AT THE APEX:

The 2030 Educational Attainment Forecast and Implications for Bay State Policymakers

MassINC
PUBLISHER OF COMMONWEALTH

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Massachusetts Institute for a New Commonwealth (MassINC) is a non-partisan think tank and civic organization focused on putting the American Dream within the reach of everyone in Massachusetts. MassINC uses three distinct tools — research, journalism, and civic engagement — to fulfill its mission, each characterized by accurate data, careful analysis, and unbiased conclusions. MassINC sees its role not as an advocacy organization, but as a new kind of think tank, rigorously non-partisan, whose outcomes are measured by the influence of its products in helping to guide advocates and civic and policy leaders toward decisions consistent with MassINC's mission, and in helping to engage citizens in understanding and seeking to influence policies that affect their lives.

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Established in 1971, the UMass Donahue Institute (UMDI) is the public service outreach and economic development unit of the University of Massachusetts President's Office. UMDI's Economic and Public Policy Research (EPPR) group is a leading provider of applied research, helping clients make more informed decisions about strategic economic and public policy issues. EPPR produces in-depth economic impact and industry studies that help clients build credibility, gain visibility, educate constituents, plan economic development initiatives, and prioritize investments. EPPR is known for providing unbiased economic analysis on state-level economic policy issues in Massachusetts and beyond, and has completed a number of economic studies on manufacturing, technology, defense industries, life sciences, telecommunications, health care, and transportation. EPPR's trademark publication is MassBenchmarks, an economic journal that presents timely information concerning the performance of and prospects for the Massachusetts economy. For more information, visit www.donahue.umassp.edu and www.massbenchmarks.org .

ACKNOWLEDGMENTS

MassINC would like to acknowledge the UMass Donahue Institute's Economic and Public Policy Research (EPPR) group for their hard work and dedication to this project. We would also like to express our gratitude to the Barr Foundation for providing generous financial support.

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Dear Friend:

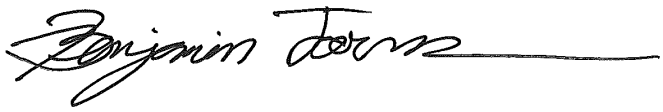
MassINC is proud to present *At the Apex*, an educational attainment forecast through 2030. This analysis vividly points out the conundrum the Commonwealth will face as the large and highly skilled Baby Boom generation ages out of the state's workforce and growth in the supply of college-educated workers — which has flowed for decades like a gusher on a Texas oil field — ebbs to just a slow trickle.

Drawing from the best available population models, this report carefully measures the dimensions of the challenge. Questions raised by the authors intersect with more than a decade of MassINC research, from studies exploring factors affecting the retention of young adults and strategies to maximize the contribution of older workers to research examining the efficacy of education reform and the employment difficulties of young college-educated residents.

We are grateful to the Barr Foundation for making available the financial support to produce this rigorous study. We would also like to express our gratitude to our partners at the UMass Donahue Institute. The extreme dedication of Dan Hodge and his colleagues is evidenced in this thorough and thoughtful analysis.

In the spirit of past MassINC endeavors, we hope that the present report provides a timely, thought-provoking resource for policymakers charged with setting a course that leads us to a stronger Commonwealth. As always, we welcome your feedback and invite you to become more involved in our work.

Sincerely,



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EXECUTIVE SUMMARY

The Massachusetts economy relies heavily on human talent to gain competitive advantage. Our dependence on this unstable resource makes it absolutely essential to closely monitor workforce trends. With a slow-growing and aging population, leaders responsible for positioning Massachusetts to compete in the future must be especially vigilant.

To help inform these policymakers, MassINC partnered with the UMass Donahue Institute to examine the drivers of recent gains in educational attainment and prepare projections of skill levels in Massachusetts out to 2030. As summarized below, the results of this analysis suggest that the remarkable increase in college-educated residents buttressing the state's economic growth over the past two decades is poised to slow through 2020 and stall completely in the following decade.

A Look Back at Two Decades of Success

Between 1990 and 2010, educational attainment rose throughout the US, but more dramatically so in Massachusetts. Massachusetts was already tied for first position with Connecticut as the state with the highest percentage of the population holding at least a bachelor's degree in 1990. Over the next two decades, the share of Massachusetts residents age 25 or older with a bachelor's degree or higher rose from 27 percent in 1990 to 39 percent in 2010. This 12 point increase was the largest percentage point gain among the 50 states.

Migration was key to Massachusetts's success. Together, domestic and international migrants combined for more than half (57 percent) of the state's total increase in residents with a bachelor's degree or higher. In general, those who move tend to have more education, but domestic migrants living in Massachusetts are exceptionally well-educated. Nearly 60 percent hold at least a bachelor's degree compared with just 35 percent of domestic migrants living in other states. By a significant margin, Massachusetts is positioned ahead of every other state for the educational attainment level of its domestic in-migrants.

While growth in degrees held by residents native to Massachusetts provided less than half of the state's bachelor's degree gains, the increase among this group over the past two decades was still quite remarkable. Compared to other states, Massachusetts has the highest share of native residents with at least a bachelor's degree (33 percent) and over the 1990 through 2010 period Massachusetts posted the largest percentage point gain for this segment (11 percentage points).

An understanding of historical drivers in the state's college-educated population reveals two risk factors. First, while in-migration of well-educated residents can be self-perpetuating, as knowledge workers tend to cluster together, migration is by definition an unstable force. From changing individual tastes and rising costs of living to unpredictable immigration policies, a variety of push and pull factors can influence migration flows. Second, Massachusetts's high levels of educational attainment make for large racial and ethnic disparities. Inequality itself can become a barrier to closing these achievement gaps. If Massachusetts cannot address this challenge, it will have a difficult time fostering educational attainment growth among native residents, who are increasingly diverse.

Fast-Forward to 2030

To forecast educational attainment through 2030, a model was developed holding constant recent net migration and college completion rates and taking into account assumptions about life expectancy over the next two decades. This approach provides a valuable window into the future to see where the current path will lead Massachusetts in terms of college graduates overall, college graduates by age group, and college graduates by region.

College Graduates Overall

In sharp contrast to the 6-percentage-point gains in bachelor's degree completion that Massachusetts experienced in each of the last two decades, the share of the population with a bachelor's degree or higher will climb by less than 2 percentage points in the current decade and by less than 1 percentage point in the 2020s.[1]

The slowdown in educational attainment growth is even more pronounced when viewed in terms of changes in the absolute number of residents with degrees—or, stated differently, in the increase in the supply of college-educated workers to feed a growing economy. The rate of increase in the population over age 25 with a bachelor's degree or higher will fall dramatically, from an average of 27 percent per decade in the 1990-2010 period, to just 13 percent in the 2010s, to 3 percent in the 2020s (Figure ES1).

College Graduates by Age Group

More concerning from this economic development standpoint, the growth in bachelor's degrees held by adults ages 25 to 64 in Massachusetts tops out in 2020 and turns downward between 2020 and 2030. The forecast suggests there will be nearly 46,000 fewer individuals with college degrees among this prime working age group in 2030 than in 2020. For the first time since the Census began reporting educational attainment, Massachusetts will end a decade with fewer prime working age college-educated residents than it began with at the start of the decade (Figure ES2).

The state is also entering uncharted territory in terms of the share of college degrees held by older adults. In 2010, residents age 65 and over represented 13 percent of all degrees in Massachusetts; by 2030, over 22 percent of college degrees will belong to residents age 65 or older. The

KEY FINDINGS

- Increases in degrees held by domestic and international migrants made up more than half (57 percent) of the state's total growth in bachelor's degrees between 1990 and 2010.
- Massachusetts ranks first among the 50 states for the attainment level of its domestic in-migrants. Domestic migrants living in Massachusetts are much more likely to hold bachelor's degrees (56 percent) than domestic migrants living in other states (35 percent).
- Compared to other states, Massachusetts has the highest share of native residents with at least a bachelor's degree (33 percent) and over the 1990 through 2010 period Massachusetts posted the largest percentage point gain for native residents (11 percentage points).
- Growth in the state's labor force with bachelor's degrees or higher is stagnating. Massachusetts averaged about 250,000 new college degree holders per decade in the prime working age population between 1990 and 2010. From 2010 to 2030, the college-educated population age 25 to 64 is expected to grow by less than 50,000 per decade.
- The rate of increase in the population over age 25 with a bachelor's degree or higher will fall dramatically, from an average of 27 percent per decade in the 1990-2010 period, to just 13 percent in the 2010s, to 3 percent in the 2020s.
- In 2010, just over 13 percent of all bachelor's degrees in Massachusetts were held by residents age 65 or older; by 2030, these older adults will represent 22 percent of residents with a college degree.
- Between 2010 and 2030, the number of prime working age adults with college degrees will fall by 41 percent on Cape Cod, 27 percent in the Pioneer Valley, and 9 percent in the Berkshires; the Southeast (1 percent) and Northeast (5 percent) regions will see slow growth, while Central Massachusetts (9 percent), Greater Boston (10 percent), and Metrowest (10 percent) are forecast to generate modest gains.

increasing educational levels of older adults will have profound implications depending on how long these older workers remain in the labor force and the occupations they pursue as they conclude their careers.

College Graduates by Region

MassINC research has long been concerned with the disparate fate of regions outside of Greater Boston. The educational projections suggest increasing large regional variation in educational attainment will complicate efforts to generate more balanced growth: Central, Metrowest, and the Northeast region will experience above average increases in residents with at least a bachelor's degree; Berkshire/Franklin, Greater Boston, and the Southeast region will see more modest gains; Cape Cod and the Pioneer Valley will endure significant losses.

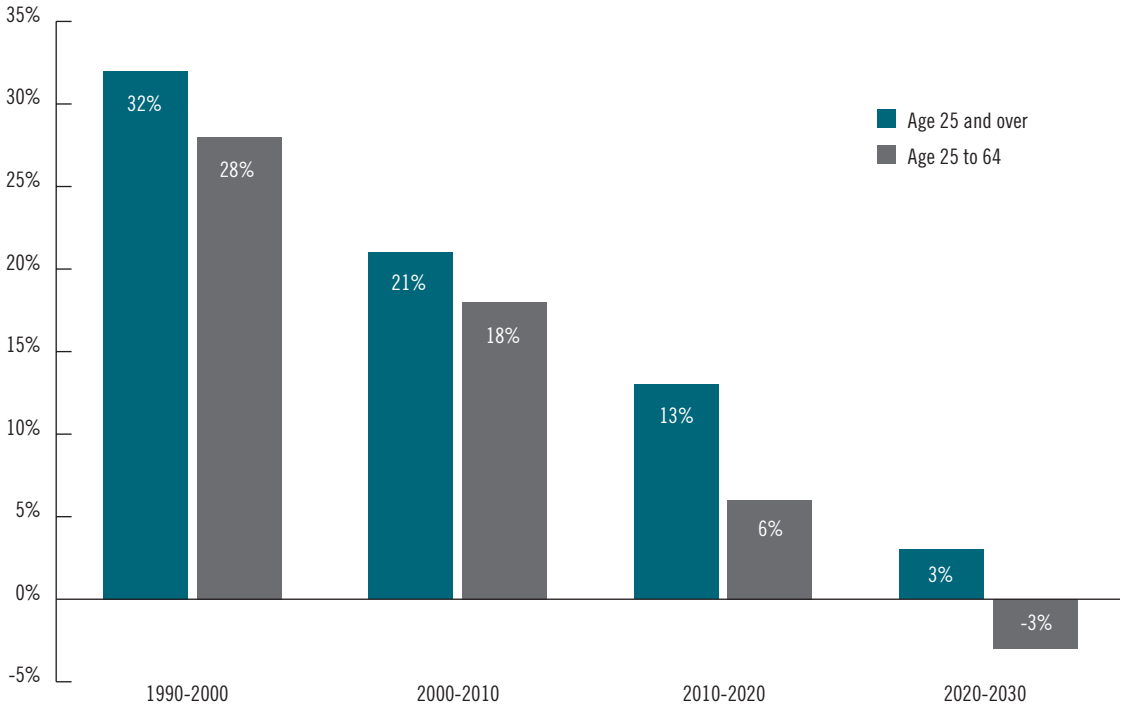
These regional disparities are even sharper when looking at just the prime working age population. The 2030 forecast shows the number of prime working age adults with college degrees falling by 41 percent on Cape Cod and 27 percent in the Pioneer Valley. While the total Southeast population over age 25 increases by 10 percent, the region generates less than 1 percent growth in residents ages 25 to 64 with a bachelor's degree or higher.

Asking Provocative Questions

Population projections are not a crystal ball; they simply provide information about what is likely to occur absent unexpected change. Projections offer the best available information to dialogue about how decisions that we make today might alter the course of events. The prediction that educational attainment growth in Massachusetts is reaching an apex raises several provocative questions.

Figure ES1:

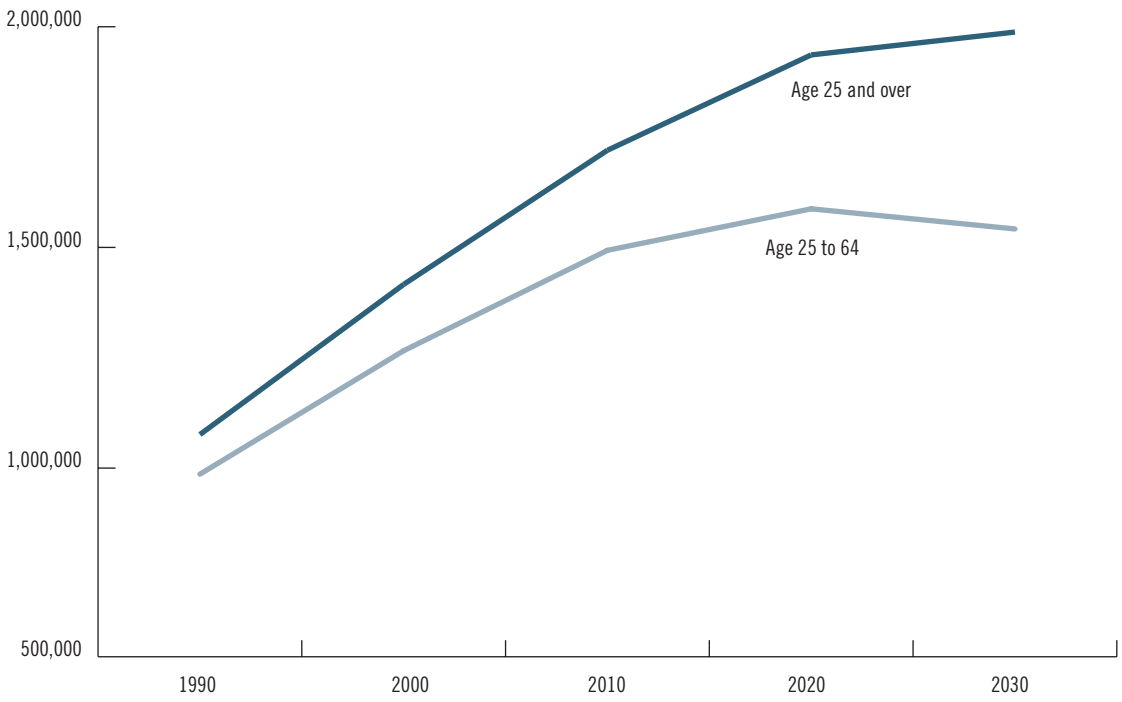
Growth rate for the Massachusetts population with bachelor's degrees or higher by decade, 1990 to 2030



Source: US Census Bureau; UMDI Projections

Figure ES2:

Number of Massachusetts residents with bachelor's degrees or higher, 1990 to 2030



Source: US Census Bureau; UMDI Projections

First, is this welcome news? Many believe that Massachusetts has an oversupply of educated workers. Slower growth could lead to higher wages and increase the return that individuals receive on their investment in higher education.

Second, how do we manage in a slow growth environment? What can be done to ensure that the skills residents build closely match the changing demands of employers? How can we maximize the contribution of older adults to the workforce?

Third, can we alter the trajectory by closing racial achievement gaps and ensure that residents in communities like the Gateway Cities, who complete college at half the rate of students statewide, fully contribute their human potential Massachusetts's future workforce?

GROWTH IN DEGREE HOLDERS VERSUS EDUCATIONAL ATTAINMENT GROWTH

The forecast also shows a slowdown in educational attainment gains in percentage point terms (from 6 percentage points in the 1990s and 5.8 percentage points in the 2000s to 1.5 percentage points in the 2010s and 0.5 percentage points in the 2020s), but it is important to distinguish between the significance of this trend and the downward trajectory of growth in the absolute number of residents with at least a college degree. Massachusetts has an extremely well-educated population. The fact that the percentage of residents with a college degree will only rise from 40.5 percent in 2020 to 41 percent in 2020 is certainly not cause for alarm. The slowdown in the absolute number of residents with bachelor's degrees is much more profound, as this suggests a constrained supply of skilled workers could become a serious impediment to future economic growth.

INTRODUCTION

Massachusetts saw enormous gains in the share of residents with college degrees over the last two decades. From the life sciences and defense sectors to software and renewable energy, the leading industries in Massachusetts, in a self-reinforcing cycle, both fed off of and helped generate the Commonwealth's unique concentration of raw human talent. With employers now heavily dependent on an increasing volume of skilled workers flowing from the pipeline, a slow-growing and aging population raises serious questions about the state's ability to keep the labor force on pace with future economic development.

To help leaders better understand the dimensions of this challenge, MassINC partnered with the UMass Donahue Institute to project the growth of the state's college-educated population through 2030. *At the Apex* presents the results of this analysis. As the title implies, the projection shows that Massachusetts is entering a new era in which increases in the college-educated population will slow dramatically, with a significant portion of the college-educated population in the state shifting to non-prime working ages.

True to all MassINC research, this report is intended to foster public discourse. Readers must take care to recognize that this prediction is based on a model that relies on the state's current age structure and patterns of migration and college completion from the recent past. While these inputs are subject to change, they represent the best available information upon which today's decision makers can act.

With this note of caution in mind, continue on to find thought-provoking data in the pages that follow. The analysis begins with an examination of the drivers behind the state's educational attainment gains over the past two decades, followed by the projection of skill levels in Massachusetts out to 2030. The concluding section explores a series of probing questions that ask what diminishing growth in educational attainment means for the Commonwealth and the choices the state confronts as it faces this new reality.

A FEW NOTES FOR THE READER

For simplicity, the analysis presented throughout this report focuses on residents with a bachelor's degree or higher. While close attention to the supply of both associate's degree and advanced degree holders is also critical, describing all of these trends is too cumbersome. Estimates broken out across each educational attainment category are provided in the forecast section. Readers are encouraged to explore variation across all levels of post-secondary education.

To make the text readable, we adopted two other noteworthy editing conventions.

Data for the year 2010 come from the American Community Survey five-year sample. These multi-year estimates combine data collected between 2008 and 2012 into one larger sample to reduce error. When using these multi-year ACS data, we refer to the sample's mid-year, in this case 2010.

Data in this report related to educational attainment are for the population age 25 and over, as is generally the case with Census tables on the topic. In this way, the percentage of the population holding degrees represents only the universe of residents of age to have completed post-secondary education.

A LOOK BACK AT TWO DECADES OF SUCCESS

During the past two decades, educational attainment rose steadily higher throughout the US but the gains in Massachusetts—the nation's most educated state—were particularly stunning. In 1990, Massachusetts was already tied for first position with Connecticut on bachelor's degree completion. Over the next two decades, the Commonwealth's population of college-educated residents grew 62 percent, nearly five times faster than the state's rate of general population growth (13 percent). This increase drove up the share of Massachusetts residents age 25 or older with at least a bachelor's degree by 12 percentage points, from 27 percent in 1990 to 39 percent in 2010 (Figure 1).[2]

This section explores these gains from three perspectives: An exercise in simple arithmetic dividing the increases into three birthplace cohorts; a closer examination of the growth in Massachusetts relative to other states; and reflections on what the state's experience over the past two decades suggests about the prospects for maintaining a competitive edge in the future.

Growth by Place of Birth

Massachusetts's growth in educational attainment over the past two decades can be broken down into three components based on place of birth: 1) increases in degrees held by residents native to Massachusetts; 2) increases in degrees held by domestic migrants to Massachusetts; and 3) increases in degrees held by international migrants to Massachusetts. An examination of the large differences in degree attainment and relative change across these categories improves our understanding of the state's educational attainment gains (Figure 2).[3]

Increases in degrees held by residents native to Massachusetts

Between 1990 and 2010, the share of residents native to Massachusetts (age 25 and over) with a bachelor's degree or higher rose from 22 percent to 33 percent.

The absolute number of native residents (age 25 and over) with at least a bachelor's degree grew by 285,000 or 51 percent. Growth in bachelor's degrees among Massachusetts natives comprised 43 percent of the state's net increase in residents with at least a bachelor's degree between 1990 and 2010. In percentage point terms, this growth accounted for 5.1 of the state's 12 point gain. Massachusetts residents who were born in the Commonwealth represented 48 percent of all bachelor's degree holders in 2010, a slight decline from 52 percent in 1990.

Increases in degrees held by domestic migrants to Massachusetts

Between 1990 and 2010, the share of domestic migrants to Massachusetts (age 25 and over) with at least a bachelor's degree rose from 44 percent to 56 percent.

The absolute number of domestic migrants with at least a bachelor's degree grew by 186,000 or 45 percent. Growth in bachelor's degrees among domestic migrants accounted for 28 percent of the state's net increase in residents with at least a bachelor's degree over the two decade period. In percentage point terms, this growth accounted for 3.4 points of the state's 12 point gain. Domestic migrants made up 34 percent of the state's bachelor's degree holders in 2010, a slight decline from 38 percent in 1990.

Increases in degrees held by international migrants to Massachusetts

Between 1990 and 2010, the share of foreign-born residents (age 25 and over) with at least a bachelor's degree rose from 22 percent to 35 percent.

The absolute number of Massachusetts residents born outside of the US holding a bachelor's degree grew by nearly 200,000 or 180 percent. Growth in bachelor's degrees among foreign-born

residents comprised 29 percent of the state's net increase in residents with at least a bachelor's degree over the two-decade period. In percentage point terms, this growth accounted for 3.4 of the state's 12 percentage point gain. Residents born abroad made up 17 percent of the state's residents with bachelor's degrees in 2010, up significantly from 10 percent in 1990.

Gains in Massachusetts Relative to Other States

A variety of forces could explain the outsized gains in educational attainment that Massachusetts made over the last two decades relative to other states. While fully disentangling them is difficult, it is possible to make some distinctions.

Growth from changes in the state's age structure

Younger residents in Massachusetts are completing bachelor's degrees at significantly higher rates than generations past, but in terms of the Commonwealth's stronger growth in the college-educated, neither a population bubble in younger age cohorts nor a disproportionate loss of older, less educated residents were responsible.

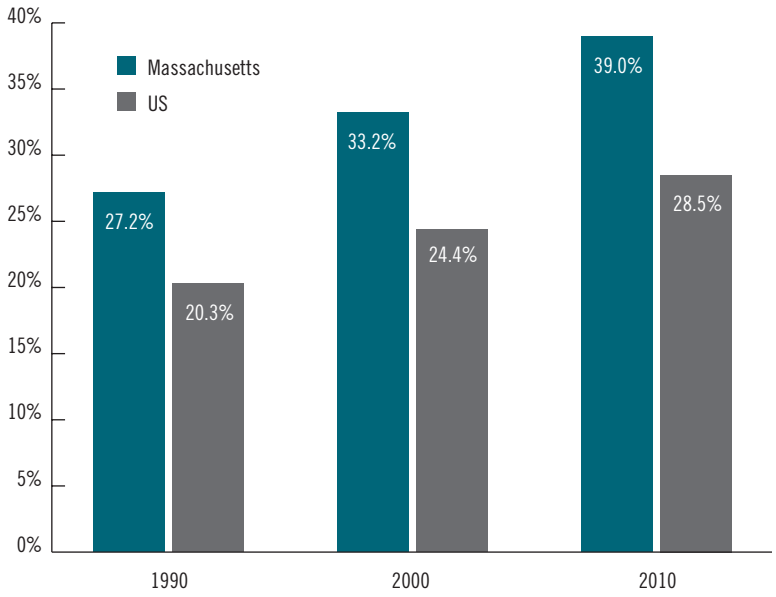
The share of Massachusetts residents over age 25 in the 25-to-44-year-old cohort fell by 11 percentage points between 1990 and 2010. The decline of the share in this most highly educated age group was on par with the average across US states. Similarly, Massachusetts experienced only a slight decline in the share of the population age 65 and older, right in line with aging nationally and thus not a significant influence for the Commonwealth's gains in bachelor's degrees over and above other states.

Growth from net migration

Data limitations make it difficult to estimate the gains attributable to net migration over the 1990

Figure 1:

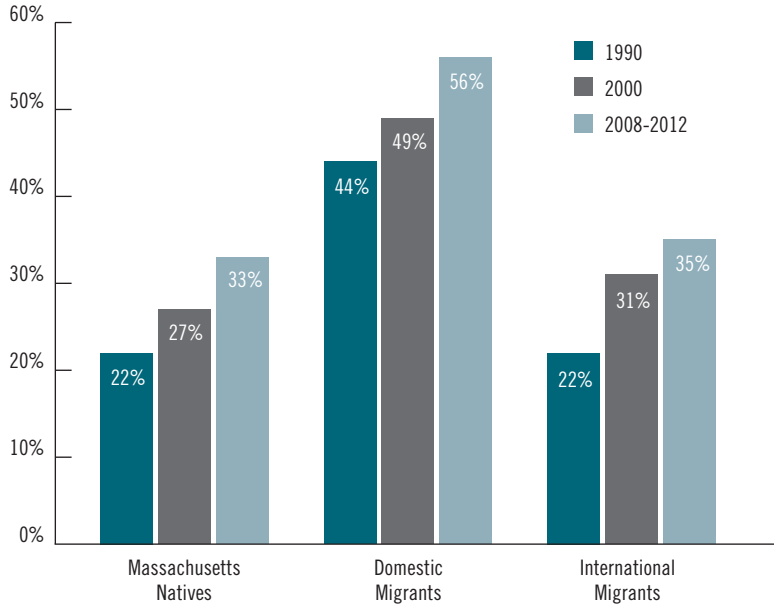
Percent with bachelor's degree or higher, Massachusetts and US



Source: US Census Bureau; 2008-2012 American Community Survey

Figure 2:

Massachusetts residents with bachelor's degree or higher by place of birth, 1990 to 2010



Source: US Census Bureau, 2008-2012 American Community Survey

to 2010 period precisely, but the exchange of residents was clearly a factor. Domestic and international migration combined for more than half (57 percent) of the state's total increase in bachelor's degrees. Massachusetts did not have the largest percentage point gain in the share of residents with degrees for either category, but for both domestic and international migrants, only a handful of states did better.

Movers to any state tend to have higher levels of education than the state's native population, but domestic migrants living in Massachusetts in 2010 were much more likely to hold bachelor's degrees (56 percent) than domestic migrants living in other states (35 percent). Massachusetts ranks first among the 50 states for the attainment level of its domestic in-migrants and the gap between Massachusetts and Connecticut, the next highest state, is exceptionally large (10 percentage points).

Conversely, residents born in Massachusetts living in other states have only slightly more educational attainment than Massachusetts natives who stay here (37 percent and 33 percent with bachelor's degrees, respectively). This suggests Massachusetts, which has often experienced negative net domestic migration in recent years, is likely generating positive net domestic migration among highly educated residents.[4]

MASSACHUSETTS RANKS FIRST AMONG THE 50 STATES FOR THE ATTAINMENT LEVEL OF ITS DOMESTIC IN-MIGRANTS.

Both the nation and Massachusetts saw large growth in international migrants (180 percent versus 193 percent), but more than half (58 percent) of the absolute increase in degrees held by international migrants in Massachusetts came from rising levels of attainment for this cohort; for the US, rising attainment produced just 41 percent of the bachelor's degree growth for international migrants. All things being equal, growth in degrees from attainment gains have more impact on the overall share of the population with degrees because these net new degree holders do not add to the denominator.

Similarly, reducing the number of residents without college degrees also lowers the denominator and pushes the attainment rate higher. In this regard, Massachusetts outperformed all others, posting a 5 percent loss in the state's population without a college degree versus a 19 percent increase for the US between 1990 and 2010. While attainment gains were likely a factor in reducing the state's population with lower levels of education, the state's industrial mix and high cost of living certainly deter those without high skills from migrating to Massachusetts.

Taken together these data points indicate that net migration was a very significant factor in Massachusetts's gains.[5]

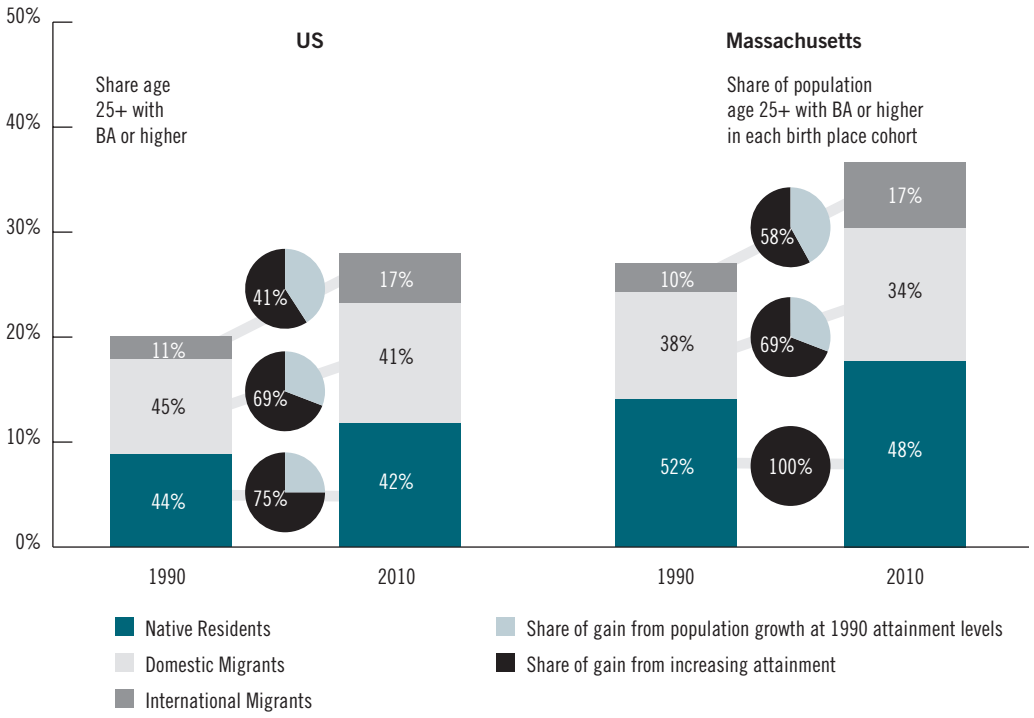
Growth from higher rates of completion

The most fundamental question—how much of Massachusetts's success is attributable to the quality of its education system?—is the most difficult. While increasing achievement among residents native to Massachusetts provided less than half of the state's growth in bachelor's degrees, the gain among this group over the past two decades is still exceptional. Compared to other states, Massachusetts has the highest share of native residents with at least a bachelor's degree (33 percent) and over the 1990 through 2010 period Massachusetts posted the largest percentage point gain for this segment (11 percentage points).

In contrast to the nation as a whole, where 25 percent of the degree growth among residents native to each state was attributable to increases in this population group, Massachusetts received zero growth from straight population gains. The number of residents age 25 and over native to Massachusetts fell by 1 percent over the two

COMPARING MASSACHUSETTS TO THE US

Growth in bachelor's degree or higher by place of birth, 1990 to 2010



The graphic above contrasts growth in bachelor's degrees holders as a percentage of the population across several dimensions. Bar heights show Massachusetts's outsized gains. The segments within the bars reveal the changing share of degree holders represented by each birthplace cohort. The pie charts provide the share of growth in degree holding among each birthplace cohort attributable to increasing attainment. This breakdown is calculated by multiplying the 1990 completion rate by the population increase in the cohort to get the number of new degree holders that would come along with straight population growth at constant rates of attainment. This figure is then subtracted from the total increase in degree holders in each cohort between 1990 and 2010. The difference is equal to the amount generated by increased attainment.

decade period, and yet the state still managed to boost the number of native residents with bachelor's degrees by 51 percent between 1990 and 2010.

These figures provide an indication that the Commonwealth's learning system could be an important factor, but it is very difficult to separate out the effects of migration. Because of the large number of highly educated in-migrants, one could argue that outsized gains in the native population become demographic destiny as the offspring of these residents enter the state's education system.

Maintaining the Competitive Edge

The past is prologue, but historic performance is not always an indication of future success. Massachusetts is likely to face both challenges and opportunities as it seeks to maintain the nation's most skilled workforce.

1. Aging will present a greater obstacle in the future. Up until now, the state's relatively older population has not been a barrier to dramatically growing the skilled workforce. This is because the share of the state's population in the prime working years (ages 25 to 64) has remained fairly constant. But the share of residents ages 45 to 64 has risen by 9 percentage points, while the share ages 25 to 44 has fallen by 7 percentage points. As more and more of this Baby Boom bubble reaches retirement age, Massachusetts will have difficulty replacing these older highly educated workers (Figure 3).

While the cohort that will take their place is more educated (46 percent of residents ages 25 to 44 have BA's versus 39 percent of residents ages 45 to 64), this will not generate anywhere near the volume of degree growth that the large 45-to-64-year-old cohort produced when it replaced a smaller proceeding generation of 45-to-64-year-olds with far fewer total degrees.

This demographic challenge will hit states throughout the US; however, the problem will be particularly acute for Massachusetts, which ranks 41st among the 50 states for median age and 26th for population growth.[6]

2. Migration is inherently uncertain. Numerous studies show that areas with higher levels of human capital become magnets, drawing other well-educated residents.[7] This would tend to suggest that Massachusetts is well positioned to maintain its prowess for attracting skilled migrants. However, migration is subject to a variety of uncertain forces, from federal immigration policy to changing social and economic trends. Indeed, the state may already be experiencing a different pattern. One recent study of migration showed much closer parity in educational attainment between in-migrants and out-migrants for Massachusetts (60 percent entering held a bachelor's degree versus 58 percent of those departing for other states) than the educational attainment profiles of domestic migrants referenced above would suggest.[8]

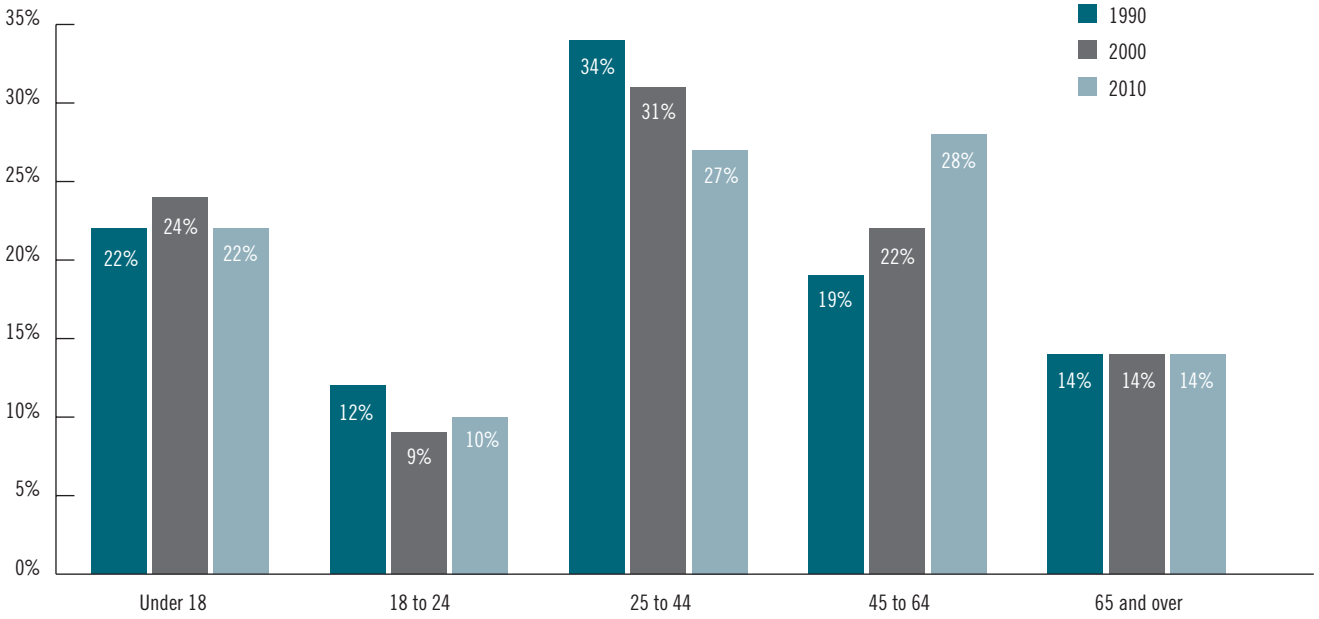
3. Wide racial and ethnic disparities will be difficult to close. While Massachusetts has experienced a marked increase in educational attainment over the past two decades, the gains have not been even across race and ethnicity (Figure 4). Growth in bachelor's degree attainment has lagged for African-Americans and Latino residents. Between 2000 and 2010, completion grew by just 3 percentage points for African-Americans (20 to 23 percent) versus a 6 point gain for whites (34 to 40 percent). This drove the African-American/white gap up from 14 percentage points in 2000 to 17 in 2010. Growth in bachelor's degrees for Latinos was faster (10 to 17 percent) but Latinos still have the largest gap relative to the state's non-Hispanic white residents (23 percentage points). Racial and ethnic disparities are wider in Massachusetts than in the US by 6 percentage points for African-Americans and 8 percentage points for Latinos.

Differences in high school graduation rates suggest these gaps will persist in Massachusetts for some time to come. While 2013 data show 90 percent of white students graduated within four years, just 74 percent of African-American students and 67 percent of Latino students completed on time. Similarly, there are wide college enrollment gaps for those graduating high school. From the class of 2012, 78 percent of white students enrolled in a post-secondary degree program the following year versus 71 percent of African-American students and 63 percent of Latino students.

These racial and ethnic disparities are important not just because the state will be more diverse in the future, but also because evidence suggests that inequality can be self-reinforcing.[9] In this regard, the state's higher levels of racial and ethnic disparities in educational attainment could present a disadvantage.

Figure 3:

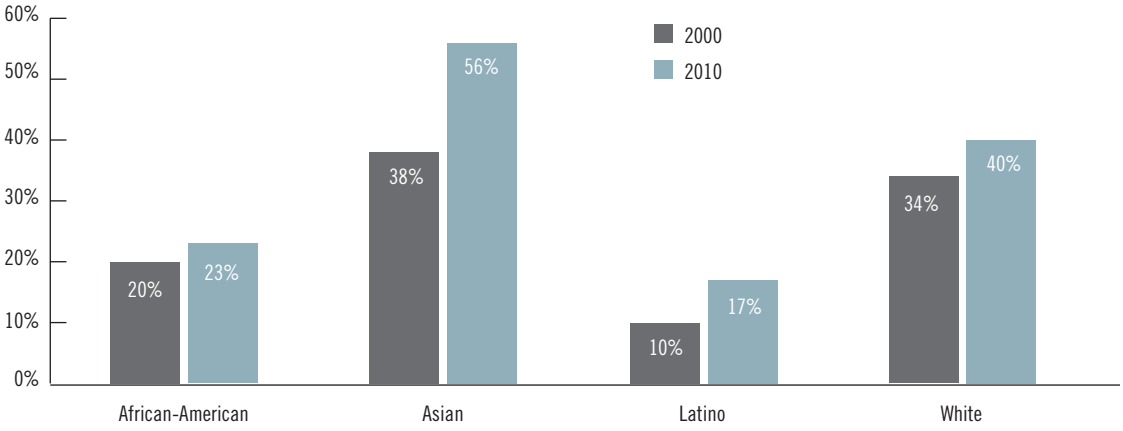
Age distribution of Massachusetts residents, 1990 to 2010



Source: US Census Bureau

Figure 4:

Percent with a bachelor's degree or higher by race and ethnicity, 2000 to 2010



Source: US Census Bureau, 2008-2012 American Community Survey

FAST-FORWARD TO 2030

The educational composition of Massachusetts is a complicated dance of in- and out-migration, improved educational attainment of people native to the Bay State, and the aging of the Commonwealth's large older adult population. Younger residents tend to have higher levels of educational attainment, but these age cohorts are also much smaller in size. This could lead to a scenario whereby the percentage of the total population with a college degree increases, but the number of college-educated adults in the workforce decrease over time. This outcome would have significant ramifications for the state's knowledge-based economy. The projections presented below gauge the likelihood of this scenario for both the Commonwealth and its regions.

Educational Attainment Projection for Massachusetts

Viewing the educational attainment projections for the Massachusetts population over age 25, the prime working age population, and older adults provide different perspectives on future growth trends.

Population over age 25

The projection shows that rather than continuing on the current upward trajectory, educational attainment growth in Massachusetts will slow. In sharp contrast to the 6-percentage-point gains in bachelor's degree completion the Commonwealth experienced in each of the last two decades, the forecast shows the share of the population with bachelor's degrees will climb by less than 2 percentage points in the current decade and by less than 1 percentage point in the 2020s.

Whereas the state added 664,000 residents with a bachelor's degree or higher between 1990 and 2010, between 2010 and 2030 the college-educated population will grow by only 268,000 (Figure 5). Looking at these figures as growth rates brings them into sharper focus. The rate of increase in the population over age 25 with a bachelor's degree or higher will fall dramatically, from an average of 27 percent per decade in the 1990-2010 period, to just 13 percent in the 2010s, to 3 percent in the 2020s (Figure 6).

Prime working age population

Growth in bachelor's degrees for adults ages 25 to 64 in Massachusetts tops out in 2020 and turns downward between 2020 and 2030. The estimate suggests there will be nearly 46,000 fewer individuals with college degrees among this prime working age group in 2030 than in 2020.

Growth in the percentage of the state's prime working age population with at least a bachelor's degree also stalls, climbing from 42 percent in 2010 to 45 percent in 2030.

To put this pattern into context, the state

PROJECTING FUTURE GROWTH IN EDUCATIONAL ATTAINMENT

The estimates reported in this section were built from 2020 and 2030 population projections developed previously by the UMass Donahue Institute for eight sub-regions within the Commonwealth. These population projections use base 2010 Census data for each region to estimate six main types of population change: in-migration from northeastern states, in-migration from elsewhere in the US, domestic out-migration, international migration, deaths, and births.[10] To project educational attainment, the 2010 Census data are paired with estimates from the 2007-2011 American Community Survey Public Use Microdata Sample (PUMS). For more information on the methodology employed to produce these projections, see Appendix A.

Table 1:

Massachusetts Educational Attainment Estimates — 25 Years and Older

ATTAINMENT	2010	PERCENTAGE	2020	PERCENTAGE	2030	PERCENTAGE
Less than High School	495,850	11.1%	478,025	10.0%	468,235	9.7%
High School	1,173,042	26.4%	1,198,991	25.1%	1,187,364	24.5%
Some College/Associate's	1,061,812	23.9%	1,164,522	24.4%	1,204,314	24.8%
Bachelor's or More	1,720,115	38.6%	1,936,223	40.5%	1,987,973	41.0%
Total	4,450,818	100.0%	4,777,760	100.0%	4,847,886	100.0%

Source: U.S. Census Bureau, 2007-2011 American Community Survey, Public Use Microdata Sample, UMDI Population Projections

added more than 500,000 residents with a bachelor's degree or higher between 1990 and 2010; between 2010 and 2030, the college-educated population will grow by fewer than 50,000 residents. The rate of increase in the population ages 25 to 64 with a bachelor's degree or higher declines from an average of 23 percent per decade in the 1990-2010 period, to 6 percent in the 2010s, to -3 percent in the 2020s.

Older adults

The projections show a general "graying" of Massachusetts. Roughly 20 percent of Massachusetts in 2010 was 65 years or over. By 2030, this age group will make up 30 percent of the state's population. The bulk of the growth in older adults is expected to occur within the 65-to-74 and the 75-to-84 age groups, or people who were ages 45-to-64 in 2010. Conversely, the projections show significant declines in the 45-to-54 and 55-to-64 age groups by 2030.

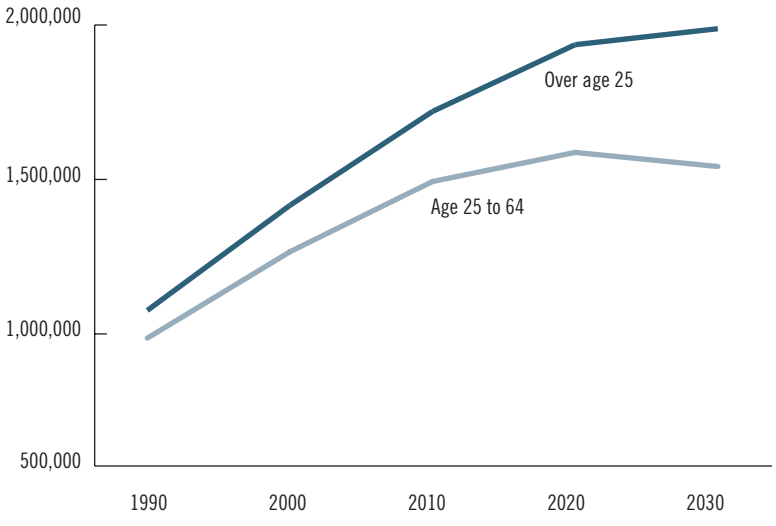
This will lead to a dramatic increase in the estimated percentage of all college degrees in Massachusetts held by residents 65 years of age or older. In 2010, 14 percent of all degrees in Massachusetts (25+) were held by someone 65 years of age or older. In 2020 that share is expected to increase to 18 percent. By 2030, nearly one-quarter (22 percent) of college degrees in Massachusetts will be held by someone 65 years of age or older (Figure 7).

The increased share of degrees for older workers is due to two main factors. First, the current 45-to-64-year-old cohort in Massachusetts, or the population aging into the 65-or-older age bracket over the next 20 years, is large. In 2010, people between the ages of 45 and 64 made up roughly 41 percent of the state's 25 or older population. Second, the cohort aging into the 65-or-older age bracket over the next 20 years is much more educated than the population it is replacing in the older age groups.

These data signal some concerns about the long-range health of the Massachusetts economy.

Figure 5:

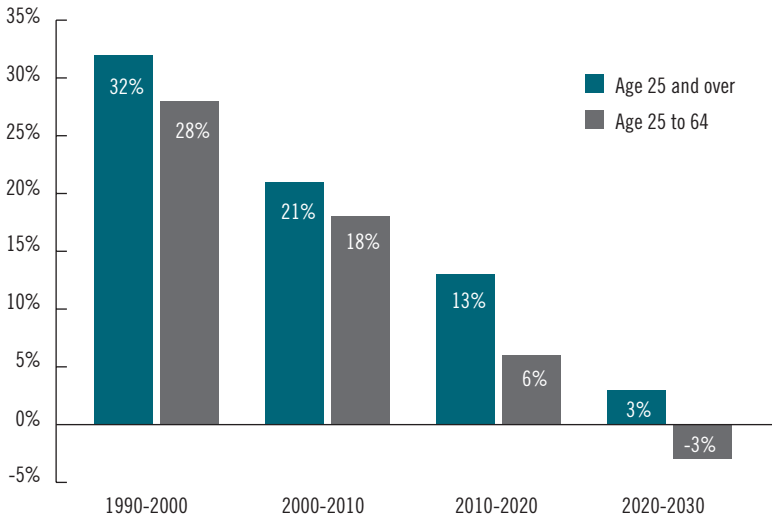
Massachusetts residents with bachelor's degrees or higher, 1990 to 2030



Source: US Census Bureau; UMDI Projections

Figure 6:

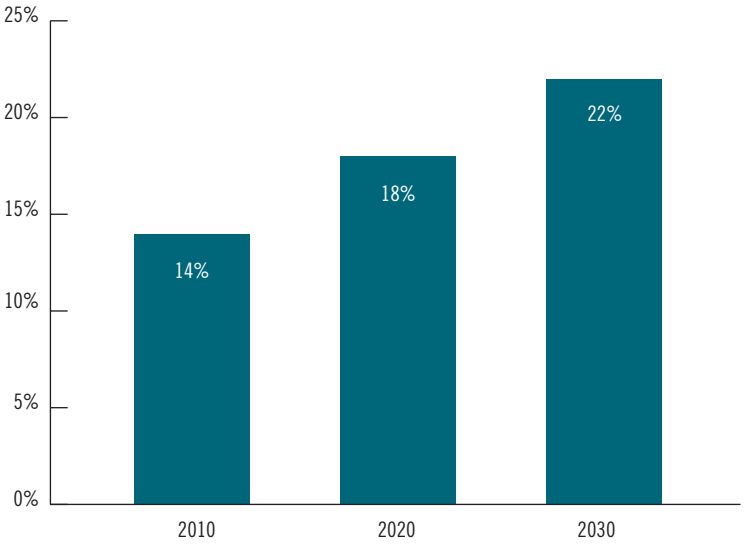
Growth rate for the Massachusetts population with bachelor's degrees or higher by decade, 1990 to 2030



Source: US Census Bureau; UMDI Projections

Figure 7:

Older adults (age 65 and older) as a percentage of Massachusetts residents with bachelor's degrees or higher, 2010-2030



Source: US Census Bureau; UMDI Population Projections

While the projections show Massachusetts will still have a well-educated population in 2020 and 2030, there is a significant shift in the number of college degrees held by older adults in non-prime working ages. While it is likely that these workers will participate in the labor market more than older workers traditionally have, these data suggest that employers in the Bay State may have a difficult time filling high-skill positions and replacing well-educated Baby Boomers leaving the labor force.

Regional Educational Attainment Projections

Projected educational attainment out to 2030 varies among the state's eight regions according to differing age distributions and net migration rates for the college-educated population. Central, Metrowest, and the Northeast region experience above-average increases, while Berkshire/Franklin, Greater Boston, and the Southeast region see more modest gains. Cape Cod and the Pioneer Valley are the only two regions to endure significant losses, both in terms of the absolute number and the share of residents with bachelor's degrees.

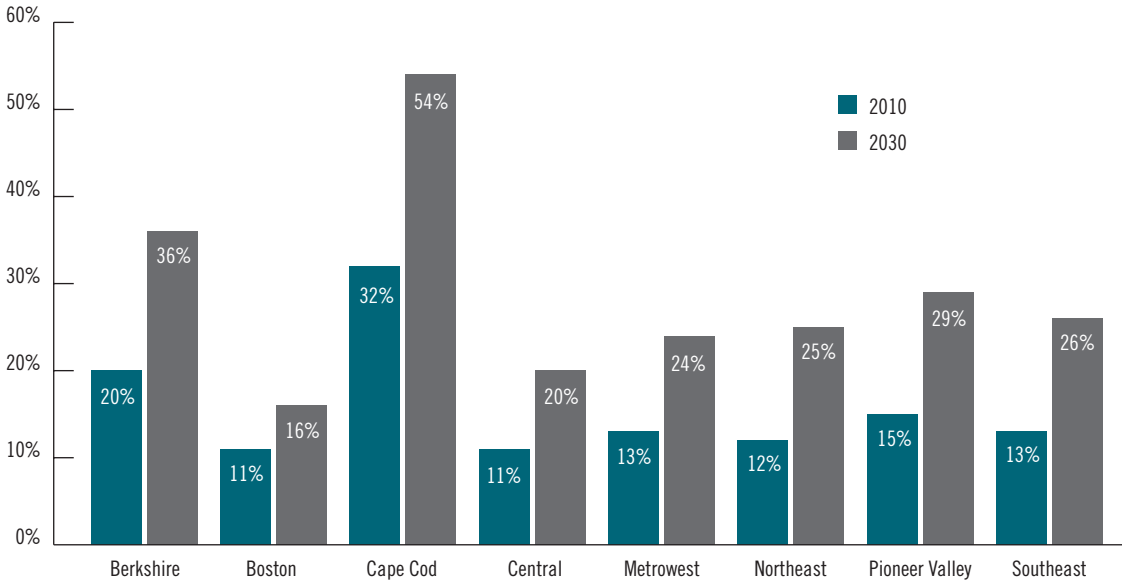
Among the regions, the projection's most striking prediction is the changes in the share of degrees held by residents age 65 and older. In Cape Cod, the older adult share grows from less than one-third to more than one-half. Older adults will hold more than a third of college degrees in the Berkshire/Franklin region in 2030, up from about one-fifth in 2010. In many regions, including Central, the Northeast, the Pioneer Valley, and the Southeast, residents age 65 and older double their share of degrees (Figure 8).

Looking at just the prime working age population, the growth in residents with bachelor's degrees is more muted and in some regions sharply negative. The 2030 forecast shows the number of prime working age adults with college degrees falling by 41 percent on Cape Cod and 27 percent in the Pioneer Valley. While the Southeast population over age 25 increases by 10 percent, the region ekes out less than 1 percent growth in residents ages 25 to 64 with a bachelor's degree or higher (Figure 9).

A synopsis of the projection for each region is provided below (for more detailed tables, see Appendix B).

Figure 8:

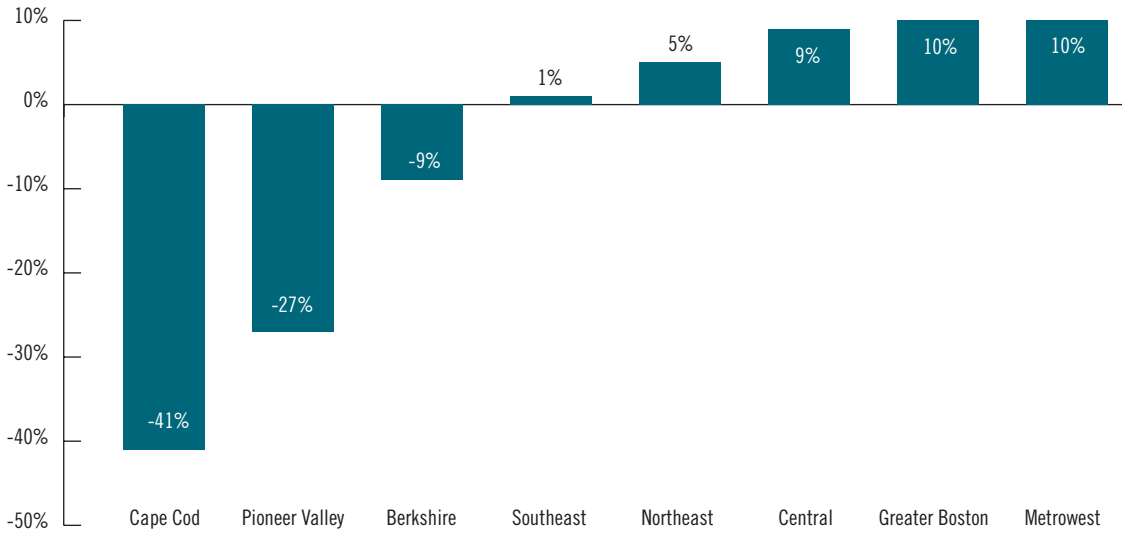
Percent of bachelor's or higher degrees held by residents age 65 and older, 2010 and 2030



Source: US Census Bureau; UMDI Population Projections

Figure 9:

Percent change in residents age 25 to 64 with a bachelor's degree or higher, 2010 to 2030



Source: US Census Bureau; UMDI Population Projections

Berkshire/Franklin

The projection shows several interesting trends in the Berkshire/Franklin region. First, the share of the population with at least a bachelor's degree will rise to nearly 32 percent by 2030. This increase is driven, in part, by domestic in-migrants between the ages of 25 and 44. Native residents aging into the 25 or older cohort also contribute some to increases in educational attainment, though overall this population tends to have low levels of attainment. Interestingly, the region is one of only two (alongside Cape Cod) expected to see an increase in individuals with less than a high school education. This is mainly due to the low educational attainment of international in-migrants and limited educational attainment for young adults native to the region.

Greater Boston

The projection shows rising educational attainment in Greater Boston with the percent of the population holding at least a bachelor's degree ticking up from 46 percent to 49 percent between 2010 and 2030. Native young adults aging into the 25 or older age group help balance negative net migration among residents with college degrees.

Cape Cod and the Islands

Factoring in the balance of in-migration, out-migration, residents aging into the 25 and over age group, and deaths, the forecast suggests that the population of adults age 25 or older on Cape Cod will rise by approximately 10 percent by 2030. Despite this growth, the college-educated population will decline due to out-migration and deaths. Growth in the Cape Cod population is driven largely by increases in international in-migrants with low levels of education. Overall, the projection shows the share of residents with at least a bachelor's degree falling rather sharply, from 41 percent in 2010 to 32 percent in 2030.[12]

Central

The projection shows rising educational attainment in Central Massachusetts through 2030. Net gains from migration and native residents aging into the 25 or older cohort drive this increase. Interestingly, the Central region is also projected to experience significant net gains in college educated residents between the ages of 45 and 54, suggesting people moving to the region after completing their education. The forecast also suggests a decrease in the share of the region's population with less than a high school education. This is mainly due to the death of older residents over the next couple of decades.

Metrowest

The projection suggests Metrowest will remain the most educated region in the Commonwealth out to 2030. Individuals with less than a high school education will fall and the population with a bachelor's degree will rise. The decrease in individuals with less than a high school education comes from a combination of loss of international in-migrants, domestic out-migrants, and death of residents with low education levels. Increases in educational attainment are driven by well-educated domestic in-migrants, particularly among individuals ages 25 to 44. From 2010 and 2020, the forecast shows a net gain of over 26,000 residents between the ages of 25 and 44 with at least a college degree. This cohort of young college-educated adults will grow by another 23,000 residents between 2020 and 2030.

Northeast

The projection shows increases in educational attainment for the Northeast region out to 2030. The growth in the college-educated population is driven mainly by well-educated in-migrants to the region, particularly in the 25-to-54 age group. The Northeast region gains over 17,000 individuals ages 25 to 54 with college degrees between 2010 and 2020 and another 13,000 between 2020 and

Table 2:

Educational Attainment Estimates for the Berkshire Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	16,021	9.5%	20,204	11.2%	25,055	13.8%
High School	55,984	33.2%	57,454	31.9%	55,479	30.5%
Some College/Associate's	46,321	27.5%	44,718	24.9%	44,257	24.3%
Bachelor's or More	50,095	29.7%	57,548	32.0%	57,068	31.4%
Total	168,421	100.0%	179,923	100.0%	181,859	100.0%

Table 3:

Educational Attainment Estimates for the Greater Boston Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	157,234	11.8%	149,824	10.4%	141,354	9.8%
High School	312,605	23.4%	313,132	21.8%	310,044	21.5%
Some College/Associate's	253,175	18.9%	274,987	19.1%	282,176	19.6%
Bachelor's or More	615,078	46.0%	699,474	48.7%	708,541	49.1%
Total	1,338,093	100.0%	1,437,418	100.0%	1,442,116	100.0%

Table 4:

Educational Attainment Estimates for the Cape Cod Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	9,367	5.1%	15,753	8.0%	21,403	10.6%
High School	46,234	25.1%	48,128	24.3%	48,284	23.8%
Some College/Associate's	53,093	28.8%	62,386	31.5%	67,654	33.4%
Bachelor's or More	75,654	41.0%	71,708	36.2%	65,299	32.2%
Total	184,347	100.0%	197,974	100.0%	202,640	100.0%

Table 5:

Educational Attainment Estimates for the Central Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	54,361	11.7%	50,135	10.0%	49,522	9.5%
High School	137,710	29.7%	143,468	28.7%	147,140	28.3%
Some College/Associate's	124,256	26.8%	138,350	27.7%	144,254	27.8%
Bachelor's or More	147,471	31.8%	167,843	33.6%	178,343	34.3%
Total	463,798	100.0%	499,796	100.0%	519,260	100.0%

Source: U.S. Census Bureau, 2007-2011 American Community Survey, Public Use Microdata Sample, UMDI Population Projections

Table 6:

Educational Attainment Estimates for the Metrowest Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	27,965	6.2%	26,487	5.3%	25,380	4.9%
High School	95,036	21.2%	98,096	19.5%	95,585	18.5%
Some College/Associate's	96,930	21.6%	104,773	20.9%	105,517	20.5%
Bachelor's or More	229,003	51.0%	272,562	54.3%	289,264	56.1%
Total	448,934	100.0%	501,919	100.0%	515,746	100.0%

Table 7:

Educational Attainment Estimates for the Northeast Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	70,717	10.1%	67,437	8.9%	64,543	8.3%
High School	179,770	25.6%	182,104	24.0%	172,514	22.2%
Some College/Associate's	178,527	25.4%	195,624	25.8%	205,134	26.4%
Bachelor's or More	272,525	38.8%	314,499	41.4%	334,059	43.0%
Total	701,539	100.0%	759,664	100.0%	776,249	100.0%

Table 8:

Educational Attainment Estimates for the Pioneer Valley Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	57,828	14.9%	50,353	13.0%	43,002	11.4%
High School	117,515	30.2%	119,491	30.8%	120,782	32.0%
Some College/Associate's	104,094	26.7%	113,502	29.2%	117,214	31.1%
Bachelor's or More	109,954	28.2%	104,906	27.0%	96,454	25.6%
Total	389,390	100.0%	388,253	100.0%	377,452	100.0%

Table 9:

Educational Attainment Estimates for the Southeast Region — 25 Years and Older

Attainment	2010	Percentage	2020	Percentage	2030	Percentage
Less than High School	102,357	13.5%	97,832	12.0%	97,976	11.8%
High School	228,188	30.2%	237,119	29.2%	237,535	28.5%
Some College/Associate's	205,417	27.2%	230,180	28.3%	238,108	28.6%
Bachelor's or More	220,335	29.1%	247,683	30.5%	258,945	31.1%
Total	756,296	100.0%	812,815	100.0%	832,564	100.0%

Source: U.S. Census Bureau, 2007-2011 American Community Survey, Public Use Microdata Sample, UMDI Population Projections

2030. The estimate suggests the population with a high school diploma or less will decline, due mainly to domestic out-migration and older, less educated residents dying.

Pioneer Valley

The Pioneer Valley is the only region projected to experience a decline in the total population age 25 or older. The region will also see a significant decrease in college-educated residents. This drop is projected to occur mainly among young adults ages 25 to 34. According to the projection, the Pioneer Valley will experience a net loss of nearly 22,000 college-educated residents ages 25 to 34 between 2010 and 2020 and another 25,000 from 2020 and 2030. Interestingly, the loss through net migration is largely driven by international migrants. Between 2010 and 2030, the estimates show the Pioneer Valley will lose over 43,000 college-educated international migrants.

Southeast

The projection shows modest increases in educational attainment in the Southeast region out to 2030. Gains in the bachelor's degree holding population are mainly attributable to well-educated in-migrants, particularly in the 25-to-54 age group, which is projected to see a gain of nearly 30,000 individuals with college degrees through net migration by 2030. In addition, there are a significant number of native residents earning a college degree aging into the 25 or older age group. The number of college degree holders will rise by nearly 40,000 residents by 2030. However, growth in the share of residents with at least a bachelor's degree ages 25 and older with is modest, increasing 2 percentage points between 2010 and 2030 to 31 percent.

GROWING EDUCATIONAL ATTAINMENT IN THE GATEWAY CITIES

Massachusetts will need to pursue a diverse set of strategies to meet the challenge of replacing well-educated Baby Boomers. One clear option is to work to close disparities in educational attainment. Gateway City students complete post-secondary degrees at half the rate of non-Gateway City students in Massachusetts (19 percent versus 39 percent).

Bringing the post-secondary completion rate up in Gateway Cities and inducing more of these students to opt for a four-year degree over a two-year degree would go a long way toward helping fill the labor force gap left by aging Boomers. The projections show that the number of residents ages 25 to 64 with a college degree will fall by nearly 46,000 between 2020 and 2030. Bringing each Gateway City's six-year post-secondary completion rate to non-Gateway City levels would increase the number of prime working age residents with college degrees in 2030 by more than 46,000, making up for the entire potential loss of degrees in the forecast.[13]

In addition to filling the hole left by retirees, increased attainment in Gateway Cities would help ameliorate the poverty and unemployment challenges low levels of educational attainment create for Gateway Cities and their regions. Successfully increasing college completion rates would not only improve the life chances and economic mobility of Gateway City residents, it would also strengthen urban centers, improving the quality of life in regions outside of Greater Boston, better positioning them to retain talent.

ASKING PROVOCATIVE QUESTIONS

With the impending graying of Massachusetts's college-educated labor force over the next two decades, there is little time remaining to develop a coherent strategy. In considering the most appropriate response, leaders must think carefully about the implications of this forecast. Explored below are three provocative questions they should ask and answer.

1. Is this welcome news?

Many believe that Massachusetts has an oversupply of educated workers. Slower growth could lead to higher wages and increase the return that individuals receive on their investment in post-secondary education. Perhaps the benefits of higher wages would be a net positive for the state's economy. If this were the case, it would be appropriate to simply stay the course.

Writing for both MassINC and others, Northeastern University labor economist Andrew Sum has argued forcefully for this position. His research suggests an oversupply of workers with post-secondary degrees has left many college graduates mal-employed in Massachusetts.[14] A recent analysis revealing elevated rates of unemployment in Massachusetts among residents with a post-secondary degree compared to their counterparts in other states lends support to his claim.[15] With emerging research suggesting that the skills gap in the US is overstated and that over education is a larger and growing problem, this position cannot be easily discounted.[16]

BRINGING COLLEGE COMPLETION RATES FOR STUDENTS IN GATEWAY CITIES UP TO THOSE FOR STUDENTS RAISED IN OTHER MASSACHUSETTS COMMUNITIES WOULD MAKE A REAL DIFFERENCE.

Those on the other side of the debate, represented most prominently by Georgetown University's Anthony Carnevale, argue that the US is producing too few college degrees. They believe this will become a real barrier to growth as the economy recovers and more Baby Boomers enter retirement.[17]

With technological change continuing to place more downward pressure on low- to mid-skill employment, many economists see few alternatives to striving to increase post-secondary education levels.[18] Since 2007, the number of US jobs for workers with a high school diploma or less has trended steadily downward.[19]

As additional research delves into this problem and US labor markets heal more fully from the Great Recession, an answer to this important question should emerge.

2. What can policymakers do to alter the trajectory?

Eliminating large racial and ethnic college completion disparities would have a significant impact on the growth trajectory of the state's population with college degrees. Likewise, bringing college completion rates for students in Gateway Cities up to those for students raised in other Massachusetts communities would make a real difference. While this may seem like a tall task, it is important to keep in mind that recent attempts to reduce achievement gaps by dramatically overhauling education are relatively new compared to the historical factors that have produced these large disparities. The data-driven focus and early success of initiatives to reduce high school dropout rates suggest that with continued attention, efforts to provide more equitable access to educational opportunity could succeed.

Whether Massachusetts can influence migration flows is another question. Certainly policy intervention to expand the supply of housing to keep escalating costs in check will be important.

But in the long run, macro issues, such as the changing marketplace for higher education, may have a far greater impact on the state's ability to attract and retain skilled migrants.[20]

3. How should Massachusetts manage in an era of slow growth?

If policymakers were to find that slower growth in the state's college-educated population is both problematic and largely inevitable, there is still much that could be done to adapt to these conditions.

First, high schools, colleges and universities, and workforce development organizations could take steps to ensure that the skills workers build closely match the changing demands of employers. Equally important, education systems could be redesigned to better serve adult learners transitioning into new careers in growing industries. Education leaders in Massachusetts are hard at work developing and implementing programs along these lines. Manufacturing, where the aging labor force has already emerged as a major threat to growth, has been a particular focus. Leaders could build a supportive environment for these efforts to ensure that effective models can be brought to scale.

Policymakers can also respond to slower growth in the prime working age population by maximizing the contribution of older adults. Workers today are already retiring later than in previous generations. In part this may be driven by economic circumstances, but there are also clearly health benefits and other motivations.[21] Employers recognize the chance to retain the skills older workers uniquely hold presents an opportunity, and many are creatively structuring programs to keep this talent in the workforce longer.[22] Much can be learned from Europe, where low immigration and negative birth rates have already brought about declines in the working age population and companies have developed many innovative approaches to retain older workers.[23]

Commonwealth Corporation and others, including MassINC, have been following this issue closely for some time.[24] Older adults in Massachusetts are already working at rates that are among the highest in the county, but even still, just one-third of adults ages 65 to 74 remain in the state's labor force, according to the most recent data from the American Community Survey.[25]

GROWTH IN DEGREE HOLDERS VERSUS EDUCATIONAL ATTAINMENT GROWTH

The forecast also shows a slowdown in educational attainment gains in percentage point terms (from 6 percentage points in the 1990s and 5.8 percentage points in the 2000s to 1.5 percentage points in the 2010s and 0.5 percentage points in the 2020s), but it is important to distinguish between the significance of this trend and the downward trajectory of growth in the absolute number of residents with at least a college degree. Massachusetts has an extremely well-educated population. The fact that the percentage of residents with a college degree will only rise from 40.5 percent in 2020 to 41 percent in 2020 is certainly not cause for alarm. The slowdown in the absolute number of residents with bachelor's degrees is much more profound, as this suggests a constrained supply of skilled workers could become a serious impediment to future economic growth.

APPENDIX A: DETAILED EDUCATION PROJECTION METHODOLOGY

In order to estimate future educational attainment, we used population projections developed by the UMass Donahue Institute for eight sub-regions within the Commonwealth for 2020 and 2030. These sub-regions are Berkshire/Franklin, the Cape Cod and the Islands, Central, Greater Boston, Pioneer Valley, Metrowest, Northeast, and Southeast. These population projections used base 2010 Census data for each region, split by gender and five-year age cohorts. The projections estimate six main types of population change by five-year age/gender cohorts: Northeastern in-migration, domestic in-migration, domestic out-migration, international migration, deaths, and births. UMass Donahue completed population projections in five-year intervals between 2010 and 2030. The aggregate of estimated population totals and net changes by sub-region equals the total population and changes projected for the Commonwealth.

There are minor rounding differences by sub-region between our population/education estimates and what is published on UMass Donahue's website. At the time of publication, UMDI was working on an update of the 2020 and 2030 projections. We ran our educational projection model through a draft version of the new projections and got similar results and trends. However, the new UMDI projections will not be released until later in 2014. The current analysis uses the official projections from UDMI as of September 2014. For more information on the methodology employed for the UMDI population projections please visit http://pep.donahue-institute.org/UMDI_LongTermPopulationProjectionsReport_2013.11.pdf. For more information on the population projections themselves, please visit: http://pep.donahue-institute.org/

To project educational attainment in 2020 we estimated net changes for each education level and applied those changes to the estimated educational attainment distribution for Massachusetts in 2010. We estimated the number of degrees in Massachusetts in 2010 by applying the educational attainment distribution for the Massachusetts population 25 or older observed in the 2007-2011 American Community Survey (ACS) Public Use Microdata Sample (PUMS) to the population total for the Census in 2010. We did this because the Decennial Census no longer asks questions about educational attainment. Our assumption is the educational attainment distribution in the ACS would be similar to what would have occurred in 2010.

PUMS data was selected as it allows users to customize cross tabulations, which was critical for our analysis as we were interested in educational attainment by age group and different migration types. A five-year sample of the ACS was selected as to increase sample size and data reliability. The 2007-2011 ACS was selected because the U.S. Census Bureau introduced changes to the primary geographic units used in the 2008-2012 ACS. UMDI previously defined the eight sub-regions of Massachusetts using the older geographies in the ACS. In addition, the UMDI population projections used data for the eight sub-region from the ACS that predate the 2008-2012 geographic changes, including estimates of migration patterns for the sub-regions of the state.

For our analysis we split the population in to six 10-year age cohorts: 25-to-34, 35-to-44, 45-to-54, 55-to-64, 65-to-74, 75-to-84, and 85 and older for each of the eight sub-regions split by six types of population change: Northeast in-migration, domestic in-migration, international migration, domestic out-migration, age-in, and death. We then applied the educational attainment distribution observed in the 2007-2011 ACS PUMS by region for each age cohort within each population change category. Table A1 shows the education distribution used by age group for each population type. We decided to use the same edu-

Table A1:

Education Distribution by Age Cohort by Population Change Type

POPULATION CHANGE TYPE	EDUCATION DISTRIBUTION BY AGE GROUP
In-migration Northeast	The average educational attainment for Massachusetts residents who migrated in in the last year and U.S. residents who migrated from Massachusetts in the last year.
In-migrant domestic	The average educational attainment for Massachusetts residents who migrated in in the last year and U.S. residents who migrated from Massachusetts in the last year.
International migration	Massachusetts residents who migrated in the last year from outside of the U.S.
Out-migrant domestic	The average educational attainment for Massachusetts residents who migrated in the last year and U.S. residents who migrated from Massachusetts in the last year.
Death	The region average
Age-in	The average educational attainment within the region for people born in Massachusetts

Source: UMDI

Table A2:

2007-2011 ACS Educational Attainment Used by Age Cohort

AGE COHORT	2020 PROJECTION	2030 PROJECTION
25-34	25-34	25-34
35-44	25-34	25-34
45-54	35-44	25-34
55-64	45-54	35-44
65-74	55-64	45-54
75-84	65-74	55-64
85+	75+	65+

Source: UMDI

cational attainment distribution for all domestic in-migrants and out-migrants. In this way, our assumption is that educational attainment distribution is the same for these three groups (northeast in-migrant, domestic in-migrant, and domestic out-migrant). This was done because of some of the small sample sizes per age cohort and educational level by region. Ideally, we would have used different educational attainment distribution for each of these population change types, but data limitation led us to consolidating the educational attainment distribution for these three groups. The product of applying educational attainment distributions to projections in net population change provided an estimate of net changes in attainment level. In all cases, these data were split by sub-region and aggregated together to reach state totals.

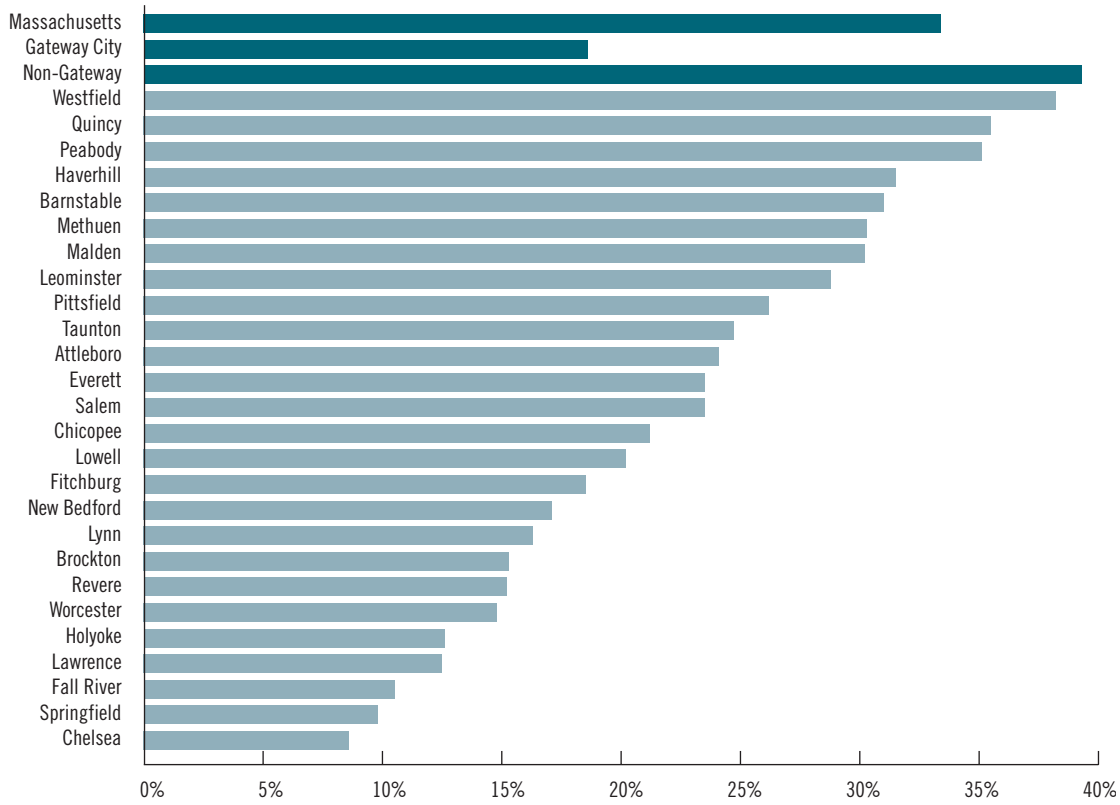
Table A2 shows the educational attainment distribution used for each age cohort by region. We applied an age cohort's education distribution to the projected net change in the population estimates for each specific region. Our assumption is that once a person reaches 25 years of age their gains in educational attainment stops and that as people age they take their educational attainment with them. We assumed that the population aging into the 25-to-34 cohort will have the same educational attainment as the current 25-to-34 cohort. If educational attainment for any of these age groups change in the future, particularly those aging into the 25-34 cohort as their educational attainment is in the most flux, then our current projections would change accordingly.

Estimating Degrees for 65 or Older Population

In order to estimate the split of college degrees between individuals 25-to-64 and 65 and older, we took our estimate for degrees in a given year (2010, 2020, and 2030) and split them between the two age groups. To do this for 2010 we used the 2007-2011 ACS PUMS to estimate the percentage of degrees in each region and the state that were held by individuals 65 or older. That provided the baseline estimate of degrees. We then used our population change estimate by age to add and subtract people 65 or older with a college degree for each decade. This led to a significant decrease in the number of degrees remaining as this age group has more negative change than positive

Figure A1:

Six-Year Post Secondary Completion Rate—Gateway Cities



Source: MassINC Completion Rate Data

change in our projections, most notably through higher death rates than the younger cohorts. We then added in individuals aging in to the 65 or older cohort. In 2020, we took the 55-to-64 cohort from 2010 and added and subtracted population with a college degree from our population change estimate. The remaining degrees in this cohort were then added to the remaining degrees in the 65 or older population to provide an estimate of degrees for all people 65 or older in 2020. This estimate was than subtracted from the total estimate of degrees in 2020 to derive the number of degrees for individuals 25-to-64.

For 2030, we did the same thing with the 65 or older population as we did for the 2020 projection. We then took the 45-to-54 cohort in 2010 and did two rounds of additions and subtractions by college degree. The first round estimated the number of college degrees within this group that would remain in 2020. The second round estimated the number of degrees that would remain in 2030. The sum of these degrees was then added to the remaining degrees in the 65 or older population to provide an estimate of degrees for all people 65 or older in 2030. This estimate was than subtracted from the total estimate of degrees in 2030 to derive the number of degrees for individuals 25-to-64. This process was done first for the state and then replicated for each of the eight regions, normalizing minor rounding differences to the estimated state totals. The regional breakdowns are presented in table A20 in Appendix B.

Estimating Degree Production for the Gateway Cities

UMass Donahue Institute was provided data by MassINC on educational completion rates for each of the Gateway Cities. These data show the percent of a 9th grade cohort that graduates high school, enrolls in a post-secondary institution, and completes post-secondary education within six years. The figure below shows the six-year completion rate for each of the Gateway Cites, the state average, and the non-Gateway City average. As we see in Figure A1, the six-year completion rate in Gateway Cities is just under 19 percent, compared to over 33 percent for the state overall. The state percentage is depressed, however, by the Gateway Cities. The average completion rate for non-Gateway Cities was over 39 percent.

In order to estimate the number of new college degrees added to the Massachusetts labor force from Gateway Cities, we applied the six-year completion rate for each respective city to the estimated surviving population 25-to-29. In essence, these individuals would be the Gateway City residents who "aged in" to the prime working age cohort over the previous five years. Next, we split the estimate of post-secondary degrees to a number of associate's degrees and bachelor's degrees and above. To do this, we used the current split of associate's and bachelor's degrees and above for each of the respective Gateway Cities.

Table A3 shows the estimated number of associate's degrees and bachelor's degree for the prime working age-in cohorts of Gateway Cities assuming the current completion rate for each respective city. Next, we estimated the number of potential degrees that could occur within this population if the completion rate for each Gateway City was brought up to the current non-Gateway City level. We also recalibrated the split of associate's degrees and bachelor's degrees in the estimate to reflect the average for Massachusetts, as Gateway Cities tend to have a higher percentage of their post-secondary population earning associate's degrees rather than bachelor's degrees than the Commonwealth overall.

Table A2:

Post-Secondary Education Completion for Gateway Cities

ESTIMATED NUMBER OF DEGREES BY GATEWAY CITY AVERAGE		
Degree Type	2010 - 2020	2020 - 2030
Added Associate's	20,207	21,550
Added Bachelor's+	36,751	39,229
ESTIMATED NUMBER OF DEGREES BY NON-GATEWAY CITY AVERAGE		
Added Associate's	29,479	31,380
Added Bachelor's+	80,144	85,323
POTENTIAL INCREASE		
Added Associate's	9,272	9,830
Added Bachelor's+	43,393	46,094

Source: MassINC Completion Rate Data, U.S Census Bureau,
American Community Survey 2008-2012, UMDI Population Projections

APPENDIX B: DETAILED MIGRATION TABLES AND DEGREE ESTIMATES FOR POPULATION 65 OR OLDER BY REGION

The tables in this appendix show detailed population change for each region in the state, as well as an estimate of degrees for the population 65 or older by region. Tables A4 through A11 show the net changes between 2010 and 2020 by population change type for each level of education, in-migration by age and educational attainment, and out-migration by age and educational attainment. Tables A12 through A19 show the net changes between 2020 and 2030 for the same categories. Table A3 shows the percentage breakdown of degrees for the 25-to-64 and 65 or older populations by region for 2010, 2020, and 2030.

Our in-migration table is the sum of in-migration Northeast, in-migration domestic, and international migration. In reality, our international migration number is the net difference between in- and out-migration. Generally, this number is positive. As a result, we included it in the in-migration table for simple display. That said, some in-migration cells below are negative. That means that the net balance of negative international migration was greater than in-migration in that particular cell. The out-migration table is a more detailed display on the domestic out-migration population for each region.

Table A3:

College Degree Split-25-64 and 65 or Older—By Region

	2010	2020	2030
BERKSHIRE			
25 - 64	80.1%	64.9%	63.8%
65+	19.9%	35.1%	36.2%
Total	100.0%	100.0%	100.0%
BOSTON			
25 - 64	88.7%	86.7%	84.5%
65+	11.3%	13.3%	15.5%
Total	100.0%	100.0%	100.0%
CAPE COD			
25 - 64	68.4%	57.5%	46.5%
65+	31.6%	42.5%	53.5%
Total	100.0%	100.0%	100.0%
CENTRAL			
25 - 64	88.9%	84.5%	80.4%
65+	11.1%	15.5%	19.6%
Total	100.0%	100.0%	100.0%
METROWEST			
25 - 64	87.3%	81.7%	75.9%
65+	12.7%	18.3%	24.1%
Total	100.0%	100.0%	100.0%
NORTHEAST			
25 - 64	88.1%	82.2%	75.5%
65+	11.9%	17.8%	24.5%
Total	100.0%	100.0%	100.0%
PIONEER VALLEY			
25 - 64	85.3%	76.3%	70.7%
65+	14.7%	23.7%	29.3%
Total	100.0%	100.0%	100.0%
SOUTHEAST			
25 - 64	86.8%	80.4%	74.5%
65+	13.2%	19.6%	25.5%
Total	100.0%	100.0%	100.0%

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A4:

Migration Estimates – Berkshire Region – 2010 to 2020 – Ages 25 years & over

BERKSHIRE POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	2,556	986	3,967	2,868	2,662	3,533	4,182
High School	10,973	4,304	2,667	6,847	13,972	9,350	1,469
Some College	6,671	2,727	(4,486)	4,828	8,710	4,311	(3,280)
Associate's	1,206	406	-	3,036	1,233	1,737	1,677
Bachelor's	10,341	4,068	1,461	4,597	13,027	3,839	3,600
Master's & Higher	6,885	2,542	4,372	1,349	7,684	3,611	3,853
Total	38,632	15,033	7,980	23,526	47,288	26,381	11,502

BERKSHIRE IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	841	180	5,543	1,031	109	(496)	301	7,509
High School	7,157	3,115	3,271	2,746	566	620	469	17,944
Some College	4,470	2,040	1,028	1,760	(4,907)	326	194	4,912
Associate's	295	167	146	59	430	424	90	1,611
Bachelor's	7,711	3,007	2,428	1,276	1,078	1,033	(663)	15,870
Master's & Higher	3,045	1,299	1,144	5,156	1,147	1,324	684	13,799
Total	23,519	9,808	13,561	12,028	(1,576)	3,231	1,075	61,645

BERKSHIRE OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	444	223	698	893	109	221	72	2,662
High School	6,023	3,025	2,924	1,119	567	203	112	13,972
Some College	3,895	1,956	959	1,021	724	107	46	8,710
Associate's	303	152	136	51	431	139	22	1,233
Bachelor's	5,994	3,011	1,414	1,106	1,080	339	84	13,027
Master's & Higher	2,524	1,268	1,067	1,063	1,148	450	163	7,684
Total	19,184	9,635	7,198	5,253	4,059	1,460	499	47,288

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A5:

Migration Estimates - Boston Region – 2010 to 2020 – Ages 25 years & over

BOSTON POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	13,375	7,165	(12,661)	35,004	23,984	26,308	(7,409)
High School	28,366	17,169	(10,746)	67,298	55,976	45,584	526
Some College	28,078	18,305	(6,975)	58,619	56,978	20,589	20,460
Associate's	7,776	5,041	(2,623)	14,546	15,508	7,880	1,352
Bachelor's	109,237	75,311	(37,830)	179,047	225,143	25,576	75,046
Master's & Higher	113,785	76,915	(32,379)	113,087	232,419	29,639	9,349
Total	300,616	199,907	(103,214)	467,599	610,008	155,576	99,325

BOSTON IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	5,105	(112)	3,420	4,410	(7,259)	1,146	1,168	7,879
High School	13,028	625	8,378	8,596	767	274	3,120	34,789
Some College	20,890	3,162	6,771	4,818	1,095	1,353	1,320	39,409
Associate's	5,764	787	1,965	1,356	276	(189)	236	10,194
Bachelor's	97,390	12,713	21,930	9,573	1,180	2,699	1,233	146,718
Master's & Higher	94,303	12,827	32,455	12,662	132	4,053	1,888	158,321
Total	236,480	30,002	74,919	41,415	(3,809)	9,337	8,965	397,309

BOSTON OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	8,733	2,702	2,261	3,718	1,558	3,403	1,608	23,984
High School	20,558	6,360	7,671	12,119	5,491	1,631	2,146	55,976
Some College	28,863	8,930	6,072	6,753	3,881	1,620	858	56,978
Associate's	8,127	2,514	1,872	1,300	1,002	385	307	15,508
Bachelor's	138,414	42,823	20,314	13,361	5,773	3,636	822	225,143
Master's & Higher	133,044	41,162	27,192	18,428	6,500	4,841	1,252	232,419
Total	337,740	104,492	65,380	55,680	24,205	15,515	6,994	610,008

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A6:

Migration Estimates – Cape Cod Region – 2010 to 2020 – Ages 25 years & over

CAPE COD POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	2,164	1,200	8,412	840	4,332	1,898	6,386
High School	8,070	4,156	7,521	5,330	15,081	8,103	1,894
Some College	6,871	3,950	14,176	4,034	14,296	5,973	8,761
Associate's	2,703	1,259	1,874	1,873	4,518	2,659	533
Bachelor's	11,454	6,147	5,771	5,218	21,930	7,523	(862)
Master's & Higher	5,485	2,850	2,485	3,049	10,835	6,118	(3,083)
Total	36,747	19,561	40,240	20,345	70,992	32,274	13,627

CAPE COD IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	1,892	910	5,228	2,879	199	134	533	11,775
High School	7,265	2,851	2,450	4,571	1,754	421	436	19,747
Some College	11,860	4,078	3,015	3,669	965	376	1,033	24,997
Associate's	291	290	789	3,592	460	347	67	5,836
Bachelor's	4,569	3,578	7,041	4,680	1,573	1,536	396	23,372
Master's & Higher	2,898	1,913	919	2,211	1,670	1,030	178	10,820
Total	28,776	13,620	19,442	21,603	6,621	3,844	2,642	96,548

CAPE COD OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	1,550	815	250	1,052	225	212	228	4,332
High School	4,563	2,400	2,277	2,733	1,809	667	632	15,081
Some College	6,210	3,267	1,432	1,290	1,094	597	407	14,296
Associate's	561	295	733	1,901	521	408	97	4,518
Bachelor's	6,710	3,530	3,553	3,836	1,731	1,995	574	21,930
Master's & Higher	3,489	1,835	854	1,239	1,809	1,351	258	10,835
Total	23,084	12,142	9,099	12,052	7,189	5,230	2,195	70,992

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A7:

Migration Estimates – Central Region – 2010 to 2020 – Ages 25 years & over

CENTRAL POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	7,779	2,825	(1,232)	6,790	9,030	11,359	(4,226)
High School	22,243	7,716	(1,147)	23,940	25,197	21,799	5,757
Some College	14,065	4,965	4,602	18,302	17,266	10,552	14,116
Associate's	6,471	2,303	(951)	5,089	8,073	4,860	(22)
Bachelor's	20,592	7,379	(1,258)	17,663	24,506	9,297	10,573
Master's & Higher	20,048	7,218	5,646	8,300	24,407	7,007	9,799
Total	91,199	32,406	5,660	80,085	108,478	64,875	35,998

CENTRAL IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,775	1,671	2,844	1,225	(424)	(219)	501	9,372
High School	10,979	5,229	6,332	2,774	(696)	2,880	1,316	28,813
Some College	7,242	3,515	8,417	2,752	589	842	276	23,633
Associate's	2,873	1,445	2,627	1,260	(792)	182	228	7,822
Bachelor's	13,659	5,827	6,946	1,662	(2,243)	846	16	26,713
Master's & Higher	12,384	5,495	11,211	1,485	1,443	688	207	32,912
Total	50,911	23,181	38,375	11,158	(2,123)	5,220	2,543	129,266

CENTRAL OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,051	1,696	1,965	1,513	552	-	252	9,030
High School	8,900	4,948	4,703	3,549	1,763	1,060	274	25,197
Some College	5,875	3,266	2,917	3,437	1,348	372	51	17,266
Associate's	2,334	1,298	1,917	1,556	780	145	42	8,073
Bachelor's	11,024	6,129	3,765	2,198	983	350	57	24,506
Master's & Higher	10,010	5,566	4,875	2,135	1,515	267	39	24,407
Total	41,194	22,904	20,143	14,388	6,941	2,194	715	108,478

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A8:

Migration Estimates – Metrowest Region – 2010 to 2020 – Ages 25 years & over

METROWEST POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	5,837	1,350	(5,460)	7,329	5,543	4,992	(1,478)
High School	20,001	5,086	(1,687)	17,457	23,124	14,673	3,060
Some College	19,770	5,268	609	10,372	21,235	8,116	6,668
Associate's	8,575	2,425	(262)	3,751	10,019	3,295	1,176
Bachelor's	50,753	14,896	5,573	24,657	56,917	12,019	26,943
Master's & Higher	49,572	14,824	5,684	13,019	56,182	10,300	16,616
Total	154,508	43,849	4,457	76,585	173,020	53,395	52,985

METROWEST IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	2,474	645	2,711	409	(6,978)	2,038	428	1,728
High School	9,301	2,968	4,510	4,644	(955)	1,338	1,594	23,399
Some College	11,133	4,038	2,173	2,420	1,670	2,756	1,458	25,647
Associate's	4,629	2,048	2,462	1,021	131	(50)	497	10,738
Bachelor's	35,929	13,461	10,999	4,772	2,946	2,019	1,097	71,222
Master's & Higher	38,030	12,505	12,077	3,907	1,013	861	1,687	70,079
Total	101,496	35,665	34,931	17,172	(2,173)	8,961	6,761	202,814

METROWEST OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	1,482	702	1,378	407	307	975	291	5,543
High School	6,026	2,854	3,514	6,802	1,930	1,092	905	23,124
Some College	7,619	3,609	2,893	3,779	1,346	1,318	671	21,235
Associate's	3,477	1,647	2,663	1,547	106	350	229	10,019
Bachelor's	24,950	11,817	8,661	7,361	2,374	1,250	504	56,917
Master's & Higher	24,950	11,817	10,354	5,930	1,875	412	842	56,182
Total	68,506	32,447	29,463	25,826	7,937	5,397	3,442	173,020

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A9:

Migration Estimates – Northeast Region – 2010 to 2020 – Ages 25 years & over

NORTHEAST POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	7,957	3,207	(3,379)	12,772	10,047	13,791	(3,281)
High School	26,966	10,656	4,227	26,042	35,796	29,761	2,334
Some College	27,504	10,624	14	28,616	37,989	15,257	13,512
Associate's	10,112	3,922	(1,392)	11,083	13,374	6,766	3,585
Bachelor's	51,565	19,457	6,976	40,041	70,124	16,047	31,868
Master's & Higher	29,102	11,158	5,508	16,579	39,184	13,057	10,106
Total	153,207	59,024	11,954	135,133	206,513	94,679	58,125

NORTHEAST IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,361	1,411	3,843	1,514	(2,910)	50	515	7,785
High School	12,808	5,491	8,314	6,678	2,091	3,440	3,026	41,849
Some College	16,760	6,951	9,599	4,402	(2,918)	2,070	1,277	38,142
Associate's	5,664	2,571	2,649	1,377	(1,488)	1,099	771	12,642
Bachelor's	41,721	17,748	13,630	3,911	(788)	1,348	428	77,998
Master's & Higher	17,938	8,290	12,091	3,343	422	2,868	816	45,768
Total	98,251	42,463	50,127	21,226	(5,591)	10,876	6,832	224,184

NORTHEAST OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	2,923	1,373	1,619	1,732	1,430	395	575	10,047
High School	11,332	5,325	5,199	8,072	3,514	1,285	1,069	35,796
Some College	14,429	6,780	7,631	5,518	2,444	742	445	37,989
Associate's	5,255	2,469	2,469	1,710	797	405	269	13,374
Bachelor's	36,677	17,235	8,914	5,092	1,430	501	275	70,124
Master's & Higher	16,897	7,940	6,736	4,204	2,114	1,008	284	39,184
Total	87,512	41,122	32,568	26,328	11,730	4,335	2,917	206,513

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A10:

Migration Estimates – Pioneer Valley Region – 2010 to 2020 – Ages 25 years & over

PIONEER VALLEY POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	5,850	5,367	(9,420)	12,564	10,555	11,280	(7,474)
High School	10,150	8,665	(1,928)	22,542	17,945	19,508	1,976
Some College	9,928	8,431	(1,531)	16,112	17,042	9,313	6,585
Associate's	4,226	3,912	(2,184)	9,009	7,952	4,187	2,824
Bachelor's	12,572	10,063	(13,005)	18,101	21,204	7,520	(992)
Master's & Higher	8,082	6,828	(8,077)	9,985	14,117	6,757	(4,056)
Total	50,807	43,266	(36,145)	88,312	88,814	58,563	(1,137)

PIONEER VALLEY IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	(4,197)	1,056	2,678	2,416	(1,566)	982	428	1,796
High School	4,919	3,837	3,539	2,524	691	988	390	16,887
Some College	5,497	3,935	3,749	2,232	(202)	1,282	335	16,828
Associate's	396	1,408	1,894	1,757	160	155	182	5,953
Bachelor's	(1,494)	5,299	4,140	1,346	(667)	716	291	9,631
Master's & Higher	(2,171)	2,839	4,105	2,264	606	(1,166)	356	6,833
Total	2,950	18,374	20,107	12,539	(978)	2,956	1,981	57,928

PIONEER VALLEY OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	2,906	1,141	1,613	2,554	1,794	353	193	10,555
High School	7,517	2,950	2,068	3,002	1,876	355	176	17,945
Some College	7,641	2,999	1,984	2,799	1,006	461	151	17,042
Associate's	2,972	1,166	1,140	1,856	721	56	40	7,952
Bachelor's	11,633	4,566	2,072	1,887	658	258	131	21,204
Master's & Higher	6,439	2,527	1,613	2,273	900	206	161	14,117
Total	39,108	15,349	10,490	14,371	6,954	1,689	853	88,814

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A11:

Migration Estimates – Southeast Region – 2010 to 2020 – Ages 25 years & over

SOUTHEAST POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out Migrants	Death	Calculations
Less than High School	14,785	5,324	(2,132)	17,597	19,351	20,748	(4,525)
High School	34,035	12,092	2,979	38,960	44,242	34,892	8,932
Some College	27,347	9,719	3,870	32,468	35,867	16,694	20,842
Associate's	9,346	3,488	1,375	10,295	12,741	7,841	3,921
Bachelor's	34,376	11,970	7,318	31,586	44,385	15,954	24,911
Master's & Higher	27,511	9,294	978	8,847	34,429	9,764	2,437
Total	147,400	51,887	14,387	139,753	191,014	105,893	56,519

SOUTHEAST IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	4,964	4,313	4,131	3,736	(1,975)	1,067	1,741	17,977
High School	16,690	8,953	11,981	7,044	(596)	3,115	1,919	49,106
Some College	14,595	8,371	7,984	5,655	2,372	1,598	360	40,935
Associate's	4,198	2,154	2,963	3,874	(107)	721	407	14,208
Bachelor's	17,658	11,559	16,414	5,996	(294)	1,471	860	53,664
Master's & Higher	16,250	9,006	6,960	3,341	31	1,214	982	37,783
Total	74,354	44,355	50,433	29,646	(569)	9,186	6,268	213,674

SOUTHEAST OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	5,654	2,874	4,376	3,100	1,549	860	938	19,351
High School	14,834	7,541	8,451	7,343	2,735	2,323	1,016	44,242
Some College	13,380	6,802	5,518	5,992	2,844	1,119	211	35,867
Associate's	3,657	1,859	2,156	3,342	983	505	239	12,741
Bachelor's	17,264	8,777	8,917	4,875	2,805	1,242	505	44,385
Master's & Higher	14,660	7,453	5,326	2,788	2,552	1,074	576	34,429
Total	69,449	35,307	34,744	27,440	13,468	7,123	3,485	191,014

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A12:

Migration Estimates – Berkshire Region – 2020 to 2030 – Ages 25 years & over

BERKSHIRE POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	2,093	845	4,959	2,528	2,558	3,015	4,852
High School	11,663	5,090	135	6,036	14,764	10,134	(1,975)
Some College	7,561	3,150	(1,239)	4,257	9,321	5,603	(1,195)
Associate's	1,149	385	-	2,677	933	2,544	734
Bachelor's	11,379	4,689	4,121	4,052	13,748	5,089	5,403
Master's & Higher	6,780	2,588	(4,946)	1,190	7,315	4,179	(5,883)
Total	40,624	16,747	3,031	20,739	48,639	30,565	1,936

BERKSHIRE IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	838	188	525	5,970	923	153	(701)	7,897
High School	7,327	3,269	3,261	2,798	(1,024)	796	461	16,888
Some College	4,588	2,141	1,965	868	183	(481)	208	9,473
Associate's	307	175	105	123	53	604	167	1,534
Bachelor's	7,852	3,153	3,780	2,296	1,143	1,515	449	20,188
Master's & Higher	3,114	1,362	1,408	966	(4,788)	1,611	749	4,422
Total	24,027	10,289	11,043	13,021	(3,509)	4,198	1,333	60,402

BERKSHIRE OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	443	227	124	545	1,092	48	79	2,558
High School	6,008	3,081	1,680	2,283	1,367	247	99	14,764
Some College	3,886	1,993	1,086	749	1,248	315	45	9,321
Associate's	302	155	84	106	62	187	36	933
Bachelor's	5,980	3,067	1,672	1,104	1,352	469	105	13,748
Master's & Higher	2,518	1,291	704	833	1,300	499	170	7,315
Total	19,136	9,814	5,350	5,622	6,421	1,764	532	48,639

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A13:

Migration Estimates – Boston Region – 2020 to 2030 – Ages 25 years & over

BOSTON POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	11,683	6,725	(16,432)	33,254	21,152	22,548	(8,470)
High School	26,574	16,357	(14,434)	63,935	52,843	42,676	(3,087)
Some College	28,945	19,313	(10,199)	55,689	60,155	22,668	10,926
Associate's	8,030	5,379	(5,001)	13,819	16,702	9,263	(3,737)
Bachelor's	119,548	84,730	(48,475)	170,100	258,152	33,090	34,661
Master's & Higher	120,370	84,358	(42,815)	107,436	259,604	35,339	(25,594)
Total	315,151	216,863	(137,356)	444,232	668,609	165,584	4,698

BOSTON IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	4,719	(198)	1,832	2,062	(7,046)	(1,315)	1,922	1,975
High School	12,488	523	4,129	5,098	821	3,188	2,250	28,497
Some College	21,081	3,280	5,322	4,117	340	2,417	1,503	38,060
Associate's	5,775	808	1,520	1,197	(1,696)	622	183	8,409
Bachelor's	97,286	13,000	26,032	13,350	509	3,462	2,163	155,803
Master's & Higher	94,456	13,172	24,896	19,692	2,933	3,543	3,221	161,914
Total	235,804	30,585	63,732	45,517	(4,139)	11,916	11,242	394,658

BOSTON OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	10,252	2,762	1,281	2,096	2,111	1,062	1,589	21,152
High School	24,133	6,502	3,016	7,112	6,880	3,741	1,460	52,843
Some College	33,882	9,128	4,234	5,630	3,834	2,644	804	60,155
Associate's	9,540	2,570	1,192	1,735	738	683	243	16,702
Bachelor's	162,481	43,773	20,303	18,834	7,585	3,933	1,242	258,152
Master's & Higher	156,178	42,075	19,515	25,211	10,462	4,429	1,733	259,604
Total	396,466	106,810	49,540	60,619	31,611	16,491	7,071	668,609

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A14:

Migration Estimates – Cape Cod Region – 2020 to 2030 – Ages 25 years & over

CAPE COD POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	2,324	1,270	7,438	716	4,354	1,744	5,651
High School	8,466	4,628	7,051	4,544	15,708	8,825	156
Some College	7,994	4,833	14,194	3,439	15,460	7,196	7,803
Associate's	2,475	1,068	23	1,596	4,226	3,471	(2,534)
Bachelor's	12,229	6,631	5,721	4,448	22,421	9,002	(2,394)
Master's & Higher	5,346	3,183	1,821	2,599	10,483	6,481	(4,015)
Total	38,833	21,613	36,248	17,343	72,651	36,720	4,666

CAPE COD IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	1,836	952	1,027	6,193	622	136	266	11,032
High School	6,949	2,969	3,734	3,072	1,775	1,270	376	20,145
Some College	11,253	4,233	5,907	3,672	755	662	539	27,021
Associate's	306	306	207	989	1,212	316	229	3,566
Bachelor's	4,653	3,770	2,933	8,592	2,587	1,099	946	24,581
Master's & Higher	2,895	2,012	1,744	1,152	797	1,178	572	10,350
Total	27,893	14,242	15,551	23,670	7,749	4,661	2,928	96,694

CAPE COD OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	1,453	851	450	353	880	202	164	4,354
High School	4,280	2,507	1,324	3,216	2,285	1,626	470	15,708
Some College	5,825	3,412	1,802	2,022	1,079	983	337	15,460
Associate's	526	308	163	1,035	1,590	469	135	4,226
Bachelor's	6,294	3,686	1,948	5,018	3,208	1,556	711	22,421
Master's & Higher	3,273	1,917	1,013	1,206	1,036	1,626	412	10,483
Total	21,652	12,681	6,700	12,851	10,078	6,462	2,228	72,651

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A15:

Migration Estimates – Central Region – 2020 to 2030 – Ages 25 years & over

CENTRAL POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	7,853	2,890	692	6,605	9,210	9,444	(613)
High School	21,806	8,047	(1,514)	23,287	25,301	22,654	3,673
Some College	14,445	5,294	(358)	17,803	17,278	12,991	6,916
Associate's	6,450	2,326	(478)	4,950	7,781	6,479	(1,012)
Bachelor's	22,539	8,578	2,316	17,182	27,169	13,363	10,083
Master's & Higher	21,697	8,161	(2,183)	8,074	26,286	9,045	418
Total	94,789	35,296	(1,524)	77,902	113,025	73,974	19,464

CENTRAL IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,918	1,798	2,789	1,207	936	465	322	11,435
High School	11,405	5,588	5,585	2,886	(461)	1,603	1,733	28,339
Some College	7,524	3,750	3,231	1,811	1,309	1,426	330	19,381
Associate's	2,986	1,536	940	1,177	963	623	73	8,297
Bachelor's	14,173	6,296	11,578	2,320	(1,774)	561	280	33,433
Master's & Higher	12,855	5,913	9,050	3,014	(5,218)	1,743	317	27,675
Total	52,862	24,880	33,173	12,415	(4,245)	6,422	3,054	128,561

CENTRAL OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,124	1,630	1,273	1,749	1,095	207	132	9,210
High School	9,111	4,755	3,713	4,185	2,570	661	306	25,301
Some College	6,015	3,139	2,451	2,596	2,488	505	84	17,278
Associate's	2,390	1,247	974	1,706	1,127	292	44	7,781
Bachelor's	11,286	5,890	4,600	3,351	1,591	368	83	27,169
Master's & Higher	10,248	5,348	4,176	4,339	1,546	568	61	26,286
Total	42,173	22,010	17,187	17,925	10,418	2,602	710	113,025

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A16:

Migration Estimates – Metrowest Region – 2020 to 2030 – Ages 25 years & over

METROWEST POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	4,866	1,297	(3,666)	6,387	5,426	4,565	(1,107)
High School	19,649	5,121	(6,159)	15,213	21,279	15,056	(2,511)
Some College	19,774	5,622	(4)	9,038	21,936	9,721	2,773
Associate's	8,516	2,541	(1,027)	3,269	10,815	4,513	(2,029)
Bachelor's	54,978	16,791	404	21,487	64,861	16,907	11,893
Master's & Higher	54,076	16,714	2,017	11,345	65,473	13,870	4,808
Total	161,859	48,085	(8,434)	66,739	189,790	64,633	13,827

METROWEST IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	2,431	635	877	1,025	(2,275)	(1,271)	1,075	2,498
High School	9,306	3,020	2,867	2,296	(3,113)	2,626	1,607	18,611
Some College	11,287	4,182	3,046	1,687	813	2,409	1,969	25,392
Associate's	4,805	2,169	973	1,614	(153)	189	432	10,030
Bachelor's	36,555	13,998	9,487	5,644	644	4,250	1,597	72,174
Master's & Higher	38,164	12,782	11,427	6,606	(467)	3,031	1,263	72,806
Total	102,548	36,787	28,676	18,873	(4,552)	11,235	7,945	201,511

METROWEST OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	1,692	746	511	1,475	182	243	579	5,426
High School	6,877	3,032	2,076	3,759	3,035	1,527	974	21,279
Some College	8,695	3,833	2,625	3,095	1,686	1,065	938	21,936
Associate's	3,968	1,749	1,198	2,849	690	84	278	10,815
Bachelor's	28,471	12,552	8,595	9,266	3,284	1,878	816	64,861
Master's & Higher	28,471	12,552	8,595	11,077	2,645	1,483	649	65,473
Total	78,173	34,464	23,598	31,521	11,521	6,281	4,233	189,790

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A17:

Migration Estimates – Northeast Region – 2020 to 2030 – Ages 25 years & over

NORTHEAST POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	7,675	3,238	(3,764)	11,607	9,227	12,423	(2,894)
High School	26,143	10,959	(6,263)	23,666	33,972	30,123	(9,589)
Some College	28,343	11,621	1,293	26,006	39,488	18,450	9,326
Associate's	10,216	4,190	(1,238)	10,072	13,960	9,097	184
Bachelor's	57,360	23,010	10,519	36,388	81,395	23,121	22,761
Master's & Higher	30,478	12,401	(1,647)	15,066	42,241	17,259	(3,201)
Total	160,216	65,420	(1,100)	122,805	220,282	110,473	16,586

NORTHEAST IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,490	1,454	1,611	1,336	(2,438)	1,358	339	7,149
High School	13,310	5,689	5,622	3,841	(5,492)	4,800	3,069	30,839
Some College	17,400	7,136	8,424	5,347	(1,219)	2,645	1,526	41,258
Associate's	5,896	2,704	1,837	1,679	(586)	778	859	13,168
Bachelor's	43,346	18,350	18,944	6,515	1,215	1,694	825	90,889
Master's & Higher	18,685	8,761	5,141	5,123	(768)	2,756	1,534	41,232
Total	102,128	44,094	41,580	23,840	(9,288)	14,030	8,152	224,536

NORTHEAST OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,256	1,340	860	1,586	1,110	589	487	9,227
High School	12,624	5,196	3,334	5,093	5,172	1,448	1,106	33,972
Some College	16,074	6,616	4,245	7,475	3,535	1,007	536	39,488
Associate's	5,854	2,409	1,546	2,419	1,096	329	308	13,960
Bachelor's	40,858	16,816	10,791	8,732	3,263	589	346	81,395
Master's & Higher	18,823	7,747	4,971	6,598	2,693	871	537	42,241
Total	97,488	40,124	25,748	31,901	16,869	4,833	3,320	220,282

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A18:

Migration Estimates – Pioneer Valley Region – 2020 to 2030 – Ages 25 years & over

PIONEER VALLEY POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	5,506	4,848	(10,699)	12,175	9,426	9,757	(7,352)
High School	10,502	9,244	(3,382)	21,845	17,702	19,215	1,292
Some College	10,157	8,931	(2,034)	15,613	17,416	10,884	4,366
Associate's	4,366	3,956	(4,107)	8,731	7,901	5,699	(655)
Bachelor's	13,692	12,089	(12,750)	17,541	23,064	9,869	(2,361)
Master's & Higher	8,452	7,466	(9,391)	9,676	14,501	7,793	(6,091)
Total	52,676	46,533	(42,363)	85,581	90,010	63,218	(10,801)

PIONEER VALLEY IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	(5,008)	1,287	1,619	1,687	(995)	579	486	(344)
High School	4,984	4,103	3,111	2,284	(47)	1,459	470	16,364
Some College	5,632	4,195	3,128	2,603	394	572	529	17,054
Associate's	210	1,546	1,336	1,193	(729)	522	137	4,215
Bachelor's	(2,642)	5,903	5,435	2,980	832	178	344	13,031
Master's & Higher	(2,991)	3,202	3,101	3,345	(1,296)	800	367	6,527
Total	185	20,238	17,729	14,092	(1,841)	4,110	2,333	56,846

PIONEER VALLEY OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	3,112	819	647	2,468	1,714	491	174	9,426
High School	8,048	2,119	1,673	3,166	2,014	514	168	17,702
Some College	8,180	2,154	1,701	3,038	1,879	275	189	17,416
Associate's	3,182	838	662	1,746	1,246	197	31	7,901
Bachelor's	12,454	3,279	2,590	3,172	1,266	180	123	23,064
Master's & Higher	6,894	1,815	1,433	2,468	1,525	246	119	14,501
Total	41,869	11,023	8,706	16,058	9,645	1,904	805	90,010

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projections

Table A19:

Migration Estimates – Southeast Region – 2020 to 2030 – Ages 25 years & over

SOUTHEAST POPULATION CHANGE							
Attainment	In Migrants, NE	In Migrants, US	Int'l Migration	Aged-In	Out-Migrants	Death	Calculations
Less than High School	14,518	5,472	1,013	16,187	19,167	17,879	144
High School	34,338	12,875	130	35,838	45,369	37,396	416
Some College	29,066	10,878	1,722	29,866	38,158	21,548	11,826
Associate's	9,191	3,606	(2,529)	9,470	12,494	11,142	(3,898)
Bachelor's	36,875	13,609	4,414	29,055	48,422	22,295	13,236
Master's & Higher	30,065	10,806	(251)	8,138	38,280	12,453	(1,974)
Total	154,053	57,245	4,500	128,554	201,889	122,713	19,749

SOUTHEAST IN-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	4,999	4,335	7,271	3,273	(1,315)	999	1,440	21,003
High School	17,284	9,479	6,543	8,007	1,513	2,226	2,292	47,343
Some College	15,068	8,787	7,470	5,296	1,472	2,791	782	41,666
Associate's	4,355	2,294	1,329	2,003	(1,023)	817	493	10,268
Bachelor's	18,106	11,946	13,659	10,037	(2,380)	2,333	1,198	54,898
Master's & Higher	16,803	9,494	7,304	4,798	(1,133)	2,170	1,185	40,620
Total	76,614	46,334	43,577	33,413	(2,866)	11,335	7,390	215,798

SOUTHEAST OUT-MIGRATION								
Attainment	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75-84	85+	Total
Less than High School	6,219	2,639	2,400	4,059	2,162	988	699	19,167
High School	16,316	6,924	6,297	7,839	5,121	1,746	1,126	45,369
Some College	14,717	6,245	5,680	5,119	4,179	1,815	403	38,158
Associate's	4,022	1,707	1,552	2,000	2,331	627	254	12,494
Bachelor's	18,990	8,059	7,329	8,271	3,400	1,790	583	48,422
Master's & Higher	16,125	6,843	6,224	4,941	1,945	1,628	574	38,280
Total	76,389	32,417	29,483	32,229	19,137	8,595	3,639	201,889

Source: U.S. Census Bureau, 2007-2011 American Community Survey, UMDI Population Projection

ENDNOTES

1. An earlier attempt at projecting educational attainment for the Commonwealth produced slightly higher percentages for college-educated people in Massachusetts. We estimated that 41.1% of the Commonwealth would have a college degree in 2020 and 42.1% would have a college degree in 2030. These estimates were done by using the state average for educational attainment for the six types of migration instead of using the regionally specific educational attainment estimates. What this means is educational attainment for the various forms of in- and out-migration in some regions produces lower levels of educational attainment in the aggregate. In theory, if these regions did a better job attracting or retaining well-educated residents, the educational attainment projections could approach the state averages mentioned above.

2. The American Community Survey replaced the long form of the US Census. It is an annual survey of the population that collects information on social, economic, and housing characteristics. The ACS is a sample of the total population and releases data in 1-year, 3-year, and 5-year samples. The multi-year estimates averages data results together to reduce sampling error. Throughout this report, we use 5-year samples from the ACS. When using multi-year ACS data, we refer to the sample's mid-year, in this case 2010 for the 2008 through 2012 five-year sample.

3. It is important to note that these categories have limitations. For instance, it is possible that some domestic and international migrants arriving at a young age will have received all of their schooling in Massachusetts. Even with these shortcomings, the large variation across the categories suggests the differences are meaningful.

4. For example, see Robert Nakosteen and Susan Strate. "The Great Massachusetts Migration Exchange" *MassBenchmarks* 16(1) (2014).

5. It is worth noting that the current student population, some 40,000 residents over age 25 with bachelor's degrees, does not significantly change Massachusetts' place among states. While difficult to quantify, in-migrants who arrive for post-secondary education and remain in Massachusetts are undoubtedly an important component of the state's formula for success.

6. The median age in Massachusetts was 39.1 at the 2010 Census, nearly 2 years older than US median. With a growth rate of 2.2 percent between 2010 and 2013, Massachusetts fell below the US growth rate (2.4 percent) and ranked 26th among the 50 states.

7. Waldorf, Brigitte S. "Is human Capital Accumulation a Self-Propelling Process? Comparing Educational Attainment Levels of Movers and Stayers." *The Annals of Regional Science* 43.2 (2009): 323-344; Whisler, Ronald L., et al. "Quality of Life and the Migration of the College-Educated: A Life-Course Approach." *Growth and Change* 39.1 (2008): 58-94; Berry, Christopher R., and Edward L. Glaeser. "The Divergence of Human Capital Levels across Cities." *Papers in regional science* 84.3 (2005): 407-444.

8. Nakosteen and Strate (2014).

9. For example, see Ann Owens. "Neighborhoods and schools as competing and reinforcing contexts for educational attainment." *Sociology of Education* 83.4 (2010): 287-311.

10. Defined as migration from New York, Connecticut, Rhode Island, New Hampshire, and other Massachusetts regions.

11. An earlier attempt at projecting educational attainment for the Commonwealth produced slightly higher percentages for college-educated people in Massachusetts. We estimated that 41.1% of the Commonwealth would have a college degree in 2020 and 42.1% would have a college degree in 2030. These estimates were done by using the state average for educational attainment for the six types of migration instead of using the regionally specific educational attainment estimates. What this means is educational attainment for the various forms of in- and out-migration in some regions produces lower levels of educational attainment in the aggregate. In theory, if these regions did a better job attracting or retaining well-educated residents, the educational attainment projections could approach the state averages mentioned above.

12. Of all the figures in the forecast, this is perhaps the most uncertain, as the large inflow of low skilled service workers predicted is heavily dependent on the region's ability to absorb additional tourists. Moreover, as the forecasted drop in residents with higher education and disposal income occurs, it will likely lead to some reduction in the migration rate for low skilled workers.

13. It should be noted here that we do not attempt to migrate out or consider death rates for any of these "additional new degrees" in Massachusetts. In theory, increased educational attainment within this population will likely lead to increased levels of mobility. For the purposes of this exercise, we were concerned about the total labor pool in Massachusetts, so mobility within the state is not problematic. However, out-migration from Massachusetts would decrease this number.

14. For example, see Andrew Sum and others. "Recapturing the American Dream: Meeting the Challenges of the Bay State's Lost Decade" (Boston, MA: MassINC, 2011); and Paul Harrington and Andrew Sum. "College Labor Shortages in 2018?" *New England Journal of Higher Education* (November 2010).

15. Alan Clayton-Matthews. "Benchmarking the Massachusetts Unemployment Rate" *MassBenchmarks* 16(1) (2014).

16. Peter Cappelli. "Skill Gaps, Skill Shortages and Skill Mismatches: Evidence for the US" *NBER Working Paper No. 20382* (August 2014).

17. Anthony Carnevale and others. "Recovery 2020: Job Growth and Education Requirements through 2020." (Washington, DC: Georgetown University, 2013)

18. For example, see Frank Levy and Richard Murnane. *The New Division of Labor: How Computers Are Creating the Next Job Market.* (Princeton, NJ: Princeton University Press, 2012).

19. Carnevale and others (2013).

20. For example, see Michael Barber and others. "An Avalanche Is Coming: Higher Education and the Revolution Ahead" (London, England: Institute for Public Policy Research, 2013).

21. Joseph Quinn and others. "Early Retirement: The Dawn of a New Era?" (New York, NY: TIAA-CREF Institute, 2011).

22. Richard Johnson. "Managerial Attitudes Toward Older Workers: A Review of the Evidence" (Washington, DC: Urban Institute, 2007); Michael North and Hal Hershfield. "Four Ways to Adapt to an Aging Workforce" *Harvard Business Review* (April 2014).

23. For example, see "How BMW is Defusing the Demographic Time Bomb" *Harvard Business Review* (March 2010).

24. See Andrew Bundy. "Retaining Older Workers: Practical Strategies for Workforce Development Leaders" (Boston, MA: Commonwealth Corporation, 2011). Alicia Munnell. "The Graying of Massachusetts: Aging, the New Rules of Retirement, and the Changing Workforce" (Boston, MA: MassINC, 2004).

25. Braedyn Kromer and David Howard. "Labor Force Participation and Work Status of People 65 Years and Older" (Washington, DC: US Census Bureau, 2013).

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