### THE MA INNOVATION ECONOMY: BENCHMARKING WITH OUR COMPETITORS

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> **MassEcon** May 16, 2014

**TOPICS**\*

- I. The Index of the MA Innovation Economy
- II. The Good News about the MA Innovation Economy
- **III.** Challenges Facing the MA Innovation Economy
- IV. Conclusions

#### Q&A

\*Unless noted otherwise, all data on these slides are from the 2013 Index of the MA Innovation Economy, published by the MA Tech Collaborative (MTC).

# THE MA INNOVATION INDEX



- Published since 1997 by MTC to benchmark the performance of the Innovation Economy.
  - To better understand the Massachusetts Innovation Economy.
  - To support evidence-based decision making.
  - To increase awareness and trigger conversations about the performance and impact of the Massachusetts Innovation Economy.

#### Comparisons

- With 9 other "Leading Technology States"
- U.S. averages
- International innovation hubs where possible.



### WHY FOCUS ON INNOVATION?

- ✓ Innovation is one of the most important factors underlying economic growth in today's global economy.
- ✓ Innovation is an important source of new technologies, products & services, industries, jobs and income.
- ✓ For decades innovation has been a key driver of Massachusetts' competitiveness.

### MA INDEX INDUSTRY CLUSTERS

#### 11 Clusters

- Advanced Materials
- Bio-Pharma & Medical Devices
- Business Services
- Computer & Communications Hardware
- Defense Manufacturing & Instrumentation
- Diversified Industrial Manufacturing
- Financial Services
- Healthcare Delivery
- Postsecondary Education
- Scientific, Technical & Management Services
- Software & Communications Services

### **LEADING TECHNOLOGY STATES**

#### 10 Leading Technology States (LTS)

- California
- Connecticut
- Illinois
- Massachusetts
- Minnesota
- New Jersey
- New York
- Ohio
- Pennsylvania
- Texas



# II. THE GOOD NEWS ③

- [1] Wages and Household Income
- [2] Research & Development (R&D)
- [3] Technology Development
- [4] Talent
- [5] Venture Capital

### [1] WAGES AND HOUSEHOLD INCOME

- Employment in MA is growing and shifting into Healthcare; Business, Financial and Legal; and Computers & Math occupations where employees generally earn wages well above the national average.
- ✓ MA has a higher median household income than the LTS and U.S. averages. (2012)
  - MA \$63,656
  - LTS Average \$ 55,264
  - U.S. Average \$51,017

# [2] RESEARCH & DEVELOPMENT (R&D)

 ✓ MA continues to be the top state among the LTS in terms of R&D as a % of Gross Domestic Product (GDP). (2010)

•	MA	5.3%	•	IL	2.4%
•	CA	4.3%	•	PA	2.3%
•	NJ	3.7%	•	OH	2.2%
•	СТ	3.4%	•	ТΧ	1.6%
•	MN	2.7%	•	NY	1.5%

 $\checkmark$  MA also is a global leader in R&D.

### R&D Expenditures as % of GDP, International Comparisons, 2010

•	MA	5.30 %
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•	ISI del	
•	Finiand	3.90 %
•	Republic of Korea	3.74 %
•	Sweden	3.39 %
•	Japan	3.26 %
•	Germany	2.80 %
•	United States	2.80 %

Source: Main Science & Technology Indicators, OECD, Technology and R&D Statistics, 2013.



- ✓ MA continues to attract high levels of research funding from the federal government.
  - MA ranks first among the LTS in terms of federal funding for R&D per \$1,000 GDP.
  - MA also ranks first in NIH funding per \$1,000 GDP.

# [3] TECHNOLOGY DEVELOPMENT

- MA is a leader in turning R&D funding into ideas, technologies and companies.
  - MA has the 2<sup>nd</sup> highest (after CA) number of start-up companies initiated from universities, hospitals, research institutions and technology investment firms.
  - MA leads the LTS in technology licenses and options executed, key factors in commercialization of technology.
  - MA leads the LTS in S&E academic articles published per R&D dollar, and per 1,000 S&E doctorate holders.
  - MA also excels internationally in S&E articles published on a per capita basis.

#### **INDICATOR 8: ACADEMIC ARTICLE OUTPUT**

Science and Engineering (S&E) Academic Article Output per Million Residents Massachusetts & International, 2009

Massachusetts	1,591
Switzerland	1,223
Sweden	1,019
Denmark	961
Finland	927
Norway	919
Netherlands	899
Australia	862
Canada	860
Israel	842
Singapore	839



Data Source: Bureau of Labor Statistics, Occupational Employment Estimates



- $\checkmark$  MA leads the LTS in patents granted per capita.
- ✓ In 2012, patents granted in MA reached an historic high in number (5,734) and in share of U.S. total (4.7%.)
- ✓ MA organizations were awarded 37% more patents in 2012 than in 2008.

# [4] TALENT

✓ MA continues to lead the LTS in terms of its college-educated workforce.

- ✓ 45% of the working age population in MA has a bachelor's degree or higher (2010-2012 avg.)
  - CT is 2nd at 41%.
  - CA is 6<sup>th</sup> at 33%.
  - The U.S. average is 32%.

# SCIENCE, TECHNOLOGY, ENGINEERING & MATH (STEM)

 ✓ MA leads the LTS in Bachelor's Degrees conferred in S&E per 1,000 18 to 24 year olds (2011) (source: NSF)

•	MA	29.2		• CA	17.2
•	PA	22.3		• IL	16.5
•	MN	21.8		• NJ	16.5
•	СТ	21.6		• OH	16.2
•	NY	21.5		• TX	11.6
			U.S. 17	<b>'</b> .7	

- ✓ MA also is the leader in S&E doctorates granted per capita, producing more than twice as many per capita as any of the other LTS.
- ✓ STEM degrees granted in MA increased by 25% between 2001 and 2011.

# STEM Degrees Granted, MA

#### Degrees Granted in STEM Fields

Massachusetts, 2011

	2011	% Change 2001-2011
Computer & Information Sciences & Support Services	2,139	-9%
Engineering	5,044	22%
Biological & Biomedical Sciences	4,008	56%
Mathematics & Statistics	995	55%
Physical Sciences	1,490	20%
Total	13,676	25%

# **Sources of MA S&E Talent**

- Of MA S&E workers in 2011:
  - 39% were born in MA
  - 34% were born elsewhere in the U.S.
  - 26% were born outside the U.S. (up from 21% in 2000)
    (Source: 2012 MA Innovation Index)
- More generally, among the LTS MA was the top destination for the relocation of college educated adults (from out of state or abroad) in 2011-2012.

#### **INDICATOR 23: TALENT FLOW AND ATTRACTION**



Data Source: Bureau of Labor Statistics, Occupational Employment Estimates

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at the MassTech Collaborative

# [5] VENTURE CAPITAL

 MA continues to attract a significant amount of Venture Capital (VC) dollars. (2012)

	<u>VC \$</u>	<u>% of U.S</u>
#1. CA	\$14.09 bil.	53.1 %
#2. <b>MA</b>	\$ 3.03 bil.	11.4 % *
#3. NY	\$ 1.85 bil	7.0 %

\* MA accounts for 2.09% of the U.S. population (2010).

✓ Relative to state GDP, MA continues to lead the LTS in VC dollars.

Source: PWC Money Tree Survey

#### **INDICATOR 18: VENTURE CAPITAL**

#### VC Investment per \$1,000 GDP Massachusetts & LTS, 2012



Data Source: Bureau of Labor Statistics, Occupational Employment Estimates

THE INNOVATION INSTITUTE at the MassTech Collaborative III. CHALLENGES FACING THE MA INNOVATION ECONOMY (2) -- (3)

[1] Federal Funding

[2] Housing

[3] Public Higher Education

[4] International Education Comparisons

# [1] FEDERAL SPENDING

- Federal funding, which has been a key driver of the MA Innovation Economy for years, has a very uncertain future as Congress seeks to reduce the federal debt.
- Budget cuts and future uncertainty, e.g.,
  - ≻ NIH
  - ≻ NSF
  - ≻ DoD
  - ➤ etc.



- 46.8% of MA rental households spend 30% or more of their income on housing. (This is actually below the US average, 48.9%.)
- □ 35.1% of MA homeowners spend 30% or more of their income on housing. (Above the U.S. average, 33.7%)
- □ After several years (2005-2012) of decline and stagnation, housing prices in MA are again on the rise.

# [3] PUBLIC HIGHER EDUCATION

MA remains below the LTS and the national average in state higher education appropriations per full-time equivalent (FTE) student. (2012)

MA	\$ 4,712
LTS	\$ 6 <i>,</i> 087
U.S.	\$ 5,896

## [4] International Education Comparisons

Even if MA is a leader in many talent and education measures in the United States, our competitiveness in the increasingly global marketplace depends also on what is happening beyond our national borders.

#### ✤ INTERNATIONAL COMPARISONS

#### % OF **BACHELOR'S DEGREES** AWARDED IN MATH, SCIENCE AND

#### **ENGINEERING**, 2010

Republic of Korea	34.4%	Canada	19.9
Germany	29.0	Slovenia	19.9
Finland	27.4	Slovak Republic	19.7
Greece	26.1	Poland	19.2
Mexico	25.6	Hungary	18.9
Austria	25.1	Switzerland	23.0
United Kingdom	24.3	Chile	18.2
Spain	24.0	Australia	17.0
Italy	22.9	Iceland	16.6
New Zealand	22.1	Denmark	16.4
Sweden	22.1	Japan	16.1
Portugal	22.0	UNITED STATES	16.0
Czech Republic	21.7	Turkey	15.7
Ireland	21.6	Norway	15.0
Estonia	21.1	Netherlands	13.4
Israel	21.0		
Belgium	20.0	OECD average	21.0

Source: U.S. Dept. of Education, National Center for Educational Statistics

#### INTERNATIONAL COMPARISONS

#### AVERAGE PERCENTAGE OF <u>GRADUATE DEGREES</u> AWARDED IN <u>MATH, SCIENCE &</u>

#### ENGINEERING, 2010

Japan	46.4	Australia	18.8
Sweden	40.1	New Zealand	20.2
Finland	39.8	Ireland	17.3
Germany	33.1	Israel	16.7
Greece	31.0	Turkey	16.5
Austria	31.8	Netherlands	15.5
Portugal	31.3	Iceland	14.0
Czech Republic	29.4	<b>UNITED STATES</b>	13.0
Estonia	28.0	Mexico	12.7
Canada	26.0	Poland	11.4
Switzerland	25.2	Chile	10.5
Denmark	24.5	Hungary	9.5
Republic of Korea	24.1		
Spain	23.2		
Slovenia	22.9	OECD avg.	23.2
Slovak Republic	22.5		
Belgium	22.1		
United Kingdom	21.4	Source: U.S. Dept. of Educati	on, National Center for
Norway	19.8	Education Statistics, 2013.	

#### INTERNATIONAL COMPARISONS

#### AVERAGE MATH LITERACY SCORES OF 15-YEAR-OLD STUDENTS, 2012

Republic of Korea	554	Iceland	493
Japan	536	Luxemburg	490
Switzerland	531	Norway	489
Netherlands	523	Portugal	487
Estonia	521	Italy	485
Finland	519	Spain	484
Canada	518	Slovak Republic	482
Poland	518	UNITED STATES	481
Belgium	515	Sweden	481
Germany	514	Hungary	477
Austria	506	Israel	466
Australia	504	Greece	453
Ireland	501	Turkey	448
Slovenia	501	Chile	423
Denmark	500	Mexico	413
New Zealand	500		
Czech Republic	499	OECD Avg.	494
France	495		
United Kingdom	494	Source: U.S. Dept. of Education, Nati Education Statistics, 2013.	onal Center for

#### INTERNATIONAL COMPARISONS

#### AVERAGE SCIENCE LITERACY SCORES OF 15-YEAR-OLD STUDENTS, 2012

Japan	547	Denmark	498
Finland	545	UNITED STATES	497
Estonia	541	Spain	496
Republic of Korea	538	Norway	495
Poland	526	Hungary	494
Canada	525	Italy	494
Germany	524	Luxembourg	491
Ireland	522	Portugal	489
Netherlands	522	Sweden	485
Australia	521	Iceland	478
New Zealand	516	Slovak Republic	471
Switzerland	515	Israel	470
Slovenia	514	Turkey	463
United Kingdom	514	Greece	467
Czech Republic	508	Chile	445
Austria	506	Mexico	415
Belgium	505		
France	499	OECD avg.	501

Source: U.S. Dept. of Education, National Center for Education Statistics, 2013.

## IV. CONCLUSIONS

- MA continues to have a strong Innovation Economy, that helps drive the success of the state's overall economy.
- MA is a leader in the U.S. and among the LTS in key areas that drive the innovation economy, including:
  - ≻R&D
  - Technology Development
  - Colleges & Universities
  - Educated Workforce
  - ➢ Venture Capital

### Conclusions (cont.)

- However, the MA Innovation Economy has some key vulnerabilities, such as those linked to federal funding and public higher education.
- And, the rest of the world is not standing still. Several countries are now focusing more intently on, and investing in, innovation, R&D and the education of their workforces, as a means to long-term economic development and competitiveness.

### **Bottom Line**

 MA cannot afford to be complacent and rest on its laurels regarding its Innovation Economy – its future is at stake.

