

New Jersey's Advanced Manufacturing Cluster Winter 2014 – 2015

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LABOR AND WORKFORCE DEVELOPMENT

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The goal of this report is to get an “IDEA” of what advanced manufacturing means to New Jersey

Identify the types of industries and establishments that make up the advanced manufacturing cluster based on a standard industry classification system

Describe any similarities and differences among its components with regard to such variables as employment, wage, occupation type, education, and demographic characteristics

Examine any present distinctions within the cluster and its components that give New Jersey a competitive advantage compared to neighboring states, regions or the nation, or show areas where New Jersey could improve to add to the state’s economy

Analyze the current state of the advanced manufacturing cluster and provide an outlook for employment into the future

New Jersey Advanced Manufacturing Highlights

- The advanced manufacturing industry cluster contributed nearly \$30.6 billion to the Gross Domestic Product in 2012, or about 6.1 percent of all output
- In 2013, New Jersey employed roughly 49,000 people in chemical manufacturing, the state's largest segment of advanced manufacturing, which ranks third among states behind only California and Texas
- Greater than half of all manufacturing industry employment in the state is classified as advanced
- Average wages paid in many advanced manufacturing industries are well above the statewide private sector average of \$59,026 in 2013
- Advanced manufacturing establishment employers paid nearly \$12.6 billion in total wages in 2013, or about 6.6 percent of all wages paid

Overview

There were over 4,100 establishments in New Jersey that employed nearly 133,700 people in the advanced manufacturing cluster in 2013. Employment is scattered throughout the state and found in places ranging from very large pharmaceutical firms to much smaller machine shops. These establishments are generally found in the Northeastern part of the state and also along the Interstate 95 corridor.

The occupational composition within advanced manufacturing industries is continuously changing as more technical skills are required to operate more advanced processes. The expectation of higher skills has resulted in many higher paying jobs, especially among chemical manufacturing firms.

According to the U.S. Census Bureau's 2013 American Community Survey, the profile of the average New Jersey resident worker is generally older than average and male. More than 50 percent of the workforce is aged 45 and over. Racially, it is more diverse than average, especially among the Asian population. The workforce is highly educated, with roughly 50 percent having attained at least a bachelor's degree.

Advanced Manufacturing

Industry Definition

The four primary components of the advanced manufacturing sector with some examples of industries classified within them

Chemical Manufacturing

- Basic chemical
- Pharmaceutical & medicine
- Cleaning compound and toiletry
- Paint, coating & adhesive

Fabricated Metal Product Manufacturing

- Architectural and structural metals
- Machine shops and threaded product
- Forging and stamping
- Coating, engraving, and heat treating metals

Machinery Manufacturing

- Industrial machinery
- HVAC and commercial refrigeration equipment
- Commercial and service industry machinery
- Turbine and power transmission

Computer and Electronic Product Manufacturing

- Computers and peripheral equipment
- Communications equipment
- Audio and visual equipment
- Semiconductors and other electronic components

The complete list of 163 detailed NAICS industries classified as advanced manufacturing

Chemical Manufacturing

325110	Petrochemical Mfg	325311	Nitrogenous Fertilizer Mfg	325611	Soap and Other Detergent Mfg
325120	Industrial Gas Mfg	325312	Phosphatic Fertilizer Mfg	325612	Polish and Other Sanitation Good Mfg
325130	Synthetic Dye and Pigment Mfg	325314	Fertilizer (Mixing Only) Mfg	325613	Surface Active Agent Mfg
325180	Other Basic Inorganic Chemical Mfg	325320	Pesticide and Other Agricultural Chemical Mfg	325620	Toilet Preparation Mfg
325193	Ethyl Alcohol Mfg	325411	Medicinal and Botanical Mfg	325910	Printing Ink Mfg
325194	Cyclic Crude, Gum and Wood Chemical Mfg	325412	Pharmaceutical Preparation Mfg	325920	Explosives Mfg
325199	All Other Basic Organic Chemical Mfg	325413	In-Vitro Diagnostic Substance Mfg	325991	Custom Compounding of Purchased Resins
325211	Plastics Material and Resin Mfg	325414	Biological Product (except Diagnostic) Mfg	325992	Photographic Film, Paper, Plate, and Chemical Mfg
325212	Synthetic Rubber Mfg	325510	Paint and Coating Mfg	325998	All Other Misc. Chemical Product and Preparation Mfg
325220	Artificial and Synthetic Fibers and Filaments Mfg	325520	Adhesive Mfg		

The complete list of 163 detailed NAICS industries classified as advanced manufacturing, continued...

Fabricated Metal Product Manufacturing

332111	Iron and Steel Forging	332323	Ornamental and Architectural Metal Work Mfg	332812	Metal Coating and Allied Services to Manufacturers
332112	Nonferrous Forging	332410	Power Boiler and Heat Exchanger Mfg	332813	Electroplating, Plating, Polishing, and Coloring
332114	Custom Roll Forming	332420	Metal Tank (Heavy Gauge) Mfg	332911	Industrial Valve Mfg
332117	Powder Metallurgy Part Mfg	332431	Metal Can Mfg	332912	Fluid Power Valve and Hose Fitting Mfg
332119	Metal Crown, Closure, and Other Metal Stamping	332439	Other Metal Container Mfg	332913	Plumbing Fixture Fitting and Trim Mfg
332215	Metal Kitchen Cookware and Flatware Mfg	332510	Hardware Mfg	332919	Other Metal Valve and Pipe Fitting Mfg
332216	Saw Blade and Handtool Mfg	332613	Spring Mfg	332991	Ball and Roller Bearing Mfg
332311	Prefabricated Metal Building and Component Mfg	332618	Other Fabricated Wire Product Mfg	332992	Small Arms Ammunition Mfg
332312	Fabricated Structural Metal Mfg	332710	Machine Shops	332993	Ammunition (except Small Arms) Mfg
332313	Plate Work Mfg	332721	Precision Turned Product Mfg	332994	Small Arms, Ordnance, and Accessories Mfg
332321	Metal Window and Door Mfg	332722	Bolt, Nut, Screw, Rivet, and Washer Mfg	332996	Fabricated Pipe and Pipe Fitting Mfg
332322	Sheet Metal Work Mfg	332811	Metal Heat Treating	332999	All Other Misc. Fabricated Metal Product Mfg

The complete list of 163 detailed NAICS industries classified as advanced manufacturing, continued...

Machinery Manufacturing

333111	Farm Machinery and Equipment Mfg	333413	Industrial and Commercial Fan and Air Purification Equipment Mfg	333912	Air and Gas Compressor Mfg
333112	Lawn and Garden Tractor Equipment Mfg	333414	Heating Equipment Mfg	333913	Measuring and Dispensing Pump Mfg
333120	Construction Machinery Mfg	333415	AC, Refrigeration, & Forced Air Heating	333921	Elevator and Moving Stairway Mfg
333131	Mining Machinery and Equipment Mfg	333511	Industrial Mold Mfg	333922	Conveyor and Conveying Equipment Mfg
333132	Oil and Gas Field Machinery and Equipment Mfg	333514	Special Die and Tool, Die Set, Jig, and Fixture Mfg	333923	Overhead Crane, Hoist, and Monorail System Mfg
333241	Food Product Machinery Mfg	333515	Cutting Tool and Machine Tool Accessory Mfg	333924	Industrial Truck, Tractor, and Trailer Machinery Mfg
333242	Semiconductor Machinery Mfg	333517	Machine Tool Mfg	333991	Power-Driven Handtool Mfg
333243	Sawmill, Woodworking, and Paper Machinery Mfg	333519	Rolling Mill and Other Metalworking Machinery Mfg	333992	Welding and Soldering Equipment Mfg
333244	Printing Machinery and Equipment Mfg	333611	Turbine and Turbine Generator Set Units Mfg	333993	Packaging Machinery Mfg
333249	Other Industrial Machinery Mfg	333612	Speed Changer, Industrial High-Speed Drive, and Gear Mfg	333994	Industrial Process Furnace and Oven Mfg
333314	Optical Instrument and Lens Mfg	333613	Mechanical Power Transmission Equipment Mfg	333995	Fluid Power Cylinder and Actuator Mfg
333316	Photographic and Photocopying Equipment Mfg	333618	Other Engine Equipment Mfg	333996	Fluid Power Pump and Motor Mfg
333318	Other Commercial and Service Industry Machinery Mfg	333911	Pump and Pumping Equipment Mfg	333997	Scale and Balance Mfg

The complete list of 163 detailed NAICS industries classified as advanced manufacturing, continued...

Computer and Electronic Product Manufacturing

334111	Electronic Computer Mfg	334413	Semiconductor and Related Device Mfg	334513	Industrial Process Variable Instruments
334112	Computer Storage Device Mfg	334416	Capacitor, Resistor, Coil, and Other Inductor Mfg	334514	Totalizing Fluid Meter and Counting Device Mfg
334118	Terminal and Other Computer Peripheral Equip. Mfg	334417	Electronic Connector Mfg	334515	Instrument Mfg for Measuring Electrical Signals
334210	Telephone Apparatus Mfg	334418	Printed Circuit Assembly Mfg	334516	Analytical Laboratory Instrument Mfg
334220	Radio and Other Broadcasting Equipment Mfg	334419	Other Electronic Component Mfg	334517	Irradiation Apparatus Mfg
334290	Other Communications Equipment Mfg	334510	Electromedical and Electrotherapeutic Apparatus Mfg	334519	Other Measuring and Controlling Device Mfg
334310	Audio and Video Equipment Mfg	334511	Search, Detection & Navigation Instrumnt	334613	Blank Magnetic and Optical Recording Media Mfg
334412	Bare Printed Circuit Board Mfg	334512	Automatic Environmental Control Mfg.	334614	Software, CD, Tape, and Record Reproducing

The complete list of 163 detailed NAICS industries classified as advanced manufacturing, continued...

All Other Advanced Manufacturing

324110	Petroleum Refineries	335313	Switchgear and Switchboard Apparatus Mfg	336412	Aircraft Engine and Engine Parts Mfg
324121	Asphalt Paving Mixture and Block Mfg	335314	Relay and Industrial Control Mfg	336413	Other Aircraft Parts and Auxiliary Equipment Mfg
324122	Asphalt Shingle and Coating Materials Mfg	336310	Motor Vehicle Gasoline Engine and Engine Parts Mfg	336414	Guided Missile and Space Vehicle Mfg
324191	Petroleum Lubricating Oil and Grease Mfg	336320	Motor Vehicle Electrical and Electronic Equipment Mfg	336415	Space Vehicle Propulsion Units and Parts
324199	All Other Petroleum and Coal Products Mfg	336330	Motor Vehicle Steering and Suspension Mfg	336419	Other Guided Missile/Space Vehicle Parts
327211	Flat Glass Mfg	336340	Motor Vehicle Brake System Mfg	336611	Ship Building and Repairing
327212	Other Pressed and Blown Glass and Glassware Mfg	336350	Motor Vehicle Transmission and Power Train Mfg	336612	Boat Building
327213	Glass Container Mfg	336360	Motor Vehicle Seating and Interior Trim Mfg	339112	Surgical and Medical Instrument Mfg
327215	Glass Product Mfg Made of Purchased Glass	336370	Motor Vehicle Metal Stamping	339113	Surgical Appliance and Supplies Mfg
335311	Power, Distribution, and Specialty Transformer Mfg	336390	Other Motor Vehicle Parts Mfg	339114	Dental Equipment and Supplies Mfg
335312	Motor and Generator Mfg	336411	Aircraft Mfg	339115	Ophthalmic Goods Mfg
				339116	Dental Laboratories

Advanced Manufacturing

Economic Impact and GDP

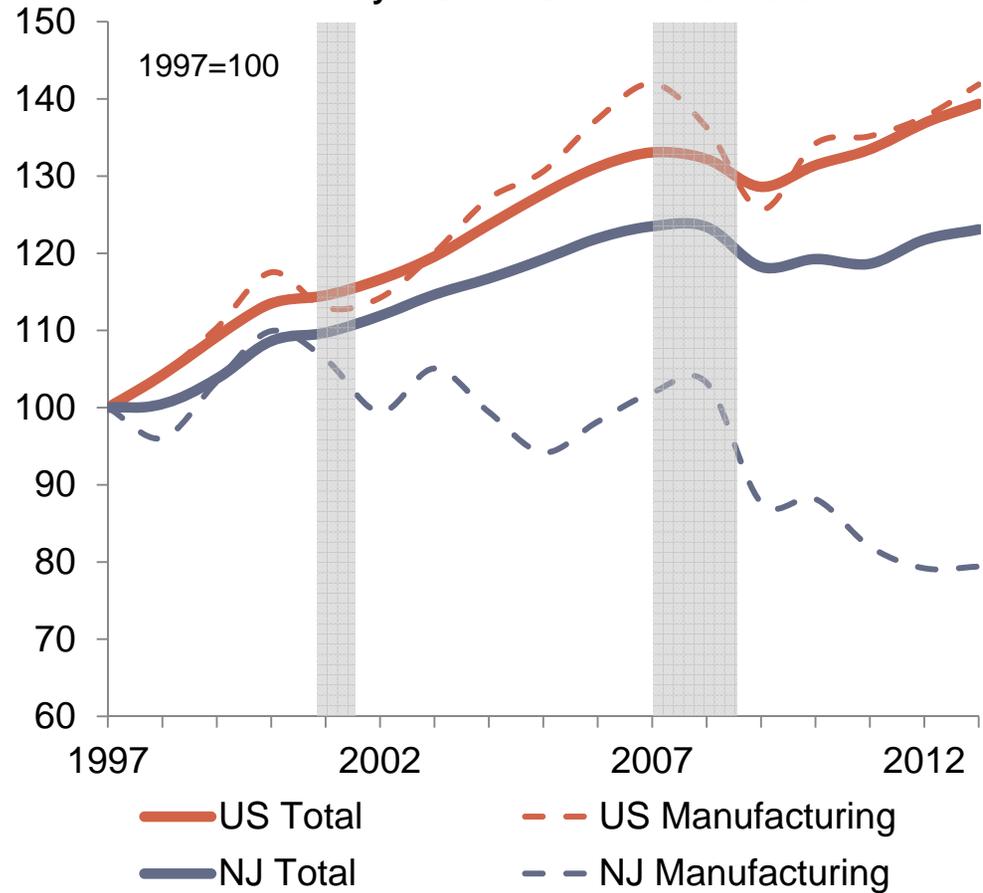
GDP growth in New Jersey has averaged 1.3 percent per year from 1997 to 2013, and now exceeds half of a trillion dollars

Over the same period, the national GDP has averaged 2.1 percent annual growth

Manufacturing GDP in the United States has grown in line with the overall economy, but in New Jersey, the declining manufacturing GDP estimate has been a detractor

New Jersey's manufacturing sector averaged marginal growth of 0.3 percent per year from 1997 through 2008, but tumbled to decline by an annual average of 5.1 percent from 2008 through 2013

Gross Domestic Product Index (Chained 2009 Dollars)
New Jersey & United States: 1997-2013

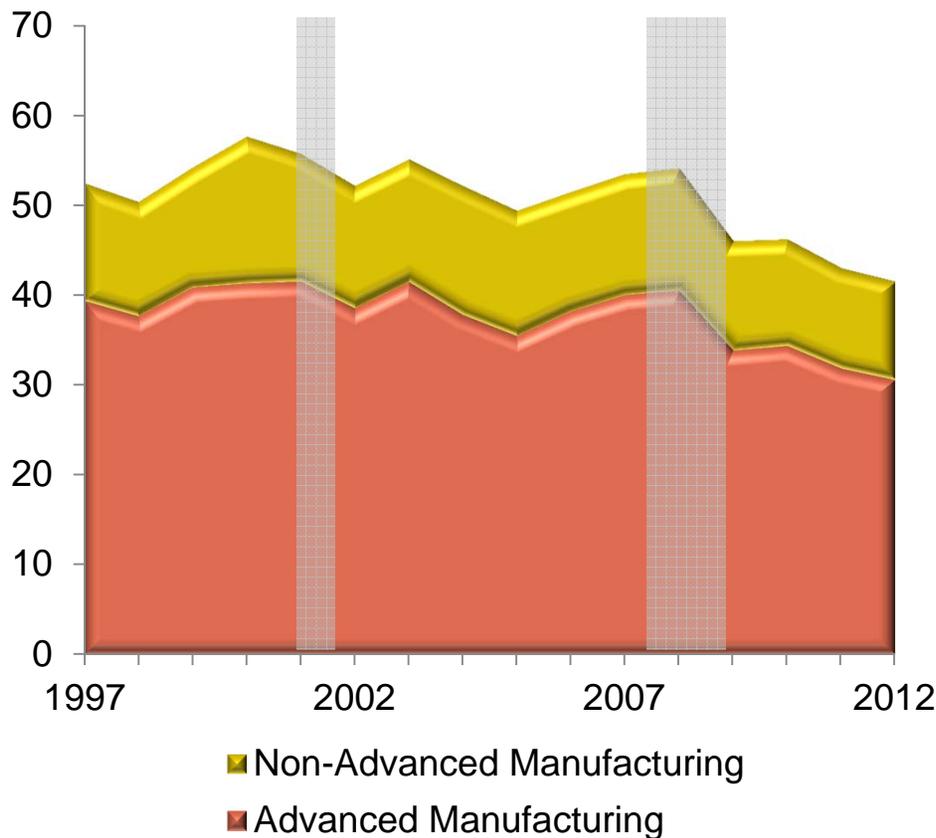


Gray area denotes U.S. economic recession as defined by the National Bureau of Economic Research (NBER)

Source: United States Bureau of Economic Analysis, GDP in Chained 2009 Dollars
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

Roughly 75 percent of manufacturing GDP in New Jersey is derived from industries classified as advanced

**Gross Domestic Product of Manufacturing Sector
(Billions of Chained 2009 Dollars)
New Jersey: 1997-2012**



These advanced manufacturing industries accounted for roughly 67 percent of manufacturing GDP at the national level

Total manufacturing GDP in New Jersey exceeded \$50 billion consistently from 1997 through 2008, averaging 0.3 percent annual growth

Statewide advanced manufacturing industries also averaged 0.3 percent growth from 1997-2008, but declined by an average of 6.8 percent over the next four years following the national recession

Gray area denotes U.S. economic recession as defined by the National Bureau of Economic Research (NBER)

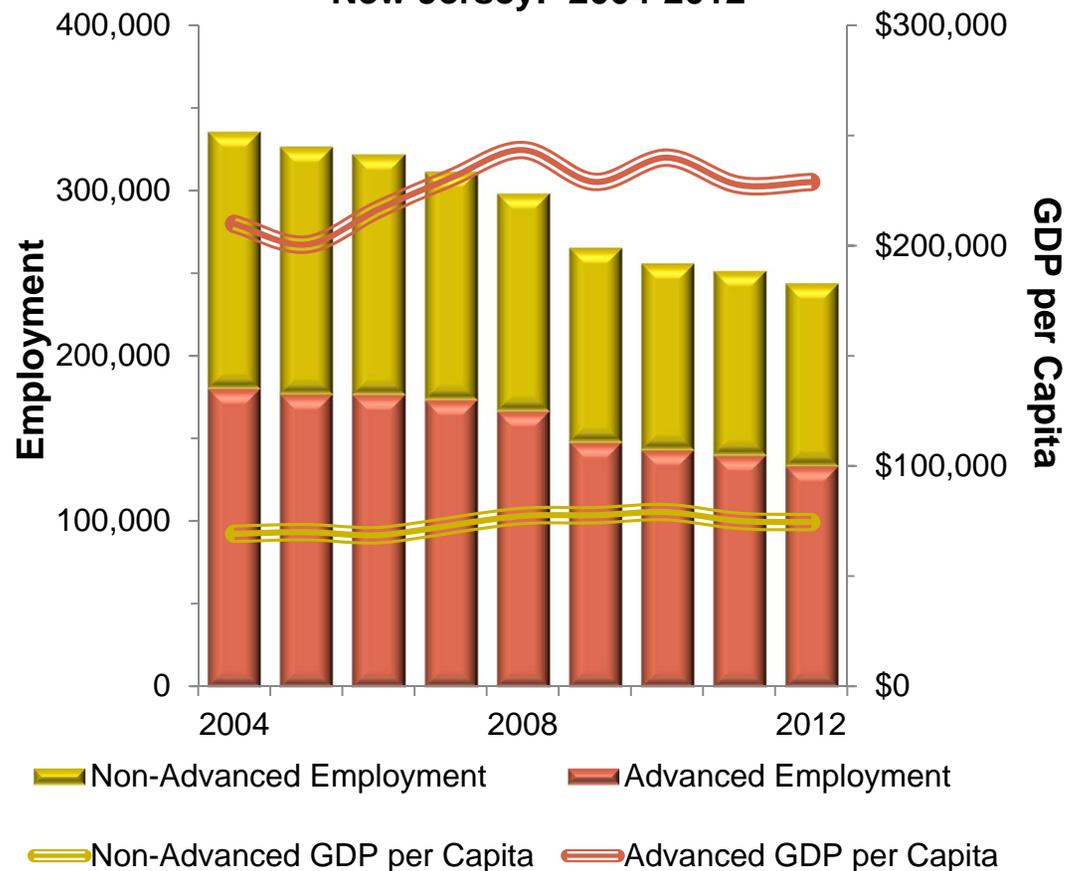
The decline in manufacturing employment has not had a negative effect on productivity by worker

While manufacturing employment in New Jersey has been trending downward for some time, 2008 and 2009 were particularly difficult as more than 45,000 jobs were lost during these recessionary years

GDP output per worker, calculated as total manufacturing GDP divided by manufacturing employment, has remained very strong, especially among advanced manufacturing industries

This measure of output per worker has exceeded \$200,000 for advanced manufacturing industries, and is well above more than double the output per work among non-advanced manufacturing industries

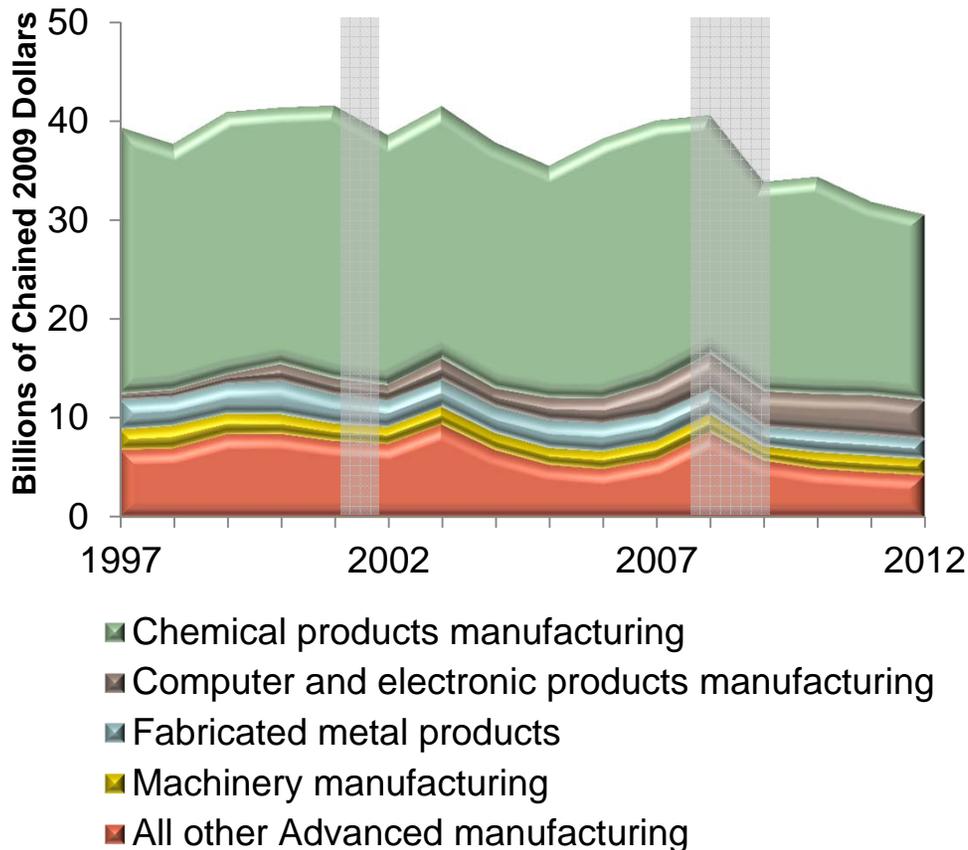
**Employment and GDP per Capita by Manufacturing Segment
New Jersey: 2004-2012**



Source: United States Bureau of Economic Analysis, GDP in Chained 2009 Dollars
 Quarterly Census of Employment and Wages, Annual Averages
 Prepared by: New Jersey Department of Labor and Workforce Development
 December, 2014

Output produced from the chemical manufacturing sector dominates GDP output among advanced manufacturing industries

**Gross Domestic Product by Advanced Manufacturing Segment
New Jersey: 1997-2012**



Chemical manufacturing accounted for 68 percent of advanced manufacturing GDP in 1997, but only 61 percent in 2012

The fabricated metal, machinery, and all other advanced manufacturing segments maintained a fairly steady share of total GDP throughout this time period.

Computer and electronic products manufacturing has been the best performing gainer among this group, increasing its GDP from \$588 million in 1997 to nearly \$4 billion in 2012

Source: United States Bureau of Economic Analysis, GDP in Chained 2009 Dollars
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

Gray area denotes U.S. economic recession as defined by the National Bureau of Economic Research (NBER)

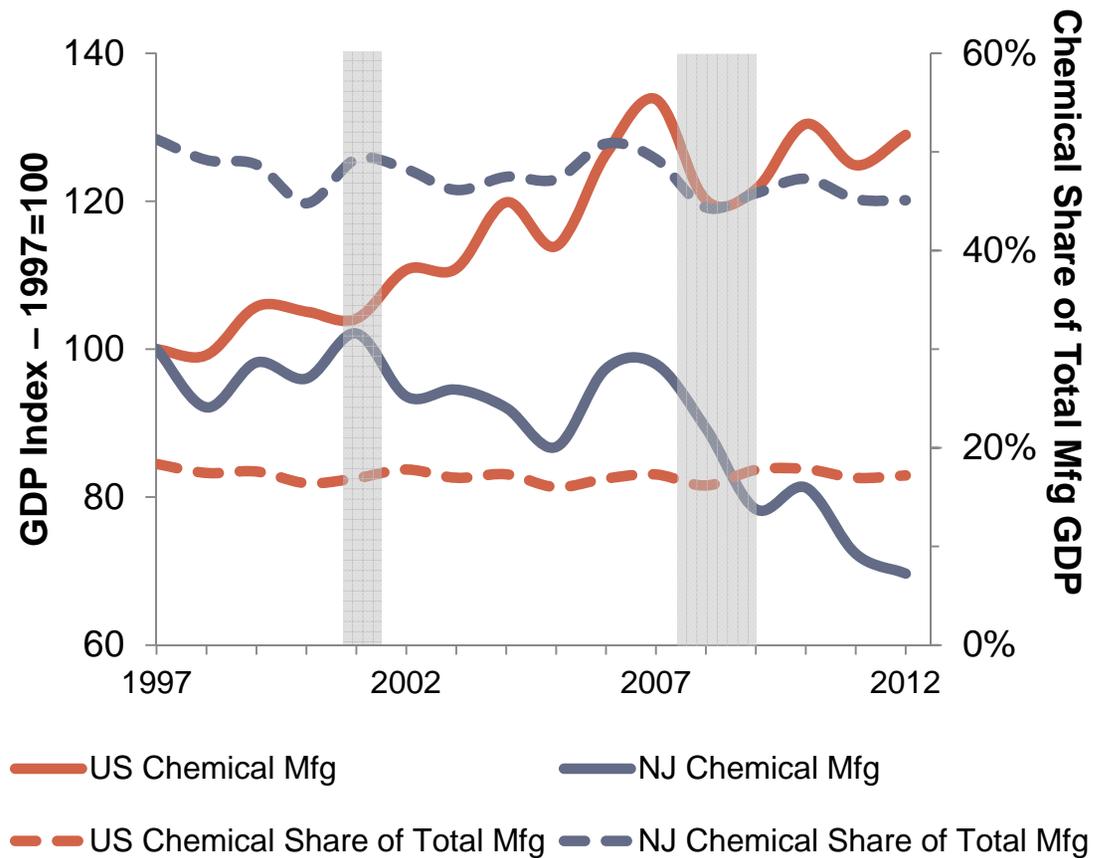
Chemical manufacturing accounts for nearly half of New Jersey's manufacturing GDP, which makes the rate of decline alarming

Annual average change in GDP by chemical manufacturers in New Jersey and the nation have been moving in opposite directions for some time

From 1997-2007, the nation had robust growth of 3 percent per year while New Jersey remained level

From 1997-2012, New Jersey experienced deep losses in GDP of 6.6 percent per year while the nation declined only marginally

**Measures of GDP for Chemical Manufacturing
New Jersey & United States: 1997-2012**

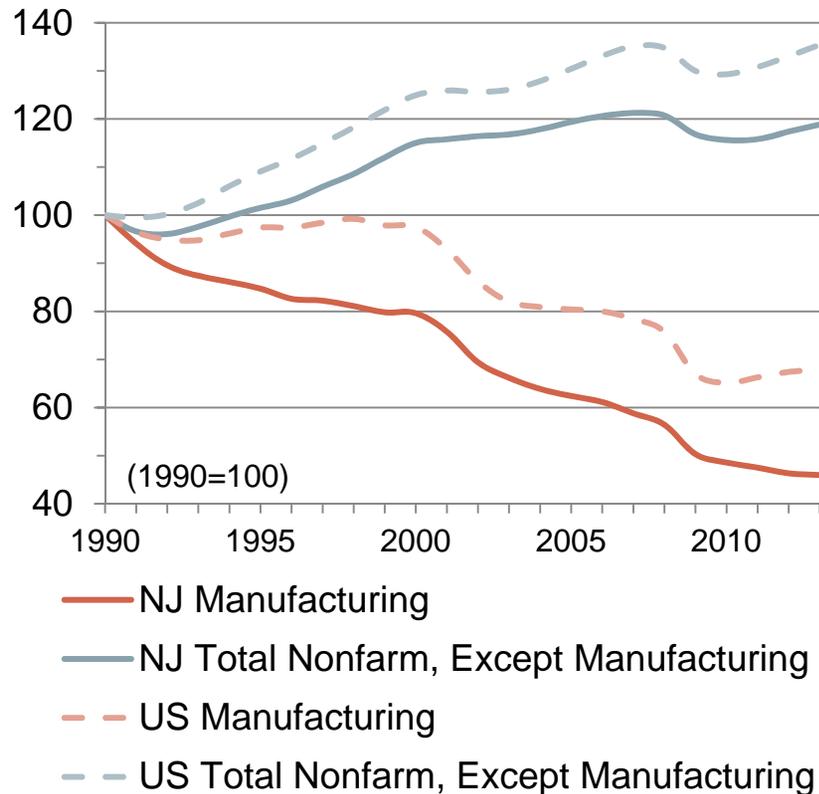


Advanced Manufacturing

Industry Analysis

New Jersey has followed a similar employment trend as the nation, but has fared worse over the last 23 years

**Employment: Manufacturing vs.
All “other” Industries
New Jersey & United States: 1990-2013**



Manufacturing has lost 286,000 jobs in New Jersey since 1990, a 3.3 percent annual decline, while the nation has declined at a 1.7 percent annual rate, shedding nearly 5.7 million jobs

The “other” non-agricultural industries grew by an annual average of 0.8 percent posting a net gain of 585,800 jobs in New Jersey, while the United States added over 32.5 million jobs, an average gain of 1.3 percent per year

Since 1990, the manufacturing sector in New Jersey has failed to experience a year over year gain. Its best year was a 0.2 decline from 1999-2000

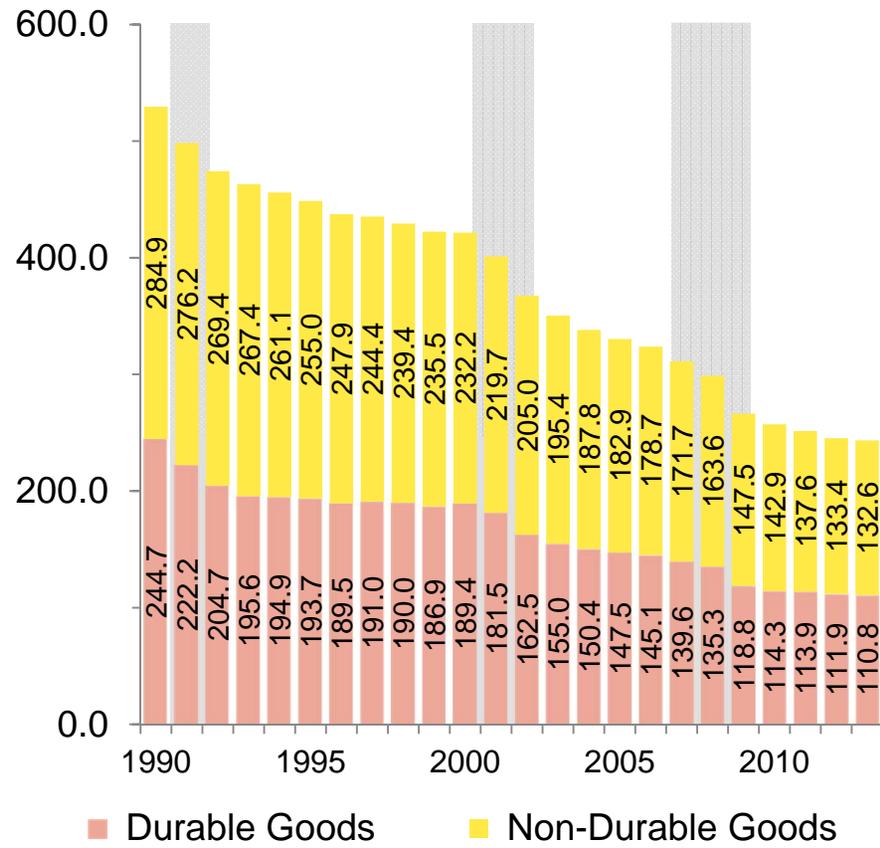
Manufacturing employment in New Jersey has declined from 14.6 percent of all jobs in 1990 to 6.2 percent in 2013

Nationally, manufacturing's share of total employment has declined from 16.2 percent in 1990 to 8.8 percent in 2013

Widespread and consistent losses among industries that manufacture both durable and non-durable goods have resulted in closely distributed annual average losses of 3.4 and 3.3 percent, respectively

During the six worst years for manufacturing employment in New Jersey ('91-'92, '01-'02, '08-'09), more than 156,000 of the 286,000 total jobs losses occurred, an average rate of decline of more than 6 percent per year

**Employment (000s) breakdown
Durable vs. Non-durable Goods
New Jersey: 1990-2013**

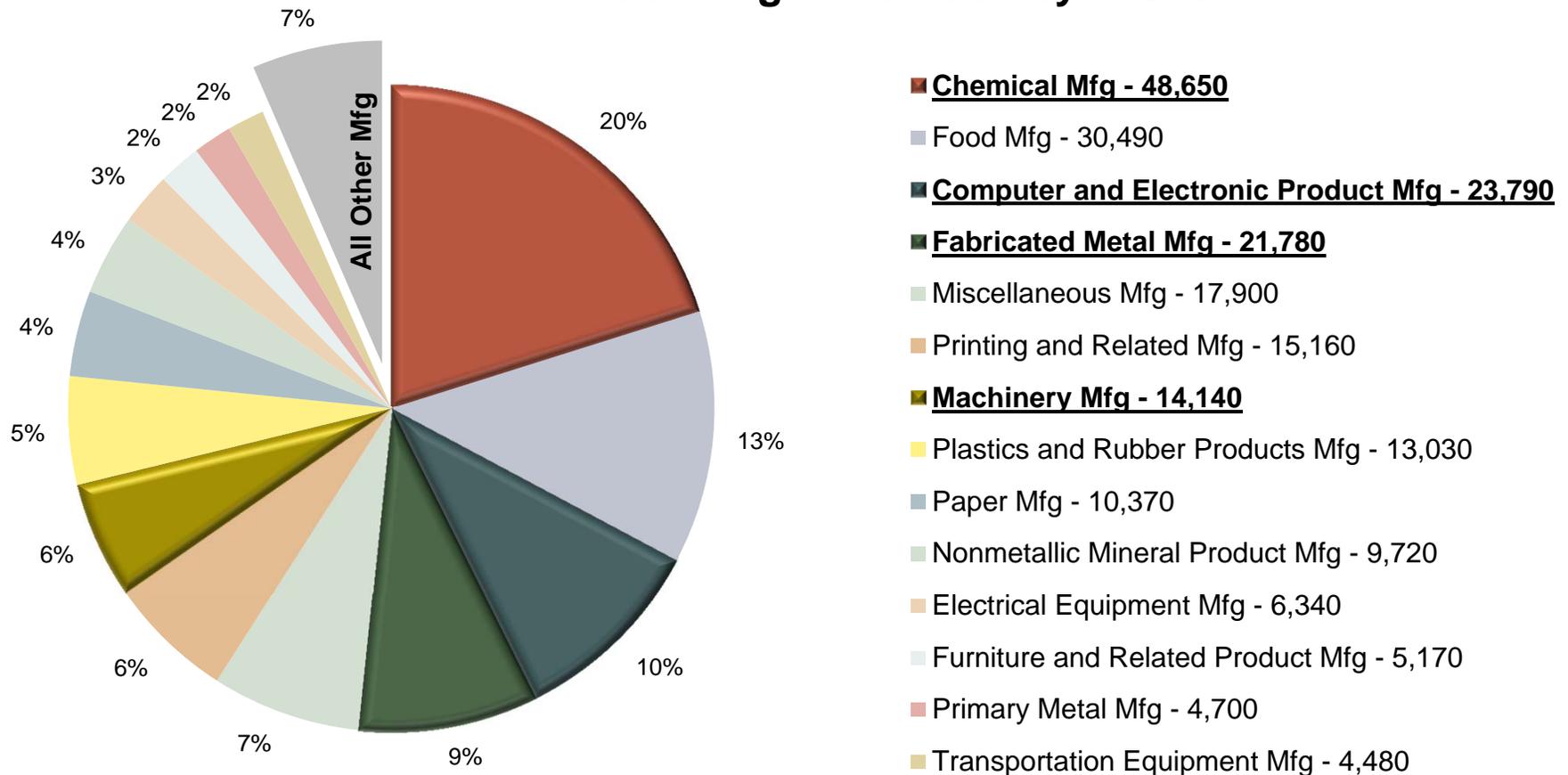


Gray area denotes U.S. economic recession as defined by the National Bureau of Economic Research (NBER)

Source: NJLWD, Current Employment Statistics, Annual Averages
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

The chart below shows the distribution of all manufacturing employment across its many different industries

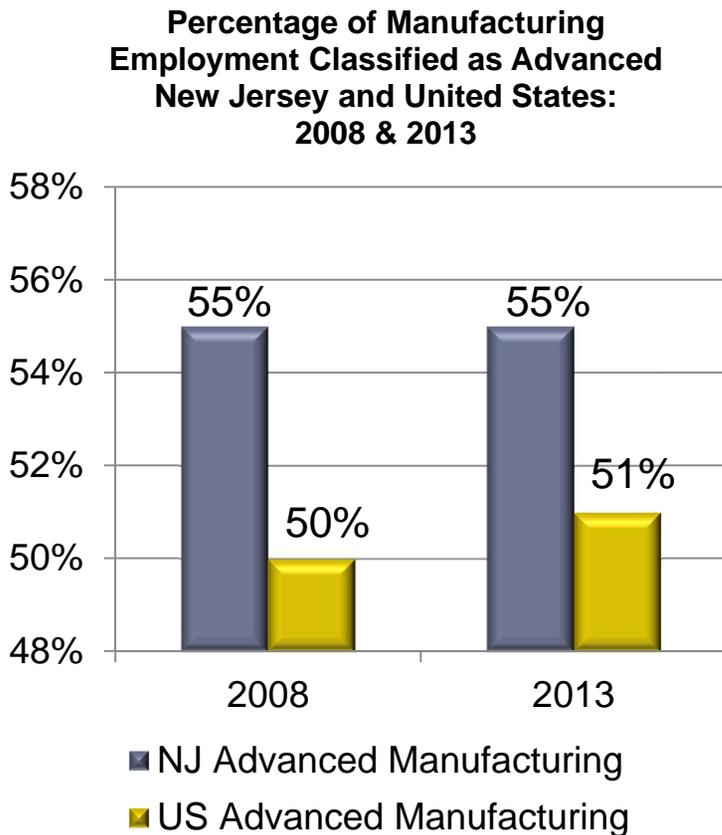
All Manufacturing Industries as a Percentage of Total Manufacturing in New Jersey: 2013



Source: NJLWD, Quarterly Census of Employment and Wages, Annual Averages
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

*** Advanced Manufacturing industries are **bolded** and underlined in legend and beveled in pie chart

The New Jersey Department of Labor and Workforce Development has classified 163 out of 364 NAICS-based manufacturing industries as advanced



Employment in advanced manufacturing industries declined at slightly faster rate (4.3 percent) than non-advanced industries (3.9 percent) in New Jersey from 2008 to 2013.

In 2013, there were more than 132,100 people employed in industries classified as advanced manufacturing in New Jersey

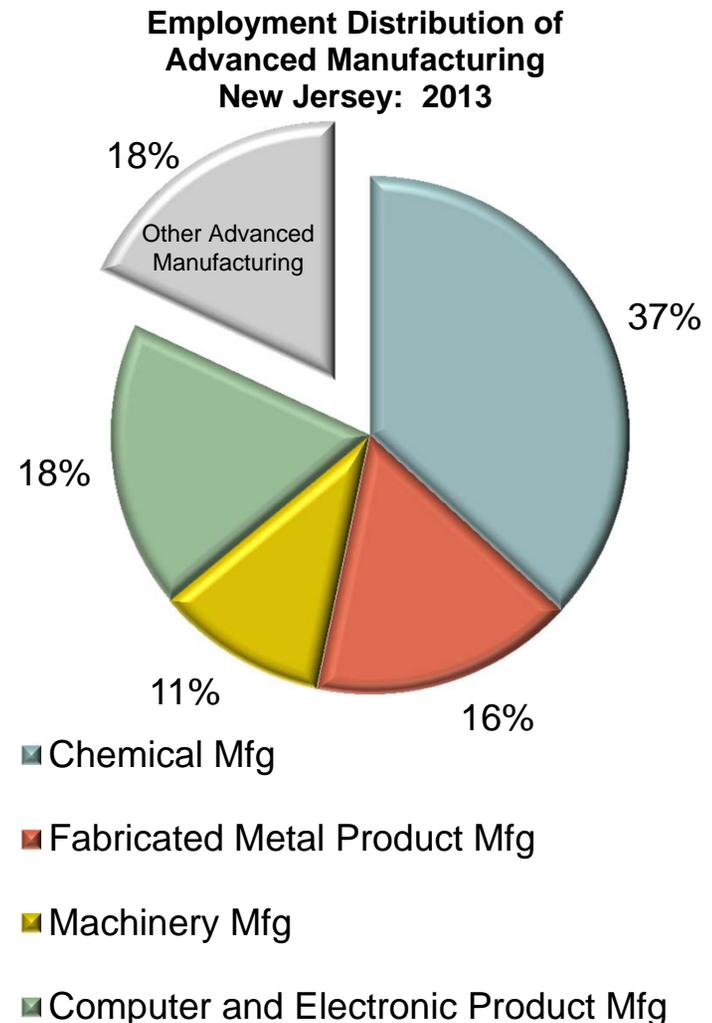
Roughly 55 percent of all manufacturing employment in New Jersey occurred in advanced industries in 2013 versus only 51 percent nationwide in 2013

The four major components of advanced manufacturing accounted for more than 80 percent of its employment in New Jersey in 2013

Chemical manufacturing, which includes pharmaceuticals and medicine, employed nearly 49,000 in 2013, which is about 20 percent of all manufacturing in the state

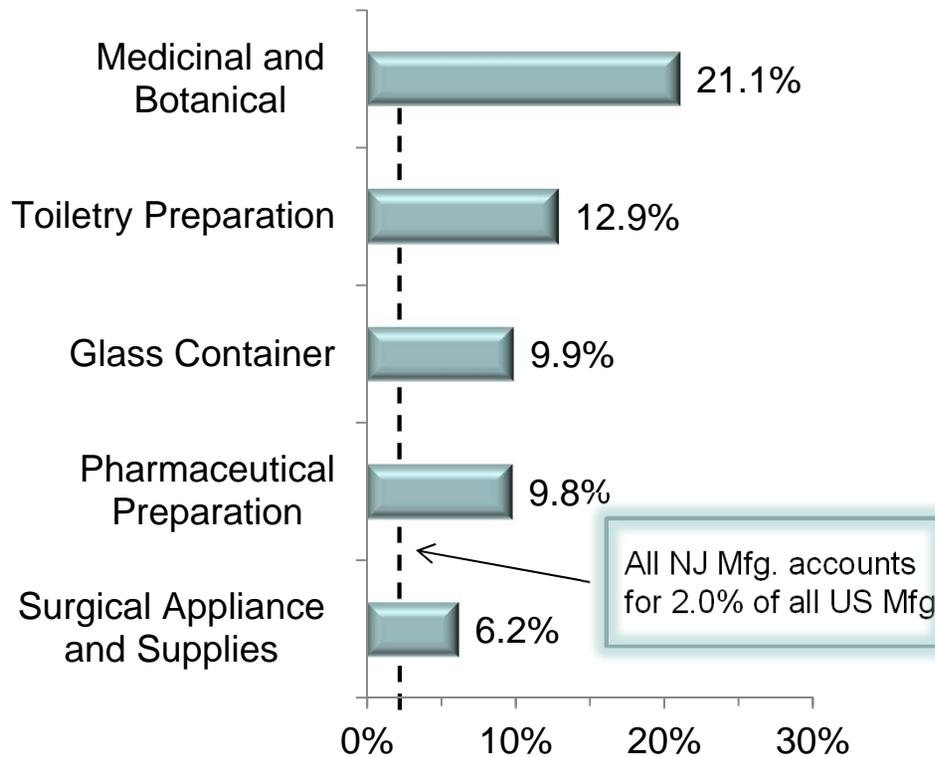
Computer and electronic product and fabricated metal product manufacturing together employed more than 45,500 in 2013

The remaining 18 percent of advanced manufacturing employment is comprised of a group of industries producing goods such as glass and glass products, electrical equipment, transportation equipment, and medical instruments and devices



These industries each employ a disproportionate number of people in New Jersey and are among the manufacturing industries that define the state in 2013

New Jersey Employment as a Percentage of the nation: 2013



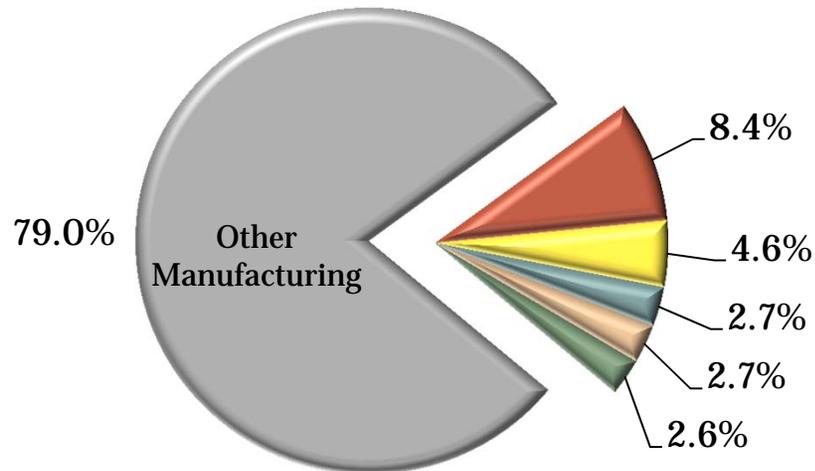
Chemical manufacturing in New Jersey, where three of the five industries on this list are classified, accounts for 6.1 percent of chemical manufacturing employment in the nation

Overall, New Jersey employed 2.2 percent of all advanced manufacturing in the nation

Glass container manufacturing is the only industry that does not pay an average wage significantly higher than the statewide average of \$59,026

The five largest manufacturing industries make up over 21 percent of all manufacturing employment in the state in 2013

**Percentage of Industry's Employment
of All Manufacturing
New Jersey, 2013**



- Pharmaceutical Preparation
- Commercial Gravure Printing
- Toiletry Preparation
- Search, Detection & Navigation Instrument
- Surgical Appliance and Supplies

Pharmaceutical preparation accounts for one of every twelve manufacturing jobs in New Jersey, but less than 2 percent of all manufacturing jobs nationally

Among these five largest manufacturing industries, only commercial gravure printing is not considered to be advanced

Each of these industries earns a substantial average annual wage, ranging from \$58,600 for commercial gravure printing to \$152,900 for pharmaceutical preparation

Annual average wages in New Jersey in 2013 among advanced manufacturing industries are about 66 percent more than those non-advanced manufacturing industries

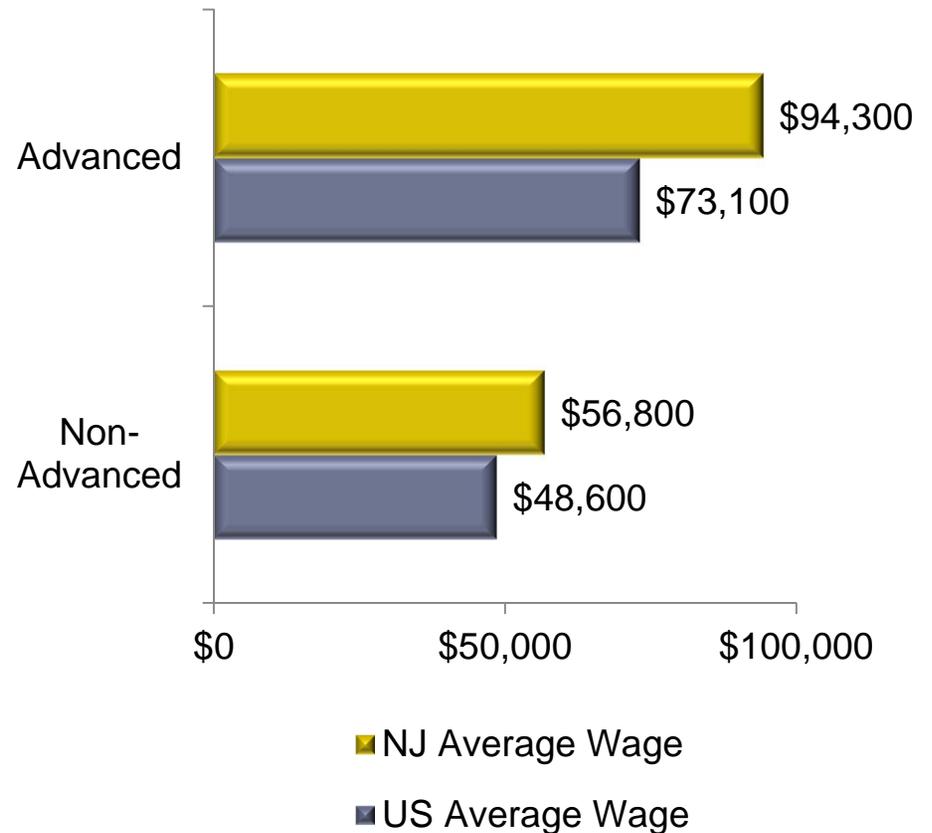
From 2008 to 2013, annual average wages in New Jersey in advanced manufacturing have increased 2.3 percent per year compared to only 1.0 percent per year for non-advanced

Annual average wages paid are 29 percent higher in New Jersey in 2013 than the nation among advanced manufacturing industries

One of the higher paying industry clusters in New Jersey, the advanced manufacturing industry earns about 60 percent more than the state average of \$59,026 in 2013

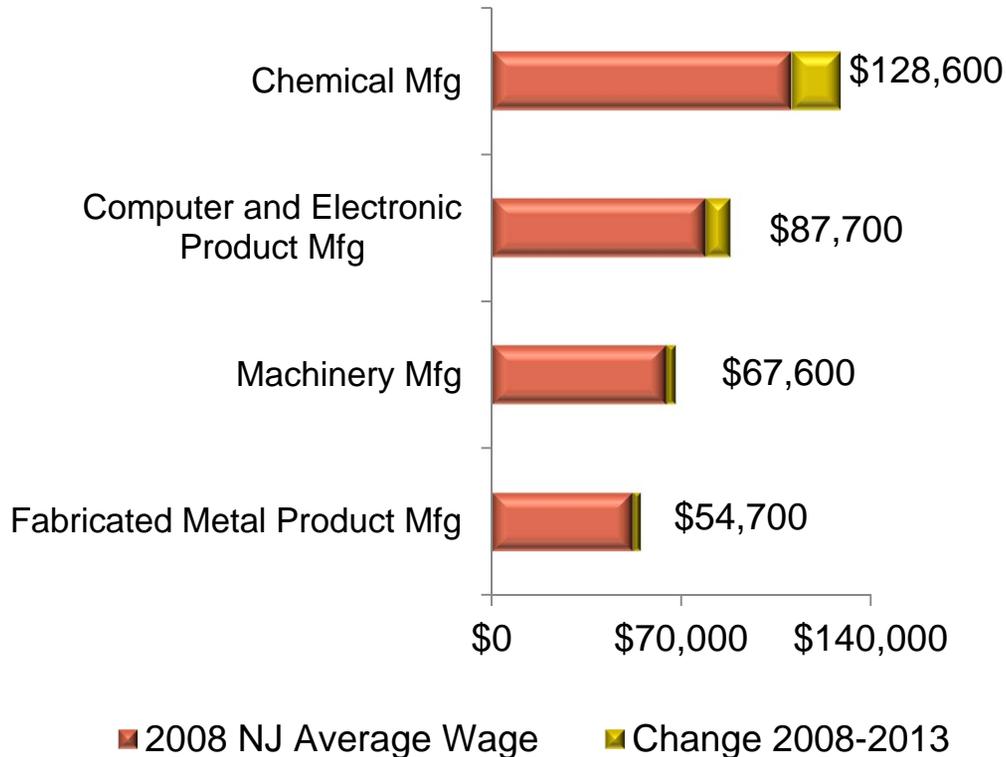
Source: NJLWD, Quarterly Census of Employment and Wages, Annual Averages
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

Comparison of Annual Average Wages Among Advanced and Non-advanced Manufacturing: New Jersey & United States, 2013



Annual average wages in New Jersey among the four main components of advanced manufacturing have averaged 2.2 percent annual growth from 2008 to 2013

**Annual Average Wage of Major Components of Advanced Manufacturing
New Jersey, 2013**



The chemical manufacturing industry earned more than twice as much as the state average in 2013, and averaged annual increases of 3.1 percent from 2008 to 2013

The higher annual average wages paid in both chemical and computer and electronic product manufacturing are reflective of the greater composition of jobs requiring higher educational levels

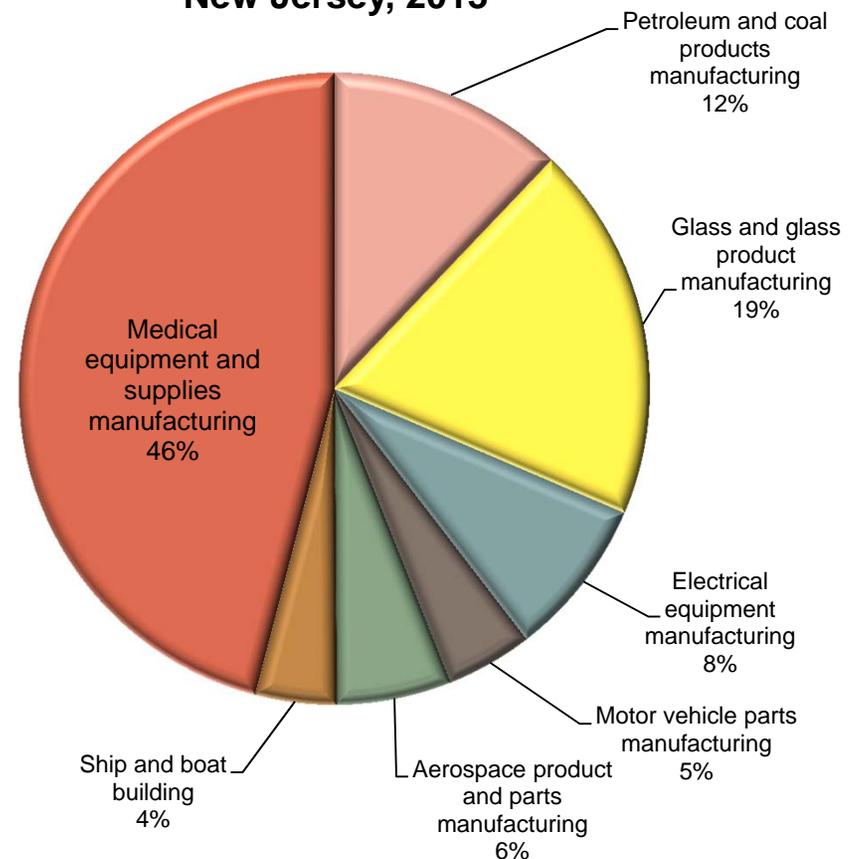
The skill requirements at machinery and fabricated metal product manufacturing establishments are increasing quickly, and wages should reflect that over time

Seven detailed industries make up the roughly 25,300 workers employed in the “other” advanced manufacturing component

Nearly half of these “other” workers are employed in the medical equipment and supplies manufacturing industry, which tends to have very high annual average wages and are primarily located in northeast New Jersey

Glass and glass product manufacturing is a vital industry in New Jersey unique mainly to its southern counties

Breakdown of Employment of “Other” Advanced Manufacturing New Jersey, 2013



...however, advanced manufacturing in New Jersey's more sparsely populated counties make up a larger percentage of total private sector employment

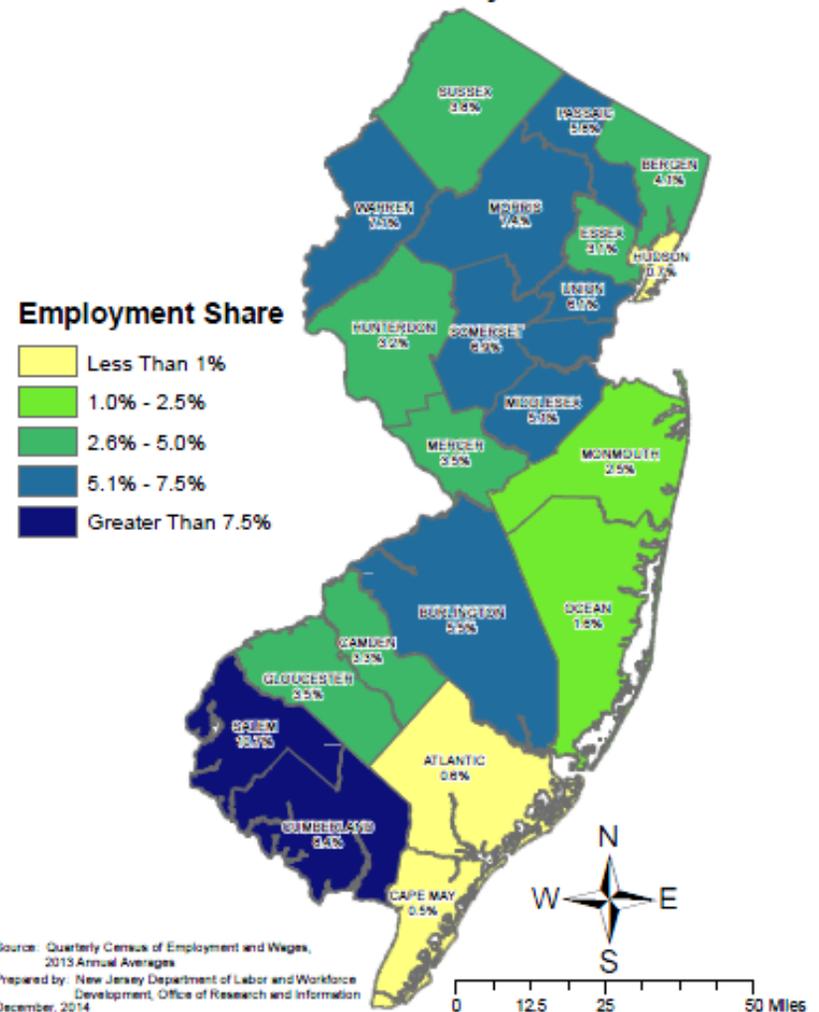
Cumberland and Salem Counties have the largest shares of advanced manufacturing of total employment, each exceeding 7.5 percent

Morris, Middlesex, Union, and Somerset Counties are at the center of the chemical manufacturing employment base in New Jersey

In the coastal counties of Ocean, Atlantic, and Cape May, less than 2 percent of employment is classified as advanced manufacturing

Source: NJLW, Quarterly Census of Employment and Wages, Annual Average
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

Advanced Manufacturing Employment as a Share of Total Employment
New Jersey: 2013



Industry components tend to group among one another within the advanced manufacturing cluster

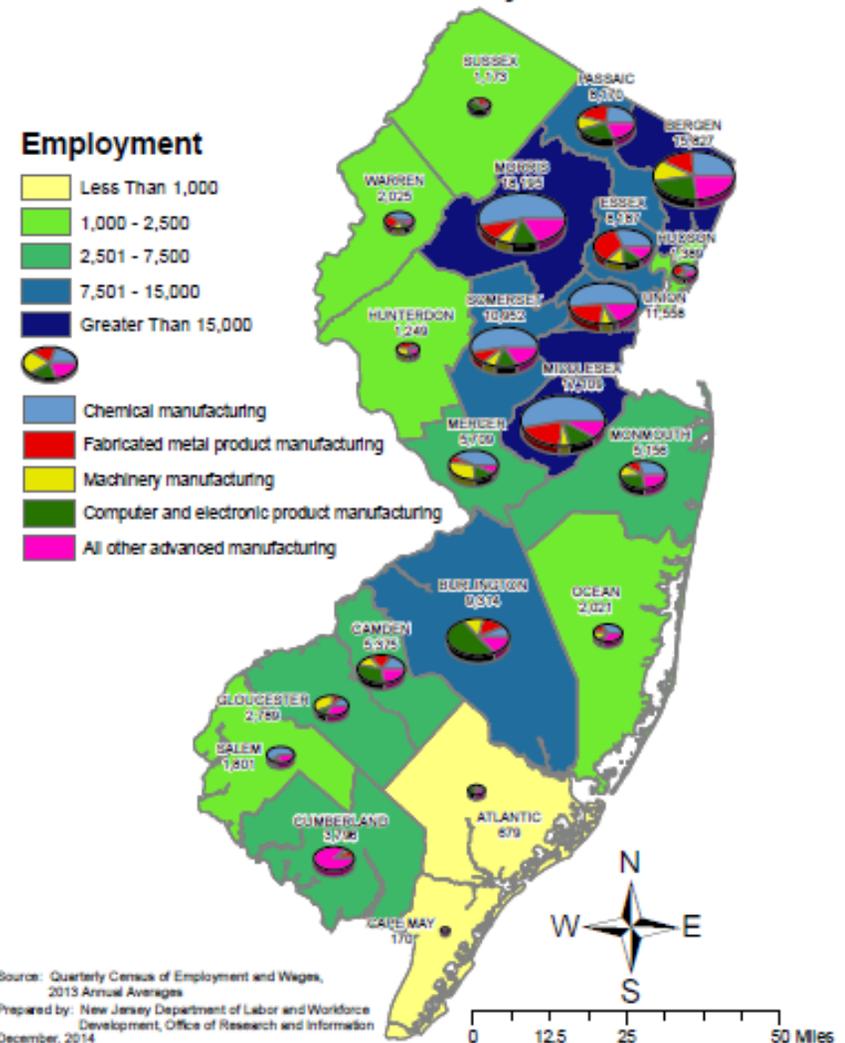
Roughly 77 percent of all chemical manufacturing employment is found in these six counties in the northeastern region of New Jersey:

- Bergen
- Essex
- Somerset
- Union
- Morris
- Middlesex

Nearly 30 percent of all computer and electronic product manufacturing employment is found in the southern counties of Camden and Burlington

Cumberland county is the glass center of New Jersey, employing nearly two-thirds of all glass product manufacturing workers in the state

Advanced Manufacturing Employment by County
New Jersey: 2013

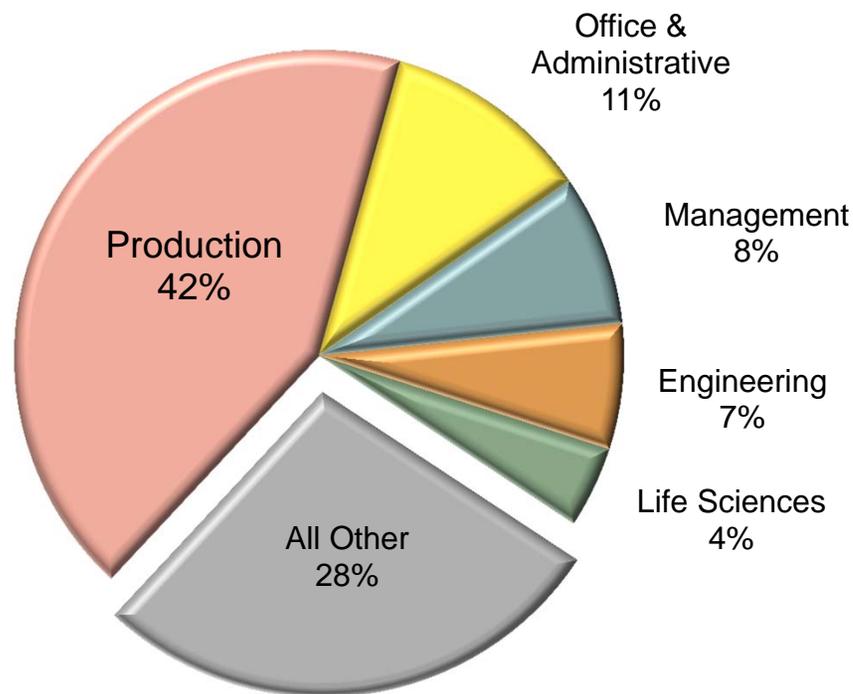


Advanced Manufacturing

Occupational Analysis

Greater than 70 percent of all advanced manufacturing jobs are classified into these five groups

Breakdown of Major Occupational Groups within Advanced Manufacturing Industry: New Jersey, 2013



More than 40 percent of advanced manufacturing workers are directly involved with production

Roughly 11 percent of workers contributes to research and development as part of the engineering and science groups

The “other” 28 percent of advanced manufacturing occupations primarily consists of business, computer, material moving, and sales occupations

This list shows the top 20 occupations by employment in advanced manufacturing

Occupation	2013 Employment	Share of Industry	2013 Average Salary	Minimum Education Requirements
Total, All Occupations	132,170	100.0%	\$52,799	
Top 20 Occupations	55,063	41.7%	\$54,700	
Packaging and Filling Machine Operators and Tenders	5,004	3.8%	\$27,340	High school diploma or equivalent
Inspectors, Testers, Sorters, Samplers, and Weighers	4,492	3.4%	\$37,840	High school diploma or equivalent
Supervisors of Production and Operating Workers	4,310	3.3%	\$63,370	Postsecondary non-degree award
Machinists	3,492	2.6%	\$46,730	High school diploma or equivalent
Electrical and Electronic Equipment Assemblers	3,401	2.6%	\$32,330	High school diploma or equivalent
Mixing and Blending Machine Operators	2,862	2.2%	\$37,970	High school diploma or equivalent
Chemical Equipment Operators	2,820	2.1%	\$44,440	High school diploma or equivalent
Team Assemblers	2,709	2.0%	\$27,840	High school diploma or equivalent
General and Operations Managers	2,643	2.0%	\$160,140	Associate's degree
Chemists	2,597	2.0%	\$86,800	Bachelor's degree
Industrial Production Managers	2,437	1.8%	\$119,740	Bachelor's degree
Laborers and Freight and Stock	2,432	1.8%	\$26,240	Less than high school
Shipping, Receiving, and Traffic Clerks	2,273	1.7%	\$33,480	High school diploma or equivalent
Extruding, Forming, Pressing, and Compacting Machine Operators	2,264	1.7%	\$35,280	High school diploma or equivalent
Industrial Machinery Mechanics	2,149	1.6%	\$54,590	High school diploma or equivalent
Wholesale Sales Representatives	2,105	1.6%	\$77,410	High school diploma or equivalent
General Office Clerks	1,884	1.4%	\$32,690	High school diploma or equivalent
Cutting, Punching, and Press Machine Operators	1,842	1.4%	\$29,870	High school diploma or equivalent
Mechanical Engineers	1,674	1.3%	\$89,390	Bachelor's degree
Industrial Engineers	1,673	1.3%	\$85,260	Bachelor's degree

Source: NJLWD, Occupational Employment Statistics Survey, May 2013
 Prepared by: New Jersey Department of Labor and Workforce Development
 December, 2014



Production occupations

Skills, Knowledge and Abilities most important to the top 20 occupations found in advanced manufacturing

Skills	Knowledge	Abilities
Active listening Critical thinking Speaking Reading comprehension Monitoring Judgment and decision making Complex problem solving Time management Coordination Writing	Production and processing Mathematics English language Mechanical Customer and personal service Administration and management Education and training Computers and electronics Engineering and technology Clerical	Oral comprehension Oral expression Problem sensitivity Near vision Written comprehension Information ordering Deductive reasoning Speech clarity Speech recognition Inductive reasoning

****In addition to industry specific SKAs, effective communication is key****

Many of the occupations found in advanced manufacturing have moderate to high education/training requirements for entry

Total Number of Employment in Advanced Manufacturing by Minimum Education Requirement New Jersey, 2013

Educational Requirement	2013 Employment	% of Total
Total, Advanced Manufacturing	132,170	100.0%
Total High Requirements	37,485	28.4%
Doctoral or professional degree	927	0.7%
Master's degree	20	0.0%
Bachelor's degree	29,919	22.6%
Associate's degree	6,620	5.0%
Total Moderate Requirements	6,157	4.7%
Postsecondary non-degree award	5,648	4.3%
Some college, no degree	509	0.4%
Total Low Requirements	85,475	64.7%
High school diploma or equivalent	75,882	57.4%
Less than high school	9,593	7.3%
Education Unavailable	3,053	2.3%

Scientists and engineers primarily account for the roughly 28 percent of the occupations found in advanced manufacturing that require at least an associate's degree for entry

Although the majority of employment in advanced manufacturing may not require postsecondary education, the tradesmen and production workers that comprise this group often have many years of experience, and may have completed an apprenticeship or on-the-job training program

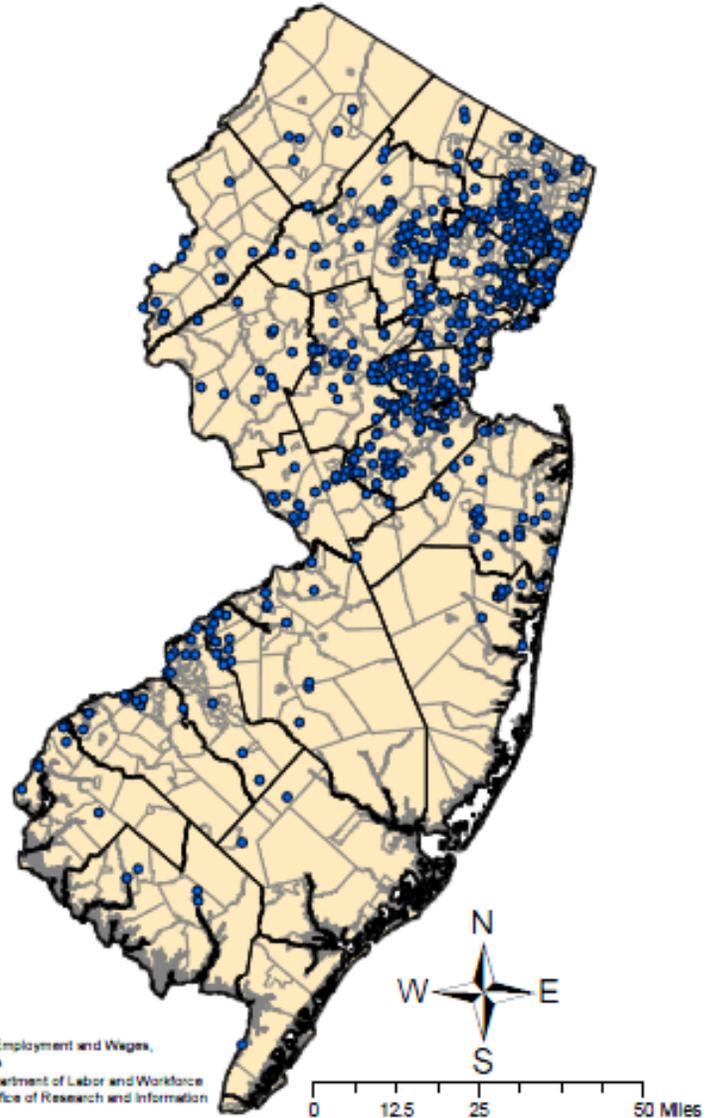
Advanced Manufacturing

Closer Look at Component
Industries

Chemical Manufacturing

Chemical Manufacturing Establishments
New Jersey: 2013

	Establishments	Employment	Employment Per Establishment
2008	918	65,292	71
2013	819	48,650	59
Change	-99	-16,642	-12



Chemical manufacturing declined from 2008-2013 both in the absolute number of establishments and also in the average employment per unit

Some well-known employers vital to New Jersey's economy include:

- Johnson & Johnson
- Bristol-Myers Squibb
- Hoffman-La Roche
- Colgate Palmolive
- Smith Kline Beecham
- Sanofi-Aventis
- Novartis
- L'Oreal
- Merck
- Pfizer

Source: NJLWD, Quarterly Census of Employment and Wages, Annual Average
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

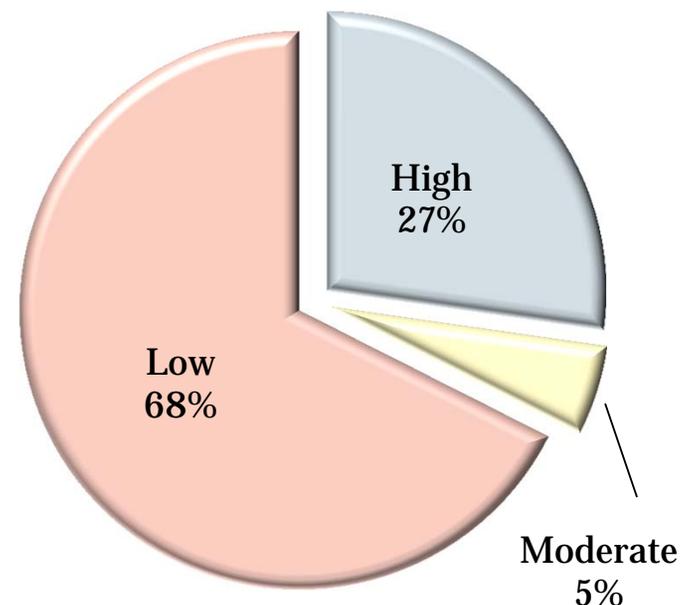
Source: Quarterly Census of Employment and Wages,
2013 Annual Averages
Prepared by: New Jersey Department of Labor and Workforce
Development, Office of Research and Information
December, 2014

Occupations requiring **high levels of education** for entry make up 27 percent of chemical manufacturing. More than 20 percent require a bachelor's degree and almost 2 percent of the workforce requires at doctorate degree.

Roughly 5 percent have **moderate education** requirements. Production supervisors primarily make up this group.

The remaining 68 percent of the workforce require only **high school education or less**.

Minimum Educational Requirements



Top Ten Occupations in Chemical Manufacturing

Occupation	2013 Employment	Education Requirement	2013 Average Wage
Packaging and Filling Machine Operators	4,890	High school diploma or equivalent	\$ 27,340
Chemical Equipment Operators	2,770	High school diploma or equivalent	\$ 44,440
Mixing and Blending Machine Operators	2,620	High school diploma or equivalent	\$ 37,970
Chemists	2,520	Bachelor's degree	\$ 86,800
Inspectors, Testers, Sorters, Samplers, and Weighers	2,020	High school diploma or equivalent	\$ 37,840
Supervisors of Production Workers	2,010	Postsecondary non-degree award	\$ 63,370
Laborers and Freight and Stock	1,660	Less than high school	\$ 26,240
Extruding, Forming, Pressing, and Compacting Machine Operators	1,610	High school diploma or equivalent	\$ 35,280
Chemical Technicians	1,430	Associate's degree	\$ 55,770
Industrial Machinery Mechanics	1,390	High school diploma or equivalent	\$ 54,590

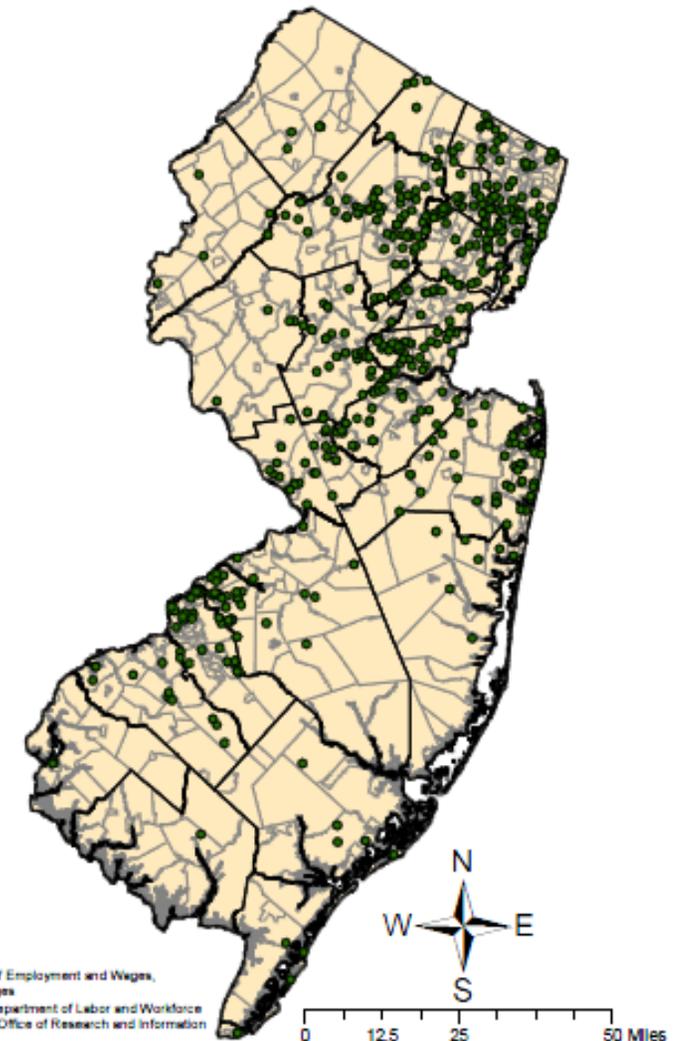
Nearly half of all chemists in the state work for companies classified in chemical manufacturing

Source: NJLWD, Occupational Employment Statistics Survey, May 2013
 Prepared by: New Jersey Department of Labor and Workforce Development
 December, 2014

Computer and Electronic Manufacturing

Computer & Electronic Product Manufacturing Establishments
New Jersey: 2013

	Establishments	Employment	Employment Per Establishment
2008	792	30,323	38
2013	684	23,791	35
Change	-108	-6,532	-3



Among the four components, computer and electronic product manufacturing have the fewest number of establishments in New Jersey

Some well-known employers vital to New Jersey's economy include:

- L-3 Communications
- Lockheed Martin
- Crestron Electronics
- ITT Industries
- Smiths Detection
- Datascope
- BAE Systems
- Honeywell
- Anadigics
- Oticon

Source: NJLWD, Quarterly Census of Employment and Wages, Annual Average
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

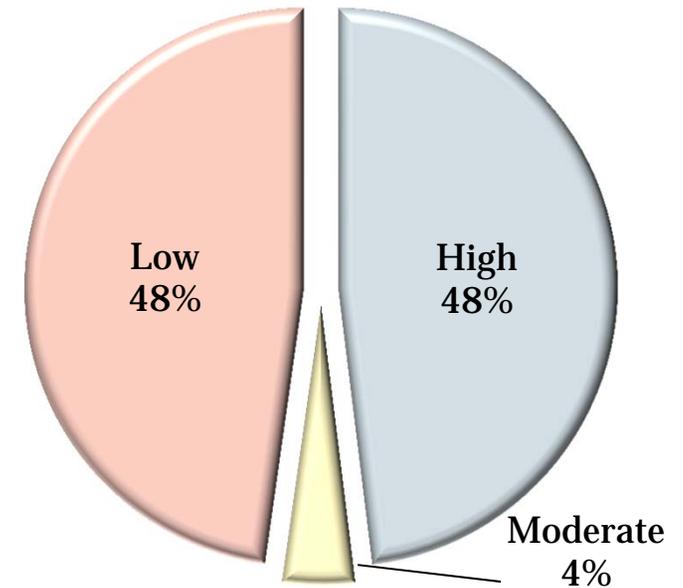
Source: Quarterly Census of Employment and Wages,
2013 Annual Averages
Prepared by: New Jersey Department of Labor and Workforce
Development, Office of Research and Information
December, 2014

Occupations requiring **high levels of education** for entry make up 48 percent of computer and electronic product manufacturing. Nearly 40 percent require at least a bachelor's degree.

Roughly 4 percent have **moderate education** requirements. Production supervisors and maintenance and repair workers primarily make up this group.

The remaining 48 percent of the workforce require only a **high school education or less**.

Minimum Educational Requirements



Top Ten Occupations in Computer and Electric Product Manufacturing

Occupation	2013 Employment	Education Requirement	2013 Average Wage
Electrical and Electronic Equipment Assemblers	3,130	High school diploma or equivalent	\$ 32,330
Inspectors, Testers, Sorters, Samplers, and Weighers	910	High school diploma or equivalent	\$ 37,840
Electromechanical Equipment Assemblers	870	High school diploma or equivalent	\$ 36,040
Mechanical Engineers	800	Bachelor's degree	\$ 89,390
Software Developers, Systems Software	780	Bachelor's degree	\$ 114,630
Software Developers, Applications	650	Bachelor's degree	\$ 99,190
Supervisors of Production Workers	620	Postsecondary non-degree award	\$ 63,370
Electrical Engineers	590	Bachelor's degree	\$ 95,680
Electrical and Electronic Engineering Technicians	540	Associate's degree	\$ 59,380
Computer Hardware Engineers	450	Bachelor's degree	\$ 104,240

Engineering and production occupations account for more than half of all employment in this industry.

Source: Occupational Employment Statistics Survey, May 2013
 Prepared by: New Jersey Department of Labor and Workforce Development
 December, 2014

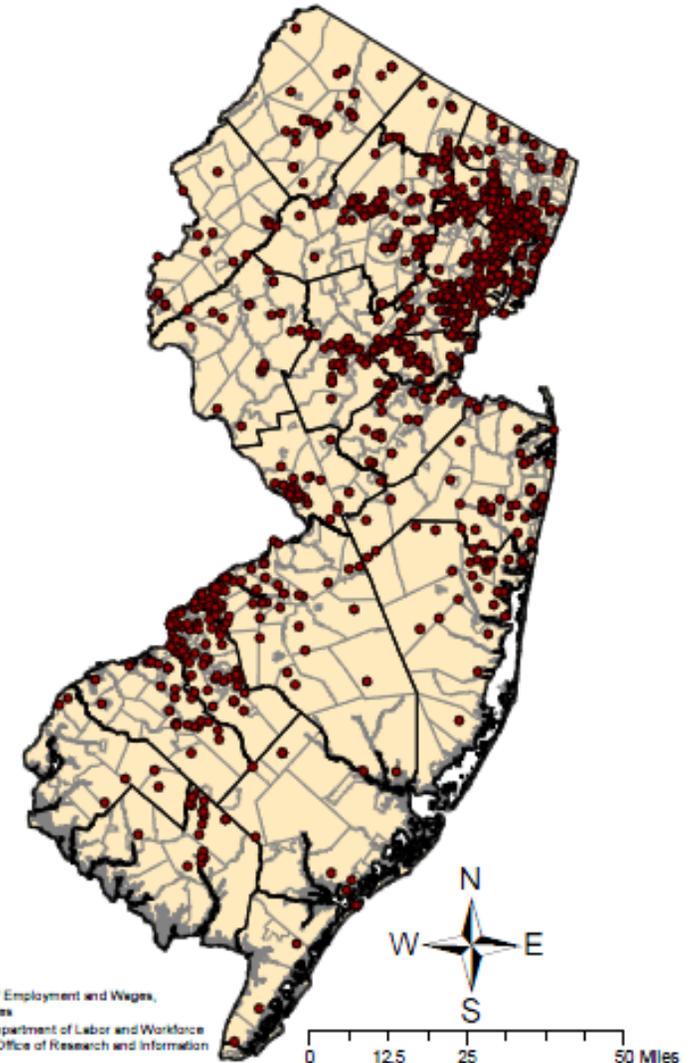
Fabricated Metal Product Manufacturing

Fabricated Metal Manufacturing Establishments
New Jersey: 2013

	Establishments	Employment	Employment Per Establishment
2008	1,398	26,172	19
2013	1,195	21,775	18
Change	-203	-4,397	-1

Fabricated metal product manufacturing lost the most establishments from 2008-2013

Most of the establishments classified in this industry are smaller shops who predominantly operate in a support capacity to other types of manufacturers in the state and region



Source: NJLWD, Quarterly Census of Employment and Wages, Annual Average
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

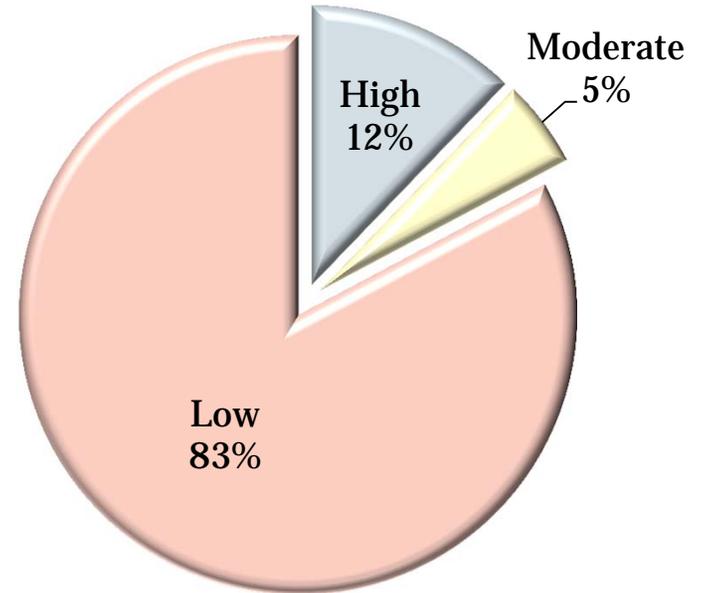
Source: Quarterly Census of Employment and Wages,
2013 Annual Averages
Prepared by: New Jersey Department of Labor and Workforce
Development, Office of Research and Information
December, 2014

Occupations requiring **high levels of education** for entry make up 12 percent of computer and electronic product manufacturing. Only 8 percent require at least a bachelor's degree.

Roughly 5 percent have **moderate education** requirements. Production supervisors and maintenance and repair work primarily make up this group.

The remaining 83 percent of the workforce require only **a high school education or less**.

Minimum Educational Requirements



Top Ten Occupations in Fabricated Metal Product Manufacturing

Occupation	2013 Employment	Education Requirement	2013 Average Wage
Machinists	1,740	High school diploma or equivalent	\$ 46,730
Cutting, Punching, and Press Machine Operators	1,380	High school diploma or equivalent	\$ 29,870
Supervisors of Production Workers	1,090	Postsecondary non-degree award	\$ 63,370
Welders, Cutters, Solderers, and Brazers	870	High school diploma or equivalent	\$ 43,790
Computer-Controlled (CNC) Machine Tool Operators	830	High school diploma or equivalent	\$ 43,880
Team Assemblers	540	High school diploma or equivalent	\$ 27,840
Wholesale Sales Representatives	520	High school diploma or equivalent	\$ 77,410
Inspectors, Testers, Sorters, Samplers, and Weighers	500	High school diploma or equivalent	\$ 37,840
Sheet Metal Workers	480	High school diploma or equivalent	\$ 57,740
Coating, Painting, and Spraying Machine Operators	470	High school diploma or equivalent	\$ 36,590

Although many of the occupations on this list require only a high school education, most require a great amount of skill and experience to excel

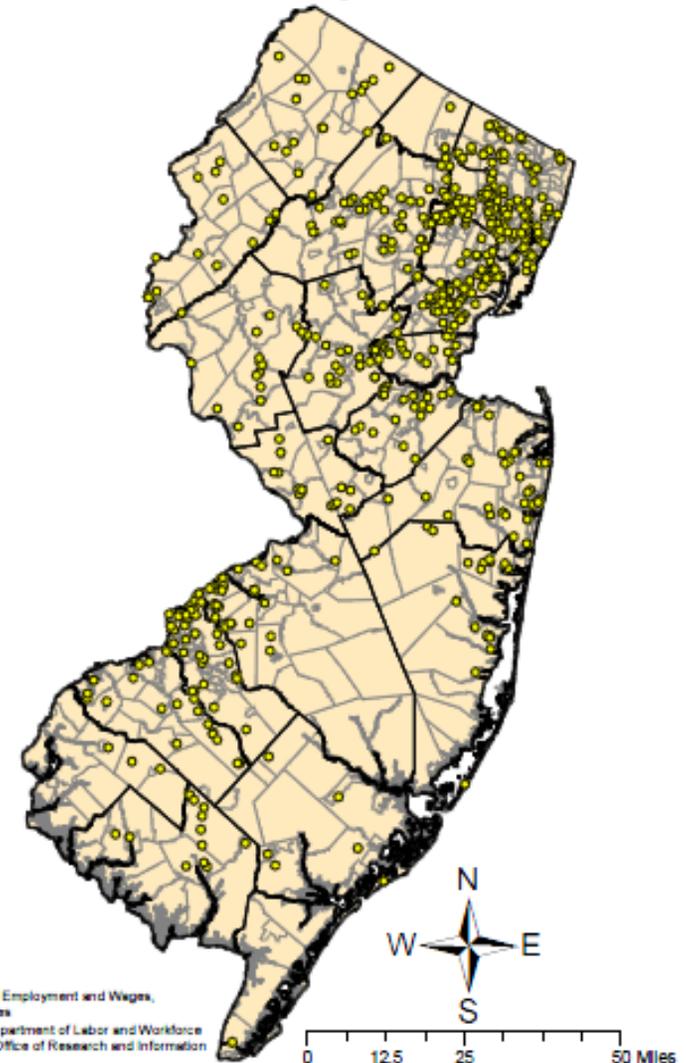
Machinery Manufacturing

**Machinery Manufacturing Establishments
New Jersey: 2013**

	Establishments	Employment	Employment Per Establishment
2008	856	16,379	19
2013	717	14,138	20
Change	-139	-2,241	1

Employment declined at the slowest rate among the four components from 2008-2013, roughly 2.9 percent per year

Similar to primary metal fabrication, many of the establishments in this component are relatively small and dispersed throughout the state, have less popularity or name recognition, and more commonly serve their local area instead of a broader market



Source: NJLWD, Quarterly Census of Employment and Wages, Annual Average
Prepared by: New Jersey Department of Labor and Workforce Development
December, 2014

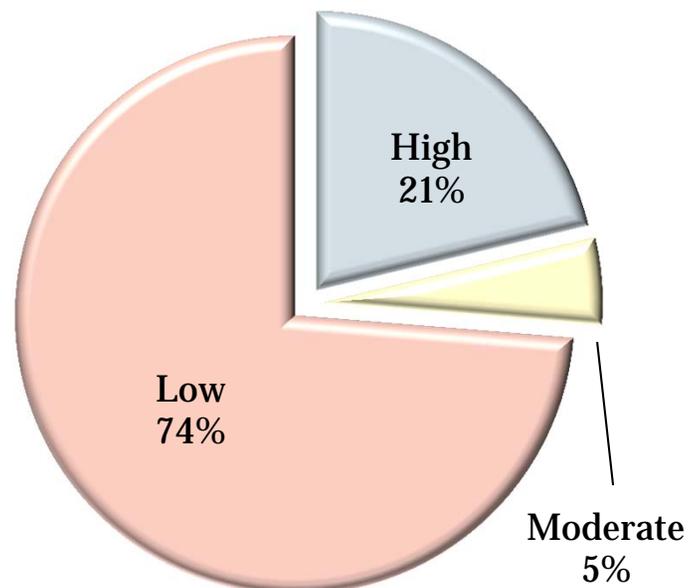
Source: Quarterly Census of Employment and Wages,
2013 Annual Averages
Prepared by: New Jersey Department of Labor and Workforce
Development, Office of Research and Information
December, 2014

Occupations requiring **high levels of education** for entry make up 21 percent of machinery manufacturing. Most of this group are classified as either engineering or computer occupations.

Nearly 5 percent have **moderate education** requirements. Production supervisors primarily make up this group.

The remaining 74 percent of the workforce require only **a high school education or less**.

Minimum Educational Requirements



Top Ten Occupations in Machinery Manufacturing

Occupation	2013 Employment	Education Requirement	2013 Average Wage
Machinists	1,000	High school diploma or equivalent	\$ 46,730
Team Assemblers	850	High school diploma or equivalent	\$ 27,840
Supervisors of Production Workers	590	Postsecondary non-degree award	\$ 63,370
Computer-Controlled (CNC) Machine Tool Operators	410	High school diploma or equivalent	\$ 43,880
Wholesale Sales Representatives	390	High school diploma or equivalent	\$ 77,410
Engine and Other Machine Assemblers	390	High school diploma or equivalent	\$ 36,060
Mechanical Engineers	380	Bachelor's degree	\$ 89,390
Electromechanical Equipment Assemblers	310	High school diploma or equivalent	\$ 36,040
Industrial Production Managers	280	Bachelor's degree	\$ 119,740
Shipping, Receiving, and Traffic Clerks	280	High school diploma or equivalent	\$ 33,480

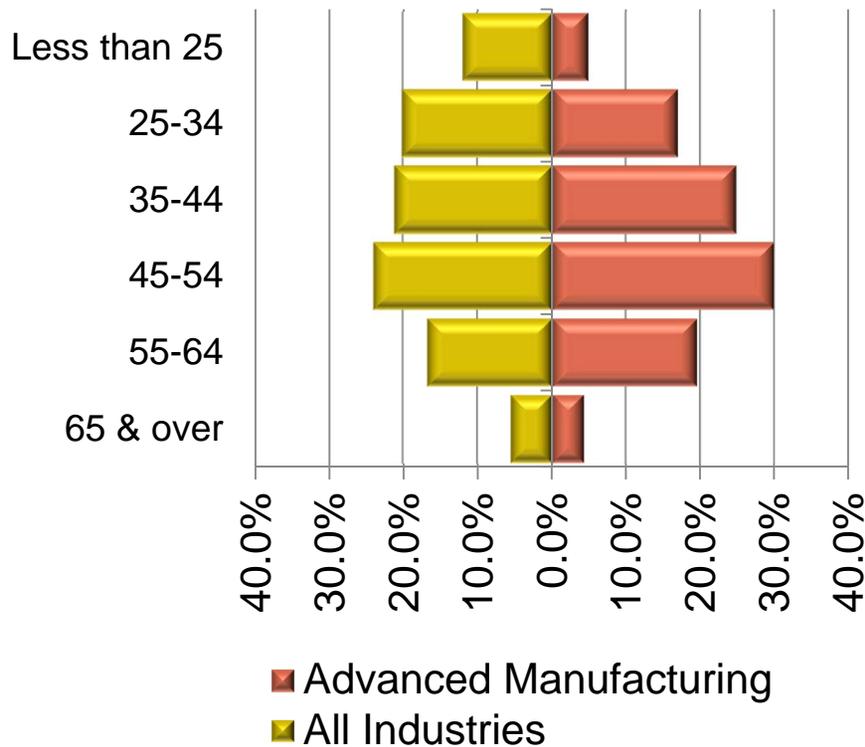
Many of the occupations on this list have low *minimum* educational and training requirements for entry, but are filled by workers with vast levels of experience

Advanced Manufacturing

Demographic profile

The age breakdown of NJ residents working in the advanced manufacturing industries differs significantly from the overall economy

Age Breakdown of Workers in Advanced Manufacturing Industry New Jersey, 2013



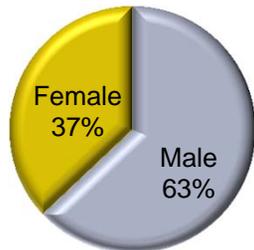
Only 5 percent of the workforce is under 25 years of age compared to almost 12 percent overall

Advanced manufacturing's workforce is very middle-aged heavy, with nearly 55 percent of all workers compared to about 45 percent overall

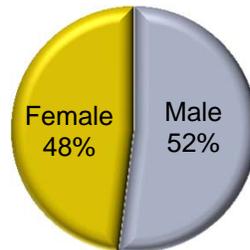
There is a greater proportion of the workforce aged 55 and older in advanced manufacturing compared to the overall economy, 24 and 22 percent, respectively

Gender, racial, and ethnic profile of New Jersey residents working in advanced manufacturing industries.

Advanced Manufacturing



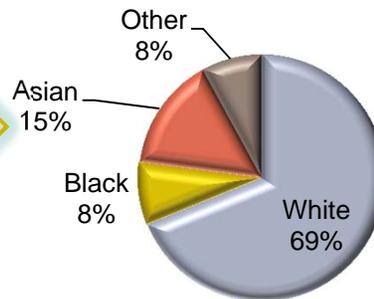
All Industries



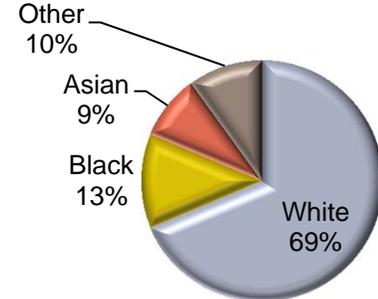
The advanced manufacturing workforce is predominantly male

The Asian population makes up a larger portion of the advanced manufacturing workforce than the overall economy

Advanced Manufacturing

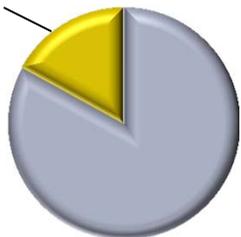


All Industries

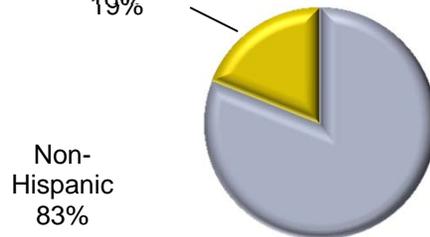


The Hispanic population is slightly less among advanced manufacturing industries

Advanced Manufacturing



All Industries



Advanced Manufacturing

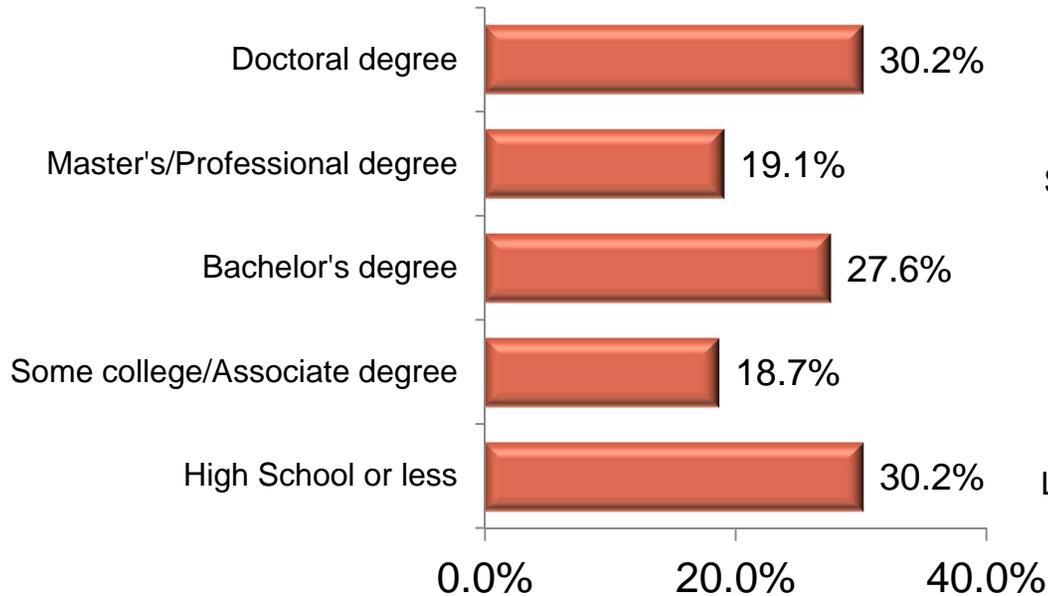
All Industries

Self-reported educational attainment and average wage of NJ residents in the advanced manufacturing workforce

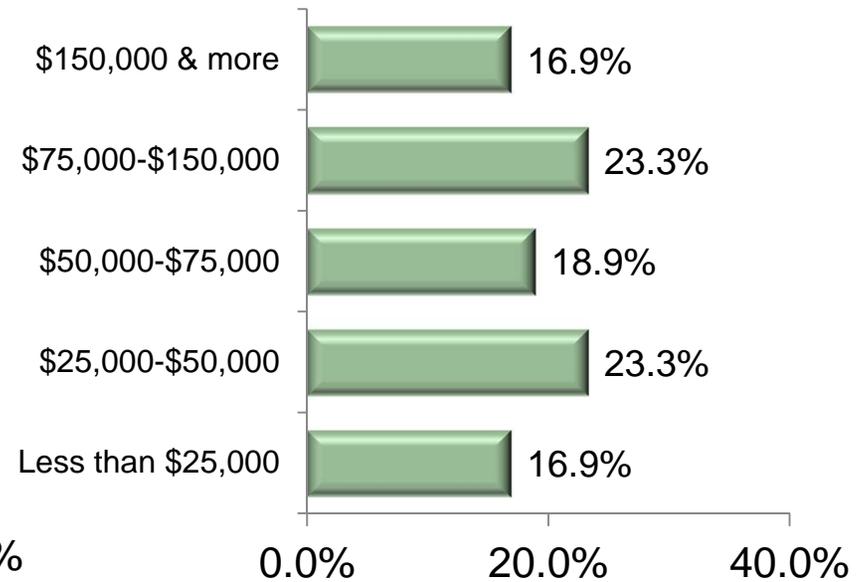
More than 50 percent of the workforce reported that they have earned at least a bachelor's degree, while...

...nearly 60 percent of the workforce claimed to have earned wages above \$50,000

Education Level



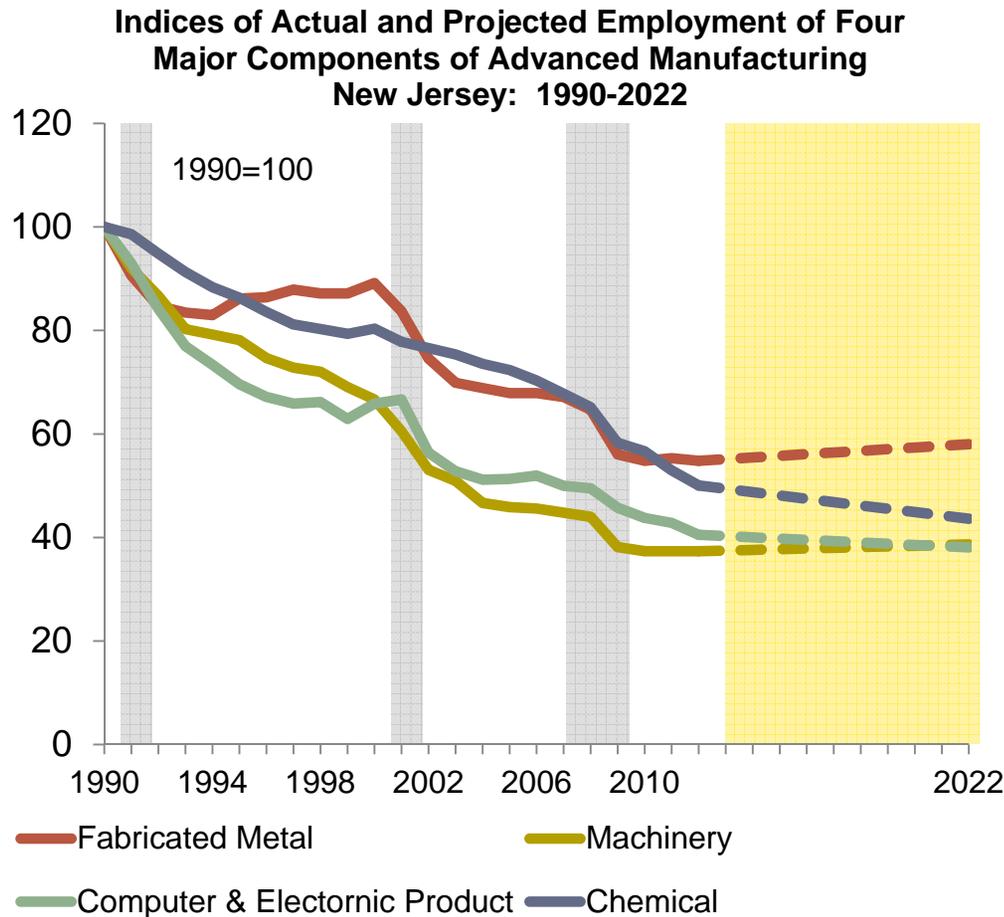
Average Wage



Advanced Manufacturing

Outlook

The employment losses experienced by the four major components of advanced manufacturing are projected to stabilize



Each of the four components have experienced fairly deep losses overall, with recessionary periods being particularly acute

Fabricated metal and chemical manufacturing has retained the greatest portion of its employment since 1990

Machinery and fabricated metal manufacturing employment is projected to increase slightly through 2022, while chemical and computer and electronic product manufacturing is expected to continue their decline, albeit at a much slower pace

Yellow area denotes projected period from 2012-2022

Shaded areas indicate recessionary periods as determined by the National Bureau of Economic Research

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