

# Manufacturing

## A Susquehanna Region Industry Brief

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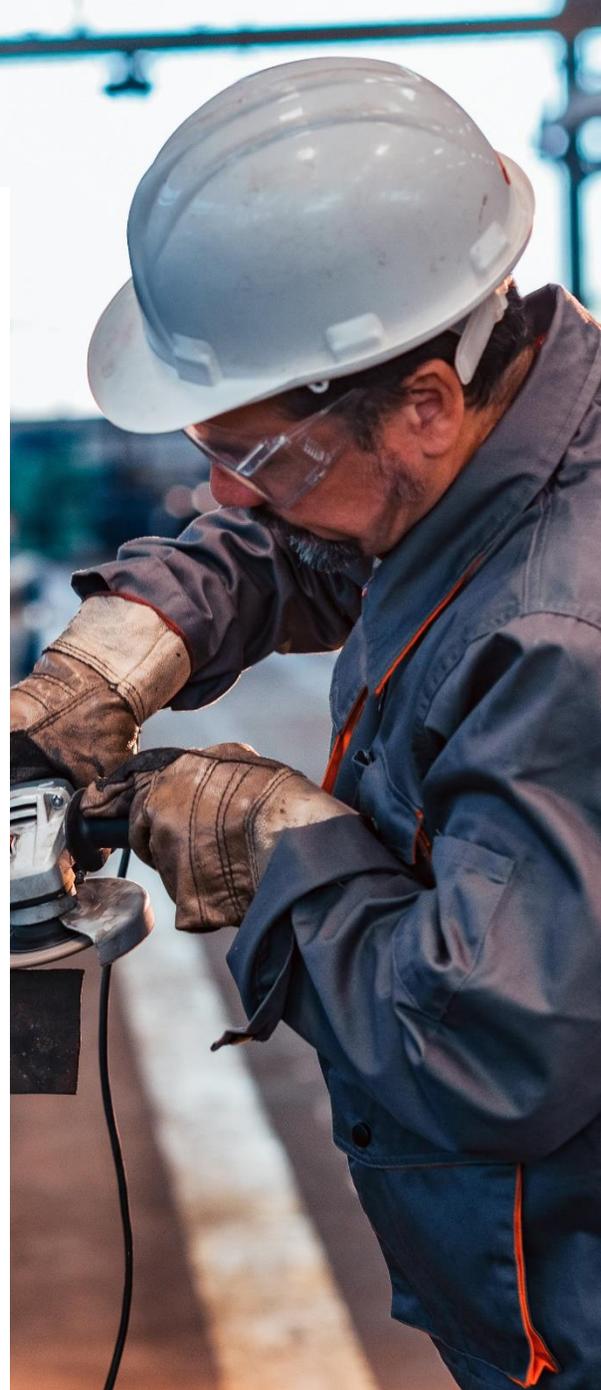
JUNE 2020

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Sage Policy Group, Inc.

Submitted to:

The Susquehanna Workforce Network



# Manufacturing: A Susquehanna Region Industry Brief

## Executive Summary

### Background

U.S. manufacturing output is at least 5 percent greater than it was in 2000, but has become less labor intensive and more capital intensive over time. Accordingly, despite the growth in production, there are far fewer manufacturing workers overall, with approximately 7.5 million jobs lost in the U.S. since 1980.<sup>1</sup>

The shift toward more capital-intensive processes also means that today's manufacturing workers are more likely to have at least some college education than their counterparts of years past. It also creates a new set of opportunities for higher wage, higher value added work.

Many policymakers, educators, and jobseekers have discounted manufacturing as a driver of economic growth and opportunity because of its perceived decline. As indicated by an MIT Work for the Future Initiative, the “digital era has catalyzed labor market polarization – that is the simultaneous growth of high-education high-wage and low-education/low-wage jobs at the expense of middle-skill jobs.”<sup>2</sup>

But middle-income manufacturing positions are set to return to America in abundance. Even prior to the recent spate of trade disputes between the U.S. and China, a growing share of production was shifting back to America as CEOs sought to minimize supply chain disruptions, become less exposed to spikes in transportation costs, and better protect intellectual property.

Analysis by economists at the National Bureau of Economic Research found that job opening rates in the U.S. manufacturing sector nearly doubled between 2001 and 2017, from 1.8 percent to 3.1 percent. The authors of the study suggest that this increase in job openings is due to a skills mismatch — the gap between the skills workers have and the skills employers need — causing job vacancies to remain unfilled for lengthier periods.<sup>3</sup> For those who supply workforce development

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<sup>1</sup> U.S. Bureau of Labor Statistics, “The fall of employment in the manufacturing sector”, by Richard Hernandez, August 2018. <https://www.bls.gov/opub/mlr/2018/beyond-bls/the-fall-of-employment-in-the-manufacturing-sector.htm>.

<sup>2</sup> MIT Work of the Future Initiative, Fall 2019.

<sup>3</sup> U.S. Bureau of Labor Statistics, “The fall of employment in the manufacturing sector”, by Richard Hernandez, August 2018. <https://www.bls.gov/opub/mlr/2018/beyond-bls/the-fall-of-employment-in-the-manufacturing-sector.htm>.

services, including SWN, this represents an important emerging opportunity to help improve business outcomes while expanding household prosperity.

### Findings

This industry brief addresses the following questions:

1. What are the realistic growth prospects for manufacturing employment in the Susquehanna region?
2. To what extent is there evidence of inadequate human capital supply now and into the future with respect to regional manufacturing?
3. What does an individual need to do to access manufacturing opportunities and are those opportunities available within the confines of the Susquehanna region?

Sage concludes that the Susquehanna region could experience significant demand for skilled manufacturing workers in the future, particularly if: a) more investment is made in generating machinists, welders, software engineers, mechanics and other professionals relevant to modern manufacturing and b) if the State of Maryland strives to improve the local business climate.

Sage further concludes that there is evidence of inadequate human capital supply presently and that the gaps between skills demand and supply will climb absent intervention. The data indicate that over time it has become increasingly difficult for the region's manufacturers to fill available job openings. Finally, Sage concludes that there are already opportunities, especially at local two-year colleges to prepare oneself for manufacturing positions that already exist in the Susquehanna region.

### Recommendations

Sage recommends that:

1. **SWN maintain its partnership with HCC** to support entry-level manufacturing workers as well as on-the-job training. Given the economic dislocations caused by the COVID 19-induced recession, it should become easier to attract more participants into SWN programs targeting manufacturing.
2. **SWN consider expanding its role at Cecil College.** Cecil County has experienced more rapid growth in manufacturing employment than has Harford County, and that may continue given the lower cost of land there and available industrial zoning.
3. **SWN strive to expose more high school juniors and seniors to career path opportunities** across industries, ensuring that manufacturing is well-represented in any materials developed toward this end.

## I. Industry Overview

*Industry/Sector Definition.* The manufacturing sector is part of the goods-producing industries super-sector. The manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products.

Establishments in the manufacturing sector are often described as plants, factories, or mills. Manufacturing establishments characteristically use power-driven machines and materials-handling equipment. Establishments that transform materials or substances into new products by hand or in a worker's home, or those engaged in selling products made on the same premises from which they are sold, such as bakeries, candy stores, and custom tailors, may also be included in this sector.

Manufacturing establishments may process materials or may contract with other establishments to process their materials for them. Both types of establishments are considered part of the manufacturing sector. Similarly, the product of a manufacturing establishment may be a finished product (finished good) ready for utilization or consumption, or it may be a semi-finished product set to become an input (intermediate good) for an establishment engaged in additional value added manufacturing.

In addition to activities traditionally associated with manufacturing, manufacturing establishments often perform one or more activities that are classified outside the manufacturing sector of NAICS. For example, almost all manufacturing enterprises have some captive R&D and administrative operations such as management, accounting, and/or payroll. These activities are treated as captive manufacturing activities except when such services are provided to manufacturers by separate establishments such as accounting firms and/or law firms.<sup>4</sup>

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<sup>4</sup> U.S. Census Bureau. *North American Industry Classification System*. <https://www.census.gov/eos/www/naics/>.

*Key Subsectors/Industries.* Manufacturing subsectors generally reflect distinct production processes related to material inputs, production equipment, and employee skills.

The manufacturing sector consists of these subsectors:

- *Food Manufacturing (NAICS 311)*
- *Beverage and Tobacco Product Manufacturing (NAICS 312)*
- *Textile Mills (NAICS 313)*
- *Textile Product Mills (NAICS 314)*
- *Apparel Manufacturing (NAICS 315)*
- *Leather and Allied Product Manufacturing (NAICS 316)*
- *Wood Product Manufacturing (NAICS 321)*
- *Paper Manufacturing (NAICS 322)*
- *Printing and Related Support Activities (NAICS 323)*
- *Petroleum and Coal Products Manufacturing (NAICS 324)*
- *Chemical Manufacturing (NAICS 325)*
- *Plastics and Rubber Products Manufacturing (NAICS 326)*
- *Nonmetallic Mineral Product Manufacturing (NAICS 327)*
- *Primary Metal Manufacturing (NAICS 331)*
- *Fabricated Metal Product Manufacturing (NAICS 332)*
- *Machinery Manufacturing (NAICS 333)*
- *Computer and Electronic Product Manufacturing (NAICS 334)*
- *Electrical Equipment, Appliance, and Component Manufacturing (NAICS 335)*
- *Transportation Equipment Manufacturing (NAICS 336)*
- *Furniture and Related Product Manufacturing (NAICS 337)*
- *Miscellaneous Manufacturing (NAICS 339)<sup>5</sup>*

Nationally, the industry group that represents the largest portion of manufacturing employment is transportation equipment manufacturing (NAICS 336), which accounts for a bit more than 13 percent of total sector employment. Food manufacturing (NAICS 311) represents nearly 13 percent of sector employment and fabricated metal product manufacturing (NAICS 332) represents 11.6 percent of total manufacturing employment. Rounding out the top 5 manufacturing industries are machinery manufacturing (NAICS 333 -- 8.8% of manufacturing employment) and computer and electronic product manufacturing (NAICS 334 -- 8.3%). The top 5 manufacturing industries represent more than half of total manufacturing employment in the U.S., each employing more than 1 million people as indicated by Exhibit 1.

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<sup>5</sup> U.S. Census Bureau. *North American Industry Classification System*. <https://www.census.gov/eos/www/naics/>.

Exhibit 1. U.S. Manufacturing Employment by Industry Group, 2018

Industry Group	Employment (000s)	% of Total
Transportation Equipment Manufacturing	1,702.4	13.4%
Food Manufacturing	1,619.8	12.8%
Fabricated Metal Product Manufacturing	1,466.8	11.6%
Machinery Manufacturing	1,120.1	8.8%
Computer and Electronic Product Manufacturing	1,055.4	8.3%
Chemical Manufacturing	837.8	6.6%
Plastics and Rubber Products Manufacturing	730.9	5.8%
Miscellaneous Manufacturing	607.9	4.8%
Printing and Related Support Activities	430.9	3.4%
Nonmetallic Mineral Product Manufacturing	414.9	3.3%
Wood Product Manufacturing	406.4	3.2%
Electrical Equipment, Appliance, and Component Manufacturing	399.0	3.1%
Furniture and Related Product Manufacturing	394.6	3.1%
Primary Metal Manufacturing	378.0	3.0%
Paper Manufacturing	366.9	2.9%
Beverage and Tobacco Product	272.8	2.1%
Textile Mills and Textile Product Mills	228.9	1.8%
Apparel, Leather and Allied Product Manufacturing	139.6	1.1%
Petroleum and Coal Products Manufacturing	115.6	0.9%
<b>Total Manufacturing</b>	<b>12,688.7</b>	<b>100.0%</b>

Source: U.S. Bureau of Labor Statistics, *Employment Projections — 2018-2028*; Sage.

Nationwide manufacturing employment is expected to contract 0.5 percent annually, or by more than 640,000 positions from 2018 to 2028. This is a pre-COVID 19 projection. Within the sector, only beverage and tobacco product manufacturing and food manufacturing employment are expected to expand.

Manufacturing industries expected to decline the most in terms of employment include computer and electronic products manufacturing (-122,800 jobs), printing and related support activities manufacturing (-84,500 jobs), and machinery manufacturing (-62,600 jobs).<sup>6</sup> Technological advancements are expected to be significant driver of the decline in manufacturing employment, particularly production jobs as many processes become computer-controlled.

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<sup>6</sup> U.S. Bureau of Labor Statistics. *Employment Projections — 2018-2028*. <https://www.bls.gov/emp/>.

*Key Occupations.* Though there are stereotypical images of manufacturing workers, who are often visualized in assembly line settings, there are a myriad of different occupational categories and skill sets implicated by the sector. Below are some brief descriptions:

- *Production workers* help to make a product according to design specifications, conducting tasks such as operating machinery, overseeing product quality, or packaging and preparing finished goods for shipping. Many production worker positions are susceptible to automation.
- *Transportation and material moving workers* handle products and raw materials and help to move them from one location — such as a shipping and receiving area, loading dock, or warehouse — to another. The demand for workers to do heavy lifting inside factories continues to diminish with the increased use of technology.
- *Office and administrative support workers* answer phones, process orders, and perform clerical tasks. One of the largest occupations in this group is shipping, receiving, and traffic clerks. Job growth for this occupation, however, is expected to be limited as automation and the increased use of radiofrequency identification (RFID) tags help workers track incoming and outgoing shipments more quickly and efficiently.
- *Science, technology, engineering and mathematics workers* are frequently involved at the earliest stages of manufacturing when product design is being developed or improved. These workers may also help design the machines, robots, and other technologies used in factories. Employment in these types of activities is expected to expand going forward.
- *Management and business and financial operations workers* plan and oversee manufacturing operations. Occupations in this category are often highly compensated and include general and operations managers and industrial production managers.
- *Installation, maintenance, and repair workers* keep production equipment and machinery, as well as facilities themselves, functioning properly. As a result of the increased use of automated processes, maintenance and repair work of machinery will remain an important manufacturing component though associated skills will continue to evolve.
- *Sales workers* interact with existing and prospective customers to help market manufactured products to wholesalers, retailers, and consumers.<sup>7</sup>

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<sup>7</sup> U.S. Bureau of Labor Statistics, “Got skills? Think manufacturing” by Elka Torpey. June 2014. <https://www.bls.gov/careeroutlook/2014/article/manufacturing.htm>.

Exhibit 2 supplies statistical detail regarding the top 10 major occupational groups representing the most employment in manufacturing in the U.S. as of 2019. Production occupations account for more than half of manufacturing jobs. Transportation and material moving occupations and office and administrative support occupations represent the next largest occupational groups followed by the categories that includes engineering and management, respectively. Together these top 5 occupation groups account for nearly 80 percent of industry employment.

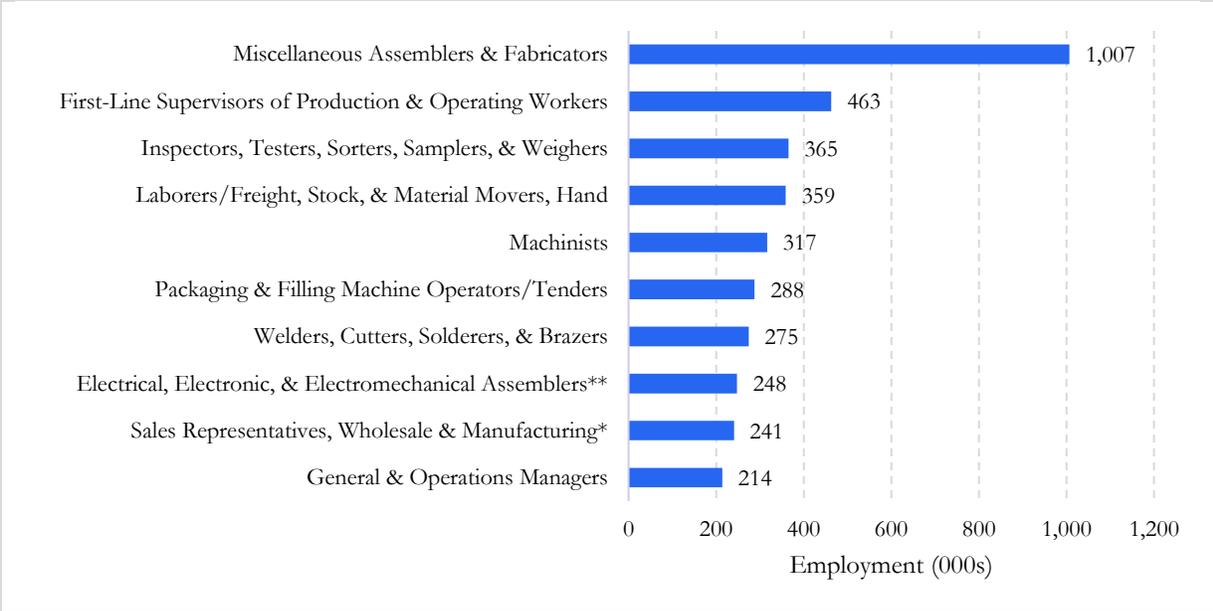
Exhibit 2. U.S. Manufacturing Employment by Top 10 Major Occupation Groups, May 2019

Occupation Group	% of Industry Employment
Production Occupations	50.9%
Transportation and Material Moving Occupations	8.6%
Office and Administrative Support Occupations	8.1%
Architecture and Engineering Occupations	6.5%
Management Occupations	5.7%
Installation, Maintenance, and Repair Occupations	5.1%
Business and Financial Operations Occupations	4.1%
Sales and Related Occupations	3.4%
Computer and Mathematical Occupations	2.4%
Construction and Extraction Occupations	1.6%
All Other Occupation Groups	3.6%

Source: U.S. Bureau of Labor Statistics, *Occupational Employment Statistics (OES)*; Sage.

Exhibit 3 reflects U.S. employment in the largest detailed occupations in the manufacturing sector. Seven of the 10 detailed occupations are considered production occupations. Sales representatives and general/operations managers are also among the top 10 occupations employed in manufacturing.

Exhibit 3. Largest Occupations in U.S. Manufacturing, May 2019



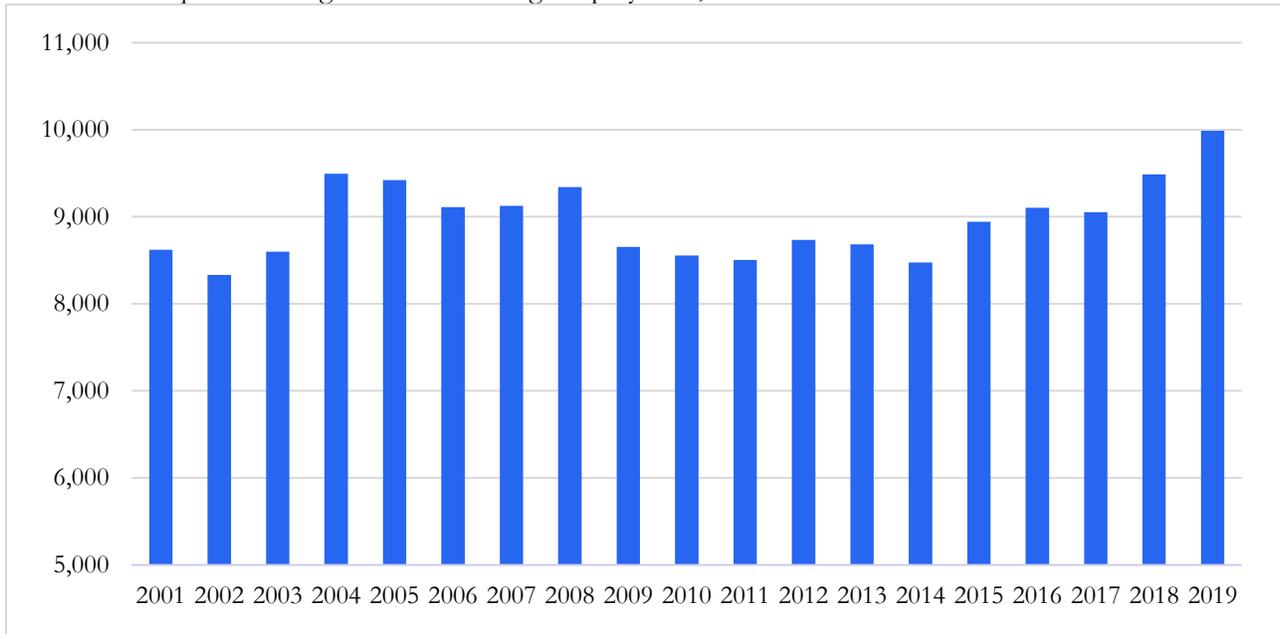
Source: U.S. Bureau of Labor Statistics, *Occupational Employment Statistics (OES)*; Sage.  
 Notes: \*Except Technical and Scientific Products \*\*Except Coil Winders, Tapers, and Finishers.

## II. Manufacturing in the Susquehanna Region

Like many American communities, the Susquehanna region experienced declines in manufacturing employment over time. That pattern has shifted markedly more recently, however.

Between 2004 and 2014, regional manufacturing employment declined from nearly 9,500 positions to fewer than 8,500 positions. However, roughly half of this loss was recovered in 2015 itself. Since 2014, manufacturing employment in the Susquehanna region has expanded at an impressive average annual rate of 3.3 percent or by more than 1,500 positions.

Exhibit 4. Susquehanna Region Manufacturing Employment, 2001-2019



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW) program; Sage. Notes: 1. Data are not seasonally adjusted (NSA).

Further growth could be ahead, COVID-19 notwithstanding. Once the economy begins to recover in earnest from the pandemic, another source of jobs will begin impacting America profoundly – the reshoring of manufacturing from China and perhaps other low cost countries (LCCs). Parts of the global supply chain that left America have been coming back more forcefully over the past decade, and that will continue.

According to the Reshoring Initiative, 2018 experienced the 2<sup>nd</sup> highest annual rate on record for combined reshoring and related foreign direct investment (FDI) announcements, resulting in the addition of more than 145,000 jobs in the U.S. This brings the total number of announced manufacturing jobs brought to the U.S. from offshore to over 757,000 since the manufacturing employment low of 2010. In 2018 the number of companies reporting new reshoring and FDI was at the highest level in history, up 38 percent from 2017 to 1,389 companies.

FDI continues to exceed reshoring in terms of total jobs added, but reshoring has continued to close the gap since 2015. Furthermore, reshoring has been progressing at a similar rate as FDI since 2016,

suggesting that U.S. headquartered companies are starting to understand the same benefit to U.S. production that foreign companies have understood over the last few years.<sup>8</sup>

The Kearney Reshoring Index provides further evidence of rising reshoring activity. The index recently revealed a dramatic reversal of a 5-year trend as domestic U.S. manufacturing in 2019 commanded a rising share versus 14 Asian low-cost countries (LCCs) tracked in their study, with manufacturing imports from China registering a particularly sharp decline.

In 2019 U.S. imports of manufactured goods from Asian LCCs declined 7.2 percent, while U.S. domestic output of manufactured goods was virtually unchanged from 2018, resulting in the first reduction in the manufacturing import ratio (MIR) since 2011. Last year (2019) saw companies actively adapting to what then felt like a major disruption — the U.S.–China trade war — by reducing imports of manufactured goods from China while increasing manufacturing imports from the other countries in the Asia LCC sample as well as from Mexico.<sup>9</sup>

To date, reshoring activity has been concentrated in certain regions/states. The Southeast and Texas get the most and, on average, the largest reshoring/FDI projects. This is presumably due to right-to-work laws and typically lower property costs, wage rates, taxes and energy costs.

The Midwest, led by Michigan (also right-to-work), is second based on reshoring to its strong industrial base. From 2010-2018, 58 percent of total jobs due to reshoring/FDI was in the South, 21 percent was in the Midwest, 10 percent was in the Northeast, and 10 percent was in the West.

Maryland ranks relatively low among the states in terms of reshoring activity; 40<sup>th</sup> in terms of jobs from reshoring/FDI from 2010-2018. That ranks Maryland, with a population of approximately 6 million, just behind 39<sup>th</sup> Rhode Island, with a population a bit above 1 million.<sup>10</sup>

Maryland is therefore far from being a leader in attracting reshored jobs. There is a significant amount of repositioning in which Maryland must engage if it is to take full advantage of this emerging megatrend.

A company's decision to reshore can be encouraged through favorable business conditions, a skilled workforce, and incentives encouraging innovative manufacturing practices. There are opportunities for the private sector, various levels of government, and partnerships between the two to create an environment supporting reshoring.<sup>11</sup>

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<sup>8</sup> The Reshoring Initiative, 2018 Data Report.

<sup>9</sup> Kearney Reshoring Index

<sup>10</sup> The Reshoring Initiative, 2018 Data Report.

<sup>11</sup> International Economic Development Council (IEDC), "Defining the Reshoring Discussion".

For SWN, this creates many opportunities to help Maryland position itself for rapid growth in manufacturing employment. This is really a chicken-and-egg challenge. Leaders at local two-year colleges and among other stakeholders may wonder why significant investments should be made in programs when the associated manufacturing positions don't yet exist. But for those jobs to come to Maryland, there needs to be a ready, properly credentialed workforce. In northeast Maryland, SWN will need to coordinate the actions of various stakeholders to create a new equilibrium – one in which manufacturers reshoring to the U.S. consider Maryland as a realistic option.

Among the International Economic Development Council's (IEDC) recommendations for public efforts to encourage reshoring are increased federal investment in R&D, greater investment in broadband infrastructure, and education. The IEDC outlines three pillars of focus for encouraging reshoring:

*Innovate: Focus should be on building the vibrancy of the critical advanced manufacturing industry sector;*  
*Deepen: U.S. must strengthen the depth of the nation's regional advanced industry ecosystems;*  
*Collaborate: Governments, companies, and individuals to work collectively to rebuild the nation's local skills pools, industrial innovation capacity, and supply chains.<sup>12</sup>*

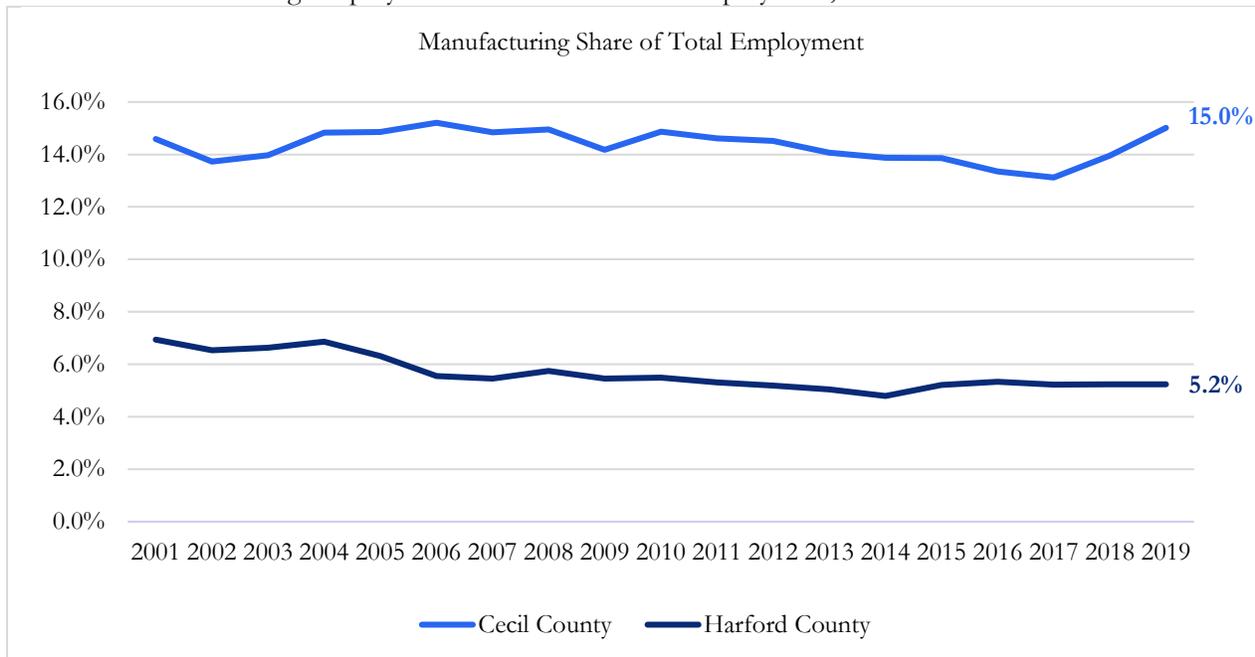
Despite a relative lack of reshoring in Maryland, manufacturing already exists as an important source of economic opportunity in the Susquehanna region. In 2019, manufacturing represented 7.8 percent of total regional employment.

Exhibit 5 indicates that manufacturing is much more concentrated in Cecil County as a share of total employment than in Harford County. In Cecil County, manufacturing represents 15 percent of total employment, compared to just 5 percent of total employment in Harford County. As a share of total *private* employment, manufacturing accounts for 18.6 percent in Cecil County and 6.7 percent in Harford County.

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<sup>12</sup> International Economic Development Council (IEDC), "Defining the Reshoring Discussion".

Exhibit 5. Manufacturing Employment as a Share of Total Employment, 2001-2019



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW) program; Sage. Notes: 1. Data are not seasonally adjusted (NSA).

Manufacturing employment has grown much more quickly in the Susquehanna region than in the state of Maryland as a whole. Between 2014 and 2019 manufacturing employment expanded at an average annual rate of 3.3 percent in the Susquehanna region, compared to growth rate of 1.7 percent statewide. Even prior to that, when manufacturing contracted substantially between 2009 and 2014, manufacturing contracted far less in the Susquehanna region than in the balance of the state.

Exhibit 6. Recent Growth in Manufacturing Employment, Maryland v. Susquehanna Region

	Employment			Net Growth		CAGR	
	2009	2014	2019	2009-2014	2014-2019	2009-2014	2014-2019
Maryland	118,658	103,431	112,270	-15,227	8,839	-2.7%	1.7%
Susquehanna WIA	8,654	8,475	9,988	-179	1,513	-0.4%	3.3%
Cecil County, MD	4,282	4,252	5,013	-30	761	-0.1%	3.3%
Harford County, MD	4,372	4,223	4,975	-149	752	-0.7%	3.3%

Source: U.S. Bureau of Labor Statistics; Quarterly Census of Employment and Wages (QCEW) program; Sage. Notes: 1. Data are not seasonally adjusted (NSA).

The leading manufacturing segment in the region is plastics & rubber products manufacturing, a reflection of the presence of W.L. Gore & Associates and its estimated 2,400 positions in Cecil County. This single employer is responsible for nearly a quarter of all manufacturing employment in the Susquehanna region. Other large manufacturers include Northrop Grumman Innovation Systems (formerly Orbital ATK) and Terumo Medical Products in Cecil County and Frito-Lay in Harford County.

The second largest manufacturing industry in the Susquehanna region is food manufacturing, employing more than 1,000 people, followed by fabricated metal product manufacturing and miscellaneous manufacturing, each employing more than 900 workers. Exhibit 7 supplies relevant statistical detail.

Exhibit 7. Susquehanna Region Manufacturing Employment by Detailed Industry, 2019Q2

Industry	Stable Employment
Plastics & Rubber Products Manufacturing*	2,925
Food Manufacturing*	1,138
Fabricated Metal Product Manufacturing	982
Miscellaneous Manufacturing	978
Transportation Equipment Manufacturing*	638
Computer & Electronic Product Manufacturing*	577
Chemical Manufacturing*	568
Machinery Manufacturing	342
Printing & Related Support Activities	252
Nonmetallic Mineral Product Manufacturing	228
Wood Product Manufacturing	110
Beverage & Tobacco Product Manufacturing	86
Furniture & Related Product Manufacturing	25
Electrical Equipment, Appliance, & Component Manufacturing	9
Textile Product Mills*	8
Textile Mills	N/A
Leather & Allied Product Manufacturing	N/A
Petroleum & Coal Products Manufacturing	N/A
Primary Metal Manufacturing	N/A

Source: U.S. Bureau of Labor Statistics, LED Extraction Tool - Quarterly Workforce Indicators (QWI); Sage.

Notes: 1. Data are not seasonally adjusted (NSA). 2. Employment figures are the number of stable jobs: the number of jobs that are held on both the first and last day of the quarter with the same employer. 3. Some manufacturing industries are not represented above because the U.S. Bureau of Labor Statistics suppresses figures when they do not meet US Census Bureau publication standards. \*Data for these industries may be distorted/fuzzed.

The same four manufacturing industries that represent the majority of sectoral employment in the region represent the majority of sectoral establishments, though not in the same order. As of 2019, there were 46 fabricated metal product manufacturing establishments, 28 plastic and rubber product manufacturing establishments, 20 miscellaneous manufacturing establishments, and 19 food manufacturing establishments. Compared to other sectors, there are relatively few establishments in manufacturing since manufacturing facilities tend to employ large numbers of people in order to reap economies of scale and move down the average cost curve.

Exhibit 8. Susquehanna Region Manufacturing Business Establishments by Detailed Industry, 2019

Industry	Total Susq. Region	
	# of Establishments	% of Total Sector Establishments
Fabricated Metal Product Manufacturing	46	19.5%
Plastics and Rubber Products Manufacturing	28	11.9%
Miscellaneous Manufacturing	20	8.5%
Food Manufacturing	19	8.1%
Printing and Related Support Activities	17	7.2%
Machinery Manufacturing	17	7.2%
Beverage and Tobacco Product Manufacturing	15	6.4%
Computer and Electronic Product Manufacturing	15	6.4%
Nonmetallic Mineral Product Manufacturing	13	5.5%
Wood Product Manufacturing	9	3.8%
Chemical Manufacturing	9	3.8%
Furniture and Related Product Manufacturing	9	3.8%
Textile Product Mills	5	2.1%
Transportation Equipment Manufacturing	4	1.7%
Electrical Equipment, Appliance, and Component Manufacturing	3	1.3%
All Other Manufacturing Industries	7	3.0%
<b>Total Manufacturing</b>	<b>236</b>	<b>100.0%</b>

Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW) program; Sage. Notes: 1. Data are not seasonally adjusted (NSA).

There are a number of reasons that communities around the nation continue to focus upon manufacturing despite the large-scale loss of employment over time and the expectation that global competition and automation will likely continue to drive job totals lower. One is that people are instinctively aware that manufacturing represents a source of wealth creation.

In a purely service-oriented environment, wealth can only be transferred from one economic actor (the consumer) to another (the service providers). It is only through the translation of inputs (that have little value merely as inputs) into outputs (which often have great value) that actual wealth is created and this only occurs in a handful of segments, including manufacturing, construction, mining/energy, and agriculture.

Moreover, wages are higher in manufacturing than in most other industries. This is certainly true in the Susquehanna region, where the average annual wage in manufacturing is nearly 40 percent higher than across all industries. Within manufacturing, the highest wages are in the computer and electronic products (average annual wage in excess of \$100,000/annum), transportation equipment (nearly \$93,000), chemicals (\$91,500), and plastic/rubber products (nearly \$86,000).

Exhibit 9. Average Wages in the Susquehanna Workforce Region for Select Industries, 2019Q3

Industry	Avg. Hourly Wage*	Avg. Weekly Wage	Avg. Annual Wage*
All Industries	\$25.70	\$1,028	\$53,456
All Manufacturing	\$35.93	\$1,437	\$74,724
Computer and Electronic Product Manufacturing	\$49.70	\$1,988	\$103,376
Transportation Equipment Manufacturing	\$44.60	\$1,784	\$92,768
Chemical Manufacturing	\$44.00	\$1,760	\$91,520
Plastics and Rubber Products Manufacturing	\$41.30	\$1,652	\$85,904
Miscellaneous Manufacturing	\$34.23	\$1,369	\$71,188
Fabricated Metal Product Manufacturing	\$30.60	\$1,224	\$63,648
Electrical Equipment, Appliance, and Component Manufacturing	\$30.35	\$1,214	\$63,128
Nonmetallic Mineral Product Manufacturing	\$29.28	\$1,171	\$60,892
Food Manufacturing	\$26.13	\$1,045	\$54,340
Machinery Manufacturing	\$25.28	\$1,011	\$52,572
Furniture and Related Product Manufacturing	\$23.75	\$950	\$49,400
Wood Product Manufacturing	\$23.45	\$938	\$48,776
Printing and Related Support Activities	\$21.55	\$862	\$44,824
Textile Product Mills	\$13.00	\$520	\$27,040
Beverage and Tobacco Product Manufacturing	\$10.63	\$425	\$22,100

Source: Maryland Workforce Exchange, Labor Market Statistics, Covered Employment and Wages Program; Sage.

\*Assumes a 40-hour week worked year round. \*\*Wage data not available for the following manufacturing industries: Apparel Manufacturing, Leather and Allied Product Manufacturing, Paper Manufacturing, Petroleum and Coal Products Manufacturing, Primary Metal Manufacturing, Textile Mills.

### III. Looking Ahead: Meeting Future Demands in Manufacturing

This industry brief addresses the following questions:

1. What are the realistic growth prospects for manufacturing employment in the region?
2. To what extent is there evidence of inadequate human capital supply now and into the future with respect to regional manufacturing?
3. What does an individual need to do to access manufacturing opportunities and are those opportunities available within the confines of the Susquehanna region?

1. What are the realistic growth prospects for **manufacturing** employment in the region?

- Projected Employment Growth in Key Industries and Occupations

Projections produced by the Office of Workforce Information and Performance (OWIP), a component of Maryland’s Department of Labor, indicate that Susquehanna regional manufacturing industries are expected to expand employment 0.8 percent annually between 2016 and 2026. This is equivalent to the collective pace of growth across all industries.

Within manufacturing, food manufacturing is expected to expand fastest; 4.5 percent annually. This segment is forecast to account for 64 percent of all new manufacturing jobs in the region.

Employment in several manufacturing categories is anticipated to contract, including in transportation equipment, wood products, computer and electronic products, nonmetallic mineral products, and miscellaneous manufacturing. These projections do not embody considerations related to COVID-19.

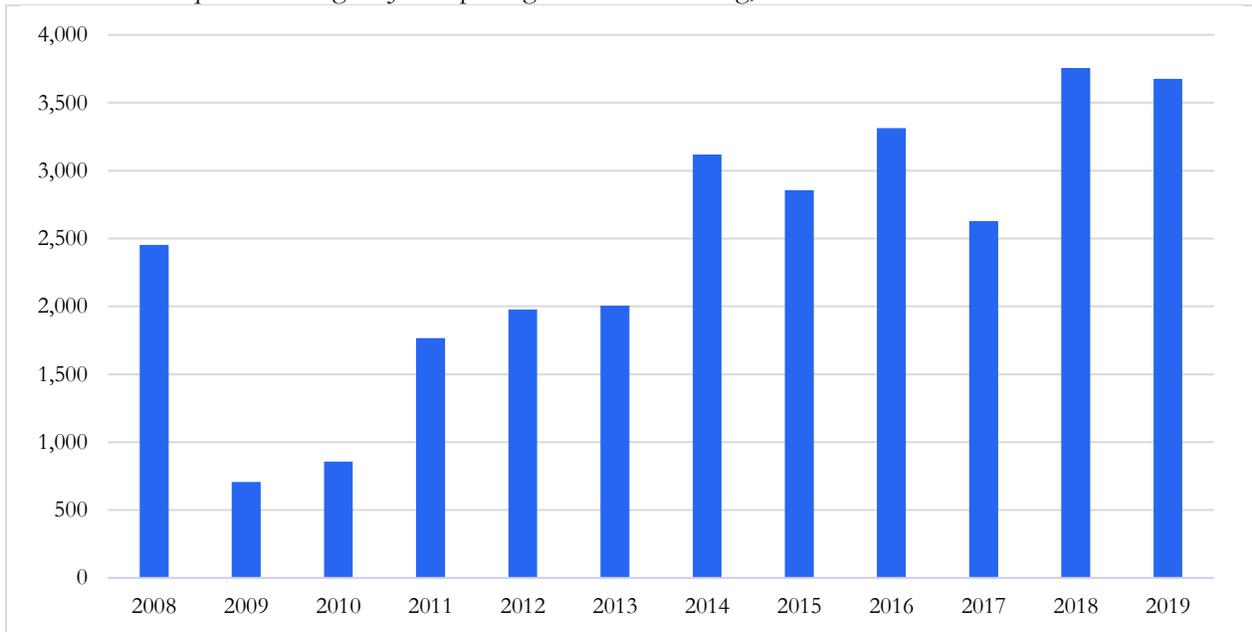
Exhibit 10. Susquehanna Region – Projected Employment Growth in Select Industries, 2016-2026

Industry	2016	2026	2016-2026	
			Total Growth	Annual % Growth
<b>ALL INDUSTRIES</b>	<b>130,904</b>	<b>141,205</b>	<b>10,301</b>	<b>0.8%</b>
<b>Manufacturing</b>	<b>9,200</b>	<b>9,994</b>	<b>794</b>	<b>0.8%</b>
Food Manufacturing	914	1,425	511	4.5%
Plastics and Rubber Products Manufacturing	2,823	3,011	188	0.6%
Fabricated Metal Product Manufacturing	958	1,022	64	0.6%
Chemical Manufacturing	800	853	53	0.6%
Machinery Manufacturing	349	372	23	0.6%
Primary Metal Manufacturing	287	306	19	0.6%
Printing and Related Support Activities	278	296	18	0.6%
Leather and Allied Product Manufacturing	99	106	7	0.7%
Beverage and Tobacco Product Manufacturing	113	117	4	0.3%
Wood Product Manufacturing	69	67	-2	-0.3%
Transportation Equipment Manufacturing	509	498	-11	-0.2%
Nonmetallic Mineral Product Manufacturing	253	235	-18	-0.7%
Miscellaneous Manufacturing	869	845	-24	-0.3%
Computer and Electronic Product Manufacturing	776	736	-40	-0.5%

Source: Maryland Department of Labor, Licensing and Regulation (DLLR), Workforce Region Industry Projections; Sage.

Exhibit 11 indicates the number of job openings in the Susquehanna region in manufacturing posted online on the Maryland Workforce Exchange from 2008-2019. While the number of job openings declined slightly in 2019, job postings have generally been increasing since 2009. Job postings in 2019 were more than 5 times higher than in 2009, which represented the worst period for manufacturing hiring in recent memory.

Exhibit 11. Susquehanna Region Job Openings in Manufacturing, 2008-2019



Source: Maryland Workforce Exchange: Labor Market Information (Job Source: Online advertised jobs data); Sage. Notes: 1. The table shows the number of job openings advertised online in the Susquehanna Workforce Region (Jobs De-duplication Level 2). 2. Jobs De-duplication Level 2: high level de-duplication of advertised job openings (for statistical analysis).

More than 40 percent of the 3,600+ openings registered in 2019 were for positions in the miscellaneous manufacturing industry (1,577 positions advertised throughout the year) and nearly a quarter of openings were for positions in computer and electronic product manufacturing (908 positions). There were more than 500 openings posted throughout the year for jobs in plastics and rubber products manufacturing and more than 230 openings in food manufacturing.

To the extent that SWN maintains/develops programs and partnerships pertinent to manufacturing, electronics, rubber/plastics, and food processing should serve as focal points. As the data immediately below indicate, transportation equipment may emerge as another significant source of opportunity despite the fact that some projections indicate that this segment will not add jobs on net.

Exhibit 12. Susquehanna Region Job Openings: Manufacturing Job Openings by Top Detailed Industries in 2019

Industry	Job Openings
Miscellaneous Manufacturing	1,577
Computer and Electronic Product Manufacturing	908
Plastics and Rubber Products Manufacturing	503
Food Manufacturing	235
Transportation Equipment Manufacturing	141
Chemical Manufacturing	111
Beverage and Tobacco Product Manufacturing	80
Nonmetallic Mineral Product Manufacturing	38
Fabricated Metal Product Manufacturing	26
Printing and Related Support Activities	26
All Other Manufacturing Industries	32

Source: Maryland Workforce Exchange, Labor Market Information. Job Source: Online advertised jobs data; Sage. Notes: 1. The table shows the number of job openings advertised online in the Susquehanna Workforce Region in 2019 (Jobs De-duplication Level 2). 2. Jobs De-duplication Level 2: high level de-duplication of advertised job openings (for statistical analysis).

Exhibit 13 reflects the ten leading manufacturing-related occupations by projected growth in absolute terms between 2016 and 2026 in the Susquehanna region. In absolute terms, positions for hand laborers and freight/stock/material movers are expected to expand the most, by more than 700 positions over the course of a decade or the equivalent of 1.9 percent annually. Positions in the industrial truck and tractor operators' category are expected to grow with particular rapidity in percentage terms.

Exhibit 13. Susquehanna Region – Projected Employment Growth in Select Detailed Occupations, 2016-2026

Occupations	2016	2026	2016-2026	
			Total Growth	Annual % Growth
<b>ALL OCCUPATIONS</b>	<b>130,904</b>	<b>141,202</b>	<b>10,298</b>	<b>0.8%</b>
<b>OCCUPATIONS LIKELY TO BE EMPLOYED IN MANUFACTURING*</b>				
Hand Laborers and Freight, Stock, and Material Movers	3,445	4,156	711	1.9%
General and Operations Managers	2,032	2,187	155	0.7%
Industrial Truck and Tractor Operators	440	572	132	2.7%
General Maintenance and Repair Workers	1,194	1,324	130	1.0%
Heavy and Tractor-Trailer Truck Drivers	1,543	1,669	126	0.8%
Shipping, Receiving, and Traffic Clerks	908	1,014	106	1.1%
Industrial Machinery Mechanics	433	501	68	1.5%
Customer Service Representatives	635	692	57	0.9%
Hand Packers and Packagers	432	486	54	1.2%
Industrial Engineers	467	513	46	0.9%

Source: Maryland Department of Labor, Licensing and Regulation (DLLR), Workforce Region Occupational Projections; Sage. Notes: \*Top 10 growing occupations in the Susquehanna region out of the 50 occupations representing the largest share of manufacturing (NAICS 31-33) employment nationwide in 2019.

Exhibit 14 details the number of Susquehanna regional job openings in manufacturing related occupations in 2019. There were more than 500 job openings posted on the Maryland Workforce Exchange for industrial truck and tractor operators in the Susquehanna region throughout the year and another 500 job postings for hand laborers/movers.

Many of the occupations listed below are considered production occupation, transportation and material moving occupations, or installation, maintenance, and repair occupations. There are also management, office and administrative support, and sales occupations on the list of manufacturing-related job openings. Many of the job openings germane to physical production are associated with hourly compensation rates in the range of \$15-\$23/hour.

Exhibit 14. Susquehanna Region Job Openings: Select Manufacturing Related Occupations, 2019

Occupation Title	Job Openings	Mean Annual Wage
Industrial Truck and Tractor Operators	541	\$31,369
Hand Laborers and Freight, Stock, and Material Movers	508	\$30,893
General and Operations Managers	286	\$75,629
First-Line Supervisors of Production and Operating Workers	205	\$62,942
Inspectors, Testers, Sorters, Samplers, and Weighers	163	\$33,578
Software Quality Assurance Engineers and Testers	157	N/A
Machinists	122	N/A
General Office Clerks	106	\$27,386
Shipping, Receiving, and Traffic Clerks	94	\$32,110
General Maintenance and Repair Workers	87	\$45,518
Helpers--Production Workers	87	\$25,325
Industrial Engineers	54	N/A
Welders, Cutters, and Welder Fitters	40	N/A
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	38	N/A
Industrial Machinery Mechanics	18	N/A

Source: Maryland Workforce Exchange: Labor Market Information (Wage Data Source: Labor Market Statistics, Occupational Employment Statistics & Wages Program; Job Source: Online advertised jobs data); Sage. Notes: 1. The table shows the number of job openings advertised online in the Susquehanna Workforce Region in 2019 (Jobs De-duplication Level 2). 2. Jobs De-duplication Level 2: high level de-duplication of advertised job openings (for statistical analysis). \*Occupations with the most job openings in the Susquehanna region out of the 20 occupations representing the largest share of manufacturing (NAICS 31-33) employment nationwide in 2019.

2. To what extent is there evidence of inadequate human capital supply now and into the future with respect to regional **manufacturing**?

According to data from the U.S. Census Bureau, more than 8,700 people worked in manufacturing in the Susquehanna region in 2017, including people who do not live in the region. There were more than 10,000 residents of the Susquehanna region working in manufacturing, some of whom commute outside of the region to work. This is an indication that the Susquehanna region already has the workforce capacity to embrace more manufacturing activity within its boundaries. But this presumes that the skill sets offered by people living within the region fit neatly with current and future employer requirements.

The more than 8,700 regional manufacturing jobs represent 8.5 percent of regional employment. The more than 10,000 residents who hold manufacturing jobs represent 6.6 percent of the total number of employed residents. This is largely a reflection of the fact that Cecil and Harford counties jointly export many workers each day to denser portions of their respective metropolitan areas.

Manufacturing is relatively more concentrated in Cecil County. Manufacturing has an employment location quotient of 1.77 in Cecil County and an employment location quotient of 0.61 in Harford County (a reading of 1 means that an industry is no more or no less represented in a region than in the U.S. as a whole as a fraction of total employment).<sup>13,14</sup>

Exhibit 15. Susquehanna Region Manufacturing Employment: Work v. Home Area, 2017

Industry	Work Area	Home Area
Manufacturing	8,764	10,095
All Industries	102,610	152,822

Source: U.S. Census Bureau. Longitudinal-Employer Household Dynamics Program, OnTheMap Application; Sage.  
 Notes: 1. Numbers represent *primary* jobs, not total jobs. Primary Jobs: Public and private-sector jobs, one job per worker. A primary job is the highest paying job for an individual worker. 2. Job figures presented are for the Susquehanna Workforce Investment Area (WIA), which is comprised of Cecil County and Harford County.

<sup>13</sup> As of 2019Q4.

<sup>14</sup> U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW) program.

Exhibit 16 supplies statistical detail regarding the characteristics of regional manufacturing workers. Manufacturing employees are predominately male (68%). Nearly 30 percent of manufacturing employees in the region are at least 55 years old. This means that a significant number of manufacturing job openings will result from elevated rates of retirement.

Just under 30 percent of manufacturing workers have only a high school diploma, while another nearly 30 percent have some college/associate’s degree. Nearly a quarter have a bachelor’s or advanced degree. In general, manufacturing has come to be associated with rising levels of educational attainment, a reflection of advancing technologies and the growing role of robotics, computing, 3D printing, artificial intelligence, etc. Another way to consider this is to note that manufacturing has become far more capital intensive and less labor intensive over time<sup>15</sup>

Exhibit 16. Characteristics of Manufacturing Industry Employees in the Susquehanna Region, 2019Q2

	# of Employees	% of Total
<b>TOTAL EMPLOYEES</b>	9,351	100.0%
<b>SEX</b>		
Male	6,348	67.9%
Female	3,003	32.1%
<b>AGE</b>		
<19	37	0.4%
19-24	577	6.2%
25-34	1,903	20.4%
35-44	1,758	18.8%
45-54	2,321	24.8%
55-64	2,301	24.6%
65+	453	4.8%
<b>RACE</b>		
White Alone	7,383	79.0%
Black or African American Alone	1,441	15.4%
All Other	527	5.6%
<b>ETHNICITY</b>		
Hispanic or Latino	426	4.6%
Not Hispanic or Latino	8,925	95.4%
<b>EDUCATION LEVEL</b>		
Less than high school	1,015	10.9%
High school or equivalent, no college	2,741	29.3%
Some college or Associate degree	2,731	29.2%
Bachelor’s degree or advanced degree	2,249	24.1%
Educational attainment NA*	614	6.6%

Source: U.S. Census Bureau, LED Extraction Tool - Quarterly Workforce Indicators (QWI); Sage. Notes: 1. Data are not seasonally adjusted (NSA). 2. Employment figures are the number of stable jobs: the number of jobs that are held on both the first and last day of the quarter with the same employer. \*Educational attainment not available—workers aged 24 or younger.

<sup>15</sup> U.S. Bureau of Labor Statistics, “The fall of employment in the manufacturing sector”, by Richard Hernandez, August 2018. <https://www.bls.gov/opub/mlr/2018/beyond-bls/the-fall-of-employment-in-the-manufacturing-sector.htm>.

Historically, one of manufacturing’s principal features is that it has provided middle income opportunities for those who lack substantial formal educational attainment. To a certain extent, that is still the case, but less so since: 1) the number of manufacturing jobs is not as elevated as it once was and 2) emerging technologies and processes have created relatively greater demand for highly educated workers.

As indicated by Exhibit 17, approximately 55 percent of jobseekers across all industries in the Susquehanna region lack a bachelor’s degree. This means that there is significant potential to either induce more people to enter relevant programming at local 2-year colleges, or to create separate credentialing opportunities that are relevant to manufacturers in search of human capital.

Exhibit 17. Education & Work Experience of Available Candidates in the Susquehanna Region, all Industries (as of 5/27/2020)

Education Level	# of Potential Candidates	% of Total Candidates
Less than High School	350	2.1%
High School Diploma or Equivalent	5,794	34.2%
Vocational School Certificate	1,580	9.3%
Associate’s Degree	1,747	10.3%
Bachelor’s Degree	4,766	28.2%
Master’s Degree	2,166	12.8%
Doctorate Degree	417	2.5%
Specialized Degree (e.g. MD, DDS)	105	0.6%
<b>Total</b>	<b>16,925</b>	<b>100.0%</b>
Work Experience	# of Potential Candidates	% of Total Candidates
Less than 1 year	1,789	9.0%
1-2 Years	747	3.7%
2-5 Years	2,200	11.0%
5-10 Years	3,262	16.3%
More than 10 Years	11,957	59.9%
<b>Total</b>	<b>19,955</b>	<b>100.0%</b>

Source: Maryland Workforce Exchange; Labor Market Information (Candidate Source: Individuals with active resumes in the workforce system); Sage. Notes: 1. Jobs De-duplication Level 2: high level de-duplication of advertised job openings (for statistical analysis).

Exhibit 18 compares numbers of online job postings with candidates with active resumes in the Maryland Workforce Exchange for manufacturing related occupations in the region as of late May 2020. While this represents only a snapshot in time, it supplies some sense of the scale of the demand for workers in the sector as well as the supply of candidates.

According to these data, there is an ample number of candidates per job opening in most occupational categories. Including candidates willing to work anywhere in the state, there is more than one candidate per available job opening in all ten of the manufacturing-related occupations listed below. In late May, there were nearly 10 candidates per job opening in the category of general and operations managers, the highest ratio of candidates to openings among the occupations listed below. The category with the fewest candidates per opening was industrial truck and tractor trailer operators, in which there were only 1.7 candidates per job opening.

As is often the case, data indicate that the majority of jobseekers are not firmly tied to the Susquehanna region. Ostensibly, these people are willing to work anywhere in Maryland and perhaps outside of Maryland as well. For example, there were 223 candidates seeking customer service representative positions in the Susquehanna region only, but another 656 candidates were willing to work anywhere in Maryland.

Exhibit 18. Susquehanna Region Job Openings & Candidates for Select Manufacturing Related Occupations\*, as of 5/27/2020

Occupation Title	Job Openings	Potential Candidates		Candidates Per Job Opening	
		Only Looking in Susq.	Willing to Work Anywhere in MD	Only Looking in Susq.	Willing to Work Anywhere in MD
Customer Service Representatives	129	223	879	1.7	6.8
Stock Clerks & Order Fillers	84	159	462	1.9	5.5
Industrial Truck & Tractor Operators	51	53	84	1.0	1.7
Hand Laborers/Freight, Stock, & Material Movers	50	119	330	2.4	6.6
Heavy and Tractor-Trailer Truck Drivers	46	65	255	1.4	5.5
General and Operations Managers	38	114	372	3.0	9.8
First-Line Supervisors of Production & Operating Workers	36	26	71	0.7	2.0
First-Line Supervisors of Office & Administrative Support Workers	17	26	93	1.5	5.5
Shipping, Receiving, & Traffic Clerks	16	20	56	1.3	3.5
General Maintenance & Repair Workers	42	100	350	2.38	8.33

Source: Maryland Workforce Exchange: Labor Market Information (Wage Data Source: Labor Market Statistics, Occupational Employment Statistics & Wages Program; Candidate Source: Individuals with active resumes in the workforce system; Job Source: Online advertised jobs data); Sage. Notes: 1. Jobs De-duplication Level 2: high level de-duplication of advertised job openings (for statistical analysis). \*Occupations with the most job openings in the Susquehanna region out of the 50 occupations representing the largest share of manufacturing (NAICS 31-33) employment nationwide in 2019.

Based on this assessment, the lack of qualified manufacturing workforce persisted into 2020. While there are facially sufficient numbers of jobseekers, these jobseekers frequently lack the skills necessary to take on the requirements of open positions. Historically, many have not been able to pass a drug test, an imperative for anyone working with or around large-scale equipment.

This is nothing new. In a 2017 Sage study on behalf of the Susquehanna Workforce Network (SWN), local manufacturers reported great difficulty securing properly credentialed and trainable workers.

3. What does an individual need to do to access **manufacturing** job opportunities and are those opportunities available within the confines of the Susquehanna region?

Exhibit 19 details entry level educational levels, training, and experience required for the top 10 manufacturing-related occupations associated with the most expected growth in the Susquehanna region from 2016-2026. Three of these 10 occupations require no formal educational credential and only some short-term on-the-job training. This includes: 1. hand laborers/freight, stock, and material movers; 2. industrial truck and tractor operators; and 3. hand packers and packagers.

Four of the occupations require a high-school diploma or equivalency and a more substantial level of on-the-job training. This group includes: 1. general maintenance and repair workers; 2. shipping, receiving, and traffic clerks; 3. industrial machinery mechanics; and 4. customer service representatives. One occupation requires a post-secondary non-degree award (heavy and tractor trailer truck drivers) and two occupations require a bachelor’s degree (general/operations managers and industrial engineers).

Exhibit 19. Education Requirements in Top 10 Manufacturing Related Occupations with the Most Projected Growth in the Susquehanna Region

Occupation	2019 Median Pay (U.S.)	Entry Level Education	Work Experience in a Related Occup.	On-the-job Training	Licenses/Cert. Required
Hand Laborers/Freight, Stock, and Material Movers	\$28,710	No Formal Educ. Credential	None	Short-term OTJ Training	CDL required in some positions
General and Operations Managers	\$104,690	Bachelor's Degree	5 years or more	None	Not required except for in some types of work
Industrial Truck and Tractor Operators	\$35,850	No Formal Educ. Credential	None	Short-term OTJ Training	Not required except for in some types of work
General Maintenance and Repair Workers	\$39,080	HS Diploma or Equivalent	None	Moderate-term OTJ Training	Not required except for in some types of work
Heavy and Tractor-Trailer Truck Drivers	\$45,260	Postsecondary Non-degree Award	None	Short-term OTJ Training	CDL
Shipping, Receiving, and Traffic Clerks	\$30,010	HS Diploma or Equivalent	None	Short-term OTJ Training	None
Industrial Machinery Mechanics	\$52,860	HS Diploma or Equivalent	None	Long-term OTJ Training	None
Customer Service Representatives	\$34,710	HS Diploma or Equivalent	None	Short-term OTJ training	Not required except for in some types of work
Hand Packers and Packagers	\$28,710	No Formal Educ. Credential	None	Short-term OTJ Training	CDL required in some positions
Industrial Engineers	\$88,020	Bachelor's Degree	None	None	Not required for entry-level positions, may be pursued later in career

Source: U.S. Bureau of Labor Statistics, *Occupational Outlook Handbook*; Maryland Department of Labor, Licensing and Regulation (DLLR), Workforce Region Occupational Projections; Sage. Notes: \*Top 10 growing occupations in the Susquehanna region out of the 50 occupations representing the largest share of manufacturing (NAICS 31-33) employment nationwide in 2019.

Exhibit 20 lists certification requirements associated with Susquehanna regional job postings on the Maryland Workforce Exchange related to manufacturing as of April 2020. Many of the certifications pertain to information technology, cybersecurity, and/or computer networks. This neatly reflects the shift in manufacturing toward computer-controlled automated processes that have rendered the industry increasingly capital intensive.

Exhibit 20. Susquehanna Region Advertised Jobs During the Month of April 2020  
 Certification Requirements for Manufacturing Job Openings

Rank	Certification	Certification Category
1	Project Management Institute (PMI) Certifications	Business Planning
2	Cisco Professional Certifications	Computer Network
3	(ISC) Certifications	Information & Cyber Security
4	CompTIA Certifications	Information Technology
5	GIAC Security Certifications - Cyber Defense	Information & Cyber Security
6	Cisco Associate Certifications	Computer Network
7	GIAC Security Certifications - Penetration Testing	Information & Cyber Security
8	Cisco Security Certifications	Information & Cyber Security
9	Information Systems Audit & Control Association (ISACA)	Information & Cyber Security
10	Commercial Driver's License (CDL)	Ground Transportation

Source: Maryland Workforce Exchange, Labor Market Information. Job Source: Online advertised jobs data; Sage. Notes: 1. The table shows the top advertised certifications found in job openings advertised online in Susquehanna Workforce Region (Jobs De-duplication Level 1) 2. Jobs De-duplication Level 1: low level de-duplication of advertised job openings (more jobs).

Exhibit 21 provides a sense of the skills required in rapidly expanding manufacturing segments that are also associated with a significant fraction of total regional job openings. Basic skills such as attention to detail and problem solving are commonly at the forefront of need. Interpersonal skills like verbal communication and conflict management are also in demand. On the more technical side, there is demand for skills like hardware design, preventative maintenance, regulatory compliance, and root cause analysis.

Exhibit 21. Susquehanna Region Job Skills Requirements in the Top 3 Manufacturing Subsectors  
 With the Most Job Openings During the Month of April 2020

Skill Rank	Job Skill	Skill Group
<b>Computer and Electronic Product Manufacturing</b>		
1	Attention to detail	Basic Skills
2	Problem solving	Basic Skills
3	Verbal communication skills	Interpersonal Skills
4	Self-motivated	Basic Skills
5	Hardware design	Mechanical Engineer Skills
<b>Miscellaneous Manufacturing</b>		
1	Record keeping	Bookkeeper Skills
2	Problem solving	Basic Skills
3	Conflict management	Interpersonal Skills
4	Preventative maintenance	Maintenance Technician Skills
5	Regulatory compliance	Chief Financial Officer Skills
<b>Plastics and Rubber Products Manufacturing</b>		
1	Attention to detail	Basic Skills
2	Must be flexible	Basic Skills
3	Root cause analysis	Reliability Engineer Skills
4	Problem solving	Basic Skills
5	Work independently	Basic Skills

Source: Maryland Workforce Exchange, Labor Market Information. Job Source: Online advertised jobs data; Sage. Notes: 1. The table shows the top advertised job skills found in job openings advertised online in Susquehanna Workforce Region (Jobs De-duplication Level 1) 2. Jobs De-duplication Level 1: low level de-duplication of advertised job openings (more jobs).

Exhibit 22 lists the tool/technology requirements associated with Susquehanna regional job postings on the Maryland Workforce Exchange in the three manufacturing industries with the most job opening as of April 2020. Many of the requested tools and technologies take the form of various types of software. There is also a need for workers who can operate certain tools/machinery like forklifts, ladders, and hand trucks.

Exhibit 22. Susquehanna Region Tools & Technology Requirements in the Top 3 Manufacturing Subsectors With the Most Job Openings During the Month of April 2020

Rank	Tool/Technology	Tool/Technology Group
<b>Computer and Electronic Product Manufacturing</b>		
1	Microsoft (MS) Office	Office Suite Software
2	National Instruments LabVIEW	Development Environment Software
3	C#	Object or Component Oriented Development Software
4	Microsoft PowerPoint	Presentation Software
5	Oscilloscopes	Oscilloscopes
<b>Miscellaneous Manufacturing</b>		
1	Microsoft (MS) Office	Office Suite Software
2	Forklift	Forklifts
3	Eye protection	Safety Glasses
4	Microsoft PowerPoint	Presentation Software
5	Hand Truck	Hand Trucks or Accessories
<b>Plastics and Rubber Products Manufacturing</b>		
1	Structured query language (SQL)	Database User Interface and Query Software
2	Forklift	Forklifts
3	Ladders	Ladders
4	Microsoft (MS) Office	Office Suite Software
5	Templates	Templates

Source: Maryland Workforce Exchange, Labor Market Information. Job Source: Online advertised jobs data; Sage. Notes: 1. The table shows the top advertised job skills found in job openings advertised online in Susquehanna Workforce Region (Jobs De-duplication Level 1) 2. Jobs De-duplication Level 1: low level de-duplication of advertised job openings (more jobs).

It is worth noting that many manufacturing positions have little to do with actual production. Some require facility with software, others with the capacity to conduct market research, basic accounting or inventory management. These are likely the types of skills that require a degree of formal education, perhaps at a two-year institution. Cecil College and Harford Community College (HCC) offer a number of relevant programs, including in welding, forklift operations, and heavy equipment

operations.<sup>16,17</sup> Both schools offer commercial driver's license (CDL) training. HCC also offers a basic machine manufacturing technology certificate program.<sup>18</sup>

Notably, HCC operates the Entry Level Manufacturing Training Program in conjunction with SWN, which prepares students to be entry-level manufacturing technicians. The Susquehanna Manufacturing Coalition has approved this training.

This program targets those who will ultimately perform regular and routine preventive maintenance on the equipment used in manufacturing processes. Classes include Math for Manufacturing, Basic Machining, and Basic Electricity. Program entry requirements include only that one possesses a 10<sup>th</sup> grade reading level, be at least 18, and have the benefit of reliable transportation. The program can be completed in just 8 weeks, which represents one of its principal advantages.<sup>19</sup>

SWN has also organized a customized cohort training of SWN's Manufacturing Training Program at HCC, which encompasses more than the Entry Level Manufacturing Training Program. The complete initiative also includes On-the-Job Training opportunities, incumbent worker training and skills training through various existing programs offered by several suppliers of training.

Skills training takes place in the context of activities identified by area manufacturers as representing sources of human capital need. These initiatives have collectively resulted in the training of 129 participants, 70 of whom were new entrants to manufacturing.<sup>20</sup> There has been occasional difficulty identifying enough people to populate training sessions. But given the economic dislocations triggered by COVID-19, demand for this type of training should be more apparent going forward.

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<sup>16</sup> Cecil College. *Workforce Training-Skilled Trades*. <https://www.cecil.edu/programs-courses/career-community-education/workforce-training/skilled-trades>.

<sup>17</sup> Harford Community College. *Community Education, Business & Applied Technology*. <http://www.harford.edu/Academics/CEBAT.aspx>.

<sup>18</sup> Harford Community College. *Basic Machine Manufacturing Technology Certificate*. <http://www.harford.edu/Academics/CEBAT/construction-manufacturing-and-industry/basic-machine-manufacturing-technology-certificate.aspx>.

<sup>19</sup> Susquehanna Workforce Network. *Entry Level Manufacturing Training*. <http://www.swnetwork.org/documents/EntryLevelMfgTrainingFlyer.pdf>.

<sup>20</sup> Communications with Susquehanna Workforce Network.

## Conclusion

The number of middle-income manufacturing positions is set to expand in the United States. More corporate CEOs are seeking to: a) avoid additional supply chain disruptions; b) diminish transportation costs; c) more easily ensure quality of output; and d) better protect intellectual property. The recently ratified US-Mexico-Canada trade agreement creates even greater incentives than did NAFTA (effective 1994) to relocate production to North America, including the U.S.

Accordingly, there is an opportunity for the Susquehanna region, home to many manufacturers and a tradition of industrial production, to participate in the reshoring megatrend. In the past, manufacturing has not only lost jobs in large numbers, but there has been significant labor market polarization as technology has advanced. While automation has created many high-wage jobs, it has destroyed even more middle-income jobs while leaving behind lower-level jobs that don't directly relate to emerging technologies.

That is changing. The reshoring of significant portions of the global supply chain to America will create a new generation of opportunities in manufacturing that can propel many into the region's middle class.

Sage recommends that:

1. SWN maintain its partnership with HCC to support entry-level manufacturing workers as well as on-the-job training. Given the economic dislocations caused by the COVID 19-induced recession, it should become easier to attract more participants into SWN programs targeting manufacturing.
2. SWN consider expanding its role at Cecil College. Cecil County has experienced more rapid growth in manufacturing employment than has Harford County, and that may continue given the lower cost of land there and available industrial zoning.
3. Manufacturing be well-represented in any materials designed by SWN to expose high school juniors and seniors to career path opportunities.