

## **Manufacturing Jobs: Trends, Issues, and Outlook**

The mix of jobs by industry in Maine has changed a great deal over the last few generations. Employment in manufacturing accounted for 43 percent of nonfarm jobs 60 years ago; in 2011 it accounted for just 8.5 percent of jobs. During the same period jobs in service-providing industries nearly quadrupled. Shifting buying patterns related to demographic trends, technological advances, international competition, and a wide range of other factors contributed to the substantial changes in the structure of employment. The trends that have played out in Maine have largely mirrored those of the nation and many of the industrialized nations.

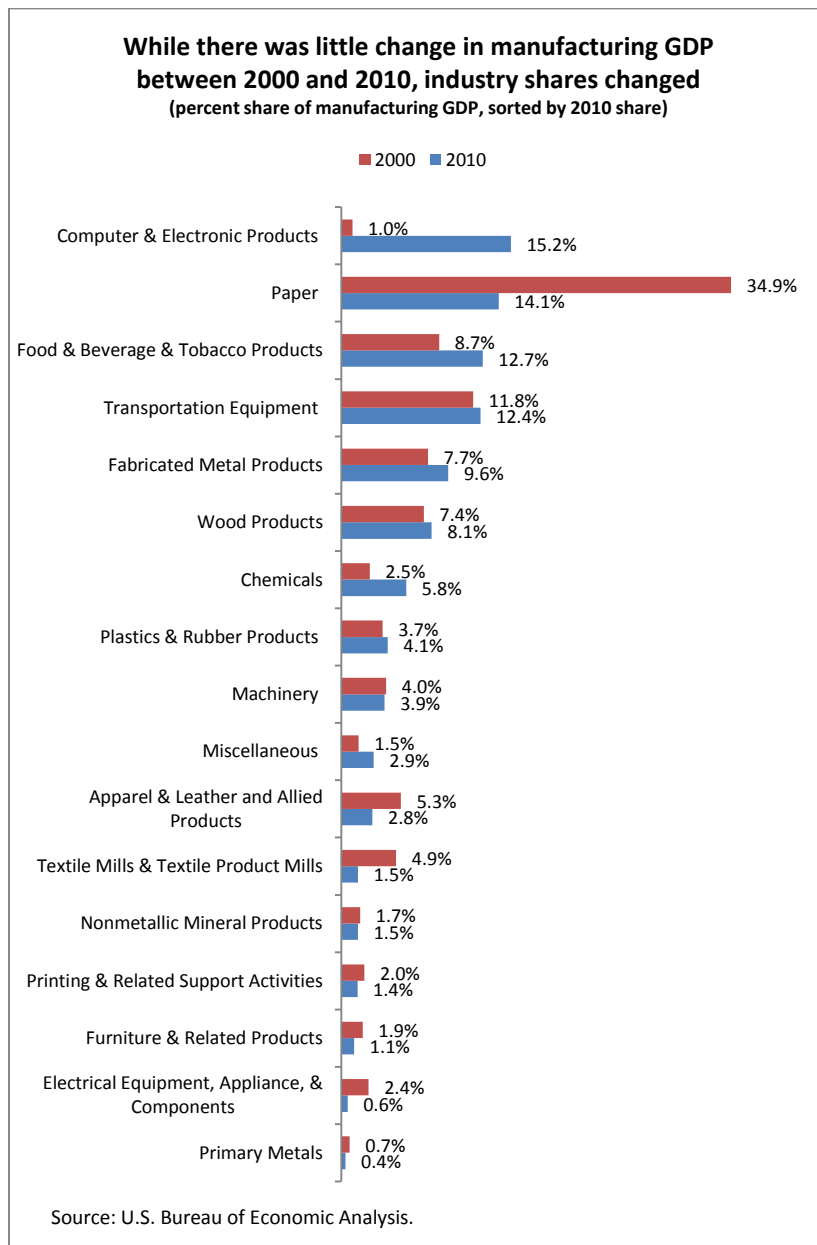
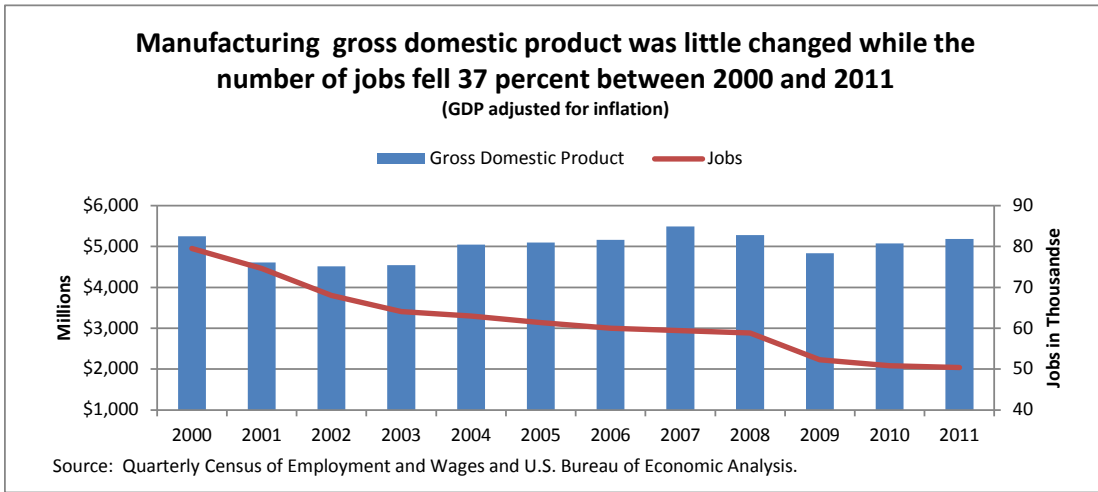
Now, and for the foreseeable future, manufacturers will be subject to foreign competition and technology-driven job and industry restructuring. Moreover, the pace of change will likely increase.

Despite the current environment of relatively high unemployment and the large numbers of production workers that have been displaced in recent years, manufacturers in Maine and the U.S. face some significant labor supply challenges. Large numbers of production job openings remain unfilled. The primary reason is that the manufacturers that have survived and are thriving are those that invested heavily in capital-intensive production systems that tend to have much higher performance requirements than what many of the former production workers possess in terms of education and experience. A successful future for manufacturing will depend, in part, on how well we bridge the divide between the talent employers need and job seekers offer.

### **Manufacturing output increased from recession lows**

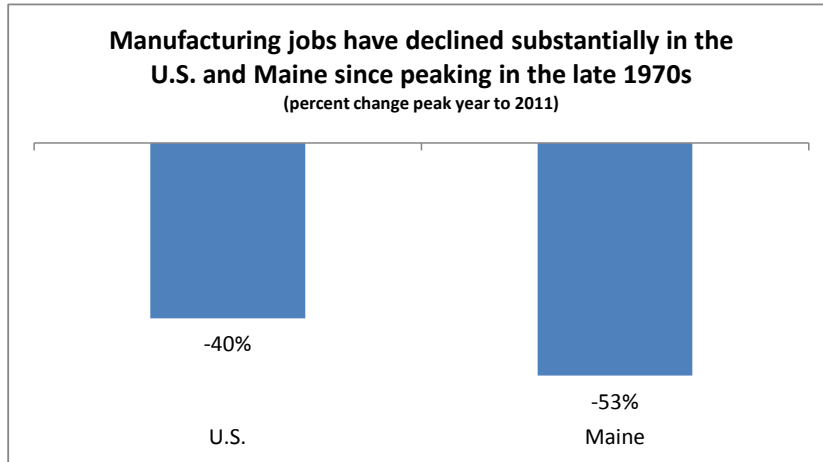
The manufacturing sector has long benefitted from the application of technical knowledge and skill. Every year, production workers, engineers, and managers find better ways to solve the technical problems of production. While the output (measured by gross domestic product or GDP) of Maine manufacturers rose and fell with the recessions of the early and late 2000s, their output changed little between 2000 and 2011, even as the number of jobs declined.

Between 2000 and 2010, more than half of manufacturing industries recorded declining output as the impact of two recessions and international competition took its toll. The latest detailed data available indicates manufacturing output declined in 10 of 17 industries between 2000 and 2010. The most substantial changes were a share gain of 14 percentage points in computer and electronic products and a share loss of 21 percentage points in paper.



### Long-run trend of declining jobs

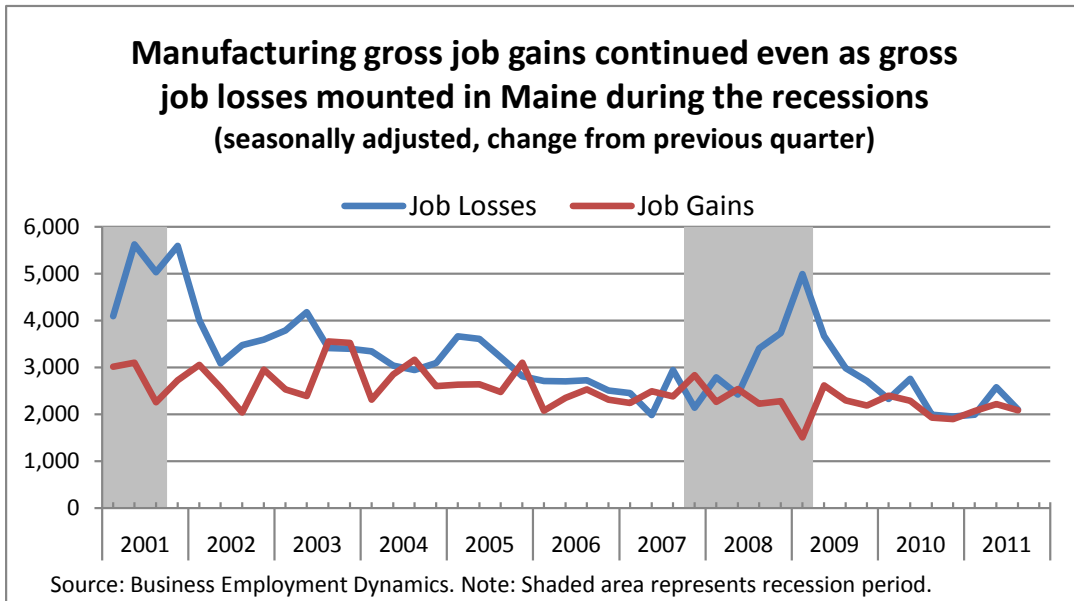
U.S. manufacturing jobs peaked in 1979 at 19.4 million; by 2010, the number dropped to 11.5 million. Manufacturing employment in Maine also peaked in 1979 at 114,600, dropping 13,000 in the 1980s, 13,500 in the 1990s, and 28,800 in the 2000s. Job losses impacted most industries, but were especially heavy in shoe shops and textile mills, industries that formed the economic backbone of many of the largest cities in the state, and in forest products, which served as the backbone of rim regions of the state bordering Quebec and New Brunswick.



Since 2000, most manufacturing industries lost jobs, with the largest losses in forest products (paper and other wood products), apparel and leather products, computer and electronic products, and textiles. These declines were due to many factors including continued transfer of production of labor-intensive goods such as shoes and apparel to other countries, the increased use of technology, and the impact of two recessions.

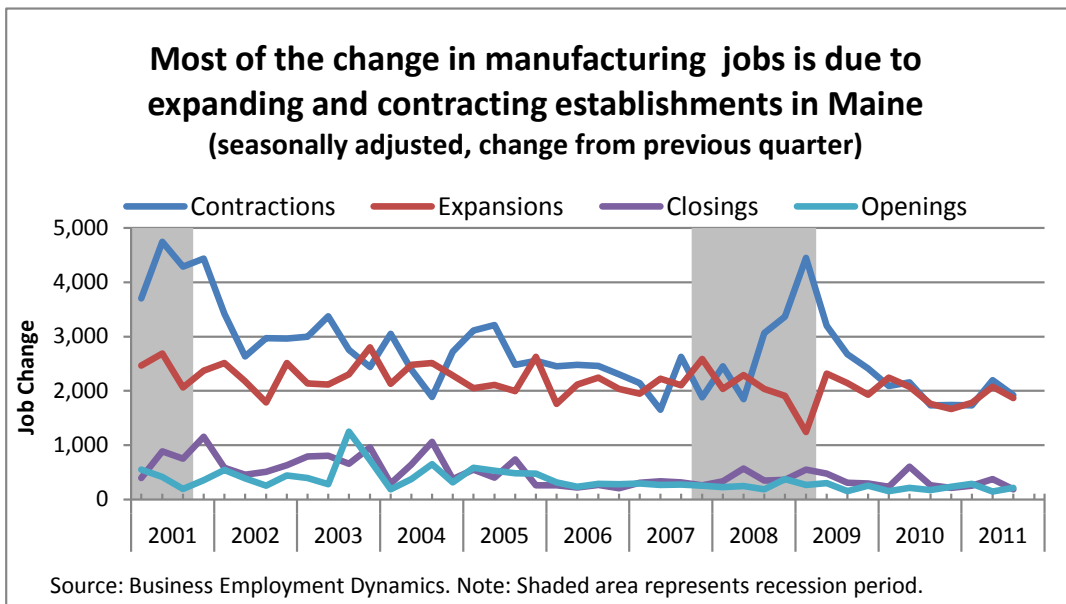
<b>Change in Maine Manufacturing Jobs by Industry, 2000-2011 (sorted by job change)</b>	
<b>Industry</b>	<b>Job Change</b>
Paper	-5,548
Apparel and Leather and Allied Products	-4,367
Computer and Electronic Products	-4,094
Wood Products	-3,738
Textile Mills and Textile Product Mills	-2,480
Transportation Equipment	-1,581
Printing and Related Support Activities	-1,388
Electrical Equipment and Appliances	-1,055
Furniture and Related Products	-1,034
Food, Beverage, and Tobacco Products	-865
Plastics and Rubber Products	-830
Machinery	-768
Nonmetallic Mineral Products	-611
Fabricated Metal Products	-309
Primary Metal	-145
Miscellaneous	-59
Chemical	284

The net decline in manufacturing jobs masks the substantial churning of jobs between 2001 and 2011. Through the recent recession, quarterly gross job losses averaged 3,428 and quarterly gross job gains averaged 2,277. Since then, quarterly gains and losses have averaged 2,200 and 2,507, respectively. Gross job gains are the sum of increases in employment from expansions at existing businesses and the addition of new jobs at opening businesses; gross job losses are the result of contractions at existing businesses and closing businesses.



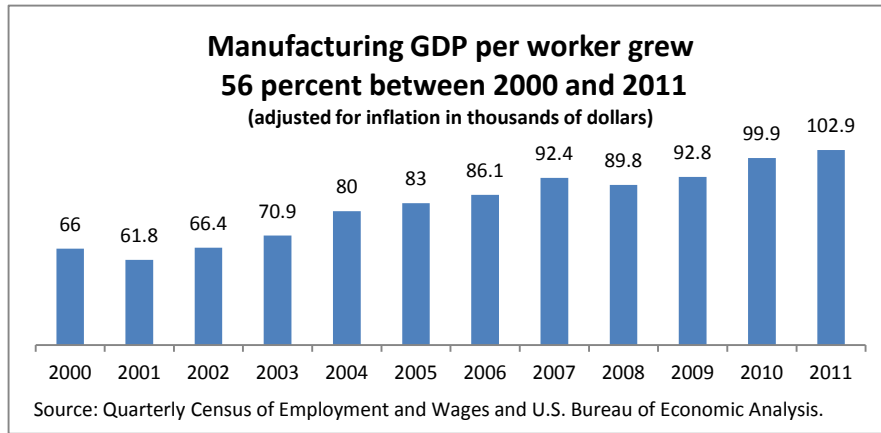
Job gains and losses from expanding and contracting establishments are much larger than from businesses opening and closing. From 2001 through the second quarter of 2011, on average, 86 percent of quarterly job gains were from expansions and 85 percent of quarterly job losses were from contracting establishments.

Job gains and losses have definite business cycle properties. During recessions, simultaneous sharp rises in jobs lost and drops in jobs gained occur. Most of the dynamics associated with gross job gains and losses were concentrated in the expanding and contracting establishments, as opposed to opening and closing establishments.



### Rising worker productivity

Manufacturing output per worker rose 56 percent between 2000 and 2011, with the sector maintaining a level of production (measured in dollars) with fewer workers.



Despite job losses in 16 manufacturing industries, output per worker increased in 14 of 17 industries between 2000 and 2010. These gains, in part, reflect rising productivity due to the increased use of technology and rising skill levels of the workers.

Change in Maine Jobs, GDP, and GDP per Worker, 2000-2010 (GDP adjusted for inflation in millions of dollars, sorted by GDP)			
Manufacturing Industry	Jobs	GDP	GDP per Worker (in dollars)
Computer and Electronic Products	-4,000	599	258,447
Food, Beverage, and Tobacco Products	-1,045	224	42,411
Chemical	335	175	75,805
Fabricated Metal Products	-354	96	24,532
Miscellaneous	-187	77	46,136
Machinery	-939	25	38,290
Nonmetallic Mineral Products	-626	3	23,981
Apparel and Leather and Allied Products	-4,389	-2	49,951
Wood Products	-3,764	-6	47,083
Printing and Related Support Activities	-1,331	-12	18,276
Primary Metal	-142	-14	-12,732
Furniture and Related Products	-1,108	-29	13,599
Plastics and Rubber Products	-687	-35	12,156
Electrical Equipment and Appliances	-1,018	-70	1,271
Textile Mills and Textile Product Mills	-2,695	-111	2,011
Transportation Equipment	-1,486	-180	-6,658
Paper	-5,450	-912	-29,984

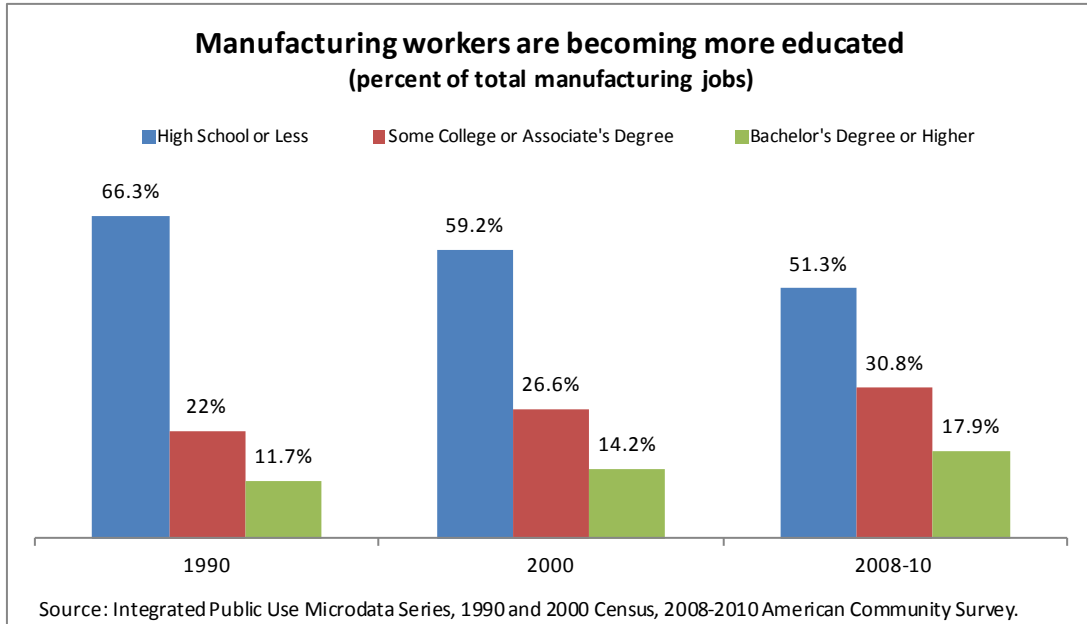
Source: Quarterly Census of Employment and Wages and U.S. Bureau of Economic Analysis.

### Manufacturing workers are becoming more educated and older

Much of the growth in manufacturing output per worker was fueled by process improvement and the introduction of new technologies. As a result, employers did not always need more workers to meet increased demand, but they did require a more skilled workforce. The evidence indicates that

manufacturing workers have been “upskilling” for many years (using educational attainment as a proxy for skills).

Between 1990 and 2010 (combined 2008, 2009, and 2010 American Community Survey samples), the educational attainment of Maine manufacturing workers rose. About 66 percent of the employed had a high school education or less in 1990, by 2010 the number of workers with this level of attainment had dropped to 51 percent of the total. Conversely, the percentage of employed with at least some college education increased, accounting for 49 percent of total employment, up from 34 percent for 1990.

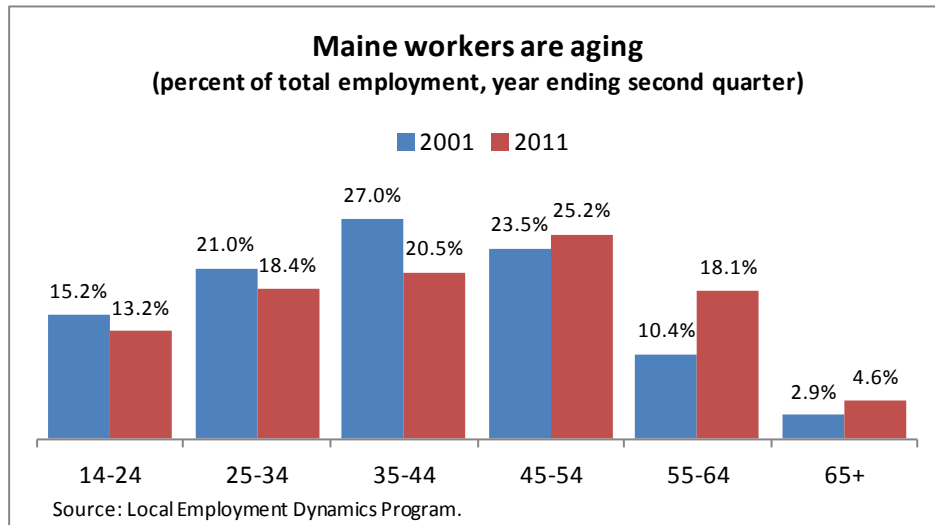


The number of manufacturing workers engaged as production workers (defined here as precision production, craft, repairers, operatives and laborers) fell nearly 50 percent between 1990 and 2008-2010. At the same time, educational attainment of these workers rose, with the share of workers with some college or an associate’s degree and a bachelor’s degree or more rising by 13 percentage points and 2 percentage points, respectively.

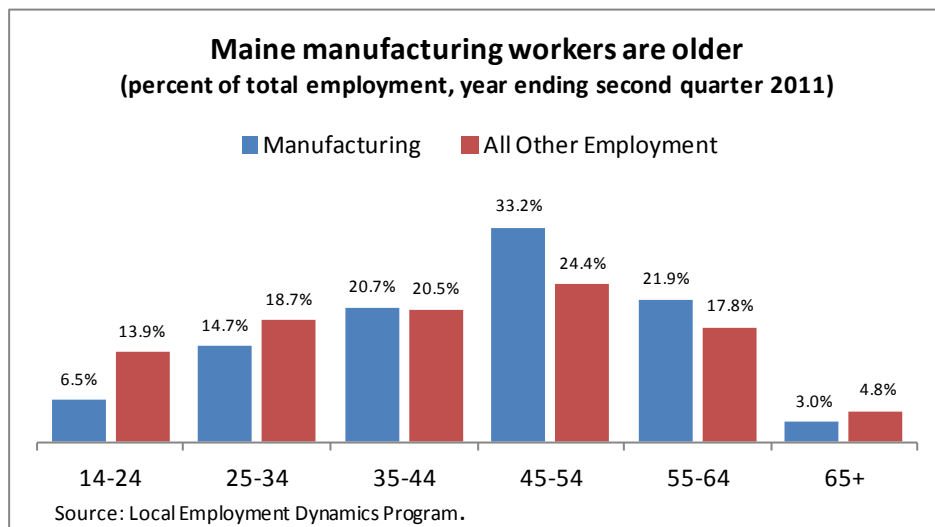
Educational Attainment of Manufacturing Production Workers in Maine (percent distribution)				
Educational Attainment	1990	2000	2008-10	Percentage Point Change 1990-(2008-10)
High School or Less	77.3%	70.6%	62.2%	-15.1
Some College or Associate's Degree	18.6%	24.7%	31.8%	13.2
Bachelor's Degree or Higher	4.1%	4.7%	6.0%	1.9

Source: Integrated Public Use Microdata Series, 1990 and 2000 Census, 2008-2010 ACS.

While the educational attainment of manufacturing workers is increasing, so is the average age. For all wage and salary workers, the influence of the aging population, the rising labor force participation rate of the older population, and the falling participation rate of younger workers on employment demographics during the past ten years was significant. Workers age 55 and over comprised 23 percent of total employment for 2011, up from 13 percent for 2001. Conversely, the percentage of workers under the age of 45 fell from 63 to 52 percent.



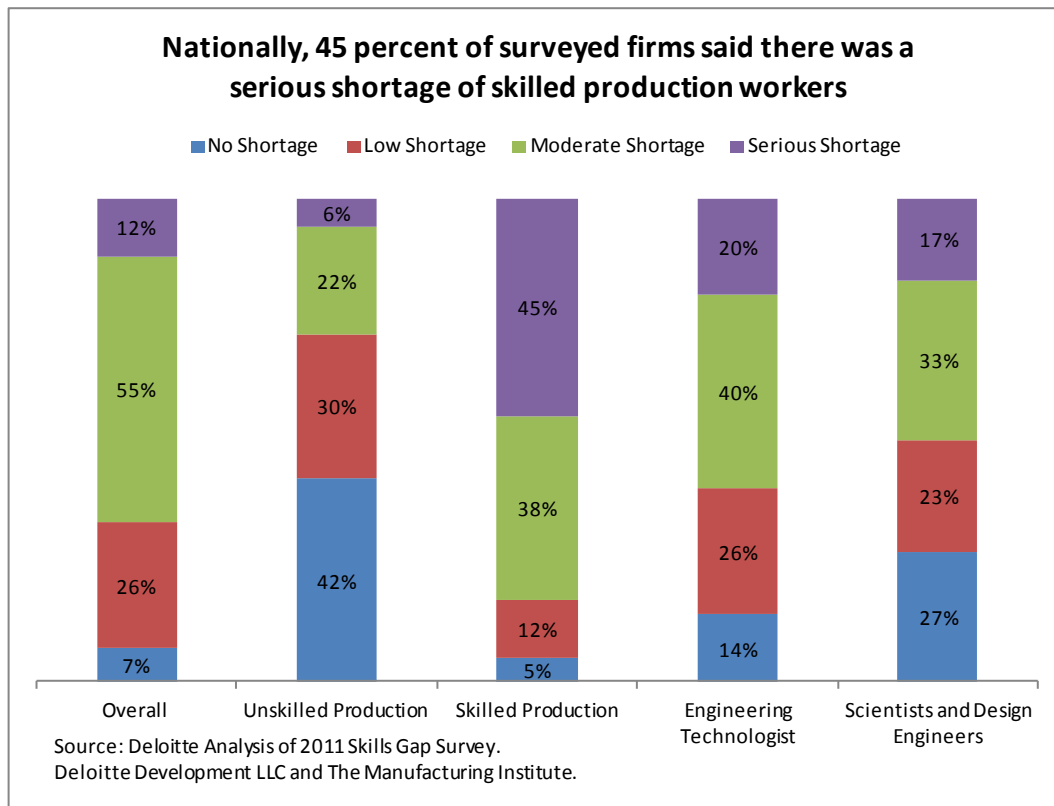
Manufacturing workers, on average, are older than other workers. This is due in part to the relative lack of hiring in the manufacturing sector and the resultant aging of the workforce in place. Those 45 years of age or older account for 58 percent of the manufacturing workforce, compared to 47 percent for all other industries combined. With many of these workers at or nearing retirement age, replacement has become a major issue.



**Openings for manufacturing workers exist today**

The changing needs of manufacturing employers have resulted in the use of more highly trained workers, and the current demand for them has translated into unfilled job openings. According to a national survey, conducted jointly by the Manufacturing Institute and Deloitte, published September 2011, American manufacturing companies could not fill as many as 600,000 skilled positions. Their analysis indicated “the changing nature of manufacturing work is making it harder for talent to keep up” and “the skills gap is expected to take the biggest toll on skilled production jobs....”





In Maine, reflective in part of the skills gap, there were 615 job postings for production occupations (mostly in manufacturing) in June 2012 according to Wanted Analytics. Surveys by the Manufacturers Association of Maine and others have found many job openings going unfilled, particularly for machinists and other precision manufacturing occupations.

**Going Forward**

The outlook for manufacturing may be improving. Global competition has seen rising costs, particularly in China. The Boston Consulting Group indicated that conditions are ripe for resurgence in manufacturing. They found that “rising wages, shipping costs, and land prices ... are rapidly eroding China’s cost advantages.” This does not necessarily mean that Chinese manufacturing will decline, but it does mean that companies will begin to look at alternatives to locating in China.

Such factors as the rising costs of offshore competitors, the increasing innovation of employers, and the increasing use of technology are improving the competitiveness of many manufacturers. A prime example is the growing success of specialized, quality-focused durable goods manufacturers.

Employment growth in industries depends on output and worker productivity (how much each worker produces). Labor-saving technologies and methods can increase productivity, limiting employment growth even as output increases. While technology-driven productivity growth does reduce the need for workers for a given amount of production, it also reduces the cost of goods and the market for them expands. Increased productivity is a primary reason for forecasted manufacturing employment declines between 2010 and 2020, both nationally and in Maine.

Nationally, projections developed by the U.S. Bureau of Labor Statistics indicate that output is expected to increase from nearly \$4.4 trillion in 2010 to \$5.7 trillion in 2020, compared to a loss of \$222.1 billion

between 2000 and 2010. However, manufacturing employment is expected to fall 73,000, driven by increased productivity gains. This compares to 5.7 million jobs lost between 2000 and 2010.

The Center for Workforce Research and Information of the Maine Department of Labor projects manufacturing employment in Maine will fall 6,700 between 2010 and 2020, after dropping 28,700 between 2000 and 2010. The decrease in employment may be attributed to a combination of productivity gains and continued import competition.

Employment Projections to 2020 for Manufacturing Industries in Maine (sorted by net change)				
Industry	2010	2020	Change	
			Net	Percent
Chemicals	1,991	2,200	209	10.5%
Fabricated Metal Products	4,969	5,060	91	1.8%
Primary Metals	310	285	-25	-8.1%
Apparel and Leather and Allied Products	1,945	1,875	-70	-3.6%
Plastics and Rubber Products	2,096	2,000	-96	-4.6%
Electrical Equipment and Appliances	398	300	-98	-24.6%
Machinery	2,054	1,950	-104	-5.1%
Nonmetallic Mineral Products	1,172	1,052	-120	-10.2%
Miscellaneous	1,811	1,659	-152	-8.4%
Furniture and Related Products	1,090	800	-290	-26.6%
Printing and Related Support Activities	1,516	1,100	-416	-27.4%
Transportation Equipment	8,314	7,877	-437	-5.3%
Food, Beverage, and Tobacco Products	6,659	6,058	-601	-9.0%
Textile Mills and Textile Product Mills	1,686	1,064	-622	-36.9%
Computer and Electronic Products	2,712	2,086	-626	-23.1%
Wood Products	4,105	2,947	-1,158	-28.2%
Paper	7,397	5,214	-2,183	-29.5%

The projections do not mean there will be no job openings in manufacturing. Attrition in the coming years from baby boomer retirements bodes well for hiring opportunities. In addition, the analysis by the Manufacturing Institute and Deloitte indicated that the skills gap "...will likely widen as times passes" in the United States. The implication of this statement is such that if a worker has the advanced skills employers are looking for, jobs will be available. For both of these reasons, it is likely job openings will exist even if total manufacturing employment declines as projected.

## Summary

Manufacturing is and will be an important part of Maine's economy. However, the nature of work is changing and employers need workers with higher skill levels. Published in *The Future of Manufacturing, Opportunities to Drive Economic Growth* (April 2012), the World Economic Forum concluded, "Talented human capital will be the most critical resource differentiating the prosperity of countries and companies."