



LOS ANGELES COUNTY ECONOMIC DEVELOPMENT CORPORATION



Four-Year Colleges and Universities
Addressing the
Knowledge Worker Talent Gap
in Southern California

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This study was commissioned and funded by California State University, Northridge (CSUN) as part of its ongoing commitment to making purposeful and effective educational and research contributions that will help ensure that the region and beyond has university-prepared workforce, the change makers and the innovative insights essential for the future of the economy and for the evolution of diverse and inclusive communities.

(No state tax dollars — general fund dollars — were spent to commission, fund, or produce this study.)

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CSUN’s Tseng College design team

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FOREWORD

Southern California's impressive array of four-year colleges and universities have always played an outsized role in the region's talent development landscape, educating more than 141,300 post-secondary and graduate students annually. But, as the Southern California regional economy, like the global economy, continues to be further enveloped and transformed by digital technology in what has been referred to as a "globotics" economy,¹ their already outsized role will become more important as the rapidity and scale of changing labor market conditions continue to accelerate and an increasing number of the region's residents are presented with both the promise of economic success and the peril of being left behind.

"Recent years have yielded significant advances, with profound impacts on society. Technology is transforming the way we work, play, and interact with others. From these technological capabilities, new industries, organizational forms, and business models are emerging. The education system will need to adapt to prepare individuals for the changing labor market."

— National Academies of Sciences²

In particular, structural changes in the labor market brought on by information technologies, automation, robotics, artificial intelligence, machine learning, internet of things, and ever more powerful computers are changing the nature of work, the need for labor, the organization of firms, the rewards that workers now earn, and the segmentation of our labor markets, with the fastest-growing labor market segments being low- and high-skilled occupational categories. At the same time as labor markets are rapidly changing and becoming increasingly stratified, we are also not meeting industry's growing demand for a university-prepared workforce.

¹ See Richard Baldwin, "The Globotics Upheaval: Globalization, Robotics, and the Future of Work" (February 2019)

² National Academies of Sciences, Engineering, and Medicine, "Information Technology and the U.S. Workforce: Where Are We and Where Do We Go from Here" (2017)

According to Georgetown University's Center on Education and the Workforce, at the current production rate in higher education, the U.S. will fall short millions of the workers with post-secondary credentials that it will need over the next few years. Here in California, that shortage is forecasted to be around 1.1 million by 2030.³ And according to a McKinsey Global Institute analysis, approximately 60 percent (60%) of employers say that college graduates currently lack the "soft" and technical skills needed to succeed in the labor market of the future.

This is clearly a need that is not being met and could be further exacerbated by the fact that the number of high school graduates in the region is flat, and that number is likely to remain flat because the population of under-25-year-olds is projected to stay constant or decline through 2025 due to lower replacement rates and an aging population.⁴ Taken together, these marked demographic shifts and our failure to meet industry's growing need for workers with post-secondary credentials, along with the necessary "soft" and technical skill competencies, could hasten the substitution of labor with capital at the post-secondary skills level, resulting in the potentially extreme economic situation where we experience both high unemployment as a result of displacement due to automation and a shortage of high-skilled talent, depressing gross regional production (GRP) and putting further pressure on government and other institutions to provide more social assistance with fewer resources (i.e. tax revenues) to pay for and support those services.

In face of these challenges, higher education should not be asked to solve these problems on its own. In the coming years, it will be increasingly more important for industry to collaborate with educators in creating programs that guarantee students are learning the skills future employers expect. These partnerships should promote flexibility at universities to equip students with the professional development and knowledge necessary to secure a decent paying job and avoid over or under supplies of workers. Some programs may see an increase in apprenticeships or on-the-job learning in lieu of class time. Creating more nimble degree requirements, that allow math and science majors more opportunities to develop soft skills, or students in social sciences to receive increased instruction to develop technical skills, will lead to a more productive and hireable workforce. The private sector must be encouraged to digest reports such as this and collaborate with higher education in order to initiate greater upward job mobility for workers. Accepting apprentices and interns, designing new degree programs, and encouraging lifelong learning are all ways in which the private sector can support the future workforce instead of relying on automation and distancing itself from labor demands.

While Southern California's four-year universities and colleges face a number of threats and challenges as a result of the above-mentioned labor market and demographic trends, these weighty matters also represent major opportunities if the region's four-year colleges and universities can responsively address them. This report, which represents a collaboration between the Los Angeles County Economic Development Corporation (LAEDC) and California State University, Northridge (CSUN), is intended to provide useful information about the region's future industrial and high-skill employment concentrations, to forecast important shifts in the region's post-secondary-relevant job markets and to identify trends (i.e. projected growth or contraction) within key post-secondary occupational categories to help guide Southern California's four-year colleges and universities.

³ See Public Policy Institute of California, "Will California Run Out of College Graduates?" (October 2015)

⁴ See LAEDC, "LA Area Community Colleges at a Crossroads" (February 2019), citing IPEDS, DataMart, California Department of Finance and California Department of Education statistics

More specifically, the four (4) co-equal goals of this report are to:

1. Identify the economic forces that are shaping the future industrial makeup and associated labor markets for undergraduate and graduate degree holders in the Southern California region
2. Understand the implications of these future economic and labor market trends on post-secondary credentialing and education in the region
3. Ascertain the most promising pathways into a four-year college for those who are at risk of being left behind and ease their transition towards post-secondary credentialing
4. Use 1, 2 and 3 to help guide the region's four-year colleges and universities as they prepare our local supply of labor for the innovation-intensive industries of tomorrow

This report researches the importance of education in the region and the increased demand for job-seekers to attain higher levels of education now than ever before. The report identifies occupations at-risk of increased degree requirements, as well as high-skill, in-demand occupations with degree gaps that can be filled by new university programs or boot camps. The importance of soft skills, as well as technical skills, is a consistent requirement across all industries, further underlying the importance of higher education to be more flexible and adopt degree programs that develop an array skill sets that equip students for the rapidly changing workplace.

To this end, the LAEDC is partnering with CSU campuses on this foundational "future of work" report that will help inform and influence higher education here in Southern California as it educates and trains its students for the economy of the future.

In the coming years, it will be increasingly more important for industry to collaborate with educators in creating programs that guarantee students are learning the skills future employers expect.

EXECUTIVE SUMMARY

In the contemporary context, there is a need for a high talent university-prepared workforce. Many long-term trends are shifting the economy away from growth predicated on labor—that is, where additional labor capital is the primary driver of value creation and capture—toward an economy in which growth is dependent on the productivity, creative input and knowledge of the existing and future workforce. Here in the five-county region of Southern California (counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura), the labor market continues to bifurcate, as we produce greater numbers of high-tech and other “knowledge economy” jobs, as well as a vast quantity of low-skill service jobs that don’t necessarily provide family-supporting wages and sustainable career trajectories.

It is important for Southern California to fully connect its population to the broader economy and the industries in which it has productive advantages, as well as to take advantage of its existing human capital by tackling the skills mismatch endemic in many of our communities and population cohorts and by connecting the education pipeline to growing industries at low risk of capital-labor substitution in order to provide the labor force necessary for the region to experience broad-based and more inclusive economic prosperity.

A more educated and better prepared workforce is beneficial to the Southern California economy, contributing to increased productivity, higher wages, lower poverty rates and social service expenditures, improved health outcomes and

By 2023, approximately 23 percent of all jobs in the region will require a bachelor’s degree or higher.

higher tax revenues. Moreover, a deep and highly-educated talent pool is a key determinant—if not, the key factor—to successful attraction of firms from high-wage, growth industries to the region. Today in Southern California just under 60 percent of the population ages 25 years and older has an education of bachelor’s degree or higher. To keep up with this transitioning economy, we need to do even better.

The Southern California economy is expected to grow from 7.0 million jobs across all industries in 2018 to 7.5 million jobs in 2023. By 2023, approximately 23 percent of all jobs in the region will require a bachelor’s degree or higher. There will be 10.5 million total openings between 2018 and 2023, including 5.1 million new jobs and 5.4 million replacement jobs, which are job openings related to employment churn and attrition. Of these 10.5 million total openings in the Southern California region over the next five years, the educational attainment requirements will be as follows: 15.6 percent of openings (1.6 million) will require at least a bachelor’s degree for entry; 0.6 percent will require a master’s degree; and 0.6 percent will require a doctorate or professional degree.

The annual unemployment rate in the Southern California region in 2018 was 4.2 percent (Exhibit ES-1); a rate this low means employers will find it more difficult to fill job openings. At the peak of the Great Recession, the unemployment rate in the Southern California region reached 12.2 percent in the region. Across the U.S., unemployed individuals numbered 6.6 for every one job opening during the recession’s peak; currently that number has dropped to 1.1 for every one opening (2018).

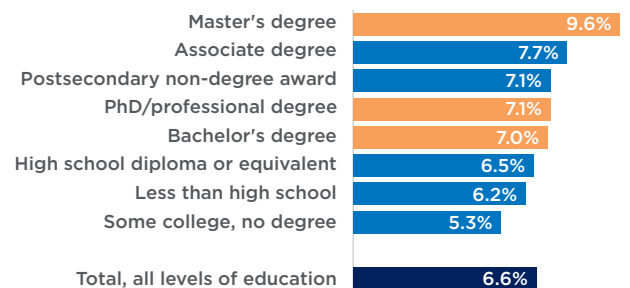
Upward economic mobility is easiest for those who obtain a bachelor’s degree or higher. Employers were increasingly demanding a four-year college degree while there was slack in the labor market and educated applicants were plentiful; however, the tight labor market of today is influencing employers to become more lax in their job posting degree requirements out of necessity, providing opportunities for colleges and universities to create modular programs such as credential programs, training boot camps and more flexible online options.

EXHIBIT ES-1
Unemployment in Southern California 1990 to June 2020

By June 2020, the unemployment rate reached 17.0% as a result of COVID-19



EXHIBIT ES-2
Projected Job Growth by Entry-Level Education Percentage change from 2018 to 2023



Southern California

Demographics play a key role in the growth and quality of the labor force and to a large extent determine the growth potential of the economy.

Just over 31 percent of Southern California residents have a bachelor’s degree or higher.

Jobs in occupations with an entry-level requirement of a bachelor’s degree or higher are expected to grow at faster rates compared to occupations requiring lower levels of education for entry (ES-2).

Job openings in health care and social assistance, accommodation and food services, and construction will add the most jobs, while construction, transportation and warehousing, and healthcare and social assistance will grow the fastest.

Hiring Industries with Promise

We identify target industries that are most promising in terms of having a high concentration of high-skill jobs, those requiring a bachelor's degree or higher for entry, and use the occupational composition of those industries along with their expected job growth, to identify the top detailed occupations classified as high-skill. We present their predicted job needs from 2018 to 2023.

The following industries are identified as targets for specific education interventions:

- Health Care and Social Assistance
- 21st Century Education
- Professional and Business Services
- Information
- Manufacturing

Degree Gap Analysis

Changes in the requested entry-level education, such as moving from a minimum Associate degree requirement to a bachelor's degree requirement, in job postings for occupations can identify either a change in the skills, including, for example, the expanded use of technology to successfully perform the job duties, or it may indicate that existing education and training programs are not teaching the right mix of skills that employers are seeking in potential job candidates. We compare the entry-level education requested in employer job postings for our target high-skill occupations in Southern California to the educational attainment of workers currently employed in that occupation in the region to identify degree gaps. In this way, imbalances in the regional labor market can be identified. In instances where degree inflation may be occurring (when employers are requesting a level of education higher than is necessary to

successfully perform the job duties for a specific occupation), this report quantifies the number of current workers at risk of being shut out of future job opportunities.

The following target high-skill occupations are identified as having a degree gap in Southern California, meaning employers of these occupations are requesting higher degrees from their job candidates compared to what has traditionally been identified as the entry-level education required to obtain work in this occupation:

High-skill occupations with a degree gap may represent the best opportunities for universities to create modular programs such as credential programs, training boot camps, and online options.

High-skill occupations identified in our target industries, which traditionally required a master's degree for entry with the largest degree gaps include:

- Computer and Information Research Scientists
- Marriage and Family Therapists
- Physician Assistants
- Education Administrators, Postsecondary
- Librarians
- Statisticians
- Survey Researchers

High-skill occupations identified in our target industries, which traditionally required a bachelor's degree for entry with the largest degree gaps include:

- Computer and Information Systems Managers
- Electronics Engineers, Except Computer
- Financial Managers
- Health Educators
- Electrical Engineers
- Mechanical Engineers

One way of identifying occupations that are increasing in tech intensity is by tracking employers requesting a four-year degree for occupations that have typically not required one. These occupations may represent future opportunities for universities to offer new baccalaureate-level programs, providing job seekers with the new skills required by employers for these jobs today and into the future.

The following middle-skill occupations are identified as having a degree gap in Southern California:

- Nuclear Technicians
- Wind Turbine Service Technicians
- Environmental Engineering Technicians
- First-Line Supervisors of Fire Fighting and Prevention Workers
- Respiratory Therapists
- Desktop Publishers
- Respiratory Therapy Technicians
- Psychiatric Technicians
- Funeral Service Managers
- Bookkeeping, Accounting, and Auditing Clerks

Regardless of the degree requested, workers with a higher level of education than necessary to successfully complete the job duties in an occupation are more likely to feel disengaged and find employment elsewhere.

Other Key Findings

In addition to identifying hiring industries with promise for high-skill occupations and looking into potential degree gaps, this report identifies a number of other key findings, including:

- **The well-educated are migrating to Southern California.** While fewer than one-third (31 percent) of current Southern California-based residents have at least a bachelor's degree, half of the individuals who moved into Southern California from another state or from abroad have a bachelor's degree or higher. This suggests that there are significant and growing job prospects for individuals with higher levels of education.

- **Educational attainment plays an out-sized role in our understanding Southern California's current and future labor markets.** It is a key element in understanding challenges and opportunities present in a region's workforce. It helps employers assess the quality of the local labor pool. It helps individuals quantify the benefits of pursuing additional education, such as being less exposed to economic shocks (like the one related to the Coronavirus pandemic), and it can reveal whether an area is economically disadvantaged requiring higher levels of public services and resources.
- **"Soft skills" matter...a lot.** The most in-demand skills and competencies include "soft skills" such as interpersonal skills, creativity, critical thinking and problem solving, and written and verbal communication skills. Leadership, mathematical or statistical knowledge and data and analysis are additional skills required by employers looking to fill high-skill positions.
- **Scale and speed of this great economic transformation are outpacing the ability of educators to respond in real-time.** Educators are facing several hurdles when trying to educate students for the jobs of tomorrow:
 - a. Irrespective of the degree program, all students will need to adapt quickly to changing technologies and be proficient with data.
 - b. The pace of technology acceptance, adoption and deployment is affecting the ability of educators to keep up, and so degree and non-degree programs are constantly playing catch up in terms of both their understanding of and their ability to teach to these changes, as well as the tasks students and incumbent workers will need to perform as a result.
 - c. Educators will need to teach students how to apply the knowledge they learn in a real-world, real-time setting.
- **Economic transformation presents challenges, but also opportunities.** Collaboration between employers and educators may reveal opportunities to create new education and training programs to ensure workers who completed these programs are trained in the required skills and are job ready within specific industries.

01.

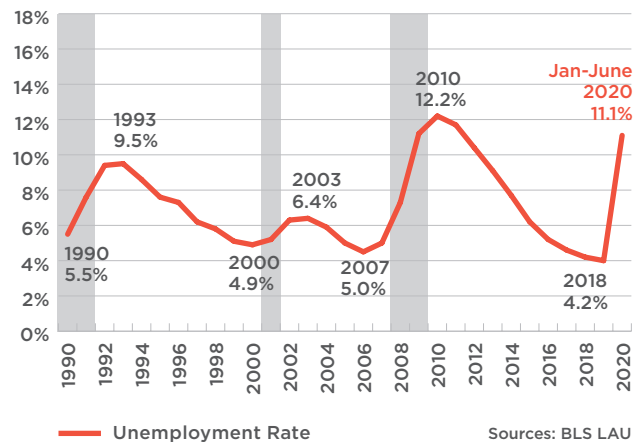
INTRODUCTION

Southern California is experiencing a tight labor market, with its lowest annual unemployment rate (4.2 percent in 2018) in decades (Exhibit 1-1). Related to this, many employers assert they are having difficulty finding qualified candidates with the right mix of skills to meet their diverse needs, meaning workers with the requisite skills are in high demand. The rapid transition toward information- and knowledge-centered work across almost all industries and at all skill levels makes an amalgam of soft skills and analytical abilities essential to a student's employability and professional advancement in the future.

This report, which is the initial research in a collaboration between the LAEDC and CSUN, sheds further light on the above issues and provides useful information about the region's future industrial and high-skill employment concentrations, forecasting the region's job markets and identifying trends (i.e. projected growth) within key industries and their post-secondary occupations to help inform and guide Southern California's four-year colleges and universities.

EXHIBIT 1-1
Unemployment in Southern California
1990 to June 2020

By June 2020, the unemployment rate reached 17.0% as a result of COVID-19



Industry forecasts and occupational projections included in this report were developed prior to the COVID-19 pandemic. It is likely that growth in these industries/occupations will be impacted by the measures taken to mitigate the spread of the virus, including lingering effects of mandated closures, new guidelines for doing business, federal monetary and fiscal policies, local and state relief measures, and changes in consumer behavior, but that over the longer-term (beyond our forecasts and projections for 2023), employment is expected to return to pre-COVID-19 levels. Due to rapidly changing conditions in the Southern California economy, the dearth of real-time economic information and data, and the uncertainty that exists for many economic factors used to determine our forecasts/projections, we have not yet made revisions.

Geographic Definition

The Southern California region in this report includes five counties, which are shown in Exhibit 1-2 and defined below.

1. LA County
2. Orange County
3. San Bernardino County
4. Riverside County
5. Ventura County

These five counties account for 47.5 percent of California’s total population of million and 46.4 percent of total nonfarm payroll employment across the state.

Economic Overview

Employment opportunities for residents of Southern California will depend on the health of the regional economy. Before looking at what lies ahead for regional employment, let’s look at where we have been.

EXHIBIT 1-2
The Southern California Region

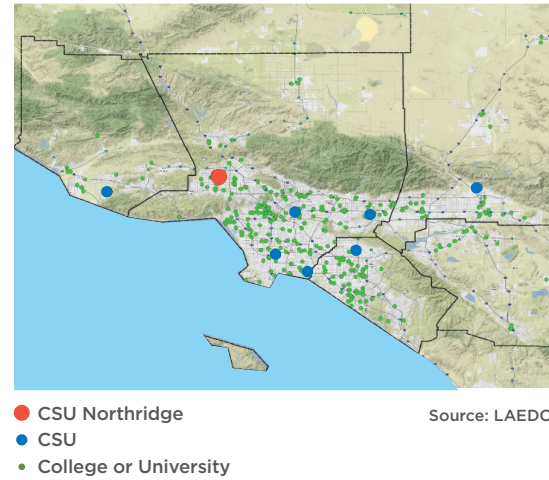


EXHIBIT 1-3
Nonfarm Employment in Southern California (millions of jobs)



Nonfarm employment in Southern California has exceeded pre-recession peak employment (2007) by more than 600,000 jobs (8.2 percent). While recovery from the Great Recession saw anemic employment growth beginning in 2011, by 2015 we had recovered the number of jobs lost. Nonfarm employment has been growing in the region for eight consecutive years, and we anticipate this trend to continue through 2023 (Exhibit 1-3).

Similarly, many industry sectors follow this general contour of growth; however, there are differences among individual industries. For example, manufacturing (NAICS 31-33) employment in Los Angeles County has been experiencing a long-term sectoral decline for decades, yet employment in beverage manufacturing (NAICS 312) and petroleum and petroleum products manufacturing (NAICS 324) have grown by 20 percent and 27 percent, respectively, over the last decade (Exhibit 1-4).

Despite ample positive macroeconomic news, the labor market continues to bifurcate, as we produce greater numbers of high-tech and other “knowledge economy” jobs, as well as a vast quantity of low-skill service jobs that don’t necessarily provide sustainable career trajectories.

These tight labor market conditions have recently begun to drive wage growth, with increases in wages being felt most strongly at the low and high ends of the income distribution.

While the broader economy of the region is quite strong, as reflected by regularly reported economic data, such as unemployment and production rates, the recovery from the financial crisis has dramatically shifted the economic fortunes of most of households. For example, despite the decline in the unemployment rate, labor force participation remains lower than earlier levels (Exhibit 1-5), and the workforce overall is still feeling the maleficent effects of the structural shifts that resulted from that dramatic economic shock, coupled with a fast-transforming macro economy.

Many long-term trends are shifting the economy away from growth predicated on labor—that is, where additional labor capital is the primary driver of value creation—toward an economy in which growth is dependent on the productivity of the existing workforce. An aging population and workforce, coupled with historically low replacement rates, has created additional pressure to automate jobs, and even migration trends are reflecting less domestic labor demand for unskilled labor and more for immigrants with college degrees.

EXHIBIT 1-4
Manufacturing Employment Growth 2008 to 2018
Los Angeles County

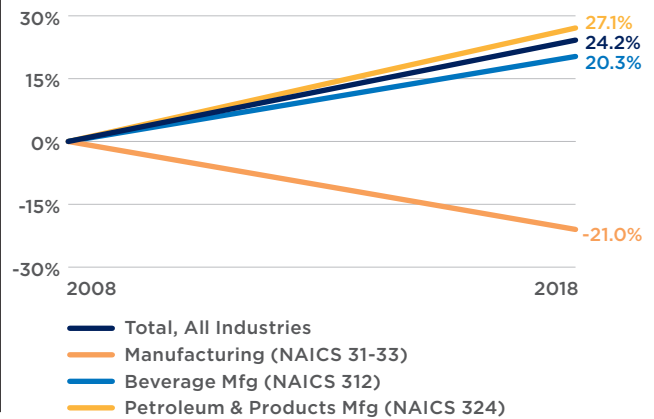
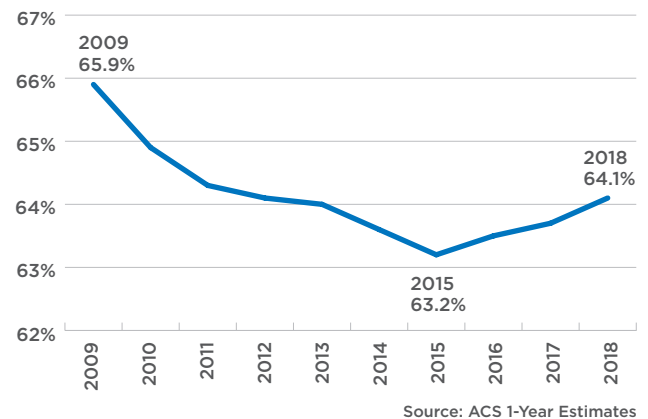


EXHIBIT 1-5
Labor Force Participation Rates
in Southern California



As this deceleration in human capital expansion continues, it is important for Southern California to fully connect its population to the broader economy and to take advantage of its existing human capital by tackling the skills mismatch and connecting the education pipeline to growing industries in order to provide the labor force necessary for the region to experience broad based economic prosperity.

Why Higher Education Matters

Higher education plays an essential and dynamic role in economic development in regions across the United States, particularly so in large urban areas. In the contemporary context, there is a need for a high talent university-prepared workforce; it is a key component of economic growth, diversification, and attracting and holding both new and existing employers with evolving needs that are often engaged nationally and globally. For the university-prepared workforce today, the nature of practice across the career span requires a great deal of versatility and conceptual depth and breadth.

Today, an individual's compilation of knowledge, skills, abilities, experiences, values, and habits of mind is required to be responsive to changing possibilities and evolving realities in and across fields of expertise and in practice. Increasingly, an individual working in the contemporary context must be ready to apply knowledge (broadly understood) of a changing array of roles/projects and the altering nature of the work done by any highly-competitive employer as the regional and world economy evolves. Given the nature of work for the university-prepared workforce today and looking towards the future of work, universities are now called upon to rethink the education they provide. Disciplines and fields are integrating and transforming in contemporary professional practice. Universities are (or need to be) responding to that fundamental change, providing the knowledge and skills a university graduate at the baccalaureate or graduate level needs to know and the training for how they need to think in many different working groups. These graduates will be engaging with others who bring a very different compilation of capabilities to the work—making the high-value collaborative work they produce far greater than the sum of its parts, leading to new directions and other possibilities.

Universities that provide today the high-talent university-prepared workforce needed to lead and shape the sustainable and more equitable economic future of complex urban regions, like Southern California, must be increasingly cross-disciplinary, purposefully linking the breadth of education (general/liberal) to preparation for professional practice in any field. That is, a university-level education today should be increasingly focused on educating students to be both thought and field leaders. Indeed, those organizations hiring, for example, someone with advanced university preparation in computer engineering, social work, or media development, are not looking for individuals who require a significant amount of guidance and oversight. Instead, they are looking for individuals with a level of talent and insight in such fields that will tell them what the organization needs to do—what new possibilities are there, how to think about the work differently in market and industry context, how to create/co-create, and how to design solutions to a changing array of challenges.

Education and Economic Opportunity

Obtaining some form of higher learning is the primary vehicle to better one’s economic position, whether it is to increase employment opportunities, change career paths, earn higher wages, or seek out a better quality of life. Unemployment rates, median earnings and poverty levels all differ according to the highest level of education obtained; that is, an individual’s educational attainment.

Unemployment is highly correlated with educational attainment (Exhibit 1-6).

Overall, the unemployment rate for individuals aged 25 to 64 years was 4.5 percent in Southern California in 2018. However, residents with a bachelor’s degree or higher had an unemployment rate of just 3.4 percent in the region in 2018, roughly half the rate experienced by those at the opposite end of the spectrum. (Those with less than a high school education and those with a high school diploma or equivalent reported an unemployment rate of 5.9 and 5.5 percent, respectively.)

Higher levels of educational attainment are also highly correlated with higher earnings (Exhibit 1-7).

Earnings differentials exist among employed individuals with varying levels of educational attainment. In the Southern California region, those with the highest level of education—i.e. a graduate or professional degree—earn an annual wage premium of about \$58,000 over those with less than a high school education. Similarly, individuals with an bachelor’s degree enjoy a significant wage premium over those with lower levels of educational attainment; approximately \$28,500 over those with a high school diploma or equivalent annually, and close to \$36,000 over those with less than a high school education annually.

The combination of higher rates of unemployment and lower annual median earnings yield higher levels of poverty for those with lower levels of education. Relative poverty is a measure of income inequality.

EXHIBIT 1-6
Civilian Unemployment Rate 2018
by educational attainment

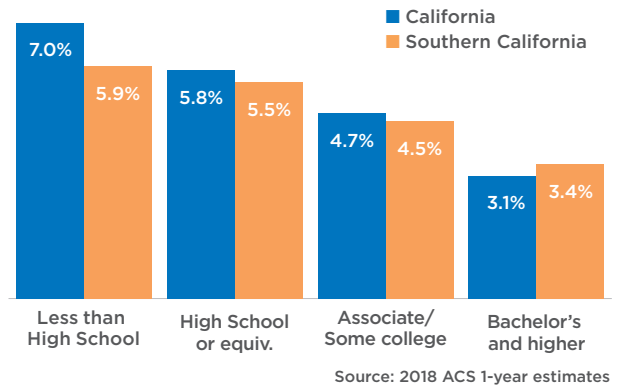
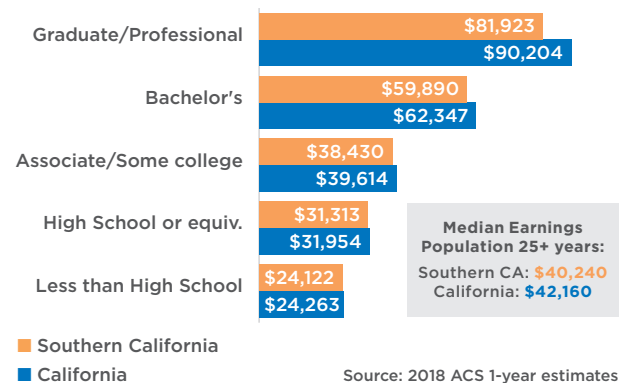


EXHIBIT 1-7
Median Earnings and Educational Attainment 2018
Population 25 years and older



Education and COVID-19

Moving into 2020, we were continuing a long and unprecedented expansionary period, economic fundamentals were strong, with few economists predicting a recession in 2020...just a few months later we found ourselves in a whole different world.

First appearing in California in late-February, the novel Coronavirus (COVID-19) and the measures taken to mitigate the spread of the virus, brought business and life to a grinding halt over the first half of 2020. In mid-March, we had already started to experience disruptions in global supply chains, hoarding and the resulting short-term shortages of essential goods, the cancellation of large gatherings, the closure of schools and universities moving to online instruction, sheltering in place and self-quarantining, and of course, the mandated closure of nonessential businesses such as restaurants, hair and nail salons, theaters, and retail stores, which left many workers in Southern California stuck at home without the guarantee of pay. These events have given rise to unprecedented economic challenges.

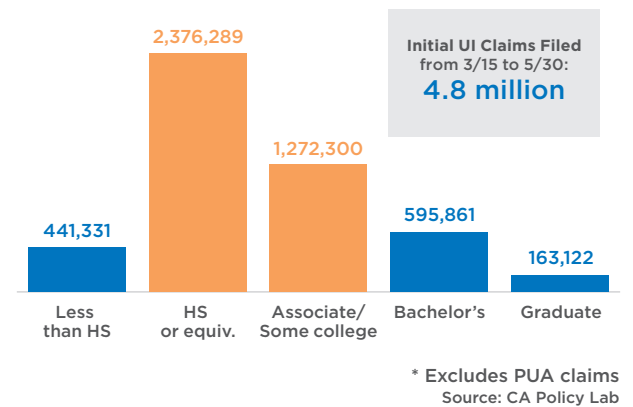
In a typical recession, which is usually a “demand-side” problem, driven by a demand shortfall, the contraction takes place over several quarters or months, but this economic disruption is both a demand and supply-side problem, with demand and supply shocks, and it was almost instantaneous, occurring in a matter of weeks. While COVID-19 may be an exogenous, single event-driven economic shock, and some indicators may return to their pre-crisis trend, it is highly likely that longer-term implications for the diverse industries here in Southern California will be varied.

The immediate economic effects of COVID-19 have not been equally distributed. Higher-income workers in professional services, management, and computer and mathematical occupations were able to make the transition to work remotely. Not only have their jobs been somewhat inoculated, if not protected over the short-term, but these households are also likely to have higher saving

rates. In stark contrast, a significant portion of jobs that require lower levels of education are concentrated in businesses identified as non-essential that were mandated to close under the Stay at Home order issued by Governor Gavin Newsom on March 19, 2020.

In the midst of the Coronavirus, weekly initial Unemployment Insurance (UI) claims data has been a metric providing much needed insight on the effects the pandemic has been having on our economy, specifically, the magnitude of COVID-19’s labor market impacts and how different types of workers are experiencing these impacts. More than 4.8 million initial UI claims have been filed in California from March 15th to May 30th (Exhibit 1-8). **Of these claims, just under 4.1 million were filed by those with an education of less than a bachelor’s degree, accounting for more than three quarters (76.2 percent) of total initial claims filed over the period.**

EXHIBIT 1-8
Initial UI Claims in CA During the COVID-19 Crisis*
by educational attainment



If we split out the labor force in California according to the educational attainment of workers and then look at the number of initial UI claims filed as a share of each cohort (Exhibit 1-9), the data shows workers with lower levels of educational attainment have been experiencing unemployment at higher rates compared to those with a bachelor's or graduate degree; over 55 percent of those in the labor force with a high school diploma (or equivalent) have filed an initial UI claim, that's over four and a half times the share of claims filed by those with a bachelor's degree and more than ten times the share of claims filed by those with a graduate degree.

Going forward, workers with low educational attainment who lose their jobs during this global health crisis will find it much more difficult to find new ones in similar sectors decimated by the secondary economic effects of the pandemic. Increasingly a bachelor's degree is a key driver and predictor of joblessness, and going forward it may increasingly determine how many factors, including health outcomes, play out over a person's lifetime.

Education and skills requirements for growing occupations

Another way to illustrate the value in postsecondary education is by looking at occupational employment grouped together by entry-level educational requirements.

In Southern California in 2018, approximately 20 percent of employment exists in occupations having the entry-level education requirement of a bachelor's degree and three percent (3%) require a graduate or professional degree for entry (Exhibit 1-10).

Looking at the educational attainment of individuals moving into Southern California reveals that about half of those who moved from another state or from abroad to our region have a bachelor's degree or higher (Exhibit 1-11). This suggests that there are significant job prospects for individuals with higher levels of education.

EXHIBIT 1-9
Initial UI Claims in CA by Education*
as a share of each cohort's labor force

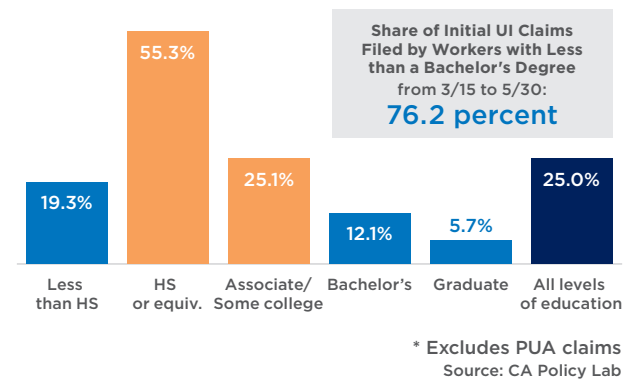


EXHIBIT 1-10
Job Distribution in Southern CA 2018
Entry-level education requirements

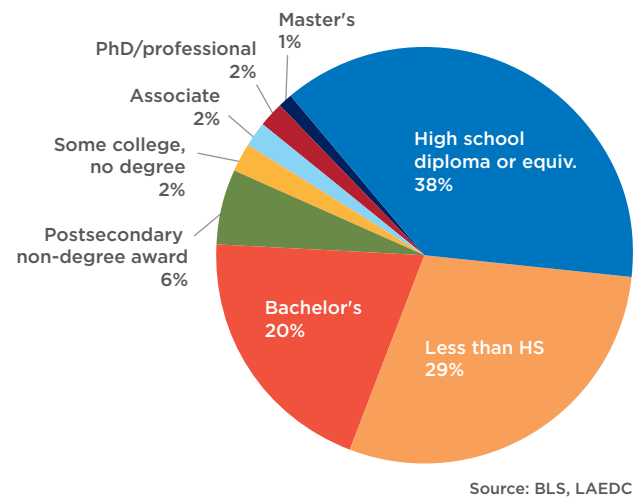
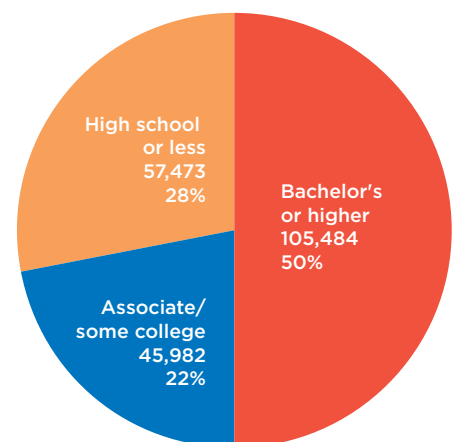


EXHIBIT 1-11
Individuals who moved into Southern California from out of state or from abroad in 2017
Population 25 years and over by educational attainment



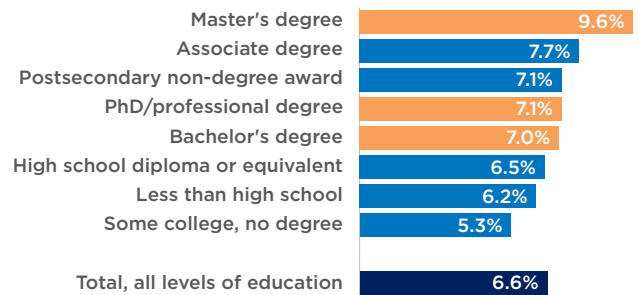
Jobs in occupations with an entry-level education requirement of a bachelor’s degree or higher are expected to grow at faster rates compared to occupations requiring lower levels of education for entry (Exhibit 1-12).

The projected net change in jobs in Southern California between 2018 and 2023 ranked by educational requirements, provides insight into expected hiring trends. Over the five-year period, the number of jobs in occupations requiring a bachelor’s degree, will grow by seven percent (7%), those requiring a master’s degree will grow by almost 10 percent (the fastest growth rate), and doctorate and professional degrees are expected to grow by just over seven percent (7%).

Alternatively, jobs requiring lower levels of education for entry, less than high school, a high school diploma or equivalent and some college with no degree, are expected to have lower growth rates between 2018 and 2023.

Higher education ultimately enables greater employment opportunities for students, leads to upskilling amongst incumbent workers, and assists in providing education for career changers. The different growth rates across the various levels of educational attainment illustrate that Southern California’s system of four-year colleges and universities, along with the professional and advanced degree schools they support, will play a more prominent role in satisfying the region’s labor force needs.

EXHIBIT 1-12
Projected Job Growth by Entry-Level Education
Percentage change from 2018 to 2023



Source: LAEDC

The Role the California State University System Plays

Given the requirements of what is needed for a robust regional economy today, Southern California needs the full capabilities of all universities serving the region. Among those higher-education resources, California State Universities (CSUs) serving Southern California are well positioned to provide the kind of education needed for the regional economy of tomorrow; both the public and private sector, and across all industries and fields important for sustainable and equitable economic growth—from arts to zoology. Each CSU has a strong link to the region it serves as well as to other CSUs serving interconnected large urban regions. An example of this is the CSU5⁵ serving Los Angeles County. The CSUs are not just regionally located; they are stewards of place that have the future of the region embedded in their mission.

The CSU system was formed in 1960 under the California Master Plan for Higher Education. Currently, the CSU system has 23 campuses and eight off-campus centers, making it the largest four-year public university system in the U.S.

⁵ CSU5 includes California State Polytechnic University, Pomona; CSU Dominguez Hills; CSU Long Beach; CSU Los Angeles; and CSU Northridge

The CSU system is a major player in California's talent development; 95 percent of enrolled students are California residents, 91 percent of all new undergraduate transfers are from community colleges in the state, and 88 percent of first-time freshmen come from public high schools in California.

The CSU system graduates approximately 126,000 students annually, representing about forty percent of all college graduates in the state of California (Exhibit 1-13).

The CSU system has a diverse student body, socioeconomically, demographically (age, race and ethnicity) and academically. Of the 23 CSUs in California, 21 CSUs have at least 25 percent of their student enrollment reported as Latino.⁶ Pell grant recipients account for 43 percent of all undergraduates in the system. Close to a third of their students are first-generation college students, making the system a vital part of economic mobility in the state.

The CSU system is often considered more responsive to industrial and economic transformations when compared to other postsecondary systems (such as the University of California system). Each CSU university has ongoing connections to professional practice in the region that allows for a dynamic dialog between university preparation and rapidly evolving professional practice. Each CSU university has a significant range of fields, disciplines, centers and institutes that can be engaged in new ways across disciplinary lines. They also have the ability to make significant changes in the curriculum, as warranted, to provide the kind of university education needed as the region looks to the jobs of the future. For example, a number of CSU campuses have created academic programs for nascent and emerging industries, such as cybersecurity, sustainable business, and environmental technology. These regionally-focused and globally-connected universities also have a rapidly growing number of programs with strong foundations in faculty and student research, which leads to graduates well prepared to analyze, investigate, explore new options, and test the viability of those options. The CSUs now provide many well-designed opportunities for learning in the classroom and in practice that includes internships, fieldwork, and the like.

EXHIBIT 1-13
Graduates in California 2017/2018
Four-year colleges and universities

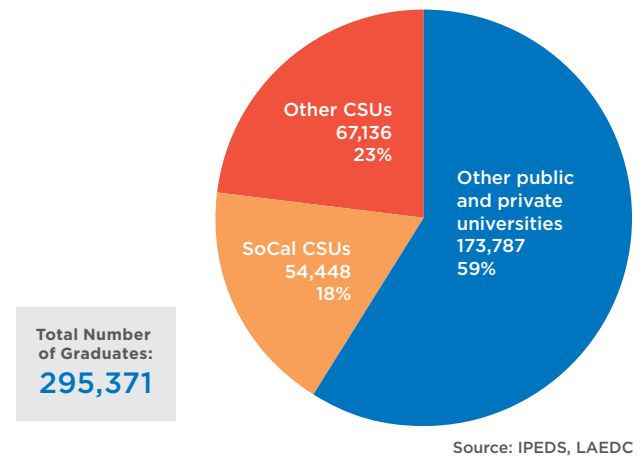
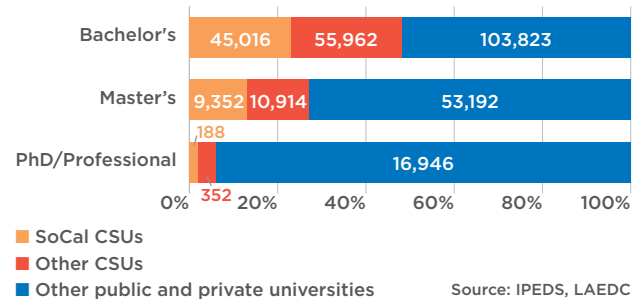


EXHIBIT 1-14
Share of Graduates in California by Degree Type 2017/2018
Four-year colleges and universities



The system's extended post-baccalaureate education programs are often able to respond quickly to shifts and technological changes in industry. These programs are selected and developed carefully as they are market-driven funded and receive no public funding. While their market-driven funding model allows for more agility in program development, this model also comes with more risk, as these programs will fail fast if students and employers do not see the benefit in enrolling. Taken together, the real-time adaptiveness and "fail fast" quality (as opposed to continuing a program long after it loses its market value) of these extended education programs make them highly practical and suitable for today's rapidly transforming economy.

A number of initiatives have been put in place by the CSU system to raise completion rates and improve instruction in STEM (science, technology, engineering and mathematics) programs. The Graduation Initiative 2025 was launched in 2016 to increase completion rates and narrow equity gaps between underserved students and their peers. All CSU campuses are now connected by the new STEM NET affinity group, which enables faculty to share best practices in science, technology, engineering and mathematics.

While the CSU is a public university system, each CSU university also has Professional and Continuing Education (PaCE) colleges that provide the capacity to create new programs and test new ideas outside of the programs funded by state resources. The PaCE program extends resources related to degree and certificate programs, personal enrichment, and professional development. PaCE courses are offered online or face-to-face to encourage lifelong learning for anyone, from high school students, working professionals, military, to international students. Having this capacity allows for more rapid innovation as well as allows for a wide range of productive collaboration between economic development initiatives, employers, and the university across fields and disciplines. This

capacity can be, and often is, used as a co-creative and agile context for the development and implementation of new programs (degree and non-degree) that respond to regional needs, which is important for increasing the responsiveness of CSU universities to those needs for a university-prepared workforce in changing and cross-disciplinary fields. It is also important for the ongoing expansion and refinement of compilation of knowledge, skills, abilities, experience and habits of mind that define each high-value member of a region's university-prepared workforce. The ability to add to that compilation in significant ways throughout the career span, during which field and disciplinary knowledge expands and changes as the economy and practice shifts, as careers are redirected, and as new knowledge and insights are needed in the industry or global context, is essential. Indeed, the ability for universities to provide ongoing education in many formats and delivery modes to degreed (baccalaureate, master's, or doctorate) individuals across the career span will be moving very soon from useful to essential.

The CSU system has responded to changing workforce demands by expanding resources for incumbent workers and working professionals. In addition to the PaCE program outlined above, the CSU Open University (Open U) program allows anyone to enroll in courses at any of the 23 CSU campuses without being admitted to the system. Open U and PaCE are progressive solutions to meet workforce demands, upskill workers, and provide flexible resources.

As an example of how one CSU university has used this PaCE self-funding innovative capacity is California State University Northridge (CSUN) through its Tseng College: Graduate, International, and Midcareer Education. The Tseng College has been able to engage its faculty within and across disciplinary lines to respond to the dynamics of the regional economy with nationally recognized programs with distinctive formats, effective digital delivery modes in many cases, and high rates of student success as measured by on-time graduation rates and the performance of graduates on national licensure exams required for some fields of professional practice.

⁶ These 21 CSU campuses have been recognized by the Department of Education as Hispanic-Serving Institutions (HSIs).

Examples of these programs include:

- Master's Degree in Assistive Technologies⁷
- Master's Degree in Diverse Community Development Leadership⁸
- Master's Degree in Music Industry Administration⁹
- Master's in Public Health: Community Health Education¹⁰
- Certificate of Advanced Professional Development in Leadership in the Age of Disruption¹¹

All of these programs are developed and taught by CSUN faculty working across disciplinary lines with a focus on the changing realities of the urban economy and professional practice in that context. Each CSU university has a similar capacity that can be engaged to leverage university strengths in light of the necessary evolution of the regional economy and a similar need for the purposeful evolution of higher education, so that the university-prepared workforce is indeed ready to be both the foundation and the pathfinders as urban regions collide with local and international shifts that could easily change the economic realities of the future for all.

Employers and the region's economic development leaders will need to learn more about what universities can do beyond what is traditionally expected and, in turn, engage those capacities in a collaborative and sustained effort leading to a positive impact on each region's future. Indeed, a more active and comprehensive partnership between regional economic development leaders, employers and industries, and higher education is no longer optional if those now graduating from universities are to thrive in the years ahead. Nor is the ability of universities to innovate, not just once but regularly and at greater speed, optional anymore.

The system also faces a number of challenges. For example, the CSU system receives so many applications that some programs have become impacted and require higher standards for admission. This is exacerbated on campuses with local admission guarantee policies for graduates and by transfers from local high schools and community colleges. The local admission requirements they face further restricts admission for promising applicants who do not live locally. Impacted programs are likely to intensify with reduced state funding and investment. The state general fund covers slightly more than half the CSU operating costs, while tuition fees cover the remainder. Therefore, a decrease in funding will either drive CSUs to cut costs or increase tuition fees. Concerns over operating costs could strain faculty, which would have adverse effects on the student-to-faculty ratio, providing less assistance to enrolled students and potentially increasing the time it takes to receive a degree. An increase in tuition fees would deter more student from enrollment or impede on their ability to graduate. Higher fees also impede the CSU mission of accessibility. Low-income students and those from non-traditional backgrounds could be deterred from enrollment or degree completion if fees were to rise substantially, without any increase in financial aid assistance. Potential funding cuts continue to be a primary concern for the CSU system, which is dedicated to being an affordable and quality provider of higher education.

... a more active and comprehensive partnership between regional economic development leaders, employers and industries, and higher education is no longer optional.

⁷ <https://tsengcollege.csun.edu/programs/ATE>

⁸ <https://tsengcollege.csun.edu/programs/DCDL>

⁹ <https://tsengcollege.csun.edu/programs/MIA>

¹⁰ <https://tsengcollege.csun.edu/programs/MPH>

¹¹ <https://tsengcollege.csun.edu/programs/LAD>

02.

SOUTHERN CALIFORNIA

This section presents a picture of the characteristics of Southern California’s resident population, accompanied by an overview of the region’s labor market, including its industrial base and occupational composition.

Resident Characteristics

Social and economic characteristics of the residents of Southern California provide context and insight into the strengths and challenges of the region. Based upon this information, trends and patterns are revealed and can be used to target education programs and other types of talent development efforts.

The population of the Southern California region in 2018 was 18.8 million in 6.0 million households, accounting for just under 48 percent of the population of the State of California (Exhibit 2-1). The median age is 36.6 years.

Median household income in Southern California, estimated to be \$71,489, is approximately 5 percent lower than the state median. At \$33,856, per capita income in the region is 9 percent below the state average.

EXHIBIT 2-1
Selected Demographic and
Income Characteristics 2018

	<i>Southern California</i>	<i>California</i>	<i>Southern California versus CA</i>
Population	18,764,814	39,557,045	47.4%
Median age	36.6	36.7	younger
Households	5,993,032	13,072,122	45.8%
Average household size	3.08	2.96	larger
Median household income	71,489	75,277	-5.0%
HH below poverty level	12.9%	12.2%	-0.7%
Per capita income	33,856	37,124	-8.8%
Individuals below poverty	13.2%	12.8%	-0.4%

Source: 2018 ACS 1 year estimates

Nearly 13 percent of households in Southern California lived under the poverty level in 2018, 0.4 percentage points higher than the percent of households across the state.

Educational Attainment

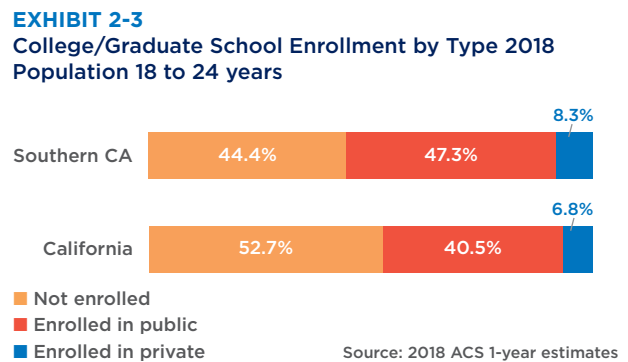
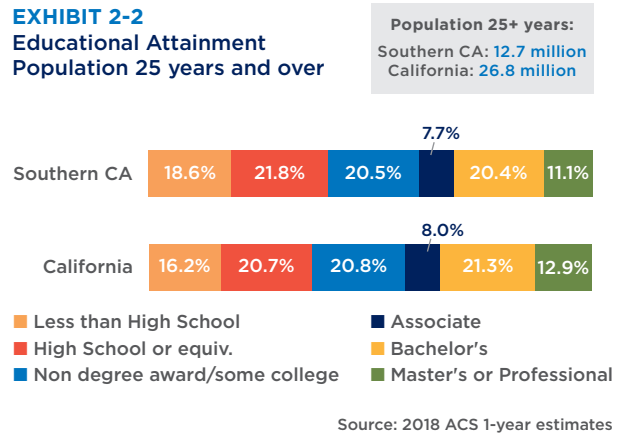
Educational attainment is the highest level of education that an individual has achieved. Knowing the educational attainment of the population within a specific area can provide insight into a variety of social, health and economic factors about the area. Areas with high rates of low educational attainment usually face challenges such as higher rates of unemployment and poverty and will therefore use higher levels of public services and resources.

From a business perspective, educational attainment of the resident population provides information about the quality of the labor pool from which businesses will pick employees. Areas with high levels of educational attainment may be sought out by businesses during their site selection process if they require highly educated and high skilled workers. Understanding the gap between workforce needs and resident capabilities can provide insight into the need for educational programs, along with other workforce training initiatives, and help quantify the benefits of pursuing additional education to individuals.

Southern California has a large proportion of their resident population with low levels of educational attainment (Exhibit 2-2). About 40 percent of the resident population of age 25 and older have a high school education or less. Just over 31 percent of residents have a bachelor’s degree or higher, which breaks down as 20 percent with a bachelors and 11 percent with a master’s or higher.

As an increased number of jobs require higher skill levels, a shortage of individuals with higher levels of education can result in fewer prospects for their employment, and consequently higher rates of unemployment.

Educational attainment is typically reported for individuals aged 25 years and over, as those who are younger may be in the process of obtaining higher levels of education. Exhibit 2-3 shows the percentage of the population ages 18 to 24 years that were enrolled in school at a college, university or graduate school in 2018 in Southern California. Approximately 55 percent of this cohort is currently enrolled in school and in the process of obtaining a higher level of education.



Resident Employment

While educational attainment can provide insight into the capability of residents, an examination of the actual employment status of current residents reveals the occupations in which residents are working and in which industries. It is possible that working residents are under-employed, but current employment, like educational attainment, will provide a baseline indicator of residents' capabilities.

The employment of current residents of Southern California by industry is shown in Exhibit 2-4. Note that this is employment of residents no matter where the jobs are located.

The top three employing industries are: health care and social assistance (accounting for 12.3 percent of Southern California's resident employment); retail trade (10.7 percent); and manufacturing industries (9.3 percent).

Other regional industries that employ a large number of local residents include educational services, accommodation and food services, professional, technical and scientific services, and construction. Within each industry, there are a variety of occupations. For example, workers employed by health care industries can include physicians, nurses, medical technicians, accountants, data processors, food preparers, orderlies, janitors, lawyers, and many more.

Similarly, workers trained or skilled for a particular occupation can be employed by many industries. For example, sales representatives are employed in retail industries, in manufacturing firms, in health care services and across a number of other sectors. Nurses may be employed in hospitals, in schools or by insurance carriers.

Individuals trained in an occupation may therefore find employment in a variety of industries, and will be especially interested in industries that are growing no matter what their individual skill levels may be since growing industries will hire a panoply of workers at many skills and education levels.

... growing industries will hire a panoply of workers at many skills and education levels.

EXHIBIT 2-4
Resident Employment by Industry
Population Ages 16 years and over
Southern California 2018

NAICS	Industry	Employment	Share of Total
11	Ag, forestry, fishing and hunting	66,280	0.7%
21	Mining/ /oil and gas extraction	7,440	0.1%
22	Utilities	57,600	0.6%
23	Construction	604,440	6.7%
31-33	Manufacturing	844,610	9.3%
42	Wholesale trade	292,470	3.2%
44-45	Retail trade	972,830	10.7%
48-49	Transportation and warehousing	516,510	5.7%
51	Information	285,740	3.2%
51	Finance and insurance	341,440	3.8%
53	Real estate/rental/leasing	220,060	2.4%
54	Professional and technical services	676,310	7.5%
55	Mgmt of companies and enterprises	12,040	0.1%
56	Admin/support/waste mgmt services	447,650	4.9%
61	Educational services	731,200	8.1%
62	Health care and social assistance	1,112,540	12.3%
71	Arts, entertainment, and recreation	283,460	3.1%
72	Accommodation and food services	740,040	8.2%
81	Other services	509,470	5.6%
92	Government	328,130	3.6%
Total - Industry - 16+ years		9,050,250	100.0%

Source: 2018 ACS 1-year estimates, *may not sum due to rounding

The working residents of Southern California are trained and employed in a variety of occupations, as shown in Exhibit 2-5. The groupings shown are major occupational groups; there are many detailed occupations within each major group that will be further examined in the following section. The occupational distribution of the region's working residents is diverse, with: 59.9 percent employed in so-called "white collar" occupations, such as office and administrative support, sales, management and professional occupations; 20.7 percent in so-called "blue collar" occupations, such as construction, production and transportation; and 19.4 percent in services.

Note that although 12.3 percent of working residents of the region were employed in health care industries (see Exhibit 2-4), only 8.6 percent of working residents were in healthcare occupations. The remainder are in other occupations (such as office, administrative, sales, building maintenance, food preparation and serving, and so on) that are employed in health care industries. This is an important point to consider. The healthcare industry is large and growing, and its occupational needs are very diverse—not only limited to health-care occupations.

The relationship between industries and their occupational needs is not always carefully examined as the nature of industrial production and its technological evolution changes. However, it is clear that there is a wide variety of occupational needs within each industry that can provide opportunities at all skill levels.

The largest occupational group of working residents of Southern California is office and administrative support occupations. Workers in these occupations accounted for 11.6 percent of all resident employment in Southern California in 2018, or nearly 1.1 million jobs, the largest occupational group by far.

Sales and related occupations are held by the second largest proportion of working residents in the region, accounting for 10.6 percent of all jobs. Almost one million residents work in sales occupations.

EXHIBIT 2-5
Resident Employment by Occupation
Population Ages 16 years and over
Southern California 2018

<i>SOC</i>	<i>Occupational Group</i>	<i>Employment</i>	<i>Share of Total</i>
11-0000	Management	887,740	9.8%
13-0000	Business and financial operations	482,380	5.3%
15-0000	Computer and mathematical sciences	225,270	2.5%
17-0000	Architecture and engineering	166,210	1.8%
19-0000	Life, physical and social science	64,630	0.7%
21-0000	Community and social services	146,860	1.6%
23-0000	Legal	103,060	1.1%
25-0000	Education, training and library	451,460	5.0%
27-0000	Arts/ /entertainment/sports/media	320,170	3.5%
29-0000	Healthcare practitioner and techs	459,160	5.1%
31-0000	Healthcare support	319,380	3.5%
33-0000	Protective service	180,660	2.0%
35-0000	Food preparation and serving related	544,040	6.0%
37-0000	Building/grounds cleaning/maintenance	395,900	4.4%
39-0000	Personal care and service	288,520	3.2%
41-0000	Sales and related	958,860	10.6%
43-0000	Office and admin support	1,050,740	11.6%
45-0000	Farming, fishing and forestry	51,490	0.6%
47-0000	Construction and extraction	471,920	5.2%
49-0000	Installation, maintenance, repair	230,430	2.5%
51-0000	Production	495,410	5.5%
53-0000	Transportation / material moving	755,980	8.4%
Total - Occupations - 16+ years		9,050,250	100.00%

Source: 2018 ACS 1-year estimates, *may not sum due to rounding

EXHIBIT 2-6
Industry Employment Growth 2018-2023
in Southern California

	<i>Annual Average % Growth</i>	<i>Δ Employment (000s)</i>
Total Nonfarm Payroll Employment	0.3	88.1
Good Producing Industries:	0.8	12.1
Natural Resources and Mining	0.2	0.0
Construction	0.5	9.1
Manufacturing	0.1	2.9
Service Providing Industries	3.5	76.0
Wholesale Trade	0.2	2.7
Retail Trade	0.1	3.5
Transportation, Warehousing, Utilities	0.5	7.0
Information	0.3	3.6
Financial Activities	0.3	2.6
Professional and Business Services	0.8	16.3
Educational and Health Services	0.7	24.9
Leisure and Hospitality	0.5	14.1
Other Services	0.1	1.3
Government	0.2	0.1

Sources: BLS QCEW; forecast by LAEDC

Other occupations held by a large proportion of Southern California residents include: management occupations (which are employed in all industries and often have higher educational requirements), accounting for 887,740 working residents; transportation and material moving occupations, which are employed for the most part in the region's large trade and logistics industry, employing 755,980 workers; and production occupations, which are employed in the region's manufacturing industries.

Employment by industry (the industrial base) and occupation of businesses located in Southern California are discussed in the appendix.

Industry and Occupational Forecasts

The LAEDC produced a combined industry and occupational forecast that considers both the industrial changes that the region is undergoing and the demand for certain skills driving occupational growth. Using our model, we produce forecasts for the unique industries and occupations that are most likely to create opportunities for the region's dynamic and shifting labor market.

The three industries that will add the most job openings in Southern California include (Exhibit 2-6): (1) educational instruction and health care, which includes educational institutions and support services, ambulatory health care, hospitals, nursing and residential care facilities and social assistance industries (individual and family services, community and relief services, vocational rehabilitation and child day care); (2) professional and business services, a large and diverse industry that includes a variety of professions such as legal, accounting, architectural, engineering, computer design, advertising, environmental consulting, commercial photography, veterinary services and more; and (3) leisure and hospitality, which includes art and recreation industries, accommodation and all food services, including full-service restaurants, fast food outlets, caterers, mobile food services and drinking establishments.

The industries with the fastest job growth rates between 2018 and 2023 are: Professional and business services, education and health services and transportation, warehousing and utilities, with five-year growth rates of 4.0 percent, 3.4 percent, and 2.1 percent, respectively.

The largest number of overall openings will occur in the largest occupational groups, such as office and administrative support occupations, food preparation and serving occupations, and sales and related (Exhibit 2-7 shows projected openings for Southern California). Although many of these occupations require lower levels of education and training, a significant portion are high-skilled occupations, requiring and educational attainment of a bachelor's or graduate degree.

EXHIBIT 2-7

Occupational Growth in Southern California 2018-2023

SOC	Occupational Group	New Jobs	Replacement	Total
11-0000	Management occupations	61,890	62,490	124,390
13-0000	Business and financial	43,270	42,020	85,290
15-0000	Computer and mathematical	19,630	17,880	37,510
17-0000	Architecture and engineering	11,000	9,680	20,680
19-0000	Life, physical, social science	6,310	7,820	14,120
21-0000	Community and social services	11,110	13,750	24,860
23-0000	Legal occupations	3,650	3,140	6,790
25-0000	Education, training and library	40,950	121,440	162,390
27-0000	Arts, entertainment, sports	21,000	24,080	45,090
29-0000	Healthcare practitioners	25,510	20,640	46,150
31-0000	Healthcare support	22,590	20,550	43,140
33-0000	Protective services	17,980	19,400	37,390
35-0000	Food preparation and serving	147,280	142,770	290,050
37-0000	Building/grounds maintenance	39,450	42,710	82,160
39-0000	Personal care and service	98,530	97,450	195,980
41-0000	Sales and related	117,490	113,970	231,450
43-0000	Office and administrative	141,800	149,800	291,600
45-0000	Farming, fishing and forestry	4,790	4,760	9,550
47-0000	Construction and extraction	46,280	39,600	85,880
49-0000	Installation, maint / repair	25,780	24,470	50,250
51-0000	Production	39,390	38,690	78,090
53-0000	Transportation/material moving	76,720	69,260	145,980
Total*		1,022,400	1,086,380	2,108,780

* May not sum due to rounding

Source: Estimates by LAEDC

California State Universities in Southern California

There are eight CSU campuses located in the five-county region of Southern California. In the 2017/2018 academic year, there were 54,448 graduates, accounting for close to 40 percent of all graduates in Southern California (Exhibit 2-8).

Graduates from these eight CSU campuses account for 45 percent of all graduates in the CSU system, and just over 18 percent of all university graduates statewide (Exhibit 2-9).

Splitting out the number of graduates in Southern California by the degree type shows that the CSU campuses in Southern California account for 48 percent of all bachelor's degrees awarded in the region (45,016 graduates), 24 percent of all master's degrees awarded in the region (9,352 graduates), and two percent (2%) of all doctoral and professional degrees awarded in the region (188 graduates) in the 2017/2018 academic year (Exhibit 2-10).

Case Study: CSU Northridge

CSUN is making a significant impact in educating local talent for the diverse industries that exists in the Southern California region.

CSUN develops partnerships with stakeholders that include government, industry and other educational institutions. In 2018, the university was named an Innovation and Economic Prosperity University by the Association of Public and Land-grant Universities (APLU) for establishing these strong partnerships as a means to promote innovation and entrepreneurship, increase technology transfer, and develop much needed leadership talent in the region.

EXHIBIT 2-8
Graduates in Southern California 2017/2018
Four-year colleges and universities

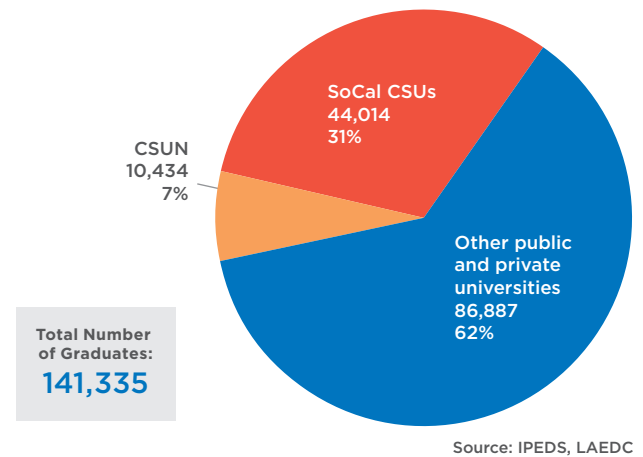


EXHIBIT 2-9
Southern California Share of Graduates 2017/2018
Four-year colleges and universities

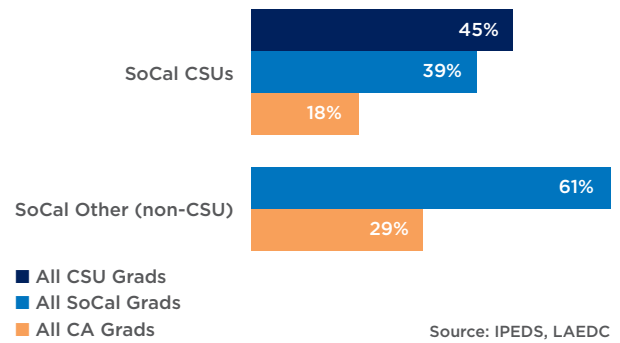
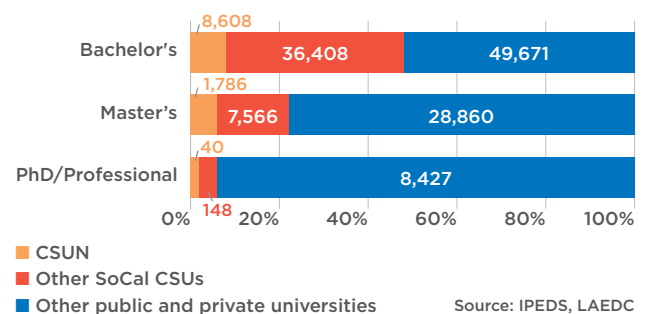


EXHIBIT 2-10
Graduates in Southern California 2017/2018
By degree type



In 2020, CSUN received the Carnegie Foundation's Classification for Community Engagement.¹³

CSUN designs advanced professional development workshops, seminars and certificate programs for individuals with a bachelor's or graduate degree. These programs are flexible and vary in format, from single day program to weeklong training seminars or fully online degree and certificate programs.

CSUN has a robust online education capacity. Many CSUN graduate programs for midcareer professionals are offered fully online, providing maximum flexibility of when and where to study. These programs unite students from across the nation and around the globe. Students benefit from studying with counterparts in a variety of locations and working environments. Through the cohort format, each program builds a cohesive and supportive learning community for midcareer professionals.

CSUN's fully online graduate-degree programs are taught by the same faculty and practitioners as the university's on-campus programs. Online program accreditation and evaluation standards, as well as on-time graduation rates and student-success rates on licensing exams, are as high as or higher than their classroom-delivered counterparts. Offered through CSUN's Tseng College, these fully online degree and certificate programs have on-time graduation rates that average 85 percent or higher.

Online program faculty collaborate with instructional design and educational technology professionals in CSUN's Tseng College's distance learning unit. All faculty receive individualized training and ongoing support to ensure instructional excellence and the smooth and effective use of online educational technology.

The Tseng College's professional distance learning staff also provides training and start-to-finish technical support to those who enroll in CSUN's online degree programs.

CSUN's Tseng College is developing new programs in order to respond and adopt to changing needs. Programs at the master's level currently in development are: data analytics, AI, cybersecurity, nurse educator, accounting analytics, hospitality management.

Also highly valuable are "hybrid" graduate-degree programs, in which online instruction is blended with face-to-face instruction at off-campus locations. While online content predominates in CSUN's hybrid model, the face-to-face component enables students to network with fellow professionals from different parts of their organization.

With the majority of employers citing soft skills, and critical thinking skills in particular, as a challenge to find in today's job market, CSUN's ranking 9th in the Wall Street Journal's 2017 "The 20 Colleges That Improve Critical Thinking Skills the Most" is a noteworthy achievement.

¹³ The elective classification involves data collection and documentation of important aspects of institutional mission, identity and commitments and requires substantial effort invested by participating institutions. It is an institutional classification; it is not for systems of multiple campuses or for part of an individual campus. The classification is an evidence-based documentation of institutional practice to be used in a process of self-assessment and quality improvement. It is similar to an accreditation process of self-study. The documentation is reviewed by a National Review Panel to determine whether the institution qualifies for recognition as a community engaged institution.

In the 2017/2018 academic year, there were 10,434 CSUN graduates, accounting for close to 19 percent of graduates across the eight CSU campuses in Southern California and 9 percent of all graduates in the CSU system statewide. Graduates from CSUN accounted for just over 7 percent of all university graduates in Southern California and close to 4 percent of all university graduates statewide (Exhibit 2-11).

Total campus enrollment at CSUN in the 2017/2018 academic year numbered 38,716, with 31,338 students enrolled full-time (81 percent) and 7,378 student enrolled part-time (19 percent) across 18 undergraduate (excludes undeclared) and 17 master's degree programs (Exhibits 2-12 and 2-13). CSUN's enrollment distribution by bachelor's degree programs and master's degree programs are displayed in Exhibit 2-14 and Exhibit 2-15 respectively.

EXHIBIT 2-12
Undergraduate Degree Programs, Fall 2019

Program	Enrollment
General Psychology	2,449
Radio/ TV/ Broadcasting	1,802
Kinesiology	1,585
Criminal Justice	1,524
Sociology	1,422
Accounting	1,301
Orgnzt Sy Management	1,211
Marketing	1,210
Computer Science	1,185
Mechanical Engineering	1,177
Other	19,767

EXHIBIT 2-13
Graduate Degree Programs, Fall 2019

Program	Enrollment
Counseling	292
Soc/Welfare	255
Admin/Super	150
Community Disordr	145
Business Administration	97
Health Ed	96
Physical Therapy	95
English	85
Electrical Engineering	78
Special Education	75
Other	2,465

EXHIBIT 2-11
CSUN Share of Graduates 2017/2018
By degree type

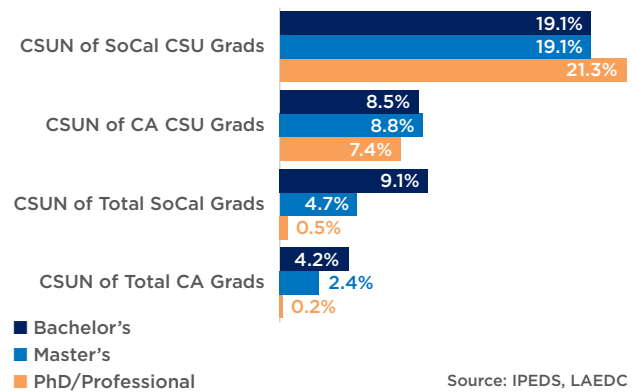


EXHIBIT 2-14
CSUN Enrollment Distribution
Bachelor's degree programs Fall 2018

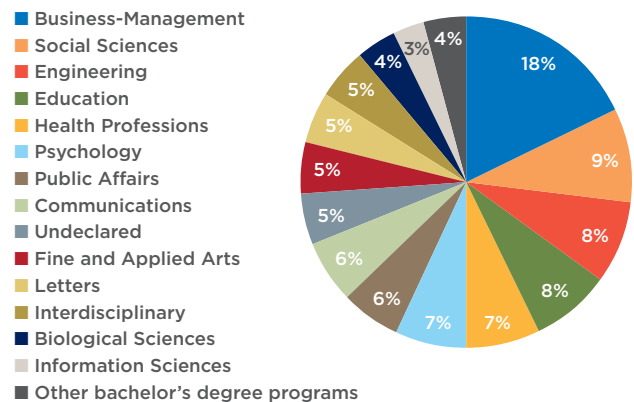
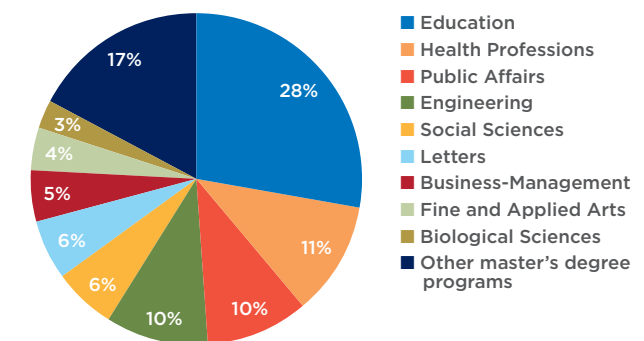


EXHIBIT 2-15
CSUN Enrollment Distribution
Master's degree programs Fall 2018

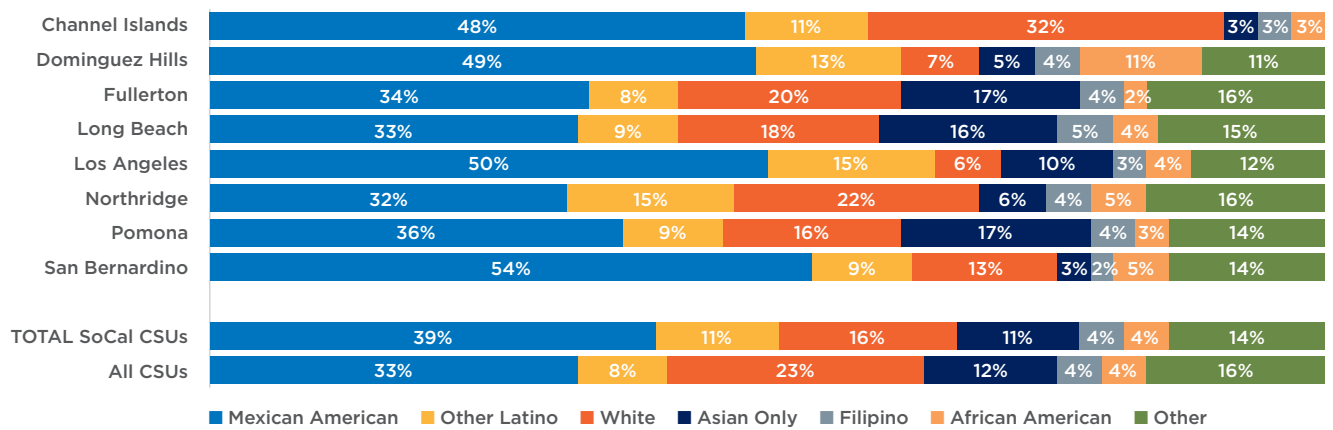


The CSU Student Body in Southern California

CSUs provide a high-quality education to students, allowing them to gain access to high-skill occupations across numerous industries and ensuring that they will be job-ready.

Students enrolled in CSUs in Southern California are racially and ethnically diverse. Exhibit 2-16 shows the distribution of race and ethnicity of students enrolled across the eight CSU universities in Fall 2018; diversity varies between universities, but all have a strong representation of students who report their ethnicity as Latino, especially those reporting as Mexican-American. All eight of the CSUs in Southern California are recognized by the Department of Education as HSIs (Hispanic-Serving Institutions).¹⁴

EXHIBIT 2-16
CSU Enrollment in Southern California
Distribution of Race and Ethnicity Fall 2018



Source: CSU Institutional Research, LAEDC

¹⁴ See supra note 4.

03.

HIRING INDUSTRIES WITH PROMISE

In this section, we identify target industries that are most promising in terms of high-skill jobs, and use the occupational composition of the expected jobs in those industries to identify the top detailed occupations classified as high-skill, requiring a bachelor's or graduate degree, presenting their predicted job needs from 2018 to 2023.

The Demand for High-Skill Jobs

Projected demand for labor (total openings, including net new jobs and replacement jobs) from 2018 to 2023 by industry sector is broken out according to the job's entry-level education requirements.

The growth of industries in the region will precipitate the growth of particular occupations. The overall net growth of an occupation is a consequence of its contribution to industries that are both growing and declining. This may result in an occupation experiencing no or little growth as workers that had been employed in a failing industry shift to similar roles in industries that are growing, or as workers in certain occupations are replaced with improved technologies or processes.

In addition to the growth and decline of industries, job replacement rates depend on several factors. The age profile of the existing workforce can portend higher than average replacement rates, such as occurs in many manufacturing industries as highly-skilled craftsmen are reaching retirement age and younger workers have not been trained or received apprenticeships to replace them. Occupations that enable current workers to gain valuable skills through on-the-job training will encourage them to move into higher-skilled occupations and leave job openings for those with less experience. Industries that are undergoing technological change may find that new processes require fewer workers, leaving fewer openings available as workers retire or leave for other positions.

Education and Skills Requirements

We identified industries in Southern California that would be prime targets for new or continued investments made to programs specializing in the training and/or education for individuals to fill the projected demand for high-skill jobs over the next five years. These training and education programs, to be provided by four-year colleges and universities, include bachelor's, master's and doctoral degree programs.

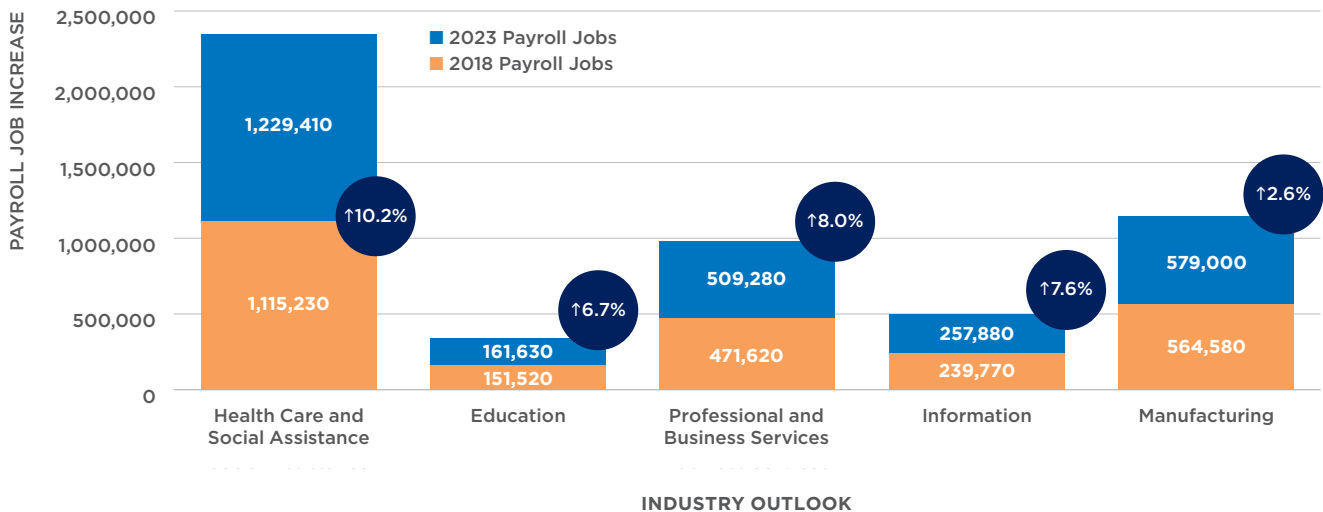
Our criteria for choosing target industries thus include: (1) industry growth rate—those demonstrating high rates of growth are preferred to those growing slowly; (2) potential job creation—the numbers of jobs projected to be added is also an important metric; and (3) the share of current and projected jobs in the industry that require a bachelor's degree or above—the focus of this report is on high-skill jobs, so industries with a larger share of highly educated workers in their workforce and larger numbers of high-skill jobs projected are preferred.

Using these goals, the following industries are identified as targets for specific workforce training and education interventions (in order of relevant NAICS):

- Health Care and Social Assistance (NAICS 62)
- 21st Century Education (NAICS 61)
- Professional, Scientific and Technical Services (NAICS 54)
- Information (NAICS 51)
- Manufacturing (NAICS 31-33)

These industries are discussed individually below, including employment projections at the industry level and the types of occupations that they are most likely to employ, requiring a bachelor's degree or higher for entry.

EXHIBIT 3-1
Employment Outlook for Industries with High-Skill Jobs



Health Care

The health care industry is the single largest employment sector in the United States, employing over 20 million Americans, and approximately 13 percent of all workers in the nation. The same is true in Southern California, where over 1 million of those workers reside. In addition to being a massive employer currently, the industry is projected to remain the single largest source of employment growth as the nation faces an aging population that will demand more health services, new therapies and medicines and an ever more technically skilled workforce to provide those complex services. The Kaiser Family Foundation's research shows that the average family of four now spends \$22,855 a year on medical services (Exhibit 3-2), including their employers' premium contribution, up 67 percent from \$14,625 a decade ago. This translates into more revenues for the industry, which in turn results in substantially more employment opportunity.

Workforce

Health care is a highly-educated industry, with nearly 60 percent of jobs held by workers with at least some college (Exhibit 3-3). Only 16.5 percent of jobs in the industry belong to those with less than a high school education. As the industry becomes even more technically focused, we should expect the percentage of the workforce with a bachelor's degree or higher (currently 28 percent) to rise.

The level of ethnic and racial diversity within the health care industry is extremely high, with demographics relatively representative of the region as a whole (Exhibit 3-4). There is substantial employment among Whites and Hispanics, with a large number of Asians as well. There is also a significant population of Black workers in the region. A major source of this diversity is the wide availability of health care jobs, both geographically and in terms of required skills.

HEALTHCARE QUICK FACTS

1,141,680 Workers in SoCal in 2018
28.0 percent bachelor's and graduate degrees

\$46,600 Average annual wage in SoCal in 2018
21.1 percent lower than the regional all industry average due to social assistance

857,270 Projected openings from 2018 to 2023
22.2 percent bachelor's and graduate degrees

89,790 Projected openings in identified key occupations from 2018 to 2023

35,686 Graduates in majors for key occupations (2017)

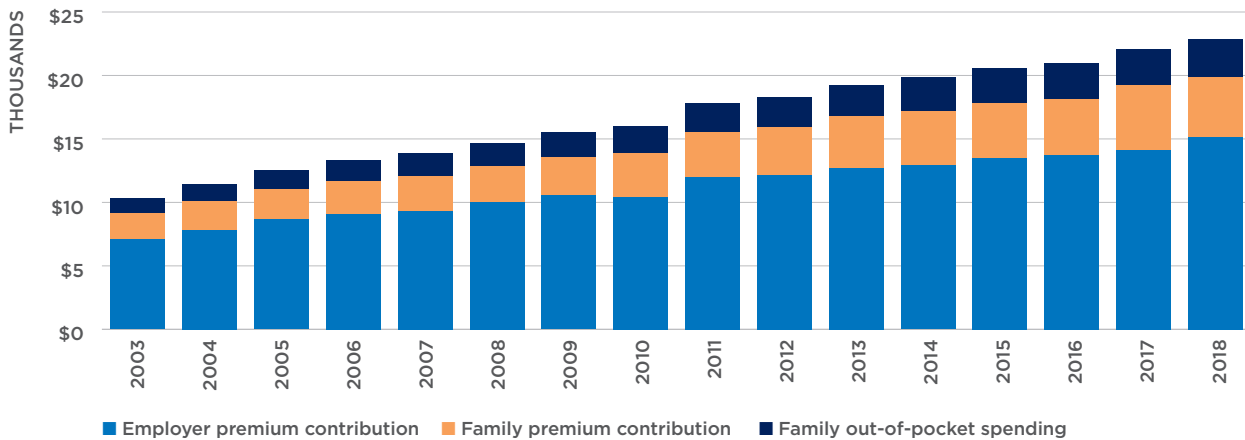
Healthcare is projected to remain the single largest source of employment growth

Most automation is complimentary to labor

Intense demand for business skills

Workers are racially and ethnically diverse.

EXHIBIT 3-2
Average Annual Healthcare Spending
Family of four



The health care sector is one of the most female-dominated fields among major industries, with women making up 72.5 percent of the workforce to men’s 27.5 percent. This is in stark contrast to many of the other STEM fields, such as information or manufacturing, which remain heavily male-dominated (Exhibit 3-5). With women making up far more than 50 percent of the degrees being granted in health sciences, we should expect this distribution to remain similar into the near future.

Innovation and New Technologies

While a number of other industries are facing the rising specter of automation replacing jobs, the vast majority of new technologies in the health care space are complementary to labor, allowing workers to be more productive and garner higher wages (Exhibit 3-6). For instance, newer, more sophisticated diagnostic tools are increasing the demand for labor needed to perform tests, and newly developed pharmaceuticals and surgical procedures mean more demand for nurses and physicians in clinical settings to perform these treatments. The research and development spending necessary to produce these new technologies is already driving up employment both in health care and related sectors, as venture capital investments made in pharmaceutical and biotech firms were up 232 percent from 2010 to 2018, and health tech investments were up 186 percent in the same period (Exhibit 3-7). In addition, the adoption and deployment of software-based technologies to

EXHIBIT 3-3
Industry Employment by Education

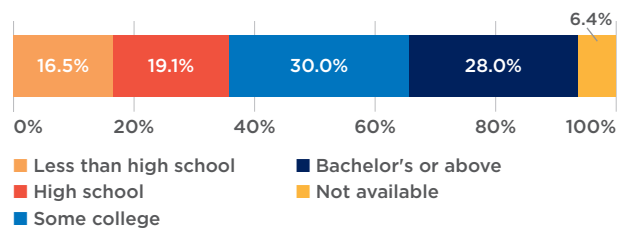


EXHIBIT 3-4
Industry Employment by Race and Ethnicity

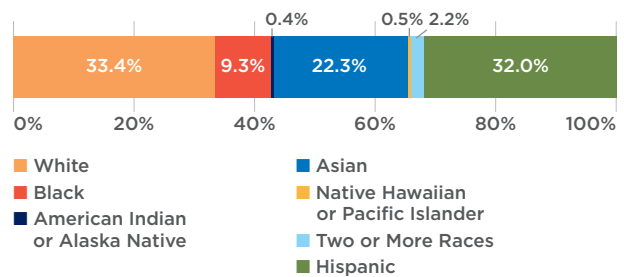
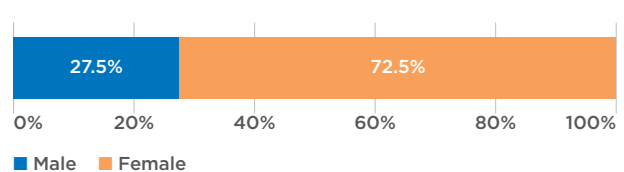


EXHIBIT 3-5
Industry Employment by Sex



manage patient records is becoming increasingly ubiquitous across the industry, which directly affects the skills and other competencies needed for the successful performance of occupational duties.

Even the advent of customer facing technologies, such as direct-to-consumer genetic testing will drive more health care consumption, as genetic risk factors are taken more seriously, and more informed consumers demand more screenings and personalized treatments and health services than people in the past.

The Impact of COVID-19 on the Industry

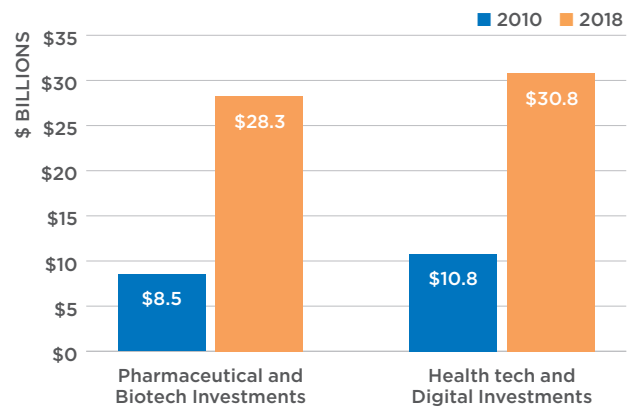
Although it would seem that the immediate impact of a pandemic on the health care industry would be to drive a substantial increase in demand, in practice that various policy and behavioral changes of people in response to the crisis have meant that demand for typical health-care services has plummeted. This reduction of demand is likely to hit smaller clinics and providers significantly harder than the major health systems, whose broader support and ability to access funding streams will allow them to weather the changing environment. Because of this disparate impact, the trend will likely be towards ever more health care system consolidation, as smaller practices are subsumed into broader systems in order to survive the uncertain economic environment.

In the longer term, the crisis has served as something of a proof of concept for telemedicine, which had seen limited usage up to this point. By forcing medical systems to adapt, we should expect to see an acceleration of technology adoption, and these newer more consolidated systems will be more prepared to do so. In addition, given that we expect to see further industry consolidation into unified healthcare systems, the demand for administrative and management expertise is unlikely to waver, as wrangling many more workers and technologies will require further effective administrative capacity.

EXHIBIT 3-6
Average Annual Wage in Healthcare in 2018



EXHIBIT 3-7
Venture Capital Investment



Key Occupations by Education

An occupation is classified according to the set of activities or tasks that an employee is paid to perform.

BACHELOR'S OCCUPATIONS

The single most in-demand occupation from employers requiring a bachelor's degree for entry is that of Registered Nurses (RNs). At 127,000 employees in the region, RNs make up over 10 percent of all employment in the sector. And, demand is projected to continue and grow for the near future. The RN occupation is expected to rise to nearly 140,000 employed by 2023, with total openings of nearly 45,000 over the next five years, or roughly 9,000 per year. If there can be said to be a single occupation which gives a worker the best chances of being employed in a high paying job, it is nursing. In particular, because the employment of nurses is widely spread out both in the region and throughout the country, it gives nurses great geographic flexibility, allowing them to find work anywhere.

Following nursing we see large demand for Medical and Health Services Managers, as well as Business Operations Specialists and Child, Family and School Social Workers. Employment in each of these occupations is easily an order of magnitude smaller than nursing, but they still employ thousands of people each, and they should continue to add large numbers of jobs for the foreseeable future.

One major takeaway from the health care occupations requiring a bachelor's degree is the intense demand for managerial and business skills. Indeed, looking at the top 10 growing occupations in the industry, we find Medical and Health Services Managers, Business Operations Specialists, General and Operations Managers, Accountants and Auditors and Human Resource Specialists (Exhibit 3-8). Fully one half of the top 10 growing

A major takeaway from the healthcare occupations requiring a Bachelor's degree is the intense demand for managerial and business skills.

occupations are related to the growth of health care as a business, with financial, regulatory, human resource, administrative and operational responsibilities. As health care systems have become larger, the need for a battalion of professionals to help manage their increasingly complex organizational challenges has grown, and even in the case of more technical professions, such as nursing, having these business skills is key to career growth and development. The importance of these management skills is reflected in the annual wages for relevant occupations, as General and Operations Managers see by far the highest average annual wages at nearly \$140,000 per year, followed by Medical and Health Services Managers at just over \$120,000. In contrast, a number of the more social services-oriented growth occupations, such as Community and Social Services Specialists and Education Administrators are seeing wages much closer to the regional average at around \$50,000 dollars a year (Exhibits 3-9 and 3-10).

EXHIBIT 3-8

**Key Occupations Requiring a Bachelor's Degree for Entry
Employment Growth Rate 2018-2023**



EXHIBIT 3-9

**Key Occupations Requiring a Bachelor's Degree for Entry
Average Annual Wages 2018**

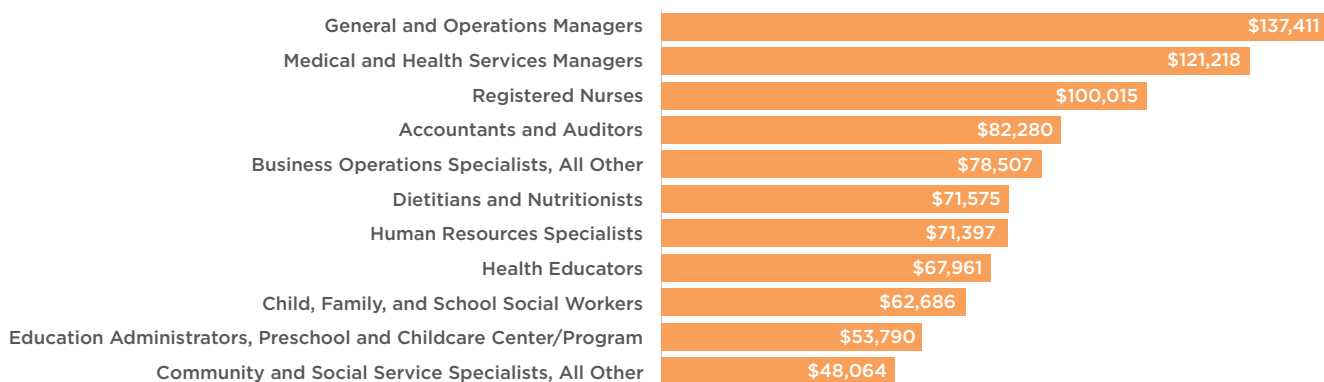


EXHIBIT 3-10

Key Occupations Requiring a Bachelor's Degree for Entry

SOC	Title	HEALTH CARE EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
29-1141	Registered Nurses	127,277	138,990	11,710	\$100,015	8,920	6,580
11-9111	Medical and Health Services Managers	13,948	15,400	1,450	\$121,218	1,500	1,210
13-1199	Business Operations Specialists, All Other	7,569	8,240	670	\$78,507	670	540
21-1021	Child, Family, and School Social Workers	6,519	7,160	640	\$62,686	830	700
11-1021	General and Operations Managers	6,248	6,790	540	\$137,411	680	570
13-2011	Accountants and Auditors	3,057	3,340	280	\$82,280	370	310
29-1031	Dietitians and Nutritionists	2,812	3,090	280	\$71,575	270	210
13-1071	Human Resources Specialists	3,142	3,410	260	\$71,397	320	270
21-1091	Health Educators	2,281	2,510	230	\$67,961	360	320
21-1099	Community and Social Service Specialists,	2,455	2,670	220	\$48,064	290	250
11-9031	Education Administrators, Preschool and Childcare Center/Program	2,482	2,700	220	\$53,790	270	250

GRADUATE OCCUPATIONS

The number one occupation requiring a graduate degree in terms of both raw employment and job growth prospects is Marriage and Family Therapists, which are seeing current employment levels of around 8,400 for the region, expected to rise to roughly 9,300 by 2022. Therapists are followed by Healthcare Social Workers at 7,900 employed, then Nurse Practitioners, Mental Health and Substance Abuse Social Workers and Physician Assistants.

The most financially lucrative of these careers include Nurse Practitioners and Physician Assistants, who earn an average of \$134,000 and \$115,000 respectively. This is unsurprising given the more technical nature of the occupations. In contrast, Marriage and Family Therapists, despite requiring a graduate degree, earn an average of \$50,000 dollars per year.

Health care as a field also contains several occupations that require a doctorate outside of the traditional medical and dental degrees. Two of these relevant occupations are Physical Therapists and Audiologists. Employment prospects for Physical Therapists, in particular, are very good; there are currently roughly 8,800 Physical Therapists in the five-county Southern California region, and that number is expected to rise to nearly 9,700 over the next five years. In contrast, there are only around 350 Audiologists employed in the region; though that number will also increase in the coming years. Both occupations are highly compensated with Audiologists earning an average of \$111,000 per year and Physical Therapists earning around \$97,000 per annum.

EXHIBIT 3-11
Key Occupations Requiring a Graduate Degree for Entry
Employment Growth Rate 2018-2023



EXHIBIT 3-12
Key Occupations Requiring a Graduate Degree for Entry
Average Annual Wages 2018



EXHIBIT 3-13

Key Occupations Requiring a Graduate Degree for Entry

SOC	Title	HEALTH CARE EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
Master's Degree							
21-1013	Marriage and Family Therapists	8,381	9,320	940	\$49,682	620	430
21-1022	Healthcare Social Workers	7,889	8,620	730	\$78,243	820	670
29-1171	Nurse Practitioners	5,273	5,910	630	\$133,925	440	310
21-1023	Mental Health and Substance Abuse Social Workers	5,018	5,540	520	\$61,708	620	510
29-1071	Physician Assistants	4,109	4,570	460	\$115,115	340	250
Doctoral Degree							
29-1123	Physical Therapists	8,818	9,670	860	\$96,860	620	450
29-1181	Audiologists	364	420	60	\$111,456	30	20

HEALTH CARE

Key Academic Majors for Growth Occupations

Looking at the occupations that are expected to see the most growth in health care, there are a few clear choices for majors that will best prepare students to take advantage of these opportunities. Most obviously, nursing is a major that easily allows graduates to move into high-growth field. The five-county region of Southern California graduated around 4,300 people in nursing related majors in 2017 for an annual openings number of more than twice that amount at 8,900. This implies that the region is vastly under-producing nurses to satisfy its health care needs.

Another degree that sees major opportunity is general Business Administration. Although it is one of the most common majors, with over 17,000 graduates, it is good in that it prepares students for employment across several fast-growing health care industry occupations, never mind the myriad opportunities across different industries.

Other key majors are Public Health, which sees opportunity for graduates as Health Educators, as well as Medical and Health Services Managers, as well as Psychology.

For graduate opportunities, the two most in demand majors will be Social Work and Nursing. Although Social Work does not offer the highest paid jobs, there is significant demand across several different occupations, giving graduates numerous opportunities within the very broad health care industry. In Nursing, while there is plenty that can be done with a bachelor's degree, more education means more opportunities to take on management roles and positions, as well as to work in positions with greater autonomy; for example, as a Nurse Practitioner.

There are also a number of opportunities at the doctoral level for those not studying medicine directly. Physical Therapy doctorates in particular are highly demanded, with 482 graduates in the region in 2017 versus an estimated 620 open jobs.

EXHIBIT 3-14**Majors for Key Growth Occupations Requiring a Bachelor's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
29-1141	Registered Nurses	Registered Nursing/Registered Nurse	Nursing	3,675	4,288
11-9111	Medical and Health Services Managers	Health/Health Care Administration/Management, Public Health, General	Health Administration, Public Health	1,807	1,995
13-1199	Business Operations Specialists, All Other	Business Administration and Management, General	Business Administration	17,397	18,886
21-1021	Child, Family, and School Social Workers	Social Work	Child and Adolescent Development	3,048	3,048
11-1021	General and Operations Managers	Business Administration and Management, General	Business Administration	17,397	20,139
13-2011	Accountants and Auditors	Accounting	Accounting	1,431	1,570
29-1031	Dietitians and Nutritionists	Dietetics/Dietitian	Family and Consumer Sciences	386	443
13-1071	Human Resources Specialists	Human Resources Management/Personnel Administration, General, Organizational Behavior Studies	Business Administration, Psychology	347	348
21-1091	Health Educators	Public Health, General	Public Health	735	1,037
21-1099	Community and Social Service Specialists, All Other	Human Services, General	Psychology	423	500
11-9031	Education Administrators, Preschool and Childcare Center/Program	Educational Leadership and Administration, General	Public Sector Management	1,169	1,173

EXHIBIT 3-15**Majors for Key Growth Occupations Requiring a Master's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
21-1013	Marriage and Family Therapists	Social Work, Marriage and Family Therapy/Counseling	Social Work	3,149	3,156
21-1022	Healthcare Social Workers	Social Work	Social Work	2,581	2,581
29-1171	Nurse Practitioners	Registered Nursing, Nursing Administration, Nursing Research and Clinical Nursing, Other	Nursing	173	372
21-1023	Mental Health and Substance Abuse Social Workers	Social Work	Social Work	2,581	2,581
29-1071	Physician Assistants	Physician Assistant	Nursing	215	215

EXHIBIT 3-16**Majors for Key Growth Occupations Requiring a Master's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
29-1123	Physical Therapists	Physical Therapy/Therapist	Physical Therapy	482	482
29-1181	Audiologists	Audiology/Audiologist and Speech-Language Pathology/Pathologist, Communication Sciences and Disorders, General	Audiology	162	162

21st Century Education

Educational Instruction and Support Services in an Age of Technology and Change

Education is not typically thought of as an industry; however, it is both a major employer and an important fount of economic strength.

While the future of education as an industry has some looming challenges and threats to overcome in the 21st century, in particular declining birth rates, shifting perceptions about relevancy and reductions in immigration causing less demand, the near-term outlook is quite strong with estimated employment growth.

Education in the 21st century is required to keep pace with rapid changes in technology, the economy and in society. Educational instruction and support services in an age of technology and change requires the teaching of core competencies to students today to set them up for success in the jobs of tomorrow. These core competencies often include, digital literacy, critical thinking, and problem-solving.

Size of Industry

Combined private and public employment in education account for roughly half a million jobs in the Southern California region (Exhibit 3-17), with the vast preponderance of those being in Los Angeles County (over 377,000 employees), home to one of the largest school districts in the country: Los Angeles Unified School District, which boasts well over 600,000 K-12 students. The next largest county by employment is Riverside, which employs just short of 70,000 people, and by far the smallest employment is found in Ventura County, which only employs approximately 5,000 people in the industry.

21st CENTURY EDUCATION INDUSTRY QUICK FACTS

505,020	Workers in SoCal in 2018 37.2 percent bachelor's and graduate degrees
\$57,870	Average annual wage in SoCal in 2018 2.0 percent lower than the regional all industry average
326,580	Projected openings in SoCal from 2018 to 2023 55.5 percent bachelor's and graduate degrees
136,480	Projected openings in identified key occupations from 2018 to 2023
25,987	Graduates in majors for key occupations (2017) in SoCal

21st century education requires empathy and communication skills

Most new openings require more education

More openings than graduates in relevant majors

Provides opportunities for diverse majors

Overall, education in the 21st century is not a particularly high paying industry, with average annual wages across the region ranging from around \$40,000 to close to \$60,000 a year (Exhibit 3-18).

Workforce

Working in education is by and large stereotyped as being a more female profession, and this perception is born about by the data regarding the industry in Southern California. Fully two thirds of all region employment in education is women, with men accounting for the remaining third (Exhibit 3-19).

Unsurprisingly, those who choose to go into education in the 21st century need to have a relatively high level of educational attainment themselves, and 37 percent of those working in the industry in Southern California have a bachelor’s degree or higher (Exhibit 3-20). Those who have at least some college education number a total of 28 percent of those working in the labor force, and only around 11 percent of workers lack a high school degree.

The education industry in California is significantly more white than the population as a whole, with non-Hispanic whites accounting for around half of all employment, and Hispanics only accounting for around 30 percent (Exhibit 3-21). Of the remaining employment, around 11 percent is Asian and six percent (6%) is Black.

Innovation and New Technologies

Despite the narrative of online learning disrupting the education sector, it is ever more apparent that technology is likely to play a more complementary role in the sector, at least in the near-term. Colleges are using predictive analytics to increase retention rates, reduce the time to degree completion, identify the markers of struggling students and alleviate “pain points,” as well as to accelerate progress on other important initiatives.

Although there has been something of a rush into online learning, it is increasingly obvious that the optimal form of learning requires a significant amount of in person instruction.

EXHIBIT 3-17
Total Employment in 2018

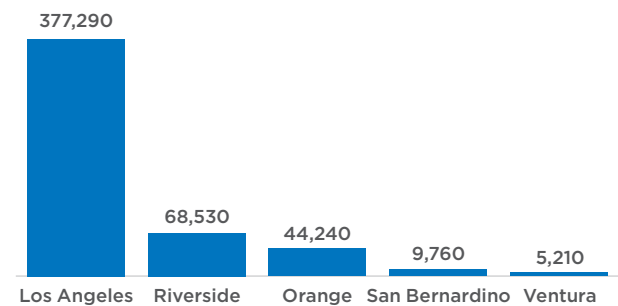
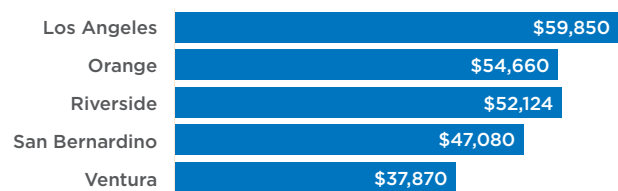


EXHIBIT 3-18
Average Annual Wage in Education in 2018



Online learning does have a key role to play in augmenting course availability in schools that lack it. For instance, it provides access to advanced math and science coursework in smaller schools that would otherwise not have the resources to provide those classes. Additionally, online programs are being offered by alternative education providers (MOOCs, “boot camps,” and other low-cost, online alternatives) to adult learners looking to upskill.

In California, there are significant capacity challenges in the UC and CSU systems, out-of-state public institutions are growing enrollment in their online programs by offering tuition guarantees to residents of the Golden State who are facing impacted programs.

Another place in which there is room for technological adoption is in the application of artificial intelligence to textbooks and learning systems, in which an AI assistant or the system itself can provide further clarification and examples on topics the student is not clear on, without having to consult the teacher. This more dynamic model of textbook creation allows students to immediately dive into topics they are interested in, helping to keep them engaged in the learning process while also leaving teachers time to spend on students who are most struggling. This model can be seen in online learning systems such as Duolingo, which allow learners to direct their own studies towards the topics that they most need work on, while still moving them towards a broader goal.

Embracing these new learning platforms is allowing the education industry to accelerate development across all other industries. In addition to the occupations listed in this section, educational tools are merging services between learning institutions and the entertainment and information industries. Web-based learning videos provided by universities and other education providers are employing traditional roles such as instructors, while also driving demand for content creators involved in production, video editing, translating, and handling communication equipment. Education is also being brought to the forefront of games, software and virtual reality. These technologies are increasingly being used as tools for learning and support an array of professions

EXHIBIT 3-19
Industry Employment by Sex

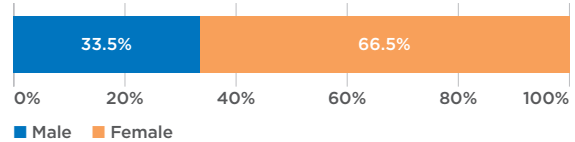


EXHIBIT 3-20
Industry Employment by Education

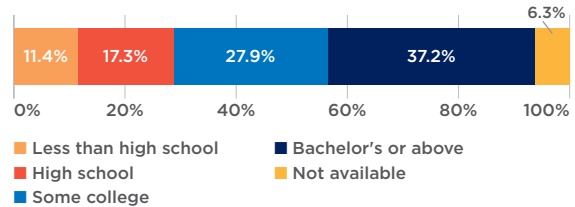
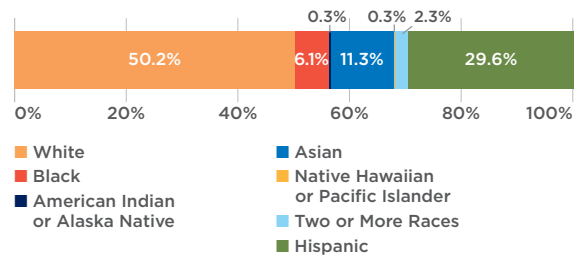


EXHIBIT 3-21
Industry Employment by Race and Ethnicity



involved in producing these resources. Higher education would benefit in working in collaboration with entertainers and developers producing learning content and integrating innovative technologies into the classroom.

It's also worth remembering that professionals from every sector can trace their careers back to the education industry. Instructors at every level serve as mentors, coaches and motivators for professional athletes, performers, managers, scientists, health care workers, and so on. Increasingly, each industry is encouraging its workforce to adopt new technologies and continue participating in lifelong learning. As such, the education industry must collaborate closely with each industry and continue serving as the lifeline of professional development.

The Impact of COVID-19 on the Industry

In the short term, COVID represents an abrupt shock to the financial security of numerous educational institutions and systems, with many previously robust universities facing perilous fiscal shortfalls. When this is coupled with the specter of a potential declining enrollment trend, as the number of children aging into college falls, some institutions will likely have to close or downsize. Beyond the downsizing, most universities will have to continue to offer a complete array of online courses as the pandemic-induced uncertainty continues to worry students about physical attendance. One effect of this will be a likely reduction of the various university experience related investments, i.e. athletics and campus life, and a refocusing on the core teaching and research capacities.

In addition, although the need for administrators will remain, these jobs will likely become more technical, as a need to manage a more complex university presence in both the virtual and real worlds emerges. Much as with the financial crisis, we expect to see a student led shift away from more theoretical and academic studies towards those with more technical education and a clearer path to employment. So although 21st century education will continue to be a major employer and driver of local economies, it will likely experience dramatic shifts in the coming years.

Key Occupations by Education

An occupation is classified according to the set of activities or tasks that an employee is paid to perform.

BACHELOR'S OCCUPATIONS

The education sector offers a substantial number of opportunities for those with a bachelor's degree. Most obviously, there are variety of different opportunities for teachers, who can choose to work in widely different grade levels, subjects and schools, or opt for more tailored programs such as special education.

By far the largest occupation in the industry is Elementary School Teachers, Except Special Education, who number nearly 60,000 in Southern California This is perhaps unsurprising, as class sizes in elementary schools are typically smaller than those in later grades and there are more elementary school grades than either secondary or middle school, thus necessitating a substantially larger number of teachers for the same number of students in a grade. Elementary School Teacher jobs are expected to grow from a current employment level of 60,000 to roughly 63,500 in the

next five years, adding around 4,000 jobs, at a growth rate of around 7 percent.

After Elementary School Teachers, the second largest occupation is Secondary School Teachers, Except Special and Career/Technical Education. These Secondary School teachers number some 40,000 in the region, and it is projected that nearly 3,000 more jobs will be added by 2023.

More generally, the majority of opportunities to be found in the industry are for different varieties of teachers, with fully eight of the top-10 growth occupations being direct employment of teachers. The remaining two are for Coaches and Scouts, which number roughly 6,000 and Business Operations Specialists, who number nearly 5,000. Despite the narrative of the increasing bureaucratization of the education system, employment is still dominated by those doing the actual teaching work.

The wages suggest that the cultural narrative of the underpaid teacher is probably true. The full-time teachers of the Elementary, Middle and Secondary School varieties all pulling in roughly \$80,000 dollars a year on average. Meanwhile Substitute Teachers (including teaching assistants) earn notably less at around \$40,000 a year.

EXHIBIT 3-22
Key Occupations Requiring a Bachelor's Degree for Entry
Employment Growth Rate 2018-2023

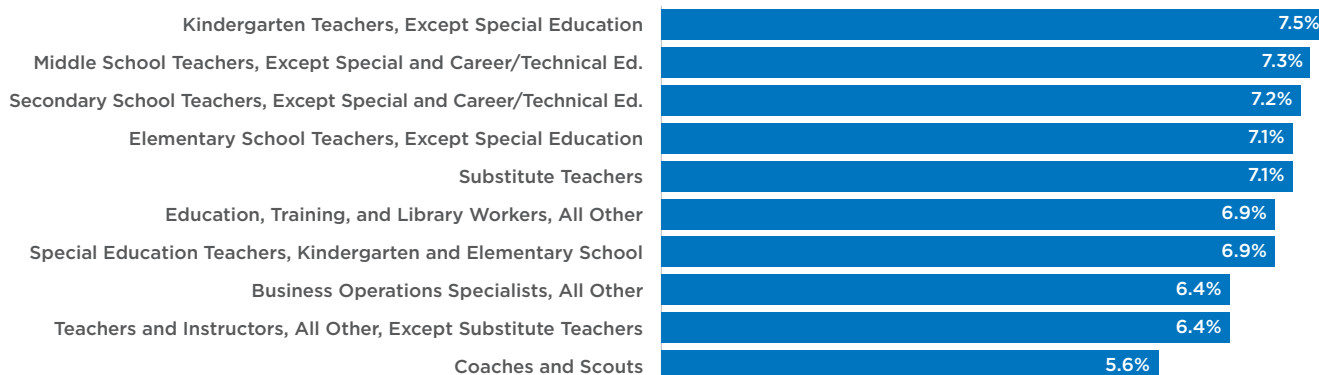


EXHIBIT 3-23

**Key Occupations Requiring a Bachelor's Degree for Entry
Annual Average Wages 2018**

Special Education Teachers, Kindergarten and Elementary School	\$83,986
Elementary School Teachers, Except Special Education	\$83,858
Secondary School Teachers, Except Special and Career/Technical Ed.	\$80,325
Business Operations Specialists, All Other	\$79,199
Middle School Teachers, Except Special and Career/Technical Ed.	\$78,590
Kindergarten Teachers, Except Special Education	\$69,890
Education, Training, and Library Workers, All Other	\$49,525
Teachers and Instructors, All Other, Except Substitute Teachers	\$49,271
Coaches and Scouts	\$45,821
Substitute Teachers	\$42,554

EXHIBIT 3-24

Key Occupations Requiring a Bachelor's Degree for Entry

SOC	Title	21ST C. EDUCATION EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
25-2021	Elementary School Teachers, Except Special Education	59,299	63,510	4,210	\$83,858	5,460	4,620
25-2031	Secondary School Teachers, Except Special and Career/ Technical Education	40,279	43,180	2,900	\$80,325	3,640	3,060
25-3098	Substitute Teachers	31,644	33,890	2,250	\$42,554	5,240	4,800
25-3097	Teachers and Instructors, All Other, Except Substitute Teachers	19,146	20,370	1,230	\$49,271	2,510	2,260
25-2022	Middle School Teachers, Except Special and Career/ Technical Education	16,007	17,180	1,170	\$78,590	1,640	1,400
25-1191	Graduate Teaching Assistants	7,415	7,930	510	\$36,164	900	800
25-9099	Education, Training, and Library Workers, All Other	7,415	7,930	510	\$49,525	810	720
25-2052	Special Education Teachers, Kindergarten and Elementary School	5,176	5,530	360	\$83,986	560	490
27-2022	Coaches and Scouts	5,948	6,280	330	\$45,821	1,300	1,230
13-1199	Business Operations Specialists, All Other	4,860	5,170	310	\$79,199	430	370
25-2012	Kindergarten Teachers, Except Special Education	4,072	4,380	310	\$69,890	750	690

MASTER'S OCCUPATIONS

The largest growth occupation requiring a master's degree in the education sector is that of Educational, Guidance, School, and Vocational Counselors, who number some 9,700 in the region, with projected employment to rise to around 10,400 over the next five years. These categories are followed by several varieties of education administrators, who number nearly 20,000 jobs (when combined) in the management and administration of schools, with projected growth rates for these occupations all exceeding 7 percent over the next five years.

Of the top-five occupations requiring a master's degrees, only Postsecondary Art, Drama and Music Teachers requires actual teaching. While most disciplines require a doctorate in order to teach in a university setting, the arts typically offer a much wider range of opportunities for those with degrees such as a Master of Fine Arts.

Of these key growth occupations, the highest paid are administrative positions, with Postsecondary Education Administrators and Elementary and Secondary School Education Administrators both earning in the area of \$130,000 per year.

In contrast, Educational, Guidance, School, and Vocational Counselors, while employing the largest number of people, only earn around \$78,000 per year.

EXHIBIT 3-25

Key Occupations Requiring a Master's Degree for Entry
Projected Growth Rate 2018 to 2023

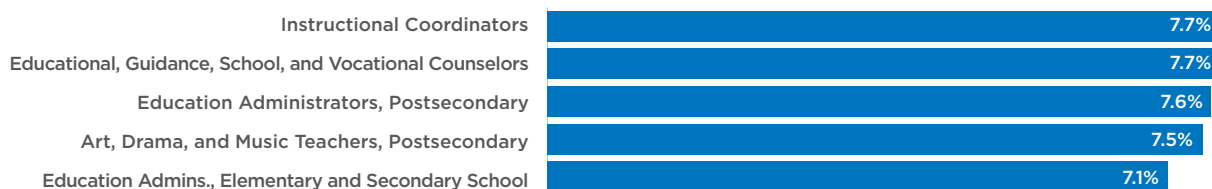


EXHIBIT 3-26

Key Occupations Requiring a Master's Degree for Entry
Annual Average Wage 2018

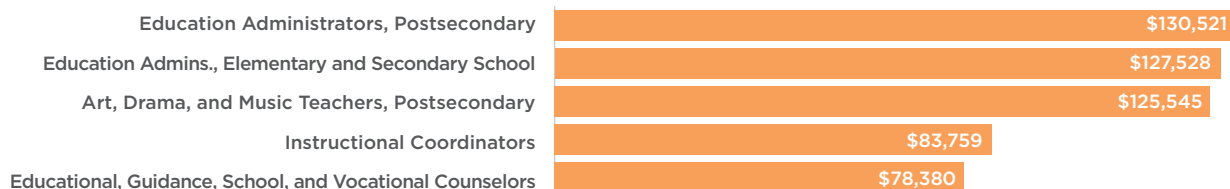


EXHIBIT 3-27**Key Occupations Requiring a Graduate Degree for Entry**

SOC	Title	21ST C. EDUCATION EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
Master's Degree							
21-1012	Educational, Guidance, School, and Vocational Counselors	9,693	10,440	750	\$78,380	1,320	1,170
11-9032	Education Administrators, Elementary and Secondary School	8,061	8,630	570	\$127,528	750	630
25-9031	Instructional Coordinators	5,931	6,390	460	\$83,759	720	630
11-9033	Education Administrators, Postsecondary	4,596	4,950	350	\$130,521	710	640
25-1121	Art, Drama, and Music Teachers, Postsecondary Education	3,195	3,430	240	\$125,545	570	520

Key Majors for Growth Occupations

Education is perhaps unique among the industries studied in that there is not the same demand for specific college majors, rather there is a substantial demand for those with a passion for their major and an interest pursuing the teaching credentials necessary in order to share that passion with students.

Most of the occupations with the highest projected growth in the sector are those directly related to teaching. In these instances, the most demanded majors are those that broadly align with K-12 education. Several of these majors include: Biology, English, History and Mathematics. In the case of Elementary School Teachers however, the subject knowledge is much less important.

Among those occupations demanding master's degrees, there is demand for more managerial roles in the educational system, with substantial demand for majors in Educational Leadership and Administration, as well as Curriculum and Instruction. There are also opportunities for those interested in working as Counselors.

Demand is also high for those interested in teaching the arts at a postsecondary level. So those with graduate degrees in Cinematography and Film/Video Production, Music Performance or Fine/Studio Arts will find ample opportunities in education.

EXHIBIT 3-28

Majors for Key Growth Occupations Requiring a Bachelor’s Degree for Entry

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
25-2021	Elementary School Teachers, Except Special Education	Elementary Education and Teaching, Teacher Education, Multiple Levels	Child and Adolescent Development	464	644
25-2031	Secondary School Teachers, Except Special and Career/ Technical Education	Biology/Biological Sciences, General. English Language and Literature, General. History, General. Mathematics, General.	Biology, English, History, Liberal Studies, Mathematics	8,467	14,394
25-3098	Substitute Teachers	Biology/Biological Sciences, General. English Language and Literature, General. History, General. Mathematics, General.	Biology, English, History, Liberal Studies, Mathematics	8,467	14,394
25-3097	Teachers and Instructors, All Other, Except Substitute Teachers	Biology/Biological Sciences, General. English Language and Literature, General. History, General. Mathematics, General.	Biology, English, History, Liberal Studies, Mathematics	8,467	14,394
25-2022	Middle School Teachers, Except Special and Career/ Technical Education	Biology/Biological Sciences, General. English Language and Literature, General. History, General. Mathematics, General.	Biology, English, History, Liberal Studies, Mathematics	8,467	14,394
25-1191	Graduate Teaching Assistants	Biology/Biological Sciences, General. English Language and Literature, General. History, General. Mathematics, General.	Biology, English, History, Liberal Studies, Mathematics	8,467	14,394
25-9099	Education, Training, and Library Workers, All Other	Learning Sciences.	Liberal Studies	14	14
25-2052	Special Education Teachers, Kindergarten and Elementary School	Special Education and Teaching, General.	Communicative Disorders, Child and Adolescent Development	290	299
27-2022	Coaches and Scouts	Health and Physical Education/Fitness, General. Sports and Fitness Administration/Management	Athletic Training, Kinesiology	2,619	2,846
13-1199	Business Operations Specialists, All Other	Business Administration and Management, General.	Business Administration	17,397	18,886
25-2012	Kindergarten Teachers, Except Special Education	Early Childhood Education and Teaching.	Child and Adolescent Development	1,361	1,541

EXHIBIT 3-29

Majors for Key Growth Occupations Requiring a Master’s Degree for Entry

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
21-1012	Educational, Guidance, School, and Vocational Counselors	Counselor Education/School Counseling and Guidance Services	Psychology	675	707
11-9032	Education Administrators, Elementary and Secondary School	Educational Leadership and Administration, General	Educational Administration	1,169	1,173
25-9031	Instructional Coordinators	Curriculum and Instruction	Secondary Curriculum and Instruction, Educational Technology	315	437
11-9033	Education Administrators, Postsecondary	Educational Leadership and Administration, General	Educational Administration, Higher Education Leadership	1,169	1,286
25-1121	Art, Drama, and Music Teachers, Postsecondary	Cinematography and Film/Video Production. Film/Cinema/Video Studies. Music Performance, General. Fine/Studio Arts, General.	Screenwriting, Music, Theatre Arts, Art	721	1,353

Professional Services

The Professional and Business Services sector encompasses a variety of interrelated industries, ranging from accounting to engineering and scientific research, with high demand for well-educated, technically proficient workers.

The subsectors that comprise this comprehensive industry are, broadly speaking: Legal Services; Accounting; Architecture & Engineering; Design Services; Computer Systems Design; Consulting Services; Scientific Research; and Advertising & Public Relations. Across these subsectors, there is a shared need to synthesize and analyze a complex array of technical information in order to deliver important insights, services and products to clients and other key stakeholders. As the anchor of value creation and capture in the 21st century increasingly centers around knowledge capital, as opposed to physical and labor capital, the highly sophisticated professional firms that are part of the Professional and Business Services industry will play a significant role in regional and global growth.

In the Southern California region, these industries are well-represented, with strong Professional Services clusters in Los Angeles and Orange counties, where many firms choose to locate national, regional or state headquarters. Thanks to the agglomerative impacts of having more talented professionals and sophisticated companies working in close proximity, we should expect even more clustering and a comparatively large increase in employment in the urban cores of the region.

21st CENTURY EDUCATION INDUSTRY QUICK FACTS

475,440 Workers in SoCal in 2018
43.7 percent bachelor's and graduate degrees

\$99,870 Average annual wage in SoCal in 2018
69.1 percent higher than the regional all industry average

268,440 Projected openings in SoCal from 2018 to 2023
55.6 percent bachelor's and graduate degrees

65,690 Projected openings in identified key occupations from 2018 to 2023 in SoCal

40,937 Graduates in majors for key occupations (2017) in SoCal

Computational and quantitative skills highly valued

Employment is clustered in urban cores

Diverse opportunities for different skill sets

Highest percentage of new opportunities for college graduates

Size of Industry

The professional and business services sector employs nearly half a million people across the region, with Los Angeles and Orange counties accounting for over 80 percent of those jobs (Exhibit 3-30). Downtown Los Angeles is the major center of gravity for employment in the region with 290,000 employees in this industry, and Orange County’s miles of office parks support nearly 130,000 workers.

Of these workers, the highest paid are also unsurprisingly found in Los Angeles and Orange counties where the industry pays roughly \$108,000 and \$95,000 a year, respectively (Exhibit 3-31). The lowest paid are in Riverside County where they average just below \$62,000 per year.

Workforce

The professional services sector is relatively egalitarian when it comes to employment by sex. Men make up roughly 56 percent of the workforce and women accounting for the other 44 percent (Exhibit 3-32). This makes it significantly more equal than health care, which is dominated by women, or information, which primarily employs men.

It is no surprise that such a technically demanding industry is made up mostly of highly educated workers. Approximately 44 percent of the industry has a bachelor’s degree or above, with another 25 percent having at least some college education (Exhibit 3-33). In sharp contrast, less than 10 percent of the industry has less than a high school diploma, meaning that the appropriate educational background is crucial for future opportunities in professional services.

Despite the region’s majority Hispanic population, the professional services industry is still a majority white at over 51 percent. Asians are also well represented, accounting for a further 24 percent of the workforce. So although the industry has a relatively equitable sex distribution, its racial and ethnic makeup is far more homogenous.

EXHIBIT 3-30
Total Professional Services Employment in 2018

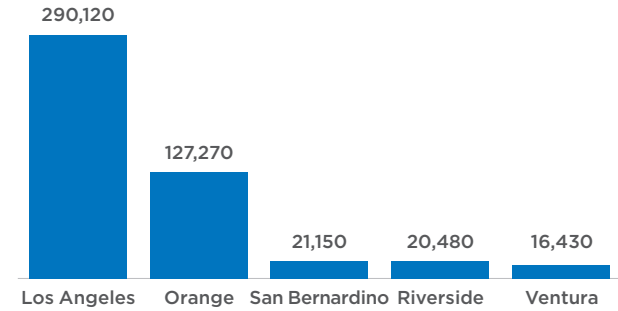


EXHIBIT 3-31
Average Annual Wages in Professional Services in 2018

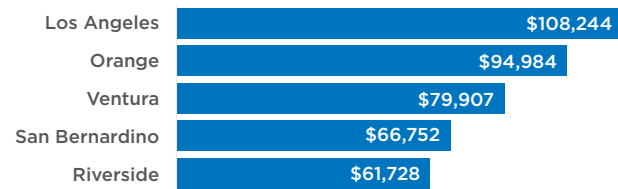


EXHIBIT 3-32
Industry Employment by Sex

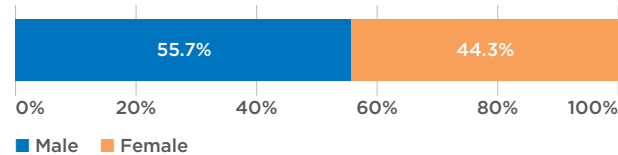
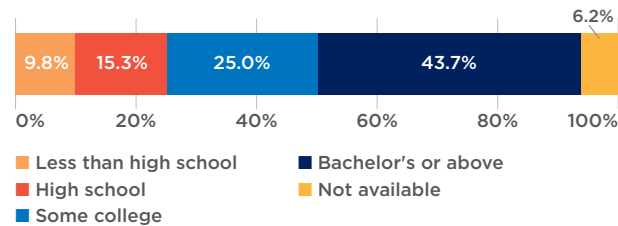


EXHIBIT 3-33
Industry Employment by Education



Innovation and New Technologies

Although much of the current value in professional services is the ability to convey human expertise, the industry is rapidly shifting into one where the ability to scale these insights and provide them to a wider audience is key. In particular, many of the core businesses of professional services are being augmented by automation, which broadly refers to any process or procedure that is performed with minimal human assistance, with fields such as accounting and legal services increasingly relying on computational services to more efficiently provide their services. These fields are becoming rapidly commoditized via technology, with, for example, reports and consulting work becoming increasingly systematized, and success in the industry means being able to interface with these automated systems to respond in real-time to client demand. Especially prized in this industry are skills related to data analytics, as being able to access, interpret and visualize data is becoming an indispensable capability for professionals in these sectors.

The professional and business services sector employs nearly half a million people across the region, with Los Angeles and Orange counties accounting for over 80 percent of those jobs.

Although the industries in professional and business services are highly diverse, the common thread is a demand for highly educated, technically sophisticated workers.

The Impact of COVID-19 on the Industry

The immediate impact of the COVID-19 pandemic on professional services has been significantly lower than its impact on myriad other industries. In particular, professional services is dominated by the kinds of highly technical knowledge economy-based jobs that were most able to shift a majority of their work online, and thus work from home. Because of this, the industry was able to avoid much of the first wave of layoffs that were associated with the crisis.

However, given how closely professional services is tied to the broader business ecosystem, with many firms working as contractors to firms in other industries, business has started to slow and new, more permanent layoffs are underway in a number of firms. As in other industries, this shock is likely to reinforce the shift towards a smaller more technical workforce, as companies try to find new ways to do more with less and pull back on hiring and investment in the face of broad uncertainty in the global market.

Key Occupations by Education

An occupation is classified according to the set of activities or tasks that an employee is paid to perform.

BACHELOR'S OCCUPATIONS

By far the largest occupation in the region within the professional and business services industry is that of Accountants and Auditors at nearly 23,000 workers, with projections to grow to nearly 25,000 over the next five years (an 8.4 percent growth rate).

There are also a substantial number of software development and computing occupations within the industry, including Software Developers for both applications and systems software and Computer Occupations. Taken together, these occupations combine for well over 30,000 jobs in the region and are broadly representative of the demand for software and computing skills outside of the Information sector. In particular, many firms within this industry are making substantial investments in developing software to help automate some of the accounting and consulting services they offer and to provide detailed analytics support as a complement to their services. With the increase in software automation, tasks performed in related occupations too are shifting to require higher levels of critical thinking and the relevant training needed to analyze complex datasets.

Other major sources of employment are more traditional business-related occupations such as Market Research Analysts, General and operations Managers, Management Analysts, Business Operation Specialists and Financial Managers. These occupations are driven by general business and knowledge skills and are appropriate occupations for business and finance majors.

Rounding out the major employment opportunities are Civil Engineers, who number 10,000 workers in the region and provide important consulting services in the Architecture and Engineering subsector.

Among these occupations, the single highest annual average compensation is found for Financial Managers, who earn an average of roughly \$154,000 a year. They are followed by General and Operations Managers at nearly \$140,000 per year, and then the Software Developers at around \$124,000 a year for Systems and \$114,000 for Applications. On the low end for this group are Market Research Analysts, earning an average income of \$70,000 a year.

Given the variety of employment opportunities and unique career paths within the industry it is difficult to draw broad-based insights regarding in-demand majors. Although these occupations may only require a bachelor's degree to start, many are going to require a significant commitment to lifelong learning and further certification in order to keep up with the pace of technological changes, as well as to continue up the "corporate ladder." For instance, accountants may have to pick up a CPA in the course of their career, financial managers need securities licenses and may opt for a CFA designation. Still others may decide to return to school to pick up an MBA or other technical masters that will enable them to stay at the forefront of these demanding technical careers.

EXHIBIT 3-34

**Key Occupations Requiring a Bachelor's Degree for Entry
Employment Growth Rate 2018-2023**

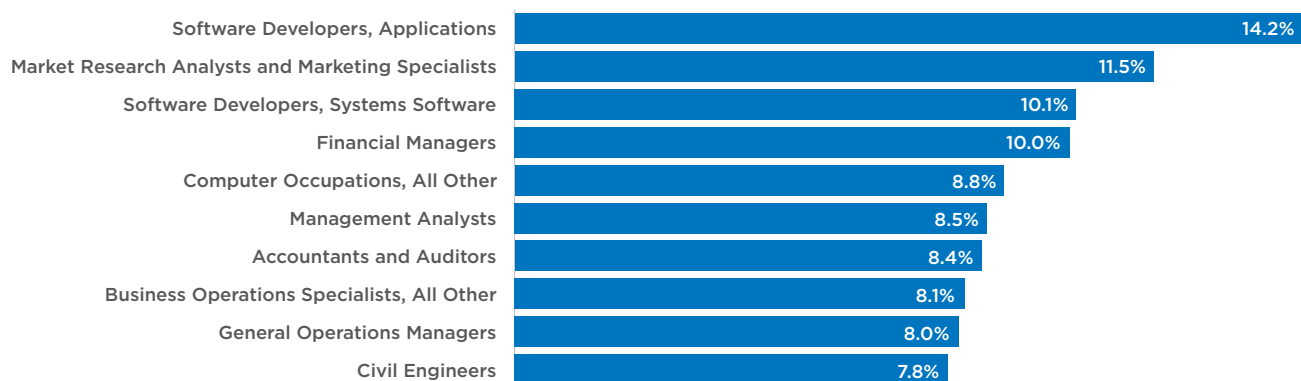


EXHIBIT 3-35

**Key Occupations Requiring a Bachelor's Degree for Entry
Annual Average Wages 2018**

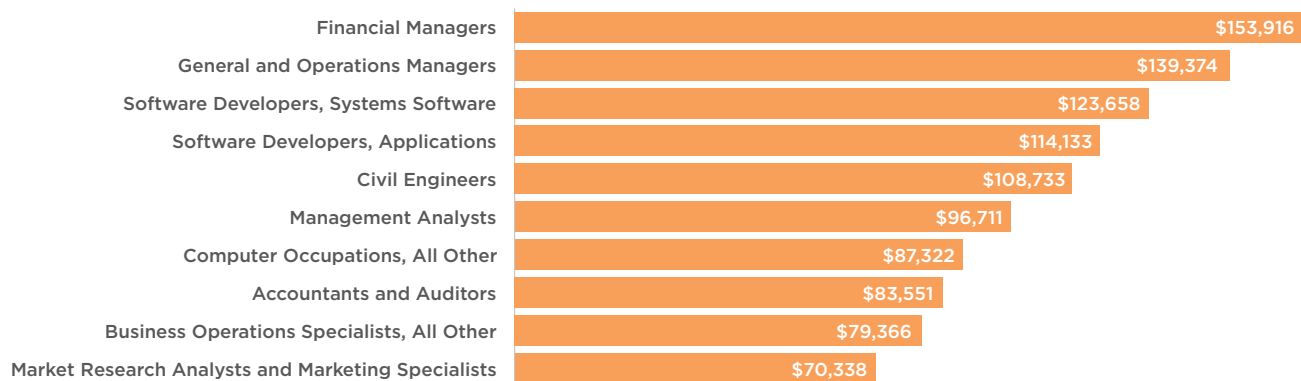


EXHIBIT 3-36

Key Occupations Requiring a Bachelor's Degree for Entry

SOC	Title	PROFESSIONAL SERVICES EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
13-2011	Accountants and Auditors	22,930	24,860	1,930	\$83,551	2,760	2,370
15-1132	Software Developers, Applications	12,551	14,330	1,780	\$114,133	1,390	1,040
13-1161	Market Research Analysts and Marketing Specialists	12,342	13,760	1,420	\$70,338	1,660	1,380
11-1021	General and Operations Managers	14,738	15,920	1,180	\$139,374	1,600	1,370
15-1199	Computer Occupations, All Other	11,798	12,840	1,040	\$87,322	500	290
13-1111	Management Analysts	11,418	12,390	970	\$96,711	1,520	1,330
13-1199	Business Operations Specialists, All Other	11,615	12,560	940	\$79,366	1,040	850
15-1133	Software Developers, Systems Software	7,950	8,750	800	\$123,658	800	640
17-2051	Civil Engineers	10,209	11,010	800	\$108,733	820	660
11-3031	Financial Managers	7,879	8,670	790	\$153,916	740	580

MASTER'S OCCUPATIONS

The largest master's-level occupation within the industry is Computer and Information Research Scientists at 1,100 employed, with a projected increase to around 1,200 by 2023. Much as in the Information sector, the demand here is for highly trained researchers who can develop and apply the sophisticated machine learning models that are necessary in order to deliver the advanced technologies that these companies rely on in an increasingly cutthroat business environment.

Other growth occupations that require a graduate degree for entry are Urban and Regional Planners and Statisticians; both saw substantial employment in the industry at around 850 and 500 workers, respectively. Urban planners, although more commonly associated with government employment, find significant work in many of the architecture, engineering and design firms in

the region, where their expertise in urban forms and zoning help firms to assess the legality and feasibility of projects, along with their potential impacts. In many cases these professionals also have technical Geographic Information System Mapping (GIS), drafting and design skills.

Statisticians see employment opportunities utilizing their quantitative skills to assess the validity and impact of different projects, as well as providing analysis of corporate analytics, which allow these firms to monitor success or failure across a range of key performance indicators.

The key factor separating many of the common bachelor's degree occupations with their master's-requiring counterparts is the importance of advanced quantitative and computational skills. For instance, while many of the bachelor's degree workers will be able to get by with basic Microsoft Office knowledge, most of the master's occupations demand either programming or more complex and comprehensive software expertise.

EXHIBIT 3-37
Key Occupations Requiring a Master's Degree for Entry
Employment Growth Rate 2018-2023



EXHIBIT 3-38
Key Occupations Requiring a Graduate Degree for Entry

SOC	Title	PROFESSIONAL SERVICES EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
Master's Degree							
15-1111	Computer and Information Research Scientists	1,110	1,230	120	\$124,212	80	60
19-3051	Urban and Regional Planners	845	920	80	\$95,407	70	60
15-2041	Statisticians	484	550	70	\$89,050	50	30
19-3022	Survey Researchers	209	230	20	\$77,840	50	50
19-3041	Sociologists	270	280	10	\$102,470	30	30
19-3011	Economists	231	240	10	\$128,013	20	20

Key Majors for Growth Occupations

Professional and Business Services is rife with opportunities for those with a wide variety of college degrees; still, there are a few clear choices for majors that dominate the high-growth occupations. Certainly, Accounting is a valuable bachelor's degree for those looking to take advantage of the large numbers of expected accounting and auditing opportunities. In particular, only 1,570 students graduated in 2017 with an accounting major in the region, for an estimated 2,756 openings.

Unsurprisingly, another major which finds enormous demand in the industry is that of Business Administration, where graduates can find employment as Managers, Management Analysts and Business Operations Specialists, to say nothing of their demand in other fields. We also again see enormous interest in graduates of Computer Science and Information Technology programs to fill coveted Software Development occupations that are increasingly necessary and abundant across the sector.

Rounding out the majors in high demand are Marketing, Civil Engineering and Finance. Not only do these major lead to high-value opportunities in professional services, but they are also highly sought after across a variety of different sectors, meaning that graduates are not pigeonholing themselves into a single industry.

At the master's level, the most sought after degrees are the most technical ones. With substantial demand for Computer Science, Economics and Mathematics. Computer Science graduates meet the need for highly computational work such as machine learning, while graduates in Mathematics and Statistics meet a much wider variety of quantitative needs for different firms, finding work as Statisticians, Survey Researchers and Economists.

There is also some more demand for those in the social sciences, as there will be an increased need for Urban and Regional Planners and Sociologists across the Southern California region. These occupations require degrees in Urban Planning, Sociology or Criminology.

The key factor separating many of the common bachelor's degree occupations with their master's-requiring counterparts is the importance of advanced quantitative and computational skills.

EXHIBIT 3-39**Majors for Key Growth Occupations Requiring a Bachelor's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
13-2011	Accountants and Auditors	Accounting.	Accounting	1,431	1,570
15-1132	Software Developers, Applications	Computer Science, Information Technology, Computer Engineering, General	Computer Science, Information Systems, Computer Engineering	4,601	5,024
13-1161	Market Research Analysts and Marketing Specialists	Marketing/Marketing Management, General.	Marketing	616	660
11-1021	General and Operations Managers	Business Administration and Management, General.	Business Administration	17,397	20,139
15-1199	Computer Occupations, All Other	Computer Science.	Computer Science	3,511	3,804
13-1111	Management Analysts	Business Administration and Management, General.	Business Administration	17,397	18,886
13-1199	Business Operations Specialists, All Other	Business Administration and Management, General.	Business Administration	17,397	18,886
15-1133	Software Developers, Systems Software	Computer Science, Information Technology, Computer Engineering, General	Computer Science, Information Systems, Computer Engineering	4,601	4,947
17-2051	Civil Engineers	Civil Engineering, General.	Civil Engineering	1,136	1,263
11-3031	Financial Managers	Finance, General.	Finance	649	667

EXHIBIT 3-40**Majors for Key Growth Occupations Requiring a Master's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
15-1111	Computer and Information Research Scientists	Computer Science	Computer Science	1,621	2,003
19-3051	Urban and Regional Planners	City/Urban, Community and Regional Planning.	Urban Planning	202	232
15-2041	Statisticians	Mathematics, General, Statistics, General	Mathematics	336	466
19-3022	Survey Researchers	Economics, General, Statistics General	Economics, Mathematics	355	450
19-3041	Sociologists	Sociology, Criminology	Sociology	148	177
19-3011	Economists	Economics, General, Financial Mathematics	Mathematics	432	486

Information

The information industry has become the most important and innovative sector in the California economy over the past decade, driving global productivity and economic growth more than any other sector over that time. At the time of writing, the top-4 largest companies in the S&P 500 are technology companies: Microsoft, Apple, Amazon and Facebook, combining for trillions of dollars of market capitalization.

Although Southern California has not seen quite the same information “gold rush” as the Bay Area has over the past decade, the information sector, in particularly entertainment and digital media, has become an increasingly key portion of the region’s economy, and a major driver of growth in high-paying jobs. In 2016 alone, venture capital investment in Los Angeles County totaled \$3.5 billion (Exhibit 3-41) and is a major contributor to the growing “Silicon Beach” cluster, which is home to around 2,000 technology companies (about 55 companies per square mile according to the Boston Consulting Group). In addition, the region has seen increasingly intense competition between innovative streaming companies such as Netflix and Amazon and their legacy competitors in film and motion picture production, which have been the historical drivers of economic strength in the LA basin.

While the technology cluster developing in Southern California is more nascent than that of Northern California, there remains a lot of untapped potential in this industry here in Southern California. The region graduates more tech PhDs per year than anywhere else in the country and is home to some of the best universities in the world.¹⁵

¹⁵ A 2017 report by the Milken Institute found that among the best universities in the nation for technology transfer were CalTech at 9th, the university responsible for the most patents filed annually, and University of California Los Angeles at 15th, notable for launching the most startups of any university in the region.

INFORMATION QUICK FACTS

240,807 Workers in SoCal in 2018
44.3 percent bachelor’s and graduate degrees

\$128,870 Average annual wage in SoCal in 2018
118.2 percent higher than the regional all industry average

154,800 Projected openings in SoCal from 2018 to 2023
47.2 percent bachelor’s and graduate degrees

32,820 Projected openings in identified key occupations from 2018 to 2023 in SoCal

33,124 Graduates in majors for key occupations (2017) in SoCal

High demand for computing skills

Rising opportunities for creative workers

Most educated workforce of any industry

Information offers the highest average wage of any industry

Size of Industry

The information industry is responsible for 240,000 jobs in the region, with the vast preponderance of these jobs being in Los Angeles County, where many of the region’s media and tech companies are headquartered (Exhibit 3-42). Direct employment in Orange County is only around 26,000 and hovers around 5,000 for the remaining Southern California counties.

The financial compensation follows a similar shape to employment, with by far the highest average annual pay coming in Los Angeles County at nearly \$137,000 per year. This is followed by Orange County at over \$110,000 a year.

Workforce

The narrative of the “tech bro” is by now a cultural touchstone, and stories of frat house like behavior among Silicon Valley startups are well known, but the industry is slowly becoming more diverse. Over sixty percent (63.4%) of the industry is male, with 36.6 percent female (Exhibit 3-44).

Unsurprisingly, the information sector is perhaps the single most highly educated sector in the economy, with 44.3 percent of workers (California) having a bachelor’s degree or higher (Exhibit 3-45). In contrast, only 8.7 percent of the workforce has less than a high school degree. The demand for highly educated and technically skilled workers will only increase, as important technologies such as machine learning and cloud computing require an ever more sophisticated workforce to power them. In addition, workers in this sector will have to focus on building and maintaining their technical skillsets in order to stay relevant in an ever-changing industry.

The information industry is still dominated by white employees, making up 54.1 percent of the workforce, followed by Asians at 20.3 percent. Hispanics are dramatically underrepresented for the region at only 16 percent of workers.

EXHIBIT 3-41
Venture Capital Investment
Los Angeles Region

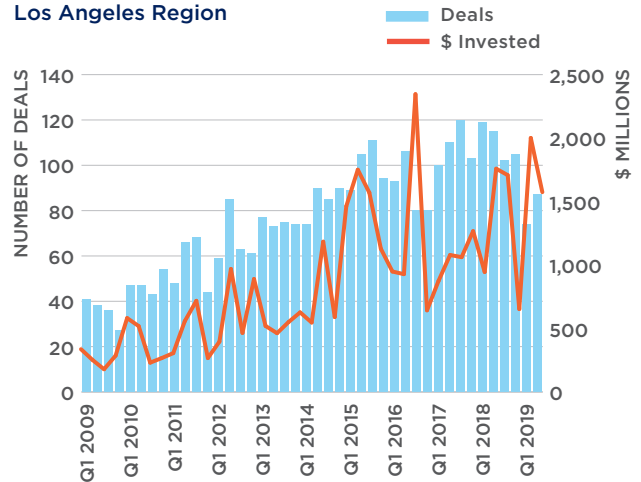


EXHIBIT 3-42
Total Information Employment in 2018

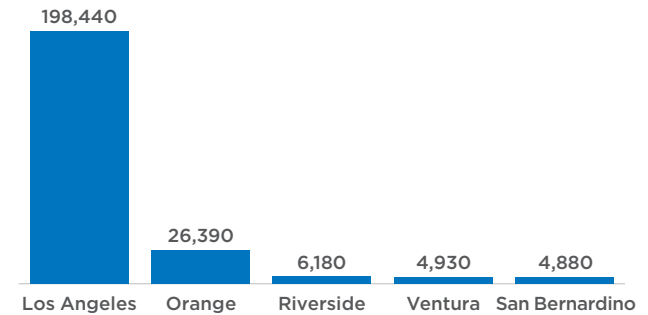


EXHIBIT 3-43
Average Annual Wages 2018

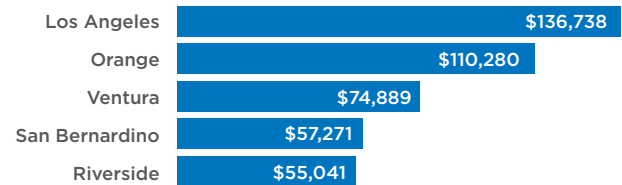
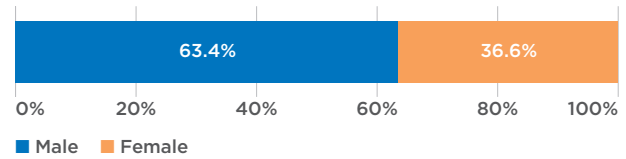


EXHIBIT 3-44
Industry Employment by Sex



Innovation and New Technologies

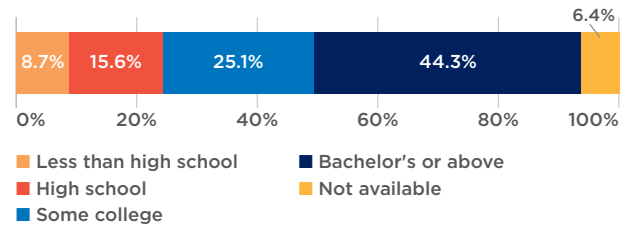
The information sector almost tautologically implies innovation, and as such, there are myriad emerging technologies that will ultimately re-shape the industry in the coming years. In particular, the increasing demand for services in machine learning and artificial intelligence are rapidly shifting the technical skills needed in the industry. So, while fundamental software engineering skills are still key, there is a significant need for more mathematical sophistication, and many of these machine learning algorithms require a graduate education to properly understand and implement.

Another major shift is the paradigm of software as a service (SaaS), which replaces fixed purchases of software with subscription and consulting model that has firms hosting applications and programs via the internet rather than locally. SaaS demands a set of skills related to networking and cloud computing. In particular, familiarity with the various cloud computing solutions such as Amazon Web Services, Google Compute Platform and Microsoft Azure is an indispensable skill in building and scaling these software enterprises. Given the massive data-centers needed to power these firms, there is also intense demand for expertise related to advanced networking and troubleshooting this infrastructure.

The Impact of COVID-19 on the Industry

The initial impact from the pandemic on the information sector has been one of growth, as ever greater shares of consumption have been shifted online. Major tech companies have benefitted as the demand for digital media and entertainment have soared, and the need for connected virtual office spaces have driven growth in others. However, despite the increased demand for many technology firms, the reaction of them to the crisis has been increasingly negative. With uncertain future demand, and an unstable economic environment, many companies are reducing payrolls, with thousands of employees in major firms in California losing their jobs.

EXHIBIT 3-45
Industry Employment by Education



In 2016 alone, venture capital investment in Los Angeles County totaled \$3.5 billion and is a major contributor to the growing “Silicon Beach” cluster.

Beyond simple layoffs, many companies are choosing to reduce their hiring, and cutting back on more experimental projects, choosing to instead focus on their profitable core businesses. As part of this response, many technology firms have announced plans to allow work from home indefinitely. This is likely appealing to a number of workers, but more importantly will have dramatic impacts on the economic picture of major urban centers that need those high wage workers to drive the local service economies, particularly in California.

Key Occupations by Education

An occupation is classified according to the set of activities or tasks that an employee is paid to perform.

BACHELOR’S OCCUPATIONS

It is no surprise that the single largest occupation for employment in the information industry is that of Software Developers, with Software Developers, Applications employing nearly 12,000 people in the region. This number is projected to rise to over 13,000 over the next five years, with an estimated 1,300 total openings per year. In addition, Software Developers, Systems Software are responsible for another 4,200 jobs in 2018, rising to an estimated 4,600 by 2023. Both of these occupations are widely employed in various industries, meaning that, while they are concentrated directly in the information sector, they are widely employable as numerous industries rush to avoid being left behind by rapid technological change.

Other major occupations are those related to the business of technology, with major employment opportunities to be found as Market Research Analysts, Business Operations Specialists, General

and Operations Managers, as well as Accountants and Auditors, meaning that even those who are not directly interested in programming and computer science can find opportunities in the rapidly growing information sector. Each of these occupations employs thousands of people in the region, with annual incomes ranging from an average of \$70,000 for Market Research Analysts to as high as \$140,000 for General and Operations Managers.

One major difference between the Southern California and Northern California information industries is that Southern California’s is largely driven by the global industry’s insatiable hunger for [digital media] content and entertainment, which requires creative professionals to produce that content. As such, there are substantial opportunities for Producers and Directors, with nearly 10,000 employed in the region, as well as for Film and Video Editors and Multimedia Artists and Animators. As companies such as Netflix and Disney compete for market share, the differentiating factor is going to be the ability to produce the new and interesting shows and experiences that consumers demand, meaning that we should continue to see increases in demand for these creative professionals.

EXHIBIT 3-46
Key Occupations Requiring a Bachelor’s Degree for Entry
Employment Growth Rate 2018-2023

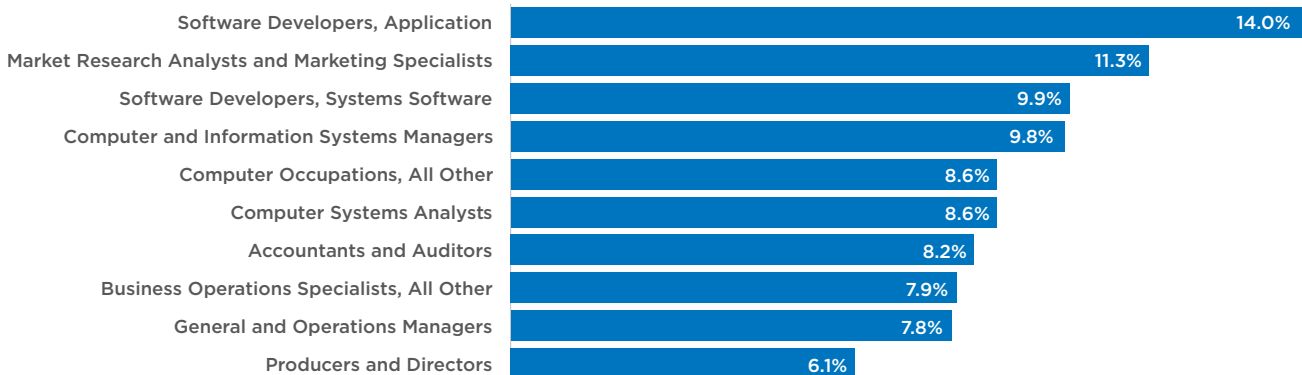


EXHIBIT 3-47

**Key Occupations Requiring a Bachelor's Degree for Entry
Annual Average Wages 2018**

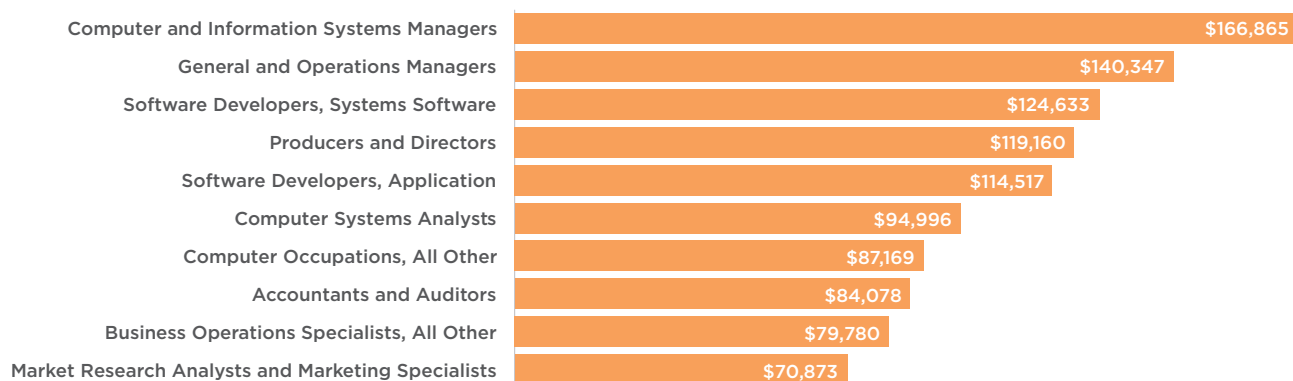


EXHIBIT 3-48

Key Occupations Requiring a Bachelor's Degree for Entry

SOC	Title	INFORMATION EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
15-1132	Software Developers, Applications	11,712	13,350	1,640	\$ 114,517	1,300	970
13-1161	Market Research Analysts and Marketing Specialists	6,593	7,340	750	\$ 70,873	900	740
13-1199	Business Operations Specialists, All Other	7,582	8,180	600	\$ 79,780	680	560
27-2012	Producers and Directors	9,597	10,180	590	\$119,160	1,140	1,020
11-3021	Computer and Information Systems Managers	5,210	5,720	510	\$166,865	470	360
15-1133	Software Developers, Systems Software	4,235	4,650	420	\$124,633	430	340
11-1021	General and Operations Managers	5,346	5,760	420	\$140,347	580	500
15-1199	Computer Occupations, All Other	4,391	4,770	380	\$ 87,169	190	110
13-2011	Accountants and Auditors	4,199	4,540	340	\$ 84,078	510	4340
15-1121	Computer Systems Analysts	3,273	3,550	280	\$ 94,996	340	280

MASTER'S OCCUPATIONS

Although the information sector as a whole tends to only require bachelor's degrees for most of its employment opportunities, there are still several occupations that either require, or benefit from, a graduate degree. In particular, Computer and Information Research Scientists as well as Statisticians represent master's-level growth opportunities. Although direct employment in these occupations within the information sector is small, at around 200 each, these occupations are highly sought after across industries and will continue to grow in importance over the coming years with growth rates exceeding 10 percent by 2023. Computer and Information Research Scientists, in particular, are a critical component for the development and implementation of advanced machine learning algorithms that power many of the most innovative and technologically sophisticated firms.

Statisticians are also involved in machine learning, but also serve critical roles in more traditional data-focused endeavors, helping to perform A/B tests for market research as well as working cross-functionally with different industries to assess the significance of potential findings. There is also significant employment of Librarians in the sector, who are really more digital records keepers than the traditional image of a book-keeper amongst the stacks. As issues of fake news and misleading information become increasingly apparent, the role of those with critical thinking and information synthesis skills will be ever more crucial.

Computer and Information Research Scientists are a particularly highly paid profession, making an average income of nearly \$125,000 per year, reflective of both the advanced technical difficulty of their work and the shortage of relevantly qualified workers relative to demand. In fact, these research scientists can easily make several times the average if they are luckily enough to be employed at a Google or Facebook that highly values these skills. Statisticians make a more modest, but not insubstantial, \$89,000 per year. Librarians earn roughly \$83,000 per annum.

Although there are not many of these occupations that mandate a master's degree in the information sector, many of the bachelor's degree requiring professions prefer to see candidates with a master's degree. In fact, many open software development occupations will frequently require a master's degree for some of their more technical positions, or will routinely pass over those with just bachelor's in favor of their more highly educated fellows.

EXHIBIT 3-49

**Key Occupations Requiring a Master's Degree for Entry
Employment Growth Rate 2018-2023**



EXHIBIT 3-50

Key Occupations Requiring a Graduate Degree for Entry

SOC	Title	INFORMATION EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
Master's Degree							
15-1111	Computer and Information Research Scientists	238	262	24	\$ 124,429	17	12
15-2041	Statisticians	176	200	24	\$ 89,408	17	12
25-4021	Librarians	176	191	15	\$ 82,724	24	21

Key Academic Majors for Growth Occupations

When thinking of the information industry, it is clear that the single most in-demand major for college graduates looking for employment is that of Computer Science, and this is borne out by the data. Four of the top-10 growth occupations in the industry want Computer Science graduates. In general, all of the computing related majors are in high demand, with Information Technology and Computer Engineering also being highly sought after by information sector employers. There are also a substantial number of more business-oriented majors that find significant employment opportunity in the information sector. Business Administration degrees are in high demand to fill positions as managers and operations specialists. In addition, both Marketing and Accounting majors also see opportunity in the industry.

As discussed earlier, Southern California's information sector has a unique demand for majors related to entertainment, with comparatively high need for those with education in Film/Video Production, as well as in Theatre to fill roles producing the content that powers the region's film and television industry. Although, there is heavy demand for these workers, there is still fierce competition for these roles, as unlike Computer Science majors, it is difficult for these graduates to find employment in other industries.

Although there is generally high demand for master's degrees in the information industry, there aren't that many occupations that directly require them. So although it may look like there is not much of a need for a graduate education in Computer Science, that could not be further from the truth. The most direct source of employment for those with master's degrees are as Computer and Information Research Scientists; but, they are also heavily in demand, and in some cases preferred, in all of the same occupations as their related bachelor's degree counterparts.

EXHIBIT 3-51**Majors for Key Growth Occupations Requiring a Bachelor's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
15-1132	Software Developers, Applications	Computer Science, Information Technology, Computer Engineering, General	Computer Science, Information Systems, Computer Engineering	4,601	5,024
13-1161	Market Research Analysts and Marketing Specialists	Marketing/Marketing Management, General	Marketing	616	660
13-1199	Business Operations Specialists, All Other	Business Administration and Management, General.	Business Administration	17,397	18,886
27-2012	Producers and Directors	Cinematography and Film/Video Production, Drama and Dramatics/Theatre Arts, General, Film/Cinema/Video Studies, Radio and Television	Cinema and Television Arts, Theatre	2,556	3,342
11-3021	Computer and Information Systems Managers	Computer Science, Information Technology	Computer Science, 3,958 Information Systems	4,279	
15-1133	Software Developers, Systems Software	Computer Science, Information Technology, Computer Engineering, General	Computer Science, Information Systems, Computer Engineering	4,601	4,947
11-1021	General and Operations Managers	Business Administration and Management, General.	Business Administration	17,397	20,139
15-1199	Computer Occupations, All Other	Computer Science	Computer Science	3,511	3,804
13-2011	Accountants and Auditors	Accounting	Accounting	1,431	1,570
15-1121	Computer Systems Analysts	Information Technology	Information Systems	447	605

EXHIBIT 3-52**Majors for Key Growth Occupations Requiring a Master's Degree for Entry**

<i>SOC</i>	<i>Occupation Title</i>	<i>Key IPEDS Majors</i>	<i>Closest CSUN Majors</i>	<i>SoCal Graduates, Key Majors (2017)</i>	<i>SoCal Graduates, All Relevant Majors (2017)</i>
15-1111	Computer and Information Research Scientists	Computer Science	Computer Science	1,621	2,003
15-2041	Statisticians	Mathematics, General, Statistics, General	Mathematics	336	466
25-4021	Librarians	Library and Information Science.	Knowledge Management	26	40
15-1111	Computer and Information Research Scientists	Computer Science	Computer Science	1,621	2,003
15-2041	Statisticians	Mathematics, General, Statistics, General	Mathematics	336	466

Manufacturing

The dominant narrative about manufacturing in the United States, and more specifically the Southern California region, is one of inexorable decline. The evocation of the rust belt is now synonymous with economic collapse, social instability and political upheaval. But the story of manufacturing in Southern California is more one of transformation than collapse. There have been substantial declines in regional employment for years, but the industry itself still has several key competitive advantages and is poised for a potential transformative change.

Since the 90's, the region has seen a dramatic shift from the Cold War environment that previously drove manufacturing in the region for the dominant aerospace industry, to one with a much broader and oftentimes more consumer-facing. For instance, while the region's aerospace industry was previously centered entirely around providing products for defense purposes, one of the most important regional success stories is that of SpaceX, which is leading the race to commercialize and commoditize space traffic.

There are still major challenges for the manufacturing industry in Southern California, but there is a clear transformation underway, from a slow low-tech empire of defense firms powered by a vast army of low skilled labor to a smaller more nimble series of diverse companies that rely on a sophisticated technical workforce in order to deliver high quality products efficiently to a global consumer base.

MANUFACTURING QUICK FACTS

627,890 **Workers in SoCal in 2018**
26.6 percent bachelor's and graduate degrees

\$72,740 **Average annual wage in SoCal in 2018**
23.2 percent higher than the regional all industry average

338,030 **Projected openings in SoCal from 2018 to 2023**
23.9 percent bachelor's and graduate degrees

35,380 **Projected openings in identified key occupations from 2018 to 2023 in SoCal**

32,260 **Graduates in majors for key occupations (2017) in SoCal**

Most opportunities for graduates in engineering

The industry is rapidly demanding more educated workers

Automation demands computing and robotic skillsets

Highly racially and ethnically diverse

Size of Industry

The Southern California region employs a total of roughly 628,000 people in the manufacturing industry, making it an enormous source of employment for the region (Exhibit 3-53). Most of this employment is in Los Angeles County at roughly 340,000 workers, but there are also 160,000 employed in Orange County.

Orange County is the highest paid region in the manufacturing industry, with an average income of over \$81,000 per year (Exhibit 3-54). Los Angeles and Ventura Counties are not far behind at roughly \$70,000 a year, and the inland empire manufacturing industry averages around \$55,000 for its employees.

Workforce

Men account for fully two-thirds of all employment in the manufacturing sector regionally, with women making up only the remaining third (Exhibit 3-55).

In general, manufacturing is thought of as being the domain of the low-skilled employee, as it was long a major source of steady “middle class” employment for those with little education. However, the industry in Southern California is significantly more varied in educational attainment than might be expected. Nearly 27 percent of employees have a bachelor’s degree or higher, and that number should grow as automation efforts and increasingly sophisticated robotics demand ever more educated workers (Exhibit 3-56). More than 50 percent of the industry has at least some college completed, with roughly 42 percent being those with a high school education or less.

Manufacturing employees are a highly diverse group, with similar numbers of Hispanic and non-Hispanic whites employed, roughly 35 percent and 38 percent respectively. There is also a substantial contingent of Asian workers, accounting for nearly 21 percent of the industry, and the bulk of the remainder.

EXHIBIT 3-53
Total Manufacturing Employment in 2018

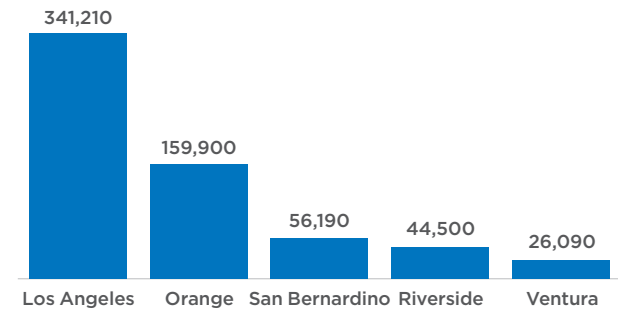


EXHIBIT 3-54
Average Annual Wage in 2018



EXHIBIT 3-55
Industry Employment by Sex

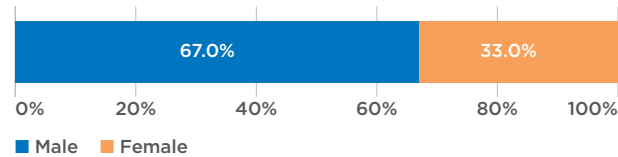
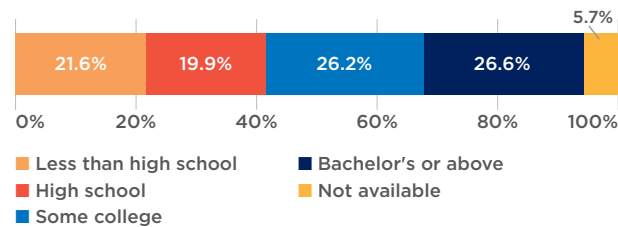


EXHIBIT 3-56
Industry Employment by Education



Innovation and New Technologies

Manufacturing is perhaps the poster child for the disruptive impact of technological change, with the advent of advanced robotics dramatically reducing employment levels in the industry across the country. There is no reason to suspect that this trend of robotization is coming to an end anytime soon, as automation continues to be an ever more attractive option for manufacturing firms as the technological efficiency gains increase and the technology price points decrease.

Perhaps the biggest near-term manufacturing technology change is the implementation of Internet of Things (IoT) devices, both to provide analytics in production, as well as producing new IoT devices for sale. To this end, the change to a more internet-connected presence is going to demand engineers with a broader expertise, including both mechanical and electrical engineering, as well as software engineering. Another major technology driving change in the sector is 3D Printing, which allows a much more dynamic manufacturing sector that rapidly responds to changing production and client needs.

The Impact of COVID-19 on the Industry

Manufacturing, although impacted by the decline in global demand due to the pandemic, has weathered the crisis relatively well as compared to other industries. Much of manufacturing was able to avoid the long shutdowns of more consumer facing industries, and thus did not have to eat the same level of cost and disruption. In the longer term, COVID will accelerate the already ongoing shifts to a more highly technical and automated manufacturing process, as companies increasingly invest in more robotics and machine learning in order to limit the number of frontline workers interacting with one another. This means fewer raw employees, but with higher skill levels, more education and greater technical training to take advantage of these new advanced manufacturing processes. So, although the manufacturing industry will likely continue to shrink as a source of raw employment, it will increasingly provide higher paying and high skilled jobs for a more educated workforce.

The changes to a more internet connected presence in manufacturing is going to demand engineers with a broader expertise, including both mechanical and electrical engineering as well as software engineering.

Key Occupations by Education

An occupation is classified according to the set of activities or tasks that an employee is paid to perform.

BACHELOR'S OCCUPATIONS

The occupation with the largest employment by far is General and Operations Managers at nearly 15,000 workers in the region. Other major business focused occupations in the industry include: Market Research Analysts at 4,200 employees; Accountants and Auditors at 6,000 employees; and Business Operations Specialists at 5,800 employees. These occupations are relevant across a wide variety of engineering disciplines and can help manage and run enterprises ranging from computer manufacturing to biopharmaceutical development.

Other large growth groups include Software Developers, who number 8,600 employees for Systems development and 4,600 employees for Applications. These occupations help to develop the software that manages these sophisticated manufacturing operations and are a key component in the attempts to automate and improve efficiency for the sector.

There are a variety of different engineering occupations that have substantial employment in the region and are projected to continue to grow. Chief among the engineering disciplines are Industrial Engineers who account for 10,000 employees in the region. Following them are: Mechanical Engineers at 7,400 employees; Electronics Engineers at 5,500 employees; and Electrical Engineers at 4,600 employees. These engineers, along with other varieties such as Aerospace or Computer Hardware Engineers represent the vast technical expertise that drives

productivity in the industry and thus represent major high value employment opportunities in the labor market.

Among these disciplines, the best remunerated are General and Operations Managers at nearly \$140,000 per year. Software Developers, Systems are next at an average of \$122,000 per year, followed by Electronics Engineers at \$120,000.

Key Academic Majors for Growth Occupations Manufacturing may not sound like the most exciting and in vogue industry for a young college graduate looking for their first job, but the industry provides a number of technical opportunities that are not found in other industries. In particular, manufacturing employs a vast army of Engineers of all different types, providing substantial opportunity for those whose majors were on the more technical side.

Of the top growth occupations, six of the 10 demand those who majored in various forms of engineering. Most directly, there is a huge need for those with majors in Industrial Engineering or Manufacturing Engineering to fill roles as Industrial Engineers. And given that only 353 students graduated in these fields in 2017 in the region for an estimated 833 openings, it seems unlikely that this demand will be totally met for the foreseeable future.

There is also substantial need for Computer Engineering, Mechanical Engineering and Electrical and Electronics Engineering graduates, who are responsible for ensuring that the increasingly technical and automated manufacturing processes run properly.

Filling out the most demanded majors for these occupations are those related to the management and operations of manufacturing firms as businesses. In these roles, Business Administration, Accounting and Marketing graduates can find themselves at home.

EXHIBIT 3-57

**Key Occupations Requiring a Bachelor's Degree for Entry
Employment Growth Rate 2018-2023**

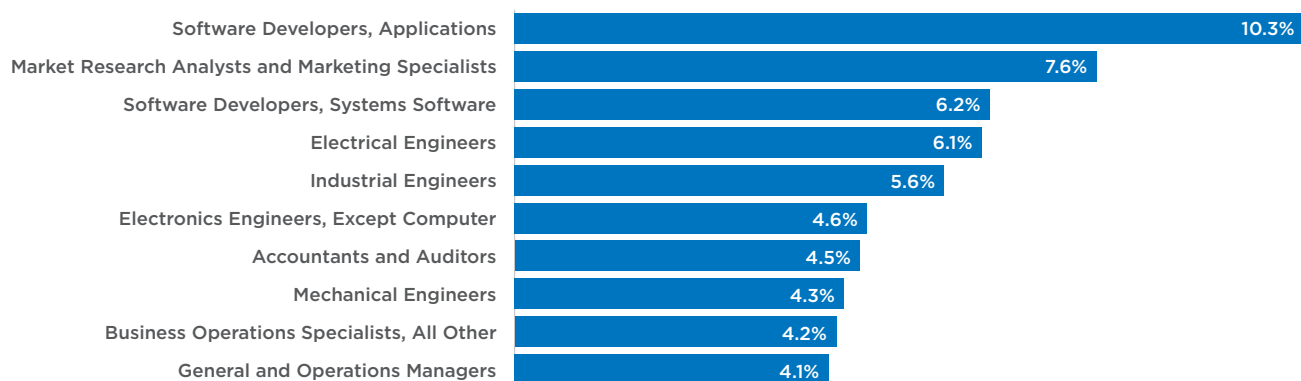


EXHIBIT 3-58

Key Occupations Requiring a Bachelor's Degree for Entry

SOC	Title	MANUFACTURING EMPLOYMENT			ALL INDUSTRIES 2018-2023		
		2018	2023	Net Growth 2018-23	Average Annual Wage	Annual New Jobs	Annual Replacements
Master's Degree							
11-1021	General and Operations Managers	14,907	15,520	610	\$137,823	1,620	1,500
17-2112	Industrial Engineers	9,968	10,530	560	\$102,993	830	720
15-1133	Software Developers, Systems Software	8,575	9,110	530	\$122,177	860	750
15-1132	Software Developers, Applications	4,626	5,100	480	\$113,322	510	420
13-1161	Market Research Analysts and Marketing Specialists	4,208	4,530	320	\$69,398	570	500
17-2141	Mechanical Engineers	7,434	7,750	320	\$101,190	570	510
17-2071	Electrical Engineers	4,563	4,840	280	\$108,460	410	350
13-2011	Accountants and Auditors	6,061	6,330	270	\$82,595	730	670
17-2072	Electronics Engineers, Except Computer	5,533	5,790	260	\$120,837	460	410
13-1199	Business Operations Specialists, All Other	5,848	6,090	250	\$78,693	520	470

EXHIBIT 3-60

**Key Occupations Requiring a Bachelor's Degree for Entry
Annual Average Wages 2018**

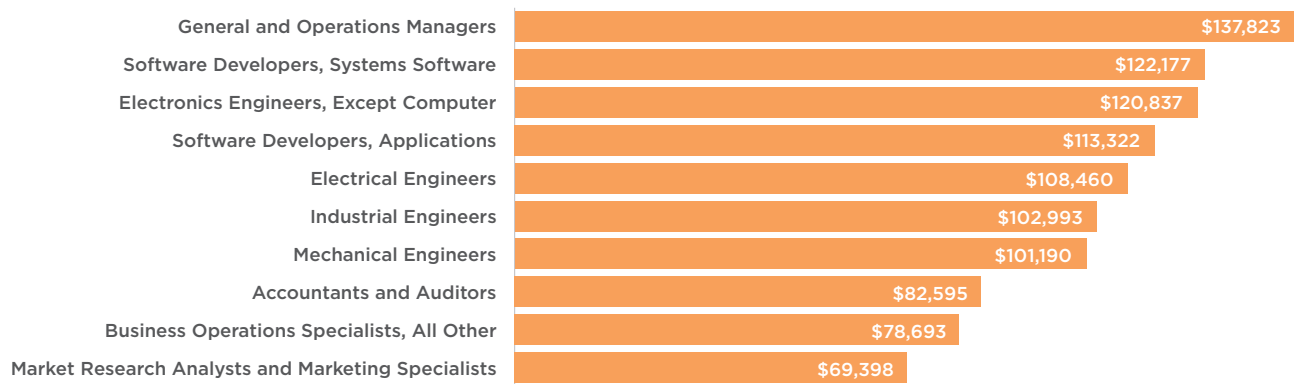


EXHIBIT 3-61

Majors for Key Growth Occupations Requiring a Bachelor's Degree for Entry

SOC	Occupation Title	Key IPEDS Majors	Closest CSUN Majors	SoCal Graduates, Key Majors (2017)	SoCal Graduates, All Relevant Majors (2017)
11-1021	General and Operations Managers	Business Administration and Management, General.	Business Administration, Engineering Management	17,397	20,139
17-2112	Industrial Engineers	Industrial Engineering, Manufacturing Engineering	Manufacturing Systems Engineering	353	353
15-1133	Software Developers, Systems Software	Computer Science, Information Technology, Computer Engineering, General	Computer Science, Information Systems, Computer Engineering	4,601	4,947
15-1132	Software Developers, Applications	Computer Science, Information Technology, Computer Engineering, General	Computer Science, Information Systems, Computer Engineering	4,601	5,024
13-1161	Market Research Analysts and Marketing Specialists	Marketing/Marketing Management, General.	Marketing	616	660
17-2141	Mechanical Engineers	Mechanical Engineering.	Mechanical Engineering	2,131	2,131
17-2071	Electrical Engineers	Electrical and Electronics Engineering	Electrical Engineering	2,306	2,315
13-2011	Accountants and Auditors	Accounting.	Accounting	1,431	1,570
17-2072	Electronics Engineers, Except Computer	Electrical and Electronics Engineering	Electrical Engineering	2,306	2,315
13-1199	Business Operations Specialists, All Other	Business Administration and Management, General.	Business Administration, Engineering Management	17,397	18,886

04.

DEGREE GAP ANALYSIS

Changes in the requested entry-level education, such as moving from a minimum bachelor's degree requirement to a master's degree requirement, in job postings for occupations can identify either a change in the skills, including, for example, the expanded use of technology to successfully perform the job duties, or it may indicate that existing education and training programs are not teaching the right mix of skills that employers are seeking in potential job candidates.

We compare the entry-level education requested in employer job postings for our target high-skill occupations in Southern California to the educational attainment of workers currently employed in that occupation in the region to identify degree gaps. In this way, imbalances in the regional labor market can be identified. In instances where degree inflation may be occurring (when employers are requesting a level of education higher than is necessary to successfully perform the job duties for a specific occupation), we quantify the number of current workers at risk of being shut out of future job opportunities.

Degree gaps have negative consequences for both workers and employers; the number of job opportunities available for applicants without the requested degree are reduced, and the applicant pool from which employers find their workers shrinks. Additionally, older workers who have extensive experience without the requested degree can be overlooked, resulting in the loss of their deep knowledge of the industry. Workers who possess a higher degree tend to cost employers more in payroll, but they can lack valuable experience, feel disengaged if the job duties don't warrant the increased degree requirement and may not actually contribute to increases in productivity. This is especially concerning as today's employers are reluctant to train new employees, they expect them to be job ready. The mismatch between employer expectations and worker skills will perpetuate unless workers continue to upskill and keep abreast of the latest in digitization and information technology, which has become ubiquitous across all industries, and employers provide adequate training for new employees to ensure their workers have the relevant skills for the industry today and for tomorrow.

Degree inflation can occur across the skills spectrum, changes in education are often predicated upon changes in skills required to successfully perform job duties in occupations. The future of work will require higher levels of cognitive and noncognitive competencies.

The skills required for entry-level positions have changed and workers need to engage in continuous learning to remain relevant in the workplace. Technology has been leading productivity growth, even in typically low-skill industries, resulting in increased demand for workers with higher levels of education. Critical thinking, problem solving, creativity and interpersonal skills are in high demand by employers across all industries and across all skill levels.

Metropolitan areas tend to experience degree inflation more than other less densely populated areas, as employers have access to a larger number of workers with higher levels of educational attainment. Unfortunately, this creates additional hurdles for populations who have lower graduation rates, including minorities and individuals from lower income households; they are disproportionately affected by degree inflation.

Burning Glass Technologies data on job postings in Southern California is used to identify the current demand for the entry-level education for each occupation identified as high-skill, requiring at least a bachelor's degree, and with strong job growth projections over the next five years. We compare this with the distribution of educational attainment of individuals actually working in the occupation to identify degree gaps in Southern California as of 2018.

Jobs Requiring a Master's Degree for Entry with Degree Gaps

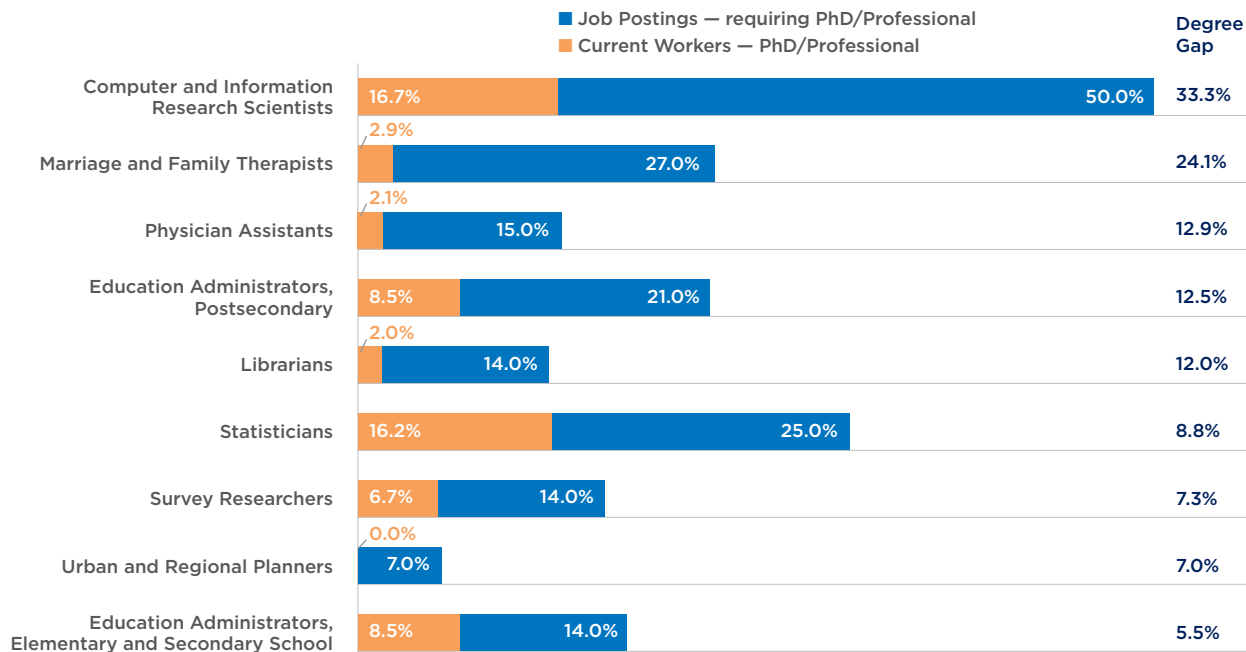
Occupations identified in our target industries as requiring a master's degree, with a degree gap of five percent or more are shown in Exhibit 4-1. These occupations haven't typically required a doctoral or professional degree to complete their job duties; however, more of today's employers are requesting this advanced degree in their job postings.

Computer and information research scientists are experiencing the largest degree gap of the high-skill occupations we identified in our target industries that typically require a master's degree for entry. Workers in this occupation invent and design new approaches to computing technology and find innovative uses for existing technology. They study and solve complex problems in computing for business, science, medicine, and other fields. Some computing tasks are very

difficult and require complex algorithms. Employers that request a higher degree in their job postings may try to ensure that a candidate has the requisite skills. If this is the case, this occupation may also benefit from customized programs that can demonstrate to potential employers that individuals with master's degrees who complete these programs possess the skills and competencies that employers are looking for.

Statisticians are another occupation that typically requires a master's degree for entry; however, 25 percent of the job postings in Southern California in 2018 are requesting a statistician with a Ph.D. Only 16 percent of the incumbent workers have a Ph.D. Similar to computer and information research scientists, this occupation analyzes data and applies mathematical and statistical techniques to help solve complex problems. Individuals interested in this occupation may also benefit from customized programs that demonstrate skills and competencies to employers that are specific to this occupation.

EXHIBIT 4-1
Jobs in SoCal Requiring a Master's for Entry
Occupations with the Largest Degree Gaps



Jobs Requiring a Bachelor's Degree for Entry with Degree Gaps

Occupations identified to require a bachelor's degree in our identified target industries, with a degree gap of five percent or more are shown in Exhibit 4-2.

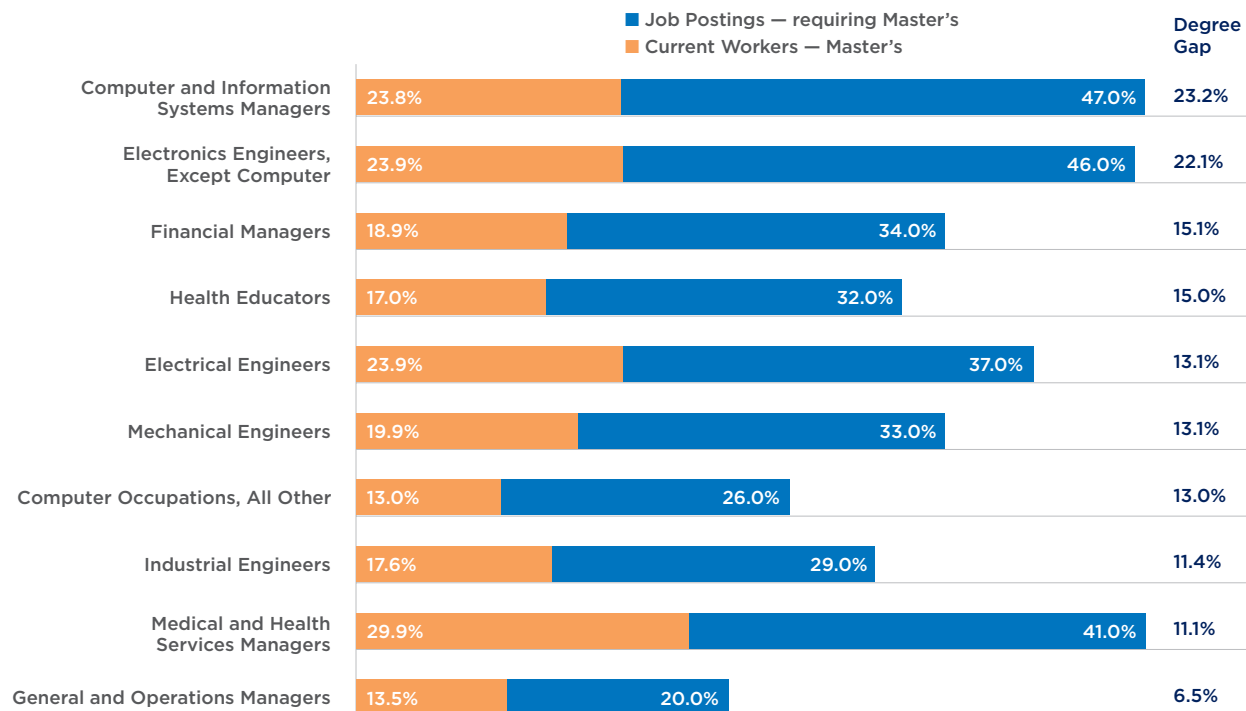
These occupations haven't typically required a master's degree, but more of today's employers are requesting this higher degree in their job postings.

Computer-related occupations and engineering occupations (electrical, mechanical and industrial engineers) are experiencing degree gaps as employers in Southern California are increasingly searching for more educated applicants. Computer and information systems managers (or information technology (IT) managers) plan, coordinate, and direct computer-related activities in an organization. They help determine the information technology goals of an organization and are responsible for implementing computer systems to meet those goals. Demand

for computer and information systems managers will grow as firms increasingly expand their business to digital platforms. Technology is constantly changing, individuals in computer-related occupations face the challenge of keeping their finger on the pulse of cutting-edge technologies and new software and applications used in their specific industries. Workers in these roles include Chief information officers (CIOs), Chief technology officers (CTOs), IT directors and IT security manager. C-level positions often require a master's degree or a Master of Business Administration (MBA).

Engineering occupations can be varied, but all heavily rely on math and various types of software to solve complex problems and increase efficiencies. Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment, such as electric motors, radar and navigation systems, communications systems, or power generation equipment. Electrical engineers also design the electrical systems of automobiles and aircraft. Mechanical engineers research, design, develop, build, and test mechanical and thermal sensors and devices, including tools, engines, and

EXHIBIT 4-2
Jobs in SoCal Requiring a Bachelor's for Entry Occupations with the Largest Degree Gaps



machines. Mechanical engineers design and oversee the manufacture of many products ranging from medical devices to new batteries. Industrial engineers find ways to eliminate wastefulness in production processes. Engineering courses include: mathematics and life and physical sciences, as well as engineering and design, digital systems design, differential equations, and electrical circuit theory, statistics, production systems planning, and manufacturing systems design. Individuals working as an engineer will benefit from a graduate degree if they wish to specialize in their field or promote to a management position. Postbaccalaureate management courses would be especially beneficial for these individuals as they often work in and lead teams. Programs to help working engineers obtain their Principles and Practice of Engineering (PE) certification will present these engineers with additional employment opportunities and/or the opportunity to start their own business and become part of the gig economy.

Current Workers at Risk

Identifying the presence of degree gaps doesn't provide any information on the scale in which those gaps will affect regional employment. We use the calculated degree gaps for the identified high-skill occupations from our target industries, along with their 2018 occupational employment, to quantify the number of current workers at risk of being shut out of future job opportunities in Southern California. Occupations with more than 100 workers at risk are shown in Exhibit 4-3. Managerial occupations and engineering-related occupations have the largest presence on the list in both number of occupations and the number of workers that stand to be affected by increased degree requirements for the positions listed which traditionally only require a bachelor's degree.

EXHIBIT 4-3 High-Skill Occupations Facing Potential Degree Inflation in SoCal

	2018 Jobs	Workers at Risk
BACHELOR'S DEGREE FOR ENTRY WITH EMPLOYERS REQUESTING MASTER'S		
General and Operations Managers	117,027	7,619
Financial Managers	36,412	5,495
Computer and Information Systems Managers	19,757	4,581
Electronics Engineers, Except Computer	10,433	2,309
Medical and Health Services Managers	15,767	1,743
Mechanical Engineers	11,729	1,534
Industrial Engineers	11,917	1,353
Electrical Engineers	9,627	1,264
Software Developers, Systems Software	25,037	647
Health Educators	2,879	432
MASTER'S DEGREE FOR ENTRY WITH EMPLOYERS REQUESTING DOCTORAL OR PROFESSIONAL		
Marriage and Family Therapists	8,406	2,022
Computer and Information Research Scientists	1,659	553
Physician Assistants	4,145	534
Education Administrators, Postsecondary	1,458	182
Healthcare Social Workers	8,166	172
Educational, Guidance, School, and Vocational Counselors	4,843	148
Education Administrators, Elementary and Secondary School	2,555	140
Statisticians	1,368	121
Librarians	928	111

High-skill occupations in healthcare and those that involve performing complex analyses with large amounts of data (such as statisticians and computer research scientists), stand to be impacted most by increased degree requirements resulting from employers requesting a doctoral or professional degree when they traditionally require a master's degree.

Across the ten occupations from our target industries, those that require a bachelor's degree for entry but are facing increased degree requirements (a degree gap), they number close to 26,980 workers in Southern California. These workers are at risk of being shut off from future employment prospects in the occupation in which they are currently employed due to employers requesting a higher degree. Across the nine identified occupations that require a master's degree for entry, but are facing increased degree requirements, over 3,980 workers are at risk of decreased employment opportunities related to degree inflation in Southern California.

Traditionally, middle-skill jobs have provided individuals with pathways into the middle class; however, today's employers are increasingly requiring their employees to have a bachelor's degree or higher.

Middle-Skill Jobs with Degree Gaps

Middle-skill jobs are those that require more than a high school diploma (or equivalent), but less than a four-year degree. Changes in the processes and inputs of what we produce, and the commercialization of services over the last few decades has led to middle-skill jobs becoming more technical and complex. As such, many employers are looking for candidates with higher levels of education (a bachelor's degree or higher).

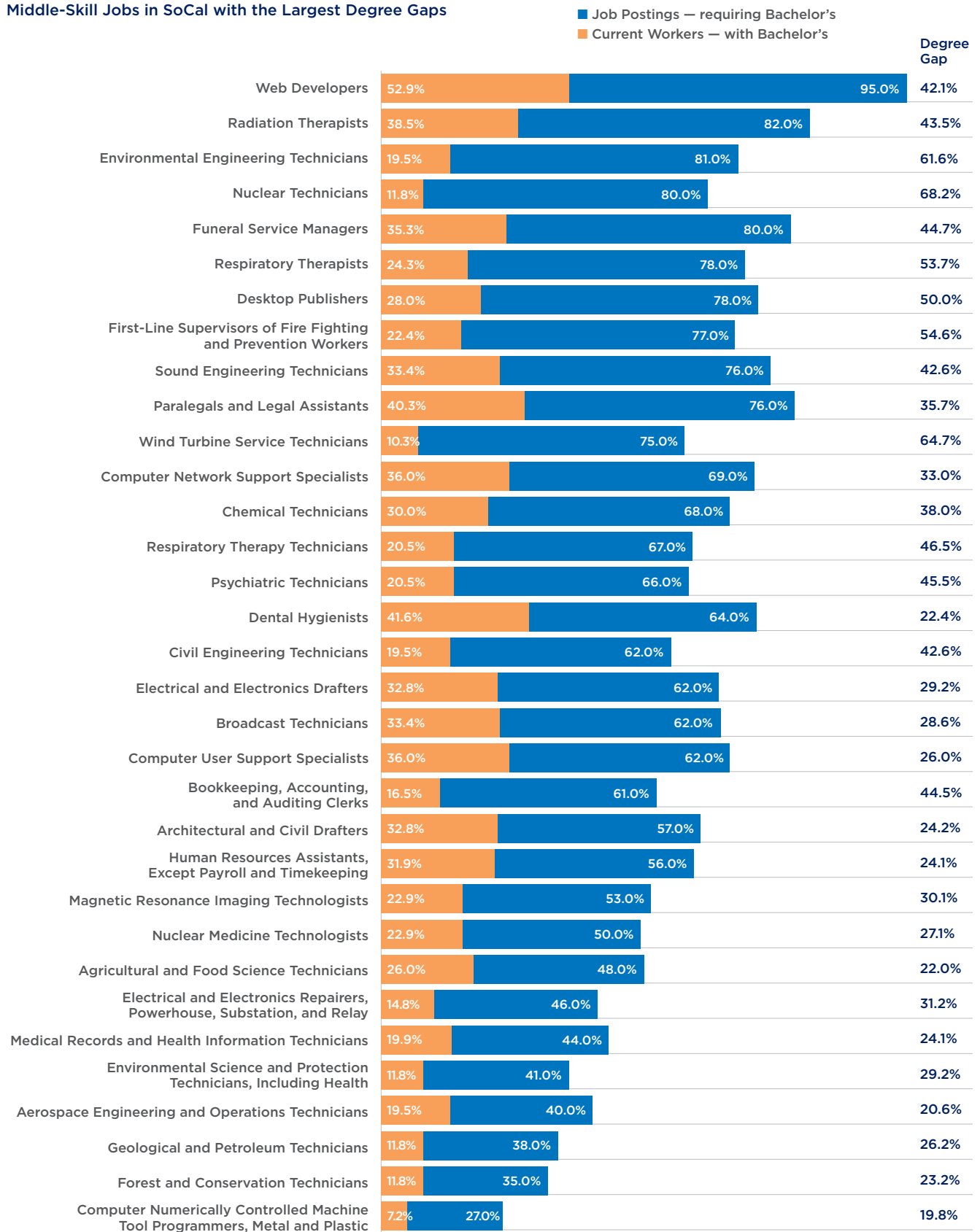
Traditionally, middle-skill jobs have provided individuals with pathways into the middle class; however, today's employers are increasingly requiring their employees to have a bachelor's degree or higher. Employers are using higher levels of education as a proxy for both hard and soft skills. Over time, if the degree gap is not addressed, an occupation may lose its middle-skill status.

While this report does not focus on middle-skill jobs in the region, it may be valuable for four-year degree granting institutions to be aware of which middle-skill jobs are experiencing degree inflation. In the event that the technical nature of a job increases to the point that it warrants a change in classification from middle-skill to high-skill, educators will be prepared to create programs to educate and train workers to perform the new, more complex job duties associated with the occupation.

There are a number of occupations where employers are requesting higher degrees for jobs that have traditionally been middle-skill. Exhibit 4-4 displays the top middle-skill occupations with degree gaps of 20 percent or more.

Again, computer-related occupations (web developers, desktop publishers and medical records and health information techs), and occupations related to health care (radiation therapists, nuclear technicians, and nuclear medicine technologists) figure prominently.

EXHIBIT 4-4
Middle-Skill Jobs in SoCal with the Largest Degree Gaps



05.

CONCLUSION

Current research clearly demonstrates that today's jobs require higher levels of education than ever before. A study from the Georgetown Public Policy Institute found that by 2020, 65 percent of all jobs will require some postsecondary education and training—in 1973 this was merely 28 percent of jobs. Moreover, 24 percent of jobs will require a bachelor's degree. The range of opportunities for those with lower levels of educational attainment is beginning to shrink, and workers must now seriously consider higher education in order to increase their chances of employment.

This movement is being generated by several sources. First of all, the changing nature of the macro economy is creating an environment where more advanced skills are necessary for employment in most industries. The increasing role of technology is certainly important here; as baby boomers retire, employers are now demanding that instead of providing training on the job for their replacements, these workers simply arrive on day one better educated and better prepared. Additionally, the transition from an industrial manufacturing economy to an information-oriented one prioritizes skills in decision-making, analysis, communication, administration, and a diverse range of other skills that are aided by

higher education. The rapidly growing fields of science, technology, math, and engineering all require a higher degree of education than provided by high school.

Last decade's recession seems to have accelerated the divide between education levels in the workforce, as a 2018 study found that nine out of 10 new jobs created in the last year went to those with a college degree. Since the recession, the number of workers in the U.S. with a college degree has risen by 12 million, while the amount with just a high-school degree or less has fallen by more than 4 million.

Another cause has been a dramatic increase in "degree inflation," which originates from employers believing that college-educated employees are smarter, more productive, and more engaged than those without degrees. Many "middle-skill" positions are being filled by college graduates at higher salaries. This has been exacerbated by automated hiring tools, which often exclude applicants with relevant experience due to the lack of a college degree. Disconnect between the desired and necessary experience for many positions leaves millions of jobs unfilled, while contributing to under-productivity.

Thus, although the economy has returned the jobs lost during the Great Recession, not everyone is ready to take advantage of them. It is likely the proportion of employment openings that require a college degree will continue to inflate, forcing more of the prospective workforce to seek additional postsecondary educational opportunities. As industries continue to evolve, it will be a major challenge for educational providers to keep pace; teaching students the skills they need to be hired and remain employed in this increasingly changing technical world will prove difficult, especially as the pace of change quickens. Success will require heavy interaction with industry stakeholders and public-private partnerships for workforce development programs tailored to satisfy industry employment needs.

If educators cannot keep up and provide local industries with qualified workers with the skills they need, skills gaps will widen and result in unfilled job vacancies for businesses, causing them to seek out talent from other places or leave the region completely, which will increase unemployment and economic instability for individuals and their households and communities.

Opportunities for further research

This report serves as an initial foray into industries that employ high-skill workers and which high-skill occupations are projected to be the highest in demand for industries throughout Southern California. A number of opportunities for further research exist including a target industry workforce survey, a series of deep-dive industry reports for key industries, and looking deeper into high-skill occupations across all industries.

Target Industry Workforce Survey

A Target Industry Workforce Survey Report includes a statistically sound, workforce-focused survey distributed to businesses in identified target industries in order to complete a qualitative assessment of the industry and its high-skill workforce needs. Incorporating direct input from industry representatives and key players, survey work can allow an estimation of measurables like the near-term growth of the industry, challenges employers are facing, and relevant workforce needs, including what skill, competencies and tools employers looking for and potential opportunities for specialty education and training programs (especially post-baccalaureate programs and master's degrees). Questions can be crafted to obtain additional information including: the share of high-skill workers; current educational attainment of high-skill workers employed (Graduate degree versus bachelor's degree, or other); Pathways into PhD and professional doctorate programs; use of specific technology in high-skill positions, their tech-intensity; what new types of skills workers in these demand industries will need to acquire to stay employed; vulnerability of their workforce to automation; and if there are new high-skill occupations emerging.

Deep-Dive Industry Reports

A series of full-length "deep-dive" industry reports can be produced focusing on key industries with significant projected demand for high-skill occupations, occupations that require a bachelor's degree or higher for entry. Deep-dive industry reports can establish a baseline from which the CSUN and other four-year universities can further build their knowledge and, working in partnership with industry, amplify their understanding about the region's labor markets and potential high-skill workforce gaps.

Deep-dive industry reports would provide a closer look at high-skill occupations and industries identified to be the drivers of the high-demand, high-wage, and high-skill jobs for university students. The structure of these reports is dependent upon the industry being covered, but may include the following metrics:

- Industry hiring trends;
- Comparisons to the living wage;
- Middle skill occupation forecasts;
- Occupational vulnerability to fluctuations in the business cycle and/or dislocation due to automation, AI, robotics or another capital-labor substituting modality;
- Middle skill employment and occupation concentrations;
- Middle skill worker/occupation characteristics;
- Middle skill employment churn; and
- Other indicators of activity specific to the middle skill occupations within the identified industry targets.

Subsequent industry and/or occupation(s) focused research including analysis of the impact of technology, assessment of economic and business trends, employer validation and contribution to traditional demand data can be incorporated, relying upon information obtained from industry councils, a target industry workforce survey, or other LAEDC research or workforce development efforts.

Looking Deeper into High-Skill Occupations

High-skill occupations with the largest number of total openings predicted over the next five years, removed from the industry code structure, can be identified, along with recent employment trends, hiring industries and each occupation's exposure to new technology can be researched, forecasted and analyzed. University programs and graduates can be identified, and potential challenges faced by universities in providing these programs, including funding, employer bias, etcetera, can be covered. A degree gap analysis can be performed, and for high-skill occupations where degree inflation may be occurring, and current workers at risk of being shut out of future job opportunities can be quantified.

Possible next steps

As the pace of change in businesses grows faster, the LAEDC has created regional industry and education partnerships to bridge and build the local talent pipeline.

The LAEDC Institute for Applied Economics' (IAE) research and labor market data influences the strategic initiatives arm of the LAEDC to convene industry councils and curriculum advisory committees to validate the data and identify opportunities for upward mobility for college students, focusing on emerging and prominent industries here in the region with an occupational need.

The LAEDC has extensive experience linking educational partners to industry. Currently, the LAEDC and its partners host quarterly industry councils in Bioscience, Digital Media and Entertainment, Advanced Transportation, and Aerospace. These industry councils provide venues for the region's suppliers of skilled talent to help identify work-based learning opportunities for students, inform faculty externship and learning opportunities, provide new or updated information about occupational targets for the curriculum advisory committees, and create other fortifying opportunities and institutionalized "feedback" loops between industry and education to strengthen the supply of skilled talent.

The LAEDC, as a collaborative founder of CCW, understands that if our postsecondary institutions are to be more demand-driven, industry-responsive, future-forward, and adaptive, then we need to integrate in real-time across systems and with employers. The LAEDC is spearheading the Center for a Competitive Workforce (CCW) Workforce and Education Partner Portal, utilizing technology to facilitate peer-to-peer interaction through industry-focused community pages, employer-direct messaging and engagement across all 19 community colleges, and student work-based learning and employment applications, along with performance-based metrics and outcomes tracking. Opportunities exist to include four-year universities, or to establish a similar system with a high-skill focus.

The CSU system is in an ideal position to engage in a similar system. As the nation's largest four-year public university system, the CSU network of faculty, alumni and partners extends across all industries and backgrounds. The CSU system is already a leader in its mission to create a multi-cultural society of graduates that are dedicated to contributing to California's future. The CSU system already works closely with other California educational institutions to maximize educational opportunities for students. Aligning the CSUs and other education partners with industry can, through open communication about opportunities and challenges for all partners: identify emerging skills and technologies; rework articulation agreements and supplemental certifications and upskilling programs where necessary; help identify and address potential degree inflation for certain hard to fill occupations; and potentially aid in repairing broken career ladders for today's workers and establishing new ladders for the careers of tomorrow.

The range of opportunities for those with lower levels of educational attainment is beginning to shrink, and workers must now seriously consider higher education in order to increase their chances of employment.

APPENDIX

The Industrial Base

To investigate the potential for employment opportunities in Southern California, an understanding of existing employment is needed. Previously, we identified current industry employment of residents of the region. Here, we consider instead the industry employment offered by current businesses located in the region. This will allow us to determine the industrial composition of the local economy and its workforce needs.

The industrial distribution of employment in Southern California is examined and employment by industry quantified in Exhibit A-1.

In general, Southern California reflects the national pattern of a largely service-oriented economy, which accounts for 86 percent of all nonfarm employment, and a government sector accounting for less than one percent (1%), excluding state and local schools and hospitals and the U.S. Postal Service, of all nonfarm employment (including local, state and federal government employment).

Occupational Profile of Industry

Occupations are commonly classified using the Standard Occupational Classification (SOC) system, developed by the Bureau of Labor Statistics. This system classifies all workers into one of 867 detailed occupations with similar job duties, skills, education and training. These detailed occupations are not generally industry-specific but are common to many industries. For example, customer service representatives, salespersons, accounting staff and receptionists are employed in a full spectrum of industries.

Detailed occupations are aggregated into 23 major groups, which include broad descriptive categories such as production occupations, management occupations and business and financial operations occupations.

EXHIBIT A-1 Industrial Profile 2018 (% of Total Employment)

	<i>Southern California</i>
Total Nonfarm Payroll Employment	100.0%
Good Producing Industries:	14.1%
Natural Resources and Mining	0.1%
Construction	5.6%
Manufacturing	8.5%
Service Providing Industries	85.7%
Wholesale Trade	5.4%
Retail Trade	11.9%
Transportation, Warehousing, Utilities	5.2%
Information	3.6%
Financial Activities	6.0%
Professional and Business Services	16.5%
Educational and Health Services	19.0%
Leisure and Hospitality	14.4%
Other Services	3.7%
Government*	0.2%

*Excludes schools, hospitals and postal service
Sources: BLS (QCEW); LAEDC

EXHIBIT A-2 Occupational Profile 2018 (% of Employment)

<i>SOC</i>	<i>Occupational Group</i>	<i>Share of Total</i>
11-0000	Management occupations	6.0%
13-0000	Business and financial operations	5.6%
15-0000	Computer and mathematical science	2.8%
17-0000	Architecture and engineering	1.7%
19-0000	Life, physical and social science	0.7%
21-0000	Community and social services	1.2%
23-0000	Legal occupations	0.7%
25-0000	Education, training and library	4.8%
27-0000	Arts, design, entertainment, sports, media	1.9%
29-0000	Healthcare practitioners and technical	5.0%
31-0000	Healthcare support	2.3%
33-0000	Protective services	1.3%
35-0000	Food preparation and serving	10.8%
37-0000	Building/grounds cleaning and maintenance	3.0%
39-0000	Personal care and service	6.2%
41-0000	Sales and related	11.0%
43-0000	Office and administrative support	15.7%
45-0000	Farming, fishing and forestry	0.2%
47-0000	Construction and extraction	3.8%
49-0000	Installation, maintenance and repair	3.2%
51-0000	Production	4.5%
53-0000	Transportation/material moving	7.5%
Total		100.0%

Sources: BLS: OES & QCEW and LAEDC

The occupational profile of Southern California is shown in Exhibit A-2. These are the occupations of the jobs that are located in the region. There is a diversity of occupations, as would be expected from such a large economy. The largest occupational group is office and administrative support, accounting for 15.7 percent of all jobs in the region. This is followed by sales occupations,

accounting for just 11 percent. These two occupational groups represent a variety of detailed occupations that are employed across many industries. The third largest occupational group, food preparation and serving occupations, accounted for 10.8 percent of all jobs. These are more likely to be found in restaurants and other food services establishments.

Detailed Tables

Employment Projections for High-Skill Occupations

EXHIBIT A-3
High-Skill Occupations in Southern California 2018-2023

SOC	Detailed Occupation	EMPLOYMENT			Job Training	Experience
		2018	2023	Total Openings		
ENTRY-LEVEL EDUCATION - BACHELOR'S DEGREE						
11-1011	Chief Executives	12,405	12,840	6,610	None	=5 years
11-1021	General and Operations Managers	117,027	124,180	63,550	None	=5 years
11-1031	Legislators	41	40	20	None	<5 years
11-2011	Advertising and Promotions Managers	1,253	1,320	1,060	None	<5 years
11-2021	Marketing Managers	13,767	14,790	7,220	None	=5 years
11-2022	Sales Managers	36,597	38,240	17,390	None	<5 years
11-2031	Public Relations and Fundraising Managers	3,177	3,350	1,430	None	=5 years
11-3011	Administrative Services Managers	15,384	16,420	8,480	None	<5 years
11-3021	Computer and Information Systems Managers	19,757	21,510	8,820	None	=5 years
11-3031	Financial Managers	36,412	39,310	17,100	None	=5 years
11-3051	Industrial Production Managers	9,847	10,110	3,760	None	=5 years
11-3061	Purchasing Managers	3,527	3,710	1,860	None	=5 years
11-3111	Compensation and Benefits Managers	699	720	1,960	None	=5 years
11-3121	Human Resources Managers	8,077	8,650	3,630	None	=5 years
11-3131	Training and Development Managers	1,774	1,880	780	None	=5 years
11-9021	Construction Managers	13,757	15,370	11,760	Moderate-term on-the-job training	None
11-9031	Education Administrators, Preschool and Childcare Center/Program	2,887	3,130	1,560	None	<5 years
11-9039	Education Administrators, All Other	985	1,050	310	None	<5 years
11-9041	Architectural and Engineering Managers	11,567	12,370	4,850	None	=5 years
11-9111	Medical and Health Services Managers	15,767	17,350	8,480	None	<5 years
11-9121	Natural Sciences Managers	228	250	130	None	=5 years
11-9151	Social and Community Service Managers	1,697	1,870	71,280	None	<5 years
11-9199	Managers, All Other	25,921	27,620	18,380	None	<5 years
13-1011	Agents and Business Managers of Artists, Performers, and Athletes	2,672	3,060	3,270	None	<5 years
13-1041	Compliance Officers	10,762	11,340	4,650	Moderate-term on-the-job training	None

EMPLOYMENT

<i>SOC</i>	<i>Detailed Occupation</i>	<i>2018</i>	<i>2023</i>	<i>Total Openings</i>	<i>Job Training</i>	<i>Experience</i>
13-1051	Cost Estimators	12,167	13,380	7,690	Moderate-term on-the-job training	None
13-1071	Human Resources Specialists	28,895	30,730	14,870	None	None
13-1075	Labor Relations Specialists	3,786	3,730	1,670	None	<5 years
13-1081	Logisticians	9,637	10,210	4,550	None	None
13-1111	Management Analysts	30,768	32,930	20,480	None	<5 years
13-1121	Meeting, Convention, and Event Planners	6,893	7,340	4,430	None	None
13-1131	Fundraisers	3,497	3,720	1,940	None	None
13-1141	Compensation, Benefits, and Job Analysis Specialists	3,427	3,620	1,780	None	<5 years
13-1151	Training and Development Specialists	12,237	13,190	7,250	None	<5 years
13-1161	Market Research Analysts and Marketing Specialists	41,867	46,020	28,220	None	None
13-1199	Business Operations Specialists, All Other	70,970	75,700	31,570	None	None
13-2011	Accountants and Auditors	60,901	65,170	36,600	None	None
13-2021	Appraisers and Assessors of Real Estate	1,305	1,380	590	Long-term on-the-job training	None
13-2031	Budget Analysts	2,083	2,190	1,020	None	None
13-2041	Credit Analysts	3,977	4,060	1,680	None	None
13-2051	Financial Analysts	15,297	16,220	7,610	None	None
13-2052	Personal Financial Advisors	11,941	12,320	6,930	Long-term on-the-job training	None
13-2053	Insurance Underwriters	4,060	4,030	1,220	Moderate-term on-the-job training	None
13-2061	Financial Examiners	1,918	1,980	710	Long-term on-the-job training	None
13-2071	Credit Counselors	1,495	1,590	840	Moderate-term on-the-job training	None
13-2072	Loan Officers	18,392	18,900	9,120	Moderate-term on-the-job training	None
13-2081	Tax Examiners and Collectors, and Revenue Agents	103	110	40	Moderate-term on-the-job training	None
13-2099	Financial Specialists, All Other	7,893	8,260	3,120	Moderate-term on-the-job training	None
15-1121	Computer Systems Analysts	21,397	23,010	11,130	None	None
15-1122	Information Security Analysts	3,077	3,430	1,750	None	<5 years
15-1131	Computer Programmers	10,407	10,950	5,300	None	None
15-1132	Software Developers, Applications	32,517	36,830	18,050	None	None
15-1133	Software Developers, Systems Software	25,037	27,100	12,560	None	None
15-1141	Database Administrators	4,057	4,400	2,260	None	None
15-1142	Network and Computer Systems Administrators	15,427	16,440	7,530	None	None
15-1143	Computer Network Architects	5,907	6,390	2,710	None	=5 years
15-1199	Computer Occupations, All Other	24,657	26,610	5,230	None	None
15-2011	Actuaries	490	500	230	Long-term on-the-job training	None
15-2031	Operations Research Analysts	4,367	4,810	2,890	None	None
17-1011	Architects, Except Landscape and Naval	5,410	5,790	2,910	Internship/residency	None
17-1012	Landscape Architects	637	670	390	Internship/residency	None
17-1021	Cartographers and Photogrammetrists	259	290	220	None	None
17-1022	Surveyors	1,303	1,390	600	Internship/residency	None
17-2011	Aerospace Engineers	4,322	4,570	1,570	None	None

EMPLOYMENT

<i>SOC</i>	<i>Detailed Occupation</i>	<i>2018</i>	<i>2023</i>	<i>Total Openings</i>	<i>Job Training</i>	<i>Experience</i>
17-2031	Biomedical Engineers	1,098	1,160	680	None	None
17-2041	Chemical Engineers	655	700	330	None	None
17-2051	Civil Engineers	14,193	15,320	5,720	None	None
17-2061	Computer Hardware Engineers	4,217	4,580	2,580	None	None
17-2071	Electrical Engineers	9,627	10,390	4,310	None	None
17-2072	Electronics Engineers, Except Computer	10,433	11,070	4,300	None	None
17-2081	Environmental Engineers	2,721	2,940	940	None	None
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	682	730	350	None	None
17-2112	Industrial Engineers	11,917	12,650	4,980	None	None
17-2131	Materials Engineers	1,048	1,130	688	None	None
17-2141	Mechanical Engineers	11,729	12,380	4,485	None	None
17-2171	Petroleum Engineers	569	580	162	None	None
17-2199	Engineers, All Other	6,992	7,430	2,461	None	None
19-1012	Food Scientists and Technologists	539	560	445	None	None
19-1013	Soil and Plant Scientists	365	390	289	None	None
19-1022	Microbiologists	857	940	586	None	None
19-1023	Zoologists and Wildlife Biologists	315	340	190	None	None
19-1029	Biological Scientists, All Other	2,967	3,200	1,190	None	None
19-1031	Conservation Scientists	297	300	100	None	None
19-1099	Life Scientists, All Other	448	480	290	None	None
19-2031	Chemists	3,627	3,890	2,420	None	None
19-2032	Materials Scientists	345	380	310	None	None
19-2041	Environmental Scientists and Specialists, Including Health	3,115	3,330	2,130	None	None
19-2042	Geoscientists, Except Hydrologists and Geographers	1,237	1,350	710	None	None
19-2099	Physical Scientists, All Other	505	540	350	None	None
19-3099	Social Scientists and Related Workers, All Other	772	830	490	None	None
19-4021	Biological Technicians	3,167	3,470	2,490	None	None
19-4061	Social Science Research Assistants	763	820	670	None	None
19-4092	Forensic Science Technicians	53	60	40	Moderate-term on-the-job training	None
21-1021	Child, Family, and School Social Workers	7,591	8,300	4,830	None	None
21-1029	Social Workers, All Other	780	840	470	None	None
21-1091	Health Educators	2,879	3,150	2,280	None	None
21-1092	Probation Officers and Correctional Treatment Specialists	189	200	80	Short-term on-the-job training	None
21-1099	Community and Social Service Specialists, All Other	3,577	3,850	2,110	None	None
21-2011	Clergy	2,671	2,740	3,570	Moderate-term on-the-job training	None
21-2021	Directors, Religious Activities and Education	1,718	1,750	3,320	None	<5 years
21-2099	Religious Workers, All Other	418	420	820	None	None
23-1022	Arbitrators, Mediators, and Conciliators	49	50	20	Moderate-term on-the-job training	<5 years
25-1191	Graduate Teaching Assistants	2,331	2,490	1,420	None	None
25-1194	Vocational Education Teachers, Postsecondary	1,193	1,290	710	None	<5 years

EMPLOYMENT

<i>SOC</i>	<i>Detailed Occupation</i>	<i>2018</i>	<i>2023</i>	<i>Total Openings</i>	<i>Job Training</i>	<i>Experience</i>
25-2012	Kindergarten Teachers, Except Special Education	1,568	1,690	1,440	None	None
25-2021	Elementary School Teachers, Except Special Education	18,525	19,830	8,530	None	None
25-2022	Middle School Teachers, Except Special and Career/Technical Education	4,855	5,210	2,480	None	None
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	12,289	13,170	5,550	None	None
25-2032	Career/Technical Education Teachers, Secondary School	481	510	210	None	<5 years
25-2051	Special Education Teachers, Preschool	49	50	30	None	None
25-2052	Special Education Teachers, Kindergarten and Elementary School	1,591	1,700	870	None	None
25-2053	Special Education Teachers, Middle School	531	570	380	None	None
25-2054	Special Education Teachers, Secondary School	1,160	1,240	550	None	None
25-2059	Special Education Teachers, All Other	436	470	210	None	None
25-3011	Adult Basic and Secondary Education and Literacy Teachers and Instructors	200	210	100	None	None
25-3097	Teachers and Instructors, All Other, Except Substitute Teachers	7,886	8,410	5,170	None	N/A
25-3098	Substitute Teachers	11,829	12,690	9,800	None	N/A
25-4013	Museum Technicians and Conservators	703	760	430	None	None
25-9011	Audio-Visual and Multimedia Collections Specialists	133	140	150	None	<5 years
25-9099	Education, Training, and Library Workers, All Other	2,587	2,760	1,420	None	None
27-1011	Art Directors	3,564	3,770	3,250	None	=5 years
27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	895	950	1,430	Long-term on-the-job training	None
27-1014	Multimedia Artists and Animators	4,636	4,940	5,260	None	None
27-1021	Commercial and Industrial Designers	2,044	2,170	1,330	None	None
27-1022	Fashion Designers	2,897	2,930	1,450	None	None
27-1024	Graphic Designers	13,672	14,430	9,280	None	None
27-1025	Interior Designers	3,622	3,950	2,420	None	None
27-1027	Set and Exhibit Designers	1,173	1,220	840	None	None
27-1029	Designers, All Other	974	1,010	510	None	None
27-2012	Producers and Directors	12,139	12,850	7,220	None	<5 years
27-2022	Coaches and Scouts	7,086	7,470	7,720	None	None
27-2041	Music Directors and Composers	468	490	1,070	None	<5 years
27-3011	Radio and Television Announcers	1,436	1,530	1,240	None	None
27-3022	Reporters and Correspondents	1,548	1,620	930	None	None
27-3031	Public Relations Specialists	11,227	11,910	6,340	None	None
27-3041	Editors	5,089	5,410	3,430	None	<5 years
27-3042	Technical Writers	1,987	2,160	1,390	Short-term on-the-job training	<5 years
27-3043	Writers and Authors	3,667	3,860	5,080	Long-term on-the-job training	None
27-3091	Interpreters and Translators	2,924	3,250	2,140	None	None
27-4031	Camera Operators, Television, Video, and Motion Picture	2,069	2,160	1,600	None	None
27-4032	Film and Video Editors	5,395	5,670	3,300	None	None
29-1031	Dietitians and Nutritionists	3,358	3,680	1,610	Internship/residency	None

EMPLOYMENT

<i>SOC</i>	<i>Detailed Occupation</i>	<i>2018</i>	<i>2023</i>	<i>Total Openings</i>	<i>Job Training</i>	<i>Experience</i>
29-1125	Recreational Therapists	566	600	240	None	None
29-1129	Therapists, All Other	99	110	110	None	None
29-1141	Registered Nurses	134,206	146,400	47,030	None	None
29-9011	Occupational Health and Safety Specialists	2,947	3,180	900	None	None
29-9091	Athletic Trainers	259	280	150	None	None
41-3031	Securities, Commodities, and Financial Services Sales Agents	24,647	25,010	11,550	Moderate-term on-the-job training	None
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	17,367	18,190	12,380	Moderate-term on-the-job training	None
41-9031	Sales Engineers	4,027	4,320	2,720	Moderate-term on-the-job training	None
43-9081	Proofreaders and Copy Markers	547	570	620	None	None
45-2011	Agricultural Inspectors	216	220	240	Moderate-term on-the-job training	None
53-2011	Airline Pilots, Copilots, and Flight Engineers	3,151	3,640	2,180	Moderate-term on-the-job training	<5 years
ENTRY-LEVEL EDUCATION - MASTER'S DEGREE						
11-9032	Education Administrators, Elementary and Secondary School	2,555	2,740	1,180	None	=5 years
11-9033	Education Administrators, Postsecondary	1,458	1,570	1,120	None	<5 years
15-1111	Computer and Information Research Scientists	1,659	1,820	600	None	None
15-2041	Statisticians	1,368	1,540	640	None	None
19-3011	Economists	330	340	170	None	None
19-3022	Survey Researchers	272	300	350	None	None
19-3039	Psychologists, All Other	52	60	20	Internship/residency	None
19-3041	Sociologists	282	300	170	None	None
19-3051	Urban and Regional Planners	949	1,030	410	None	None
19-3091	Anthropologists and Archeologists	251	260	160	None	None
21-1012	Educational, Guidance, School, and Vocational Counselors	4,843	5,230	3,290	None	None
21-1013	Marriage and Family Therapists	8,406	9,350	3,090	Internship/residency	None
21-1015	Rehabilitation Counselors	6,377	6,990	3,530	None	None
21-1019	Counselors, All Other	1,067	1,180	560	None	None
21-1022	Healthcare Social Workers	8,166	8,905	4,240	Internship/residency	None
21-1023	Mental Health and Substance Abuse Social Workers	5,234	5,760	3,210	Internship/residency	None
25-1121	Art, Drama, and Music Teachers, Postsecondary	985	1,060	870	None	None
25-4012	Curators	400	410	260	None	None
25-4021	Librarians	928	1,000	630	None	None
25-9031	Instructional Coordinators	2,765	2,990	1,680	None	=5 years
29-1071	Physician Assistants	4,145	4,600	1,730	None	None
29-1122	Occupational Therapists	4,142	4,530	1,820	None	None
29-1127	Speech-Language Pathologists	3,907	4,250	1,360	Internship/residency	None
29-1151	Nurse Anesthetists	402	450	190	None	None
29-1171	Nurse Practitioners	5,425	6,070	2,240	None	None
29-1199	Health Diagnosing and Treating Practitioners, All Other	1,246	1,350	600	None	None

EMPLOYMENT

<i>SOC</i>	<i>Detailed Occupation</i>	<i>2018</i>	<i>2023</i>	<i>Total Openings</i>	<i>Job Training</i>	<i>Experience</i>
ENTRY-LEVEL EDUCATION DOCTORAL OR PROFESSIONAL DEGREE						
19-1021	Biochemists and Biophysicists	608	680	400	None	None
19-1042	Medical Scientists, Except Epidemiologists	8,158	8,930	4,690	None	None
19-2012	Physicists	588	650	340	None	None
19-3031	Clinical, Counseling, and School Psychologists	5,005	5,450	3,330	Internship/residency	None
23-1011	Lawyers	29,255	31,010	8,940	None	None
23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers	12	10	5	Short-term on-the-job training	=5 years
25-1011	Business Teachers, Postsecondary	541	590	360	None	None
25-1021	Computer Science Teachers, Postsecondary	245	260	150	None	None
25-1032	Engineering Teachers, Postsecondary	221	240	120	None	None
25-1042	Biological Science Teachers, Postsecondary	420	450	290	None	None
25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	145	160	100	None	None
25-1052	Chemistry Teachers, Postsecondary	142	150	90	None	None
25-1054	Physics Teachers, Postsecondary	149	150	90	None	None
25-1062	Area, Ethnic, and Cultural Studies Teachers, Postsecondary	125	130	60	None	None
25-1063	Economics Teachers, Postsecondary	85	100	70	None	None
25-1065	Political Science Teachers, Postsecondary	93	100	70	None	None
25-1066	Psychology Teachers, Postsecondary	459	500	270	None	None
25-1067	Sociology Teachers, Postsecondary	117	120	70	None	None
25-1071	Health Specialties Teachers, Postsecondary	1,106	1,220	910	None	<5 years
25-1072	Nursing Instructors and Teachers, Postsecondary	409	450	310	None	<5 years
25-1081	Education Teachers, Postsecondary	377	400	260	None	<5 years
25-1111	Criminal Justice and Law Enforcement Teachers, Postsecondary	133	150	60	None	None
25-1123	English Language and Literature Teachers, Postsecondary	634	690	380	None	None
25-1124	Foreign Language and Literature Teachers, Postsecondary	291	320	200	None	None
25-1125	History Teachers, Postsecondary	146	160	100	None	None
25-1126	Philosophy and Religion Teachers, Postsecondary	205	220	120	None	None
25-1193	Recreation and Fitness Studies Teachers, Postsecondary	211	230	140	None	None
29-1011	Chiropractors	1,417	1,520	320	None	None
29-1021	Dentists, General	8,130	8,650	1,420	None	None
29-1029	Dentists, All Other Specialists	79	80	30	Internship/residency	None
29-1041	Optometrists	1,602	1,720	430	None	None
29-1051	Pharmacists	13,974	14,560	3,450	None	None
29-1061	Anesthesiologists	1,391	1,520	160	Internship/residency	None
29-1062	Family and General Practitioners	4,848	5,200	1,220	Internship/residency	None
29-1063	Internists, General	1,243	1,310	300	Internship/residency	None
29-1064	Obstetricians and Gynecologists	697	740	160	Internship/residency	None
29-1065	Pediatricians, General	1,293	1,400	250	Internship/residency	None
29-1066	Psychiatrists	1,236	1,340	250	Internship/residency	None
29-1067	Surgeons	1,078	1,140	300	Internship/residency	None

EMPLOYMENT

<i>SOC</i>	<i>Detailed Occupation</i>	<i>2018</i>	<i>2023</i>	<i>Total Openings</i>	<i>Job Training</i>	<i>Experience</i>
29-1069	Physicians and Surgeons, All Other	14,580	15,610	2,140	Internship/residency	None
29-1123	Physical Therapists	9,158	10,040	3,220	None	None
29-1131	Veterinarians	2,471	2,770	950	None	None
29-1181	Audiologists	370	420	150	None	None

TABLE A-4
All CSUN Degrees

<p>A Accounting & Information Systems Africana Studies American Indian Studies Anthropology Art Asian American Studies Athletic Training</p>	<p>G Gender and Women's Studies Geography Geological Sciences Gerontology (interdisciplinary program) Global Supply Chain Management Graduate Programs in Business</p>	<p>P Philosophy Physical Therapy Physics & Astronomy Political Science Psychology Public Administration Public Health Public Sector Management</p>
<p>B Biology Business Law</p>	<p>H Health & Human Development Health Administration Health Sciences History Human Sexuality (interdisciplinary program in Psychology Department) Humanities (M.A.) Humanities (Minor)</p>	<p>Q Queer Studies</p>
<p>C Central American Studies Chemistry & Biochemistry Chicano/a Studies Child & Adolescent Development Cinema and Television Arts Civil Engineering & Construction Management Classical Greek/Roman Civilization Clinical Psychology Communication Disorders & Sciences Communication Studies Computer Science Credential Office</p>	<p>I Information Systems</p>	<p>R Radiologic Sciences Real Estate Recreation and Tourism Management Religious Studies Russian</p>
<p>D Deaf Studies</p>	<p>J Jewish Studies Journalism</p>	<p>S Secondary Education Social Work Sociology Spanish Special Education Special Major Speech Communication Sustainability Systems and Operations Management</p>
<p>E Economics Educational Leadership & Policy Studies Educational Psychology & Counseling Electrical & Computer Engineering Elementary Education English Environmental and Occupational Health</p>	<p>K Kinesiology</p>	<p>T Telecourses (Distance Learning) Theatre</p>
<p>F Family and Consumer Sciences Finance, Financial Planning & Insurance French</p>	<p>L Language and Cultures Liberal Studies Linguistics & TESL</p>	<p>U Urban Studies & Planning</p>
	<p>M Management Manufacturing Systems Engineering & Management Marketing Mathematics Mechanical Engineering Middle Eastern & Islamic Studies Modern & Classical Languages & Literature Music</p>	<p><i>Source: online catalog</i></p>
	<p>N Nursing</p>	

TABLE A-5
CSUN Online Degree and Certificate Programs

CSUN Online Master's Degree Programs

- M.S., Assistive Technology Engineering
- M.S., Assistive Technology Studies and Human Services
- M.S., Communicative Disorders
- M.A., Diverse Community Development Leadership
- M.S., Engineering Management
- M.A., Humanities
- M.A., Instructional Design
- M.K.M., Knowledge Management
- M.P.A., Public Administration
 - Health Administration option
 - Nonprofit Sector Management option
 - Public Sector Management and Leadership option
- M.P.H., Public Health: Community Health Education option
- M.S.W., Social Work

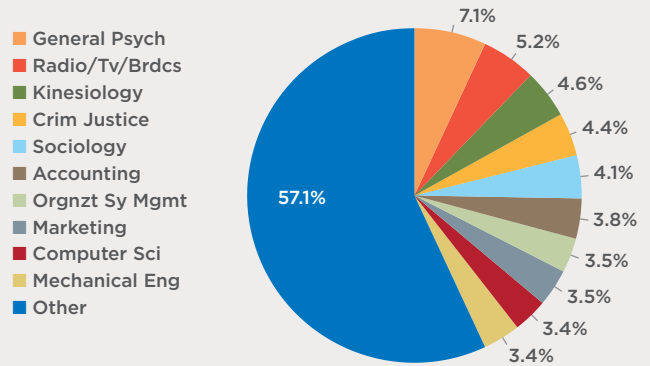
CSUN Online Baccalaureate Degree Programs

- B.A., Liberal Studies
- B.A., Public Sector Management

CSUN Online Certificate Programs

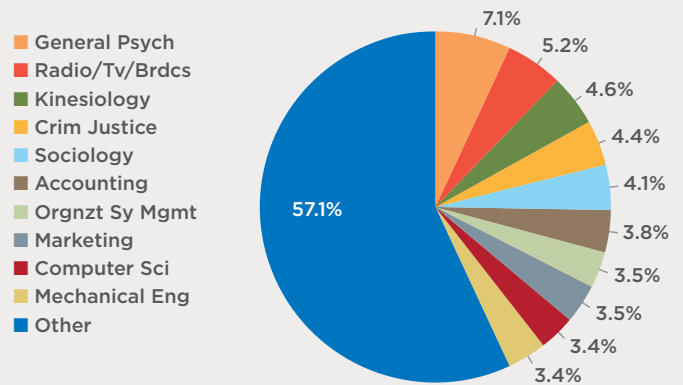
- Certificate of Preparation for Advanced Studies in Speech-Language Pathology
- Design Thinking and Innovation, Certificate of Advanced Professional Development
- Leadership in an Age of Disruption, Certificate of Advanced Professional Development
- Radiologic Technology: CT/MRI, Certificate of Advanced Professional Development – online and clinical setting
- Speech-Language Pathology Assistant Fieldwork Experience, Certificate of Advanced Professional Development – online and clinical setting

CSUN Headcount Graduate Majors Fall 2019



Source: CSU Institutional research

CSUN Headcount Undergraduate Majors Fall 2019



Source: CSU Institutional research

Methodology

HOW AND WHY WE DID WHAT WE DID

Industry Forecast

An economic forecast is created to project employment by industry over the next five years using statistical analysis of historical data paired with the most recent qualitative information impacting a set of 151 industries in the Southern California Region. The industries configured for this forecast are defined through the North American Industry Classification System (NAICS) and comprise industries denoted with 2-digit, 3-digit and 4-digit codes through the NAICS hierarchical classification system. Industry projections take into account the shifting demands for specific industries, as well as population changes and the broader macroeconomic environment.

Occupations and Projections

Occupations are commonly classified using the Standard Occupational Classification (SOC) system, developed by the Bureau of Labor Statistics. This system classifies all workers into one of 867 detailed occupations with similar job duties, skills, education and training. These detailed occupations are not generally industry-specific but are common to many industries. For example, retail salespersons are employed in a full spectrum of industries, from department and discount stores to computer systems design.

Detailed occupations are aggregated into 23 major groups, which include broad descriptive categories such as production occupations, management occupations and business and financial operations occupations.

Projections for changes in occupations are created based on changing needs for specific skillsets and broader macroeconomic changes, as well as the industries in which specific occupations reside. These forecasts are then combined with the industry projections to create a single unified set of projections for occupations by industry.

The United States Census Bureau estimates replacement needs by industry and occupation through detailed surveys of employers and households. These take into account industry changes, the age of the current workforce within each industry and occupation, and the nature of the career path. These estimates are an important component of occupational job openings and workforce development needs, since the retirement and promotion of individuals leave openings for new entrants and those moving up the career ladder.

Total openings are the sum of projected five-year replacement needs and positive net new jobs forecast over the period.

Target Occupations

Target occupations are selected in a two-step process. First, industries with the largest number of projected total openings in occupations identified as those with a minimum entry requirement of a bachelor's degree or higher are identified as potential target industries. Then, a variety of metrics are used to select target occupations: 2018 employment; projected net job change; replacement rate; number of projected replacement jobs from 2018 to 2023; number of projected total job openings from 2018 to 2023.

Supply

Four-year educational institutions provide education and training relevant to high-skill occupations. Comparing occupations with related degree programs provides information for supply-and-demand analysis. The number of graduates by four-year universities reflects the most recent data available from the 2017-18 academic year. Due to data and timing limitations, training gap forecasts are an approximation of unmet labor demand do not represent an absolute oversupply or under-supply of available talent. In addition, a one-to-one relationship between program completions and occupational demand does not exist because some programs train for multiple occupations. Consequently, awards for some education and training programs overall with multiple occupations.

Workforce Characteristics

The Center for Economic Studies at the U.S. Census Bureau provides several public-use data products derived from existing census, survey, and administrative data. One of these products is the Quarterly Workforce Indicators (QWI), which provides workforce statistics by demography, geography and industry at the sector, subsector and 4-digit industry level.

The QWI is unique in that it reports data at the job-level, obtained from linked employer-employee microdata in the Longitudinal Employer-Household Dynamics (LEHD), a database covering more than 95 percent of U.S. private sector jobs. Additional sources include administrative records on employment by states, Social Security data, Federal tax records and other census and survey data.

Data available through the QWI allows for the analysis of the demographics of a particular labor market or specific industry. Estimates used to determine employment distributions of worker characteristics are stable full-quarter employment counts, the number of jobs held on both the first and last day of the quarter with the same employer. Quarterly data has been annualized.

Data Sources

All data was obtained from the Bureau of Labor Statistics and the Census Bureau. Annual employment and payroll data are from the Quarterly Census of Employment and Wages series. Estimates for non-disclosed employment and payroll data were produced using proportional shares of the prior year's data or using midpoint estimates from the Census Bureau's County Business Patterns dataset. Occupational data are from the Occupational Employment Statistics program. Unless noted otherwise, all data is for the 2017 or 2018 calendar year.

Description of NAICS Industry Sectors

The industry sectors used in this report are established by the North American Industry Classification System (NAICS). NAICS divides the economy into twenty sectors, and groups industries within these sectors according to production criteria. Listed below is a short description of each sector as taken from the sourcebook, North American Industry Classification System, published by the U.S. Office of Management and Budget (2017).

Agriculture, Forestry, Fishing and Hunting:

Activities of this sector are growing crops, raising animals, harvesting timber, and harvesting fish and other animals from farms, ranches, or the animals' natural habitats.

Mining: Activities of this sector are extracting naturally-occurring mineral solids, such as coal and ore; liquid minerals, such as crude petroleum; and gases, such as natural gas; and beneficiating (e.g., crushing, screening, washing and flotation) and other preparation at the mine site, or as part of mining activity.

Utilities: Activities of this sector are generating, transmitting, and/or distributing electricity, gas, steam, and water and removing sewage through a permanent infrastructure of lines, mains, and pipes.

Construction: Activities of this sector are erecting buildings and other structures (including additions); heavy construction other than buildings; and alterations, reconstruction, installation, and maintenance and repairs.

Manufacturing: Activities of this sector are the mechanical, physical, or chemical transformation of material, substances, or components into new products.

Wholesale Trade: Activities of this sector are selling or arranging for the purchase or sale of goods for resale; capital or durable non-consumer goods; and raw and intermediate materials and supplies used in production and providing services incidental to the sale of the merchandise.

Retail Trade: Activities of this sector are retailing merchandise generally in small quantities to the general public and providing services incidental to the sale of the merchandise.

Transportation and Warehousing: Activities of this sector are providing transportation of passengers and cargo, warehousing and storing goods, scenic and sightseeing transportation, and supporting these activities.

Information: Activities of this sector are distributing information and cultural products, providing the means to transmit or distribute these products as data or communications, and processing data.
Finance and Insurance: Activities of this sector involve the creation, liquidation, or change of ownership of financial assets (financial transactions) and/or facilitating financial transactions.

Real Estate and Rental and Leasing: Activities of this sector are renting, leasing, or otherwise allowing the use of tangible or intangible assets (except copyrighted works) and providing related services.
Professional, Scientific, and Technical Services: Activities of this sector are performing professional, scientific, and technical services for the operations of other organizations.

Management of Companies and Enterprises: Activities of this sector are the holding of securities of companies and enterprises, for the purpose of owning controlling interest or influencing their management decision, or administering, overseeing, and managing other establishments of the same company or enterprise and normally undertaking the strategic or organizational planning and decision-making of the company or enterprise.
Administrative and Support and Waste Management and Remediation Services: Activities of this sector are performing routine support activities for the day-to-day operations of other organizations, such as: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

Educational Services: Activities of this sector are providing instruction and training in a wide variety of subjects. Educational services are usually delivered by teachers or instructors that explain, tell, demonstrate, supervise, and direct learning. Instruction is imparted in diverse settings, such as educational institutions, the workplace, or the home through correspondence, television, or other means.

Health Care and Social Assistance: Activities of this sector are operating or providing health care and social assistance for individuals.

Arts, Entertainment and Recreation: Activities of this sector are operating facilities or providing services to meet varied cultural, entertainment, and recreational interests of their patrons, such as: (1) producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; (2) preserving and exhibiting objects and sites of historical, cultural, or educational interest; and (3) operating facilities or providing services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure-time interests.

Accommodation and Food Services: Activities of this sector are providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption.

Other Services (except Public Administration): Activities of this sector are providing services not specifically provided for elsewhere in the classification system. Establishments in this sector are primarily engaged in activities such as equipment and machinery repairing, promoting or administering religious activities, grant-making, advocacy, and providing dry-cleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services.



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