The State of the Massachusetts Tech Economy

2023
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Report Written by Rachel Sederberg, Ph.D. and Jade Nguyen, Ph.D.  
Report Designed by Laurel Gieszelmann
Executive Summary

The Commonwealth of Massachusetts has a rich history in technology, stemming from a legacy of innovation that spans from the industrial revolution to the many tech advances over the past 5 decades. Notable contributions to the tech landscape include pioneers like Digital Equipment Corporation in the early computer industry, Lotus Development Corporation, and Akamai Technologies during the personal computer and dot-com eras. Presently, Massachusetts continues to be a hub for technological advancements, with companies leading the way in robotics, CRM software, wearable devices, fintech, AI, IoT, and various other cutting-edge fields. However, there are trends that show reasons for concern within the tech sector\textsuperscript{1}, issues such as an increasing number of tech workers leaving the Commonwealth, and gender and race disparity increasing in recent years.
KEY FINDINGS:

The tech industry in Massachusetts has experienced a decrease in diversity and an increase in competitiveness.

The tech sector accounts for 17% of Massachusetts’ GDP.

A notable number of tech workers exited the Commonwealth, resulting in a net migration of approximately -2,000 tech professionals in 2022 – this equates to a loss of approximately 90 million dollars that would otherwise flow back into the economy through the discretionary spending of those workers.

Of the workers who leave Massachusetts for other states, 76.3 percent are between the ages of 20 and 40, likely exacerbating the challenge of having a more diverse workforce.

This report serves to give a look into the tech sector within the Commonwealth of Massachusetts in 2022, to understand the breadth and depth of the industry, as well as understand the dynamics of the labor market and its impact on the broader economy.

In Massachusetts in 2022, we find that the top firms hiring tech workers range from computer software providers to biotech firms, and from utility providers to electronic shopping and professional services.

1 We follow CompTIA’s definition of the tech workforce throughout this report: Tech workforce = All roles in tech industries + Technical roles in non-tech industries

Top 10 Tech Employers in 2022, Excluding Staffing Firms

<table>
<thead>
<tr>
<th>Employer</th>
<th>Number of Job Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderna Therapeutics</td>
<td>4500</td>
</tr>
<tr>
<td>Raytheon Technologies</td>
<td>3000</td>
</tr>
<tr>
<td>Dell Technologies</td>
<td>3000</td>
</tr>
<tr>
<td>Dana-Farber Cancer Institute</td>
<td>2500</td>
</tr>
<tr>
<td>Thermo Fisher Scientific</td>
<td>2500</td>
</tr>
<tr>
<td>Amazon</td>
<td>2000</td>
</tr>
<tr>
<td>National Grid</td>
<td>1500</td>
</tr>
<tr>
<td>Verizon Communications</td>
<td>1000</td>
</tr>
<tr>
<td>Accenture</td>
<td>1000</td>
</tr>
<tr>
<td>Waters</td>
<td>1000</td>
</tr>
</tbody>
</table>

Source: Lightcast
This report on the Massachusetts Tech Economy is authored by Lightcast and sponsored by the Mass Technology Leadership Council. Its purpose is to analyze the dynamics of the tech workforce and assess the broader economic impact of tech workers on the Commonwealth of Massachusetts.

ABOUT MASS TECHNOLOGY LEADERSHIP COUNCIL

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SECTION ONE

Size of the MA Tech Economy
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In order to understand the importance of the Tech economy in Massachusetts, we need to start by understanding the size and composition of it.

1. Employment and job openings exceed pre-Covid levels, and Tech workers account for 14 percent of the workforce, as compared to 10 percent nationally.

2. Tech industries have expanded, while technical roles outside of the Tech sector have contracted.

3. Increased hiring post Covid for non-technical roles in Tech and IT occupations, as well as for engineers.

4. Top employers feature biotech, aerospace, ecommerce, computer software, telecommunications, and IT services.

Employment and job openings exceed pre-Covid levels

Since 2018, tech employment in Massachusetts has consistently grown by an average of 2.4% per year. While the state’s tech employment aligns closely with the national index, the year 2020 presented a distinctive scenario for Massachusetts compared to the rest of the nation. Tech job openings exhibit a similar trend in both Massachusetts and the national landscape, showing a robust upward trajectory in recent times. Putting a finer point on the significant size of the Massachusetts tech sector – approximately 505,000 workers are in the tech sector as of 2020, equating to 13 percent of the total workforce.
After the Covid-19 pandemic, we observed a significant uptick in hiring, not only for non-technical positions within the tech industry but also for roles in IT and Engineering. Likely influenced by the nature of work in the Bay State, these four categories collectively contribute more than 220,000 job postings to the Commonwealth's economy in 2022.

When analyzing the types of workers sought after by the leading companies in the Commonwealth, it becomes evident that there is a pronounced reliance on tech workers spanning various industries. This underscores the expanding depth and breadth of Massachusetts' tech economy. In 2022, the company with the highest demand for tech workers was Moderna Therapeutics, a biotechnology firm, with Raytheon Technologies and Dell Technologies securing the second and third positions, respectively.

Massachusetts' tech workforce growth is modest compared to many other tech hubs within the nation. Over the last five years, Massachusetts has seen a growth rate of nearly 15 percent resulting in a gain of 64,000 workers. In comparison, California had a 5-year growth rate of approximately 15 percent, Texas surpassed 27 percent, and Illinois reached 7 percent.

The share of tech workers employed in the Massachusetts labor force is significant – to the tune of 14 percent. This is both higher than the national average, and higher than similar tech forward states, underscoring the importance of the Tech sector in the Massachusetts economy.
Massachusetts' tech workforce as a share of all employed is significantly above the national level, and leads tech hubs as well.

Similarly, we can examine the share of job postings that come from the tech sector in a given state. In 2022, Massachusetts and California led tech hubs in this metric, and far outpaced the national average. This serves to underscore the importance of tech jobs in the Commonwealth's economy.

Source: Lightcast, 2023
The Changing Demographics of Tech in Massachusetts
The Changing Demographics of Tech in Massachusetts

Tech has become less diverse and more competitive in the Commonwealth of Massachusetts in recent years across multiple measures.

1. Workers in Tech are predominantly male and white
2. White males have recently experienced a gain in dominance within Tech
3. Tech tends to gravitate towards more educated workers than the economy writ large

The typical tech worker in Massachusetts is a white male.

The gender distribution in the Massachusetts tech sector is far from parity, with males constituting 70 percent of the workforce. Over the past five years, the gender imbalance in tech has become more pronounced, with male representation increasing by 16 percentage points, or about 50,000 workers, compared to a 10-percentage-point, or 13,400 workers, increase for female workers in the sector since 2018.

Looking at the breakdown of employed workers in the tech sector in Massachusetts, we can see that there is striking similarity in the educational distribution of workers. This stands in stark contrast to the non-parity in so many other measures of the workforce.
Educational attainment distribution shows little difference between males and females in the Massachusetts Tech

Exempting the racial breakdown of male and female tech workers in Massachusetts, we find that gender parity, or something therabouts, is only occurring amongst the American Indian/Aleut/Eskimo and multi-racial groups of tech workers; groups that are incredibly small in number in the Commonwealth. What this suggests is that it is not because of disparities in educational attainment levels that the tech workforce has a lack of gender balance. There are, instead, likely other factors in play, such as field of study, family dynamics and work demands, work culture aspects, and other factors that are driving the gender imbalance we see in the data.

Source: IPUMS Current Population Survey
The tech sector in Massachusetts is somewhat more diverse, yet it remains predominantly white, with over 75 percent of the workforce identifying as such, as compared to the 79 percent measure for the Commonwealth as a whole. However, the Tech sector has become significantly less diverse racially as of late.

This all said, the lack of gender parity is not something unique to Massachusetts. In fact, many similar tech hubs, as well as the nation as a whole face similar challenges.

Massachusetts is similar to other tech hubs with respect to severe gender imbalance in the tech workforce.
Most Tech jobs require a Bachelor's degree or higher, however, we are seeing an ever so slight push in recent years towards companies showing openness to employing workers who have less than a four year degree. However, that initial openness is offset by the need for at least a four year degree to remain competitive within the sector. Less than ten percent of tech jobs state that a Masters degree is required, however, over 30 percent of workers in the sector possess the degree. We also find that of all educational groups, those who fared the worst since the covid pandemic with respect to job loss were the workers who had less than a four year degree.
In the Massachusetts Tech sector, those who thrive the most are typically white, male, and highly educated individuals.

If we look at the comparison of tech job openings to recent graduates in mathematics and computer science, we find that those with Associates, Bachelor's and Masters degrees are likely to fare the best on the job market in the Commonwealth. That said, there are wide variations in the number of graduates who are in each group. For example, there are only about 585 new graduates with an Associates degree in 2022, as opposed to over 6,300 with a Bachelor’s degree.

**Job Postings to New Graduates Ratio**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Postings</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate</td>
<td>585</td>
<td>14:1</td>
</tr>
<tr>
<td>Bachelors</td>
<td>6,307</td>
<td>18:1</td>
</tr>
<tr>
<td>Masters</td>
<td>4,414</td>
<td>2:1</td>
</tr>
<tr>
<td>PHD</td>
<td>298</td>
<td>12:1</td>
</tr>
</tbody>
</table>

Source: Lightcast, IPEDS (number of degrees conferred in Mathematics and Computer Science)
SECTION THREE

The Economic Impacts of the Tech sector in Massachusetts
The Economic Impacts of the Tech sector in Massachusetts

Tech in Massachusetts contributes positively to both the livelihood of its workforce and to the economy as a whole. This can be measured as contributions to GDP, salary differentials as compared to other sectors, and through stability.

1. Tech makes a substantial contribution to the Commonwealth's GDP
2. Tech jobs offer higher salaries than non-tech jobs
3. Salaries in tech are substantial enough that they proved to better insulate workers from the economic impact of Covid-19

83% Non-tech, 17% Tech
86% Non-tech, 14% Tech

Tech workers, constituting 14 percent of Massachusetts’ overall workforce, contribute a noteworthy 17 percent to the Commonwealth's GDP. When comparing the GDP per capita contributions of tech workers to non-tech workers, the ratio reveals a substantial difference, with tech workers contributing 25 percent more. This gap holds significance not only in terms of policy considerations but also in assessing the standard of living. The undeniable importance of the tech sector in the Massachusetts economy underscores the need for attention and continued active support.

Source: Economic Census, FRED, and IPUMS Current Population Survey
Tech jobs offer a much higher salary than non-tech jobs in Massachusetts. Tech roles, on average, command a salary just north of $100,000, while non-tech jobs command far less, averaging about $65,900.

With a higher salary, comes higher discretionary income, a higher standard of living, and likely better financial stability to weather storms such as the Covid-19 pandemic.

Average salary for tech workers outpaces non-tech workers and far exceeds the cost of living.


Massachusetts, being a high-cost-of-living state with elevated housing and transportation expenses, presents a considerable financial challenge. By comparing data from the MIT Living Wage Calculator and the Current Population Survey, we estimate the overall cost of living to be just over $55,000 annually for the average household. In 2022, the average non-tech worker is left with a little more than $9,000 for discretionary spending after covering all necessities. In contrast, a tech worker enjoys over $45,000 in discretionary income. This substantial difference underscores not only the stability of the tech industry but also the significant financial capacity of tech workers for spending or savings within the Commonwealth. Looking over the past five years, we see that the discretionary spending abilities of non-tech workers has dropped nearly 10 percent, while for tech workers there has been an almost 2 percent increase.

When comparing Massachusetts salaries to the national average and to other tech hub states, we find that there is comparability – the Commonwealth only pays $6,000 more than the national average, and the figure is in line with the likes of New York, Washington state, and California. This reiterates the impetus of incentivizing workers to remain in the Commonwealth; base salaries in other tech hubs, as well as nationally, are not that much different from what is found in Massachusetts, and the benefits of having tech workers in the economy of Massachusetts is significant.
Average salary for tech workers in Massachusetts is in line with that of other tech hubs.

Source: Lightcast

Tech sector salaries have been increasing across tech hubs and the nation, however, Massachusetts lags behind at a 7 percent year over year growth from 2021 to 2022. This lower growth would give reason for workers to look elsewhere for employment – to areas where salary growth is even more robust.

Year over year salary for tech workers in Massachusetts is meager compared to other tech hubs and the national average, dampening the competitiveness of the Commonwealth.

Source: Lightcast
SECTION FOUR

Migration of Tech Workers: Is Massachusetts winning or losing?
Migration of Tech Workers: Is Massachusetts winning or losing?

When it comes to talent, there is reason to be concerned that talented workers are leaving the Bay State for other locales. Between a global pandemic, a very tight labor market, and a high cost of living, there is a lot going on in the Commonwealth's tech labor market over and above the usual things.

In the broader context, tech workers often relocate from established tech hubs, and prominent tech firms are progressively hiring employees outside the state where their headquarters are located. This trend contributes to a less centralized workforce, reflecting shifts in the overall landscape of talent mobility within the tech industry, and the economy writ large.

1. Tech workers are more likely to move across state lines and reside within metro areas
2. Most tech hubs experience a net outflow of workers
3. Big tech firms are increasingly hiring outside of their headquarter location

Source: IPUMS Current Population Survey
In recent years, there has been considerable discussion about workers shifting away from city centers to suburbs or rural areas. However, tech workers are somewhat diverging from this trend. While they are open to relocation, they often opt for another city or metropolitan area. On the contrary, non-tech workers tend to move farther away from city centers. While this trend may reflect something about the working arrangements of tech firms, it likely speaks more to the preferences and tastes of tech households. Despite the broader trend of people leaving metropolitan areas, tech workers have not followed suit.

Except for CA, tech hubs experience a net outflow of tech workers

Interstate migration patterns of tech workers in 2022 show that all major tech hubs, save for California, experienced net negative migration. Massachusetts loses many workers to California, Illinois, and others in smaller amounts, but at the same time gains workers from the likes of California, Florida, and Illinois. In the end, Massachusetts experienced net migration of about -2,000 workers, a loss similar to Illinois (-4,000) and much better than Texas (-12,000).
As a decentralized work environment becomes more and more common. We have seen a strong increase in the biggest tech companies hiring across the country. Looking at the likes of Apple, Alphabet (Google), Amazon, Meta, Microsoft, Nvidia, and Tesla, we find that the percentage of job postings in the top 10 states for tech has changed drastically in the last 5 years.

Big Tech is embracing a decentralized work environment

Five year change in job posting concentration by Big Tech companies, top 10 states in 2018 posting concentration

Source: Lightcast

Massachusetts tech outmigration by age, 2022

Looking at migration patterns by age, we see that workers who migrate tend to be younger. Over three quarters of those who leave the state are in their 20s or 30s. This is significant because they are in the prime of their working years, and likely have significant wage growth potential, which translates into higher tax contributions and spending within the state.

Source: IPUMS Current Population Survey
Taking an even closer look at those who are likely recent graduates in their mid 20’s to late 30’s, and comparing the outmigration levels from states with significant tech workforce movement, it becomes evident that a significant number of young Massachusetts residents between the ages of 25-39 are heading to California. However, that is partially offset by the in-migration of workers in the same age group from California to Massachusetts. Some of this is due to the increased mobility of younger workers who may not have put down the deepest of roots just yet, but some is going to be due to the lure of lucrative offers and differentiated conditions between states.

Younger workers are highly mobile, and moving across state lines in significant numbers

<table>
<thead>
<tr>
<th>SENDING STATES</th>
<th>RECEIVING STATES</th>
<th>NUMBER OF WORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>From CA</td>
<td>To FL</td>
<td>10,479</td>
</tr>
<tr>
<td>From CA</td>
<td>To MA</td>
<td>5,387</td>
</tr>
<tr>
<td>From CA</td>
<td>To NY</td>
<td>4,344</td>
</tr>
<tr>
<td>From CA</td>
<td>To Others</td>
<td>14,534</td>
</tr>
<tr>
<td>From FL</td>
<td>To MA</td>
<td>3,535</td>
</tr>
<tr>
<td>From FL</td>
<td>To Others</td>
<td>6,861</td>
</tr>
<tr>
<td>From FL</td>
<td>To NY</td>
<td>4,848</td>
</tr>
<tr>
<td>From FL</td>
<td>To Others</td>
<td>8,413</td>
</tr>
<tr>
<td>From MA</td>
<td>To CA</td>
<td>10,220</td>
</tr>
<tr>
<td>From MA</td>
<td>To IL</td>
<td>2,815</td>
</tr>
<tr>
<td>From MA</td>
<td>To Others</td>
<td>1,205</td>
</tr>
<tr>
<td>From NY</td>
<td>To Others</td>
<td>23,364</td>
</tr>
<tr>
<td>From TX</td>
<td>To CA</td>
<td>8,068</td>
</tr>
<tr>
<td>From TX</td>
<td>To IL</td>
<td>2,546</td>
</tr>
<tr>
<td>From TX</td>
<td>To Others</td>
<td>25,365</td>
</tr>
</tbody>
</table>

Source: IPUMS Current Population Survey

Examining migration patterns by race and gender, there is yet more evidence that those who are white males are more likely to thrive in the Massachusetts tech sector. Tech migrants from Massachusetts are more likely to be female and non-white. Of those who leave Massachusetts, over 64 percent are female and 62 percent are non-white.
Hiring Trends and Talent Strategy for Tech Employers in Massachusetts
Hiring Trends and Talent Strategy for Tech Employers in Massachusetts

Remote work, once an infrequent anomaly, is now a significant player in the talent acquisition and retention game. In Massachusetts, we find that remote work in Massachusetts bucked a lot of common preconceptions, and offers a viable strategy for firms going forward as the labor market presents new challenges due to demographic changes across the Commonwealth and the country.

1. Tech ramps up remote hiring post-Covid
2. Remote jobs reduce time to fill
3. Remote jobs reduce turnover and increase employment duration
4. Remote jobs ask for more qualified workers and offer higher salaries

Tech has heavily ramped up fully remote jobs since 2018, with jobs offering a remote option increasing sevenfold, and 85 percent of jobs offering a remote option are listed as fully remote.

Share of remote jobs in Tech opening positions in Massachusetts, 2018-2022

Tech ramped up remote hiring post-covid and hasn't looked back

Source: Lightcast, 2023
Remote jobs are advantageous for firms who are looking to reduce the time it takes to fill an open role. Fully remote jobs in the tech sector are 5 days faster than traditional in-office jobs, and 2 days faster than hybrid-remote jobs.

Employers are also keen to figure out ways to keep workers employed for longer periods. In Massachusetts, remote workers tend to stay with their employer for far longer periods of time than their non-remote counterparts.

Remote work in Massachusetts reduces worker turnover, and increases employment duration

![Graph showing share of MA Tech workers staying with the same company, 2018-2022](image1)

![Bar chart showing average number of years that MA Tech workers stay in their current job, Jan 2022](image2)

Source: IPUMS Current Population Survey

Analyzing the employee retention data presented above, a notable decline in workers remaining with their employers is evident from mid-2021 through mid-2022. This dip is likely attributable to two phenomena: the Great Resignation and tech layoffs experienced by certain firms during the winter of 2021-2022.

In terms of employee retention, it is observed that remote workers, on average, stay with their employer for six months longer than their non-remote counterparts.

Remote jobs in the tech sector demand a higher level of qualifications and come with more competitive salaries. Despite common assumptions that remote positions might offer lower compensation due to job flexibility, this is not the case in the Massachusetts tech sector. On average, fully remote jobs provide a salary exceeding the non-remote average by more than $30,000, while hybrid-remote jobs outpace non-remote jobs by over $22,000. Along with this increased compensation and flexibility, employers seek individuals with more valuable and potentially costly-to-hire skills. Furthermore, remote workers are expected to have more experience, requiring an additional five months of relevant work experience compared to their non-remote counterparts.
In Massachusetts, there is strong growth in the tech sector. Looking at the two year growth rates of tech popular states, we find MA in fourth place with respect to growth, outpaced by Pennsylvania, New York, and California.

Employment growth is strongly positive in MA after Covid-19, but still lags behind a few states

Two-year growth of tech workforce in Massachusetts and peer states, 2021-2022

- PA: 0.47M ← number of workers in 2021
- NY: 0.66M
- CA: 2.13M
- MA: 0.46M
- NJ: 0.47M
- NC: 0.46M
- TX: 1.26M
- FL: 0.72M
- VA: 0.54M
- IL: 0.55M

Source: IPUMS Current Population Survey

To keep this growth up, there is a need for creative solutions, and for collective initiatives that include voices from workers, employers, policymakers and educators. These solutions could range from finding ways to incentivise workers to stay in the Commonwealth, incentivise employers to bring or keep more tech sector jobs in the area, expanding non-monetary benefits to make employment in the tech sector more attractive, and many more.
The Massachusetts tech sector is growing. How can we make it grow stronger and faster?
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**WORKERS**

Workers should recognize the high value and broad transferability of their skills across various industries in Massachusetts. As highlighted earlier in this report, tech workers are in demand not only in the traditional information sector but also in diverse fields such as biotechnology and professional services. The opportunities available in Massachusetts, including the potential for a lucrative career, are noteworthy for both newcomers to the workforce and individuals considering a career change. Exploring opportunities within the tech sector can unveil a wide array of possibilities and open doors to a new world of career prospects.

**EMPLOYERS**

As employers face an ever challenging labor market, and ongoing issues as the demographics of the Bay State and the country as a whole changes. Employers should note specifically the positive impacts of remote workers, and should think critically about creating pipelines of talent to stem hiring troubles both now and in the future.

**POLICYMAKERS**

Policymakers would do well to note the strong positive impacts of the tech sector workforce on the broader Massachusetts economy. As measured by the percentage of GDP contributed, a quarter of the Commonwealth's GDP comes from workers in the tech sector. In order to grow GDP, investing in jobs in the tech sector, and in education programs to help fill those jobs and keep them the Commonwealth would be prudent.

**EDUCATORS**

Educators should strategize on how to effectively prepare both traditional and non-traditional students for roles within the ever-evolving tech sector, which consistently demands a shifting set of skills. As educators anticipate the future landscape, collaborating with employers to facilitate opportunities, including internships and full-time employment, can motivate students to engage in programs and set them on a path for long-term success.