

12-2013

The Manufacturing Sector in the Greater Northeastern/Northern Region of Pennsylvania

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Prepared for:
**Northeastern Pennsylvania Industrial Resource Center
(NEPIRC)**

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December 2013

**THE MANUFACTURING
SECTOR IN THE GREATER
NORTHEASTERN/
NORTHERN REGION OF
PENNSYLVANIA**

**CENTER FOR
ECONOMIC
DEVELOPMENT**

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EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the findings of an in-depth study of the manufacturing sector in the Greater Northeastern/Northern region of Pennsylvania. The objective of the first section is to draw attention to the role manufacturing plays in the regional economy. It compares manufacturing to other sectors of the economy in terms of employment, gross regional product, wages, productivity, and number of establishments (See Table E-1). It also briefly describes trends in the value of shipments of manufacturing goods as a proxy for exports, manufacturers' investments in capital expenditures as a measure of capital intensity and adoption of technology, and patenting activity as one measure of research and development (Figure E-1 and Appendix A.1). The second section of the report analyzes the performance of 11 manufacturing driver industries, those industries that drive the regional economy, and identifies growing and large industries among the non-driver manufacturing industries. The third section discusses the competitive advantage of Pennsylvania's Greater Northeastern/Northern region in regards to manufacturing using data, previous expertise, and an extensive literature review. The fourth and fifth sections describe challenges faced by manufacturers and offers recommendations for growth to the region's manufacturers, based on research and interviews. Finally, the sixth section summarizes the economic impact of the manufacturing companies assisted by the Northeastern Pennsylvania Industrial Resource Center (NEPIRC) over the last five years.

IMPORTANCE OF MANUFACTURING TO THE REGIONAL ECONOMY

The industry sector of *Manufacturing* ranks first in terms of Gross Regional Product among all major sectors of the economy and across all 16 years of historical and projected data (2000 to 2016). In 2011, *Manufacturing* GRP reached \$5.17 billion, a 15.7% share of all industries in the Greater Northeastern/Northern region. The area studied includes the 11-county Greater Northeastern/Northern region and its two sub-regions: the 6-county Northeastern sub-region and the 5-county Northern sub-region. From 2011 through 2016, *Manufacturing* GRP is projected to increase at an annual rate of 2.7%, the second highest increase in the region. Manufacturing GRP is expected to grow in the region to \$5.88 billion by 2016, a remarkable 17.2% share of all industries. Not only does *Manufacturing* GRP lead in the Greater Northeastern/Northern region, but it also does so in each of the two sub-regions at (\$4.12 billion and \$1.05 billion in the Northeastern and Northern sub-regions, respectively in 2011).

Table E-1: Manufacturing Indicators for the Greater Northeastern/Northern Region

Year	2011	Annual Percent Change, 2009-2011
Employment (#jobs)	45,154	-2.7%
Gross Regional Product	\$5.17 Billion	-0.5%
Productivity	\$114,425	2.3%
Total Wage	\$2.15 Billion	-1.4%
Average Wage	\$47,684	1.3%
Workers' Average Benefits	\$16,420	-
Number of Establishments	999	-2.5%
Capital Expenditures	\$442 Million	6.2%
Shipments Value	\$16.39 Billion	4.3%
Number of Patents	164	-

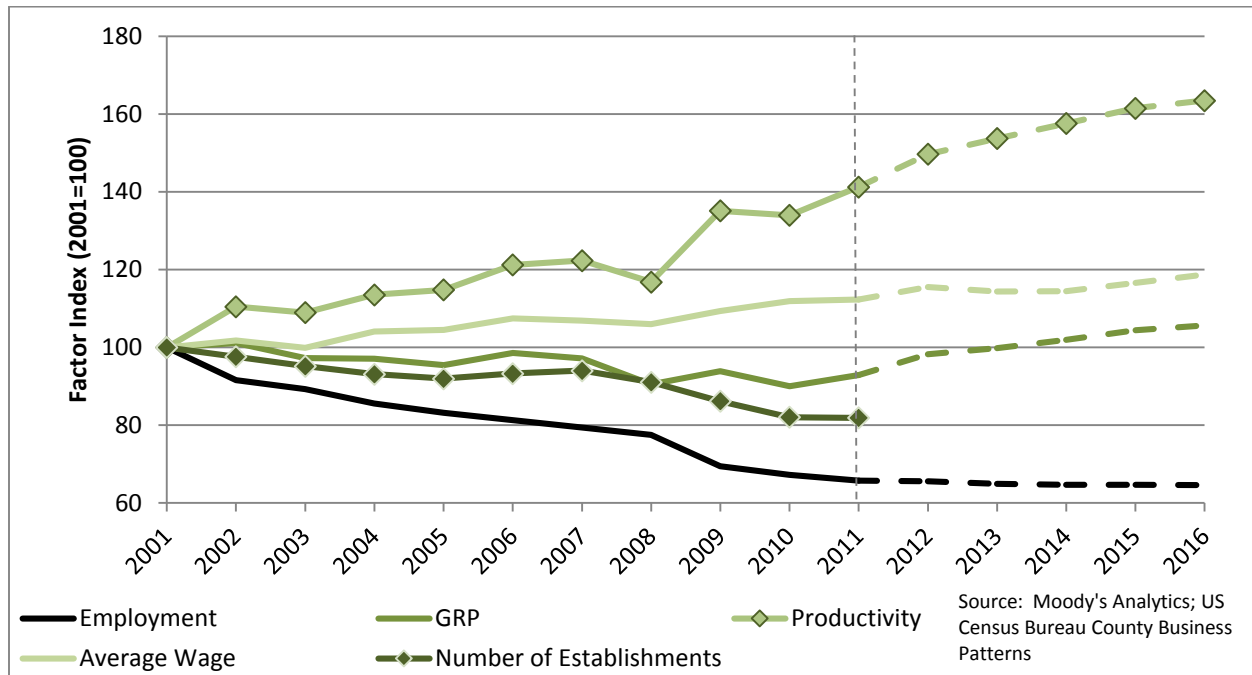
Source: Moody's Analytics; U.S. Census Bureau County Business Patterns; U.S. Census Bureau Annual Survey of Manufacturing; U.S. Patent and Trade Organization; Bureau of Labor Statistics, National Compensation Survey
 Note: Number of Patents data only available for 2010. Workers' Benefits only available for 2011.

Employment is another strong indicator of *Manufacturing* in the Greater Northeastern/Northern region. In terms of employment, the *Manufacturing* sector ranks 4th out of 20 sectors in 2011, with 45,154 persons and a 10.6% share of the overall economy. In the Northeastern sub-region, *Manufacturing* ranks 4th in terms of employment among the major economic sectors, accounting for 35,349 employees in 2011. *Manufacturing* in the Northern sub-region, although smaller, has a larger share and ranks 3rd, with 9,805 employees.

Manufacturing wage is the third indicator by which manufacturing role in the economy is measured. Total *Manufacturing* wages is consistently in the top three sectors from 2001 to 2011 and projected through 2016, with \$2.16 billion in 2011. *Manufacturing* also features positive annual growth in average wage of over 1.0% each year, while other industries tend to have much more fluctuation throughout the years. Both sub-regions are in the top ten for average wages in 2011, with the Northeastern sub-region at \$48,713, and Northern at \$43,973.

In the United States, *Manufacturing* workers' benefits accounted for 37% of total wages in 2011, ranking *Manufacturing* as having the 3rd highest ratio of benefits to wages among all industries. Applying the same ratio to the Greater Northeastern/Northern region results in *Manufacturing* compensation (wages and benefits) being ranked 2nd, and surpassed only by *Financial Activities*. In 2011, average benefit per employee in the *Manufacturing* sector in the Greater Northeastern/Northern region was \$16,420 resulting in a total compensation of \$60,790. The only industry in the region with higher benefits is *Transportation and Warehousing*, with average benefits of \$17,820.

Figure E-1: Manufacturing Indicators, Indexed, 2001-2016



In 2011 the Greater Northeastern/Northern region ranked 6th in terms of productivity, with a GRP per employee of \$114,425 . Both sub-regions have seen productivity increases of at least 2.0% each year, with the largest boost experienced from 2001 through 2009. *Manufacturing* also ranked among the top ten sectors in terms of number of establishments, with 999 establishments in 2011.

The value of *Manufacturing* shipments serve as a proxy for exports activity, another descriptor of manufacturing activity. Of all *Manufacturing* shipments in Pennsylvania, 7% originated in the Greater Northeastern/Northern region, with a value of \$16.4 billion in 2011. The Northeastern sub-region contained \$13.1 billion, with the remaining \$3.3 billion found in the Northern sub-region.

Manufacturing investments in capital expenditures measure capital intensity and technological advances. There was an investment of \$442 million in capital expenditures in the Greater Northeastern/Northern region, accounting for 7% of capital expenditures in Pennsylvania for the year 2011. Of the Greater Northeastern/Northern region, there was \$354 million of capital expenditures in the Northeastern sub-region and \$89 million in the Northern sub-region. Both the value of shipments and capital expenditures follow peaks and troughs that coincide with the Great Recession, but are now increasing; they are currently above 2004 starting levels.

Patents are a useful indicator to measure research and development. In 2010, 164 patents originated in the Greater Northeastern/Northern region, accounting for 3.5% of total patents in Pennsylvania. Being a larger sub-region, the Northeastern sub-region was responsible for 76%

of the patents, with the Northern sub-region accounting for 24%. The Northeastern sub-region also was home to more inventors than the Northern region, with 76% of the total 207 inventors in the Greater Northeastern/Northern region. The most innovative *Manufacturing* industries are “Machinery Manufacturing” and “Semiconductors and other Electronic Components Manufacturing”.

All of the previously mentioned indicators are essential to painting an image of manufacturing in the Greater Northeastern/Northern region of Pennsylvania.

MANUFACTURING DRIVER INDUSTRIES

In the second section, the research team identified 11 drivers for the Greater Northeastern/Northern Pennsylvania regional economy among the 86 detailed manufacturing industries. Table E-2 shows the list of the 11 manufacturing drivers. This section analyzes the performance of these 11 manufacturing industries because they drive the competitiveness of the regional economy.

Table E-2. Manufacturing Driver Industries for the Greater Northeastern/Northern Region

NAICS	Industry Description	Employment LQ (2011)	GRP LQ (2011)
3111	Animal Food Product	3.71	6.91
3113	Sugar and Confectionery Product	4.76	5.48
3141	Textile Furnishings Mills	5.46	7.11
3222	Converted Paper Product	3.14	6.39
3256	Soap, Cleaning, and Toilet	2.34	5.35
3261	Plastics Product	2.24	3.93
3315	Foundries	2.66	3.46
3321	Forging and Stamping	2.07	3.67
3326	Spring and Wire Product	3.72	4.71
3346	Magnetic and Optical Media	6.04	7.71
3379	Other Furniture-Related Product	2.73	5.91

Source: Moody's Analytics

Analysis is conducted in terms of employment, gross regional product (GRP), wages, productivity, and number of establishments. This section also briefly describes trends for the driver industries pertaining to the value of manufacturing shipments and manufacturers’ investments in capital expenditures. Value of manufacturing shipments is viewed by many researchers as a proxy measure for regional exports, while investments in capital expenditures are used as a measure of capital intensity and adoption of technology. In addition to the analysis of the driver manufacturing industries, this section analyzes all other 4-digit manufacturing industries to identify which non-driver manufacturing industries are large and/or growing in the Greater Northeastern/Northern region. These non-driver industries, along with the driver industries, are industries that policy decision makers are advised to heed.

Plastic Product Manufacturing had the largest GRP in 2001 among the driver industries, but it was surpassed by the *Converted Paper Product Manufacturing*, which grew faster between 2009 and 2011. During the long-term period between 2001 and 2011, the *Plastic Product* industry grew by 14.3% from \$427 million in 2001 to \$488 million in 2011, while the GRP of the *Converted Paper Product* industry rapidly increased by 40.6% over the same period, from \$373 million in 2001 to \$525 million in 2011. Both industries are projected to continue to grow between 2011 and 2016.

The *Plastic Product Manufacturing* industry also has employed the largest number of employees in the region but this sector experienced falling employment numbers between 2001 and 2011 (-14.3%); it employed nearly 4,500 people by 2011. During the same period, the *Converted Paper Product* industry, the second-largest industry, showed a decline in employment by 14.6%, from 3,870 employees in 2001 to 3,304 employees in 2011. On the other hand, the employment in *Sugar and Confectionery Manufacturing* and *Textile Furnishings Manufacturing* increased 12.0% and 4.6%, respectively, between 2001 and 2011. However, the *Foundries* industry lost 889 employees (-42%) during the same period. It should be noted that employment is projected to decrease in the five largest industries between 2011 and 2016.

While the 11 manufacturing drivers as a whole showed growth of GRP over the long-term period (11.5%), the total number of employees in the 11 drivers decreased 22.6%. As a result, productivity of the driver industries as a group increased rapidly (44%) from \$86,418 in 2001 to \$124,433 in 2011.

The average wage of all manufacturing industries in the Greater Northeastern/Northern region was \$47,684 in 2011. Among the 11 drivers, five driver industries showed higher average wages than the average wage for all of manufacturing. The industry with the highest average wage in 2011 was *Soap, Cleaning Compound, and Toilet-Preparation* (\$92,117). The *Plastic Product* industry ranked first in terms of the total wages in 2011 (\$188.2 million), consistent with being the largest employer. However, the average wage of this industry was relatively small (\$41,893), compared to other drivers.

Plastics Product Manufacturing consistently has the highest number of manufacturing establishments. In 2011, *Plastics Product Manufacturing* accounted for over 34% of all driver industries establishments, at 544 establishments. *Converted-Paper Product Manufacturing* had the second highest number of establishments at 222, and *Forging and Stamping* followed close behind with 168 establishments.

The total value of manufacturing shipments from the 11 driver industries was quite stable in the Greater Northeastern/Northern region between 2004 and 2009; the total value decreased by only 1% from \$4.4 billion in 2004 to \$4.3 billion in 2009. During the post-recession period (2009-2011), the total value of shipments from all the driver industries increased 17% and reached \$5.1 billion in 2011.

The total capital expenditures from the 11 driver industries was also quite stable between 2004 and 2009 in the Greater Northeastern/Northern region; the expenditures increased by only 0.2% from \$111.3 million in 2004 to \$111.6 million in 2009. However, post-recession, the total capital expenditures from all driver industries combined increased 46% between 2009 and 2011 and reached \$163.4 million in 2011.

The analysis of 75 non-driver industries revealed that nine non-driver industries showed positive growth in both employment and GRP between 2001 and 2011. Among these nine non-driver industries, the *Dairy Product* industry experienced the largest growth in GRP over the long-term period (36.4%), while the growth rate of employment was relatively small (9.3%) compared to other growing non-drivers. On the other hand, both the *Pharmaceutical and Medicine* industry and the *Ship and Boat-Building* industry showed a rapid increase of employment by 50.8% and 50.0% respectively. In addition, the *Pharmaceutical and Medicine* industry has the highest average wage (\$84,499) among the growing non-driver industries

GREATER NORTHEASTERN/NORTHERN PENNSYLVANIA'S COMPETITIVE ADVANTAGE

The Greater Northeastern/Northern region has a strong legacy in manufacturing and has been an integral part of U.S. manufacturing growth over the last seventy years. Most of its history has been marked by an economy driven by natural resource exploitation that has led to boom and bust. Acknowledging this history, the region's economic development has focused on diversifying its economic base to attract varied companies to the region. Nonetheless, the area has been plagued with high unemployment throughout the Great Recession and is struggling to regain its footing.

There are four major industry clusters in the region. They are: Advanced Materials and Manufacturing, Agriculture and Food Processing, Lumber and Wood Products, and Marcellus Shale Gas and Manufacturing, which are thriving clusters currently. Perhaps one of the greatest advantages is with the shale gas boom, which has the potential to bring numerous investment and jobs to the region. Besides its industry clusters, the region maintains a competitive advantage in its high quality of life, abundant natural resources, low cost of doing business and low cost of living.

It is important to determine what a region's competitive disadvantages are in order to improve on them so it may become more competitive. The biggest challenge that the Greater Northeastern/Northern faces is in regards to its workforce. The aging population of skilled workers, the outmigration of younger workers from the region (who in earlier times would have taken the graying generations place) and an increase in orders now that the economy is picking up is a perfect storm about to cause a workforce shortage. Moreover, those that would fill the vacancies from unemployment rolls cannot because of the skill mismatch between the unemployed and the potential vacancies. Combining the skill mismatch with the small number of younger workers in the region indicates that there is a severe workforce development challenge for manufacturers in the region, and which could put it at a competitive

disadvantage. In addition, it is essential that the region look to attract and retain young talent to grow the workforce to enhance the region, because without the proper workforce, manufacturing will be forced to relocate to an area with available workforce.

RECOMMENDATION OF GROWTH OPPORTUNITIES

The report provides six recommendations for growth opportunities. These include: solicit and retain a high-skilled talent pool; improve skills and behaviors of available, potential talent pool; disseminate business-development and innovation best practices; share continuous-improvement expertise; foster relationships between manufacturers and the Marcellus business infrastructure; and promote the vitality and importance of the region's manufacturing base.

COMMON CHALLENGES & COMMON SUCCESS FACTORS

The report describes six types of challenges. The challenges include: Workforce and employment challenges (baby boomers approaching retirement, younger workers looking elsewhere for manufacturing jobs or for other fields, and job applicants for frontline manufacturing positions often lacking the required skills and/or are having behavioral characteristics); problems with information-technology connectivity and skills (lack of effective connection of business systems and application to suppliers and customers, and remote pockets within the 11 counties have inadequate broadband connectivity); low levels of innovation as indicated by a low number of patents; lack of resources and staff to improve productivity and profitability; difficulty to expand sale channels and attract new sales beyond Pennsylvania; and having some shortage support services.

The report also identifies three success factors in the Northeastern/Northern region. First, the region has a long history of being a manufacturing region. Manufacturing is the largest sector in terms of Gross Regional Product among all major sectors of the regional economy and across all 16 years of historical and projected data (2000 to 2016). In 2011, manufacturing GRP reached \$5.17 billion, a 15.7% share of all industries in the Greater Northeastern/Northern region; manufacturing is expected to remain the largest industry through 2016 (\$5.87 billion).

Second, the region is home to several learning institutions that offer manufacturing-centric education opportunities, such as advanced machining, CNC programming, engineering design, and process engineers. Continued collaboration among manufacturing leaders in the region and the educational institutions can help to address the skilled-talent gap, and to develop programs that nurture interest in manufacturing careers among job candidates.

Third, the region has location advantages. It is a relatively low-cost production platform near the Eastern seaboard. The region's transportation infrastructure, if properly maintained and further developed (railways, airports, highways), offers a high level of service for moving goods. And last, the region's manufacturing base has access to natural resources, which directly

support many of the region's driver industries (e.g., methane for plastics products, wood for converted paper products, and agriculture for animal food products). The Marcellus Shale business infrastructure also represents exceptional opportunities for new and existing manufacturers in the area to prosper from its natural resources.

NEPIRC'S IMPACT UPON MANUFACTURING

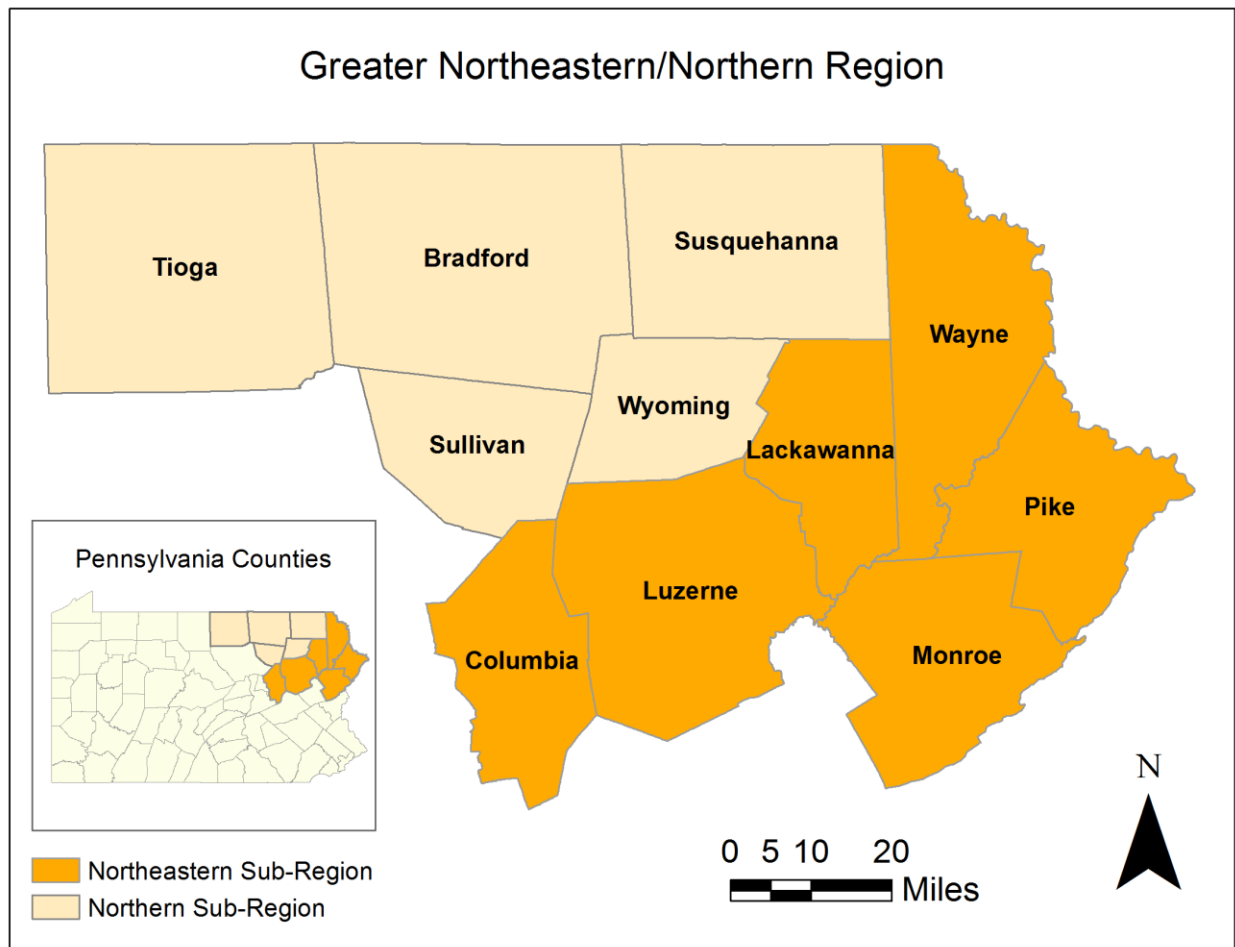
This study measures the economic impact of companies that have been assisted by NEPIRC in the Greater Northeastern/Northern region. It analyzes the data collected by Fors Marsh over a 5-year period for fiscal year (FY) 2008-2009 through FY 2012-2013. Over the last five years, the companies assisted by NEPIRC added 1,185 jobs and retained another 5,058 employees. Additionally, they saw \$81.2 million in new sales and \$503.1 million in retained sales due to work with NEPIRC. Also, over \$106.2 million dollars in additional investment has been made by the companies.

The economic impact estimates are based on the 2011 IMPLAN model built for the 11 Pennsylvania counties that are served by the NEPIRC. The economic impact of the companies assisted by NEPIRC is based on two types of data: (1) direct new sales and new employment of client companies over the 5-year study period from the Fors Marsh survey and (2) federal funding that came to NEPIRC. The total economic impact of the companies on the Greater Northeast/Northern region over the five fiscal years included a total of 1,693 employees, a payroll of \$68.7 million, value added impact of \$110.3 million, output impact of \$318.6 million, and a tax impact of \$23.0 million.

INTRODUCTION

Cleveland State University’s Center for Economic Development and The MPI Group, in association with the Northeastern Pennsylvania Industrial Resource Center (NEPIRC) have conducted an in-depth research on the Manufacturing industry and its contribution to the Greater Northeastern/Northern region of Pennsylvania (Figure I-1). The study area includes five counties in the Northern sub-region, with a population of 182,663, and the much more populated six counties in the Northeastern sub-region, with a population of 882,683.¹ These areas include metropolitan, micropolitan, and non-metropolitan statistical counties.²

Figure I-1: Map of Region



Source: U.S. Census Bureau TIGER files

¹ The Northern sub-region of Pennsylvania includes the counties of Bradford, Sullivan, Susquehanna, Tioga, and Wyoming. The Eastern sub-region includes the counties of Columbia, Lackawanna, Luzerne, Monroe, Pike, and Wayne. Population estimates are from the U.S. Census Bureau 2010 Census.

² A metropolitan area contains a core urban area of at least 50,000 persons. A micropolitan area contains an urban core of at least 10,000 persons, but less than 50,000 persons. For more information on statistical areas, please visit: <http://www.census.gov/population/metro/>.

The study is conducted for NEPIRC, which assists small and medium-size manufacturing businesses to become more efficient, and increase their innovation and competitiveness. NEPIRC designs customized solutions for clients that enable them to adopt best industry practices, implement next generation manufacturing studies, achieve profitable growth, successfully enter new markets and innovate new products, and achieve profitability levels that exceed industry benchmarks. Their services include, but are not limited to: sustainability, supply chain development, quality management systems and industry certification, and lean and continuous improvement.

The report includes seven sections, including this introduction. The second section describes the importance of manufacturing to the Greater Northeastern/Northern region of Pennsylvania by comparing the *Manufacturing* industry with all other major industry sectors. It shows the contribution of manufacturing in terms of employment, gross metropolitan product, wages, productivity, innovations, and more. The third section analyzes the driver manufacturing industries in the region, highlighting those industries that drive the regional economy, and tracking their performance. The fourth section describes the regional competitiveness of the Greater Northeastern/Northern region. The fifth section recommends growth opportunities, while the sixth section summarizes common challenges and successes of manufacturers located in the region. The last section, section seven, estimates the economic impact of the companies served by NEPIRC on the regional economy, based on information collected quarterly from these companies.

METHODOLOGY

The study area includes the 11-county Greater Northeastern/Northern region and its two sub-regions: the Northern sub-region and Northeastern sub-region. Depending on the analysis, the sub-regions may be looked at separately, or totaled together into the larger Greater Northeastern/Northern Pennsylvania region.

The study uses both quantitative and qualitative methodologies. Secondary data for the study has been derived from several sources including Moody's Analytics, the U.S. Census Bureau County Business Patterns³, the U.S. Census Survey of Manufacturing, Bureau of Labor Statistics, National Compensation Survey, and the U.S. Patent and Trademark Organization. Primary data has been collected through a survey of the clients assisted by NEPIRC, manufacturing companies located in the region with at least 20 employees, and participants at focus groups. In addition to surveys, the study uses interviews, focus groups, review of local media and other reports pertaining to the regional economy.

³ County Business Patterns (CBP) data include only non-government industries, while Moody's data includes all sectors. In addition, CBP uses *Industries not Classified* (NAICS code 99), which is distributed in Moody's prior to our analysis. In addition, Moody's data does not include the NAICS code 92, *Public Administration*. Instead, Moody's classifies these industries into Local Government, State Government, Federal Government, and Military. These include public hospitals and schools, and other entities that are government-owned. For the purpose of this study, all four classifications are combined and titled *Public Sector*. For more information on the North American Industry Classification System, see: <http://www.census.gov/eos/www/naics/>

PART 1: THE IMPORTANCE OF MANUFACTURING TO THE GREATER NORTHEASTERN/NORTHERN REGIONAL ECONOMY

The objective of this section is to highlight the role manufacturing plays in the regional economy. The first part compares manufacturing to other sectors of the economy of the Greater Northeastern/Northern region in terms of employment, gross regional product, wages, productivity, and the number of establishments. The second part describes briefly the trends in value of manufacturing shipments as a proxy for exports, capital expenditures as a measure of capital intensity and adoption of technology, and patenting activity as one measure of research and development. Trends in these three measures in the Greater Northeastern/Northern region are compared to the state of Pennsylvania.

MANUFACTURING IN COMPARISON TO OTHER SECTORS OF THE GREATER NORTHEASTERN/NORTHERN REGION

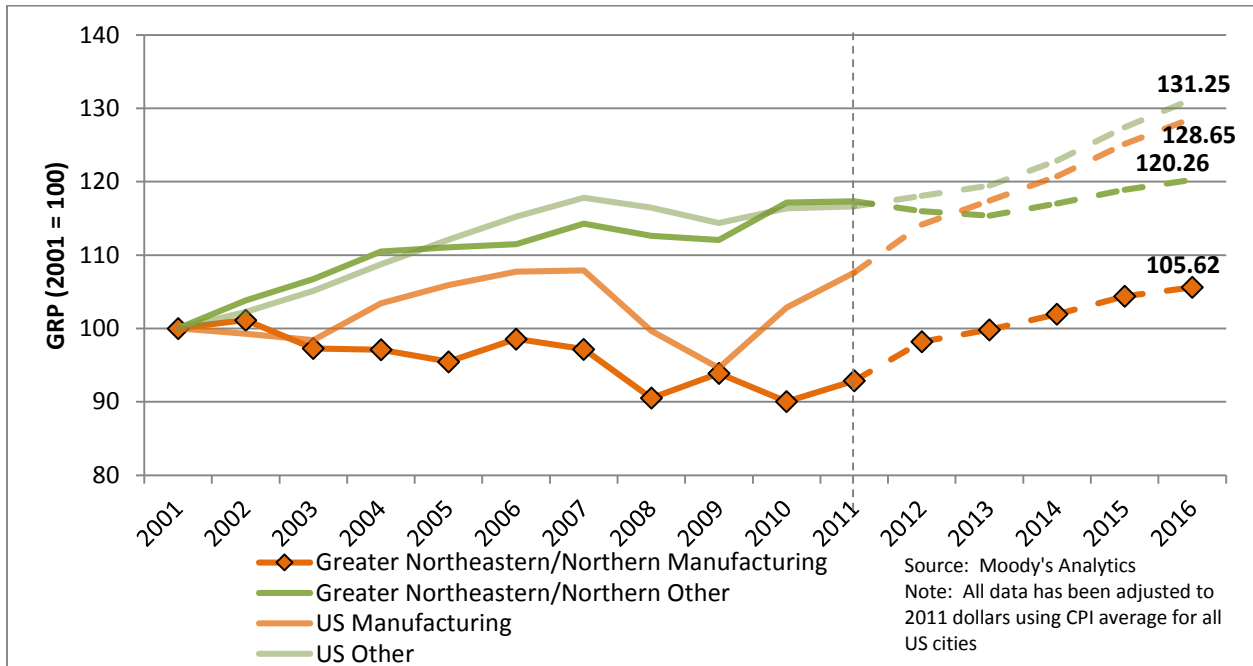
The different sectors of the regional economy are analyzed in terms of five different measures: gross regional product (GRP), which measures the scale of the economy, or the value of goods and services produced in the economy; employment, including both full time and part-time jobs; total wages and average wage; productivity, which is defined as GRP per employee; and number of establishments.

Gross Regional Product

Much useful information can be gathered from comparing the *Manufacturing* Gross Regional Product (GRP) of Greater Northeastern/Northern Pennsylvania (PA) and the United States to other sectors of the economy. From 2001 to 2011, all United States and Greater Northeastern/Northern industries, not including *Manufacturing*, seemed to be increasing steadily, while *Manufacturing* GRP declined.⁴ Interestingly, where the United States experienced its lowest *Manufacturing* numbers, the Greater region showed a slight increase. The region, while in decline from 2001 to 2011, seems much more stable than the drastic fluctuations viewed for U.S. *Manufacturing* as a whole. Forecasts estimate that all industries, *Manufacturing* and others, in both the Greater region and the United States will see a boom from 2011 forward (Figure 1-1).

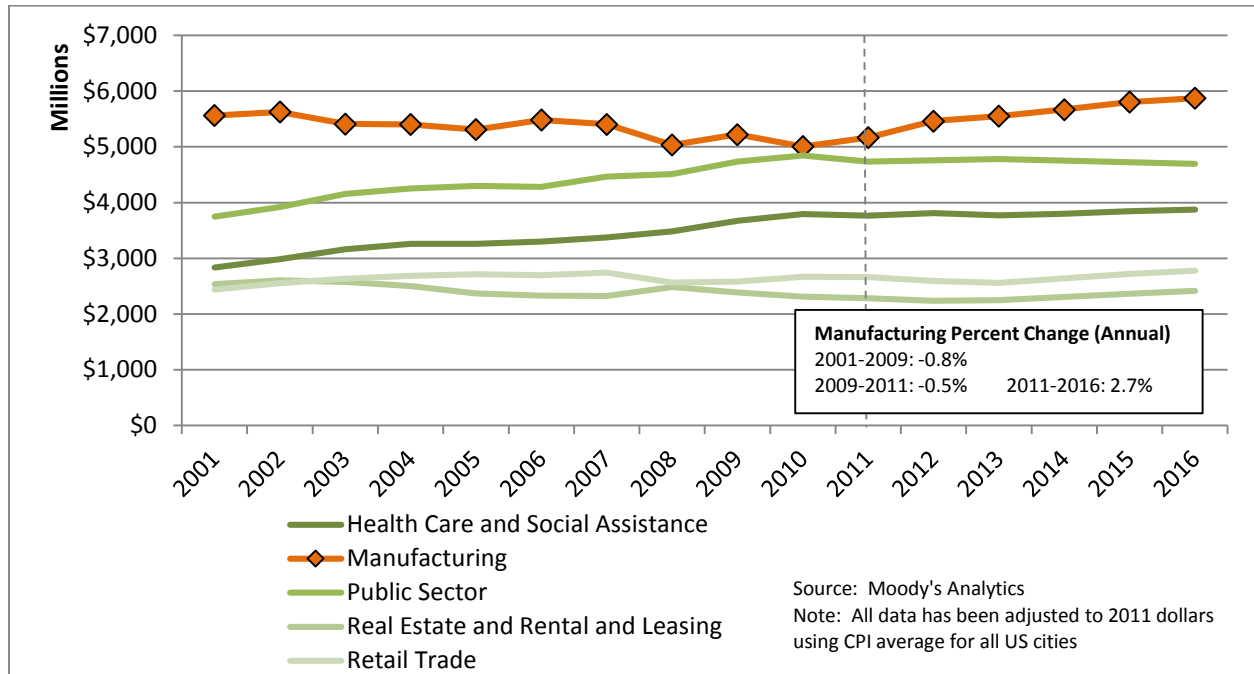
⁴ All dollar amounts have been inflated to 2011 dollars using the Consumer Price Index for U.S. Cities

Figure 1-1: GRP Trends in the Greater Northeastern/Northern Region & the U.S., 2001-2016



What are the leading industries that contribute the most to the GRP in the Greater Northeastern/Northern PA region? Manufacturing is the leading sector in terms of GRP, contributing the most to the regional economy. The same five industries remain among the top five throughout the past decade and the following five years in Greater Northeastern/Northern PA: *Manufacturing, Health Care and Social Assistance, Public Sector, Retail Trade, and Real Estate and Rental and Leasing*. *Manufacturing* has generally remained millions of dollars ahead of all other industries (Figure 1-2). Throughout the entire period of this study, including forecasted years, *Manufacturing* is ahead of all other industries in the region. In 2010, *Public Sector* gets the closest to reaching *Manufacturing* GRP values, but does not surpass it. *Manufacturing* is projected to reach nearly \$6 billion by 2016, still the industry with the highest GRP in the region.

Figure 1-2: GRP of the Top 5 Industries in the Greater Northeastern/Northern Region, 2001-2016



Not only does *Manufacturing* have the largest GRP in the region, it is projected to grow at an annual percent change of 2.7% from 2011 through 2016, the second-largest increase following *Transportation and Warehousing*, which has a GRP of only one-fifth of *Manufacturing* (Table 1-1).

Table 1-1: GRP in the Greater Northeastern/Northern Region by Major Industry

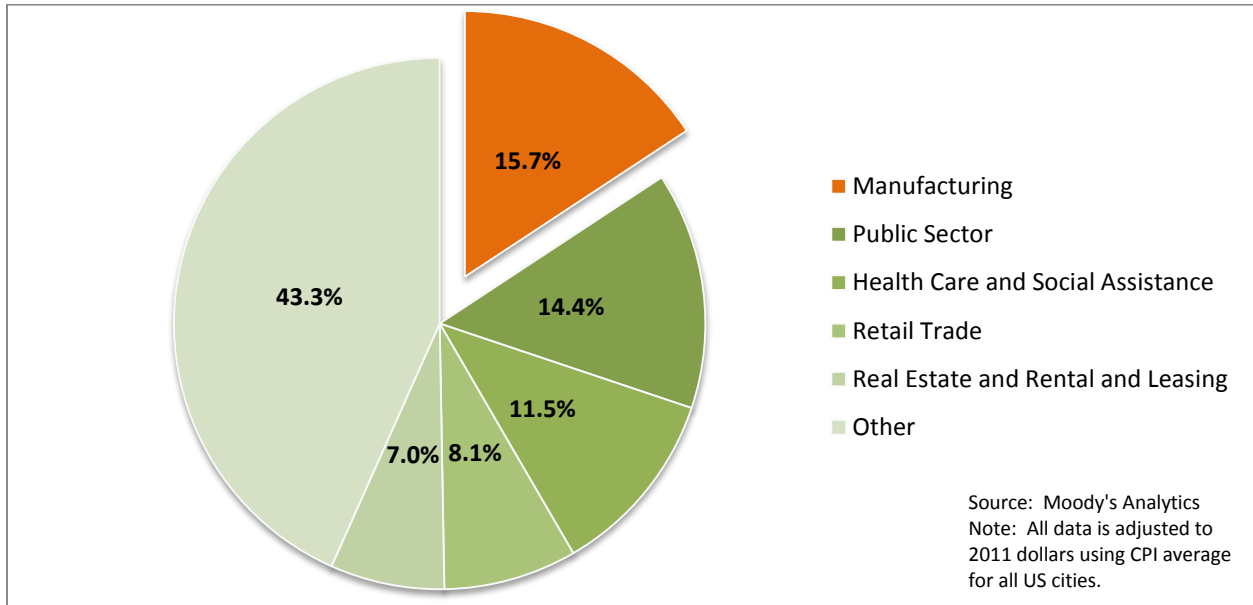
NAICS Description	GRP (in Millions)				Annual Percent Change		
	2001	2009	2011	2016	2001-2009	2009-2011	2011-2016
Manufacturing	\$5,562	\$5,222	\$5,167	\$5,875	-0.8%	-0.5%	2.7%
Public Sector	\$3,746	\$4,737	\$4,736	\$4,696	3.3%	0.0%	-0.2%
Health Care and Social Assistance	\$2,836	\$3,673	\$3,765	\$3,872	3.7%	1.3%	0.6%
Retail Trade	\$2,437	\$2,582	\$2,662	\$2,776	0.7%	1.6%	0.9%
Real Estate and Rental and Leasing	\$2,535	\$2,388	\$2,284	\$2,416	-0.7%	-2.2%	1.2%
Finance and Insurance	\$1,837	\$1,847	\$2,119	\$2,148	0.1%	7.4%	0.3%
Wholesale Trade	\$1,288	\$1,526	\$1,627	\$1,727	2.3%	3.3%	1.2%
Transportation and Warehousing	\$1,139	\$1,295	\$1,431	\$1,682	1.7%	5.2%	3.5%
Construction	\$1,276	\$1,092	\$1,187	\$1,135	-1.8%	4.4%	-0.9%
Information	\$998	\$1,165	\$1,113	\$1,150	2.1%	-2.2%	0.7%
Accommodation and Food Services	\$1,067	\$1,064	\$1,108	\$1,174	0.0%	2.1%	1.2%
Utilities	\$1,110	\$1,047	\$1,106	\$1,017	-0.7%	2.8%	-1.6%
Professional, Scientific, and Technical Services	\$959	\$1,022	\$1,043	\$1,134	0.8%	1.0%	1.7%
Administrative and Support and Waste Management and Remediation Services	\$653	\$807	\$861	\$874	2.9%	3.4%	0.3%
Other Services (except Public Administration)	\$786	\$776	\$799	\$749	-0.2%	1.5%	-1.3%
Mining, Quarrying, and Oil and Gas Extraction	\$145	\$297	\$584	\$631	13.2%	48.2%	1.6%
Educational Services	\$331	\$441	\$441	\$447	4.2%	0.0%	0.3%
Arts, Entertainment, and Recreation	\$150	\$314	\$338	\$307	13.6%	3.8%	-1.8%
Management of Companies and Enterprises	\$167	\$244	\$323	\$291	5.8%	16.3%	-2.0%
Agriculture, Forestry, Fishing and Hunting	\$133	\$117	\$151	\$143	-1.5%	14.7%	-1.2%
Total	\$29,152	\$31,655	\$32,844	\$34,243	1.1%	1.9%	0.9%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

In 2011, *Manufacturing* GRP accounted for the largest share of all industries at 15.7%, with the next highest, *Public Sector*, at 14.4% (Figure 1-3). Although 15.7% is the largest share in 2011, it has decreased from 2001, the first year of this study, when *Manufacturing* accounted for a 19.1% share of all industries (Appendix Table A-1-2). Forecasts show, as seen in Figure 3, that by 2016, *Manufacturing* will see a slight increase, and it will reach a 17.2% share of industries.

Figure 1-3: GRP Share in the Greater Northeastern/Northern Region by Major Industry, 2011



The Northern and Northeastern sub-regions are very different from each other in size and composition. Looking at each separately, the Northeastern sub-region has a *Manufacturing* GRP nearly four times larger than the more rural Northern sub-region (Appendix Table A-1-3; Figure 1-4). In fact, all industries have a larger GRP in the Northeastern sub-region, except *Mining, Quarrying, and Oil and Gas Extraction*, which is to be expected since often large, rural swaths of land are needed to sustain that industry. In both sub-regions, *Manufacturing* is the largest industry in terms of GRP. The largest increase in annual percent change is different for each sub-region. GRP growth in the Northeastern sub-region peaks from 2011 to-2016, with a 3.0% annual change, where growth in the Northern sub-region peaks from 2009 to2011 at 2.3%. Since the Northeastern sub-region is much larger in terms of GRP, the Greater Northeastern/Northern region has the highest annual percent change from 2011 to 2016, as shown in Table 1-2.

Figure 1-4: GRP by Industry in the Greater Northeastern/Northern Region and the Two Sub-Regions, 2011



Table 1-2: Annual Percent Change in Manufacturing GRP in the Greater Northeastern/Northern Region and the Two Sub-Regions

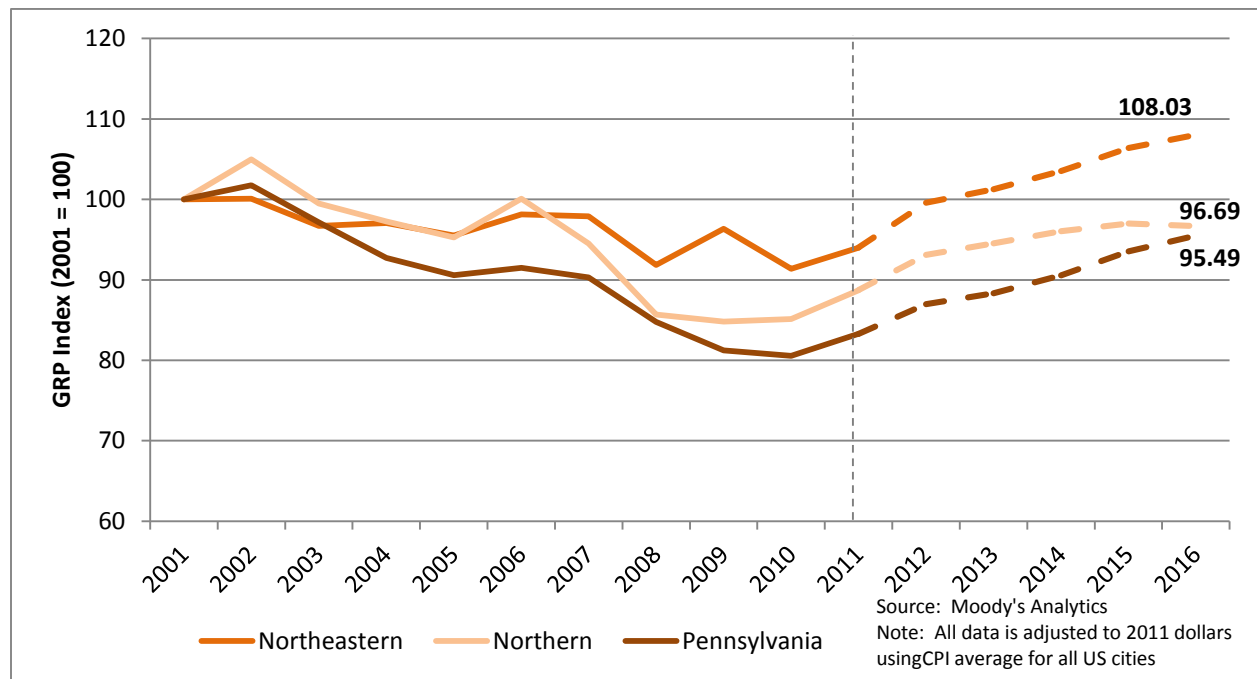
	Northeastern	Northern	Greater Region
2001-2009	-0.5%	-1.9%	-0.8%
2009-2011	-1.2%	2.3%	-0.5%
2011-2016	3.0%	1.8%	2.7%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

When looking at indexed values for the sub-regions, along with the entire state of Pennsylvania, the sub-regions seem stronger than Pennsylvania as a whole in *Manufacturing* through 2011, as shown in Figure 1-5. By 2011, both sub-regions and the Greater region start to exhibit an increase. From 2011 through 2016, the Northeastern sub-region recovers faster and is projected to have a higher GRP than in 2001. The Northern sub-region and the Greater Northeastern/Northern region both have increases as well, though not to the extent that the larger, Northeastern sub-region displays.

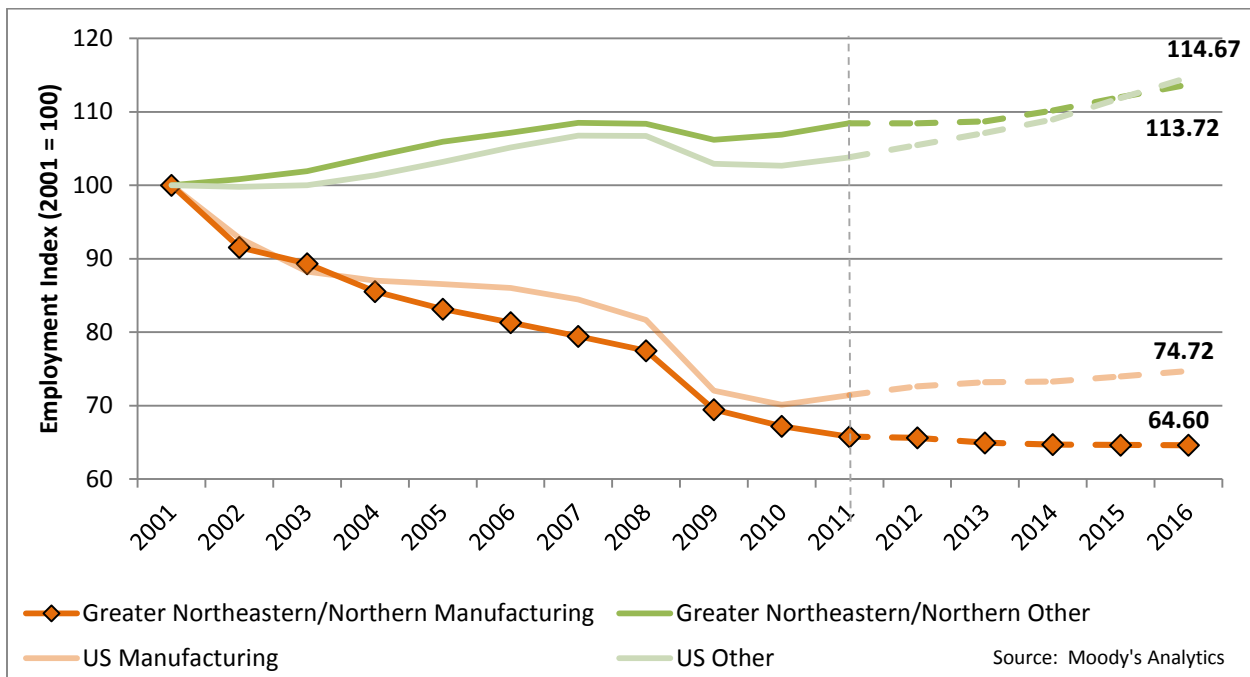
Figure 1-5: Indexed Manufacturing GRP Trends, Statewide and Sub-Regions, 2001-2016



Employment

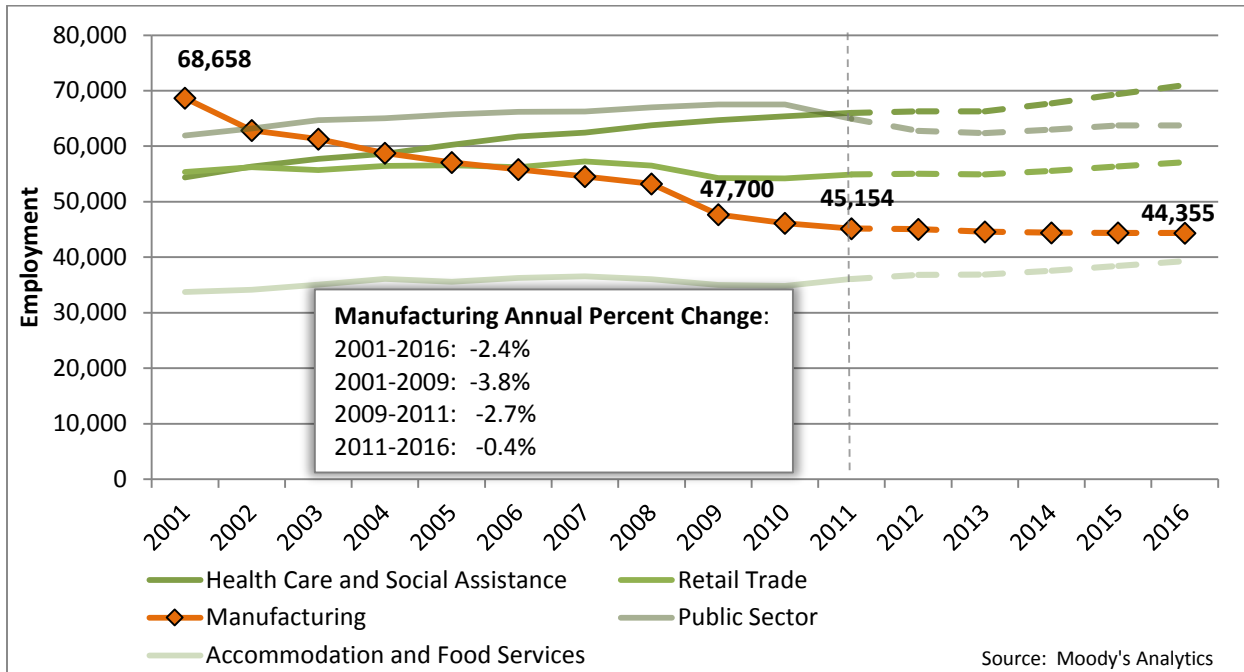
The trend in *Manufacturing* employment in Greater Northeastern/Northern Pennsylvania follow a very similar pattern as *Manufacturing* employment in the United States (Figure 1-6). From 2001 until 2009, we see a steep decline in employment for both the region and the country. After 2009, employment numbers for the region, while still decreasing, start to level off, and are projected to be flat, or show small declines throughout 2016. Projection data for the United States reflects an increase in *Manufacturing* employment from its lowest point in 2010 through 2016. All other industries in both the United States and Greater Northeastern/Northern Pennsylvania gradually increase throughout the 16-year study period reaching employment levels that are more than 10% higher than in the base year.

Figure 1-6: Manufacturing Employment Trends in the Greater Northeastern/Northern Region & the U.S., 2001-2016



The employment levels of *Manufacturing* in the most recent year of data (2011) are the 4th highest in the region, at 45,154 persons (Figure 1-7). *Health Care and Social Assistance*, *Public Sector*, and *Retail Trade* are the only industries with a higher number of employees, at 66,000 persons, 64,942 persons, and 54,898 persons respectively. The *Accommodation and Food Services* sector is close behind *Manufacturing* at 36,079 persons. Throughout the 16 years of analysis, these five industries always have the highest levels of employment, and are also the top five in GRP, except for *Accommodation and Food Services*.

Figure 1-7: Employment in the Top 5 Industries in the Greater Northeastern/Northern Region, 2001-2016



Manufacturing was once the largest industry in the region in terms of employment, with 68,658 jobs in 2001, but its rank has been declining over the last ten years. By 2006, *Manufacturing* was surpassed by *Health Care and Social Assistance*, *Public Sector*, and *Retail Trade*. From 2001 to 2016, the *Manufacturing* sector's employment experienced a negative annual percent change although the industry still maintains a top five industry ranking in Northern Pennsylvania (Table 1-3). Analyzing only the years from 2009 through 2011, there was an annual decline of -2.7% in *Manufacturing*, a reduced rate of decline. The forecasts for *Manufacturing* seem the most promising from 2011 through 2016. Although there is a small annual decline in employment, it is lower than both the long and short term trends, at only a -0.4% annual change. The forecasted data also shows that *Manufacturing* maintains its position as the 4th largest industry in the region, at 44,355 persons.

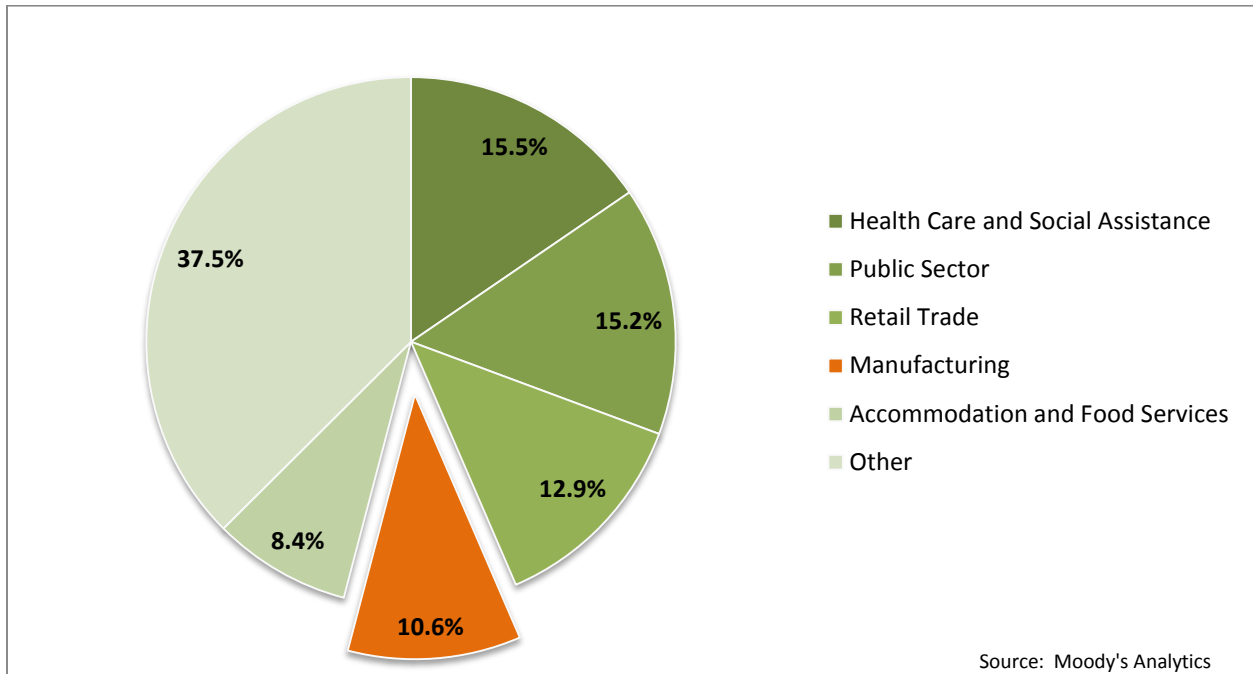
Table 1-3: Employment in the Greater Northeastern/Northern Region by Major Industry

NAICS Description	Employment				Annual Percent Change		
	2001	2009	2011	2016	2001-2009	2009-2011	2011-2016
Health Care and Social Assistance	54,402	64,701	66,000	71,012	2.4%	1.0%	1.5%
Public Sector	61,904	67,537	64,942	63,720	1.1%	-1.9%	-0.4%
Retail Trade	55,362	54,287	54,898	57,115	-0.2%	0.6%	0.8%
Manufacturing	68,658	47,700	45,154	44,355	-3.8%	-2.7%	-0.4%
Accommodation and Food Services	33,716	35,001	36,079	39,293	0.5%	1.5%	1.8%
Transportation and Warehousing	14,271	20,393	22,098	25,523	5.4%	4.2%	3.1%
Administrative and Support and Waste Management and Remediation Services	15,665	17,086	19,182	21,957	1.1%	6.1%	2.9%
Other Services (except Public Administration)	17,409	16,074	16,259	16,649	-1.0%	0.6%	0.5%
Construction	16,308	15,191	15,875	16,823	-0.9%	2.3%	1.2%
Wholesale Trade	13,583	13,993	14,655	14,758	0.4%	2.4%	0.1%
Finance and Insurance	15,422	14,167	13,696	14,039	-1.0%	-1.7%	0.5%
Professional, Scientific, and Technical Services	10,618	12,074	11,797	13,507	1.7%	-1.1%	2.9%
Educational Services	9,509	10,394	10,774	11,022	1.2%	1.8%	0.5%
Agriculture, Forestry, Fishing and Hunting	9,415	8,016	8,051	7,683	-1.9%	0.2%	-0.9%
Arts, Entertainment, and Recreation	4,441	7,231	7,388	7,169	7.9%	1.1%	-0.6%
Information	8,746	7,147	6,248	6,033	-2.3%	-6.3%	-0.7%
Management of Companies and Enterprises	2,037	3,507	4,519	4,285	9.0%	14.4%	-1.0%
Real Estate and Rental and Leasing	4,692	3,474	3,541	3,460	-3.2%	1.0%	-0.5%
Mining, Quarrying, and Oil and Gas Extraction	1,208	1,293	3,380	3,989	0.9%	80.7%	3.6%
Utilities	3,460	2,322	2,537	2,439	-4.1%	4.6%	-0.8%
Total	420,826	421,588	427,073	444,831	0.0%	0.7%	0.8%

Source: Moody's Analytics

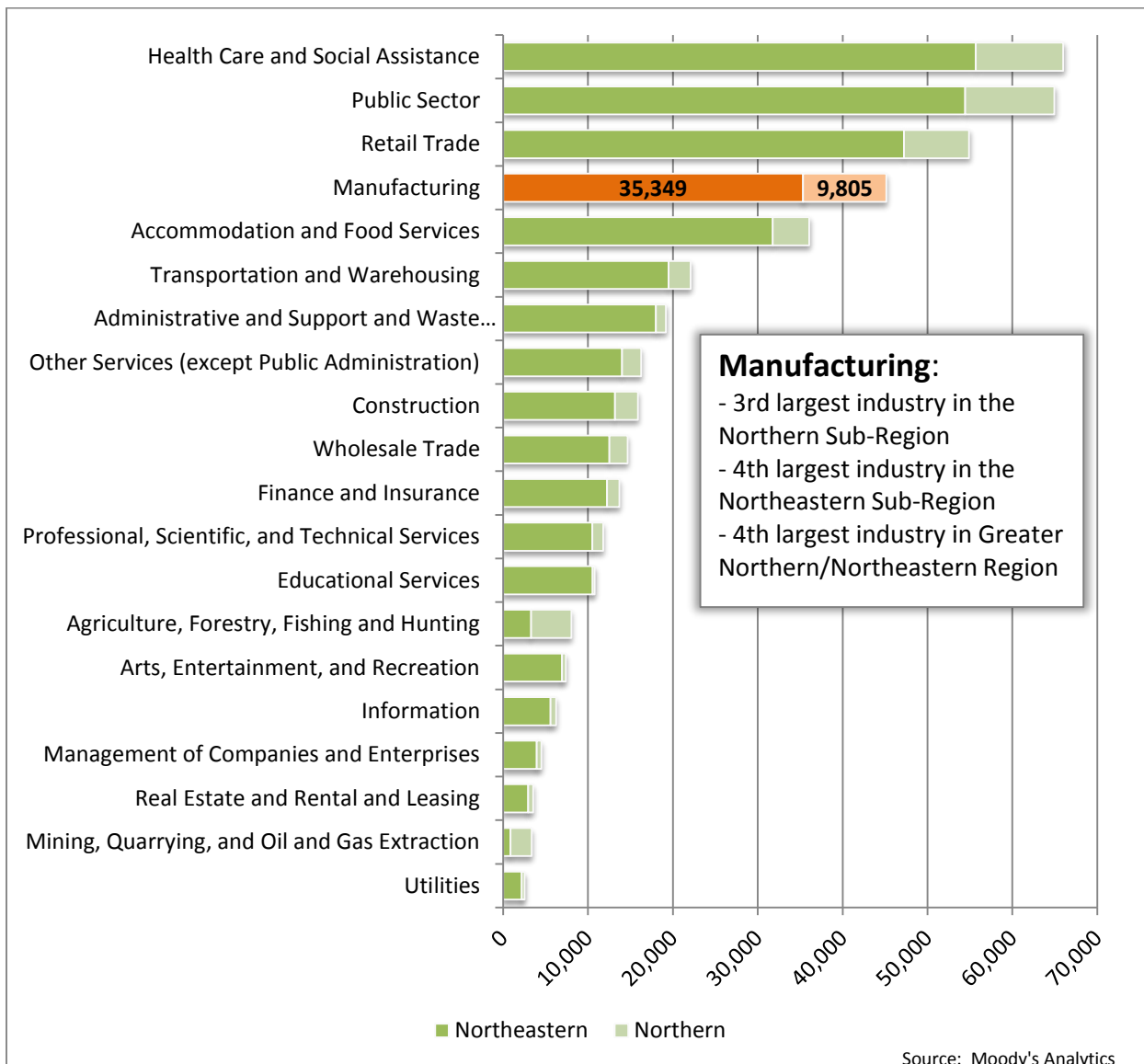
Manufacturing accounts for 10.6% of all employment in 2011 in the Greater Northeastern/Northern region; *Health Care*, the largest sector, accounts for 15.5% followed by the *Public Sector* with 15.2% if the greater region (Figure 1-8). The top five industries combined make up 62.5% of total industries, with the 15 remaining industries covering the remaining 37.5%. The share of manufacturing employment has decreased over time (Appendix Table A-1-4), with *Manufacturing* comprising a 16.3% share of all industries in 2001, but projected to have a share of only 10.0% by 2016. The major drop in employment occurs from 2001 to 2009, as seen previously in Figure 1-8. Although the *Manufacturing* share of employment drops through the years, it still retains a top five spot, ranking fourth by 2016.

Figure 1-8: Employment Share by Industry in the Greater Northeastern/Northern Region, 2011



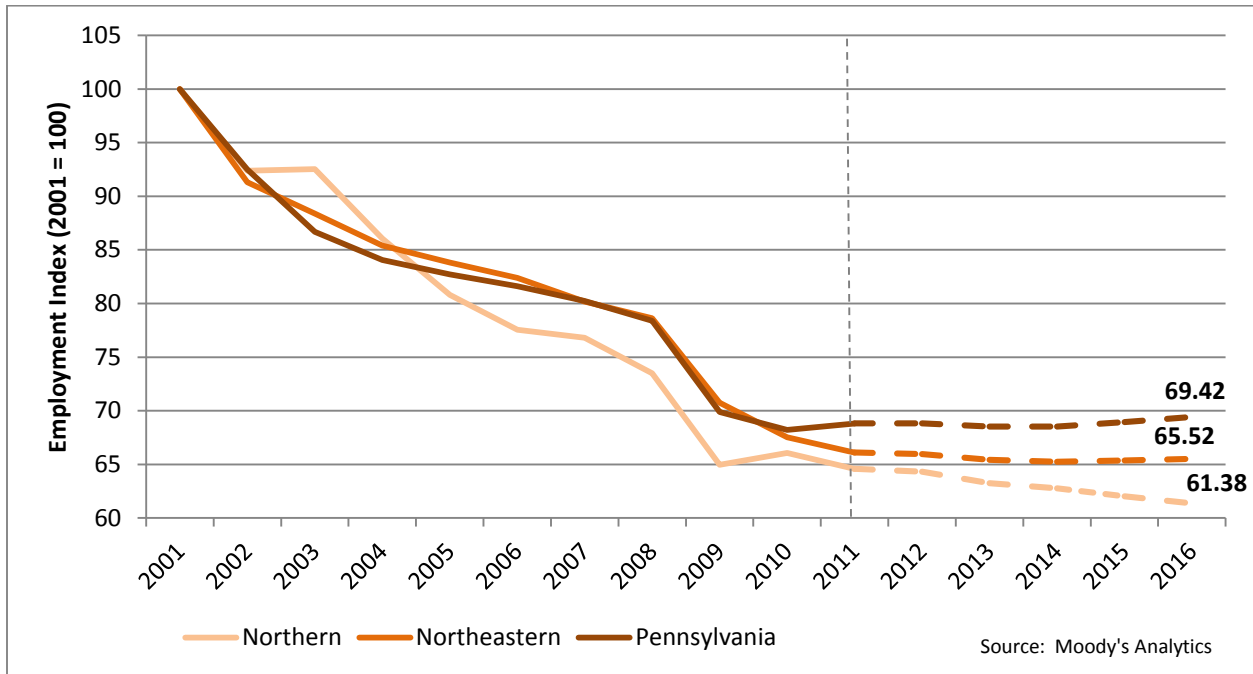
As with Gross Regional Product, employment numbers are much higher for all industries in the Northeastern sub-region than the Northern sub-region. The only exceptions for the most recent year (2011) are two industries: *Agriculture, Forestry, Fishing and Hunting* and *Mining, Quarrying, and Oil and Gas Extraction*. These industries are more commonly found in rural regions, so the higher employment is to be expected. In the Northeastern sub-region, *Manufacturing*, employment is 35,349 and it is the fourth largest industry; in the Northern sub-region *Manufacturing* employment reached 9,805 persons, ranking as the third largest industry in that sub-region (Figure 1-9).

Figure 1-9: Employment by Major Industry in the Greater Northeastern/Northern Region and its Two Sub-Regions, 2011



Both the Northern and Northeastern sub-regions of Pennsylvania seem to follow the state's employment trends and projections, including an especially steep drop from 2008 through 2009 during the Great Recession. Projected data through 2016 indicate a general stability in *Manufacturing* employment in the region and Pennsylvania as a whole although the Northern sub-region still sees a decrease, as shown in Figure 11. By 2016, the Northern and Northeastern sub-regions are predicting employment numbers at 9,320 and 35,035 persons, respectively (Appendix Table A-1-5). This is an annual percent change of -0.4% per year in the Greater Northeastern/Northern region from 2011 through 2016.

Figure 1-10: Indexed Manufacturing Employment Trends, Statewide and Sub-Regions, 2001-2016

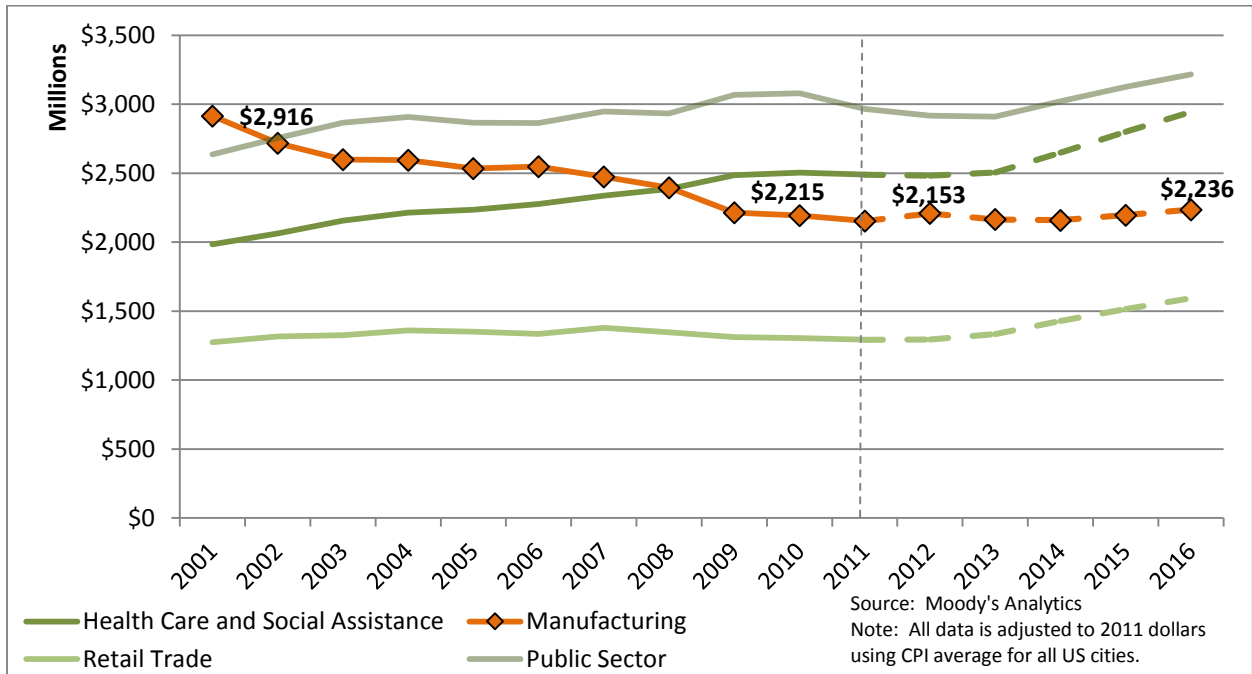


Total Wage and Average Wage

Total wage is total wages earned by all employees, including regular pay, overtime pay, and bonuses. The top four industries in terms of total wage are *Health Care and Social Assistance*, *Public Sector*, *Retail Trade*, and *Manufacturing* (Figure 1-11). The top four, instead of five, were selected because the fifth spot fluctuated among many industries, and was not consistent throughout the 16-year period of analysis. Starting in 2001, *Manufacturing* had nearly \$3 billion in total wages. By 2009, *Public Sector* and *Health Care and Social Assistance* surpassed it, with projected increases through 2016. Although total wages in *Manufacturing* decreased from 2001 through 2011, *Manufacturing* wages are expected to level out and retain the second highest total wages from 2009 to the projection year 2016. *Manufacturing* total wage share decreases most from 2001 through 2009 with a 13.7% share in 2011. Only *Manufacturing*, *Public Sector*, and *Health Care and Social Assistance* have total wage shares above 10.0%, with 13 major industries consistently holding less than 5.0% shares of total wages (Appendix Table A-1-6).

In the Northern sub-region, *Manufacturing* has the highest total wage for 2011, but ranks second in the much larger Northeastern sub-region, behind *Health Care and Social Assistance* (Appendix Table A-1-7). Similar to GRP, *Manufacturing* wages in the Northeastern sub-region account for a much larger percentage of total wages than the Northern sub-region.

Figure 1-11: Total Wages in the Top 4 Major Industries in the Greater Northeastern/Northern Region, 2001-2016



Average wage is total wage divide by number of employees with no differentiation between part-time and full-rime employees. Thus, industries with higher proportions of part-time employees, such as retail, will show lower average wage because total wage is spread over a larger number of employees. While *Manufacturing* was among the highest ranked industries in total wage, it is ranked much lower in terms of average wage (Table 1-4). None of the top five industries in terms of employment are featured in the top ten industries of average wage for 2011 except *Manufacturing* (which is ranked as 7th) and *Public Sector* (ranked 10th). However, *Manufacturing* does consistently have a positive annual growth rate in average wage, over 1.0% each year, while other industries have much more fluctuation, both positive and negative.

Table 1-4: Average Wage by Major Industry in The Greater Northeastern/Northern Region

NAICS Description	Average Wage				Annual Percent Change		
	2001	2009	2011	2016	2001-2009	2009-2011	2011-2016
Utilities	\$79,908	\$85,231	\$86,719	\$96,095	0.8%	0.9%	2.2%
Mining, Quarrying, and Oil and Gas Extraction	\$48,469	\$63,393	\$60,694	\$60,904	3.8%	-2.1%	0.1%
Finance and Insurance	\$49,650	\$54,560	\$55,733	\$55,174	1.2%	1.1%	-0.2%
Wholesale Trade	\$44,998	\$51,454	\$50,940	\$61,872	1.8%	-0.5%	4.3%
Management of Companies and Enterprises	\$53,835	\$47,155	\$49,222	\$55,658	-1.6%	2.2%	2.6%
Construction	\$43,426	\$46,303	\$49,082	\$49,048	0.8%	3.0%	0.0%
Manufacturing	\$42,466	\$46,439	\$47,684	\$50,413	1.2%	1.3%	1.1%
Professional, Scientific, and Technical Services	\$52,419	\$47,324	\$47,291	\$47,198	-1.2%	0.0%	0.0%
Information	\$45,225	\$44,410	\$45,813	\$46,078	-0.2%	1.6%	0.1%
Public Sector	\$42,600	\$45,424	\$45,682	\$50,486	0.8%	0.3%	2.1%
Transportation and Warehousing	\$43,096	\$35,939	\$37,781	\$42,323	-2.1%	2.6%	2.4%
Health Care and Social Assistance	\$36,479	\$38,424	\$37,729	\$41,453	0.7%	-0.9%	2.0%
Real Estate and Rental and Leasing	\$27,921	\$29,328	\$34,742	\$41,360	0.6%	9.2%	3.8%
Educational Services	\$28,050	\$31,650	\$31,167	\$34,582	1.6%	-0.8%	2.2%
Other Services (except Public Administration)	\$24,961	\$28,851	\$28,572	\$28,885	1.9%	-0.5%	0.2%
Administrative and Support and Waste Management and Remediation Services	\$26,787	\$28,183	\$26,910	\$27,451	0.7%	-2.3%	0.4%
Arts, Entertainment, and Recreation	\$20,290	\$22,862	\$26,466	\$29,078	1.6%	7.9%	2.0%
Retail Trade	\$23,040	\$24,160	\$23,554	\$27,897	0.6%	-1.3%	3.7%
Accommodation and Food Services	\$16,094	\$16,630	\$16,370	\$17,983	0.4%	-0.8%	2.0%
Agriculture, Forestry, Fishing and Hunting	\$3,425	\$3,874	\$3,620	\$4,069	1.6%	-3.3%	2.5%
Total	\$35,232	\$36,762	\$36,934	\$39,945	0.5%	0.2%	1.6%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

The average wage of *Manufacturing* industries in Greater Northeastern/Northern Pennsylvania, \$47,684, is lower than the U.S. average wage for *Manufacturing*, \$60,306. Within the larger area, manufacturing employees earn a larger average wage in the Northeastern sub-region. The difference, however, is not as drastic and could be a result of employing higher-skilled people and compensating for a higher cost of living in the more urban areas. The average wage for the Northeastern sub-region is \$48,713, over 10% higher than the average wage in the Northern sub-region of \$43,973. Both are projected to increase annually at a percent change of at least 1.0% (Figure 1-12 and Table 1-5).

Figure 1-12: Average Wage by Major Industry in the Two Sub-Regions, 2011

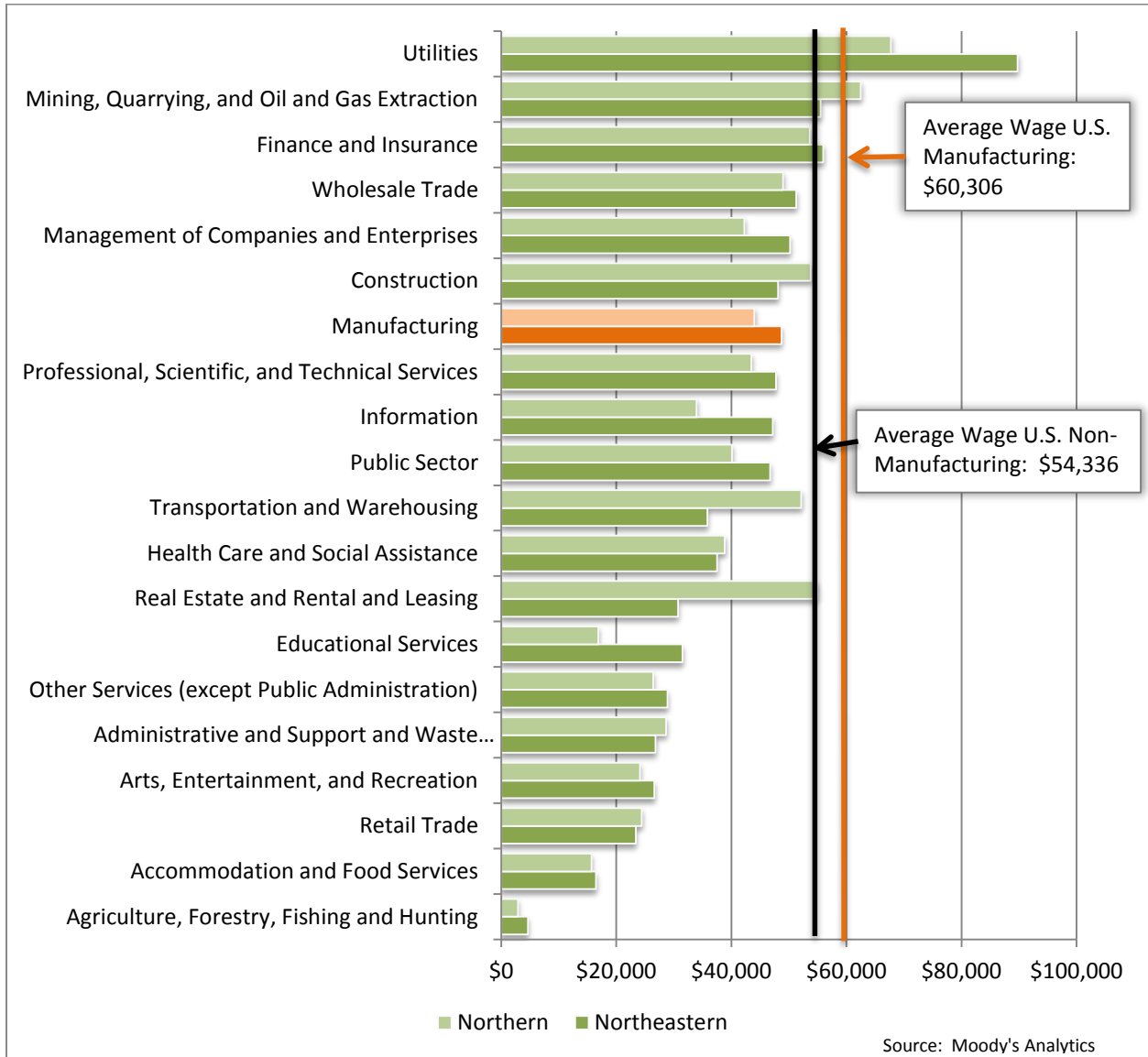


Table 1-5: Manufacturing Average Wage in the Greater Northeastern/Northern Region and its Two Sub-Regions

Year	Northeastern	Northern	Greater Region
2001	\$43,484	\$38,881	\$42,466
2002	\$43,970	\$40,671	\$43,233
2003	\$43,540	\$38,605	\$42,409
2004	\$45,306	\$40,312	\$44,195
2005	\$45,310	\$41,010	\$44,386
2006	\$46,538	\$42,226	\$45,629
2007	\$46,278	\$42,128	\$45,390
2008	\$45,910	\$41,668	\$45,020
2009	\$47,391	\$42,788	\$46,439
2010	\$48,702	\$43,309	\$47,530
2011	\$48,713	\$43,973	\$47,684
2012	\$50,284	\$44,592	\$49,050
2013	\$49,668	\$44,528	\$48,561
2014	\$49,717	\$44,600	\$48,619
2015	\$50,628	\$45,340	\$49,506
2016	\$51,565	\$46,083	\$50,413
Annual Percent Change			
2001-2009	1.1%	1.3%	1.2%
2009-2011	1.4%	1.4%	1.3%
2011-2016	1.2%	1.0%	1.1%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

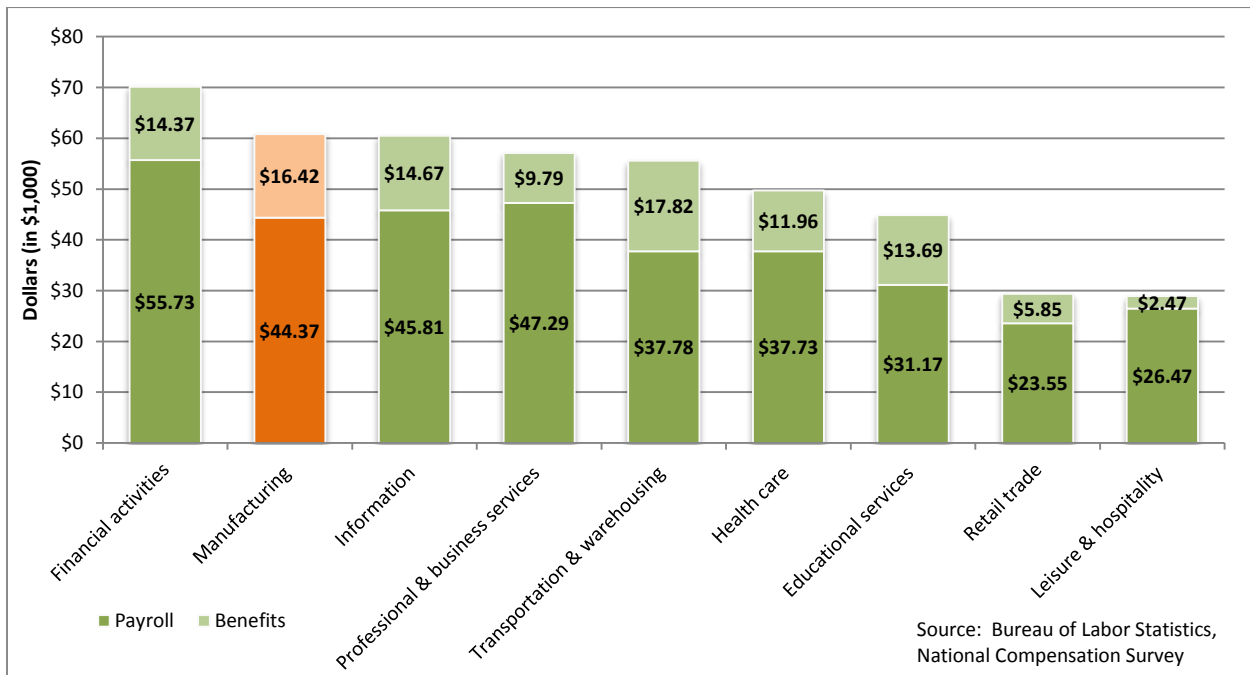
Workers' Benefits

This section analyzes the value of total manufacturing worker benefits and the average benefits per worker. To calculate benefits, the national ratio of benefits to wages was applied to the Greater Northeastern/Northern region. In the *Manufacturing* sector, benefits account for 37% of total wages. *Manufacturing* ranks third in ratio of benefits to total wages, trailing behind *Transportation & Warehousing* and *Educational Services*.

Analyzing total compensation per employee (wage and benefits) in the Greater Northeastern/Northern region reveals that *Manufacturing* ranks second with \$60,790; benefits account for \$16,420 (Figure 1-13). *Financial Activities* is the only industry with a higher total compensation per employee.

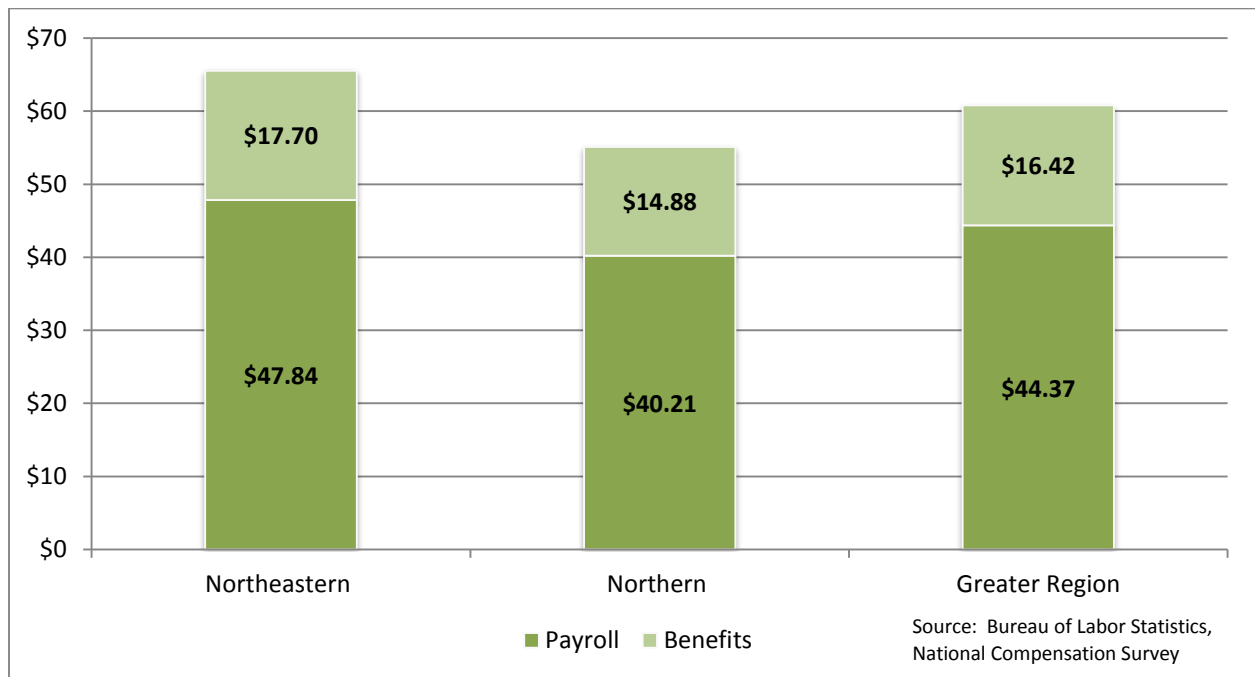
Analyzing the benefits by major industry shows that *Manufacturing* has the second highest benefits per employee, behind *Transportation and Warehousing*. *Retail Trade* and *Leisure and Hospitality* have the lowest annual benefits per employee.

Figure 1-13: Compensation (Wage and Benefits) by Industry in the Greater Northeastern/Northern Region (in \$1,000)



As with other indicators, the Northeastern sub-region has higher compensation and higher benefits than the Northern sub-region, at \$65,540 and \$55,090 respectively (Figure 1-14).

Figure 1-14: Payroll and Benefits of Manufacturing in Greater Northeastern/Northern Region (in \$1,000)



Productivity

Productivity for this study is calculated as GRP divided by Employment, essentially the value added per employee. *Real Estate and Rental and Leasing* consistently have the highest productivity (Table 1-6). *Manufacturing* ranked 9th in productivity in 2001, but increases to a 6th rank in 2009. Manufacturing productivity continues to rank 6th in the following years and is projected to remain at the same rank through 2016. For the most recent year of data, 2011, *Manufacturing* productivity is estimated at \$114,425 (Figure 1-15).

Table 1-6: Productivity by Major Industry in the Greater Northeastern/Northern Region

NAICS Description	2001		2009		2011		2016	
	GRP per Emp.	Rank	GRP per Emp.	Rank	GRP per Emp.	Rank	GRP per Emp.	Rank
Real Estate and Rental and Leasing	\$540,234	1	\$687,249	1	\$645,120	1	\$698,325	1
Utilities	\$320,706	2	\$450,806	2	\$435,955	2	\$417,134	2
Information	\$114,115	5	\$162,949	4	\$178,074	3	\$190,605	3
Mining, Quarrying, and Oil and Gas Extraction	\$119,831	3	\$229,840	3	\$172,649	4	\$158,212	4
Finance and Insurance	\$119,130	4	\$130,347	5	\$154,686	5	\$152,993	5
Manufacturing	\$81,013	9	\$109,486	6	\$114,425	6	\$132,450	6
Wholesale Trade	\$94,832	6	\$109,056	7	\$111,038	7	\$117,046	7
Professional, Scientific, and Technical Services	\$90,278	7	\$84,627	8	\$88,395	8	\$83,951	8
Construction	\$78,215	11	\$71,860	9	\$74,760	9	\$67,470	11
Public Sector	\$60,513	12	\$70,146	10	\$72,928	10	\$73,698	9
Management of Companies and Enterprises	\$81,753	8	\$69,574	11	\$71,542	11	\$67,988	10
Transportation and Warehousing	\$79,813	10	\$63,512	12	\$64,751	12	\$65,883	12
Health Care and Social Assistance	\$52,123	13	\$56,766	13	\$57,041	13	\$54,529	13
Other Services (except Public Administration)	\$45,143	14	\$48,272	14	\$49,153	14	\$44,986	15
Retail Trade	\$44,011	15	\$47,554	15	\$48,494	15	\$48,601	14
Arts, Entertainment, and Recreation	\$33,813	18	\$43,424	17	\$45,698	16	\$42,771	16
Administrative and Support and Waste Management and Remediation Services	\$41,695	16	\$47,232	16	\$44,903	17	\$39,790	18
Educational Services	\$34,780	17	\$42,448	18	\$40,912	18	\$40,586	17
Accommodation and Food Services	\$31,635	19	\$30,395	19	\$30,709	19	\$29,868	19
Agriculture, Forestry, Fishing and Hunting	\$14,167	20	\$14,587	20	\$18,799	20	\$18,563	20

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

Both sub-regions experienced an increase in *Manufacturing* productivity throughout the years, as shown in Table 1-7. The Northeastern sub-region has the largest annual increase from 2001 through 2009 with an annual percent change of 4.5%. The Northern sub-region also has its most rapid increase in that time span, but at a slightly lower annual rate of 3.8%. Both the Northern and Northeastern sub-regions have an annual percent change of over 2.0% throughout the 16-year study period.

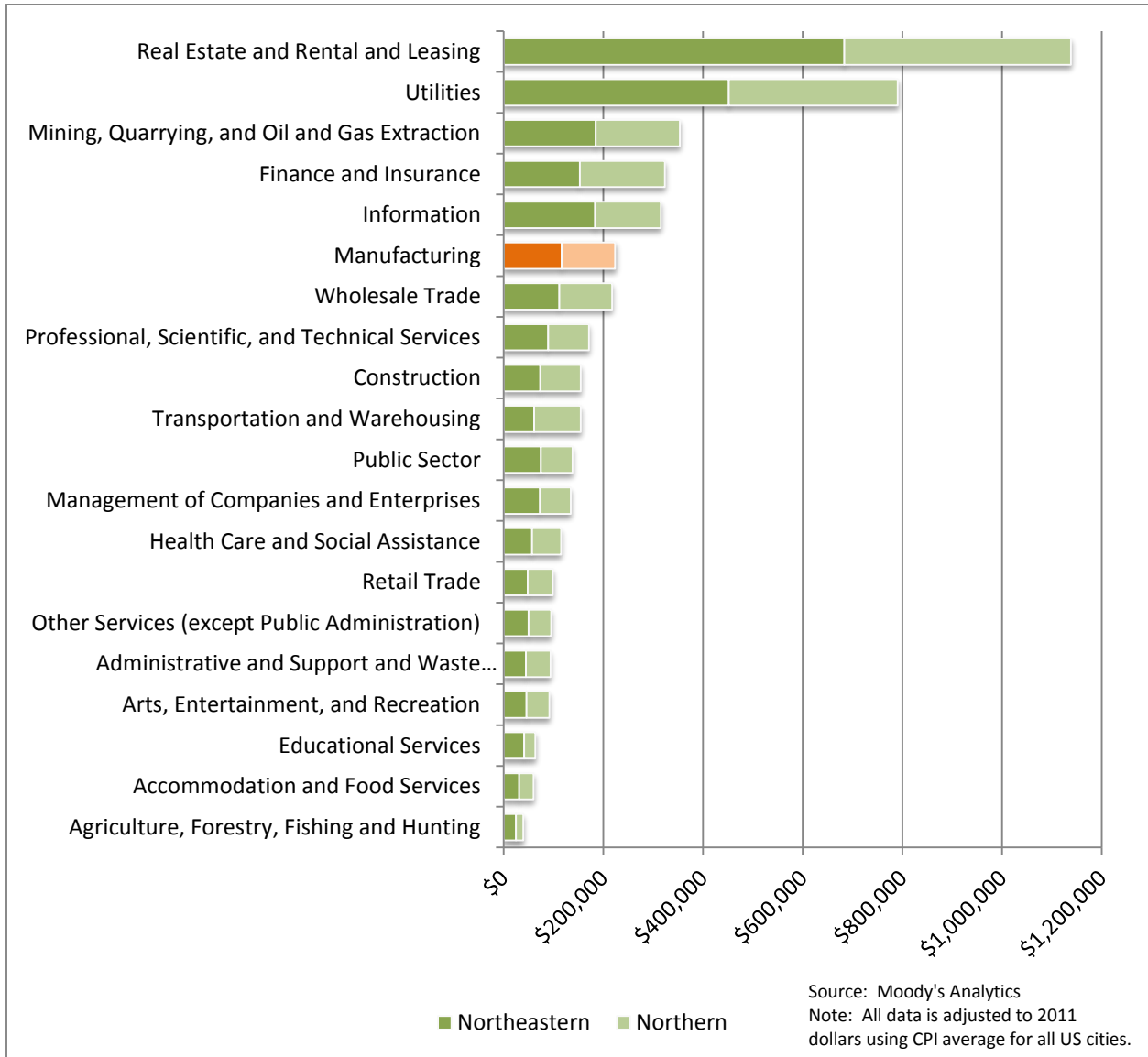
Table 1-7: Manufacturing Productivity in the Greater Northeastern/Northern Region and its Two Sub-Regions , 2001-2016

Year	Northeastern	Northern	Greater Region
2001	\$81,893	\$77,913	\$81,013
2002	\$89,777	\$88,545	\$89,502
2003	\$89,587	\$83,792	\$88,259
2004	\$93,088	\$88,034	\$91,964
2005	\$93,331	\$91,875	\$93,018
2006	\$97,563	\$100,569	\$98,197
2007	\$99,989	\$95,880	\$99,110
2008	\$95,664	\$90,811	\$94,646
2009	\$111,511	\$101,718	\$109,486
2010	\$110,783	\$100,422	\$108,531
2011	\$116,471	\$107,047	\$114,425
2012	\$123,620	\$112,779	\$121,270
2013	\$126,756	\$116,448	\$124,536
2014	\$129,972	\$119,268	\$127,676
2015	\$133,273	\$121,834	\$130,845
2016	\$135,034	\$122,736	\$132,450
Annual Percent Change			
2001-2009	4.5%	3.8%	4.4%
2009-2011	2.2%	2.6%	2.3%
2011-2016	3.2%	2.9%	3.2%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

Figure 1-15: Regional Productivity by Industry, 2011



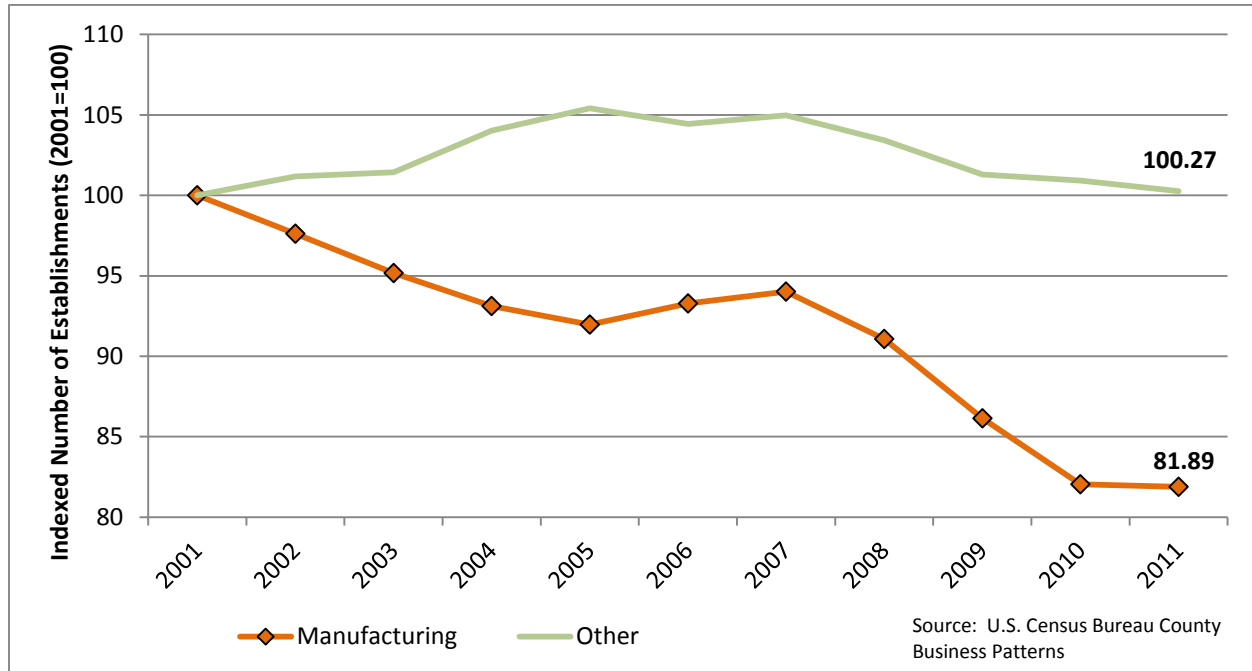
Number of Establishments

The trend in the number of *Manufacturing* establishments follows a completely different pattern than the trend in the total number of establishments (Figure 1-16).⁵ All industries experience a slight bump in establishments from 2003 to 2009, but by 2011 number of establishments is nearly exactly where it started ten years e earlier. However, the number of

⁵ Data for the number of manufacturing establishments was extracted from the U.S. Census Bureau County Business Patterns, which are categorized by NAICS codes For years 2001 and 2002, the major NAICS '95' was used, *Auxiliaries (except corporate, subsidiary, and regional management)*. For the two years, the *Auxiliaries* NAICS has been equally distributed among 10 other major NAICS codes: *Mining, Quarrying, and Oil and Gas Extraction, Utilities, Construction, Manufacturing, Transportation and Warehousing, Wholesale Trade, Retail Trade, Finance and Insurance, Real Estate and Rental and Leasing, and Accommodation and Food Services*. For more information, please visit: <http://www.census.gov/econ/cbp/historical.htm>.

Manufacturing establishments continually decreased over the same period. By 2011, *Manufacturing* ranked 9th out of 24 industries in the number of establishments; it ranked 8th in 2001 (Appendix Table A-1-8). In contrast, *Transportation and Warehousing* and *Mining, Quarrying, and Oil and Gas Extraction* saw large increases in their number of establishments, which grew by 21% and 71%, respectively.

Figure 1-16: Indexed Number of Establishments in the Greater Northeastern/Northern Region, Manufacturing and All Industries



Most industries are comprised largely of small businesses, establishments that have fewer than 100 employees. In 2011, the share of small businesses in total businesses was greater than 90.0% for all but one industry, *Manufacturing*, which at 89.0% was close. In 2001, the share of small businesses to total businesses for *Manufacturing* was 87.5%.

ADDITIONAL MEASURES OF MANUFACTURING ACTIVITIES: CAPITAL EXPENDITURES, VALUE OF SHIPMENTS, AND PATENTS

This section highlights a few additional descriptors of manufacturing activities that are unique to this sector. Here we compare the performance in the Greater Northeastern/Northern Region to the state of Pennsylvania as a whole.

Manufacturing Shipments

The total value of shipments serves as a proxy for export capacity and analyzing trends in manufacturing shipments reveals the strengths and weaknesses of regional exports to other regions or countries. Table 1-8 shows the value of manufacturing shipments between 2004 and 2011.

In 2011, the total value of manufacturing shipments in the Greater Northeastern/Northern region, \$16.4 billion, accounted for 7% of the value of manufacturing shipments in Pennsylvania. The regional share was quite stable throughout this period. As with other measures of the regional economy, the Northern sub-region is much smaller than the Northeastern sub-region and it accounts for only one-fifth of the Greater region.

Table 1-8: Value of Manufacturing Shipments Statewide, Greater Northeastern/Northern Region, and the Two Sub-Regions, 2004-2011 (in Millions)

Year	Pennsylvania	Northeastern	Northern	Greater Region
2004	226,690	12,679	3,228	15,907
2005	248,587	13,885	3,440	17,325
2006	254,260	14,309	3,471	17,780
2007	254,771	14,220	3,522	17,742
2008	260,329	14,599	3,518	18,117
2009	211,981	12,210	2,873	15,083
2010	226,953	12,848	3,173	16,021
2011	237,600	13,104	3,281	16,385
Annual Percent Change				
2004-2009	-1.3%	-0.7%	-2.2%	-1.0%
2009-2011	6.0%	3.7%	7.1%	4.3%
2004-2011	0.7%	0.5%	0.2%	0.4%

Notes: Manufacturing shipment data is only available at the state level. To estimate manufacturing shipments at the regional level, the data of manufacturing shipments for Pennsylvania were allocated to each county using the proportion of manufacturing wages in each county. Counties were then aggregated to each of the regions.

The dollar amounts of manufacturing shipments were inflated to 2011 using the national CPI-U.

Data source: U.S. Census Bureau, Annual Survey of Manufacturing

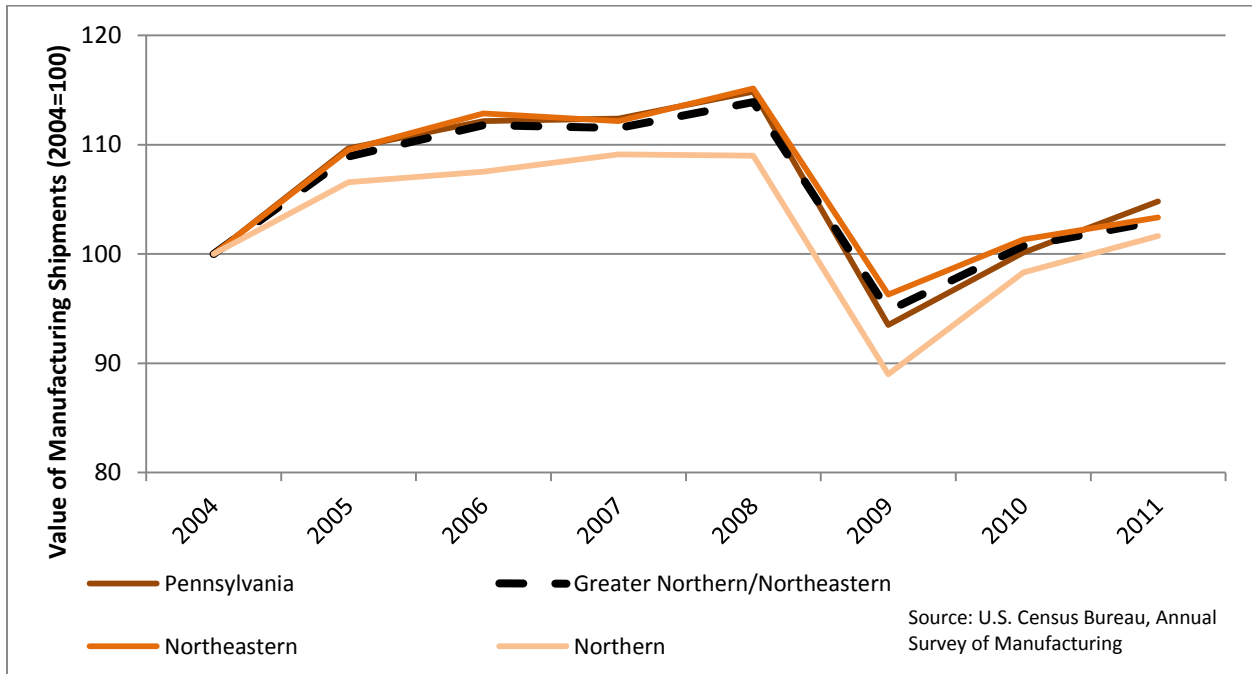
Manufacturing shipments in the Greater Northeastern/Northern region grew by 3% from \$15.9 billion in 2004 to \$16.4 billion in 2011. Comparing growth patterns between the two sub-regions reveals that the value of shipments increased twice as fast in the Northeastern region; it rose by 3.4% in the Northeastern sub-region and 1.6% in the Northern sub-region. However, dividing the time period to before and during the Great Recession (2004-2009) and post-recession (2009-2011), shows that between 2004 and 2009, manufacturing shipments in the combined region fell by 5.2% from \$15.9 billion in 2004 to \$15.1 billion in 2009. As expected, manufacturing shipments fell in both sub-regions, but the value of shipments fell at a faster pace in the Northern sub-region (-11%) than in the Northeastern sub-region (-3.7%), suggesting that the impact of the recession on manufacturing shipments was more severe in the Northern sub-region than in the Northeastern sub-region.⁶ Over the studied period, and consistent with the effects of the Great Recession, the value of shipments in the Greater region was the highest in 2008 (\$18 billion) and the lowest in 2009.

Following the end of the recession, the value of manufacturing shipments grew by 8.6% in the Greater region, from \$15.1 billion in 2009 to \$16.4 in 2011. The value of shipments rose by 14.2% in the Northern sub-region, a rate twice as large as the growth rate in the Northeastern sub-region (7.3%). However, in each of the sub-regions and the Greater region, the value of shipments in 2011 was still below the pre-recession levels.

The effects of the Great Recession can be seen in Figure 1-17 in which the percent change of manufacturing shipments is compared to the base year of 2004 (2004=100). It reveals that the trend of shipments in the Northeastern sub-region followed closely the statewide trend between 2004 and 2011. In contrast, during the growth period between 2004 and 2008, the Northern sub-region showed a smaller increase in the value of manufacturing shipments, compared to the growth trend in the Northeastern region and Pennsylvania statewide.

⁶ According to the National Bureau of Economic Research, the last recession occurred between December 2007 and June 2009.

Figure 1-17: Value of Manufacturing Shipments Statewide, Greater Northeastern/Northern Region, and the Two Sub-Regions 2004-2011



Manufacturing Capital Expenditures

Capital expenditures invested by manufacturers in their companies serve as a proxy for capital intensity and adoption of technology. Table 1-9 shows the trend in capital expenditures between 2004 and 2011. In 2011, manufacturers in the combined region spent \$442 million on capital investments, nearly 7% of the manufacturing capital expenditures in Pennsylvania (\$6.4 billion).⁷

⁷ Capital expenditures represent the total new and used capital expenditures reported by manufacturing and mining establishments in operation and any known plants under construction. This data excludes expenditures for land and mineral rights and cost of maintenance and repairs charged as current operating expenses.

Table 1-9: Manufacturing Capital Expenditures Statewide, Greater Northeastern/Northern Region, and the Two Sub-Regions, 2004-2011 (in Millions)

Year	Pennsylvania	Northeastern	Northern	Greater Region
2004	6,154	344	88	432
2005	6,794	379	94	474
2006	6,233	351	85	436
2007	7,581	423	105	528
2008	6,776	380	92	472
2009	5,518	318	75	393
2010	5,459	309	76	385
2011	6,411	354	89	442
Annual Percent Change				
2004-2009	-2.1%	-1.5%	-3.0%	-1.8%
2009-2011	8.1%	5.7%	9.3%	6.2%
2004-2011	0.6%	0.4%	0.2%	0.3%

Notes: Capital expenditure data is only available at the state level. To estimate manufacturing capital expenditures at the regional level, the data of capital expenditures for Pennsylvania were allocated to each county using the proportion of manufacturing wages in each county. Counties were then aggregated to each of the regions.

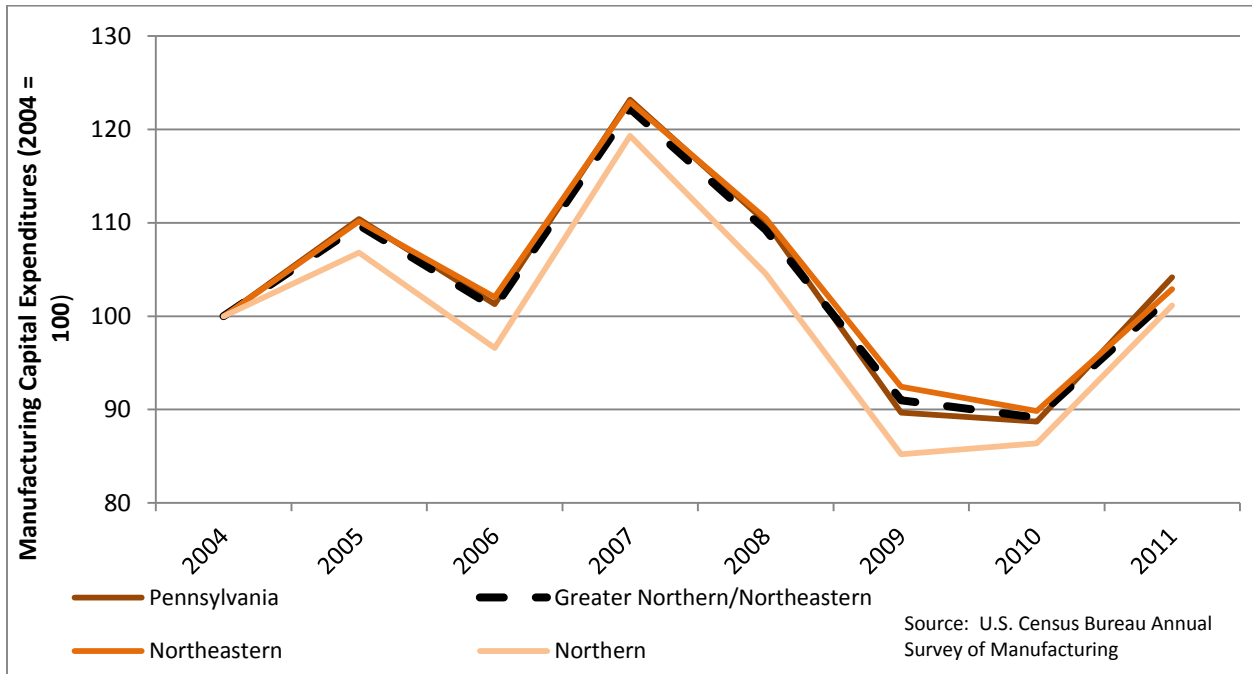
The dollar amounts of capital expenditures were inflated to 2011 dollars using the national CPI-U.

Source: U.S. Census Bureau, Annual Survey of Manufacturing

For the Greater region, manufacturing capital expenditures increased between 2004 and 2011 by 2.3%, significantly less and slower than the statewide growth of 4.2%. As with value of shipments, the Northeastern sub-region grew faster (2.9%) than the Northern (1.1%).

Between 2004 and 2009, years which include the period prior and during the Great Recession, capital expenditures fell by 9% in the Greater Northeastern/Northern region, a slightly slower decline than statewide (-10.3%). Within the studied region, the impact of the recession on capital expenditures in the Northern sub-region was more severe than the impact in Northeastern sub-region; the rate of decline in the Northern sub-region was twice as large (-14.8%) as the rate of decline in the Northeastern sub-region (-7.6%). Over the studied period 2004-2011, capital expenditures were highest in 2007, the pre-recession year, in Pennsylvania, the Greater region, and each of the sub-regions. The value of capital expenditures continued to decline in 2010 both statewide and in the Greater region. However, capital expenditures recovered in 2011 and rose above the 2004 in all areas.

Figure 1-18: Manufacturing Capital Expenditures Statewide, Greater Northeastern/Northern Region, and the Two Sub-Regions, 2004-2011



As in earlier figures, the severe effects of the Great Recession can be seen in Figure 1-18, which shows the percent change of capital expenditures in comparison to the base year of 2004 (2004=100). The figure shows that the trend of capital expenditures in the Northeastern sub-region closely followed the statewide trend between 2004 and 2011. However, during the same period, the Northern sub-region showed a slower rate of increase in capital expenditures, compared to the trend in the Northeastern sub-region and Pennsylvania.

Patent Analysis

Patents serve as a measure of research and development, where innovators seek protection of their intellectual rights and see a potential for commercialization.

The total number of patents in manufacturing-related technologies awarded to inventors who reside in Pennsylvania was 4,661 in 2010 (Table 1-10). Of the 4,661 patents, only 164 (3.5%) were awarded in the Greater Northeastern/Northern region. Within the Greater region, patents awarded in the Northeastern sub-region accounted for 75.6% (124 patents), while the Northern sub-region accounted for 24.4% (40 patents) in 2010.

Table 1-10: Patents in Manufacturing-Related Technologies Statewide, Greater Northeastern/Northern Region, and the Two Sub-Regions, 2010

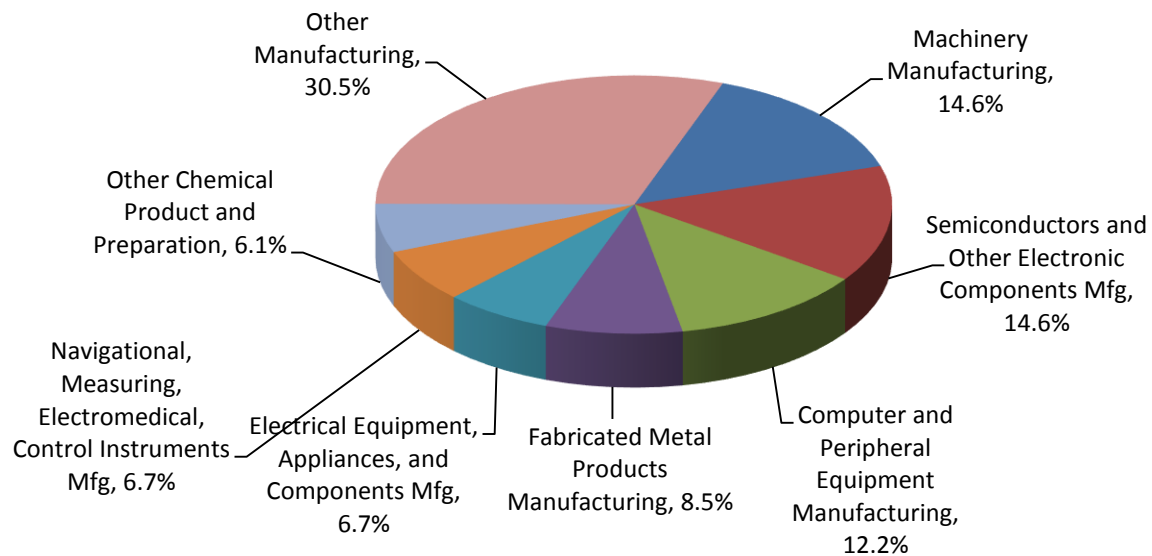
	PA, 2010	Greater Region	Northeastern	Northern
Number of Patents	4,661	164	124	40
Number of Inventors*	9,027	207	157	50

Note: Inventors who have a residential address in study regions
 Source: U.S. Patent and Trademark Organization

Many of the patents have multiple inventors from different locations and organizations, and tracking the inventors sheds light on the innovation talent that exists in the region. The number of patent inventors who reside in Pennsylvania was 9,027 in 2010. Of the total inventors, only 207 (2.3%) had a residential address in the Greater Northeastern/Northern region. As with the number of patents, about three-quarters of the Greater region inventors live in the Northeastern sub-region (75.8%; 157 inventors), while one-quarter reside in the Northern sub-region (24.2%; 50 inventors).

More revealing is the analysis of patents by industry, which allows the researcher to point to those industries with technological strengths. Figure 1-19 shows the breakdown of patents awarded in 2010 in the Greater Northeastern/Northern region by individual manufacturing industries. The two most innovative manufacturing industries in the region are (1) machinery manufacturing and (2) semiconductors and other electronic components manufacturing.

Figure 1-19: Share of Patents by Industry, Greater Northeastern/Northern Region, 2010



Total number of patents: 164

During 2010, the number of patents in machinery manufacturing (NAICS 333) and the semiconductors and other electronic components manufacturing (NAICS 3344), each accounted

for the largest percentage (14.6%, 24 patents) of the total patents in the Greater Northeastern/Northern region. However, for the Northeastern sub-region only, patents in semiconductors and other electronic components manufacturing accounted for the largest share (16.1%, 20 patents) of total patents, while patents related to machinery manufacturing accounted for the second-largest share (13.7%, 17 patents) of the total patents.

The third-largest industry in terms of patent counts is computer and peripheral equipment manufacturing (NAICS 3341), accounting for 12.2% (20 patents) of the Greater Northeastern/Northern region patents. Fabricated metal products manufacturing (NAICS 332) is the fourth-largest industry in terms of patent counts in 2010, accounting for 8.5% (14 patents) of all 164 patents in the Greater region.

Other manufacturing industries, which accounted for 30.5% (50 patents) of the total number of patents in the Greater Northeastern/Northern region aggregates several industries, including plastics and rubber products manufacturing (4.3%), communications equipment manufacturing (3.7%), and medical equipment and supplies manufacturing (3.7%), and more (Appendix Table A-1-9 presents for more detailed information.)

PART 2: ANALYSIS OF DETAILED MANUFACTURING INDUSTRIES

The first section of the report examined the role of the manufacturing industry in the Greater Northeastern/Northern regional economy by comparing it to other industrial sectors of economy; this section, part 2, analyzes the performance of 11 manufacturing industries that are known as driver industries because they drive the competitiveness of the regional economy.

Analysis is conducted in terms of employment, gross regional product, wages, productivity, and number of establishments. Part 2 also briefly describes trends for the driver industries pertaining to the value of manufacturing shipments and manufacturers' investments in capital expenditures. Value of manufacturing shipments is viewed by many researchers as a proxy measure for regional exports, while investments in capital expenditures are used as a measure of capital intensity and adoption of technology. In addition to the analysis of the driver manufacturing industries, this section analyzes all other 4-digit manufacturing industries to identify which non-driver manufacturing industries are large and/or growing in the Greater Northeastern/Northern region. These non-driver industries, along with the driver industries, are industries that policy decision makers are advised to heed.

MANUFACTURING DRIVER INDUSTRIES

To identify the manufacturing driver industries for the Greater Northeastern/Northern regional economy, the research team used the measure of location quotient (LQ) for the 4-digit manufacturing industries⁸. In this report, a driver industry is defined as an industry that has a LQ greater than 2.0 in both employment and gross regional product. Based on LQs in 2011, the research team identified 11 drivers for the Greater Northeastern/Northern regional economy among the 86 detailed manufacturing industries. Table 2-1 shows the LQs of the 11 manufacturing drivers for the Greater Northeastern/Northern region.

⁸ The location quotient (LQ) is calculated as a ratio between the local economy and the economy of some reference unit – in our case the national economy. A location quotient greater than one suggests that there is a concentration or specialization of an industry within a region, while a location quotient less than one suggests an industry is not concentrated in the region.

Table 2-1. Manufacturing Driver Industries for the Greater Northeastern/Northern Region

NAICS	Industry Description	Employment LQ (2011)	GRP LQ (2011)
3111	Animal Food Product	3.71	6.91
3113	Sugar and Confectionery Product	4.76	5.48
3141	Textile Furnishings Mills	5.46	7.11
3222	Converted Paper Product	3.14	6.39
3256	Soap, Cleaning, and Toilet	2.34	5.35
3261	Plastics Product	2.24	3.93
3315	Foundries	2.66	3.46
3321	Forging and Stamping	2.07	3.67
3326	Spring and Wire Product	3.72	4.71
3346	Magnetic and Optical Media	6.04	7.71
3379	Other Furniture-Related Product	2.73	5.91

Source: Moody's Analytics

All of the 11 driver industries have a LQ greater than 2.0 in both employment and gross regional product. Among the 11 drivers, three industries have a LQ greater than 4.0 in both indicators: the *Sugar and Confectionery Product* industry, the *Textile Furnishings Mills* industry, and the *Magnetic and Optical Media* industry. The *Magnetic and Optical Media* industry has the highest LQs in both employment (6.04) and gross regional project (7.71) and the *Textile Furnishings Mill* industry has the second-highest LQs of employment (5.46) and gross regional product (7.11). Although the employment LQs in the *Converted Paper Product* industry and the *Other Furniture-Related Product* industry are relatively smaller than other drivers, both sectors have higher LQs in gross regional product, 6.39 and 5.91 respectively.

The following sections describe the detailed performances of each driver industry in seven different measures: gross regional product (GRP), which measures the scale of economy, or the value of goods and services produced in the economy; employment; total wages and average wage; productivity, which is defined as GRP per employee; number of establishments; the value of shipments; and capital expenditures.

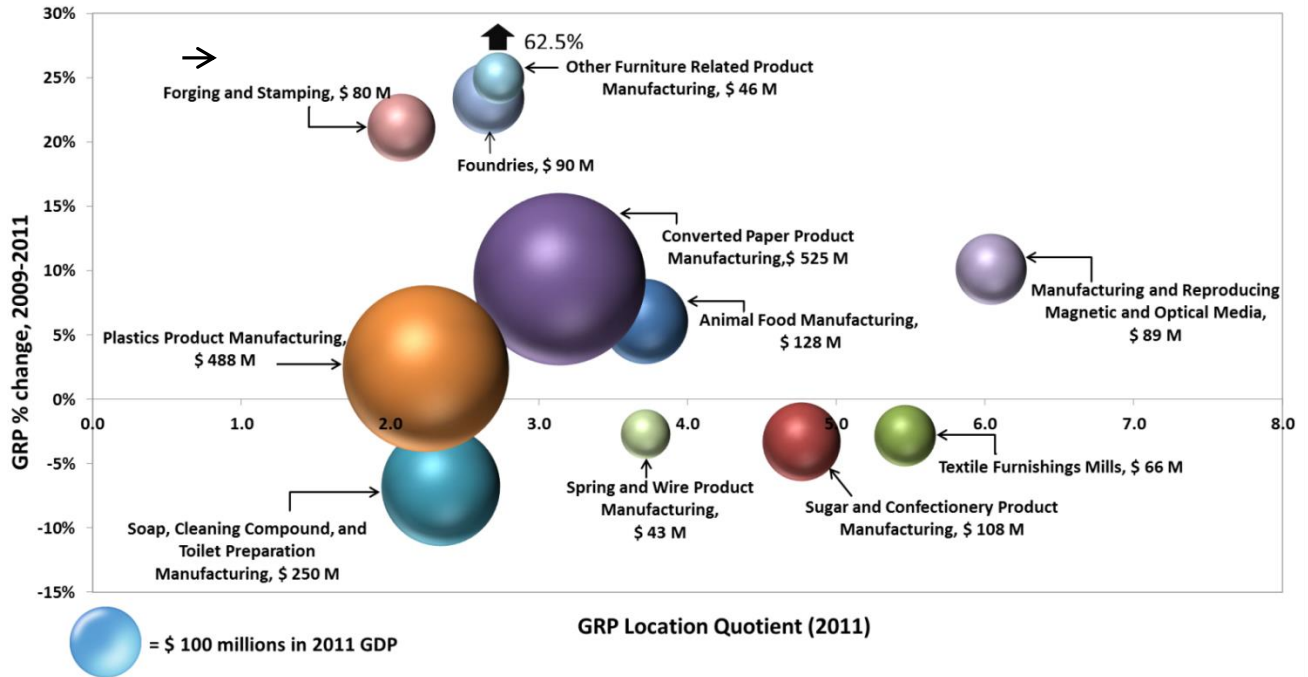
Gross Regional Product of Driver Industries

This section summarizes the findings from the analysis of the driver industries in term of gross regional product (GRP). The analysis was conducted for two different time periods: short-term performance between 2009 and 2011, which represents the post-recession period; and long-term historical performance between 2001 and 2011 and projected performance between 2011 and 2016.

Figure 2-1 shows the economic performance of the 11 driver industries in GRP over the short-term period (2009-2011). Among the 11 drivers, seven industries experienced growth of GRP, while four drivers showed a decline in GRP in the Greater Northeastern/Northern region. The GRP in the *Other Furniture-Related Product Manufacturing* rapidly increased by 62.5% from \$28 million in 2009 to \$46 million in 2011. The *Foundries* and the *Forging and Stamping* industry also showed relatively high-growth rate during the same period, 23.4% and 21.1% respectively.

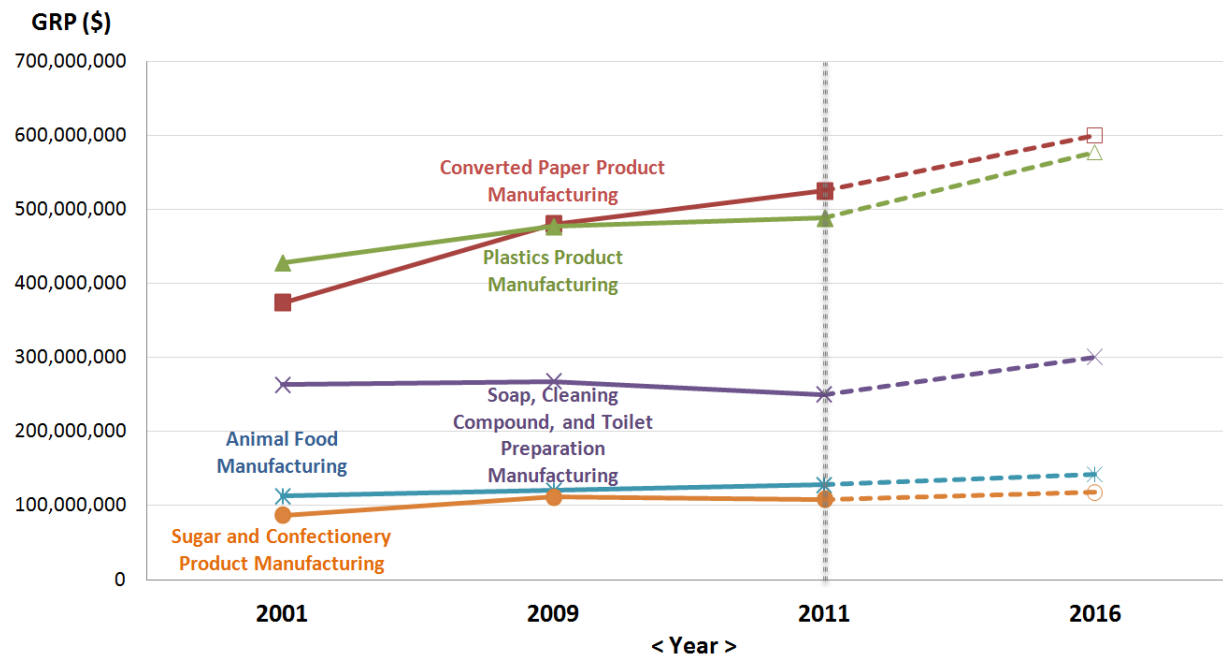
However, the GRP in the *Soap, Cleaning Compound, and Toilet Preparation Manufacturing* decreased by 6.7% from \$268 million in 2009 to \$250 million in 2011.

Figure 2-1. Short-term GRP Performance of the Driver Industries, 2009-2011



Source: Moody's Analytics

Figure 2-2. Long-term GRP Performance of the Driver Industries, 2001-2016



Source: Moody's Analytics

Among the 11 manufacturing driver industries, the five industries with the largest GRP were selected to examine long-term performance in the Greater Northeastern/ Northern regional economy (Figure 2-2). *Plastic Product Manufacturing* had the largest GRP in 2001 among the driver industries, but it was surpassed by the *Converted Paper Product Manufacturing*, which grew faster between 2009 and 2011. During the long-term period between 2001 and 2011, the *Plastic Product* industry grew by 14.3% from \$427 million in 2001 to \$488 million in 2011, while the GRP of the *Converted Paper Product* industry rapidly increased by 40.6% over the same period, from \$373 million in 2001 to \$525 million in 2011. Both industries are projected to continue to grow between 2011 and 2016.

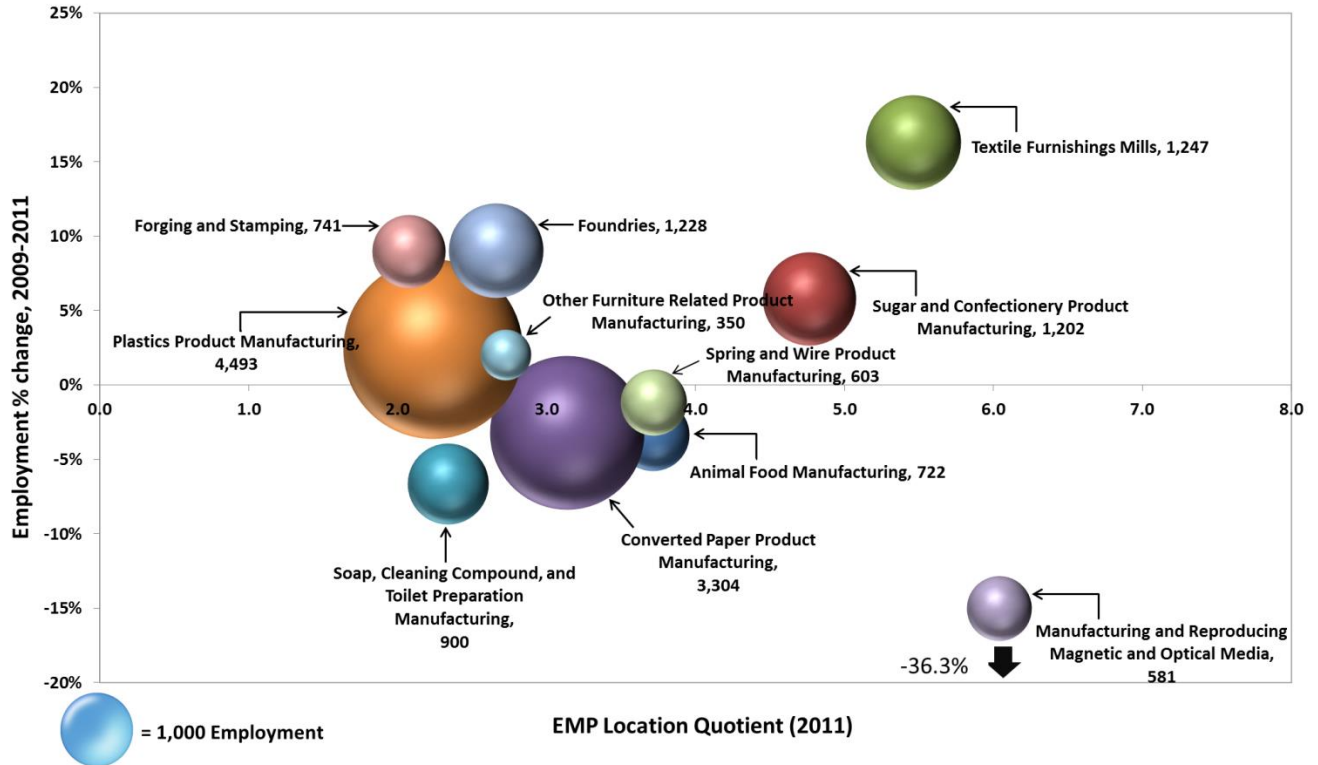
On the other hand, the *Soap, Cleaning Compound, and Toilet-Preparation Manufacturing* sector ranked third in terms of GRP in the Greater Northeastern/Northern region in 2001 but its GRP declined by 5.2% from \$263 million in 2001 to \$250 million in 2011. As a group, the 11 manufacturing drivers showed continuous growth of GRP over the long-term period (11.5% growth between 2001 and 2011). Furthermore, this trend is projected to continue to grow in the Greater Northeastern/Northern region.

Employment of Driver Industries

This section summarizes employment trends for the driver industries in both the short-term (2009-2011) and the long-term period (2001-2011). The long-term analysis includes 5-year projection between 2011 and 2016.

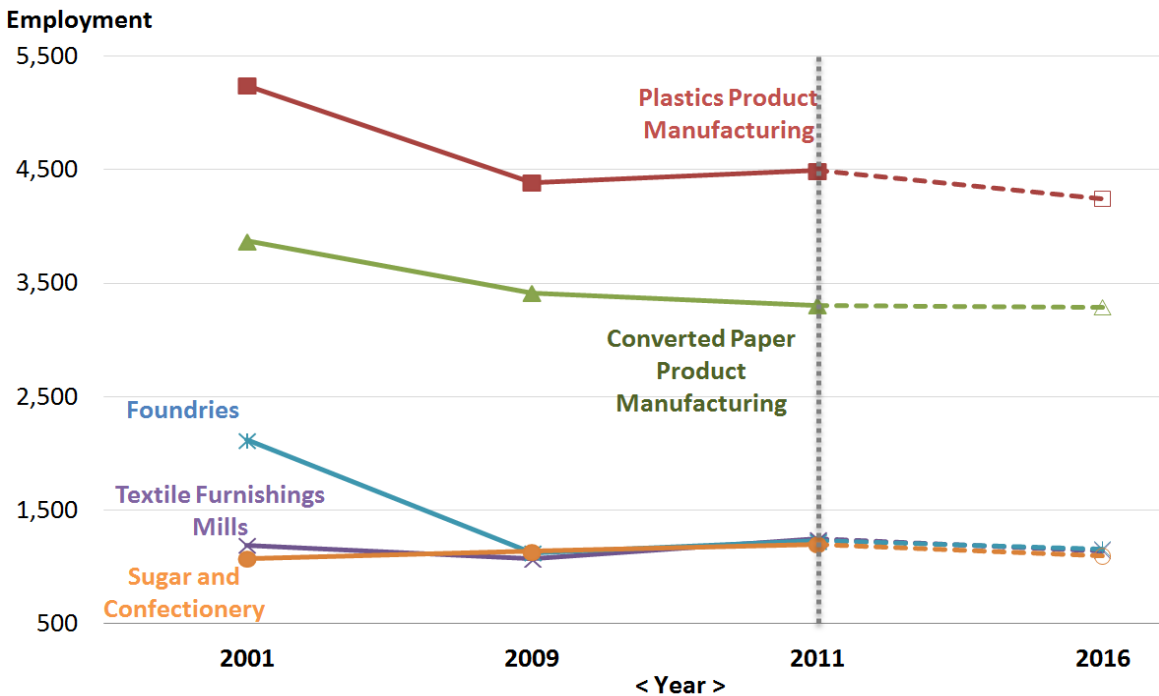
Figure 2-3 shows the economic performance of the 11 driver industries in employment over the short-term period (2009-2011). Among the 11 drivers, six industries experienced employment growth, while five drivers showed decreased employment in the Greater Northeastern/Northern region. The *Textile Furnishings Mills* industry was the fastest growing sector between 2009 and 2011, growing by 16.3%. Additionally, the employment in the *Foundries* and the *Forging and Stamping* industry increased 9.1% and 9.0%, respectively, during the same period. On the other hand, the *Magnetic and Optical Media* industry experienced a rapid drop of employment in the Greater Northeastern/Northern region (-36.3%). The 11 drivers as a whole showed stable performance in employment between 2009 and 2011; the total number of employees in all drivers combined changed slightly from 15,389 employees in 2009 to 15,371 employees in 2011 (-0.1%).

Figure 2-3. Short-term Employment Performance of the Driver Industries, 2009-2011



Source: Moody's Analytics

Figure 2-4. Long-term Employment Performance of the Driver Industries, 2001-2016



Source: Moody's Analytics

Among the 11 manufacturing driver industries, the five largest industries were selected to examine long-term employment in the Greater Northeastern/ Northern regional economy (Figure 2-4). The *Plastic Product Manufacturing* industry has employed the largest number of employees in the region but this sector experienced falling employment numbers between 2001 and 2011 (-14.3%); it employed 4,493 in 2011. During the same period, the *Converted Paper Product* industry, the second-largest industry, showed a decline in employment by 14.6%, from 3,870 employees in 2001 to 3,304 employees in 2011.

On the other hand, the employment in *Sugar and Confectionery Manufacturing* and *Textile Furnishings Manufacturing* increased 12.0% and 4.6%, respectively, between 2001 and 2011. However, the *Foundries* industry lost 889 employees (-42%) during the same period. It should be noted that employment is projected to decrease in the five largest industries between 2011 and 2016.

While the 11 manufacturing drivers as a whole showed growth of GRP over the long-term period (11.5%), the total number of employees in the 11 drivers decreased 22.6%. As a result, productivity of the driver industries as a group increased rapidly (44%) from \$86,418 in 2001 to \$124,433 in 2011.

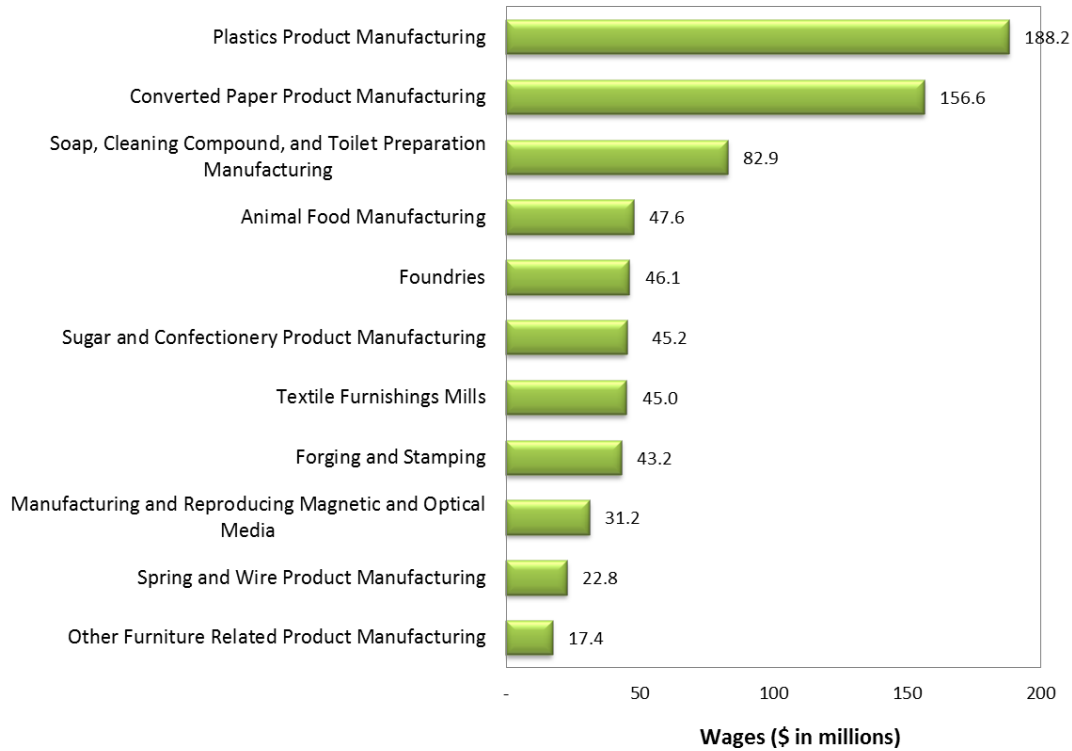
Total Wages and Average Wages for Driver Industries

This section summarizes trends in total wages and average wages for the 11 driver industries. The *Plastic Product* industry ranked first in terms of the total wages in 2011 (\$188.2 million), consistent with being the largest employer. However, the average wage of this industry was relatively small (\$41,893), compared to other drivers.

On the other hand, the *Soap, Cleaning Compound, and Toilet-Preparation* industry recorded the third-largest total wage in 2011 (\$82.9 million) but the average wage of this industry ranked first (\$92,117). The high average wage is consistent with being the first industry in terms of productivity (Table 2-2). The top rank in productivity resulted from being third-largest in terms of GRP and only the sixth-highest in terms of employment.

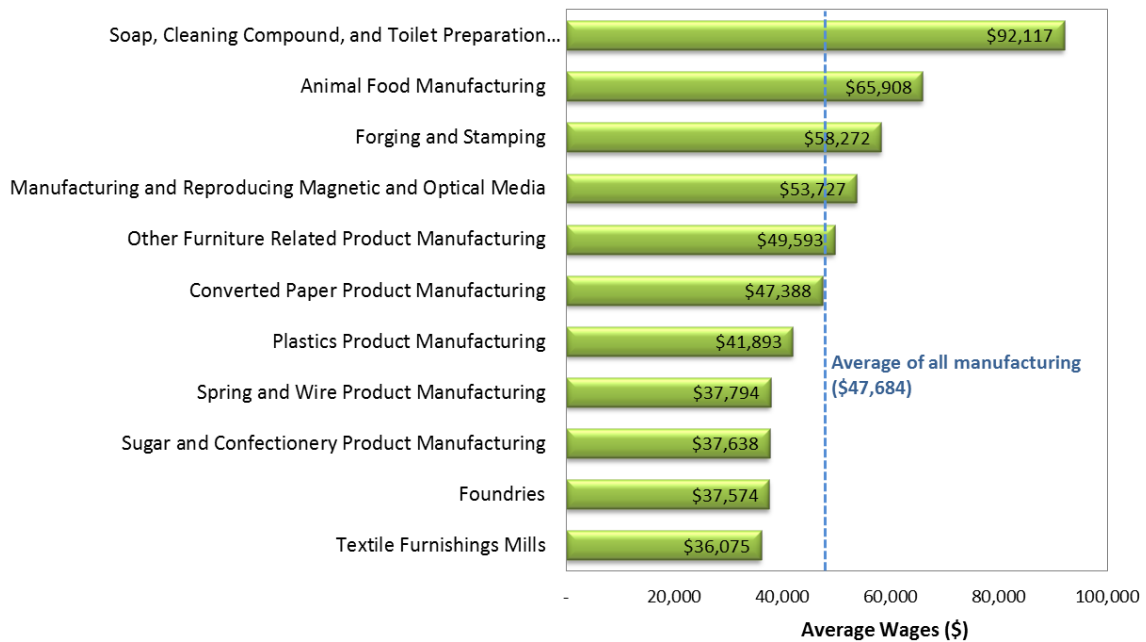
The average wage of all manufacturing industries was \$47,684 in 2011 (Figure 2-6). Among the 11 drivers, five driver industries showed higher average wages than the average wage for all of manufacturing, while six driver industries showed lower average wages.

Figure 2-5. Total Wages of the Drivers, 2011



Source: Moody's Analytics

Figure 2-6. Average Wages of the Drivers, 2011



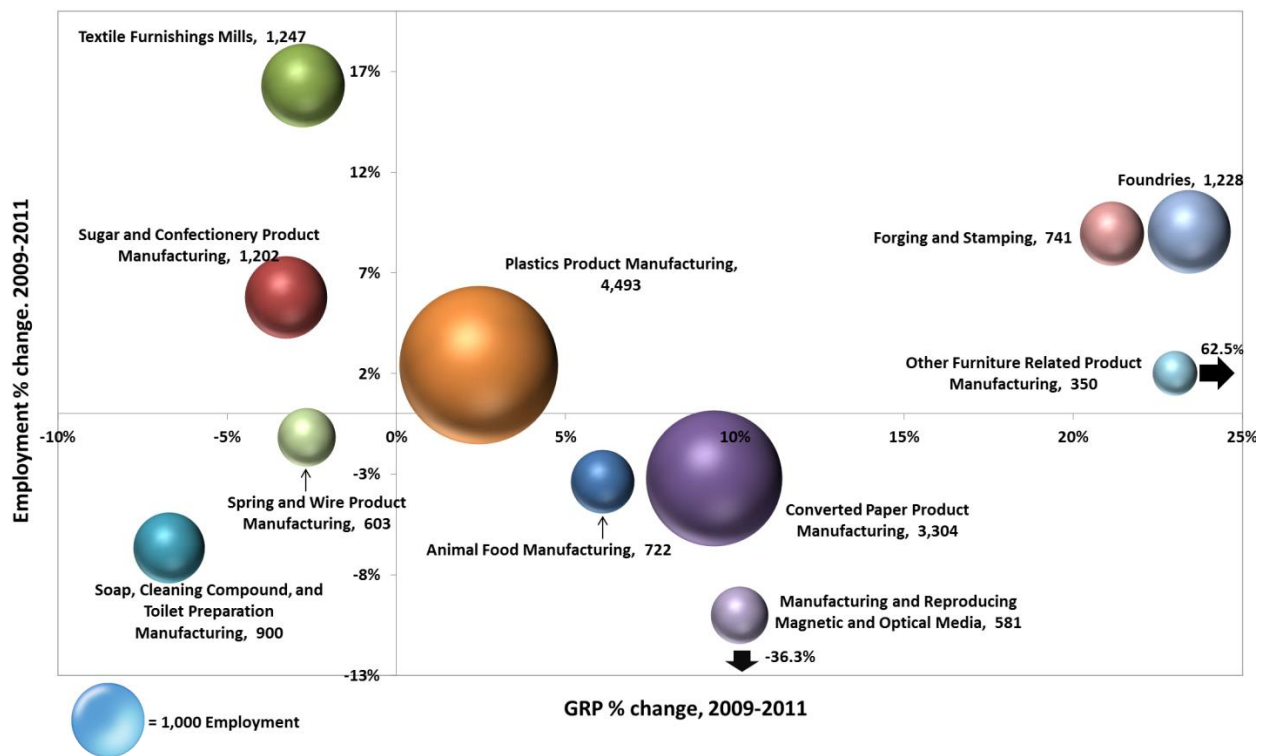
Source: Moody's Analytics

Interactions between Employment, Gross Regional Product, and Average Wages

Analyzing the interaction between different indicators provides a more comprehensive way of evaluating the driver industries' performance in the Greater Northeastern/Northern regional economy. The relationship between GRP and employment growth rates is shown in Figure 2-7, which also depicts the size of the industries' employment. Among the 11 drivers, four industries showed positive growth in both GRP and employment between 2009 and 2011: *Foundries; Forging and Stamping; Other Furniture-Related Products; and Plastic Products*. The *Foundry* industry had relatively small employment, but experienced a rapid growth in both employment and GRP.

On the other hand, the *Spring and Wire Product* industry and the *Soap, Cleaning Compound, and Toilet-Preparation* industry experienced a decline in both GRP and employment over the short-term period (2009-2011). Although employment in the *Textile* industry and the *Sugar and Confectionery* industry grew by 16.3% and 5.8%, respectively, these industries lost their GRP during the same period, which translates into declining productivity. Finally, the *Animal Food* industry, the *Converted Paper Product* industry, and the *Magnetic and Optical Media* industry increased their GRP between 6% and 10%, but these sectors recorded negative growth in employment, suggesting increased productivity.

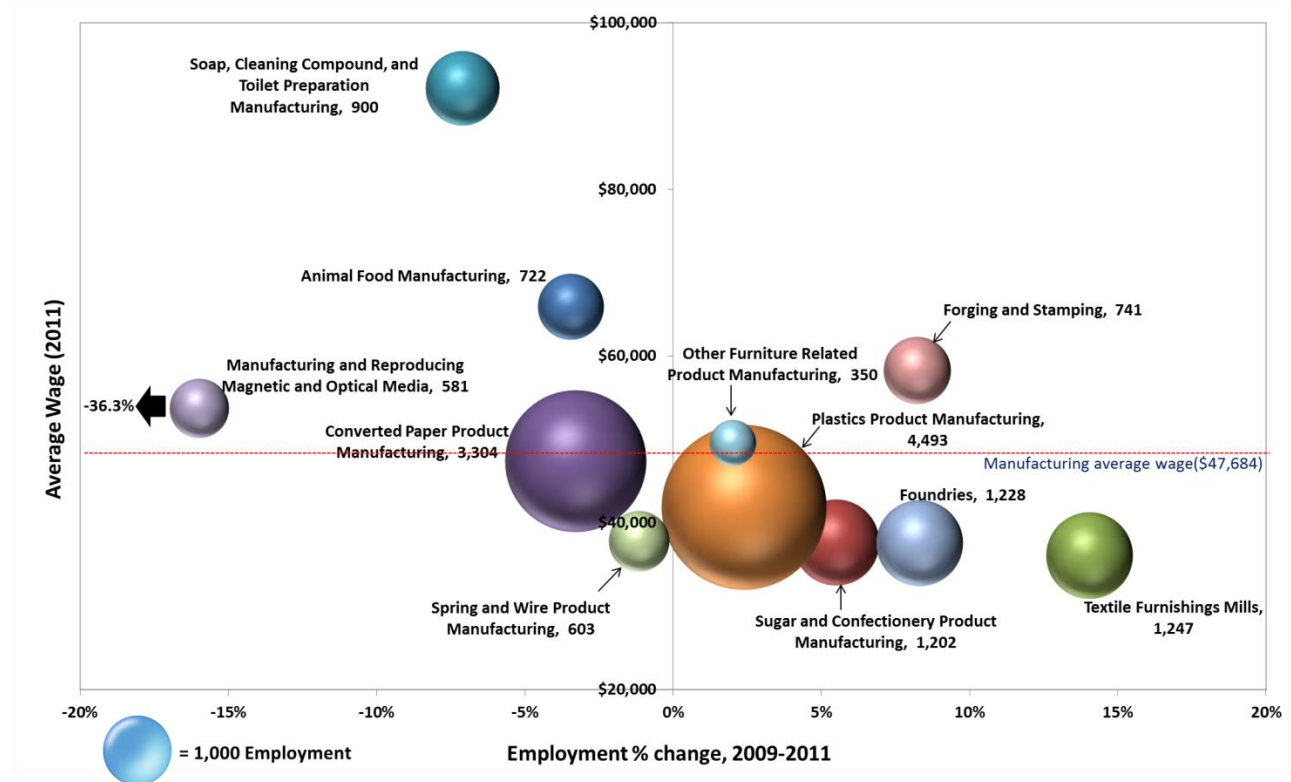
Figure 2-7 Relationship between GRP and Employment Growth Rates (2009-2011)



Source: Moody's Analytics

The relationship between employment growth and average wages is represented in Figure 2-8. Five manufacturing driver industries had higher average wages than manufacturing average wages which is represented by a horizontal dash line in Figure 2-8. However, all the five industries had relatively small employment. Among these five drivers, two industries showed positive growth in employment between 2009 and 2011: the *Forging and Stamping* industry and the *Other Furniture-Related* industry. Additionally, there were four more drivers in which the number of employees increased during the short-term period although those drivers had relatively small average wages in 2011. On the other hand, the *Magnetic and Optical Media* industry had larger average wages than the manufacturing average, but this industry showed a sharp decline in employment (-36.3%). The largest employer driver industry, *Plastics Product Manufacturing*, had a small employment gain, but an average wage lower than the manufacturing average.

Figure 2-8 Relationship between Employment Growth and Average Wages (2009-2011)

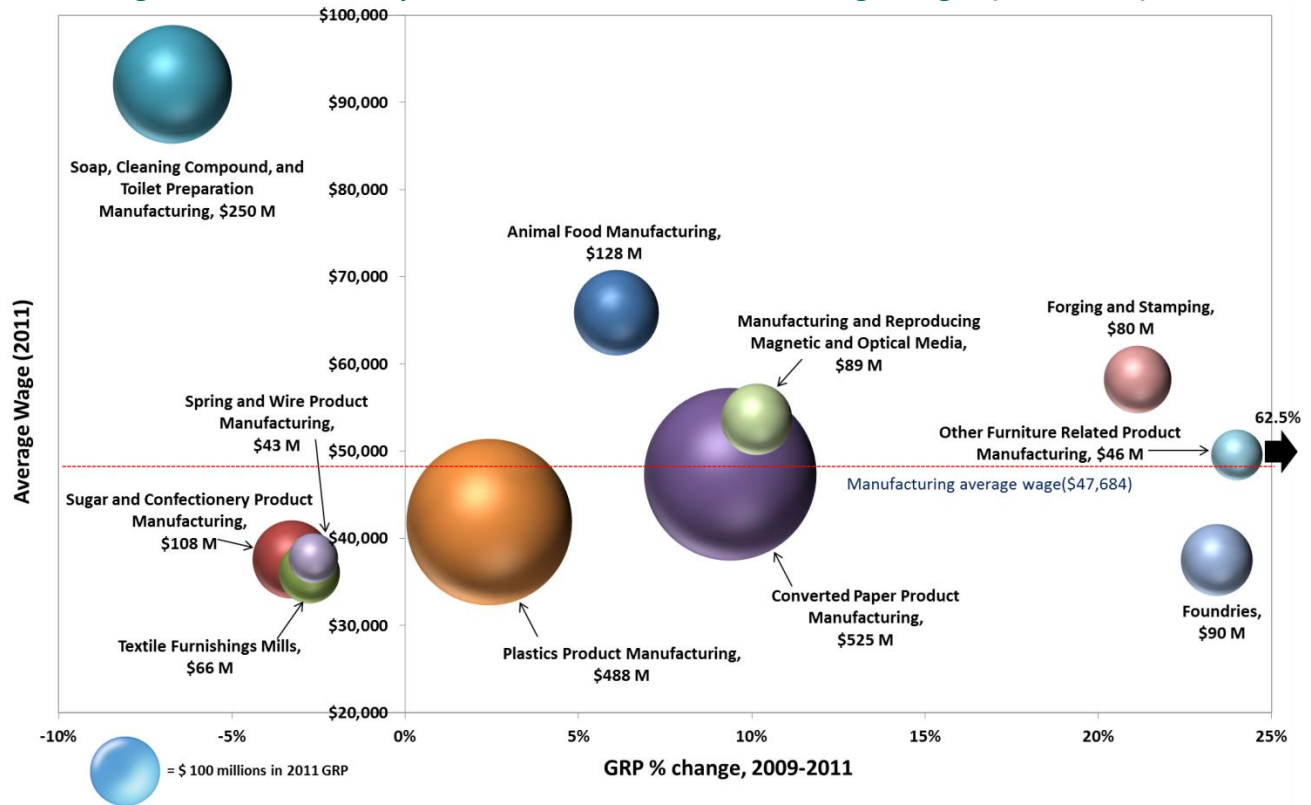


Source: Moody's Analytics

In addition, Figure 2-9 shows the relationship between GRP growth and the average wages of the eleven manufacturing drivers for the Greater Northeastern/Northern regional economy. The growth rate in GRP is during the short-term (2009-2011) period and average wages are based on 2011, the end year of the short-term period. As mentioned above, five drivers had higher average wages than the average of all manufacturing (\$47,684 in 2011). Among these five drivers, four industries grew in GRP between 2009 and 2011: the *Other Furniture-Related* industry (62.5%), the *Forging and Stamping* industry (21.1%), the *Magnetic and Optical Media*

industry (10.1%), and the *Animal Food Manufacturing* (6.1%). On the other hand, the *Soap, Cleaning Compound, and Toilet-Preparation* sector experienced a loss in GRP (-6.7%) over the same period, although the industry had the highest average wages among the eleven drivers.

Figure 2-9 Relationship between GRP Growth and Average Wages (2009-2011)



Source: Moody's Analytics

Table 2-2 (below) provides an overview of the manufacturing driver industries in 2011, including each driver's employment, GRP, total wages, average wages, and productivity. Additionally, this summary shows the proportion of the 11 driver industries out of the total manufacturing industries in the Greater Northeastern/Northern region. The driver industries employed 34% of total manufacturing employment, produced 37% of total GRP, and provided 33.7% of total wages in 2011 for Greater Northeastern/Northern regional economy.

Table 2-2. Summary of Manufacturing Driver Industries, 2011

NAICS*	Industry Description	Employment	GRP	Total wage	Average wage	Productivity (GRP/EMP)
3261	Plastics Product Manufacturing	4,493	\$488,415,247	\$188,227,132	\$41,893	108,706
3222	Converted Paper Product Manufacturing	3,304	\$524,812,825	\$156,571,265	\$47,388	158,842
3141	Textile Furnishings Mills	1,247	\$65,784,709	\$44,985,430	\$36,075	52,754
3315	Foundries	1,228	\$90,266,448	\$46,140,268	\$37,574	73,507
3113	Sugar and Confectionery Product Manufacturing	1,202	\$107,887,287	\$45,241,441	\$37,638	89,756
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	900	\$249,654,326	\$82,905,467	\$92,117	277,394
3321	Forging and Stamping	741	\$80,448,884	\$43,179,243	\$58,272	108,568
3111	Animal Food Manufacturing	722	\$127,777,742	\$47,585,827	\$65,908	176,977
3326	Spring and Wire Product Manufacturing	603	\$42,627,413	\$22,789,804	\$37,794	70,692
3346	Manufacturing and Reproducing Magnetic and Optical Media	581	\$89,240,725	\$31,215,499	\$53,727	153,598
3379	Other Furniture-Related Product Manufacturing	350	\$45,740,354	\$17,357,574	\$49,593	130,687
Total of driver industries		15,371	\$1,912,655,960	\$726,198,950	\$47,224*	124,433*
Total of manufacturing industries		45,154	\$5,166,743,263	\$2,153,120,323	\$47,684**	114,425**
Proportion of driver industries		34.0%	37.0%	33.7%	-	-

Source: Moody's Analytics

Note: The eleven driver industries are sorted by the number of employee from large to small employment.

* Average of 11 driver industries.

** Average of all manufacturing industries in the Greater Northeastern/Northern region.

Table 2-3. Performance of Manufacturing Driver Industries, % Changes, 2001-2009 and 2009-2011

Driver Industry	Industry Definition	Employment		GDP		Total Wages		Average Wages		Productivity	
		01-09	09-11	01-09	09-11	01-09	09-11	01-09	09-11	01-09	09-11
3111	Animal food Product	-11.6%	-3.3%	7.0%	6.1%	-12.7%	11.9%	-1.3%	15.8%	21.1%	9.8%
3113	Sugar and confectionery product	5.9%	5.8%	29.3%	-3.3%	5.8%	14.5%	-0.1%	8.2%	22.1%	-8.6%
3141	Textile furnishings mills	-10.1%	16.3%	-11.3%	-2.8%	-20.3%	20.7%	-11.4%	3.7%	-1.3%	-16.4%
3222	Converted paper product	-11.8%	-3.2%	28.5%	9.4%	-5.7%	0.2%	6.9%	3.5%	45.7%	13.0%
3256	Soap, cleaning, and toilet	8.1%	-6.6%	1.6%	-6.7%	20.8%	6.3%	11.7%	13.9%	-6.0%	-0.1%
3261	Plastics product	-16.4%	2.4%	11.6%	2.4%	0.3%	-1.1%	19.9%	-3.5%	33.4%	0.0%
3315	Foundries	-46.8%	9.1%	-33.9%	23.4%	-51.4%	21.5%	-8.6%	11.4%	24.4%	13.2%
3321	Forging and stamping	4.3%	9.0%	4.2%	21.1%	2.0%	15.4%	-2.2%	5.9%	-0.1%	11.2%
3326	Spring and wire product	-54.0%	-1.1%	-55.0%	-2.7%	-56.0%	-7.6%	-4.4%	-6.5%	-2.2%	-1.5%
3346	Magnetic and optical media	-62.7%	-36.3%	-6.7%	10.1%	-64.6%	-21.8%	-5.1%	22.7%	150.2%	72.9%
3379	Other furniture-related product	76.8%	2.0%	58.0%	62.5%	68.2%	6.5%	-4.9%	4.4%	-10.6%	59.2%
	All Drivers	-22.5%	-0.1%	5.9%	5.3%	-17.3%	3.7%	6.7%	3.8%	36.6%	5.4%

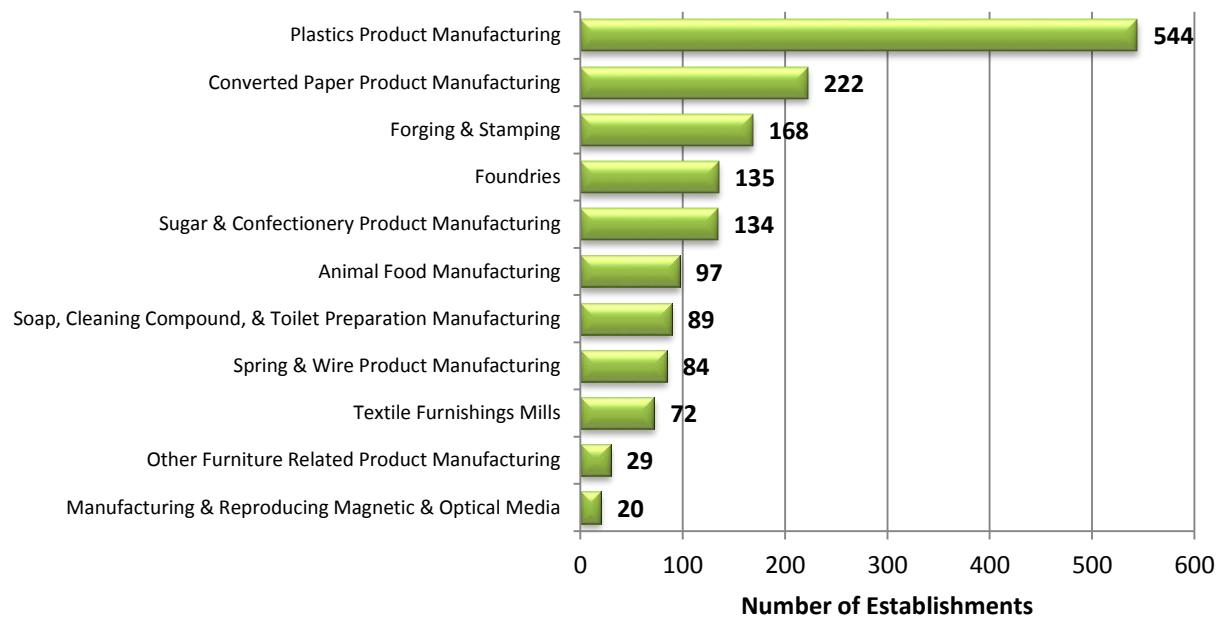
Source: Moody's Analytics

* Note: The dollar amounts were inflated to 2011 using the national CPI-U.
Positive % changes are shown in bold.

NUMBER OF MANUFACTURING ESTABLISHMENTS FOR DRIVER INDUSTRIES

Plastics Product Manufacturing consistently has the highest number of manufacturing establishments. In 2011, *Plastics Product Manufacturing* accounted for over 34% of all driver industries, at 544 establishments (Figure 2-10). *Converted-Paper Product Manufacturing* had the second highest number of establishments at 222, and *Forging and Stamping* followed close behind with 168 establishments. *Manufacturing and Reproducing Magnetic and Optical Media* have only 20 establishments, the lowest of the driver industries.

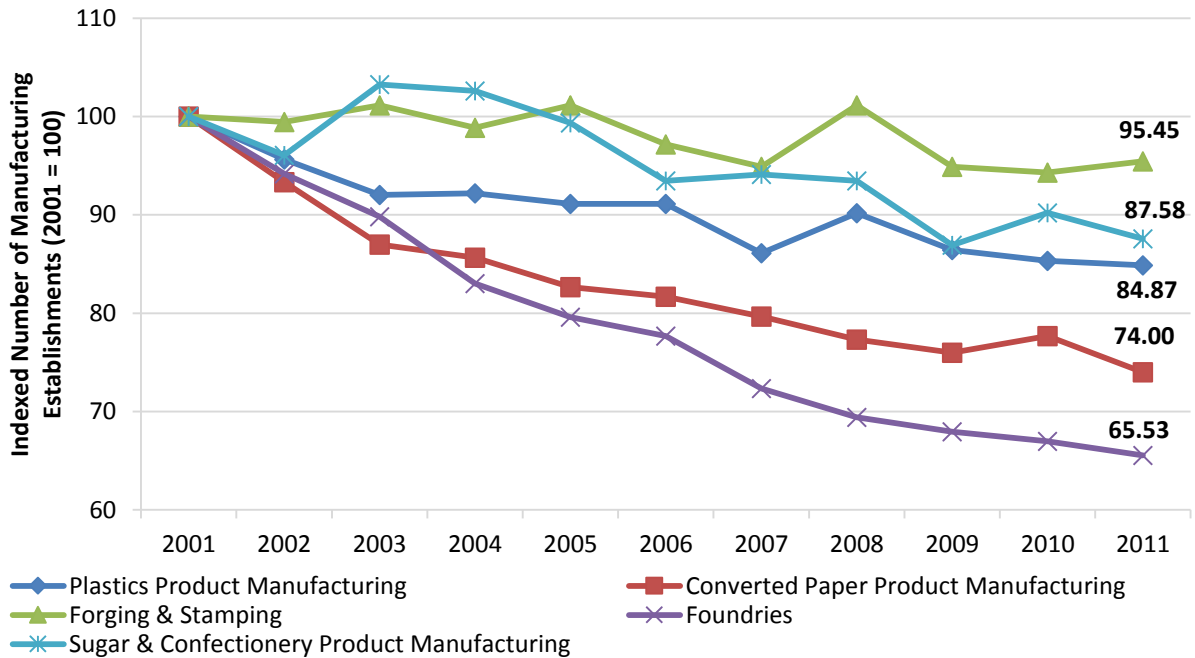
Figure 2-20: Number of Manufacturing Establishments for Driver Industries, 2011



Source: U.S. Census Bureau, County Business Patterns

Of the 11 driver industries, the top five in number of establishments are displayed in Figure 2-11, which shows indexed trends of the driver industries from 2001 to 2011. While all industries have a lower number of establishments in 2011 than 2001, some industries decrease more rapidly than others. The most stable driver industry over the 10-year period is *Forging and Stamping*, which lost only eight establishments. *Foundries* witnessed the largest decline, shrinking from 206 establishments to 135 establishments, a 34% decrease.

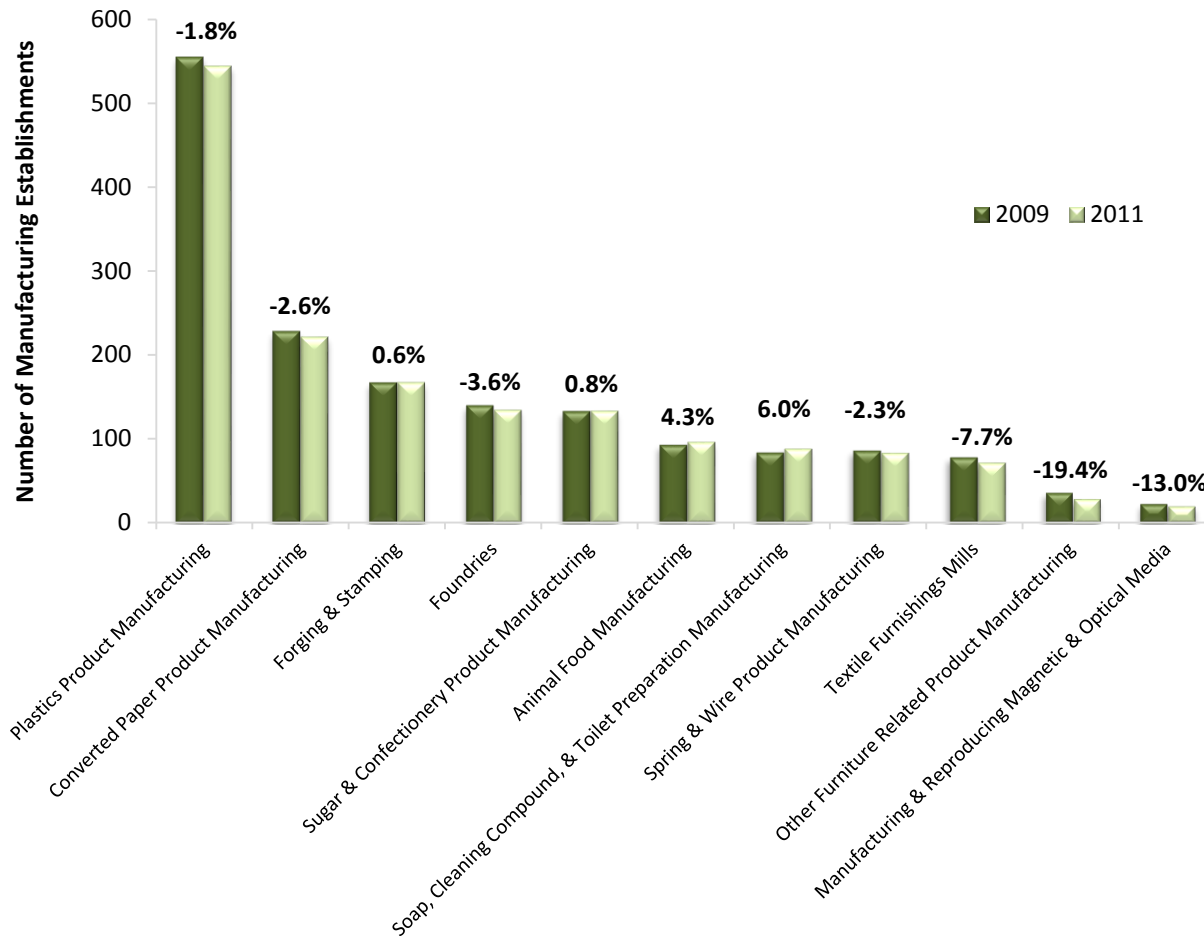
Figure 2-11: Indexed Number of Manufacturing Establishment Trends, 2001-2011



Source: U.S. Census Bureau, County Business Patterns

Although all industries lost establishments over the 10-year period, some reversed these trends in the post-recession period. Four driver industries added establishments between 2009 and 2011: *Forging and Stamping*; *Sugar and Confectionery Product Manufacturing*; *Animal Food Manufacturing*; and *Soap, Cleaning Compound, and Toilet-Preparation Manufacturing* (Figure 2-12). *Soap, Cleaning Compound, and Toilet-Preparation Manufacturing* had the largest percentage increase at 6%. *Plastics Product Manufacturing* had the most establishments in both 2009 and 2011, but witnessed a 1.8% decline.

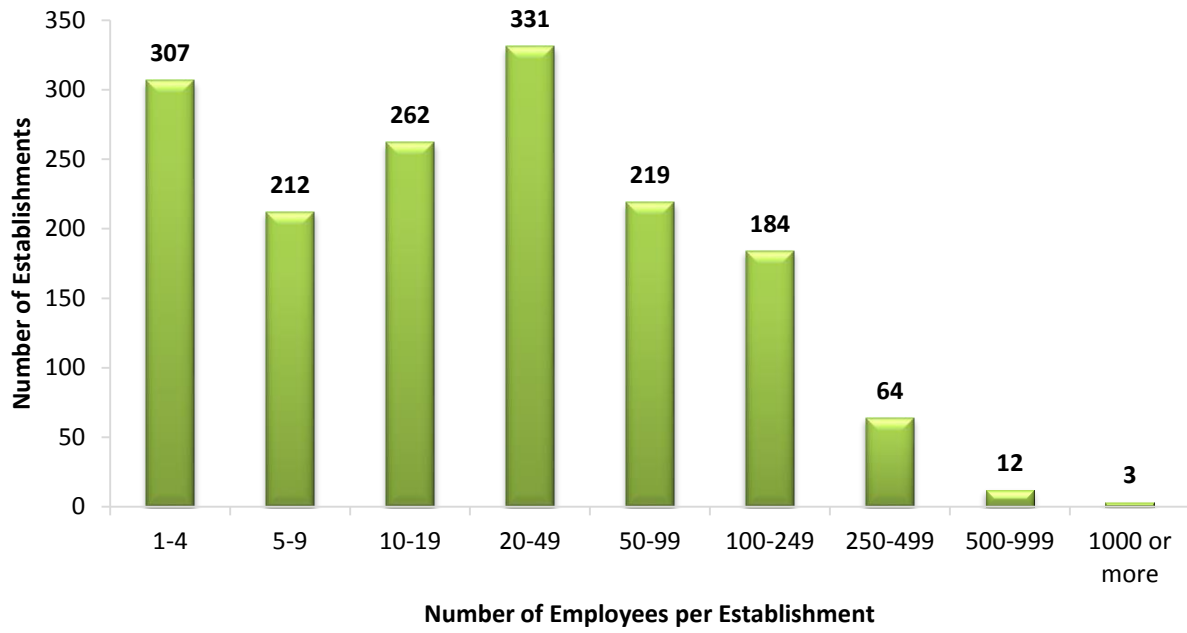
Figure 2-12: Number of Establishments Trends and Percent Change, 2009-2011



Source: U.S. Census Bureau, County Business Patterns

Figure 2-13 shows the number of establishments by establishment size in 2011. The size category with most establishments is 20-49 employees, with 331 establishments. 307 establishments reported having only 1 to 4 employees. There were only 3 establishments with at least 1,000 employees, although they employ many more than the aggregation of establishments with 1 to 4 employees or 5 to 9 employees. (For more information, see Appendix Table A-2-1.)

Figure 2-13: Number of Establishments by Establishment Size, 2011



Source: U.S. Census Bureau, County Business Patterns

MANUFACTURING SHIPMENT FOR DRIVER INDUSTRIES

The total value of manufacturing shipments serves as a proxy for regional export capacity. This section analyzes trends in manufacturing shipments of the driver industries in order to identify strengths and weaknesses of regional exports in each driver industry. Table 2-4 shows the trend of manufacturing shipments in the combined region's driver industries between 2004 and 2011.

Table 2-4. Value of Manufacturing Shipments in Driver Industries, 2004-2011

(Unit: Dollar in thousands)

Driver Industry	Industry Definition	2004	2009	2011	% Change (2004-2009)	% Change (2009-2011)
3111	Animal Food Product	\$ 421,370	\$ 821,618	\$ 935,184	95%	14%
3113	Sugar and Confectionery Product	\$ 462,973	\$ 392,148	\$ 448,619	-15%	14%
3141	Textile Furnishings Mills	\$ 296,692	\$ 259,388	\$ 327,485	-13%	26%
3222	Converted Paper Product	\$ 770,395	\$ 829,161	\$ 832,346	8%	0%
3256	Soap, Cleaning, and Toilet	\$ 204,070	\$ 308,885	\$ 545,529	51%	77%
3261	Plastics Product	\$ 1,248,669	\$ 1,121,318	\$ 1,215,952	-10%	8%
3315	Foundries	\$ 218,845	\$ 138,480	\$ 184,988	-37%	34%
3321	Forging and Stamping	\$ 200,572	\$ 179,028	\$ 253,813	-11%	42%
3326	Spring and Wire Product	\$ 275,927	\$ 164,984	\$ 143,570	-40%	-13%
3346	Magnetic and Optical Media	\$ 223,538	D	\$ 53,780	D	D
3379	Other Furniture-Related Product	\$ 62,653	\$ 107,824	\$ 134,697	72%	25%
	Total of Driver Industries	\$ 4,385,703	\$ 4,322,833	\$ 5,075,964	-1%	17%
	Total of Manufacturing Industries	\$15,906,986	\$15,082,758	\$16,384,680	-5%	9%
	% of Driver Industries	27.6%	28.7%	31.0%		

Source: U.S. Census Bureau, Annual Survey of Manufacturers

Notes:

Manufacturing shipment data is only available at the state level. To estimate manufacturing shipments at the regional level, the data of manufacturing shipments for Pennsylvania were allocated to each county using the proportion of manufacturing wages in each county. Counties were then aggregated to the combined region.

D: Withheld to avoid disclosing data for individual companies.

The dollar amounts of manufacturing shipments were inflated to 2011 using the national CPI-U.

Between 2004 and 2011, the total value of manufacturing shipments in the *Plastic Product* industry accounted for the largest share of the value of manufacturing shipments among the 11 driver industries in the Greater Northeastern/Northern region. The value of shipments in the *Plastic Product Manufacturing* fell by 10% from \$1.25 billion in 2004 to \$1.12 billion in 2009. However, the industry recovered its value of shipments after the recession, increasing by 8% to \$1.22 billion in 2011.

The *Soap, Cleaning Compound, and Toilet-Preparation Manufacturing* industry experienced the fastest growth rate between 2004 and 2011; the shipments in this industry increased by 167% from \$204 million in 2004 to \$546 million in 2011. Additionally, the value of shipments in the *Animal Food Product* industry and the *Other Furniture-Related Product Manufacturing* industry rapidly grew 122% and 115%, respectively, during the same period.

Among the 11 driver industries in the Greater Northeastern/Northern region, the *Spring and Wire Product Manufacturing* was the only industry that experienced a decreased value of shipments during the post-recession period (2009-2011). The value of shipments in this industry fell by 13% from \$165 million in 2009 to \$144 million in 2011. However, all other driver industries (except one industry with suppressed data), showed increased values of manufacturing shipments after the recession.

The total value of manufacturing shipments from the 11 driver industries was quite stable in the Greater Northeastern/Northern region between 2004 and 2009; the total value decreased by only 1% from \$4.4 billion in 2004 to \$4.3 billion in 2009. During the post-recession period (2009-2011), the total value of shipments from all the driver industries increased 17% and reached \$5.1 billion in 2011.

Manufacturing Capital Expenditures for Driver Industries

Capital expenditures in manufacturing industries serve as a proxy for capital intensity and the adoption of technology. This section analyzes capital expenditures of driver industries in the Greater Northeastern/Northern region. Table 2-5 shows the trend in manufacturing capital expenditures between 2004 and 2011.

Table 2-5. Manufacturing Capital Expenditures, 2004-2011

(Unit: Dollar in thousands)

NAICS	Industry Definition	2004	2009	2011	% Change (2004-2009)	% Change (2009-2011)
3111	Animal food Product	\$ 13,474	\$ 11,636	\$ 15,306	-14%	32%
3113	Sugar and confectionery product	\$ 13,482	\$ 6,351	\$ 27,339	-53%	330%
3141	Textile furnishings mills	\$ 3,848	\$ 9,217	\$ 7,073	140%	-23%
3222	Converted paper product	\$ 22,274	\$ 24,429	\$ 18,501	10%	-24%
3256	Soap, cleaning, and toilet	\$ 3,571	\$ 8,031	\$ 17,841	125%	122%
3261	Plastics product	\$ 40,463	\$ 37,588	\$ 48,349	-7%	29%
3315	Foundries	\$ 4,885	\$ 6,275	\$ 15,672	28%	150%
3321	Forging and stamping	\$ 5,714	\$ 4,870	\$ 10,057	-15%	107%
3326	Spring and wire product	\$ 3,297	\$ 2,580	\$ 2,157	-22%	-16%
3346	Magnetic and optical media	D	D	D	D	D
3379	Other furniture-related product	\$ 342	\$ 637	\$ 1,054	87%	65%
	Total of Driver Industries	\$111,349	\$111,612	\$163,350	0.2%	46%
	Total of Manufacturing Industries	\$431,822	\$392,621	\$442,091	-9.1%	13%
	% of Driver Industries	25.8%	28.4%	36.9%		

Source: U.S. Census Bureau, Annual Survey of Manufacturers

Notes:

Capital expenditure data is only available at the state level. To estimate manufacturing capital expenditures at the regional level, the data of capital expenditures for Pennsylvania were allocated to each county using the proportion of manufacturing wages in each county. Counties were then aggregated to each of the regions.

The dollar amounts of capital expenditures were inflated to 2011 dollars using the national CPI-U.

D: Withheld to avoid disclosing data for individual companies.

In addition to having the largest value of manufacturing shipments among the driver industries, the *Plastic Product Manufacturing* industry also accounted for the largest share of capital expenditures in the Greater Northeastern/Northern region. While capital expenditures in

Plastic Products fell by 7% from \$40 million in 2004 to \$38 million in 2009, the expenditures rapidly increased by 29% after the recession from \$38 million in 2009 to \$48 million in 2011.

The *Soap, Cleaning Compound, and Toilet-Preparation Manufacturing* industry showed the fastest growth of capital expenditures between 2004 and 2011; capital expenditures in this industry more than quadrupled growing from \$4 million in 2004 to \$18 million in 2011. *Foundries* also experienced a rapid increase of capital expenditures (221%) during the same period. Additionally, the *Other Furniture-Related Product Manufacturing* industry and the *Sugar and Confectionery Product Manufacturing* industry grew by 209% and 103% respectively between 2004 and 2011.

However, by dividing the time period to before and during the Great Recession (2004-2009) and post-recession (2009-2011), table 2-5 shows that capital expenditures in the *Sugar and Confectionery Product* sector fell by 53% between 2004 and 2009, but increased sharply (330%) after the recession from \$6.4 million in 2009 to \$27.3 million in 2011. On the other hand, the *Spring and Wire Product* industry was the only sector that experienced a continuous decrease of capital expenditures during both time periods. The expenditures in this sector fell 22% between 2004 and 2009 followed by another 16% decline during the post-recession period (2009-2011).

The total capital expenditures from the 11 driver industries was quite stable between 2004 and 2009 in the Greater Northeastern/Northern region; the expenditures increased by only 0.2% from \$111.3 million in 2004 to \$111.6 million in 2009. However, post-recession, the total capital expenditures from all driver industries combined increased 46% between 2009 and 2011 and reached \$163.4 million in 2011.

Supply Chain Analysis for Driver Industries

A supply chain analysis was conducted for each of the driver industries in the Greater Northeastern/Northern Region. The analysis identifies the backward linkages between the driver industries and their suppliers. A supplier is defined as an industry that sales goods or services to the driver industries. By providing quality goods and services to the driver industries, the supplier industries help the regional driver industries produce and deliver the products their consumers demand. Attempts to improve the supplier industries can indirectly impact the competitiveness of the driver industries. This section identifies the gaps in supplier industries to each of the 11 driver industries by comparing the major suppliers in the Greater Northeastern/Northern Region to those in the U.S.⁹ Table 2-6 shows the regional and national supplier industries for the converted paper product manufacturing industry, which ranked first in GRP among the 11 driver industries. Additionally, the concerted paper product industry showed positive growth between 2001 and 2011 in the Greater Northeastern/Northern Region.

⁹ A major supplier is defined as an industry that accounts for more than 3% of the total purchases made by a driver industry.

Table 2-6: Regional and National Suppliers for the Converted Paper Product Industry

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3222	Converted Paper Product Manufacturing	30.60%	3221	Pulp, Paper, and Paperboard Mills	37.39%
42	Wholesale Trade	11.98%	3222	Converted Paper Product Manufacturing	7.71%
484	Truck Transportation	9.72%	42	Wholesale Trade	7.46%
2211	Electric Power Generation, Transmission and Distribution	6.83%	55	Management of Companies and Enterprises	4.15%
55	Management of Companies and Enterprises	5.74%	3251	Basic Chemical Manufacturing	3.92%
3261	Plastics Product Manufacturing	4.65%	3255	Paint, Coating, and Adhesive Manufacturing	3.53%
3221	Pulp, Paper, and Paperboard Mills	3.13%			
23	Construction	3.12%			

For the converted paper product manufacturing industry, eight industries were identified as major suppliers that help the driver industry to produce and deliver its products in the Greater Northeastern/Northern Region. In contrast, the analysis revealed that there were six major supplier industries for the converted paper product industry at the national level. Among the 6 national suppliers, the basic chemical manufacturing industry and the paint, coating and adhesive manufacturing industry are not shown on the list of regional supplier industries, because they supplied less than 3% of the total purchased by the driver industry in the Greater Northeastern/Northern Region. The basic chemical manufacturing industry accounted for 3.92% of the total purchased by the converted paper product industry at the national level, but supplied only 0.04% in the region. The paint, coating, and adhesive manufacturing industry accounted for 3.53% nationwide, but supplied only 0.14% in the region. The region may want to increase its capacity in these industries, since the driver industries may be importing these supplies from other regions of the country. (For information on supplier industries to each of the 11 driver industries, see Appendix B.2.)

Table 2-7 summarizes the results from the supply chain analysis and identifies regional and national supplier industries that are common to the regional driver industries. Among the common supplier industries, the wholesale trade industry was shown on the list of major suppliers for all of the 11 driver industries in the Greater Northeastern/Northern Region. Additionally, five of the supplier industries are also among the driver industries. That means that these driver industries were also supplier industries to other driver industries in the Northeastern/Northern region.

Table 2-7: Regional and National Supplier Industries Common to the Driver Industries

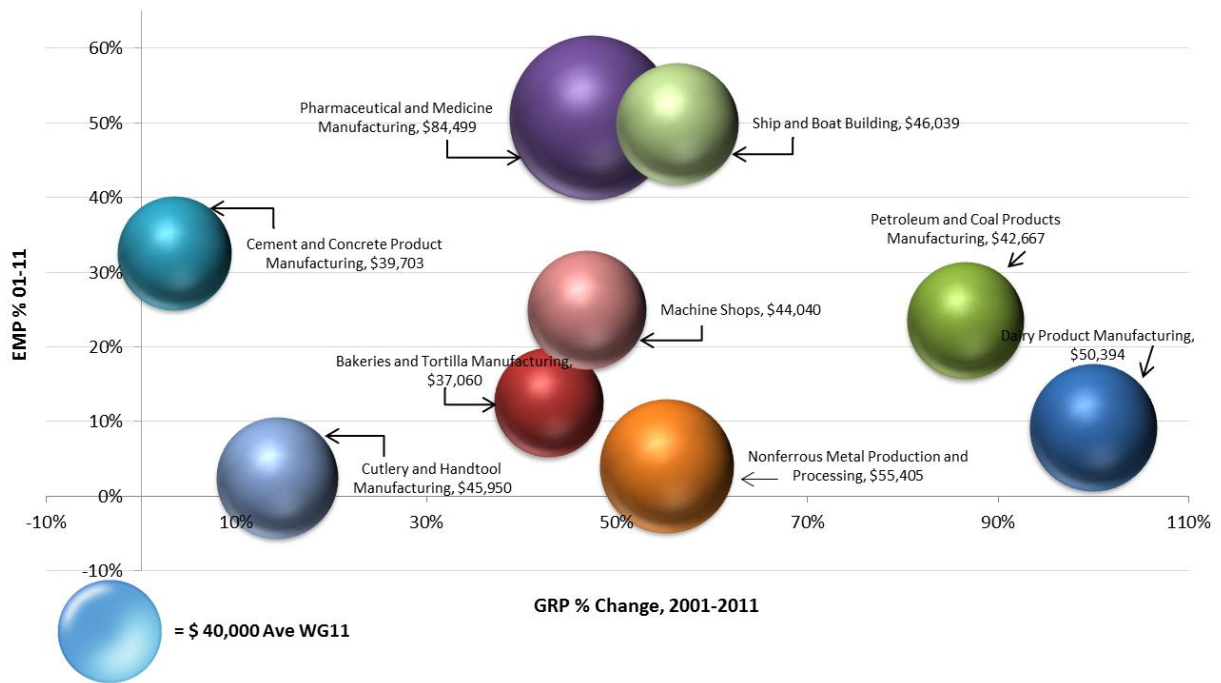
NAICS	Title	Regional Driver	Count of Major Suppliers	
			Regional	National
42	Wholesale Trade		11	10
55	Management of Companies and Enterprises		8	7
484	Truck Transportation		10	1
533	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)		1	1
1111	Oilseed and Grain Farming		1	1
2211	Electric Power Generation, Transmission		9	1
3111	Animal Food Manufacturing	x	1	1
3115	Dairy Product Manufacturing		1	1
3116	Animal Slaughtering and Processing		1	1
3131	Fiber, Yarn, and Thread Mills		1	1
3132	Fabric Mills		2	2
3133	Textile and Fabric Finishing and Fabric Coating Mills		1	1
3221	Pulp, Paper, and Paperboard Mills		1	2
3222	Converted Paper Product Manufacturing	x	5	3
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing		1	3
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	x	1	1
3261	Plastics Product Manufacturing	x	7	5
3311	Iron and Steel Mills and Ferroalloy Manufacturing		3	3
3324	Boiler, Tank, and Shipping Container Manufacturing		1	1
3326	Spring and Wire Product Manufacturing	x	2	2
5417	Scientific Research and Development Services		1	2
5418	Advertising, Public Relations, and Related Services		1	1
48A	Scenic and sightseeing transportation and support activities for transportation		1	1

NON-DRIVER INDUSTRIES

The driver industries in the Greater Northeastern/Northern region are the most competitive industries of the region. However, there are other manufacturing industries to which policy makers need to pay attention. These may be large industries that, as most large industries, have employee turnover, smaller industries that are growing, or industries that pay high wages. Among the 86 manufacturing industries (at 4-digit NAICS level), 75 non-driver industries are examined in terms of employment, GRP, and average wages (See Appendix Table B.2 and B.3). The analysis revealed that nine non-driver industries showed positive growth in both employment and GRP between 2001 and 2011 (Figure 2-14).

Among these nine non-driver industries, the *Dairy Product* industry (NAICS: 3115) experienced the largest growth in GRP over the long-term period (36.4%), while the growth rate of employment was relatively small (9.3%) compared to other growing non-drivers. On the other hand, both the *Pharmaceutical and Medicine* industry (NAICS: 3254) and the *Ship and Boat-Building* industry showed a rapid increase of employment by 50.8% and 50.0% respectively. In addition, the *Pharmaceutical and Medicine* industry has the highest average wage (\$84,499) among the growing non-driver industries (as seen by the size of the bubbles in Figure 2-14).

Figure 2-14. Employment and GRP Changes of Non-driver Industries, 2001-2011



Source: Moody's Analytics

There are 13 non-driver manufacturing industries that offer very high average wages, paying over \$70,000 in 2011 (See Appendix Table B.2). In addition to the *Pharmaceutical and Medicine* industry portrayed in the figure 2-14, there are 12 other industries with high average wage, but these 12 industries experienced declines in either employment, gross regional product, or both. Seven high wage industries had declining employment but growing gross regional product, while the other five suffered from losses in both employment and gross regional product.

Among the non-driver industries, there are eight industries with employment over 1,000 in 2011 (Appendix Table B.2). These industries also produced the largest GRP over \$100 million in 2011, except the *Other Wood Project* industry. The *Pharmaceutical and Medicine* industry ranked first in total wages, while the *Audio and Video Equipment* industry provided the highest average wages (\$136,081) in the Greater Northeastern/Northern region. The non-driver industries' average employment was 397 and the average GRP was \$ 43.4 million in 2011.

PART 3: GREATER NORTHEASTERN/NORTHERN PENNSYLVANIA'S COMPETITIVE ADVANTAGE

ECONOMIC CLIMATE

The Greater Northeastern/Northern region has a strong legacy in manufacturing and has been an integral part of U.S. manufacturing growth over the last seventy years. With the expansion of the industrial revolution, the region capitalized on its natural resource of coal and its distribution networks of railways and waterways to foster exports out of the region. Over time, however, the demand for coal declined and so did the region's competitive advantage.¹⁰ The post-war years brought a second wave of growth to the region, this time in the apparel industry, but due to international competition of low labor costs this surge ended.¹¹ Acknowledging its history of boom and bust, the region's economic development has focused on diversifying its economic base to attract varied companies to the region. Nonetheless, the area has been plagued with high unemployment throughout the Great Recession and is struggling to regain its footing.

Frank Corcione, Ph.D., former economics professor at the University of Scranton, referring to manufacturing as a major employer in the regional economy he claimed, "Manufacturing is not dead. It still is significant."¹² In 2012, manufacturing employment as a share of the total economy in the Scranton-Wilkes-Barre, PA Metropolitan Statistical Area (MSA)¹³ ranked 16th out of the nation's 100 largest metros (10.8 percent of total employment).¹⁴ From the manufacturing employment share, one can see that manufacturing is a large and important contributor to employment in the region, but many do concede that this sector may need a makeover to overcome perceptions of what the industry is like today in order to attract more workers into the field. It is not your father's manufacturing. Roger Kilmer, director of the manufacturing extension program at the National Institute of Standards and Technology visited the region in 2012 and discussed this value proposition and how it is difficult to attract new talent to the industry. "One of the biggest problems we have is the misperception of what manufacturing is," he said, "Workforce is our biggest challenge."¹⁵

In recent years there appears to be a rebound in the regional economy. With the easing of the credit market, developers are looking to engage in commercial real estate ventures, which may be beneficial for the Greater Northeastern/Northern region troubled by high unemployment levels. Mericle Commercial Real Estate Services, for example, announced that it plans to build a 223,200-square-foot industrial building in the Center Point Commerce & Trade Park West in

¹⁰ Technology Partnership Practice Battelle Memorial Institute (December 1999) Great Valley — Pennsylvania's I-81 Technology Corridor: Growing a 21st Century Knowledge Economy In Lackawanna and Luzerne Counties http://www.greatvalleyalliance.com/pdf/Battelle_Memorial_Institute_Report.pdf

¹¹ Ibid.

¹² Ibid.

¹³ Scranton-Wilkes-Barre, PA MSA consists of Lackawanna, Luzerne, and Wyoming

¹⁴ Haggerty, J. (2012, May 9). Report: Manufacturing Still Player in Region's Economy. *The Scranton Times-Tribune*.

<http://thetimes-tribune.com/news/business/report-manufacturing-still-player-in-region-s-economy-1.1312376>

¹⁵ Haggerty, J. (2012, October 4). Manufacturing Needs Makeover, Executives Told. *The Scranton Times-Tribune*.

Luzerne County;¹⁶ and TMG recently opened a new 150,000 square foot headquarters to house 1,250 employees in Lackawanna County.¹⁷ In addition, the Northern sub-region has seen rapid expansion due to gas exploration and drilling associated with the Marcellus Shale deposits. Although demand had slowed due to a decline in energy prices in 2012, it seems that 2013 may bring more revenue, drilling, and wells to the sub-region.¹⁸

INDUSTRY CLUSTERS

There are many industry clusters in the Greater Northeastern/Northern region of Pennsylvania. They are: advanced materials and manufacturing, agriculture and food processing, lumber and wood products, and Marcellus Shale gas and manufacturing.

Advanced Materials and Manufacturing

Advanced materials and manufacturing cluster,¹⁹ also known as advanced manufacturing and diversified materials (AMDM),²⁰ was designated by the state of Pennsylvania. It is widely defined to include nearly all durable goods manufacturing industries and some non-durable goods industries (excluding food production, tobacco, lumber, paper, pharmaceuticals).²¹

Agriculture and Food Processing

The agriculture and food processing cluster is concentrated mainly in the Northeastern sub-region. In this industry manufacturers use raw agriculture material to refine and repackage it into consumer goods.²² Major employers in this cluster include Archer Daniels Midland, Cargill Meat Solutions, General Mills, Gonnella Frozen Products, Inc., Hershey Company, Bimbo Bakeries, and Tootsie Roll Industries.²³

Lumber and Wood Products

There is a strong heritage of forestry, sawmills, and lumber industry in the Northern sub-region.²⁴ In order to foster this industry, the Northern Tier Regional Planning and Development Commission (NTRPDC) looked to sell wood products beyond the domestic market. The NTRPDC helps local companies through an export-based program to connect them to international

¹⁶ Staff Reporter (2013, June 3). Mericle announces plans for CenterPoint West. *Northeast Pennsylvania Business Journal*. <http://biz570.com/real-estate/mericle-announces-plans-for-centerpoint-west-1.1499320>

¹⁷ TMG. (2012, July 20). TMG Health Holds Ribbon Cutting Ceremony at Jessup, Pa. Location. *Penn's Northeast*. <http://www.pennsnortheast.com/v3/072012.shtm>

¹⁸ Falchek, D., & Allabaugh, D. (2012, December 30). Top Business Stories of 2012 in Northeast Pennsylvania. *The Scranton Times-Tribune*. <http://thetimes-tribune.com/news/business/top-business-stories-of-2012-in-northeast-pennsylvania-1.1422672>

¹⁹ Pennsylvania Department of Community and Economic Development (2013, February 2) *Advanced Manufacturing & Materials Factsheet*. http://www.newpa.com/webfm_send/3058

²⁰ Pennsylvania Workforce Investment Board (2010, November) *Advanced Manufacturing Industry Partnerships and the Pennsylvania Center for Advanced Manufacturing Careers: The Interconnected Relationship*. http://www.paworkforce.state.pa.us/portal/server.pt/community/l_i_advisory_council_on_advanced_manufacturing/18909

²¹ Luzerne - Schuylkill Workforce Investment Area (2011, July – September) *Quarterly Snapshot*. http://www.lswib.org/index.php?option=com_docman&task=doc_view&gid=656&Itemid=93

²² Pennsylvania Department of Labor & Industry. (2008, October). *Food Processing Luzerne-Schuylkill WIA*. http://www.lswib.org/index.php?option=com_docman&task=doc_download&gid=22

²³ Greater Hazelton CanDO. (2013). *Food Processing*. Retrieved from <http://www.hazletoncando.com/Food-Processing/food-processing.html>

²⁴ Northern Tier Hardwood Association. (2013). Retrieved from <http://www.nthardwoods.org/>

markets.²⁵ As of 2012, the export program had 16 clients exporting more than \$17 million to 29 countries, including Canada, China, India, Mexico, Saudi Arabia, and United Arab Emirates.²⁶ It is hoped that programs like these will create a new consumer base in order to grow an existing industry.

Marcellus Shale Gas and Manufacturing

The introduction of shale drilling in the Greater Northeastern/Northern region has changed the landscape of the businesses and manufacturing environment. Marcellus Shale is a 95,000-square mile, natural gas formation running from West Virginia to New York; roughly two thirds of the formation is in Pennsylvania.²⁷ The Northern sub-region has seen the majority of the drilling activity and the industry has ramped up quickly since the beginning of the boom. According to the Pennsylvania Department of Environmental Protection, in 2008, the Northern sub-region had 161 wells drilled.²⁸ This climbed to 908 in 2009, then to 1,836 in 2010.²⁹ By 2011 there were 1,729 wells, falling to 1,065 in 2012.³⁰

With the scale-up of this industry, major investment has flowed into the sub-region. A subsidiary of UGI Energy Services Inc. announced that it was going to spend \$150 million to extend its gathering station from Wyoming to Luzerne County; when complete this will link Northern Pennsylvania Counties to the interstate markets.³¹ The quick ramp-up of this industry has led communities to search for ways to support this industry through infrastructure, supply chain networks, and workforce. In 2012, there had been a pullback in investment due to the fall in energy prices,³² but the first half of 2013 has shown a strong rebound reporting a 57 percent increase in gas production compared to the same time period in 2012 throughout the state.³³

All of this growth does not come without negative consequences. Shale operators in rural PA counties are large emitters of point-source air pollution; in 2011, Bradford and Susquehanna counties led the state in the volume of air pollution released by companies producing and processing gas from the Marcellus Shale.³⁴ Moreover, the sub-region never thought it would see another housing bubble, especially after the foreclosure crisis, but due to the rapid and

²⁵ Northern Tier Regional Planning and Development Commission. (2012). *Northern Tier Regional Planning and Development Commission Annual Report 2012*. Towanda, PA: Northern Tier Regional Planning and Development Commission. <http://www.northerntier.org/upload/NTRPDC%202012%20Annual%20Report%20FINAL.pdf>

²⁶ Northern Tier Regional Planning and Development Commission. (2012). *Northern Tier Regional Planning and Development Commission Annual Report 2012*. Towanda, PA: Northern Tier Regional Planning and Development Commission. <http://www.northerntier.org/upload/NTRPDC%202012%20Annual%20Report%20FINAL.pdf>

²⁷ Marcellus Shale Education & Training Center. (June 2011). *Pennsylvania Statewide Marcellus Shale Workforce Needs Assessment*. A collaboration of Pennsylvania College of Technology and Penn State Extension. Williamsport, PA: Marcellus Shale Education & Training Center. http://www.shaletec.org/docs/PennsylvaniaStatewideWorkforceAssessmentv1_Final.pdf

²⁸ Pennsylvania Department of Environmental Protection. (2013). Year to Date – Permits Issued by County and Well Type Report. *Commonwealth of Pennsylvania*.

²⁹ Ibid.

³⁰ Ibid.

³¹ Bloomberg.com. (2011, October 20). UGI Subsidiary Announces \$150 Million Extension of Its Auburn Gathering System. *Bloomberg.com*.

³² Falchek, D., & Allabaugh, D. (2012, December 30). Top Business Stories of 2012 in Northeast Pennsylvania. *The Scranton Times-Tribune*. <http://thetimes-tribune.com/news/business/top-business-stories-of-2012-in-northeast-pennsylvania-1.1422672>

³³ Cusick, M. (2013, August 19). Marcellus Shale Gas Production Numbers Surge. *State Impact*. <http://stateimpact.npr.org/pennsylvania/tag/marcellus-shale/>

³⁴ Legere, L. (2013, February 13). Northern Tier Counties Top State List of Marcellus Air Pollution. *The Scranton Times-Tribune*. <http://thetimes-tribune.com/news/northern-tier-counties-top-state-list-of-marcellus-air-pollution-1.1444316>

aggressive drilling in the sub-region, a large influx of workers moved into the area, driving up home prices.³⁵ New housing has not been built in these counties (Bradford, Sullivan, and Tioga) for decades because of a lack of demand, but now there is a scramble for housing with the influx of workers.³⁶ Individuals have seen rental rates inflate up to 300% in certain markets, and this drives locals out of the housing market.³⁷

COMPETITIVE ADVANTAGES

Outside of the economic advantages that lie within the industry clusters of the Greater Northeastern/Northern regional economy, there are other identifiable assets that provide a competitive advantage for the area. Strengths acknowledged by other organizations include having a good quality of life, abundant natural resources, low cost of extensive educational resources, and relatively inexpensive cost of doing business.³⁸

A strategic advantage for the region is its cost of living, which is lower than the U.S. average; when ranked among 384 metropolitan statistical areas (MSAs) in 2010, the Scranton-Wilkes-Barre MSA ranked 250th indicating its low cost of living.³⁹ Moreover, not only does the region have a low cost of living, but it also has a low cost of doing business which provides more advantages to manufacturers. For this indicator, the Scranton MSA ranked 238th out of 384.⁴⁰

In order to maintain regional competitiveness, industry clusters must not plan on selling their products only to their own region, but they must sell outside of their region (i.e. trade clusters).⁴¹ In order to facilitate this trade, it is important for the region to have connectivity to other regions and nations through interstates, railways, and airports. The Greater Northeastern/Northern region is a highly connected region able to facilitate business, shipments, movement, and transportation.

The region is conveniently situated near the eastern seaboard, and the Pennsylvania highway system provides convenient access between New England and points West. In the last two years, funds have been allocated to numerous transportation projects in the Scranton area, including \$4.5 million for the Valley View Business Park access road, \$3 million for the I-81 Widening Project in the Wilkes-Barre/Scranton corridor, \$2.5 million for the South Valley

³⁵ Williamson, J., & Kolb, B. (2011). *Marcellus Natural Gas Development's Effect on Housing in Pennsylvania*. Lycoming College, Center for the Study of Community and the Economy (CSCE), Williamsport, PA. www.marcellus.psu.edu/resources/PDFs/housingreport.pdf

³⁶ Williamson, J., & Kolb, B. (2011). *Marcellus Natural Gas Development's Effect on Housing in Pennsylvania*. Lycoming College, Center for the Study of Community and the Economy (CSCE), Williamsport, PA. www.marcellus.psu.edu/resources/PDFs/housingreport.pdf

³⁷ Ruff, K. (2012, January 27). Out in the Cold. *Northern Pennsylvania Business Journal*. <http://biz570.com/economy/economy/out-in-the-cold-1.1263551>

³⁸ Northeastern Pennsylvania Alliance (August 2011) *2010 – 2011 Comprehensive Economic Development Strategy Annual Performance Report for Northeastern Pennsylvania* <http://www.nepa-alliance.org/CEDS/CEDS%202010-2011%20Annual%20Report.pdf>

³⁹ Moody's Analytics (2010) *Cost of Living Index*

⁴⁰ Moody's Analytics (2010) *Cost of Doing Business*

⁴¹ Porter, M. E. (2003, August/October). The Economic Performance of Regions. *Regional Studies*, 37(6&7), 549-578.

Parkway development, a 4-lane highway to connect northern and southern Luzerne County, and \$1 million for the Scranton Intermodal Transportation Center.⁴²

There is a highly sophisticated rail network throughout the region. The Northern sub-region is served by short lines and Class I railroad companies such as Wellsboro & Corning Railroad, Towanda-Monroeton Shippers Lifeline, Norfolk Southern, Reading, Blue Mountain & Northern, and Canadian Pacific Rail;⁴³ the Northeastern sub-region has similar rail networks including New York, Susquehanna & Western Railway Company, North Shore Railroad System, Reading Blue Mountain & Northern Railroad Company, Stourbridge Railroad Company, Canadian Pacific Railway, Norfolk Southern Railway Company, Short Line Railroads, Delaware - Lackawanna Railroad, and the Luzerne & Susquehanna Railroad.⁴⁴

The region also has strong airline connectivity and is served by several airports. Many studies have reported that it is essential to have major airports within a region to facilitate transportation for executives, easy accessibility for boards of directors to fly into the region, and other visitors to the region.⁴⁵ Currently, three airports serve the Northern sub-region: Bradford Regional Airport in Towanda Township, Bradford County; Wellsboro Johnson Airport in Tioga County; and Tunkhannock's Sky Haven Airport in Wyoming County.⁴⁶ Moreover, there are six airports connecting the Northeastern sub-region: the Wilkes-Barre/Scranton International Airport, the Hazleton Municipal Airport, Wilkes-Barre Wyoming Valley Airport, the Lehigh Valley International Airport, the Newark Liberty International Airport, and Philadelphia International Airport.⁴⁷

COMPARATIVE DISADVANTAGES

While it is always important to identify the advantages of a region, it is just as important to recognize challenges in order to improve the region. The Greater Northeastern/Northern region has a few comparative disadvantages that the region should focus on in order to be more competitive with other regions.

One of the major regional competitive disadvantages is its aging workforce; this is even a bigger challenge in the manufacturing sector. From 2000 to 2010, the population ages 25 to 44 experienced a decline, while the number of 45- to 64-year olds increased, suggesting that as the

⁴² Institute for Public Policy and Economic Development (February 2009) *2008 Lackawanna & Luzerne County Regional Factbook* www.institutepa.org/PDF/Research/factbook09.pdf

⁴³ Northern Tier Regional Planning & Development Commission. (June 30, 2008). *Comprehensive Economic Development Strategy*. Northern Tier Regional Planning & Development Commission.

⁴⁴ Penn's Northeast (n.d.) *Penn's Northeast Regional Profile for Northeast Pennsylvania's Lackawanna, Luzerne, Monroe and Wayne Counties* <http://www.pennsnortheast.com/V3/downloads/PNE%20Regional%20Profile.pdf>

⁴⁵ Piazza, M. C., Auerbach, E., Chase, J., Park, S., & Austrian, Z. (June 2011). *Upstate New York Regional Analysis: Demographics, Economy, Entrepreneurship and Innovation*. Cleveland, OH: Cleveland State University.

⁴⁶ Northern Tier Regional Planning & Development Commission. (June 30, 2008). *Comprehensive Economic Development Strategy*. Northern Tier Regional Planning & Development Commission.

⁴⁷ Penn's Northeast (n.d.) *Penn's Northeast Regional Profile for Northeast Pennsylvania's Lackawanna, Luzerne, Monroe and Wayne Counties* <http://www.pennsnortheast.com/V3/downloads/PNE%20Regional%20Profile.pdf>

older generation increases there will be fewer workers to take their place.⁴⁸ The out migration of younger workers because of the region's poor job prospects has resulted in a decreased number of potential workers in the 25- to 44-year-old age bracket. This poses a challenge now that the region's economy is picking-up.

The exodus of the baby-boomer generation causes a severe shortage in the workforce for manufacturers who need trained workers to fill job vacancies.^{49,50} Most of these job vacancies lie in areas that require a high school or associate's degrees, and sometimes additional on-the-job training; these jobs are considered middle-skilled jobs.⁵¹ In the United States, about 38 percent of the population (45 million) held jobs with this classification, and it is projected that this segment of the labor market will grow faster than lower-skilled jobs over the next 10 years.⁵²

With this growing demand for workers, it is hoped that the unemployed in the region will be able to fill these gaps, since the region also has a higher unemployment rate⁵³ than the national average.⁵⁴ However, the skills of the unemployed do not match the job vacancies. Skill mismatches for middle-skills jobs are not unique to the Greater Northeastern/Northern region; it is happening across the United States. In a survey on the Skills Gap in U.S. Manufacturing, 67% of respondents reported a moderate to severe shortage of available, qualified workers.⁵⁵ Some critics believe that manufacturers do not want to pay the higher wages required for qualified workers, but 86% of respondents in a global study by McKinsey said they would pay more for the right talent.⁵⁶

Combining the skill mismatch with the small number of younger workers in the region indicates that there is a severe workforce development challenge for manufacturers in the region, and which could put it at a competitive disadvantage. There are opportunities for the region to take advantage of the unemployed workers in the region and retrain them in order to fill the gap in workforce supply. Moreover, it is essential that the region look to attract and retain young talent to grow the workforce to enhance the region, because without the proper workforce, manufacturing will be forced to relocate to an area with available workforce.

⁴⁸ Northeastern Pennsylvania Alliance (August 2011) *2010 – 2011 Comprehensive Economic Development Strategy Annual Performance Report for Northeastern Pennsylvania* <http://www.nepa-alliance.org/CEDS/CEDS%202010-2011%20Annual%20Report.pdf>

⁴⁹ Dino, J. (2012, September 19). Job Creators Sense Lack of Highly Skilled Workers. *Standard Speaker*. <http://standardspeaker.com/news/job-creators-sense-lack-of-highly-skilled-workers-1.1375345>

⁵⁰ Northern Tier Regional Planning and Development Commission (n.d.) *Northern Tier Workforce Investment Area Local Plan 2012-2017* <http://www.northerntier.org/upload/10-1-12-2-1Local%20Plan%202012%20for%20comment.pdf>

⁵¹ Memmot, M. (2011, June 15). 2 Million 'Open Jobs'? Yes, But U.S. Has A Skills Mismatch. *NPR*.

<http://www.npr.org/blogs/thetwo-way/2011/06/15/137203549/two-million-open-jobs-yes-but-u-s-has-a-skills-mismatch>

⁵² Hilliard, Thomas (2013, July) *Building the American Workforce*. New York: Council on Foreign Relations

⁵³ U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics (2013) <http://bls.gov/lau/>

⁵⁴ U.S. Bureau of Labor Statistics, Employment Situation (2013) <http://www.bls.gov/news.release/empstat.toc.htm>

⁵⁵ Tom Morrison et al. (2012) *Boiling Point: The Skills Gap in Manufacturing*. Deloitte and the Manufacturing Institute, 2012, <http://www.themanufacturinginstitute.org/~media/A07730B2A798437D98501E798C2E13AA.ashx>.

⁵⁶ Mourshed, Mona et al. (2012) *Education to Employment: Designing a System that Works*. McKinsey Center for Government http://dl.njit.edu/mnj/Education-to-Employment_FINAL.pdf

There have been some inroads made in the last few years to overcome these challenges. The organization *Work & Play in Northeast, PA*, is an effort to connect with 15- to 35-year old students and graduates, promoting the area as a place to *work, live, and play*.⁵⁷ *Professional, Organized, and Working to Enrich the Region (i.e. POWER!)*, is a professional organization in Northeastern Pennsylvania that promotes the region and encourages members to shape the community.⁵⁸ Other programs involve leveraging the assets of PA CareerLink⁵⁹, a state resource that connects job seekers, employers, and service providers in a better way to promote better job matching; in addition, workforce agencies have been *experimenting with* job skills assessment systems (such as Work Keys) to promote more efficient job matching and to lower the skills gap.⁶⁰

Beyond the challenges of building a workforce, the infrastructure in the region is in serious distress. Significant investment has not been spent on infrastructure for many years and, because of this, 23% of the bridges on Northeastern Pennsylvania's state roads are structurally deficient (558 bridges out of 2,433).⁶¹ If the location and connectivity is a competitive advantage, then it is essential that the roads and bridges be capable of operating as supply routes for businesses so that they can grow their businesses and deliver goods.

CONCLUSION

The Greater Northeastern/Northern region in Pennsylvania is similar to other regions in the country, especially in the Midwest. It has strengths in several industrial clusters and additional advantages in its lower cost of living and cost of doing business. However, it is a region that suffers from declines in traditional manufacturing and the need for a skilled workforce. Its biggest advantage results from the new technological improvement in the gas and oil industry that allows for the development of Marcellus Shale in the region, bringing investment and jobs to the region.

⁵⁷ Work& Play in Northeast PA (n.d.) <http://www.worknplaynepa.com/>

⁵⁸ Power! (2013) <http://www.nepapower.com/>

⁵⁹ Commonwealth of Pennsylvania (2013) *PA CareerLink* <https://www.cwds.pa.gov/cwdsonline/>

⁶⁰ Northern Tier Regional Planning and Development Commission (n.d.) *Northern Tier Workforce Investment Area Local Plan 2012-2017* <http://www.northerntier.org/upload/10-1-12-2-1Local%20Plan%202012%20for%20comment.pdf>

⁶¹ Wind, Kyle (2013, July 13) Deficient Bridges in Region will Take Years to Fix, Even with a New Transportation Bill. *The Scranton Times-Tribune*. <http://thetimes-tribune.com/news/deficient-bridges-in-region-will-take-years-to-fix-even-with-a-new-transportation-bill-1.1520068>

PART 4: RECOMMENDATION OF GROWTH OPPORTUNITIES

This section of the report identifies recommendations for the Greater Northeastern/Northern region's manufacturing base.

- *Solicit and retain a high-skilled talent pool:* The region offers a high quality of life, low cost of doing business, and employment opportunities for hard-to-find manufacturing skills. Promotion of the region — locally, nationally, and globally — as a career and lifestyle destination will help to attract new manufacturing talent and spur regional manufacturing entrepreneurship. In addition, local support should be directed toward training and skills enhancement programs that help manufacturers to develop, reward, and retain existing talent. Special emphasis should be placed on aligning these efforts with initiatives to employ skilled military veterans, who may only need specific manufacturing skills training and/or experience.
- *Improve skills and behaviors of available, potential talent pool:* Many regional manufacturing executives are concerned about the overall quality of available job candidates, especially at entry-level positions. They cite insufficient skills and/or behavioral issues with these candidates. The region must not dismiss inexperienced candidates as unemployable, but rather encourage and support their transition into long-term, consistent employment — via improved basic education, entry-level skills training, transportation assistance, and rehabilitation programs and counseling for drug and alcohol problems. This group may also include military veterans in need of specific manufacturing skills and/or behavioral counseling.
- *Disseminate business-development and innovation best practices:* Many manufacturers in the region are expert within their current fields of business. But business changes at lightning speed in the digital age, and executives must be able to rapidly steer their organizations in new directions to remain competitive. Many of the region's executives report major challenges in developing new products and new customers, or in entering new markets. There is a significant opportunity for development of a regional program — an Innovation Roundtable — that brings executives together with successful peers and business-development and innovation experts to share ideas and best practices. The Innovation Roundtable will help organizations expand their intellectual-property holdings — and their revenues.
- *Share continuous-improvement expertise:* Executives in the Greater Northeastern/Northern region would be well-served by a list of regional process-improvement mentors and coaches with which their colleagues have successfully worked. Too often the region's executives rely solely on business advisers whose real expertise resides outside of advanced manufacturing methodologies and technologies. A go-to source of region-endorsed improvement gurus (imagine an *Angie's List* for

continuous improvement) will help executives separate the wheat from the chaff — and help to improve the productivity and profitability of their organizations.

- *Foster relationships between manufacturers and the Marcellus business infrastructure:* Establish ties through networking events and regional symposia between manufacturing executives and leaders of companies developing the Marcellus shale formation. New relationships can help to identify specific products and services that the region's manufacturing base can provide in the short-term (using existing production capabilities) and long-term (capabilities, processes, and products to support the region's Marcellus business infrastructure).
- *Promote the vitality and importance of the region's manufacturing base:* The Greater Northeastern/Northern region *already* has a strong manufacturing base — leadership, facilities, know-how — which represents significant economic advantage over competing regions that lack manufacturing legacies. What the region's manufacturing base lacks — young employees, capital influx, etc. — can be enhanced through an effort to recognize and promote globally the region's manufacturing expertise, vitality, and future.

PART 5: COMMON CHALLENGES & COMMON SUCCESS FACTORS

This section of the report summarizes common challenges and successes of manufacturers located in the Greater Northeastern/Northern region. Analysis is based on roundtable interviews with executives in the region, research within this report, and secondary research.

CHALLENGES

Workforce and employment challenges

Similar to declines across the U.S., the region's manufacturing employment shrank considerably between 2001 and 2011. While job reductions is partially a result of higher manufacturing productivity in the region—rising from 9th in 2001 to 6th in 2009—the employment decline (and the decline in the number of manufacturing establishments) is problematic at a time when manufacturing is enjoying a national resurgence dependent upon skilled labor:

- Job reductions over the last decade often spared those with the most seniority, workers now approaching retirement age. As financial markets and retirement packages improve, the incentive to retire increases for these baby-boomer company owners, executives, skilled tradespersons, and frontline staff. Who will replace them?
- In recent years, many of the region's younger workers have looked elsewhere for manufacturing jobs, or to other fields altogether (misperceptions of manufacturing as dirty, physical labor contribute to this trend both regionally and nationally). Manufacturing employment in the region is now lower than that in health care and social assistance, public sector, and retail trade. The declining image and status of manufacturing employment is further affected by the hiring of younger workers by the Marcellus business infrastructure, especially in middle-skilled occupations often critical to manufacturing.
- Job applicants for frontline manufacturing positions often lack the skills and/or behavioral characteristics (i.e., ability to pass drug testing) needed to cross even the lowest hiring bar. Many of these candidates also lack the ability or resources to take advantage of educational opportunities within the region.

Information-technology connectivity and skills

Many areas of the Greater Northeastern/Northern region have state-of-the-art broadband access sufficient to meet even the most demanding information-technology (IT) needs of manufacturers and their data files (e.g., product CAD files). Pennsylvania as a whole ranks high among states for broadband connectivity. But remote pockets within the 11 counties have inadequate broadband connectivity.

Other manufacturing executives in the region worry about their organization's ability to effectively connect their business systems and applications to suppliers and customers. This

frequently results from a capital constraint (no cash to upgrade systems) but also reflects lack of internal IT talent.

Innovation challenges

The total number of patents in manufacturing-related technologies awarded to inventors who reside in Pennsylvania was 4,661 in 2010. Of those patents, only 164 (3.5%) were awarded in the Greater Northeastern/Northern region. Patents serve as a measure of intellectual property (IP) created and owned in the region, and serve as a barometer of a region's capacity and capabilities for innovation.

Subpar patent (and IP/innovation) measures cast manufacturers in a region as legacy (non-growth) industries, whereas a strong innovation and IP status allows a region's manufacturers to grow by:

- Leveraging IP to access capital to grow and expand product lines, services, and the business overall;
- Building collaborative relationships with suppliers and customers that want access to innovations and innovation processes; and
- Attracting employees who want to work in cutting-edge fields.

Long-term manufacturing strength of the region is reliant upon innovation. Companies that can adapt and invent new ways of business and doing business dramatically increase their likelihood of survival and growth. And in improving their own innovation positions, they improve the IP of companies with which they do business, many of which are in the region.

Improving the work vs. doing the work

Some executives in the region report that they have sufficient staff to operate their small to midsized organizations, but face challenges when they try to improve their productivity and profitability. They cannot afford to staff a continuous improvement (CI) office or even one CI position, nor can they afford the time and resources to train managers and staff on improvement methods. Because of this, their firms lack a focused effort with which to benchmark best practices and improve their processes — from sourcing to design to production through delivery.

This inability to strategically improve is compounded in many organizations by a reliance on traditional business relationships (e.g., legal counsel, accountants, insurers) for complex improvement ideas. While expert in their fields, these advisors often lack experience and expertise in manufacturing improvement methodologies (e.g., lean manufacturing, six sigma).

Expanding sales channels and attracting new sales

Thanks to technology, manufacturers in the Greater Northeastern/Northern region can market their products to anyone, anywhere. Yet many of the region's executives find it difficult to establish strategic processes to enter new markets, develop new distribution channels, and find

new customers. This lack of marketing expertise means that some of the region's manufacturers are missing potential sales beyond Pennsylvania.

Manufacturing support services in short supply

The Greater Northeastern/Northern region is a diversified manufacturing economy, as evidenced by the range represented in the 11 driver industries. But executives note that some support services are in short supply, such as technical support for tooling and tooling capacity (e.g., forging and die casting).

SUCCESS FACTORS

Manufacturing history

Manufacturing is a strong industry in the Greater Northeastern/Northern region, ranking first in terms of Gross Regional Product among all major sectors of the regional economy and across all 16 years of historical and projected data (2000 to 2016). In 2011, Manufacturing GRP reached \$5.17 billion, a 15.7% share of all industries in the Greater Northeastern/Northern region; manufacturing is expected to remain the largest industry through 2016 (\$5.87 billion).

The GRP growth projection for manufacturing in the region, based on 2001 figures equaling 100, is not expected to increase at the same rate as U.S. manufacturing between 2010 and 2016 (93 to 106 vs. 108 to 129). But manufacturing executives in the region remain optimistic, pointing to a manufacturing base that has become more entrepreneurial as smaller, more nimble firms replace larger legacy manufacturers.

Many regions lacking a manufacturing base seek to lure manufacturers in order to create stable employment bases. The Greater Northeastern/Northern region's manufacturing legacy represents an enormous, existing economic advantage.

Access to educational resources

The region is home to numerous learning institutions that offer manufacturing-centric education opportunities — advanced machining, CNC programming, engineering design, process engineers, and more. The Pennsylvania College of Technology, located outside of Williamsport, and others have been a source of talent for manufacturers; staff at the institutions are allies of manufacturing executives. Continued collaboration among manufacturing leaders in the region and these educational institutions can help to address the skilled-talent gap within the region, and to develop programs that nurture interest in manufacturing careers among job candidates.

Location advantages

A distinct advantage for the region is its location. It is a relatively low-cost production platform near the Eastern seaboard. The region's transportation infrastructure, if properly maintained and further developed (railways, airports, and highways) offers a high level of service for moving goods. The region's manufacturing base is further enhanced by access to a natural-resource economy. Natural resources directly support many of the region's driver industries (e.g., methane for plastics products, wood for converted paper products, and agriculture for animal food products). The Marcellus Shale business infrastructure represents unique opportunities for new and existing manufacturers in the area to prosper from its natural resources.

PART 6: NEPIRC'S IMPACT UPON MANUFACTURING

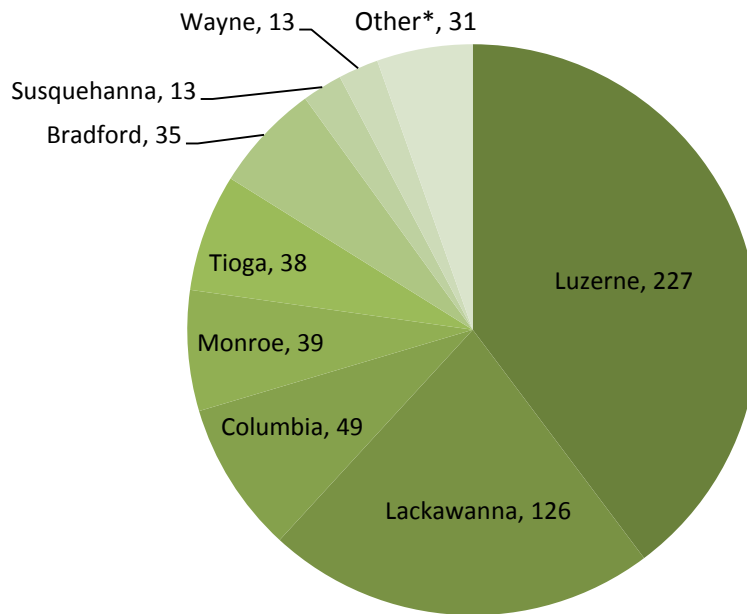
This section describes the economic impact and contribution of the companies assisted by NEPIRC to the regional economy. We first describe the direct impact on companies assisted by NEPIRC in terms of jobs, sales, and investments. We then estimate the total economic impact on the Greater Northeastern/Northern region of Pennsylvania.

MANUFACTURING FIRM SURVEY AND DIRECT ECONOMIC IMPACT

The NEPIRC works with Fors Marsh, a research and consulting firm, to collect data on the impact of the assistance provided to companies in Northeast Pennsylvania. The survey is conducted quarterly and underwritten by the Manufacturing Extension Partnership at the National Institute of Standards and Technology (NIST) of the U.S. Department of Commerce. The Fors Marsh questionnaire asks how the project with NEPIRC impacted the company over the past 12 months. For companies that are working with NEPIRC over multiple years, only one survey is conducted each year. Therefore, some companies are included in multiple years. The impact is based on jobs added and/or retained and sales added and/or retained in the past 12 months, so there is no double-counting of the data.

This study analyzes the data collected by Fors Marsh over a 5-year period for FY 2008-2009 through FY 2012-2013. A total of 571 responses were analyzed from 230 unique companies that were serviced by NEPIRC in the past five fiscal years. Figure 6-1 shows the breakdown of the companies served by county. The majority of companies served are located in Luzerne County (40%). Lackawanna County has 22% of the companies and all other counties had less than 10% of the total.

Figure 6-1: Number of Companies Assisted by NEPIRC by County, Fiscal Years 2008-2013



* Other includes Wyoming (9), Pike (7), Schuylkill (5), Lycoming (4), Northumberland (3), and Sullivan Counties (3).

The companies surveyed were asked two questions about their employment. The first asked if the services they received from NEPIRC directly lead to the *creation* of any jobs over the previous 12 months. The second question asked if the services they received directly lead to the *retention* of any jobs over the past 12 months. Table 6-1 shows the number of jobs created and retained as reported by the individual companies combined. Over the last five years, the companies assisted by NEPIRC in the Greater Northeastern/Northern region added 1,185 jobs and retained another 5,058 employees. The largest annual job creation and retention numbers were in FY 2008-2009, followed by FY 2010-2011. FY 2012-2013 represents the lowest number of jobs created and retained. Almost 40% of the new and retained jobs were located in Luzerne County. Of the new and retained jobs 25% were located in Lackawanna County and 18% were located in Tioga County. Lycoming and Northumberland Counties saw no employment creation or retention even though several companies in these counties received assistance from NEPIRC.

Table 6-1: Jobs Created and Retained due to Assistance Provided by NEPIRC, FY 2008-FY 2013

Fiscal Year	Jobs Created	Jobs Retained	Total Jobs
2008-2009	322	1,414	1,736
2009-2010	220	804	1,024
2010-2011	310	1,339	1,649
2011-2012	221	1,010	1,231
2012-2013	112	491	603
Total	1,185	5,058	6,243

The questionnaire also asks about any change in sales at each company over the previous 12 months. Mirroring the questions on employment, the survey asks if the services received from NEPIRC directly led to any increase in sales over the past 12 months and if the services received directly led to any retained sales over the past 12 months. In the five years studied, over \$81.2 million in new sales were conducted and \$503.1 million in sales were retained due to work with NEPIRC (Table 6-2), amounting to a total sales figure of \$584.3 million in new and retained sales. FY 2010-2011 saw the highest amount of increased and retained sales (\$181.6 million) and FY 2009-2010 saw the lowest (\$34.3 million). In terms of increased and retained sales, companies in Lackawanna County saw the largest figure (\$310.7 million or 53%). Companies in Luzerne County saw 32% of the total new and retained sales (\$186.0 million). Companies in all of the other counties saw less than 5% of the total, except Lycoming, Northumberland, and Schuylkill Counties which had none.

Table 6-2: New Sales and Retained Sales due to Assistance Provided by NEPIRC, FY 2008-FY 2013

Fiscal Year	New Sales	Retained Sales	Total Sales
2008-2009	\$16,953,321	\$66,730,000	\$83,683,321
2009-2010	\$8,017,220	\$26,253,000	\$34,270,220
2010-2011	\$23,241,159	\$158,403,200	\$181,644,359
2011-2012	\$15,271,000	\$143,747,000	\$159,018,000
2012-2013	\$17,791,000	\$107,921,000	\$125,712,000
Total	\$81,273,700	\$503,054,200	\$584,327,900

The survey also asks about cost savings in terms of labor, materials, energy, overhead, and other areas that the company experienced in the past 12 months due to their work with NEPIRC. The companies that answered the questionnaire reported savings of \$39.65 million in the five fiscal years that were analyzed.

The last section of the survey asks about several different types of investments that the company may have made as a result of the NEPIRC services. These investments are broken down into four categories: plant or equipment, information systems or software, workforce

practices or employee skills, and other areas of business. Table 6-3 outlines these investments by fiscal year.

Table 6-3: Company Investments due to NEPIRC Assistance, FY 2008-FY 2013

Fiscal Year	Plant / Equipment	Information Services / Software	Workforce Practices / Employee Skills	Other Areas of Business	Total Investments
2008-2009	\$43,498,035	\$729,660	\$2,317,072	\$4,669,000	\$51,213,767
2009-2010	\$12,323,451	\$658,500	\$2,259,086	\$681,445	\$15,922,482
2010-2011	\$17,198,304	\$981,082	\$1,222,013	\$457,795	\$19,859,194
2011-2012	\$7,718,847	\$519,754	\$706,471	\$724,285	\$9,669,357
2012-2013	\$6,309,749	\$208,654	\$783,252	\$2,188,735	\$9,490,390
Total	\$87,048,386	\$3,097,650	\$7,287,894	\$8,721,260	\$106,155,190

Overall, over \$106.2 million in additional investment has been made due to work with the NEPIRC over the past five fiscal years. The majority of the investments were made in plants and/or equipment (\$87.0 million or 82%). However, the majority of the investment was made in the earlier years of the study period and has decreased over time. Of all the investments, 51% were made by companies that are located in Luzerne County (\$54.0 million); 21% were made in Columbia County (\$22.3 million) and 12% were made in Lackawanna County (\$13.2 million). No investments were made in by companies in Northumberland or Lycoming Counties. In addition, the companies that answered the survey reported that they avoided \$41.9 million in unnecessary investments or savings on investments in the studied period.

TOTAL ECONOMIC IMPACT

Economic impact analysis is based on inter-industry relationships within an economy—that is, the buy-sell relationships that exist among industries. These relationships largely determine how an economy responds to changes in economic activity. Input-output (I-O) models estimate inter-industry relationships in a region by measuring the industrial distribution of inputs purchased and outputs sold by each industry. Thus, by using I-O models, it is possible to estimate how the impact of one dollar or one job ripples through the local economy, creating additional expenditures and jobs. This is the concept of an economic multiplier, which measures the ripple effect that an initial expenditure has on the local economy.

The economic impact estimates presented in this report use the IMPLAN® (IMPact analysis for PLANning) Version 3.0 model, which is the most recent economic impact assessment software system released by Minnesota IMPLAN Group, Inc. The user can develop sophisticated models of local economies in order to estimate a wide range of economic impacts. The IMPLAN® impact model is used by more than 1,000 public and private institutions and the number of

users, as well as their reputations, points to the high regard for the IMPLAN® model among researchers and consultants.

Economic impact is an analytical approach used to estimate economic benefits produced in affected regions by projects, programs, or companies. Economic impact estimates the benefits for a specific region and time period. These economic benefits are estimated in terms of five different measures:

- Employment impact measures the number of jobs created in the economy.
- Labor income estimates the household earnings that are generated in the economy.
- Value-added impact estimates the value of goods and services produced in the economy less intermediary goods and services, such as materials, utilities, and other goods used in the production process. Value-added impact is comparable to gross regional product.
- Output impact measures the total value of goods and services produced in the economy.
- Taxes include federal taxes as well as state and local taxes.

Each economic impact is a summation of three components: direct impact, indirect impact, and induced impact. Direct impact refers to the initial value of goods and services, including labor, purchased by the affected companies. These purchases are sometimes referred to as the first-round effect. Indirect impact measures the value of labor, capital, and other inputs of production needed to produce the goods and services required by the supplier companies (second-round and additional-round effects). Induced impact measures the change in spending by local households as a result of increased earnings of employees working in the local companies and their suppliers.

The economic impact for Northeast Pennsylvania was estimated through an IMPLAN model built for the 11-county area including the counties of: Bradford, Columbia, Lackawanna, Luzerne, Monroe, Pike, Sullivan, Susquehanna, Tioga, Wayne, and Wyoming. Each of the survey responses was assigned to one of the 440 sectors included in the IMPLAN® model. The IMPLAN® regional model and its data were edited to reflect each company's information. These changes to the model result in better impact estimates because they are based on actual estimates of the specific manufacturing companies studied, rather than on the average industry data provided by IMPLAN®.

ECONOMIC IMPACT METHODOLOGY

The impact calculations are based on the 2011 IMPLAN model built for the 11 Pennsylvania counties, which are served by the NEPIRC. The economic impact of the companies assisted by NEPIRC is based on two types of data.

The first data source is the direct new sales and new employment of client companies over the 5-year study period. To be conservative in our estimates of program impact, retained sales and employment that were reported were not included. This assumption compensates for any

substitution effects created when a sale by a manufacturer that was assisted by NEPIRC came at the expense of another Pennsylvania manufacturer that was not assisted.

The second source of data was the federal funding that came to NEPIRC. This was included because this represents external demand for Pennsylvania goods and services and is new money in the region. The NEPIRC funds are used along with state and local funds to provide assistance to manufacturing companies. The federal funds support the NEPIRC staff cost in assisting the companies. Thus, to avoid the possibility of double counting, which would occur if the NEPIRC funds were included along with the impact from the sales increase, only the indirect and induced spending impacts from the IRC program's federally funded activities were included in the impact calculations. In other words, the model captured the indirect effects of the IRC program on its own supply chain and of the spending of IRC employees and their contractors. The direct impact of the increased employment and sales at the individual companies is included in the impact estimates.

ECONOMIC IMPACT ESTIMATES

This study reports the economic impact of NEPIRC-assisted companies in terms of five economic indicators: employment, labor income, value added, output, and taxes. Hereafter, the assisted companies will be referred to collectively as “the companies.” The total economic impact of the companies on the Greater Northeast/Northern region over the five fiscal years included a total of 1,693 employees, a payroll of \$68.7 million, value-added impact of \$110.3 million, output impact of \$318.6 million, and a tax impact of \$23.0 million. Table 6-4 summarizes the impact results of the five measures by direct, indirect, induced, and total effects.

Table 6-4: Economic Impact in Northeast Pennsylvania

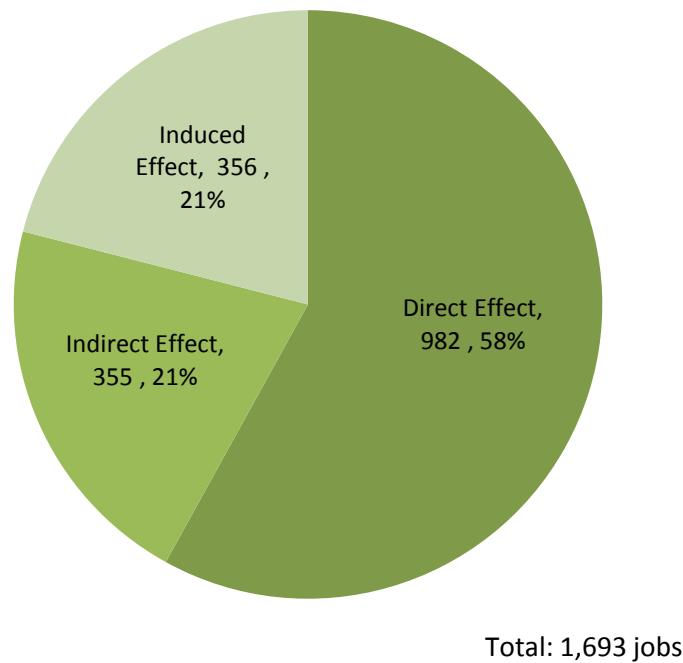
Impact Type	Employment	Labor Income	Value Added	Output	Tax
Direct Effect	982	\$41,975,794	\$61,194,505	\$227,308,243	\$11,332,971
Indirect Effect	355	\$14,423,521	\$25,147,510	\$51,014,209	\$5,935,786
Induced Effect	356	\$12,308,982	\$23,954,336	\$40,246,085	\$5,715,333
Total Effect	1,693	\$68,708,297	\$110,296,351	\$318,568,537	\$22,984,090

Note: The economic impact is presented in 2013 dollars.

Employment Impact

In Northeast Pennsylvania, the total employment impact attributed to the companies amounted to 1,693 jobs (Figure 6-2). Of these, 982 (58%) were the result of direct impact – the employees of the companies. An additional 355 jobs (21%) were created in industries supporting the companies, and 356 (21%) more jobs were created throughout the economy because of employees’ spending due to their increased earnings.

Figure 6-2: Employment in Northeast Pennsylvania by Impact Measure



Labor Income (Earnings) Impact

Every job created by the companies and their suppliers generates earnings for local households. Over the five fiscal years, total household earnings in Northeast Pennsylvania increased by \$68.7 million. Of this impact, \$42.0 million (61%) resulted from the direct effects of the companies' payroll, and \$14.4 million dollars (21%) resulted from increased earnings in other industries in the region that supply the companies. The induced income impact of \$12.3 million (18%) was due to increased household spending throughout the economy because of their additional earnings. Figure 6-3 shows the breakdown of the output, value-added, and labor income impacts by type of effect.

Value-Added Impact

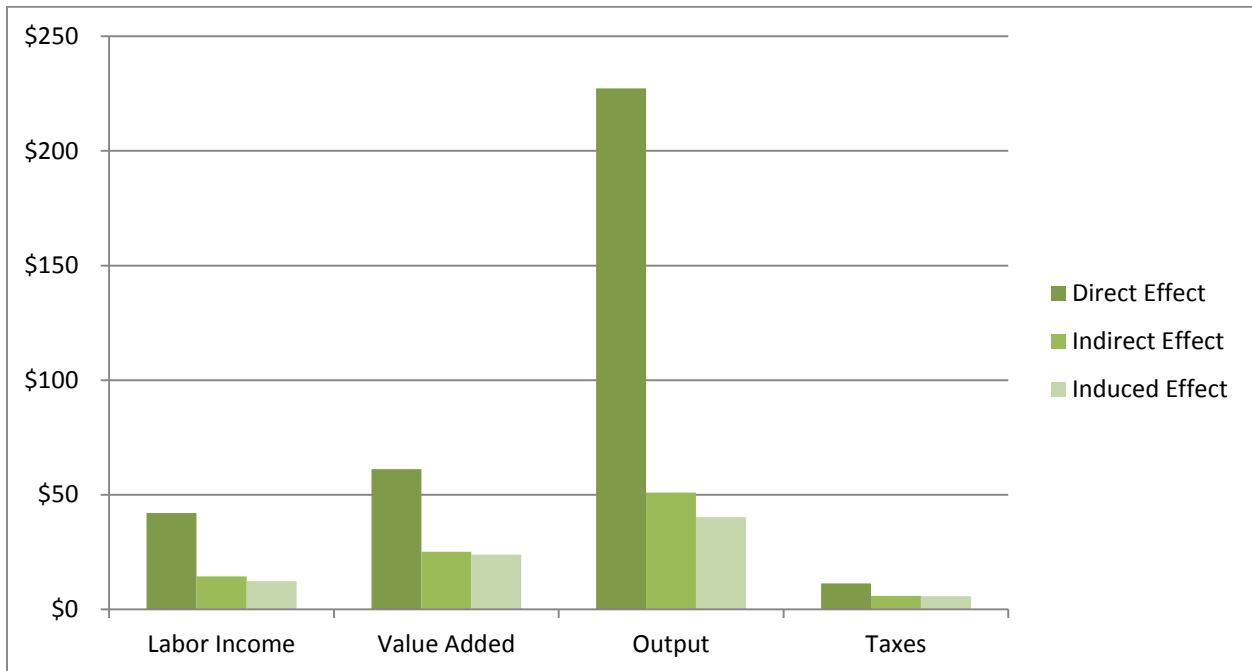
Value-added impact measures the value of goods and services produced in the economy less intermediate goods and services; it is equivalent to the definition of gross regional product. The value-added impact from the companies was \$110.3 million. Of that, \$61.2 million (55%) was attributed to direct impact, \$25.1 million (23%) to indirect impact, and \$24.0 (22%) to induced impact.

Output Impact

Output measures the total value of goods and services produced in the region as a result of the spending of the companies. Output impact provides an estimate of the total change in output produced in the Greater Northeastern/Northern region of Pennsylvania because of the

companies' increased activities over the five fiscal years. Output impact amounted to \$318.6 million. Of that, the direct production of goods and services by the companies accounted for \$227.3 million, which is almost three quarters of the entire impact (71%). This shows the high value of the goods and services purchased for production in the region. An additional \$51.0 million (16%) was indirect impact—goods and services produced regionally to support the activities of the companies. The induced impact of \$40.2 million (13%) measures the value of goods and services produced in the region to satisfy the increased demand by households working for the companies and their suppliers.

Figure 6-3: Economic Indicator by Impact Types for Northeast Pennsylvania



Tax Impact

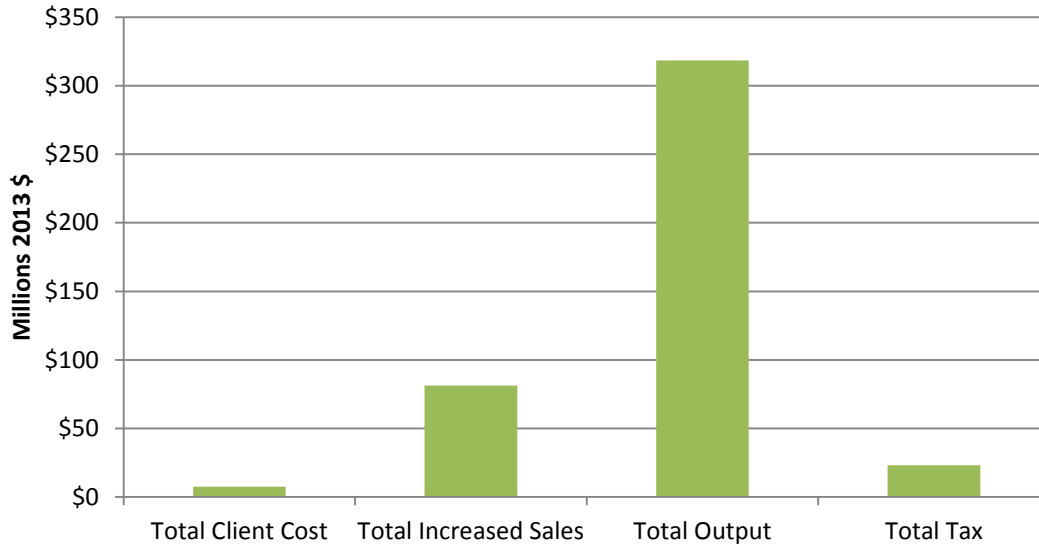
Based on the IMPLAN model, there was \$23.0 million in tax revenue associated with the increased activities of the companies over the five fiscal years. Of the tax impact, \$11.3 million (49%) was attributed to direct impact, \$6.0 million (26%) to indirect impact, and \$5.7 (25%) to induced impact. Thirty-six percent (36%) of the \$23 million of tax impact was in state and local taxes. Sixty-four percent (64%) of the tax impact was in federal taxes.

CLIENT COST & RETURN

The total cost of NEPIRC services to the 230 companies was about \$7.5 million (\$7,457,146) across all five fiscal years. The range of cost is from \$0 to \$236,250, depending on the service given and the level of NEPIRC engagement. On average, the cost is of \$6,484 per company per year.

For each dollar that the companies spent, on average, \$11 was returned by increased sales. Moreover, for each of those same dollars spent, \$43 was returned in total regional output, and almost \$14 in taxes. Figure 6-4 shows the investment by the client companies, the total in increased sales, and the total output for the 5-year period.

Figure 6-4: Cost, Sales, Output, & Taxes for NEPIRC Companies, FY 2008- FY 2013



**APPENDIX A: THE IMPORTANCE OF MANUFACTURING TO THE GREATER
NORTHEASTERN/NORTHERN REGION**

Appendix A.1: Manufacturing Performance in the Greater Northeastern/Northern Region, Year Over Year Percent Change

Year	Employment	GRP	Productivity	Total Wage	Average Wage	Number of Estab.	Capital Exp.	Shipments Value
2001-2002	-8.5%	1.1%	10.5%	-6.8%	1.8%	-2.4%	-	-
2002-2003	-2.5%	-3.8%	-1.4%	-4.3%	-1.9%	-2.5%	-	-
2003-2004	-4.2%	-0.2%	4.2%	-0.2%	4.2%	-2.2%	-	-
2004-2005	-2.8%	-1.7%	1.1%	-2.4%	0.4%	-1.2%	9.7%	8.9%
2005-2006	-2.2%	3.2%	5.6%	0.5%	2.8%	1.4%	-8.0%	2.6%
2006-2007	-2.3%	-1.4%	0.9%	-2.8%	-0.5%	0.8%	21.1%	-0.2%
2007-2008	-2.4%	-6.8%	-4.5%	-3.2%	-0.8%	-3.1%	-10.6%	2.1%
2008-2009	-10.3%	3.7%	15.7%	-7.5%	3.2%	-5.4%	-16.7%	-16.7%
2009-2010	-3.3%	-4.1%	-0.9%	-1.0%	2.3%	-4.8%	-2.0%	6.2%
2010-2011	-2.1%	3.2%	5.4%	-1.8%	0.3%	-0.2%	14.8%	2.3%
2011-2012	-0.2%	5.7%	6.0%	2.6%	2.9%	-	-	-
2012-2013	-1.0%	1.7%	2.7%	-2.0%	-1.0%	-	-	-
2013-2014	-0.4%	2.1%	2.5%	-0.3%	0.1%	-	-	-
2014-2015	-0.1%	2.4%	2.5%	1.7%	1.8%	-	-	-
2015-2016	0.0%	1.2%	1.2%	1.8%	1.8%	-	-	-

Source: Moody's Analytics; US Census Bureau County Business Patterns; U.S. Census Bureau, Annual Survey of Manufacturing

Note: All data is adjusted to 2011 dollars using CPI average for all US cities

Appendix A.2: Total GRP and GRP Share by Industry in the Greater Northeastern/Northern Region (in Millions)

NAICS Description	2001		2009		2011		2016	
	GRP	Share	GRP	Share	GRP	Share	GRP	Share
Manufacturing	\$5,562	19.1%	\$5,222	16.5%	\$5,167	15.7%	\$5,875	17.2%
Public Sector	\$3,746	12.8%	\$4,737	15.0%	\$4,736	14.4%	\$4,696	13.7%
Health Care and Social Assistance	\$2,836	9.7%	\$3,673	11.6%	\$3,765	11.5%	\$3,872	11.3%
Retail Trade	\$2,437	8.4%	\$2,582	8.2%	\$2,662	8.1%	\$2,776	8.1%
Real Estate and Rental and Leasing	\$2,535	8.7%	\$2,388	7.5%	\$2,284	7.0%	\$2,416	7.1%
Finance and Insurance	\$1,837	6.3%	\$1,847	5.8%	\$2,119	6.5%	\$2,148	6.3%
Wholesale Trade	\$1,288	4.4%	\$1,526	4.8%	\$1,627	5.0%	\$1,727	5.0%
Transportation and Warehousing	\$1,139	3.9%	\$1,295	4.1%	\$1,431	4.4%	\$1,682	4.9%
Construction	\$1,276	4.4%	\$1,092	3.4%	\$1,187	3.6%	\$1,135	3.3%
Information	\$998	3.4%	\$1,165	3.7%	\$1,113	3.4%	\$1,150	3.4%
Accommodation and Food Services	\$1,067	3.7%	\$1,064	3.4%	\$1,108	3.4%	\$1,174	3.4%
Utilities	\$1,110	3.8%	\$1,047	3.3%	\$1,106	3.4%	\$1,017	3.0%
Professional, Scientific, and Technical Services	\$959	3.3%	\$1,022	3.2%	\$1,043	3.2%	\$1,134	3.3%
Administrative and Support and Waste Management and Remediation Services	\$653	2.2%	\$807	2.5%	\$861	2.6%	\$874	2.6%
Other Services (except Public Administration)	\$786	2.7%	\$776	2.5%	\$799	2.4%	\$749	2.2%
Mining, Quarrying, and Oil and Gas Extraction	\$145	0.5%	\$297	0.9%	\$584	1.8%	\$631	1.8%
Educational Services	\$331	1.1%	\$441	1.4%	\$441	1.3%	\$447	1.3%
Arts, Entertainment, and Recreation	\$150	0.5%	\$314	1.0%	\$338	1.0%	\$307	0.9%
Management of Companies and Enterprises	\$167	0.6%	\$244	0.8%	\$323	1.0%	\$291	0.9%
Agriculture, Forestry, Fishing and Hunting	\$133	0.5%	\$117	0.4%	\$151	0.5%	\$143	0.4%
Total	\$29,152	100%	\$31,655	100%	\$32,844	100%	\$34,243	100%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

Appendix A.3: Manufacturing GRP for the Northeastern and Northern Regions

Year	Northeastern	Northern	Greater Northeastern/Northern
2001	\$4,379,141,584	\$1,183,031,143	\$5,562,172,726
2002	\$4,383,706,705	\$1,242,020,899	\$5,625,727,605
2003	\$4,234,433,943	\$1,177,188,605	\$5,411,622,548
2004	\$4,251,424,932	\$1,150,425,310	\$5,401,850,242
2005	\$4,183,095,542	\$1,127,219,363	\$5,310,314,905
2006	\$4,298,154,233	\$1,184,294,756	\$5,482,448,989
2007	\$4,286,412,488	\$1,118,344,587	\$5,404,757,074
2008	\$4,021,986,055	\$1,013,542,903	\$5,035,528,958
2009	\$4,219,354,733	\$1,003,141,758	\$5,222,496,491
2010	\$4,000,698,131	\$1,007,230,197	\$5,007,928,328
2011	\$4,117,146,313	\$1,049,596,950	\$5,166,743,263
2012	\$4,361,202,734	\$1,101,284,216	\$5,462,486,950
2013	\$4,434,432,931	\$1,118,484,964	\$5,552,917,895
2014	\$4,534,328,810	\$1,136,509,350	\$5,670,838,160
2015	\$4,658,546,765	\$1,147,432,704	\$5,805,979,469
2016	\$4,730,915,385	\$1,143,896,861	\$5,874,812,246

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

Appendix A.4: Total Employment and Employment Share by Industry in the Greater Northeastern/Northern Region

NAICS Description	2001		2009		2011		2016	
	Employment	Share	Employment	Share	Employment	Share	Employment	Share
Public Sector	61,904	14.7%	67,537	16.0%	64,942	15.2%	63,720	14.3%
Health Care and Social Assistance	54,402	12.9%	64,701	15.3%	66,000	15.5%	71,012	16.0%
Retail Trade	55,362	13.2%	54,287	12.9%	54,898	12.9%	57,115	12.8%
Manufacturing	68,658	16.3%	47,700	11.3%	45,154	10.6%	44,355	10.0%
Accommodation and Food Services	33,716	8.0%	35,001	8.3%	36,079	8.4%	39,293	8.8%
Transportation and Warehousing	14,271	3.4%	20,393	4.8%	22,098	5.2%	25,523	5.7%
Administrative and Support and Waste Management and Remediation Services	15,665	3.7%	17,086	4.1%	19,182	4.5%	21,957	4.9%
Other Services (except Public Administration)	17,409	4.1%	16,074	3.8%	16,259	3.8%	16,649	3.7%
Construction	16,308	3.9%	15,191	3.6%	15,875	3.7%	16,823	3.8%
Finance and Insurance	15,422	3.7%	14,167	3.4%	13,696	3.2%	14,039	3.2%
Wholesale Trade	13,583	3.2%	13,993	3.3%	14,655	3.4%	14,758	3.3%
Professional, Scientific, and Technical Services	10,618	2.5%	12,074	2.9%	11,797	2.8%	13,507	3.0%
Educational Services	9,509	2.3%	10,394	2.5%	10,774	2.5%	11,022	2.5%
Agriculture, Forestry, Fishing and Hunting	9,415	2.2%	8,016	1.9%	8,051	1.9%	7,683	1.7%
Arts, Entertainment, and Recreation	4,441	1.1%	7,231	1.7%	7,388	1.7%	7,169	1.6%
Information	8,746	2.1%	7,147	1.7%	6,248	1.5%	6,033	1.4%
Management of Companies and Enterprises	2,037	0.5%	3,507	0.8%	4,519	1.1%	4,285	1.0%
Real Estate and Rental and Leasing	4,692	1.1%	3,474	0.8%	3,541	0.8%	3,460	0.8%
Utilities	3,460	0.8%	2,322	0.6%	2,537	0.6%	2,439	0.5%
Mining, Quarrying, and Oil and Gas Extraction	1,208	0.3%	1,293	0.3%	3,380	0.8%	3,989	0.9%
Total	420,826	100%	421,588	100%	427,073	100%	444,831	100%

Source: Moody's Analytics

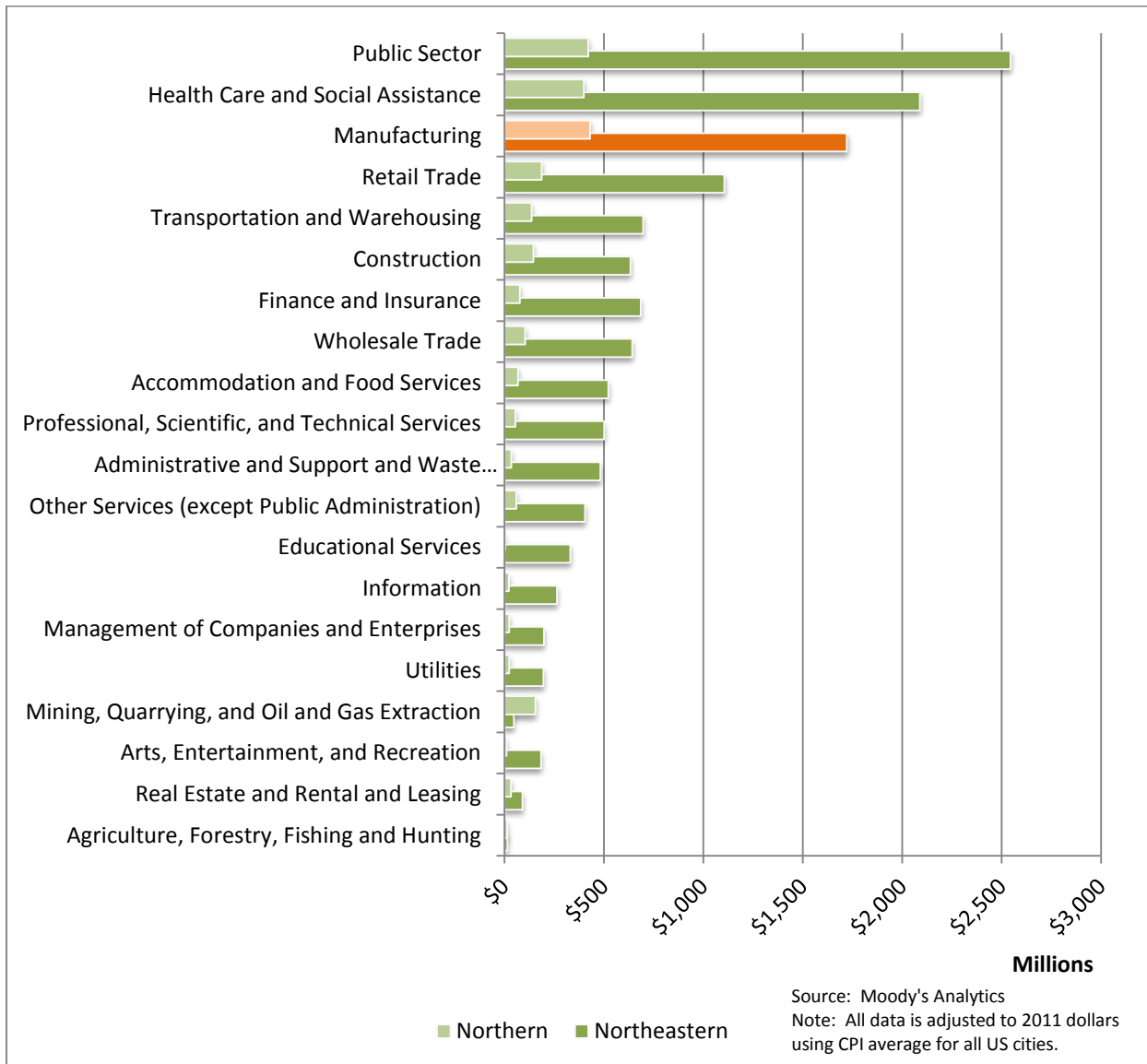
Appendix A.6: Total Wage and Wage Share by Industry in the Greater Northeastern/Northern Region (in Millions)

NAICS Description	2001		2009		2011		2016	
	Total Wage	Share	Total Wage	Share	Total Wage	Share	Total Wage	Share
Public Sector	\$2,637	17.8%	\$3,068	19.8%	\$2,967	18.8%	\$3,217	18.1%
Health Care and Social Assistance	\$1,985	13.4%	\$2,486	16.0%	\$2,490	15.8%	\$2,944	16.6%
Manufacturing	\$2,916	19.7%	\$2,215	14.3%	\$2,153	13.7%	\$2,236	12.6%
Retail Trade	\$1,276	8.6%	\$1,312	8.5%	\$1,293	8.2%	\$1,593	9.0%
Transportation and Warehousing	\$615	4.1%	\$733	4.7%	\$835	5.3%	\$1,080	6.1%
Construction	\$708	4.8%	\$703	4.5%	\$779	4.9%	\$825	4.6%
Finance and Insurance	\$766	5.2%	\$773	5.0%	\$763	4.8%	\$775	4.4%
Wholesale Trade	\$611	4.1%	\$720	4.6%	\$747	4.7%	\$913	5.1%
Accommodation and Food Services	\$543	3.7%	\$582	3.8%	\$591	3.7%	\$707	4.0%
Professional, Scientific, and Technical Services	\$557	3.8%	\$571	3.7%	\$558	3.5%	\$638	3.6%
Administrative and Support and Waste Management and Remediation Services	\$420	2.8%	\$482	3.1%	\$516	3.3%	\$603	3.4%
Other Services (except Public Administration)	\$435	2.9%	\$464	3.0%	\$465	2.9%	\$481	2.7%
Educational Services	\$267	1.8%	\$329	2.1%	\$336	2.1%	\$381	2.1%
Information	\$396	2.7%	\$317	2.0%	\$286	1.8%	\$278	1.6%
Management of Companies and Enterprises	\$110	0.7%	\$165	1.1%	\$222	1.4%	\$238	1.3%
Utilities	\$276	1.9%	\$198	1.3%	\$220	1.4%	\$234	1.3%
Mining, Quarrying, and Oil and Gas Extraction	\$59	0.4%	\$82	0.5%	\$205	1.3%	\$243	1.4%
Arts, Entertainment, and Recreation	\$90	0.6%	\$165	1.1%	\$196	1.2%	\$208	1.2%
Real Estate and Rental and Leasing	\$131	0.9%	\$102	0.7%	\$123	0.8%	\$143	0.8%
Agriculture, Forestry, Fishing and Hunting	\$32	0.2%	\$31	0.2%	\$29	0.2%	\$31	0.2%
Total	\$14,827	100%	\$15,498	100%	\$15,773	100%	\$17,769	100%

Source: Moody's Analytics

Note: All data is adjusted to 2011 dollars using CPI average for all US cities.

Appendix A.7: Total Wage in the Northeastern and Northern Sub-Regions, 2011



Appendix A.8: Number of Manufacturing Establishments in the Greater Northeastern/Northern Region, 2001-2011

NAICS Description	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Retail Trade	4476	4487	4435	4432	4456	4363	4354	4259	4188	4163	4102
Health Care and Social Assistance	2537	2593	2624	2756	2930	2821	2849	2817	2811	2844	2836
Other Services (except Public Administration)	2749	2793	2784	2818	2832	2807	2768	2756	2726	2732	2700
Accommodation and Food Services	2344	2353	2394	2425	2455	2425	2487	2498	2500	2510	2499
Construction	2535	2497	2551	2611	2644	2626	2634	2509	2302	2221	2144
Professional, Scientific, and Technical Services	1715	1819	1822	1892	1928	1912	1944	1905	1912	1899	1885
Finance and Insurance	1306	1377	1363	1368	1365	1419	1420	1400	1355	1268	1262
Administrative and Support and Waste Management and Remediation Services	1006	982	986	1020	1059	1093	1100	1140	1124	1135	1134
Manufacturing	1220	1191	1161	1136	1122	1138	1147	1111	1051	1001	999
Wholesale Trade	1018	1040	989	1006	1013	997	1016	998	966	963	963
Transportation and Warehousing	755	774	800	827	837	850	874	854	829	892	960
Real Estate and Rental and Leasing	648	716	711	732	764	762	776	753	722	705	679
Information	355	352	379	389	400	421	415	402	388	373	382
Arts, Entertainment, and Recreation	350	347	375	406	403	392	400	385	374	380	363
Educational Services	179	179	175	195	191	190	199	184	184	195	190
Mining	105	119	121	111	126	138	136	143	142	152	180
Utilities	99	104	99	96	91	93	84	106	110	108	111
Management of Companies and Enterprises	89	89	96	98	100	103	112	116	105	101	110
Agriculture, Forestry, Fishing and Hunting	91	92	80	70	73	73	67	62	67	72	73
Industries not Classified	170	79	66	181	80	43	13	11	16	21	15
Total	23,747	23,983	24,011	24,569	24,869	24,666	24,795	24,409	23,872	23,735	23,587

Source: U.S. Census Bureau County Business Pattern

Appendix A.9: Number of Patents by Industry in the Greater Northeastern/Northern Region and its Two Sub-Regions, 2010

Product Field* (NAICS)	Northeastern		Northern		Greater	
	# of Patent	%	# of Patent	%	# of Patent	%
Machinery Manufacturing (333)	17	13.7%	7	17.5%	24	14.6%
Semiconductors & Other Electronic Components Mfg (3344)	20	16.1%	4	10.0%	24	14.6%
Computer and Peripheral Equipment Manufacturing (3341)	12	9.7%	8	20.0%	20	12.2%
Fabricated Metal Products Manufacturing (332)	14	11.3%	0	0.0%	14	8.5%
Electrical Equipment, Appliances, and Components Mfg (335)	11	8.9%	0	0.0%	11	6.7%
Navigational, Measuring, Electromedical, Control Mfg (3345)	6	4.8%	5	12.5%	11	6.7%
Other Chemical Product & Preparation(3250,3253,3255,3256)	4	3.2%	6	15.0%	10	6.1%
Other Miscellaneous Manufacturing (339 except 3391)	7	5.6%	0	0.0%	7	4.3%
Plastics and Rubber Products Manufacturing (326)	7	5.6%	0	0.0%	7	4.3%
Communications Equipment Manufacturing (3342)	0	0.0%	6	15.0%	6	3.7%
Medical Equipment and Supplies Manufacturing (3391)	6	4.8%	0	0.0%	6	3.7%
Pharmaceutical and Medicines Manufacturing (3254)	5	4.0%	1	2.5%	6	3.7%
Motor Vehicles, Trailers and Parts Manufacturing (3361-3363)	5	4.0%	0	0.0%	5	3.0%
Nonmetallic Mineral Products Manufacturing (327)	3	2.4%	2	5.0%	5	3.0%
Paper, Printing and support activities (322, 323)	3	2.4%	0	0.0%	3	1.8%
Basic Chemicals Manufacturing (3251)	1	0.8%	1	2.5%	2	1.2%
Food Manufacturing (311)	1	0.8%	0	0.0%	1	0.6%
Textiles, Apparel and Leather Manufacturing (313-316)	1	0.8%	0	0.0%	1	0.6%
Wood Products Manufacturing (321)	1	0.8%	0	0.0%	1	0.6%
Total	124	100%	40	100%	164	100%

Note: The original patents data from the U.S. Patent and Trademark Organization are classified by the U.S. Patent Classification System (USPC). The concordance between USPC, product fields, and NAICS was used to find the NAICS industry of each patent.

APPENDIX B: ANALYSIS OF DETAILED MANUFACTURING INDUSTRIES

Appendix B.1: Number of Establishments by Driver Industry

Industry Description	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Animal Food Manufacturing	103	98	98	98	98	104	101	102	93	96	97
Converted Paper Product Manufacturing	300	280	261	257	248	245	239	232	228	233	222
Forging and Stamping	176	175	178	174	178	171	167	178	167	166	168
Foundries	206	194	185	171	164	160	149	143	140	138	135
Manufacturing and Reproducing Magnetic and Optical Media	41	41	37	33	29	28	27	48	23	22	20
Other Furniture Related Product Manufacturing	38	38	37	37	37	40	39	43	36	33	29
Plastics Product Manufacturing	641	613	590	591	584	584	552	578	554	547	544
Soap, Cleaning Compound, and Toilet-Preparation Manufacturing	102	93	92	88	84	91	89	85	84	90	89
Spring and Wire Product Manufacturing	101	95	105	100	95	97	94	91	86	86	84
Sugar and Confectionery Product Manufacturing	153	147	158	157	152	143	144	143	133	138	134
Textile Furnishings Mills	115	112	115	108	102	94	90	89	78	73	72
Total	1976	1886	1856	1814	1771	1757	1691	1732	1622	1622	1594

Source: U.S. Census Bureau, County Business Patterns

Appendix B.2: Regional and National Supplier Industries for the 11 Driver Industries

3111 Animal Food Product

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
42	Wholesale Trade	13.85%	1111	Oilseed and Grain Farming	25.98%
484	Truck Transportation	12.55%	3112	Grain and Oilseed Milling	16.44%
3111	Animal Food Manufacturing	9.45%	3111	Animal Food Manufacturing	10.80%
55	Management of Companies and Enterprises	7.50%	42	Wholesale Trade	7.31%
3222	Converted Paper Product Manufacturing	7.12%	484	Truck Transportation	4.14%
3116	Animal Slaughtering and Processing	5.84%	3324	Boiler, Tank, and Shipping Container Manufacturing	3.91%
2211	Electric Power Generation, Transmission and Distribution	5.72%	55	Management of Companies and Enterprises	3.82%
3324	Boiler, Tank, and Shipping Container Manufacturing	4.09%	3116	Animal Slaughtering and Processing	3.70%
3261	Plastics Product Manufacturing	3.88%	482	Rail Transportation	3.49%
1111	Oilseed and Grain Farming	3.70%			

3113 Sugar and Confectionery Product

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3222	Converted Paper Product Manufacturing	20.92%	1119	Other Crop Farming	15.16%
55	Management of Companies and Enterprises	14.43%	3113	Sugar and Confectionery Product Manufacturing	14.70%
42	Wholesale Trade	13.04%	3222	Converted Paper Product Manufacturing	8.90%
484	Truck Transportation	6.56%	55	Management of Companies and Enterprises	8.36%
2211	Electric Power Generation, Transmission and Distribution	5.48%	3112	Grain and Oilseed Milling	6.16%
3261	Plastics Product Manufacturing	4.71%	42	Wholesale Trade	5.94%
3119	Other Food Manufacturing	3.48%	3115	Dairy Product Manufacturing	3.75%
3115	Dairy Product Manufacturing	3.04%	3261	Plastics Product Manufacturing	3.57%

3141 Textile Furnishings Mills

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3132	Fabric Mills Truck	18.40%	3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	44.47%
484	Transportation	15.91%	3131	Fiber, Yarn, and Thread Mills	19.47%
42	Wholesale Trade	15.32%	3132	Fabric Mills	8.61%
3131	Thread Mills	7.20%	42	Wholesale Trade	4.05%
	Electric Power Generation, Transmission and Distribution	5.23%	3251	Basic Chemical Manufacturing	3.85%
3141	Textile Furnishings Mills	4.98%			
	Textile and Fabric Finishing and Fabric Coating Mills	3.49%			

Converted Paper Product

3222 Manufacturing

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3222	Converted Paper Product Manufacturing	30.60%	3221	Pulp, Paper, and Paperboard Mills	37.39%
42	Wholesale Trade	11.98%	3222	Converted Paper Product Manufacturing	7.71%
484	Truck Transportation	9.72%	42	Wholesale Trade	7.46%
	Electric Power Generation, Transmission and Distribution	6.83%	55	Management of Companies and Enterprises	4.15%
55	Management of Companies and Enterprises	5.74%	3251	Basic Chemical Manufacturing	3.92%
3261	Plastics Product Manufacturing	4.65%	3255	Paint, Coating, and Adhesive Manufacturing	3.53%
3221	Pulp, Paper, and Paperboard Mills	3.13%			
23	Construction	3.12%			

3256 Soap, Cleaning Compound, and Toilet Preparation Manufacturing

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
55	Management of Companies and Enterprises	19.60%	32	Soap, Cleaning Compound, and Toilet Preparation	26.39%
42	Wholesale Trade	12.71%	56	Manufacturing	9.85%
3222	Converted Paper Product Manufacturing	7.57%	55	Management of Companies and Enterprises	9.85%
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	5.63%	32	Petroleum and Coal Products Manufacturing	8.64%
484	Truck Transportation	4.29%	41	Basic Chemical Manufacturing	8.10%
3261	Plastics Product Manufacturing	4.00%	51	Manufacturing	8.10%
5417	Scientific Research and Development Services	3.67%	54	Scientific Research and Development Services	6.44%
			17	Development Services	6.44%
			32	Plastics Product Manufacturing	6.00%
			61	Manufacturing	6.00%
			42	Wholesale Trade	5.41%
			32	Electric Power Generation, Transmission and Distribution	3.26%
			22		3.26%

3261 Plastics Product Manufacturing

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3261	Plastics Product Manufacturing	10.91%	32	Basic Chemical Manufacturing	37.55%
2211	Electric Power Generation, Transmission and Distribution	9.77%	51	Manufacturing	37.55%
3222	Converted Paper Product Manufacturing	8.77%		Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments	21.06%
42	Wholesale Trade	8.35%	32	Artificial Synthetic Fibers and Filaments Manufacturing	21.06%
52A	Monetary authorities and depository credit intermediation	6.54%	52	Filaments Manufacturing	5.97%
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	6.46%	32	Plastics Product Manufacturing	5.97%
55	Management of Companies and Enterprises	4.90%	61	Manufacturing	5.97%
484	Truck Transportation	4.62%			
23	Construction	3.86%			

3315 Foundries

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
2211	Electric Power Generation, Transmission and Distribution	16.21%	3311	Iron and Steel Mills and Ferroalloy Manufacturing	7.05%
42	Wholesale Trade Management of Companies and Enterprises	9.61%	55	Management of Companies and Enterprises	6.82%
55	Enterprises	7.20%	2211	Electric Power Generation, Transmission and Distribution	6.70%
23	Construction	6.81%	42	Wholesale Trade	6.36%
52A	Monetary authorities and depository credit intermediation	5.04%	3313	Alumina and Aluminum Production and Processing	6.08%
3311	Iron and Steel Mills and Ferroalloy Manufacturing	4.52%	3314	Nonferrous Metal (except Aluminum) Production and Processing	5.38%
484	Truck Transportation	3.78%	3335	Metalworking Machinery Manufacturing	4.16%
2212	Natural Gas Distribution	3.45%	523	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	3.31%

3321 Forging and Stamping

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3311	Iron and Steel Mills and Ferroalloy Manufacturing	12.40%	3311	Iron and Steel Mills and Ferroalloy Manufacturing	20.25%
42	Wholesale Trade	8.89%	3312	Steel Product Manufacturing from Purchased Steel	6.67%
52A	Monetary authorities and depository credit intermediation	6.92%	3314	Nonferrous Metal (except Aluminum) Production and Processing	6.32%
2211	Electric Power Generation, Transmission and Distribution	5.84%	42	Wholesale Trade	4.67%
484	Truck Transportation	5.54%	3321	Forging and Stamping	3.97%
517	Telecommunications	4.49%			
722	Food Services and Drinking Places	3.57%			
23	Construction	3.29%			
531	Real Estate	3.12%			

3326 Spring and Wire Product Manufacturing

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3326	Spring and Wire Product Manufacturing	10.02%	3311	Iron and Steel Mills and Ferroalloy Manufacturing Steel Product Manufacturing from Purchased Steel	19.71%
42	Wholesale Trade	7.61%	3312	Purchased Steel Spring and Wire Product Manufacturing	10.84%
484	Truck Transportation	7.41%	3326	Product Manufacturing	10.26%
52A	Monetary authorities and depository credit intermediation	6.94%	42	Wholesale Trade	4.01%
3311	Iron and Steel Mills and Ferroalloy Manufacturing	6.94%	55	Management of Companies and Enterprises	3.25%
2211	Electric Power Generation, Transmission and Distribution	5.72%			
55	Management of Companies and Enterprises	4.63%			
517	Telecommunications	3.30%			
23	Construction	3.23%			

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6 Manufacturing and Reproducing Magnetic and Optical Media

Supplier Industries for Regional Industries	% of Purchased by Driver Industry	Supplier Industries for National Industries	% of Purchased by Driver Industry
55	15.36%	3261	11.54%
3261	9.45%	3251	9.48%
533	6.72%	55	9.24%
42	6.23%	5112	8.37%
2211	5.86%	3252	5.99%
52A	5.01%	3344	5.35%
5415	3.94%	5417	5.08%
23	3.69%	42	4.05%
		533	3.96%
		3221	3.53%
		3346	3.53%

3379 Other Furniture Related Product Manufacturing

Supplier Industries for Regional Industries		% of Purchased by Driver Industry	Supplier Industries for National Industries		% of Purchased by Driver Industry
3261	Plastics Product Manufacturing	18.85%	3261	Plastics Product Manufacturing	23.19%
3326	Spring and Wire Product Manufacturing	9.01%	3326	Spring and Wire Product Manufacturing	10.25%
42	Wholesale Trade	7.17%	42	Wholesale Trade	5.57%
48A	Scenic and sightseeing transportation and support activities for transportation	6.14%	48A	Scenic and sightseeing transportation and support activities for transportation	3.67%
484	Truck Transportation	5.89%	5418	Advertising, Public Relations, and Related Services	3.57%
3132	Fabric Mills	5.43%	3379	Other Furniture Related Product Manufacturing	3.27%
5111	Newspaper, Periodical, Book, and Directory Publishers	5.18%	3132	Fabric Mills	3.21%
52A	Monetary authorities and depository credit intermediation	5.00%	3133	Textile and Fabric Finishing and Fabric Coating Mills	3.14%
5418	Advertising, Public Relations, and Related Services	4.20%			

Appendix B.3: Overview of Manufacturing Non-driver Industries, 2011

NAICS	Definition	GRP (\$ Million) 2011	EMP 2011	Total Wages (\$ Million) 2011	Ave. Wages (\$) 2011
3231	Printing & Related Support Activities	\$131.4	2,210	\$82.0	\$37,102
3116	Animal Slaughtering & Processing	\$182.4	2,004	\$70.9	\$35,380
3323	Architectural & Structural Metals	\$160.9	1,897	\$84.8	\$44,710
3391	Medical Equipment & Supplies	\$200.3	1,895	\$69.8	\$36,856
3327	Machine Shops; Turned Product; Screw, Nut, Bolt	\$125.8	1,546	\$68.1	\$44,040
3254	Pharmaceutical and Medicine	\$393.8	1,481	\$125.1	\$84,499
3118	Bakeries and Tortilla	\$141.8	1,456	\$54.0	\$37,060
3219	Other Wood Product	\$77.8	1,235	\$44.2	\$35,770
3399	Other Miscellaneous	\$97.4	984	\$35.3	\$35,862
3329	Other Fabricated Metal Product	\$91.8	915	\$48.8	\$53,329
3359	Other Electrical Equipment and Component	\$94.9	755	\$49.5	\$65,608
3121	Beverage	\$103.3	727	\$34.1	\$46,862
3273	Cement and Concrete Product	\$48.0	675	\$26.8	\$39,703
3364	Aerospace Product and Parts	\$51.1	652	\$44.1	\$67,710
3115	Dairy Product	\$87.6	649	\$32.7	\$50,394
3272	Glass and Glass Product	\$50.0	632	\$26.6	\$42,033
3345	Navigational, Measuring, Electro-medical Instruments	\$95.3	540	\$38.5	\$71,272
3314	Nonferrous Metal (except Aluminum) Production	\$53.5	460	\$25.5	\$55,405
3311	Iron and Steel Mills and Ferroalloy	\$60.1	455	\$32.5	\$71,498
3211	Sawmills and Wood Preservation	\$33.3	409	\$19.1	\$46,755
3132	Fabric Mills	\$27.1	407	\$12.7	\$31,117
3114	Fruit and Vegetable Preserving and Specialty Food	\$41.4	392	\$15.7	\$40,170
3344	Semiconductor and Other Electronic Component	\$74.1	346	\$31.6	\$91,224
3259	Other Chemical Product and Preparation	\$46.8	321	\$16.5	\$51,285
3252	Resin, Synthetic Rubber, Artificial Synthetic Fibers	\$49.9	316	\$18.1	\$57,306
3324	Boiler, Tank, and Shipping Container	\$26.9	305	\$13.8	\$45,135
3371	Household and Institutional Furniture, Kitchen Cabinet	\$24.4	280	\$9.7	\$34,817
3241	Petroleum and Coal Products	\$65.0	257	\$11.0	\$42,667
3212	Veneer, Plywood, and Engineered Wood Product	\$18.3	242	\$10.6	\$43,703
3262	Rubber Product	\$28.1	241	\$11.5	\$47,787
3133	Textile and Fabric Finishing and Fabric Coating Mills	\$13.8	240	\$7.4	\$30,949
3251	Basic Chemical	\$46.6	234	\$17.2	\$73,663

Importance of Manufacturing to the Greater Northeastern/Northern Region of Pennsylvania

NAICS	Definition	GRP (\$ Million) 2011	EMP 2011	Total Wages (\$ Million) 2011	Ave. Wages (\$) 2011
3339	Other General Purpose Machinery	\$22.4	233	\$11.6	\$49,929
3149	Other Textile Product Mills	\$13.8	229	\$8.9	\$39,062
3313	Alumina and Aluminum Production, Processing	\$31.8	212	\$15.2	\$71,811
3221	Pulp, Paper, Paperboard Mills	\$57.7	211	\$17.4	\$82,296
3255	Paint, Coating, and Adhesive	\$31.5	210	\$10.9	\$51,859
3312	Steel Product from Purchased Steel	\$21.1	204	\$10.5	\$51,254
3112	Grain and Oilseed Milling	\$39.4	201	\$15.2	\$75,718
3335	Metalworking Machinery	\$20.6	201	\$10.3	\$51,093
3334	HVAC and Commercial Refrigeration Equipment	\$18.4	195	\$8.7	\$44,527
3369	Other Transportation Equipment	\$11.7	191	\$9.1	\$47,728
3342	Communications Equipment	\$36.4	186	\$14.7	\$79,066
3328	Coating, Engraving, Heat Treating, and Allied Activities	\$13.2	181	\$7.0	\$38,596
3152	Cut and Sew Apparel	\$9.5	176	\$5.6	\$31,777
3119	Other Food	\$27.8	175	\$11.1	\$63,178
3322	Cutlery and Hand-tool	\$15.2	164	\$7.5	\$45,950
3279	Other Nonmetallic Mineral Product	\$13.8	162	\$6.3	\$38,935
3332	Industrial Machinery	\$20.8	160	\$10.8	\$67,798
3351	Electric Lighting Equipment	\$15.8	156	\$8.1	\$52,013
3362	Motor Vehicle Body & Trailer	\$8.7	135	\$5.0	\$36,971
3151	Apparel Knitting Mills	\$5.7	121	\$2.7	\$22,094
3363	Motor Vehicle Parts	\$4.8	106	\$5.2	\$49,125
3372	Office Furniture	\$9.7	99	\$4.0	\$40,653
3331	Agriculture, Construction, and Mining Machinery	\$10.9	96	\$5.6	\$58,588
3365	Railroad Rolling Stock	\$2.7	89	\$2.8	\$31,204
3333	Commercial and Service Industry Machinery	\$8.3	85	\$3.9	\$46,264
3159	Apparel Accessories and Other Apparel	\$3.3	78	\$2.0	\$25,227
3336	Engine, Turbine, and Power Transmission Equipment	\$6.4	49	\$3.3	\$67,857
3131	Fiber, Yarn, and Thread Mills	\$4.0	48	\$2.0	\$41,623
3271	Clay Product and Refractory	\$2.9	41	\$1.7	\$40,410
3353	Electrical Equipment	\$2.3	39	\$1.3	\$32,347
3274	Lime and Gypsum Product	\$2.4	35	\$1.5	\$41,440
3325	Hardware	\$2.4	24	\$1.2	\$49,905
3361	Motor Vehicle	\$1.7	23	\$1.6	\$70,425
3341	Computer and Peripheral Equipment	\$5.0	19	\$1.8	\$94,991
3162	Footwear	\$1.2	17	\$0.6	\$37,480
3343	Audio and Video Equipment	\$4.7	16	\$2.2	\$136,081

Importance of Manufacturing to the Greater Northeastern/Northern Region of Pennsylvania

NAICS	Definition	GRP (\$ Million) 2011	EMP 2011	Total Wages (\$ Million) 2011	Ave. Wages (\$) 2011
3253	Pesticide, Fertilizer, and Other Agricultural Chemical	\$1.3	8	\$0.4	\$54,208
3161	Leather and Hide Tanning and Finishing	\$0.4	7	\$0.2	\$33,644
3169	Other Leather and Allied Product	\$0.3	5	\$0.2	\$33,176
3122	Tobacco	\$0.9	4	\$0.3	\$73,208
3352	Household Appliance	\$0.3	3	\$0.1	\$49,440
3366	Ship and Boat Building	\$0.2	3	\$0.1	\$46,039
3117	Seafood Product Preparation and Packaging	-	-	-	-
Total of non-driver industries		\$3,254.1	29,755	\$1,426.9	
Average of non-driver industries		\$43.4	397	\$19.0	

Source: Moody's Analytics

Notes:

* 75 non-driver industries are sorted by 2011 employment from largest to smallest.

* 9 non-driver industries highlighted in grey showed positive growth in both employment and GRP between 2001 and 2011. These 9 non-driver industries are also shown in Figure 2-9.

Appendix B.4: Changes in Manufacturing Non-driver Industries, 2001-2011

(Unit: %, \$)

No.	NAICS	EMP 01-09	EMP 09-11	EMP 01-11	GRP 01-09	GRP 09-11	GRP 01-11	Ave. Wage 2001	Ave. Wage 2011	Ave. Wage 01-11
1	3231	-32.9%	-17.7%	-44.7%	-29.1%	-21.1%	-44.0%	\$ 41,565	\$ 37,102	-10.7%
2	3116	-7.2%	-2.5%	-9.5%	41.2%	-6.5%	32.0%	\$ 27,021	\$ 35,380	30.9%
3	3323	-24.2%	-2.2%	-25.8%	-14.8%	2.1%	-13.0%	\$ 41,612	\$ 44,710	7.4%
4	3391	15.8%	-22.9%	-10.7%	72.0%	-26.7%	26.0%	\$ 37,712	\$ 36,856	-2.3%
5	3327	9.5%	14.1%	25.0%	19.9%	22.4%	46.8%	\$ 39,883	\$ 44,040	10.4%
6	3254	64.0%	-8.0%	50.8%	89.3%	-22.2%	47.3%	\$ 66,356	\$ 84,499	27.3%
7	3118	2.0%	10.4%	12.6%	35.5%	5.4%	42.8%	\$ 33,222	\$ 37,060	11.6%
8	3219	-38.5%	-18.5%	-49.9%	-30.7%	1.2%	-29.9%	\$ 27,844	\$ 35,770	28.5%
9	3399	-40.4%	14.7%	-31.7%	-8.7%	11.7%	1.9%	\$ 32,425	\$ 35,862	10.6%
10	3329	-11.6%	-9.4%	-19.9%	1.5%	-3.2%	-1.8%	\$ 47,070	\$ 53,329	13.3%
11	3359	-46.4%	-5.9%	-49.6%	-33.7%	7.4%	-28.8%	\$ 48,348	\$ 65,608	35.7%
12	3121	-12.8%	5.4%	-8.1%	23.9%	13.6%	40.7%	\$ 40,061	\$ 46,862	17.0%
13	3273	23.2%	7.7%	32.6%	-16.4%	23.8%	3.5%	\$ 47,572	\$ 39,703	-16.5%
14	3364	-9.7%	-9.8%	-18.6%	9.1%	3.3%	12.7%	\$ 38,450	\$ 67,710	76.1%
15	3115	-5.1%	15.1%	9.3%	30.6%	4.5%	36.4%	\$ 46,813	\$ 50,394	7.7%
16	3272	-68.9%	-8.4%	-71.5%	-74.0%	-2.1%	-74.5%	\$ 45,954	\$ 42,033	-8.5%
17	3345	-52.5%	-21.3%	-62.6%	81.0%	29.9%	135.1%	\$ 36,479	\$ 71,272	95.4%
18	3314	-21.9%	33.3%	4.1%	-0.5%	55.9%	55.2%	\$ 55,128	\$ 55,405	0.5%
19	3311	-7.6%	-4.2%	-11.5%	39.6%	4.9%	46.5%	\$ 56,266	\$ 71,498	27.1%
20	3211	-52.0%	-6.8%	-55.3%	-44.9%	27.4%	-29.7%	\$ 32,630	\$ 46,755	43.3%
21	3132	-81.7%	8.5%	-80.2%	-77.8%	5.7%	-76.6%	\$ 35,454	\$ 31,117	-12.2%
22	3114	-12.4%	-4.6%	-16.4%	20.4%	-10.6%	7.7%	\$ 35,592	\$ 40,170	12.9%
23	3344	-61.8%	-26.8%	-72.0%	23.4%	20.1%	48.2%	\$ 52,470	\$ 91,224	73.9%
24	3259	15.0%	-10.8%	2.6%	14.0%	-28.5%	-18.5%	\$ 44,898	\$ 51,285	14.2%
25	3252	45.9%	-10.5%	30.6%	29.6%	-23.0%	-0.2%	\$ 50,692	\$ 57,306	13.0%
26	3324	-18.3%	-13.6%	-29.4%	-8.4%	-12.1%	-19.4%	\$ 44,608	\$ 45,135	1.2%
27	3371	-61.5%	-1.4%	-62.1%	-69.2%	58.9%	-51.0%	\$ 38,594	\$ 34,817	-9.8%
28	3241	26.9%	-2.7%	23.6%	-11.6%	111.2%	86.6%	\$ 50,148	\$ 42,667	-14.9%
29	3212	-45.4%	-6.9%	-49.2%	-48.0%	21.1%	-37.1%	\$ 38,494	\$ 43,703	13.5%
30	3262	-17.4%	10.6%	-8.7%	-28.2%	4.6%	-24.8%	\$ 65,100	\$ 47,787	-26.6%
31	3133	-26.7%	18.2%	-13.4%	0.6%	6.0%	6.6%	\$ 29,383	\$ 30,949	5.3%
32	3251	-80.7%	56.0%	-69.9%	-79.3%	17.8%	-75.6%	\$ 60,260	\$ 73,663	22.2%
33	3339	-42.7%	-19.1%	-53.7%	-33.4%	-8.6%	-39.1%	\$ 52,600	\$ 49,929	-5.1%
34	3149	-36.6%	7.5%	-31.8%	-11.8%	3.5%	-8.8%	\$ 29,253	\$ 39,062	33.5%
35	3313	-20.4%	-4.5%	-24.0%	27.3%	2.2%	30.1%	\$ 61,840	\$ 71,811	16.1%
36	3221	-43.8%	-2.8%	-45.3%	-24.5%	11.8%	-15.6%	\$ 78,838	\$ 82,296	4.4%
37	3255	-15.6%	-7.5%	-21.9%	-19.6%	-7.6%	-25.7%	\$ 38,678	\$ 51,859	34.1%
38	3312	-13.7%	-4.7%	-17.7%	29.1%	5.1%	35.7%	\$ 44,259	\$ 51,254	15.8%
39	3112	-33.8%	-2.4%	-35.4%	-1.6%	2.7%	1.1%	\$ 54,181	\$ 75,718	39.8%
40	3335	-53.3%	-39.1%	-71.6%	-25.6%	-38.5%	-54.2%	\$ 45,590	\$ 51,093	12.1%
41	3334	-55.7%	21.9%	-46.0%	-48.2%	44.7%	-25.0%	\$ 48,975	\$ 44,527	-9.1%
42	3369	-2.1%	-32.5%	-33.9%	-6.6%	-44.9%	-48.5%	\$ 52,900	\$ 47,728	-9.8%
43	3342	-65.5%	-29.0%	-75.5%	13.9%	25.0%	42.3%	\$ 57,423	\$ 79,066	37.7%
44	3328	-31.5%	-1.1%	-32.2%	-24.1%	4.8%	-20.5%	\$ 35,862	\$ 38,596	7.6%
45	3152	-88.0%	0.0%	-88.0%	-89.7%	-3.3%	-90.1%	\$ 26,628	\$ 31,777	19.3%
46	3119	-12.6%	-38.6%	-46.3%	0.8%	-43.6%	-43.1%	\$ 64,938	\$ 63,178	-2.7%
47	3322	1.3%	1.2%	2.5%	-2.4%	17.1%	14.3%	\$ 47,858	\$ 45,950	-4.0%
48	3279	-33.3%	-60.7%	-73.8%	-56.7%	-51.9%	-79.2%	\$ 55,957	\$ 38,935	-30.4%
49	3332	-30.1%	-41.6%	-59.2%	-9.0%	-35.4%	-41.2%	\$ 65,395	\$ 67,798	3.7%
50	3351	-41.1%	9.9%	-35.3%	-31.0%	45.4%	0.4%	\$ 35,498	\$ 52,013	46.5%
51	3362	-16.2%	-6.9%	-22.0%	-15.6%	-20.1%	-32.6%	\$ 50,687	\$ 36,971	-27.1%
52	3151	-36.4%	-19.3%	-48.7%	-67.6%	-34.4%	-78.7%	\$ 38,697	\$ 22,094	-42.9%
53	3363	-72.4%	23.3%	-66.0%	-73.2%	-10.9%	-76.1%	\$ 43,724	\$ 49,125	12.4%

Importance of Manufacturing to the Greater Northeastern/Northern Region of Pennsylvania

No.	NAICS	EMP 01-09	EMP 09-11	EMP 01-11	GRP 01-09	GRP 09-11	GRP 01-11	Ave. Wage 2001	Ave. Wage 2011	Ave. Wage 01-11
54	3372	-74.0%	8.8%	-71.7%	-76.7%	68.6%	-60.7%	\$ 38,225	\$ 40,653	6.4%
55	3331	6.3%	-18.6%	-13.5%	39.9%	-9.4%	26.8%	\$ 55,767	\$ 58,588	5.1%
56	3365	-17.4%	-18.3%	-32.6%	-25.7%	-42.2%	-57.1%	\$ 31,725	\$ 31,204	-1.6%
57	3333	-32.0%	-70.2%	-79.7%	-24.9%	-63.9%	-72.9%	\$ 52,091	\$ 46,264	-11.2%
58	3159	-49.5%	-18.8%	-58.9%	-66.0%	-32.2%	-76.9%	\$ 26,166	\$ 25,227	-3.6%
59	3336	-18.7%	-33.8%	-46.2%	13.6%	-27.5%	-17.6%	\$ 60,687	\$ 67,857	11.8%
60	3131	-73.9%	2.1%	-73.3%	-68.0%	1.4%	-67.5%	\$ 43,364	\$ 41,623	-4.0%
61	3271	-58.5%	-6.8%	-61.3%	-66.0%	4.6%	-64.4%	\$ 39,346	\$ 40,410	2.7%
62	3353	-35.1%	-18.8%	-47.3%	-21.8%	-12.2%	-31.3%	\$ 24,472	\$ 32,347	32.2%
63	3274	7.0%	-23.9%	-18.6%	35.7%	-10.2%	21.8%	\$ 23,991	\$ 41,440	72.7%
64	3325	-70.0%	-20.0%	-76.0%	-64.8%	-13.3%	-69.5%	\$ 44,837	\$ 49,905	11.3%
65	3361	-44.4%	-8.0%	-48.9%	-43.7%	-28.2%	-59.6%	\$ 62,992	\$ 70,425	11.8%
66	3341	-70.5%	-17.4%	-75.6%	-7.6%	39.1%	28.6%	\$ 64,796	\$ 94,991	46.6%
67	3162	-93.7%	41.7%	-91.0%	-92.5%	39.8%	-89.5%	\$ 27,017	\$ 37,480	38.7%
68	3343	-94.6%	-68.0%	-98.3%	-82.4%	-35.9%	-88.7%	\$ 58,530	\$ 136,081	132.5%
69	3253	-30.8%	-11.1%	-38.5%	-38.7%	-32.5%	-58.6%	\$ 59,800	\$ 54,208	-9.4%
70	3161	-96.4%	40.0%	-95.0%	-96.3%	32.5%	-95.0%	\$ 27,564	\$ 33,644	22.1%
71	3169	-94.5%	66.7%	-90.9%	-94.1%	65.9%	-90.2%	\$ 22,471	\$ 33,176	47.6%
72	3122	-98.6%	33.3%	-98.1%	-98.7%	69.6%	-97.7%	\$ 82,299	\$ 73,208	-11.0%
73	3352	-75.0%	0.0%	-75.0%	-78.3%	31.8%	-71.3%	\$ 43,751	\$ 49,440	13.0%
74	3366	100.0%	-25.0%	50.0%	101.1%	-22.3%	56.3%	\$ 40,788	\$ 46,039	12.9%
75	3117	-100.0%	-	-100.0%	-100.0%	-	-100.0%	\$ 46,987	\$ -	-100.0%

Source: Moody's Analytics

Notes:

* 75 manufacturing non-driver industries are sorted by the number of employment in 2011 from largest to smallest.

* Nine non-driver industries highlighted in grey showed positive growth in both employment and GRP between 2001 and 2011. These nine non-driver industries are also shown in Figure 2-9.

* This table does not show the definition of the NAICS due to the limited space. The NAICS definitions can be found in the U.S. Census Bureau web page. (www.census.gov/eos/www/naics)