploma	69.1%	86.0%	66.5%	19.5***	104,884
Associate’s degree	77.5%	87.7%	73.0%	14.7***	23,088
Bachelor’s degree	82.1%	91.4%	78.8%	12.6***	47,087
Graduate/professional degree	84.6%	91.3%	78.4%	12.9***	25,597
Employed in a STEM occupation					
Less than a high school diploma	8.0%	15.8%	7.6%	8.2***	22,135
High school diploma	12.5%	20.3%	11.3%	9.0***	104,884
Associate’s degree	24.1%	37.3%	18.2%	19.1***	23,088
Bachelor’s degree	29.6%	39.0%	26.2%	12.8***	47,087
Graduate/professional degree	32.7%	34.1%	31.4%	2.7***	25,597
Employed in the ONG industry					
Less than a high school diploma	1.4%	2.5%	1.3%	1.2**	22,135
High school diploma	2.8%	3.4%	2.8%	0.6**	104,884
Associate’s degree	2.7%	2.1%	3.0%	−0.9***	23,088
Bachelor’s degree	3.4%	3.3%	3.4%	−0.1	47,087
Graduate/professional degree	2.9%	2.1%	3.7%	−1.6***	25,597

SOURCE: Authors’ analysis of CPS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

This table shows that, with respect to overall employment and employment specifically in STEM jobs, those with a license or certification are more likely to be currently employed than their peers who do not have such credentials. These differences are evident at all levels of educational attainment, with large differences that are always statistically significant at $p < 0.01$.

For the outcome of employment in any occupation, those with a license or certification are more than 10 percentage points more likely to be employed, true at every education level. For example, among bachelor's degree recipients, 91.4 percent of those with a license or certification are employed compared with 78.8 percent of those without a license or certification.[8] The difference in employment rates between these two groups (12.6 percentage points) is statistically significant at $p < 0.01$. With respect to overall employment, there is a clear gradient in the size of the effect with respect to the educational attainment: The difference between license or certification holders and nonholders is highest among those with less than a high school diploma (27.7 percentage points) and smallest for those with a bachelor's degree (12.6 percentage points).

There is likewise a consistent positive effect of having a license or certification on the likelihood of employment in a STEM occupation. While the difference between license or certification holders and nonholders is highest among those with an associate's degree (19.1 percentage points), for all sub-baccalaureate levels of education, having a license or certification approximately doubles the likelihood of being employed in a STEM occupation. This is a significant effect that may be related to the likelihood of STEM occupations to value licenses or certifications, especially at sub-baccalaureate levels.

The positive effect of licenses or certifications disappears when looking at employment in the ONG industry.[9] Only those with a high school diploma or less benefit from having a certification or license. Among those with an associate's degree, bachelor's degree, or graduate degree, having a license or certification carries an employment penalty in the ONG labor market. It is worth noting, however, that the penalties associated with license or certification receipt for jobs in this industry, though statistically significant, are substantively small in absolute terms.

Employment Outcomes by Gender

Next, we look at whether employment status differences associated with licenses and certifications differ by gender (Table 4.2). With respect to overall employment, both women and men benefit from having a license or certification. However, this benefit is considerably larger for women (25.0 percentage points) than for men (13.8 percentage points). Both genders benefit from holding a license or certification about equally when pursuing employment in a STEM job. Interestingly, much like the STEM bachelor's degree gender findings in Chapter Three, we see that the percentage of women who have licenses or certifications and who work in a STEM job is

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[8] The difference in employment rates may reflect the fact that some jobs require workers to keep their certification or license current. If the worker should leave that job or the workforce entirely, he or she may let the certification or license lapse. We are unable to parse out this possibility because we have no information on the timing of the award of the certification or license, nor do we know whether that certification or license is required for the job in which the sample member is currently employed.

[9] The mostly null findings between certification or license receipt and employment in the ONG industry may be due to limited occupations within the industry that require occupational credentials to perform.

equal to the percentage of men who do not have a license or certification and who work in a STEM job, both at 23.6 percent. This emphasizes that, despite women receiving a benefit from acquiring a license or certification, they are still substantially less likely (conditional on license or certification attainment) to work in a STEM occupation than men. When looking at employment in the ONG industry, women experience a small *penalty* from holding a license or certification, while men experience a small *benefit*. Such differences suggest that the value of these credentials is not uniform.

Table 4.2: Employment Status, by License or Certification Status and Gender

		Has License or Certification			
	Overall	**Yes**	**No**	**Difference**	**Sample Size**
Employed in any occupation					
Men	79.4%	90.5%	76.7%	13.8***	108,315
Women	66.5%	85.9%	60.9%	25.0***	114,476
Employed in a STEM occupation					
Men	26.2%	36.6%	23.6%	13.0***	108,315
Women	12.2%	23.6%	9.0%	14.6***	114,476
Employed in the ONG industry					
Men	4.4%	4.7%	4.3%	0.4**	108,315
Women	1.2%	0.8%	1.3%	−0.5**	114,476

SOURCE: Authors' analysis of CPS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Employment Outcomes by Race/Ethnicity

In Table 4.3, we examine whether employment status differences associated with licenses and certifications differ by race/ethnicity. In this table, we see that all racial/ethnic groups are more likely to work conditional on having a license or certification, and the effect is surprisingly uniform at around a 20-percentage-point increase, with the exception of American Indians, who receive an even larger benefit from having a license or certification. This stands in contrast to the large difference found by gender. The increased likelihood of working in a STEM occupation conditional on having a license or certification is also relatively similar across racial and ethnic groups, with the outlier being Asians reaping the largest benefit. That said, the effect across groups is generally that the likelihood about doubles from the baseline. This again stands in contrast to our findings between men and women, where the proportional effect for women was three times the size as for men (at about a 150-percent increase versus a 50-percent increase, respectively). By and large, there are no racial/ethnic differences in the effect of licenses and certifications on employment in the ONG industry. The lone exception is for whites, who receive a small penalty in the industry for holding a license or certification: 3.0 percent of whites with a license or certification are employed in the ONG industry compared with 3.3 percent of whites without a license or certification.

Table 4.3: Employment Status, by License or Certification Status and Race/Ethnicity

	Overall	Has License or Certification		Difference	Sample Size
		Yes	No		
Employed in any occupation					
White	74.6%	89.3%	70.0%	19.3***	151,545
Black	66.3%	84.5%	62.4%	22.1***	23,467
Hispanic	71.7%	87.8%	69.4%	18.4***	30,068
Asian	73.9%	92.1%	69.6%	22.5***	12,304
American Indian	59.1%	83.5%	53.9%	29.6***	2,460
Employed in a STEM occupation					
White	21.5%	32.0%	18.2%	13.8***	151,545
Black	11.7%	21.3%	9.6%	11.7***	23,467
Hispanic	13.0%	23.5%	11.5%	12.0***	30,068
Asian	28.0%	45.3%	23.9%	21.4***	12,304
American Indian	13.1%	26.3%	10.3%	16.0***	2,460
Employed in the ONG industry					
White	3.2%	3.0%	3.3%	−0.3*	151,545
Black	1.9%	1.8%	1.9%	−0.1	23,467
Hispanic	2.3%	2.7%	2.2%	0.5	30,068
Asian	2.0%	2.0%	2.0%	0.0	12,304
American Indian	1.7%	2.3%	1.5%	0.8	2,460

SOURCE: Authors' analysis of CPS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The Relationship Between Licenses or Certifications and Wages

In this section, we examine whether license or certification holders earn more at their jobs than their peers who do not have such credentials. Our analyses here follow the same order and interpretation as those reported in the previous section for employment status. In the CPS, those who reported that they were employed were also asked to report their hourly wage or weekly wage. For those reporting weekly wages, we estimated their hourly wage based on a 40-hour workweek if they reported full-time employment and a 20-hour workweek if they reported part-time employment.

Wage Outcomes by Education Level

We begin by looking at differences in self-reported hourly wages between license or certification holders and nonholders by level of education. The findings are shown in Table 4.4.

Table 4.4: Hourly Wages, by License or Certification Status and Education Level

	Overall	Has License or Certification: Yes	No	Difference	Sample Size
Employed in any occupation					
Less than a high school diploma	$13.16	$14.33	$13.07	$1.26***	10,488
High school diploma	$17.76	$17.43	$17.83	−$0.40*	65,089
Associate's degree	$21.14	$21.80	$20.80	$1.00**	16,237
Bachelor's degree	$30.16	$29.74	$30.33	−$0.59	34,706
Graduate/professional degree	$37.52	$37.72	$37.32	$0.40	19,295
Employed in a STEM occupation					
Less than a high school diploma	$16.60	$19.76	$16.25	$3.51**	1,397
High school diploma	$23.69	$23.76	$23.67	$0.09	11,022
Associate's degree	$26.41	$26.90	$25.96	$0.94	5,096
Bachelor's degree	$35.54	$34.65	$35.98	−$1.33**	12,490
Graduate/professional degree	$41.45	$41.15	$41.70	−$0.55	7,198
Employed in the ONG industry					
Less than a high school diploma	$15.70	$15.74	$15.70	$0.04	315
High school diploma	$22.33	$24.35	$21.94	$2.41**	3,075
Associate's degree	$25.99	$28.65	$25.21	$3.44	682
Bachelor's degree	$34.62	$35.63	$34.32	$1.31	1,504
Graduate/professional degree	$41.98	$40.99	$42.45	−$1.46	676

SOURCE: Authors' analysis of CPS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Whereas holding a license or certification was associated with an increased likelihood of holding a job, or a job specifically in a STEM field, such benefits do not necessarily manifest themselves in the form of higher wages. Put differently, employers may be more likely to hire applicants with licenses or certifications than those without, but they do not appear to be paying them more for having a license or certification. Although the findings here are mostly null, there is some evidence of a wage premium for holding a license or certification, mostly at lower levels of education. For example, for those with less than a high school diploma and those with an associate's degree, there is a wage premium for having a license or certification in the overall population of workers and among STEM occupation workers. The effect disappears for higher levels of education. Surprisingly, high school graduates experience zero to slightly negative wage changes for having a license or certification. This is not true for high school graduates in the ONG industry, however, where such workers experience a substantial premium at about $2.41 per hour. While this is much smaller than the $7.87 per hour premium that those with STEM bachelor's degrees earn, on average, over those with non-STEM bachelor's degrees, the broad category of licenses and certifications masks significant heterogeneity in the type of credential. Nonetheless, that the ONG industry has positive returns for license or certification holders, where they have negative overall returns, suggests the significant potential variation in the value of different licenses and certifications to different industries. Here, we remind readers about the heterogeneity in time, energy, and resources to earn different licenses and certifications, as well as the heterogeneity in the competencies these credentials convey.

Wage Outcomes by Gender

Next, we look at wage premiums by gender (Table 4.5). Related to the findings for current employment status, here we see that the benefit of holding a license or certification in terms of overall wages and wages earned in STEM jobs is confined to women only. Women holding licenses or certifications earn an average of $10.10 more per hour than women lacking such credentials, and within STEM jobs, the difference is $5.12 per hour in favor of those holding a license or certification. Both differences are statistically significant at $p < 0.01$. This wage premium exceeds the wage premium that women experience for a STEM bachelor's degree over a non-STEM bachelor's degree, or for a STEM occupation over a non-STEM occupation (see Chapter Three). This large wage premium for a license or certification might partially explain the large increase in the likelihood of employment for women with a license or certification.

Table 4.5: Hourly Wages, by License or Certification Status and Gender

		Has License or Certification			
	Overall	**Yes**	**No**	**Difference**	**Sample Size**
Employed in any occupation					
Men	$24.91	$23.26	$25.37	−$2.11***	75,001
Women	$21.51	$28.75	$18.65	$10.10***	70,814
Employed in a STEM occupation					
Men	$31.46	$31.01	$31.64	−$0.63	24,220
Women	$30.97	$33.80	$28.68	$5.12***	12,983
Employed in the ONG industry					
Men	$28.34	$29.79	$27.93	$1.86	4,904
Women	$25.48	$29.48	$24.82	$4.66	1,348

SOURCE: Authors' analysis of CPS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Wage Outcomes by Race/Ethnicity

Finally, we look at wage differences between license or certification holders and nonholders by race/ethnicity (Table 4.6). There is a wage premium associated with holding a license or certification in terms of overall employment, and this holds for all racial and ethnic groups. Hispanics and blacks are the groups most likely to benefit from holding a license or certification overall. For Hispanics only, there remains a large positive effect in STEM occupations.

In the ONG industry, however, white workers have the only statistically significant wage premium for a license or certification. Interestingly, Hispanic and black workers, who have the largest wage premium for overall employment, have the smallest (negative but statistically insignificant) within the ONG industry. However, this is because Hispanic and black workers without licenses or certifications and who work in ONG have higher wages than average workers without licenses or certifications (e.g., for Hispanics, $21.80 per hour in an ONG job versus $17.04 per hour overall), rather than Hispanic and black workers with licenses or certifications and who work in ONG having much lower wages than average workers with licenses or certifications across all industries (e.g., for Hispanics, $21.53 per hour in an ONG job versus $22.51 per hour overall).

Table 4.6: Hourly Wages, by License or Certification Status and Race/Ethnicity

		Has License or Certification			
	Overall	Yes	No	Difference	Sample Size
Employed in any occupation					
White	$25.21	$26.51	$24.69	$1.82***	100,148
Black	$18.76	$21.52	$17.96	$3.56***	14,480
Hispanic	$17.86	$22.51	$17.04	$5.47***	19,691
Asian	$28.01	$30.25	$27.36	$2.89***	8,336
American Indian	$19.41	$22.49	$18.40	$4.09**	1,283
Employed in a STEM occupation					
White	$32.05	$31.84	$32.17	−$0.33	27,655
Black	$28.90	$27.71	$26.49	$1.22	2,447
Hispanic	$24.31	$28.74	$23.01	$5.73***	3,371
Asian	$38.49	$38.91	$38.31	$0.60	2,998
American Indian	$25.30	$29.49	$22.94	$6.55	279
Employed in the ONG industry					
White	$29.44	$32.11	$28.71	$3.40***	4,807
Black	$21.12	$20.12	$21.30	−$1.18	433
Hispanic	$21.76	$21.53	$21.80	−$0.27	656
Asian	$32.47	$38.50	$31.06	$7.44	250
American Indian	$20.29	$22.50	$19.54	$2.96	42

SOURCE: Authors' analysis of CPS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Summary

In this chapter, we explored whether acquiring a license or certification is associated with an improvement in employment outcomes beyond the benefits associated with attaining traditional academic degrees. Key findings include the following.

Possessing a license or certification is associated with an increased probability of employment but not necessarily higher wages. For example, among those with a high school diploma, 86.0 percent of those with a license or certification are employed, while 66.5 percent of those without a license or certification are employed.

The benefits of holding a license or certification are strongest for those lacking a high school diploma, women, and Hispanics. For example, with respect to hourly wages, women receive a $10.10 per hour *benefit* from having a license or certification, while men experience a $2.11 per hour *penalty* from having such credentials. These findings suggest that license or certification receipt is a possible avenue for improving employment outcomes for traditionally underrepresented groups.

The benefits associated with licenses and certifications, however, were mostly for overall employment and employment in STEM jobs and were not as strong for jobs in the ONG industry.

Chapter Five

Summary and Conclusion

In this report, we examine trends in STEM degree attainment and their relationship with employment outcomes, including any employment, employment in a STEM occupation, wages, and the premiums on wages for STEM degrees and STEM occupations. We find that the total number of STEM bachelor's degrees steadily increased between 2003 and 2015, hitting its peak in total numbers and proportion of total bachelor's degrees in 2015. In 2015, the most recent year with available data, 680,890 STEM bachelor's degrees were awarded in the United States. With their increasing prevalence, STEM bachelor's degrees account for about 36 percent of all bachelor's degrees awarded annually. Across the board, we find that there are substantial returns both to employment and to wages for recipients of STEM bachelor's degrees: Those with STEM bachelor's degrees are more likely than those with non-STEM bachelor's degrees to land STEM jobs and to earn higher wages on average. Those who work in STEM occupations earn, on average, higher wages than those who work in non-STEM occupations. Additionally, we find that earning a license or certification helps bolster the probability of securing a STEM job, particularly for those with associate's degrees.

Of special interest is the ONG industry, which is a critical part of the domestic STEM economy and will need to fill nearly 1.9 million job opportunities through 2035. In our study, we find that occupations in the ONG industry pay, on average, substantially higher wages, both overall and for gender and race/ethnicity breakouts. Furthermore, those with specific postsecondary training in ONG fields are well-positioned for jobs in the STEM economy. However, licenses and certifications, which are growing in popularity, do not appear to convey the same benefits in the industry: Certification or license holders are about as likely to work in the ONG industry as their peers who lack such credentials.

To inform efforts at increasing STEM participation for underrepresented groups, we focus on gender and racial/ethnic differences. Some of the largest differences we observe in outcomes are related to gender. Although women attain more overall bachelor's degrees, men attain approximately the same number of bachelor's degrees in STEM fields as women. With respect to employment outcomes, women earn lower wages than men, and this is especially true among those with STEM bachelor's degrees, where the gap is around $7 per hour (versus the non-STEM gap of around $3.50 per hour). This gap could partially explain the low levels of STEM bachelor's attainment among women. However, the wage gap between men and women in STEM occupations is relatively small, at around $2 per hour, compared with the non-STEM occupation gap of around $6 per hour. This is likely driven by our finding that women with a STEM degree are much less likely to enter a STEM occupation than men with a STEM degree; in fact, women with a STEM degree are also marginally less likely to enter a STEM occupation than even men with a non-STEM bachelor's degree. Given the large wage premium for working in a STEM occupation, the fact that women with a STEM degree enter a STEM occupation at a lower rate than men increases the wage gap observed between the genders. And this trend is unlikely to be resolved soon: Over the past decade, the gap between the percentage of women graduating with a STEM degree and that of men graduating with a STEM degree has increased. On the other hand, we find much larger wage premiums among women than men for attaining a license or certification, including among those in STEM occupations.

Similar gaps in attainment and wages persist among racial and ethnic groups. Whites and Asians earn more bachelor's degrees in STEM fields and benefit more from their STEM degrees than their black and Hispanic peers. However, one particularly promising finding for traditionally disadvantaged populations is that the benefits of holding a license or certification are strongest for those lacking a high school diploma, women, and Hispanics. For example, women receive a \$10.10 per hour *benefit* from having a license or certification, while men experience a \$2.11 per hour *penalty*. For comparison, Hispanics receive a \$5.47 per hour wage boost from obtaining a license or certification, and those without a high school diploma receive a \$1.26 per hour wage boost. These findings suggest that attaining a license or certification is a possible avenue for improving employment outcomes for traditionally underrepresented groups. This warrants further research.

In closing, as the economy becomes increasingly reliant on workers with strong quantitative and analytical skills, there is a growing need for policymakers to identify the most-efficient ways to prepare all youth—including those not continuing on to college—for careers in STEM. Our study indicates that the receipt of a bachelor's degree in a STEM field and the attainment of a certification or license (in any field) are important educational milestones that support success in the STEM labor market. However, in both absolute and relative numbers, women and racial or ethnic minorities are less likely to earn these critical degrees. Without stronger support for these traditionally underrepresented groups, the STEM economy in general and the ONG industry in particular may fail to optimize the pool of potential workers that it needs to sustain growth and innovation.

Appendix A

STEM Degrees

STEM Degrees in the 2015 ACS, with U.S. Census Bureau Major Codes

- agricultural economics (1102), animal sciences (1103), food science (1104), plant science and agronomy (1105), soil science (1106), environmental science (1301), forestry (1302), area ethnic and civilization studies (1501), computer and information systems (2100), computer science (2102), information sciences (2105), computer administration management and security (2106), computer networking and telecommunications (2107), general engineering (2400), aerospace engineering (2401), biological engineering (2402), architectural engineering (2403), biomedical engineering (2404), chemical engineering (2405), civil engineering (2406), computer engineering (2407), electrical engineering (2408), engineering mechanics physics and science (2409), environmental engineering (2410), geological and geophysical engineering (2411), industrial and manufacturing engineering (2412), materials engineering and materials science (2413), mechanical engineering (2414), metallurgical engineering (2415), mining and mineral engineering (2416), naval architecture and marine engineering (2417), nuclear engineering (2418), petroleum engineering (2419), miscellaneous engineering (2499), linguistics and comparative language and literature (2601), biology (3600), biochemical sciences (3601), botany (3602), molecular biology (3603), ecology (3604), genetics (3605), microbiology (3606), pharmacology (3607), physiology (3608), zoology (3609), neuroscience (3611), miscellaneous biology (3699), mathematics (3700), applied mathematics (3701), statistics and decision science (3702), multi/interdisciplinary studies (4000, 4003, 4008), intercultural and international studies (4001), nutrition sciences (4002), mathematics and computer science (4005), cognitive science and biopsychology (4006), interdisciplinary social sciences (4007), physical sciences (5000), astronomy and astrophysics (5001), atmospheric sciences and meteorology (5002), chemistry (5003), geology and earth science (5004), geosciences (5005), oceanography (5006), physics (5007), materials science (5008), multi-disciplinary or general science (5098), nuclear, industrial radiology, and biological technologies (5102), psychology (5200), educational psychology (5201), clinical psychology (5202), counseling psychology (5203), industrial and organizational psychology (5205), social psychology (5206), miscellaneous psychology (5299), public policy (5402), general social sciences (5500), economics (5501), anthropology and archeology (5502), criminology (5503), geography (5504), international relations (5505), political science and government (5506), sociology (5507), miscellaneous social sciences (5599)

API Major Groupings

- **ONG**: geological and geophysical engineering (2411), petroleum engineering (2419), geology and earth science (5004), geosciences (5005)
- **ONG-related**: computer and information systems (2100), computer programming and data processing (2101), computer science (2102), information sciences (2105),

architectural engineering (2403), chemical engineering (2405), civil engineering (2406), electrical engineering (2408), mechanical engineering (2414), mechanical engineering related technologies (2504), geography (5504), electrical, mechanical, and precision technologies and production (5701)

- **Other STEM**: general agriculture (1100), agriculture production and management (1101), agricultural economics (1102), animal sciences (1103), food science (1104), plant science and agronomy (1105), soil science (1106), miscellaneous agriculture (1199), environmental science (1301), forestry (1302), natural resources management (1303), communication technologies (2001), computer administration management and security (2106), computer networking and telecommunications (2107), general engineering (2400), aerospace engineering (2401), biological engineering (2402), biomedical engineering (2404), computer engineering (2407), engineering mechanics physics and science (2409), environmental engineering (2410), industrial and manufacturing engineering (2412), materials engineering and materials science (2413), metallurgical engineering (2415), mining and mineral engineering (2416), naval architecture and marine engineering (2417), nuclear engineering (2418), miscellaneous engineering (2499), engineering technologies (2500), engineering and industrial management (2501), electrical engineering technology (2502), industrial production technologies (2503), miscellaneous engineering technologies (2599), biology (3600), biochemical sciences (3601), botany (3602), molecular biology (3603), ecology (3604), genetics (3605), microbiology (3606), pharmacology (3607), physiology (3608), zoology (3609), neuroscience (3611), miscellaneous biology (3699), mathematics (3700), applied mathematics (3701), statistics and decision science (3702), nutrition sciences (4002), mathematics and computer science (4005), physical sciences (5000), astronomy and astrophysics (5001), atmospheric sciences and meteorology (5002), chemistry (5003), oceanography (5006), physics (5007), materials science (5008), multi-disciplinary or general science (5098), nuclear, industrial radiology, and biological technologies (5102), construction services (5601), transportation sciences and technologies (5901)
- **Business, communications, and public policy**: communications (1901), journalism (1902), mass media (1903), advertising and public relations (1904), public administration (5401), general business (6200), accounting (6201), actuarial science (6202), business management and administration (6203), operations logistics and e-commerce (6204), business economics (6205), marketing and marketing research (6206), finance (6207), human resources and personnel management (6209), international business (6210), hospitality management (6211), management information systems and statistics (6212), miscellaneous business and medical administration (6299)
- **Professional**: architecture (1401), general education (2300), educational administration and supervision (2301), school student counseling (2303), elementary education (2304), mathematics teacher education (2305), physical and health education teaching (2306), early childhood education (2307), science and computer teacher education (2308), secondary teacher education (2309), special needs education (2310), social science or history teacher education (2311), teacher education: multiple levels (2312), language and drama education (2313), art and music education (2314), miscellaneous education (2399), library science (3501), general medical and health services (6100), communication disorders sciences and services (6102), health and medical administrative services (6103), medical assisting services (6104), medical technologies technicians (6105), health and

medical preparatory programs (6106), nursing (6107), pharmacy pharmaceutical sciences and administration (6108), treatment therapy professions (6109), community and public health (6110), miscellaneous health medical professions (6199)

- **Social science**: area ethnic and civilization studies (1501), linguistics and comparative language and literature (2601), French German Latin and other common foreign language studies (2602), other foreign languages (2603), English language and literature (3301), composition and rhetoric (3302), liberal arts (3401), humanities (3402), intercultural and international studies (4001), cognitive science and biopsychology (4006), interdisciplinary social sciences (4007), philosophy and religious studies (4801), theology and religious vocations (4901), psychology (5200), educational psychology (5201), clinical psychology (5202), counseling psychology (5203), industrial and organizational psychology (5205), social psychology (5206), miscellaneous psychology (5299), public policy (5402), social work (5404), general social sciences (5500), economics (5501), anthropology and archeology (5502), criminology (5503), international relations (5505), political science and government (5506), sociology (5507), miscellaneous social sciences (5599), fine arts (6000), drama and theater arts (6001), music (6002), visual and performing arts (6003), commercial art and graphic design (6004), film video and photographic arts (6005), art history and criticism (6006), studio arts (6007), miscellaneous fine arts (6099), history (6402), United States history (6403)
- **Other**: cosmetology services and culinary arts (2201), family and consumer sciences (2901), court reporting (3201), pre-law and legal studies (3202), military technologies (3801), multi/interdisciplinary studies (4000), physical fitness parks recreation and leisure (4101), criminal justice and fire protection (5301), human services and community organization (5403)

Appendix B

STEM Occupations and Industry Groupings

High STEM Occupations in the Brookings Institution Study, with U.S. Census Bureau Codes

- computer and information systems managers (0110), financial managers (0120), compensation and benefits managers (0135), purchasing managers (0150), farmers, ranchers, and other agricultural managers (0205), construction managers (0220), architectural and engineering managers (0300), natural sciences managers (0360), emergency management directors (0425), managers, all other (0430), purchasing agents, except wholesale, retail, and farm products (0530), compliance officers (0565), cost estimators (0600), logisticians (0700), accountants and auditors (0800), appraisers and assessors of real estate (0810), budget analysts (0820), financial analysts (0840), personal financial advisors (0850), tax preparers (0940), financial specialists, all other (0950), computer and information research scientists (1005), computer systems analysts (1006), information security analysts (1007), computer programmers (1010), software developers, applications and systems software (1020), web developers (1030), computer support specialists (1050), database administrators (1060), network and computer systems administrators (1105), computer network architects (1106), computer occupations, all other (1107), actuaries (1200), operations research analysts (1220), miscellaneous mathematical science occupations (1240), architects, except naval (1300), surveyors, cartographers, and photogrammetrists (1310), aerospace engineers (1320), biomedical engineers (1340), chemical engineers (1350), civil engineers (1360), computer hardware engineers (1400), electrical and electronics engineers (1410), environmental engineers (1420), industrial engineers, including health and safety (1430), marine engineers and naval architects (1440), materials engineers (1450), mechanical engineers (1460), petroleum engineers (1520), engineers, all other (1530), drafters (1540), engineering technicians, except drafters (1550), surveying and mapping technicians (1560), agricultural and food scientists (1600), biological scientists (1610), conservation scientists and foresters (1640), medical scientists (1650), astronomers and physicists (1700), atmospheric and space scientists (1710), chemists and materials scientists (1720), environmental scientists and geoscientists (1740), physical scientists, all other (1760), economists (1800), urban and regional planners (1840), miscellaneous social scientists and related workers (1860), agricultural and food science technicians (1900), biological technicians (1910), chemical technicians (1920), geological and petroleum technicians (1930), miscellaneous life, physical, and social science technicians (1965), artists and related workers (2600), technical writers (2840), television, video, and motion picture camera operators and editors (2920), chiropractors (3000), dentists (3010), dietitians and nutritionists (3030), optometrists (3040), pharmacists (3050), physicians and surgeons (3060), physician assistants (3110), podiatrists (3120), audiologists (3140), occupational therapists (3150), physical therapists (3160), radiation therapists (3200), respiratory therapists (3220), therapists, all other (3245), veterinarians (3250), registered nurses (3255), nurse anesthetists (3256), nurse practitioners (3258), health diagnosing and treating practitioners, all other (3260), clinical laboratory technologists and technicians (3300), diagnostic related technologists and technicians (3320), emergency medical technicians and paramedics (3400), other healthcare practitioners and technical occupations (3540), physical therapist assistants and aides (3620), veterinary assistants and laboratory animal caretakers (3648), first-line supervisors of firefighting and prevention workers (3720), firefighters (3740), fire inspectors (3750), first-line supervisors of landscaping, lawn service, and groundskeeping workers (4210), pest control workers (4240), morticians, undertakers, and funeral directors (4465), sales engineers (4930), credit authorizers, checkers, and clerks (5230), computer operators (5800), statistical assistants (5920), forest and conservation workers (6120), boilermakers (6210), carpenters (6230), cement masons, concrete finishers, and terrazzo workers (6250), drywall installers, ceiling tile installers, and tapers (6330), electricians (6355), pipelayers, plumbers, pipefitters, and steamfitters (6440), sheet metal workers (6520), structural iron and steel workers (6530), construction and building inspectors (6660), elevator installers and repairers (6700), explosives workers, ordnance handling experts, and blasters (6830), mining machine operators (6840), first-line supervisors of mechanics, installers, and repairers (7000), computer, automated teller, and office machine repairers (7010), radio and telecommunications equipment installers and repairers (7020), avionics technicians (7030), electric motor, power tool, and related repairers (7040), electrical and electronics repairers, industrial and utility (7100), electronic equipment installers and repairers, motor vehicles (7110), electronic home entertainment equipment installers and repairers (7120), aircraft mechanics and service technicians (7140), automotive service technicians and mechanics (7200), heavy vehicle and mobile equipment service technicians and mechanics (7220), small engine mechanics (7240), heating, air conditioning, and refrigeration mechanics and installers (7315), industrial and refractory machinery mechanics (7330), maintenance workers, machinery (7350), millwrights (7360), precision instrument and equipment repairers (7430), first-line supervisors of production and operating workers (7700), extruding and drawing machine setters, operators, and tenders, metal and plastic (7920), machinists (8030), tool and die makers (8130), welding, soldering, and brazing workers (8140), prepress technicians and workers (8250), power plant operators, distributors, and dispatchers (8600), stationary engineers and boiler operators (8610), water and wastewater treatment plant and system operators (8620), miscellaneous plant and system operators (8630), furnace, kiln, oven, drier, and kettle operators and tenders (8730), aircraft pilots and flight engineers (9030), sailors and marine oilers (9300), ship and boat captains and operators (9310), transportation inspectors (9410), cleaners of vehicles and equipment (9610), pumping station operators (9650)[10]

[10] For more information on the Brookings Institution study that gave STEM occupations a knowledge score of low to high, see Rothwell, 2013.

API Industry Groupings

- **Downstream**: natural gas distribution (0580), petroleum refining (2070), miscellaneous petroleum and coal products (2090), petroleum and petroleum products merchant wholesalers (4490), fuel dealers (5680)
- **Investment**: iron and steel mills and steel product manufacturing (2670), metal forgings and stampings (2780), structural metals, and boiler, tank, and shipping container manufacturing (2870), miscellaneous fabricated metal products manufacturing (2980), construction, and mining and oil and gas field machinery manufacturing (3080), architectural, engineering, and related services (7290)
- **Midstream**: rail transportation (6080), pipeline transportation (6270), warehousing and storage (6390)
- **Petrochemical**: resin, synthetic rubber, and fibers and filaments manufacturing (2170), agricultural chemical manufacturing (2180), industrial and miscellaneous chemicals (2290)
- **Upstream**: oil and gas extraction (0370), support activities for mining (0490)

Appendix C

Analytic Methods

The employment and wage results presented in this report come from regressions with demographic variables included to control for these factors. For the employment outcomes, the regression samples include everyone in the relevant regression sample (e.g., all individuals, all men, all American Indians). The basic specification is given by Equation C.1.

$$Y_{ij} = \alpha + \beta STEM\ Major_i + \gamma_1 College_i + \gamma_2 Some\ College_i + \gamma_3\ HS + X_i\delta + \psi_j + \varepsilon_{ij} \qquad \text{(C.1)}$$

We look at three employment outcomes in Y_{ij}: overall employment, employment in a STEM occupation, and employment in a specific industry (e.g., ONG). We control for many variables: educational attainment (college graduate, some college, high school graduate, or less than a high school diploma), age decades (individuals in their teens, 20s, 30s, 40s, 50s, or 60s), gender, race, marital status, whether someone has children at home, and all of those variables interacted with whether someone is a college graduate. We also control for small geographic fixed effects in ψ_j; for the ACS regressions, this is the Public Use Microdata Areas. We use the provided weights to get to nationally representative numbers.

To calculate the predicted percentages, we use the average marginal effects. For example, for the overall employment rate, we use Equation C.2.

$$\hat{Y} = \sum_{i=1}^{N} \hat{\alpha} + \hat{\beta} STEM\ Major_i + \widehat{\gamma_1} College_i + \widehat{\gamma_2} Some\ College_i + \widehat{\gamma_3}\ HS + X_i\hat{\delta} + \widehat{\psi_J} \qquad \text{(C.2)}$$

To calculate the predicted percentage of bachelor's graduates who are working, we use Equation C.3.

$$\hat{Y} = \sum_{i=1}^{N} \hat{\alpha} + \hat{\beta} STEM\ Major_i + \widehat{\gamma_1} + X_i\hat{\delta} + \widehat{\psi_J} \qquad \text{(C.3)}$$

To calculate the predicted percentage of STEM bachelor's recipients who are working, we use Equation C.4.

$$\hat{Y} = \sum_{i=1}^{N} \hat{\alpha} + \hat{\beta} + \widehat{\gamma_1} + X_i\hat{\delta} + \widehat{\psi_J} \qquad \text{(C.4)}$$

The methodology to calculate wage effects is slightly more complicated. To account for the fact that there is nonrandom selection in a person's choice of whether to work, we use a Heckman two-stage model. The first stage calculates the likelihood of working for wages using a probit model, and the second stage calculates the wage effect using ordinary least squares while including the inverse mills ratio derived from the first stage. We do these steps separately. Because of the large sample size and the large number of regressions needed to run, we do not use the full-information maximum likelihood approach of the Heckman selection model; instead, we use the two-step method. We again use the weights for each step. The first-stage probit regression includes all of the variables as in the employment regression (except for variables only observed for employed individuals, such as industry or occupation), as well as the interaction of female and marital status and number of children at home. The second-stage wage regression, on the other hand, does not include the interaction between female and marital status nor the number of children at home, but does include an indicator for being part-time, part-time status times the number of hours worked, and part-time status interacted with gender, as well as the inverse mills ratio to control for the nonrandom selection for working or not working.

We use the average marginal effects to calculate the average regression-adjusted wages, in the same way as described earlier, here using the second-stage regression.

Appendix D

Additional Tables and Figures

Table D.1: Total Number of Postsecondary Degrees Awarded, 2003–2015

Year	Bachelor's Degrees	Associate's Degrees	Total Degrees
2003	1,348,811	634,016	1,982,827
2004	1,399,542	665,363	2,064,905
2005	1,439,264	696,720	2,135,984
2006	1,485,242	713,125	2,198,367
2007	1,524,092	728,181	2,252,273
2008	1,563,069	750,215	2,313,284
2009	1,601,399	787,243	2,388,642
2010	1,649,919	848,856	2,498,775
2011	1,716,053	943,506	2,659,559
2012	1,792,163	1,021,718	2,813,881
2013	1,840,381	1,007,427	2,847,808
2014	1,870,150	1,005,155	2,875,305
2015	1,894,934	1,013,971	2,908,905

SOURCE: Authors' analysis of IPEDS data.

Table D.2: Total Number of Bachelor's Degrees Awarded in STEM and Non-STEM Majors, 2003–2015

Year	STEM	Non-STEM
2003	469,923	878,888
2004	486,515	913,027
2005	498,202	941,062
2006	507,752	977,490
2007	516,222	1,007,870
2008	527,777	1,035,292
2009	536,902	1,064,497
2010	558,362	1,091,557
2011	587,890	1,128,163
2012	622,015	1,170,148
2013	647,759	1,192,622
2014	666,779	1,203,371
2015	680,890	1,214,044

SOURCE: Authors' analysis of IPEDS data.

Table D.3: Total Number of Bachelor's Degrees Awarded in Oil and Natural Gas Majors, 2003–2015

Year	ONG	ONG-Related
2003	3,754	32,129
2004	3,709	32,878
2005	3,703	32,542
2006	3,786	33,152
2007	3,908	33,679
2008	4,218	34,170
2009	4,645	33,989
2010	5,022	34,619
2011	5,788	36,288
2012	6,353	36,954
2013	6,846	37,819
2014	7,584	38,036
2015	8,341	37,964

SOURCE: Authors' analysis of IPEDS data.

Table D.4: Total Number of Associate's Degrees Awarded in STEM and Non-STEM Majors, 2003–2015

Year	STEM	Non-STEM
2003	114,436	519,580
2004	109,399	555,964
2005	99,899	596,821
2006	92,552	620,573
2007	90,263	637,918
2008	92,568	657,647
2009	97,655	689,588
2010	108,597	740,259
2011	125,680	817,826
2012	137,739	883,979
2013	137,121	870,306
2014	138,732	866,423
2015	142,929	871,042

SOURCE: Authors' analysis of IPEDS data.

Table D.5: Total Number of Associate's Degrees Awarded in Oil and Natural Gas Majors, 2003–2015

Year	ONG	ONG-Related
2003	4,220	31,945
2004	4,586	32,620
2005	4,776	32,689
2006	5,028	30,744
2007	5,333	30,059
2008	5,908	31,137
2009	6,160	32,462
2010	6,812	34,183
2011	8,185	37,140
2012	8,531	36,743
2013	8,059	32,459
2014	8,082	30,411
2015	8,535	29,056

SOURCE: Authors' analysis of IPEDS data.

Table D.6: Total Number of Postsecondary Degrees Awarded, by Gender, 2003–2015

	Men		Women	
Year	Bachelor's Degrees	Associate's Degrees	Bachelor's Degrees	Associate's Degrees
2003	573,258	253,451	775,553	380,565
2004	595,425	260,095	804,117	405,268
2005	613,000	267,596	826,264	429,124
2006	630,600	270,154	854,642	442,971
2007	649,570	275,254	874,522	452,927
2008	667,928	282,566	895,141	467,649
2009	685,422	298,066	915,977	489,177
2010	706,660	322,747	943,259	526,109
2011	734,159	361,408	981,894	582,098
2012	765,772	393,479	1,026,391	628,239
2013	787,408	389,195	1,052,973	618,232
2014	801,905	391,474	1,068,245	613,681
2015	812,669	396,613	1,082,265	617,358

SOURCE: Authors' analysis of IPEDS data.

Table D.7: Total Number of Bachelor's Degrees Awarded in STEM and Non-STEM Majors, by Gender, 2003–2015

	Men		Women	
Year	STEM Degrees	Non-STEM Degrees	STEM Degrees	Non-STEM Degrees
2003	233,312	339,946	236,611	538,942
2004	242,168	353,257	244,347	559,770
2005	247,965	365,035	250,237	576,027
2006	251,996	378,604	255,756	598,886
2007	256,366	393,204	259,856	614,666
2008	262,078	405,850	265,699	629,442
2009	266,014	419,408	270,888	645,089
2010	277,533	429,127	280,829	662,430
2011	292,436	441,723	295,454	686,440
2012	309,130	456,642	312,885	713,506
2013	322,998	464,410	324,761	728,212
2014	334,904	467,001	331,875	736,370
2015	344,349	468,320	336,541	745,724

SOURCE: Authors' analysis of IPEDS data.

Table D.8: Total Number of Bachelor's Degrees Awarded in Oil and Natural Gas Majors, by Gender, 2003–2015

	Men		Women	
Year	ONG	ONG-Related	ONG	ONG-Related
2003	2,200	26,155	1,554	5,974
2004	2,174	26,618	1,535	6,260
2005	2,185	26,458	1,518	6,084
2006	2,274	27,143	1,512	6,009
2007	2,384	27,815	1,524	5,864
2008	2,600	28,137	1,618	6,033
2009	2,982	28,205	1,663	5,784
2010	3,216	28,591	1,806	6,028
2011	3,730	29,896	2,058	6,392
2012	4,110	30,296	2,243	6,658
2013	4,473	30,971	2,373	6,848
2014	4,997	31,013	2,587	7,023
2015	5,577	30,984	2,764	6,980

SOURCE: Authors' analysis of IPEDS data.

Table D.9: Total Number of Associate's Degrees Awarded in STEM and Non-STEM Majors, by Gender, 2003–2015

	Men		Women	
Year	STEM	Non-STEM	STEM	Non-STEM
2003	76,677	176,774	37,759	342,806
2004	73,641	186,454	35,758	369,510
2005	67,416	200,180	32,483	396,641
2006	61,937	208,217	30,615	412,356
2007	59,880	215,374	30,383	422,544
2008	61,133	221,433	31,435	436,214
2009	63,476	234,590	34,179	454,998
2010	69,728	253,019	38,869	487,240
2011	81,178	280,230	44,502	537,596
2012	88,849	304,630	48,890	579,349
2013	87,073	302,122	50,048	568,184
2014	87,025	304,449	51,707	561,974
2015	88,422	308,191	54,507	562,851

SOURCE: Authors' analysis of IPEDS data.

Table D.10: Total Number of Bachelor's Degrees Awarded, by Race/Ethnicity, 2003–2015

Year	White	Black	Hispanic	Asian	American Indian
2003	944,136	117,796	84,337	83,254	9,369
2004	967,899	123,464	89,060	86,438	10,020
2005	987,923	127,844	94,995	91,197	9,703
2006	1,011,469	133,577	100,960	96,014	10,280
2007	1,032,762	137,421	107,716	98,730	10,749
2008	1,051,196	142,435	114,979	101,977	10,768
2009	1,069,090	145,837	120,681	105,016	11,409
2010	1,081,905	152,160	129,866	108,670	11,485
2011	1,104,665	160,741	143,995	109,065	11,139
2012	1,133,877	173,046	158,352	113,610	10,740
2013	1,150,537	179,409	175,475	117,733	10,750
2014	1,154,578	180,780	191,557	119,851	10,205
2015	1,150,015	182,628	206,681	122,623	9,691

SOURCE: Authors' analysis of IPEDS data.

Table D.11: Total Number of Associate's Degrees Awarded, by Race/Ethnicity, 2003–2015

Year	White	Black	Hispanic	Asian	American Indian
2003	418,073	72,169	63,549	31,084	7,133
2004	431,458	76,864	68,321	31,306	7,691
2005	449,975	81,747	74,280	31,831	8,001
2006	456,983	84,477	76,105	33,129	8,067
2007	461,896	85,892	80,198	35,007	8,076
2008	467,415	89,022	85,123	36,201	8,256
2009	486,263	94,487	91,559	38,487	8,222
2010	512,615	105,418	104,154	40,745	9,372
2011	561,354	119,505	117,269	38,551	9,452
2012	589,220	131,835	140,858	41,659	9,956
2013	581,228	127,823	148,870	42,938	9,936
2014	568,889	127,161	159,202	44,090	9,780
2015	561,742	131,132	172,061	46,025	9,515

SOURCE: Authors' analysis of IPEDS data.

Table D.12: Total Number of Bachelor's Degrees Awarded in STEM Majors, by Race/Ethnicity, 2003–2015

Year	White	Black	Hispanic	Asian	American Indian
2003	311,613	40,119	31,147	41,841	3,183
2004	319,190	41,580	32,418	43,321	3,595
2005	325,306	42,529	34,518	45,163	3,393
2006	331,471	42,633	36,199	46,326	3,560
2007	336,496	43,016	38,305	47,384	3,595
2008	341,453	44,041	40,619	49,328	3,615
2009	344,831	44,634	42,509	50,278	3,813
2010	352,084	46,426	46,222	52,431	3,924
2011	364,661	49,413	51,979	53,355	3,743
2012	379,835	53,086	58,110	55,252	3,657
2013	390,405	55,553	65,656	58,125	3,730
2014	396,463	56,286	72,246	59,566	3,436
2015	396,559	57,194	78,483	61,191	3,241

SOURCE: Authors' analysis of IPEDS data.

Table D.13: Total Number of Associate's Degrees Awarded in STEM Majors, by Race/Ethnicity, 2003–2015

Year	White	Black	Hispanic	Asian	American Indian
2003	72,211	13,814	11,706	7,602	1,241
2004	68,666	12,676	11,574	6,576	1,275
2005	62,717	11,648	11,316	5,722	1,209
2006	58,315	10,905	10,513	5,294	1,156
2007	56,272	10,208	11,008	5,477	1,159
2008	56,409	10,501	11,969	5,646	1,235
2009	58,938	10,632	12,523	6,267	1,172
2010	63,792	12,125	13,939	6,984	1,204
2011	72,431	13,905	16,346	7,287	1,441
2012	75,108	14,352	19,788	8,148	1,413
2013	75,552	14,753	22,840	9,030	1,502
2014	74,263	14,805	25,807	9,151	1,518
2015	74,164	15,627	28,188	10,231	1,467

SOURCE: Authors' analysis of IPEDS data.

Table D.14: Total Number of Bachelor's Degrees Awarded to Men in STEM Majors, by Race/Ethnicity, 2003–2015

Year	White	Black	Hispanic	Asian	American Indian
2003	158,347	14,924	13,524	22,011	1,396
2004	162,859	15,477	14,059	22,393	1,673
2005	166,302	15,864	14,762	23,320	1,546
2006	169,610	16,065	15,467	23,462	1,572
2007	173,048	16,051	16,200	24,019	1,610
2008	175,668	16,537	17,288	25,075	1,682
2009	177,784	16,528	17,985	25,302	1,708
2010	182,448	17,386	19,709	26,333	1,788
2011	188,886	18,657	22,210	27,239	1,724
2012	196,620	20,027	24,933	28,217	1,644
2013	202,535	21,813	28,177	30,176	1,753
2014	207,389	22,178	31,402	30,876	1,570
2015	209,102	22,913	34,233	31,900	1,532

SOURCE: Authors' analysis of IPEDS data.

Table D.15: Total Number of Bachelor's Degrees Awarded to Women in STEM Majors, by Race/Ethnicity, 2003–2015

Year	White	Black	Hispanic	Asian	American Indian
2003	153,266	25,195	17,623	19,830	1,787
2004	156,331	26,103	18,359	20,928	1,922
2005	159,004	26,665	19,756	21,843	1,847
2006	161,861	26,568	20,732	22,864	1,988
2007	163,448	26,965	22,105	23,365	1,985
2008	165,785	27,504	23,331	24,253	1,933
2009	167,047	28,106	24,524	24,976	2,105
2010	169,636	29,040	26,513	26,098	2,136
2011	175,775	30,756	29,769	26,116	2,019
2012	183,215	33,059	33,177	27,035	2,013
2013	187,870	33,740	37,479	27,949	1,977
2014	189,074	34,108	40,844	28,690	1,866
2015	187,457	34,281	44,250	29,291	1,709

SOURCE: Authors' analysis of IPEDS data.

Table D.16: Employment Status, by STEM or Non-STEM Bachelor's Degree and Oil and Natural Gas Subindustry

		Type of Bachelor's Degree			
	Overall	STEM	Non-STEM	Difference	Sample
Downstream	0.3%	0.4%	0.3%	0.1***	4,926
Midstream	0.4%	0.6%	0.3%	0.3***	6,514
Upstream	0.5%	0.2%	0.3%	0.0	7,393
Investment minus construction	1.6%	3.1%	1.5%	1.6***	24,953
Petrochemical	0.4%	0.7%	0.3%	0.4***	6,022
Retail†	0.3%	0.1%	0.1%	0.0**	4,758
Construction†	5.9%	2.5%	2.5%	0.0	75,683

SOURCE: Authors' analysis of ACS data.

NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

† Not included as an ONG subindustry in this report.

Table D.17: Employment Status, by STEM or Non-STEM Bachelor's Degree and Census Region

		Type of Bachelor's Degree			
	Overall	**STEM**	**Non-STEM**	**Difference**	**Sample**
Employed in any occupation					
New England	76.4%	85.3%	85.5%	−0.2	79,953
Middle Atlantic	73.3%	83.5%	83.6%	−0.2	226,536
East North Central	72.7%	84.7%	84.2%	0.5	254,555
West North Central	77.5%	86.3%	86.5%	−0.1	113,745
South Atlantic	71.3%	82.4%	81.8%	0.6**	331,479
East South Central	66.9%	82.3%	82.3%	0.0	102,065
West South Central	70.9%	81.2%	81.9%	−0.6	201,156
Mountain	71.8%	81.3%	81.0%	0.3	120,926
Pacific	71.8%	82.4%	81.5%	0.9***	278,589
Employed in a STEM occupation					
New England	24.0%	40.0%	28.7%	11.3***	79,953
Middle Atlantic	21.0%	37.7%	26.5%	11.2***	226,536
East North Central	21.8%	42.0%	28.6%	13.4***	254,555
West North Central	22.9%	43.3%	28.3%	15.0***	113,745
South Atlantic	21.6%	39.8%	28.1%	11.7***	331,479
East South Central	20.2%	40.4%	26.7%	13.7***	102,065
West South Central	21.5%	40.4%	27.5%	13.0***	201,156
Mountain	20.9%	39.0%	26.7%	12.3***	120,926
Pacific	21.6%	40.8%	28.1%	12.8***	278,589
Employed in the ONG industry					
New England	2.2%	3.1%	1.8%	1.4***	79,953
Middle Atlantic	2.6%	3.9%	2.0%	1.8***	226,536
East North Central	3.7%	5.3%	2.8%	2.5***	254,555
West North Central	3.2%	4.6%	2.6%	2.1***	113,745
South Atlantic	2.4%	3.8%	2.1%	1.7***	331,479
East South Central	3.3%	5.8%	2.5%	3.3***	102,065
West South Central	6.4%	11.8%	5.4%	6.4***	201,156
Mountain	3.1%	5.1%	2.4%	2.7***	120,926
Pacific	2.3%	4.0%	2.5%	1.5***	278,589

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.18: Employment Status, by STEM or Non-STEM Bachelor's Degree, Gender, and Race/Ethnicity

			Type of Bachelor's Degree			
Outcome	**Overall**	**Bachelor's Graduates**	**STEM**	**Non-STEM**	**Difference**	**Sample Size**
Employed in any occupation						
White men	78.8%	87.4%	87.7%	87.3%	0.4***	580,088
Black men	62.7%	80.7%	81.6%	80.6%	1.0	85,571
Hispanic men	80.4%	86.9%	86.8%	86.9%	−0.1	120,302
Asian men	84.0%	87.8%	89.6%	86.9%	2.7***	42,285
American Indian men	58.2%	81.3%	80.5%	81.4%	−0.008	8,128
White women	69.0%	78.9%	78.1%	79.0%	−0.8***	578,707
Black women	66.4%	81.9%	81.8%	81.9%	−0.001	89,045
Hispanic women	62.0%	77.3%	76.7%	77.3%	−0.006	117,535
Asian women	66.3%	71.6%	72.3%	71.5%	0.008	49,236
American Indian women	56.1%	78.1%	79.6%	78.1%	0.015	8,052
Employed in a STEM occupation						
White men	30.8%	34.4%	50.2%	31.7%	18.5***	580,088
Black men	15.7%	25.3%	37.8%	24.4%	13.4***	85,571
Hispanic men	20.3%	28.6%	43.8%	27.7%	16.1***	120,302
Asian men	39.0%	48.8%	62.7%	41.0%	21.7***	42,285
American Indian men	20.6%	23.2%	40.5%	22.2%	18.3***	8,128
White women	16.3%	24.4%	30.0%	23.7%	6.2***	578,707
Black women	11.0%	22.8%	24.7%	22.7%	2.0**	89,045
Hispanic women	8.0%	19.3%	23.4%	19.0%	4.3***	117,535
Asian women	26.6%	39.1%	46.0%	37.0%	8.9***	49,236
American Indian women	10.9%	18.3%	31.0%	17.6%	13.4***	8,052
Employed in the ONG industry						
White men	5.4%	4.5%	7.8%	3.9%	3.9***	580,088
Black men	3.4%	2.5%	4.9%	2.3%	2.6***	85,571
Hispanic men	4.2%	4.4%	7.0%	4.3%	2.7***	120,302
Asian men	3.5%	3.4%	4.9%	2.6%	2.3***	42,285
American Indian men	3.3%	3.1%	5.4%	3.0%	2.4	8,128
White women	1.5%	1.6%	2.5%	1.4%	1.0***	578,707
Black women	1.0%	1.0%	1.4%	0.9%	0.5**	89,045
Hispanic women	1.4%	1.5%	2.0%	1.5%	0.5**	117,535
Asian women	1.3%	1.5%	2.2%	1.3%	0.9***	49,236
American Indian women	1.0%	0.2%	1.1%	0.1%	1.0**	8,052

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.19: Hourly Wages, by Oil and Natural Gas or Non–Oil and Natural Gas Industry

	Type of Industry			
Overall	ONG	Non-ONG	Difference	Sample
$25.67	$30.46	$25.47	$4.98***	1,232,815

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.20: Hourly Wages, by STEM or Non-STEM Bachelor's Degree

	Type of Bachelor's Degree			
	STEM	Non-STEM	Difference	Sample
All Industries	$37.67	$31.50	$6.17***	438,491
ONG industry	$43.57	$35.70	$7.87***	16,569

SOURCE: Authors' analysis of ACS data.
NOTE: Degree refers to bachelor's degree. Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.21: Hourly Wages, by STEM or Non-STEM Occupation

	Type of Occupation			
	STEM	Non-STEM	Difference	Sample
All Industries	$31.98	$23.63	$8.36***	1,228,264
ONG industry	$33.34	$28.82	$4.52***	49,808

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.22: Hourly Wages, by STEM or Non-STEM Bachelor's Degree and Oil and Natural Gas Subindustry

	Type of Bachelor's Degree			
	STEM	Non-STEM	Difference	Sample
Downstream	$59.09	$38.14	$20.95***	1,346
Midstream	$61.61	$41.61	$20.00***	1,751
Upstream	$44.78	$33.99	$10.79*	973
Investment, non-construction	$38.41	$33.88	$4.53***	10,564
Petrochemical	$43.39	$35.59	$7.80***	1,935

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.23: Hourly Wages, by STEM or Non-STEM Occupation and Oil and Natural Gas Subindustry

		Type of Occupation			
	Overall	STEM	Non-STEM	Difference	Sample
Downstream	$32.29	$40.50	$31.57	$8.94***	4,926
Midstream	$35.75	$43.62	$35.10	$8.52***	6,514
Upstream	$28.15	$36.95	$26.34	$10.61***	7,393
Investment, non-construction	$28.04	$29.66	$27.35	$2.31***	24,953
Petrochemical	$29.75	$34.61	$28.25	$6.36***	6,022

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.24: Hourly Wages, by Oil and Natural Gas or Non–Oil and Natural Gas Industry and Census Region

		Type of Industry			
Group 1	Overall	ONG	Non-ONG	Difference	Sample
New England	$30.07	$30.18	$30.07	$0.11	60,630
Middle Atlantic	$28.71	$30.35	$28.66	$1.69***	166,904
East North Central	$24.32	$27.36	$24.18	$3.18***	187,547
West North Central	$24.15	$27.26	$24.03	$3.23***	86,664
South Atlantic	$24.73	$28.16	$24.63	$3.53***	237,473
East South Central	$21.76	$28.19	$21.48	$6.71***	68,876
West South Central	$23.92	$34.31	$23.03	$11.28***	141,160
Mountain	$24.24	$29.75	$24.02	$5.73***	87,204
Pacific	$28.12	$30.30	$28.06	$2.24***	196,340

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.25: Hourly Wages, by STEM or Non-STEM Bachelor's Degree and Census Region

	Type of Bachelor's Degree			
	STEM	Non-STEM	Difference	Sample
All industries				
New England	$40.00	$34.95	$5.05***	27,780
Middle Atlantic	$40.21	$35.62	$4.58***	66,088
East North Central	$34.98	$29.46	$5.52***	60,333
West North Central	$35.50	$29.21	$6.29***	27,045
South Atlantic	$35.66	$29.48	$6.18***	89,603
East South Central	$31.88	$26.83	$5.05***	20,434
West South Central	$36.62	$29.25	$7.37***	44,427
Mountain	$35.27	$29.29	$5.97***	29,578
Pacific	$40.41	$34.28	$6.13***	73,186
ONG industry				
New England	$39.08	$35.00	$4.08*	741
Middle Atlantic	$42.80	$36.70	$6.10***	1,988
East North Central	$36.89	$32.48	$4.40***	2,346
West North Central	$40.68	$31.66	$9.03**	873
South Atlantic	$38.86	$32.57	$6.30***	2,914
East South Central	$45.64	$32.00	$13.64*	769
West South Central	$52.59	$38.06	$14.52***	3,627
Mountain	$40.17	$34.60	$5.57***	1,173
Pacific	$39.82	$36.85	$2.97***	2,138

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.26: Hourly Wages, by STEM or Non-STEM Occupation and Census Region

	Type of Occupation			
	STEM	Non-STEM	Difference	Sample
All industries				
New England	$37.39	$27.41	$9.98***	60,533
Middle Atlantic	$35.00	$26.77	$8.22***	166,723
East North Central	$30.09	$22.44	$7.65***	187,378
West North Central	$30.07	$22.18	$7.88***	86,497
South Atlantic	$30.67	$22.78	$7.89***	235,826
East South Central	$27.88	$19.89	$7.99***	68,632
West South Central	$29.73	$22.06	$7.67***	140,592
Mountain	$30.44	$22.25	$8.19***	86,889
Pacific	$35.47	$25.75	$9.72***	195,177
ONG industry				
New England	$31.33	$29.95	$1.38	1,588
Middle Atlantic	$31.95	$29.70	$2.25*	5,669
East North Central	$29.99	$26.13	$3.86***	8,647
West North Central	$28.70	$26.84	$1.86	3,413
South Atlantic	$30.49	$26.82	$3.67***	7,233
East South Central	$35.78	$23.55	$12.23**	3,034
West South Central	$37.83	$32.07	$5.76***	11,336
Mountain	$31.77	$28.91	$2.86***	3,393
Pacific	$32.76	$28.93	$3.83***	5,495

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.27: Hourly Wages, by Oil and Natural Gas or Non–Oil and Natural Gas Industry, Gender, and Race/Ethnicity

		Type of Industry			
	Overall	ONG	Non-ONG	Difference	Sample Size
White men	$31.52	$35.75	$31.23	$4.52***	448,285
Black men	$21.34	$26.31	$21.11	$5.20***	52,989
Hispanic men	$19.99	$25.22	$19.71	$5.51***	93,448
Asian men	$35.25	$37.16	$35.16	$2.00**	34,960
American Indian men	$21.36	$25.87	$21.13	$4.73***	4,880
White women	$23.95	$28.83	$23.86	$4.97***	403,271
Black women	$19.38	$22.31	$19.34	$2.98***	61,024
Hispanic women	$17.38	$19.52	$17.34	$2.18***	74,424
Asian women	$28.60	$32.48	$28.53	$3.95***	33,419
American Indian women	$17.73	$19.93	$17.71	$2.22	4,751

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.28: Hourly Wages, by STEM or Non-STEM Bachelor's Degree, Gender, and Race/Ethnicity

	Type of Bachelor's Degree			
	STEM	**Non-STEM**	**Difference**	**Sample**
All industries				
White men	$43.40	$35.86	$7.54***	163,271
Black men	$32.36	$26.12	$6.25***	10,617
Hispanic men	$36.24	$28.61	$7.64***	13,749
Asian men	$46.70	$37.23	$9.47***	20,654
American Indian men	$31.92	$26.87	$5.05	585
White women	$34.48	$30.60	$3.88***	168,301
Black women	$26.48	$24.81	$1.67***	16,774
Hispanic women	$28.81	$26.24	$2.57***	16,321
Asian women	$40.40	$34.20	$6.20***	19,583
American Indian women	$21.75	$21.96	−$0.21	808
ONG industry				
White men	$47.03	$39.80	$7.23***	9,911
Black men	$49.70	$29.75	$19.96**	398
Hispanic men	$43.68	$33.52	$10.17***	753
Asian men	$47.84	$38.61	$9.24***	927
American Indian men	$45.10	$30.72	$14.38	34
White women	$44.04	$34.21	$9.83***	3,341
Black women	$36.94	$26.92	$10.01***	209
Hispanic women	$35.91	$27.88	$8.04***	327
Asian women	$43.82	$37.36	$6.46**	386
American Indian women	$27.74	$24.13	$3.61	8

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.29: Hourly Wages, by STEM or Non-STEM Occupation, Gender, and Race/Ethnicity

	Type of Occupation			
	STEM	Non-STEM	Difference	Sample
All industries				
White men	$35.80	$29.38	$6.42***	445,593
Black men	$27.29	$19.99	$7.31***	52,563
Hispanic men	$24.17	$18.80	$5.37***	92,886
Asian men	$42.77	$29.55	$13.22***	34,826
American Indian men	$26.07	$19.90	$6.18***	4,850
White women	$32.23	$21.97	$10.26***	402,977
Black women	$26.81	$18.28	$8.53***	60,905
Hispanic women	$25.03	$16.56	$8.48***	74,340
Asian women	$38.91	$23.87	$15.04***	33,393
American Indian women	$22.03	$17.08	$4.94***	4,748
ONG industry				
White men	$36.83	$34.84	$1.99***	29,660
Black men	$32.14	$23.86	$8.28**	2,415
Hispanic men	$28.79	$23.42	$5.37***	4,839
Asian men	$39.37	$34.01	$5.36***	1,384
American Indian men	$31.89	$21.62	$10.27***	249
White women	$32.88	$26.62	$6.26***	7,777
Black women	$29.58	$20.03	$9.55***	822
Hispanic women	$26.09	$17.88	$8.21***	1,327
Asian women	$38.24	$26.26	$11.98***	535
American Indian women	$21.85	$18.89	$2.96	62

SOURCE: Authors' analysis of ACS data.
NOTE: Results are weighted so that the estimates generalize to all noninstitutionalized individuals aged 18–65 in the United States in 2015 who were not currently in school. All estimates are regression-adjusted to eliminate the potential confounding effects of gender, race/ethnicity, age, marital status, the presence of dependents, and county of residence.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure D.1: Hourly Wages, by Oil and Natural Gas Subindustry

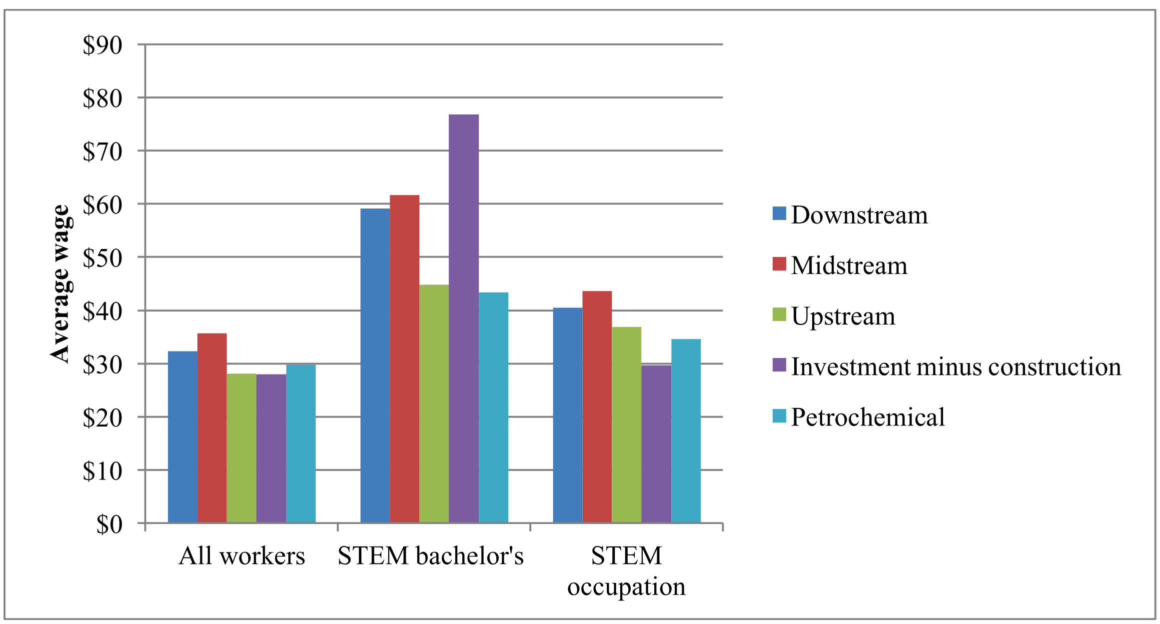
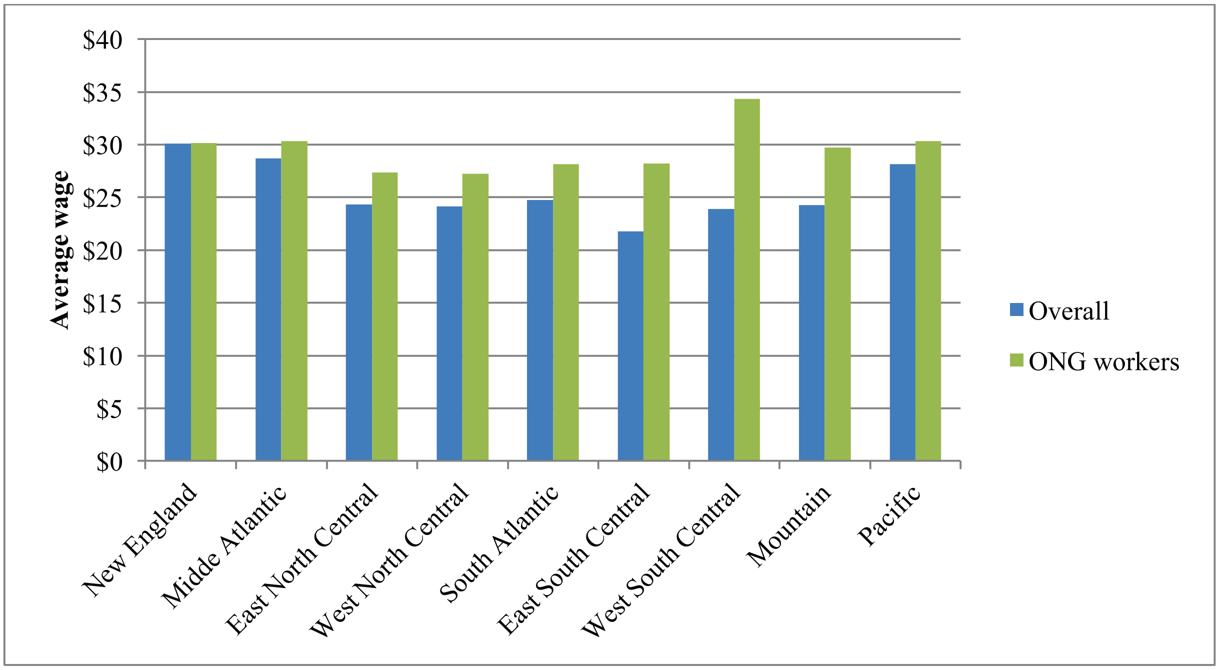


Figure D.2: Hourly Wages, by Census Region



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