The State of Manufacturing

John Lawyer, Vice President
MACNY – The Manufacturers Association
Global Catastrophic Risks

Hypothetical future event that has the potential to end civilization or end in extinction.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Estimated probability from an expert survey for human extinction before 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall probability</td>
<td>19%</td>
</tr>
<tr>
<td>Molecular nanotechnology weapons</td>
<td>5%</td>
</tr>
<tr>
<td>Superintelligent AI</td>
<td>5%</td>
</tr>
<tr>
<td>Non-nuclear wars</td>
<td>4%</td>
</tr>
<tr>
<td>Engineered pandemic</td>
<td>2%</td>
</tr>
<tr>
<td>Nuclear wars</td>
<td>1%</td>
</tr>
<tr>
<td>Nanotechnology accident</td>
<td>0.5%</td>
</tr>
<tr>
<td>Natural pandemic</td>
<td>0.05%</td>
</tr>
<tr>
<td>Nuclear terrorism</td>
<td>0.03%</td>
</tr>
</tbody>
</table>
Preconceptions

1. Manufacturing is dead – we live in a post manufacturing world
2. Manufacturing is being killed in America
3. Manufacturing jobs are being ripped from the US and put in cheap labor Countries like China, Vietnam and Indonesia
4. Manufacturing is a victim of its own success
5. We are being out-competed by other majors economies like EU, Korea, China, Japan, etc.
6. Our trade deficit proves that we do not have valuable manufactured goods that the world values.
7. Manufacturing jobs are dead because they will all be automated out of existence.
8. We have lost the technology race to China
9. We have a mature economy that is destined to peak out and fall in comparison to other faster growing economies like BRIC
10. No one wants to work in manufacturing – it is dirty, low paying, hard work without a future.
New Jersey

(I don’t know anything about New Jersey)
Important to the State

New York
5.1%

- Manufacturing employment: 455,100
- Total nonfarm employment: 8,915,600
- Manufacturing GDP ($ billions): $67.9
- Manufacturing GDP as a share of total GDP: 5.20%

New Jersey
6.2% of employment

- Manufacturing employment: 243,300
- Total nonfarm employment: 3,935,300
- Manufacturing GDP ($ billions): $45.9
- Manufacturing GDP as a share of total GDP: 8.50%

(Note – 8% to 14% Upstate)
Snapshot of the Chemistry Industry In New Jersey

- Total Employment - 50,000 - State Rank 3
- Chemical Industry Average Wages $123,750 - State Rank 4
- Value of Output ($mil) $25,300 - State Rank 9
- Exports ($mill) $8,620
Largest Private Sector Manufacturers in New Jersey?

- Goya $1B
- NFI $1.1B
- Conair Corp $2.23B
- GAF $2.5B
- Alpha Industries $2.6B
- SHI International $6B
All Employees: Total Nonfarm in New Jersey

Source: U.S. Bureau of Labor Statistics
fred.stlouisfed.org
Schott Manufacturing
Manufacturing is Dead?

Manufacturing is largest sector

- Manufacturing
- Government
- Professional, Business Services
- Real estate
- Finance, Insurance
- Health care
- Wholesale
- Retail
- Information
- Construction

2014 gross output, in trillions of dollars

Source: BEA
Manufacturing is Dead?

Manufacturing output near record

Index 2012 = 100

Three-month moving average

Source: FRB/Haver
Is America In Decline?

Are we being out-competed by other majors economies like EU, Korea, China, Japan, etc.?

“By market cap...the U.S. is home to the top ten companies in the world (Apple, Google, Microsoft, Exxon, Berkshire Hathaway, General Electric, Facebook, Amazon, Wells Fargo and Johnson & Johnson). Five of these are tech companies with strong momentum.” Forbes
All told, manufacturing’s value chain accounts for about $\frac{1}{3}$ of GDP and employment in the United States.
Manufacturing is Dead?

The Manufacturing Sector

World % of GDP
China % of GDP
World Services % Value Add - Services
United States % Value Add - Services
China % Value Add Services

Data from World Bank and OECD National Accounts data files.

![Graph showing services value added (% of GDP)](image-url)
<table>
<thead>
<tr>
<th>Rank</th>
<th>Country/Region</th>
<th>Millions of $US</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>World</td>
<td>12,578,627</td>
<td>2014</td>
</tr>
<tr>
<td>2</td>
<td>China</td>
<td>3,713,300</td>
<td>2014</td>
</tr>
<tr>
<td>3</td>
<td>European Union</td>
<td>2,566,070</td>
<td>2014</td>
</tr>
<tr>
<td>2</td>
<td>United States</td>
<td>2,068,080</td>
<td>2014</td>
</tr>
<tr>
<td>4</td>
<td>Eurozone</td>
<td>1,946,857</td>
<td>2014</td>
</tr>
<tr>
<td>3</td>
<td>Japan</td>
<td>850,902</td>
<td>2014</td>
</tr>
<tr>
<td>4</td>
<td>Germany</td>
<td>787,503</td>
<td>2014</td>
</tr>
<tr>
<td>5</td>
<td>South Korea</td>
<td>389,582</td>
<td>2014</td>
</tr>
<tr>
<td>6</td>
<td>India</td>
<td>321,721</td>
<td>2014</td>
</tr>
<tr>
<td>7</td>
<td>Italy</td>
<td>296,611</td>
<td>2014</td>
</tr>
<tr>
<td>8</td>
<td>France</td>
<td>283,664</td>
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<td>9</td>
<td>United Kingdom</td>
<td>282,675</td>
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<td>10</td>
<td>Russia</td>
<td>248,481</td>
<td>2014</td>
</tr>
<tr>
<td>11</td>
<td>Brazil</td>
<td>218,799</td>
<td>2014</td>
</tr>
<tr>
<td>12</td>
<td>Mexico</td>
<td>216,773</td>
<td>2014</td>
</tr>
<tr>
<td>13</td>
<td>Indonesia</td>
<td>186,744</td>
<td>2014</td>
</tr>
<tr>
<td>14</td>
<td>Spain</td>
<td>166,594</td>
<td>2014</td>
</tr>
<tr>
<td>15</td>
<td>Canada</td>
<td>162,074</td>
<td>2014</td>
</tr>
<tr>
<td>16</td>
<td>Switzerland</td>
<td>128,881</td>
<td>2014</td>
</tr>
<tr>
<td>17</td>
<td>Turkey</td>
<td>126,365</td>
<td>2014</td>
</tr>
<tr>
<td>18</td>
<td>Thailand</td>
<td>112,214</td>
<td>2014</td>
</tr>
<tr>
<td>19</td>
<td>Netherlands</td>
<td>95,683</td>
<td>2014</td>
</tr>
<tr>
<td>20</td>
<td>Australia</td>
<td>93,461</td>
<td>2016</td>
</tr>
</tbody>
</table>
World Population: 1950-2050

Source: U.S. Census Bureau, International Data Base, August 2016 Update.
What will we need to Manufacture? – EVERYTHING!
How many Earths does it take to support humanity?

- Business as usual
  - Earth Overshoot Day: June 28, 2030
- Carbon emissions reduced 30%
  - Earth Overshoot Day: September 16, 2030
| Country | Population     | Area (sq. miles) | Gross Manufacturing
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1.36 Billion</td>
<td>3.70M</td>
<td>$2.56 trillion</td>
</tr>
<tr>
<td>US</td>
<td>0.321 Billion</td>
<td>3.72M</td>
<td>$1.99 trillion</td>
</tr>
</tbody>
</table>
From Factories to Cubicles

An American economy that used to be built on making stuff is now built on shuffling paper instead. From 1947 to 2009, manufacturing shrank from more than a quarter of the gross domestic product to just a ninth of it. Meanwhile, white-collar work grew from less than a fifth of GDP to nearly half of it (counting finance, insurance, real estate, professional and business services, information, education, and health care).

Government’s hand has barely grown heavier. The share of GDP accounted for by government at all levels peaked at 15.3 percent in 1971, though it’s been growing slowly again since 2006.

Manufacturing’s role in the economy crested in 1953, when factories contributed 28.3 percent of GDP. Since 1977, its share has declined every year except 1988 and 2004.

Education’s share of the economy has nearly quadrupled (to 1.1 percent). Health care and social services’ share has nearly quintupled (to 7.3 percent) as a proportion of GDP.

Arts, entertainment, and recreation began a slow, though steady rise during a former Screen Actors Guild president’s presidency, but have stagnated at about 1 percent of GDP since the mid-1990s.
WHY?
Move Jobs for Cheap Labor?

Jonathan Ive
Senior Vice President, Design

London-born designer Jonathan Ive is Apple’s senior vice president of Design, reporting to CEO Tim Cook. Since 1996, he has been responsible for leading a design team widely regarded as one of the world’s best. As the driving force behind the look and feel of Apple’s innovative products, Jony also provides leadership and direction for Human Interface (HI) software teams across the company.

Recognized with numerous design awards, Apple products are featured in the permanent collections of museums worldwide, including MoMA in New York and the Pompidou in Paris.
Move Jobs for Cheap Labor?
Garment Worker Protest in Bangladesh
Now Hiring
Number of job openings and hires, millions

Source: Labor Department  |  WSJ.com
Labor Participation at Long Term Low 63%
Don’t Call It a Comeback
U.S. labor-force participation has been falling for more than a decade. Any rebound as the economy strengthens may be short-lived as an aging population pushes participation lower.

Labor-force participation rate
68%

Notes: Data from the Labor Dept. and Macroeconomic Advisers are annual averages; data from the Congressional Budget Office are fourth-quarter averages.
Sources: Labor Dept. (actual); Congressional Budget Office; Macroeconomic Advisers
THE WALL STREET JOURNAL.
“In the next 10 to 15 years, we expect U.S. employers to demand more labor than will be available, which will, in turn, constrain overall economic growth,”
Retiring Baby Boomers

"the number of retirees increased by about 400,000 a year; in the past four years the figure has surged to more than 1.2 million annually...

Second, an aging population also will spur demand in some fields, especially health care. That becomes more obvious with a look at occupations facing shortages. Demand will drive up the need for physical therapists and nurses. Meanwhile, retirements will create openings in many skilled jobs that younger workers have eschewed, such as plant operators, railroad workers, machinists and electricians—jobs that require a specific skill set but not necessarily a college degree. - WSJ

“manufacturing workers are aging and up to 3 million are expected to retire over the next decade, Paul said. Many will need to be replaced.” - CNN
U.S. manufacturing workers average $20.17 an hour – nearly 3x the minimum wage.
Creative Destruction

about 5 million jobs get destroyed and about 5 million get created.
What about TPP?

Hypothesis. The benefits from free trade ALWAYS outweigh the negatives.

TPP Countries are Important for New Jersey’s Exporters

$12.2 Billion in goods exports from New Jersey to TPP countries in 2015, including $1.4 Billion in goods exports to Japan, $134 Million to Malaysia, and $74 Million to Vietnam

38% of New Jersey’s goods exports went to TPP countries in 2015

8,467 companies from New Jersey exported goods to TPP countries in 2014 – 90% were small and medium sized companies
What about TPP?

Hypothesis. The benefits from free trade ALWAYS outweigh the negatives.

TPP Countries* are Important for New York’s Exporters

$22.5 Billion in goods exports from New York to TPP countries in 2015, including $2.0 Billion in goods exports to Japan, $300 Million to Malaysia, and $140 Million to Vietnam

27% of New York’s goods exports went to TPP countries in 2015

16,153 companies from New York exported goods to TPP countries in 2014 – 91% were small and medium sized companies
Major Business Segments

Table 1. Weights of Major Industries in US GDP (%)

<table>
<thead>
<tr>
<th>Industry</th>
<th>w (1947)</th>
<th>w (2013)</th>
<th>1947-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry, fishing, and hunting</td>
<td>8.2</td>
<td>1.4</td>
<td>-6.8</td>
</tr>
<tr>
<td>Mining</td>
<td>2.4</td>
<td>2.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Utilities</td>
<td>1.4</td>
<td>1.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Construction</td>
<td>3.6</td>
<td>3.7</td>
<td>0.1</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>25.6</td>
<td>12.1</td>
<td>-13.5</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>6.4</td>
<td>6.0</td>
<td>-0.4</td>
</tr>
<tr>
<td>Retail trade</td>
<td>9.5</td>
<td>5.8</td>
<td>-3.7</td>
</tr>
<tr>
<td>Transportation and warehousing</td>
<td>5.8</td>
<td>2.9</td>
<td>-2.9</td>
</tr>
<tr>
<td>Information</td>
<td>2.8</td>
<td>4.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>2.4</td>
<td>7.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Real estate and rental and leasing</td>
<td>8.1</td>
<td>13.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Professional and business services</td>
<td>3.3</td>
<td>11.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Educational services, health care, and social assistance</td>
<td>1.9</td>
<td>8.2</td>
<td>6.3</td>
</tr>
<tr>
<td>Arts, entertainment, recreation, accommodation, and food services</td>
<td>3.3</td>
<td>3.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Other services, except government</td>
<td>3.1</td>
<td>2.2</td>
<td>-0.9</td>
</tr>
<tr>
<td>Government</td>
<td>12.5</td>
<td>13.2</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Source: BEA
What Are We Making?

- Petroleum and Coal Products: 17%
- Motor Vehicles, Parts: 14%
- Computers, Electronics: 10%
- Aerospace, Other Transportation: 7%
- Machinery: 9%
- Chemicals: 10%
- Primary Metals: 7%
- Food, Beverages, Tobacco: 6%
- All Other Manufacturing: 20%
How’s it going?

Industrial production: absolute level

Total

Manufacturing

Recessions

2007 = 100
Industrial Production Index

2016-03: 103.3759 Index 2012=100 (+ see more)
Monthly, Seasonally Adjusted, INDPRO, Updated: 2016-04-15 8:54 AM CDT

Different This Time?
US Industrial Production Expanded in August

- Industrial Production MoM
- Industrial Select Sector SPDR ETF (XLI)

Source: Federal Reserve, NYSE Arca
All Employees: Total Nonfarm in New York

fred.stlouisfed.org
The number of jobs in the manufacturing sector has declined by about 5 million since 2000, falling from 17.3 million at the turn of the century to 12.3 million in 2015.

But - The sector has actually gained about 838,000 jobs since 2010.
By 2025, it is estimated that automation will displace 22.7 million jobs according to Forrester Research. But - Forrester expects automation will generate 13.6 million new jobs by 2025,
Manufacturing employment as a share of total **6.20%**
New Jersey
Manufacturing employment: 243,300
Total nonfarm employment: 3,935,300
Manufacturing GDP ($ billions): $45.9
Manufacturing GDP as a share of total GDP: **8.50%**

Manufacturing employment as a share of total **5.10%**
New York
Manufacturing employment: 455,100
Total nonfarm employment: 8,915,600
Manufacturing GDP ($ billions): $67.9
Manufacturing GDP as a share of total GDP: **5.20%**
At peak times, around 33,000 people were using FireChat simultaneously in Hong Kong.
Industrial Production?
Contribution to GDP

- Manufacturing gross output
- Manufacturing value added (GDP)

Purchased intermediates: nonmanufacturing goods and services

- 35.4%
- 12.1%
“In part, however, the measured improvement in labor productivity in manufacturing also reflects the rapid shrinkage of low-productivity manufacturing activities since 2000. During this period, many manufacturers moved routine assembly work abroad, either to their own factories or to those of contract suppliers.”
Industrial Revolution in Developing Countries?

The Third (and Fastest) Transition in World Manufacturing Output Since 1750

Shares of World Manufacturing Output 1750 – 2009

- U.S.
- Europe
- Japan
- Russia and FSU
- India, Brazil, Mexico and Other EM / DM*
- China
What is Advanced Manufacturing?

### The 50 Industries That Constitute the Advanced Industries Sector

<table>
<thead>
<tr>
<th>MANUFACTURING</th>
<th>ENERGY</th>
<th>SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Products and Parts</td>
<td>Motor Vehicles</td>
<td>Electric Power Generation, Trans., and Distribution</td>
</tr>
<tr>
<td>Agr., Construction, and Mining Machinery</td>
<td>Navigation, Measurement, and Control Instruments</td>
<td>Metal Ore Mining</td>
</tr>
<tr>
<td>Aluminum Production and Processing</td>
<td>Other Chemical Products</td>
<td>Oil and Gas Extraction</td>
</tr>
<tr>
<td>Audio and Video Equipment</td>
<td>Other Electrical Equipment and Components</td>
<td></td>
</tr>
<tr>
<td>Basic Chemicals</td>
<td>Other General Purpose Machinery</td>
<td>Architecture and Engineering</td>
</tr>
<tr>
<td>Clay Products</td>
<td>Other Miscellaneous Manufacturing</td>
<td>Cable and Other Subscription Programming</td>
</tr>
<tr>
<td>Commercial and Service Industry Machinery</td>
<td>Other Nonmetallic Mineral Products</td>
<td>Computer Systems Design</td>
</tr>
<tr>
<td>Communications Equipment</td>
<td>Other Transportation Equipment</td>
<td>Data Processing and Hosting</td>
</tr>
<tr>
<td>Computers and Peripheral Equipment</td>
<td>Pesticides, Fertilizers, and Other Agr. Chemicals</td>
<td>Medical and Diagnostic Laboratories</td>
</tr>
<tr>
<td>Electric Lighting Equipment</td>
<td>Petroleum and Coal Products</td>
<td>Mgmt., Scientific, and Technical Consulting</td>
</tr>
<tr>
<td>Electrical Equipment</td>
<td>Pharmaceuticals and Medicine</td>
<td>Other Information Services</td>
</tr>
<tr>
<td>Engines, Turbines, and Power Trans. Equipment</td>
<td>Railroad Rolling Stock</td>
<td>Other Telecommunications</td>
</tr>
<tr>
<td>Foundries</td>
<td>Resins and Synthetic Rubbers, Fibers, and Filaments</td>
<td>Satellite Telecommunications</td>
</tr>
<tr>
<td>Household Appliances</td>
<td>Semiconductors and Other Electronic Components</td>
<td>Scientific Research and Development</td>
</tr>
<tr>
<td>Industrial Machinery</td>
<td>Ship and Boat Building</td>
<td>Software Publishers</td>
</tr>
<tr>
<td>Iron, Steel, and Ferroalloys</td>
<td>Medical Equipment and Supplies</td>
<td>Wireless Telecommunications Carriers</td>
</tr>
<tr>
<td>Motor Vehicle Bodies and Trailers</td>
<td>Reproducing Magnetic and Optical Media</td>
<td></td>
</tr>
<tr>
<td>Motor Vehicle Parts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overall US Economy
“Even this picture is too strong. The minor gains from the 2007 top are entirely attributable to autos, defense and metal fabrications—much of which went into the booming energy patch and related pipelines and support industries. All of these gains are fueled by cheap debt including the subprime lending boom behind autos.”

“The Bush/Obama wars resulted in a 75% gain between 2000 and July 2014.”

“...the Fed has not fueled an industrial recovery in any meaningful sense of the word. Outside of energy and defense, which are reversing, and motor vehicles, which have tapped out the household sector’s remaining credit veins, there have been virtually no industrial production gains at all.

“the real truth is that the Fed’s massive money printing during this entire century—which has expanded its balance sheet by 9X from $500 billion to $4.5 trillion—has done nothing for the industrial economy.”
Military Expenditures

One of Areas of Investment is Military - Global expenditures of $1.776T

The five biggest spenders in 2014
1. USA
2. China,
3. Russia
4. Saudi Arabia
5. France.

US Expenditures = $610 B (34% of total world expenditures)
China $216B
Russia $84.5B
Saudi Arabia $80.8B

Military expenditure in the USA fell by 6.5 per cent, to $610 billion, as part of ongoing deficit reduction measures required by the US Budget Control Act of 2011.
Oil Price Drop – Major Impact

Is the Fall in the US Rig Count Accelerating?

Crude oil rig count was at its lowest level since August 2010.
Real Elephant in the Room - China

CHINA’S INVESTMENT-LED GROWTH IN GDP
CHINA REAL GDP* AND SHARE OF CONSUMPTION

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment (Blue)</th>
<th>Consumption (Orange)</th>
<th>Total GDP</th>
<th>Share of Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td>28%</td>
<td>$10.7 TRILLION</td>
<td></td>
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<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
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<td>2000</td>
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<tr>
<td>1999</td>
<td>47%</td>
<td></td>
<td>$4.2 TRILLION</td>
<td></td>
</tr>
</tbody>
</table>

Source: Penn World Table version 8.0
A Few Core Industries Dominate Foreign Trade in Manufactures


U.S. Exports of Manufactured Goods, 2011: $1,480 Billion
US as Low Cost?

EXHIBIT 1 | Labor and Energy Cost Advantages Will Make the U.S. One of the Developed World’s Lowest-Cost Countries

Average projected manufacturing cost structures of the major exporting nations relative to the U.S., 2015

Manufacturing cost index (U.S. = 100)


Note: Cost structures were calculated as a weighted average across all industries. No difference was assumed in “other” costs (e.g., raw materials inputs and machine and tool depreciation). Differences in values are a function of the industry mix of each exporting country.

1 U.S. figures represent costs in a set of select lower-cost states specified in previous publications.
2 Chinese figures represent the Yangtze River Delta region.
So Where Are We Now?
Higher Wages and Benefits

“Manufacturing jobs pay about $54,000 a year, with benefits, 20 percent more than the average compensation in the United States. (Source: NAM)”

“For every person directly employed in manufacturing, manufacturing output supports more than 1.4 jobs elsewhere in the economy”
# Income Inequality

## The View From the Top

The **richest 20%** of U.S. families...

- Own **88.9%** of all wealth*

<table>
<thead>
<tr>
<th><strong>Person</strong></th>
<th><strong>Money</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="Gold.png" alt="Gold" /></td>
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</tbody>
</table>

The **highest-earning 20%** of U.S. families...

- Earned **61.8%** of all income*

<table>
<thead>
<tr>
<th><strong>Person</strong></th>
<th><strong>Money</strong></th>
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The **highest-earning 20%** of U.S. households...

- Accounted for about **38%** of total expenditures**

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*2013, **2010

Share of Total Annual Income by Income Bracket Groups

Includes capital gains

- **21.2%**
  Top 1%
  Families with incomes at or above $423,090 in 2014

- **16.6%**
  Next 4%
  $174,240 - $423,089

- **12.1%**
  Next 5%
  $121,360 - $174,239

- **50.2%**
  Bottom 90%
  Below $121,360

Note: Figures may not sum to 100% due to rounding.
Source: "Striking it Richer: The Evolution of Top Incomes in the United States (Updated with 2014 preliminary estimates)," by Emmanuel Saez, UC-Berkeley (June 2015)

PEW RESEARCH CENTER
2017 is murky
Capital may dry up
Rate adjustments may slow activity
Trends Shaping Advanced Manufacturing
1. One of manufacturers’ large investments in automation, which have eliminated many routine assembly jobs

2. Fewer than 39% of the workers in U.S. manufacturing establishments are now directly engaged in production.

3. A related factor is the rapid increase in education levels among U.S. manufacturing workers, some 29% of whom possess college degrees.

4. A third cause of improvement in average manufacturing productivity is the rapid growth of certain sectors in which labor productivity is extremely high.

5. E.g. - instrument manufacturing, in which output grew 56% from 2002 to 2012, and aerospace manufacturing, which expanded output 39% over the same period, during which total U.S. manufacturing output rose 9%.
Emerging Technologies

Robotics
3D Printing
Precision Agriculture
CO2 Related
Advanced Materials (E.g. graphene)
Superconductivity
3D displays
Wearables/IoT
Fusion Power
Quantum Computing
Speed of Technology

- Mechanism-based drug discovery - rational biochemical screening
- Molecular Biology - new era of Biologics
- KO Mice
- HTS & UHTS Sieble, SAP, ...
- CombiChem & HTSCS
- "EDC"
- Genomics
- Genetics
- Proteomics
- Stem Cells

Past 5-10 years; more new types of information than in preceding 50 years
Accelerating information "diversity" and "backlog"

Structural Biology & Modeling - "rational drug design"
Translational Medicine
Clusters Matter

Clusters are geographic concentrations of interconnected businesses, suppliers, service providers, and associated institutions in a particular sector.
Growth Clusters in CNY

According to Battelle’s findings, the clusters with the greatest prospects for growth are:

(1) biosciences,
(2) digital and electronic devices,
(3) environmental systems,
(4) packaging, and
(5) precision metalworking.

For all but the biosciences cluster, the potential clusters are at least 40 percent more concentrated in the region than they are nationally, with environmental systems four times more concentrated.
NAM Priorities

1. Free trade agreements
2. Export-Import (Ex-Im) Bank
3. Protection of intellectual property
4. Boost our energy exports by expediting the approval of LNG and coal export terminals
5. Infrastructure
6. Tort Reform
7. Regulatory Reform
8. Tax reform. America has the highest corporate tax rate among developed countries—a big reason why it’s 20 percent more expensive to do business here than in any other country, before you even account for wage costs.
General Observations

1. The US is a commodity rich nation.
2. The US is an agricultural nation
3. The US is the (second) largest manufacturing nation in the world
4. The US is an educated nation
5. The US has become a consumer-based economy
6. The US is pretty big (required investment in transportation and communications infrastructure)
7. The US is the most productive nation (Mostly)
8. Major US Anchor Industries Account for Manufacturing Success: Aerospace, Automotive, Industrial Machines, Chip Fab,
9. US Manufacturers are now International Companies and/or part of multi-national supply chains
On the return of manufacturing

“Democrats want the economy of the 1950s, while Republicans just want to live there.”