Annual Economic Analysis Report

Massachusetts Workforce and Labor Area Review
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Authors:
Mark Rembert, Chief Economist
David Jan, Senior Applied Economist
Victor Owusu, Senior Regional Economist

MASSACHUSETTS EXECUTIVE OFFICE OF LABOR & WORKFORCE DEVELOPMENT

DER
DEPARTMENT OF ECONOMIC RESEARCH

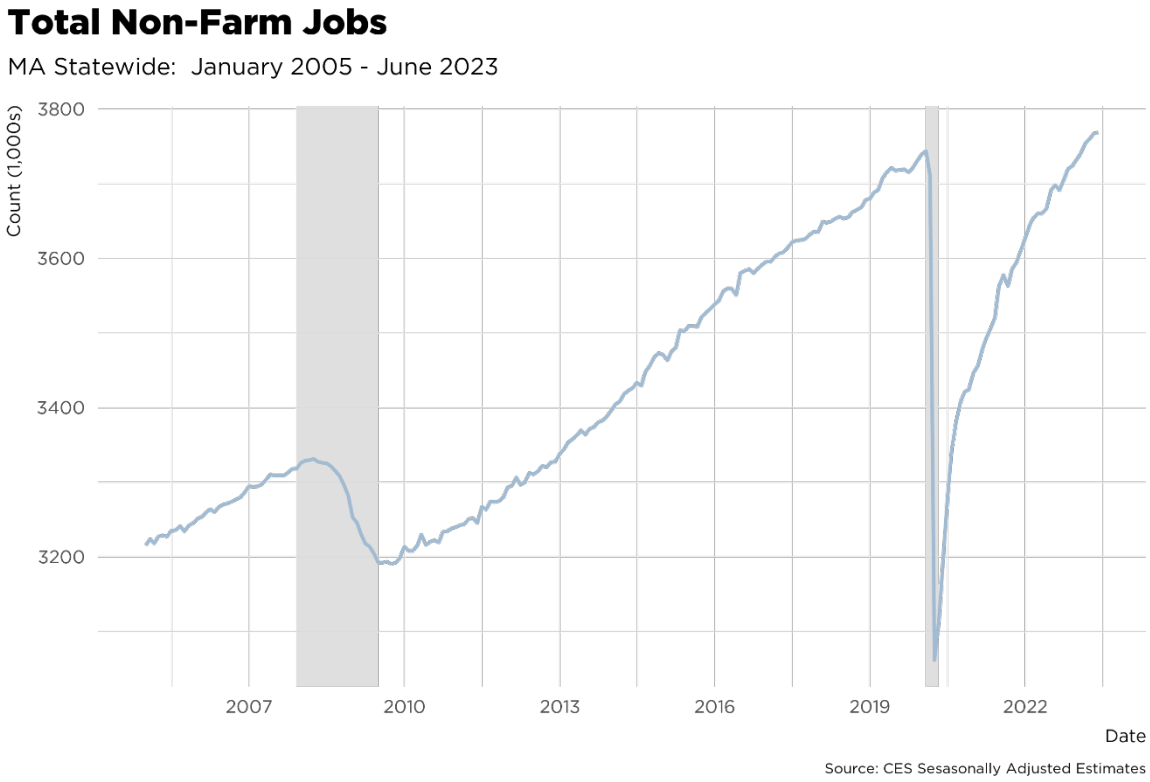
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Introduction

The COVID-19 pandemic brought about profound economic shifts, the magnitude and rapidity of which were unprecedented in recent history. In a mere month, Massachusetts lost approximately 650,000 jobs. For context, the employment downturn during the 2008-09 Great Recession—an era renowned for its pronounced economic contraction—resulted in job losses that amounted to 138,000 jobs (Figure 1).

Figure 1

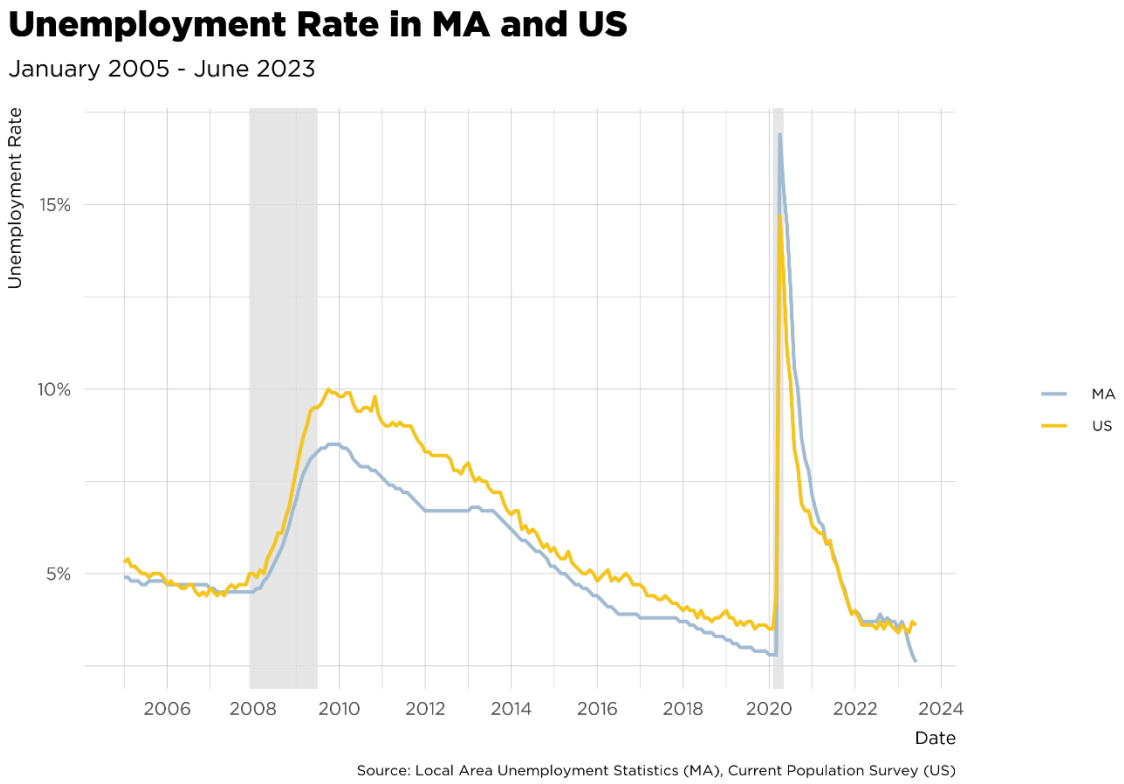


However, contrasted with the aftermath of the Great Recession, the Massachusetts economy has displayed remarkable resilience in its recovery. Despite the significant job losses caused by the pandemic, the Commonwealth's economy swiftly returned to pre-pandemic employment levels, reaching a full recovery by March 2023, a mere three years following the

pandemic's advent. This recovery stands in stark contrast to the prolonged, near five-year recovery after the Great Recession.

Much of the recovery occurred during 2020 and 2021, a period in which employment grew rapidly from the pandemic period low. While the employment recovery continued during 2022, a shift into a new normal for the Massachusetts economy became apparent. This new normal has been marked by economic signals that are both encouraging and contradictory.

Figure 2



For example, the state unemployment rate has reflected a strong recovery. During the pandemic, the unemployment rate escalated from a historically low 2.8% in March 2020 to a peak of 15.5% in May 2020, surpassing the level experienced during the Great Recession (Figure 2). However, by the start of 2022, the unemployment rate had fallen to 4%, and declined further to 3.7% by the end of the year, tracking closely with the national unemployment rate.

By June 2023, the unemployment rate had fallen further to 2.6%, an all-time low recorded in the state. This recovery was much quicker than the nearly eight years it took for the unemployment rate to return to its pre-Great Recession level low (January 2008 – November 2015).

However, when considering the employed population and labor force, a more complicated signal emerges. Despite the Massachusetts economy recovering nearly 100,000 jobs during 2022, the overall employed population fell by more than 10,000 people and labor force decreased by nearly 30,000 people. These trends have continued in 2023. Compared to December 2019, there were 95,000 fewer people employed and 108,000 fewer people in the labor force (Table 1).

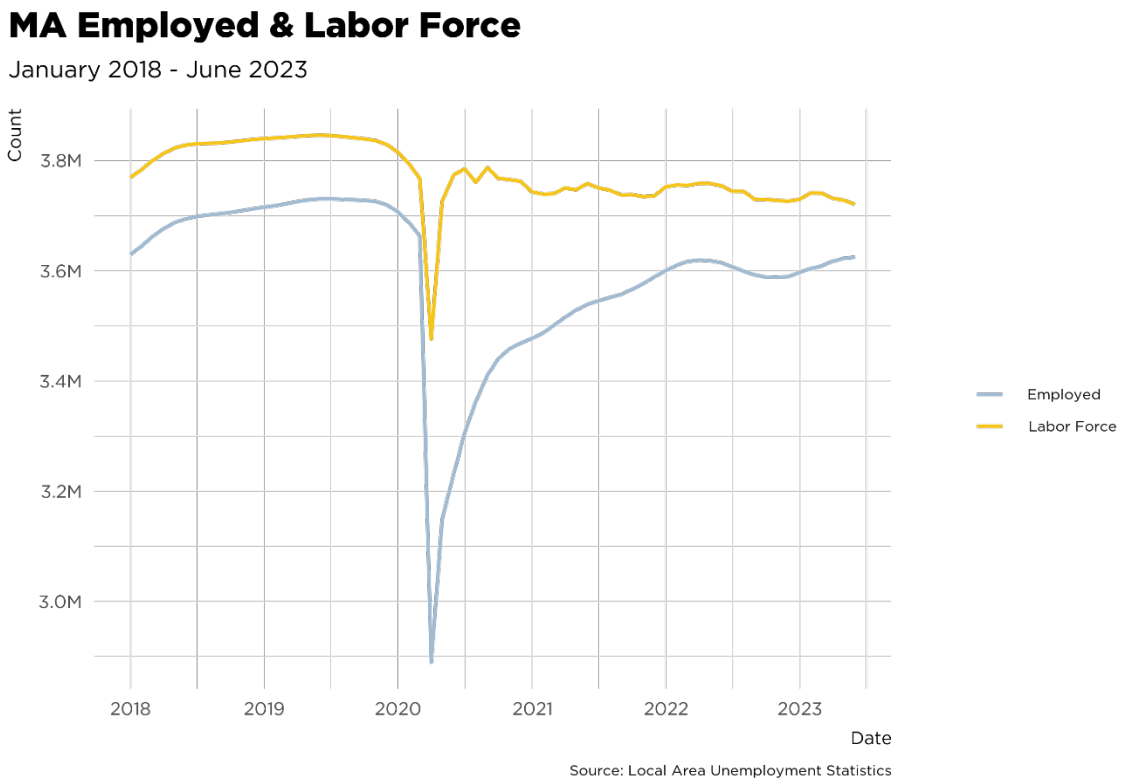
Table 1. Change in labor market outcomes between December 2019 and June 2023

	Unemployed	Employed	Labor Force	Jobs
Change from Dec 2019 to May 2023	-13,600	-95,100	-108,700	+32,000

Source: Bureau of Labor Statistics

These conflicting signals—complete recovery of jobs and unemployment rate but lagging recovery in the employed population and labor force—suggest that full effects of the pandemic period's changes will take time to be measured and understood. Yet, an aging population, a period of reduced immigration, and deaths of prime age workers from COVID-19 have put pressure on the labor market. Additionally, structural shifts like the increase in remote work and changing worker preferences present both new opportunities and challenges for workers and employers in Massachusetts.

Figure 3



This report delves deeper into some of the most significant changes that are likely to impact the future economy of the Commonwealth, exploring the following trends:

- The Massachusetts economy is on a trend of strong economic recovery from the pandemic, reaching historic highs in employment and historic low unemployment rates in the first half of 2023.

- The recovery has been uneven across industries. The professional and business services sector in Massachusetts has seen significant growth since 2019. This surge is primarily driven by the strength of the biotech sector, the commercialization of AI, and the rise of remote work. Additionally, sectors such as advanced manufacturing, life sciences, healthcare, and clean energy have

largely withstood the impacts of the pandemic, offering employment opportunities across various skill levels.

- The slow recovery of the leisure and hospitality sectors likely reflects structural shifts in demand due to the rise of remote work and the decline in business travel. While most other sectors have recovered to pre-pandemic levels, it could be a long time before this sector of the economy fully recovers.

- Rising labor demand coupled with a declining labor force has resulted in a historically tight labor market. Most sectors are experiencing tight labor markets where job postings exceed the number of employed individuals, with extreme the healthcare and education sectors reaching extraordinarily high levels.

- The tight labor market has created opportunities for workers who have traditionally faced barriers to employment. Particularly, Black workers and workers with disabilities have seen their labor market outcomes improve during this period. Despite this progress, notable disparities persist among different racial and ethnic groups and people with disabilities. While the positive trends among these groups are encouraging, workers that have traditionally faced barriers to employment are most severely impacted during economic downtowns, so sustaining these trends will require focused attention.

- Foreign-born workers are playing an increasingly critical role in Massachusetts' workforce, and the slowdown in immigration during the pandemic have contributed to labor market tightness, emphasizing the need to address barriers like English proficiency and legal work status to encourage more participation among the foreign-born population.

- The recovery from the pandemic has been uneven across regions in Massachusetts. Regions like Boston and Boston and Metro North recovered employment lost in the pandemic by 2022, while most regions still saw employment fall below pre-pandemic levels. The slowed recovery of the healthcare sector likely stemming from a lack of labor supply has impeded the full employment recovery of regions outside of Boston and Metro North have benefited from an industrial composition that has supported employment recovery. Other regions have lagged in their recovery due to an array of reasons, including the lingering impacts on the tourism industry, aging workforces, and the slow recovery of employment in the ambulatory and elderly care industries.

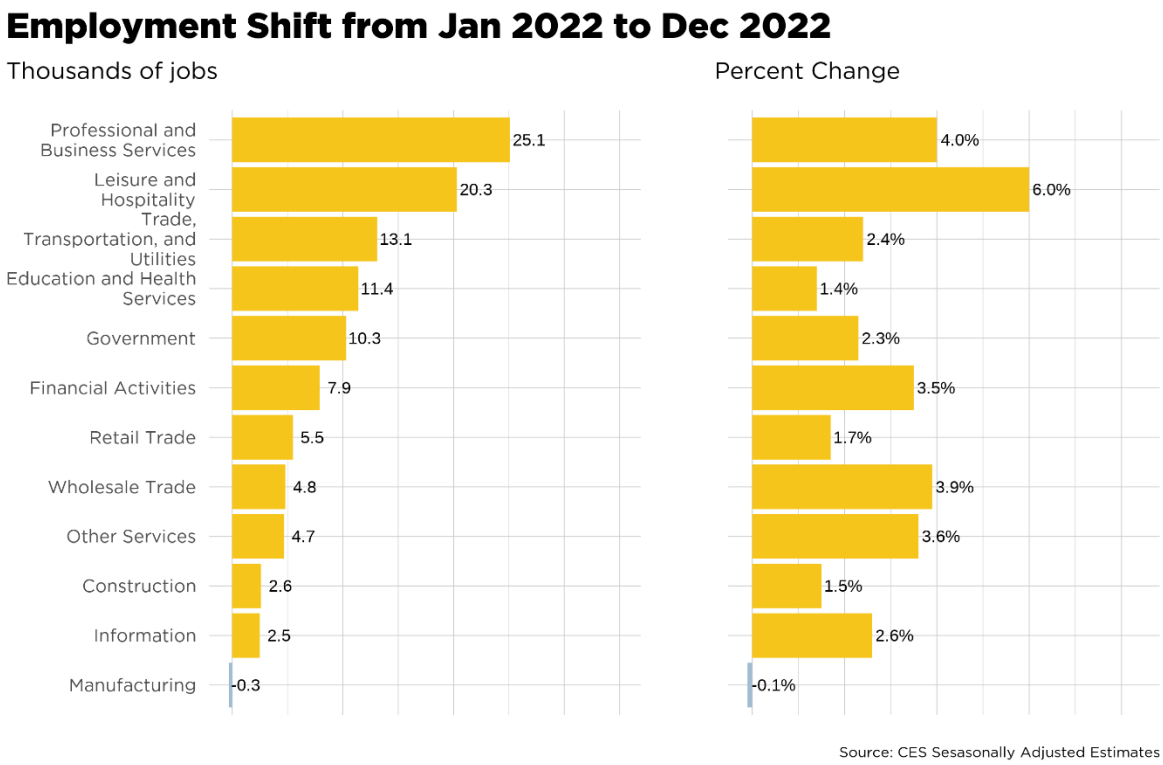
- Occupational projections suggest that there will continue to be significant demand for new workers across key occupations in the healthcare, advanced manufacturing, life sciences, and clean energy sectors. The analysis shows the importance of considering not only expected growth in employment, as retirements and the movement of workers across occupations will create both challenges for employers to attract new workers, and opportunities for workers to pursue a broad range of career opportunities. For example, despite the healthcare sector already experiencing a very tight labor market, occupation projections suggest that there will be estimated 4,374 annual openings for registered nurses in the state, more than half of which will likely be the result of workers retiring.

Industry Trends

Post-Pandemic Industry Dynamics

The employment landscape has improved overall, but the pandemic's impacts on different industries have been uneven. Factors such as remote work, labor market supply and demand, and pandemic-specific effects have played a role in driving these transformations.

Figure 4

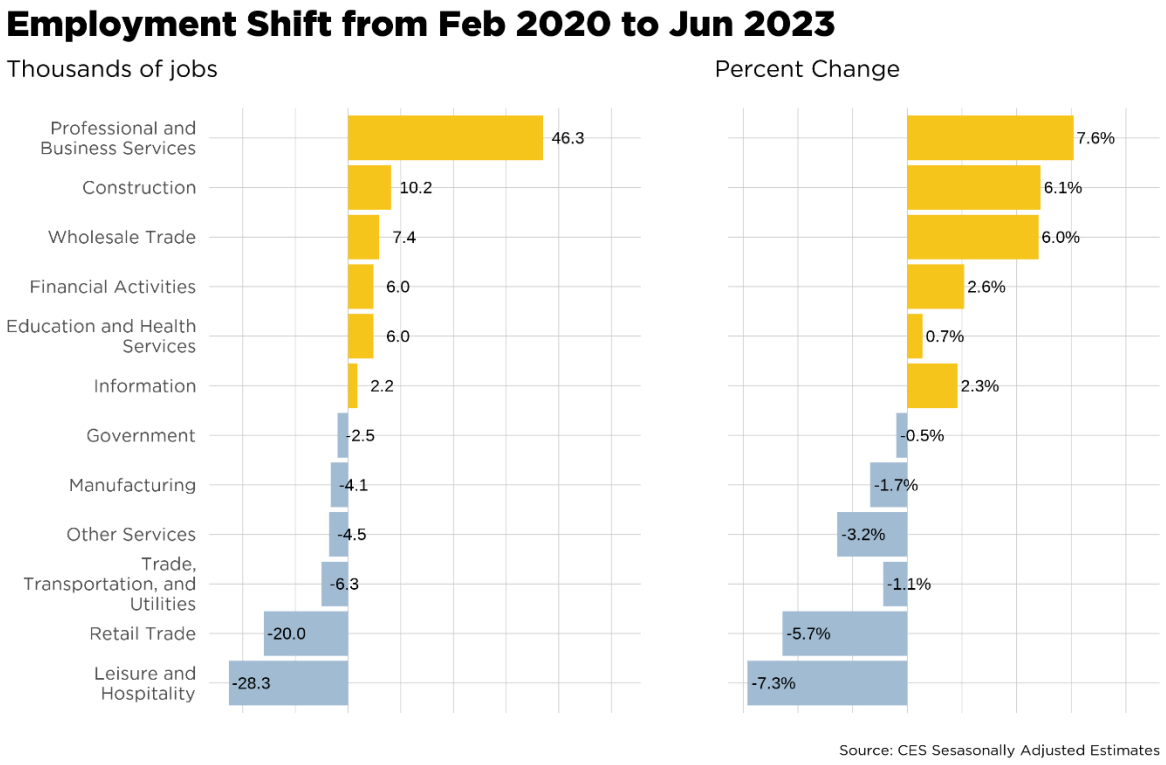


Overall, 2022 was a period of growth and recovery across most industries. Over the course of the year, every sector except manufacturing increased employed. The most significant growth in percentage terms was observed in the professional and business services sector which added 25,100 jobs (+4.0%), and the leisure and hospitality sector which added

20,300 jobs (+6.0%) (Figure 4). The growth in leisure and hospitality was particularly notable because it is representative of the tourism economy, which was hard hit during the pandemic.

Despite the growth across most sectors in 2022, the recovery of employment relative to February 2020 is still uneven across sectors. Several sectors have seen significant growth in employment compared to pre-pandemic levels, as of June 2023. These include wholesale trade (+6.0%), construction (+6.1%), and professional and business services (+7.6%). The professional and business services sector stands out as an area of strong growth, adding more than 46,000 new jobs in Massachusetts since February 2020 (Figure 5).

Figure 5



The growth of the professional and business services sector, primarily driven by professional, scientific, and technical services, can be attributed to several factors:

- **Strong growth in the biotechnology sector:** Massachusetts has a strong biotechnology sector that has shown significant growth in 2021 in both workforce and real estate, despite some challenges posed by the pandemic. According to the Massachusetts Biotechnology Council, biopharma employment in Massachusetts grew by 13.2 percent in 2022, and the companies headquartered in the state received 32 percent of all venture capital investment in the industry nationally. This growth boosted employment in the Research and Development in the Physical, Engineering, and Life Sciences industry, which added 18,868 jobs between 2019 and 2022.

- **Emerging commercial uses of AI technologies:** The period since 2019 has seen the growing emergence of commercial artificial intelligence (AI) technologies, particularly in the life sciences sector. Firms in the AI space are predominantly in the professional, scientific, and technical services sector (Brookings). Massachusetts, a global leader in AI technology, with Boston ranking 3rd globally for the most diverse AI talent pool (HBR), has seen new business opportunities for its companies and workers as AI commercialization increases.

- **The rise of remote work**: Jobs in the professional, scientific, and technical services sector were already conducive to remote work prior to the pandemic. This allowed for a smooth transition to a largely remote work environment during the pandemic. In 2021, nearly 50% of professional and business services workers nationally worked from home at least part of the time, compared to 22% overall (BLS).

In stark contrast, the retail and accommodation and food services sectors experienced significant job losses during the pandemic and have been slow to recover. As of May 2023, employment in the retail sector was down 5.4% compared to February 2020, and the accommodation and food services sector was down 7.4%. These two sectors represent a loss of more than 47,000 jobs. Several factors have contributed to these dynamics:

- **Pandemic shutdowns:** The accommodation and food services sector, as well as the retail sector, were heavily impacted by the shutdowns and social distancing measures implemented during the pandemic. These measures led to temporary closures of many businesses and reduced customer traffic, resulting in significant job losses.

- **Decline in tourism and business travel:** The pandemic led to a sharp decline in both household and business travel. This had a direct impact on the accommodation and food services sector, which relies heavily on tourism and business travel for revenue. With fewer people traveling, the demand for these services decreased, leading to job losses in the sector.

- **Remote work decreasing spending in business districts:** The shift to remote work meant fewer people commuting to business districts, leading to a decrease in spending on retail and food services in these areas. This decline in foot traffic and spending further exacerbated job losses in these sectors.

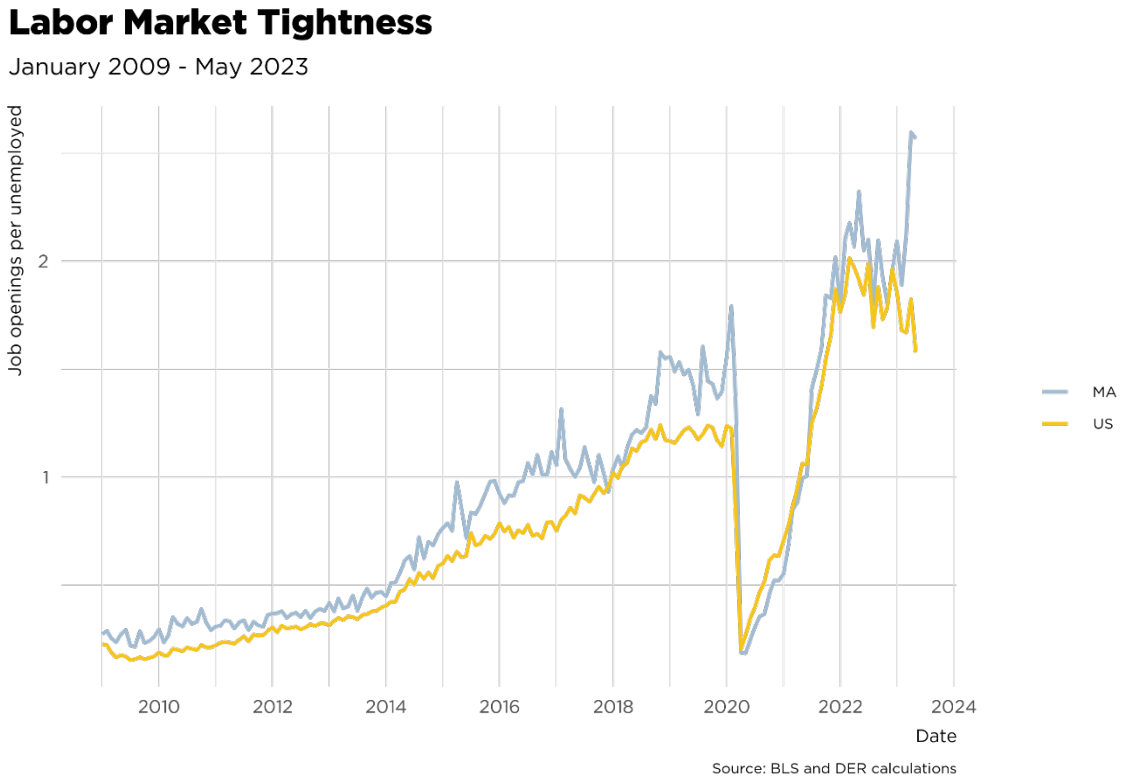
The impact on retail and accommodation and food services was widespread across the state—particularly areas with strong travel and tourism economies—it was particularly severe in Boston. Between 2019 and 2022, Suffolk County lost 15% of its retail and accommodation and food services employment, compared to a decline of 7% statewide (Lightcast). A single Boston zip code—the area roughly representing Back Bay—lost more than 3,000 retail and accommodation and food services jobs between 2019 and 2022 and accounted for more than

6% of the total state losses (Lightcast). This area's position as an area catering to commuters, tourists, and business travelers made it particularly vulnerable to the pandemic period dynamics described above.

The Pandemic and the Tightening Labor Market

A notable dynamic that unfolded during the pandemic was the intensifying labor market tightness. As previously mentioned, the labor force contracted and has remained below pre-pandemic levels, even as the number of jobs in the state has rebounded. This tightening is reflected in the number of job openings per unemployed person, a metric for labor market tightness that has reached historic levels in the post-pandemic period. While labor market tightness in Massachusetts tracked the US measure through 2021 and 2022, a surge in demand in summer of 2022 led the number of openings per unemployed person to peak at 2.3 in May 2022, compared to 1.9 nationally (Figure 6). After returning to levels similar to the US in following months, labor market tightness diverged and peaked again in May 2023, reaching an unprecedented high of 2.6 openings per unemployed person in May 2023.

Figure 6



A closer look at job postings per unemployed worker within individual sectors reveals that this historic level of labor market tightness is primarily driven by four sectors: healthcare, educational services, finance and insurance, and utilities.

The healthcare and educational services sectors share several characteristics that shed light on the high degree of labor market tightness experienced in the post-pandemic period:

- **In-person work:** Both sectors generally require in-person work. With the pandemic sparking a surge in demand for remote work options, some workers may be opting to switch careers or pursue opportunities in fields that offer remote work. This shift could be contributing to the labor shortages in these sectors.

- **Aging workforce:** Even before the pandemic, both sectors had workforces that were older than the overall workforce in Massachusetts. In 2019, 28% of the educational services workforce and 27% of the healthcare workforce were 55 years old or older, compared to 25% of the overall workforce (Quarterly Workforce Indicators). As these workers reach retirement age, the sectors may be struggling to replace them, further exacerbating labor market tightness.

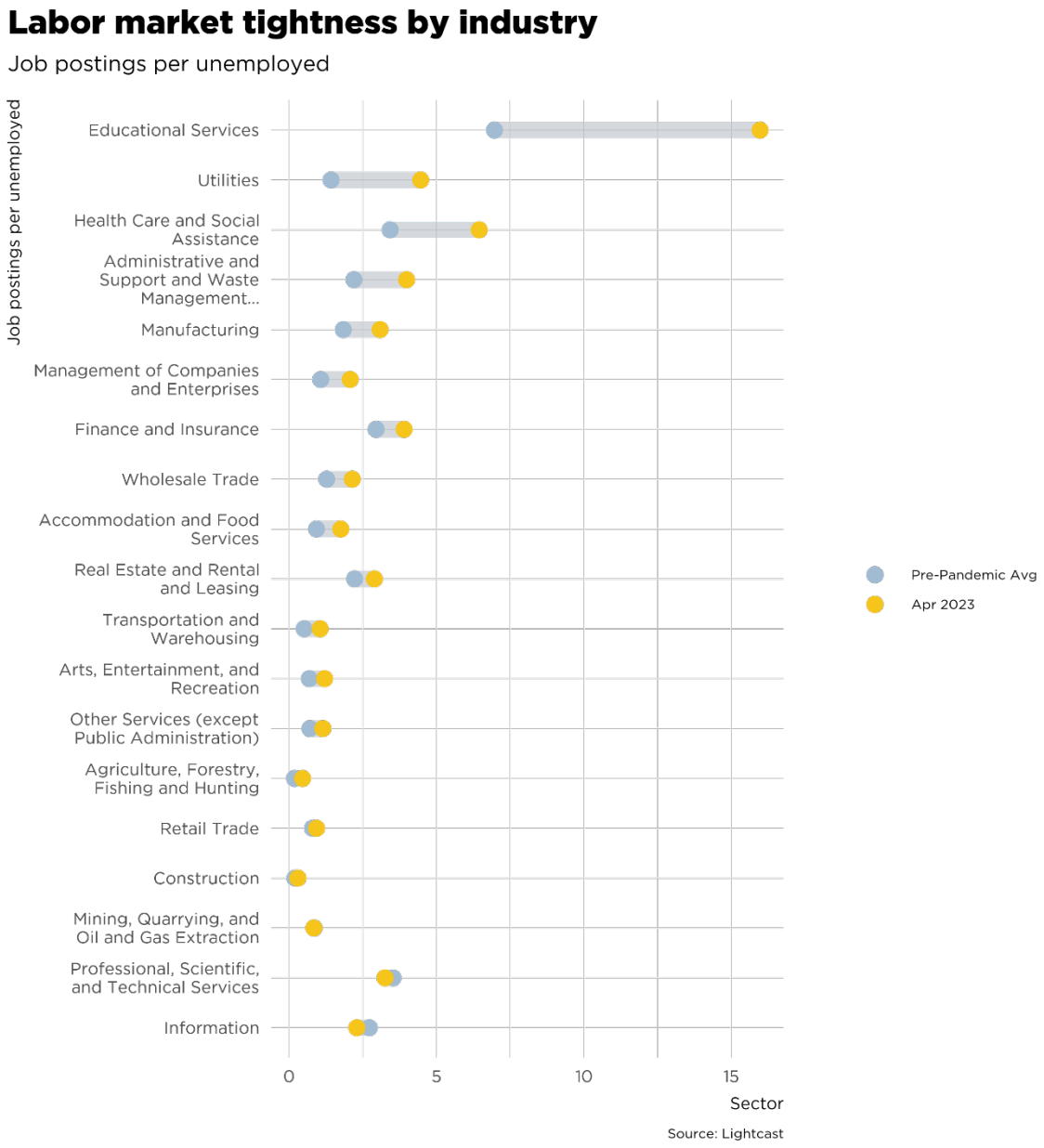
- **High levels of credentialing:** The healthcare and educational services sectors are among the industries with the highest share of workers with a bachelor's degree or higher. Additionally, many jobs within the sectors require specialized licenses or credentials. This dynamic can slow labor supply responses to increased demand, as workers are required to complete specialized degree or training programs to qualify for employment.

- **Burnout:** The pandemic placed exceptional demands on workers in both sectors, leading to high levels of burnout. Consequently, the average number of workers per quarter leaving a job in the healthcare and educational services sector for a job in another sector rose from 11,000 per quarter from 2017 to 2019 to 14,000 per quarter from Q2 2021 (when the vaccine became widely available) to Q2 2022 (J2J Flows). Notably, there was a 51% increase in the rate of workers switching from jobs in healthcare and educational services to jobs in professional, scientific, and technical services.

For most sectors, the number of job postings per unemployed person within the sector has returned to pre-pandemic levels. In some sectors, there were fewer job postings per unemployed person in April 2023 than there were prior to the pandemic, particularly in information and professional, scientific, and technical services (Figure 7). These sectors are notable because they are among the industries with the highest rates of remote working. This offers the opportunity for firms in these sectors to expand their potential labor market beyond

Massachusetts, making them less sensitive to local labor market conditions. At the same time, it could mean that jobs growth in these sectors may not translate to employment growth in Massachusetts.

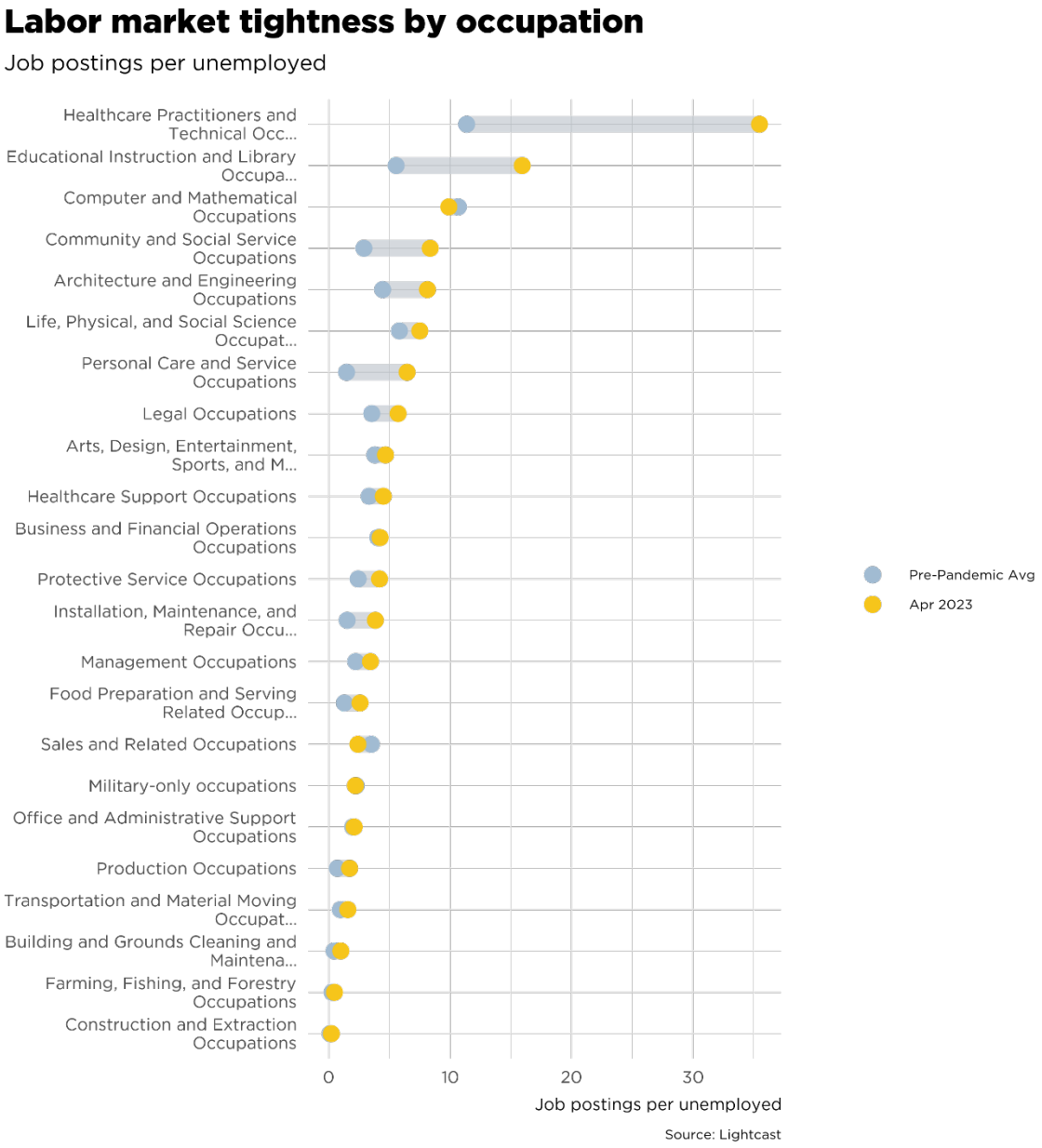
Figure 7



Similar trends emerge when considering occupations. The largest increases in labor market tightness were among occupations specific to the healthcare and educational services sector (Figure 8). The labor market was already tight for healthcare practitioners and technical occupations prior to the pandemic, but the number of job openings per unemployed rose to

exceed 35 by May 2023. Similarly, the number of job postings per unemployed among educational instructors and library occupations grew to exceed 15 in May 2023.

Figure 8



The workforce shortages experienced by the healthcare and educational services sectors as the economy has recovered from the pandemic shock have been influenced by factors such as the need for in-person work, an aging workforce, and high levels of credentialing. The pandemic-induced demands and burnout among workers in these sectors have further exacerbated the labor market tightness.

While aggregate employment numbers may show a positive trend in terms of jobs regained, this broad-brush picture hides considerable variability between different sectors. For instance, while the technology and professional services sectors have seen robust employment growth, the hospitality and retail sectors have struggled. This unequal recovery is critical for policymakers to understand because it affects employment opportunities in different communities and demographic groups.

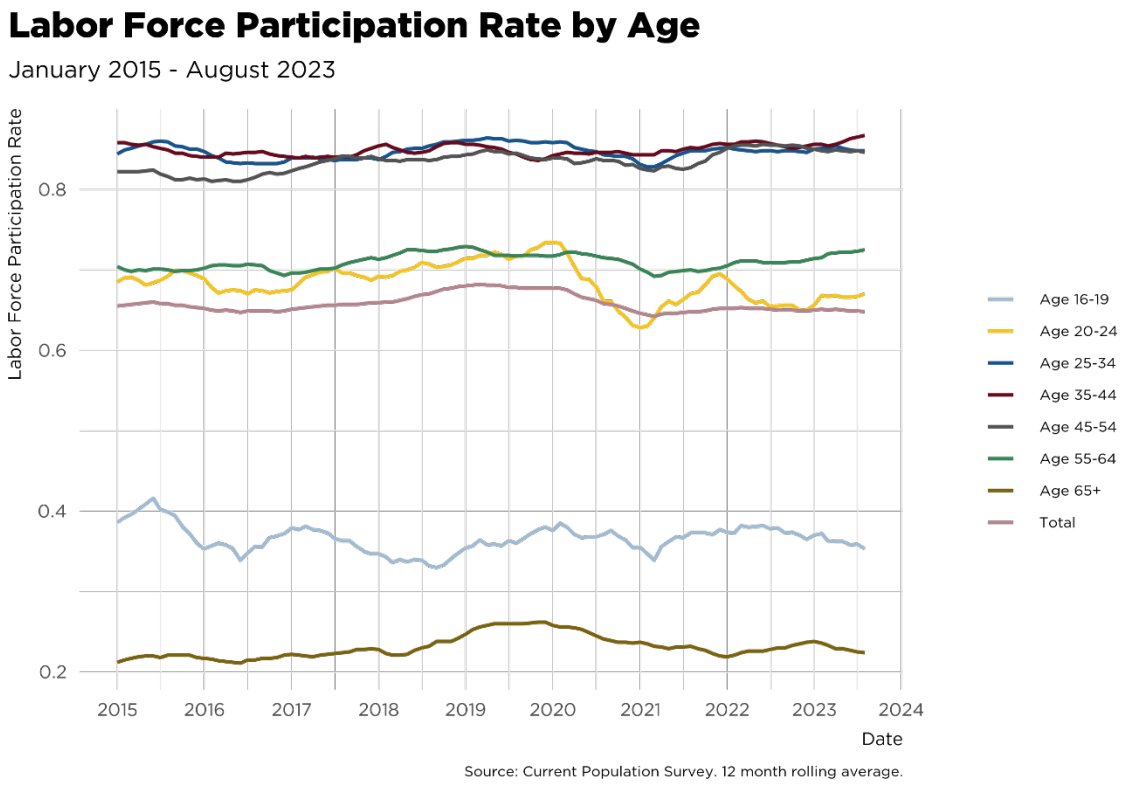
The kinds of jobs being created in growing sectors often require different skills and credentials than those lost in declining sectors. This mismatch can make it difficult for workers laid off from shrinking industries to transition to sectors where jobs are available. For example, a restaurant worker may not easily transfer their skills to a programming job in the tech industry without significant reskilling.

The variability in sectoral recovery and the required skills and credentials pose significant challenges for workforce planning. Programs aimed at retraining may need to be designed with a nuanced understanding of the evolving skills demand in the labor market.

Demographic Analysis

The COVID-19 pandemic has undoubtedly left an indelible mark on the Massachusetts labor market. Its effects have been complex and multifaceted, with distinct patterns emerging across different demographics, industries, and educational backgrounds.

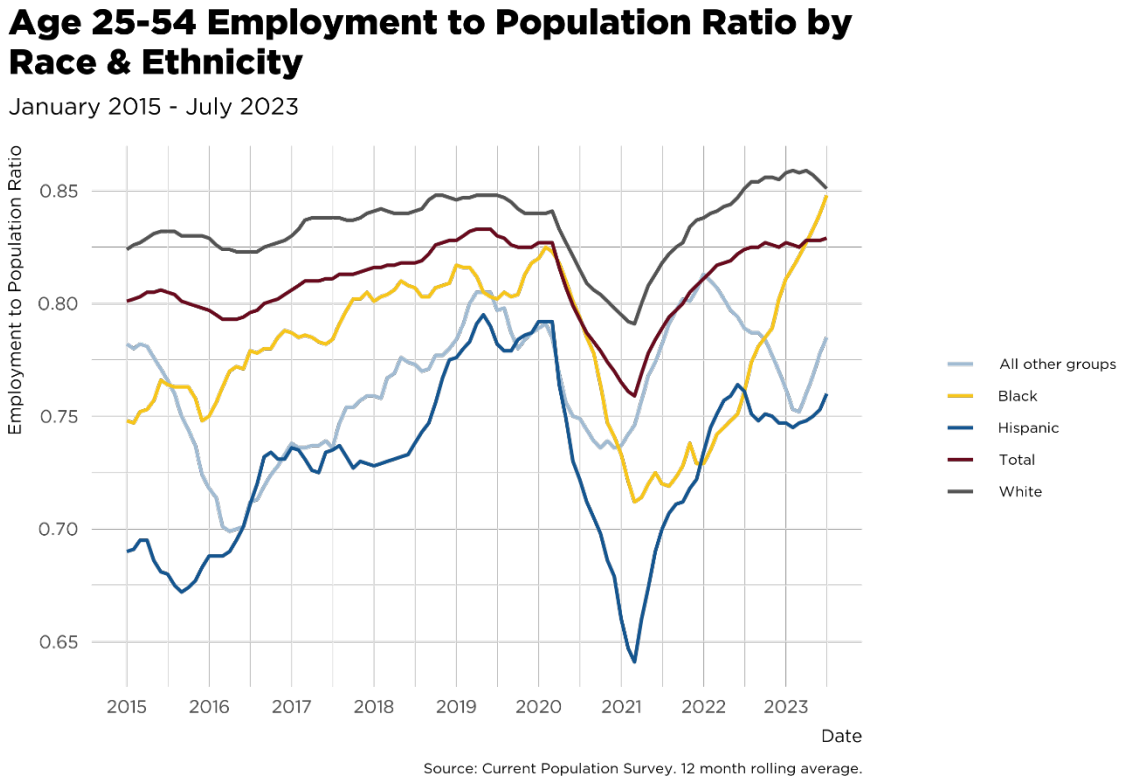
Figure 9



The economic impact of the pandemic varied significantly among age groups. Young workers, particularly those aged 16-24, were hit hardest, facing unemployment rates that soared during the worst period of the pandemic. These young workers were disproportionately employed in industries hardest hit by the pandemic, such as accommodation, food services, and retail trade, which made their recovery more challenging as these industries have been slower to regain lost employment. While employment and labor force participation has largely

recovered among younger workers, employments rates among the 20-24 aged cohort have fallen significantly. Employment rates among this group rose throughout 2021, this trend reversed and leveled out in 2022. This decline in employment rates has been accompanied by a large fall in labor force participation among the 20-24 age cohort. As of July 2023, the 12-month average labor force participation rate among 20–24-year-olds was 6.7 percentage points lower than it was in December 2019 (Figure 9).

Figure 10



An aging workforce has also contributed to a declining labor force. Between 2018 and 2022, the population aged 55 and older grew by 8.5% based on data from the Current Population Survey (CPS). This growing population coupled with rising retirement rates from a pre-pandemic low have contributed to labor market declines despite high demand. The tightening labor market has created unique opportunities for some groups. Black workers in

Massachusetts experienced robust employment growth, with employment among Black workers returning to pre-pandemic levels in 2022. This positive trend has continued into 2023, with the 12-month average Black prime-age employment rate reaching historic levels by July 2023, nearing parity with white workers (Figure 10).

Additionally, foreign born workers fared better than the overall population during the pandemic. From 2019 to 2021, employment among foreign-born workers fell by just 0.3%, while the labor force grew by 3% over the period based on data from the American Community Survey (ACS). Foreign-born workers fill essential roles in various industries, and account for a disproportionate share of the workforce in many occupations, such as 36.9% of software developers, 42.2% of cooks, and 73.5% of housekeeping cleaners (ACS). Yet, many foreign-born workers still face barriers to employment, with 37% of immigrant workers reporting the have levels of English proficiency below the average English-only speaker.

The decline in immigration during the pandemic represents a significant shock to the labor supply for occupations that disproportionately rely on foreign born workers. The annual number of new immigrant residents arriving in Massachusetts fell by 67% from its peak in 2017 and 2021 (Department of Homeland Security). While immigration levels have shown signs of recovery nationally in 2022, state level data has not yet been released. These dynamics have made it harder for businesses to hire the workers they needed to operate as the economy recovered.

Post-pandemic shifts like the increased prevalence of remote work have also created new opportunities for workers. This has been particularly true for workers with disabilities. People with disabilities can face a variety of barriers to employment, including physical accessibility of office workspaces, lack of transportation, and lack of flexibility in work schedules, among others. The growth of remote work during the pandemic has the potential to address some of these barriers and expand employment opportunities for people with disabilities.

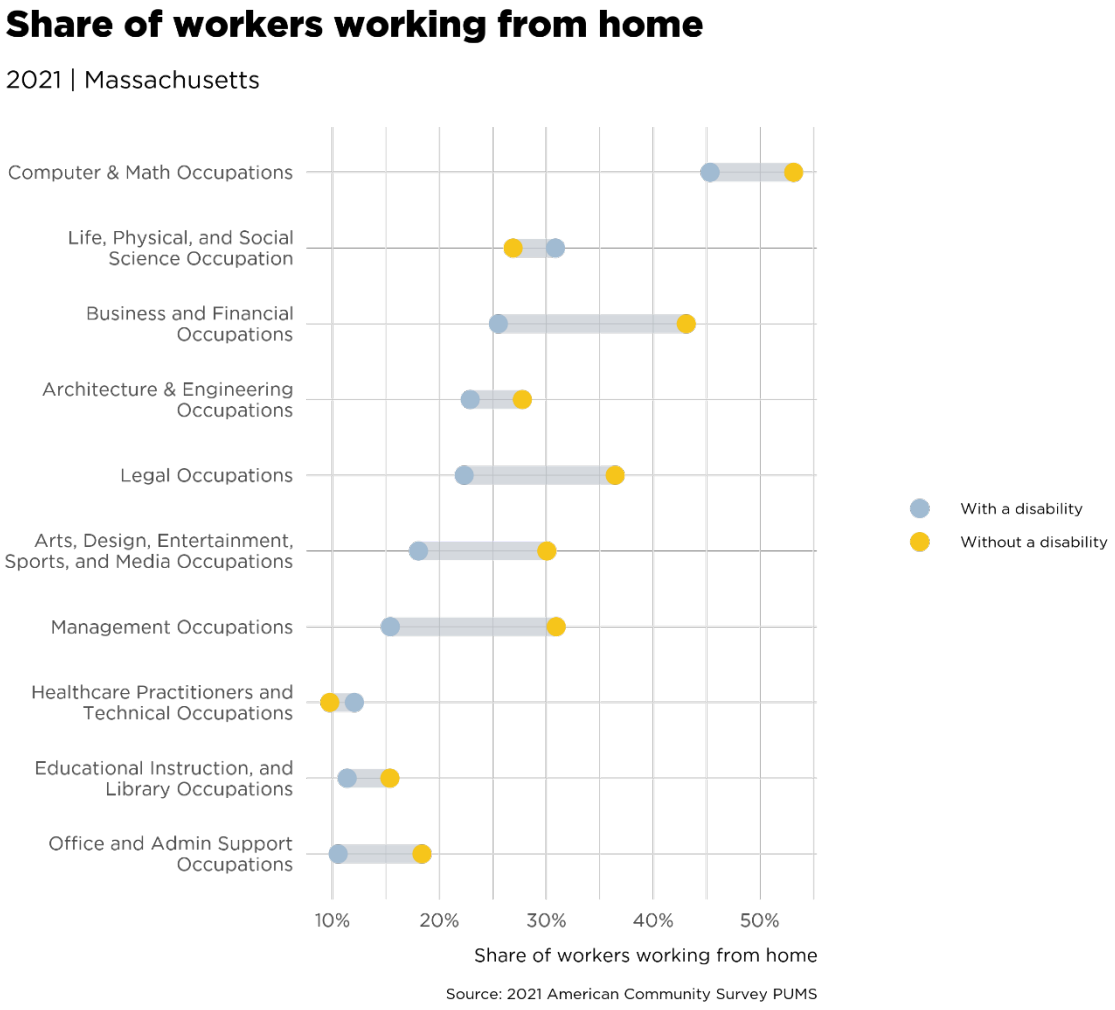
Despite lower levels of labor force participation, people with disabilities saw their employment expand during the pandemic, growing by 3.4% between 2019 and 2021 (ACS). In 2021, those who identified as having a hearing difficulty were most likely to engage in the labor force, with a labor force participation rate of 65% (ACS). On the other hand, those reporting self-care difficulty were least likely to participate in the labor force, with a labor force participation rate of just 21% (ACS).

This growth in employment corresponded with a marked increase in the share of people with disabilities working from home. In 2019, 6.5% of people with disabilities worked from home, and by 2021 this figure had risen to 17.4%, representing a 176% increase (2019 and 2021 1yr ACS PUMS).

Despite these gains, people with disabilities were still less likely to work from home than the general population in 2021 (23.2%). This difference was not only driven by occupation mix among those with and without disabilities. Data suggests that even within occupations, people with disabilities were also less likely to work from home than those without disabilities. Among the top 10 occupations with the largest share of people with disabilities working from home, there are just two in which people with disabilities were more likely to work from home than the general population: life, physical, and social science occupations, and healthcare practitioner and technical occupations (Figure 11). This suggests that there are still significant opportunities to expand access to employment through remote work for people with disabilities.

However, not all groups have experienced positive trends. Hispanic workers, for example, continue to face higher unemployment rates, and the strong labor market for Black workers contrasts sharply with the slower recovery for the Hispanic community. Hispanic or Latino workers identifying as Puerto Rican and Dominican, particularly those who had lived in the United States for more than five years, were most severely impacted by the pandemic.

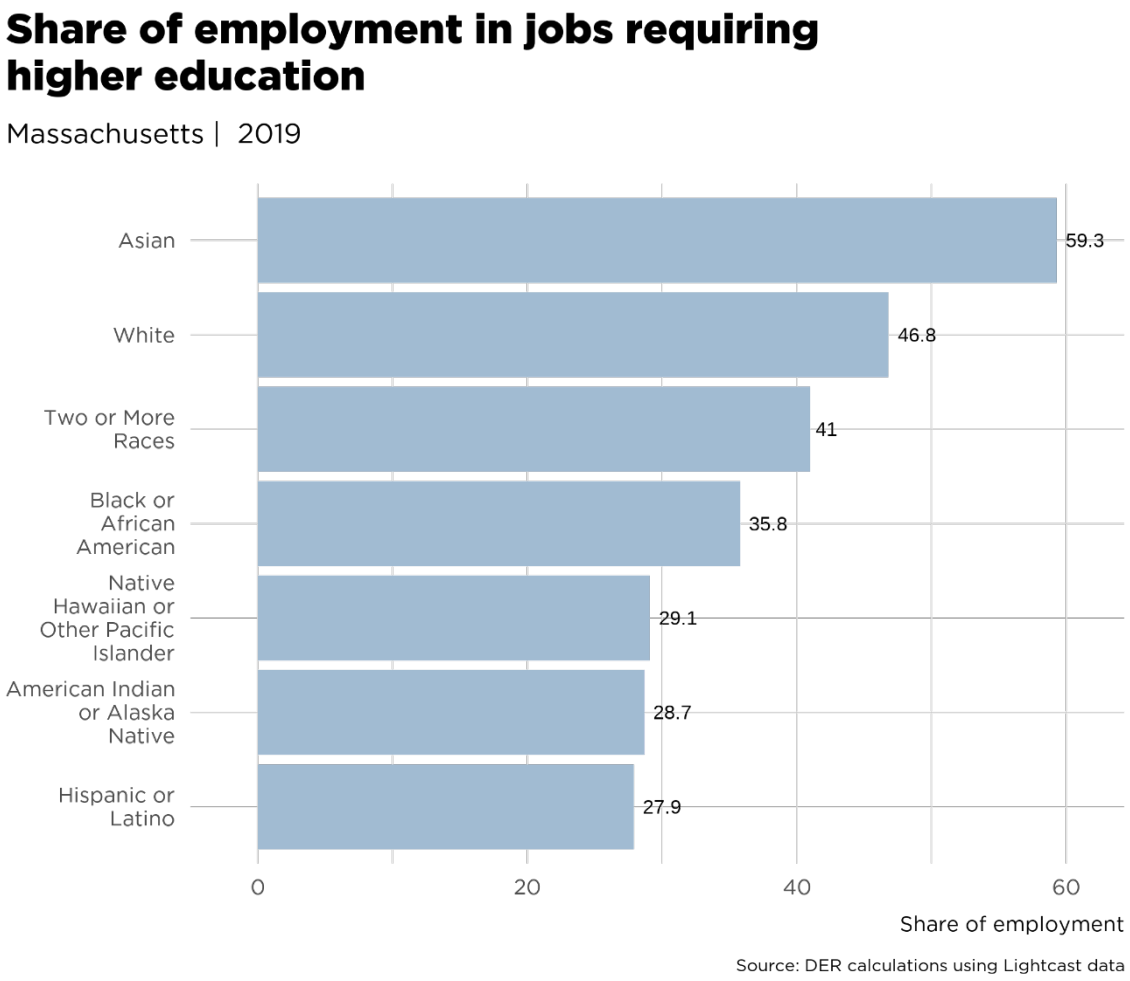
Figure 11



While we do not yet have enough data to fully explain these different trajectories, there are a few possible explanations. First, it could relate to differences in employment by industry across the groups. Prior to the pandemic, Black workers were 50% more likely than Hispanic or Latino workers to be employed in the Health Care and Social Assistance sector, which has proven resilient to the pandemic shock. In contrast, Hispanic and Latino workers—along with Native Americans and Pacific Islanders—were more concentrated in the Retail, Accommodation and Food Services, and Administrative and Support and Waste Management and Remediation Services sectors that were hit hard by the pandemic and have been slower to recover.

Additionally, Hispanic or Latino workers—along with Native Americans and Pacific Islanders—were less likely to be employed in occupations requiring an associate or bachelor's degree prior to the pandemic. In 2019, 27.9% of Hispanic or Latino worker were employed in occupations requiring higher education, compared to 35.8% of Black workers, and 46.8% of white workers (Figure 12).

Figure 12

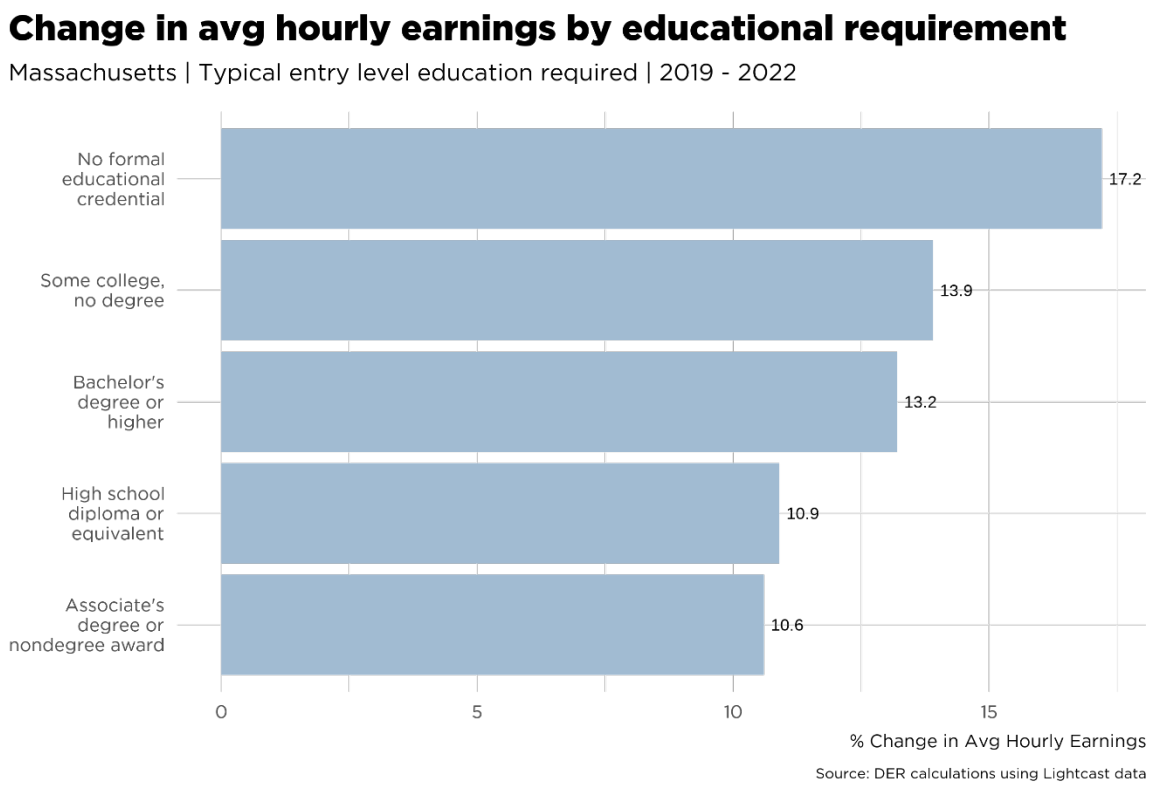


Workers without a bachelor's degree were more likely to lose their job during the pandemic, and employment among this group has been slower to recover. From 2019 to May

2023, employment among bachelor's degree holders surged by 8%, while those with some college or associate degrees and those with just a high school diploma saw their employment shrink by 19% and 16% respectively (CPS). These shifts were accompanied by a decline in the labor force for those with a high school diploma of 239,000 workers, while the labor force for those with a bachelor's degree or higher grew by 147,000 (CPS).

Despite the challenges, the tight labor market indicates that opportunities still exist for workers with the right skills and without barriers to employment. Jobs not typically requiring a bachelor's degree still accounted for two-thirds of all jobs in Massachusetts in 2022, and the high demand for occupations not typically requiring a bachelor's degree during the pandemic recovery has led to significant increases in average hourly earnings (Figure 13).

Figure 13



Occupations that do not typically require a formal educational credential saw the largest increase in wages among all occupations from 2019 to 2022, growing by more than 17%. These occupations spanned various sectors, from construction and retail to accommodation and food services. These jobs are concentrated in industries that were hardest hit by the pandemic and have been slow to return to pre-pandemic employment. These trends are consistent with the concern that labor supply issues have slowed recovery.

The Massachusetts labor market's response to the pandemic offers a rich and multifaceted picture of economic resilience and challenges. The shifts have created new opportunities for some workers while leaving others grappling with recovery. The trends underscore the importance of targeted interventions, leveraging remote work, focusing on skill development, and acknowledging the unique experiences of various demographics.

Regional Analysis

The COVID-19 pandemic triggered economic shocks across Massachusetts' 16 Workforce Development Areas (WDAs) including significant job losses, a notable increase in the unemployment rate, and a substantial decline in both the labor force and the employed population. However, as of April 2023, the labor markets within these WDAs have made progress in their recovery, although to varying degrees. Understanding how the impact of the pandemic varies across regions is critical to our understanding of the state's labor market and provides insights into the post-pandemic economic landscape.

Impact On Jobs and Unemployment

The COVID-19 pandemic had widespread impact on employment across regions, with average employment levels still below pre-pandemic levels in most regions through 2022. Initial pandemic-related job impacts across these regions ranged from a 5.4% reduction in jobs in the Boston WDA to an 11.1% decrease in the Cape & Islands WDA. By 2022, only three WDAs—Boston, Central, and Metro North—had recovered the jobs lost during the pandemic. (Table 2).

The Boston WDA's unique industrial composition has played an important role in the recovery of total jobs lost during the pandemic. By the end of 2022, the top four sectors in the region-including healthcare and social assistance, professional, scientific, and technical services, finance and insurance, and education services—had fully recovered jobs lost during the pandemic. Data from the Quarterly Workforce Indicators (QWI) show that these four sectors accounted for approximately 54% of pre-pandemic total employment in the Boston WDA, compared to about 38% outside of the Boston WDA.

Table 2: Change in Total Non-Farm Employment by WDA

Area	Change in Employment (2019 - 2020)	Percent Change in Employment (2019-2020)	Change in Employment (2019 - 2022) *	Percent Change in Employment (2019-2022) *
Berkshire WDA	-6,094	-10.5%	-3,188	-5.5%
Boston WDA	-37,018	-5.4%	2,891	0.4%
Bristol County WDA	-10,243	-7.0%	-879	-0.6%
Brockton WDA	-7,767	-7.9%	-2,358	-2.4%
Cape & Islands WDA	-12,100	-11.1%	-3,322	-3.0%
Central MA	-15,931	-5.9%	219	0.1%
Franklin/Hampshire WDA	-7,673	-8.0%	-1,238	-1.3%
Greater Lowell WDA	-8,739	-6.7%	-4,636	-3.6%
Greater New Bedford WDA	-6,639	-7.5%	-1,326	-1.5%
Hampden County WDA	-17,048	-8.0%	-8,737	-4.1%
Lower Merrimack Valley WDA	-8,911	-5.9%	-365	-0.2%
Metro North WDA	-27,010	-5.8%	150	0.0%
Metro South/West WDA	-44,732	-7.4%	-14,747	-2.5%
North Central WDA	-6,538	-7.7%	-1,725	-2.0%
North Shore WDA	-15,970	-8.9%	-5,204	-2.9%
South Shore WDA	-19,152	-8.3%	-5,290	-2.3%

Source: Quarterly Workforce Indicators. *2022 data is from the Q1 to Q3.

In the healthcare and social assistance sector, one factor contributing to the sector recovery was the rebound of employment in the hospital industry, one of the four industry subsectors within the health care and social assistance sector. The hospital industry accounts for about 65% of employment in the health care and social assistance sector in the Boston WDA (QWI). This is uniquely high compared to other regions where the hospital industry accounts for

employment in the range of 13% in Metro South/West WDA to 31% in Metro North WDA (QWI). Boston WDA boasts of some of the largest hospitals in Massachusetts, and as reported by Boston Planning & Development Authority, four out of the ten largest employers in Boston are hospitals, and they include Massachusetts General Hospital, Brigham and Women's Hospital, Boston Children's Hospital, and Beth Israel Deaconess Medical Center.

The Boston WDA is also differentiated from other regions in the state by its substantial share of employment in the professional, scientific, and technical services sector. Specifically, this sector is the second largest source of employment in the area representing about 14% of total employment in the Boston WDA in 2022 (QWI). When compared to other regions, employment in this sector is relatively high in Boston WDA, except for Metro North WDA which has an employment share of about 20%. The sector's employment rates in other regions vary, ranging from about 3% in Brockton WDA to about 13% in the Metro South/West WDA. As was noted previously, this sector has seen the largest employment gains in the state compared to pre-pandemic levels, supported by growth in life sciences research, the technology sector, and remote work.

In contrast, the Berkshire WDA has been grappling with a considerable share of unrecovered job losses, which stood at 5.5% by the end of 2022 (QWI). A key contributing factor is the sluggish rebound in the accommodation and food services sector, which is the area's second-largest employer, accounting for about 12% of total employment in 2022. When compared to other regions, the employment share is relatively high in Berkshire WDA, except for Cape & Islands WDA which has an employment share of about 16%. In the other areas, the employment share in this sector varies, from approximately 6% in Metro South/West WDA to about 10% in South Shore WDA.

This sector was severely impacted by the shutdowns and social distancing measures implemented during the COVID-19 pandemic. This caused a steep drop in both leisure and business travel, which heavily impacted the sector due to its reliance on tourism and corporate

travel. The drop in tourism and business travel resulted in reduced demand for various services in the sector, resulting in significant job losses.

The unemployment rate across all 16 WDAs have fallen below pre-pandemic levels by April 2023 (Table 3). However, according to the Local Area Unemployment Statistics (LAUS), the rate across the regions varies, ranging from 1.9% in Metro North WDA to 3.5% in the Cape & Islands WDA.

In Metro North WDA, the unemployment rate declined from 2.3% in 2019 to 1.9% in the first quarter of 2023 (LAUS). This rate is the lowest compared to other regions where it ranges from 2.0% in Franklin/Hampshire and Metro South/West WDAs respectively to 3.5% in Cape & Islands WDA in the first quarter of 2023.

A significant factor that has contributed to the decline in the region's unemployment rate is the full rebound of employment in the professional, scientific, and technical sector. As the largest employer in the Metro North WDA, accounting for about 20% of the region's total employment, the full recovery of this sector has a large effect on the area's unemployment dynamics (QWI). Additionally, the advantageous location of the region, being near Boston WDA, could be contributing to the decline in the unemployment rate. The proximity to Boston WDA provides the benefits of industry interconnectivity and the ability of the region's unemployed population to find jobs in Boston WDA.

Similarly, the unemployment rate in the Cape & Islands WDA declined from 4.1% in 2019 to 3.5% in the first quarter of 2023 (LAUS). However, when compared to other regions, this rate remains relatively high. One contributory factor to this trend is the sluggish recovery of the accommodation and food services sector, the region's leading employment sector, which accounts for about 16% of jobs in 2022. As of 2022, employment in the accommodation and food services was down by 8%. Another factor that has influenced the region's unemployment landscape is the slow rebound in the retail trade sector, which is the area's third-largest

employer, comprising approximately 14% of the region's total employment in 2022. Pandemic-related shutdown and restrictions resulted in job losses as many businesses had to temporarily close due to reduced customer traffic.

Table 3: Unemployment Rate by WDA

Area	2019 Unemployment Rate	2023* Unemployment Rate
Berkshire WDA	3.7%	2.8%
Boston WDA	2.7%	2.2%
Bristol County WDA	3.7%	3.0%
Brockton WDA	3.3%	3.0%
Cape & Islands WDA	4.1%	3.5%
Central MA WDA	3.2%	2.5%
Franklin/Hampshire WDA	2.9%	2.0%
Greater Lowell WDA	3.0%	2.4%
Greater New Bedford WDA	4.2%	3.2%
Hampden County WDA	4.3%	3.0%
Lower Merrimack Valley WDA	3.4%	2.8%
Metro North WDA	2.3%	1.9%
Metro South/West WDA	2.4%	2.0%
North Central WDA	3.3%	2.6%
North Shore WDA	2.9%	2.4%
South Shore WDA	2.9%	2.3%

Source: BLS – Local Area Unemployment Statistics. *The 2023 data is from January to April (Q1).

Labor Market Conditions

The labor force and the employed population in the 16 WDAs remain below the pre-pandemic level (see Table 4). The decline in labor force varies across the regions, from 1.4% in the South Shore WDA to 7.2% in the Cape & Island WDA. At the same period, the decrease in

the employed population fluctuates between 2.0% in the South Shore WDA and the 9.4% in Cape & Island WDA.

The Berkshire and Cape & Islands labor force have been the most sluggish in the recovery of the labor force, with 6.7% and 7.2% of the workforce yet to rejoin the labor market. At the same period, the employed population is lagging by 7.4% and 9.4% respectively. This is especially notable in the Cape & Islands WDA which experienced one of the most severe shocks during the pandemic period.

In both the Cape & Islands and Berkshire Workforce Development Areas (WDAs), demographic shifts towards an aging population could be posing challenges for labor force recovery. According to the Cape & Island Regional Workforce Blueprint, the region is experiencing a decline in its core labor force age group (30-54), while seeing an increase in the 55-69 age bracket. This suggests a portion of the workforce is nearing retirement, which could hinder the area's ability to recover its labor force.

Similarly, the Berkshire WDA faces its own challenges, as outlined in the MassHire Berkshire Workforce-WIOA Plan. The region has seen a 3.1% population decline since 2012 and is projected to lose an additional 2.2% over the next five years. Also, the 20-24 age group is expected to see a sharp decline of approximately 2,000 individuals, or 22%. This loss of younger workers is a concern as it exacerbates the challenges faced by employers in terms of workforce supply. Moreover, the Berkshire WDA has more than 28,100 individuals aged 65 and older, significantly above the national average in proportion to its total population. This also points to the challenges related to retirement and labor supply.

Table 4: Changes in Total Labor Force and Employed Population by WDA

Area	Change in Labor Force (2019-2023) *	Change in Employed Population (2019-2023) *
Berkshire WDA	-6.7%	-7.4%
Boston WDA	-2.0%	-2.4%
Bristol County WDA	-2.4%	-3.4%
Brockton WDA	-2.0%	-2.9%
Cape & Islands WDA	-7.2%	-9.4%
Central MA	-2.0%	-2.5%
Franklin/Hampshire WDA	-3.1%	-3.5%
Greater Lowell WDA	-3.0%	-3.5%
Greater New Bedford WDA	-3.8%	-4.7%
Hampden County WDA	-3.5%	-3.8%
Lower Merrimack Valley WDA	-2.5%	-3.2%
Metro North WDA	-1.8%	-2.2%
Metro South/West WDA	-2.4%	-2.9%
North Central WDA	-2.8%	-3.5%
North Shore WDA	-2.4%	-3.1%
South Shore WDA	-1.4%	-2.0%

Source: Local Area Unemployment Statistics. *2023 Data is from January to April (Q1).

Understanding Regional Differences

When delving into regional differences, an important inquiry revolves around whether changes in the economy can be attributed to differences in industrial compositions across regions or differences in local regional characteristics. To delve into these dynamics, Table 5 breaks down the change in employment in each WDA between 2019 and 2022 based on three components:

- **Industrial mix effect:** This effect describes how employment in the region would have been expected to change if employment within each region grew at the national rate for that particular industry. This measure helps to highlight how differences in industrial composition across regions impacts growth.

- **The national growth effect:** This effect describes how employment in the region would be expected to change given overall growth in the national economy. Given that all regions experience the same national effect, the value is constant across regions.

- **The local effect:** This component measures the part of the change in regional employment attributed to local conditions. These local conditions could include differences in policies, the competitiveness of business, or labor force characteristics that are specific to each region.

The industry mix effect varies across different WDAs. This suggests that the specific mix of industries present in each area contributes differently to their economic changes over this period. For instance, the Boston WDA and Metro North WDA show a positive industrial mix effect of 1.4% and 1.2% respectively. These regions have a high concentration of employment in the professional, scientific, and technical services sector. Conversely, the Berkshire WDA and Cape & Islands WDA are examples of regions that had slight negative industry mix effects of -0.5% and -0.8% respectively. Both regions have large tourism industries that were impacted by the pandemic.

The data suggests that most of the differences across WDAs can be attributed to local effects, with this measuring ranging from -.6% to -5.4%. The largest local effects were in the Berkshire WDA, where this component accounted for a -5.4% drop in employment.

Table 5: Shift-Share Analysis by WDA

Area	Industry Mix Effect	National Growth Effect	Local Effect	Total Net Effect
Berkshire WDA	-0.5%	0.4%	-5.4%	-5.5%
Boston WDA	1.4%	0.4%	-1.4%	0.4%
Bristol County WDA	-0.2%	0.4%	-0.8%	-0.6%
Brockton WDA	0.1%	0.4%	-2.9%	-2.4%
Cape & Islands WDA	-0.8%	0.4%	-2.6%	-3.0%
Central MA	0.3%	0.4%	-0.6%	0.1%
Franklin/Hampshire WDA	-0.3%	0.4%	-1.4%	-1.3%
Greater Lowell WDA	0.8%	0.4%	-4.8%	-3.6%
Greater New Bedford WDA	0.0%	0.4%	-1.9%	-1.5%
Hampden County WDA	-0.1%	0.4%	-4.4%	-4.1%
Lower Merrimack Valley WDA	0.0%	0.4%	-0.6%	-0.2%
Metro North WDA	1.2%	0.4%	-1.6%	0.0%
Metro South/West WDA	0.9%	0.4%	-3.8%	-2.5%
North Central WDA	-0.4%	0.4%	-2.0%	-2.0%
North Shore WDA	-0.5%	0.4%	-2.8%	-2.9%
South Shore WDA	0.0%	0.4%	-2.7%	-2.3%

Source: Quarterly Workforce Indicators

One factor that has likely contributed to a slow recovery across regions is the health care and social assistance sector, which is the largest employment sector across 10 WDAs. While employment in the health care and social assistance sector had recovered to pre-pandemic levels nationally in 2022, employment lagged pre-pandemic levels in all regions except for Boston.

The extent of decline in this sector varies across these WDAs, ranging from 1.4% in the Metro South/West WDA to 12.2% in the Greater New Bedford WDA (see Table 6). Expanding on this observation, the health care and social assistance sector contribution to job losses in the 15 WDAs varies, and it ranges from 4.5% in Metro South/West WDA to 61.9% in Greater New Bedford WDA. Within the Greater New Bedford WDA and Central WDA, the healthcare and social assistance employment remains more than 10% below pre-pandemic levels in 2022. However, this sector accounts for more than 60% of the remaining post-pandemic job losses in both regions.

The lagging recovery of the health care and social assistance sector outside Boston through 2022 can largely be attributed to differences in the composition of the sector across regions. We noted previously, the Boston WDA is distinguished by the high level of employment in the hospital sector, which statewide had nearly recovered to pre-pandemic levels in 2022. Outside of the Boston WDA, the health care sector is predominantly composed of ambulatory health care services like physicians and dentist offices, and nursing and residential care facilities.

Nursing and residential care facilities were hard hit during the pandemic and have been slow to recover. In 2022, employment in this sector was down more than 13,000 jobs statewide compared to pre-pandemic levels, a decline of 12% (Lightcast). The Cape & Islands WDA, the New Bedford WDA, and the North Shore WDA were among the areas hardest hit by the fall in nursing and residential care facility employment. These declines are consistent with a decline in occupancy among skilled nursing facilities in Massachusetts, which fell from 85% in 2019 to 75% in 2022 (Kaiser Family Foundation).

In terms of earnings, the average monthly earnings in the health care and social sector increased across all 16 WDAs (see Table 8). The fact that some of the highest increases in earnings have occurred in WDAs with the largest jobs losses—including Greater New Bedford,

Berkshire, Cape & Islands, and Central—suggest that worker shortages are a key contributor to the delayed recovery of this sector.

Table 6: Healthcare Employment and Earning Changes by WDA

Area	Percent Change in Employment (2019-2022)*	Percent Share of Job Losses (2019-2022)*	Percent Change in Average Monthly Earnings (2019-2022)*
Berkshire WDA	-5.9%	-17.7%	15.0%
Boston WDA	2.0%	2.0%	9.0%
Bristol County WDA	-3.8%	-25.0%	17.0%
Brockton WDA	-3.4%	-24.9%	15.9%
Cape & Islands WDA	-10.3%	-38.0%	14.6%
Central MA WDA	-9.9%	-60.6%	18.6%
Franklin/Hampshire WDA	-5.0%	-30.6%	14.9%
Greater Lowell WDA	-10.0%	-36.5%	13.3%
Greater New Bedford WDA	-12.2%	-61.9%	20.4%
Hampden County WDA	-3.4%	-18.5%	11.2%
Lower Merrimack Valley WDA	-5.1%	-37.9%	12.9%
Metro North WDA	-5.8%	-16.1%	16.9%
Metro South/West WDA	-1.4%	-4.5%	15.7%
North Central WDA	-4.8%	-24.2%	22.3%
North Shore WDA	-9.4%	-39.1%	18.7%
South Shore WDA	-1.8%	-8.2%	21.1%

Source: DER calculations using the Quarterly Workforce Indicators. *2022 data is from the Q1 to Q3.

Overall, the pandemic had a significant impact on the labor markets of Massachusetts' 16 Workforce Development Areas (WDAs). While most regions have made progress in their recovery, there are still notable differences in the pace of recovery across regions. While regions like Boston and Metro North benefited from an advantageous industrial composition,

much of the variation across regions is attributed to local dynamics, particularly the slow recovery of health care and social assistance sectors in regions outside of Boston. In many cases, the local factors related to demographics and an aging workforce, which has been growing pressure on local labor markets and slowed the recovery to full employment.

Future Labor Market Demand

Massachusetts's economy and labor market have undergone unprecedented changes due to the shock of the pandemic, resulting in labor market tightness, an uneven employment recovery, and the highlighting of an aging workforce. Naturally, these broad economic trends also have a direct impact on the occupational job market. By anticipating future occupational demands, the workforce development system can strategize to address labor force gaps, by devoting more resources to train workers for current or new positions.

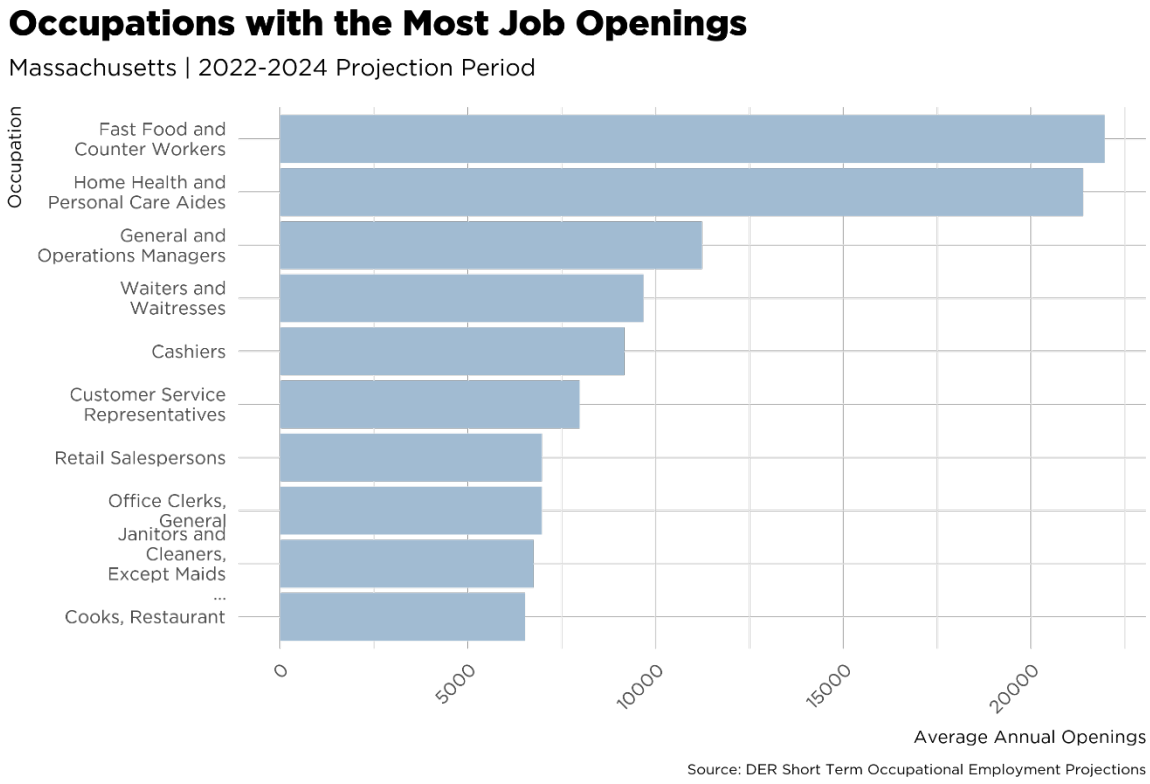
Annual job openings are a forward-looking measure that predicts the number of vacancies anticipated in each occupation, based on short-term projections by the Massachusetts Department of Economic Research (DER). They are determined by combining the average annual labor force exits, job transfers, and net new growth throughout the two-year projection span of 2022 to 2024.

These openings represent potential opportunities for job seekers. These can stem from separations in existing roles (like labor force exits and job transfers) or from the creation of new positions. It's worth noting the distinction between job openings and job postings: both indicate the demand for an occupation but are derived and utilized differently. While job openings are designed to anticipate future annual demand—encompassing job creation and separations—job postings capture the present momentum of the job market and are less suited to be used as a forward-looking measure.

To define the specific elements of annual job openings, labor force exits pertain to workers exiting their roles, predominantly because of retirement. Other reasons for leaving the labor force may include pursuing additional education, illness, or family issues. On the other hand, net new job growth relates to the creation of new jobs due to reasons like increased consumer demand or company growth. Job transfers, however, are more complex. They occur when a worker switches to a different occupation, leaving a vacancy in their original position.

The same worker might later return to that initial position, or a new worker may fill the vacancy. Nevertheless, each component of job openings presents an avenue for job seekers to secure a position in their preferred field.

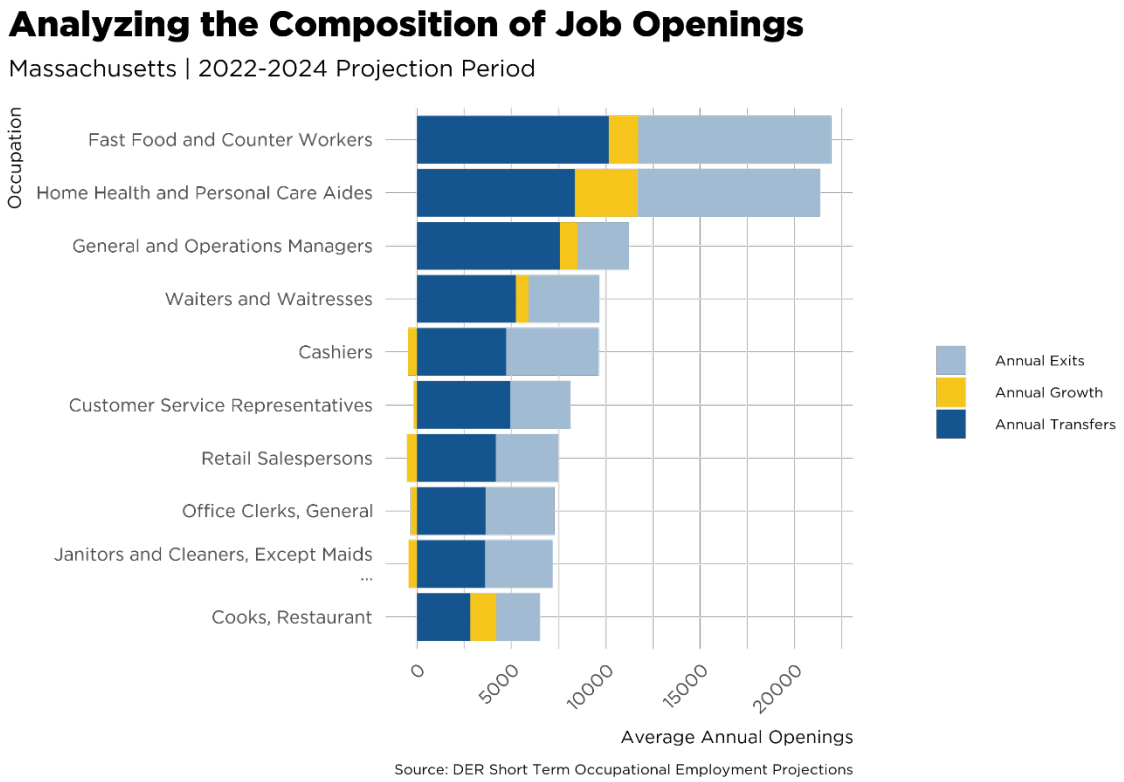
Figure 14



In Figure 14, the occupations boasting the most significant annual job openings are those most profoundly affected by the pandemic. This is especially evident in the accommodation and food services sector, as well as in professions that necessitate face-to-face interactions like home health care aides, cashiers, and janitors. Notably, four of the top ten occupations with the most annual job openings in Massachusetts were in the food services industry: fast food and counter workers, waiters/waitresses, cashiers, and restaurant cooks.

The roles that topped the list for annual job openings were fast food workers, home health and personal care aides, and general operations managers, with 21,958, 21,382, and 11,235 openings respectively, as depicted in Figure 14. Another intriguing observation is that the majority of the jobs with the highest annual openings do not mandate a bachelor's degree for entry, with general and operations managers being the notable exception.

Figure 15



In analyzing the composition of job openings for occupations with the highest numbers of openings, factors tied to job separations, such as labor force exits and job transfers, emerged as the primary drivers of job openings. This overshadowed new job growth (as depicted in Figure 15). Among the occupations with the most openings, the typical occupation comprised approximately 51% from job transfers, 44% from labor force exits, and just 5% from new

growth. The BLS indicates that such a composition of job openings is standard since labor force exits and occupational transfers generally outpace new growth (BLS). Thus, assessing the demand of an occupation based solely on its annual growth rate might not provide a complete picture unless one also considers the impact of labor force exits and job transfers. For instance, while there was negative occupational growth for roles such as cashiers, retail salespersons, and janitors/cleaners (indicating a potential reduction in the overall employment within these occupations), the demand remains strong. This robust demand is due to the significant number of openings resulting from exits and transfers.

Specifically, fast food workers and home health/personal care aides rank top in the state, with 21,958 and 21,382 annual job openings, respectively. For fast food worker openings, 47% arose from labor force exits, 46% from job transfers, and 7% from new job growth. Similarly, for home health/personal care aides, 45% were due to labor force exits, 39% from job transfers, and 16% from job growth.

During the pandemic, the fast-food industry, a segment of the broader retail, accommodation, and food services sector, grappled with challenges such as social distancing measures, a drop in tourism and business travel, and the rise of remote work which led to fewer visits to these restaurants. From 2019 to 2021, there was a 14% decline in fast-food worker employment. However, there was a rebound in 2022, which resulted in an overall 8% decrease from 2019 figures. While the pandemic significantly impacted employment during this time, the issue of low wages cannot be overlooked. In 2022, the median hourly wage for fast food and counter workers stood at $16.04. According to MIT's Living Wage Calculator, this is below the livable wage for a single adult without children in Massachusetts.

Additionally, the industry's dependence on younger demographics can lead to elevated job vacancies, especially as these workers pursue diverse professions aligned with their aspirations or financial goals. The BLS highlights age as a key determinant of occupational transfers, with individuals aged 16-24 showing the highest propensities to make such

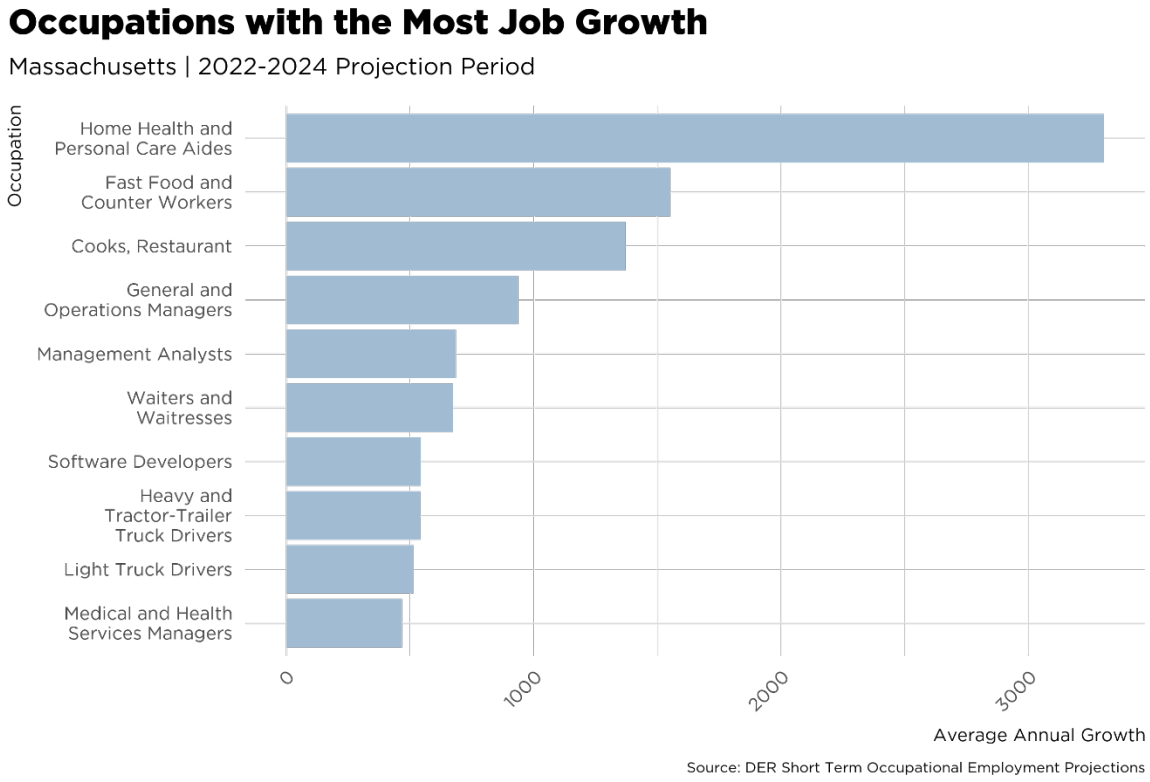
transitions as they shape their career trajectories. In 2022, a striking 47% of fast-food workers were under the age of 25, in stark contrast to the average 12% in the same age bracket across all occupations.

Employers, in their bid to address staffing challenges in the restaurant sector, have increased monthly average wages, from $2,159 in Q3 2019 to $2,811 in Q3 2022, reflecting a 30% over three years (QWI). In parallel with wage boosts, the fast-food sector is also pivoting towards tech solutions, integrating self-service kiosks to mitigate labor shortfalls.

In comparison, home health and personal care aides also deal with issues related to low wages , strenuous work, and transportation difficulties especially during the pandemic (Taube and Lipson). However, there have been attempts to augment labor supply through wage increases as median hourly wages grew from $15.01 in 2019 to $17.45 in 2021, representing a 16.3% rise over two years, although that wage fell to $16.40 in 2022. Unlike the fast-food industry, home health care agencies depend on predetermined Medicare reimbursement rates dictated by federal law. Thus, the ability of home health care agencies to determine their workers' wages based on market dynamics is somewhat constrained, compared to the more freely operating labor market for fast food workers.

Home health and personal care aides have the highest annual growth of new positions in the state as shown in Figure 16. While the job's low pay and modest pay trajectory might impede growth from a labor supply standpoint, the increasing elderly population in Massachusetts is likely to sustain the demand for these roles. As of 2021, 17.4% of the Massachusetts population was aged 65 and older (according to the 2021 ACS 1-year estimate). Based on a 2014 aging report by the University of Massachusetts Boston, this proportion is projected to rise to 21% by 2030.

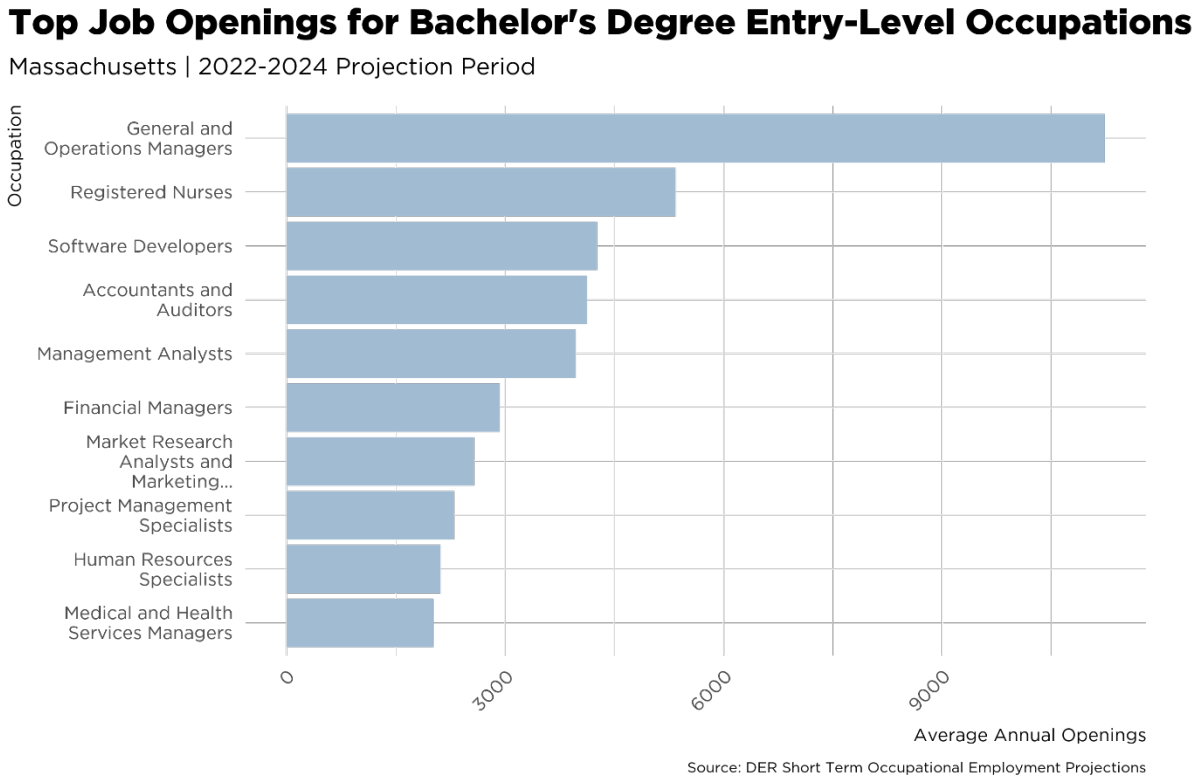
Figure 16



Furthermore, the home health and personal care aide sectors have a significant reliance on the foreign-born workforce. Specifically, 37% of home health aides and 34% of personal care aides are foreign-born. This is notably higher than the 22% representation of foreign-born workers in the overall Massachusetts workforce, as per the 2021 1-year ACS PUMS data.

Other professions witnessing notable annual growth are management analysts and software developers. The growth of these bachelor's degree-enabled occupations has been bolstered by the surge of the professional and business services sector, which has benefited from providing remote services, leveraging AI technologies, and capitalizing on the strength of the biotech sector. Lastly, the notable annual growth observed in the commercial truck driving profession can be attributed to a rise in online product delivery.

Figure 17



While the occupations with the highest number of annual job openings primarily consisted of those that didn't require a bachelor's degree for entry (as shown in Figure 14), Figure 17 focuses on the top job openings that specifically require a bachelor's degree for entry into the profession. General and operations managers had, by far, the largest number of annual openings among those requiring a bachelor's degree for entry, totaling 11,235. For context, general and operations managers were the most populous occupation in the state, boasting 120,280 jobs in 2022. They were followed by home health and personal care aides (107,220) and registered nurses (94,502).

Whereas occupations such as home health and personal care aides or registered nurses adhere to a narrow occupational definition, which involves standardized education and

training, general and operations managers have a more ambiguous set of tasks that include creating policies, managing operations, and coordinating materials and human resources.

According to BLS occupational classification, the responsibilities of general and operations managers are too broad to align with managers who have functional specializations in areas like advertising, finance, or construction (BLS). Consequently, this general management category encompasses management roles that don't fit neatly into a specific definition. It spans many jobs across multiple sectors, with a significant presence in the professional, scientific, and technical services (17%) and retail trade (13%). Titles such as business managers or retail district managers fall under this category, solidifying it as the largest occupation in the state with the most openings for those typically requiring a bachelor's degree for entry.

Additionally, given the size of the healthcare industry, registered nurses had the second largest number of annual openings among jobs that require a bachelor's degree for entry at 5,340 openings. Lastly, software developers bolstered by the growth of the professional and business services sector and the widespread adoption of AI technologies have also seen high demand with 4,264 annual openings.

Key Sector Analysis

To better understand how job and workforce development opportunities align with the economic shifts discussed above, this analysis provides a deeper assessment of the industrial and occupational composition of five industry groups that have been identified as key sectors that are critical to the future economic growth of the state or are emerging sectors.

The first four industry groups considered are industries that have been prioritized by the state through the MassTalent initiative:

- **Advanced Manufacturing:** This industry group is composed of manufacturing industries that employ a high level of STEM occupations and engage in a high degree of research and development. This analysis uses definitions of advanced manufacturing industries published by the Brookings Institution.

- **Life Sciences:** This industry group encompasses various fields such as advanced and applied sciences that expand the understanding of human physiology and have the potential to lead to medical advances or therapeutic applications. This analysis uses definitions of life sciences published by MassBio.

- **Healthcare:** This industry group encompasses ambulatory health care services, hospitals, and nursing and residential care facilities.

- **Clean Energy:** The clean energy sector encompasses organizations engaged in renewable energy, energy efficiency, alternative transportation, and carbon management technologies.

Additionally, this report considers an additional industry group representing emerging industries in the state:

- **Advanced Services:** Advanced services encompasses service industries that—like advanced manufacturers—employ many STEM occupations and engage in a high degree of research and development. This industry grouping isolates the key drivers of growth in the professional, scientific, and technical services sector discussed above—such as scientific research and development services—while removing professional services industries like accounting, tax preparation, and legal services. Additionally, it includes high growth technology related industries from the information sector, such as software publishers and data processing

industries. This analysis uses definitions of advanced services industries published by the Brookings Institution.

Across each of these industry groups, Massachusetts is nationally competitive, ranking among the top 10 states for the share of employment in life sciences, healthcare, and advanced services, and clean energy. Within the key sectors, healthcare ranks as the largest share of overall employment in Massachusetts, followed by advanced services, advanced manufacturing, life sciences, and clean energy. Among these sectors healthcare and clean energy were the hardest hit during the pandemic, with employment still lagging pre-pandemic levels in 2022. Although life sciences had the smallest share of employment in Q2 2022, it saw the greatest increase in employment between 2017 and 2022, followed by the advanced services sector.

Gross state product (GSP) is the state equivalent to gross domestic product (GDP) and measures the final monetary value of all goods and services produced within the state. As a measure of economic productivity relative to the number of workers in each sector, the Gross State Product (GSP) per worker for these select fields is exceptionally high. Advanced manufacturing ($335,000), life sciences ($303,000), and advanced services ($291,000) had GSP per worker that exceeded the state average of $170,000 per worker. The GSP per worker in healthcare ($113,000) and clean energy ($136,000) fell below the state average. This is consistent with the fact that these industries primarily serve a local customer, whereas advanced manufacturing, life sciences, and advanced services are scalable and have the potential to serve a global customer base. While the share of advanced manufacturing ranks Massachusetts lower compared to other states, it is the most productive among these industry groups.

Advanced Manufacturing

There are 35 industries within advanced manufacturing, employing a total of 121,059 workers in 2022.

Table 7: Adv. Manufacturing Occupations by Entry-Level Education

Education	# of Occupations	% Share Employment	Avg. Median Hourly Wage
HS Degree	126	47.3	24.65
Bachelors	90	41.6	51.27
Associates/Some Degree	34	7.0	29.17
No Degree	19	2.8	20.04
Advanced Degree	7	1.2	56.44

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. 2022 employment data. Wage data sourced from 2021 statistics.

While examining a cross-section of advanced manufacturing occupations, it is notable that many of these entry-level jobs are relatively accessible to those with varying levels of educational achievement (Table 7). Of all jobs in advanced manufacturing, 50.1% typically require a high school degree or no degree and are compensated at an average median hourly wage of $24.05 which is considered a livable wage for a single adult with no children in the state of Massachusetts, according to MIT's Living Wage Calculator. The remaining advanced manufacturing entry-level occupations require a bachelor's degree or higher, which typically encompasses the more technical engineering work as an industrial engineer or software developer.

Table 8: Top 10 Advanced Manufacturing Occupations – 2019 -2022

Occupation	Educational Level Needed	2019	2022	% Growth	Annual Openings[1]	Median Hourly Earnings
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	HS Degree	9,090	9,074	-0.2	970	22.38
Miscellaneous Assemblers and Fabricators	HS Degree	7,299	8,931	22.4	998	17.70
Industrial Engineers	Bachelors	5,898	6,332	7.4	448	48.35
Software Developers	Bachelors	5,715	4,977	-12.9	350	61.62
General and Operations Managers	Bachelors	3,244	3,966	22.3	370	60.58
Inspectors, Testers, Sorters, Samplers, and Weighers	HS Degree	3,360	3,891	15.8	423	22.95
First-Line Supervisors of Production and Operating Workers	HS Degree	2,922	3,154	7.9	375	31.95
Machinists	HS Degree	2,358	2,406	2.0	299	27.71
Mechanical Engineers	Bachelors	2,755	2,280	-17.2	146	48.49
Electrical Engineers	Bachelors	2,271	2,133	-6.1	178	58.03

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Wage data sourced from 2021 statistics. Table sorted by the occupation with the highest number of 2022 jobs.

1Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022.

Although the advanced manufacturing sector offers opportunities for individuals with varying levels of education, the nature of the work involved can differ significantly. Entry-level occupations that do not require a bachelor's degree, such as electrical, electronic, and electromechanical assemblers, assemblers and fabricators, inspectors/testers, and machinists, are typically found on the production floor (Table 8). On the other hand, entry-level occupations which require a bachelor's degree, such as industrial engineers, software

developers, and general managers, are typically found in technical or strategic planning roles guiding the production process. These diverse employment opportunities present the workforce development system with the opportunity to integrate workers into the production level or enhance their skills as engineers or other technical staff.

While understanding the available roles for individuals with differing levels of education is critical, equally important is quantifying the job opportunities available to those seeking employment.

The average annual openings for the largest occupation—electrical, electronic, and electromechanical assemblers—totaled 970 (Table 8). As the job growth for electrical, electronic, and electromechanical assemblers has seen a slight decline, most of the annual job openings were driven by labor force exits and occupational transfers. There were also a significant number of annual openings for miscellaneous assemblers and fabricators, totaling 998, with the majority driven by occupational transfers.

In terms of industries within the sector, the NMEC (navigational, measuring, electromedical, and control) instruments manufacturing industry stands as the main industry within advanced manufacturing, employing approximately one-quarter of the advanced manufacturing workforce (Table 9).

Table 9: Top Advanced Manufacturing Industries - 2019-2022

Industry	Employment[1]	% Employment Growth	GSP per Worker[1]	Avg. Earnings Per Job[1]
Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	26,642	4.3	426,690	165,743
Semiconductor and Other Electronic Component Manufacturing	14,457	-0.4	261,200	158,924
Medical Equipment and Supplies Manufacturing	10,938	-4.3	278,367	150,925
Pharmaceutical and Medicine Manufacturing	10,171	23.6	696,004	217,199
Aerospace Product and Parts Manufacturing	10,091	-8.3	273,157	176,602
Other Miscellaneous Manufacturing	8,209	-3.2	152,417	109,634
Computer and Peripheral Equipment Manufacturing	6,569	-24.6	324,287	236,380
Industrial Machinery Manufacturing	5,382	23.4	274,882	171,673
Other Electrical Equipment and Component Manufacturing	3,763	-3.8	233,164	127,730
Other General Purpose Machinery Manufacturing	3,483	-13.1	211,727	110,996
Commercial and Service Industry Machinery Manufacturing	3,325	13.7	179,505	130,868

Source: DER calculations using Lightcast data. Only includes industry greater than 2,000 jobs. [1]2022

This industry comprises companies engaged in the production of a range of products used to conduct scientific and medical research such as measurement tools (like thermometers and gauges), electromedical devices (including medical diagnostic equipment), and control instruments utilized in robotics and automation. Prominent examples of companies operating

in this industry include Raytheon Technologies, Thermo Fisher Scientific Inc., and Waters Corporation. Within this sector are various occupations, including product engineers responsible for design and development, scientists and researchers driving innovation, technicians who assemble and test the products, and production workers involved in the manufacturing process.

As established earlier, within the five industry groups from 2017 to 2022, advanced manufacturing generated the highest gross state product per worker in Massachusetts at $335,000 with the state average closer to $170,000 per worker. In comparison, the NMEC industry stands out even among highly productive industries within advanced manufacturing with a GSP per Worker at $426,690 (Table 9).

While not as large of an employer, the pharmaceutical and medicine manufacturing industry leads the advanced manufacturing sector with the highest GSP per worker of $696,004. Given Massachusetts' prominence as a hub for pharmaceutical innovation, the manufacturing of medications to treat illnesses and prevent diseases holds significant value. It is worth noting that this industry has also experienced substantial employment growth of 23.6% from 2019 to 2022.

The semiconductor industry, another noteworthy sector within advanced manufacturing, stands as the second-largest employer, accounting for 14% of the advanced manufacturing sector or 14,457 total jobs (Table 9). The industry has gained national priority with the signing of President Biden's CHIPS and Science Act ("CHIPS Act") on August 9, 2022, aimed at revitalizing domestic semiconductor manufacturing.

Table 10: Semiconductor Industries - 2019-2022

Industry	Employment[1]	% Employment Growth	GSP per Worker[1]	Avg. Earnings Per Job[1]
Semiconductor and Related Device Manufacturing	8,029	-1.1	342,175	203,514
Other Electronic Component Manufacturing	3,163	13.0	121,475	91,105
Printed Circuit Assembly (Electronic Assembly) Manufacturing	1,184	-9.9	255,770	96,825
Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	1,102	5.5	184,167	141,371
Electronic Connector Manufacturing	582	-36.4	143,685	109,395
Bare Printed Circuit Board Manufacturing	398	21.7	138,724	104,120

Source: DER calculations using Lightcast data. [1]2022

Semiconductors, which regulate electrical flow in modern electronics like cars, cell phones, and telecommunications equipment, are essential components for a thriving economy. The importance of which was demonstrated by the 2021 "chip shortage", which led to extended lead times, reaching an average of 15 weeks in January 2021, causing difficulties for consumers seeking products such as automobiles and gaming systems (Bloomberg). Bloomberg also estimated that U.S. automobile manufacturers lost approximately $61 billion in sales due to semiconductor shortages in the same year. To address disruptions in the semiconductor supply chain, the "CHIPS Act" allocated $50 billion out of the total $280 billion to stimulate domestic semiconductor production (USAFacts).

From a state perspective, in 2022, Massachusetts ranked seventh in the nation with 65 semiconductor establishments employing 14,458 workers. The industry's GSP per worker in Massachusetts stands at $261,200, surpassing the state average.

Further, semiconductors rank as the third-highest value export in Massachusetts, with shipments worth $2.7 billion (SIA). Although the employment size and growth of the semiconductor industry may not be remarkable, it is important to consider the industry's high productivity and potential future growth driven by national interests for the purpose of workforce development.

In the semiconductor industry, the composition of entry-level employment for individuals without bachelor's degrees generally aligns with the overall advanced manufacturing sector. Notable semiconductor occupations in this regard include electrical and electronic assemblers, semiconductor processing technicians, inspectors, and assemblers and fabricators (Table 11). Among the top occupations in this subsector, there were approximately an average of 70 annual job openings per occupation, primarily driven by occupational transfers, accounting for 65% of the openings. Like the overall advanced manufacturing sector, electrical, electronic, and electromechanical assemblers exhibited the largest number of annual job openings.

Despite the high average annual earnings of $124,388 in the semiconductor industry in 2022, surpassing the median annual wage of $103,263 across all industries in Massachusetts, and even higher earnings in sub-industries like semiconductor and related device manufacturing ($203,514, Table 10), it is important to note that the entry-level pay distribution for individuals without bachelor's degrees in the general semiconductor industry may not reach those levels.

Instead, entry-level workers without bachelor’s degrees in the semiconductor industry have an average median hourly pay of $25.25 or an annualized income of $52,520, which meets the criteria of a livable wage according to MIT's Living Wage Calculator for a single adult with no children in Massachusetts.

Table 11: Top 10 Semiconductor Occupations - 2019-2022

Occupation	Education	2019	2022	% Employment Growth	Annual Openings[1]	Median Hourly Earnings
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	HS Degree	2,079	2,341	12.6	250	22.38
Industrial Engineers	Bachelors	1,030	1,004	-2.6	71	48.35
Semiconductor Processing Technicians	HS Degree	702	717	2.2	60	27.91
Inspectors, Testers, Sorters, Samplers, and Weighers	HS Degree	517	640	23.9	70	22.95
Industrial Engineering Technologists and Technicians	Associates/Some Degree	527	605	14.7	64	29.34
Miscellaneous Assemblers and Fabricators	HS Degree	525	557	6.1	62	17.70
Software Developers	Bachelors	536	525	-1.9	37	61.62
Electrical and Electronic Engineering Technologists and Technicians	Associates/Some Degree	449	410	-8.7	43	29.41
First-Line Supervisors of Production and Operating Workers	HS Degree	331	354	7.1	42	31.95
General and Operations Managers	Bachelors	288	350	21.5	33	60.58

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Wage data sourced from 2021 statistics. Table sorted by the occupation with the highest number of 2022 jobs.

[1]Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022.

Healthcare

The healthcare sector holds importance in Massachusetts as it serves as the largest employment sector in the state, employing 477,704 individuals and housing some of the top hospitals in the country. Unfortunately, it was also one of the sectors most directly affected by the pandemic. As the COVID-19 outbreak rapidly spread in early 2020, the healthcare infrastructure faced significant strain. In May 2020, the state documented the third-highest rate of reported COVID-19 cases and the fourth-highest number of deaths in the country (Taube and Lipson).

In the report "COVID-19 and the Changing Massachusetts Healthcare Workforce" by Taube and Lipson (2021), the complex impact of the pandemic on the healthcare workforce is highlighted. While the healthcare sector is often considered more resilient to economic downturns compared to industries like consumer goods, it experienced significant disruption initially. During April and May 2020, healthcare occupations saw a surge in unemployment claims due to reduced demand for elective procedures, outpatient care, and in-home care as people chose to isolate themselves during uncertain times.

Table 12: Healthcare Occupations by Entry-Level Education

Education	# of Occupations	% Share Employment	Avg. Median Hourly Wage1
Bachelors	100	29.7	45.03
HS Degree	101	27.2	25.06
Associates/Some Degree	49	24.0	29.13
Advanced Degree	57	15.0	69.71
No Degree	28	4.0	16.66

Source: DER calculations using Lightcast data. Includes standardized occupational classification (SOC) codes related to NAICS 621, 622, and 623. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. 2022 employment data. [1]2021

The healthcare sector offers a range of occupations, covering diverse roles from physical therapists to surgical assistants. More than half of the occupations (55.2%) comprise positions that require less than a bachelor's degree for entry (Table 12), compensating an average of $23.24 per hour.

Observing various roles within healthcare from 2019 to 2022, home health and personal care aides experienced a decline in employment of -12.3%, while nursing assistants saw a decline of -11.5% (Table 13). These declines were primarily attributed to reduced consumer demand for in-home care due to social distancing measures, transportation difficulties, and low pay/high stress (Taube and Lipson). They also suggest that the availability of generous unemployment benefits in Massachusetts may have contributed to a slower rebound in employment for these roles.

Further, the largest healthcare occupation of registered nurses, with 77,405 workers in 2022, also experienced changes in demand, with a spike in unemployment claims in the middle of 2020. This is primarily due to the varying demand for different types of registered nurses during the pandemic. Critical care nurses working in intensive care units were in extremely high demand, resulting in a surge in job postings. However, many ambulatory care nurses involved in "routine medical care" were either furloughed or laid off. The supply of new nurses was also disrupted, with education, training, and testing centers closed, leading to a months-long backlog of new nurses, which in turn affected employment growth in the healthcare sector.

Moreover, the stress and workload of the pandemic may have accelerated attrition and retirement among registered nurses in Massachusetts. According to a 2023 U.S. research study by the National Council of State Boards of Nursing (NCSBN), 62% of respondents stated an increase in their workload during the pandemic and many reported feeling "emotionally drained", "fatigued", or "burned out" (NCSBN).

Table 13: Top 10 Healthcare Occupations 2019-2022

Occupation	Education	2019	2022	% Employment Growth	Annual Openings[1]	Median Hourly Earnings[2]
Registered Nurses	Bachelors	75,572	77,405	2.4	4,374	45.65
Home Health and Personal Care Aides	HS Degree	47,949	42,072	-12.3	8,390	17.45
Nursing Assistants	Associates/Some Degree	38,624	34,199	-11.5	5,489	17.97
Medical Secretaries and Administrative Assistants	HS Degree	21,115	21,664	2.6	2,579	22.60
Medical and Health Services Managers	Bachelors	12,283	13,543	10.3	1,338	60.26
Medical Assistants	Associates/Some Degree	13,440	13,173	-2.0	1,912	22.06
Licensed Practical and Licensed Vocational Nurses	Associates/Some Degree	13,942	13,164	-5.6	1,123	28.94
Substance Abuse, Behavioral Disorder, and Mental Health Counselors	Bachelors	9,894	11,154	12.7	1,315	23.54
Clinical Laboratory Technologists and Technicians	Bachelors	9,397	9,868	5.0	622	28.67
Receptionists and Information Clerks	HS Degree	8,549	8,575	0.3	1,002	17.57

Source: DER calculations using Lightcast data. Includes standardized occupational classification (SOC) codes related to NAICS 621, 622, and 623. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Table sorted by the occupation with the highest number of 2022 jobs.

[1]Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022. [2]2021

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Additionally, the high annual openings for top healthcare occupations, particularly for home health and personal care aids and nursing assistants, support the narrative of job loss. Home health and personal care aids saw annual openings of 8,390 driven by 3,805 labor force exits and 3,287 occupational transfers (Table 13). The annual job openings (8,390) are roughly 20% of the 2022 employment (42,072) of home health and personal care aids, signifying large turnover trends in the occupation. Similarly, nursing assistants saw 5,489 annual openings comprised of 2,355 labor exits, 3,046 occupational transfers, and minimal job growth.

Among registered nurses, there were 4,374 annual openings, led by 2,343 labor force exits and 1,815 occupational transfers. In addition to the factors influencing the supply of nurses mentioned earlier, age composition is a contributor to the increased occurrence of labor force exits within this group. Age is correlated with aspects such as retirement, disability, and heightened personal responsibilities. As of 2022, roughly 29% of nurses are aged over 55, compared to the average across all occupations, which stands at 25%.

Lastly, in terms of the workforce, entry-level positions requiring a four-year degree encompassed roles such as registered nurses, medical and health services managers, and mental health counselors, offering an average median hourly wage of $53.99. In contrast, entry-level occupations not necessitating a bachelor's degree included home health and personal care aides, nursing assistants, medical assistants, and licensed practical and licensed vocational nurses, providing an average median hourly wage of $24.86.

Table 14: Top Healthcare Industries - 2019-2022

Industry	Employment[1]	% Employment Growth	GSP per Worker[1]	Avg. Earnings Per Job[1]
General Medical and Surgical Hospitals	170,858	1.0	129,201	105,984
Offices of Physicians	57,960	0.4	171,162	146,811
Home Health Care Services	40,254	-11.4	65,917	59,108
Nursing Care Facilities (Skilled Nursing Facilities)	37,836	-22.0	76,715	69,366
Outpatient Care Centers	26,510	-1.3	150,463	89,872
Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities	26,000	-3.0	73,089	65,643
Offices of Dentists	25,192	-0.3	109,333	83,519
Offices of Other Health Practitioners	22,043	5.6	131,341	65,855
Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly	21,949	-4.8	58,876	53,318
Specialty (except Psychiatric and Substance Abuse) Hospitals	21,916	4.2	124,318	102,247

Source: DER calculations using Lightcast data. Includes sectors related to NAICS 621, 622, 623. Only includes industries greater than 10,000 jobs. [1]2022

Within industries in the healthcare sector (Table 14), the decline in employment within home health care services can be attributed mainly to the reduced demand for in-person services during the pandemic as well as strenuous work and low pay affecting labor supply (Taube and Lipson). Nursing care facilities were also hit hard by staffing turnover during the pandemic, with more than 50% of nurses leaving their roles after a year (NIH). This was due to several stressors, including the high infection and mortality rates within nursing homes, which were facilitated by denser enclosed areas with elderly populations. These shifts persisted into 2022, when occupancy rates at skilled nursing facilities reached just 75%, well below the 85% occupancy rate in 2019 (Kaiser Family Foundation).

Life Sciences

Massachusetts is a national leader in the life sciences sector, driven by pioneering research conducted in pharmaceuticals, biotechnology, and medical labs. The 2023 Massachusetts Life Sciences Employment Outlook Report by MassBioEd emphasizes the state's global prominence in this field. It highlights the strong employment growth and the significant presence of STEM workers, contributing to the local economy's prosperity.

Table 15: Life Sciences Occupations by Entry-Level Education[1]

Education	# of Occupations	% Share Employment	Avg. Median Hourly Wage
Bachelors	102	62.5	49.89
Advanced Degree	24	18.0	60.57
HS Degree	77	12.2	24.84
Associates/Some Degree	44	6.5	30.48
No Degree	11	0.9	16.27

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. 2022 employment data. Wage data sourced from 2021 statistics.

According to MassBio's 2022 Massachusetts Life Sciences Workforce Analysis methodology, occupations include industries where 50% or more of the employees work in the life sciences sector. The industries include medical laboratories, medicinal and botanical manufacturing, pharmaceutical preparation manufacturing, in-vitro diagnostic substance manufacturing, biological product manufacturing (excluding diagnostics), research/development in biotechnology (excluding nanobiotechnology), research/development in physical, engineering, and life sciences (excluding nanotechnology and biotechnology), as well as research/development in nanotechnology.

In the life sciences sector, the majority (80.5%) of employment in entry-level positions typically require a bachelor's degree or higher, whereas 19.6% of those employed had completed education below the bachelor's level (Table 15). Although there is substantial entry-level employment for bachelor's degree holders in the life sciences field, there are still 132 different roles that do not require a bachelor's degree, indicating the potential for expanding employment opportunities in these positions.

When considering the top occupations within the life sciences sector, it is primarily composed of highly skilled professionals who hold at least a bachelor's degree. Notable occupations in this field include medical scientists, biochemists and biophysicists, and software developers.

Furthermore, the life sciences sector exhibits a remarkable trend of employment growth, largely attributed to groundbreaking research in genomics, genetics, and pharmaceuticals. Specifically, during this period, biochemists and biophysicists, software developers, and general and operations managers experienced impressive growth rates of 70.7%, 77.0%, and 95.6%, respectively (Table 16).

Table 16: Top 10 Life Sciences Occupations - 2019-2022[1]

Occupation	Education	2019	2022	% Employment Growth	Annual Openings[2]	Median Hourly Earnings
Medical Scientists, Except Epidemiologists	Advanced Degree	9,029	7,869	-12.8	532	49.01
Biochemists and Biophysicists	Advanced Degree	3,945	6,736	70.7	673	63.40
Software Developers	Bachelors	2,644	4,678	77.0	329	61.62
General and Operations Managers	Bachelors	2,104	4,114	95.6	384	60.58
Biological Technicians	Bachelors	3,481	3,767	8.2	610	29.29
Natural Sciences Managers	Bachelors	2,194	2,803	27.8	172	112.71
Chemists	Bachelors	2,006	2,707	34.9	207	48.23
Clinical Laboratory Technologists and Technicians	Bachelors	1,898	2,169	14.3	137	28.67
Project Management Specialists	Bachelors	941	1,835	95.1	167	48.10
Microbiologists	Bachelors	894	1,807	102.1	200	62.20

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Wage data sourced from 2021 statistics.

[1]According to MassBio's 2022 Massachusetts Life Sciences Workforce Analysis methodology, occupations include industries where 50% or more of the employees work in the life sciences sector. The industries include medical laboratories, medicinal and botanical manufacturing, pharmaceutical preparation manufacturing, in-vitro diagnostic substance manufacturing, biological product manufacturing (excluding diagnostics), research/development in biotechnology (excluding nanobiotechnology), research/development in physical, engineering, and life sciences (excluding nanotechnology and biotechnology), as well as research/development in nanotechnology.

[2]Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022. Table sorted by the occupation with the highest number of 2022 jobs.

In terms of job demand, annual openings for top occupations such as medical scientists, biochemists and biophysicists, and biological technicians were relatively higher than other

occupations. Among these specific occupations, approximately two-thirds of the openings were linked to occupational transfers.

When considering entry-level employment for individuals without bachelor's degrees in the life sciences field, there are growing roles that do not require a bachelor's degree (Table 17). These roles include packaging and filling machine operators and tenders, inspectors, testers, sorters, samplers, and weighers, chemical technicians, and customer service representatives. As a group, these positions command an average median hourly wage of $26, which is considered a livable wage according to MIT's Living Wage Calculator for a single adult with no children in the state of Massachusetts. Furthermore, annual openings were the highest for occupations such as phlebotomists, packaging and filling operators, and executive secretaries.

Table 17: Top 10 Life Sciences Occupations Without a Bachelor's Degree - 2019-2022[1]

Occupation	Education	2019	2022	% Employment Growth	Annual Openings[2]	Median Hourly Earnings
Executive Secretaries and Executive Administrative Assistants	HS Degree	1,100	1,044	-5.0	115	30.27
Packaging and Filling Machine Operators and Tenders	HS Degree	572	903	58.0	123	16.11
Inspectors, Testers, Sorters, Samplers, and Weighers	HS Degree	511	817	59.9	89	22.95
Secretaries and Administrative Assistants	HS Degree	799	763	-4.5	80	23.00
Phlebotomists	Associates/Some Degree	727	686	-5.7	132	21.55
Office Clerks, General	HS Degree	690	674	-2.3	91	20.88
Chemical Technicians	Associates/Some Degree	549	578	5.3	46	28.27
Customer Service Representatives	HS Degree	484	543	12.3	67	21.64
First-Line Supervisors of Production and Operating Workers	HS Degree	373	533	42.9	63	31.95
Bookkeeping, Accounting, and Auditing Clerks	Associates/Some Degree	385	524	36.2	69	23.49

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Wage data sourced from 2021 statistics.

[1]According to MassBio's 2022 Massachusetts Life Sciences Workforce Analysis methodology, occupations include industries where 50% or more of the employees work in the life sciences sector. The industries include medical laboratories, medicinal and botanical manufacturing, pharmaceutical preparation manufacturing, in-vitro diagnostic substance manufacturing, biological product manufacturing (excluding diagnostics), research/development in biotechnology (excluding nanobiotechnology), research/development in physical, engineering, and life sciences (excluding nanotechnology and biotechnology), as well as research/development in nanotechnology.

[2]Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022. Table sorted by the occupation with the highest number of 2022 jobs.

Advanced Services

As mentioned earlier, the significance of the advanced services sector lies in its substantial overlap with the growing professional, technical, and scientific services industries.

Based on the 2016 report by the Brookings Institution on advanced industries, from 2010 to 2013, it was found that following the Great Recession, the collective "advanced industries" which include advanced manufacturing and advanced services, generated approximately one million new jobs nationwide. Notably, advanced services accounted for 65% of the jobs created, with the computer systems design and related services industry contributing to 250,000 jobs alone.

Although advanced manufacturing historically employed more workers than advanced services, the shift in the U.S. economy from manufacturing to services since 1980 has resulted in advanced services overtaking advanced manufacturing in terms of total employment in recent decades. By 2002, Massachusetts had already witnessed a significant divide between advanced services and manufacturing, with advanced services outpacing manufacturing by 61,700 jobs. By 2022, the gap had widened considerably. The advanced services sector employed 371,454 workers, accounting for 10.4% of total employment, whereas advanced manufacturing had dwindled to 121,059 jobs, or just 3.4% of total employment.

A distinguishing feature of advanced industries is the high GSP per worker driven by emphasis on innovation and research and development.

Table 18: Adv. Services Occupations by Entry-Level Education

Education	# of Occupations	% Share Employment	Avg. Median Hourly Wage
HS Degree	141	14.8	26.05
Bachelors	140	69.9	46.42
Associates/Some Degree	74	8.3	29.79
Advanced Degree	38	6.2	54.32
No Degree	27	0.8	18.82

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. 2022 employment data. Wage data sourced from 2021 statistics.

In considering occupations based on entry-level education, the advanced services sector is skewed towards occupations that typically require higher education, with approximately 76.1% of jobs requiring at least a bachelor's degree to enter, compared to 23.9% for those without (Table 18). Despite the entry-level employment bias towards highly educated workers, there are numerous entry-level roles (242) available that do not require a bachelor's degree. This presents an opportunity for expanding employment opportunities.

For the top occupations within the advanced services sector, the leading entry-level occupations predominantly demand a bachelor's degree, such as software developers, general managers, and management/computer analysts (Table 19).

The largest number of annual job openings was observed for software developers totaling 3,020, with approximately two-thirds driven by occupational transfers. A significant predictor of workers changing occupations is age, with younger individuals being more likely to change, possibly due to processes of career discovery and fewer personal commitments (BLS). Thus, the younger average age of software developers may partially account for the higher occurrence of occupational transfers as 40% of software developers are younger than 35 as of 2022.

Table 19: Top 10 Advanced Services Occupations - 2019-2022

Occupation	Education Level	2019	2022	% Employment Growth	Annual Openings[1]	Median Hourly Earnings
Software Developers	Bachelors	35,513	42,967	21.0	3,020	61.62
General and Operations Managers	Bachelors	12,706	19,593	54.2	1,830	60.58
Management Analysts	Bachelors	11,608	13,734	18.3	1,898	49.85
Computer and Information Systems Managers	Bachelors	10,223	12,249	19.8	1,072	78.44
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	HS Degree	8,533	11,391	33.5	1,253	35.62
Project Management Specialists	Bachelors	5,851	10,742	83.6	977	48.10
Medical Scientists, Except Epidemiologists	Advanced Degree	10,137	8,872	-12.5	600	49.01
Computer User Support Specialists	Associates/ Some Degree	9,228	8,414	-8.8	650	29.79
Market Research Analysts and Marketing Specialists	Bachelors	7,159	8,082	12.9	863	36.64
Biochemists and Biophysicists	Advanced Degree	4,465	7,363	64.9	736	63.40

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Wage data sourced from 2021 statistics. 1Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the

occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022. Table sorted by the occupation with the highest number of 2022 jobs.

Table 20: Top 10 Adv. Services Occupations Without a Bachelor's Degree - 2019-2022

Occupation	Education Level	2019	2022	% Employment Growth	Annual Openings[1]	Median Hourly Earnings
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	HS Degree	8,533	11,391	33.5	1,253	35.62
Computer User Support Specialists	Associates / Some Degree	9,228	8,414	-8.8	650	29.79
Customer Service Representatives	HS Degree	8,365	6,927	-17.2	854	21.64
Office Clerks, General	HS Degree	4,489	4,129	-8.0	557	20.88
Bookkeeping, Accounting, and Auditing Clerks	Associates / Some Degree	3,314	3,764	13.6	495	23.49
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	HS Degree	4,015	3,659	-8.9	383	23.00
Executive Secretaries and Executive Administrative Assistants	HS Degree	3,633	3,079	-15.2	340	30.27
First-Line Supervisors of Office and Administrative Support Workers	HS Degree	2,926	3,046	4.1	317	30.19
Telecommunications Equipment Installers and Repairers, Except Line Installers	Associates / Some Degree	2,372	2,414	1.8	327	37.80
Computer Network Support Specialists	Associates / Some Degree	2,322	1,963	-15.5	264	38.57

Source: DER calculations using Lightcast data. Excludes occupations less than 10 instances. Education represents the typical entry level education most needed to enter an occupation. Wage data sourced from 2021 statistics. 1Annual openings are the sum of labor force exits ("annual exits"), occupational transfers ("annual transfers"), and job growth ("annual growth"). These openings figures are based on an average over the

occupational projection period from Q2-2022 to Q2-2024. Estimated annual openings at the industry level based on share of total employment in 2022. Table sorted by the occupation with the highest number of 2022 jobs.

Clean Energy

The clean energy sector encompasses power generation from renewable and sustainable sources, coupled with energy-efficient technologies such as solar, wind, and electric vehicles that mitigate environmental impact and support the reduction of greenhouse gas emissions (GHG).

Unlike other groups considered here, there is not a standardized process for defining the clean energy sector in terms of industries or occupations. Instead, there are firms and occupations within a range of sectors—including utilities, construction, professional, technical, and scientific services—that engage in activities aligned with the clean energy sector. For example, a complex methodology is needed to distinguish between electricians who mainly work on home improvements and those who focus on solar panels. Similarly, industries either directly or partially involved with clean energy activities need accurate categorization. Thus, for the purposes of this report, data and analysis was obtained from the Massachusetts Clean Energy Center (MassCEC).

The primary source of data on the clean energy economy comes from a US Department of Energy's survey of employers which aims to measure activity related to clean energy. This data is combined with publicly available workforce data to estimate the clean energy workforce for the US and states. MassCEC utilizes this data from the US Department of Energy 2022 Industry Report to estimate employment trends in clean energy jobs.

Based on the MassCEC 2022 Massachusetts Clean Energy Industry Report, prior to the pandemic, employment in the clean energy sector was growing rapidly, with the number of workers spending at least part of their time working on clean energy nearly doubling from

60,000 in 2010 to 114,000 in 2020. After falling during the pandemic, employment in the sector regained jobs between 2021 and 2022 and is expected to see continued growth in 2023.

The Commonwealth's focus on clean energy has positioned it as a national leader. In 2022, Massachusetts accounted for 4% of the national clean energy workforce, double its share of the total national workforce. In 2022, the Massachusetts Secretary of Energy and Environmental Affairs outlined climate targets in the Massachusetts Clean Energy and Climate Plan for 2025 and 2030 ("2025/2030 CECP"). The plan aims to cut greenhouse gas emissions by 50% (relative to 1990 levels) by 2030 and reach net zero emissions by 2050. Recognizing the significant workforce needed to drive growth in energy efficiency, solar, and wind sectors to meet these objectives, MassCEC commissioned the report titled Powering the Future: A Massachusetts Clean Energy Workforce Needs Assessment. This assessment delves into anticipated labor demands and offers insights on workforce strategies essential for realizing these decarbonization goals.

According to the report, developing a robust and adequate clean energy workforce to support growth in related industries will require a collaboration across education providers, policymakers/funders, workforce development organizations and employers. It is estimated that to achieve the 2030 GHG objectives, Massachusetts will need to increase its clean energy workforce by 29,700 full-time equivalent (FTE) workers or 38,100 workers that devote either partial or full time to clean energy tasks. For the realization of net zero emissions by 2050, 77,000 new FTE workers will be necessary.

While clean energy jobs span 144 distinct occupations, analysis suggests that 36% of the anticipated job growth will be focused on just five specific roles. A substantial 65% of this growth is expected within 20 occupations. The clean energy roles projected to experience the highest growth are electricians (+69%), construction laborers (+33%), general and operations managers (+31%), first-line supervisors of construction trades and extraction workers (+35%), and insulation workers (+25%). Notably, among the top ten growth roles, eight don't demand a

bachelor's degree. Thus, concentrating initially on these roles might lead to substantial benefits, even though growth is essential across all clean energy professions.

From an industry perspective, the energy efficiency sector is expected to account for 60% of all new growth in clean energy workers by 2030, adding 17,900 jobs. These jobs focus on energy efficiency design in new home construction and improvements to existing homes. Tasks may include installing energy-efficient appliances/fixtures, enhancing insulation, and introducing advanced heating and cooling systems. Within this sector, the roles of construction laborer, insulation worker, and general operations manager will be pivotal for growth. Other notable growth sectors include renewable energy (+7,800) and alternative transportation (+3,800). Training electricians to set up and maintain offshore wind turbines, solar panels, and electric vehicle charging stations will be essential in these sectors.

Among these sectors, notable subsectors such as offshore wind, transmission and distribution, utility scale solar, and electric motor vehicles are anticipated to at least double by 2030. Offshore wind, the development of wind farms in bodies of water, is expected to witness the fastest growth rate (724%) among subsectors, translating to roughly 2,200 jobs by 2030.

Achieving the projected job growth demands a unified effort from educational institutions, employers, and training providers. This effort should focus on enhancing career awareness, expanding training capacity, and ensuring that training aligns with employer expectations for skills and knowledge, which will subsequently improve placement, retention, and advancement.

First, given the challenges of a tight labor market, falling labor participation rate, and the pandemic resulting in a loss of over 12,800 clean energy jobs between 2020 and 2021, increased career awareness about clean energy occupations is imperative. Detailed information about job responsibilities, wages/benefits, required skills, training sources, and prospects for growth and advancement should be readily available to all stakeholders, including students,

marginalized communities, and those new to the workforce. Outreach initiatives may need to emphasize the advantages of working in trade occupations in terms of competitive pay, job stability, and fewer educational prerequisites. Effective execution of these initiatives will likely require collaboration among the K-12 education system, workforce boards/career centers, and other training institutions.

The report emphasizes that while career awareness is critical, most resources should be used to train clean energy workers. By 2030, electricians will be the occupation in highest demand and the one of the most challenging to train, with a requirement for 4,400 new clean energy electricians. Given that becoming a licensed electrician requires 4-5 years of apprenticeship and considering the constraint that certified electricians can mentor only one apprentice concurrently, recruitment might be challenging. Additionally, as the majority of electricians are white males, diversifying the workforce and drawing in underrepresented communities could introduce further challenges. Boosting capacity at technical and vocational institutions, which act as pathways to apprenticeship programs, could address this demand. Increasing the number of apprenticeships overseen by community colleges, private institutions, and unions might also enhance the electrician talent pool. Heating, Ventilation, Air Conditioning, and Refrigeration Mechanics and Installers (HVAC Mechanics/Installers) represent another high-demand occupation. Typically, this role demands four years of vocational/technical education, approximately an additional year of education/training, and formal certifications. By 2030, 650 new HVAC Mechanics/Installers will be needed.

Given the unique educational and skill prerequisites for each profession, expanding capacity might involve not only amplifying existing training programs but also modernizing curricula centered on clean energy, integrating new training equipment, and collaborating with employers to pinpoint essential skills for job placement and advancement.

Conclusion

The analysis of Massachusetts's economy and labor market indicates a dynamic and evolving landscape shaped by multiple factors, including industry trends, regional disparities, demographic shifts, and educational requirements.

Several industry sectors, led by professional and business services and buoyed by the robust performance of biotech research and AI commercialization, have experienced significant growth. These sectors, along with the resilient advanced manufacturing, life sciences, healthcare, and clean energy sectors, offer diverse employment opportunities across skill levels and provide fertile grounds for strategic investments.

However, the recovery has been uneven, marked by a tightening labor market, particularly in the healthcare and educational services sectors. These conditions pose challenges to employment recovery in these critical sectors and signal the need for strategic interventions to address labor shortages and foster job growth.

Progress has been made in increasing workforce diversity, with Black workers, in particular, benefiting from the current labor market environment. Nevertheless, substantial disparities persist in employment and wage growth among different racial and ethnic groups. Additionally, the growing contribution of foreign-born workers, especially in critical roles, calls for addressing challenges they face, like English proficiency and obtaining legal work status, to fully leverage their potential.

Significant demographic shifts caused by the pandemic, such as the impacts on young workers and the 65+ age group, highlight the need for comprehensive strategies that encourage workforce re-entry and consider retirement trends.

Finally, while the recovery has generally favored individuals with a bachelor's degree or higher, two-thirds of jobs in Massachusetts do not require such a degree. The strong wage growth for jobs requiring less formal education suggests a robust demand for these roles. Therefore, balancing educational requirements with job creation strategies is key to fostering a diverse and inclusive labor market.

Regional disparities in pandemic recovery are also evident, with varied recovery rates across Massachusetts' 16 Workforce Development Areas (WDAs). While some regions, such as Boston, Central, and Metro North WDAs, are witnessing visible recovery, labor force and employment populations across most WDAs remain below pre-pandemic levels. The healthcare sector's crucial role in Massachusetts' economy, coupled with the tightened labor market, has slowed the full employment recovery, particularly in regions outside of Boston where healthcare is a significant employment sector. This underscores the need for tailored, region-specific workforce development strategies that consider the unique industrial mix and local conditions.

Looking forward, our data highlights persistent workforce demand in crucial sectors such as healthcare, advanced manufacturing, life sciences, and clean energy. The analysis underscores the necessity to examine employment dynamics holistically going beyond mere growth projections to account for retirements and occupational mobility. These factors will present dual challenges and opportunities: employers may struggle to fill roles, while employees will find an expanded scope for career development. For instance, even as the healthcare industry grapples with a constricted labor market, we anticipate around 4,374 yearly job openings for registered nurses in the state. Notably, over half of these opportunities are expected to arise from retirements.

As Massachusetts navigates the path to full recovery and future growth, this multi-dimensional understanding of its economic landscape is essential to inform policies and strategies that foster resilience, inclusivity, and prosperity for all workers and industries.

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Appendix

Figure 1: Total Non-Farm Jobs

Date	Total Non-Farm Jobs, In Thousands
1/1/2000	3294.6
2/1/2000	3302.4
3/1/2000	3310.3
4/1/2000	3323.8
5/1/2000	3326.2
6/1/2000	3332.8
7/1/2000	3348.6
8/1/2000	3344.3
9/1/2000	3356.6
10/1/2000	3366.2
11/1/2000	3373.3
12/1/2000	3381
1/1/2001	3393
2/1/2001	3395.1
3/1/2001	3385.5
4/1/2001	3374
5/1/2001	3368.4
6/1/2001	3362
7/1/2001	3345.3
8/1/2001	3340.4
9/1/2001	3327.7
10/1/2001	3313.7
11/1/2001	3301.9
12/1/2001	3297
1/1/2002	3295.3
2/1/2002	3287.9

Date	Total Non-Farm Jobs, In Thousands
3/1/2002	3288.2
4/1/2002	3281.4
5/1/2002	3277.9
6/1/2002	3274.5
7/1/2002	3272.3
8/1/2002	3268.1
9/1/2002	3265.6
10/1/2002	3255.9
11/1/2002	3252.3
12/1/2002	3247.3
1/1/2003	3236
2/1/2003	3223.2
3/1/2003	3219.4
4/1/2003	3218.7
5/1/2003	3217.8
6/1/2003	3212.4
7/1/2003	3211.1
8/1/2003	3207.3
9/1/2003	3213.3
10/1/2003	3201.1
11/1/2003	3203.9
12/1/2003	3195.1
1/1/2004	3195
2/1/2004	3202
3/1/2004	3209.4
4/1/2004	3208.7
5/1/2004	3212
6/1/2004	3212.7
7/1/2004	3214.9
8/1/2004	3215.3
9/1/2004	3218.3

Date	Total Non-Farm Jobs, In Thousands
10/1/2004	3218.3
11/1/2004	3217.6
12/1/2004	3219
1/1/2005	3215.5
2/1/2005	3223.9
3/1/2005	3218.2
4/1/2005	3227.3
5/1/2005	3229
6/1/2005	3227.3
7/1/2005	3235.2
8/1/2005	3236.1
9/1/2005	3241.2
10/1/2005	3234.3
11/1/2005	3242
12/1/2005	3245.2
1/1/2006	3250.8
2/1/2006	3253.7
3/1/2006	3259.1
4/1/2006	3263.8
5/1/2006	3259.9
6/1/2006	3266.8
7/1/2006	3269.8
8/1/2006	3271.5
9/1/2006	3274.1
10/1/2006	3277.1
11/1/2006	3279.7
12/1/2006	3286.6
1/1/2007	3294.7
2/1/2007	3293.9
3/1/2007	3294.6
4/1/2007	3297.3

Date	Total Non-Farm Jobs, In Thousands
5/1/2007	3303.5
6/1/2007	3310.2
7/1/2007	3308.8
8/1/2007	3309
9/1/2007	3308.7
10/1/2007	3312.8
11/1/2007	3317.8
12/1/2007	3318
1/1/2008	3325.9
2/1/2008	3328.9
3/1/2008	3329.7
4/1/2008	3331.3
5/1/2008	3327.5
6/1/2008	3326.1
7/1/2008	3325.3
8/1/2008	3321.4
9/1/2008	3315.1
10/1/2008	3308.4
11/1/2008	3296.3
12/1/2008	3281.9
1/1/2009	3253
2/1/2009	3245.6
3/1/2009	3230.5
4/1/2009	3217.7
5/1/2009	3213.7
6/1/2009	3204.2
7/1/2009	3192.5
8/1/2009	3192.4
9/1/2009	3193.6
10/1/2009	3190.6
11/1/2009	3192.4

Date	Total Non-Farm Jobs, In Thousands
12/1/2009	3198.6
1/1/2010	3213.6
2/1/2010	3208
3/1/2010	3208.1
4/1/2010	3214.7
5/1/2010	3229.9
6/1/2010	3216
7/1/2010	3220.2
8/1/2010	3222.2
9/1/2010	3219.5
10/1/2010	3233.5
11/1/2010	3234.6
12/1/2010	3238.3
1/1/2011	3240
2/1/2011	3242.5
3/1/2011	3243.9
4/1/2011	3250.8
5/1/2011	3251.6
6/1/2011	3245.7
7/1/2011	3267
8/1/2011	3263.6
9/1/2011	3274.4
10/1/2011	3273.5
11/1/2011	3274.9
12/1/2011	3279.7
1/1/2012	3293.3
2/1/2012	3295.6
3/1/2012	3306.2
4/1/2012	3296.5
5/1/2012	3299.9
6/1/2012	3312.5

Date	Total Non-Farm Jobs, In Thousands
7/1/2012	3310.6
8/1/2012	3314.6
9/1/2012	3322
10/1/2012	3320.6
11/1/2012	3326.8
12/1/2012	3327.5
1/1/2013	3337.5
2/1/2013	3344.2
3/1/2013	3352.7
4/1/2013	3357.8
5/1/2013	3362.7
6/1/2013	3369.6
7/1/2013	3364.1
8/1/2013	3371.5
9/1/2013	3374
10/1/2013	3380.3
11/1/2013	3382.6
12/1/2013	3388.1
1/1/2014	3396.3
2/1/2014	3404.7
3/1/2014	3408.3
4/1/2014	3418.2
5/1/2014	3422.8
6/1/2014	3426.2
7/1/2014	3433.4
8/1/2014	3429.4
9/1/2014	3448.8
10/1/2014	3456.4
11/1/2014	3468
12/1/2014	3473
1/1/2015	3470.9

Date	Total Non-Farm Jobs, In Thousands
2/1/2015	3463.4
3/1/2015	3474.5
4/1/2015	3480.5
5/1/2015	3503.3
6/1/2015	3502.4
7/1/2015	3509.2
8/1/2015	3509.2
9/1/2015	3508.5
10/1/2015	3521.3
11/1/2015	3527.4
12/1/2015	3532.5
1/1/2016	3538.4
2/1/2016	3543.8
3/1/2016	3555.7
4/1/2016	3559.5
5/1/2016	3559.1
6/1/2016	3551
7/1/2016	3580.5
8/1/2016	3583.4
9/1/2016	3585.2
10/1/2016	3580.3
11/1/2016	3586.4
12/1/2016	3591.3
1/1/2017	3595.6
2/1/2017	3596
3/1/2017	3602
4/1/2017	3606.5
5/1/2017	3608.4
6/1/2017	3614.8
7/1/2017	3621.7
8/1/2017	3624

Date	Total Non-Farm Jobs, In Thousands
9/1/2017	3624.7
10/1/2017	3626.1
11/1/2017	3631.4
12/1/2017	3636
1/1/2018	3635.5
2/1/2018	3649
3/1/2018	3647.6
4/1/2018	3649.1
5/1/2018	3653.4
6/1/2018	3656
7/1/2018	3653.6
8/1/2018	3655.3
9/1/2018	3662.3
10/1/2018	3665
11/1/2018	3668.2
12/1/2018	3677.8
1/1/2019	3680.2
2/1/2019	3688.5
3/1/2019	3691.7
4/1/2019	3707.9
5/1/2019	3715.6
6/1/2019	3721.3
7/1/2019	3717.8
8/1/2019	3718.8
9/1/2019	3719.3
10/1/2019	3715.5
11/1/2019	3721.5
12/1/2019	3730.8
1/1/2020	3739.3
2/1/2020	3743.7
3/1/2020	3711

Date	Total Non-Farm Jobs, In Thousands
4/1/2020	3061.6
5/1/2020	3111.7
6/1/2020	3195.5
7/1/2020	3277
8/1/2020	3344.2
9/1/2020	3380.6
10/1/2020	3407.2
11/1/2020	3421.2
12/1/2020	3424.6
1/1/2021	3446.8
2/1/2021	3455.7
3/1/2021	3476.2
4/1/2021	3493
5/1/2021	3505.2
6/1/2021	3520.2
7/1/2021	3563
8/1/2021	3577.7
9/1/2021	3563.3
10/1/2021	3585.7
11/1/2021	3594.8
12/1/2021	3610.3
1/1/2022	3626.3
2/1/2022	3644.1
3/1/2022	3654.3
4/1/2022	3660.1
5/1/2022	3660.6
6/1/2022	3666.6
7/1/2022	3690.9
8/1/2022	3698.2
9/1/2022	3691.4
10/1/2022	3705.6

Date	Total Non-Farm Jobs, In Thousands
11/1/2022	3720.1
12/1/2022	3723.9
1/1/2023	3732.8
2/1/2023	3742
3/1/2023	3754.1
4/1/2023	3760
5/1/2023	3767.3
6/1/2023	3768.7

Source: Current Employment Statistics

Figure 2: Unemployment Rate in Massachusetts and the United States

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
1/1/2005	5.3%	4.9%
2/1/2005	5.4%	4.9%
3/1/2005	5.2%	4.8%
4/1/2005	5.2%	4.8%
5/1/2005	5.1%	4.8%
6/1/2005	5.0%	4.7%
7/1/2005	5.0%	4.7%
8/1/2005	4.9%	4.8%
9/1/2005	5.0%	4.8%
10/1/2005	5.0%	4.8%
11/1/2005	5.0%	4.8%
12/1/2005	4.9%	4.8%
1/1/2006	4.7%	4.7%
2/1/2006	4.8%	4.7%
3/1/2006	4.7%	4.7%
4/1/2006	4.7%	4.7%
5/1/2006	4.6%	4.7%
6/1/2006	4.6%	4.7%
7/1/2006	4.7%	4.7%
8/1/2006	4.7%	4.7%
9/1/2006	4.5%	4.7%
10/1/2006	4.4%	4.7%
11/1/2006	4.5%	4.7%
12/1/2006	4.4%	4.7%
1/1/2007	4.6%	4.6%
2/1/2007	4.5%	4.6%
3/1/2007	4.4%	4.5%
4/1/2007	4.5%	4.5%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
5/1/2007	4.4%	4.5%
6/1/2007	4.6%	4.5%
7/1/2007	4.7%	4.5%
8/1/2007	4.6%	4.5%
9/1/2007	4.7%	4.5%
10/1/2007	4.7%	4.5%
11/1/2007	4.7%	4.5%
12/1/2007	5.0%	4.5%
1/1/2008	5.0%	4.5%
2/1/2008	4.9%	4.6%
3/1/2008	5.1%	4.6%
4/1/2008	5.0%	4.8%
5/1/2008	5.4%	4.9%
6/1/2008	5.6%	5.1%
7/1/2008	5.8%	5.3%
8/1/2008	6.1%	5.5%
9/1/2008	6.1%	5.7%
10/1/2008	6.5%	6.0%
11/1/2008	6.8%	6.3%
12/1/2008	7.3%	6.7%
1/1/2009	7.8%	7.0%
2/1/2009	8.3%	7.4%
3/1/2009	8.7%	7.7%
4/1/2009	9.0%	7.9%
5/1/2009	9.4%	8.1%
6/1/2009	9.5%	8.2%
7/1/2009	9.5%	8.3%
8/1/2009	9.6%	8.4%
9/1/2009	9.8%	8.4%
10/1/2009	10.0%	8.5%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
11/1/2009	9.9%	8.5%
12/1/2009	9.9%	8.5%
1/1/2010	9.8%	8.5%
2/1/2010	9.8%	8.4%
3/1/2010	9.9%	8.4%
4/1/2010	9.9%	8.3%
5/1/2010	9.6%	8.1%
6/1/2010	9.4%	8.0%
7/1/2010	9.4%	7.9%
8/1/2010	9.5%	7.9%
9/1/2010	9.5%	7.9%
10/1/2010	9.4%	7.8%
11/1/2010	9.8%	7.8%
12/1/2010	9.3%	7.7%
1/1/2011	9.1%	7.6%
2/1/2011	9.0%	7.5%
3/1/2011	9.0%	7.4%
4/1/2011	9.1%	7.4%
5/1/2011	9.0%	7.3%
6/1/2011	9.1%	7.3%
7/1/2011	9.0%	7.2%
8/1/2011	9.0%	7.2%
9/1/2011	9.0%	7.1%
10/1/2011	8.8%	7.0%
11/1/2011	8.6%	6.9%
12/1/2011	8.5%	6.8%
1/1/2012	8.3%	6.7%
2/1/2012	8.3%	6.7%
3/1/2012	8.2%	6.7%
4/1/2012	8.2%	6.7%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
5/1/2012	8.2%	6.7%
6/1/2012	8.2%	6.7%
7/1/2012	8.2%	6.7%
8/1/2012	8.1%	6.7%
9/1/2012	7.8%	6.7%
10/1/2012	7.8%	6.7%
11/1/2012	7.7%	6.7%
12/1/2012	7.9%	6.7%
1/1/2013	8.0%	6.7%
2/1/2013	7.7%	6.8%
3/1/2013	7.5%	6.8%
4/1/2013	7.6%	6.8%
5/1/2013	7.5%	6.7%
6/1/2013	7.5%	6.7%
7/1/2013	7.3%	6.7%
8/1/2013	7.2%	6.7%
9/1/2013	7.2%	6.6%
10/1/2013	7.2%	6.5%
11/1/2013	6.9%	6.4%
12/1/2013	6.7%	6.3%
1/1/2014	6.6%	6.2%
2/1/2014	6.7%	6.1%
3/1/2014	6.7%	6.0%
4/1/2014	6.2%	5.9%
5/1/2014	6.3%	5.9%
6/1/2014	6.1%	5.8%
7/1/2014	6.2%	5.7%
8/1/2014	6.1%	5.6%
9/1/2014	5.9%	5.6%
10/1/2014	5.7%	5.5%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
11/1/2014	5.8%	5.4%
12/1/2014	5.6%	5.2%
1/1/2015	5.7%	5.2%
2/1/2015	5.5%	5.1%
3/1/2015	5.4%	5.0%
4/1/2015	5.4%	5.0%
5/1/2015	5.6%	4.9%
6/1/2015	5.3%	4.8%
7/1/2015	5.2%	4.7%
8/1/2015	5.1%	4.7%
9/1/2015	5.0%	4.6%
10/1/2015	5.0%	4.6%
11/1/2015	5.1%	4.5%
12/1/2015	5.0%	4.4%
1/1/2016	4.8%	4.4%
2/1/2016	4.9%	4.3%
3/1/2016	5.0%	4.2%
4/1/2016	5.1%	4.1%
5/1/2016	4.8%	4.1%
6/1/2016	4.9%	4.0%
7/1/2016	4.8%	3.9%
8/1/2016	4.9%	3.9%
9/1/2016	5.0%	3.9%
10/1/2016	4.9%	3.9%
11/1/2016	4.7%	3.9%
12/1/2016	4.7%	3.9%
1/1/2017	4.7%	3.8%
2/1/2017	4.6%	3.8%
3/1/2017	4.4%	3.8%
4/1/2017	4.4%	3.8%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
5/1/2017	4.4%	3.8%
6/1/2017	4.3%	3.8%
7/1/2017	4.3%	3.8%
8/1/2017	4.4%	3.8%
9/1/2017	4.3%	3.8%
10/1/2017	4.2%	3.8%
11/1/2017	4.2%	3.8%
12/1/2017	4.1%	3.7%
1/1/2018	4.0%	3.7%
2/1/2018	4.1%	3.7%
3/1/2018	4.0%	3.6%
4/1/2018	4.0%	3.6%
5/1/2018	3.8%	3.5%
6/1/2018	4.0%	3.5%
7/1/2018	3.8%	3.4%
8/1/2018	3.8%	3.4%
9/1/2018	3.7%	3.4%
10/1/2018	3.8%	3.3%
11/1/2018	3.8%	3.3%
12/1/2018	3.9%	3.3%
1/1/2019	4.0%	3.2%
2/1/2019	3.8%	3.2%
3/1/2019	3.8%	3.1%
4/1/2019	3.6%	3.1%
5/1/2019	3.7%	3.0%
6/1/2019	3.6%	3.0%
7/1/2019	3.7%	3.0%
8/1/2019	3.7%	3.0%
9/1/2019	3.5%	2.9%
10/1/2019	3.6%	2.9%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
11/1/2019	3.6%	2.9%
12/1/2019	3.6%	2.9%
1/1/2020	3.5%	2.8%
2/1/2020	3.5%	2.8%
3/1/2020	4.4%	2.8%
4/1/2020	14.7%	16.9%
5/1/2020	13.2%	15.5%
6/1/2020	11.0%	14.4%
7/1/2020	10.2%	12.7%
8/1/2020	8.4%	10.6%
9/1/2020	7.9%	10.0%
10/1/2020	6.9%	8.7%
11/1/2020	6.7%	8.1%
12/1/2020	6.7%	7.8%
1/1/2021	6.3%	7.1%
2/1/2021	6.2%	6.7%
3/1/2021	6.1%	6.4%
4/1/2021	6.1%	6.3%
5/1/2021	5.8%	5.8%
6/1/2021	5.9%	5.8%
7/1/2021	5.4%	5.5%
8/1/2021	5.2%	5.2%
9/1/2021	4.8%	4.8%
10/1/2021	4.5%	4.6%
11/1/2021	4.2%	4.2%
12/1/2021	3.9%	3.9%
1/1/2022	4.0%	4.0%
2/1/2022	3.8%	3.9%
3/1/2022	3.6%	3.7%
4/1/2022	3.6%	3.7%

Date	United States Unemployment Rate	Massachusetts Unemployment Rate
5/1/2022	3.6%	3.7%
6/1/2022	3.6%	3.7%
7/1/2022	3.5%	3.7%
8/1/2022	3.7%	3.9%
9/1/2022	3.5%	3.7%
10/1/2022	3.7%	3.8%
11/1/2022	3.6%	3.7%
12/1/2022	3.5%	3.7%
1/1/2023	3.4%	3.5%
2/1/2023	3.6%	3.7%
3/1/2023	3.5%	3.5%
4/1/2023	3.4%	3.1%
5/1/2023	3.7%	2.8%
6/1/2023	3.6%	2.6%

Source: Current Population Survey, Local Area Unemployment Statistics

Figure 3: Massachusetts Employed & Labor Force

Date	Employed	Labor Force
1/1/2018	3629779	3769464
2/1/2018	3645163	3783908
3/1/2018	3661664	3799466
4/1/2018	3676332	3813006
5/1/2018	3687349	3822727
6/1/2018	3694639	3828443
7/1/2018	3698801	3830674
8/1/2018	3701355	3831400
9/1/2018	3703622	3832282
10/1/2018	3706338	3833978
11/1/2018	3709482	3836258
12/1/2018	3712645	3838490
1/1/2019	3715554	3840181
2/1/2019	3718510	3841338
3/1/2019	3721871	3842588
4/1/2019	3725635	3844239
5/1/2019	3728808	3845596
6/1/2019	3730701	3846204
7/1/2019	3731035	3845756
8/1/2019	3729927	3843970
9/1/2019	3728943	3841822
10/1/2019	3727975	3839638
11/1/2019	3726016	3836640
12/1/2019	3720005	3829604
1/1/2020	3707253	3815555
2/1/2020	3687342	3793932
3/1/2020	3663226	3767296
4/1/2020	2889467	3476035
5/1/2020	3149808	3726748

Date	Employed	Labor Force
6/1/2020	3230811	3773836
7/1/2020	3305506	3785367
8/1/2020	3363172	3760914
9/1/2020	3410540	3787541
10/1/2020	3440360	3768069
11/1/2020	3458710	3765586
12/1/2020	3469086	3762478
1/1/2021	3477470	3743442
2/1/2021	3487618	3739265
3/1/2021	3500858	3740036
4/1/2021	3515529	3750513
5/1/2021	3528915	3747162
6/1/2021	3538885	3758717
7/1/2021	3545826	3750656
8/1/2021	3551533	3746540
9/1/2021	3557550	3737893
10/1/2021	3566159	3738267
11/1/2021	3577114	3734644
12/1/2021	3589145	3736348
1/1/2022	3600641	3752622
2/1/2022	3610429	3756186
3/1/2022	3616871	3755168
4/1/2022	3619534	3758814
5/1/2022	3618734	3758999
6/1/2022	3614737	3754800
7/1/2022	3607550	3744688
8/1/2022	3599484	3744533
9/1/2022	3592850	3729695
10/1/2022	3588553	3729779
11/1/2022	3588270	3727848
12/1/2022	3589568	3726395

Date	Employed	Labor Force
1/1/2023	3597365	3729764
2/1/2023	3604321	3741461
3/1/2023	3608865	3741218
4/1/2023	3617231	3732006
5/1/2023	3622761	3728314
6/1/2023	3624855	3720872

Source: Local Area Unemployment Statistics

Figure 4: Change in Massachusetts Employment from January 2022 to December 2022

Supersector	Change in Employment (thousands)	Percent change in employment
Professional and Business Services	25.1	4.0%
Leisure and Hospitality	20.3	6.0%
Trade, Transportation, and Utilities	13.1	2.4%
Education and Health Services	11.4	1.4%
Government	10.3	2.3%
Financial Activities	7.9	3.5%
Retail Trade	5.5	1.7%
Wholesale Trade	4.8	3.9%
Other Services	4.7	3.6%
Construction	2.6	1.5%
Information	2.5	2.6%
Manufacturing	-0.3	-0.1%

Source: Current Employment Statistics

Figure 5: Change in Massachusetts Employment from February 2020 to June 2023

Supersector	Change in Employment (thousands)	Percent change in employment
Professional and Business Services	46.3	7.6%
Construction	10.2	6.1%
Wholesale Trade	7.4	6.0%
Education and Health Services	6	0.7%
Financial Activities	6	2.6%
Information	2.2	2.3%
Government	-2.5	-0.5%
Manufacturing	-4.1	-1.7%
Other Services	-4.5	-3.2%
Trade, Transportation, and Utilities	-6.3	-1.1%
Retail Trade	-20	-5.7%
Leisure and Hospitality	-28.3	-7.3%

Source: Current Employment Statistics

Figure 6: Massachusetts and National Labor Market Tightness

Date	Massachusetts - Openings per Unemployed	National - Openings per unemployed
1/1/2009	0.27	0.23
2/1/2009	0.29	0.22
3/1/2009	0.25	0.19
4/1/2009	0.24	0.17
5/1/2009	0.27	0.18
6/1/2009	0.29	0.17
7/1/2009	0.22	0.15
8/1/2009	0.22	0.16
9/1/2009	0.29	0.17
10/1/2009	0.23	0.16
11/1/2009	0.24	0.16
12/1/2009	0.26	0.17
1/1/2010	0.30	0.19
2/1/2010	0.24	0.18
3/1/2010	0.27	0.18
4/1/2010	0.35	0.21
5/1/2010	0.32	0.20
6/1/2010	0.31	0.19
7/1/2010	0.35	0.21
8/1/2010	0.32	0.21
9/1/2010	0.33	0.20
10/1/2010	0.39	0.22
11/1/2010	0.33	0.21
12/1/2010	0.29	0.21
1/1/2011	0.31	0.22
2/1/2011	0.31	0.23
3/1/2011	0.34	0.24
4/1/2011	0.33	0.23

Date	Massachusetts - Openings per Unemployed	National - Openings per unemployed
5/1/2011	0.30	0.23
6/1/2011	0.33	0.25
7/1/2011	0.34	0.26
8/1/2011	0.29	0.24
9/1/2011	0.33	0.27
10/1/2011	0.32	0.27
11/1/2011	0.31	0.27
12/1/2011	0.36	0.29
1/1/2012	0.37	0.31
2/1/2012	0.37	0.28
3/1/2012	0.38	0.31
4/1/2012	0.35	0.30
5/1/2012	0.37	0.30
6/1/2012	0.37	0.31
7/1/2012	0.35	0.30
8/1/2012	0.38	0.31
9/1/2012	0.35	0.32
10/1/2012	0.38	0.31
11/1/2012	0.39	0.32
12/1/2012	0.38	0.32
1/1/2013	0.42	0.32
2/1/2013	0.38	0.34
3/1/2013	0.44	0.35
4/1/2013	0.39	0.34
5/1/2013	0.40	0.36
6/1/2013	0.45	0.35
7/1/2013	0.38	0.34
8/1/2013	0.44	0.36
9/1/2013	0.48	0.37
10/1/2013	0.44	0.38
11/1/2013	0.47	0.38

Date	Massachusetts - Openings per Unemployed	National - Openings per unemployed
12/1/2013	0.47	0.40
1/1/2014	0.45	0.41
2/1/2014	0.51	0.42
3/1/2014	0.51	0.42
4/1/2014	0.56	0.47
5/1/2014	0.61	0.48
6/1/2014	0.64	0.53
7/1/2014	0.57	0.50
8/1/2014	0.72	0.56
9/1/2014	0.63	0.53
10/1/2014	0.70	0.56
11/1/2014	0.68	0.53
12/1/2014	0.74	0.59
1/1/2015	0.77	0.60
2/1/2015	0.79	0.64
3/1/2015	0.75	0.61
4/1/2015	0.98	0.66
5/1/2015	0.86	0.63
6/1/2015	0.72	0.64
7/1/2015	0.84	0.74
8/1/2015	0.83	0.68
9/1/2015	0.87	0.69
10/1/2015	0.93	0.73
11/1/2015	0.98	0.71
12/1/2015	0.98	0.74
1/1/2016	0.92	0.79
2/1/2016	0.88	0.75
3/1/2016	0.92	0.77
4/1/2016	0.91	0.72
5/1/2016	0.98	0.76
6/1/2016	0.98	0.74

Date	Massachusetts - Openings per Unemployed	National - Openings per unemployed
7/1/2016	1.07	0.78
8/1/2016	1.01	0.73
9/1/2016	1.10	0.74
10/1/2016	1.01	0.72
11/1/2016	1.01	0.79
12/1/2016	1.12	0.79
1/1/2017	1.06	0.75
2/1/2017	1.32	0.80
3/1/2017	1.08	0.82
4/1/2017	1.04	0.86
5/1/2017	1.00	0.83
6/1/2017	1.04	0.92
7/1/2017	1.14	0.91
8/1/2017	1.05	0.89
9/1/2017	0.98	0.92
10/1/2017	1.10	0.96
11/1/2017	1.02	0.93
12/1/2017	0.93	0.96
1/1/2018	1.04	1.02
2/1/2018	1.10	1.00
3/1/2018	1.05	1.05
4/1/2018	1.13	1.07
5/1/2018	1.20	1.13
6/1/2018	1.22	1.12
7/1/2018	1.21	1.16
8/1/2018	1.23	1.17
9/1/2018	1.38	1.22
10/1/2018	1.34	1.18
11/1/2018	1.58	1.24
12/1/2018	1.55	1.17
1/1/2019	1.56	1.17

Date	Massachusetts - Openings per Unemployed	National - Openings per unemployed
2/1/2019	1.49	1.16
3/1/2019	1.53	1.19
4/1/2019	1.48	1.22
5/1/2019	1.50	1.23
6/1/2019	1.42	1.21
7/1/2019	1.29	1.17
8/1/2019	1.61	1.20
9/1/2019	1.44	1.24
10/1/2019	1.43	1.23
11/1/2019	1.37	1.17
12/1/2019	1.40	1.14
1/1/2020	1.56	1.24
2/1/2020	1.79	1.23
3/1/2020	1.32	0.81
4/1/2020	0.19	0.20
5/1/2020	0.19	0.27
6/1/2020	0.25	0.35
7/1/2020	0.31	0.40
8/1/2020	0.36	0.47
9/1/2020	0.37	0.52
10/1/2020	0.46	0.62
11/1/2020	0.52	0.64
12/1/2020	0.52	0.64
1/1/2021	0.55	0.71
2/1/2021	0.68	0.78
3/1/2021	0.85	0.87
4/1/2021	0.89	0.95
5/1/2021	0.99	1.06
6/1/2021	1.01	1.06
7/1/2021	1.41	1.25
8/1/2021	1.50	1.32

Date	Massachusetts - Openings per Unemployed	National - Openings per unemployed
9/1/2021	1.59	1.42
10/1/2021	1.84	1.55
11/1/2021	1.83	1.66
12/1/2021	2.02	1.87
1/1/2022	1.79	1.76
2/1/2022	2.11	1.85
3/1/2022	2.18	2.01
4/1/2022	2.07	1.97
5/1/2022	2.32	1.91
6/1/2022	2.05	1.84
7/1/2022	2.10	1.99
8/1/2022	1.80	1.69
9/1/2022	2.10	1.88
10/1/2022	1.93	1.73
11/1/2022	1.79	1.79
12/1/2022	1.96	1.96
1/1/2023	2.09	1.86
2/1/2023	1.89	1.68
3/1/2023	2.13	1.67
4/1/2023	2.60	1.82
5/1/2023	2.41	1.58
6/1/2023	2.53	1.54

Source: Job Openings and Labor Turnover Survey

Figure 7: Labor market tightness by industry in Massachusetts in April 2023

Sector	Job postings per unemployed - April 2023	Job postings per unemployed - 2019 Average
Educational Services	16.0	7.0
Health Care and Social Assistance	6.5	3.5
Utilities	4.5	1.5
Administrative and Support and Waste Management and Remediation Services	4.0	2.2
Finance and Insurance	3.9	3.0
Professional, Scientific, and Technical Services	3.3	3.5
Manufacturing	3.1	1.8
Real Estate and Rental and Leasing	2.9	2.2
Information	2.3	2.7
Wholesale Trade	2.1	1.3
Management of Companies and Enterprises	2.0	1.1
Accommodation and Food Services	1.8	0.9
Arts, Entertainment, and Recreation	1.2	0.7
Other Services (except Public Administration)	1.1	0.7
Transportation and Warehousing	1.0	0.5
Retail Trade	0.9	0.8
Mining, Quarrying, and Oil and Gas Extraction	0.8	0.9
Agriculture, Forestry, Fishing and Hunting	0.5	0.2
Construction	0.3	0.2

Source: Lightcast

Figure 8: Labor market tightness by occupation in Massachusetts in April 2023

Sector	Job postings per unemployed - April 2023	Job postings per unemployed - 2019 Average
Healthcare Practitioners and Technical Occupations	34.2	11.3
Educational Instruction and Library Occupations	16.0	5.5
Computer and Mathematical Occupations	9.9	10.7
Community and Social Service Occupations	8.3	2.9
Architecture and Engineering Occupations	8.2	4.4
Life, Physical, and Social Science Occupations	7.5	5.8
Personal Care and Service Occupations	6.4	1.5
Legal Occupations	5.7	3.5
Arts, Design, Entertainment, Sports, and Media Occupations	4.7	3.8
Healthcare Support Occupations	4.5	3.3
Business and Financial Operations Occupations	4.2	4.0
Protective Service Occupations	4.1	2.4
Installation, Maintenance, and Repair Occupations	3.8	1.5
Management Occupations	3.4	2.2
Food Preparation and Serving Related Occupations	2.6	1.3
Sales and Related Occupations	2.4	3.5
Military-only Occupations	2.2	1.0
Office and Administrative Support Occupations	2.1	2.0
Production Occupations	1.7	0.7

Transportation and Material Moving Occupations	1.7	1.0
Building and Grounds Cleaning and Maintenance Occupations	1.0	0.4
Farming, Fishing, and Forestry Occupations	0.5	0.3
Construction and Extraction Occupations	0.2	0.1

Source: Lightcast

Figure 9: Massachusetts Labor Force Participation Rate by Age Group – 12-month average

Date	Age 16-19	Age 20-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65+
1/1/2015	38.6%	68.5%	84.4%	85.8%	82.2%	70.4%	21.2%
2/1/2015	39.2%	69.0%	84.9%	85.8%	82.2%	70.0%	21.5%
3/1/2015	39.6%	69.1%	85.1%	85.6%	82.2%	69.8%	21.7%
4/1/2015	40.2%	68.7%	85.4%	85.5%	82.2%	70.0%	21.9%
5/1/2015	40.9%	68.1%	85.6%	85.6%	82.3%	69.9%	22.0%
6/1/2015	41.6%	68.4%	85.9%	85.3%	82.4%	70.1%	22.0%
7/1/2015	40.2%	68.7%	86.0%	85.1%	81.9%	70.1%	21.8%
8/1/2015	39.9%	69.2%	85.9%	84.9%	81.6%	70.0%	22.1%
9/1/2015	39.4%	69.9%	85.4%	84.5%	81.2%	69.8%	22.1%
10/1/2015	38.1%	69.9%	85.3%	84.5%	81.2%	69.9%	22.1%
11/1/2015	37.2%	69.6%	85.0%	84.2%	81.4%	69.9%	22.1%
12/1/2015	36.0%	69.3%	85.0%	84.1%	81.2%	70.0%	21.8%
1/1/2016	35.3%	68.9%	84.7%	84.0%	81.3%	70.2%	21.7%
2/1/2016	35.7%	67.8%	84.2%	84.0%	81.0%	70.5%	21.6%
3/1/2016	36.0%	67.1%	83.9%	84.0%	81.1%	70.6%	21.4%
4/1/2016	35.8%	67.4%	83.4%	84.5%	81.2%	70.6%	21.3%
5/1/2016	35.3%	67.5%	83.3%	84.4%	81.0%	70.5%	21.2%
6/1/2016	33.9%	67.4%	83.2%	84.5%	81.0%	70.5%	21.1%
7/1/2016	34.8%	67.0%	83.3%	84.6%	81.2%	70.7%	21.5%
8/1/2016	35.6%	67.5%	83.2%	84.6%	81.5%	70.6%	21.5%
9/1/2016	35.6%	67.4%	83.2%	84.7%	81.9%	70.5%	21.7%
10/1/2016	36.7%	67.1%	83.2%	84.4%	82.1%	69.9%	21.7%
11/1/2016	36.9%	67.3%	83.2%	84.2%	81.9%	69.6%	21.8%
12/1/2016	37.2%	67.4%	83.4%	84.1%	82.0%	69.3%	22.1%
1/1/2017	37.9%	67.5%	83.9%	84.0%	82.3%	69.6%	22.2%
2/1/2017	37.7%	68.3%	83.9%	83.9%	82.6%	69.6%	22.1%
3/1/2017	38.1%	69.1%	83.9%	84.1%	82.8%	69.7%	22.0%
4/1/2017	37.7%	69.4%	84.0%	83.9%	83.1%	69.9%	21.9%

Date	Age 16-19	Age 20-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65+
5/1/2017	37.6%	69.7%	83.8%	84.0%	83.4%	70.1%	22.1%
6/1/2017	37.3%	69.8%	83.7%	84.1%	83.6%	70.1%	22.2%
7/1/2017	36.6%	70.2%	83.6%	84.0%	83.8%	70.2%	22.3%
8/1/2017	36.3%	69.6%	83.7%	84.1%	84.1%	70.6%	22.4%
9/1/2017	36.3%	69.6%	83.7%	84.0%	84.1%	70.9%	22.5%
10/1/2017	35.6%	69.3%	83.7%	84.3%	83.9%	71.1%	22.8%
11/1/2017	35.0%	69.1%	83.9%	84.8%	83.9%	71.3%	22.8%
12/1/2017	34.7%	68.7%	83.9%	85.1%	84.1%	71.5%	22.9%
1/1/2018	34.7%	69.2%	83.7%	85.4%	83.8%	71.3%	22.8%
2/1/2018	34.3%	69.1%	84.1%	85.6%	83.6%	71.5%	22.3%
3/1/2018	33.6%	69.3%	84.6%	85.2%	83.6%	71.8%	22.1%
4/1/2018	34.0%	69.8%	84.7%	84.9%	83.5%	72.1%	22.1%
5/1/2018	33.7%	70.0%	85.0%	84.6%	83.7%	72.5%	22.2%
6/1/2018	34.0%	70.3%	85.1%	84.5%	83.7%	72.5%	22.7%
7/1/2018	33.9%	70.9%	85.1%	84.6%	83.7%	72.4%	23.0%
8/1/2018	33.2%	70.7%	85.4%	84.8%	83.6%	72.3%	23.2%
9/1/2018	33.0%	70.3%	85.6%	85.3%	83.7%	72.3%	23.8%
10/1/2018	33.3%	70.4%	85.9%	85.7%	84.0%	72.5%	23.8%
11/1/2018	34.1%	70.6%	85.9%	85.8%	84.1%	72.6%	23.8%
12/1/2018	34.8%	71.0%	86.0%	85.8%	84.1%	72.8%	24.2%
1/1/2019	35.4%	71.4%	86.1%	85.6%	84.3%	72.9%	24.7%
2/1/2019	35.7%	71.4%	86.1%	85.6%	84.4%	72.8%	25.3%
3/1/2019	36.4%	71.8%	86.2%	85.5%	84.7%	72.5%	25.6%
4/1/2019	35.8%	71.8%	86.4%	85.3%	84.9%	72.2%	25.8%
5/1/2019	35.9%	72.2%	86.3%	85.2%	84.7%	71.8%	26.0%
6/1/2019	35.7%	71.9%	86.3%	85.0%	84.7%	71.8%	26.0%
7/1/2019	36.3%	71.3%	86.0%	84.6%	84.4%	71.8%	26.0%
8/1/2019	36.0%	71.7%	86.1%	84.4%	84.5%	71.7%	26.0%
9/1/2019	36.6%	71.7%	86.0%	84.0%	84.2%	71.8%	26.0%
10/1/2019	37.2%	72.5%	85.8%	83.7%	83.9%	71.8%	26.1%
11/1/2019	37.7%	72.8%	85.8%	83.6%	83.8%	71.8%	26.2%

Date	Age 16-19	Age 20-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65+
12/1/2019	38.0%	73.4%	85.9%	83.8%	83.7%	71.7%	26.2%
1/1/2020	37.6%	73.4%	85.8%	84.2%	83.9%	71.7%	25.8%
2/1/2020	38.5%	73.3%	85.9%	84.4%	83.9%	71.9%	25.6%
3/1/2020	38.0%	72.1%	85.8%	84.6%	83.8%	72.2%	25.6%
4/1/2020	37.1%	70.4%	85.2%	84.5%	83.2%	72.2%	25.5%
5/1/2020	36.7%	68.9%	85.0%	84.5%	83.3%	72.0%	25.3%
6/1/2020	36.8%	68.8%	84.8%	84.4%	83.5%	71.9%	24.9%
7/1/2020	36.8%	67.9%	84.7%	84.6%	83.8%	71.7%	24.5%
8/1/2020	37.1%	66.1%	84.3%	84.6%	83.6%	71.5%	24.1%
9/1/2020	37.6%	66.1%	84.2%	84.6%	83.6%	71.4%	23.9%
10/1/2020	36.9%	64.9%	84.1%	84.7%	83.5%	71.3%	23.7%
11/1/2020	36.4%	64.1%	84.1%	84.5%	83.0%	71.0%	23.7%
12/1/2020	35.5%	63.1%	83.8%	84.3%	83.1%	70.7%	23.6%
1/1/2021	35.5%	62.8%	83.1%	84.3%	82.6%	70.1%	23.7%
2/1/2021	34.7%	63.0%	82.8%	84.3%	82.4%	69.7%	23.5%
3/1/2021	33.9%	64.0%	82.8%	84.3%	82.3%	69.2%	23.2%
4/1/2021	35.6%	65.4%	83.2%	84.8%	82.8%	69.3%	23.1%
5/1/2021	36.2%	66.1%	83.7%	84.8%	82.9%	69.7%	22.9%
6/1/2021	36.8%	65.7%	84.2%	84.7%	82.6%	69.8%	23.1%
7/1/2021	36.7%	66.3%	84.5%	85.0%	82.5%	69.9%	23.1%
8/1/2021	37.3%	67.0%	84.8%	85.2%	82.7%	70.0%	23.2%
9/1/2021	37.3%	67.2%	84.8%	85.1%	83.2%	69.8%	22.9%
10/1/2021	37.3%	68.1%	84.8%	85.3%	83.5%	69.9%	22.7%
11/1/2021	37.1%	69.2%	85.0%	85.6%	84.3%	70.1%	22.3%
12/1/2021	37.7%	69.5%	85.1%	85.7%	84.6%	70.2%	22.0%
1/1/2022	37.4%	68.9%	85.2%	85.6%	85.1%	70.5%	21.9%
2/1/2022	37.3%	68.0%	85.0%	85.6%	85.4%	70.9%	22.1%
3/1/2022	38.2%	67.3%	84.9%	85.9%	85.5%	71.1%	22.4%
4/1/2022	38.0%	66.3%	84.8%	85.9%	85.5%	71.1%	22.6%
5/1/2022	38.1%	65.9%	84.7%	86.0%	85.4%	71.1%	22.6%
6/1/2022	38.2%	66.1%	84.8%	85.9%	85.6%	70.9%	22.6%

Date	Age 16-19	Age 20-24	Age 25-34	Age 35-44	Age 45-54	Age 55-64	Age 65+
7/1/2022	37.8%	65.4%	84.8%	85.7%	85.5%	70.9%	22.8%
8/1/2022	37.9%	65.5%	84.7%	85.5%	85.5%	70.9%	23.0%
9/1/2022	37.3%	65.6%	84.8%	85.3%	85.4%	70.9%	23.0%
10/1/2022	37.4%	65.6%	84.8%	85.1%	85.5%	71.0%	23.3%
11/1/2022	37.0%	65.0%	84.7%	85.2%	85.4%	71.0%	23.5%
12/1/2022	36.5%	65.0%	84.6%	85.4%	85.1%	71.2%	23.7%
1/1/2023	37.0%	65.6%	85.0%	85.6%	85.0%	71.4%	23.8%
2/1/2023	37.2%	66.8%	85.1%	85.6%	84.8%	71.5%	23.6%
3/1/2023	36.3%	66.7%	85.1%	85.4%	84.7%	72.0%	23.3%
4/1/2023	36.2%	66.8%	85.4%	85.6%	84.9%	72.1%	22.9%
5/1/2023	36.2%	66.6%	85.1%	85.9%	84.8%	72.2%	22.9%
6/1/2023	35.8%	66.6%	84.9%	86.3%	84.7%	72.2%	22.7%
7/1/2023	35.9%	66.7%	84.8%	86.5%	84.8%	72.3%	22.5%

Source: Current Population Survey. 12-month average.

Figure 10: Age 25-54 Employment to Population Ratio by Race & Ethnicity in Massachusetts

Date	Black	Hispanic	White	All other groups
1/1/2015	74.8%	69.0%	82.4%	78.2%
2/1/2015	74.7%	69.1%	82.6%	78.0%
3/1/2015	75.2%	69.5%	82.7%	78.2%
4/1/2015	75.3%	69.5%	82.9%	78.1%
5/1/2015	75.7%	68.6%	83.1%	77.6%
6/1/2015	76.6%	68.1%	83.2%	77.1%
7/1/2015	76.4%	68.0%	83.2%	76.6%
8/1/2015	76.3%	67.5%	83.2%	76.0%
9/1/2015	76.3%	67.2%	83.0%	75.0%
10/1/2015	76.3%	67.4%	83.0%	74.4%
11/1/2015	75.8%	67.7%	83.0%	73.7%
12/1/2015	74.8%	68.3%	83.0%	72.4%
1/1/2016	75.0%	68.8%	82.9%	71.8%
2/1/2016	75.6%	68.8%	82.6%	71.4%
3/1/2016	76.3%	68.8%	82.4%	70.1%
4/1/2016	77.0%	69.0%	82.4%	69.9%
5/1/2016	77.2%	69.5%	82.3%	70.0%
6/1/2016	77.1%	70.1%	82.3%	70.1%
7/1/2016	77.9%	71.1%	82.3%	71.2%
8/1/2016	77.8%	72.0%	82.3%	71.3%
9/1/2016	78.0%	73.2%	82.5%	71.9%
10/1/2016	78.0%	73.4%	82.6%	72.4%
11/1/2016	78.5%	73.1%	82.7%	72.8%
12/1/2016	78.8%	73.1%	82.8%	73.3%
1/1/2017	78.7%	73.6%	83.0%	73.8%
2/1/2017	78.5%	73.5%	83.3%	73.6%
3/1/2017	78.6%	73.1%	83.7%	73.6%
4/1/2017	78.5%	72.6%	83.8%	73.7%

Date	Black	Hispanic	White	All other groups
5/1/2017	78.3%	72.5%	83.8%	73.7%
6/1/2017	78.2%	73.4%	83.8%	73.9%
7/1/2017	78.4%	73.5%	83.8%	73.6%
8/1/2017	79.1%	73.7%	83.8%	74.7%
9/1/2017	79.7%	73.2%	83.7%	75.4%
10/1/2017	80.2%	72.7%	83.7%	75.4%
11/1/2017	80.2%	73.0%	83.8%	75.7%
12/1/2017	80.5%	72.9%	84.0%	75.9%
1/1/2018	80.1%	72.8%	84.1%	75.9%
2/1/2018	80.3%	72.9%	84.2%	75.8%
3/1/2018	80.4%	73.0%	84.1%	76.7%
4/1/2018	80.6%	73.1%	84.0%	76.9%
5/1/2018	81.0%	73.2%	84.0%	77.6%
6/1/2018	80.8%	73.3%	84.0%	77.4%
7/1/2018	80.7%	73.8%	84.1%	77.3%
8/1/2018	80.3%	74.3%	84.2%	77.0%
9/1/2018	80.3%	74.7%	84.6%	77.1%
10/1/2018	80.7%	75.6%	84.8%	77.7%
11/1/2018	80.8%	76.7%	84.8%	77.7%
12/1/2018	80.9%	77.5%	84.7%	78.0%
1/1/2019	81.7%	77.6%	84.6%	78.4%
2/1/2019	81.6%	78.0%	84.7%	79.1%
3/1/2019	81.6%	78.3%	84.7%	80.0%
4/1/2019	81.2%	79.1%	84.8%	80.5%
5/1/2019	80.5%	79.5%	84.8%	80.5%
6/1/2019	80.3%	79.0%	84.8%	80.5%
7/1/2019	80.2%	78.2%	84.8%	79.7%
8/1/2019	80.5%	77.9%	84.7%	79.8%
9/1/2019	80.3%	77.9%	84.5%	78.7%
10/1/2019	80.4%	78.4%	84.2%	78.0%
11/1/2019	81.3%	78.6%	84.0%	78.4%

Date	Black	Hispanic	White	All other groups
12/1/2019	81.8%	78.7%	84.0%	78.7%
1/1/2020	82.0%	79.2%	84.0%	78.9%
2/1/2020	82.5%	79.2%	84.0%	79.1%
3/1/2020	82.3%	79.2%	84.1%	78.5%
4/1/2020	81.8%	76.4%	83.3%	76.9%
5/1/2020	81.0%	74.9%	82.7%	75.6%
6/1/2020	80.1%	73.0%	82.1%	75.0%
7/1/2020	79.4%	72.2%	81.5%	74.9%
8/1/2020	78.5%	71.2%	80.9%	74.4%
9/1/2020	77.8%	70.5%	80.6%	73.9%
10/1/2020	76.4%	69.8%	80.4%	73.6%
11/1/2020	74.7%	68.6%	80.1%	73.9%
12/1/2020	74.1%	67.9%	79.8%	73.6%
1/1/2021	73.3%	66.0%	79.5%	73.7%
2/1/2021	72.1%	64.7%	79.2%	74.2%
3/1/2021	71.2%	64.1%	79.1%	74.6%
4/1/2021	71.4%	66.0%	80.0%	75.7%
5/1/2021	72.0%	67.4%	80.8%	76.8%
6/1/2021	72.5%	69.0%	81.3%	77.4%
7/1/2021	72.0%	70.0%	81.8%	78.2%
8/1/2021	71.9%	70.7%	82.2%	79.1%
9/1/2021	72.3%	71.1%	82.5%	79.7%
10/1/2021	72.8%	71.2%	82.7%	80.2%
11/1/2021	73.8%	71.8%	83.4%	80.1%
12/1/2021	72.9%	72.2%	83.7%	80.6%
1/1/2022	72.9%	73.4%	83.8%	81.3%
2/1/2022	73.5%	74.5%	84.0%	81.0%
3/1/2022	74.2%	75.1%	84.1%	80.7%
4/1/2022	74.5%	75.7%	84.3%	80.2%
5/1/2022	74.8%	75.9%	84.4%	79.7%
6/1/2022	75.1%	76.4%	84.7%	79.4%

Date	Black	Hispanic	White	All other groups
7/1/2022	76.1%	76.1%	85.1%	78.9%
8/1/2022	77.4%	75.1%	85.4%	78.7%
9/1/2022	78.1%	74.8%	85.4%	78.7%
10/1/2022	78.5%	75.1%	85.6%	78.4%
11/1/2022	78.9%	75.0%	85.6%	77.7%
12/1/2022	80.2%	74.7%	85.5%	77.0%
1/1/2023	81.1%	74.7%	85.8%	76.2%
2/1/2023	81.6%	74.5%	85.9%	75.3%
3/1/2023	82.1%	74.7%	85.8%	75.2%
4/1/2023	82.7%	74.8%	85.9%	76.0%
5/1/2023	83.3%	75.0%	85.7%	76.8%
6/1/2023	84.0%	75.3%	85.4%	77.8%
7/1/2023	84.8%	76.0%	85.1%	78.5%
8/1/2023	84.4%	76.6%	85.0%	78.3%

Source: Current Population Survey. 12-month average.

Figure 11. Share of workers working from home by occupation in Massachusetts in 2021

Occupation	Share of workers working from home with a disability	Share of workers working from home without a disability
Computer & Math Occupations	45.3%	53.1%
Life, Physical, and Social Science Occupation	30.9%	26.9%
Business and Financial Occupations	25.5%	43.1%
Architecture & Engineering Occupations	22.9%	27.8%
Legal Occupations	22.3%	36.4%
Arts, Design, Entertainment, Sports, and Media Occupations	18.1%	30.1%
Management Occupations	15.4%	30.9%
Healthcare Practitioners and Technical Occupations	12.1%	9.8%
Educational Instruction, and Library Occupations	11.4%	15.4%
Office and Admin Support Occupations	10.5%	18.4%

Source: 2021 1-year American Community Survey Public Use Microdata Sample (PUMS)

Figure 12: Share of employment in jobs requiring a higher education in Massachusetts in 2019

Race or Ethnicity	Share of workers in jobs that typically require a post-secondary degree in 2019
American Indian or Alaska Native	28.7%
Asian	59.3%
Black or African American	35.8%
Hispanic or Latino	27.9%
Native Hawaiian or Other Pacific Islander	29.1%
Two or More Races	41.0%
White	46.8%

Source: DER calculations of Lightcast data

Figure 13: Change in average hourly earnings by educational requirement from 2019 to 2021 in Massachusetts

Typical level of education required	Percent change in average hourly earnings from 2019 to 2021
Associate's degree or nondegree award	5.6%
Bachelor's degree or higher	7.3%
High school diploma or equivalent	6.5%
No formal educational credential	9.7%
Some college, no degree	8.7%

Source: DER calculation of Lightcast data

Figure 14: Occupations with the most project job openings from 2022 to 2024 in Massachusetts

Occupation	Annual Openings
Fast Food and Counter Workers	21958
Home Health and Personal Care Aides	21382
General and Operations Managers	11235
Waiters and Waitresses	9674
Cashiers	9168
Customer Service Representatives	7974
Retail Salespersons	6971
Office Clerks, General	6967
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	6749
Cooks, Restaurant	6524

Source: Department of Economic Research Short Term Occupational Employment Projections

Figure 15: Decomposition of job openings for occupations with the most project job openings from 2022 to 2024 in Massachusetts

Occupation	Annual Exits	Annual Transfers	Annual Growth
Fast Food and Counter Workers	10236	10170	1552
Home Health and Personal Care Aides	9698	8378	3306
General and Operations Managers	2729	7568	938
Waiters and Waitresses	3756	5244	674
Cashiers	4908	4730	-470
Customer Service Representatives	3192	4946	-164
Retail Salespersons	3318	4183	-530
Office Clerks, General	3651	3642	-326
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	3576	3614	-441
Cooks, Restaurant	2317	2835	1372

Source: Department of Economic Research Short Term Occupational Employment Projections

Figure 16: Occupations with the most projected annual job growth from 2022 to 2024 in Massachusetts

Occupation	Annual Growth
Home Health and Personal Care Aides	3306
Fast Food and Counter Workers	1552
Cooks, Restaurant	1372
General and Operations Managers	938
Management Analysts	686
Waiters and Waitresses	674
Software Developers	544
Heavy and Tractor-Trailer Truck Drivers	542
Light Truck Drivers	514
Medical and Health Services Managers	468

Source: Department of Economic Research Short Term Occupational Employment Projections

Figure 17: Occupations that typically require a bachelor's degree with the most projected annual job openings from 2022 to 2024 in Massachusetts

Occupation	Annual Job Openings
General and Operations Managers	11235
Registered Nurses	5340
Software Developers	4264
Accountants and Auditors	4124
Management Analysts	3970
Financial Managers	2927
Market Research Analysts and Marketing Specialists	2576
Project Management Specialists	2301
Human Resources Specialists	2113
Medical and Health Services Managers	2012

Source: Department of Economic Research Short Term Occupational Employment Projections