

MANUFACTURING

PENNSYLVANIA'S FUTURE

Regional Strategies that Build from Current Strengths and Address Competitive Challenges

Manufacturing: The Keystone of the Commonwealth

Manufacturing made the Commonwealth of Pennsylvania. During the age of Benjamin Franklin, the state was a hub of trade whose artisans hammered out goods that created colonial commerce and spurred aspirations for American self-reliance.

As the workshop of the new nation, Pennsylvania sent what was needed north and south and drove enterprise westward over the Alleghenies. Pennsylvania rails, engines and rolling stock sped commerce across the virgin land to link a continental nation. The factories of the Keystone State turned the tide against secession and slavery as surely as the sacrifice at Gettysburg. Pennsylvania steel, glass and oil built and fueled the reunited nation and laid the foundation for American world leadership in war and peace in the 20th century.

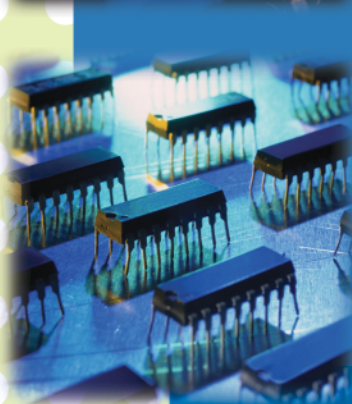
Millions of people in previous generations made new lives in Pennsylvania by making what the world needed. The leaders who marshaled their labor —Franklin, Carnegie, Mellon, Heinz, Westinghouse — stood for genius turned to social purpose, for wealth as the wellspring of commonwealth.

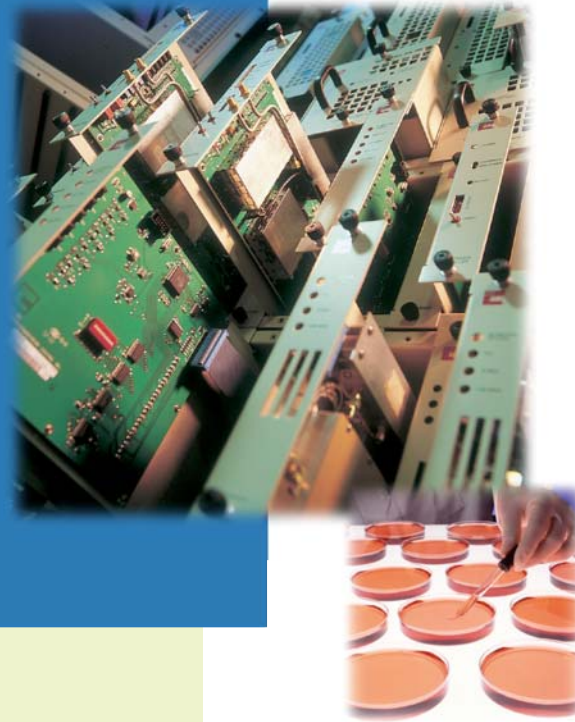
Pennsylvania carries this heritage forward. *Manufacturing Pennsylvania's Future: Regional Strategies that Build from Current Strengths and Address Competitive Challenges*, the study summarized here, shows that manufacturing is profoundly important to the economic future of the commonwealth.

Manufacturing remains by far the largest part of the state's output, and it accounts for the majority of what it exports. Manufacturing also provides the best source of hundreds of thousands of good family-wage jobs, which in turn makes it the leading source of wealth and the force that drives all of the commonwealth's regional economies.

Manufacturing is the essential anchor for hundreds of cities and towns across the state and the means through which it can bring to market most of the products conceived and developed by its entrepreneurs.

The study also defines the challenges faced by manufacturers in 21st century Pennsylvania. All manufacturers now work in a global economy in which able competitors can emerge, half a world away, without warning, in months. On a planet transformed by digital technology, commerce is transacted in a nano-second and jobs can be sent to another continent in weeks. The study assesses those challenges and recommends what manufacturers and the commonwealth must do to succeed in the future.





QUESTIONS



Manufacturing Pennsylvania's Future: Regional Strategies that Build from Current Strengths and Address Competitive Challenges was produced by Deloitte & Touche, the international consulting corporation with the largest manufacturing practice in the world. The study was sponsored and overseen by the Pennsylvania Industrial Resource Centers Network, the TEAM PA Foundation and the Pennsylvania Department of Community and Economic Development. Hundreds of questions were posed during the design phase of the study, including the following:

- › How should the significance of manufacturing to the Pennsylvania economy be measured?
- › How and why has that significance evolved in the last decade?
- › How does the performance of Pennsylvania manufacturing compare to that of other states?
- › How significant is the threat of foreign competition to various Pennsylvania industries?
- › How likely are customers of Pennsylvania manufacturers to shift to offshore suppliers?
- › How have various industries performed in Pennsylvania?
- › Which industries have a comparative advantage in Pennsylvania?
- › What types of firms within the state support industries with a comparative advantage?
- › What distinctions are there between the needs of larger and smaller manufacturers?
- › What industries are most important in each region of Pennsylvania?
- › What dynamics now shape the possible futures of manufacturing in Pennsylvania?
- › What can state government do to help secure the best future?

The study attempted to answer these questions using a very broad range of data, the industrial experts of Deloitte, the 15-year experience of the Industrial Resource Centers and the perspectives of more than 75 manufacturing executives throughout the various regions of Pennsylvania.

The analysis summarized here delves deep into comprehensive, detailed data to define Pennsylvania's manufacturing economy, and it presents compelling graphics that support the findings. This analysis may well be the most substantial study ever done of the manufacturing endowment of an industrial state.

To read the complete, comprehensive report, visit www.catalystconnection.org/bkh/report.htm.

Submitted to:
-The Industrial Resource Centers (IRCs) of Pennsylvania
-Department of Community and Economic Development, Commonwealth of Pennsylvania
-Team PA Foundation
January, 2004



The 10 core findings of the study are presented here in the precise language and accompanying illustrations developed by the Deloitte team that conducted the study.

FINDINGS

1) Manufacturing remains an essential element of Pennsylvania's economy, contributing \$64 billion annually to the gross state product. This is by far the largest share of any sector.

Pennsylvania's manufacturing output rose steadily in the 1990s; it declined some from the 2001 recession, and it currently stands at \$64 billion or 16.1 percent of total state output. No other industry contributes even 10 percent.

2) Manufacturing in Pennsylvania and in America faces new challenges. Pennsylvania has lost 133,000 manufacturing jobs since 1998. This is attributable to the recent recession, to gains in productivity and to foreign competition and offshore sourcing by transnational manufacturing corporations.

Manufacturing employment in Pennsylvania held steady in the 860,000 range through the 1990s and then fell by more than 130,000 since 2000. Part of this rapid decline was a result of the 2001 recession, which was severe for manufacturing. And part, perhaps 30 percent (40,000 jobs) came as foreign competitors in low-cost countries claimed markets once served by Pennsylvania firms and major transnational corporations selected cheaper offshore suppliers, breaking long-standing relations with firms in Pennsylvania. Yet another part of the decline was a result of ongoing and desirable gains in manufacturing productivity. As manufacturers adopt new technologies and methods, they accomplish more with the same level of effort.

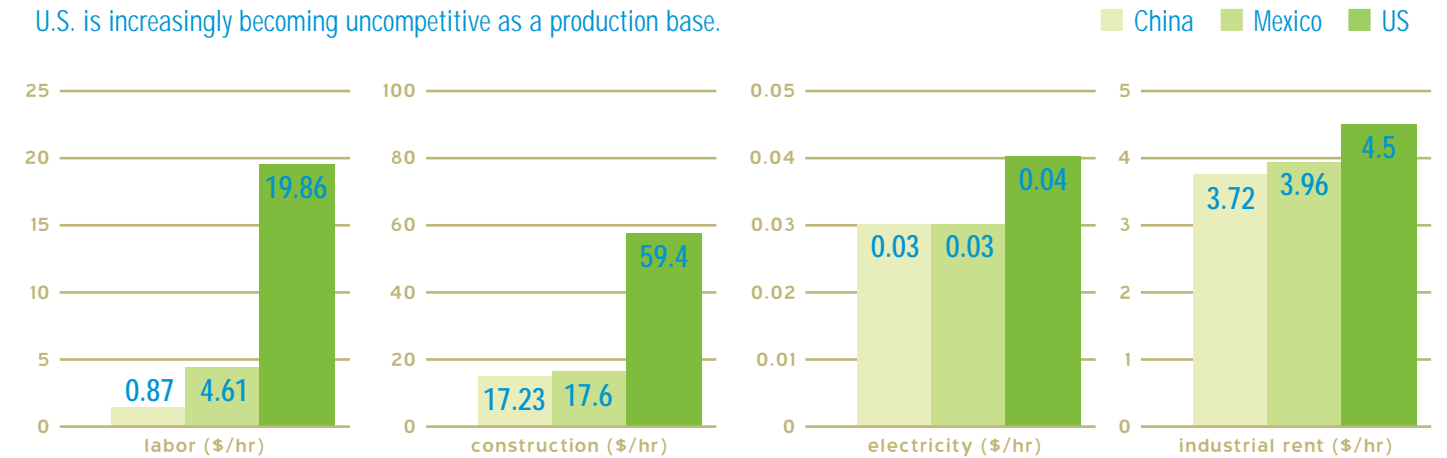
Part of the decline, of course, was the result of the 2001 recession, which was severe for manufacturing. And part, perhaps 30 percent (40,000 jobs) came as foreign competitors in low-cost countries claimed markets once served by Pennsylvania firms and major transnational corporations selected cheaper offshore suppliers, breaking long-standing relations with firms in Pennsylvania.

This challenge is illustrated by the two charts on the right, which show the comparative data on key manufacturing costs for the U.S., Mexico and China and the rising tide of Chinese manufactured imports to the U.S. in the past ten years. China is only the most dramatic case of the gathering threat of offshore sourcing.

3) The manufacturing sector in Pennsylvania is dynamic. Some industries in the sector are growing and concentrated in the state, while others (including many of the traditional manufacturing industries) are declining.

WHY OFF-SHORING? - Comparative Cost Data

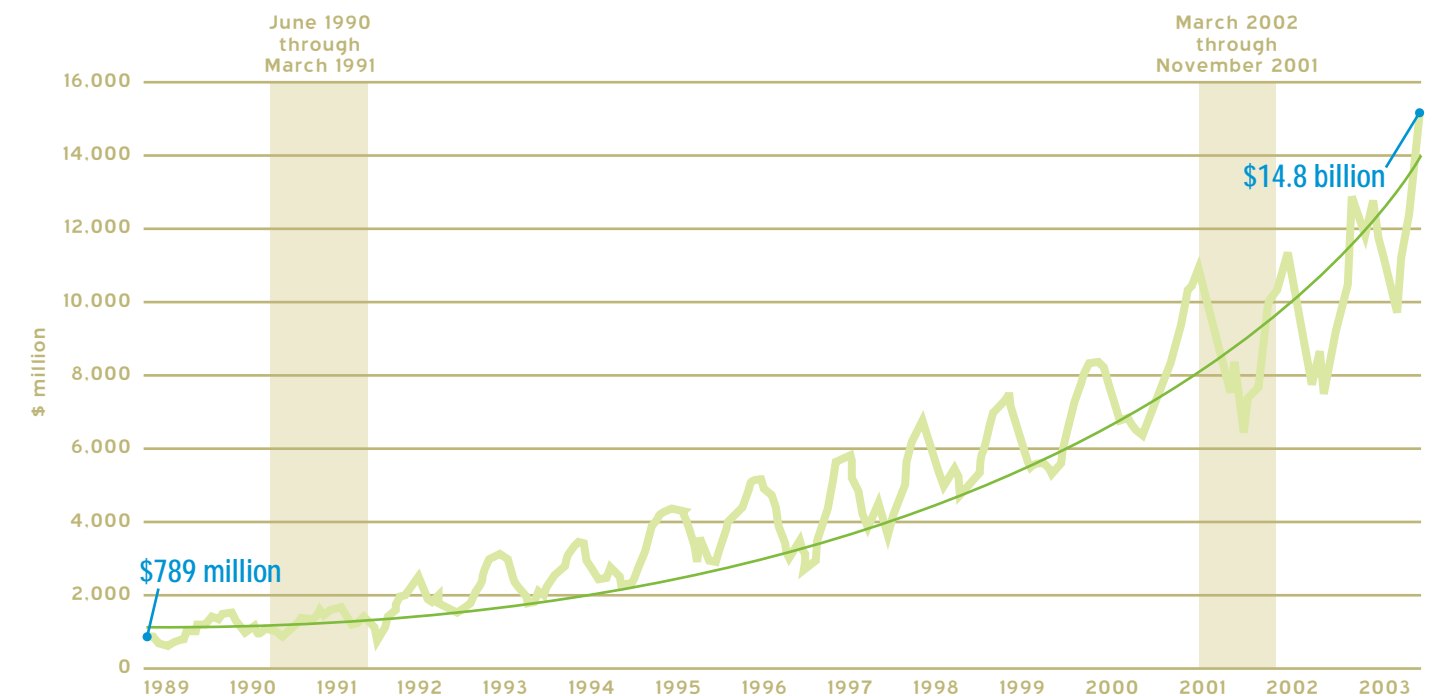
U.S. is increasingly becoming uncompetitive as a production base.



Source: EIU and Deloitte Fantus Analysis

MONTHLY IMPORTS FROM CHINA GROW EXPONENTIALLY

U.S. imports from China, current dollars, January 1989 to September 2003.



Source: U.S. Bureau of Economic Analysis



FINDINGS

4) Sixteen driver industries that produce nearly half of Pennsylvania's manufacturing output have grown and concentrated in the state in the past 10 years. These industries and their associated clusters of in-state suppliers provide a substantial portion of the export earnings of Pennsylvania manufacturing, thereby making a major contribution to the prosperity of the commonwealth.

5) A shift and share analysis of the change in gross product for the entire economy of Pennsylvania from 1999 to 2001 showed that all of the growth in gross state product attributable to local competitive factors from 1999 to 2003 is attributable to the 16 manufacturing driver industries of the state. Without these industries the state would have experienced a profound recession.

The Deloitte team that conducted the study looked in deep detail at the performance of more than 300 distinct industries in Pennsylvania over the past 10 years. The objective was to determine the driver industries that do the most to create jobs and export goods to the rest of the nation and the world, thus creating wealth in the state. In addition, driver industries are concentrating in Pennsylvania, as compared to the rest of the U.S. The results are presented in the chart below.

These industries are the dynamic core of Pennsylvania manufacturing in this decade. They are not the only source of wealth and good jobs, of course. As the study shows, several additional industries are important to specific regions in the state. Others are still large but in steady decline. However, the 16 industries defined as drivers of Pennsylvania manufacturing do contribute almost half of all our manufacturing output and together were the source of all growth in output during recent years.

Special attention must be paid to these industries and their supply chains, in order to achieve stronger growth in Pennsylvania's manufacturing sector. The study defines in detail those supplier industries clustered with the drivers.

THE ECONOMIC ANALYSIS IDENTIFIED 16 MANUFACTURING DRIVER INDUSTRIES FOR PENNSYLVANIA

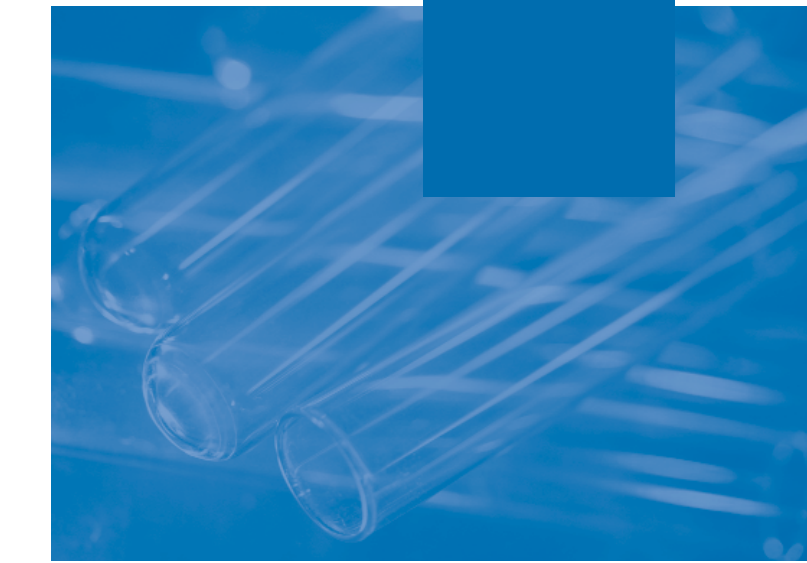
Industry	2003 Output (\$million)	2000-2003 Output CAGR (%)	1998-2003 Output CAGR (%)	1993-2003 Output CAGR (%)	2003 Output Location Quotient (LQ)	1993-2003 Output LQ Growth (%)
Pharmaceuticals	\$6,684	0.7%	4.6%	5.2%	3.44	12.6%
Electrical Equipment	\$4,612	4.6%	5.9%	7.9%	1.42	-18.5%
Plastics	\$2,818	1.8%	2.9%	5.0%	2.22	53.0%
Printing*	\$2,287	-2.2%	-1.4%	-1.0%	1.95	41.0%
Food**	\$2,149	-1.7%	-0.2%	0.3%	2.35	26.8%
Paper	\$2,109	-1.8%	-1.1%	0.4%	2.55	71.7%
Basic Chemicals	\$1,944	-3.5%	0.1%	-0.7%	1.80	9.4%
Metalworking Machinery	\$1,842	0.7%	-0.2%	7.7%	1.35	8.7%
Architectural and Structural Metals	\$1,653	-1.1%	0.4%	2.3%	1.97	16.9%
Machine Shops/Screw, Nut and Bolt Manufacturing	\$1,614	0.9%	1.2%	6.5%	1.56	10.0%
Other Fabricated Metals	\$1,398	-1.8%	-1.2%	2.4%	1.94	27.6%
Wood Products	\$1,302	-1.5%	-0.5%	2.5%	1.43	53.7%
Furniture	\$1,271	1.0%	1.7%	2.8%	1.61	61.3%
Resin, Rubber and Fibers	\$1,248	-3.6%	0.2%	0.7%	1.84	11.8%
Glass	\$938	-5.3%	-3.7%	0.5%	3.50	23.5%
Medical Equipment	\$855	5.7%	3.8%	2.4%	1.97	92.4%

*Printing may include printing services. **Food data represents Sugar and Confectionary and Bakeries and Pasta Industries only.
 Note: CAGR (Compound Annual Growth Rate) is average annual growth rate over a specified period of time. CAGR is calculated using the following formula: $CAGR = ((\text{present value}/\text{base value})^{1/\# \text{ of years}}) - 1$

Source: Deloitte

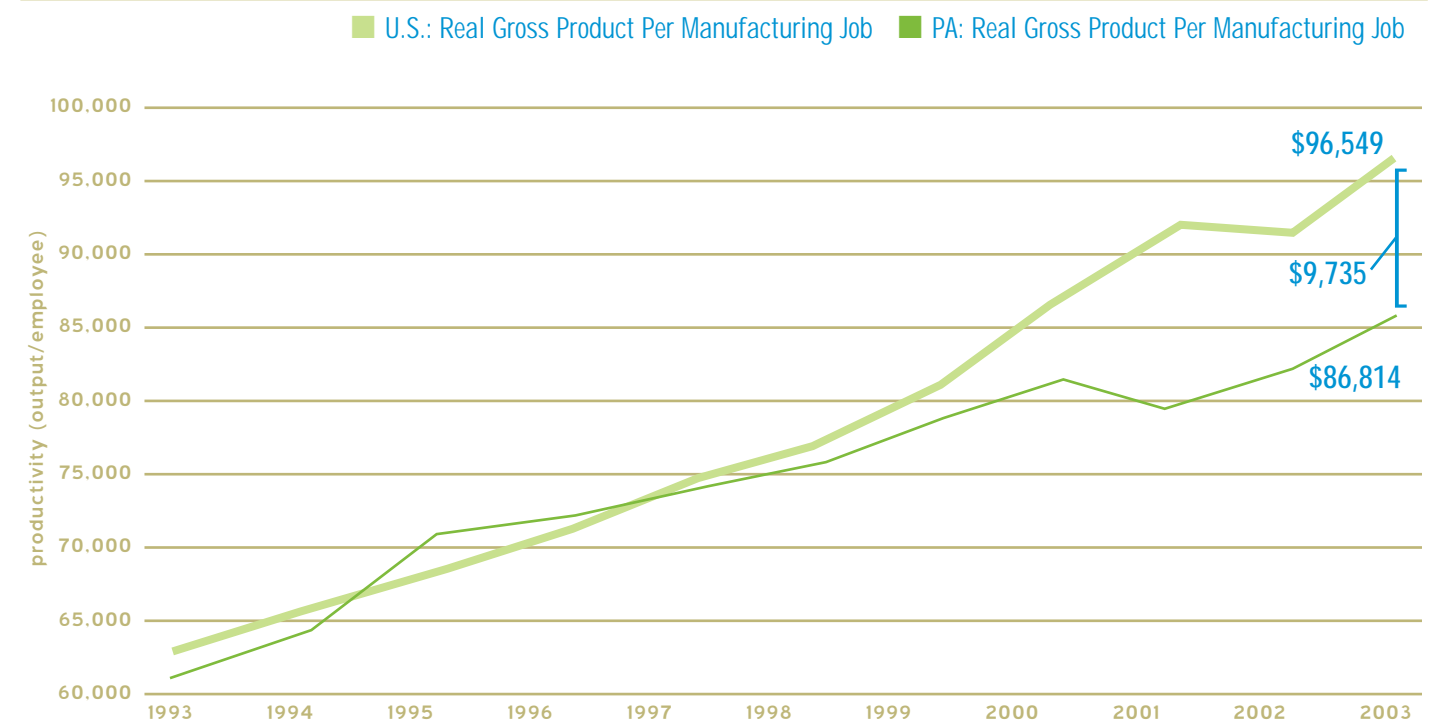
6) Average Pennsylvania productivity levels are significantly below those of the U.S. The gap is likely the result of price stagnation caused by in-state firms producing a high percentage of commodity products. The price stagnation is likely due to a combination of offshore competition and price pressure from firms that integrate parts into products for the final consumers (OEMs) and extremely price-sensitive retailers.

This growing productivity gap was a compelling finding of the study. Deloitte found the primary cause of the gap in the current industrial mix of Pennsylvania was that too many of the state's manufacturers produce commodities — mature goods with widely understood production processes and product features within the capabilities of thousands of firms in many countries. In the global economy, such firms must compete primarily on price. Neither major transnational manufacturing customers, such as General Motors and General Electric, or giant retailers, such as Wal-Mart, will long tolerate prices that can be beat by reliable sources elsewhere. Thousands of Pennsylvania firms have worked hard to contain prices by removing costs from their operations, but over time even the best firms face



diminishing returns from lean discipline. As the threat of offshoring grew in the past half-decade, the prices and margins of Pennsylvania's commodity-oriented manufacturers were hammered thin, opening the productivity gap, as the chart below shows. Pennsylvania manufacturers work very hard to produce useful goods but cannot command a good price for their products.

WHILE MANUFACTURING PRODUCTIVITY IN PENNSYLVANIA HAS GROWN, IT LAGS IN THE NATION



Source: Economy.com

FINDINGS

7) Economic development policy and strategy is best viewed by analyzing a firm's cash statement. The key to surviving and prospering during the 1990s was process innovation (i.e., being faster, better and cheaper). In other words, squeezing the middle lines of the cash statement. During the upcoming decade, price pressures will not relent; they will intensify. The keys to success in this decade lie in growing the top line of the cash statement through sales growth. Process innovations increasingly will be introduced through product innovation.

The best escape from the vice of commodity product price competition is through innovation. Growing, profitable

firms will succeed, because they achieve and sustain distinctive competencies, primarily in the product features they offer but also in the services they provide to their large manufacturing customers.

As long as steady development keeps the products fresh and distinct, firms can price what they offer, based on the value they deliver to customers, rather than the cost of competitors from low-wage regions. This finding has very significant consequences for Pennsylvania's economic development strategy in the 21st century and especially the role and responsibilities of the state's Industrial Resource Centers and other economic development organizations.

8) The industries that drive Pennsylvania's manufacturing performance, considered as a portfolio, have distinct needs, requiring distinct strategies by Pennsylvania's economic developers.

Pennsylvania and all the regions across the planet with which we now compete have entered the era of flexibly focused, customized and targeted economic development strategy. One size no longer fits all. Successful regions will assess their strengths and challenges industry by industry, understand the distinct needs of each and take those actions within the scope of public and public-private partnerships.

This is not "picking winners and losers" as some misguided critics of intelligent economic development policy once charged, but wise strategic investment to grow the commonwealth in economies shaped by market forces. The chart on the right summarizes some of the study's analysis to support such a strategy by Pennsylvania economic developers.

The chart assigns positions to the 16 driver manufacturing industries, based on many determinants, including size and growth in output and employment, export earnings and increasing concentration in the state. Each is an asset for the Pennsylvania economy; each has distinct features, needs and possible futures in the commonwealth.

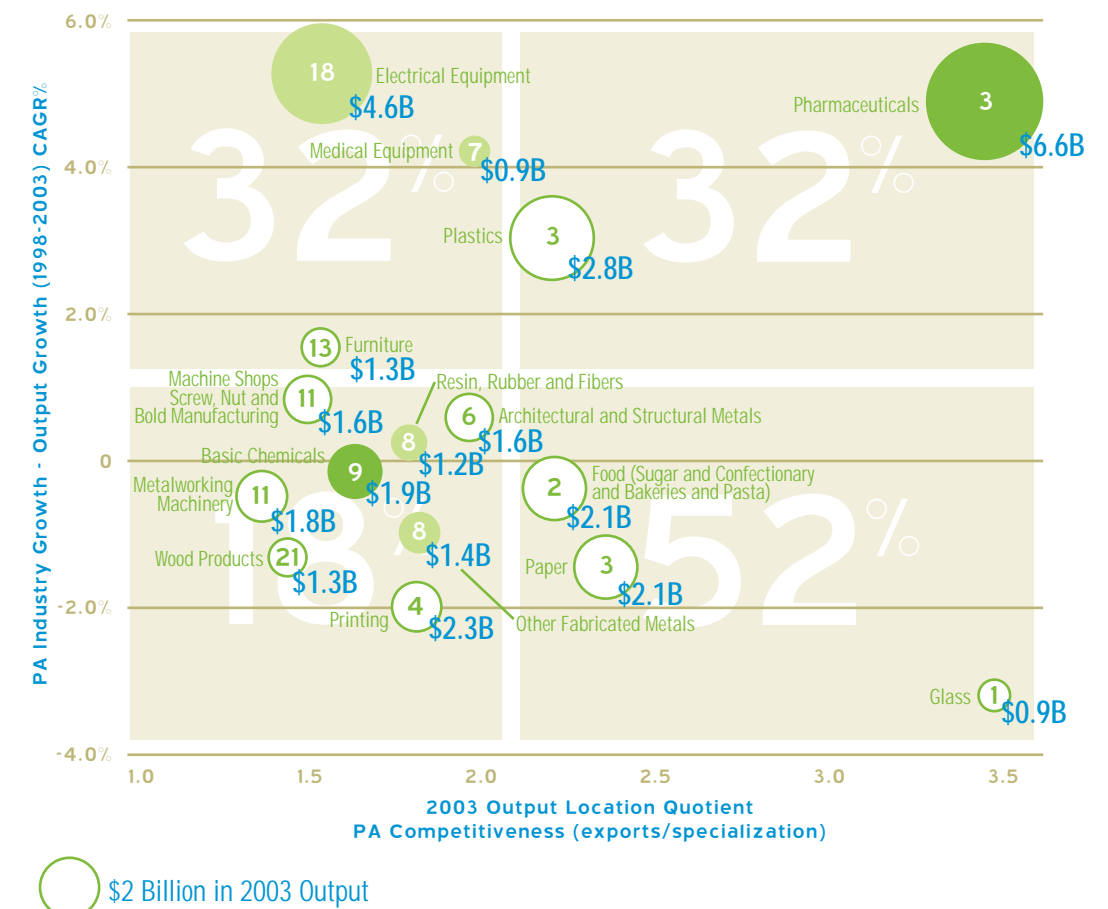
The vertical axis shows each driver industry's growth in output over the past 10 years. Most have grown, several robustly (e.g. electrical equipment and pharmaceuticals). A few (e.g. wood products and metalworking machinery) have contracted slightly but are still drivers based on all factors taken together.

The horizontal axis shows each driver's "location quotient" with regard to Pennsylvania. A value of 1.0 or more indicates that the industry is more concentrated in Pennsylvania than it is, on average, throughout the entire United States. Higher is better. The obvious stars are plastics and, once again, pharmaceuticals.



PORTFOLIO ANALYSIS OF STATE DRIVERS

- Very Technology Intensive
- Moderately Technology Intensive Industries
- Low/Non-Technology Intensive Industries
- Percentage of Employment based at Large Establishments (500+ employees)
- ① Ranking of PA Competitiveness with respect to U.S. for Industry based on Output Location Quotient



Source: Economy.com, Harris Infosource

The size of the circle for each industry represents its size, measured in Pennsylvania output, and the annual output is indicated in billions.

The shading indicates the technological intensity of the industry, as measured by demand for direct technical labor.

The number in each circle states the rank of its Pennsylvania location quotient, among all 50 states.

The portfolio analysis shows that some industries are both growing in output and concentrating in Pennsylvania (northeast quadrant), while others have a different profile.

Size matters, too. Notice the high incidence (82 percent) of small- and medium-sized establishments in the southwest quadrant. Such insight is only the beginning of targeted strategy. Deep analysis of specific industry structure, dynamics, technology, markets and much more is needed to shape the best policy and program responses by regional economic developers. The full study makes an important contribution to this essential knowledge base.

FINDINGS

9) The small- and medium-sized firms that are the broad foundation of manufacturing in Pennsylvania face distinct challenges in the global economy. The commonwealth will prosper if many more small- and medium-sized firms develop well-informed strategies that give them distinctive positions in the marketplace, based on product innovation and continuous improvement of enterprise performance. The needs of small- and medium-sized manufacturers in Pennsylvania must be better understood and their voices better heard.

The study gave special attention to the issues and needs of small- and medium-sized manufacturers, which provide more than half of the industrial output nationwide, and more than two-thirds of manufacturing employment. Smaller firms typically do not have the strategic luxury of relocation but are typically the victims of offshore sourcing by large transnational corporations who no longer feel any loyalty to specific regions and nations.

The key findings with regard to small- and medium-sized firms, and the distinctions between their issues and those of large firms, are summarized in the chart below. Again, the most important theme is the need for strategy and innovation to help smaller firms establish and sustain the distinctive competencies that enable them to assign sustainable prices and grow, both in profitability and employment.



KEY MACRO ISSUES

Strategy, product innovation, performance improvement, workforce development and advocacy/education were macro issues recurring consistently throughout the analysis.

SME = Small Manufacturing Enterprise ● Low ●●●● High

Key Macro Issue	Description	Importance by Firm Size	
		SME	Large Firm
Strategy	For SMEs, business strategy, including the ability to assess new markets for products, new operating models, and opportunities for the business was determined. For large firms the implementation of strategy appears to be the issue.	●●●●	●
Product Innovation	Both large firms and SMEs need to continue to innovate their product lines to adjust to market forces, regulation, and growth expectations. Skills for product innovation appear to be critical, particularly funding, management, and technical skills.	●●●●	●●●●
Performance Improvement	SMEs appear to need a variety of internal performance improvement assistance activities. Continuous improvement from an operations perspective is critical for competition as the market changes sales and services.	●●●	●
Workforce Development	Both large firms and SMEs need workers with the right combination of skills. Attracting, training, and retaining workers is often challenging. The problem is often exacerbated by negative perceptions about manufacturing as a career and/or about lifestyle in a particular region.	●●●●	●●●●
Advocacy/Education	Large firms drive the regional economy. While they typically have the required scale to deal with issues that are internal to the firm, they are particularly vulnerable to external issues such as public policy, infrastructure, and labor markets — market forces that they adjust to through consolidation, relocation, and divestiture. SMEs tend to have diverse points-of-view and do not aggregate their potential public policy power into a single voice. Additionally, they desire education on opportunities for growth in changing markets (off-shoring and globalization).	●●	●●●●

Source: Deloitte

10) Deloitte found that Pennsylvania's Industrial Resource Center (IRC) Network has sustained a strong positive impact on the commonwealth's economy that has been documented in previous studies; the impact estimates arrived at by NEXUS Associates in their 1999 evaluation remain valid.

Because the Industrial Resource Centers were the leading sponsor of the study, Deloitte was asked to conduct a vigorous independent analysis of IRC performance and impact on the Pennsylvania economy. Deloitte found that previous assessments of IRC impact, most recently in 1999, have been sustained, even in very challenging conditions during the years between 1999 and 2003.

Clients assisted by the IRCs continue to outperform similar but unassisted firms in productivity and output growth. The IRCs continue to enhance Pennsylvania's gross state product at a rate of at least \$2 billion per decade. The economic gains driven by IRC work return at least \$1.24 to the state treasury for every \$1.00 the state invests in the IRC program.

RECOMMENDATIONS

Deloitte also was challenged to assess the current capabilities of each IRC and to perform a gap analysis that highlighted where the IRCs must develop new or more substantial capabilities, in order to carry their mission successfully into the 21st century. The results of this extensive analysis are summarized in the chart below.

IRC CAPABILITIES GAP ANALYSIS

○ Moderate ● Significant

Key Macro Issue	IRC Capability	Potential Impact on...			Action Required
		SME Needs	PA Economy	IRC Model	
Strategy	Currently this capability is drawn from a few IRC staff or outsourced to a variety of independent consultancies.	●	●	●	1. Develop a robust strategy and planning capability specializing in SME strategy.
New Product Development	Two IRCs offer skills and services on a modest scale for new product development. There is no organized capability in funding, market strategy or technical design.	●	○	●	2. Develop an IRC Network or regional capability offering cradle-to-grave new product development assistance.
Process Improvement	The IRC network specializes in process improvement for SME. It has significant strength in Lean Manufacturing at the shop floor and supply chain levels.	●	○	○	3. Continue to support and build out consistent process improvement capabilities across the network.
Workforce Development	Currently, IRCs offer services at the Firm level. There is some activity to serve as an intermediary to bring organizations and educational institutions together.	●	○	○	4. Develop an IRC capability to support SMEs in attracting, developing, and retaining workers with the skills needed for future success.
Strategic Advocacy	Currently, IRCs offer services at the Firm level. There is no organized capability to advocate the importance of, or address key issues for, SME manufacturing across industries.	●	○	○	5. Develop an IRC Network capability to provide SME-focused research and analysis on key issues and strategic thought leadership for manufacturing across industries.

Source: Deloitte

To read the complete, comprehensive report, visit
www.catalystconnection.org/bkh/report.htm.



CONCLUSION

COOPERATION FOR COMMONWEALTH

Manufacturing remains profoundly important to the Pennsylvania economy and the life chances of millions of Pennsylvanians. While some manufacturing industries continue a long-term decline, others are growing in output and employment in the commonwealth. Sixteen growth industries have concentrated even more in Pennsylvania during the past ten years. These industries deliver nearly half of the \$64 billion that manufacturing contributes annually to the Pennsylvania gross state product.

As Pennsylvania economic developers serve all enterprises in the state, they should give special attention to these sixteen driver industries and to the Pennsylvania manufacturers that supply them with key inputs. Enhancing these value chains will do the most to create wealth in the state. The present forces acting on and within Pennsylvania industries could produce several distinctly different futures for manufacturing. Pennsylvania has an opportunity now to support the strategic vigor and innovation of thousands of manufacturers and thereby assure the best possible future for the economy of the commonwealth.

The study summarized here was the most substantial analysis ever undertaken of the manufacturing endowment of a state. It was conducted at a time when regions everywhere in the global economy have begun to discover that they must compete as surely as the enterprises they host. To prosper now, manufacturing regions must:

- › understand deeply the capabilities and performance of the manufacturers located there.
- › analyze where smart services can provide advantages to viable manufacturers in the region.
- › develop, deliver and evolve those services for maximum impact on the region.

The analysis and recommendations offered here can give Pennsylvania a competitive advantage in the next few years, but only if Pennsylvanians cooperate. In the demanding global economy, public and private sector leaders, enterprises with a common commitment to regional success and economic developers responsible for growing the commonwealth can, working together, create a more secure and rewarding future.



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