PROTAGONIST VS. ANTAGONIST

The Massachusetts Life Sciences Initiative: A New Role For Government In Accelerating Life Sciences Innovation

Presented at:
Board of Directors Retreat
Metropolitan Washington Council of Governments
July 2016

Overview

- **What is the Massachusetts Life Sciences Initiative?** Investing to Create a High-Performance Innovation Ecosystem
- **Has It Worked?** The Massachusetts Life Sciences Initiative's Impact
- **How Did It Work?** The Massachusetts Life Sciences Center's Investment Portfolio "at a Glance"

The Massachusetts Life Sciences Initiative: Investing to Create a High-Performance Innovation Ecosystem

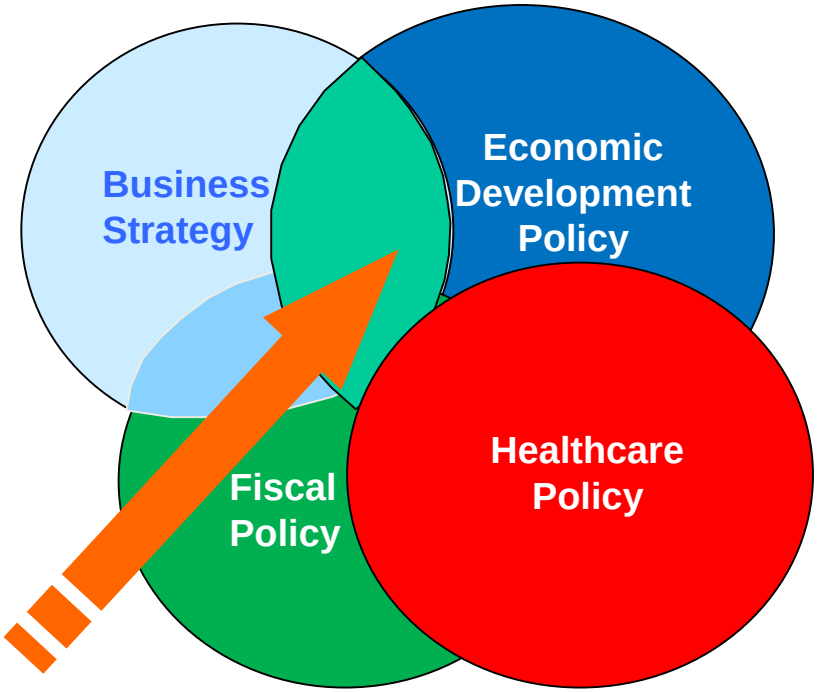
The Massachusetts Life Sciences Initiative is Our Cluster's "Secret Sauce"

- A **10-year, $1 billion USD initiative** (2008-18)
- Vision of **Governor Deval Patrick**
- Administered by the **Massachusetts Life Sciences Center (MLSC)**, a quasi-public authority governed by a Board of Directors

The MLSC *funds* innovation and also is an *innovator*:

- ✓ New roles for the public sector as "strategic investor"
- ✓ Portfolio of novel programs and financial tools
- ✓ Unique models of collaboration and partnership with the private sector

The Massachusetts Life Sciences Initiative is a Strategic Play



The Massachusetts Life Sciences Initiative "Sits" at the Juncture of Policy and Business Strategy

Goals of the Life Sciences Initiative:

- ✓ Invest in **good science and good business**
- ✓ Strengthen Massachusetts' **global leadership**
- ✓ Accelerate **commercialization**
- ✓ Create jobs and drive **economic development**

The Initiative Recognizes that Life Sciences is a “Big Tent”

What Sectors?

Biotechnology

Pharmaceuticals

Medical Devices

Diagnostics

Bioinformatics

What Skills?

Science, Technology, Engineering, Math (STEM) AND…..

- Administration
- Animal Husbandry/Care
- Advertising and Communications
- Computing/IT
- Finance
- Legal and Regulatory
- Logistics Management
- Project Management
- Sales and Marketing
- Skilled Manufacturing

The Initiative Spans Therapeutic and Disease Areas

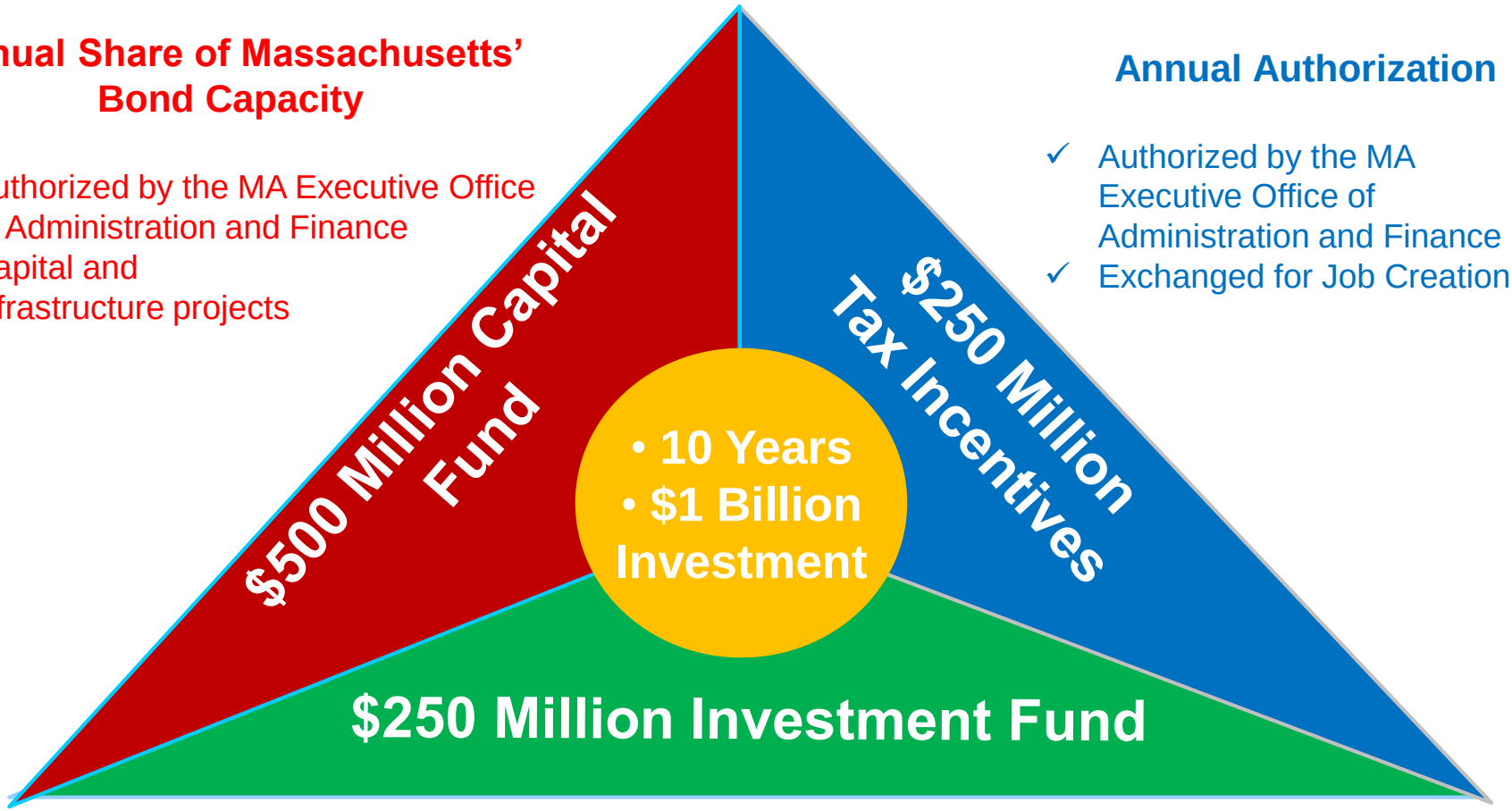
Where Did Massachusetts Find a Billion Dollars?

Annual Share of Massachusetts' Bond Capacity

- ✓ Authorized by the MA Executive Office of Administration and Finance
- ✓ Capital and infrastructure projects

Annual Authorization

- ✓ Authorized by the MA Executive Office of Administration and Finance
- ✓ Exchanged for Job Creation



Annual Appropriation

- ✓ Included in the Massachusetts Legislature's state budget
- ✓ "Discretionary" fund

The Center is the "Hub" of the Massachusetts Life Sciences Community

Stakeholders

- Trade Associations
- Other Massachusetts State and Quasi-Public Agencies
- MA Companies
- U.S. Companies
- International Companies
- Foreign Governments
- International Delegations

The MLSC is a "one stop shop" for funding, tools, programs, access and sector expertise

MLSC Activities

- Programs and Incentives
- Referrals and Coordination
- Convening and Facilitation
- Outbound Marketing
- Inbound Inquiry Management
- Targeted Outreach
- Tradeshow Participation
- Partnership
- Business Development

A "Blue Ribbon" Scientific Advisory Board* Guides Investment Decisions

CHAIR: Harvey F. Lodish, Ph. D., Whitehead Institute and Massachusetts Institute of Technology (MIT)

Academia

James J. Collins, Ph.D., Massachusetts Institute of Technology
John M. Collins, Ph.D., Center for Integration of Medicine & Innovative Technology (CIMIT)
Robert D'Amato, M.D., Ph.D., Center for Macular Degeneration Research, Harvard Medical School and Boston Children's Hospital
Glenn R. Gaudette, Ph.D., Worcester Polytechnic Institute (WPI)
Judith Lieberman, Ph.D., Immune Disease Institute, Boston Children's Hospital and Harvard Medical School
Lita L. Nelsen, Massachusetts Institute of Technology
Barbara Osborne, Ph.D., UMass Amherst
Guillermo Tearney, M.D., Ph.D., Harvard Medical School, Harvard-MIT Division of Health Sciences and Technology (HST) and Massachusetts General Hospital
David Walt, Ph.D., Tufts University School of Medicine
Frederick J. Schoen, M.D., Ph.D. Professor Harvard Medical School

Industry

James Barry, Ph.D., Inspire MD, Inc.
Dalia Cohen, Ph.D., ALN Associates
José-Carlos Gutiérrez-Ramos, Ph.D., Pfizer
Dale Larson, Draper Laboratory
Alan Smith, Ph.D., CBE, FRS, Genzyme (Retired)
Alison Lawton, Ovascience

Venture Capital

Kevin Bitterman, Ph.D., Polaris Venture Partners
T. (Teo) Dagi, M.D., M.B.A., Queens University Belfast & Broadview Ventures
Andrew Jay, DMD, Siemens Venture Capital
Henry Kay Boston Harbor Angels
Carmichael Roberts, Ph.D., M.B.A., North Bridge Venture Partners
Lauren Silverman, Ph.D., Novartis Option Fund
Frederick Jones, M.D. Broadview Ventures

Entrepreneurs

Alison Taunton-Rigby, Ph.D., RiboNovix, Inc.
Hillel Bachrach, Viztech & UltraSPECT

*As of 2016; SAB members rotate

The MLSC's Strategy is to Invest in *Innovation Capacity*

What is Innovation Capacity?

"The ability to produce and commercialize a flow of innovative technology *over the long term*."

Furman, Porter and Stern (2002)

Strategy: Fill gaps to strengthen capacity across the innovation lifecycle

Create

Develop

Grow

Sustain

Why Invest in Innovation Capacity?

- **Optimal role for the public sector**
- **Builds/Strengthens the "platform" that supports innovation**
- **All stakeholders benefit**

"Geographies with high ***innovative capacity*** usually develop faster economically, attract highly skilled populations, and experience rising incomes and trade."

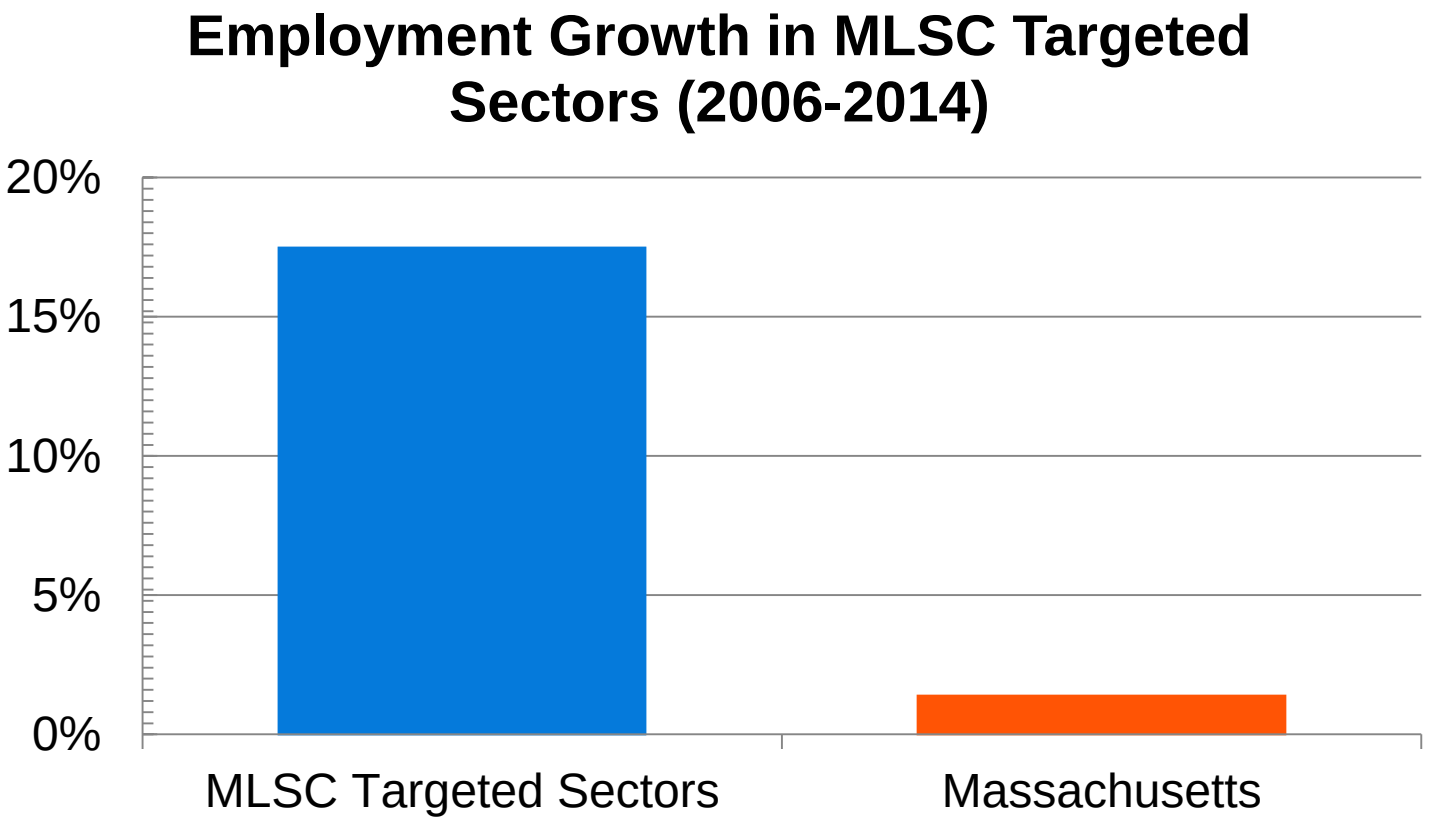
(Harvard Business School 2011)

MLSC Investment Principles

- **A "portfolio" investment strategy**
- **Matching private investment will highly leverage strategic and well chosen investments by the state**
- **Competitive process for selecting investments**
- **Inclusionary decision making ("wisdom of crowds")**
- **"Seed, accelerate, match" (vs. provide operating funds)**
- **Fund and incentivize new models of collaboration (ecosystem)**
- **"Customer driven" vs. "top down" approach more typical of public sector initiatives**

The Massachusetts Life Sciences Center: Impact

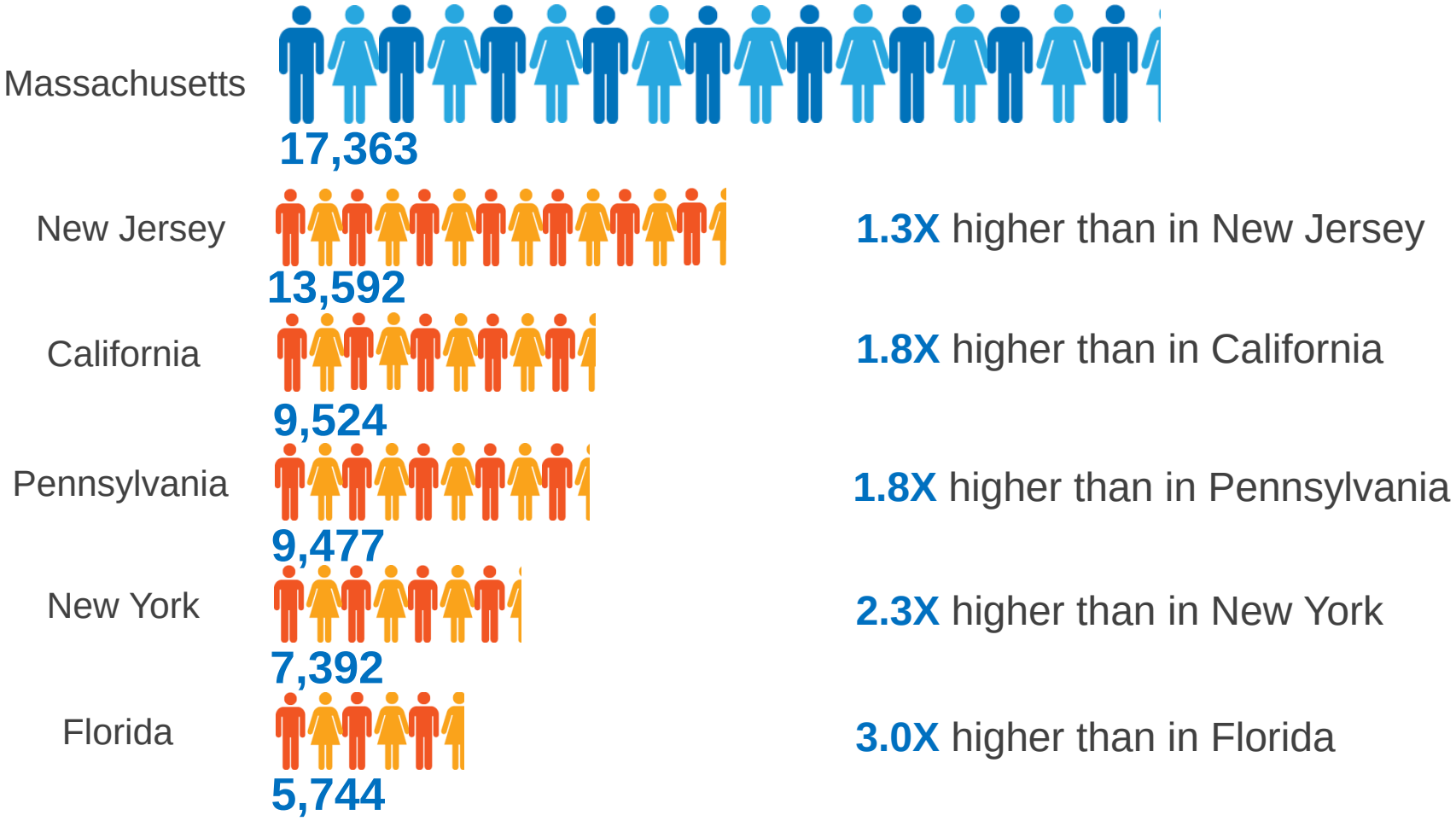
MLSC Investments Helped Lead Massachusetts Out of the Economic Recession



Sources: B. Bluestone and A. Clayton-Matthews, *Life Sciences Innovation as a Catalyst for Economic Development: The Role of the Massachusetts Life Sciences Center* (March 2013)

MA Now Ranks #1 in U.S. Life Sciences Employment On a Per Capita Basis

Total Life Sciences Employment, per One Million Population by U.S. State 2010-2013



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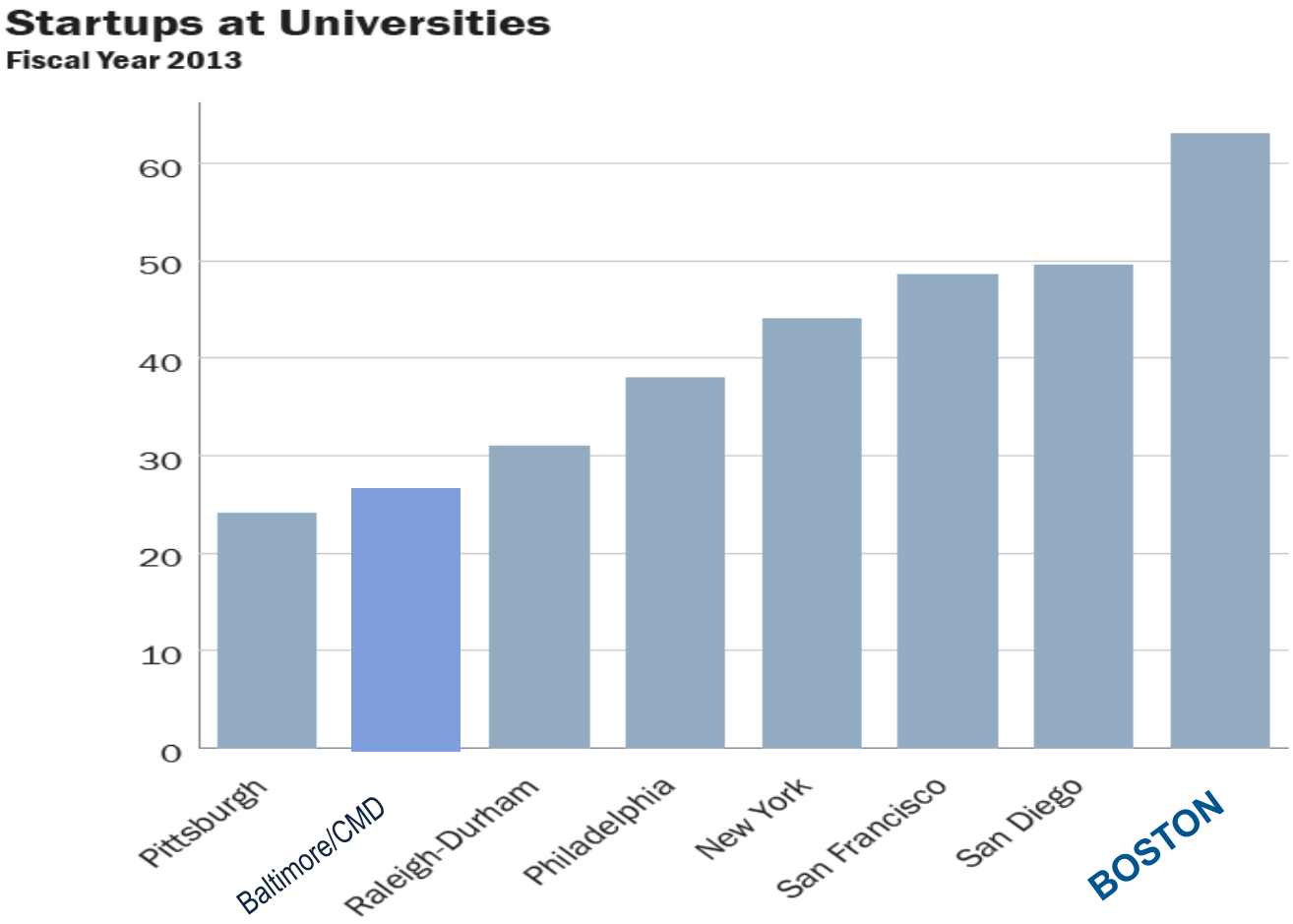
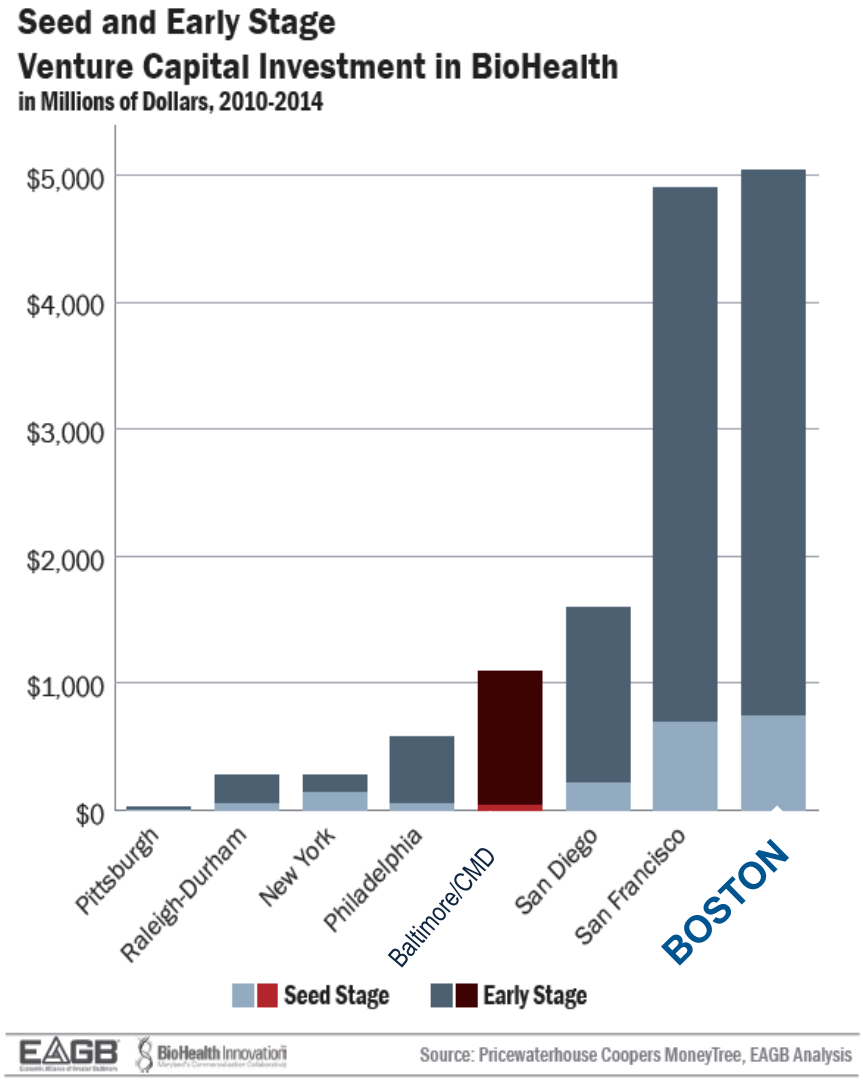
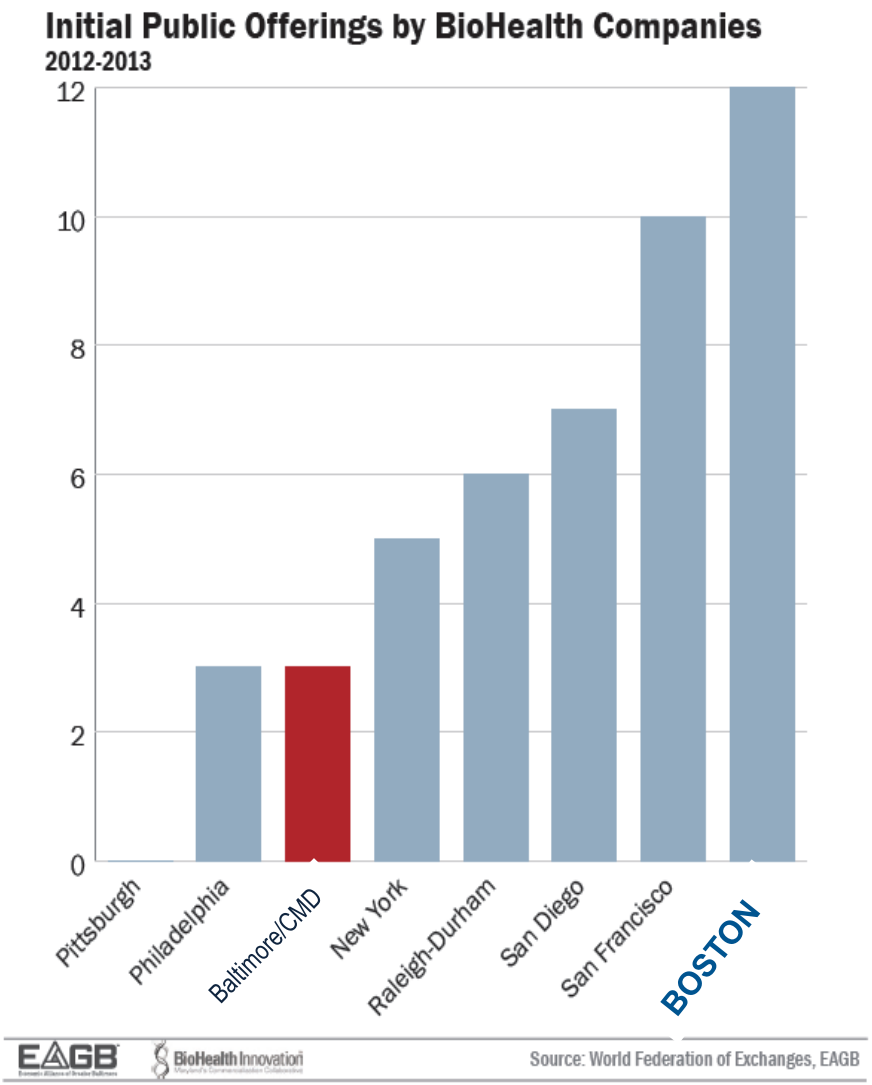
Massachusetts Academic Institutions are Actively Engaged in Creating Start-up Companies

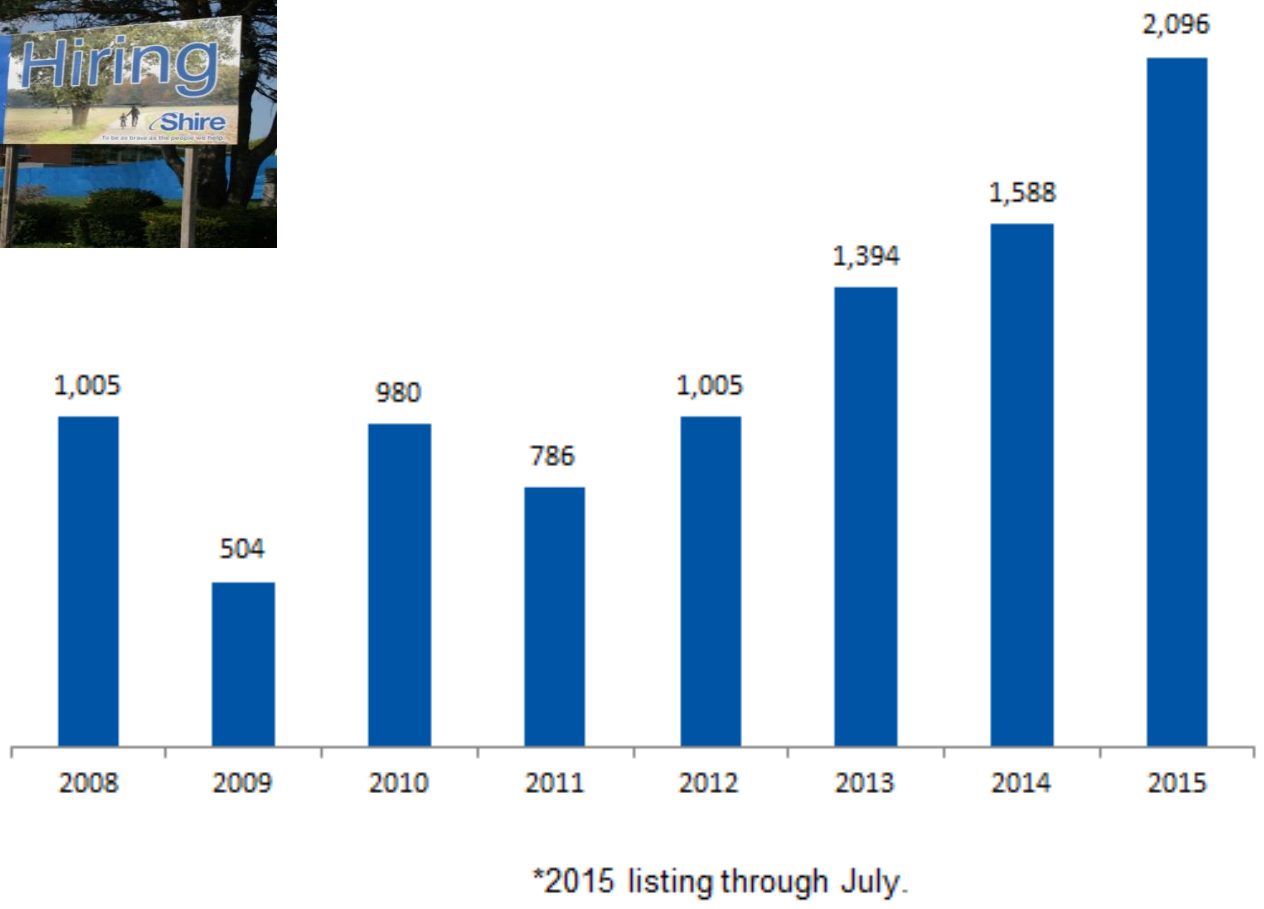


VC and IPO Activity in Massachusetts is High





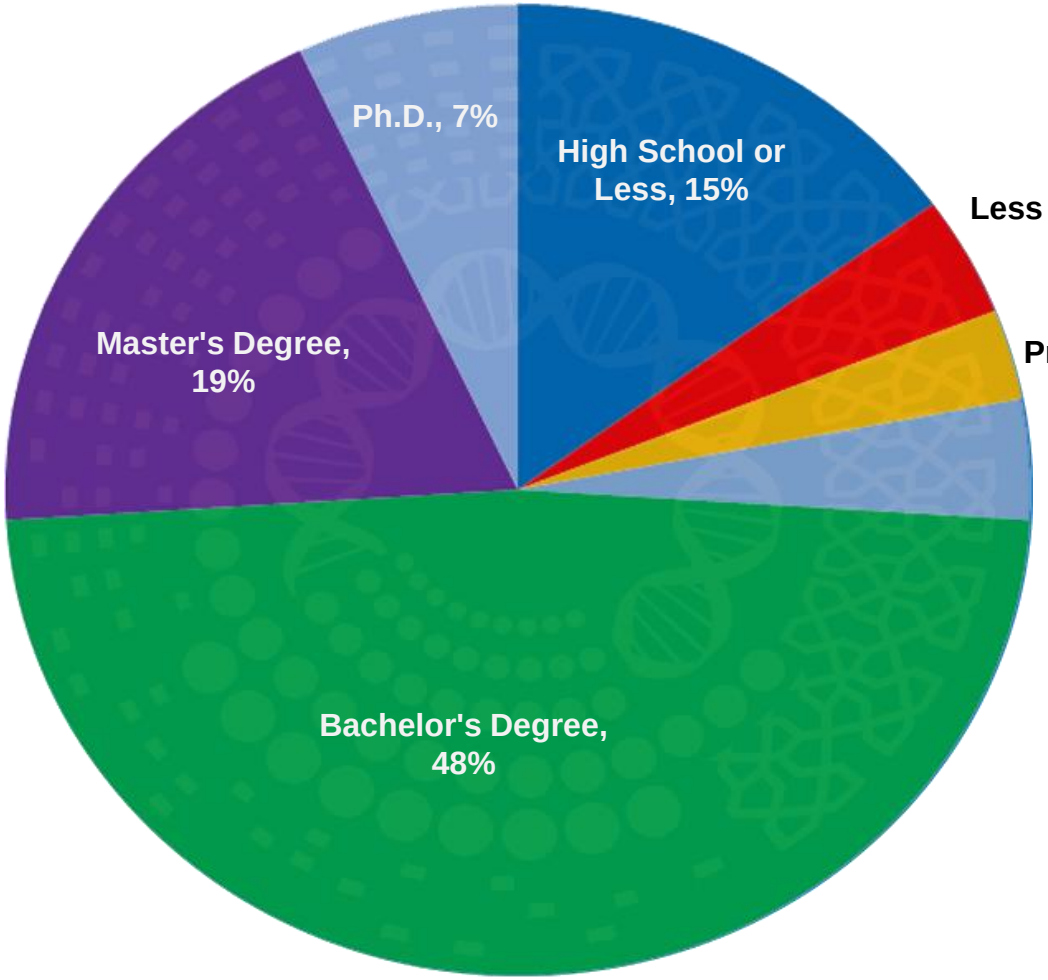
Demand for Life Sciences Workers is High



MassBio Industry Snapshot, 2015

MLSC Tax Incentives Have Created Jobs for a Range of Skills and Educational Levels

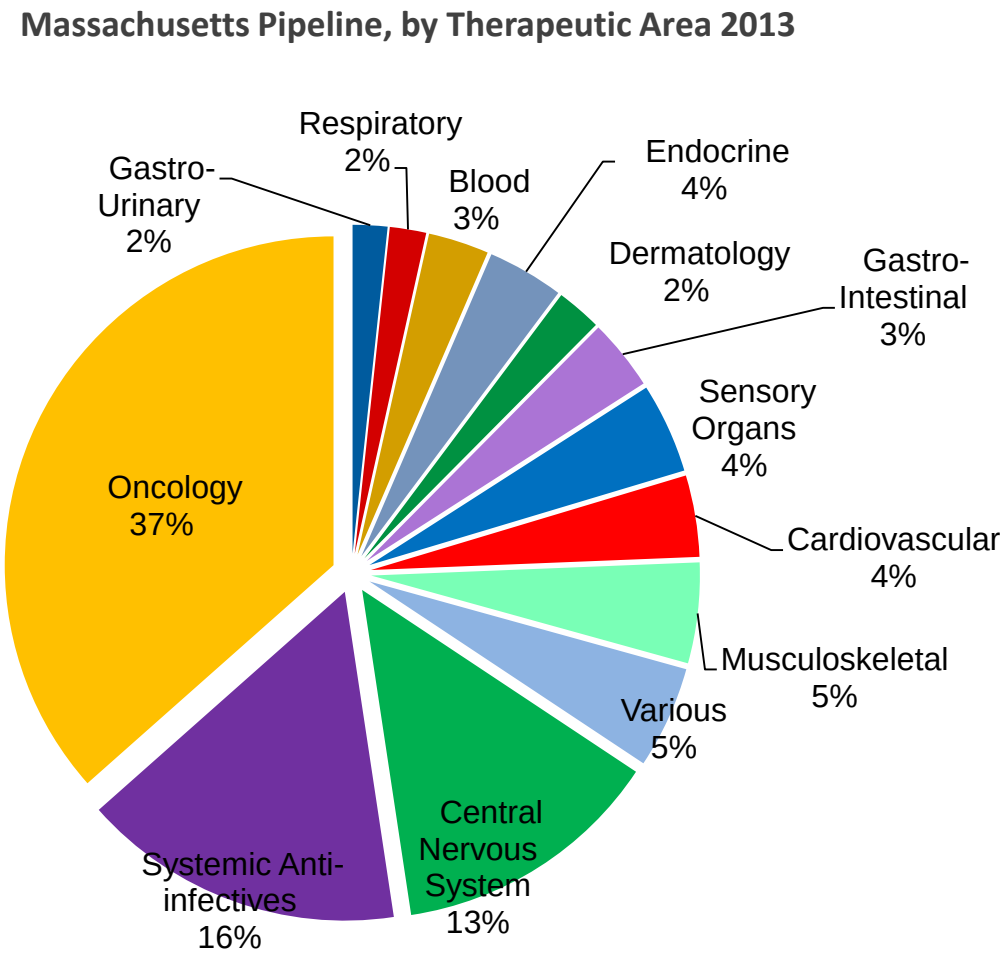
Distribution of New Hires by Level of Education Among Companies Receiving MLSC Tax Incentives



Sources: B. Bluestone and A. Clayton-Matthews, *Life Sciences Innovation as a Catalyst for Economic Development: The Role of the Massachusetts Life Sciences Center* (March 2013)

The Massachusetts Drug Pipeline is Extensive

Therapeutic Area	Candidates
Oncology	429
Systemic Anti-infectives	186
Central Nervous System	156
Various	59
Musculoskeletal	58
Sensory Organs	52
Cardiovascular	47
Endocrine	44
Gastro-Intestinal	41
Blood	35
Dermatology	26
Respiratory	21
Gastro-Urinary	20
Total (R&D)	1174



Source: EvaluatePharma®, July 2013
Courtesy of MassBio Industry Trade Association 2013

Pace of New Company Arrivals and Expansions in MA Has Accelerated Since 2008

MA Has Become a Target for Investment and Growth by Industry Leaders

- **18 of the top 20 biopharma companies now have a significant presence in MA**
- **Among MA largest life sciences employers, two-thirds employ 500-1,000 workers; one-third employ 1,000+ workers**
- **Of these major employers one-third had little or no presence in MA before 2007!**

Bayer AG is the latest to join the MA ecosystem -- will open an Innovation Center in Cambridge, October, 2016
(announced March 2016)

Sources: MassBio Membership Reports & Surveys; Boston Business Journal Book of Lists, 2015

Global Leaders are Moving Their U.S. Headquarters to MA

The Boston Globe

Merck KGaA moving US base to Billerica, Millipore deal also expected to bring new jobs to state (3/4/10)

The Boston Globe

Shire to Move US HQ and 500 Jobs to Greater Boston (11/19/14)

Shire to Buy NPS Pharmaceuticals for $5.2 Billion and Considering Moving Many of NPS's 400 Employees to its Lexington Campus (1/1/15)

Boston Business Journal

GE Healthcare Life Sciences Moves to Marlborough HQ* (8/20/14)

BostInno

Healthcare Giant Baxter International Is Moving to Cambridge (8/27/14)

Boston Business Journal

Amgen enters heavyweight fray for Kendall Square's few remaining blocks of space (8/19/14)

***GE Healthcare's decision in 2014 to move its headquarters to Massachusetts heavily influenced the decision by GE to move its corporate headquarters to Massachusetts (announced in February 2016)**

Boston Has Transitioned from an Academic Hub to a "Start-up Hub"

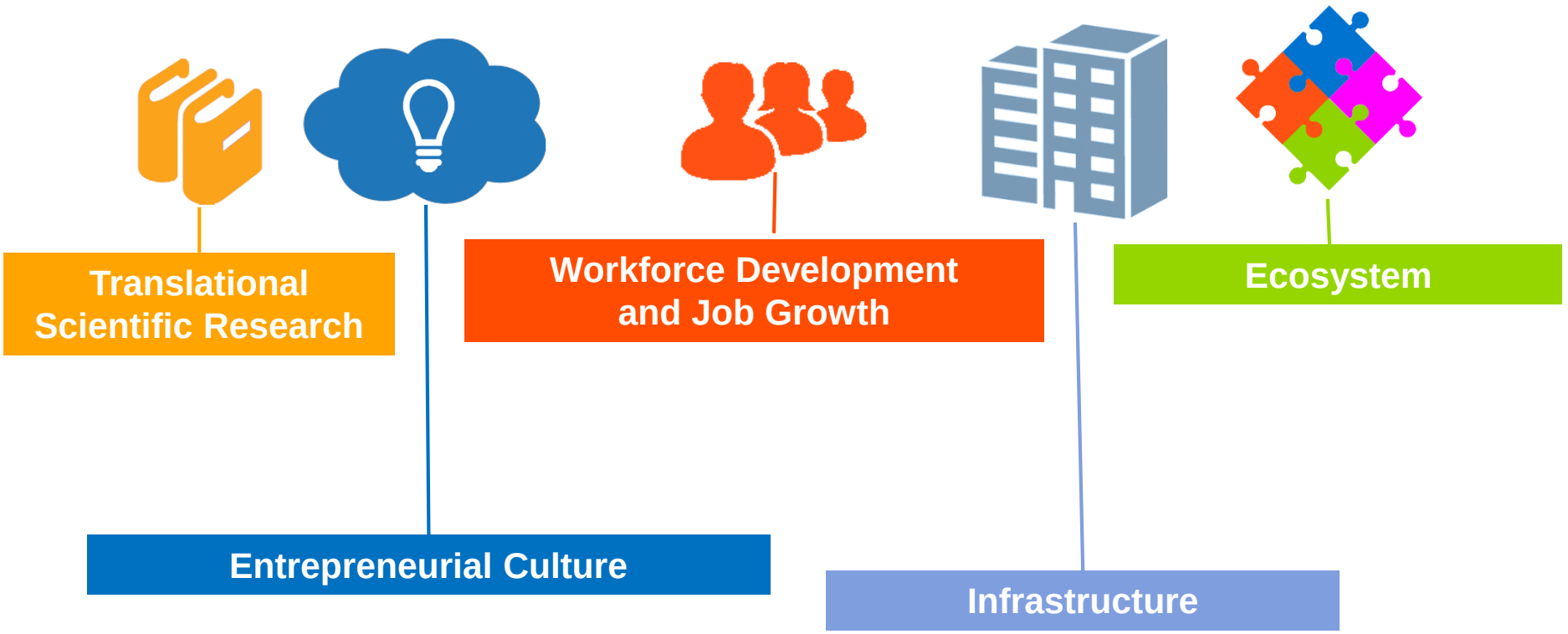
New Report Labels Boston a Better Hub for Startups Than San Francisco

***Innovation Matters*, U.S. Chamber of Commerce, May 2016**

The Massachusetts Life Sciences Center: Investment Portfolio at a Glance

How is the MLSC Implementing the Strategy?

Target the Five Key Enablers of Life Sciences Innovation Capacity



How is the MLSC Implementing the Strategy?

Target the Five "A's" of Ecosystem Creation and Effectiveness

Aspiration and Vision

Advocacy and Publicity

Advisory and Mentoring Resources

Alignment of Stakeholders on Core Competencies and Value Proposition

Attraction – what are the incentives to be part of the ecosystem?

How is the MLSC Implementing the Strategy?

A Portfolio of Investments

Translational Scientific Research
- Academic Grants

Entrepreneurial Culture
- Grants for Business Plan Competitions
- Funding for Early Stage Companies

Workforce Development and Job Growth
- Grants to Schools, Community Colleges and Research Universities
- Tax Incentives to Industry for Job Creation

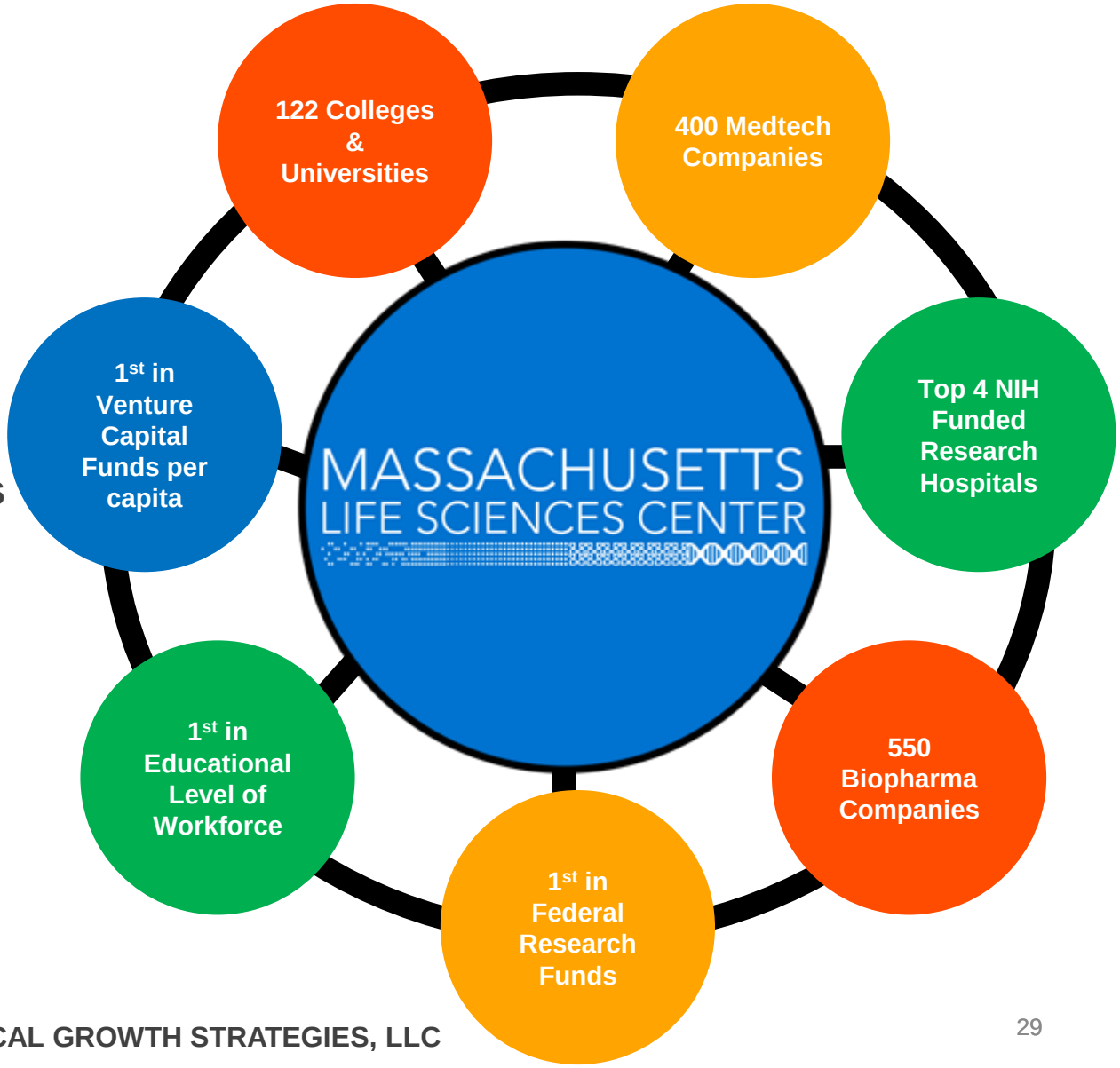
Infrastructure
- Grants for Research, Training, Business Incubating, Biomanufacturing and Computing Facilities

Ecosystem
- Fund or Facilitate Partnerships and Collaboration

Coalesce the Life Sciences "Cluster" into an "Ecosystem"

A "cluster" is a collection of assets – universities, medical centers, companies, investors, service providers, etc.

In an innovation "ecosystem" all members of the cluster work well individually and together!



Strengthen the Translational Research Pipeline

Objective: Promote academic interest in translational research and industry partnerships (culture change)

MLSC investments through end FY 15:
$14.8 million -- matched dollar for dollar by the private sector

- 21 early career investigators **($5.1 million)**
- Faculty at five (5) universities and academic medical centers **($3.7 million)**
- 12 translational research collaborations between industry and academic partners **($6 million)**

Help Life Sciences Companies Grow

Objective: **Provide funds and incentives to accelerate the formation, recruitment and growth of life sciences companies in Massachusetts**

- **Tax Incentives for Job Creation:**
  - 110 active awards
  - $109+ million

Support the Business Case for MA

- **Funding for Early Stage Companies**:
  - $22.7M invested

Share in Risky Investments

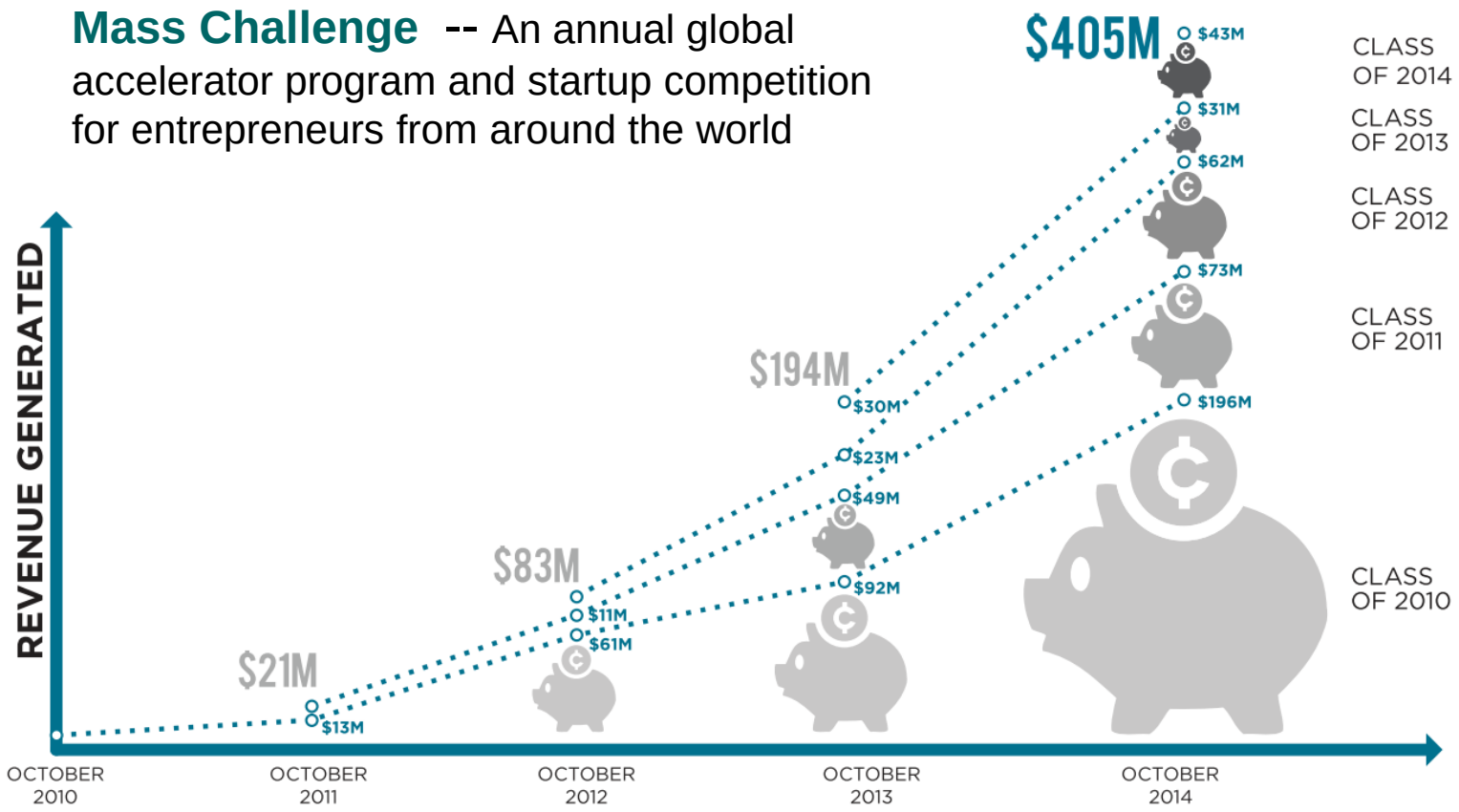
- **Business Plan Competitions**:
  - $2M in sponsorships

Promote Interest and Culture

Build a "Culture of Entrepreneurship"

Objective: **Encourage the formation of start-ups by funding *university based and "free-standing"* business plan competitions across the state**

Mass Challenge -- An annual global accelerator program and startup competition for entrepreneurs from around the world



Courtesy of MassChallenge

Business Plan Competitions Yield High Leverage

Courtesy of MassChallenge

“De-risk” Early Stage Companies

Objective: Help early-stage companies complete value-creating milestones

The MLSC Milestone Achievement Program (MAP)

- Grants of **$50,000- $200,000** to very early stage companies (seed stage)

The Accelerator Loan Program

- Loans of **up to $1M** for early stage companies (“Pre-series A”)
  - Supports proof of concept/principle work
  - “De-risks” companies for private investors
- **Corporate Consortium** expands the fund

Funding for Early Stage Companies is Highly Leveraged

MLSC has funded 50 companies since 2009

Leverage on Public Dollars

$22.7M invested or committed by MLSC

Companies have raised **over $180M in additional private and public investment** post-MLSC funding

The MLSC Has Helped Young Companies Gain Traction

Funded nine MA life sciences companies that have filed for or completed IPOs since 2013.

Total investment: $5 Million

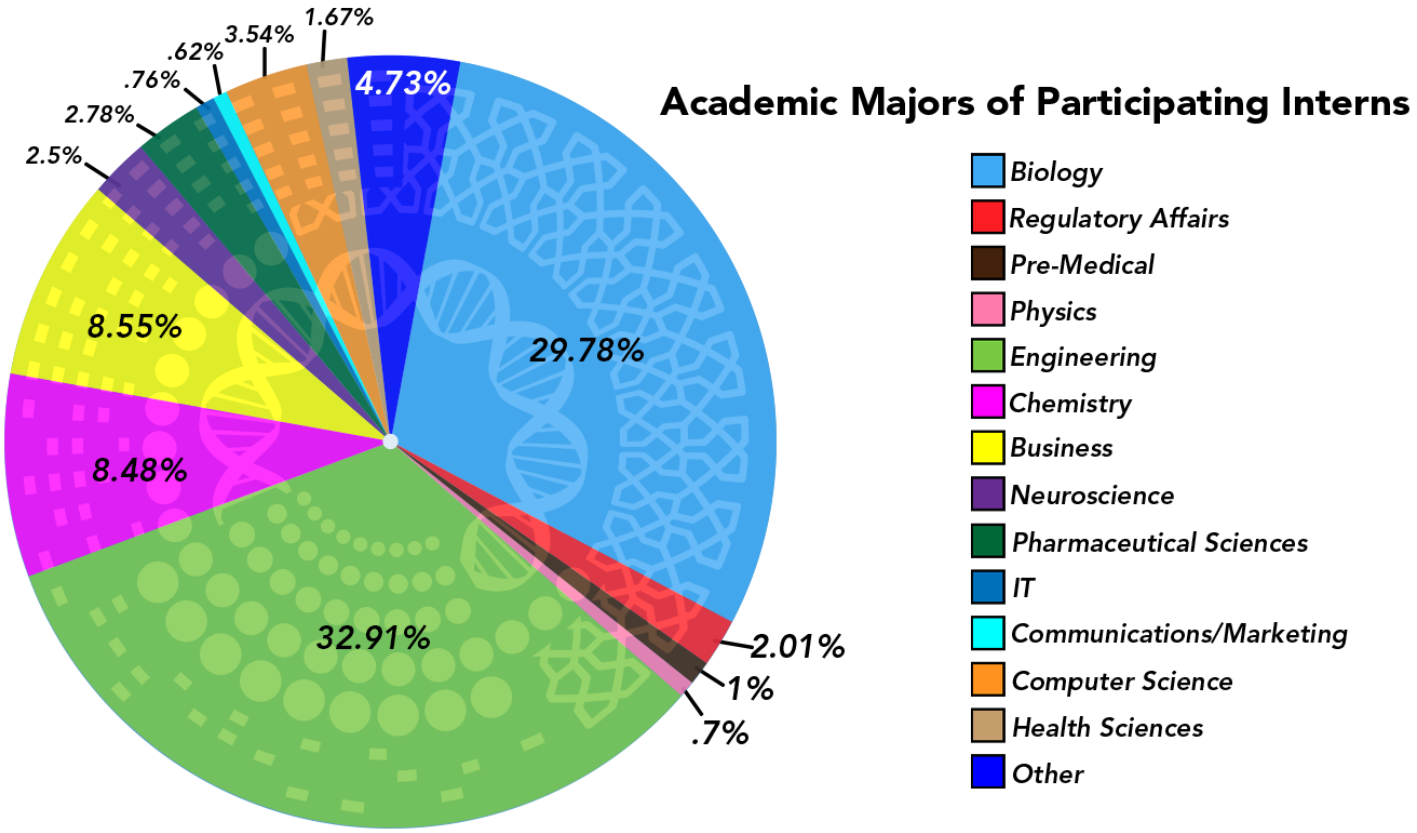
Workforce Development Programs

Objective: Train future life sciences workers -- at all skill levels and across all regions of the state

- Skill development in **K-Middle School grades**
- State-of-the-art training facilities at **public and voc-tech high schools**
- Infrastructure upgrades in **community and four-year colleges and universities**
- **Career pathways** into the life sciences – “real world experience”
- **Diversity and inclusion**

The MLSC Internship Challenge Program

- Over $12 million invested since 2009
- 3,000 internships funded
- One-quarter of participating interns offered full or part-time employment



The MLSC Capital Grant Program

Objective: Expand capital and infrastructure resources across MA, build regional strengths to host industry, support life sciences research, development and commercialization

- Over **$390M** to date in funding for capital projects

The University of Massachusetts, Amherst campus: $95 million to fit out and equip a substantial portion of the university's Life Sciences Laboratories

WPI: $5M grant for a Biomanufacturing Education and Training Center (BETC); industry matches to date are $50M

Lab Central: $5M in seed funding and $5M in expansion funding for first-of-its-kind shared laboratory space designed as a launchpad for high-potential life-sciences and biotech startups

Unique Research and Biomanufacturing Resources

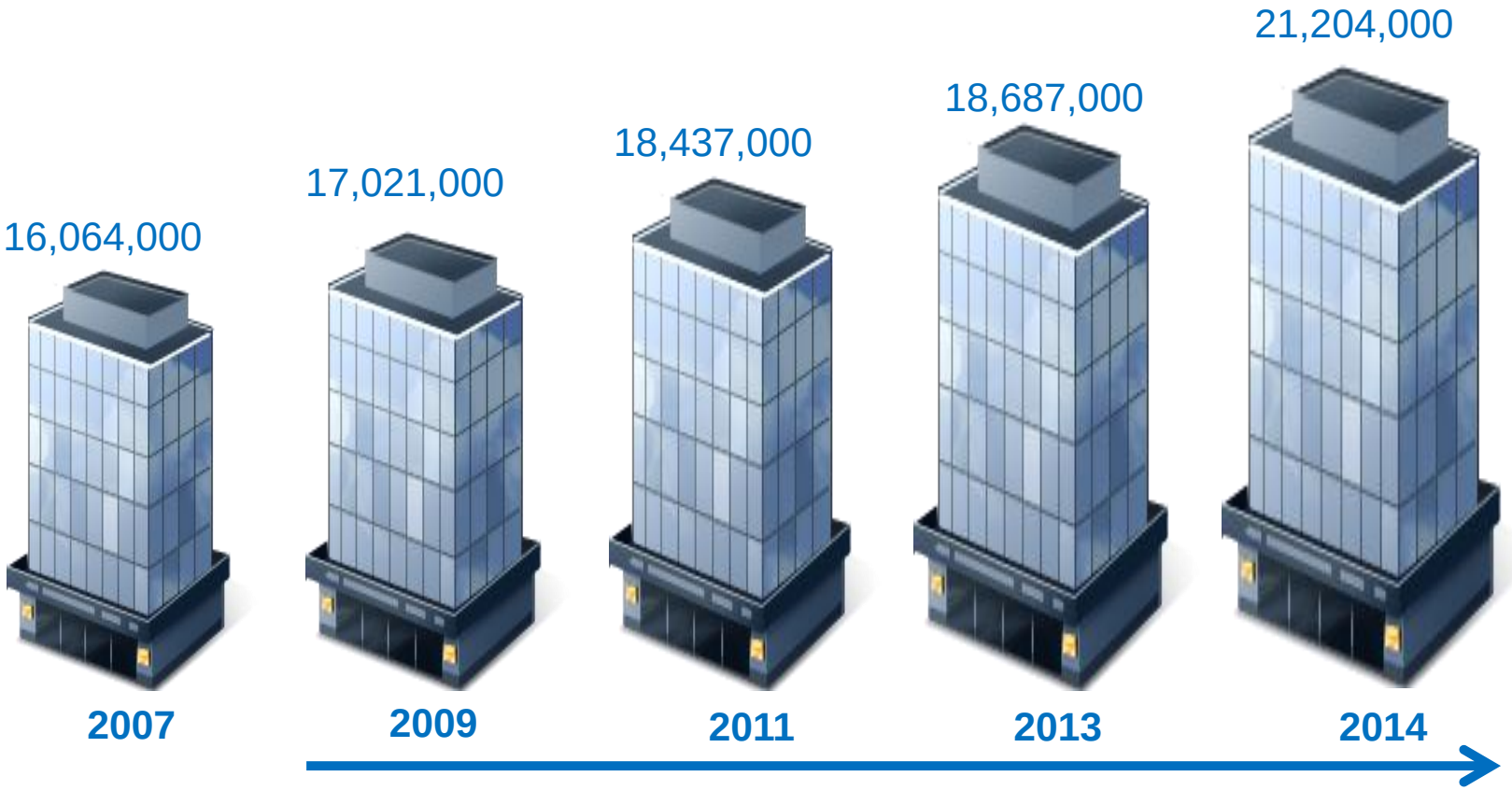
Forsyth Institute ($5M)
Salivary Diagnostic Center

University of Mass Medical School ($90M)
Albert Sherman Center for Advanced Therapeutics

MassBiologics ($30M)
Vector Manufacturing Center

New Research Space

Since 2007, over five million square feet of commercial lab space have been added to the Massachusetts' inventory



MLSC investments have helped fund 1.5M sq. ft. of this new research space since 2008

Source: Colliers Meredith & Grew, Life Science Review, 2007-2013
Courtesy of MassBio Industry Trade Association 2014

Incubating and Accelerating Spaces

SBI Springfield Business Incubator

Tufts University Photonics Center

Biotech InnoVenture Center

Advanced Technology & Manufacturing Center

Scibelli Enterprise Center Springfield Technical Community College

Cummings Properties

Venture Development Center

UMass Boston

MD Informatics Lab

TechSpring - The Baystate Health Technology Innovation Center

CREAGEN BIOSCIENCES Inc.

BIO SQUARE

Cambridge Biolabs

Sky Ventures

Cambridge innovation Center

UMASS M2D2 Massachusetts Medical Device Development Center

CABI

Cape Ann Business Incubator

Lab Central

MBI

Massachusetts Biomedical Initiatives

Enterprise Center at Salem State College

North Shore Life Sciences Accelerator

TradeCenter Executive Suites

LAUNCH

= Funded by the MLSC

Collaboration and Partnerships

Objective: Pioneer new partnerships and models of collaboration that build/strengthen the ecosystem

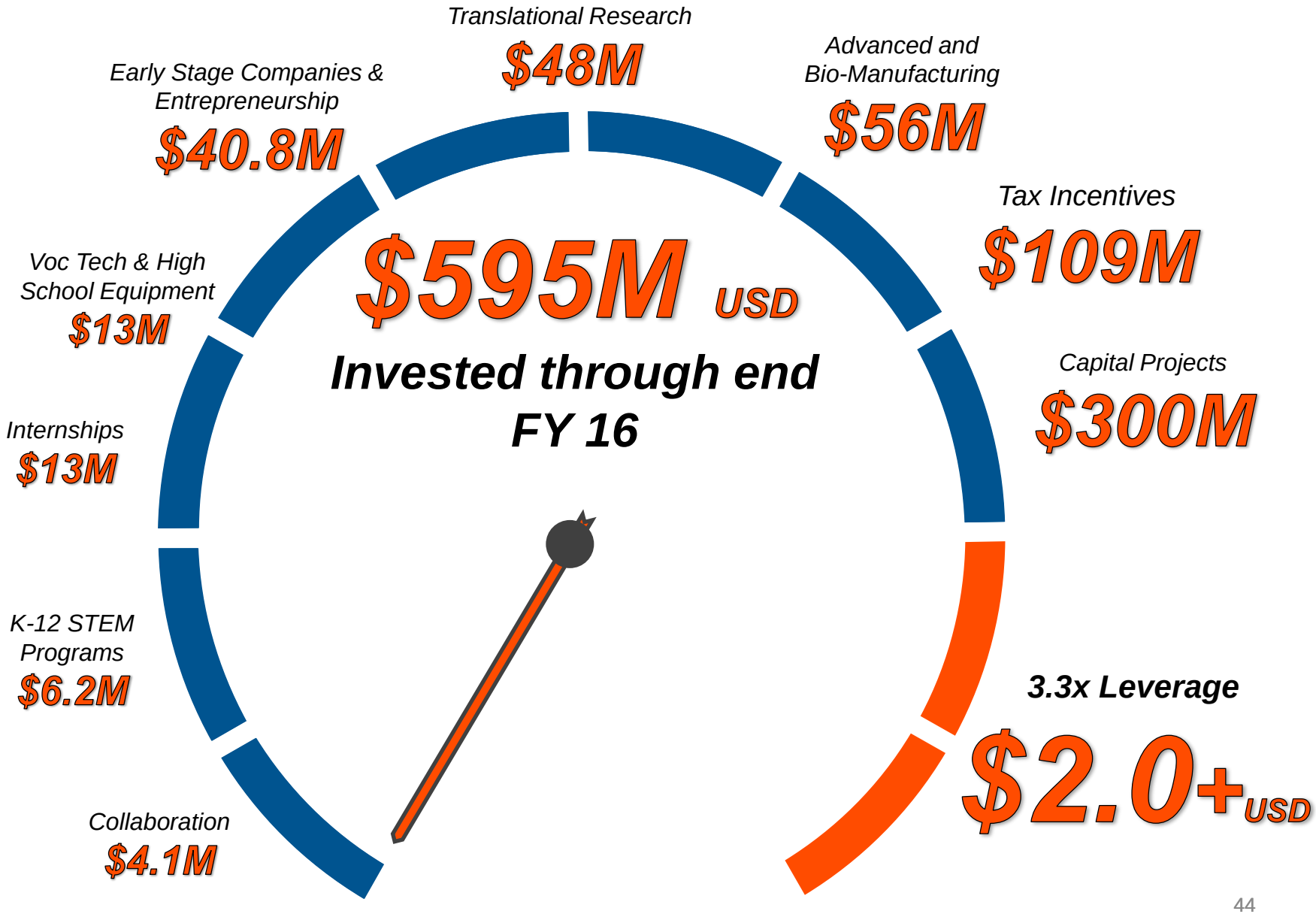
Example: Massachusetts Neuroscience Consortium

- Accelerates pre-clinical research available to industry
- Introduces academic researchers to targeted research
- Expedited access to Massachusetts' neuroscience cluster
- Projects are funded by Consortium members; MLSC provides staff support, administers the grants and serves as "honest broker"

Neuroscience Consortium Charter members:

- **AbbieVie**
- **Biogen-Idec**
- **EMD Serono**
- **Janssen Research (Johnson and Johnson)**
- **Merck**
- **Pfizer**
- **Sunovion (DainipponSumitomo)**

Revving Up the Massachusetts Life Sciences Ecosystem



Why It Works

- **Innovation can be a deliberate outgrowth of strategic investments***
- **Strategic investments will be leveraged by private investment, especially capital expenditures**
- **Expedited access to early stage companies -- stimulating the growth of innovative start-ups attracts large companies that anchor the ecosystem**
- **Academic institutions benefit from actively participating in translational research, entrepreneurship and industry partnerships**
- **Career opportunities for workers with a variety of skills and educational levels**
- **"Wisdom of crowds" identifies the relative best investments and creates shared ownership**
- **Innovation-driven economic development is a viable goal for policymakers**
- **Collaboration, partnerships, collaboration, partnerships……**

Gene M. Grossman and Elhanan Helpman, "Innovation and Growth" (1991)

THANK YOU!!