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Educational Attainment and Wage Growth in New England: Evidence from Four Decades of Administrative Wage Records

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Executive Summary

Per capita personal income in New England grew from $10,731 to $87,655 during the 1980–2024 period. This increase, the largest among all US census divisions, coincided with significant growth in educational attainment in the region. As of 2024, 53 percent of New England workers aged 25 to 64 held at least a bachelor's degree, and 23 percent possessed advanced degrees, compared with national averages of 44 percent and 17 percent, respectively. This study provides new insights into the relationship between educational attainment and income growth in New England, examining both individual earnings and broader regional trajectories.

Our analysis of 3.6 million wage records from 1978 through 2021 reveals that workers who are more educated not only begin with substantially higher starting wages but also experience steeper experience-related wage gains throughout their careers. This pattern is particularly pronounced for women with advanced degrees and men with bachelor's or advanced degrees. For individual workers, the benefits of higher education extend well beyond initial entry into the labor market, as the cumulative advantages are amplified over their career cycle.

New England's wage growth outpaced the national average by 16 percent from 1978 to 2021. Compositional differences in worker demographics—specifically educational attainment, age, and gender—account for one-third of this regional growth advantage. The remaining two-thirds are attributable to workers in New England experiencing faster wage growth compared with the corresponding US rates within their demographic groups. Greater productivity and higher labor costs both have contributed to the more substantial wage growth across the region, though their relative importance varies significantly by industrial sector.

These findings suggest that policies focused on developing, attracting, and retaining a highly educated workforce can yield broad economic benefits. Individuals who are more educated benefit from higher starting wages and stronger long-term earnings growth. For the broader workforce, the presence of a highly educated worker pool appears to generate positive spillover effects that boost wages across all education levels. Taken together, these findings underscore how human capital development can drive long-term growth for a regional economy and its workers.

I. Introduction

From 1980 to 2024, New England's per capita personal income grew sevenfold, from $10,731 to $87,655—the largest net growth among all census divisions.[1] Over the same period, the region also saw the second-largest increase in the share of workers with at least a bachelor's degree as well as the largest increase in the share with an advanced degree. By 2024, 53 percent of the 25- to 64-year-old workforce in New England had attained at least a bachelor's degree, and 23 percent held an advanced degree, in contrast to the national averages of 44 percent and 17 percent, respectively.[2]

While it is intuitive that a highly educated workforce would contribute to the region's substantial income growth, questions remain regarding the precise mechanisms by which education influences individual and aggregate earnings trajectories in New England. For instance, is attaining a higher academic degree linked to both a higher starting wage and steeper wage growth across a worker's career? Alternatively, is the region's greater income growth shared broadly across the educational-attainment spectrum? Or does it reflect a compositional shift toward a more educated, higher-earning workforce? Answers to these questions could enhance our understanding of how education shapes earnings dynamics in New England and inform related policy discussions.

By 2024, 53 percent of the 25- to 64-year-old workforce in New England had attained at least a bachelor's degree.

This report addresses those questions by leveraging newly available linked administrative data that provide insight into the relationship between educational attainment and individual wages over the career cycle in New England. The sample consists of 3.6 million annual inflation-adjusted wage records from W-2 forms of full-time, full-year workers spanning the years 1978 through 2021. The sample is restricted to workers who were surveyed by the US Census Bureau's Current Population Survey (CPS) at least once from age 25 to 64 and resided in New England at the time of the survey. We combine the wage records with self-reported demographic information from the CPS on educational attainment and gender to obtain our final sample. Our analysis uses this sample to compare baseline wages and experience-related wage gains across five education levels: less than a high school diploma, a high school diploma, some college/an associate degree, a bachelor's degree, and an advanced degree. We use the average wages of 30-year-old workers as the baseline wages, reflecting the market value of human capital at the start of careers for each education level. We define experience-related wage gains as the difference between average earnings at a specific age and the baseline wages.[3]

1 See US Bureau of Economic Analysis, "SAINC1 State annual personal income summary: personal income, population, per capita personal income" (accessed May 13, 2025).
2 According to the authors' calculation using data from the US Census Bureau's Basic Monthly Current Population Survey.
3 We log-transformed all wage measures before conducting our analysis. See Section III for details about wage measurement in the report. See the box on page 9 for an explanation of log transformation.

Our findings show that at the individual worker level, a higher level of education not only confers an initial labor market earnings advantage but also affects a worker's long-term wage-growth potential. Over the past four decades, the baseline wages of highly educated workers have gradually increased, providing a rising floor for steady earnings growth. Moreover, a higher level of education is associated with greater experience-related wage gains, particularly for women with advanced degrees and men with bachelor's or advanced degrees. These gains further amplify the career-cycle wage growth experienced by workers with higher degrees. These results are consistent with previous findings showing that education-related wage premiums widen over the course of the career cycle (Bhuller et al. 2017; Lagakos et al. 2018; Deming 2025). The seminal work of this literature, Mincer (1974), found that the age-earnings profile is steeper over the career cycle for more educated men. The age-earnings profiles of highly educated workers are different from those of other workers because workers with higher educational attainment accumulate work experience at later ages, and because experience has diminishing returns (Mincer 1974) while higher educational attainment raises the value of experience (Deming 2025; Bhuller et al. 2017; Lemieux 2006; Rubinstein and Weiss 2006; Heckman et al. 1998; Lagakos et al. 2018). As a result, the long-term gains from a higher academic degree may substantially extend beyond the short-term gains observed at the start of a career.

Wages among workers aged 25 to 64 in New England grew 16 percent more on average than the net growth across the United States from 1978 to 2021.

At the aggregate level, wages among workers aged 25 to 64 in New England grew 16 percent more on average than the net growth across the United States from 1978 to 2021. (The 16 percent figure reflects 0.15 log points; see the box on page 9 for an explanation of log transformation.) Compositional differences in worker demographics—specifically educational attainment, age, and gender—account for one-third of this regional growth advantage. The remaining two-thirds are attributable to workers in New England experiencing faster wage growth compared with the corresponding US rates within their demographic groups. This within-group growth advantage is consistently observed across education levels and genders and is driven by broad-based gains in New England workers' baseline wages. While compositional changes toward a more educated workforce contributed to the region's faster wage growth, differences in group-level wage rates played a more significant role. This finding raises the possibility that the highly educated workforce in New England has positive spillover effects on wage rates across the educational-attainment spectrum. Such human capital spillover effects are highlighted in earlier research finding that proximity to a large supply of college-educated workers can lead to wage increases among less educated workers in the same local labor market (Moretti 2004a and 2004b; Rosenthal and Strange 2008).

While we are unable to verify the exact magnitude of these spillover effects, by examining the factors underlying the higher wage rates in the region, we can make informed speculations. Conceptually, a worker's total compensation is calculated by multiplying their output

value by the proportion of that output allocated to labor compensation. An increase in labor productivity, measured by the average product per worker, or an increase in labor cost, measured by the labor share of total output, each can lead to higher wages. Using indicators on the average product of labor and labor share derived from US Bureau of Economic Analysis (BEA) and US Bureau of Labor Statistics (BLS) data, we find that greater productivity and higher labor costs both have contributed to the rising wage rates in New England. However, the relative importance of these factors varies across industrial sectors. New England sectors that depended strongly on workers with advanced education and training—that is, high-skill sectors such as professional and business services and education and health services—as well as service sectors have demonstrated labor productivity advantages over their US counterparts. Conversely, sectors that do not rely on highly educated workers—those selling tradable goods or services, including the manufacturing and trade sectors—have experienced higher unit labor costs.

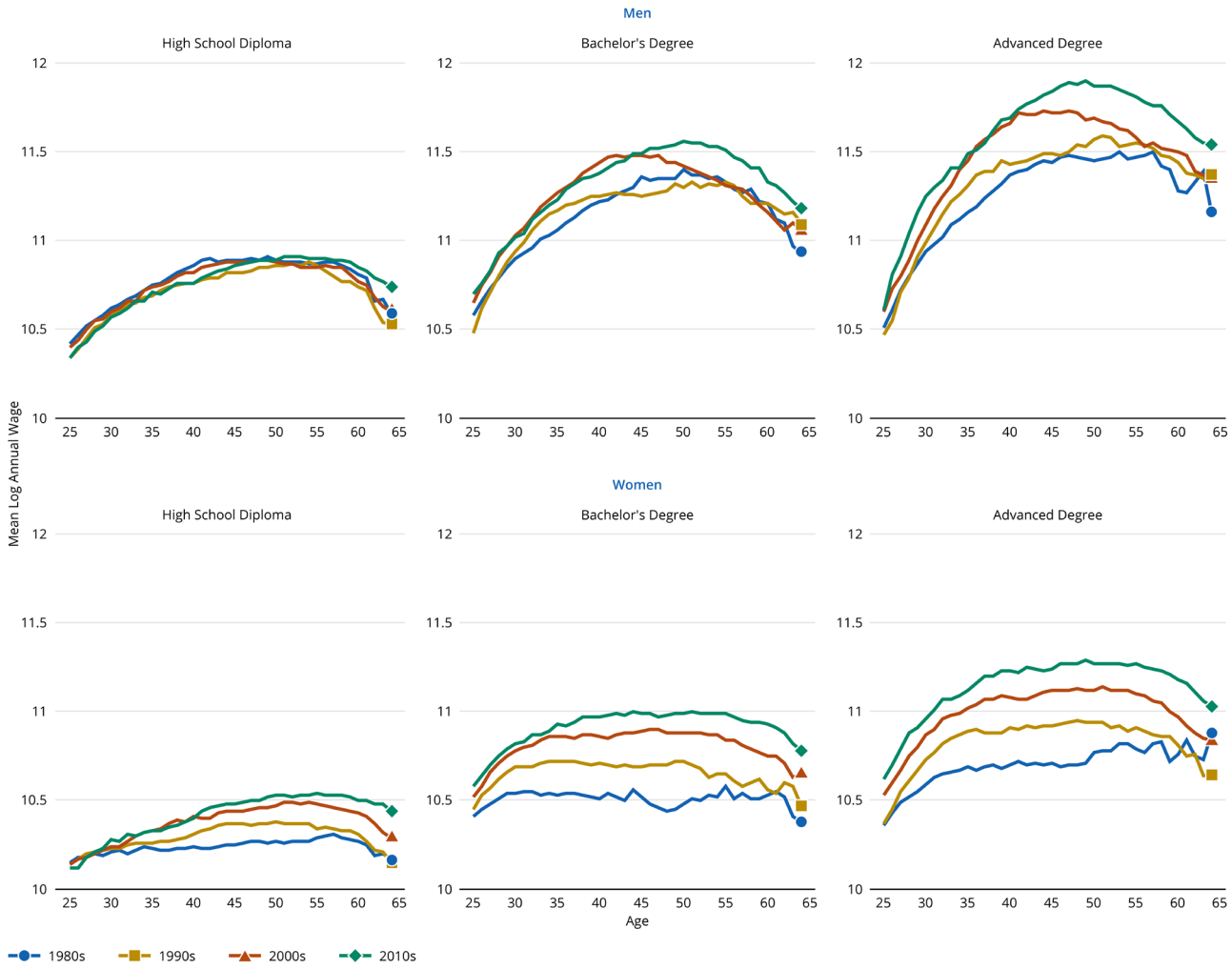
A plausible explanation for these sectoral dynamics is that the highly educated workforce in New England is directly connected to the greater labor productivity in the region's high-skill sectors, either as a contributing factor to that productivity or as a result of it by attracting more highly educated workers to the region. The higher wage rates offered by these high-skill sectors, in turn, have put upward pressure on wages across other sectors of the economy. For service sectors in which prices are largely determined within the region, firms can offset part of the wage pressure by passing it on to consumers through higher prices. The higher prices would be reflected in an increase in the average product of labor. By contrast, for tradable sectors in which prices are not set within the region, firms must absorb more of the wage pressure by increasing the labor share of output. Under this explanation, the highly educated workforce in New England can exert positive spillover effects on wage rates across the broader labor market. However, the implications of these spillover effects on firms' profit margins vary across industries, depending on firms' capacity to harness the productivity benefits of the more educated workforce, as well as their ability to pass along higher labor costs to consumers.

Public policies that cultivate, attract, and retain a highly educated workforce within a region may yield long-term benefits for wage growth across a broad range of workers.

Our findings show that public policies that cultivate, attract, and retain a highly educated workforce within a region may yield long-term benefits for wage growth across a broad range of workers. For individuals directly affected by these skill-enhancing initiatives, attaining a higher level of education is associated not only with higher initial wages, but also with greater returns on experience over the course of their careers. For workers not directly targeted by such policies, our findings offer suggestive evidence that the presence of a highly educated labor pool can generate positive spillover effects, boosting wage growth even among less educated segments of the regional workforce. Taken together, these findings underscore the strong connection between human capital development and long-term growth trajectories for a regional economy and its workers.

Figure 1: Age–Wage Profiles by Gender & Educational Attainment

New England, 1980s–2010s



Note(s): Each data point represents the average log annual wages at a given age during the 1980s, 1990s, 2000s, and 2010s decades for each gender–education group. When wages are shown in logarithmic form, the difference between two values roughly represents the percentage difference. This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2108. All results were approved for release by the US Census Bureau, authorization number CBDRB-FY25-0203.
Source(s): 1978–2021 Current Population Survey Annual Social and Economic Supplements and Social Security Administration Summary Earnings Record and Detailed Earnings Record extracts.

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II. The Relationship between Education and Wages over the Career Cycle

Figure 1 illustrates, for New England, the age–wage profile for men and women by educational attainment for four different decades, capturing the wages of workers at different ages within each decade. While the figure shows cross-sectional data—snapshots of wages at different ages—an individual worker's expected wage trajectory can be inferred from two key features of the figure. First is the overall position of the age–wage curve for their demographic group, which shifted upward from the 1980s to the 2010s

for most demographic groups, reflecting a general increase in compensation levels. Second is the worker's progression through different age brackets across decades. Thus, individual wage growth combines both broader economic trends affecting a worker's demographic group and personal age-related earnings gains throughout their career.

These age–wage profiles typically follow a concave pattern—an inverted U-shape—as experience-related wage growth slows over an individual's lifetime. Wages start relatively low in early adulthood and rise as workers accumulate experience and skills. Wages tend to peak mid-career to late career as workers gain seniority. When individuals near retirement, their wages tend to stagnate or decline as they work fewer hours and/or their productivity falls, though this decline is more gradual compared with the early-career growth phase.

The concavity of the age–wage relationship varies notably between genders and across levels of educational attainment. Men, on average, experience a more concave age–wage profile compared with women. It is characterized by steeper wage growth during the early- to mid-career stage followed by a more substantial decline in the late-career phase. Conversely, the age–wage profile for women follows a relatively flat path, with earnings increasing in the early-career stage then leveling off in the mid- and late-career phases. Furthermore, the degree of concavity in men's age–wage profile increases with educational attainment—a feature discussed extensively in the literature (Mincer 1974; Deming 2023; Bhuller et al. 2017; Lemieux 2006; Rubinstein and Weiss 2006; Heckman et al. 1998; Lagakos et al. 2018)—whereas the concavity differences across education levels are less pronounced for women.

The age–wage profile for women follows a relatively flat path, with earnings increasing in the early-career stage then leveling off in the mid- and late-career phases.

Over the four decades of our sample period, women's age–wage profiles consistently increased in both level and concavity across all education categories. Men's patterns, however, show greater heterogeneity. For example, high school graduates' age–wage profiles remained remarkably stable, while men with bachelor's and advanced degrees experienced varying rates of wage growth. These divergent patterns highlight that the career-cycle age–wage profiles differ between genders and across education levels in both baseline levels and concavity—both of which are essential for understanding how education relates to earnings across demographic groups throughout their careers. The following section details our empirical approach to decomposing and analyzing these components and their changes over time.

III. Data and Method

We analyze 3.6 million Social Security Administration annual wage records from 1978 through 2021, focusing on full-time, full-year workers (see the "Data" box, next page). These records are linked to respondents in the Current Population Survey's Annual Social and Economic Supplement (CPS-ASEC), specifically respondents who were aged 25 to 64 and in New England at the time of the survey. The resulting data set combines administrative wage data with self-reported demographic information on education and gender. Using this sample, we examine the evolution of two wage outcomes over time across worker groups categorized by educational attainment and gender: baseline wages and experience-related wage gains. Baseline wages, defined as the average logarithmic-transformed earnings (see the "Log Transformation" box) among 30-year-old workers within each gender–education group, serve as a reference point. Experience-related wage gains represent the wage differentials between workers of a given age and the baseline wages. They capture the wage increases associated with accumulated experience relative to 30-year-old workers in the same group. See the appendix for more details about our empirical analysis, including a description of our regression model.

Log Transformation

Log transformation is widely used in wage research. It compresses larger values and creates a more symmetric distribution that is closer to a normal distribution, which is crucial for inference in standard ordinary least squares (OLS) regression analyses. The transformation also enables easy interpretation of wage differences across different groups or time periods. When wages are in logarithmic form, the difference between two values roughly represents the percentage difference. For instance, if one group's wage rate is 10 log points higher than another's, the first group's wages are about 10 percent higher.

Our analysis distinguishes between wage changes stemming from being in different educational-attainment groups and those from being at different career stages, providing insights into how baseline wages and the value of experience jointly shape workers' wage trajectories over time. For an individual worker, expected wages at a given point in their career are calculated as the sum of the baseline wages and the experience-related wage gains corresponding to their age. Consequently, a worker's expected wage growth over the career cycle is determined by changes in the baseline wages as well as the evolution of experience-related wage gains across different ages and time periods. This approach offers advantages over simpler methods that compare mean wages across education groups over time. Such methods can conflate changes due to a workforce's age composition, experience value, and baseline wages. For example, New England's faster wage growth could be attributed to its more rapid pace of population aging, which is associated with increased accrued experience among workers. However, a simple comparison of mean wages might overlook this factor, potentially leading to misleading conclusions about individual and aggregate wage growth in the region.

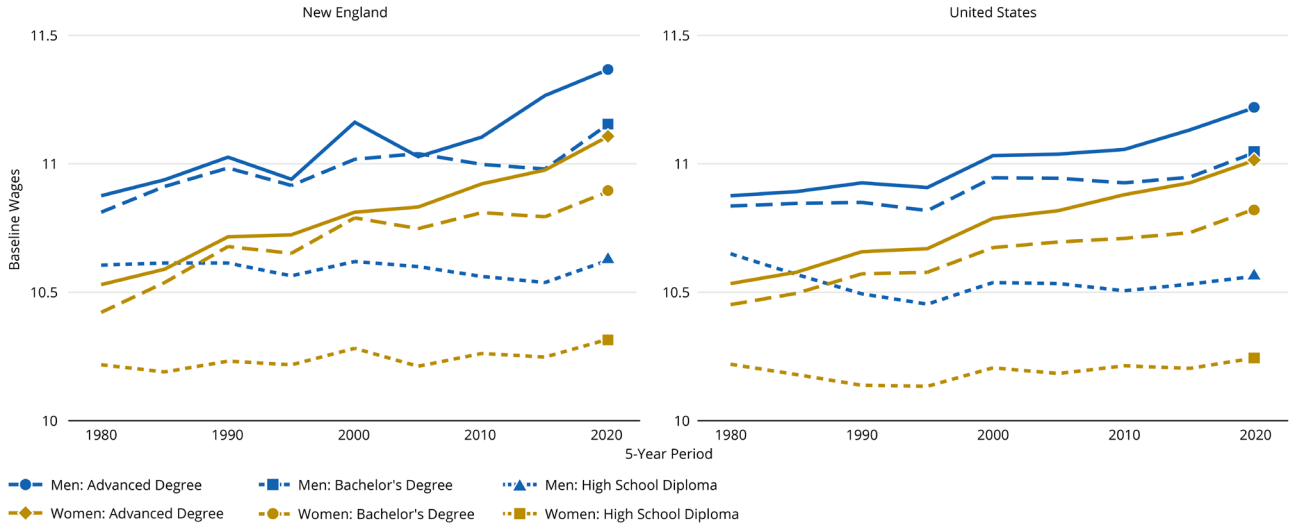
Data

Our analysis draws upon 3.6 million individual-level annual wage records and birth year information extracted from the Social Security Administration's Detailed Earnings Record (DER) and Numident databases. The sample is limited to full-time, full-year wage records, defined as records for individuals whose wages were at or above the federal minimum wage multiplied by 35 hours per week and 39 weeks per year, with self-employment income excluded from the earnings. These wage records are linked at the individual level to respondents in the Current Population Survey's Annual Social and Economic Supplement (CPS-ASEC) who were surveyed at least once from 1978 to 2021 and were aged 25 to 64 and residing in New England at the time of the survey. By merging CPS-ASEC data with the wage records, we supplement those records with self-reported demographic information about the worker, including educational attainment and gender, to create the final data set.

Combining the CPS-ASEC data with the DER data provides two key benefits over the conventional annual earnings data gathered by the CPS-ASEC. First, the administrative wage records from the DER substantially reduce estimation biases associated with self-reported earnings in the CPS-ASEC. Second, the linkage expands the CPS-ASEC sample size by the number of years a worker has been employed within the study period. For each CPS-ASEC respondent, we can observe not only their annual wages in the year of the survey but also their earnings before and after the survey year. This expanded sample size is crucial for analyzing earnings dynamics across worker demographics in smaller regional labor markets, such as New England, where insufficient sample sizes often hinder more granular demographic analyses. Notably, although our data set contains limited wage history information, our empirical method does not require longitudinal wage data, which would track wages over time. Rather, we analyze cross-sectional wage differences—differences at particular points in time—across age groups, which enables us to distinguish between the value of experience and shifts in baseline wages.

Based on this sample, we categorize workers into five educational-attainment levels: less than a high school diploma, a high school diploma, some college or an associate degree, a bachelor's degree, and an advanced degree. For conciseness, we focus on wage outcomes pertaining to workers with a high school diploma, a bachelor's degree, or an advanced degree when discussing results by education level, but all five education levels are included in the region-wide summary statistics. Our analysis estimates wage trajectories by detailed worker group jointly defined by the gender, educational attainment, and age of a group's members. To mitigate the impact of small sample sizes at this detailed demographic level, each time period in the analysis refers to the five-year period centered on the representing year, such that 1980 denotes the period from 1978 through 1982, with the exception of the last period, which includes only four years: 2018 through 2021. In this analysis, all wage values are adjusted for inflation using the Personal Consumption Expenditures (PCE) price index and presented in logarithmic form (see the "Log Transformation" box, preceding page).

Figure 2: Baseline Wages by Gender and Education in New England & United States
1978–2021



Note(s): Baseline wages represent average log annual earnings at age 30 within each gender–education group. When wages are shown in logarithmic form, the difference between two values roughly represents the percentage difference. Data points reflect five-year intervals (for example, "1980" represents the 1978–1982 period). This figure tracks the evolution of the baseline wages from 1978–1982 through 2018–2021. This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2108. All results were approved for release by the US Census Bureau, authorization number CBDRB-FY25-0203.
Source(s): 1978–2021 Current Population Survey Annual Social and Economic Supplements and Social Security Administration Summary Earnings Record and Detailed Earnings Record extracts. bostonfed.org

IV. Estimation Results

Figure 2 plots the baseline wages over time for men and women with a high school diploma, a bachelor's degree, or an advanced degree. In this report, "baseline wages" refers to the average log wages of 30-year-old workers within an educational-attainment group in a given five-year period. This measure captures the value of the human capital of workers at the start of their careers in that group. As noted in the "Log Transformation" box and in the caption to Figure 2, when wages are presented in logarithmic form, the difference between two values roughly represents the percentage difference.

A few patterns emerge from the figure. First, growth in baseline wages in New England outpaced the corresponding US rates over the study period. From the 1978–1982 period to the 2018–2021 period, growth in baseline wages for New England men exceeded the national growth rates by 14 to 15 percent (0.13 to 0.14 log points) across the three education groups. Similarly, growth in baseline wages within each education group was also larger for New England women compared with national averages, though the differences were moderately less, ranging from 7 to 9 percent (0.07 to 0.09 log points). An increase in the baseline wages can be attributable to either a rise in the unobserved unit price of a given type of human capital or an increase in the underlying quantity of human capital across cohorts of new labor market entrants. This consistency observed across education levels and gender suggests a broad-based increase in the value of human capital within the region, thereby raising wages across the educational-attainment spectrum.

Second, growth in baseline wages has become increasingly concentrated among the most educated workers in both New England and across the United States. From 1978 to 2021, the baseline wages for men in New England with a high school diploma followed a modest downward trend, while the baseline wages for women with a high school diploma remained largely stagnant. In contrast to the stagnation observed among high school graduates, workers with a bachelor's degree or an advanced degree experienced substantial and comparable growth in baseline wages until 2003. After 2003, wage growth decelerated for workers with a bachelor's degree while remaining robust for those with an advanced degree. This divergence between bachelor's-degree and advanced-degree holders indicates that the labor demand for college graduates relative to the supply stabilized over the last two decades, whereas labor demand for workers with advanced degrees continued to outpace supply, leading to persistent wage growth among the most educated workers in the labor market.

From 1978 to 2021, New England women's baseline wages grew 8 to 15 percent faster than the baseline wages of New England men with equivalent educational attainment.

Lastly, the gender difference in baseline wages has narrowed over time, although women's baseline wages still lag behind those of men across all education levels. This positive shift is attributable primarily to the more accelerated growth of women's baseline wages within each education group. During the study period, New England women's baseline wages grew 8 to 15 percent (0.08 to 0.14 log points) faster than the baseline wages of New England men with equivalent educational attainment. Several factors contributed to this trend. More recent cohorts of 30-year-old women gained greater access to industries and occupations traditionally dominated by men. They also accumulated more work experience, faced less discrimination, and received increased social encouragement to pursue employment (Blau and Kahn 2017). These cohort differences in labor market access and worker characteristics likely play a crucial role in explaining the faster baseline-wage growth observed among women.

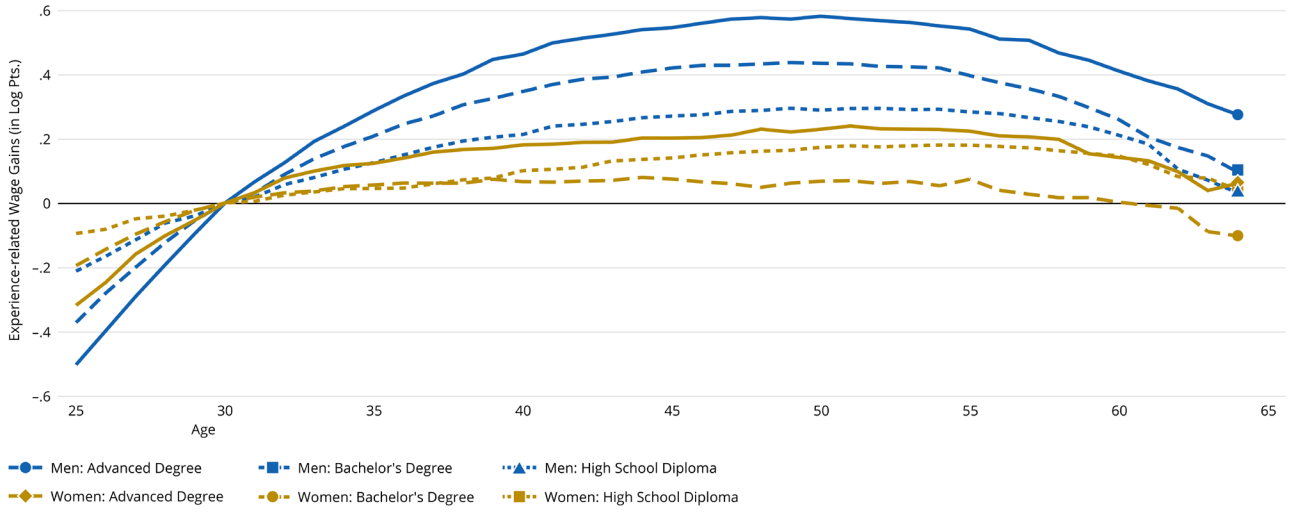
Experience-related Wage Gains

Educational attainment levels are associated not only with different baseline wages, but also with different abilities to accrue wage gains and be rewarded for experience over the career cycle. Figure 3 illustrates this relationship by plotting the value of experience-related wage gains by age from age 25 to 64, averaged across all time periods, for men and women by educational attainment. To facilitate a clear comparison of experience-related gains across different groups, we normalize the value of experience at age 30 to zero. This normalization removes baseline-level differences across groups and establishes a consistent baseline point for any age-related wage gains or losses.

Over the career cycle, experience-related wage gains largely exhibit an inverse U-shaped pattern: They increase in a person's early career (when they are aged 25 to 44), plateau in

Figure 3: Average Experience-related Wage Gains by Age, Gender & Education

New England, 1978–2021



Note(s): Each data point represents the difference between the average log annual wages at a given age and the average log annual wages at age 30 for the same demographic group. Values are averaged across all time periods. When wages are shown in logarithmic form, the difference between two values roughly represents the percentage difference. This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2108. All results were approved for release by the US Census Bureau, authorization number CBDRB-FY25-0203.

Source(s): 1978–2021 Current Population Survey Annual Social and Economic Supplements and Social Security Administration Summary Earnings Record and Detailed Earnings Record extracts.

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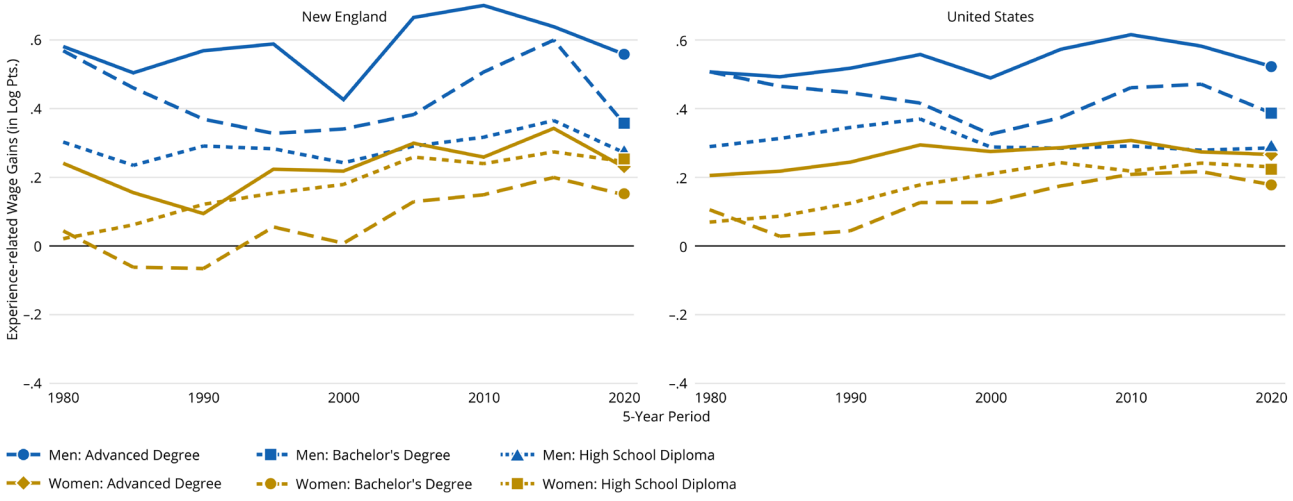
their mid-career (aged 45 to 54), and decrease in their late career (aged 55 to 64). However, there are notable differences across groups. Education and gender are both key determinants of experience-related wage gains before age 30. For each gender, more educated workers accrue experience-related gains at a quicker rate compared with their less educated peers. Within each education group, men accumulate experience-related wage gains at a faster pace than women. Growth in experience-related wage gains among women with bachelor's degrees or advanced degrees substantially decelerates after age 30. Consequently, the gender divide in experience-related gains increasingly overshadows the education-related differentiation after age 30, and by age 35, men at each education level see more substantial experience-related wage gains compared with women. This gender difference in experience-related wage gains can be explained partially by women's lower cumulative labor force participation, both in terms of total years in the workforce (Wu and Liu 2025) and hours worked while employed (see Table 1 in the Appendix).

The deceleration in experience-related wage gains is especially pronounced among women with bachelor's degrees. Their experience-related wage gains are nearly flat from age 35 to 55. The relationship between educational attainment and experience-related wage gains therefore does not follow a clear hierarchical order for women after the age of 30. Women with advanced degrees accumulate the largest experience-related gains after this age, followed by women with high school diplomas, while women with bachelor's degrees see the smallest experience-related gains. By contrast, before age 50, more educated men consistently see greater experience-related gains compared with their less educated peers. Although a higher level of educational attainment is linked to higher baseline wages for both men and women, it is associated with larger experience-

Figure 4: Experience-related Wage Gains at Age 50 over Time in New England & United States

1978–2021



Note(s): Experience-related wage gains at age 50 refer to the difference between the average log wages at age 50 and the average log wages at age 30 for the same demographic group. When wages are shown in logarithmic form, the difference between two values roughly represents the percentage difference. Data points reflect five-year intervals (for example, "1980" represents the 1978–1982 period). This figure tracks the evolution of experience-related wage gains at age 50 from 1978–1982 through 2018–2021. This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2108. All results were approved for release by the US Census Bureau, authorization number CBDRB-FY25-0203.
Source(s): 1978–2021 Current Population Survey Annual Social and Economic Supplements and Social Security Administration Summary Earnings Record and Detailed Earnings Record extracts.

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related gains only for men and for women who hold advanced degrees. A factor that may account for this finding is that, compared with women with high school diplomas and advanced degrees, women with bachelor's degrees have higher rates of leaving the labor force after childbirth and experience larger earnings penalties associated with post-childbirth employment gaps (Montes, Nunn, and Wu 2025).

Figure 4 illustrates how experience-related wage gains evolve over time by plotting—by gender and education level over time—experience-related gains at age 50, when the value of experience typically peaks in a worker's career cycle. These gains are measured as the log wage differentials between workers aged 50 and workers aged 30 within the same education–gender groups in a given period. These trends in experience-related wage gains in New England are largely consistent with the corresponding national figures, though the New England trends exhibit more fluctuations due to smaller sample sizes.

In New England, men and women showed distinct trends in their experience-related wage gains over the 1978–2021 period. For men, experience-related wage gains at age 50 remained largely stable, with some labor-supply-driven fluctuations and evidence of temporary labor-demand shocks biased toward specific age groups. Specifically, men with bachelor's degrees experienced a U-shaped trend in their experience-related wage gains, with lower levels observed from the 1993–1997 period through the 2003–2007 period. This convex trend was likely driven by changes in the relative supply of college-educated workers across cohorts (Card and Lemieux 200l; Jeong et al. 2015). A temporary surge in college-degree attainment for men born during the 1945–1950 period followed by a period of slower growth in the number of men attaining bachelor's degrees resulted

in this cohort experiencing smaller wage gains relative to workers born before and after them. Additionally, during the 1998–2002 period, the dot-com boom disproportionately raised earnings of younger, highly educated men compared with their more experienced counterparts, temporarily diminishing the experience-related wage gains among men holding bachelor's or advanced degrees.

Unlike with men, experience-related wage gains among women increasingly converged, rather than diverged, across the educational-attainment spectrum.

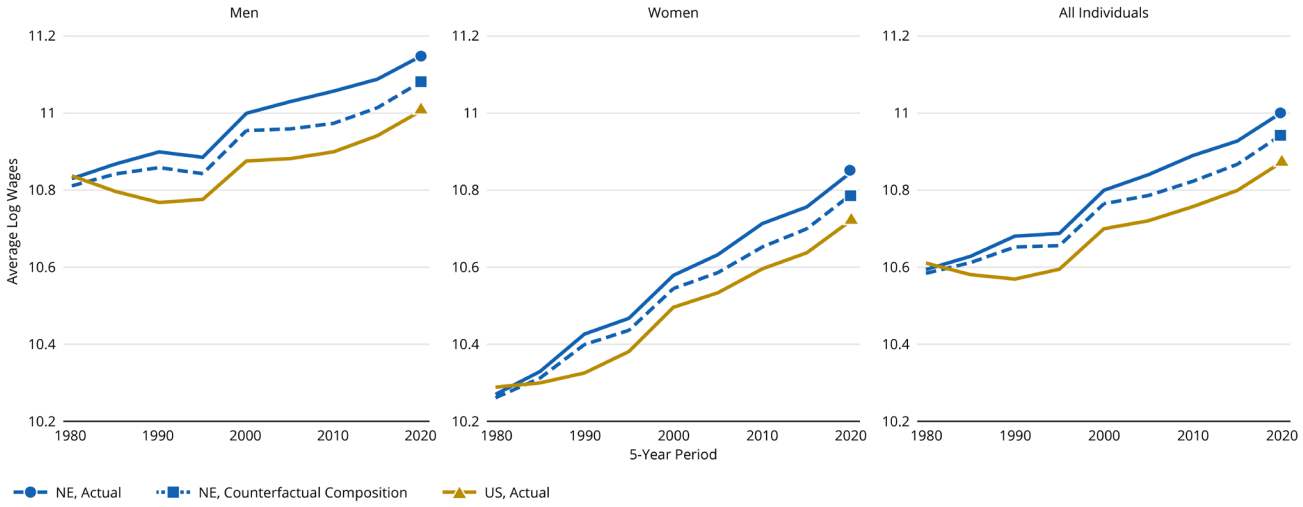
For women across education groups, the experience-related wage gains at age 50 displayed a moderate upward trend during the 1978–2021 period. Despite younger cohorts of women starting with presumably higher levels of human capital, middle-aged women exhibited growing earnings advantages over their younger peers. This indicates that women were increasingly able to accumulate more work experience and/or transform their experience into market-recognized human capital, narrowing the gap in experience-related wage gains between them and their male peers. Furthermore, the differences in experience-related wage gains across education groups diminished over time, as women with high school diplomas and women with bachelor's degrees both experienced more substantial growth in their experience-related wage gains during this period compared with women with advanced degrees. Unlike with men, experience-related wage gains among women increasingly converged, rather than diverged, across the educational-attainment spectrum. The underlying reasons for this gender-specific trend may be a worthy topic for further research.

These findings show that, at the individual-worker level, a higher level of educational attainment not only confers an initial labor market earnings advantage, but also affects long-term wage growth. For an average worker, the expected earnings growth from one time period to another consists of two components: changes in the baseline wages specific to their gender–education group and the experience-related gains they accumulate as they age. On one hand, the baseline wages of highly educated workers gradually rose over the past four decades. On the other hand, in addition to being associated with higher and rising baseline wages, a higher level of educational attainment is associated with more experience-related wage gains for women (with advanced degrees) and men (with bachelor's or advanced degrees). This growth further amplifies the career-cycle wage growth experienced by workers with higher degrees.

Collectively, these results support the idea that public policies aimed at enhancing educational attainment may yield long-term returns that extend substantially beyond the short-term gains observed at the start of a worker's career. However, these returns can fluctuate over time, as shifts in labor demand and supply may have varying effects across the educational-attainment spectrum and age groups. With the ongoing changes in technological advancements and college enrollment patterns, the market value of degrees and experience may continue to evolve. For policymakers interested in assessing the impact of such changes on wages and earnings, it is helpful to consider this education–career-cycle perspective to fully account for the implications across different education levels and career stages.

Figure 5: Changes in Average Log Wages in New England & United States

1978–2021



Note(s): Each data point shows average log annual wages across gender, education, and age groups in New England and the United States, weighted by each group's population share in its respective labor market. Counterfactual values for New England represent average log annual wages across education groups, weighted using the US labor market population shares. When wages are shown in logarithmic form, the difference between two values roughly represents the percentage difference. This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2108. All results were approved for release by the US Census Bureau, authorization number CBDRB-FY25-0203.
Source(s): 1978–2021 Current Population Survey Annual Social and Economic Supplements and Social Security Administration Summary Earnings Record and Detailed Earnings Record (DER) extracts.

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V. Implications for Aggregate Wage Growth in New England

In addition to shaping workers' career-cycle wage trajectories, educational attainment has direct implications for aggregate wage growth in a labor market. Figure 5 plots the average log wages among workers aged 25 to 64 in New England and across the United States over time. We construct these average log wages using the average log wages for each worker group—defined by education, age, and gender—weighted by the group's respective population share in the relevant labor market during the observation period.

The gap between the average log wages in New England and in the United States represents the regional wage advantage in a given time period. To assess the respective contributions of worker demographic composition and group wage rates in driving this regional wage advantage, we include a third data series measuring the counterfactual average log wages in New England. We estimate the counterfactual using the group wage rates observed in New England combined with the population weights derived from the nationwide labor market. The difference between the observed average log wages in New England and the counterfactual value indicates the portion of the regional wage advantage attributable to compositional effects—the effects from the demographic composition of the region's workforce. Conversely, the difference between the counterfactual value and the observed average log wages across the United States represents the regional wage advantage attributable to differences in the wages of different de-

mographic groups.[4] The relative magnitudes of these two differences allow us to gauge which of the two factors contributes more to the region's observed wage advantages.

From the 1978–1982 period to the 2018–2021 period, average wages in New England grew 51 percent (10.59 to 11.00 log points), whereas average wages across the United States grew 30 percent (10.61 to 10.87 log points). The difference in worker demographic composition, represented by the gap between the red solid line and the red dashed line in Figure 5, accounts for one-third (0.05 log points) of the total growth gap. The remaining two-thirds of the difference, represented by the gap between the red dashed line and the blue solid line, reflects the different pace of growth in group wage rates between the two labor markets. While a larger and growing share of highly educated workers contributed to the faster growth of average wages in New England, the region's faster growth of group wage rates played a more pivotal role in the total increase in the regional wage advantage.

From 1978–1982 to 2018–2021, average wages in New England grew 51 percent, whereas average wages across the United States grew 30 percent.

As discussed earlier, group wage rates grew faster in New England across the educational-attainment spectrum. The consistent pattern suggests that one or more regional factors contributed to the broad increase in wage rates in New England. For example, if the region experienced higher labor productivity gains, this could have created incentives for higher pay rates. Alternatively, holding labor productivity constant, if firms, on average, faced higher labor costs and spent a larger share of their revenues on worker compensation, this could also result in more elevated wage rates. A closer look at these indicators allows us to make informed speculations about factors underlying the broad-based regional wage premium. In the following analysis, we look more closely at the two measures to discern their relative importance in driving the region's faster wage growth.

Higher Labor Productivity

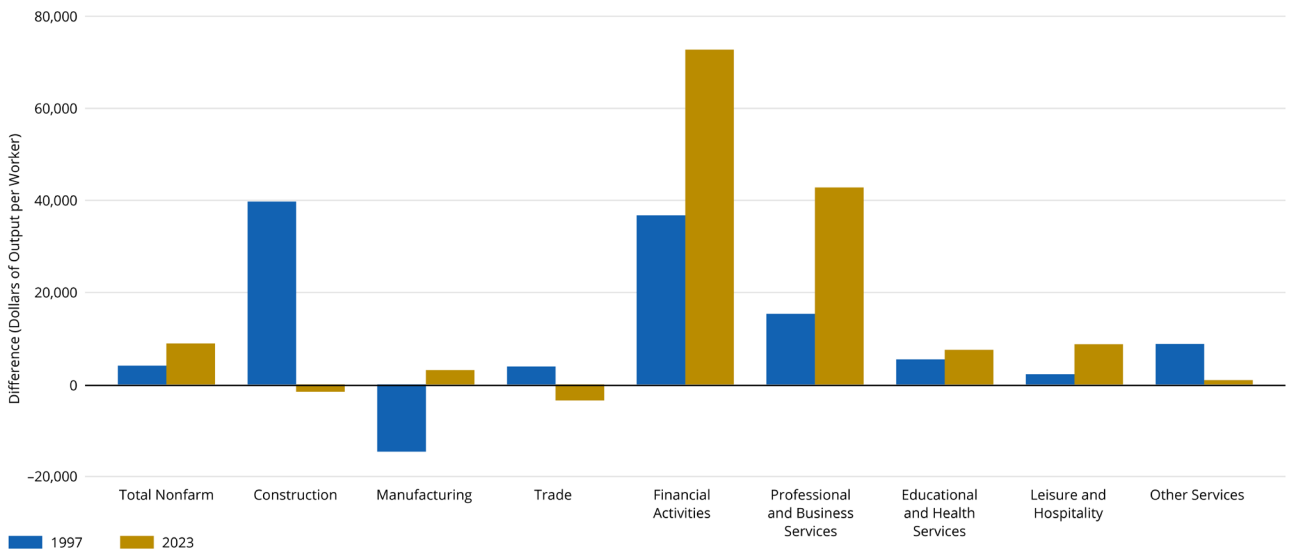
We can partially test the hypothesis that faster wage growth in New England is attributable to a more substantial increase in labor productivity by examining changes in output per worker over time. We construct our output-per-worker measure by taking the ratio of output, measured by real GDP, to the number of workers who produced that output in a given year, which is also termed the average product of labor.[5] We compute the

4 Workers in the United States and New England show comparable employment patterns in terms of weeks worked per year and average weekly hours, suggesting that disparities in annual earnings between these labor markets primarily stem from differences in wage rates rather than participation levels. See the appendix for a comparison of weeks worked each year and average hours per week between the two labor markets.

5 See US Bureau of Economic Analysis, "SAGDP9 Real GDP by Industry in Chained 2017 Dollars," and Bureau of Labor Statistics/Haver Analytics, "Employees on Nonfarm Payrolls by Selected Industry" (accessed Thursday, July 24, 2025).

Figure 6: Difference in Labor Productivity between New England & United States

1997 and 2023



Note(s): The figure shows the difference in output per worker (average product of labor) between New England and the United States by major industry for 1997 and 2023. Positive values indicate higher productivity in New England; negative values indicate higher productivity in the United States.
Source(s): 1997–2023 US Bureau of Labor Statistics/Haver Analytics from the US Department of Labor and US Bureau of Economic Analysis extracts.

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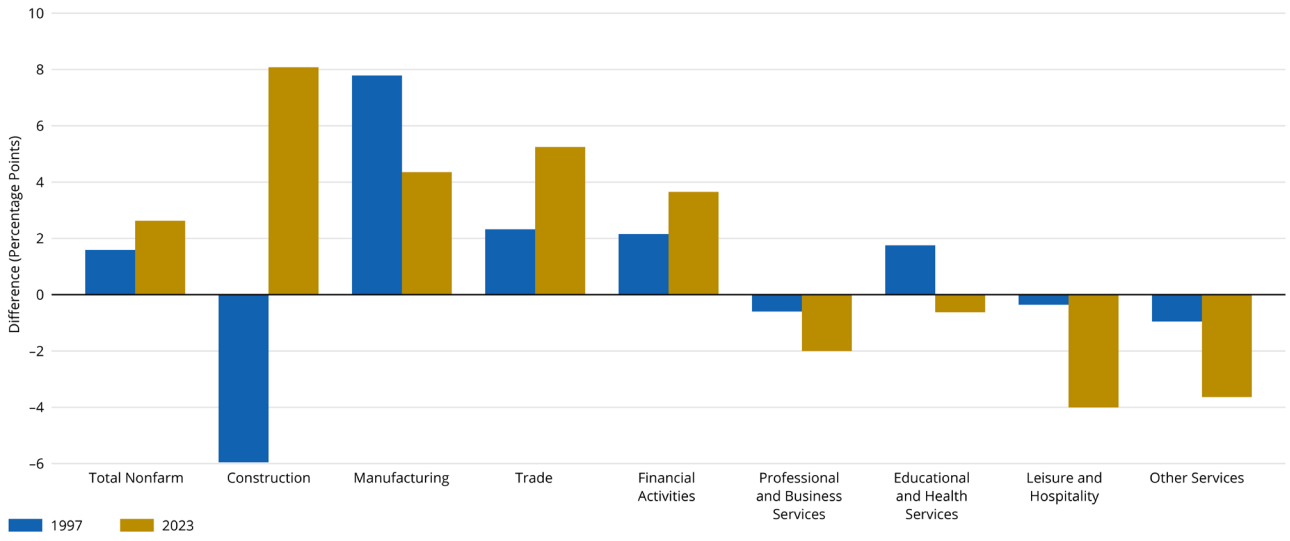
average product of labor for the New England labor market and the US labor market by major industry classifications. The difference in this measure between the two markets provides an indicator of the regional labor productivity advantage over the national average.[6]

Figure 6 plots this regional productivity advantage indicator for 1997, when the data series first became available, and 2023 for all industries and eight major industries. In 1997, the average worker in New England produced $4,100 (4 percent) more output than the average US worker. This labor productivity advantage is observed, to different extents, across the major industrial sectors, except for the manufacturing sector. This advantage grew from 1997 to 2023. By 2023, the average New England worker produced $8,900 (6 percent) more than the average US worker. Nevertheless, the sectoral distribution of this regional productivity advantage became increasingly uneven and concentrated in four of the eight sectors: financial activities, professional and business services, education and health services, and leisure and hospitality. These statistics suggest that faster and larger growth in labor productivity can account partly for the higher wage rates in the region. Nevertheless, these labor productivity advantages are not uniformly distributed across all sectors. Other factors have also contributed to the broad-based regional wage advantage.

6 The comparison implicitly assumes that New England firms are broadly comparable to US firms within the same major industry classification. The observed regional productivity advantage could reflect either better efficiency in producing the same product or differences between the two markets in product composition within the same industry.

Figure 7: Difference in Labor Share between New England & United States

1997 and 2023



Note(s): The figure shows percentage point differences in labor share, defined as the ratio of total labor compensation to nominal GDP, between New England and the United States by major industry for 1997 and 2023. Positive values indicate higher labor costs as a share of total output in New England; negative values indicate higher labor costs in the United States.
Source(s): 1997–2024 US Bureau of Labor Statistics/Haver Analytics from the US Department of Labor and US Bureau of Economic Analysis extracts.

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Excess Labor-cost Pressure

Aside from rising due to labor productivity gains, wage rates may increase when the labor cost associated with each unit of output increases. To examine how labor costs have evolved in the region relative to the national trend, we construct a labor share index, defined as the nominal cost of labor required to produce one unit of nominal output. We build the index using the total labor compensation and nominal GDP statistics published by the US Bureau of Economic Analysis for the New England labor market and the US labor market by major industry classifications.[7] If, for a given value of output, firms in the region spent more on worker compensation, the labor share would be higher in New England than the corresponding US figure. The differences in labor share between the two labor markets therefore serve as an indicator of the excess labor-cost pressure encountered by firms in the region.

Figure 7 presents the difference in labor share between New England and the United States by major industrial sectors for 1997 and 2023. A positive difference indicates that New England firms devote a larger share of their output to labor compensation compared with firms within the same sector across the country. Conversely, a negative difference suggests that labor costs, as a share of revenue, are lower for New England firms. In 1997, firms in New England, on average, spent 1.6 percentage points more of their output on labor compensation compared with the US average rate. By 2023, this gap had widened to 2.6 percentage points. This growing divergence in average labor

7 US Bureau of Economic Analysis, "SAGDP2 Gross domestic product (GDP) by state" and "SAGDP4 Compensation of employees" (accessed July 24, 2025).

shares indicates that rising labor-cost pressure serves as another mechanism increasingly driving the higher wage rates in New England.

A closer examination of Figures 6 and 7 reveals an inverse relationship between larger labor productivity gains and excess labor-cost pressure across sectors. Sectors demonstrating an advantage in labor productivity tend not to spend more on worker compensation than the average rate across the United States. Conversely, sectors lacking productivity advantages, on average, dedicate a larger share of their outputs to worker compensation compared with their US counterparts. Specifically, firms in the professional and business services, education and health services, and leisure and hospitality sectors showed increasing labor productivity advantages while having labor shares that were lower than the national average rates. By contrast, the manufacturing and trade sectors maintained productivity levels that were approximately on par with the US average yet faced persistently more elevated labor shares from 1997 to 2023.

The sectoral dynamics suggest that, despite a broad-based regional wage premium, the underlying drivers of the premium vary across industrial sectors. A plausible explanation for the sectoral dynamics is that, either as a contributing factor or result, the more accelerated growth in educational attainment in the region is directly tied to the labor productivity advantages demonstrated in sectors relying heavily on highly educated workers. The higher wages offered by these sectors, in turn, have put upward pressure on wages in other sectors of the economy, forcing firms in these sectors to increase either prices or labor share to accommodate the higher wages. The pressure to increase labor share is likely more pronounced in tradable sectors, such as manufacturing and trade, where firms have very little room to set the output prices. Conversely, in sectors offering nontradable services, where prices are largely determined within the region, firms can offset part of the wage pressure by passing it on to consumers through higher prices. An increase in the average product of labor would reflect those higher prices.

Consistent with earlier research, this explanation suggests that a large supply of highly educated workers has positive spillover effects on wage rates in both the higher-skilled and lower-skilled segments of the labor market (Moretti 2004a, 2004b; Rosenthal and Strange 2008). The exact mechanism underlying the spillover effects depends on firms' capacity to harness the productivity benefits of the more educated workforce, as well as their ability to pass through higher labor costs into consumer prices. This finding highlights that public policies aimed at fostering, attracting, and retaining highly educated workers in a region can have profound spillover effects on workers and businesses not directly targeted by these policies. The implications of these spillover effects on individuals or firms, however, can vary and are contingent on the joint trajectories of wage rates, output prices, and consumer prices.

Rising labor-cost pressure serves as another mechanism increasingly driving the higher wage rates in New England.

VI. Conclusion

This report reveals a strong positive correlation between educational attainment and wage growth, at both the individual-worker level and the aggregate-regional level. At the individual level, higher educational degrees not only confer an initial earnings advantage in the labor market, but also affect a worker's long-term wage growth, which depends on the appreciation of their existing human capital and their ability to accumulate experience-related wage gains over the course of their careers. At the aggregate level, a larger and growing share of workers with higher levels of educational attainment appears to be associated with more elevated local wage rates through channels beyond the direct effects of the regional workforce's demographic composition. Across the region, on average, both labor productivity and unit labor cost have surpassed the corresponding national rates.

These findings underscore that public policies aimed at enhancing the educational attainment of the local workforce can have a long-term and broad-based impact on wage growth in the labor market through either direct or spillover effects. As policymakers in the region contemplate such policies, these wider considerations can inform a more comprehensive discussion of the potential costs and benefits.

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