

Untapped:

Redefining Hiring in the New Economy

March 2019



Mayor's Office of
**WORKFORCE
DEVELOPMENT**

Acknowledgements

Any report of this scope and magnitude requires the assistance of a variety of organizations and individuals. We gratefully acknowledge the time and effort put forward by the members of the organizations listed below who provided us with helpful guidance about the data and programs covered in this report. We could not have accomplished this work without their insights and knowledge. We hope that this report will be a useful addition to the dialogue about the City's effort to help develop Boston's talent pool to serve the need of both workers and employers. Any errors in the analysis or conclusions are entirely our own.



The Mayor's Office of Workforce Development (OWD) is an innovative public agency that seeks to promote economic self-sufficiency to ensure the full participation of all Boston residents in the city's economic vitality and future, seeking to connect low-income residents with job training and employment opportunities and to promote lifelong literacy and educational pathways. The primary focus of OWD is to enable competitive workforce development initiatives and policies to put Boston's youth and adults on career paths toward economic security. While OWD continues to support adult basic education, ESOL and HiSET-related programs, OWD stresses the importance of collaboration with the city's workforce development and education initiatives, with an overall emphasis on empowering Bostonians to fulfill their educational and employment aspirations .



Burning Glass Technologies delivers job market analytics that empowers employers, workers, and educators to make labor market data-driven decisions. Burning Glass is reshaping how the labor market works, with data that identify the skill gaps that keep job seekers and employers apart and tools that enable both sides to bridge that gap and connect more easily. The company's artificial intelligence technology analyzes hundreds of millions of job postings and real-life career transitions to provide insight into labor market patterns. This real-time strategic intelligence offers crucial insights, such as which jobs are most in demand, the specific skills employers need, and the career directions that offer the highest potential for workers.

Report Team



Northeastern University
*Dukakis Center for Urban
and Regional Policy*

As a “think and do” tank, the Dukakis Center's collaborative research and problem-solving model applies powerful data analysis, multidisciplinary research and evaluation techniques, and a policy-driven perspective to address a wide range of issues facing cities, towns, and suburbs, with a particular emphasis on the greater Boston region. The Dukakis Center conducts interdisciplinary research, in collaboration with civic leaders and scholars both within and beyond Northeastern University, to identify and implement real solutions to the critical challenges facing urban areas throughout Greater Boston, the Commonwealth, and the nation. Founded in 1999 as the Center for Urban and Regional Policy or CURP, the Dukakis Center is equally committed to producing state-of-the-art applied research and to implementing effective policies and practices based on that research. Contributors: Alicia Sasser Modestino and Rachel Sederberg

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Dear Colleagues,

At a time of unpredictability in federal government, the City of Boston is leading the way on breaking down barriers to upward economic mobility. As federal workforce development funding sources continue to shrink, it's critical that we keep building our partnerships with community colleges, community-based organizations, training providers and employers to develop innovative ways to deliver quality job training and education to Bostonians.

.In the Mayor's Offices of Economic Development and Workforce Development, our teams are constantly exploring new ways to position Boston's workers to meet employers' changing needs. We are so fortunate to have the assistance provided by Professor Alicia Sasser Modestino of the Dukakis Center for Urban and Regional Policy in the preparation of the enclosed report, *Untapped: Redefining Hiring in the New Economy*. This report takes our work one step further – laying the groundwork to help employers identify untapped reservoirs of talent in our city and to re-think hiring strategies that meet current labor trends.

As the report describes, many individuals without a traditional college degree either have the necessary skills to thrive in well-paying careers, or can acquire them through non-traditional academic paths. This reality is good news not only for workers who cannot afford the time or expense of traditional four-year college, but also for employers who need skilled workers at a time of historically low unemployment rates. To realize these benefits, we will need to work with community and corporate partners to implement the report recommendations, create targeted new training programs, and continue to problem-solve together.

In his 2019 State of the City address, Mayor Walsh outlined his plan to leverage Boston's prosperity to build a more inclusive and equitable city. A top priority is ensuring Boston's diverse workforce has the skills required to build successful careers and meet the needs of our local businesses. With the technical assistance provided by Professor Modestino and Burning Glass Technologies, we now have additional tools to fine-tune our workforce training and education strategies to meet labor demands.

Sincerely,

Trinh Nguyen
Director, Mayor's Office of Workforce Development

John Barros
Chief, Economic Development



Dear Friends:

I'm proud to say that, in 2019, Boston is thriving. In my recent State of the City address I reported that more people are working than at any time in our City's history; unemployment is 2.4%, the lowest ever recorded; we are ranked #2 in the nation for moving people up and into the middle class; and we've been named the best city in the entire world to find a job. Additionally, in 2016, Massachusetts became the first state where 50% of the workforce holds a four-year college degree.

Yet for all this good news, not all Bostonians are fully benefiting. Businesses can't find workers with the skills they need, and well-paying jobs are going unfilled. That leaves a lot of unanswered questions. Do all these jobs require a four-year college degree? What about the other 50% of residents who don't have one?

The following report, *Untapped: Redefining Hiring in the New Economy*, tackles these questions head-on. Focusing on those workers without a college degree, it closely examines the skills required by employers and determines whether or not a college degree is needed to acquire those skills. It also makes specific recommendations for policy makers, educators and employers to better invest our limited training resources.

Economic inclusion requires the work of many hands, and this report is no exception. Northeastern University's Dukakis Center for Urban and Regional Policy, Burning Glass Technologies, and our own Office of Workforce Development (OWD) came together to undertake the research and problem-solving presented here. I am grateful for their hard work to help all Bostonians, job-seekers and employers alike. And as a City, we're committed to finding new resources and ways to create good jobs and opportunities for all our residents.

Sincerely,

A handwritten signature in black ink that reads "Martin J. Walsh". The signature is fluid and cursive, with the first name "Martin" and last name "Walsh" clearly legible.

Martin J. Walsh
Mayor City of Boston

Executive Summary

In 2016 Massachusetts became the first state where 50 percent of the workforce holds a four-year college degree. In general, states with better educated workforces consistently have stronger economies with robust job growth and high wages compared to states with less well-educated workforces. Yet, this prosperity has not been shared equally across all workers in the Commonwealth, even though the state's economic growth relies on both baccalaureate (BA) and non-baccalaureate (non-BA) workers across most industries and sectors. This disparity is even greater in the Boston-Cambridge-Newton area, recently ranked sixth in income inequality among America's largest metro areas due to widening gaps in incomes across households.

What accounts for this continued growth in inequality across educational groups? There are several factors—some are long-term trends that would be difficult to reverse while others offer more opportunity for policy to address. For example, structural forces such as changes in technology and global competition have automated or outsourced high-paying middle-skill jobs in manufacturing and production that are unlikely to return. Yet other jobs that previously required only a high school degree are now accessible only to four-year college graduates—a trend that has become known as “upskilling” or “upcredentialing.” One implication of this upskilling trend is that many middle-skill career pathways are becoming closed off to those without a bachelor's degree – a group that still comprises nearly 60 percent of the workforce in Boston.

Using proprietary individual-level detailed data from worker resumes and online job postings, this report goes beyond previous analyses of educational degrees to explore the actual skills of non-BA workers in Greater Boston and how they match up with those demanded by employers. These include baseline skills (e.g. project management), specialized skills (e.g. information security), and software skills (e.g. Oracle)

among others. We compare the supply of these skills among workers of different education levels to those demanded by employers when posting a job to answer the following research questions:

- How does the distribution of skills among non-BA workers compare to that of workers with a bachelors' degree?
- What types of skills are required for jobs that typically require a four-year college degree versus those that do not?
- How do the skillsets of non-BA workers compare to those demanded by middle-skill occupations that have experienced upcredentialing?
- What policies can foster skill development among non-BA workers to ensure that they possess qualifications that are relevant to employers?

Knowing the types of skills required by employers in middle-skill occupations that have experienced upcredentialing can help city and state leaders make better training investments to signal proficiency and guarantee employability among Boston residents without a BA. Understanding how non-BA workers fit into the Boston workforce can also help employers looking to fill middle-skill vacancies in high-demand sectors of the economy. Finally, highlighting how actual skill requirements have changed within occupations that are increasingly asking for a four-year college degree can help identify where the bar has moved for non-BA workers to qualify for those jobs, particularly individuals with an associate degree. All of these solutions require detailed knowledge of the skillsets that are currently in demand and how to better align the skills of non-BA workers to match up. We summarize our main findings below:

- Boston's labor force growth will depend on both BA and non-BA workers, many of whom are immigrants. Boston's labor force growth has been robust compared to the U.S. for the past several years, in part due to a greater reliance on immigrants. Yet population projections indicate

that a wave of Baby Boomer retirements and a weak inflow of younger workers could reverse this trend. As a result, it is more important than ever to ensure that each worker has the right mix of skills and is matched to a job that best suits his or her potential. Not doing so means more mismatch in the labor market which leads to lower productivity, slower economic growth, and sluggish wage increases.

- Non-BA workers are a much more diverse group than those with a BA. This likely comes as no surprise given that access to postsecondary training and educational attainment remains unequal with many low-income students facing barriers to college access and success. Black, Hispanic and Asian residents are all over-represented in the working-age population with less than a bachelor's degree. Upwards of 20 percent of non-BA working-age individuals are naturalized citizens and another 20 percent are not U.S. citizens.
- Non-BA workers have less favorable labor market outcomes and much greater rates of household poverty. Working-age individuals without a BA are two to three times less likely to be in the labor force, twice as likely to work part-time, and have a mean annual income that is 30 to 70 percent lower than those with a BA. Over one-third of those with a high school degree and over one-quarter of those with some college or an associate degree live in a household below 150 percent the Federal Poverty Level (FPL), compared to less than 10 percent of individuals with a BA.
- Despite recent increases in certificates and associate degrees, those without a four-year degree are more likely to major in fields of study that are not well-aligned with labor market demand. While most certificates are awarded in fields such as healthcare (27 percent) that often pay above the median income, far fewer certificates are awarded in even higher-paying fields such as IT (13 percent) and engineering (5 percent) that are in high demand and have

been shown to out-earn even bachelors' degree holders. Among associate degrees awarded, STEM fields were near the bottom of the top 10 fields and comprised less than 20 percent of all associate degrees

- While there is some overlap in the baseline and specialized skills of non-BA versus BA workers, larger differences are observed across software skills. The most overlap is observed among baseline skills but even in that category, computer literacy and knowledge of basic software like Microsoft Office seems to be a big distinction between non-BA and BA workers. That said, non-BA workers have some baseline and specialized skillsets that are much more similar to those of BA workers—particularly when comparing two-versus four-year colleges graduates—suggesting that with some additional training or instruction, these two groups may be substitutable for some subset of occupations.
- Differences in skill requirements listed on job postings across education levels show fewer differences in requested baseline and specialized skills, but very large gaps across software skills. Indeed, for some baseline and specialized categories, job postings for two-year college graduates are more likely to require certain skills than job postings for four-year college graduates. However, filling in the large gaps that do exist would likely require at least a semester-long course if not an associate degree program in targeted areas. Finally, given the rapid adoption of new software within different sectors of the economy, addressing these gaps will require close partnerships with employers and programs that can adapt quickly to changing demands for particular skills.
- Associate degree workers have some of the skills needed to fill traditional “middle-skill” occupations that increased education requirements during the recession—just not to the same degree as BA workers. These include occupations such as computer-related occupations, drafting

and engineering, law enforcement, life science technicians, sales and related workers, and secretaries and administrative assistants. For example, the top 25 baseline skills for Secretaries and Administrative Assistants postings are identical for BA versus non-BA jobs but for any given skillset, a higher percentage of BA administrative jobs require each skill compared to non-BA administrative jobs.

What actions can city leaders, community colleges, and employers take to ensure a more inclusive workforce development strategy? Jobs in fields with strong certification or licensure standards, or with discrete, measurable skill requirements seem to resist the upskilling trend. This suggests that developing certifications that better reflect industry needs, together with industry acceptance of these alternative credentials, could reduce pressure on job seekers to pursue a bachelor's degree and ensure that middle-skill workers continue to have opportunities for rewarding careers. At the same time, these new certifications would also continue to provide employers with access to the talent they need. However, while the completion of certificates has grown rapidly over the past decade, a significant share of current programs fails to provide sufficient economic value to justify their investment.

Based on our findings summarized above, we offer recommendations for policies that can foster skill development among non-BA workers. Of key importance is ensuring that these skills are relevant to employers. Of equal importance is providing the needed supports to help workers persist in their training or education to obtain a credential that is in high demand in the labor market. In each case, there are already Boston-specific models and examples that have demonstrated proof of concept and can be used as a platform to build more comprehensive and inclusive workforce development strategies.

- **Recommendation 1:** Collaborate with employers to determine what skills are in high demand and help non-BA workers acquire the right credentials. Working closely with employers to determine the experience and skills needed for such positions, the City can then help non-BA workers acquire the “right” credentials that can signal proficiency and guarantee employability. Depending on the job, this could mean developing programs that lead to a license, certification, training, or apprenticeship that provides the skills that employers are looking for. Boston already has several successful collaborations with employers to help bridge the gap between what employers require in terms of skills and the certifications that workers can obtain. These include apprenticeship programs that go beyond the traditional occupational trades, incumbent worker programs that build worker skills, and IT certificate programs designed to meet the needs of employers.
- **Recommendation 2:** Boost completion rates at community colleges, particularly in high-demand fields where employers are willing to partner to create programs that lead to guaranteed employment. Low completion rates at community colleges reflect a variety of factors including needed academic preparation, financial resources, and mentoring. Policies aimed at assisting low-income students, such as Success Boston and the City's Tuition Free Community College Plan, can help ameliorate some of these obstacles, hopefully increasing persistence and ultimately completion. In addition, providing more information about employment opportunities and earnings across STEM occupations and better preparation for entry into STEM-related programs could help individuals receive the necessary training to qualify for these higher-paying positions. Finally, because community college training is more practical and applied in nature, strong partnerships with employers, either as members of the institution's

advisory board or as developers of particular programs of study, can help certify that program curriculum is relevant and students will have the skills needed to land jobs after graduation.

- **Recommendation 3:** Improve Boston's vocational career pathways. Collaboration among existing vocational educational institutions and community partners can result in a pipeline of specialized skills training. One innovative approach at Madison Park Technical Vocational High School, for example, has been to expand dual enrollment opportunities by strengthening relationships with Roxbury Community College (RCC) and Bunker Hill Community College (BHCC) to help encourage graduation and college matriculation.
- **Recommendation 4:** Expand ESOL services and occupational training for immigrants, and streamline the credential transfer of those who are already highly skilled. Compared to the U.S., Boston has relied more heavily on immigrants to grow its labor force. As such it will be important to provide lower-skilled immigrants with ESOL services in the context of longer-term skill building and employment. For example, immigrants can be provided with not only the basic English and skills they need to obtain their first job, but also with the vocational language instruction, individualized career coaching, short-term training, job search, job placement and post-placement services that can help them increase their wages in an entry-level job or advance up the career ladder. Equally important, an intentional strategy is needed to help higher-skilled immigrants transfer credentials from their home countries and engage in English instruction that is appropriate to their education level.

For policymakers, this is the optimal time to develop strategies that address existing mismatches and skill shortages in the labor market. Unemployment is at a historic low such that workers are scarce, and employers are looking for creative ways to fill vacancies. However, employers have multiple options for addressing a labor shortage such as training, outsourcing, and automation—all of which have very different welfare implications for workers and society. In addition, a more inclusive approach to workforce investments and partnerships that aim to employ more non-BA workers can continue to pay dividends down the road for Boston area workers, firms, and residents. Having the right set of skills will help non-BA workers maintain stable employment and earn a living wage while also filling jobs that are complementary to BA positions in high-demand sectors. Finally, a diverse and inclusive workforce that has the right mix of skills at all levels of education can attract employers from outside the region seeking to expand their operations, ensuring that Boston maintains a vibrant and thriving economy benefitting all residents.



I. Introduction: The Importance of an Inclusive Workforce Strategy

In 2016 Massachusetts became the first state where 50 percent of the workforce holds a four-year college degree (Massachusetts Budget and Policy Center, 2017). In comparison, only 35.5 percent of workers nationwide have a bachelor's degree. In general, states with better educated workforces consistently have stronger economies with robust job growth and high wages compared to states with less well-educated workforces. As of 2017, the percent of the population employed in Massachusetts (63.1 percent) was significantly higher than that of the U.S. (60.0 percent) with the Commonwealth boasting the second highest median wage in the United States at \$21.22 per hour—19 percent higher than the median wage for the nation.

Yet, this prosperity has not been shared equally across all workers, even though the state's economic growth relies on both baccalaureate (BA) and non-baccalaureate (non-BA) workers across most industries and sectors. Since 1979, while actual wage growth has been flat or weak for most Massachusetts workers, the earnings premium associated with a bachelor's degree has grown steadily. By 2016, the median wage for Massachusetts workers with a bachelor's degree was about twice that of workers with no more than a high school diploma.

This disparity is even greater in the Boston-Cambridge-Newton metro area, recently ranked sixth in income inequality among America's largest metro areas due to widening gaps in incomes across households (Holmes & Berube, 2016).¹ Rising inequality has had a disparate impact on workers in the middle of the distribution—those with a high school degree, some college, or an associate degree. In previous decades, these non-BA educated workers often enjoyed middle-

class wages across a wide range of occupations and industries. Yet changes in job opportunities, such as the polarization of employment towards relatively low skill/low wage and high skill/high wage occupations, has made it less likely that individuals can make it into the middle class without a postsecondary credential or degree. Among those without a BA in Boston, only about one-third have an associate degree or some postsecondary education while the remaining two-thirds have a high school degree or less.

What accounts for this continued growth in inequality across educational groups? There are several factors—some are long-term trends that would be difficult to reverse while others offer more opportunity for policy to address. For example, structural forces such as changes in technology and global competition have automated or outsourced high-paying middle-skill jobs in manufacturing and production that are unlikely to return. Over the past several decades, the share of jobs that require postsecondary education has doubled, with employers demanding more abstract and problem-solving skills relative to tasks that can be automated or outsourced (Carnevale, Smith, & Strohl, 2010).

Yet other jobs that previously required only a high school degree are now accessible only to four-year college graduates—a trend that has become known as “upcredentialing” (Modestino, Shoag, & Ballance, 2014). Why would employers raise education requirements? In some cases, upcredentialing reflects changes in the types of tasks that are required due to changes in technology—such as moving from paper to electronic medical record keeping. In other cases, employers simply use a college degree as a proxy for the types of skills that they are looking for, such as communication, organization, and project management—none of which is explicitly taught in college (Accenture Research, 2014). For example, job postings for entry-level IT help desk positions that

¹The report, released by the Brookings Institution, ranked cities based on the ratio of household income at the 95th percentile compared to that at the 20th percentile.

typically do not require postsecondary skills show little difference in skill requirements compared to IT help desk job postings requiring a college degree. Yet the preference for a bachelor's degree among entry-level IT jobs has increased, suggesting that employers may be relying on the BA as a broad recruitment filter that may or may not correspond to specific capabilities needed to do the job (Burning Glass Technologies, 2014).

One implication of this upskilling trend is that many middle-skill career pathways are becoming closed off to those without a bachelor's degree – a group that still comprises nearly 60 percent of the workforce in Boston. Frequently these positions, such as IT help desk technicians, are the entry point into a career that leads to better-paying jobs, so job seekers without a bachelor's degree may lose out on future advancement, as well as current positions.

Upcredentialing could also make it more difficult to replace workers in both the short-term, as the labor market continues to strengthen, as well as in the long-term, as the Baby Boom generation continues to retire in large numbers. In the short-term, some employers are finding new ways to fill these positions with online certifications rather than educational degrees. For example, Google's IT Support Professional Certificate provides a low-risk, low-cost way for workers to gain the skills demanded by well-paying entry-level jobs in IT support. And universities are paying attention. Northeastern University recently announced that people who complete Google's IT Support Professional Certificate can now receive credit toward a bachelor's degree in information technology (Callahan, 2018). In the long-term, future projections show that Massachusetts will likely face even greater challenges in maintaining an adequate supply of skilled workers compared to the nation when the Baby Boom generation retires—particularly for “middle-skill” jobs that require some postsecondary education but less than a four-year college degree (Modestino, 2010).

What can policy do to address this issue? Jobs in fields with strong certification or licensure standards, or with discrete, measurable skill requirements seem to resist this trend. Indeed, higher-paid high-school educated workers are typically represented more heavily in occupations that require technical postsecondary education attainable through certificates, apprenticeships, or associate degrees (Nelson & Richter, 2014). This suggests that developing certifications that better reflect industry needs, together with industry acceptance of these alternative credentials, could reduce pressure on job seekers to pursue a bachelor's degree and ensure that middle-skill workers continue to have opportunities for rewarding careers. At the same time, these new certifications would continue to provide employers with access to the talent they need. However, while the completion of certificates has grown rapidly over the past decade, a significant share of current programs fails to provide sufficient economic value to justify their investment. Knowing the types of skills required by employers in previously middle-skill occupations can help city and state leaders make better training investments to signal proficiency and guarantee employability among Boston residents.

Using proprietary individual-level detailed data from worker resumes and online job postings, this report goes beyond previous analyses of educational degrees to explore the actual skills of non-BA workers in Greater Boston and how they match up with those demanded by employers. These include baseline skills (e.g. project management), specialized skills (e.g. information security), and software skills (e.g. Oracle) among others. We compare the supply of these skills among workers of different education levels to those demanded by employers when posting a job to answer the following research questions:

- *Skill Distribution of Boston's Labor Force:* What types of skills do non-BA workers typically acquire? How does the distribution of skills among non-BA workers compare to that of workers with a bachelors' degree? Which skills have the greatest

amount of overlap across the two groups that might suggest their substitutability, particularly for those with an associate degree?

- *Employer Demand for Skills in Boston:* What types of skills are required for jobs that typically require a four-year college degree versus those that do not? Which skills have the greatest amount of overlap across the two sets of jobs, particularly for those that require an associate degree?
- *Upcredentialing within Selected Occupations:* Are middle-skill occupations more likely to require a bachelor's degree after the Great Recession? How do the skillsets of non-BA workers compare to those demanded by middle-skill occupations that experienced upcredentialing? Do the actual skills demanded by upcredentialing occupations differ for those that require a bachelor's degree versus an associate degree?
- *An Inclusive Approach to Workforce Development:* What policies can foster skill development among non-BA workers? How can policymakers ensure that these skills are relevant to employers? What supports are needed to help workers persist in their training or education to obtain a credential that is in high demand in the labor market?

The answers to these questions are important for guiding future labor market policies, especially during a tight labor market when workers are scarce. Understanding how actual skill requirements have changed within occupations that are increasingly asking for a four-year college degree can help identify where the bar has moved for non-BA workers to qualify for those jobs. For example, if it's the case that these jobs require greater baseline skills, then incorporating instruction aimed at developing those skills into training programs could be helpful. If instead these jobs require more specialized skills and knowledge, then developing associate degrees or apprenticeships targeted at those occupations could create additional pathways into those careers. Finally, if these jobs have raised or changed software skill requirements, then working with employers

to develop short-term certificate programs could ensure that workers without a bachelor's degree are still qualified for these jobs. All of these solutions require detailed knowledge of the skillsets that are currently in demand and an understanding of how to better align the skills of non-BA workers to match up.

For policymakers, this is the optimal time to develop strategies that address existing mismatches and skill shortages in the labor market. Unemployment is at a historic low such that workers are scarce, and employers are looking for creative ways to fill vacancies. However, employers have multiple options for addressing a labor shortage, such as training, outsourcing, and automation—all of which have very different welfare implications for workers and society. Policymakers can guide these choices by working with employers to help identify workers that already have the right sets of skills or to develop training and education programs that can fill in the gaps. As the labor market continues to evolve rapidly in response to changes in technology and increased globalization, greater intervention to help align workers and firms will be needed to reduce frictions, minimize mismatches, and improve efficiency in the labor market.

Finally, a more inclusive approach to workforce investments and partnerships that aim to employ more non-BA workers can continue to pay dividends down the road for Boston area workers, firms, and residents. Having the right set of skills will help non-BA workers maintain stable employment and advance in their careers. In addition, non-BA workers can fill jobs that are complementary to positions that require at least a BA—particularly in high-demand sectors such as healthcare (e.g. nurse practitioners and physicians)—making it possible to increase or improve services even in a tight labor market. Moreover, non-BA workers are more diverse in terms of race and ethnicity, possessing additional cultural and language skills that are increasingly in high demand among employers with an increasingly minority-majority customer base. Finally, a diverse

and inclusive workforce that has the right mix of skills at all levels of education can attract employers from outside the region seeking to expand their operations. Continued economic development can help ensure that the Boston area maintains a vibrant and thriving economy that benefits all residents.

II. Where do Non-BA Workers Fit into Boston's Labor Force?

The structure of the U.S. economy has changed dramatically over the past few decades, increasing the demand for more highly skilled workers. The reduced role of the manufacturing sector, the increased importance of the professional service and knowledge sectors, advancements in technology, and the spread of globalization are evidence that the ways in which we “do work” have fundamentally changed (Autor, Levy, & Murnane 2003; Autor & Acemoglu, 2010). As a result, employers are demanding that workers obtain more formal education and training—often requiring some type of postsecondary degree or certificate—in addition to greater technical proficiency and interpersonal skills than in the past.

Over the past decade, policymakers and business leaders across Greater Boston have been concerned that the lack of skilled workers will make it difficult to fill jobs that are in high demand now that the economy has recovered—many of which are likely to require postsecondary education and training—thereby slowing the region's economic growth. That means having not only a sufficient number of skilled workers but also a workforce with the right mix of skills needed to meet the diverse needs of the region's economy.

The concern over having a sufficient number of skilled workers reflects the apprehension that when workers are in short supply, the rate at which employment can grow is constrained. For employers, slower employment growth means tighter labor markets that may require firms to find innovative

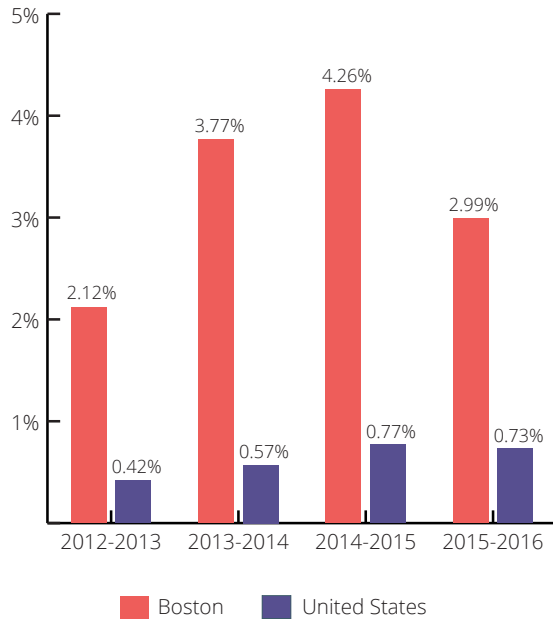
ways to increase labor productivity. For policymakers, it means fewer new jobs being added to the Greater Boston economy, raising concerns about the types of jobs that will be created and the possibility of lost opportunities for the region's workers.

A. Boston's Labor Force Depends on Both Non-BA and BA Workers

One reason why policymakers and business leaders are so concerned about there being a sufficient number of skilled workers in Greater Boston is because the region's population of working-age adults has been growing more slowly in recent years. Census data indicate that the region's rapid population growth over the past several years is tapering, with more people moving out of state. The five large counties in Eastern Massachusetts — Suffolk, Middlesex, Norfolk, Plymouth, and Essex — added about 25,000 people in 2016, according to the Census Bureau, a number that fell for the third straight year and is down nearly by half since 2013.

Despite this slower population growth, Figure 1 shows that labor force growth has been robust compared to the U.S. for the past several years. Since 2013, the Boston area's labor force grew by 2-4 percent per year for most years compared to annual growth of less than one percent for the nation. However, population projections show that if current trends continue, a wave of Baby Boomer retirements and a weak inflow of younger workers will result in very little growth in the labor force and create a drag on the economy (Metropolitan Area Planning Council, 2014). As a result, it is more important than ever to ensure that each worker has the right mix of skills and is matched to a job that best suits his or her potential. Not doing so means more mismatch in the labor market, which leads to lower productivity, slower economic growth, and sluggish wage increases.

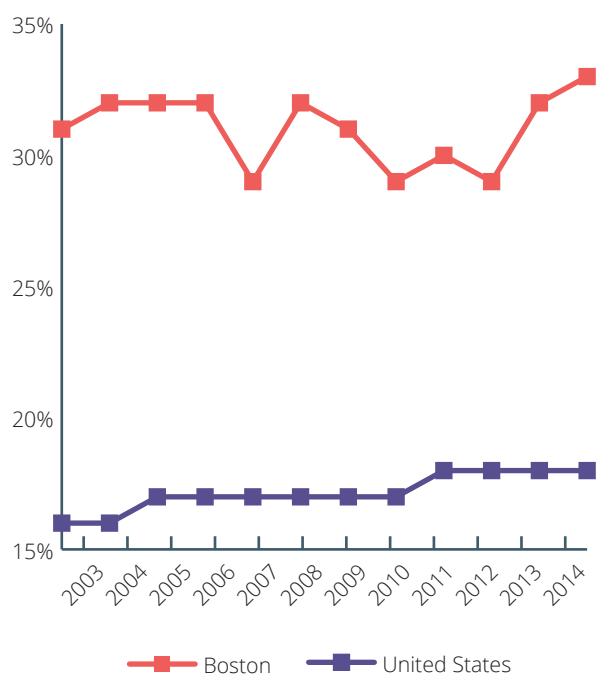
Figure 1: Labor Force Growth (annual percent change) for Boston versus U.S., 2013-2016



Source: Author's calculations using the American Community Survey, 5-Year Combined, 2012 – 2016.
 Note: Sample is the civilian non-institutionalized labor force age 16+ years who are not in the military.

In addition, Boston has relied more heavily on immigrants to grow its labor force compared to the nation. Figure 2 shows that the foreign-born share of Boston's labor force has typically hovered around 30 percent, compared to less than 20 percent for the U.S., and has increased rapidly since 2012. However, these workers come from the two extremes of the education distribution, with most immigrants having either less than a high school degree or a bachelor's degree or higher (Owens, 2008). As such it will be important to make sure that immigrants can apply their skills to the jobs available in the Boston area. This means providing lower-skilled immigrants with English for speakers of other languages (ESOL) and occupational training and ensuring that the credentials of highly skilled immigrants are transferable to the jobs that Boston employers seek to fill.

Figure 2: Foreign-Born Share of Labor Force, Boston versus U.S., 2003-2014

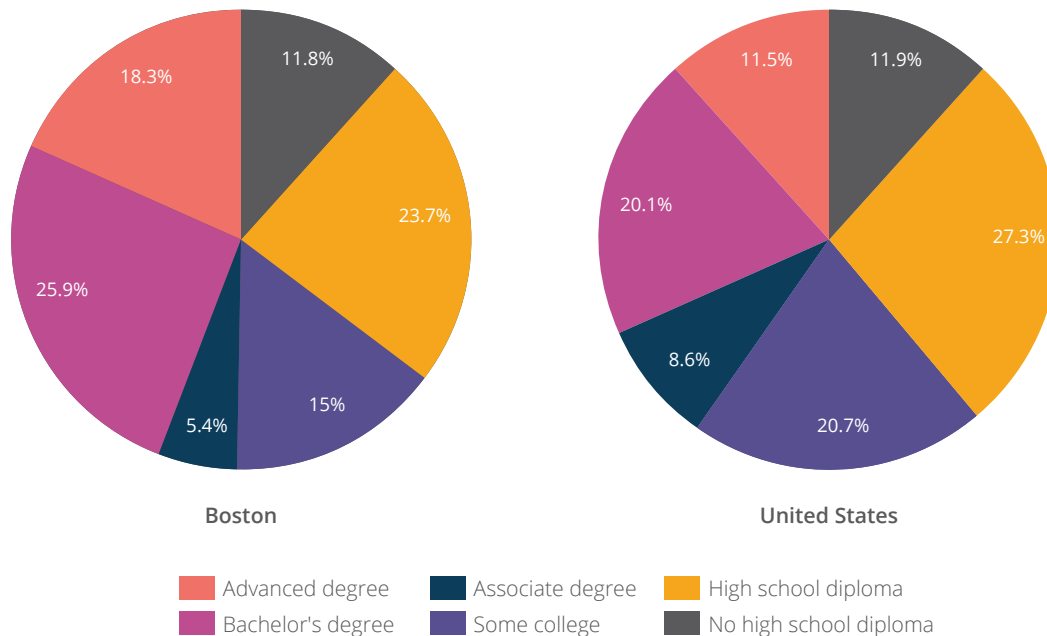


Source: Author's calculations using the 2005-2016 5-Year American Community Survey.
 Note: The year noted as the observation date is the midpoint of the five-year panel. The sample is the civilian labor force (non-institutionalized individuals age 16+ years who are not in the military).

Not surprisingly, the share of working-age adults with any postsecondary education in Boston has been increasing and is heavily skewed towards those with a four-year college degree compared to the nation. Figure 3 shows that among individuals age 25 years and over in Boston, 44.2 percent have a bachelor's degree or higher compared to only 31.6 percent for the nation. Although the region benefits from this highly skilled talent pool, more than half of the population does not have a four-year college degree. Drawing on the skills of the entire educational distribution is critical to meeting the region's labor force demands during today's tight labor market, as well as in the future as more Baby Boomers retire.

Figure 3 also shows that among non-BA workers in Boston, the most frequently held credential was a high school diploma (23.7 percent). Another 15.0 percent had some college and an additional 5.4 percent had an associate degree. Note that a much larger fraction of Boston residents falls into the “some college” category compared to those with an associate degree. This is due in part to the low completion rate at community colleges, which has historically been less than one in five students (Sbrega, 2012). Low completion rates for associate degrees reflect a variety of factors, including insufficient academic preparation, financial resources, and mentoring. Policies aimed at assisting low-income students, such as Success Boston and the City’s Tuition-Free Community College Plan, can help ameliorate some of these obstacles, hopefully increasing both persistence and degree completion.

Figure 3: Percent of Population by Educational Attainment, Boston versus U.S., 2016



Source: Author's calculations using the 2016 5-Year American Community Survey.
 Note: The sample is non-institutionalized individuals age 25 years and older who are not in the military.

Moreover, as the costs of postsecondary education continue to rise faster than inflation, students are increasingly questioning the value of the bachelor’s degree and looking for other pathways to earning a postsecondary credential that is associated with middle-class earnings. Although the bachelor’s degree is still a good investment for most students, leading to higher rates of employment and higher wages for graduates as compared to those without a bachelor’s degree, data show that labor market success is possible without a bachelor’s degree.

B. Characteristics of Non-BA versus BA Workers in Boston

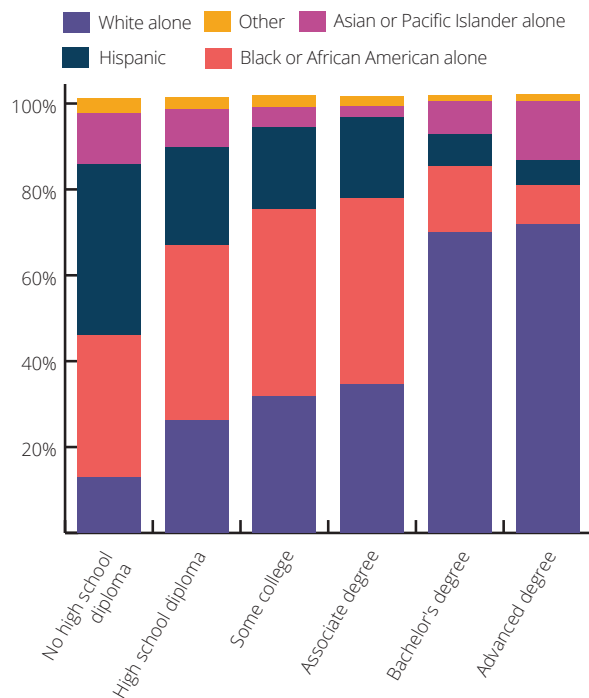
Non-BA workers are a much more diverse group than those with a BA. This likely comes as no surprise given that access to postsecondary training and educational attainment remains unequal, with many low-income students facing barriers to college access and success. Non-white youth are disproportionately located in neighborhoods with few job opportunities, failing schools, and high levels of crime that negatively affect their outcomes later in life (Chetty, Hendren, & Katz, 2016). Moreover, striking racial differences in the likelihood of upward mobility demonstrate that escaping childhood poverty appears to be more difficult for non-white youth (Corcoran &

Matsudaira, 2005; Isaacs, 2007; Kearney, 2006; Mazumder, 2005). This is due in part to neighborhood segregation by race, ethnicity and socioeconomic status that creates physical and social barriers for youth seeking access to employment, postsecondary education, and community engagement (Chetty & Hendren, 2018; Hardaway and McLoyd, 2009).

As a result, there remain substantial gaps in educational attainment between racial and ethnic groups. Figure 4 shows that Black, Hispanic and Asian residents are all over-represented in the working-age population with less than a bachelor's degree. In contrast, working-age individuals with a bachelor's degree or higher are overwhelmingly non-Hispanic White. Table 1 shows that although the majority of non-BA working-age individuals with at least a high school degree are native-born, upwards of 20 percent are naturalized citizens and another 20 percent are not U.S. citizens. As a result, non-BA workers are less likely to speak English at home and more likely to be of limited English proficiency compared to those with a BA.

Table 1 also highlights other interesting differences across working-age individuals by educational attainment. For example, the non-BA working-age population in Boston is older compared to those with a BA degree, of whom more than half are age 25-34 years. Presumably, many recent college graduates choose to remain in Boston after graduation to start their careers but then live outside the city as they form households and buy homes. While there are few gender differences, of note is the higher share of females completing associate degrees (59.99 percent) and advanced degrees (56.40 percent). Finally, working-age individuals without a BA are much more likely to self-report some type of disability (10-25 percent) compared to those with a BA degree (less than 5 percent).

Figure 4: Race of Boston Working-Age Population by Educational Attainment, 2016



Source: Author's calculations using the 2016 5-Yr American Community Survey. Note: The sample is non-institutionalized individuals age 25-54 years who are not in the military.

Table 1. Demographic Characteristics of Working-Age Boston Residents, 2016

Age	No high school diploma	High school diploma	Some college	Associate degree	Bachelor's degree	Advanced degree
25-34	24.30%	32.97%	39.07%	35.55%	59.79%	52.44%
35-44	34.31%	31.00%	30.41%	30.50%	22.28%	28.32%
45-54	41.39%	36.03%	30.53%	33.94%	17.93%	19.24%
Gender						
Female	51.79%	48.59%	49.94%	59.99%	50.67%	56.40%
Male	48.21%	51.41%	50.06%	40.01%	49.33%	43.60%
Nativity						
Native-born	41.05%	58.19%	66.13%	67.19%	79.03%	72.91%
Citizen by naturalization	23.68%	20.51%	18.83%	20.67%	11.37%	9.55%
Not U.S. citizen	34.33%	20.11%	13.67%	11.47%	8.55%	16.00%
English						
English spoken at home	33.05%	53.65%	63.50%	63.05%	78.22%	73.23%
English spoken very well	15.36%	19.25%	22.24%	21.22%	14.53%	20.99%
Limtied English proficiency	41.49%	26.01%	14.12%	15.11%	7.09%	5.62%
Disabled						
Any type	25.06%	14.70%	13.43%	10.44%	3.43%	2.77%

Source: Author's calculations using the 2016 5-Year American Community Survey.

Note: The sample is non-institutionalized individuals age 25-54 years who are not in the military.

Consistent with theories of human capital accumulation, individuals with higher levels of education have more favorable labor market outcomes. Table 2 shows that working-age individuals with a BA are two to three times more likely to be in the labor force as well as two to three times less likely to be unemployed. Of those who are employed, roughly 20 percent of working-age individuals without a BA work part-time compared to less than 10 percent of those with a BA. As a result, the mean annual income for individuals working full-time, full-year with a bachelor's degree is 1.3 to 1.7 times higher than that of full-time, full-year working-age individuals.

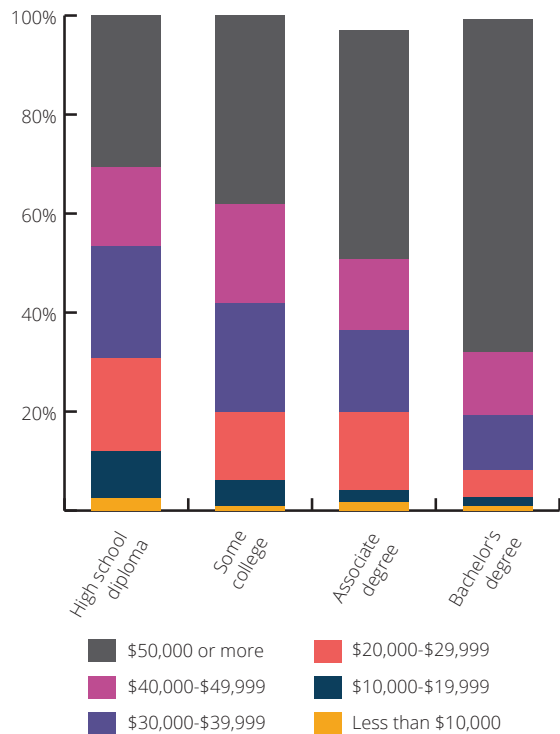
Yet, these statistics fail to recognize the living arrangements of these individuals. Looking at the share of individuals living in a household below 150 percent of the federal poverty line (FPL), a threshold that the Boston Planning & Development Agency (BPDA) considers the minimum needed to live in Boston, greater disparities emerge. Over one-third of those with a high school degree and over one-quarter of those with some college or an associate degree live in a household below 150 percent FPL, compared to less than 10 percent of individuals with a BA. Figure 5 shows that the distribution of income within each education category is quite skewed, with less than 30 percent of individuals with a high school degree earning \$50,000 compared to nearly 70 percent of individuals with a BA.

Table 2. Labor Market Characteristics of Working-Age Boston Residents, 2016

	High school Diploma	Some College	Associate Degree	Bachelor's Degree
Employment status				
Not in the labor force	21.35%	16.99%	14.37%	6.96%
Employed	67.99%	75.65%	78.51%	89.26%
Unemployed	10.66%	7.36%	7.12%	3.78%
Working status				
Full-time	77.84%	80.17%	81.62%	91.28%
Part-time	22.16%	19.83%	18.38%	8.72%
Weeks worked per year				
26 weeks or less	4.03%	3.67%	2.11%	1.95%
More than 26 weeks	95.97%	96.33%	97.89%	98.05%
Income (for full-time full-year workers)				
Mean	\$44,195	\$51,117	\$57,670	\$75,176
Median	\$37,609	\$42,531	\$46,635	\$60,828
Poverty (based on household characteristics)				
Less than 150% of federal poverty line	34.66%	26.16%	28.07%	8.90%

Source: Author's calculations using the 2016 5-Yr American Community Survey.
 Note: The sample is non-institutionalized individuals age 25-54 years not in the military.

Figure 5. Distribution of Income by Educational Attainment, Boston Workers, 2016



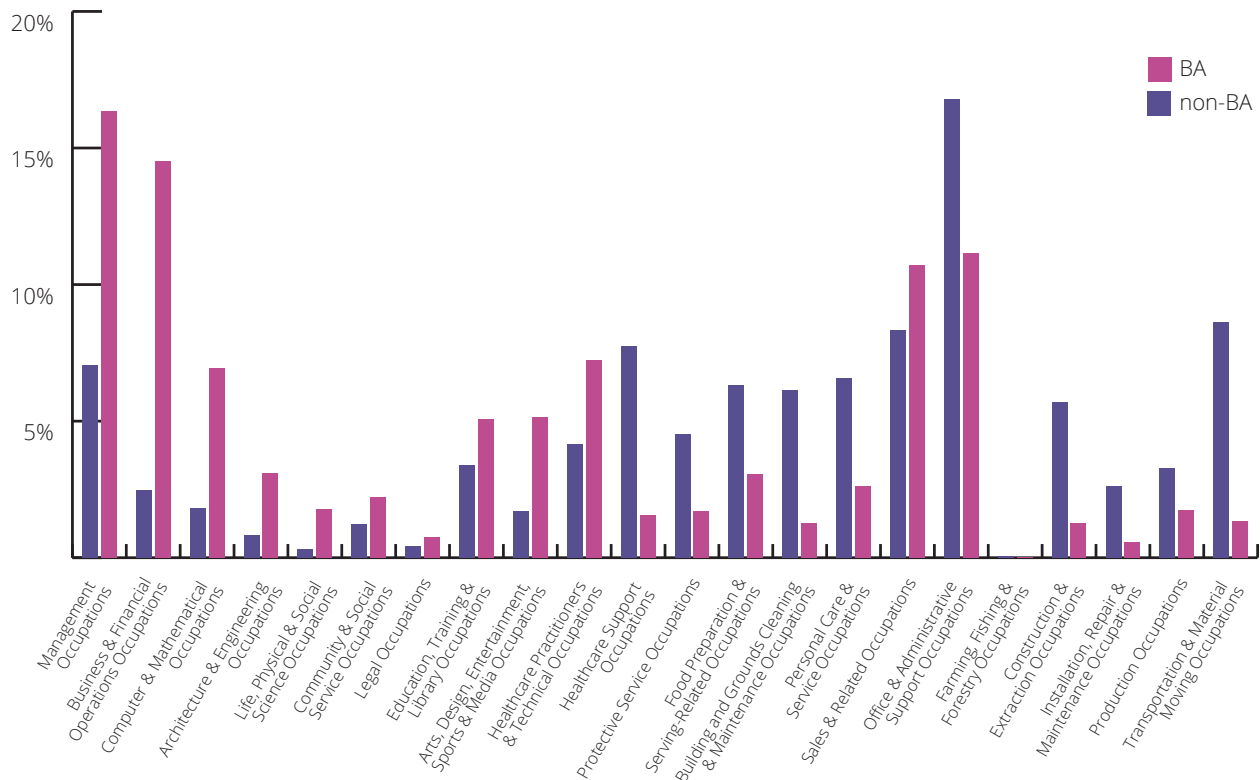
Source: Author's calculations using the 2016 5-Yr American Community Survey.
 Note: The sample is non-institutionalized individuals age 25-54 years working full-time full year not in the military.

Finally, how much do the occupations of non-BA versus BA workers overlap? Figure 6 shows that non-BA individuals are more likely to work in healthcare support, protective services, food preparation, building and maintenance, personal care, office and administrative, construction, and transportation occupations. Workers with a BA degree are more likely to work in management, business and finance, computer, architecture and engineering, arts and design, and healthcare practitioner occupations. Sectors with more overlap include community and social service, legal, education, and sales occupations.

Within these sectors some jobs have the potential for non-BA workers to be substitutes for BA workers, particularly in occupations for which employers sharply increased education requirements during the Great Recession. While some of the increase in educational requirements may reflect long-term shifts in technology or production, part of the increase was in response to the greater availability of workers during the downturn (Hershbein & Kahn, 2018; Modestino,

Shoag, & Ballance, 2016). In jobs where the latter occurred, as the labor market has since strengthened and made it more difficult to fill these positions, employers have reduced educational requirements in response to the lack of available workers (Modestino, Shoag, & Ballance, 2016). For non-BA workers with the right skills, these jobs have the potential to offer higher wages, more stable employment, and better career opportunities.

Figure 6. Occupational Distribution for Non-BA versus BA Workers, Boston 2016



Source: Author's calculations using the 2016 5-Year American Community Survey.
 Note: The sample is non-institutionalized individuals age 25-54 years working full-time full year not in the military.

C. Growth in Non-BA Degrees and Certificates is Growing Among Boston Residents

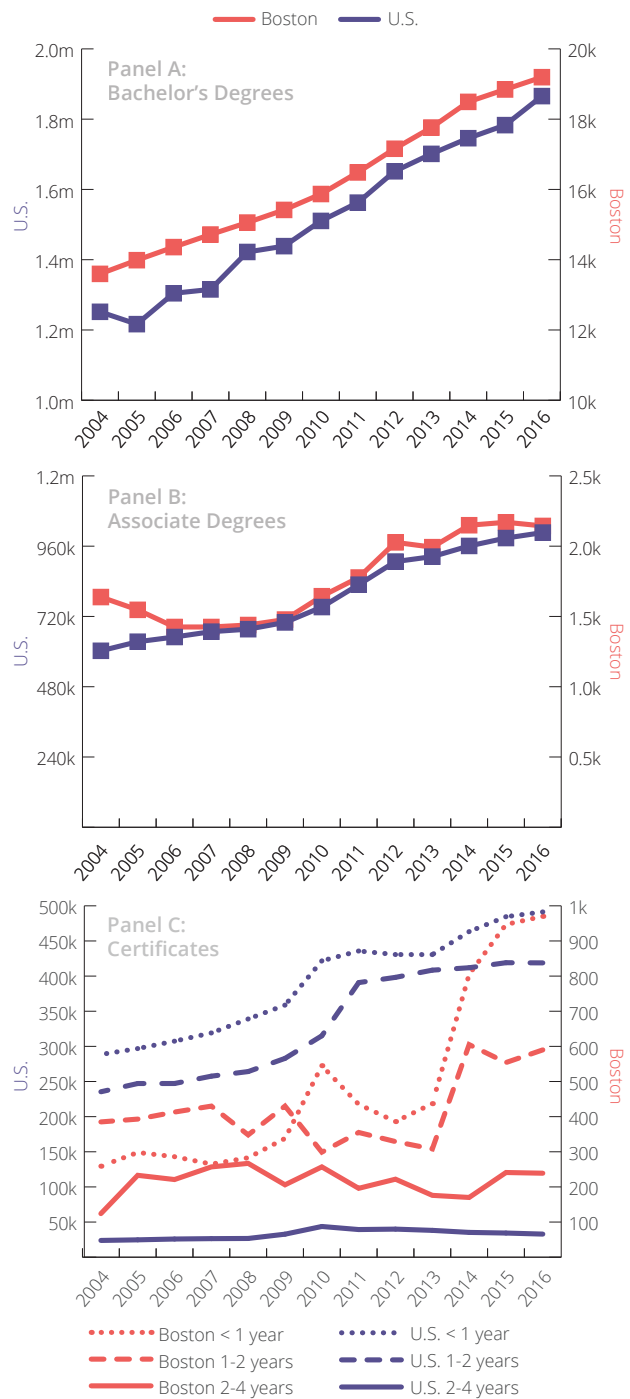
Boston area students are increasingly completing non-baccalaureate certificate programs. Figure 7 shows that as the growth in bachelor's degrees awarded has slowed in greater Boston compared to the U.S. in recent years, the increase in associate degrees awarded has kept pace over time. And the growth in short-term certificates of less than one year and 1-2 years has outpaced that of the U.S. since 2014. Data from states such as Texas and Colorado show that the return to earning a certificate varies greatly across program types. Certificates from programs such as hospitality administration and management, cosmetology, and teaching assistant typically earn less than the state per capita median income. Yet others in fields such as dental services, nursing, and mental health tend to earn more than the state median. Carpenters, telecommunications workers, and electromechanical technicians frequently earn more than the median associate degree holder, and plumbers, IT workers, and mechanical engineers often out-earn the median bachelor's degree holder (Schneider, 2015). Although many

technically oriented non-baccalaureate credentials have high market value, they also depend on the quality of the granting institution and whether there is a high demand for such skills in a given location.

In Boston, the most popular certificate programs vary across a variety of fields and depend somewhat upon the length of the program. Table 3 shows that among certificates that require less than one year to complete, culinary and health programs are the most popular, accounting for nearly 40 percent of such certificates awarded in 2016. Culinary and business programs are most popular among 1-2-year certificate programs while nearly half of all 2-4-year certificates are awarded in the performing arts. Overall, while most certificates are awarded in fields such as healthcare (27 percent) that typically pay above the median income, far fewer certificates are awarded in higher-paying fields such as IT (13 percent) and engineering (5 percent) that are in high demand and have been shown to out-earn even bachelor's degree holders. Understanding whether this is due to a lack of information about earnings across occupations or due to other barriers to completing such certificates could help individuals receive the necessary training to qualify for these higher-paying science, technology, engineering, and math (STEM) positions.

The most popular associate degree programs reflect many of the same fields. Table 4 shows that business- and health-related programs are the most popular, accounting for over 40 percent of associate degrees awarded in Boston in 2016. Yet surprisingly, STEM fields were again near the bottom of the top 10 and comprised less than 20 percent of all associate degrees. Another 14 percent of associate degree recipients had no specialized field of study. Although some individuals may be preparing to matriculate into a four-year program, it still seems that the number of students graduating from community college with degrees in high-demand fields is low.

Figure 7. Growth in Educational Degrees and Certificates Awarded, 2004-16



Source: Author's calculations using Integrated Postsecondary Education Data (IPEDS) for colleges and universities in the City of Boston and the United States.

Table 3: Top 10 Non-Baccalaureate Certificates Awarded in Boston by Program Length, 2016

Less than one year		1-2 years		2-4 years	
Program Name	% Awarded	Program Name	% Awarded	Program Name	% Awarded
Architecture & Related Services	3.8%			Area, Ethnic, Cultural, Gender, & Group Studies	0.8%
Biological & Biomedical Sciences	3.2%	Biological & Biomedical Sciences	4.7%	Biological & Biomedical Sciences	0.8%
Business, Management, Marketing, & Related Support Services	7.7%	Business, Management, Marketing, & Related Support Services	20.7%		
Computer & Information Sciences & Support Services	9.1%	Computer & Information Sciences & Support Services	4.1%		
		Construction Trades	3.9%	Construction Trades	4.6%
		Education	12.7%		
		Engineering Technologies & Engineering-related Fields	5.1%		
Health Professions & Related Programs	20.8%	Health Professions & Related Programs	5.1%	Health Professions & Related Programs	2.5%
Homeland Security, Law Enforcement, Firefighting, & Related Protective Services	2.5%				
				Mathematics & Statistics	0.4%
Mechanic & Repair Technologies/Technicians	3.1%	Mechanic & Repair Technologies/Technicians	4.1%	Mechanic & Repair Technologies/Technicians	8.4%
				Multi/Interdisciplinary Studies	0.8%
Parks, Recreation, Leisure & Fitness Studies	10.4%				
				Precision Production	10.5%
Personal & Culinary Services	27.6%	Personal & Culinary Services	25.1%		
				Public Administration & Social Service Professions	21.8%
Visual & Performing Arts	3.6%	Visual & Performing Arts	3.7%	Visual & Performing Arts	49.4%

Source: Author's calculations using Integrated Postsecondary Education Data (IPEDS) for colleges and universities in the City of Boston.

Table 4. Top 10 Associate Degrees Awarded in Boston, 2016

Field of Study	% Awarded
Business, Management, Marketing, & Related Support Services	22.1%
Health Professions and Related Programs	20.5%
Liberal Arts and Sciences, General Studies and Humanities	14.2%
Education	7.5%
Homeland Security, Law Enforcement, Firefighting, and Related Protective Services	5.6%
Computer and Information Sciences and Support Services	4.9%
Psychology	4.2%
Mechanic and Repair Technologies/ Technicians	3.2%
Biological and Biomedical Sciences	3.0%
Engineering Technologies and Engineering-related Fields	2.6%

Source: Author's calculations using Integrated Postsecondary Education Data (IPEDS) for colleges and universities in the City of Boston.

D. Summary of Boston's Labor Force

With the growing demand for workers with some postsecondary education, additional training beyond high school is quickly becoming a prerequisite for entry into the middle class. Indeed, the share of individuals in the middle class with only a high school diploma or less has fallen from roughly three-fourths in 1970 to just 39 percent by 2007 (Carnevale, Smith, & Strohl, 2010). Moreover, the youth employment rate has been declining since 2000 with about half of unemployed youth reporting that they are searching for their first job, suggesting that there are fewer pathways into the labor market without some postsecondary education and training.

Whether a four-year college degree is indeed the requirement for a middle-wage job remains unclear. Researchers have argued that our current education system is too narrowly focused on the goal of

preparing all young people to pursue a four-year college degree (Symonds, Schwartz, & Ferguson, 2011). Instead, it has been suggested that we should also develop other postsecondary routes and career pathways via community colleges and vocational/technical education that can lead to jobs in high-growth, high-demand occupational fields. This approach has the dual benefit of providing young people with valuable skills and credentials while also filling potential workforce gaps in the middle of the labor market.

Overall, Boston has a highly skilled labor force, especially among residents with a four-year college degree. Yet despite recent increases in non-baccalaureate credentials, those without a four-year degree are more likely to major in fields of study that are not well-aligned with labor market demand. In the next several chapters we will document the skill distribution of Boston's labor force and compare this to what is demanded by employers to determine where the gaps are and what can be done to fill them.

III. How do the Skills of Non-BA Workers Compare to Those of BA Workers?

We know that the return on investment for a given educational credential often varies by the length of the program as well as the field of study. However, studies show that this return reflects both the acquisition of skill as well as the signal of being a skilled worker (e.g. the "sheepskin effect"). One could argue that the actual skills that are obtained by an individual—either through an education or training program or through work experience—are a more important indicator of how they will perform in a given job than the degree that they hold. However, it's difficult for employers to directly observe what skills a candidate has without extensive testing or long probationary periods on the job. Instead, they often use educational degrees as a proxy.

Until recently, researchers only had data on the educational credentials held by an individual, with no indication of the actual skills that they had acquired. However, with the advent of online job searching, more and more individuals are posting their resumes on job boards to seek positions. These resumes contain not just a listing of education and experience, but also skills that have been picked up along the way that the individual wants to highlight. We collected a sample of resumes for both non-BA and BA workers in the greater Boston area to compare the actual skills of individuals with different education credentials. In doing so, we hope to assess which skills have the greatest amount of overlap across the two groups and what that might suggest about their substitutability in the labor market.

Before we dive into the data, a few caveats are in order. First, this is a sample of resumes in greater Boston from a large job board. As such, we capture only individuals seeking jobs online, and even more specifically through this job board, rather than all jobs seekers in greater Boston. Second, we parse out skills that are listed on the resume. This means we only capture what individuals report, even if they might possess other skills that are not listed. Finally, there is a lot of variation in how people list skills on their resumes. This means we need some way of categorizing skills to be able to compare them across groups. We do this by using a taxonomy developed by Burning Glass Technologies that creates skill clusters that can be grouped across three types: baseline skills (e.g. project management), specialized skills (e.g. information security), and software skills (e.g. Oracle). For example, an individual might list that they are proficient in English and Spanish as a skill which would be classified within the “bilingual” skill cluster and then categorized as a baseline skill.

A. Years of Experience and Field of Study for Non-BA versus BA Workers

Table 5 provides descriptive statistics for our resume data sample by educational attainment for high school graduates, associate degree holders, and bachelor’s degree recipients. In general, the associate degree recipients have more years of work experience compared to the high school graduates and bachelor’s degree recipients. This likely reflects that high school graduates tend to be younger and may still pursue additional education. Similarly, because Boston is a “college town,” we also have a disproportionate share of recent college graduates looking for jobs, as was reflected in the age distribution of BA versus non-BA workers discussed above. Thus, if anything, the sample of bachelor’s degree recipients is less experienced than the associate degree holders, which would tend to underestimate any measures of skill gaps between the two groups.

Table 5. Years of Experience by Educational Attainment of Workers, Boston Resume Sample

	High school diploma	Associate degree	Bachelor’s degree
Experience (percent in each category)			
< 1 Year	16.3%	4.4%	10.9%
1-2 Years	19.8%	9.4%	21.2%
3-5 Years	20.1%	25.0%	23.0%
6-10 Years	21.9%	30.5%	22.3%
> 10 years	21.8%	30.6%	22.6%
# of jobs (mean)	3.7	4.1	2.3
Last Update (percent in each category)			
2013	1.6%	6.1%	7%
2014	2.5%	7.3%	8%
2015	4.3%	9.7%	12%
2016	9.1%	13.5%	16%
2017	27.3%	31.7%	23%
2018	55.2%	31.7%	34%
# of individuals	8,563	6,297	6,936

Source: Author’s calculations using resume data from a large job board.
 Note: Resumes are for job seekers living in the Boston area who have updated their resumes in the past five years.

As we noted above, field of study is an important factor in terms of skill acquisition, regardless of the length of the degree program. Not surprisingly, Table 6 indicates that the field of study among our sample of associate degree holders reflects those that are most popular in the Boston area—namely business (19.4 percent), health (6.1 percent), and nursing (4.7 percent), with fewer graduates in computer science (1.8 percent) or engineering fields (2.3 percent). While business is a top field among the bachelor’s degree recipients in our sample, engineering is well-represented (9.6 percent) but not computer science (3.2 percent). This seems somewhat surprising, although computer science is one of the fields in which job seekers tend to use job boards that are more field-specific than the generic one from which we drew our sample. Again, this suggests that any skill gaps, including those involving software skills, are likely to be conservative estimates.

Table 6. Top 10 Fields of Study for Two-Year versus Four-Year College Graduates, Boston Resume Sample

Associates degree	Share	Bachelors degree	Share
Business	19.4%	Business	30.3%
Health/ Medical	6.1%	Engineering	9.6 %
Criminal Justice	6.0%	Psychology	4.7%
Nursing	4.7%	Criminal Justice	3.2%
Psychology	2.6%	Computer Science/IT	3.2%
Liberal Arts	2.4%	Biology	3.0%
Education	2.8%	Health/ Medical	3.9%
Engineering	2.3%	Nursing	2.8%
Culinary	2.0%	Political Science	2.2%
Computer Science/ IT	1.8%	Communications	1.8%

Source: Author’s calculations using resume data from a large job board.
 Note: Resumes are for job seekers living in the Boston area who have updated their resumes in the past five years.

B. Types of Skills Held by Non-BA versus BA Workers

How do the skillsets of non-baccalaureate workers compare to those of bachelor’s degree holders in the Boston area? Table 7 lists the percent of workers in each education category with a particular skillset (e.g. baseline, specialized, or software). Not surprisingly, individuals with more education tend to be more skilled and the gap between high school and college graduates is wider than the gap between two- and four-year college degree holders. For example, 36.5 percent of high school graduates have one or more baseline skills listed on their resume compared to 50.0 percent of workers with an associate degree and 58.9 percent of those with a bachelor’s degree. However, the gap differs across types of skill, with hardly any difference across groups in terms of specialized skills but large differences in terms of baseline and software skills. Only 48.1 percent of high school graduates had at least one software skill listed on their resume compared to 64.0 percent of workers with an associate degree and 81.8 percent of those with a bachelor’s degree.

Table 7: Distribution of Skills among Labor Force by Education Level, Boston Resume Sample

	Baseline skills	Specialized skills	Software skills
High school diploma	36.5%	92.1%	48.1%
Associate degree	50.0%	90.6%	64.0%
Bachelor’s degree	58.9%	92.8%	81.8%

Source: Author’s calculations using resume data from a large job board.
 Note: Resumes are for job seekers living in the Boston area who have updated their resumes in the past five years.

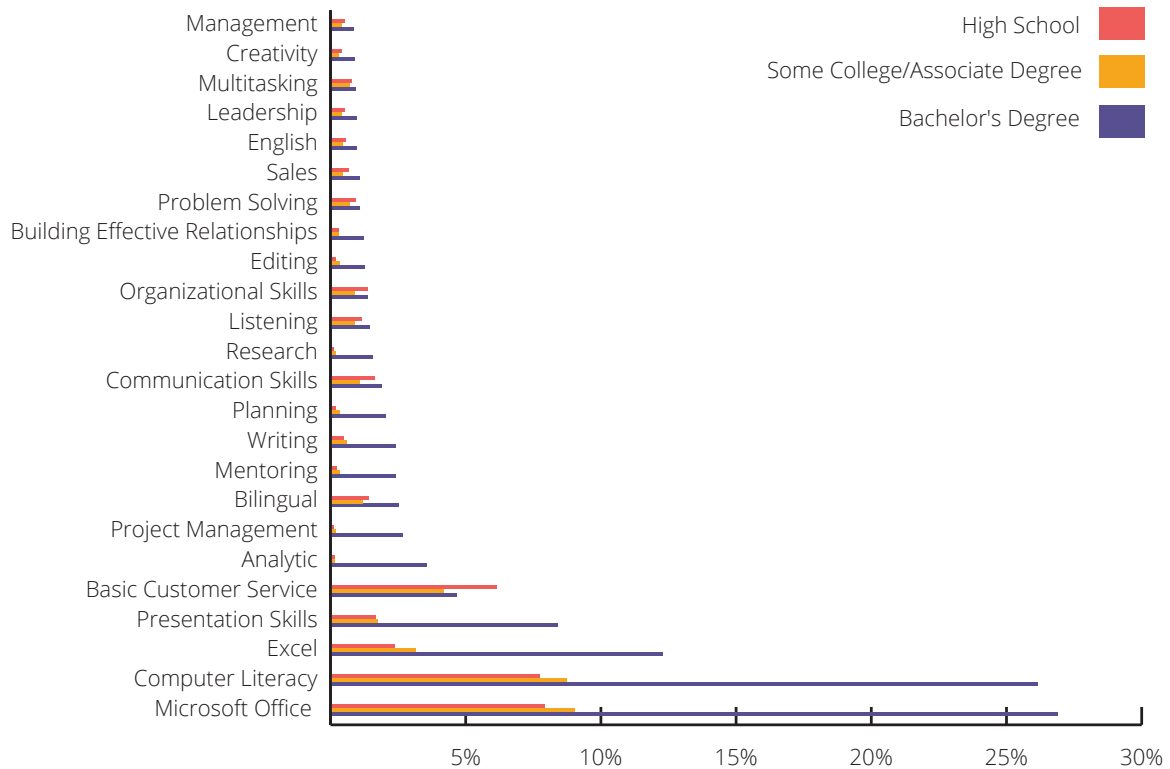
However, what about the nature and frequency at which workers with different education levels possess these skillsets? The skill categories in Table 7 are quite broad, encompassing thousands of actual skills, each differing in terms of how likely they are to be listed by an individual. For example, it could be the case that workers with a bachelor’s degree possess a different set of baseline skills than other workers or even the same set of baseline skills but at a higher frequency.

To explore this, Figure 8 plots the frequency of the top 25 baseline skills listed for individuals with a BA and examines the degree of overlap compared to individuals with some college or an associate degree versus those with a high school degree. While non-BA workers possess many of the same baseline skills as BA workers, they do so with less frequency. For example, while 27 percent of bachelor's degree recipients list Microsoft Office² on their resume, only 9 percent of associate degree holders and 8 percent of high school graduates list this skill. Gaps are also observed for other baseline skills, such as computer literacy skills, as well as presentation, analytic, project management, mentoring, writing, planning, and research skills. However, other baseline skills show more overlap between non-BA and BA workers. These include basic customer service, bilingual, communication, listening, organizational, problem solving, sales, leadership, multitasking, and management. In general, it appears that gaps in some of the frequently listed BA skills such as Microsoft Office, computer literacy, presentation, and project management could be acquired by non-BA workers through a short-term certificate program, whereas gaps in such other skills as analytic, mentoring, planning, and research would require more intensive training.

What about the degree of overlap across specialized skill clusters that reflect the kinds of knowledge or training that workers might need to do their jobs? As one might expect, the types of specialized skills required vary to a greater degree across job seekers of different education levels. Interestingly, it's not always the case that workers with a BA are more likely to list these skills than non-BA workers. For example, Figure 9 shows that BA workers are more likely to list specialized skill clusters such as office management, general marketing, information security, people management, training programs, visual design production, data science, research methodology, event planning and management, and budget management. However, non-BA workers are as likely or even more likely to list specialized skill clusters such as advanced customer service, business communications, emergency and intensive care, general administrative tasks, human resource management and planning, electrical and computer engineering, product inspection, retail sales, and inventory management. This suggests that while non-BA workers may not possess all of the same specialized skills as BA workers at the same frequency, there is a high degree of overlap in some areas. However, the large gaps that exist across some skill clusters such as office management, general marketing, and information security would likely require at least a semester-long course if not an associate degree program to confer the specialized knowledge that would be comparable to that of BA workers.

²The Microsoft Office productivity suite features Outlook, Word, Excel, PowerPoint, Access, OneNote, a team SharePoint site, as well as an online meeting place with HD video and screen sharing.

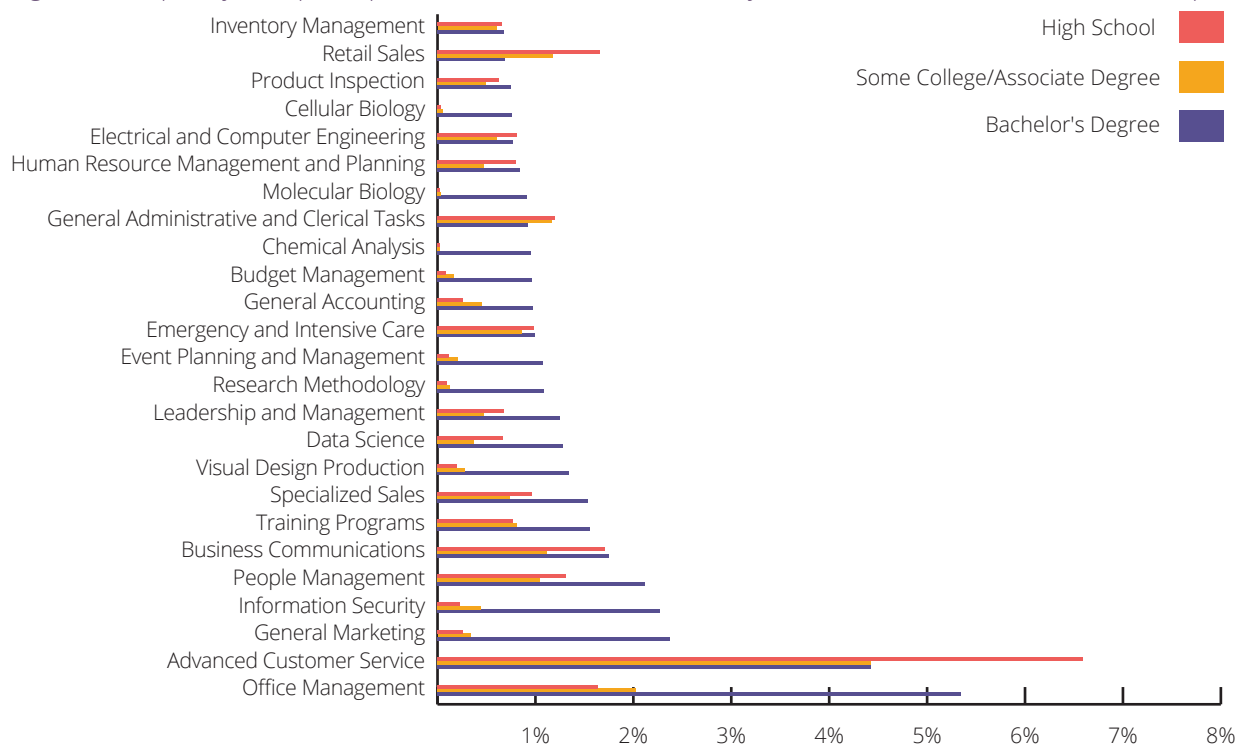
Figure 8. Frequency of Top 25 Baseline Skills Across Workers by Education Level, Boston Resume Sample



Source: Author's calculations using resume data from a large job board.

Note: Resumes are for job seekers living in the Boston area who have updated their resumes in the past five years.

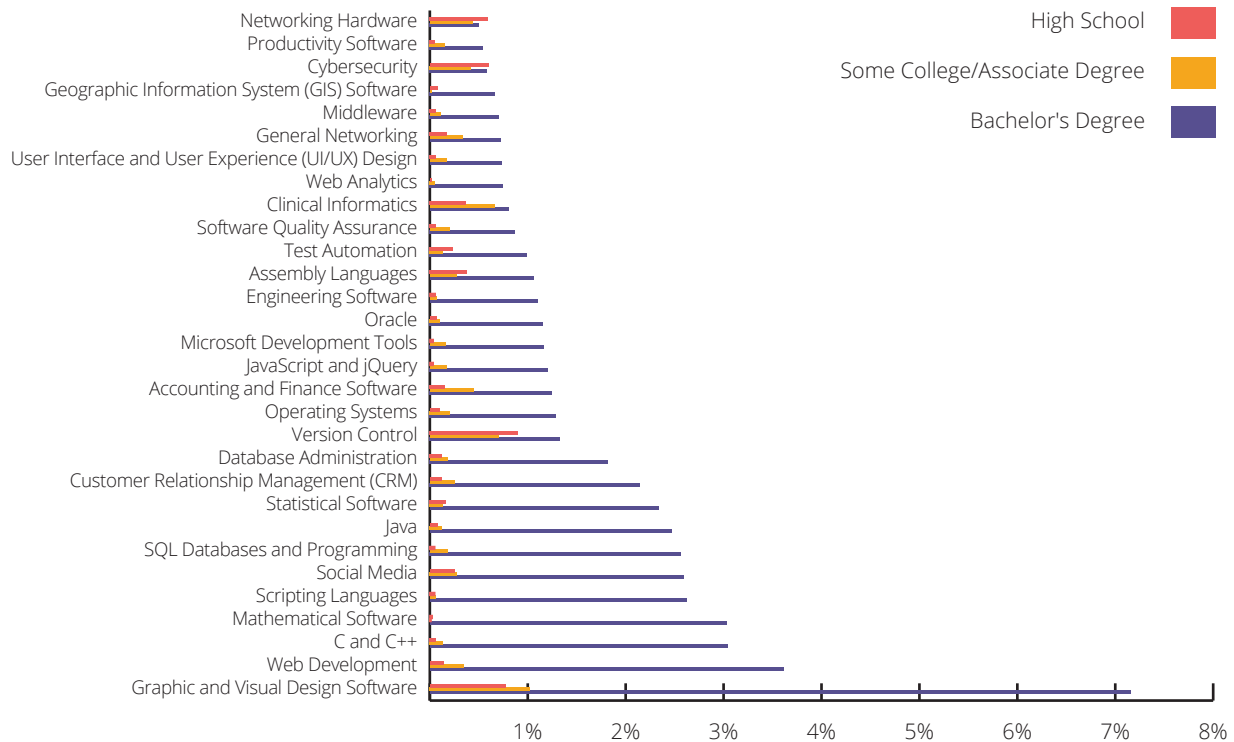
Figure 9. Frequency of Top 25 Specialized Skills Across Workers by Education Level, Boston Resume Sample



Source: Author's calculations using resume data from a large job board.

Note: Resumes are for job seekers living in the Boston area who have updated their resumes in the past five years.

Figure 10. Frequency of Top 25 Software Skills Across Workers by Education Level, Boston Resume Sample



Source: Author's calculations using resume data from a large job board.
 Note: Resumes are for job seekers living in the Boston area who have updated their resumes in the past five years.

The differences among specific skill clusters that are required across education levels is even more stark in the software skill category. Figure 10 shows that with the exception of four software skill clusters, the share of non-BA workers listing a given software skill is four to eight times less than the share of BA workers listing the same skill. The four skill clusters where the two groups overlap include version control, clinical informatics, cybersecurity, and networking hardware. In contrast, non-BA workers are far less likely to list software skills such as graphic and visual design software, web development, C and C++, mathematical and statistical software, scripting languages, SQL, Java, customer relationship management, and database administration. While it could be the case that some of these software skills (e.g. SQL, Java) could be learned in a short-term “boot camp,” it’s likely that for non-BA workers to be able to fill jobs held by BA workers, acquiring many of these software skills (e.g. C and C++, web development, database administration)

would require more intensive training and instruction such as that found at the community college level.

C. Summary of Non-BA versus BA Skillsets

Overall, it appears that while there is some overlap in the frequency of skill categories listed among job seekers of different education levels, the nature of those skills does vary and appears to be driven largely by technology related to using computer software. The most overlap is observed among baseline skills but even in that category, computer literacy and knowledge of basic software like Microsoft Office seems to be a big distinction between non-BA and BA workers. However, non-BA workers have baseline and specialized skillsets that are much more similar to those of BA workers—suggesting that with some additional training or instruction, these two groups may be substitutable for some subset of occupations.

IV. Employer Demand for Skills in Boston

Education credentials are often used by employers as a proxy for the skills acquired by job candidates in the hiring process. Yet, education may not be the best measure to assess whether a worker has the right set of skills for the job. Indeed, many employers have reported a shortage of skilled workers for the vacancies they are trying to fill, especially as the labor market has recovered, suggesting a potential “skills gap” (Enwemeka, 2017a; Templeton, 2018). However, the lack of wage growth has led some economists to question the degree of mismatch that exists in the labor market and whether employers have imposed higher education and experience requirements that have excluded workers with the necessary skills to fill the job (Cappelli, 2012).

A. Changes in Employer Demand for Education and Experience

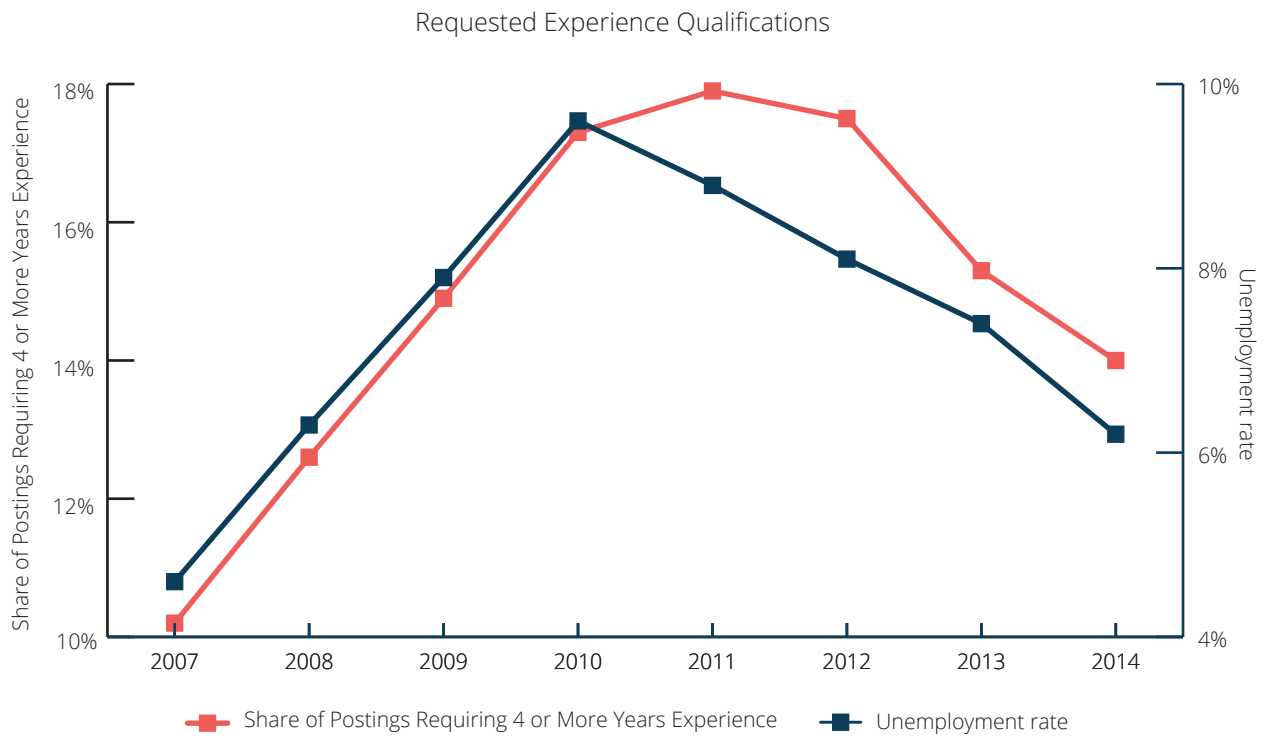
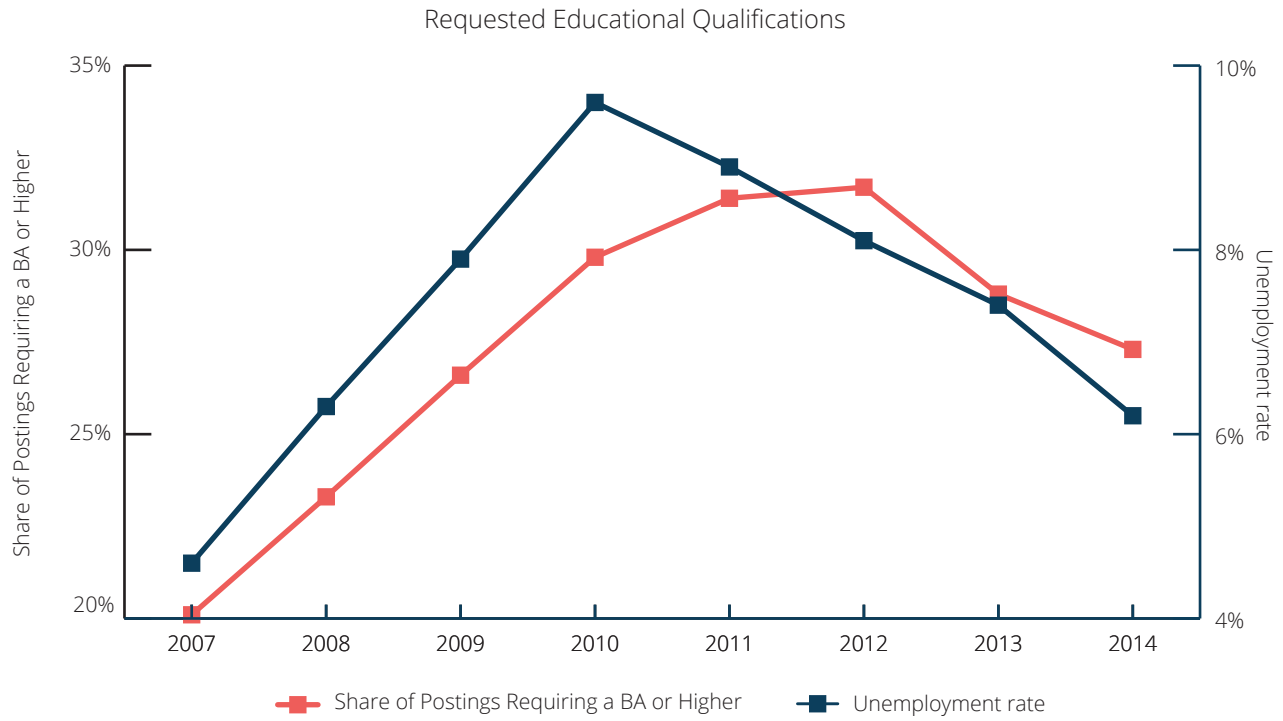
Indeed, during the Great Recession some employers raised education and experience requirements when skilled workers were plentiful only to reduce those job requirements when the labor market tightened. Recent research using data containing the near-universe of online job postings from Burning Glass Technologies provides strong evidence of this upskilling/downskilling trend (Modestino, Shoag, & Ballance, 2016). The share of employers requiring a

bachelor’s degree or five or more years of experience increased more during the recession in places where the unemployment rate rose more rapidly. But perhaps what was more surprising was that employers subsequently lowered these skill requirements during the recovery, as workers became scarcer.

The top panel in Figure 11 shows that the share of job postings requiring a bachelor’s degree or higher rose by more than 10 percentage points during the recession (from 2007 to 2010) and then fell as labor markets recovered (from 2010 through 2014). Similarly, the bottom panel shows that the share of postings requiring 5 or more years of experience rose by roughly 7 percentage points during the recession and then also fell as the labor market recovered.

While the requirements did not fully drop to pre-recession levels, the figures indicate that an important part of the rise in skill requirements was indeed opportunistic in response to the availability of skilled workers during the Great Recession. For example, only 15 percent of physician assistant jobs required a bachelor’s degree or higher in 2007. That share jumped to 35 percent in 2010 and has since fallen to only 12 percent as of 2017. Recent news articles have observed that employers have similarly reduced their experience requirements (Gee, 2018).

Figure 11. Change in Job Skill Requirements Over the Business Cycle, 2007–2014



Source: Modestino, Shoag, & Ballance, 2016.

Moreover, this upskilling/downskilling trend extends beyond just education and experience to actual skill requirements listed on the job posting. Requirements for baseline skills (e.g. project management), specialized skills (e.g. information security), and software skills (e.g. Adobe Dreamweaver) also increased during the Great Recession and then decreased during the recovery. This finding suggests that employers responded to the available supply of workers and were willing to adjust skill requirements as needed to be able to fill vacancies. Interestingly, baseline skills, which can typically be learned on the job, were more likely to fall during the recovery compared to specialized or software skills, which often require more formal instruction or training. In fact, software skills showed little reversion at all, suggesting that employer demands for these types of skills are more likely to reflect changes in the tasks required by the job. For example, prior to the Great Recession most medical record technicians recorded patient information using paper charts. Now most job postings for medical records technicians require knowledge of EPIC, a software system used primarily by large U.S. hospitals and health systems to access, organize, store and share electronic medical records.

B. Types of Skills Listed on Non-BA versus BA Job Postings

Despite the recent reversion in skill requirements as the labor market has recovered, job postings that require a higher level of education are still more likely to require specific skillsets. However, the differences in baseline skill requirements across education levels is small compared to other types of skills. Table 8 shows that, as of 2017, roughly 71 to 75 percent of job postings required baseline skills regardless of the education level advertised. In contrast, larger differences existed in the requirement of specialized or software skills. These skills were required at lower rates in job postings for high school graduates than in those requiring a two- or four-year college degree. For example, 86 percent of job postings for high school graduates require specialized skills compared

to 91 percent of postings for associate degree recipients and 94 percent of postings for bachelor's degree recipients. Job postings seeking workers with a two- or four-year college degree were twice as likely to include software skill requirements compared to postings seeking high school graduates.

However, what about the nature and frequency at which these skillsets are required for jobs seeking workers with different education levels? The skill categories in Table 8 are quite broad, encompassing thousands of actual skills, each differing in terms of how likely they are to be required. For example, it could be the case that job postings seeking bachelor's degree recipients advertise a different set of baseline skills or the same set of baseline skills but at a higher frequency.

Table 8: Distribution of Skill Requirements among Job Postings by Education Level, Boston

	Baseline skills	Specialized skills	Software skills
High school diploma	70.9%	86.2%	12.3%
Associate degree	75.6%	91.2%	31.5%
≥ Bachelor's degree	74.8%	94.1%	31.6%

Source: Author's calculations using data provided by Burning Glass Technologies for 2017.

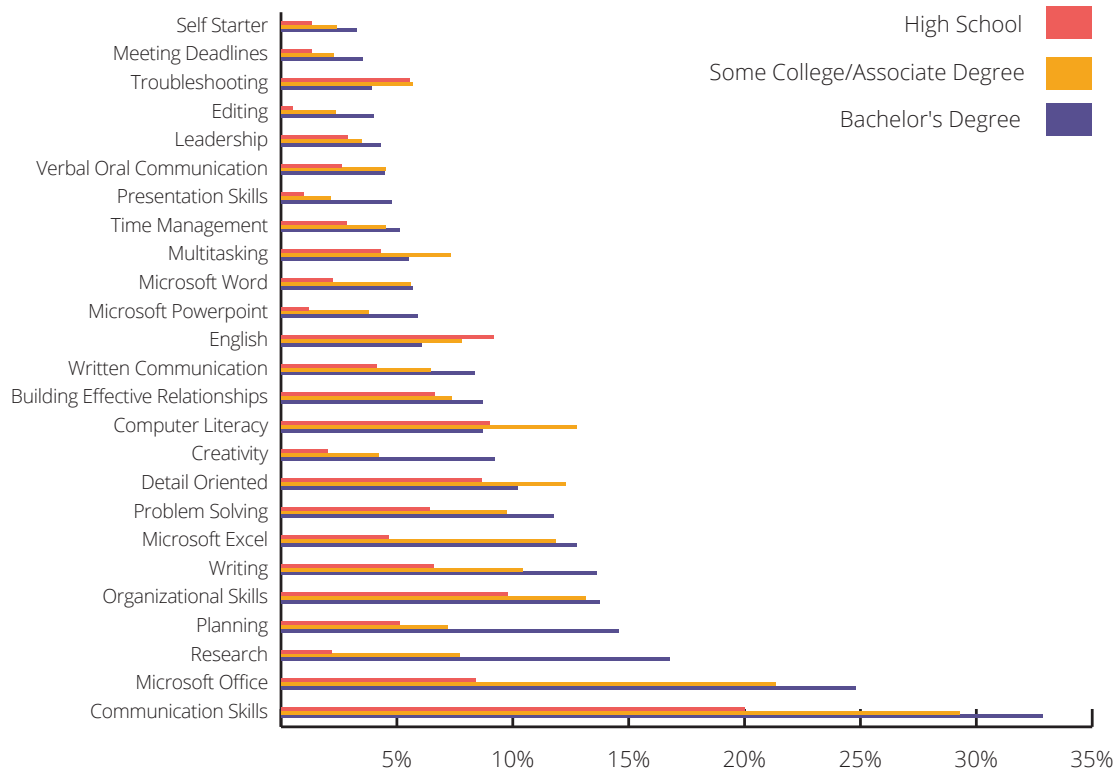
Similar to our earlier analysis, we plot the frequency of the top 25 baseline skills requested by job postings for individuals with a BA and examine the degree of overlap compared to individuals with some college or an associate degree versus those with a high school degree. Surprisingly, there is far more overlap among the baseline skills required by education level than there was in the baseline skills listed by workers—particularly for two- versus four-year college graduates. For example, a similar or greater share of associate degree job postings required organizational skills, Microsoft Excel and Word, orientation to details, computer literacy, effective relationship-building, multi-tasking, time management, verbal communication, leadership, and troubleshooting. In contrast, baseline categories that

were more likely to be required on BA job postings included overall communication skills; Microsoft Office; research, planning, writing, and creativity skills; and Microsoft PowerPoint and presentation skills, as well as an ability to meet deadlines and be a self-starter. Baseline skills were far less likely to be required across most categories for high school degree job postings. In general, it appears that jobs for associate degree holders are as likely to request about half of the top 25 baseline skills as BA job postings are, suggesting the potential for substitutability across the two groups of workers. This is particularly true for jobs that require less research, planning, writing, and creativity and more teachable skills, such as presentation skills or Microsoft Office.

What about the degree of overlap across specialized skills that include detailed knowledge needed for performing certain tasks? As before, the types of specialized skills required vary to a greater degree across jobs of different education levels. However, it's not always the case that workers with a BA are more likely to list these skills than non-BA workers—particularly among postings requiring some college or

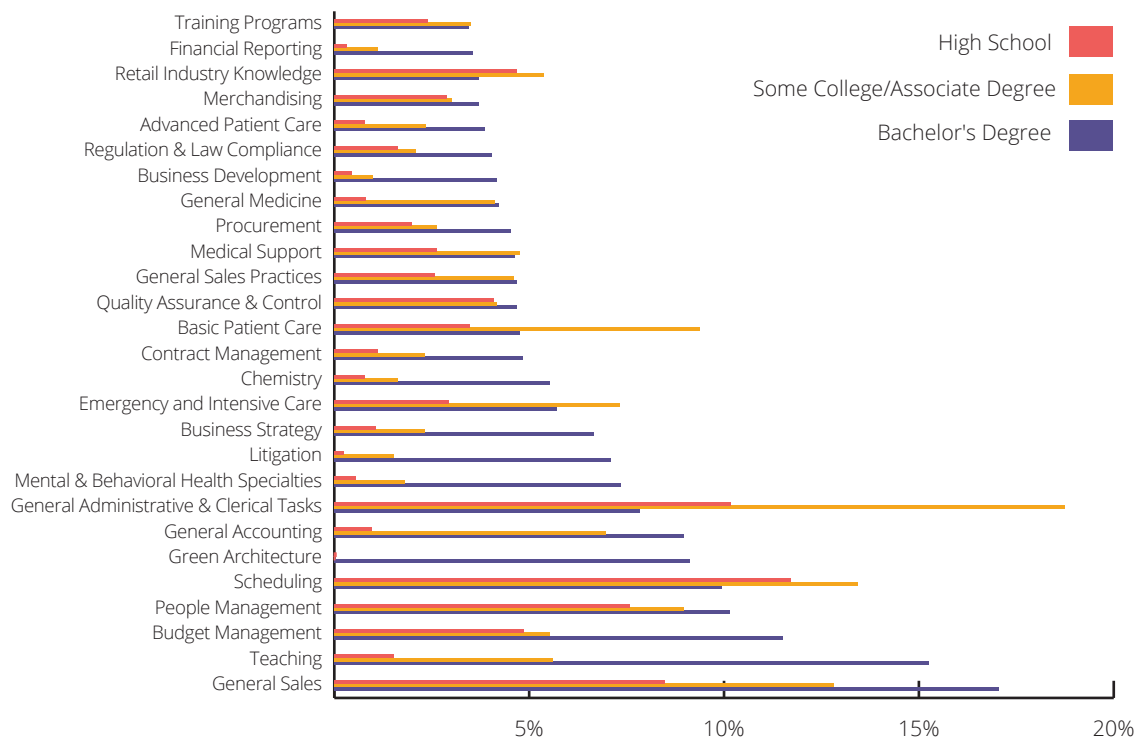
an associate degree. For example, Figure 13 shows that BA job postings are more likely to require specialized skill clusters such as general sales, teaching, budget management, litigation, business strategy and development, contract management, regulation and law compliance, and financial reporting. However, non-BA job postings are as likely or even more likely to list specialized skill clusters such as scheduling, basic patient care, emergency and intensive care, quality assurance and control, general sales, medical support, general medicine, merchandising, retail industry knowledge, and training programs. This suggests that while non-BA job postings may not require all of the same specialized skills as BA job postings or at the same frequency, there is a high degree of overlap in some areas. However, the large gaps that exist across some skill clusters, such as budget and contract management, business strategy and development, financial reporting, and regulation and law compliance, would likely require at least a semester-long course if not an associate degree program to confer the specialized knowledge comparable to that required by BA job postings.

Figure 12. Frequency of Top 25 Baseline Skills for Job Postings by Education Level



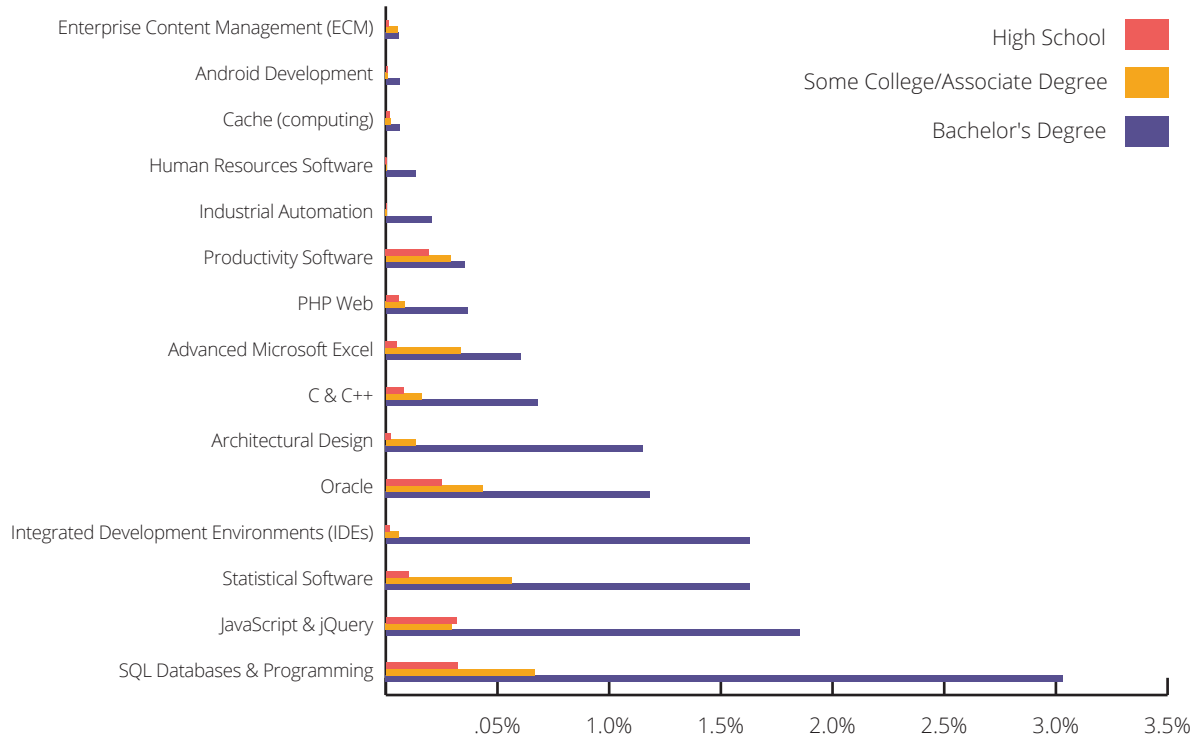
Source: Author's calculations using data provided by Burning Glass Technologies for 2017.

Figure 13. Frequency of Top 25 Specialized Skills for Job Postings by Education Level



Source: Author's calculations using data provided by Burning Glass Technologies for 2017.

Figure 14. Frequency of Top 25 Software Skills for Job Postings by Education Level



Source: Author's calculations using data provided by Burning Glass Technologies for 2017.

The differences among specific skillsets required across education levels is again more disparate in the software skill category. Note that because software is so specialized, the share of postings requiring any particular software skill cluster is very small. Nonetheless, we can still explore differences across job postings by educational categories. Figure 14 shows that among the top software skill clusters for bachelor's degree job postings, only a few categories show significant overlap with non-BA postings: productivity software (application software used for producing information), cache computing (stored collection of some data, usually website data, that helps it load faster the next time), and enterprise content management (technology used to capture, manage, store, preserve, and deliver content and documents related to organizational processes). In contrast, large gaps exist in the most frequently requested software skill clusters such as SQL, Java, statistical software, Integrated Development Environments (IDEs), Oracle, architectural design,

and C and C++. However, the software skills required by associate degree jobs seem more closely aligned to those of bachelor's degree jobs, whereas high school degree jobs are much less likely to require any software skills at all. This suggests some degree of substitutability between workers with an associate versus a bachelor's degree.

C. Summary of Employer Demand for Skill

Overall, the differences in skill requirements across education levels listed on job postings are similar to those that we observed across education levels listed on resumes. There are fewer differences in requested baseline skills and the gap is much smaller when comparing two- and four-year college graduates. Indeed, for some baseline categories, job postings for two-year college graduates are more likely to require certain baseline skills than job postings for four-year college graduates. For other baseline skills, there are large gaps that could

potentially be addressed through training for things like PowerPoint and presentations skills or Microsoft Office. Yet, more analytical baseline skills, such as research, planning, writing, and creativity, would require bigger investments in course instruction or experiential learning.

A similar pattern was observed for specialized skill clusters where non-BA job postings do not require all of the same specialized skills as BA job postings or at the same frequency, but there is a high degree of overlap in some areas. However, filling in the large gaps that do exist would likely require at least a semester-long course if not an associate degree program in areas such as budget and contract management, business strategy and development, financial reporting, and regulation and law compliance.

Finally, the largest gaps across BA and non-BA job postings are found within software skill clusters, even when comparing software skills between two- versus four-year graduates. Given the rapid adoption of new software within different sectors of the economy, addressing these gaps will require close partnerships with employers and programs that can adapt quickly to changing demands for particular tools.

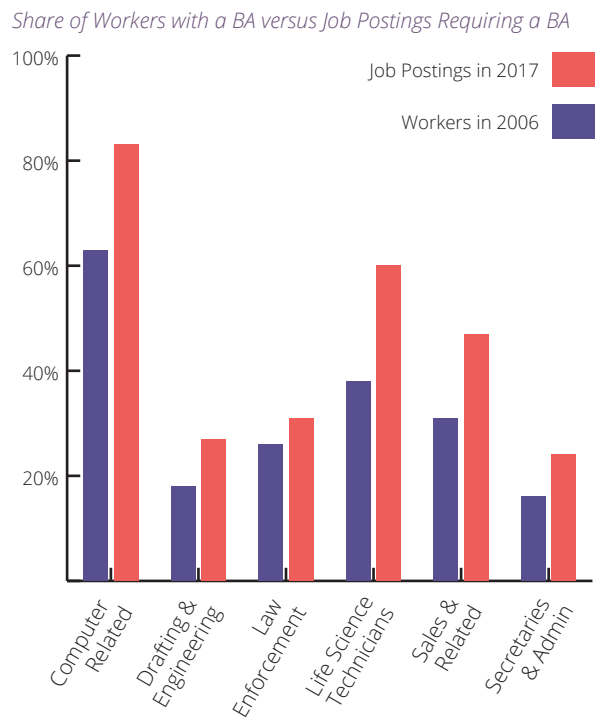
V. Upcredentialing within Selected Occupations

For which occupations might non-BA workers have the necessary skills to fill job postings that currently require a bachelor's degree? We know that during the Great Recession employers increased education requirements in certain traditionally "middle-skill" occupations to require candidates to have a four-year college degree in response to the greater availability of unemployed BA workers. Recently, employers in some of these same occupations have decreased these education requirements in response to the scarcity of workers as unemployment has reached historically low levels. Given the overlap in skillsets between

workers with a two- versus a four-year college degree, it's likely that there is a subset of occupations that currently require a BA but could be filled with a non-BA worker. If this is true, then policymakers might want to think about developing skill-specific programs and credentials for non-BA workers to signal to employers that they would be a good fit for those jobs.

Some of these upskillers included traditionally "middle-skill" occupations such as computer-related occupations, drafting and engineering, law enforcement, life science technicians, sales and related workers, and secretaries and administrative assistants. Figure 15 shows the degree of upcredentialing among these occupations by comparing the share of workers in that occupation with a bachelor's degree in 2006 to the share of postings that required a bachelor's degree in 2017. Over the past decade, there was a significant upward shift in the credentials needed to qualify within each occupation, indicating that the bar had shifted for hiring new workers relative to incumbents.

Figure 15. Upcredentialing during the Great Recession, Selected Occupations



Source: Author's calculations using data provided by Burning Glass Technologies for 2017 and the 2005-07 American Community Survey.

Our earlier analysis revealed that associate degree holders appear to be the closest substitutes for BA workers among the non-BA population. To test this hypothesis, we compare the skillsets required on job postings within each of the occupations listed in Figure 15 to those listed on the resumes of associate degree recipients with degrees in a related field of study. In general, Table 9 shows that associate degree workers compare favorably in terms of the frequency of baseline, specialized and software skills

required within each occupation—yet some large gaps do exist. For example, 77.2 percent of computer related occupations require baseline skills yet only 48.2 percent of workers with an associate degree in computer science list any baseline skills on their resume. Similarly, 59.5 percent of job postings for secretaries and administrative assistants require software skills, yet only 48.1 percent of workers with an associate degree in liberal arts list software skills on their resume.

Table 9. Comparison of Skills for Job Postings versus Associate Degree Recipients

SOC	Occupation Name	Percent of Job Postings Requiring		
		Baseline Skills	Specialized Skills	Software Skills
151	Computer Occupations	77.2%	98.3%	84.5%
173	Drafters, Engineering Technicians	80.5%	94.2%	43.5%
333	Law Enforcement Workers	78.1%	81.3%	22.4%
194	Life, Physical, & Social Science Technicians	83.3%	97.1%	43.2%
419	Other Sales & Related Workers	79.0%	95.9%	34.0%
436	Secretaries & Administrative Assistants	85.6%	98.0%	59.5%

Field of Study	Percent of Associates Degree Recipients with		
	Baseline Skills	Specialized Skills	Software Skills
Computer Science	48.2%	94.6%	80.4%
Engineering	80.3%	100.0%	40.1%
Criminal Justice	61.9%	89.7%	22.7%
Biology	69.7%	87.9%	46.7%
Business	68.7%	89.7%	30.5%
Liberal Arts	63.3%	86.1%	48.1%

Source: Author's calculations using data provided by Burning Glass Technologies for 2017 and resume data from a large job board.

But even if workers with an associate degree are as likely to list skills within each category compared to what is required in most job postings, are the skills that they list the ones that employers are looking for? We cannot answer this question given our limited sample of resumes. However, we can answer a related question: within the same occupation, do the skills on job postings that require a BA differ from jobs postings that do not? If not, then perhaps some employers are simply using a bachelor's degree

as a proxy for certain skill requirements because it is difficult to distinguish which of the candidates without a BA have the skills needed for the job. If the latter case is true, then there is a role for labor market intermediaries that can help workers signal that they have the “right” set of skills to employers. For example, if employers hiring administrative assistants look for candidates with a BA because they tend to have well-developed project management skills, then developing a certificate program in project

management for non-BA candidates can help such workers signal their qualifications to employers.

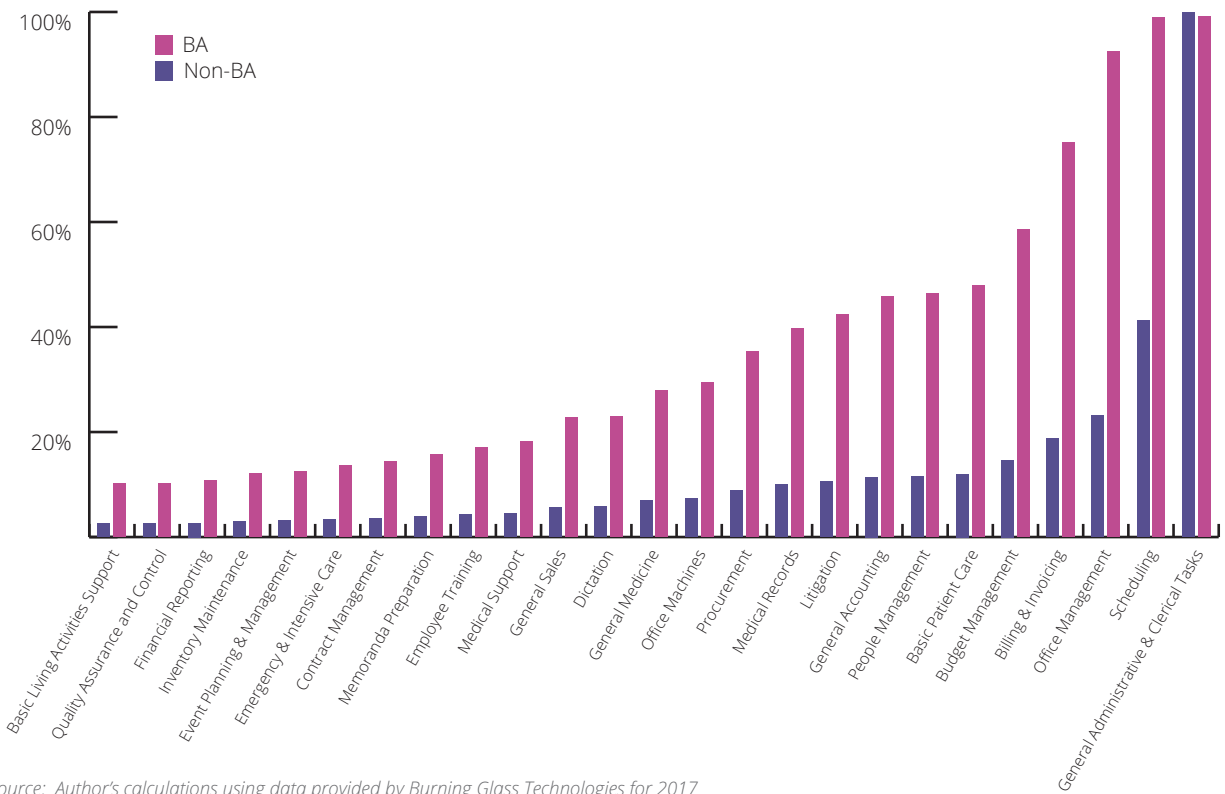
As it turns out, the same skills are often listed on BA versus non-BA jobs within a given occupation, although the frequency with which they are required is very different. For example, Figure 16 plots the top 25 baseline skills for Secretaries and Administrative Assistants postings that require a BA versus those that do not. In each case, the list of skills and the order in which they are listed is exactly the same. What is different is the share of postings that require each type of skill: for a given skillset, a higher percentage of BA administrative jobs require each skill compared to non-BA administrative jobs. For example, although nearly 100 percent of postings for BA jobs require scheduling, only 41 percent of non-BA jobs do. In general, BA administrative jobs are four times more likely than non-BA jobs to require any given skill among the top 25 list, with the exception of general administrative and clerical tasks. A similar pattern is observed for the other occupations listed in Table 9.

However, it seems that employers should be able to screen for some of these skills, especially if they recruit applicants online. A simple drop-down menu of skills or a test of basic knowledge could be a good indicator. However, in a recent survey by Accenture, employers also frequently say that they require a bachelor's degree to screen for soft skills that are harder to observe, such as work ethic, communication, teaming, and leadership (Accenture Research, 2014). Indeed, one-third of HR executives in the survey noted that while they could find skilled workers, many lacked the work ethic or ambition to be successful in

the role. In interviews, companies admitted to raising education requirements to find employees with strong communication skills, leadership potential, and reliability, especially for sales and customer-facing roles. Again, labor market intermediaries could play an important role by vouching for the soft skills of non-BA workers applying for BA positions that employers are looking to fill.

Another potential rationale for upskilling is that employers believe that a bachelor's degree ensures that the workers possess the capacity to grow in their jobs. For example, in follow-up interviews and in open-ended questions in the Accenture middle-skills survey, HR leaders said that BA candidates for IT positions are more likely to have the technical savvy, problem-solving capabilities, and ability to adapt to new systems and technologies necessary to stay productive and be promoted. Given the persistent difficulty in filling IT positions, they want to hire workers who can grow with the organization rather than spend resources constantly recruiting. One potential solution could be for labor market intermediaries to make a longer-term commitment to their clients and the employers that they place them with to help non-BA workers continue to acquire skills on the job.

Figure 16. Frequency of Top 25 Baseline Skills Listed by Secretary and Administrative Assistant Jobs BA Jobs versus Non-BA Jobs



Source: Author's calculations using data provided by Burning Glass Technologies for 2017

Why should employers worry about posting jobs with more restrictive education requirements? After all, why not always search for the best possible candidate? Because for middle-skill jobs, employers often miss out on potentially qualified candidates, which lengthens the hiring process. This can waste resources and also result in hiring an over-qualified worker who won't stay in the job for long, possibly increasing turnover. For example, a report by Burning Glass Technologies found that BA IT help-desk jobs took 40 percent longer to fill on average compared to non-BA IT help-desk jobs, despite requiring identical skillsets (Burning Glass Technologies, 2014). This explains why, as the economy has recovered, and it has become increasingly difficult to find qualified workers, some employers have rolled back their education and experience requirements.

VI. Building a More Inclusive Workforce Development Strategy

Reducing inequality and expanding opportunity are central challenges increasingly acknowledged by leaders across the political spectrum. Policymakers generally agree that one approach to addressing inequality is to prepare young people and adults with the skills to earn a good income. The data in this report indicate that equipping non-BA workers with credentials that demonstrate proficiency in high-demand fields, such as associate degrees, certificates, or apprenticeships, can provide entry into high-paying middle-skill jobs in key sectors of the Boston economy such as IT, healthcare, finance, and the life sciences.

In this section we offer recommendations for policies that can foster skill development among non-BA workers. Of key importance is ensuring that these skills are relevant to employers. Of equal importance is providing the needed supports to help workers persist in their training or education to obtain a credential that is in high demand in the labor market.

Recommendation 1: Collaborate with employers to determine what skills are in high demand and help non-baccalaureate workers acquire the right credentials.

During the Great Recession when unemployment was high, the share of employers requiring a college degree increased for entry-level positions that previously required only a high school degree in certain occupations. As the labor market has continued to recover, employers are now reducing educational requirements for some of these jobs to speed up hiring and broaden the pool of candidates (Gee, 2018). These changing requirements suggest that there is some degree of flexibility for employers to hire non-BA workers into certain entry-level positions—if they have the right skills and experience.

Working closely with employers to determine the experience and skills needed for such positions, the City can then help non-BA workers acquire the “right” credentials that can signal proficiency and guarantee employability. Depending on the job, this could mean developing programs that lead to a license, certification, training, or apprenticeship that provides the skills that employers are looking for. Indeed, occupations that showed little or no signs of educational upskilling had strong credential requirements such as state licensing, industry certifications, or specific measurable skills (e.g. coding). For example, many healthcare technician jobs such as phlebotomists, radiology technicians, and diagnostic medical sonographers only require a certificate that demonstrates their training in performing the skills that are needed (Burning Glass Technologies, 2014). When employers have specific

criteria to use as a yardstick when hiring, there is less incentive to filter applications using less-specific screens such as having a bachelor’s degree.

Yet workers are not always aware of these specific requirements, especially in fields where certifications do not already exist for the skills needed or the skills themselves change rapidly. For example, there is a perception that many administrative, clerical, and human resources positions have become more demanding because workers need to be able to use different types of software (e.g. Microsoft Office, Salesforce). However, the skills requested for these positions are similar whether they are BA or non-BA job postings, suggesting that employers may simply be using a college degree as an imperfect proxy for the ability to learn these skills. Alternatively, a recent report by Burning Glass Technologies finds that in 2013 there were 33,923 medical coding graduates and 45,185 medical coding postings for new graduates. However, a recent survey of employers by Accenture found that 29 percent of healthcare employers named medical coders as one of their three hardest-to-fill roles. A closer look revealed that the demand-supply mismatch was due to a shortage of certified coding talent. Although there were 33,923 medical coding graduates in 2013, only about 20,000 individuals took and passed the medical coding certifications necessary to secure a full-time coding position (Burning Glass Technologies, 2013).

Boston already has several successful collaborations with employers to help bridge the gap between what employers require in terms of skills and the certifications that workers can obtain. These include expanding apprenticeship programs beyond the traditional occupational trades, incumbent worker programs that build worker skills, and coding boot camps that provide training for adults seeking careers in IT.

Expand Apprenticeship Programs | A direct approach to providing non-BA workers with the skills demanded by employers would be to expand

apprenticeship programs in growing fields such as healthcare, finance, and IT. Apprenticeship programs provide paid work-based postsecondary training that enables individuals to gain competencies on-the-job that prepare them to meet industry-recognized standards. For many years, workforce development proposals in the United States have typically included little or nothing about apprenticeship. Yet established apprenticeship systems in other countries, such as Germany, have demonstrated apprenticeship to be a highly cost-effective mechanism for developing workplace skills and for reducing youth unemployment. At its core, apprenticeship combines supervised, structured on-the-job training with classroom instruction. The apprenticeship model is especially attractive because of its potential to upgrade skills, improve the transition from school to career, reduce youth unemployment, raise the wages of young adults, and increase productivity—all while using workforce development funding more effectively (Lerman, 2010).

Apprenticeships have been shown to have rates of return far exceeding alternative training methods for middle-skill jobs. A recent study examined the earnings gains of individuals who exited various education and training programs, including community colleges, Workforce Investment Act (WIA) training, and apprenticeship. Comparing workers with similar characteristics, the study used a measure of earnings gains relative to program costs to calculate social benefits. During the first 2.5 years after a participant exited the program, the net social benefits to apprenticeship were about \$50,000 per apprentice, far more than minimal gains accruing to community college students and WIA trainees. On a lifetime basis, the study projected the present value of earnings gains less costs at \$269,000 per apprentice, compared to \$96,000-\$123,000 per community college attendee, and about \$40,000 per WIA trainee (Hollenbeck, 2008).

In Massachusetts, the Commonwealth's Division of Apprentice Standards oversees registered apprenticeship programs. Currently, there are about 2,600 employers that train roughly 5,000 apprentices annually in Massachusetts. Although over 850 different occupations can be sponsored through apprenticeship training, only 101 are currently registered, with a large majority being in the construction trades. Formal training programs must be registered with the state's Division of Apprentice Standards and are overseen by a field representative or compliance officer that assist with program implementation and administration. Employer sponsors must arrange for their apprentices to receive approximately 150 hours of related instruction in all subjects related to the trade, as well as provide no less than 2,000 hours per year of employment in the relevant occupation. An average apprenticeship lasts four years, during which a typical apprentice earns \$161,000 on average.

Although expanding the apprenticeship system would require a modest increase in spending, the state would need to develop a structure that would enable individual employers to more easily implement their own programs. New apprenticeship programs often have long waiting times of up to two years for approval. To qualify as a registered apprenticeship, a program must:

1. Have a sponsor (usually an employer or union).
2. Provide work-based learning under the direction of a qualified "journey person" totaling at least 2,000 hours of structured on-the-job learning.
3. Include a curriculum with at least 150 hours of theoretical instruction, which can be provided in-house by the sponsor or by a contract training provider.
4. Pay apprentices as employees, with progressively increasing wages.
5. Result in an apprentice who successfully completes the training, achieving journey person status and receiving a nationally recognized credential.³

In June 2018, the Commonwealth unveiled a strategic plan to diversify access to apprenticeships and to expand the number of apprenticeships in healthcare, information technology, and manufacturing. Meanwhile in Boston, OWD coordinates the Greater Boston American Apprenticeship Initiative (GBAAI) to expand apprenticeship opportunities including pathways in hospitality, construction, facilities maintenance, and emergency medical services. GBAAI includes pre-apprenticeship training, apprenticeship placement services, and opportunities for apprentices to earn college credit on the job. GBAAI partners include BEST Hospitality Training, Boston EMS, Building Pathways, Bunker Hill Community College, Wentworth Institute of Technology, WinnResidential, and YouthBuild Boston.⁴ The apprenticeship effort in Boston would benefit from increases in funding, apprenticeship slots and employers, as well as expansion to such other fields.

Support Incumbent Worker Programs | The Partners HealthCare System includes 16 hospitals and health centers in Boston and across Massachusetts and has established several programs that make it a model employer for individuals looking to get on a career path with opportunities for growth. Partners collaborates with College for America (a part of Southern New Hampshire University) to offer their employees low-cost online competency-based certificate, associate, and baccalaureate programs to advance in the healthcare sector.⁵ Partners HealthCare also works with Quinsigamond Community College to offer a free 10-week Medical Terminology course where qualifying employees can earn 3 college credits. Prior to taking advantage of these opportunities, employees take the Partners Online College Preparation Program (OCP) to learn about and prepare for online classes.

Expand IT Training to be More Responsive and Inclusive | As we discussed above, the largest gaps between BA and non-BA workers in job postings was in terms of software skills. Given the rapid adoption of new software within different sectors of the economy, addressing these gaps will require close partnerships with employers and programs that can adapt quickly to changing demands for particular skills. Although many four-year universities in the Boston area offer IT certificates, these programs can be costly and inconvenient for non-BA individuals currently in the workforce. In addition, the lack of diversity within the Boston IT sector is well-known. A recent Mass Technology Leadership Council report found that only 3 percent of IT workers are black, and 5 percent are Hispanic. At the same time, the state is among the most difficult places in the country to hire tech talent (Enwemeka, 2017b).

Recently, Google created an online IT Support Professional Certificate that provides a low-risk, low-cost way for workers to gain the skills required by entry-level jobs in the IT support field. The first-of-its-kind certificate program, which includes highly interactive content developed by Google, provides a direct route to employment for those who successfully complete the program in eight months. This is because the majority of IT support positions do not require a college degree but do require prior experience, so the certificate is designed to give workers the training and experience they need to get a job in this growing field. The Google courses are open to anyone and workers who complete the certificate program will have the opportunity to share their resume directly with more than 20 top employers who have cosigned the Google certificate and are looking to hire IT Support talent. These cosigners include Boston area employers, such as Bank of America, GE, Hulu, Infosys, Intel, Kforce, PNC Bank, Walmart, and of course, Google.

³www.mass.gov/orgs/division-of-apprentice-standards

⁴owd.boston.gov/gbaai

⁵www.partners.org/For-Employees/Workforce-Development/Our-Employees/Default.aspx

At least one local university, Northeastern University, will recognize the Google certificate for credit towards their Bachelor of Science in Information Technology degree. This can potentially help workers get the degree they need to move beyond an entry-level job and advance their IT career to more senior, higher-paying positions. Individuals who successfully complete the certificate program and are accepted to Northeastern's College of Professional Studies can be awarded up to 12 credits toward a Bachelor of Science in Information Technology, shortening the time needed to earn a degree and saving them more than \$6,000 in tuition. The partnership is part of Northeastern's commitment to provide opportunities for the kind of lifelong learning that rapid advances in artificial intelligence and machine learning will require. As more and more jobs become automated, professionals will need new skills to claim new jobs.

Recommendation 2: Boost completion rates at community colleges, particularly in high-demand fields where employers are willing to partner to create programs that lead to guaranteed employment.

Initiatives such as Success Boston and the City's Tuition-Free Community College Plan are aimed at ameliorating low completion rates for associate degrees. Yet completion is most valuable when it leads to a career pathway of sustainable employment. Although some individuals may be preparing to matriculate into a four-year program, the number of students graduating from community college with degrees in high-demand fields, particularly STEM fields, is low. Providing more information about employment opportunities and earnings across STEM occupations and providing better preparation for entry into STEM-related programs could help individuals receive the necessary training to qualify for these higher-paying positions.

Because community college training is more practical and applied in nature, ensuring that degree programs align with employer demands is essential if graduates

are to be successful in the labor market. The Commonwealth is working on this alignment as part of its Regional Workforce Skills Planning Initiative. In Greater Boston, the initiative's focus is on increasing community college programs for such high-demand jobs as mid-skill health care and computer and math occupations. Strong partnerships with employers, either as members of the institution's advisory board or as developers of particular programs of study, can help certify that program curriculum is relevant and students will have the skills needed to land jobs after graduation.

Encourage Additional Partnerships between Community Colleges and Local Employers |

Across the country and the Commonwealth, an increasing number of companies are seeking to partner with community colleges because of increased difficulty in identifying and hiring employees with desired competencies. In a community college-employer partnership, the partners consciously structure the programs to meet employer skill requirements. As a result, employers are able to provide input on courses and curricula to ensure satisfaction. In addition, students acquire a set of skills that are in high demand, often leading directly to a job upon graduation. Community college-employer partnerships can range across a variety of forms, including (Heidkamp & Hilliard, 2013):

- Corporate partnerships with multiple community colleges
- Community college and employer partnerships facilitated by a regional workforce intermediary
- Sectoral partnerships across multiple community colleges and employees
- Individual community college and employer partnerships with deep employer engagement
- Career pathway partnerships that may also involve high schools

- Partnerships facilitated by other intermediaries, including community-based organizations and vocational rehabilitation programs

The Trade Adjustment Act Community College and Career Training (TAACCCT) program is the largest national initiative supporting the development of community college-employer partnerships. Enacted in 2010 by Congress as a part of the Health Care and Education Reconciliation Act, it provides \$2 billion over four years to fund the initiative. Grants are disbursed to community colleges in a competitive process, but each state and territory is guaranteed at least .5 percent of the total budget for its eligible institutions.

In Massachusetts, the U.S. Department of Labor awarded a \$20 million three-year grant (2011-2014) to the state's 15 community colleges to carry out the Community Colleges & Workforce Development Transformation Agenda (MCCWDTA) under the TAACCCT. Coordinated by the Massachusetts Community Colleges Executive Office (MCCEO) and lead campus Quinsigamond Community College (QCC), the initiative was designed to assist trade-impacted and other eligible residents of the Commonwealth with attaining degrees, certificates and other credentials in two years or fewer. Through the agenda, community colleges in Massachusetts offered new or redesigned certificate and degree programs in target industries serving roughly 4,000 students throughout the three-year grant period.

There are a number of excellent examples of such public-private partnerships in Boston. For example, Bunker Hill Community College (BHCC) and Eversource offer their Electric Power Utility Program, allowing students to earn an Associate in Science degree in Electronics Technology while taking part in paid training to learn various electrical job skills. When they complete the program, students may receive a

job offer from Eversource to work for the company in entry-level utility worker positions, paying about \$20 to \$30 per hour.⁶ Another example is BHCC's Allied Health Department⁷, which offers a variety of one-semester programs that enable students to attain healthcare credentials and access high-demand entry-level positions that do not require a postsecondary degree. Programs include Medical Assistant Certificate, Patient Care Technician Certificate, Nurse Aide/Home Health Aide, and Medical Interpreting. BHCC partners with a wide variety of healthcare providers⁸ to offer clinical internships that give students exposure to the field and experience with local employers.

Finally, Roxbury Community College (RCC) partners with CVS for their Pharmacy Technician Program, which includes 120 hours of classroom instruction and hands-on training, as well as 150 hours of internship at CVS Pharmacy. The program introduces students to pharmacology, pharmacy calculations, physiology and pathophysiology and prepares them to take the National Pharmacy Technician Certification Bond (PTCB) exam. Once they pass the PTCB exam, graduates can register as Pharmacy Technicians. If a student fails the PTCB exam, they have the opportunity to intern for an additional 500 hours at a CVS Pharmacy to become a registered pharmacy technician.⁹

Provide “Wrap-Around” Student Support Services | Another way to boost completion rates is through programs that provide comprehensive support services, referred to as “wrap-around services,” to every student enrolled in the program until they graduate from college or enter employment. These wrap-around services may include:

- Academic guidance and counseling, through which students gain information on educational programs, course planning and graduation requirements

⁶www.bhcc.edu/selectiveprogram/electricpowerutilityprogram/eversourceeput/#collapse57

⁷www.bhcc.edu/alliedhealth/

⁸www.bhcc.edu/alliedhealth/clinicalaffiliationsinternshipsites/

⁹www.rcc.mass.edu/workforce-development/professional-education-programs/pharmacy-technician

- Academic supports, such as tutoring, through which students receive additional help in meeting their academic goals
- Personal guidance and counseling, such as mental health counseling or crisis intervention
- Career counseling, through which students receive information on careers
- Supplemental services, such as childcare or transportation assistance

In addition, research on access to support services at community colleges finds that although support services technically are open to all students, few low-income students find them accessible. Typically, students who are able to take full advantage of the services are those who come to the community college with pre-existing knowledge about the social and cultural resources available. This makes it particularly important for institutions to provide staff and resources that connect low-income and first-generation students to support services (Purnell & Blank, 2004).

For the past 10 years, Boston has been engaged in Success Boston, a citywide initiative that seeks to improve college completion among Boston public high school graduates, particularly those traditionally underrepresented in higher education. Success Boston is a partnership of the Boston Foundation; the City of Boston; the Boston Public Schools (BPS); 37 area institutions of higher education, led by the University of Massachusetts Boston and Bunker Hill Community College; and local nonprofit partners, including the Boston Private Industry Council and uAspire. Central to the initiative is Success Boston Coaching (SBC)—one-on-one transition coaching, in which Boston students in the last year of high school are connected with adult coaches who support them for the first two years of college. Coaches are hired by local nonprofit organizations to help students navigate the path to college graduation across multiple areas, including academics, time-management skills, self-

advocacy, and planning pathways both for college and, eventually, a career. A recent evaluation of Success Boston found that coached students were 8 percentage points more likely than a matched comparison group to persist from their first year to their second and 13 percentage points more likely to persist from their second year to their third (Linkow et al., 2017).

Building on this early success, the City of Boston launched its Tuition Free Community College Plan in 2016. The program provides up to three years of community college tuition and mandatory college fees in addition to Success Boston coaching at, Bunker Hill Community College, Roxbury Community College, or MassBay Community College. To be eligible, applicants must be low- or middle-income Boston residents who have completed their high school degree or HiSET/GED within the past year; high school graduates must have a GPA of at least 2.0. Students must also be eligible for a Pell Grant as determined by the Free Application for Federal Student Aid (FAFSA) and require no more than three developmental courses by the start of the semester. Among the initial cohort of 52 students, 65% persisted for the second year at the same institution, achieving a higher first-year retention rate than either the national (49.1%) or state (58.6%) average for community college students, despite their economic challenges (Tuition-Free Community College Plan).

Wrap-around services may also operate on a piecemeal or smaller scale. An example of this type of program in Boston is the Bunker Hill Community College emergency assistance fund. The fund provides small one-time grants to students for emergencies that occur during the semester and that may cause a student to drop out of college, such as a lost or stolen laptop, a medical emergency or a car accident. Students who document a need may receive up to \$1,000 to help them get back on their feet and stay in school. In Fiscal Year 2012, the fund assisted 147 students and disbursed more than \$100,000.

The average grant was about \$700. The retention rate for students receiving assistance through the fund was found to be 31 percent higher than that of the student population as a whole.

Increase Dual Enrollment between High School and Community Colleges.

| As demand for a highly educated and skilled workforce grows, many cities and states have promoted the expansion of dual enrollment programs as a key strategy for strengthening academic preparedness. Dual enrollment provides high school students with opportunities to take college courses while completing their high school program. The goal is to give students a better understanding of what it takes to succeed in a postsecondary academic environment, as well as a head start on earning college credits.

Research shows that dual enrollment programs have positive impacts on students, although it is unclear whether they serve to reduce gaps in educational attainment among low- versus high-income students. A recent study using longitudinal data found that dual enrollment programs significantly increased the likelihood of attaining any college degree as well as obtaining a bachelor's degree. In addition, students who earned more dual enrollment credits prior to attending college achieved greater benefits from the dual enrollment programs. Completion rates were higher among first generation college students and similar to those of other comparison groups (An, 2012).

At Wentworth Institute of Technology in Boston, dual enrollment opportunities enable students in the Boston Public Schools system to earn college credit while also receiving credit toward a high school diploma. Each year, approximately 30-50 high school seniors who are interested in STEM take freshman-level STEM courses at Wentworth. Not only does this provide students with increased exposure to STEM subjects, but it also enables students to experience academic life at Wentworth and expand their understanding of what college is really like.

The program also increases Wentworth's exposure to student groups the institution has historically had a harder time recruiting: women and students of color. Thus, the dual enrollment program at Wentworth provides the opportunity to enhance higher education opportunities for Boston's youth as well as create a pipeline to STEM careers for minority and underserved students (Blauth & Hadjian, 2016).

Benjamin Franklin Institute of Technology (BFIT) is yet another dual enrollment partner with Boston Public Schools. In this collaboration, high school juniors and seniors can receive free tuition, fees, and books while taking BFIT courses for high school or college credit. Through the college's Advance Standing Associates Program, students can accrue enough college credit while in high school that, upon graduation, they can start at BFIT as a sophomore. In this scenario, it is possible for students to earn an associate degree only one year out of high school.

Recommendation 3: Improve Boston's vocational career pathways.

The core mission of vocational education is to ensure that students see the relevance of learning by pursuing a career track or credential as part of their program. The curriculum is designed to show the relevance of mathematics content or the application of scientific principles to fields of study like healthcare, physics, automotive or welding. But a vocational high school is not limited to just career and technical education. Every student must also meet the same rigorous graduation standards that students in a traditional high school setting must meet.

Those students who do not pursue college still graduate with a set of marketable skills and credentials that often lead to employment. Students choose from among a dozen technical career tracks, including business and consumer services, education, health services, IT, legal and protective services, and manufacturing, engineering, and technology. Schools typically have advisory committees composed of

local employers who help the school decide which outdated programs to phase out (e.g. horticulture) and which new programs (e.g. programming and web design) to develop in their place.

In Massachusetts, vocational technical schools go back 100 years. The state currently requires every school district to offer students a career vocational technical education option, either by providing it themselves—as some larger districts do—or as part of a regional career vocational technical high school system. Vocational schools in Massachusetts typically have lower dropout rates, higher Massachusetts Comprehensive Assessment System (MCAS) scores, and higher graduation rates than the state averages. More than half of graduates go on to postsecondary education, with the remaining half largely split between working full-time and working part-time while pursuing additional education (Fraser & Donovan, 2014). Yet, a recent survey of the state's vocational technical schools found long waiting lists in many communities with high unemployment and large minority populations. At least 21 of the 33 schools responding to the survey had a waiting list with roughly 3,500 students who were unable to get into public vocational schools in the past two years (Jones, 2014).

At Madison Park Technical Vocational High School in Boston dual enrollment opportunities have been expanded by strengthening relationships with Roxbury Community College (RCC) and Bunker Hill Community College (BHCC). During the 2013-2014 academic year, 13 MPHS students enrolled in college-level courses at RCC and BHCC, with half of those who attempted college credits earning a grade that was transfer-eligible. Shortly thereafter, the Office of Workforce Development (OWD) began issuing grants to eligible MPHS students to help encourage college matriculation and bridge financial gaps between the costs of college and the coverage provided by common sources of financial aid (e.g. Pell grants). Students participating in dual enrollment would seem to be the logical target group for such grants

given their motivation and preparation to undertake college coursework. For those youth in vocational training who are not continuing on to college, strong partnerships with employers can help build career pathways.

Recommendation 4: Expand ESOL services in conjunction with occupational training to help immigrants qualify for high-demand jobs and achieve economic self-sufficiency.

Compared to the U.S., Boston has relied more heavily on immigrants to grow its labor force. However, these workers come from the two extremes of the education distribution, with most immigrants having either less than a high school degree or a bachelor's degree or higher (Owens, 2008). As such, it will be important to make sure that immigrants can apply their skills to the jobs available in the Boston area. This means providing lower-skilled immigrants with ESOL and occupational training or ensuring that the credentials of highly skilled immigrants are transferable to the jobs that Boston employers seek to fill.

ESOL programs are an important component of adult education in the U.S., accounting for 44 percent of the 2.4 million students in federally funded adult education programs. As of 2014, about 1 percent of the U.S. population (667,515 individuals) participated in state-administered ESOL programs, including 11,620 individuals in Massachusetts. Participation rates vary by age, race/ethnicity, and education. For example, younger individuals age 25-29 years have higher participation rates than those of other age groups, with very few individuals over 45 taking ESOL classes. Participation rates are highest among Hispanic and Asian individuals. Few ESOL participants are in the labor force and most have only an 8th grade education or less, putting them at the lowest ESOL level, beginning literacy (National Center for Education Statistics).

There are several excellent examples in Boston of community-based organizations that partner with

employers to provide ESOL services in the context of skill-building and employment. For example, Jewish Vocational Service (JVS) works with immigrants to increase their English language or academic skills, culminating in a recognized credential, to help them attain employment in a specific industry with opportunity for career advancement. JVS provides clients with the basic English and work skills they need to obtain their first job or increase their wages in an entry-level job. These services include vocational English language classes, individualized career coaching, short-term training, and job search, job placement and post-placement services.

JVS also partners with employers to provide incumbent workers with basic education in the form of workplace English and computer skills, academic and career coaching, high school equivalency and college readiness, job-specific training, and citizenship services. For example, JVS has collaborated with Partners HealthCare to offer free, 4-week U.S. citizenship classes for employees and their families or friends. In addition, Partners affiliates Massachusetts General Hospital and Brigham and Women's Hospital also work with JVS to provide their employees with free ESOL programs that are contextualized for work in the healthcare field.

These types of services can also be incorporated as part of new workforce development initiatives linked to economic development efforts. For example, as a part of the Commonwealth's Expanded Gaming Act, the Massachusetts Gaming Commission established workforce training partnerships and provided public funding for training to ensure workers would be ready to fill jobs when new casinos opened. As a part of their approval for gaming licenses, new casinos were also required to include workforce development plans that incorporated training programs. As a result, MGM Springfield and Encore Boston Harbor produced comprehensive plans that provide inclusive employment and career advancement opportunities and could serve as models for other employers.

MGM Springfield and Encore Boston Harbor's plans include partnerships with nonprofits, one-stop career centers, postsecondary education institutions, and government agencies to assist employees who need additional education to advance their careers, or who need support to overcome barriers to employment. These barriers include mental or physical disabilities, criminal records, and the need for childcare. The casinos have formed partnerships with Holyoke Community College, Springfield Technical Community College, and Cambridge College to offer free and low-cost training opportunities to help job seekers attain relevant skills: English language, basic computer skills, culinary, table gaming dealing, and security/surveillance. Both casinos are also using innovative SkillSmart technology, which is designed to identify a skills match between a job and an employee's profile, and to identify training opportunities that align with a job seeker's interests and will help them advance their career.

VII. Conclusion

Despite a number of individual exemplary programs discussed already, the drawback to many of these policies is the need for deep partnerships across a number of stakeholders (e.g. schools, workforce investment boards, employers, and city leaders), as well as insightful leadership at all levels to sustain these partnerships. In order to pursue any of the above recommendations at significant scale, it will be necessary to build capacity into the current education and workforce development systems. Jobs for the Future has identified the following levers as proven to gain significant traction:

- Gain commitment from employers, particularly in high-growth sectors, to engage with educators to build a sequence of work-based learning experiences for young people, and to advise on curricula and pathways development.

- Provide opportunities for students who would traditionally not be college bound to earn at least 12 college credits while in high school and start on a career pathway.
- Develop and strengthen intermediary organizations that connect employers, high schools, and community colleges, and aggregate and make available work-based learning opportunities.
- Create and maintain a cross-sector (executive, legislative, and employer) state leadership team to guide and champion this work and build public will backed by effective policies and strategies for expansion.

More funding, along with a greater capacity for large-scale interventions across the city, is needed for public higher education to expand the promising partnerships and pilot programs discussed above. Many policy options require additional activities on the part of the Commonwealth's community college system, a set of institutions that are already underfunded relative to their counterparts in other states. Although funding has increased in recent years, community colleges are being asked to do more now than ever to fulfill their dual mandate of both developing the workforce and serving as a stepping-stone to a four-year college education for disadvantaged populations. Under Governor Deval Patrick, community colleges were provided some financial incentives to pursue public-private partnerships, but additional support would make those expectations more realistic.

In addition, the Commonwealth boasts a number of grant programs that can provide an additional catalyst to employers and workforce development intermediaries to come to the table. For example, the Workforce Competitiveness Trust Fund, administered by Commonwealth Corporation on

behalf of the Executive Office of Labor and Workforce Development, was capitalized at \$18 million through the Economic Stimulus Act of 2006. The state also leveraged \$16 million in matching funds from businesses, philanthropy and other sources to develop 31 regional training partnerships across the state. These partnerships provide training and education services for up to three years for key industries, including healthcare, manufacturing, and clean energy. The majority of funding is awarded as a General Program Training Grant of up to \$250,000 for businesses of any size to provide training through qualified vendors. During FY 2014 grants were awarded to 150 businesses, which provided training for roughly 11,500 workers. By requiring employers to match grant funds dollar-for-dollar, the state ensures that employers have a stake in making sure their training programs produce successful outcomes that benefit workers as well as increase productivity.

The state's Connecting Activities Grants, created in 1998 by the Massachusetts Department of Elementary and Secondary Education (DESE), aim to build connections between employers and schools. In FY 2019, appropriations totaled \$4.5 million in funds allocated to the 16 Workforce Investment Board (WIB) regions across the state. While this represents an increase over recent years, it is below the \$7.13 million appropriated in FY 2007. WIBs use the funding primarily to pay for the human capital needed for the intermediary role performed by both workforce professionals and educators. Performance is measured annually by tracking student participation, employer engagement, employer-paid wages, school involvement, skill development, and skill gain. The program requires that private sector employers provide a 2:1 match to the initial state funding in the form of wages paid to youth workers. In FY 2017, employers paid \$14.7 million in wages to support 10,780 students at over 3,500 employer sites.

Finally, the state is leveraging federal dollars as well through the Youth CareerConnect Grants, funded by the US Department of Labor. Grants are awarded to local educational agencies or public and non-profit local workforce entities with the following requirements: (1) the partnerships must include at least one of each of the following entities: a local education agency, a local workforce investment system entity, an employer, and an institution of higher education, and (2) at least 25 percent of grant awards must be matched. In Massachusetts, Jobs for the Future received \$4.9 million to put toward implementing the career pathways model during the 2014-15 school year across three regions within the state.

Yet as with most grant programs, funding has waxed and waned over time such that it is difficult to sustain, let alone expand, programs. For example, the Connecting Activities Grants are funded through a line item in the state budget that can fluctuate considerably from year to year.¹⁰ In addition, the Youth CareerConnect Grants are based on a competitive award process managed by the U.S. Department of Labor. Providing more stable funding streams for connecting activities while upholding requirements for accountability in terms of meaningful collaboration and employer matching would yield a more robust program that could then be expanded as more public-private partnerships meet the bar.

In conclusion, these types of initiatives require innovation beyond the status quo, partnerships across multiple organizations, and leadership at all levels. There are numerous examples of interventions and programs in the City of Boston and around the state that have produced positive outcomes for teens and young adults, providing evidence of what works. The question is how to replicate these success stories across the Boston area. One way is through the use of competitive grants programs that

are tied to measurable performance outcomes and require private matching funds—much like those that the Commonwealth already has in place—but on a greater scale and scope.

However, if we are to gain traction and overcome the systemic obstacles facing disadvantaged youth, we must go beyond funding one-time pilots and projects based on funding that might be here today and gone tomorrow. A commitment on the part of the state to capitalize a sustainable funding framework aimed at providing resources for the various programs already in place would be a step in the right direction. Coupled with better data collection and rigorous evaluation mechanisms to provide feedback on what works and what doesn't, such a workforce development system would allow for long-range planning while remaining nimble enough to leverage short-term opportunities.

Social impact bonds, also known as “pay for success bonds” or “social benefit bonds,” are a potential tool that may eventually prove useful in this regard. A social impact bond is a contract with the public sector in which a commitment is made to pay for improved social outcomes that result in public sector savings. This form of financing allows the government to partner with innovative and effective service providers and, if necessary, private foundations or other investors willing to cover the upfront costs and assume performance risk to expand promising programs. At the same time, taxpayers will not have to pay for the programs unless they demonstrate success in achieving the desired outcomes. Repayment to investors is contingent upon specified social outcomes being achieved.

This type of innovative funding model is already being tested in Massachusetts. In 2012, the Legislature created the Social Innovation Financing Trust Fund, authorizing the Secretary of Administration and Finance to enter into “pay for success” contracts

¹⁰See the 20-year funding history at www.massbudget.org/browser/line_item.php?id=7027001900

of up to \$50 million. Under this program, the Commonwealth of Massachusetts, Roca, Inc., and Third Sector Capital Partners worked with a variety of lenders to launch an initiative to reduce recidivism and improve employment outcomes for young men at high risk of re-offending in the Boston, Chelsea, and Springfield areas. The initiative will allow Roca to provide its high-impact intervention over an intensive two-year period to 929 at-risk young men aged 17 to 23 who are in the probation system or exiting the juvenile justice system. Massachusetts will repay funders only if Roca's services are proven to produce positive societal outcomes and savings for the Commonwealth. These success payments will come from the Commonwealth and the U.S. Department

of Labor, which awarded the Commonwealth a first pay for success grant of \$11.7 million. Alternative models of pay for success contracts pay bonuses to community-based organizations for achieving their outcomes. This approach can improve the effectiveness of established programs.

It is these types of new and bold ideas that will help the City of Boston move forward and find innovative solutions to some of society's most intractable problems, such as inequality. Although these initiatives are costly, if they are successful, they will generate social benefits that will continue to build on themselves for generations to come. Rather than trying to break the cycle of poverty, we could instead create a cycle of prosperity.

VIII. References

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