



The Changing Need for Educated Maine Workers

Maine employers face potential labor supply shortages despite current labor market conditions. Not only will a sufficient number of workers be needed which is problematic given expected slow population growth, the workforce needs to have the right skills. A concern of employers is that there will be a lack of skilled workers to fill jobs as the economy recovers. The purpose of this research brief is to determine how the need for skilled workers by industry and occupation has changed. Educational attainment is the proxy for skill level.

Decennial Census and American Community Survey data in this brief comes from the Integrated Census Public Use Microdata Series. These data are subject to sampling error, and detailed estimates by education, occupation, and industry must be viewed with caution. The data are best interpreted as trend estimates.

Educational attainment is rising. Between 1990 and 2009 the educational attainment of Maine workers rose. Over 50 percent of the employed had a high school education or less in 1990; by 2009 workers with this level of attainment had dropped to less than 40 percent of the total. Conversely, the percentage of the employed with at least some college education has risen, accounting for over 60 percent of total employment, up from 48 percent for 1990.

Year	High School or Less	Some College or Associate's Degree	Bachelor's Degree or Higher
1990	52.2	26.9	20.9
2000	44.9	29.9	25.2
2001	46.3	29.5	24.3
2002	44.8	29.2	25.9
2003	44.0	28.9	27.1
2004	43.6	29.6	26.8
2005	42.7	31.1	26.2
2006	42.1	30.2	27.6
2007	40.9	30.7	28.5
2008	40.0	34.1	25.9
2009	36.9	33.7	29.4

Source: Integrated Public use Microdata Series, 1990 and 2000 Census, 2009 American Community Survey.

The increase in educational attainment of Maine workers has resulted from changes in employment by industry and changes in employment within industries.

Employment has shifted towards industries that employ a greater share of educated workers and the employment of these workers has grown within industries.

Knowledge-based industry employment is increasing. Between 1990 and 2010, employment fell in the goods-producing sector and rose in the service-providing sector. Knowledge-based industries recording major gains

Industry	1990	2010	Change	
			Net	Percent
Nonfarm Wage and Salary Employment	535.0	592.5	57.5	10.7
Natural Resources and Mining	3.3	2.6	-0.7	-21.2
Construction	28.8	24.3	-4.5	-15.6
Manufacturing	93.0	50.9	-42.1	-45.3
Wholesale Trade	18.2	19.0	0.8	4.4
Retail Trade	75.3	81.1	5.8	7.7
Transportation, Warehousing, and Utilities	18.8	16.8	-2.0	-10.6
Information	10.2	9.1	-1.1	-10.8
Financial Activities	26.5	31.3	4.8	18.1
Professional and Business Services	33.6	55.6	22.0	65.5
Education and Health Services	66.4	119.0	52.6	79.2
Leisure and Hospitality	47.8	59.8	12.0	25.1
Other Services	17.3	19.8	2.5	14.5
Government	95.8	103.4	7.6	7.9

Source: Maine Department of Labor, Center for Workforce Research and Information.

included education and health services and professional and business services – industries that generally depend on a higher level of skills. Nonfarm wage and salary employment estimates produced by the Center for Workforce Research and Information (which excludes the self employed and agricultural workers) confirm Census data trends for total employment by industry used in this brief.

Industries recording employment gains between 1990 and 2009 currently employ a larger share of workers with a bachelor's degree or higher than industries with substantial employment losses. The education, health, business, and professional services industries all had a higher-than-average percentage of workers

Industry	High School or Less	Some College or Associate's Degree	Bachelor's Degree or Higher
Educational Services	16.1	21.8	62.2
Professional Services	18.1	22.2	59.7
Government	16.2	39.2	44.5
Finance, Insurance, and Real Estate	25.4	32.6	42.0
Social Services	25.1	34.4	40.5
Health Services	24.1	40.2	35.7
Business Services	29.1	39.3	31.6
Wholesale Trade	45.3	26.4	28.4
All Other Services	43.4	31.6	25.0
Transportation, Communication, and Public Utilities	41.3	35.7	23.0
Agriculture, Forestry, Fishery	58.5	23.6	17.9
Manufacturing	48.6	34.9	16.5
Retail Trade	49.2	37.9	12.9
Mining and Construction	57.2	32.4	10.5
Total	36.9	33.7	29.4

Source: Integrated Public Use Microdata Series, 2009 American Community Survey.

Notes: Industry coding based on 1990 Census codes.

at the bachelor's degree or higher level. Conversely, manufacturing and construction had a lower-than-average percentage of workers at the bachelor's degree or higher level.

Educational attainment of workers within industries is rising. The share of the total number of employed within each major industry division with an educational attainment of bachelor's degree or higher increased while the share of workers with a high school education or less fell between 1990 and 2009. Employment of workers with some college or associate's degree as a share of total employment rose over the past nineteen years in most of the industry divisions. Wholesale trade; finance, insurance, and real estate; and professional services experienced a share loss of workers with educational attainment of high school or less and some college or associate's degree while, with the exception of government, recording the largest share gains of workers with a bachelor's degree or higher.

Industry	High School or Less	Some College or Associate's Degree	Bachelor's Degree or Higher
Government	-18.2	1.4	16.8
Wholesale Trade	-13.5	-2.8	16.3
Finance, Insurance, and Real Estate	-12.1	-1.7	13.8
Professional Services	-4.9	-8.6	13.4
Business Services	-19.2	7.3	11.9
Transportation, Communication, and Public Utilities	-14.2	4.7	9.5
Health Services	-11.5	2.5	9.0
Social Services	-14.2	6.6	7.7
All Other Services	-10.6	5.0	5.7
Agriculture, Forestry, Fishery	-9.2	3.9	5.3
Manufacturing	-17.7	12.9	4.8
Retail Trade	-14.5	11.5	3.0
Educational Services	-6.2	3.6	2.6
Mining and Construction	-10.3	9.7	0.6
Total	-15.3	6.8	8.5

Source: Integrated Public Use Microdata Series, 1990 and 2000 Census, 2009 American Community Survey.

Notes: Industry coding based on 1990 Census codes. Numbers may not add due to rounding.

The nature of work is changing. The Maine workforce has become more educated over the past twenty years. Knowledge-based industries have accounted for most of the employment growth. Perhaps even more significantly, the share of workers with a bachelor's degree or higher increased within each major industry sector; employment of workers with some college or an associate's degree as a share of total employment rose in most industry sectors.

To a large degree, the changing educational needs of employers reflect the changing nature of work; that is, the shifting occupational structure of the workplace. Changes that have been taking place and are expected to continue include:

- continuing increases in higher level jobs and a decline in traditional manual occupations;
- movement away from skills associated with manual dexterity towards skills associated with understanding and monitoring complex systems;
- shifting away from routine processes toward coordination and collaboration;
- increase of general work skills required in many jobs such as the ability to use computers;
- need for communication skills;
- growing range of responsibilities within jobs.

The definitions of occupational categories have changed over time making it difficult to analyze trends. In this brief, the distribution of employment by occupation (standardized to reflect 1990 Census codes) from the decennial census and the ACS is applied to total resident employment, providing estimates of occupational employment.

Occupational groups requiring higher levels of education account for most job growth.

The share of employment accounted for by occupational groups has shifted, as has the industrial structure. Between 1990 and 2009, the most substantial growth occurred in healthcare; education, training, and library; management; and business and financial operations. Although not providing quite as many additional jobs, employment in computer and mathematical occupations tripled between 1990 and 2009. Conversely, significant employment declines were recorded by production; transportation and material handling, construction and extraction; office and administrative support; and

Employed Maine Residents by Occupational Group (sorted by net change)				
Occupational Group	1990	2009	Change	
			Net	Percent
Healthcare Support	13,732	28,776	15,044	109.6
Education, Training, and Library	34,636	46,628	11,993	34.6
Healthcare Practitioners and Technical	25,240	35,990	10,750	42.6
Management	46,281	56,414	10,133	21.9
Business and Financial Operations	17,685	25,633	7,949	44.9
Computer and Mathematical	3,402	10,414	7,012	206.1
Personal Services	11,243	17,840	6,597	58.7
Farming, Fishing, Forestry	16,015	22,350	6,336	39.6
Sales and Related	65,904	71,247	5,343	8.1
Arts, Design, Entertainment, Sports, and Media	8,169	11,609	3,440	42.1
Protective Services	8,997	12,045	3,048	33.9
Community and Social Service	7,307	8,926	1,619	22.2
Legal	4,111	5,468	1,357	33.0
Life, Physical, and Social Science	5,519	6,738	1,219	22.1
Food Preparation and Service	30,474	31,520	1,046	3.4
Private Households	5,214	5,964	750	14.4
Building and Grounds Cleaning and Maintenance	12,382	13,036	654	5.3
Architecture and Engineering	11,951	9,336	-2,615	-21.9
Installation, Maintenance, and Repair	23,564	20,291	-3,273	-13.9
Office and Administrative Support	90,441	87,113	-3,329	-3.7
Construction and Extraction	47,285	42,103	-5,182	-11.0
Transportation and Material Moving	45,596	36,848	-8,748	-19.2
Production	62,755	34,899	-27,856	-44.4
Total	597,902	641,189	43,287	7.2

Source: Total resident employment from Maine Department of Labor, Center for Workforce Research and Information.

Distribution of employment by occupation from Integrated Public Use Microdata Series, 1990 Census and 2009 American Community Survey.

Notes: Occupation coding based on 1990 Census codes.

installation, maintenance, and repair occupational groups.

Five of the top six job producers over the past nineteen years had above-average percentages of workers with a bachelor's degree or higher in 2009. The exception was healthcare support – an occupational group providing lower-skilled support to healthcare practitioners and technicians.

Five of the six occupational groups experiencing job losses had below-average percentages of workers with educational attainment of a bachelor's degree or higher in 2009. The exception was architecture and engineering occupations which are linked closely to building construction, a sector that has been slumping.

Employment of educated workers has increased within occupations.

Indicative of the changing nature of jobs, all of the occupational groups, with the exception of legal, lost employment share in high school or less and gained employment share in some college or associate's degree and/or bachelor's degree or higher.

Over the past nineteen years, there was a slight increase in the share of workers with

Percent Distribution of Educational Attainment by Occupation of Employed Maine Residents in 2009 (sorted by bachelor's degree or higher)			
Occupational Group	High School or Less	Some College or Associate's Degree	Bachelor's Degree or Higher
Legal	2.7	8.3	89.0
Life, Physical, and Social Science	3.7	23.9	72.4
Education, Training, and Library	6.7	21.1	72.2
Community and Social Service	6.9	25.5	67.5
Business and Financial Operations	9.7	22.9	67.3
Arts, Design, Entertainment, Sports, and Media	10.3	31.0	58.7
Healthcare Practitioners and Technical	5.0	36.7	58.3
Computer and Mathematical	7.9	35.1	57.1
Architecture and Engineering	16.1	28.1	55.8
Management	19.2	31.7	49.1
Sales and Related	39.8	38.4	21.7
Office and Administrative Support	38.8	41.3	19.9
Personal Services	41.0	39.7	19.3
Protective Services	25.5	57.4	17.2
Farming, Fishing, Forestry	63.7	23.2	13.1
Private Households	74.5	17.0	8.5
Production	53.7	38.1	8.2
Healthcare Support	52.7	39.2	8.1
Installation, Maintenance, and Repair	53.2	39.8	7.0
Transportation and Material Moving	65.9	27.5	6.6
Construction and Extraction	64.9	28.9	6.1
Building and Grounds Cleaning and Maintenance	68.1	28.1	3.9
Food Preparation and Service	55.4	41.3	3.3
Total	36.9	33.7	29.4

Source: Integrated Public Use Microdata Series, 2009 American Community Survey.
Note: Occupational coding based on 1990 Census codes.

Change in Share of Educational Attainment by Occupation of Employed Maine Residents, 1990-2009 (in percentage points sorted by bachelor's degree or higher)			
Occupational Group	High School or Less	Some College or Associate's Degree	Bachelor's Degree or Higher
Business and Financial Operations	-13.8	-10.7	24.5
Arts, Design, Entertainment, Sports, and Media	-15.8	-2.4	18.2
Life, Physical, and Social Science	-16.3	-1.0	17.3
Architecture and Engineering	-4.0	-7.3	11.3
Healthcare Practitioners and Technical	-6.6	-4.3	10.9
Management	-9.7	-0.4	10.1
Personal Services	-19.6	10.6	9.0
Office and Administrative Support	-12.5	4.7	7.8
Private Households	-9.0	2.8	6.2
Protective Services	-21.3	16.5	4.8
Farming, Fishing, Forestry	-12.7	8.1	4.6
Production	-25.2	20.9	4.3
Transportation and Material Moving	-16.9	13.0	3.9
Sales and Related	-10.2	6.7	3.5
Installation, Maintenance, and Repair	-17.1	14.0	3.1
Healthcare Support	-8.0	5.3	2.8
Legal	1.1	-3.7	2.6
Community and Social Service	-2.1	-0.4	2.5
Computer and Mathematical	-8.0	6.1	1.9
Building and Grounds Cleaning and Maintenance	-12.1	11.1	1.0
Food Preparation and Service	-17.0	16.8	0.3
Construction and Extraction	-1.6	3.7	-2.0
Education, Training, and Library	-0.1	8.8	-8.7
Total	-15.3	6.8	8.5

Source: Integrated Public Use Microdata Series, 1990 and 2000 Census, 2009 American Community Survey.
Notes: Industry coding based on 1990 Census codes. Numbers may not add due to rounding.

an educational attainment of high school or less. However, workers with an educational attainment of bachelor's degree or higher currently account for almost 90 percent of employment in legal services.

Twenty-three of the twenty-five occupational categories recorded an increase in the share of workers holding a bachelor's degree or higher between 1990 and 2009. The only exceptions were construction and education, training, and library workers. The fastest growing shares of a bachelor's degree or higher were in business and financial operations; arts, design, entertainment, sports, and media; and life, physical, and social science. Fifteen of the twenty-five occupational groups registered an increase in the share of workers with some college or an associate's degree, led by the production, food preparation, and protective services occupations.

The share of education, training, and library workers with a bachelor's degree or higher fell 9 percentage points and the share with some college or an associate's degree rose 9 percentage points between 1990 and 2009. While the number of workers with educational attainment of a bachelor's degree or higher did increase between 1990 and 2009, the number of workers with some college education or an associate's degree increased at a more rapid rate. Data for individual occupations within this group provide an explanation. The fastest rate of growth occurred among teachers' aides and assistants – an occupation that usually requires less than a bachelor's degree.

Wage growth indicates increased demand for skilled workers. It is difficult to assess the demand for skilled workers, particularly in the midst of a slow recovery from the Great Recession. With the current surplus of labor available, employers may find it easier to hire qualified workers. On the other hand, it may be difficult to find individuals with the right qualifications, even in times of high unemployment, if changing needs of the employer are not matched with skills of the available workforce.

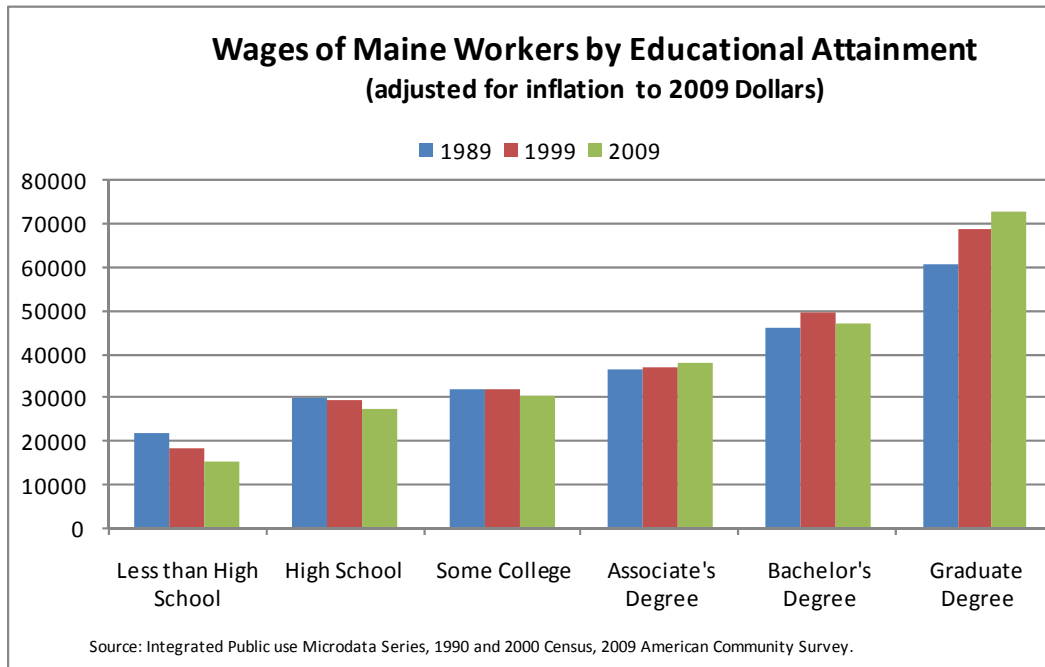
Changes in real wages (wages adjusted for inflation) provide one measure of the demand for educated workers relative to the supply. Rising wages would indicate the demand for educated workers is increasing relative to the number available. On the other hand, falling wages would reflect declining demand relative to supply.

The price of wage and salary workers as measured by annual average real wages increased for workers in all educational categories above some college between 1989 and 2009, suggesting that demand grew more rapidly than supply. These gains ranged from an increase of two percent for workers with a bachelor's degree to 20 percent for workers with a graduate degree. Those with a bachelor's or graduate degree had the most substantial gains in the 1990s; workers with an associate's degree had a larger gain in the 2000s. For workers with a high school education or less, average wages dropped between 1989 and 2009.

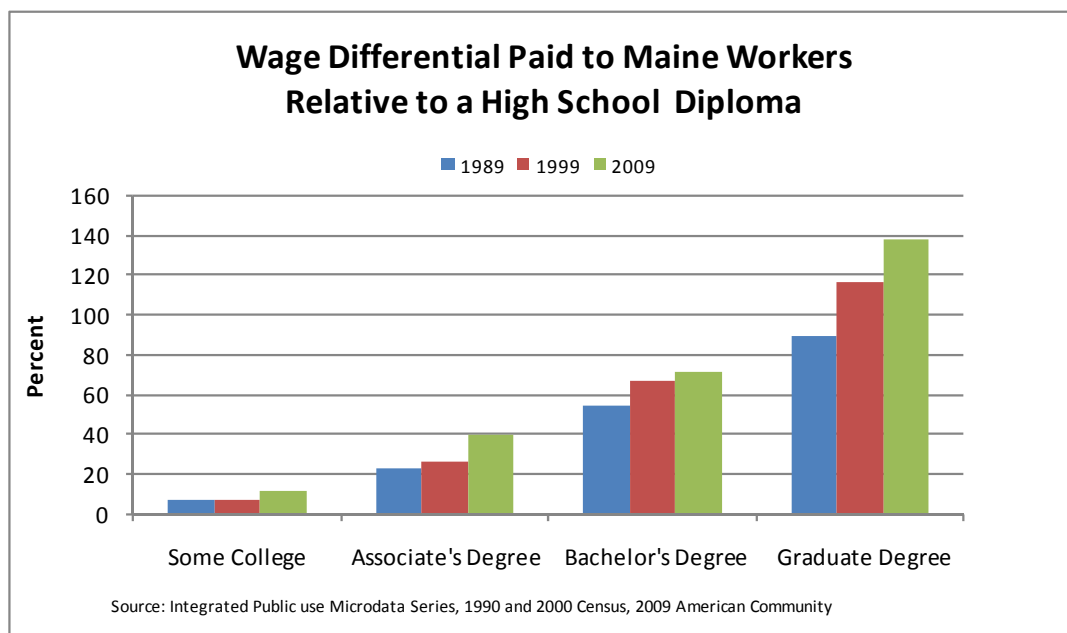
The mid-to-late 1990s were characterized by rapid employment growth and low unemployment. Reflecting this tight labor market, workers with an educational attainment of associate's degree or higher recorded a gain in real wages between 1989 and 1999. Workers with a graduate degree recorded the highest rate of wage growth (14 percent).

Needed – skilled production workers. Between 1990 and 2009, the number of production workers fell 44 percent. This decline is tied to significant job loss in the manufacturing sector. At the same time, educational attainment of production workers rose, with the share of workers with some college or an associate's degree and a bachelors' degree rising by 21 percentage points and 4 percentage points, respectively. While there are fewer production workers now, the need for more highly educated workers has grown. According to manufacturing employers interviewed for a recent article in *Mainebiz*, growth in the workforce will be accomplished, in large part, by workers with some kind of post-secondary technical training.

The late 2000s was a period of employment decline and higher unemployment. In all categories, with the exception of associate's degree, wage growth slowed or wages declined between 1999 and 2009. Workers with a graduate degree once again recorded the highest rate of wage growth (5 percent) – a reduced rate of growth from the 1990s. Workers with an associate's degree were the only group to register a faster rate of wage growth during the 2000s, three percent, compared to one percent during the 1990s. This suggests that the demand for workers with an associate's degree rose relative to the supply of workers available.



Resulting from wage trends by educational attainment, real wages paid to workers with post-secondary education increased relative to wages for workers with a high school education. For example, workers with a bachelor's degree earned 54 percent more than a worker with a high school diploma in 1989; by 2009 the difference had grown to 72 percent. Every post-secondary educational category recorded an increase in wages between 1989 and 2009 relative to workers with a high school education.



The reduced role of the manufacturing sector, the increased importance of knowledge-based services, technological advances, international competition, and other factors have all contributed to changing the way work is done. Maine employers have responded by employing workers with more education. As evidenced by rising wages over the past 20 years, employers are willing to pay for that expertise. While a general lack of demand during the past few years resulted in a slowdown in wage growth or wage decline for some educated workers, the premium employers pay workers who have an education surpassing high school will likely continue to increase in the future.

Source: All ACS and decennial Census data developed using the Integrated Public Use Microdata Series (IPUMS: Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. Integrated Public Use Microdata Series, Version 5.0 (Machine-readable database). Minneapolis: University of Minnesota, 2010.