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Manufacturing Transformed

What's New and What's Next?

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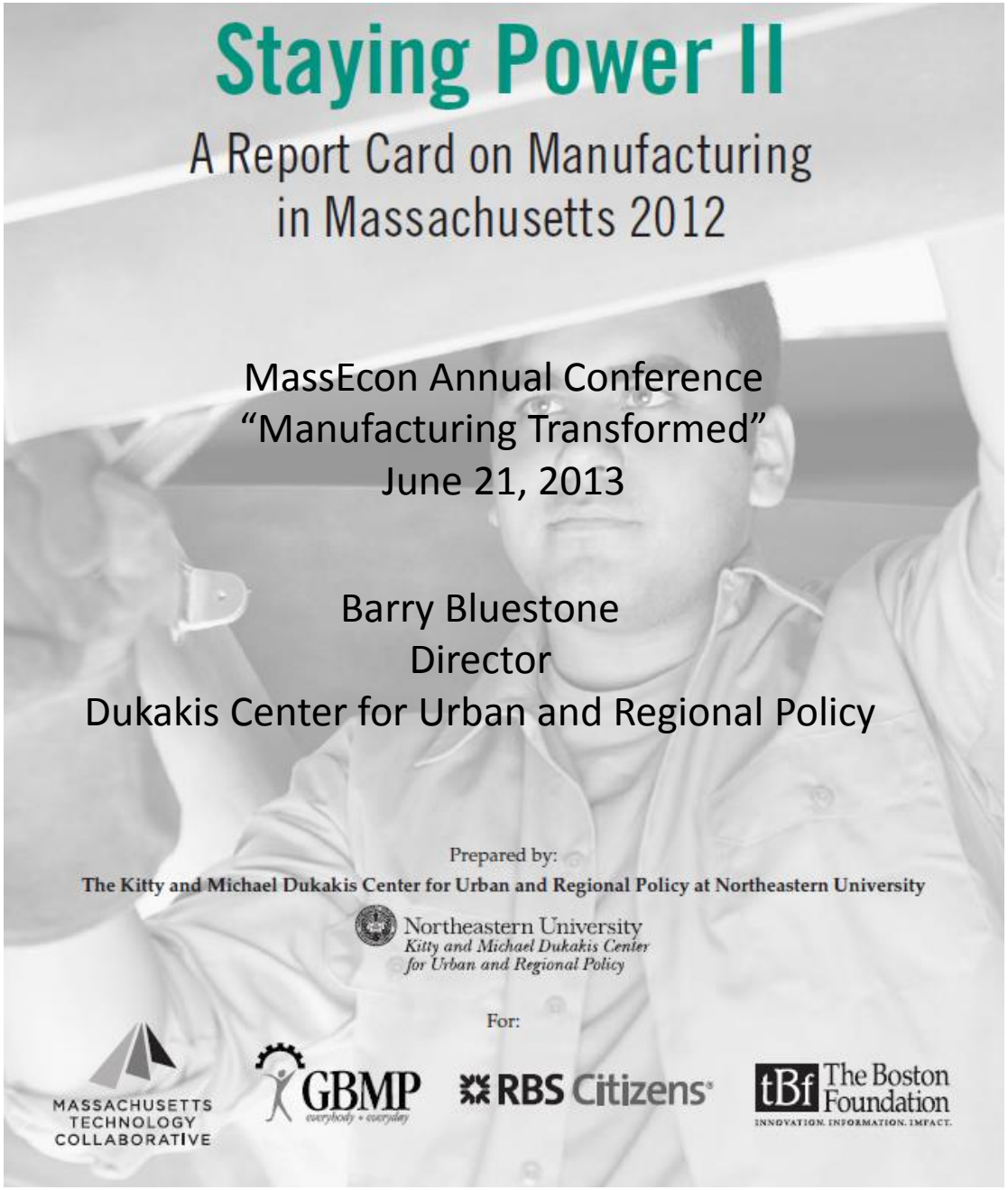
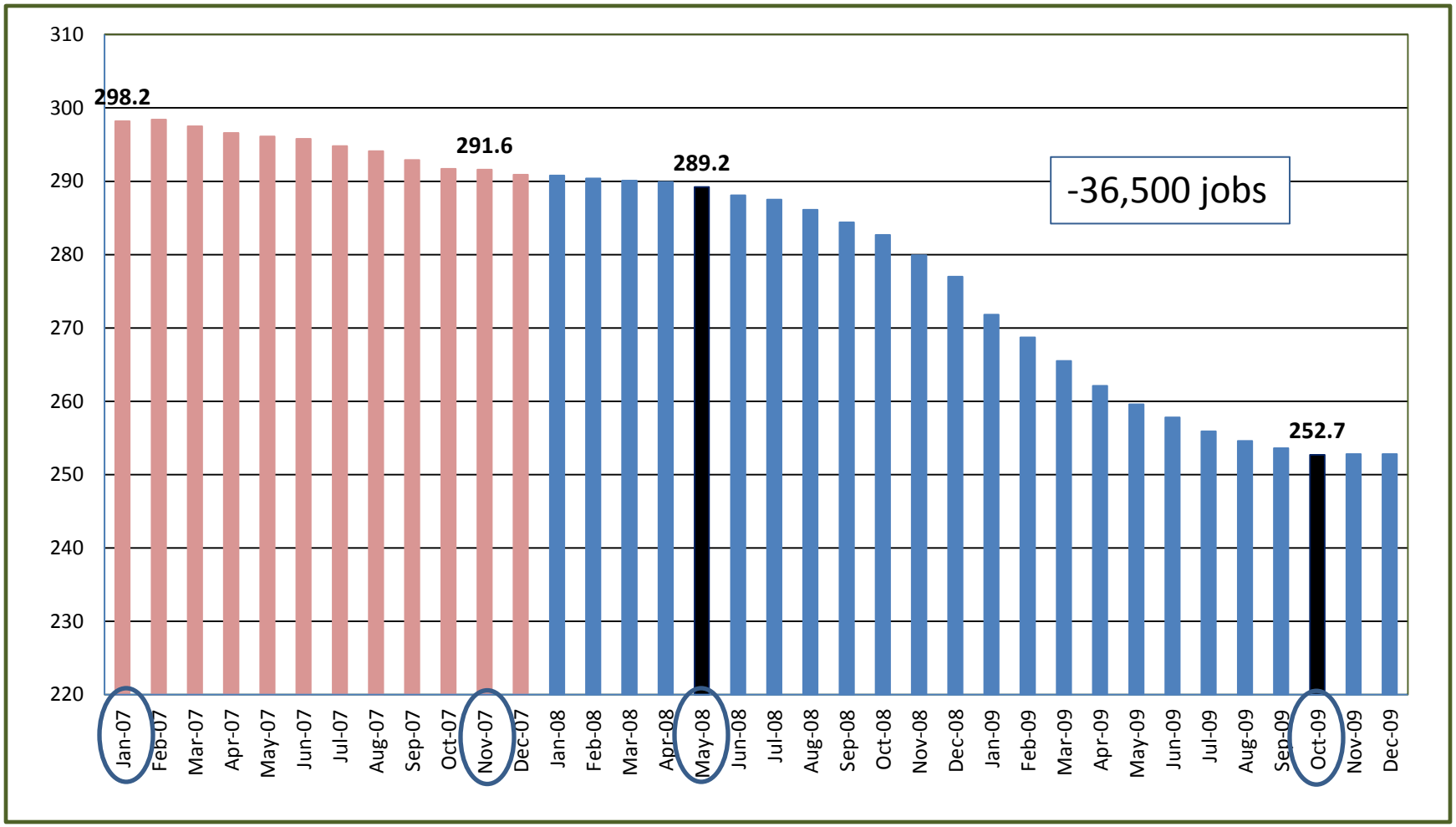
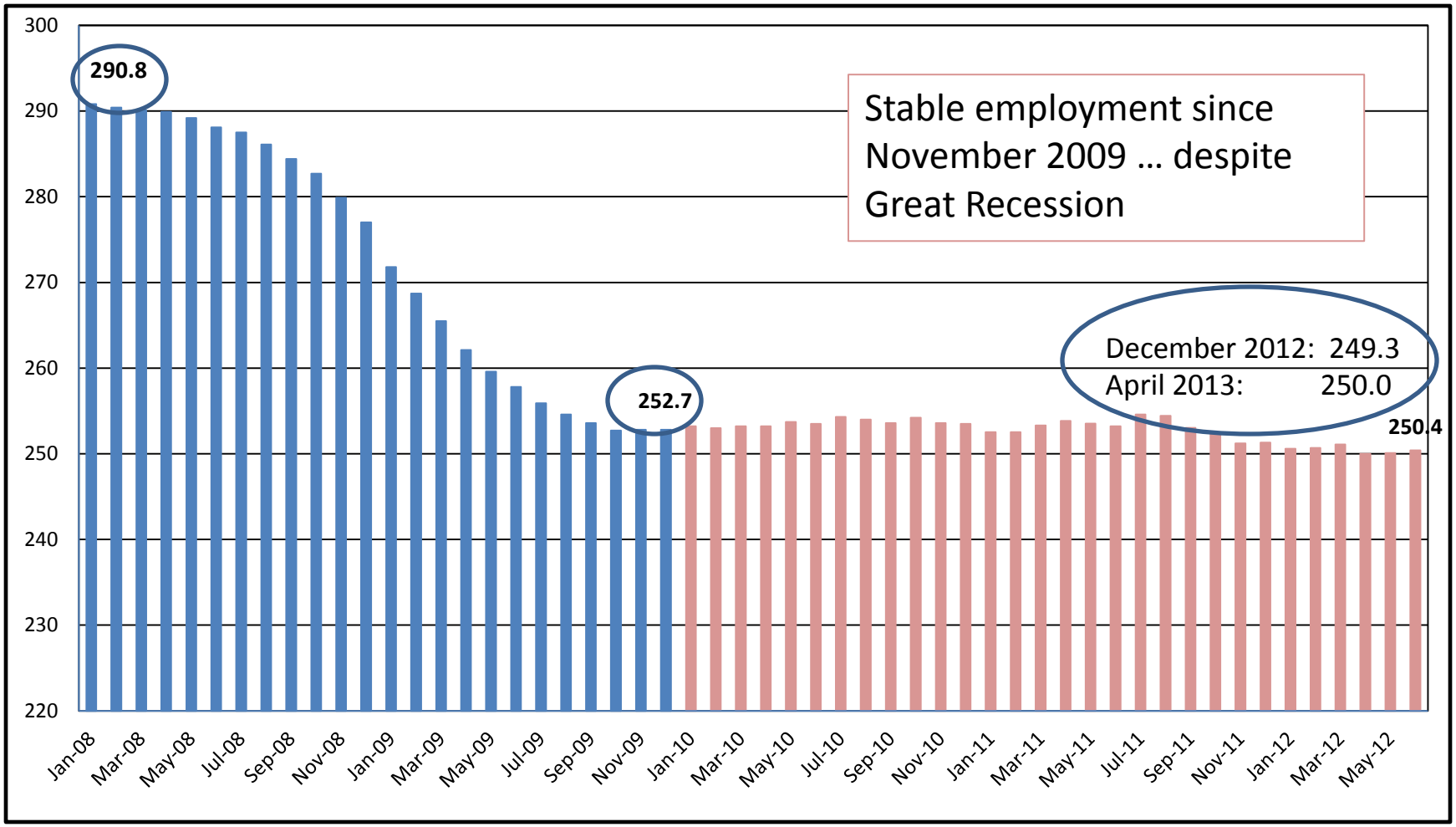

Staying Power II
A Report Card on Manufacturing in Massachusetts 2012
MassEcon Annual Conference
"Manufacturing Transformed"
June 21, 2013
Barry Bluestone
Director
Dukakis Center for Urban and Regional Policy
Prepared by:
The Kitty and Michael Dukakis Center for Urban and Regional Policy at Northeastern University
Northeastern University
Kitty and Michael Dukakis Center for Urban and Regional Policy
For:
MASSACHUSETTS TECHNOLOGY COLLABORATIVE
GBMP
everybody • everyday
RBS Citizens
tBf The Boston Foundation
INNOVATION. INFORMATION. IMPACT.

Massachusetts Manufacturing Employment (in thousands) January 2007–December 2009



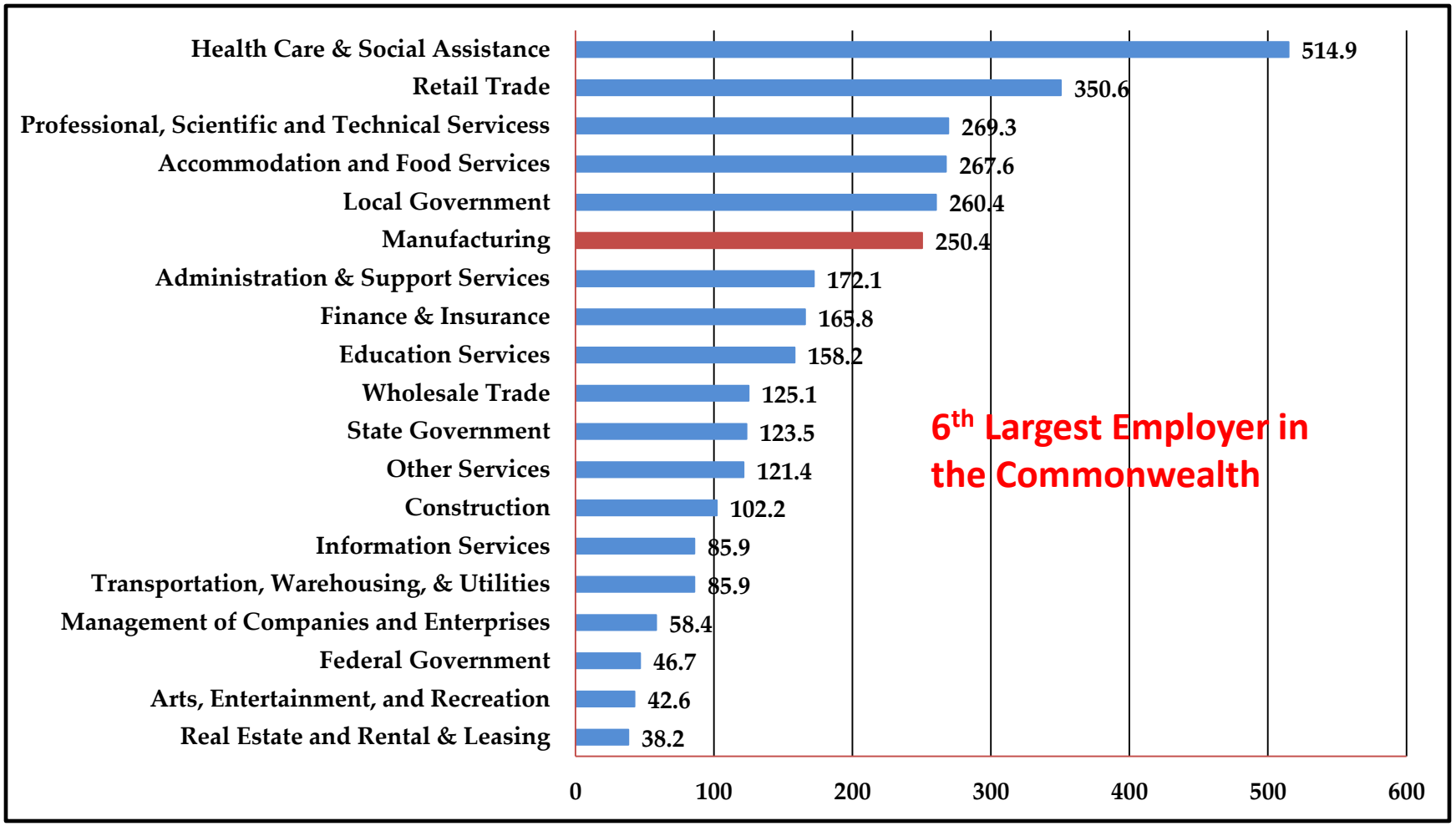
Source: U.S. Bureau of Labor Statistics

Massachusetts Manufacturing Employment (in thousands, seasonally adjusted) January 2008-June 2012



Source: U.S. Bureau of Labor Statistics

Massachusetts Employment by Sector (in thousands) June 2012



Source: Massachusetts Executive Officer of Labor and Workforce Development, Current Employment Statistics (CES 790 Series), July 2012.

Share of Massachusetts Payroll (2011:3rd Quarter) Top 4 Sectors

Employment Sector	Total Employment	Percent of Massachusetts Workforce	Percent of Massachusetts Total Payroll
Health Care	532,934	16.6%	15.3%
Retail Trade	344,751	10.8%	5.3%
Education	282,818	8.8%	8.7%
Manufacturing	**254,300**	**8.0%**	**10.1%**

Source: Massachusetts Office of Labor and Workforce Development, Employment and Wages
http://lmi2.detma.org/lmi/lmi_es_asp#IND_LOCATION

Top Ten Manufacturing Industries in Massachusetts (2010)

4-Digit Industry (2010)	Employees
Navigation, measuring, medical, and control instruments	26,139
Semiconductor and other electronic components	17,022
Printing and related support activities	12.532
Computer and peripheral equipment	12,253
Aerospace product and parts	11,978
Plastics products	11,309
Medical equipment and supplies	10,759
Machine shops, turned product and screw, nut & bolt	9,957
Bakeries and tortilla	9,356
Pharmaceutical and medicine	9,136

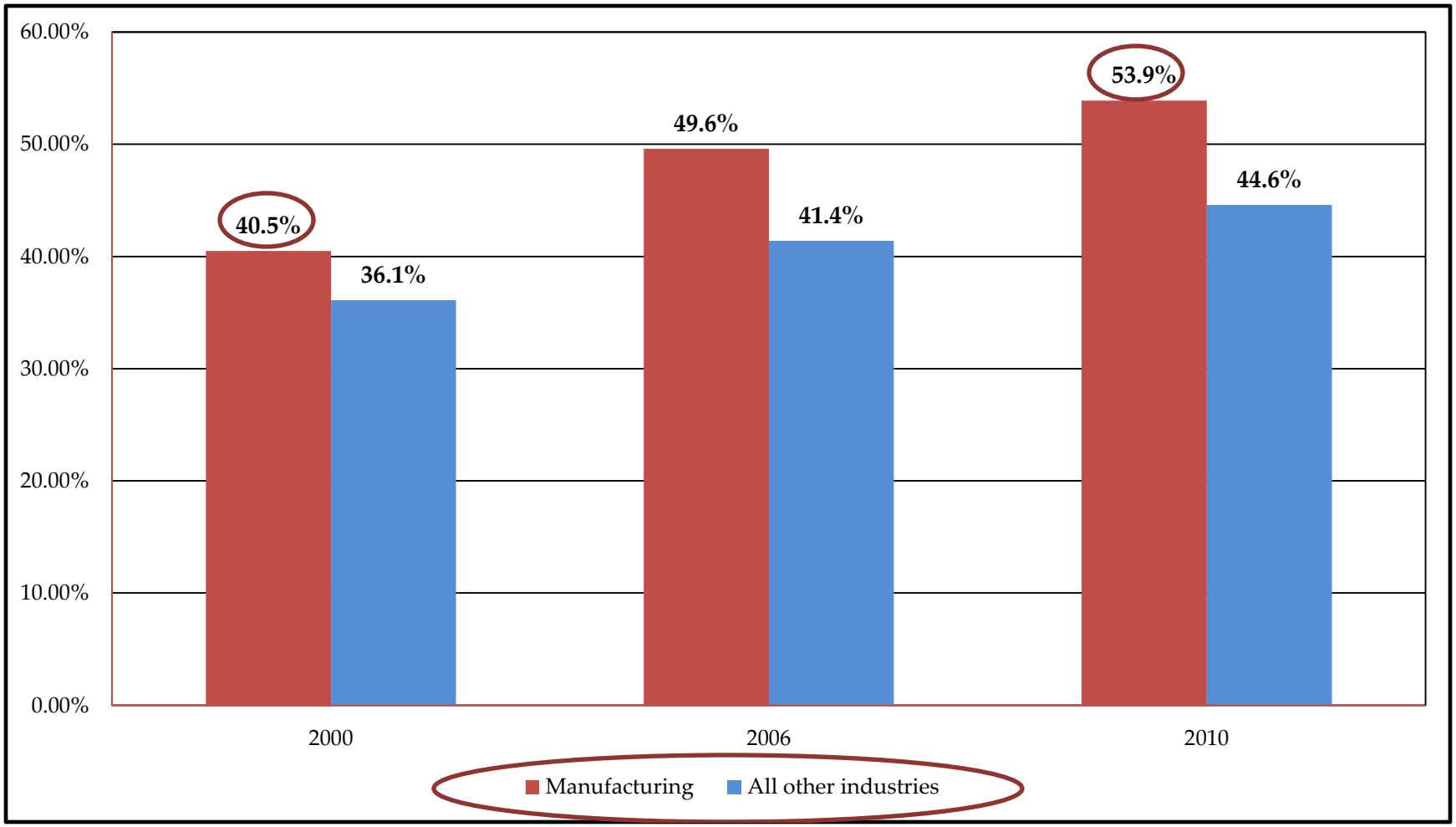
Source: Massachusetts Department of Labor and Workforce Development, ES-202 Employment and Wage Statistics

Productivity in Massachusetts All Industries vs. Manufacturing

Productivity	1997-2007 Annual Growth Rate	2007-2011 Annual Growth Rate
GSP/Worker – Private Sector	+2.3%	+1.7%
GSP/Worker - Manufacturing	+9.7%	+8.7%

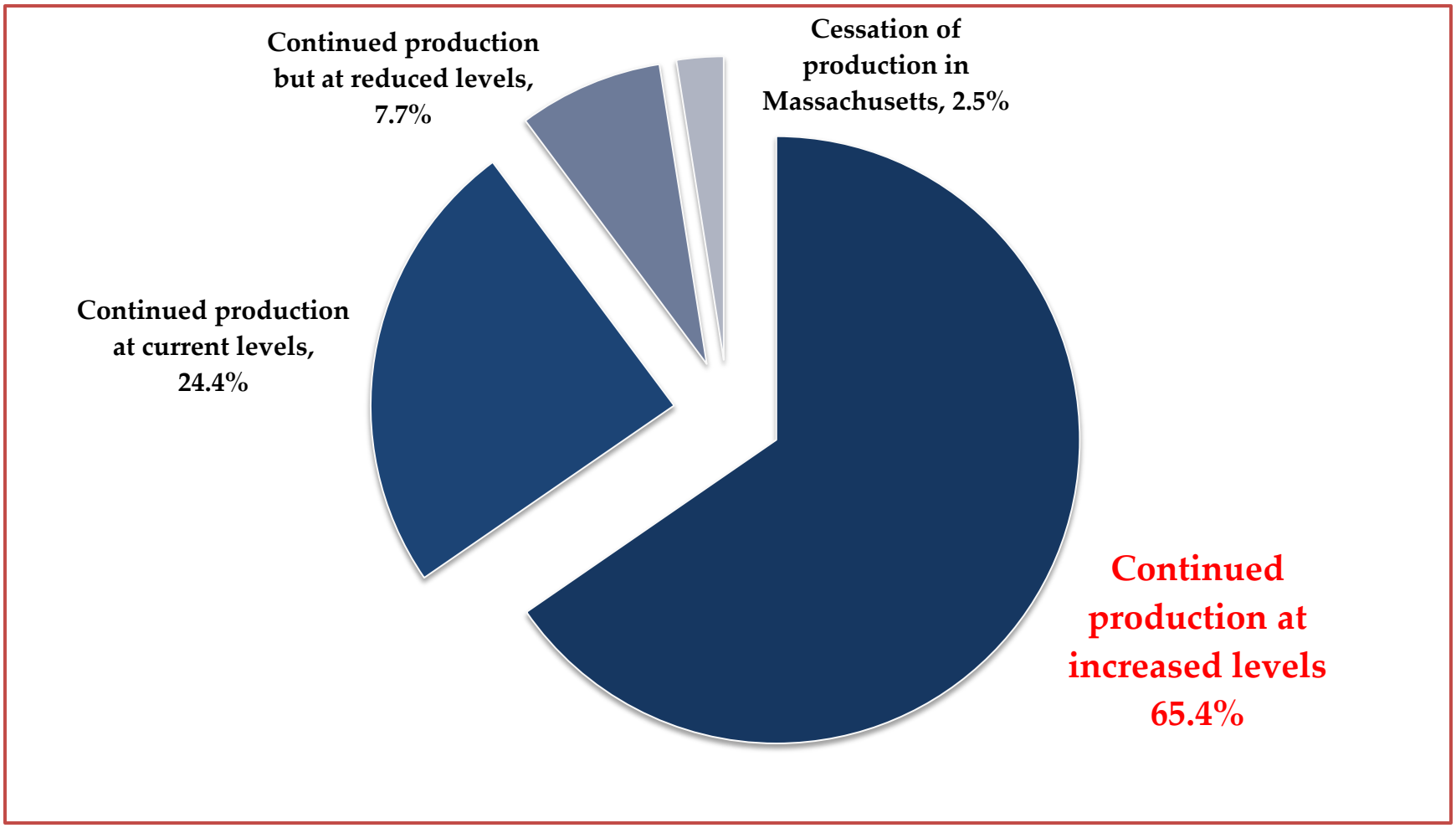
Source: U.S. Bureau of Economic Analysis (Updated June 5, 2012 with revised estimates for 1997-2010) (Gross State Product (GSP) is in $millions of chained (real) 2005 dollars)

Proportion of Workforce Age 45 or Older



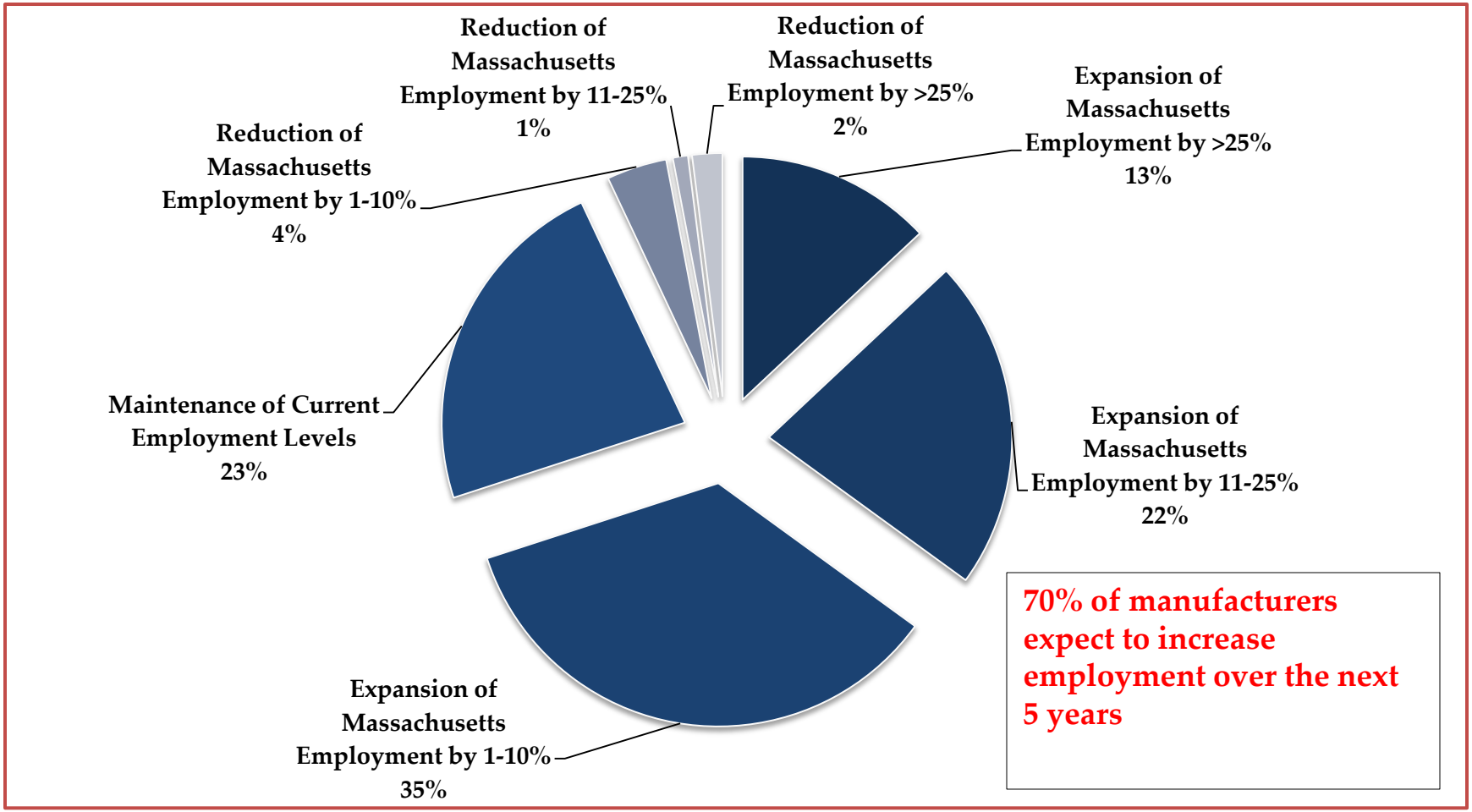
Source: American Community Survey, Public Use Files, 2006, 2010, Tabulations by Center for Labor Market Studies and Dukakis Center for Urban and Regional Policy, Northeastern University

Expected Production Levels of Massachusetts Manufacturing Firms over the Next Five Years (2012 - 2017)



Source: Dukakis Center Manufacturing Survey, 2012

5 Year Employment Projections of Massachusetts Manufacturing Firms (2012 – 2017)



Source: Dukakis Center Manufacturing Survey, 2012

Conclusions

- Manufacturing is alive and well in the Commonwealth and has a healthy future
- Closer cooperation between training institutions and manufacturing can fulfill the sector's need to replace an aging workforce
- Continuing to promote the industry will help secure the Commonwealth's prosperity for years to come

Micron® Products, Inc.

2013 MassEcon Conference

David Garrison
Chief Financial Officer

Micron® Products, Inc.

Brief History

- Founded in 1972 to coat plastics with Silver.
- 90's World leader in EP Sensors for use in Medical Devices (over 1.5 Billion annually)
- 2000's Diversified through acquisition
  - Custom Injection Molding
  - Manufacture of Molding Tools
- 2008 Expanded into Orthopedic Implants

Providing Manufacturing Solutions

- Innovative Custom Plastic Injection Molding
  - Contract manufacturing in the Medical, Defense, & Automotive industries using the latest in automation and robotics.
  - Specializing in highly complex products and materials.
- Mass Customization of Patient Specific Orthopedic Implants
  - Full cycle production of cobalt-chrome, titanium, and plastic knee implants.
  - Patient specific implants – each implant is one of a kind.
- Design & Engineering Services
  - On-site Production of Tooling for the manufacturing processes.
- Rapid Prototyping & 3D Printing – Plastic or Wax for Metal Casting

Micron®
PRODUCTS, INC.

Made in the USA

Micron® PRODUCTS, INC.

- Export to 36 countries
- Manufacturing with supply, and research partnerships across the globe.
  - Over 1,300 partners & customers worldwide.
- All operations at our Fitchburg, Mass headquarters

Micron's shop floor has a flag representing each country we sell to.

Selling Solutions Worldwide

Micron® PRODUCTS, INC.

Our Vision

Provide an integrated manufacturing solution that exceeds the complex needs of the global economy.

Strategies

Provide an integrated product offering:

- shorten lead times
- lower costs
- increased quality

Core Competencies

Engineering expertise to drive our customer's product **innovations** with robust manufacturing solutions.

Values

Industry Leadership with product innovation

To satisfy our customers beyond expectations

KIVA Systems

Kiva Systems

MassEcon Annual Conference

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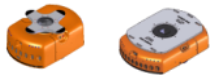
Company Background



- Founded 2003 in Woburn, MA
- First commercial customer in 2006 (Staples)
- Focused on fulfillment and distribution operations
- #6 Fastest Growing company in US (Inc. magazine)
- Installations in US, Canada, UK, and Netherlands

View a video of the Kiva Bots in action

http://www.youtube.com/watch?v=YbJwt9fEYnc

Manufacturing at Kiva

- All final assembly takes place on site
- Scaling to mass production
- Our 5S+1 and lean approach are ingrained into our culture
- Continuous improvements are part of the process
- Professional development is a priority

The Benefits of Manufacturing in Massachusetts

- Talent pool is strong for fast growing companies
- Local suppliers take a true partnership approach
- Manufacturing in MA has a cool factor
- Low cost country sourcing has its challenges

KIVA Systems

Thank You!

MASSECON ANNUAL CONFERENCE JUNE 2013

CHRISTOPHER PERLEY
SENIOR VICE PRESIDENT DYAX CORP.
JUNE 21, 2013

Two Pillars of Dyax Corp.

Dyax's mission is to discover, develop, and commercialize innovative biopharmaceuticals for unmet medical needs

Dyax

ANGIOEDEMA PORTFOLIO

KALBITOR® (ecallantide)
DX-2930
Biomarker assays

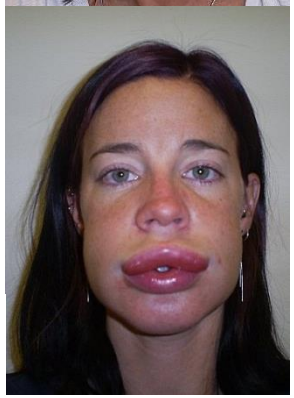
Dyax

LICENSING PROGRAM

Library Licenses
Clinical Stage Product Candidates
Royalties/Milestones

Hereditary Angioedema Profile

- Rare, genetic disease characterized by unpredictable episodes of severe, painful swelling
- Attacks can affect abdomen, face, larynx and/or extremities
- KALBITOR® (ecallantide): a treatment for acute hereditary angioedema (HAE) attacks
- Expanding the KALBITOR business beyond the U.S.
- Developing DX-2930 for prophylaxis
- Advancing biomarker assays



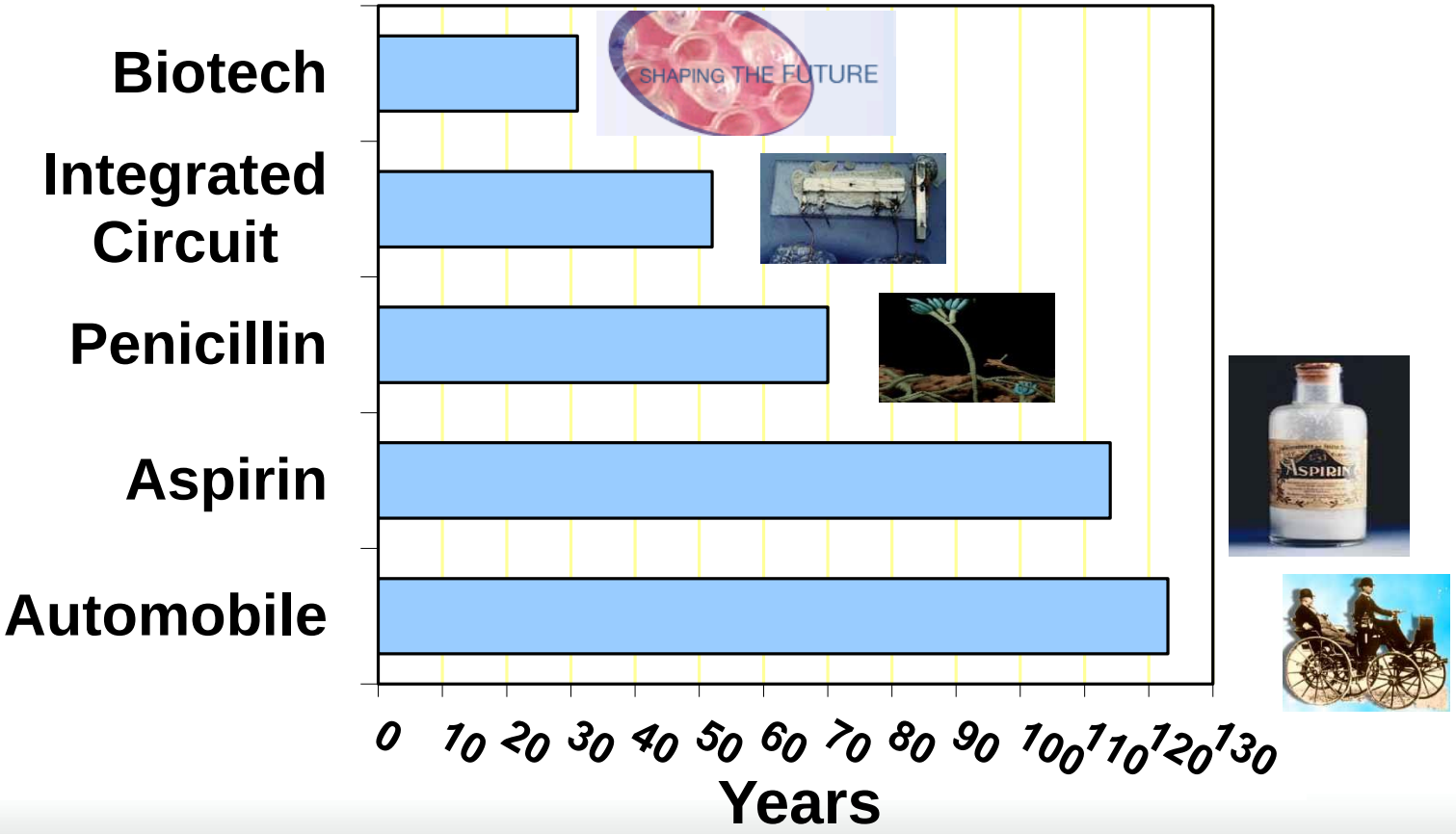
Dawn of Biotech Manufacturing

Production of recombinant DNA therapeutic proteins

Dyax

1973: Cohen Boyer patent: first rDNA organism created

1982: FDA approves first rDNA therapeutic protein: Insulin



Biotech Manufacturing The Past 30 Years

- Massachusetts companies were among the early pioneers of biotech manufacturing in the 1980's
  - BASF, Worcester (acquired by Abbott, now spun off as AbbVie)
  - Biogen, Cambridge (now Biogen Idec)
  - Genetics Institute, Andover (acquired by Wyeth, now Pfizer)
  - Genzyme, Allston/Cambridge (acquired by Sanofi)
- Nascent industry characterized by rapid learning and evolution (process technology, production equipment and systems, quality control, government regulation)
- Today, Massachusetts a top-tier Global Center of Excellence in biotech manufacturing
  - Above companies joined by Amgen, BMS, Lonza, and Shire
- Seven of the top ten selling drugs in 2012 were biotech, with combined sales of > $50 Billion

What's Next for Biotech Manufacturing?

- Biotech manufacturing industry is maturing
  - Technology converging and stabilizing
  - Biosimilars leading to commodities
- Industry is beginning to move to low-cost regions of the globe
- In the next decade, Massachusetts companies must move on to next generation of biotech products, where innovation is critical
- It's happening. ~10 Massachusetts companies in each area:
  - Interference RNA
  - Gene therapy
  - Stem cell therapy

Production in the Innovation Economy: Findings and Overview

MassEcon
Annual Conference
June 21, 2013

Elisabeth B. Reynolds
Director, MIT Industrial Performance Center

Production in the INNOVATION ECONOMY
Massachusetts Institute of Technology

MIT Industrial Performance Center
Innovation. Productivity. Competitiveness.

From Made in America to Made All Over

1980s	TODAY
Vertically-integrated firms	**Core-competence** firms
Integrate research, development, design, production and marketing to promote innovation, quality and efficiency	Massive **fragmentation** of production systems
Locate core firm activities **close to lead customers and best suppliers** to promote JIT & mutual learning	**Functions distributed** between 'home' societies and 'host' societies (globalization)
	Networks of production chains link brands, product definition and design, contract manufacturers, assemblers, distributors, retailers

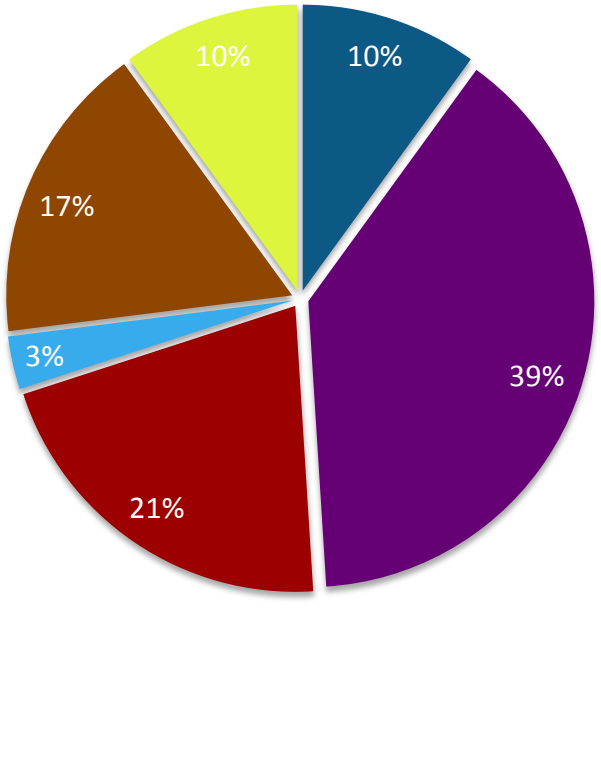
PIE Summary Findings

- **Manufacturing matters** for innovation
- Innovation is **not just about patents**; a hidden wealth of innovation in product, process, and business organization
- High-value manufacturing connects inseparably to **services**.
- Where manufacturing locates matters: clusters and the **"ecosystem" drive capabilities**
- "Not-invented-here" is a costly error: we can **learn** from Germany and China
- It takes **collaboration between industry and schools** to build skills
- There's **transformative manufacturing technology** on the horizon but technology in itself does not build capabilities

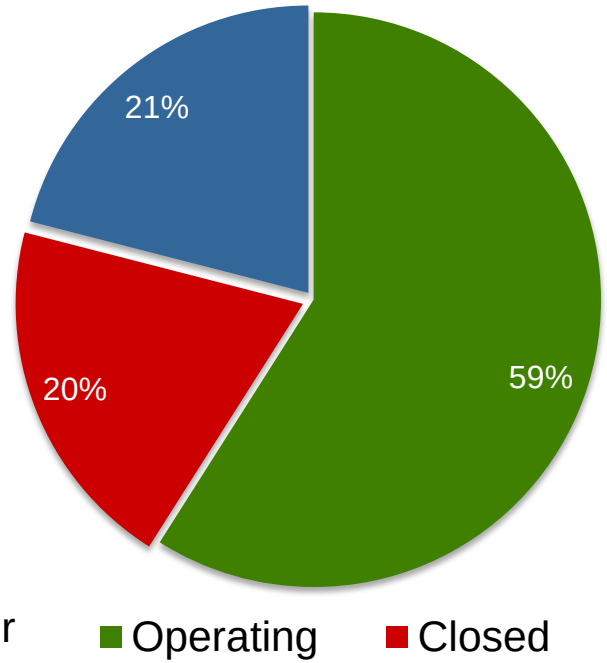
Critical Case of 150 Production Firms

Started with MIT Licensed Technology (1997-2008)

By Industry



By Current Status



Scaling Innovative Companies in the US: Robust Innovation Ecosystem at the Early Stages

- **Capital Available for Up to 10 Years**
- **Thick Labor Markets:**
  - Need access to diverse “high intellect” talent
  - Easy to find for prototyping and pilot phases
- **Networks Matter**
  - Key individuals deliver resources
- **Thick Supplier Markets**
  - Range of suppliers with an emphasis on speed and quality
    - *“We kept eight machine shops busy for two weeks at full capacity getting a system ready.”*

Search for Complementary Assets Leads Firms Overseas

- **Significant influx of new capital** required to reach commercial scale
  - $30 - 60 million
  - *"VCs cannot make any money on something that costs $100 million and takes at least 10 years to build."*

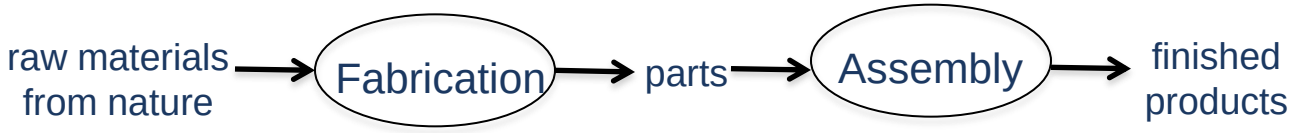
- **Strategic partners and foreign governments** provide complementary assets
  - *"When [the company] transitions from the normal VC model, there is no other model to jump to, so they go abroad."*

Implications of this Shift Abroad

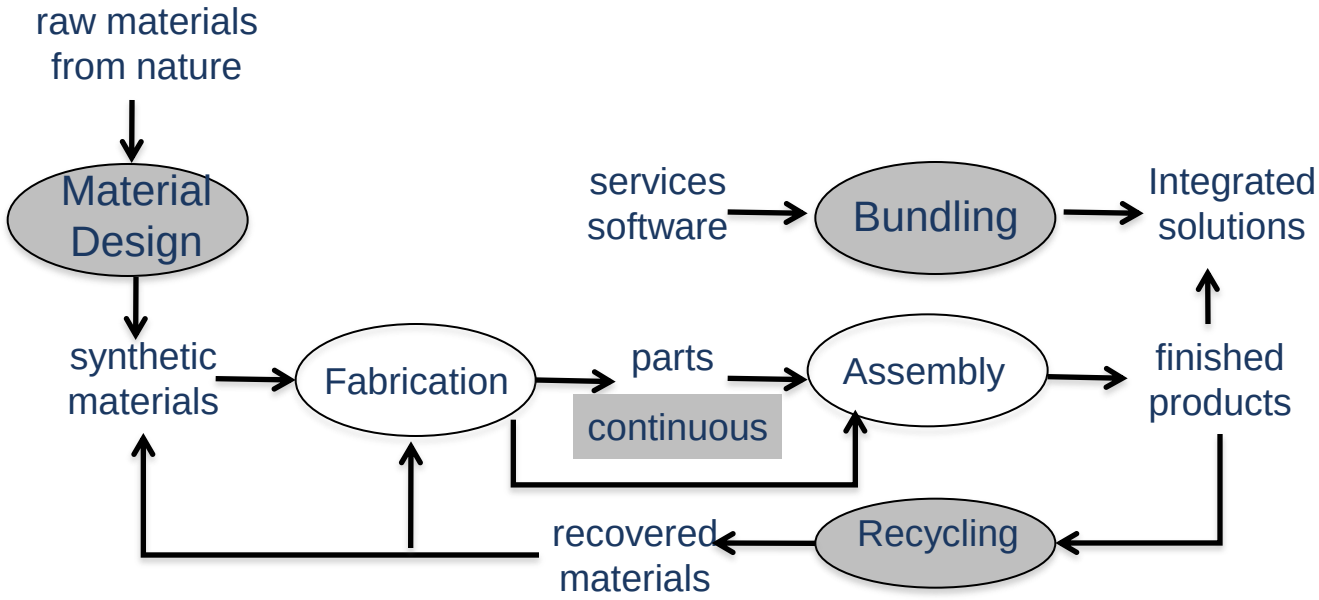
- Critical moment in firm's growth
  - **"Inflection band"** of 2-3 years
  - Knowledge is loosely codified;
  - Process of **"learning by building"** in manufacturing for scale up
- Financing, capabilities and customers/suppliers **pull technology development abroad**
  - Demand offers opportunity to iterate on technology
  - Reinforced by aggressive public policies

What is Advanced Manufacturing?

Traditional Manufacturing (20th century)



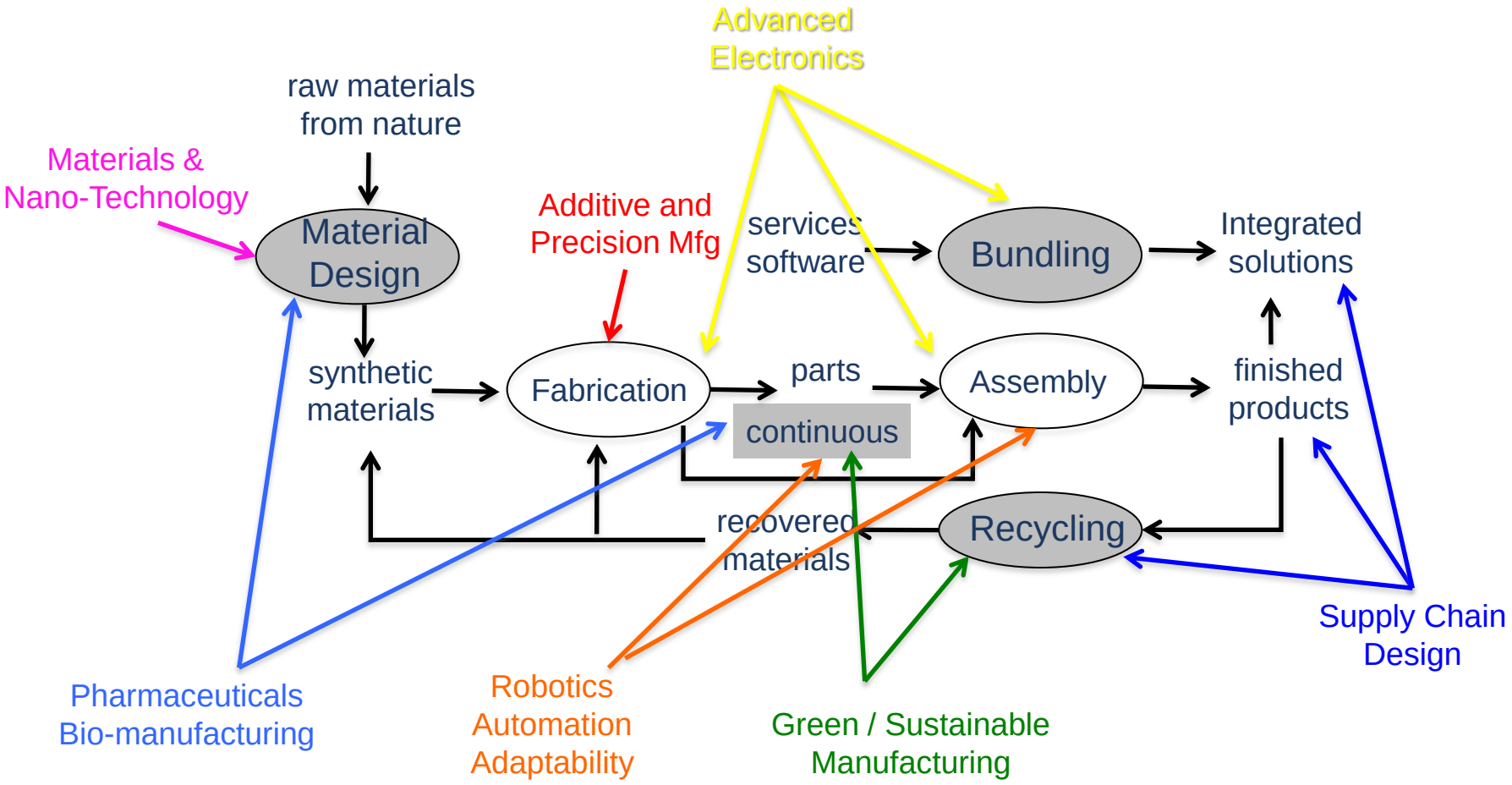
Advanced Manufacturing (21th century)



Advanced Manufacturing is the creation of integrated solutions that require the production of physical artifacts coupled with valued-added services and software, while exploiting custom-designed and recycled materials using ultra-efficient processes.

Source: Prof. Oli De Weck, PIE Commission

Seven key manufacturing technology categories will dramatically affect advanced manufacturing products and processes



Source: Prof. Oli De Weck, PIE Commission

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