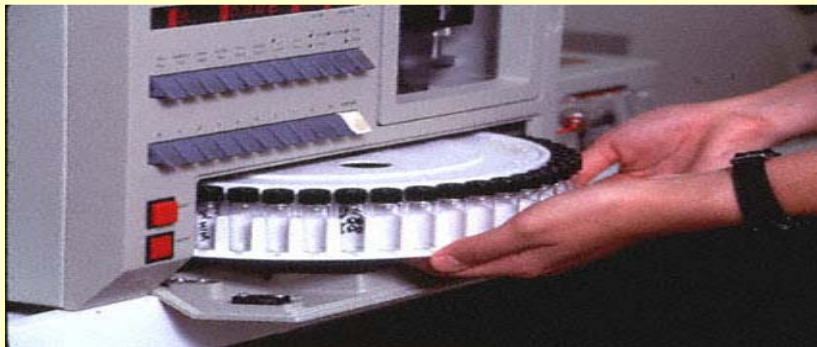
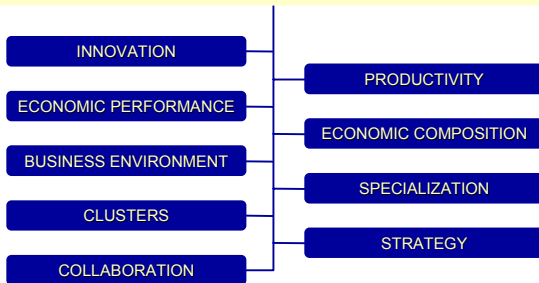


# New Jersey Life Sciences Super-Cluster Initiative



Survey Results -- Average of Regions  
Princeton, New Jersey Feb. 14, 2003



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Professor Porter donated his time as senior advisor to this project  
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*This document provides an outline of a presentation and is incomplete without the accompanying oral commentary and discussion.*

# Agenda

## ● Overview of the New Jersey Life Sciences Initiative

- Conceptual Framework and Methodology
- Economic Performance and Innovation Output of New Jersey
- Performance, Evolution and Composition of New Jersey's Life Sciences Super-Cluster
- Assessment of the Business and Innovation Environment of New Jersey's Life Sciences Super-Cluster
- Findings and Implications

# Introduction

## *Special thanks to . . .*

- Aventis Pharmaceuticals Inc.
- BD
- Biotechnology Council of New Jersey
- Celgene Corporation
- Cytogen
- Enzon, Inc.
- HealthCare Institute of New Jersey
- Hoffmann-La Roche Inc.
- Johnson & Johnson
- Lifecell
- MANIV Investments LLC
- Medarex
- Merck & Co., Inc.
- Novartis Pharmaceuticals
- Novo Nordisk Pharmaceuticals Inc.
- Organon Inc.
- Ortho Biotech
- Pfizer
- Pharmacia Corporation
- Princeton University
- Prosperity New Jersey
- Schering-Plough Corporation
- State of New Jersey
- Wyeth Pharmaceuticals

## Surveys

### **Web-based survey: 80 regional executives**

- 52 cluster representatives
- 28 representatives of institutions for collaboration, government, academia, and other organizations

## Interviews

### **51 regional and cluster experts**

- 19 cluster representatives
- 32 representatives of institutions for collaboration, government, academia and other non-cluster organizations

# Survey Respondents

## Survey Respondents by Organization\*

Acuent Inc	Federal Business Centers	New Jersey Economic Development Authority
Advance Realty Group	FYI Systems	NJ Commission on Science & Technology
Alteon Inc	Hartz Mountain Industries	Novartis Pharmaceuticals
Amersham Biosciences	HealthCare Institute of New Jersey	Novo Nordisk Pharmaceuticals, Inc.
AT&T	Hoffmann-La Roche	Ortho Biotech
Aventis Pharmaceuticals	Invention Factory Science Center	Pfizer
Becton Dickinson and Co.	Johnson & Johnson	Pharmacia
Berlex and Schering Berlin, Inc.	Kor Companies	Princeton University
BIO	Life Medical Sciences, Inc.	Roche
Bristol Myers Squibb	LigoChem, Inc.	Schering-Plough Corp.
Cebal Americas	Mack-Cali Realty Corp.	Skanska USA Building
Cytogen Corporation	Max Spann Real Estate	Stryker Howmedica Osteonics
Denholtz Associates	Medarex	The Gale Company
Domain Associates	MedPointe Inc.	Torre Lazur McCann
Dowel Associates	Memory Pharmaceuticals Corp.	Transave, Inc.
Ernst & Young LLP	Merck & Co. Inc	UMDNJ
Explorer Transportation Systems	Mountain Development Corp.	VersaTech Consulting, Inc.
		Wyeth

\* Multiple respondents for several organizations

Note: n=80

Source: Monitor online survey of key industry, academic and government leaders; October–December, 2002

# Interviews Completed

## Pharmaceutical / Medical Devices

Name	Company	Title
Mr. George Cole	Altana Pharma U.S.	President
Mr. Steve Cosgrove	Johnson & Johnson	Controller
Mr. Raymond V. Gilmartin	Merck & Co., Inc.	CEO & President
Mr. Steven Gooen	Pharmacia	Executive Vice President
Mr. Tom Gorrie	Johnson & Johnson	Corporate Vice President
Ms. Jane Kramer	Berlex Labs	VP of Public Affairs
Mr. Ned Lipos	Stryker Corporation	Group President
Mr. Edward Ludwig	Becton Dickison	CEO & President
Mr. Richard Manning	Pfizer, Inc.	Director, Economic Policy Analysis
Mr. Michael Sinapi	Wyeth Pharmaceuticals	VP of Sale & Marketing Operations
Dr. Roy Vagelos	Merck & Co., Inc.	retired Chairman and CEO

## Biotechnology

Name	Company	Title
Dr. Donald L. Drakeman	Medarex, Inc	CEO & President
Mr. Arthur Higgins	Enzon Pharmaceuticals, Inc.	Chairman
Mr. John Jackson	Celgene Corporation	CEO & Chairman
Mr Kenneth I. Moch	Alteon Inc.	CEO & President
Dr. H. Joseph Reiser	CYTOGEN Corporation	CEO & President
Mr. Stephen G. Sudovar	EluSys Therapeutics, Inc.	CEO & President
Ms. Elizabeth E. Tallett	Dioscor, Inc.	CEO & President
Mr. Paul G. Thomas	LifeCell Corporation	CEO, President & Chairman

## Government

Name	Company	Title
Ms. Caren S. Franzini	NJ Economic Development Authority	Executive Director
Mr. Henry W. Kurz	NJ Commerce & Economic Growth Com.	Account Manager
Ms. Jeanne Oswald	NJ Commission on Higher Education	Deputy Executive Director
Senator Robert W. Singer	New Jersey State Senate	Senator, District 30
Dr. John V. Tesoriero	NJ Commission on Science & Technology	Executive Director

# Interviews Completed (cont.)

Academia		
Name	Company	Title
Ms. Diane Ambrose	Rutgers University	Asst. Director of Special Projects
Dr. Michael E. Breton	Rutgers University	Associate VP, Research and Sponsored Programs
Dr. James Broach	Princeton University, Genomics Institute	Acting Director
Ms. Diane Carol	Innovation Science Center	Director
Dr. Roy Chaleff	UMDNJ	Director, Special Projects
Dr. Bonnie Diehl	UMDNJ	Director of Academic Initiatives
Dr. William Hunter	New Jersey Institute of Technology, Biomedical Engineering	Chair
Mr. Joe Montemarano	Princeton University	Director of Industrial Liason
Ms. Rebecca Perkins	UMDNJ	N/A
Dr. Joseph Seneca	Rutgers University	University VP for Academic Affairs
Dr. James Sturm	Princeton University, Engineering School	Dean
Dr. Shirley Tilghman	Princeton University	President
Dr. Howard P. Tuckman	Rutgers University, Business School	Dean
Dr. Warren Warren	Princeton University, POEM Center	Acting Director
Dr. Wise Young	Rutgers University, Keck Center for Collaborative Neuroscience	Director

Other (Institutions for Collaboration / Venture Capital / Law Firms)		
Name	Company	Title
Mr. Keith L. Brownlie	Ernst & Young LLP	Partner
Mr. Robert Franks	HealthCare Institute of New Jersey	President
Ms. Debbie Hart	Biotechnology Council of New Jersey	President
Mr. Robert Hawkes	PaceSetter Group	Partner
Mr. Patrick Kelly	Biotechnology Industry Organization	Dir., State / Govt. Affairs
Mr. Arthur Klausner	Domain Associates	General Partner
Ms. Jayne Mackta	NJ Association for Biomedical Research	Executive Director
Mr. James J. Marino	Dechert	Partner
Mr. Gil Medina	Cushman & Wakefield	Director-in-Charge
Mr. Gordon V. Ramseier	The Sage Group	Executive Director
Ms. Lisa Skeete Tatum	Cardinal Partners	General Partner
Mr. Raymond Thek	Hale & Dorr	Senior Partner

# Objectives

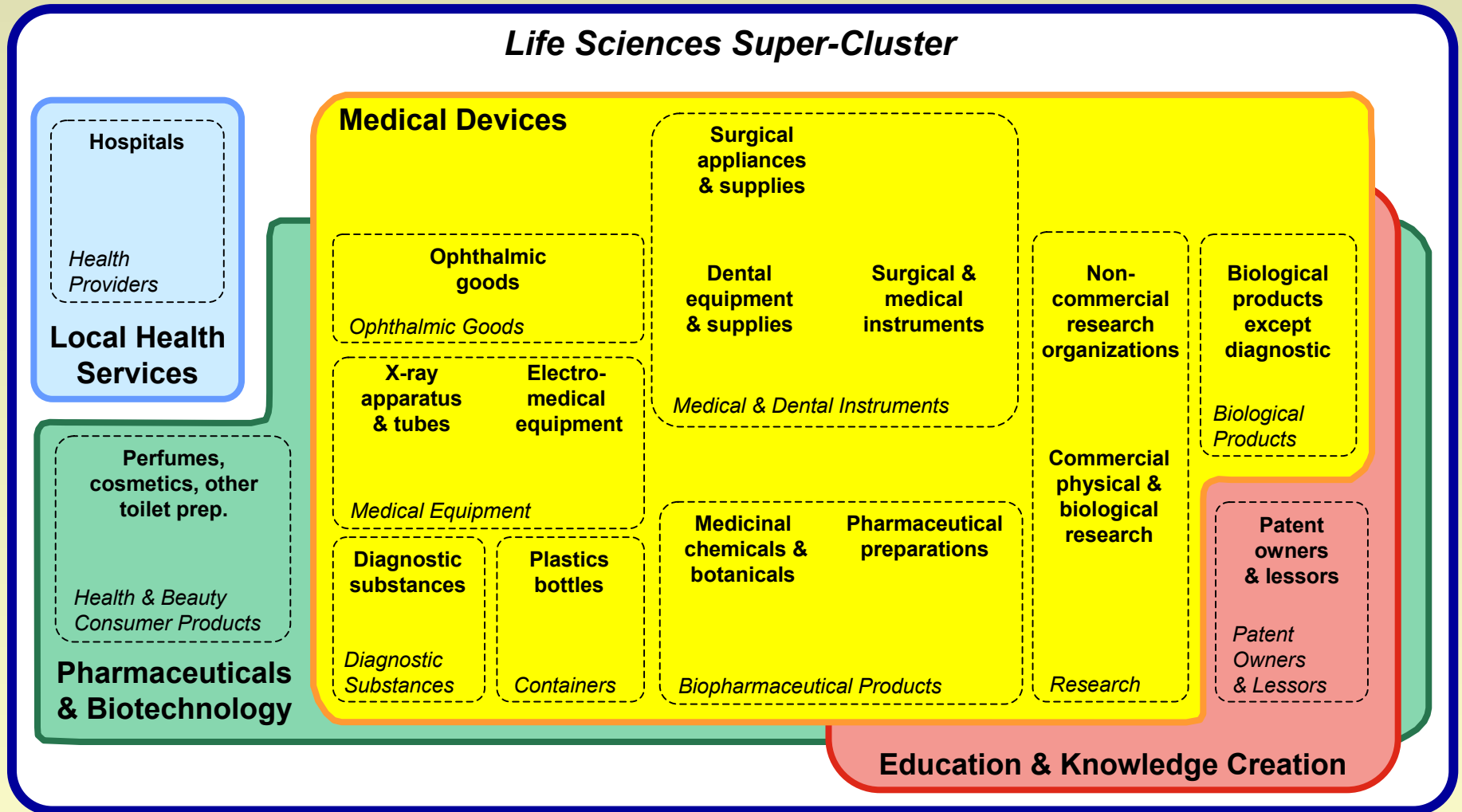
- New Jersey is one of the world leaders in life sciences, but it is a **crowded field**
  - Many other regions have strong and growing life science clusters (e.g., California, Massachusetts, North Carolina, the United Kingdom)
  - Many more regions are **committing resources** to building and improving their life sciences cluster
- Recent New Jersey State **government efforts** at revamping the state university system (e.g., the Vagelos Commission) underscores a unique opportunity for New Jersey to upgrade elements of the business environment



- This **collaborative** initiative seeks to contribute to the development of a **strategic action agenda** for New Jersey to ensure continued leadership in life sciences



# Definition of the Life Sciences Super-Cluster



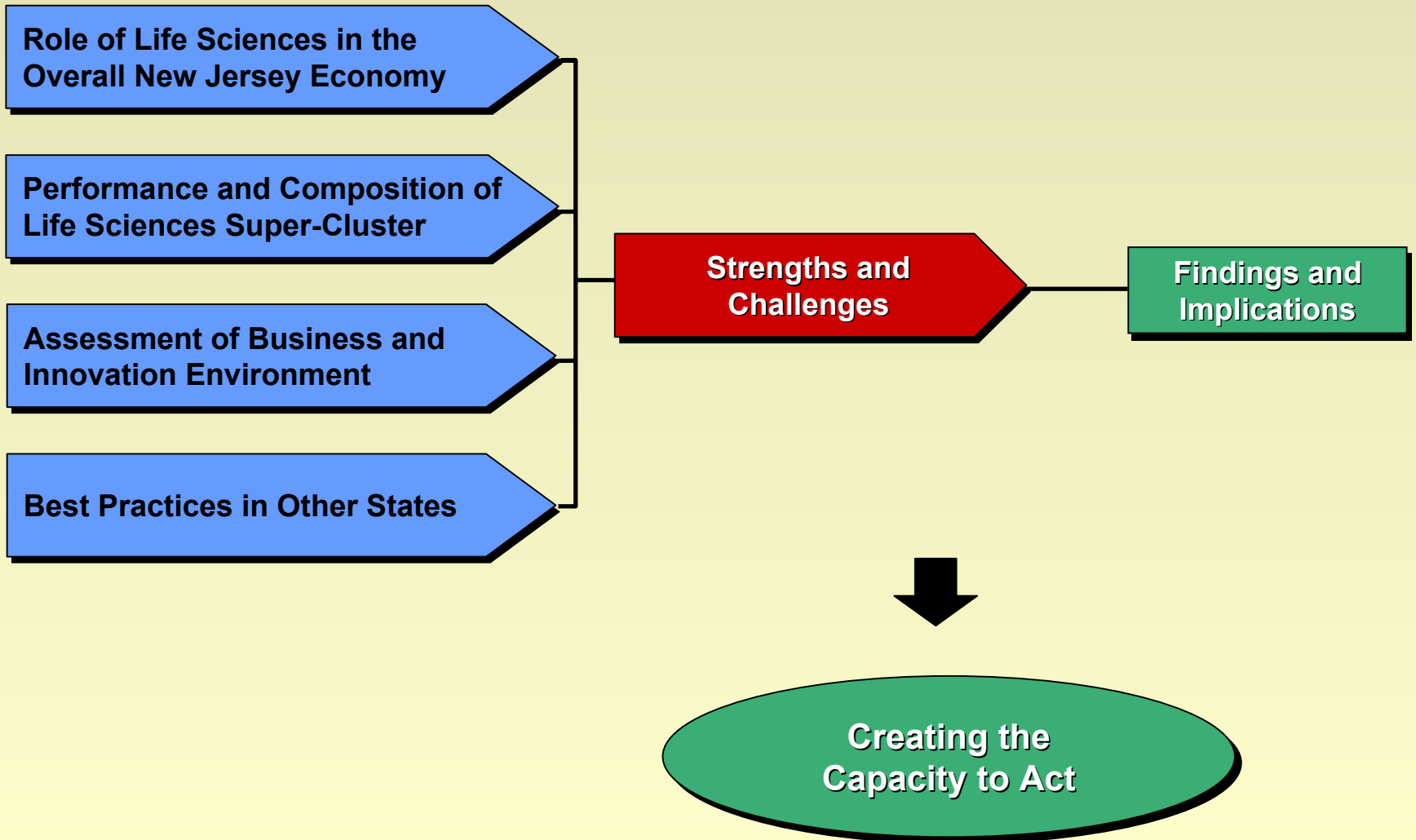
**Legend:**



Note: Colored backgrounds represent clusters in life sciences; dotted rectangles represent sub-clusters in life sciences; circles represent industries in life sciences

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Overview of the New Jersey Life Sciences Initiative



# Role of Government

## Role of Federal Government

- Invest in the foundations of science and technology
- Improve the innovation policy context
- Allocate federal resources in ways that reinforce cluster development
- Provide better data for measuring regional economic composition and performance
- Encourage the development of regional economic development strategies that stress innovation

## Role of State Governments

- Invest in the foundations of science and technology
- Sponsor state programs that encourage cluster development
- Focus business recruitment around strong clusters
- Create a regional dimension to state economic development strategies
- Improve information systems to regularly collect data and measure progress

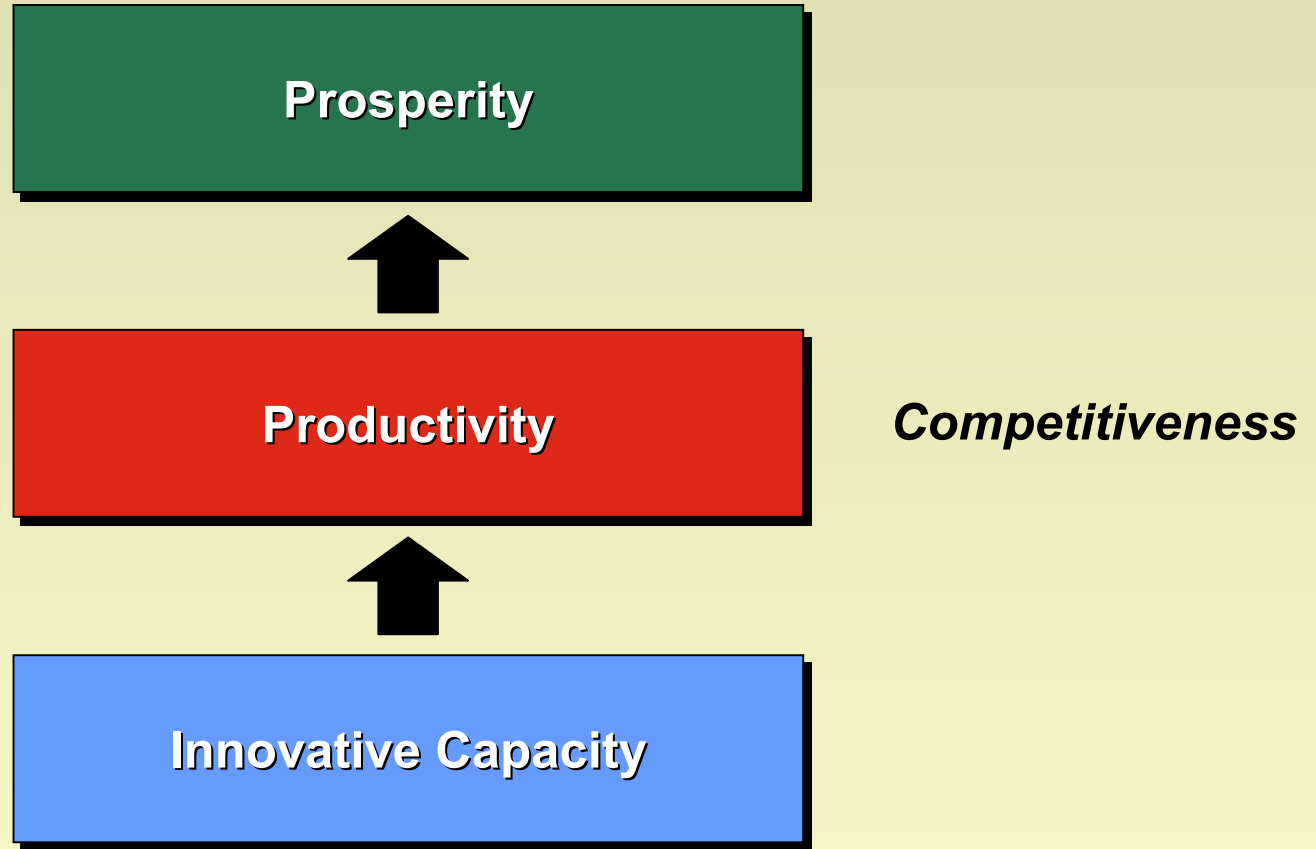
## Role of Local Regional and Local Governments

- Strongly support K–12 education
- Upgrade core business infrastructure
- Develop a regional strategy that involves all stakeholders
- Encourage cluster development

# Agenda

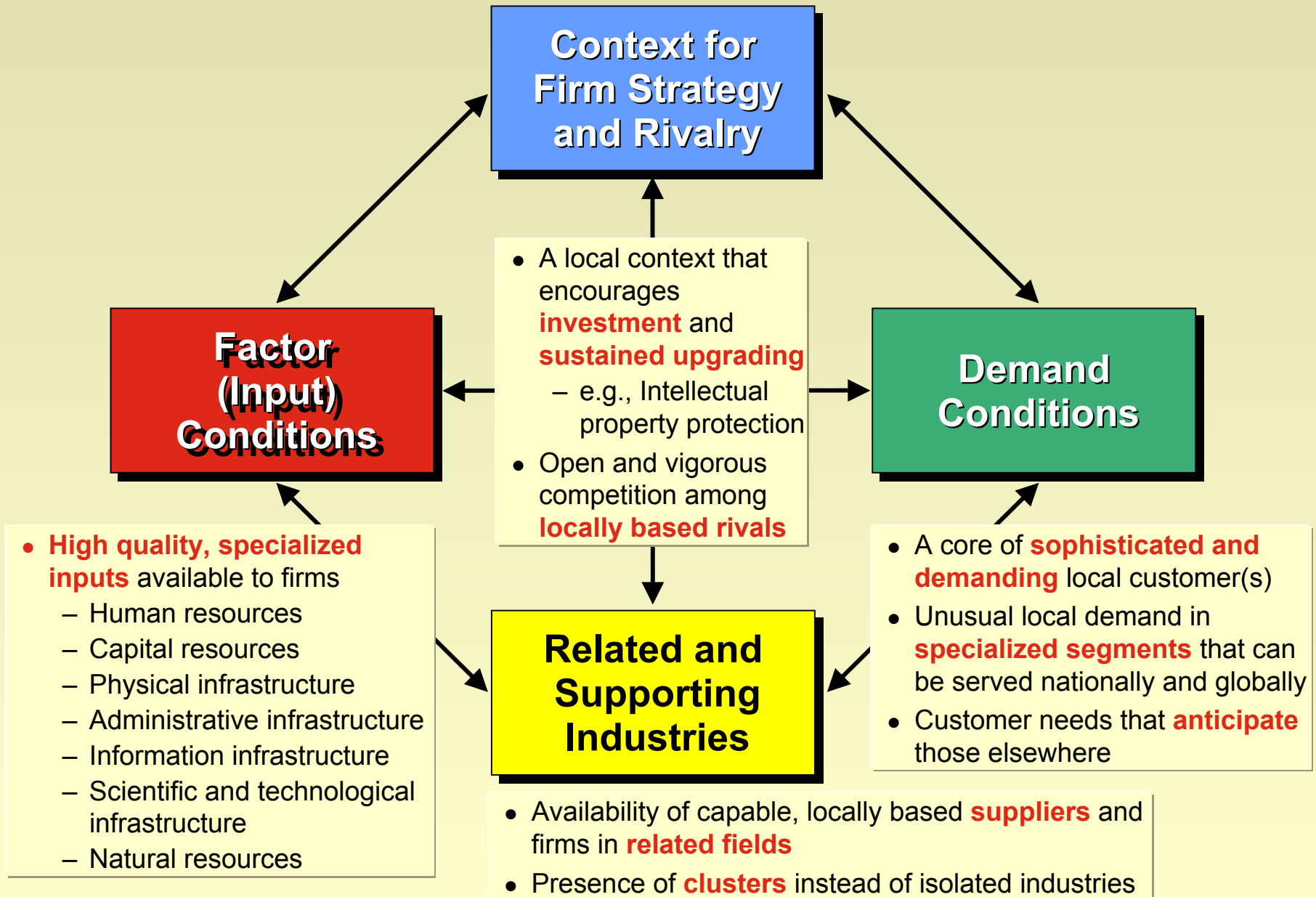
- Overview of the New Jersey Life Sciences Initiative
- **Conceptual Framework and Methodology**
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# Sources of Prosperity

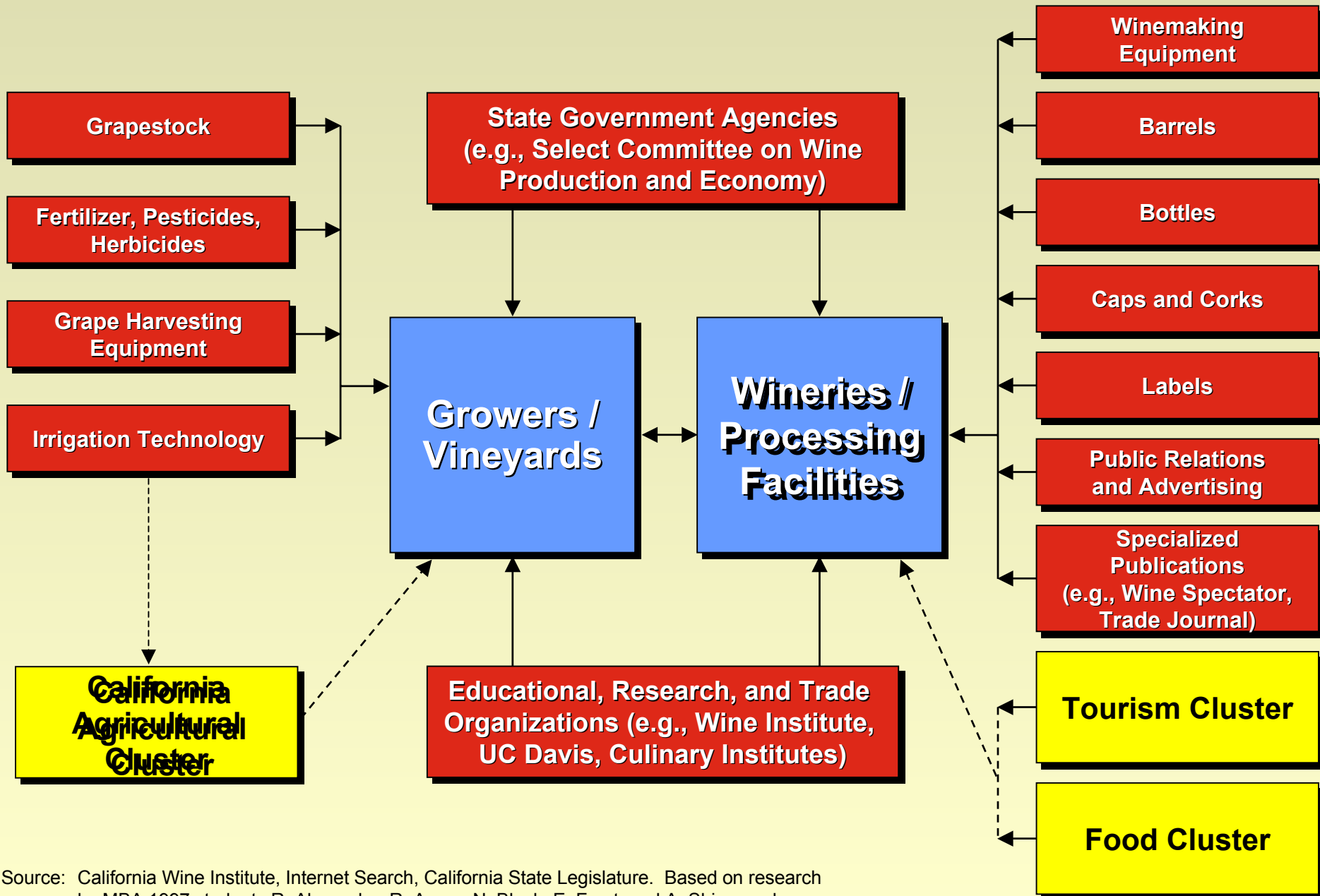


- Prosperity does not depend on **what** industries a region competes in, but on **how** it competes
- The prosperity of a region depends on the productivity of **all** its industries
- Innovation is **fundamental** to competitiveness in advanced economies

# The Business Environment



# The California Wine Cluster



Source: California Wine Institute, Internet Search, California State Legislature. Based on research by MBA 1997 students R. Alexander, R. Arney, N. Black, E. Frost, and A. Shivananda

# Selected Institutions for Collaboration

## New Jersey

### Life Sciences Cluster-Specific

#### Private Sector Industry Groups

- Biotechnology Council of New Jersey
- HealthCare Institute of New Jersey

#### Private Sector Research Institutes

- Abbot Consortium for Technology

#### Informal Networks

- Merck, Johnson & Johnson, Aventis, Bristol-Myers-Squibb, Schering-Plough alumni

#### Joint Private / Public Industry Groups

- New Jersey Hospital Association
- New Jersey Biotechnology and Life Sciences Coalition
- New Jersey's Commission on Science and Technology
- New Jersey Technology Council's Life Science Industry Network

#### Joint Private / Public Research Institutes

- Center for Advanced Biotechnology and Medicine
- Research and Development Council of New Jersey

### General

#### Private Sector Industry Groups

- Greater New Jersey Process Technology Alliance
- The Business Coalition for Educational Excellence
- New Jersey Business / Industry / Science Education Consortium

#### Informal Networks

- New Jersey Institute of Technology, UMDNJ, Princeton, Rutgers alumni
- Alumni from other universities
- Angel investor community

#### Joint Private / Public Industry Groups

- Commission on Health Science, Education, and Training (Vagelos Commission)
- New Jersey Technology Council Venture Fund
- New Jersey Presidents' Council
- Prosperity New Jersey



# Agenda

- Overview of the New Jersey Life Sciences Initiative
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- **Economic Performance and Innovation Output of New Jersey**
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# New Jersey's Economy

## Overview

- New Jersey's economy has **outpaced** the national average on several measures
- **Innovation output** is high on an absolute basis
- New Jersey's life sciences super-cluster is the **fifth largest** in the state in terms of direct employment
- New Jersey's life sciences super-cluster **added 5,403 jobs** in terms of direct employment between 1990–2000, ninth most among the region's traded clusters
- New Jersey's life sciences super-cluster is the **fourth highest wage** cluster in the region
- New Jersey has high total patent output, but is ranked lower on a **per capita** basis
- New Jersey's economy enjoys **strong and growing positions** in several clusters

### *however...*

- A series of measures of innovation and dynamism are lagging
- VC funding per worker, IPOs per worker, patents per worker, and patent growth are **lower** than the national average
- Certain core clusters are being **outpaced** by other regions in terms of employment growth

# Economic Performance and Innovation Output

## New Jersey

### Economic Performance

#### Employment

- **Employment CAGR of 1.0% between 1990–2000 was below the national average of 2.0%**

#### Unemployment

- Unemployment rate of 5.5% in December, 2002 was slightly below the national average of 6.0%

#### Average Wages

- Average wage of \$41,450 was 22% above the national average of \$34,011 in 2000

#### Wage Growth

- Growth rate for average wages was 4.6% between 1990–2000 vs. 4.2% for the U.S.

#### Cost of Living

- **Cost of living index was 42.5% above the national average in the 3<sup>rd</sup> Quarter, 2002**

#### Exports

- Per capita exports are 12% higher than the national average in 2001 and grew 4.1% faster than the U.S. as a whole between 1997–2001

### Innovation Output

#### Patents

- 11.2 patents per 10,000 NJ workers in 2000, well above the national average of 7.5, **but growing slower at 2.5% vs. 4.1% for the nation between 1990–2000**

#### Establishment Formation

- **Growth rate for traded establishments was 0.9%, between 1990–2000, versus U.S. average of 1.4%**

#### Venture Capital Investments

- **VC funding in NJ — at \$106 per worker — was slightly lower than the national average of \$125 per worker in 2002\***

#### Initial Public Offerings

- **New Jersey's 0.87 IPOs per 100,000 workers between 1998–2002 is less than leading regions, and declining faster at -47%**

#### Fast Growth Firms

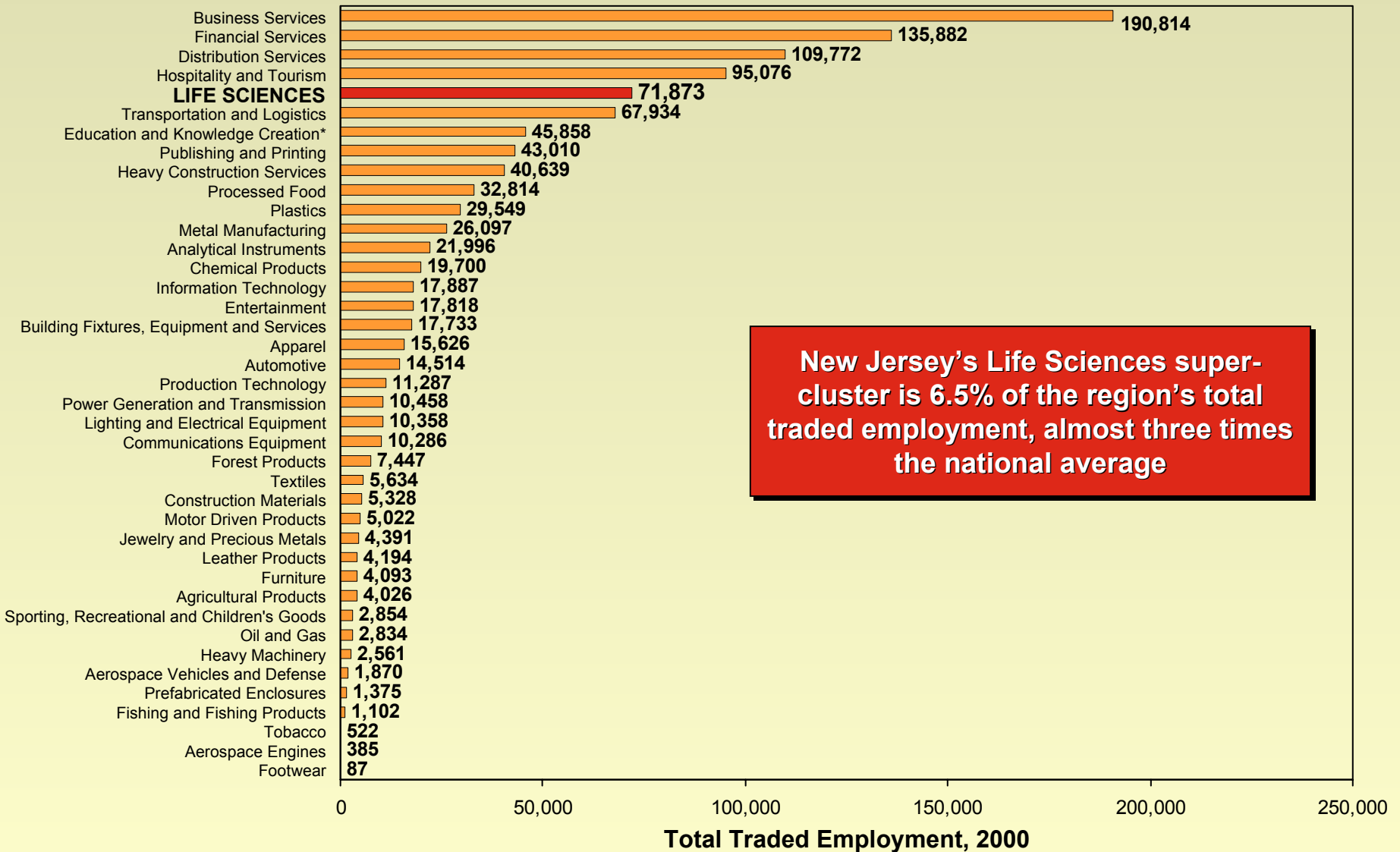
- The state averaged 3.9% of the total Inc500 fastest growing firms between 1993–2002, versus its share of 3.2% of nation's employment

Note: VC investment figures only include 2002 data until 9/30/02. COL index by averaging the ACCRA indices of participating cities and Metropolitan Areas in that state.

Source: Bureau of Labor Statistics; Bureau of Economic Analysis; International Trade Administration; U.S. Patent and Trademark Office; IPO.com; PwC MoneyTree; Inc.500 Magazine; U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; ACCRA

# Employment by Traded Clusters

## New Jersey, Narrow Cluster Definition, 2000



**New Jersey's Life Sciences super-cluster is 6.5% of the region's total traded employment, almost three times the national average**

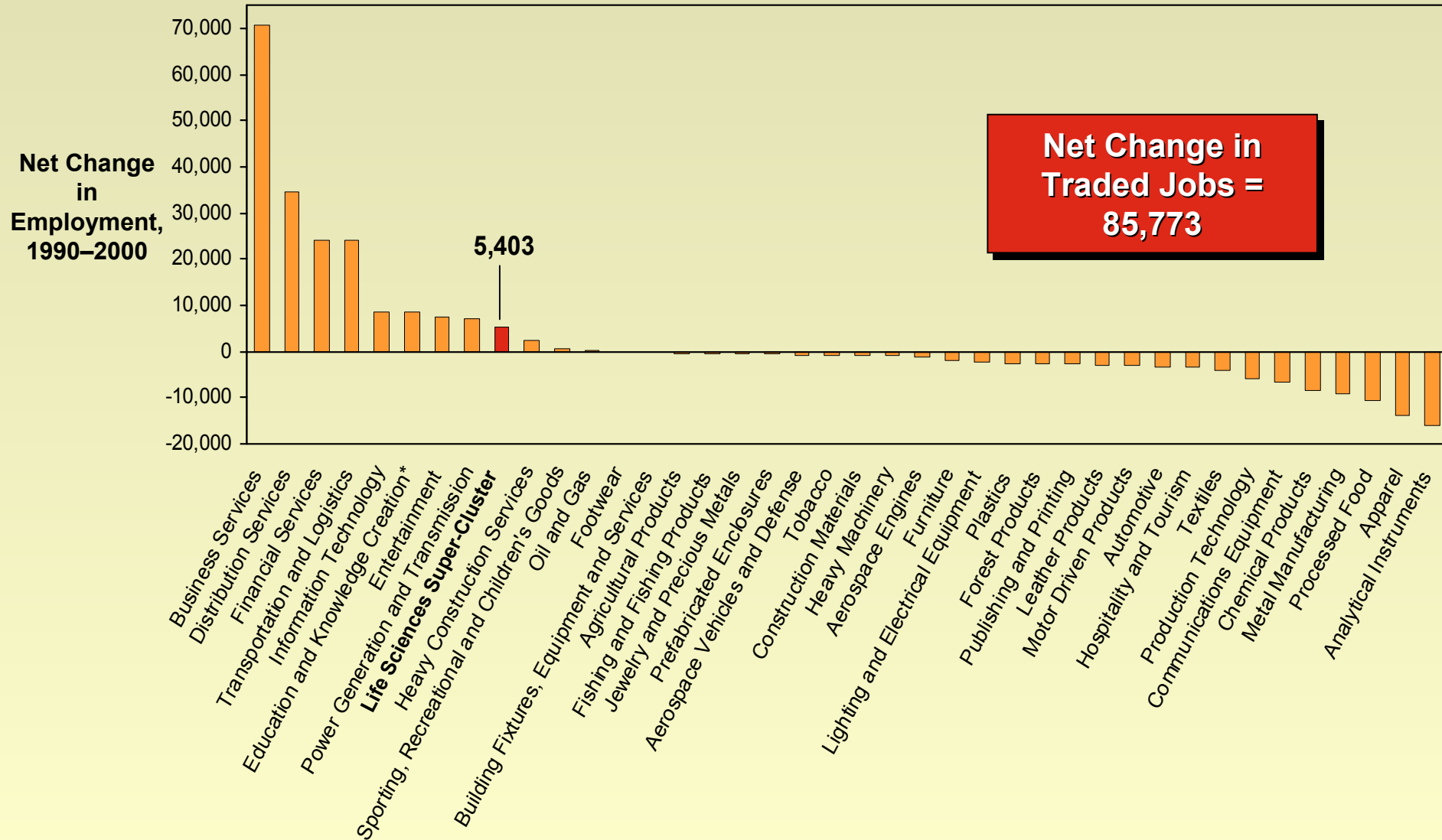
\*Some industries in the education and knowledge creation cluster are included in the life sciences super-cluster

Note: New Jersey's total traded employment equals 1,110,705, total local employment equals 2,252,414, natural endowment employment equals 9,387

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Job Creation by Cluster

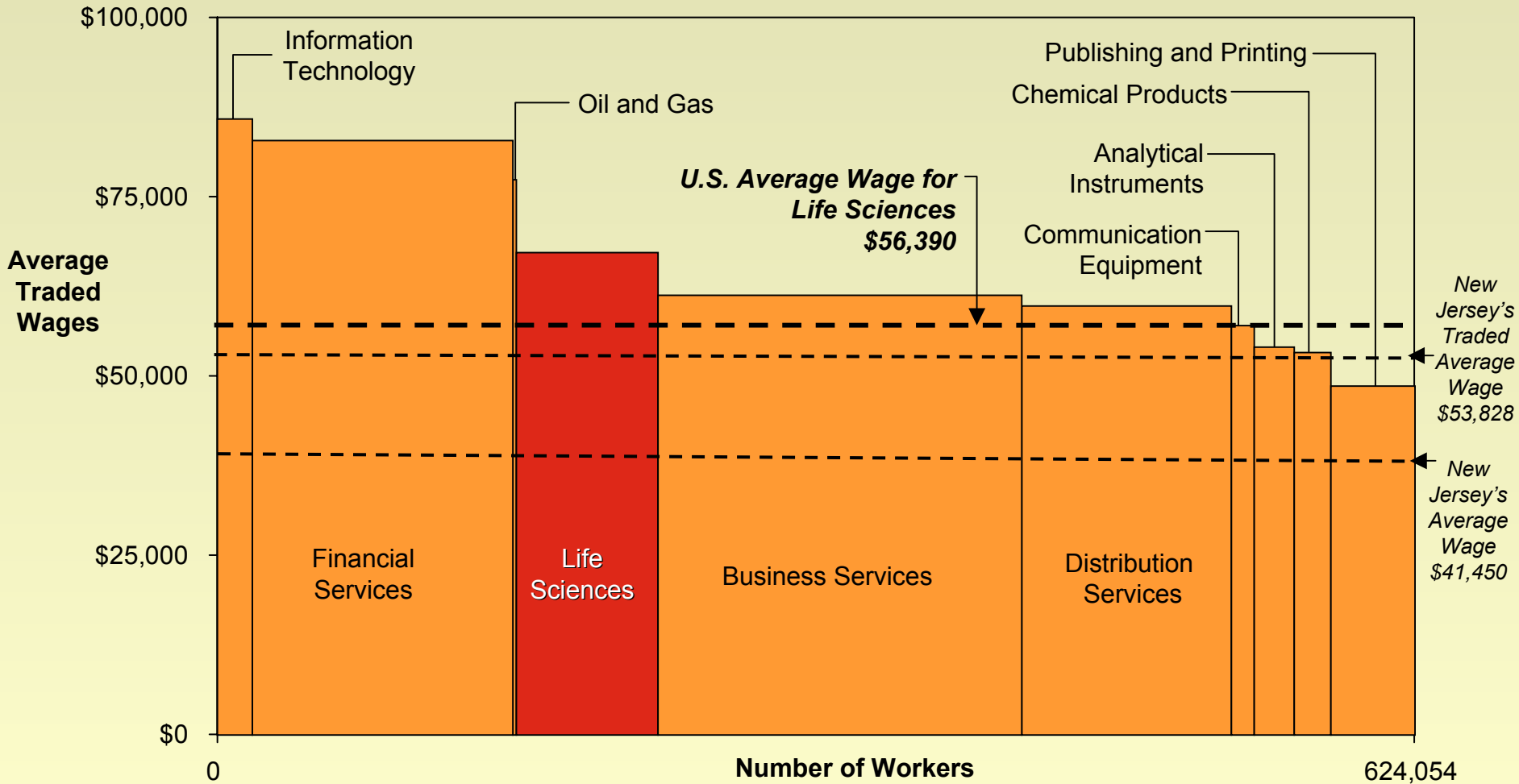
## New Jersey, Narrow Cluster Definition, 1990–2000



\*Some industries in the education and knowledge creation cluster are included in the life sciences super-cluster  
 Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Average Wages for Leading Clusters

## New Jersey, Narrow Cluster Definition, 2000



Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Total Patents and Patents per Capita by State

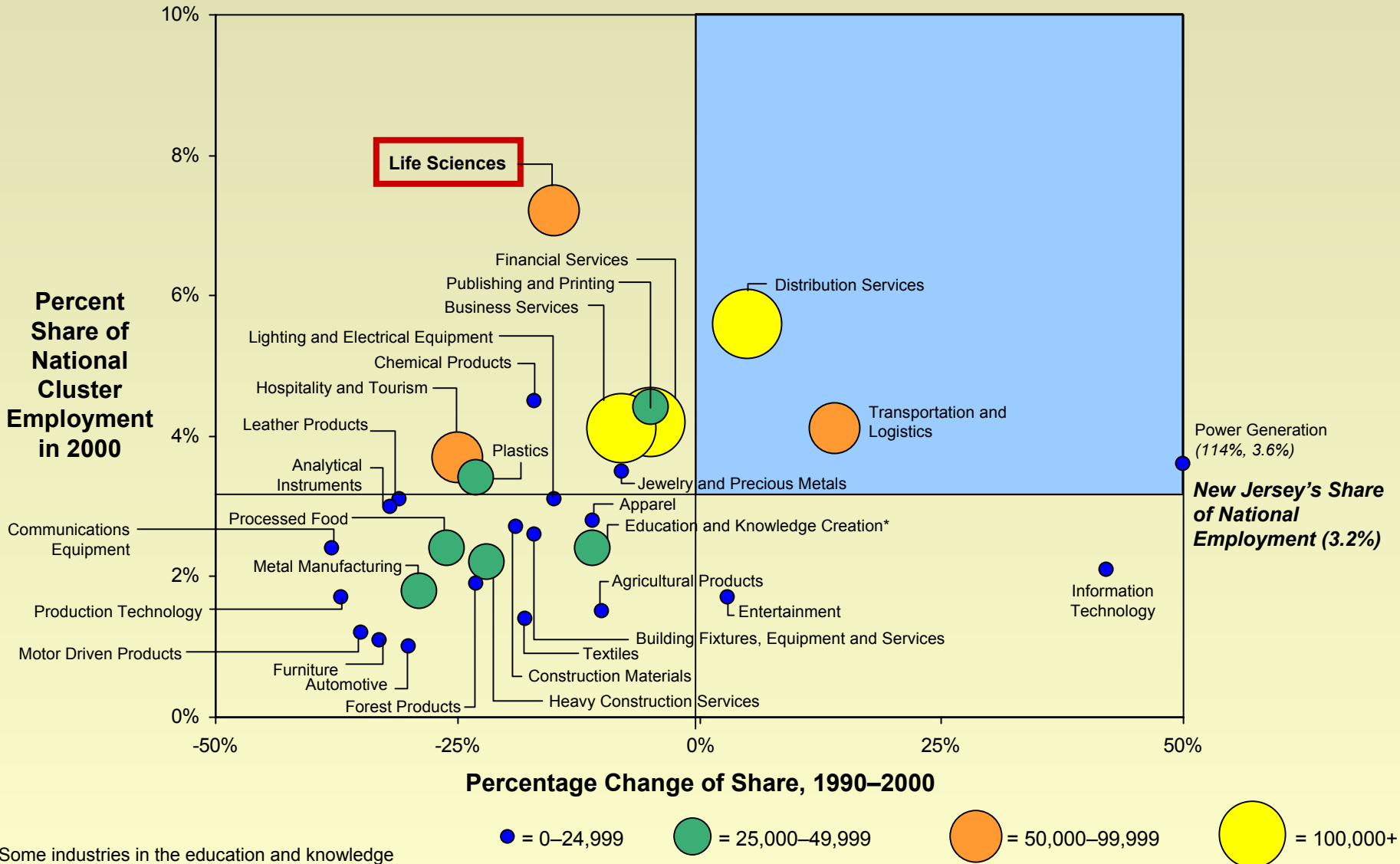
## New Jersey's Relative Patent Performance, 1998-2001

	State Name	Total Patents, 1998-2001	Rank	CAGR 1990-2001	Total Patents per 10,000 Workers 1998-2001	Rank	Total Patents per 100,000 Inhab. 1998-2001	Rank
1	Idaho	5,045	18	12%	74	1	388	1
2	Vermont	1,380	33	13%	40	2	226	2
3	Massachusetts	12,828	7	14%	38	3	202	3
4	Minnesota	9,490	10	16%	33	7	192	4
5	Connecticut	6,449	13	12%	38	4	189	5
6	Delaware	1,435	32	6%	35	5	183	6
7	California	60,100	1	16%	34	6	177	7
8	New Hampshire	2,161	28	16%	30	9	174	8
<b>9</b>	<b>New Jersey</b>	<b>13,857</b>	<b>4</b>	<b>6%</b>	<b>33</b>	<b>8</b>	<b>164</b>	<b>9</b>
10	Colorado	6,407	14	17%	27	10	148	10
11	Michigan	12,906	5	8%	25	11	130	11
12	Oregon	4,158	22	10%	23	13	121	12
13	New York	21,466	3	9%	24	12	113	13
14	Wisconsin	5,955	16	12%	19	22	111	14
15	Washington	6,468	12	14%	21	14	109	15
16	Illinois	12,863	6	10%	21	16	103	16
17	Texas	21,602	2	12%	20	18	103	17
18	Ohio	11,627	9	11%	20	20	102	18
19	Pennsylvania	12,324	8	13%	20	17	100	19
20	Arizona	5,162	17	15%	21	15	100	20

Notes: 2000 BEA population data used for per capita calculations by inhabitants; Sept. 2002 BLS civilian labor data used for per capita calculations by workers;  
 Source: U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Bureau of Labor Statistics; Bureau of Economic Analysis

# Specialization of New Jersey's Economy

## Traded Clusters, Narrow Cluster Definition



\*Some industries in the education and knowledge creation cluster are included in the life sciences super-cluster

Note: (x-axis, y-axis)

Source: U.S. Department of Commerce, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School



# Agenda

- Overview of the New Jersey Life Sciences Initiative
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# Overview of New Jersey's Life Sciences Super-Cluster

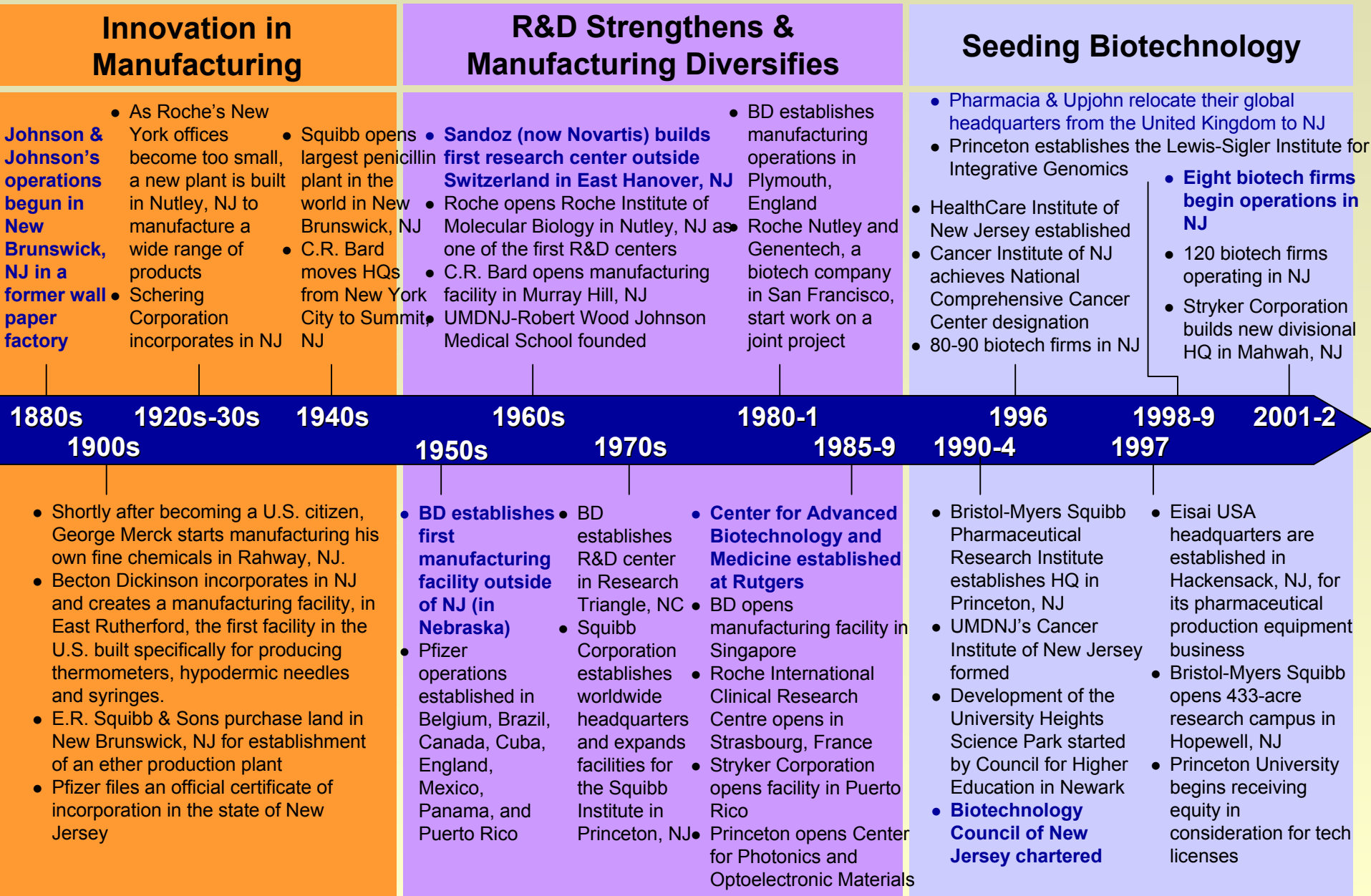
- **Strong position** in life sciences
- Data indicate that **pharmaceuticals and health-related consumer products are anchors** for the cluster
- Among the leaders in **total life science patents**

## *However...*

- Other leading states are **beginning to catch up** on a number of important measures
- New Jersey is **losing its competitive position** in several key metrics
- New Jersey is **muscle-bound** in terms of employment growth in several sub-clusters
- New Jersey's largest employment gains were in commercial physical and biological research, while the largest employment **losses** were in health-related consumer products
- New Jersey's overall life sciences **patent performance is lower** than other leading states
- New Jersey's life science patent growth is **last** in the nation

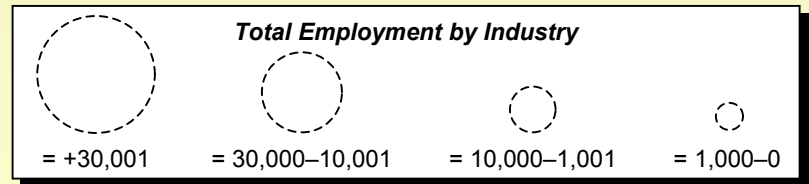
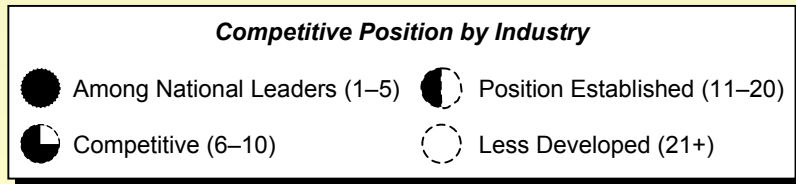
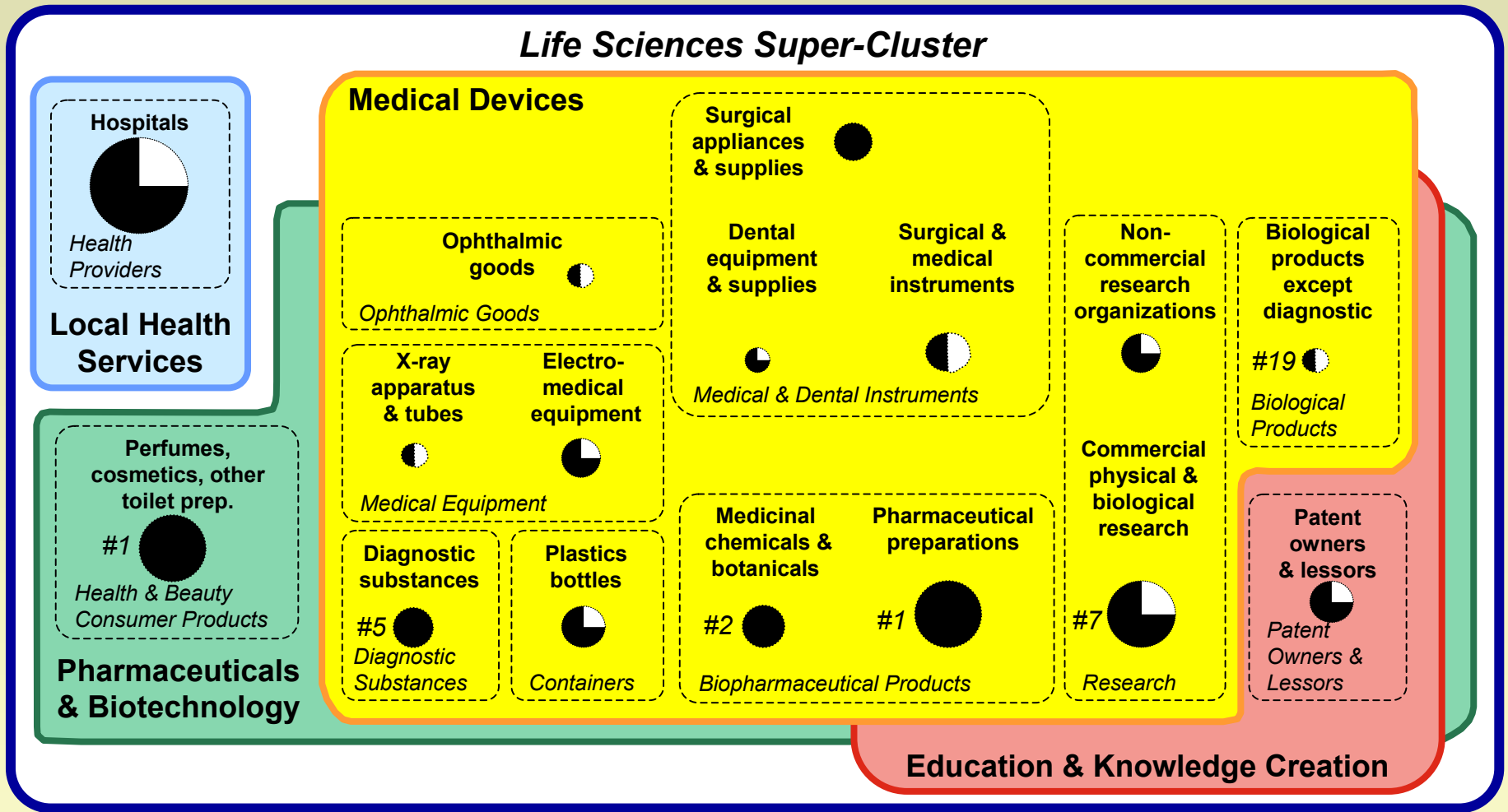
# New Jersey's Life Sciences Super-Cluster

## Economic Development Timeline



# New Jersey's Life Sciences Super-Cluster

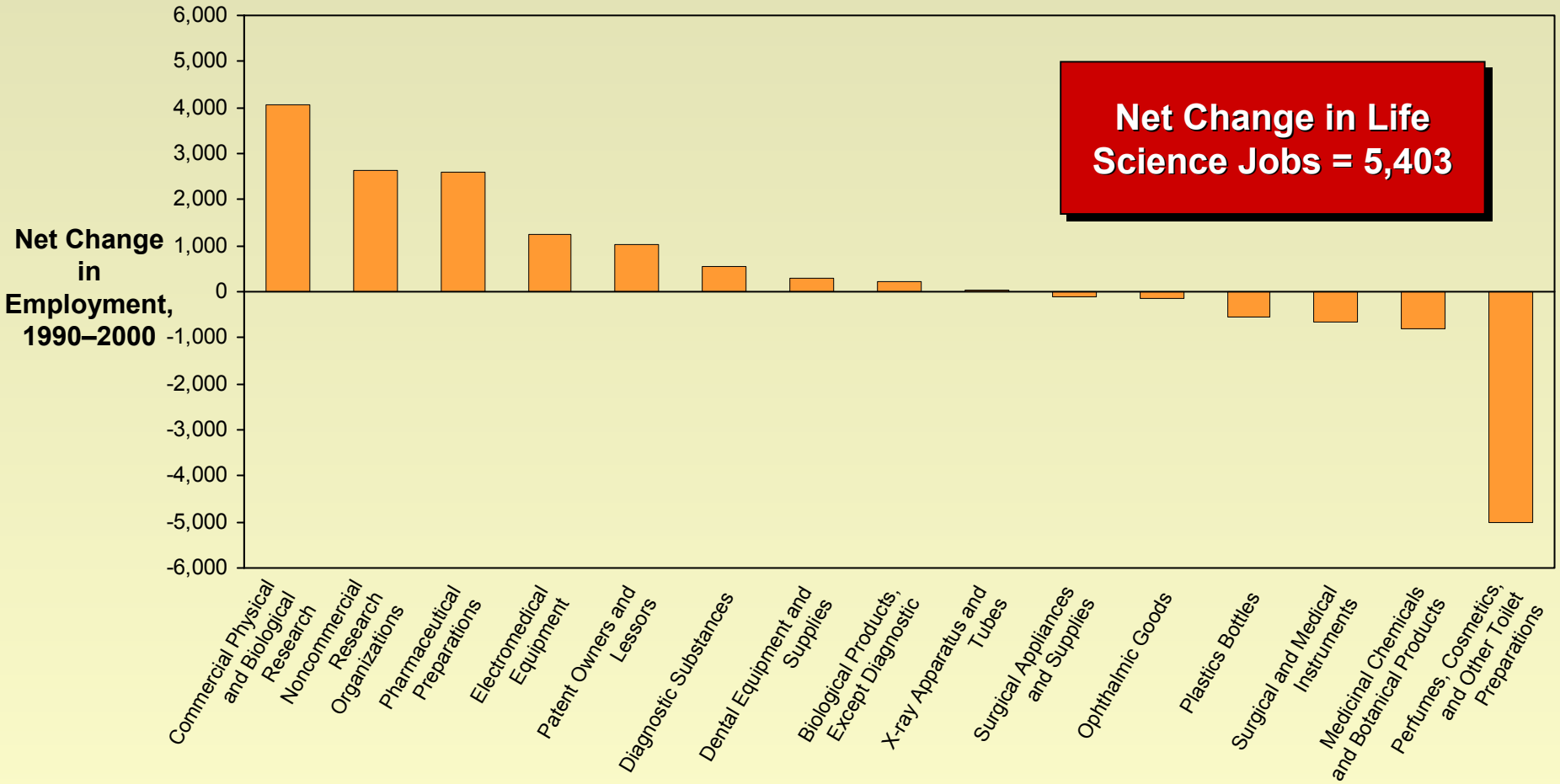
## Total Employment and Competitive Position by Traded Industries



Note: Colored backgrounds represent clusters; Dotted rectangles represent sub-clusters; Circles represent Industries; All industries are Narrow Definition industries  
 Source: U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Composition of the New Jersey Life Sciences Super-Cluster

## Change in Employment Share by Industries

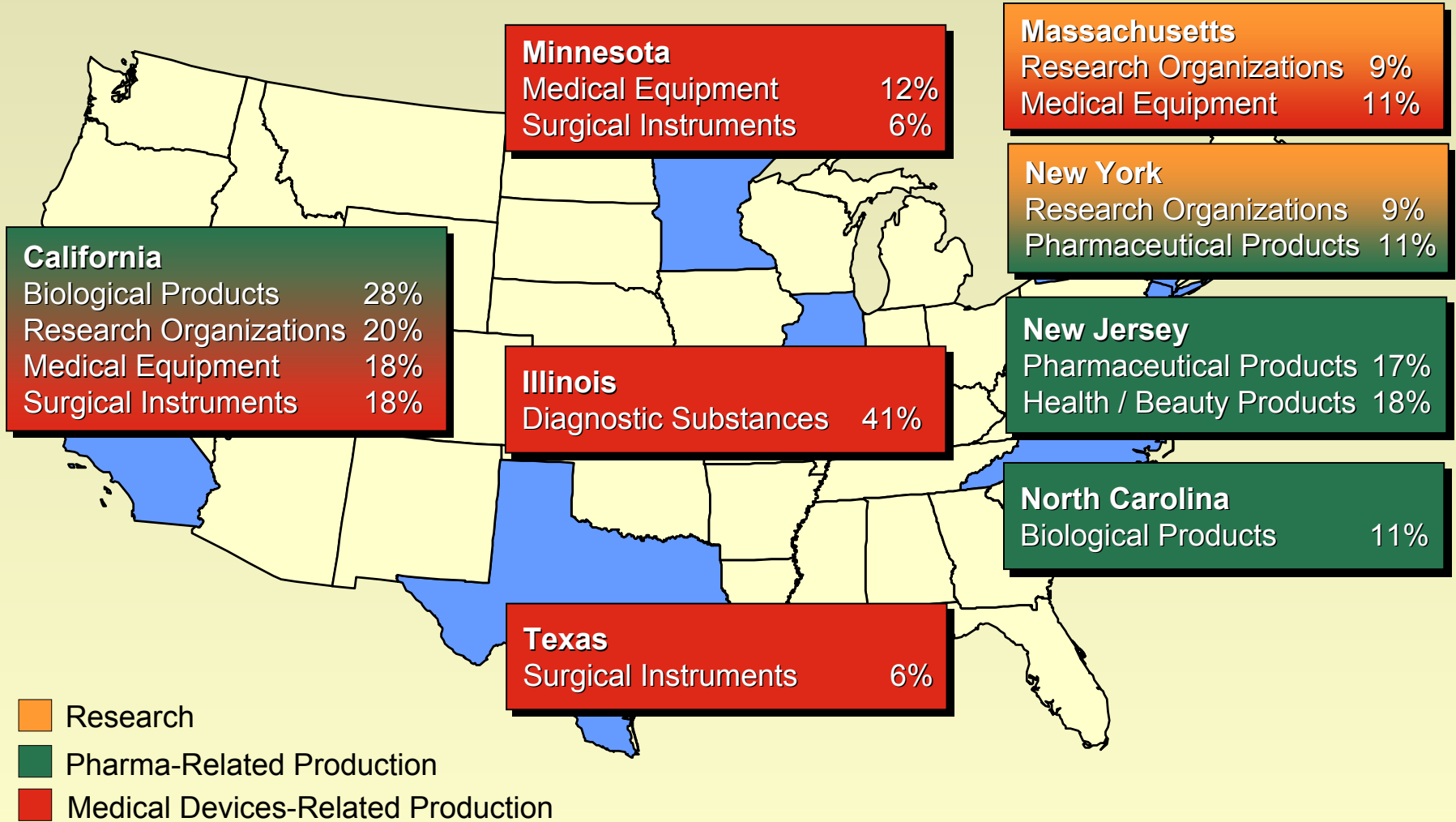


Note: Some industries in the education and knowledge creation cluster are included in the life sciences super-cluster

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Composition of Select Life Sciences Super-Clusters

## Regional Share of National Subcluster Employment

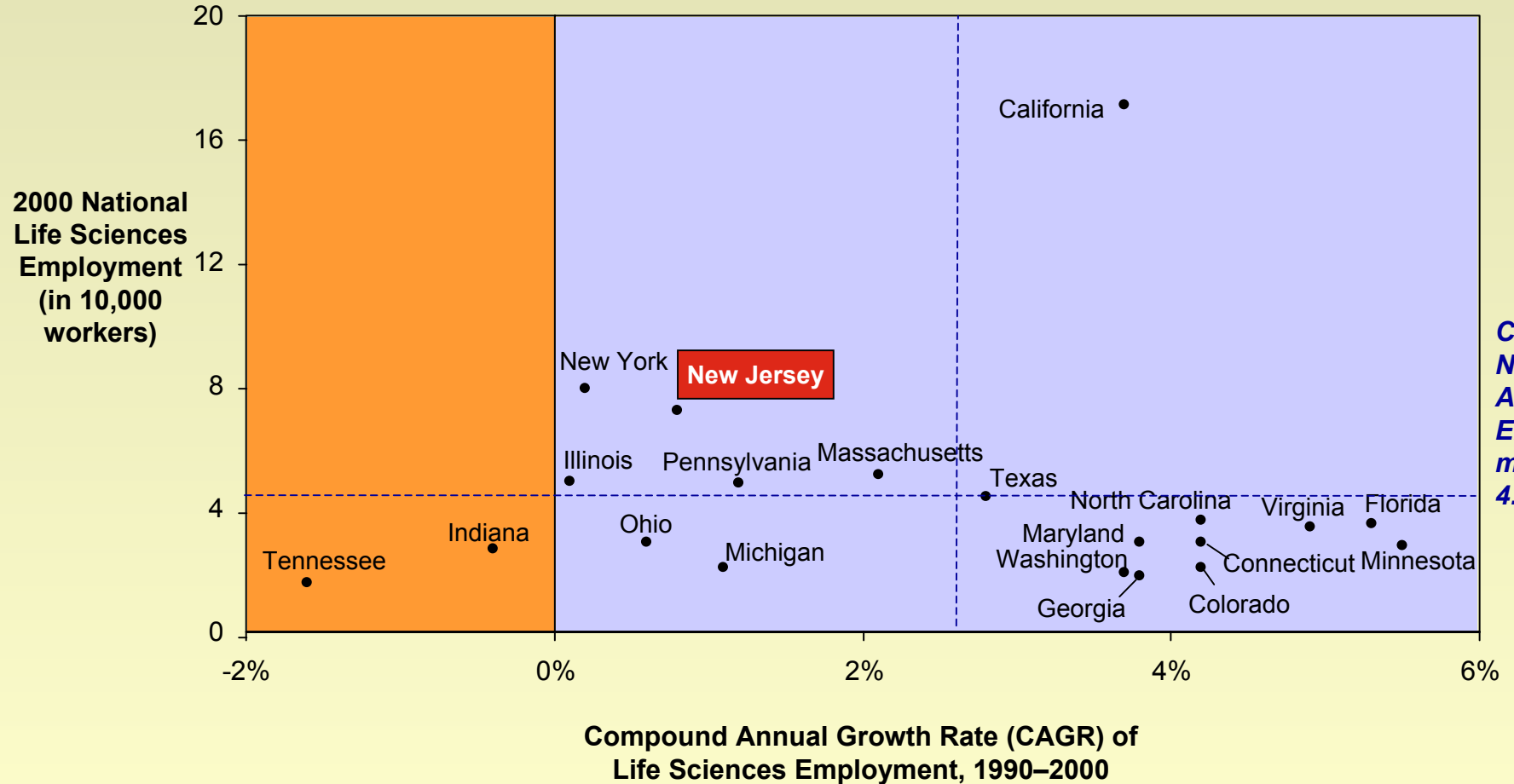


# Economic Performance of Leading Life Sciences Super-Clusters

## Employment and Change in Share of Employment

*Cluster National CAGR of  
Life Sciences Employment:  
2.5%*

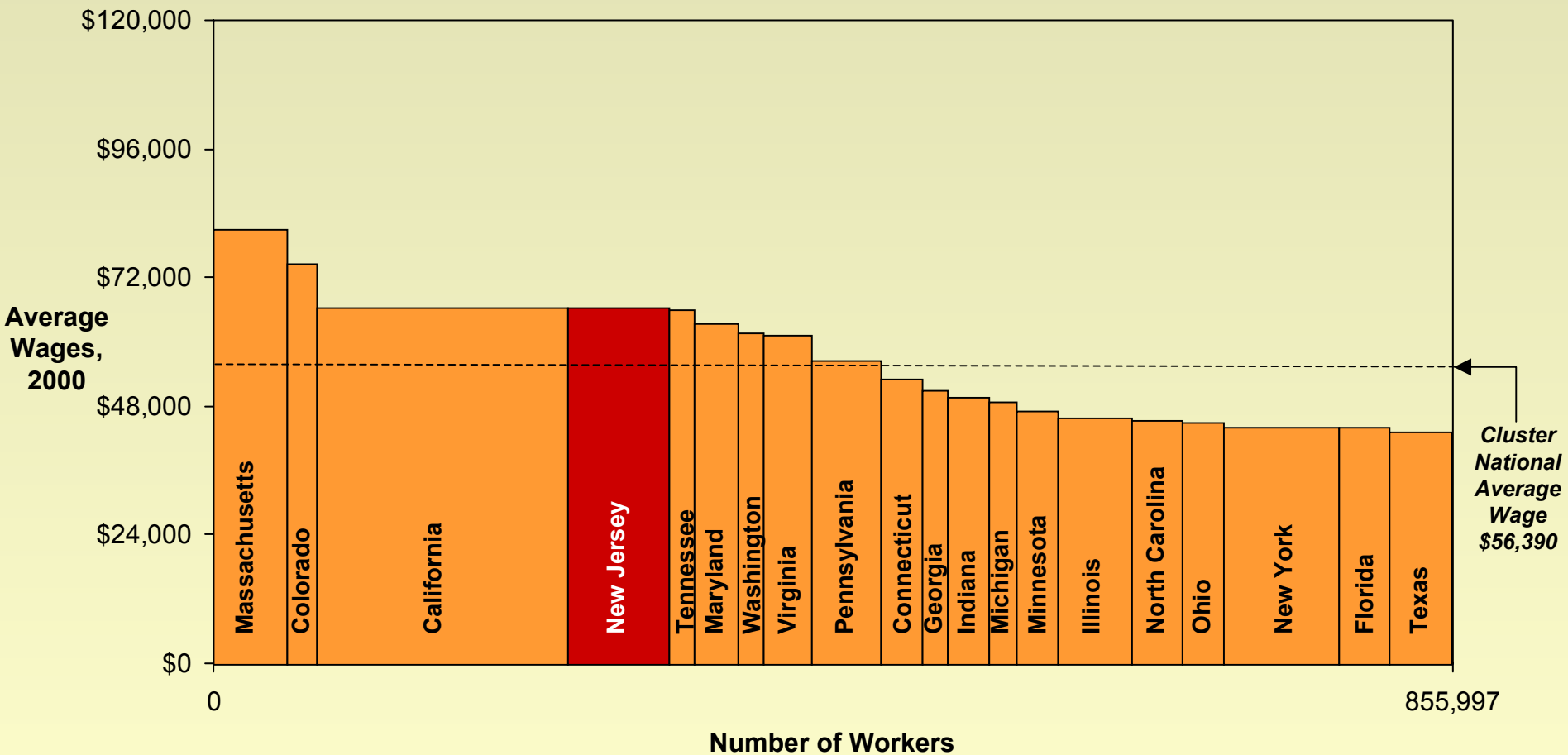
*Cluster  
National  
Average  
Employment:  
4.2*



Note: Leading life science clusters defined as being among the top twenty in life science employment; averages are shown as weighted averages based on total life sciences employment  
Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School  
PNJ-LSI-Princeton Presentation-02-14-03-PMA

# Average Wages

## Leading Life Sciences Clusters, 2000



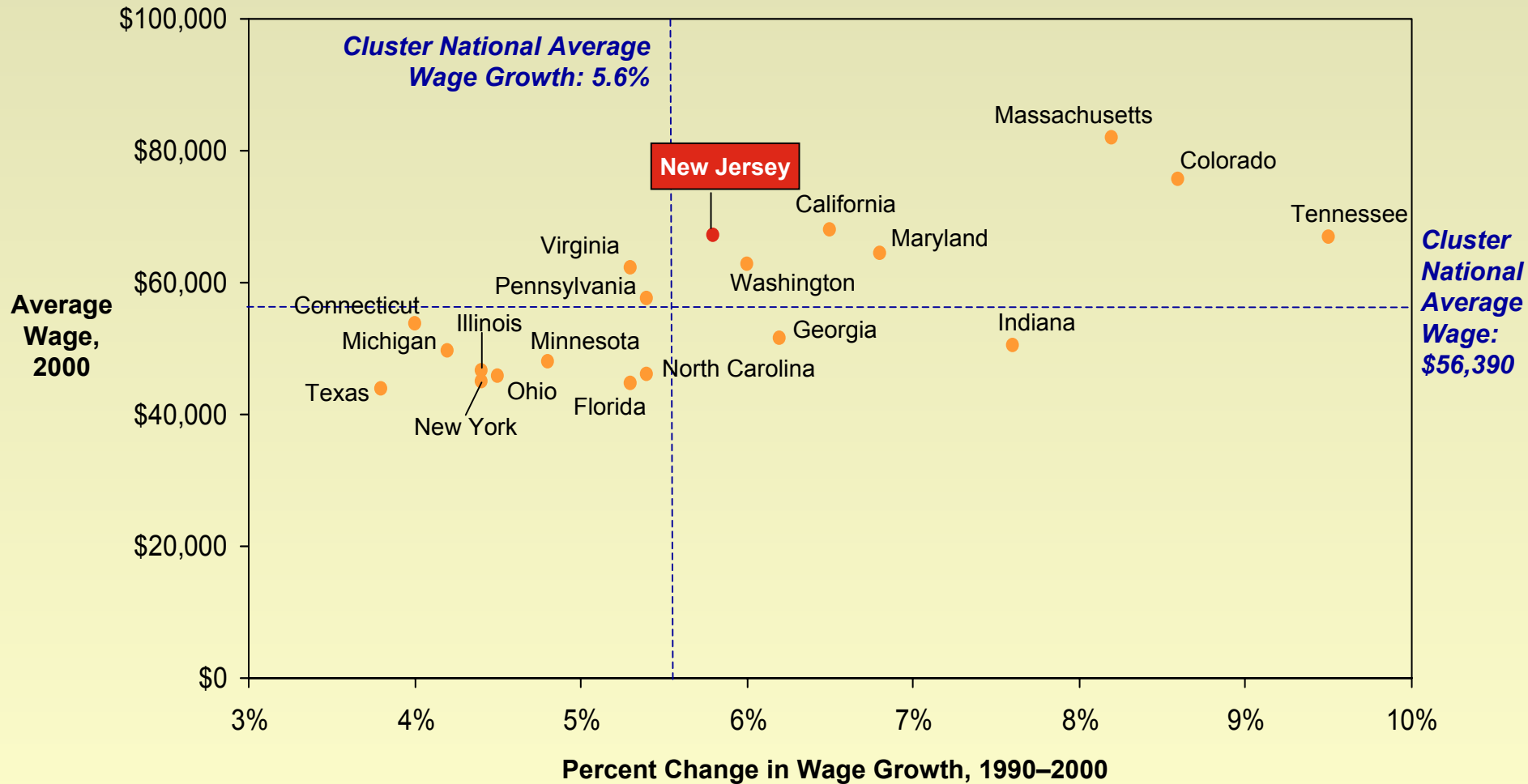
Note: Cluster national average wage is computed as a weighted average based on employment in life sciences; Leading life science clusters defined as being among the top twenty in life science employment

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School



# Economic Performance of Select Life Sciences Super-Clusters

## Average Wage and Changes in Average Wage

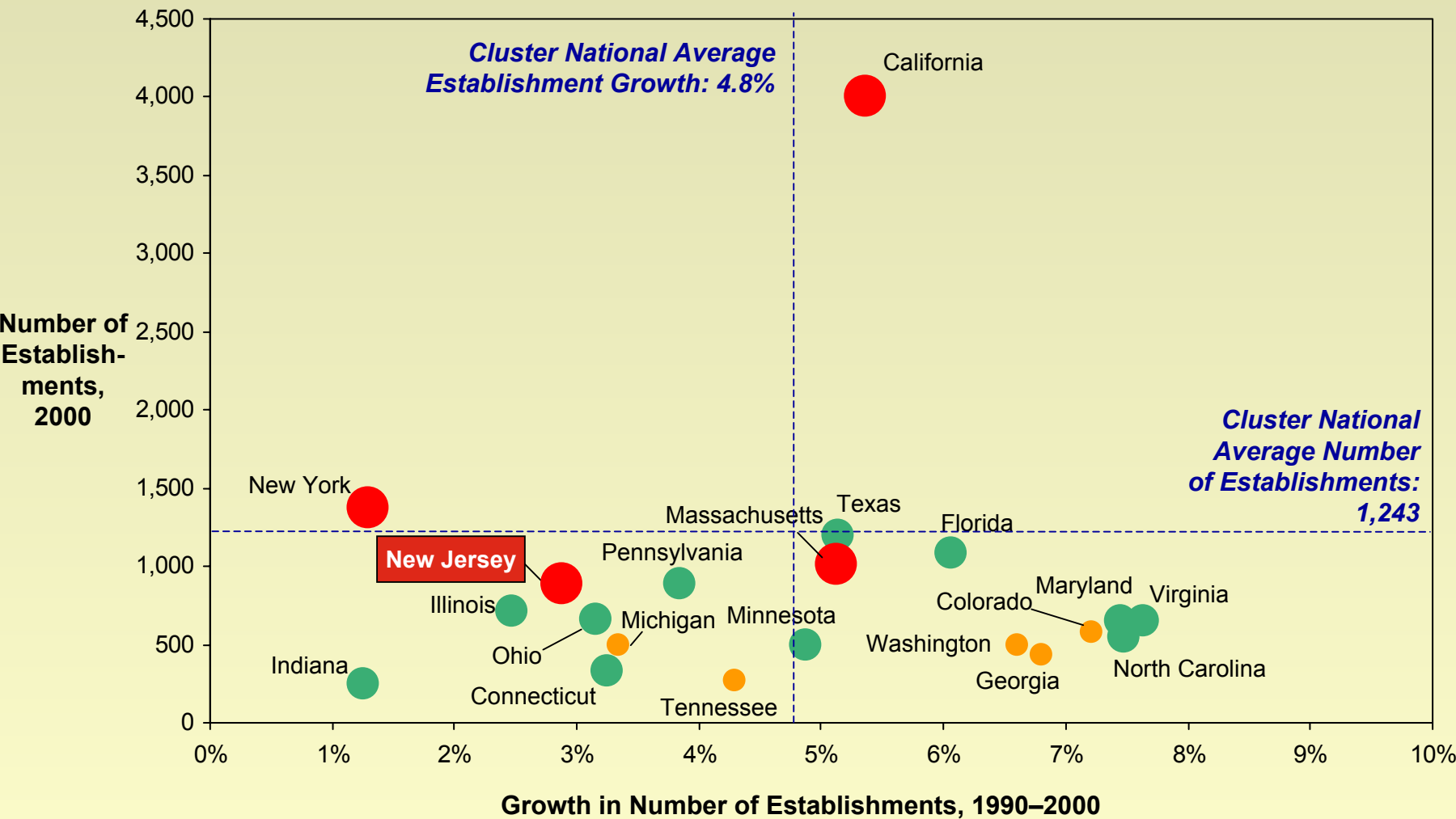


Note: Cluster national average wage and growth are computed as a weighted average based on employment in life sciences; Leading life science clusters defined as being among the top twenty in life science employment

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Industry Structure of Leading Life Science Super-Clusters

## Number and Growth of Establishments, 2000



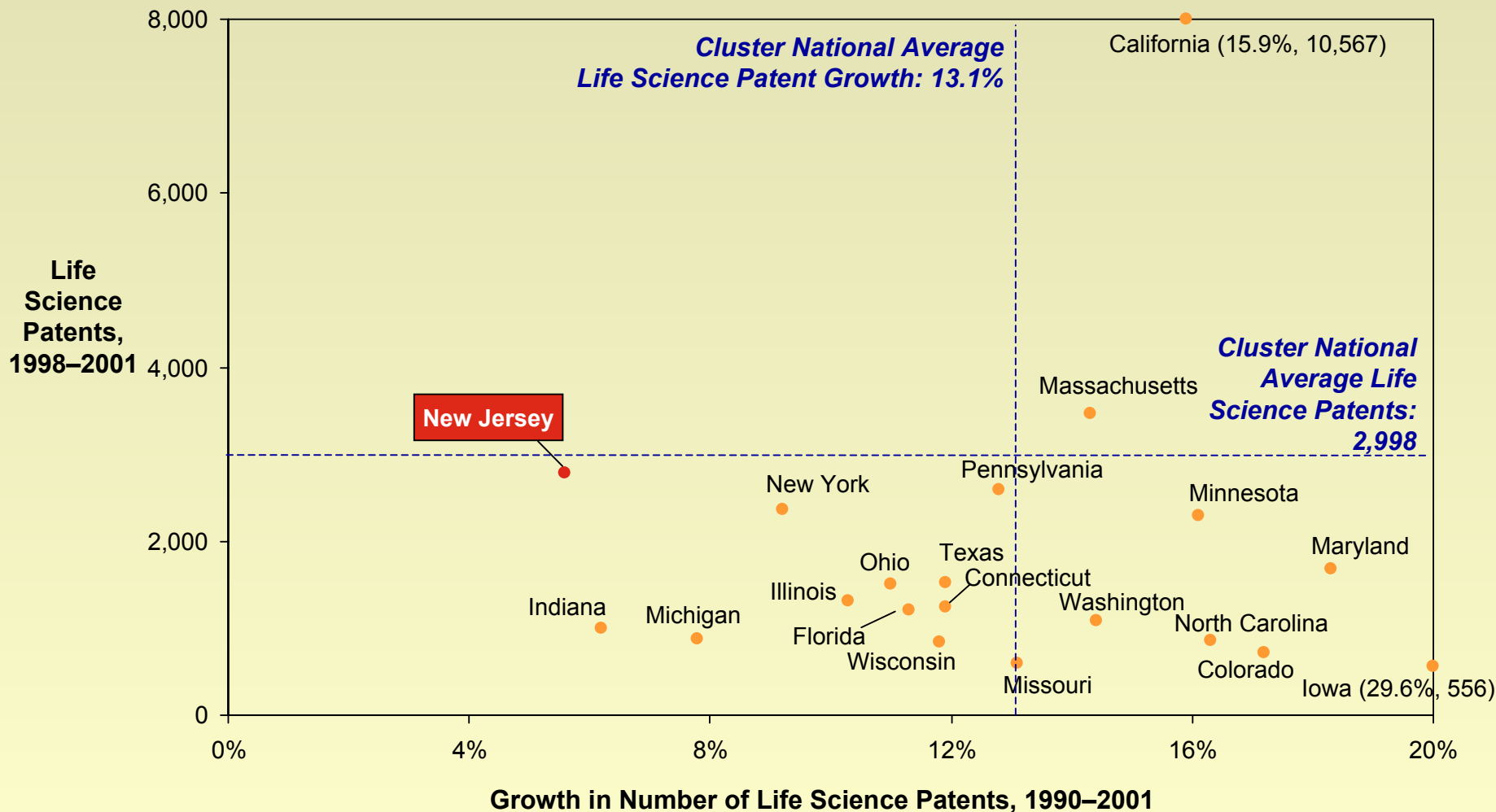
Total Employment, 2000: ● = 50,000+ ● = 25,000-49,999 ● = 0-24,999

Note: Cluster national average of number of establishments and establishment growth are computed as a weighted average based on employment in life sciences; Leading life science clusters defined as being among the top twenty in life science employment

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Innovation Output of Leading Life Science Super-Clusters

## Life Science Patents and Patent Growth, 1990–2001

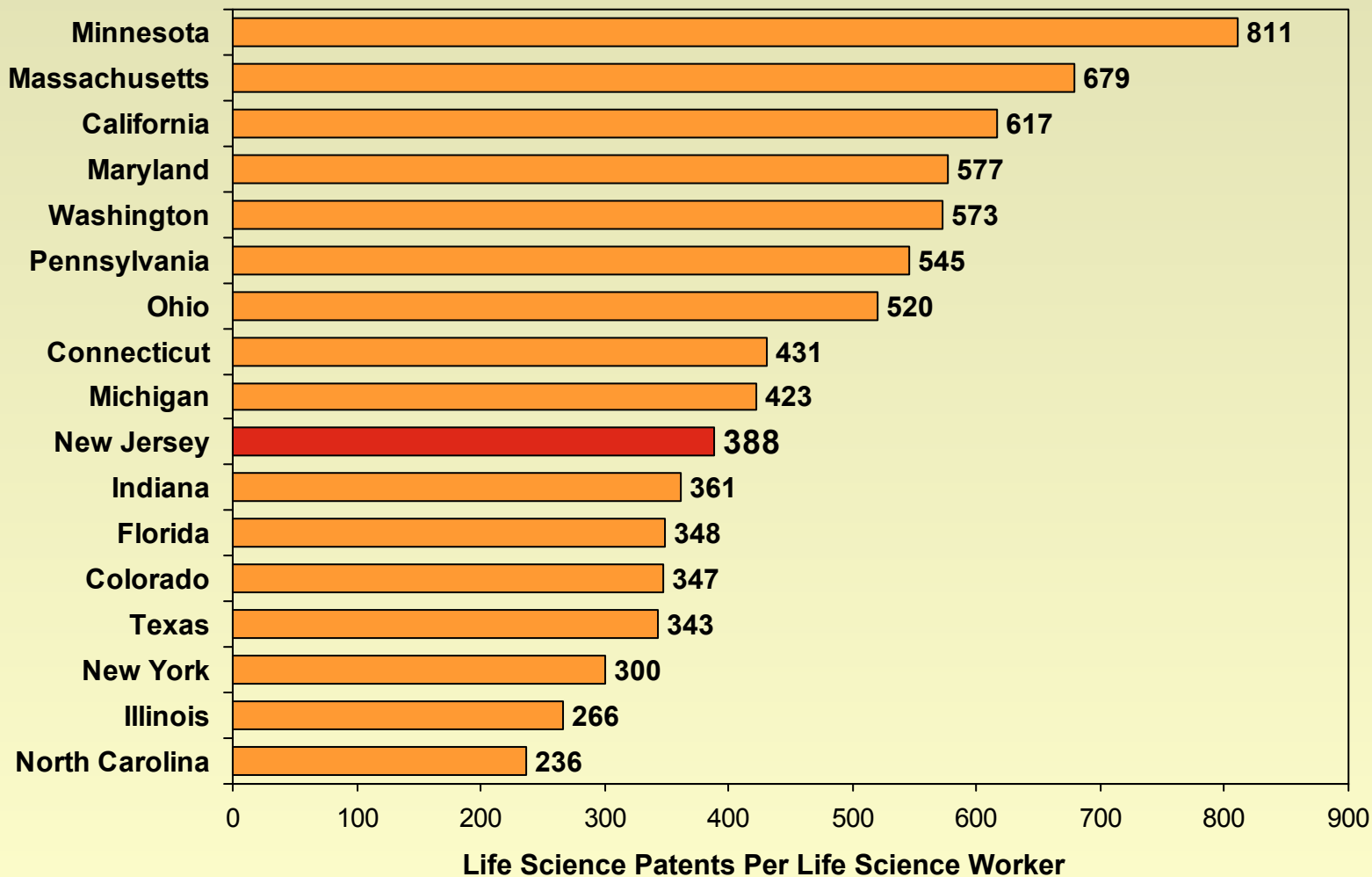


Note: (x-axis, y-axis); Cluster national average life science patents and patent growth are computed as a weighted average based on employment in life sciences; Leading life science clusters defined as being among the top twenty in life science employment

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Innovation Performance of Leading Life Sciences Super-Clusters

## Life Science Patents per Life Science Worker, 1998-2001



Note: Leading life science clusters defined as being among the top twenty in total life science patents and by LQ>1

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Top 25 Life Sciences Patentors

## United States, 1996–2000

	State Name	Organization	Patentor Type	Life Sciences Patents, 1996–2000	Total Patents, 1996–2000	Life Sciences Patents CAGR 1996–2000
1	Indiana	Eli Lilly and Company	Corporation	681	931	9.%
2	California	University of California, The Regents of	University	681	1515	22%
3	Ohio	Procter & Gamble Company	Corporation	681	1641	15%
4	California	Incyte Pharmaceuticals, Inc.	Corporation	424	520	N/A
5	Minnesota	Medtronic Inc.	Corporation	412	478	22%
6	Maryland	United States of America, Health & Human Services	U.S. Government	382	491	13%
7	Pennsylvania	Smithkline Beecham Corporation	Corporation	381	475	30%
<b>8</b>	<b>New Jersey</b>	<b>Merck &amp; Co., Inc.</b>	<b>Corporation</b>	<b>315</b>	<b>493</b>	<b>3%</b>
9	California	Genentech, Inc.	Corporation	284	370	14%
10	Pennsylvania	Merck & Co., Inc.	Corporation	269	302	4%
11	Connecticut	Pfizer Inc.	Corporation	269	338	15%
12	Illinois	Abbott Laboratories	Corporation	267	485	10%
13	Minnesota	Sci-Med Life Systems, Inc.	Corporation	260	271	38%
14	Texas	University of Texas	University	250	380	9%
15	Connecticut	United States Surgical Corporation	Corporation	217	345	14%
16	Massachusetts	Massachusetts General Hospital	Institute	212	260	17%
17	California	Chiron Corporation	Corporation	203	263	47%
18	Maryland	Johns Hopkins University	University	183	276	22%
<b>19</b>	<b>New Jersey</b>	<b>Schering Corp.</b>	<b>Corporation</b>	<b>178</b>	<b>236</b>	<b>5%</b>
20	Michigan	Warner-Lambert Company	Corporation	178	219	2%
21	Wisconsin	University of Wisconsin-Madison	University	169	318	16%
22	California	Pacesetter, Inc.	Corporation	159	195	N/A
23	California	Alza Corporation	Corporation	155	162	-5%
24	California	Ep Technologies, Inc.	Corporation	151	153	35%
25	Iowa	Pioneer Hi-Bred International, Inc.	Corporation	144	164	N/A

Note: Pfizer, Inc., Abbott Laboratories, and Warner-Lambert Company also have a major presence in New Jersey

Source: U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Top 25 Life Science Patentors

## New Jersey, 1996–2000

	Organization	Patentor Type	Life Sciences Patents, 1996-2000	Life Science Patents CAGR (%) 1990-2000	Total Patents, 1996-2000
1	Merck + Co., Inc.	Corporation	315	3%	493
2	Schering Corp.	Corporation	178	5%	236
3	Becton, Dickinson And Company	Corporation	128	8%	169
4	Bristol-Myers Squibb Company	Corporation	112	-4%	163
5	Colgate-Palmolive Company	Corporation	111	4%	301
6	American Cyanamid Company	Corporation	80	-1%	199
7	American Home Products Corporation	Corporation	79	1%	94
8	Ethicon, Inc.	Corporation	60	7%	169
9	Hoechst Marion Roussel, Inc.	Corporation	58		88
10	Hoffmann-La Roche Inc.	Corporation	55	-5%	83
<b>11</b>	<b>Rutgers University</b>	<b>University</b>	<b>57</b>	<b>30%</b>	<b>119</b>
12	Warner-Lambert Company	Corporation	44	-9%	57
13	Isp Investments Inc.	Corporation	40		103
14	Immunomedics Inc.	Corporation	40	16%	45
15	Mcneil-Ppc, Inc.	Corporation	34	-4%	70
16	Hoechst-Roussel Pharmaceuticals, Inc.	Corporation	33	-100%	49
17	Synaptic Pharmaceutical Corporation	Corporation	33		37
18	Church + Dwight Co., Inc.	Corporation	31	-10%	92
19	Enzon, Inc.	Corporation	31		44
20	Smithkline Beecham Corporation	Corporation	30	33%	41
<b>21</b>	<b>University of Medicine And Dentistry of New Jersey</b>	<b>University</b>	<b>32</b>	<b>4%</b>	<b>38</b>
22	Revlon Consumer Products Corporation	Corporation	25		41
23	Chesebrough-Pond's USA Co., Division of Conopco, Inc.	Corporation	25		29
24	Liposome Company, Inc.	Corporation	25	13%	30
25	Avon Products, Inc.	Corporation	25		31

Source: U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Top 25 Life Science Patentors

## Massachusetts, 1996–2000

	Organization	Patentor Type	Life Sciences Patents, 1996-2000	Life Science Patents CAGR (%) 1990-2000	Total Patents, 1996-2000
1	Massachusetts General Hospital	Institute	212	17%	260
2	Massachusetts Institute of Technology	University	152	-4%	607
3	Boston Scientific Corporation	Corporation	115	18%	124
4	Harvard College, President And Fellows	University	117	-4%	171
5	Genetics Institute, Inc.	Corporation	94	8%	115
6	Johnson & Johnson Professional Inc.	Corporation	81		99
7	Millennium Pharmaceuticals, Inc.	Corporation	74		95
8	Children's Medical Center Corporation	Institute	72	25%	84
9	Brigham And Women's Hospital	Institute	71	17%	92
10	Dana-Farber Cancer Institute, Inc.	Institute	62	7%	86
11	Sepracor Inc.	Corporation	58		74
12	Genzyme Corporation	Corporation	55	24%	66
13	Vertex Pharmaceuticals, Inc.	Corporation	53		64
14	Beth Israel Deaconess Medical Center, Inc.	Institute	47		59
15	Boston University	University	49	17%	86
16	Hewlett-Packard Company	Corporation	44	28%	101
17	New England Biolabs, Inc.	Corporation	38		39
18	Beth Israel Hospital Association	Institute	33	-6%	41
19	Creative Biomolecules, Inc.	Corporation	32		37
20	University of Massachusetts	University	36	16%	66
21	C. R. Bard, Inc.	Corporation	31	-16%	35
22	Hybridon, Inc.	Corporation	28		66
23	Autoimmune, Inc.	Corporation	26		28
24	New England Medical Center Hospitals, Inc.	Institute	26	0%	30
25	Cambridge Neuroscience Inc.	Corporation	25		26

Source: U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Top 20 Life Sciences Patenting Universities and Institutes

## United States, 1996–2000

	State	University	LS patents 1996-2000	LS patent CAGR 1990-2000	Total patents 1996-2000
1	CA	University of California	751	22%	1796
2	MA	Harvard and Affiliated Hospitals	573	4%	813
3	TX	University of Texas	290	10%	443
4	MD	Johns Hopkins University	210	23%	317
5	WI	University of Wisconsin-Madison	192	18%	358
6	PA	University of Pennsylvania	166	4%	258
7	FL	University of Florida Research Foundation, Inc.	157	10%	239
8	MA	Mass. Institute of Technology	152	-4%	607
9	CA	Stanford University	148	22%	383
10	MI	University of Michigan	146	18%	243
11	NY	Columbia University	139	15%	226
12	NY	Cornell Research Foundation Inc.	123	10%	275
13	MA	Harvard College	117	-4%	171
14	NC	Duke University Inc.	116	24%	150
15	NY	Research Foundation of State University of New York	115	11%	236
16	MO	Washington University	112	23%	165
17	NY	Rockefeller University	108	19%	136
18	MN	University of Minnesota	108	6%	197
19	PA	Thomas Jefferson University	105	16%	120
20	MI	Michigan State University	94	20%	226
32	NJ	Rutgers University	57	30%	119
53	NJ	University of Medicine And Dentistry of New Jersey	32	7%	38
78	NJ	Princeton University	17	0%	110
148	NJ	Stevens Institute of Technology	4	N/A	16
179	NJ	NJ Institute of Technology	2	N/A	31

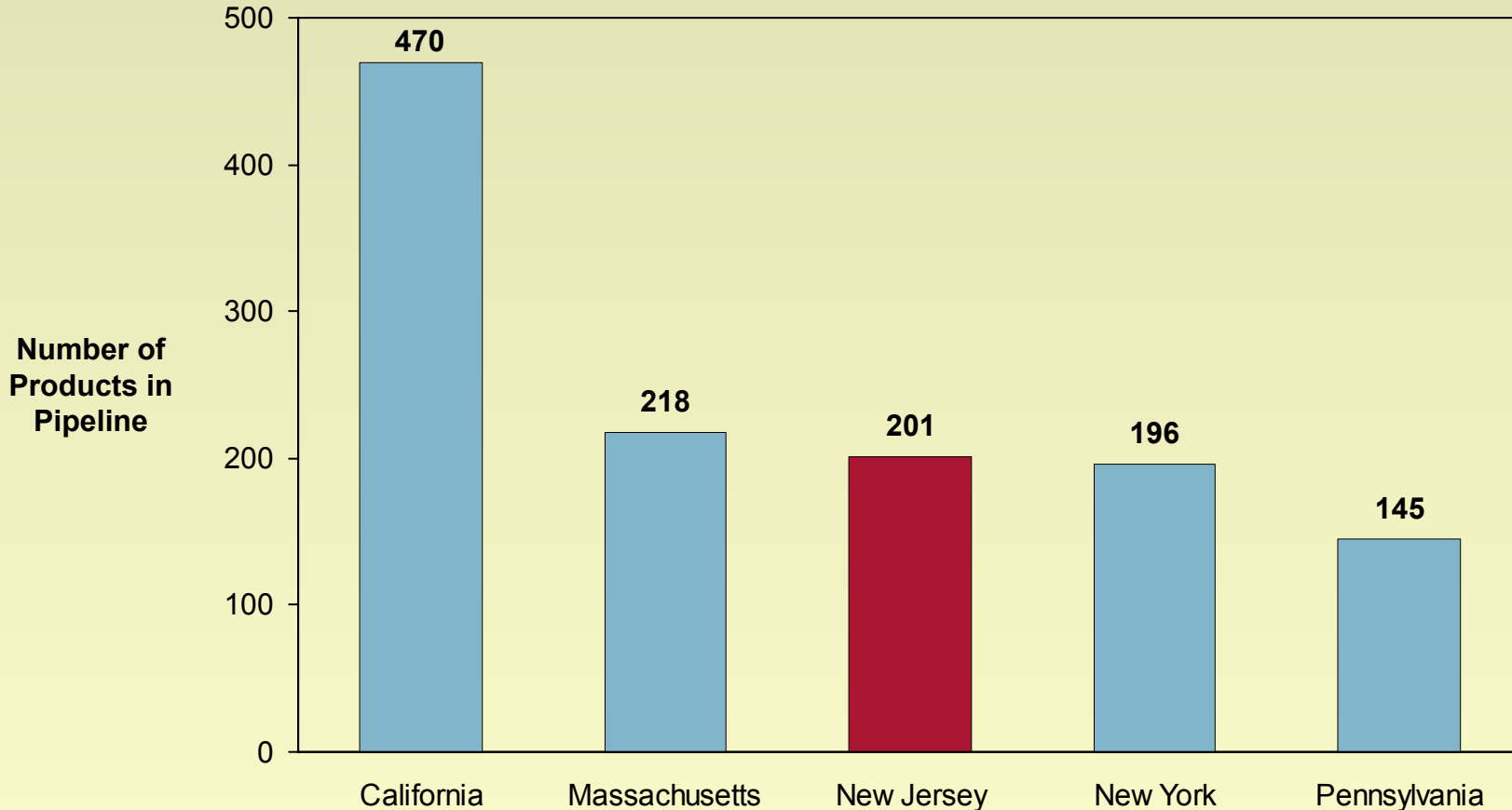
	State	Institute	LS patents 1996-2000	LS patent CAGR 1990-2000	Total patents 1996-2000
1	MA	Massachusetts General Hospital	212	17%	260
2	CA	The Scripps Research Institute	116	N/A	170
3	MA	Children's Medical Center Corporation	72	25%	84
4	MA	Brigham And Women's Hospital	71	17%	92
5	CA	Salk Institute For Biological Studies	68	18%	101
6	CA	La Jolla Cancer Research Foundation	64	17%	99
7	MA	Dana-Farber Cancer Institute, Inc.	62	7%	86
8	MN	Mayo Foundation For Medical Education And Research	62	29%	81
9	NY	Sloan-Kettering Institute For Cancer Research	49	11%	64
10	MA	Beth Israel Deaconess Medical Center, Inc.	47	N/A	59
11	OK	Oklahoma Medical Research Foundation	35	2%	46
12	MA	Beth Israel Hospital Association	33	-6%	41
13	WA	Fred Hutchinson Cancer Research Center	31	12%	34
14	NY	Picower Institute For Medical Research	26	N/A	30
15	MA	New England Medical Center Hospitals, Inc.	26	0%	30
16	WA	Washington Research Foundation	25	18%	35
17	OH	Cleveland Clinic Foundation	25	-1%	33
18	PA	The Wistar Institute of Anatomy And Biology	23	N/A	27
19	TX	Research Development Foundation	23	N/A	24
20	MA	Whitehead Institute For Biomedical Research	22	13%	30
52	NJ	David Sarnoff Research Center, Inc.	2	N/A	72

Source: U.S. Department of Commerce, County Business Patterns; Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School



# Share of Global Clinical Development Pipeline

## Leading States, 2001



Share of Products in Pipeline	California	Massachusetts	New Jersey	New York	Pennsylvania
	17.5%	8.1%	7.5%	7.3%	5.4%

Note: State attribution based on headquarters location of product's primary owner

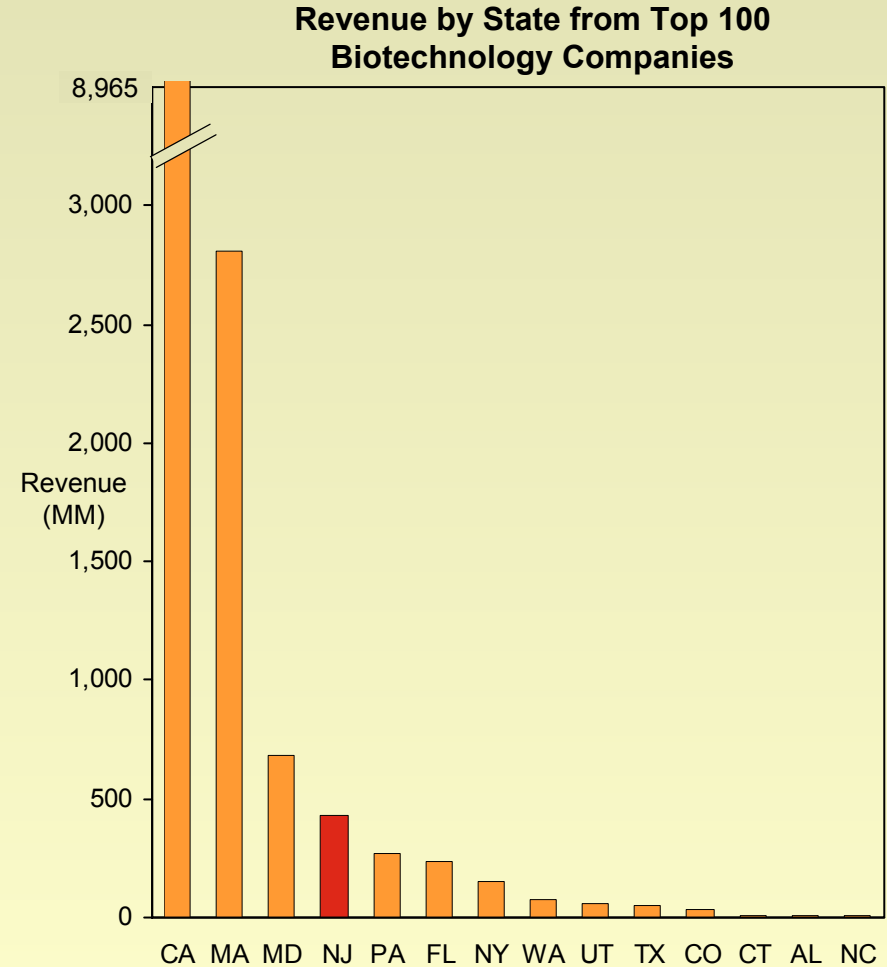
\* Pipeline includes large- and small- molecule drugs, diagnostic tests, and biodevices

Source: Biospace Clinical Competitive Intelligence System (CCIS) database, September 2002; The MassBiotech 2010 Report, MassBiotech, December, 2002

# The World's Top 20 Biotechnology Companies

## Ranked by Revenue

Rank	Company	Location	Revenue in 2001 (\$ / thousands)
1	Amgen Inc	CA	\$4,015,700
2	Genentech Inc.	CA	2,212,277
3	Serono SA	Switzerland	1,376,470
4	Genzyme Corp.	MA	1,223,630
5	Chiron Corp	CA	1,140,667
6	Biogen Inc.	MA	1,043,360
7	MedImmune, Inc	MD	618,679
8	CSL Ltd.	Australia	441,846
9	Celltech Group Plc.	United Kingdom	436,343
10	Genecor International Inc.	CA	326,018
11	Idec Pharmaceuticals Inc.	CA	272,677
12	Cephalon Inc.	PA	266,643
13	Millennium Pharmaceuticals, Inc	MA	246,216
14	Nabi Biopharmaceuticals	FL	234,829
15	Gilead Sciences Inc.	CA	233,769
16	Vertex Pharmaceuticals Inc.	MA	167,490
17	Berna Biotech Ltd.	Switzerland	166,807
18	<b>Celgene Corp.</b>	<b>NJ</b>	<b>114,243</b>
19	<b>Bio-Technology General Corp</b>	<b>NJ</b>	<b>101,965</b>
20	SangStat Inc.	CA	94,509

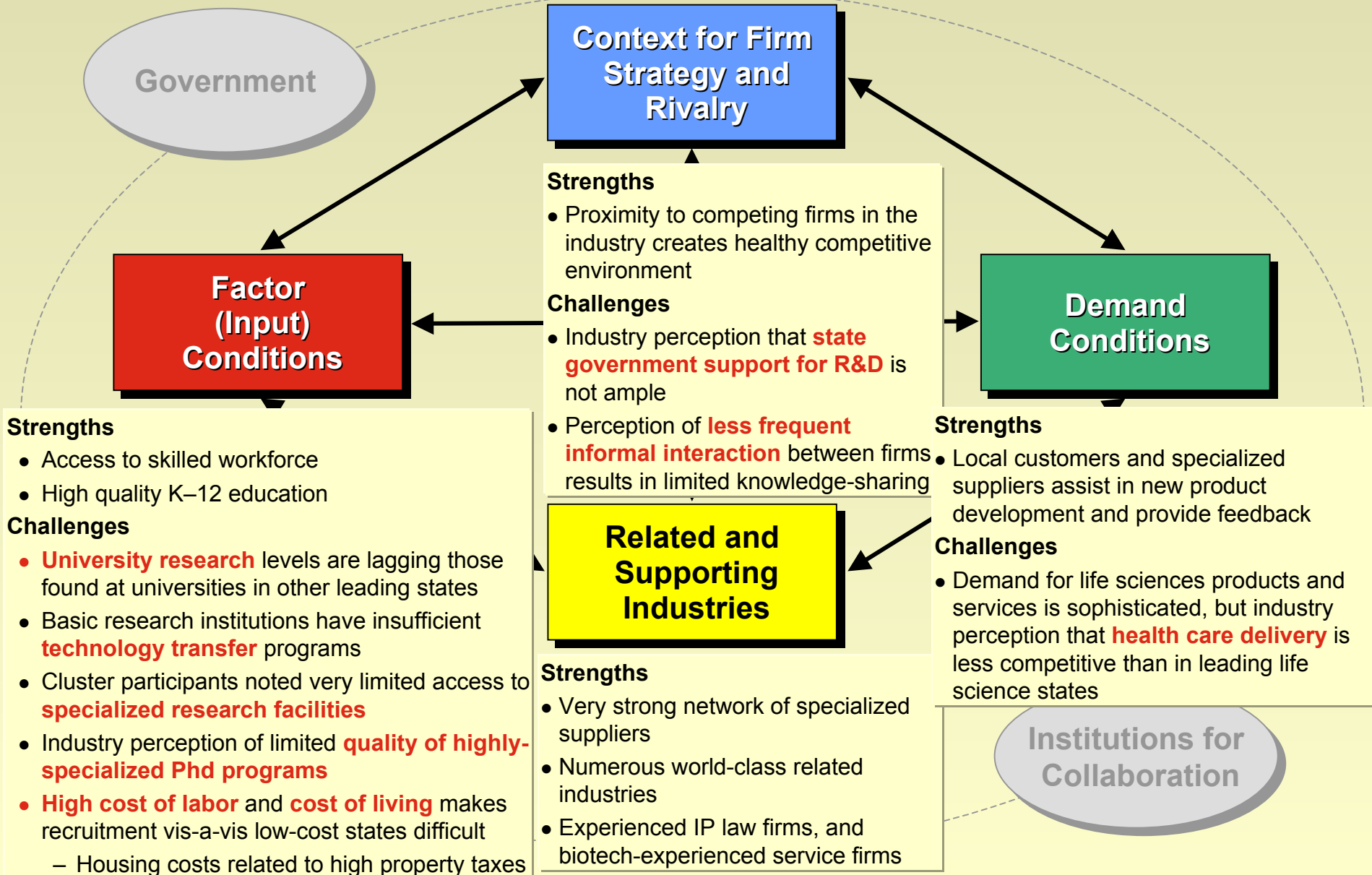


# Agenda

- Overview of the New Jersey Life Sciences Initiative
- Conceptual Framework and Methodology
- Economic Performance and Innovation Output of New Jersey
- Performance, Evolution and Composition of New Jersey's Life Sciences Super-Cluster
- **Assessment of the Business and Innovation Environment of New Jersey's Life Sciences Super-Cluster**
- Findings and Implications

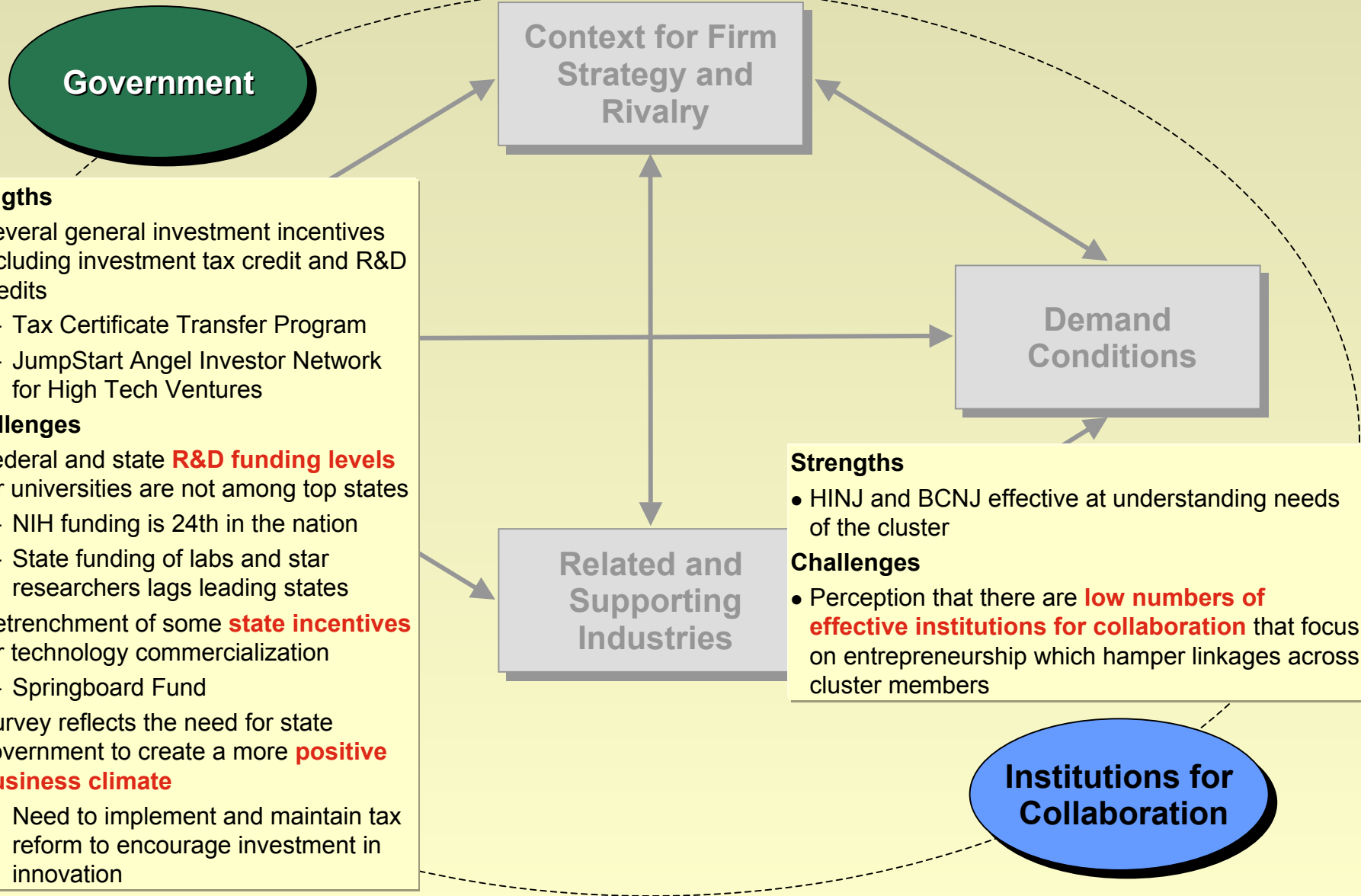
# Summary of the Business Environment

## Overview of New Jersey



# Summary of the Business Environment

## Overview of New Jersey (continued)



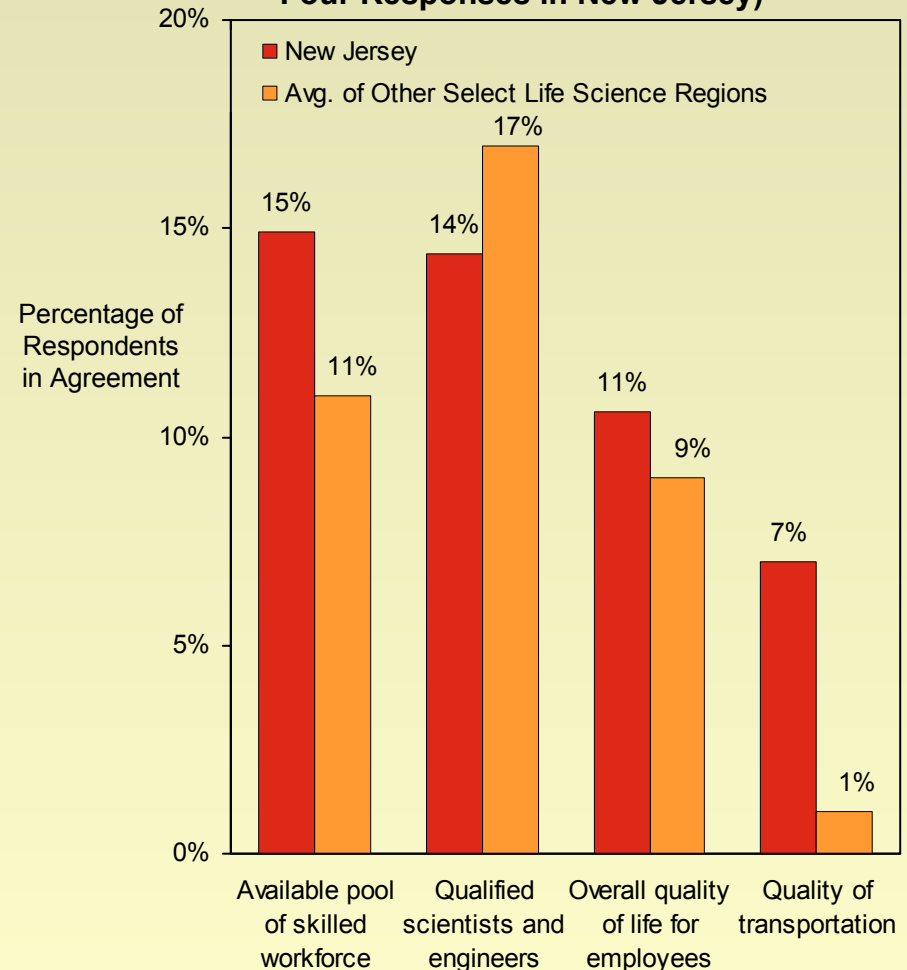
# Present Strengths of the Business Environment

## Survey and Interview Results

### Highlights from the Surveys and Interviews

- New Jersey's life science cluster participants indicated that **availability of skilled workforce, qualified scientists and engineers, quality of life, and quality of transportation** have the greatest positive impact on business success
  - *“We had to quickly hire 120 people in all types of positions. We would have **not been able to do that in Boston** where the labor market is very tight.”*
  - *“**Quality of life** is always an issue when you recruit. We are close to airports, close to large corporations, but also accessible for those who want to live in the woods or more rural settings.”*
  - *“We've got **good infrastructure**; we have great **access to transportation**. You need that kind of thing because the cost of living is higher and the wages are higher.”*

New Jersey vs. Average of Select Regions : Elements of the Business Environment That Currently Have the Greatest Positive Impact on Business Success (Top Four Responses in New Jersey)



Note: Average of other select life science regions reflect data from the life sciences super-clusters of Massachusetts, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

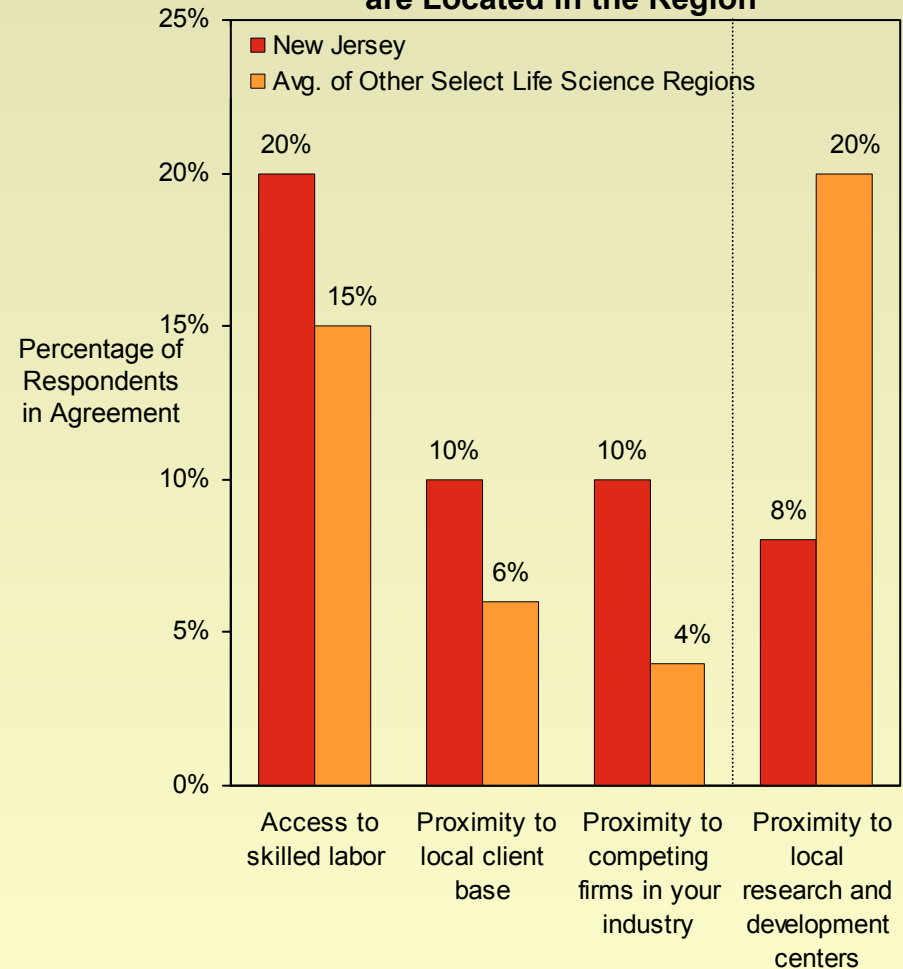
# Reasons for Locating in Region

## Survey and Interview Results

### Highlights from the Surveys and Interviews

- New Jersey's life science firms are located in New Jersey due to, among other reasons, **access to skilled labor, proximity to client base, and proximity to competing firms**
  - *“The talent that we would be trying to recruit makes this a natural location because of the local talent pool.”*
  - *“Companies came to New Jersey because they wanted to be near big pharma and its employees.”*
- Though proximity to **R&D centers is also important**, other regions scored much higher
  - *“Biotechs go across the river to New York for universities.”*
  - *Pharma companies are much more likely to send research out than to pursue it here in New Jersey. Why? Because New Jersey does not have as many Nobel Prize winners or as many National Academy of Science members.”*

### New Jersey vs. Average of Select Regions : Most Important Reasons Life Science Firms are Located in the Region



Notes: Average of other select life science regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

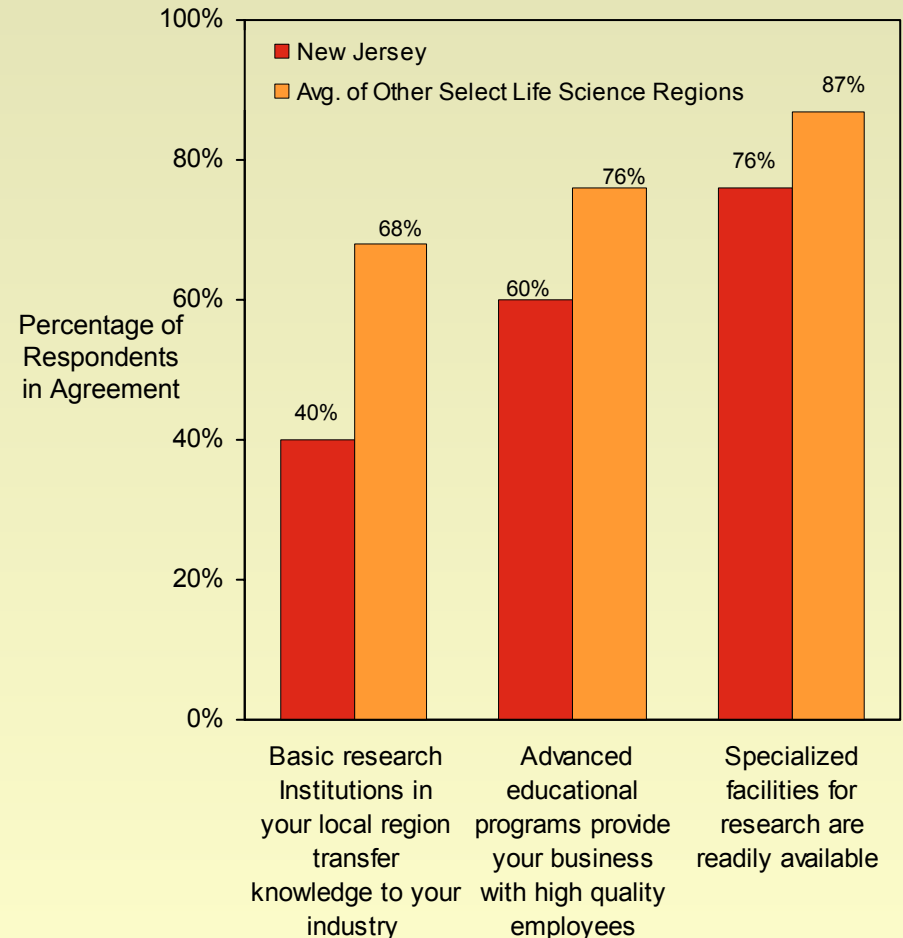
# Availability of Specialized Inputs

## Survey and Interview Results

### Highlights from the Surveys and Interviews

- New Jersey ranked significantly lower in terms of frequency of **technology transfer**
  - *“Rutgers has a one-way door - - - to protect the intellectual property of the university, to get as much as they can out of their patents. They need to know that the value is in getting in more deals, not in locking their door.”*
  - *“Universities say they open their doors but, when you go there, you see that they are only open for limited hours.”*
  - *“The university tech transfer offices are not looking to spin-out companies. If this is the case, how can we expect to be a biotech center?”*
- New Jersey’s availability of advanced educational programs and specialized research facilities was also rated lower than other life science regions
  - *“The new companies that are coming up with the new biotech products are being discouraged from working with New Jersey universities. If you don’t **support the seeds**, the whole industry is going to go away.”*

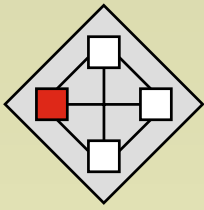
### New Jersey vs. Average of Select Regions: Availability of Specialized Inputs



Notes: Average of other select life science regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

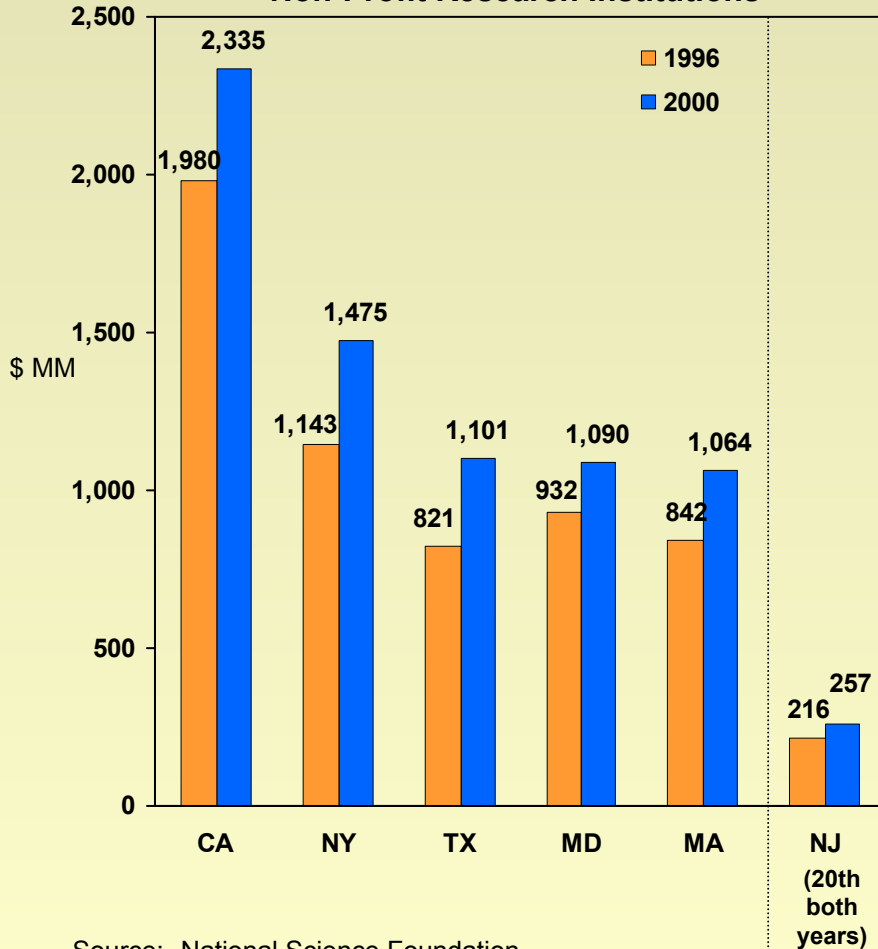




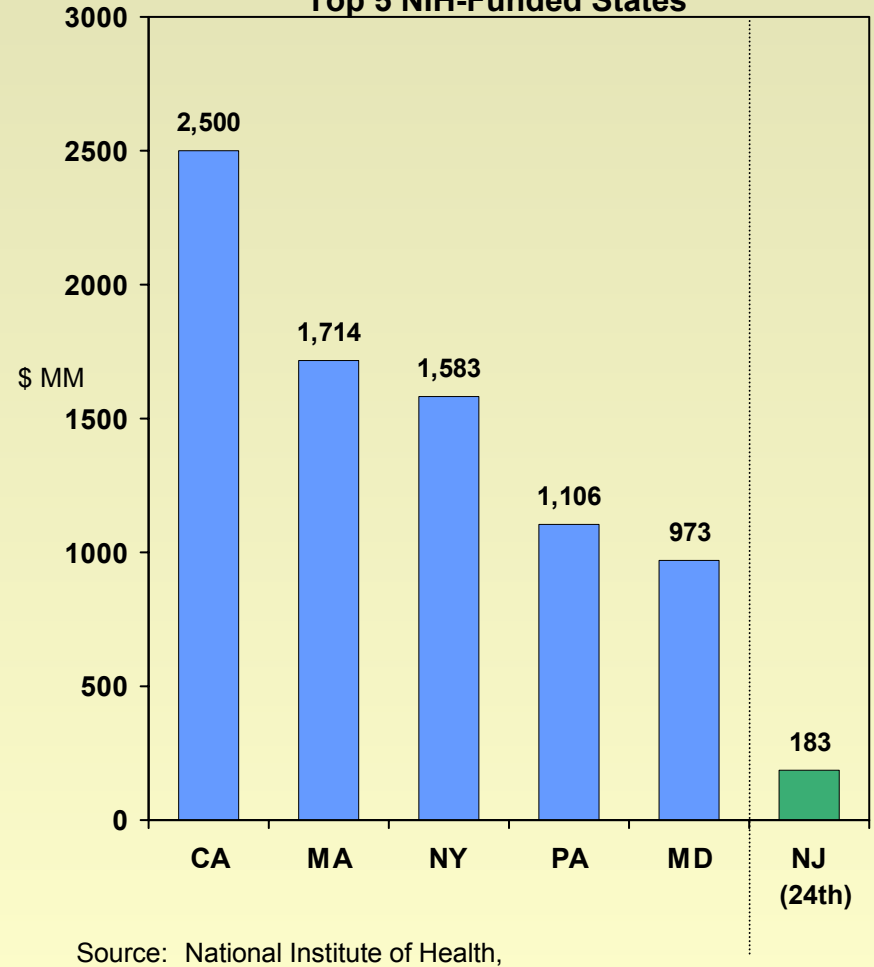
# Factor (Input) Conditions

## Federal R&D Funding, Leading States

**Total Federal R&D Funding of Academic and Non-Profit Research Institutions**

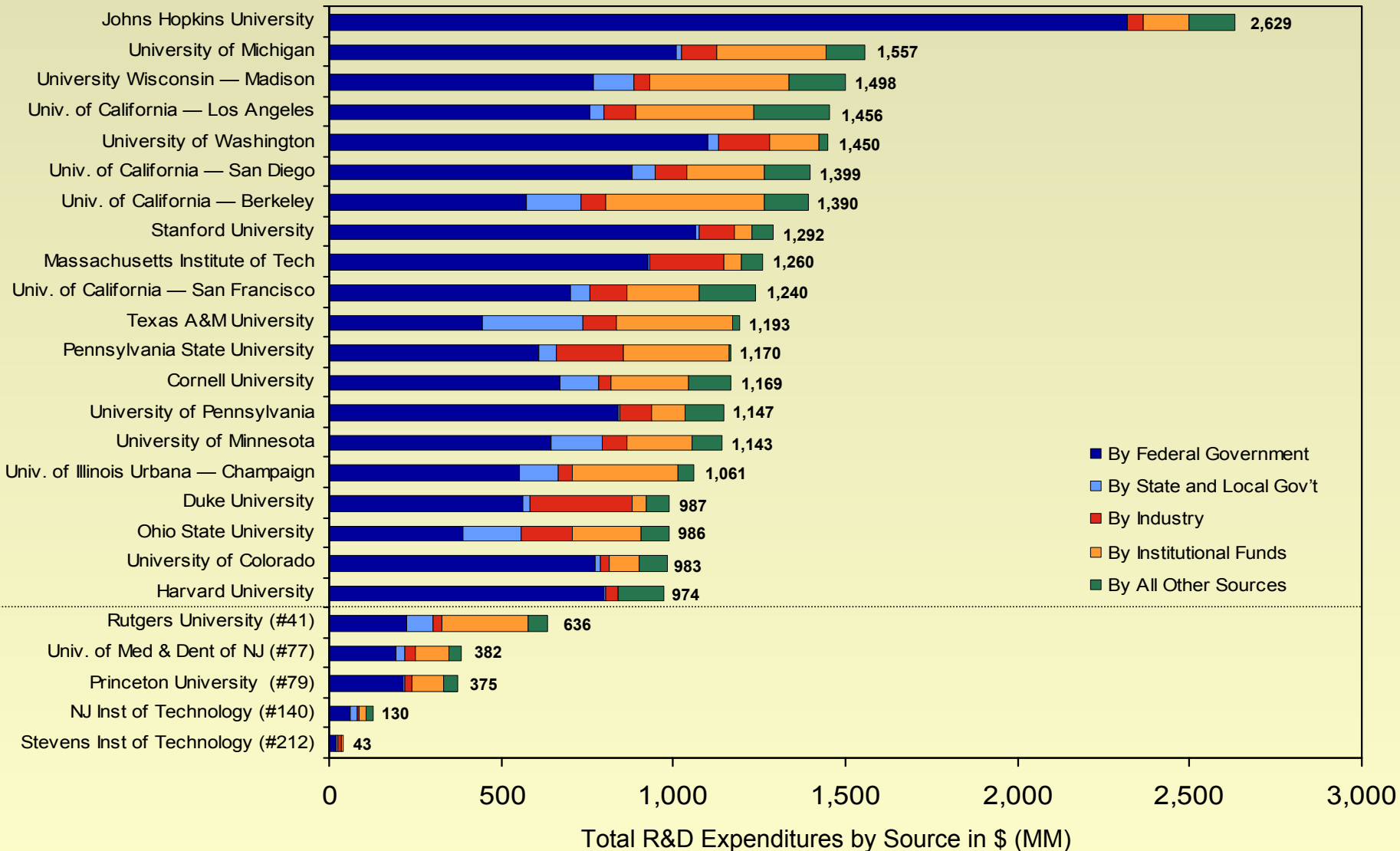
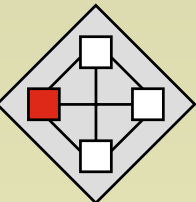


**2001 National Institute of Health Funding of Top 5 NIH-Funded States**



# Total R&D Expenditures by Source

## Top 20 Academic Institutions, 1998–2000



- By Federal Government
- By State and Local Gov't
- By Industry
- By Institutional Funds
- By All Other Sources

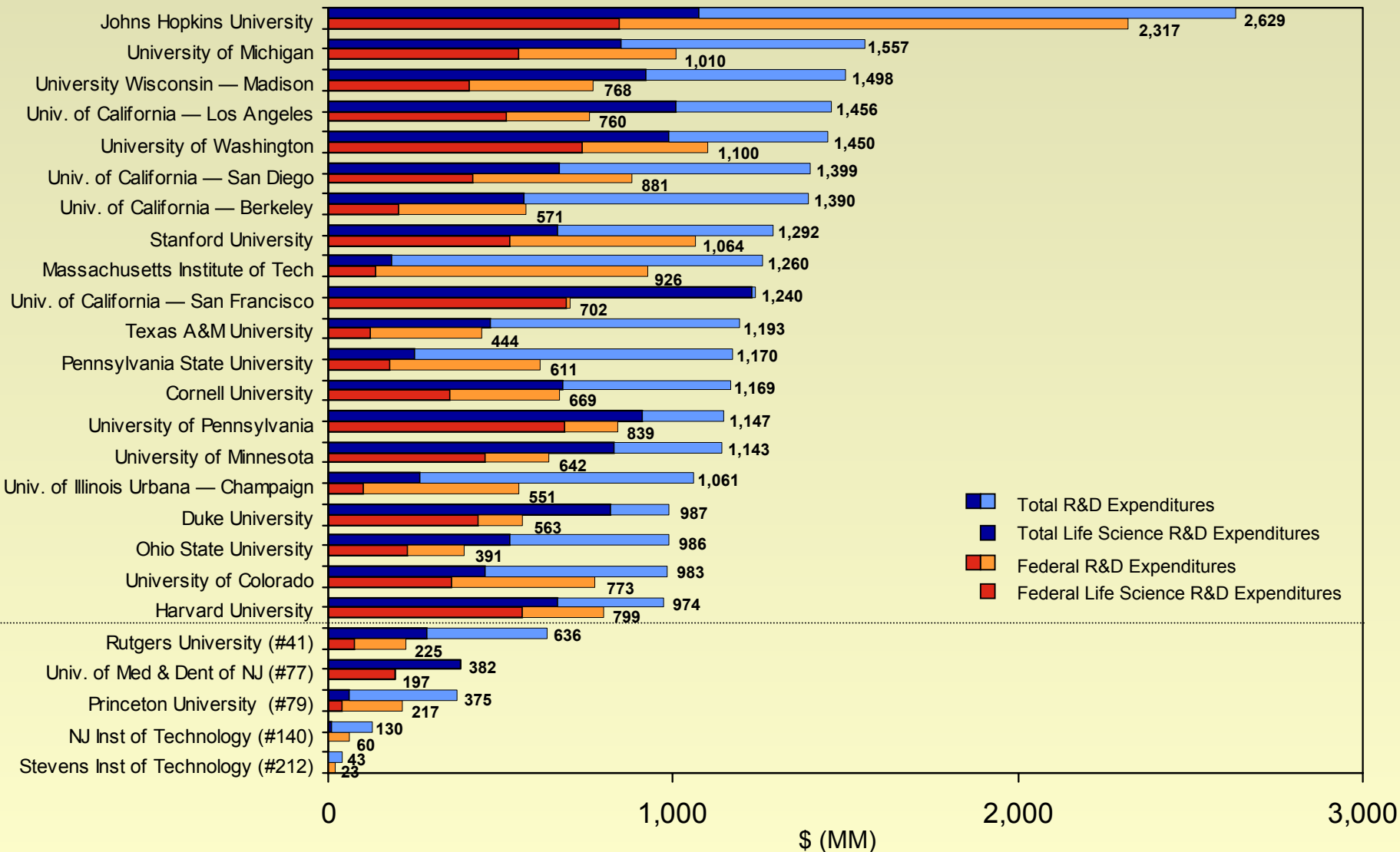
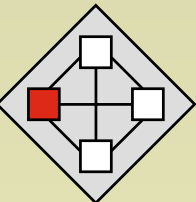
Total R&D Expenditures by Source in \$ (MM)

Note: Johns Hopkins University includes Applied Physics Laboratory. Data does not include R&D expenditures at university-associated federally funded research and development centers.

Source: National Science Foundation/Division of Science Resources Statistics, Survey of R&D Expenditures at Universities and Colleges, Fiscal Year 2000

# Life Sciences R&D Expenditures

## Top 20 Academic Institutions, 1998–2000

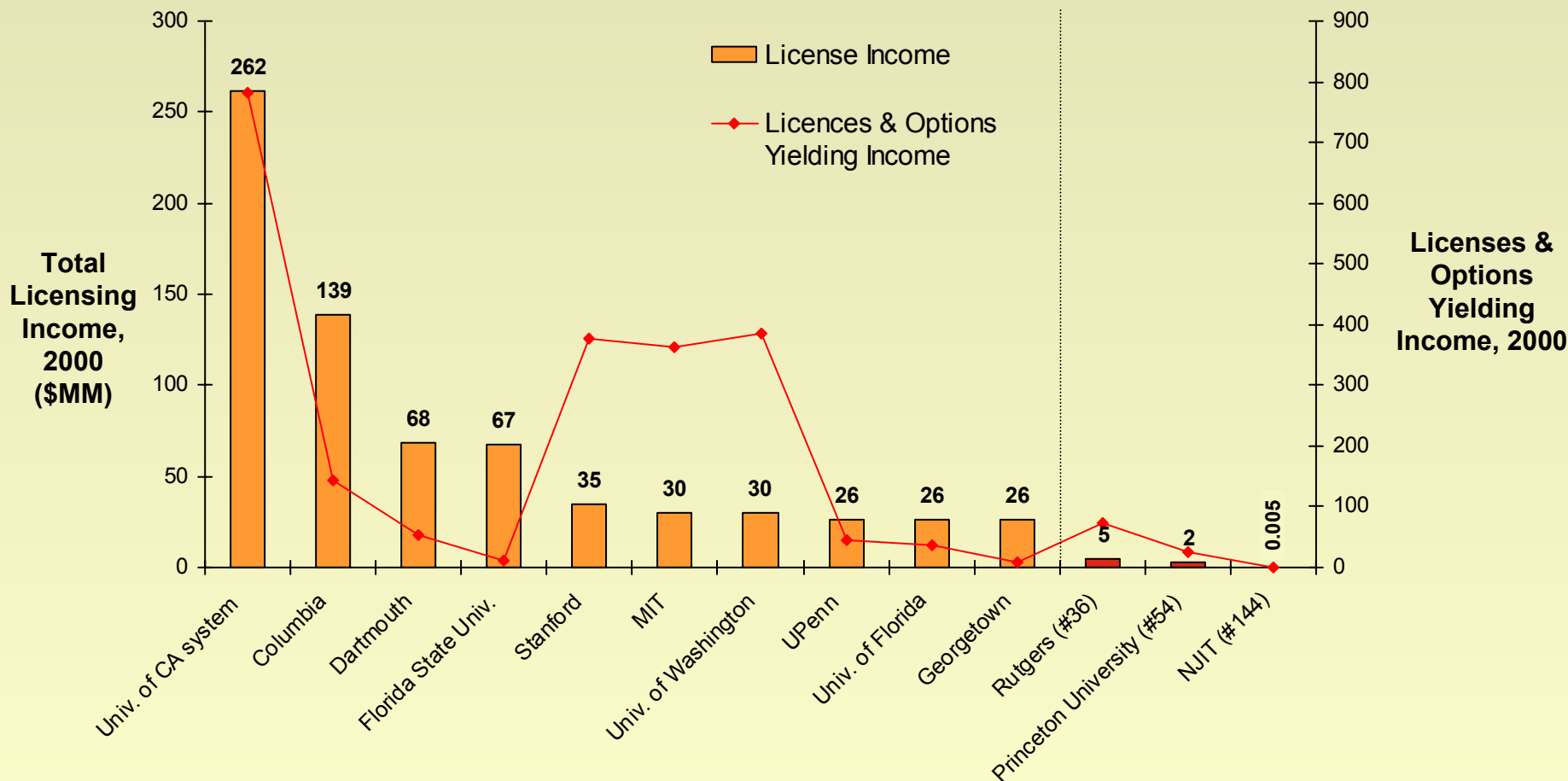
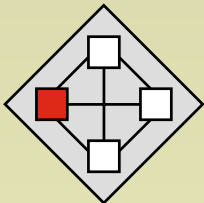


■ Total R&D Expenditures  
■ Total Life Science R&D Expenditures  
■ Federal R&D Expenditures  
■ Federal Life Science R&D Expenditures

Note: NJIT Total Life Science R&D expenditure received from the VP of Research at NJIT; NJIT was listed as \$0 in NSF rankings; NJIT Federal Life Science R&D expenditures not available; Life Science R&D expenditures include R&D fields of Biological Science, Medical Science, Agricultural Science, and Other

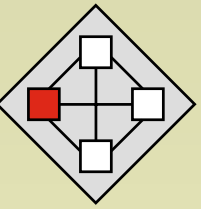
Source: National Science Foundation/Division of Science Resources Statistics, Survey of R&D Expenditures at Universities and Colleges, Fiscal Year 2000

# Total License Income and Number of Licenses Leading Universities, 2000



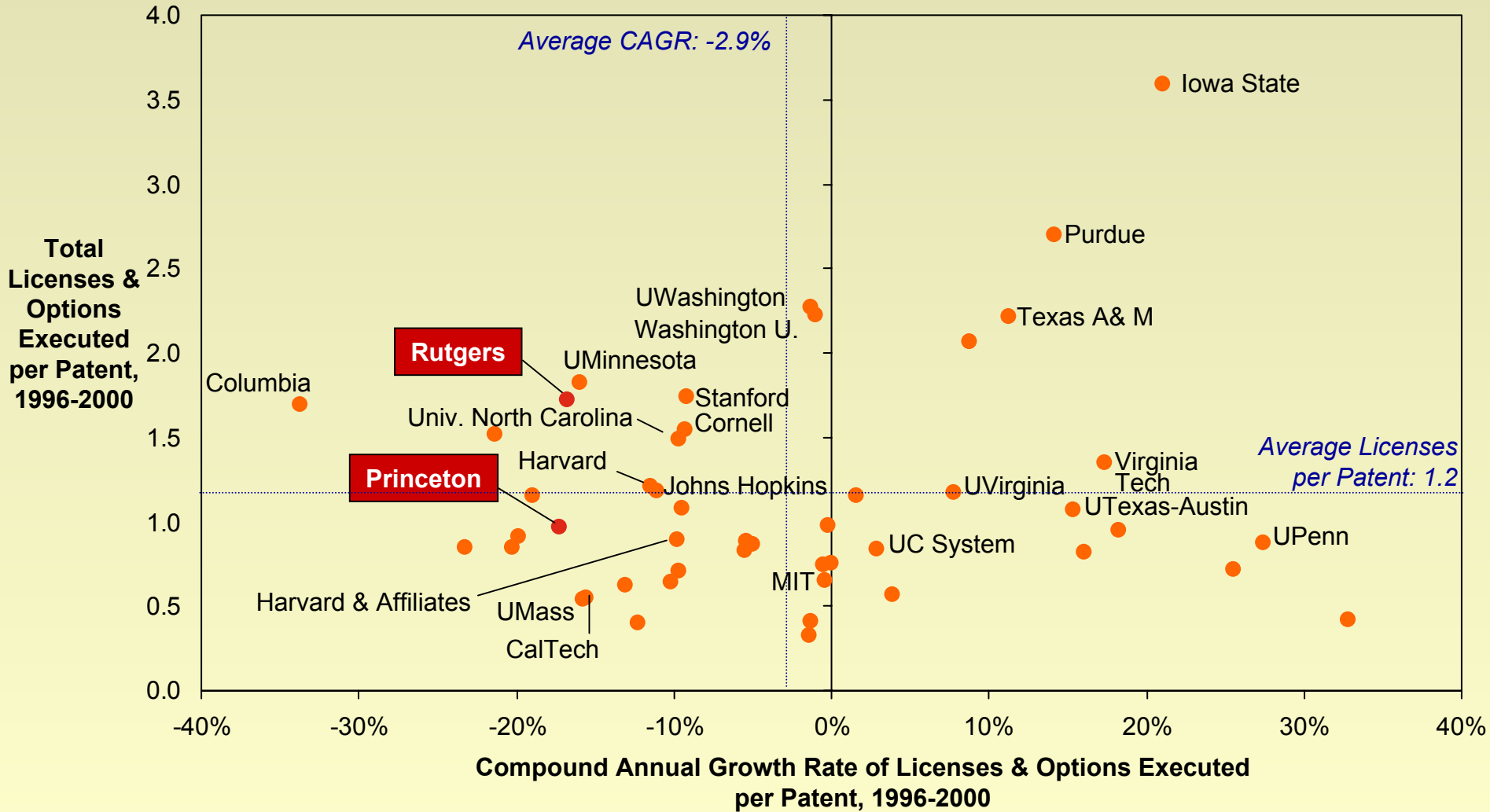
**Note: License Income:** The gross license income received by the university in fiscal year 2000 minus license fees paid to other institutions. Rankings in this category represent an institution's standing among all 142 U.S. universities surveyed by the Association of University Technology Managers.

**Licenses & options yielding income:** The number of licenses and options generating license income.



# Technology Transfer Effectiveness

## Total Licenses & Options Executed per US Patent, 1996-2000

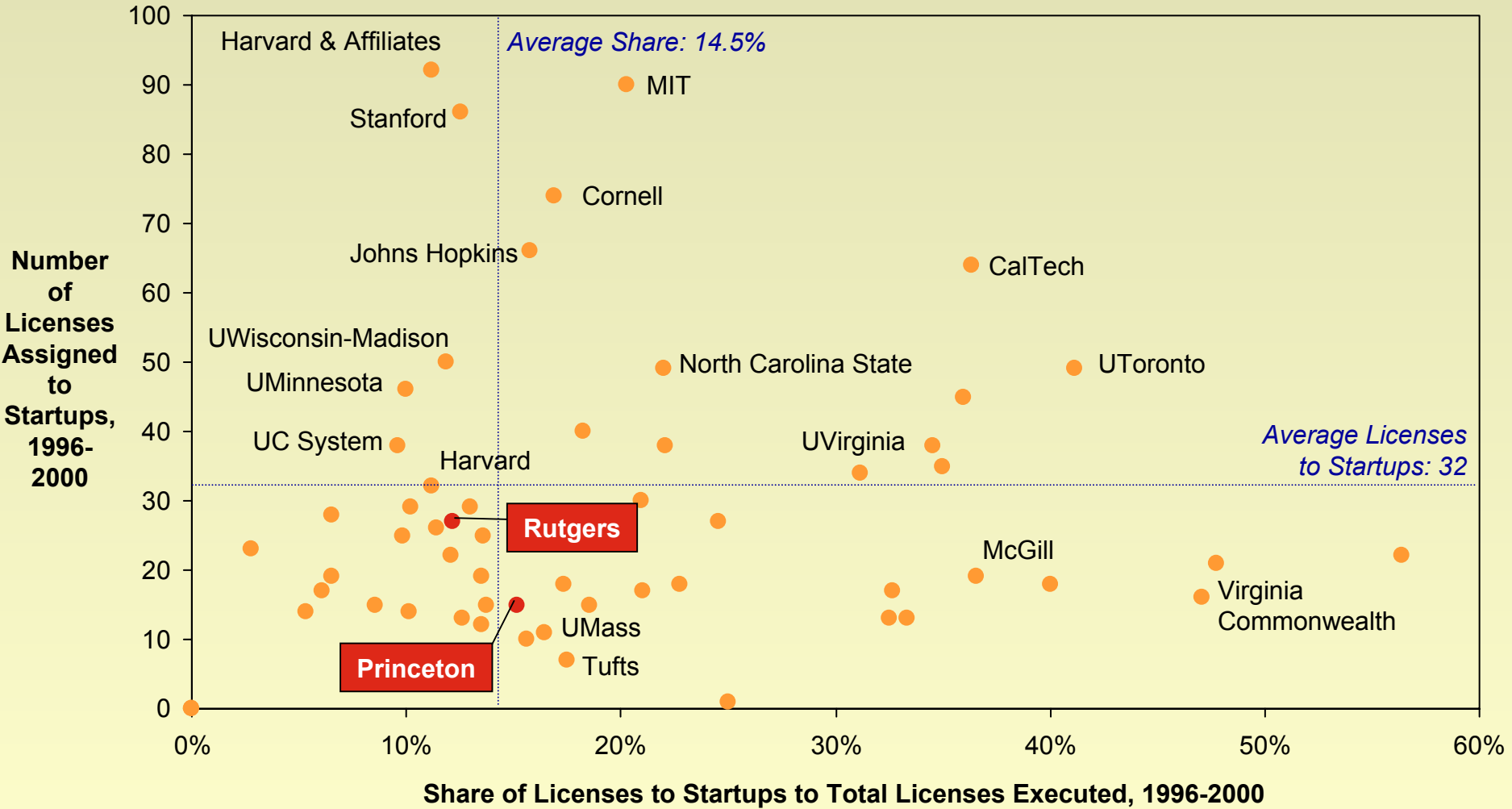
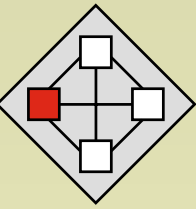


Note: Dana-Farber values for 1996 are averages of 1995 and 1997.

Source: AUTM Licensing Survey 1995-2000.

# Technology Transfer Effectiveness

## Licenses to Startups, 1996-2000



Source: AUTM Licensing Survey 1996-2000.

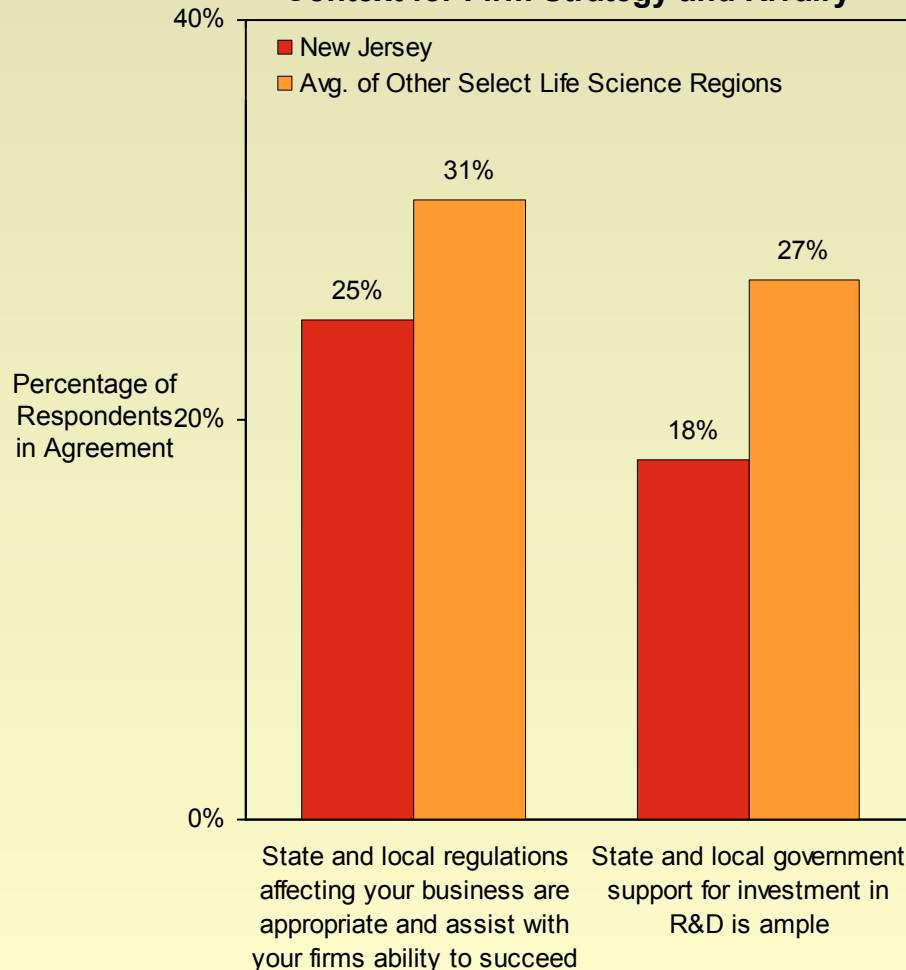
# Context for Firm Strategy and Rivalry: State Regulations

## Survey and Interview Results

### Highlights from the Survey and Interviews

- State and local regulations affecting businesses in New Jersey **hinder firms' ability to succeed**, relative to other regions
  - *“The state really helped us at a time when it was difficult to raise money, but it has **become too unfocussed...we have no point person to go to.**”*
  - *“**Little is being offered by the state in the form of incentives for entrepreneurs.** EDA is a good commercial bank and development bank, but lousy with start-ups.”*
- In New Jersey, state government **R&D investments funding is insufficient** compared to other regions, especially in relation to lab facilities and recruitment of star researchers
  - *“**We are behind our peers in R&D funding and that is our number one weakness.** Places like Baltimore are upcoming locations for life sciences because a university like Johns Hopkins leads in funded research.”*
  - *“**The magnitude of funding in New Jersey for medical and technology research is not at a competitive level, so how can they ask the university to be competitive?**”*

### New Jersey vs. Average of Select Regions: Context for Firm Strategy and Rivalry



Note: Average of other select life science regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

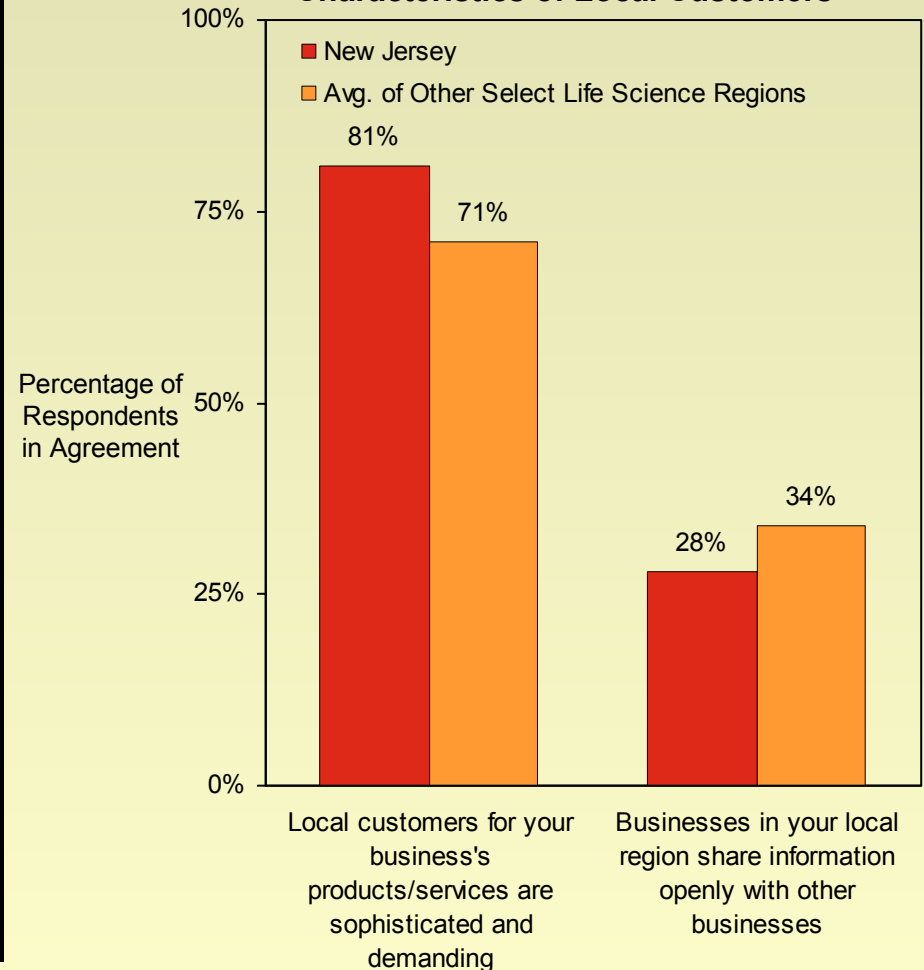
# Demand Conditions

## Survey and Interview Results

### Highlights from the Survey and Interviews

- New Jersey's life science cluster's local customers are **sophisticated and demanding**
  - *"New Jersey has heritage in life sciences. . . . You help the area grow as well as grow with the area."*
  - *"Companies like research firms and medical education companies are located in New Jersey due to the presence of the large pharma companies. And they remain in New Jersey due to the business they generate from them."*
- Compared to other regions, New Jersey businesses are less effective at openly **sharing information** with other cluster firms
  - *"In New Jersey, all of this research is going on inside of the walls of the large corporations and they don't want to share it."*
  - *"Medical device companies in Massachusetts are not in Springfield; they are all in the same I-495 corridor as the pharma companies. Nothing is centered here in New Jersey. There is nothing to rally around in New Jersey."*

**New Jersey vs. Average of Select Regions:  
Characteristics of Local Customers**



Notes: Average of other select life science regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40. Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002



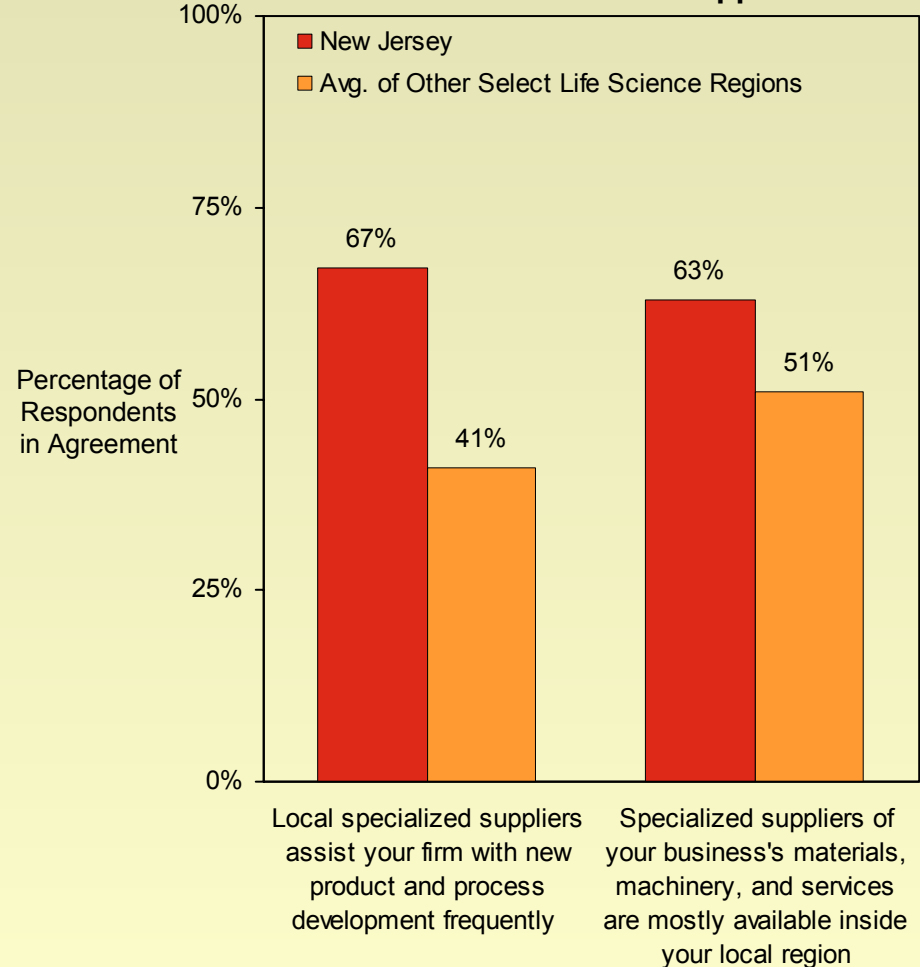
# Related and Supporting Industries

## Survey and Interview Results

### Highlights from the Survey and Interviews

- New Jersey, has a **good concentration of local specialized suppliers** who can assist life science firms with new product and process development
  - *“New Jersey is the number one state in the nation for pharma and that draws a **number of related and supporting industries close to these companies.**”*
  - *“**People in the industry gravitate toward the cluster.** If we had to do it all over again and we were starting from scratch, given the state of the pharma business in particular, New Jersey would be a serious consideration.”*

### New Jersey vs. Average of Select Regions: Characteristics of Local Suppliers



Notes: Average of other select life science regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, California Bay Area.

Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

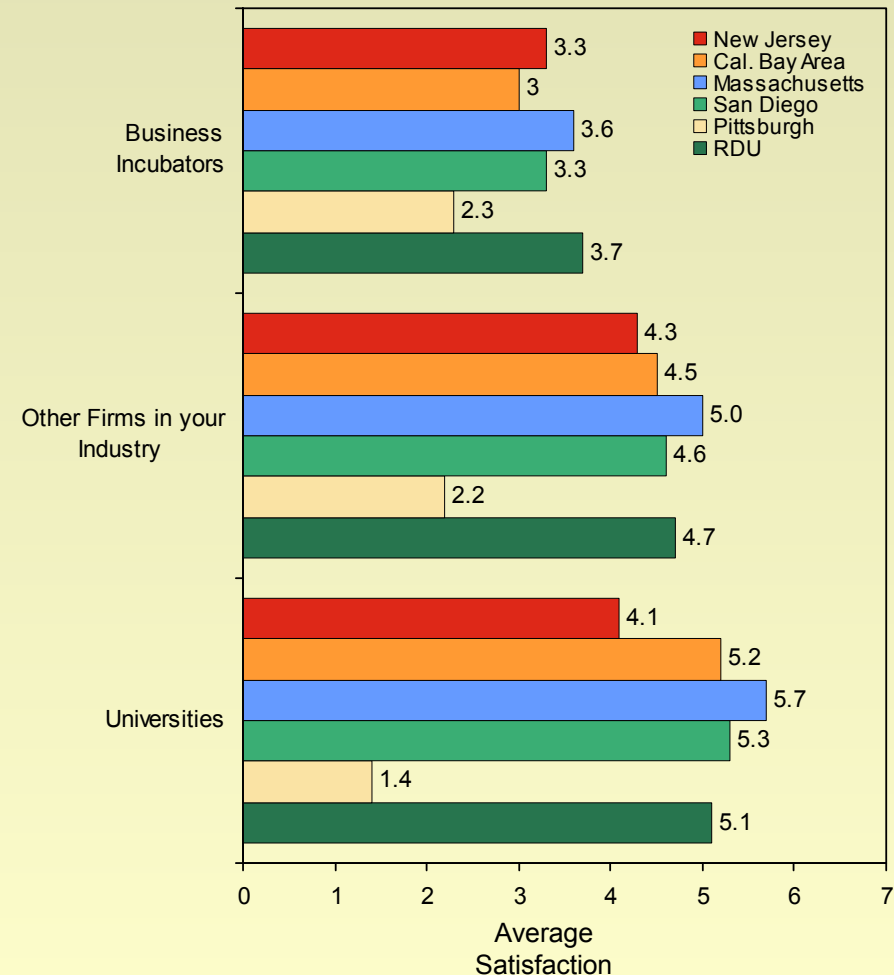
# Satisfaction with Local Partners' Impact on Innovation

## Survey and Interview Results

### Highlights from the Survey and Interviews

- Compared to other leading life science regions, New Jersey's firms are less satisfied with the impact local institutions have on the innovation process, citing a **lack of entrepreneurial spirit** both at the university level . . .
  - *“There really is not the kind of entrepreneurial spirit that there is at Harvard or Stanford. It's cultural. If you get too deeply into commerce, **professors feel it compromises the work that you do.**”*
  - *“There are **two forces working against a greater sense of entrepreneurship at our university.** First of all, we are more focused on teaching than our peers. Secondly, our interests are on the fundamental research side.”*
- ...and at the **industry level**
  - *“The whole pharma culture in New Jersey is quite laidback because companies have been around a long time and are proud of their accomplishments. They **aren't spinning off new companies.**”*
  - *“New Jersey ought to be more in the driver's seat because the management talent is definitely in this state. However, it's still **not viewed as a user-friendly state by the entrepreneurial community.**”*

### New Jersey vs. Select Regions : Satisfaction With Local Institutions' Impact on Innovation Process



Note: n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

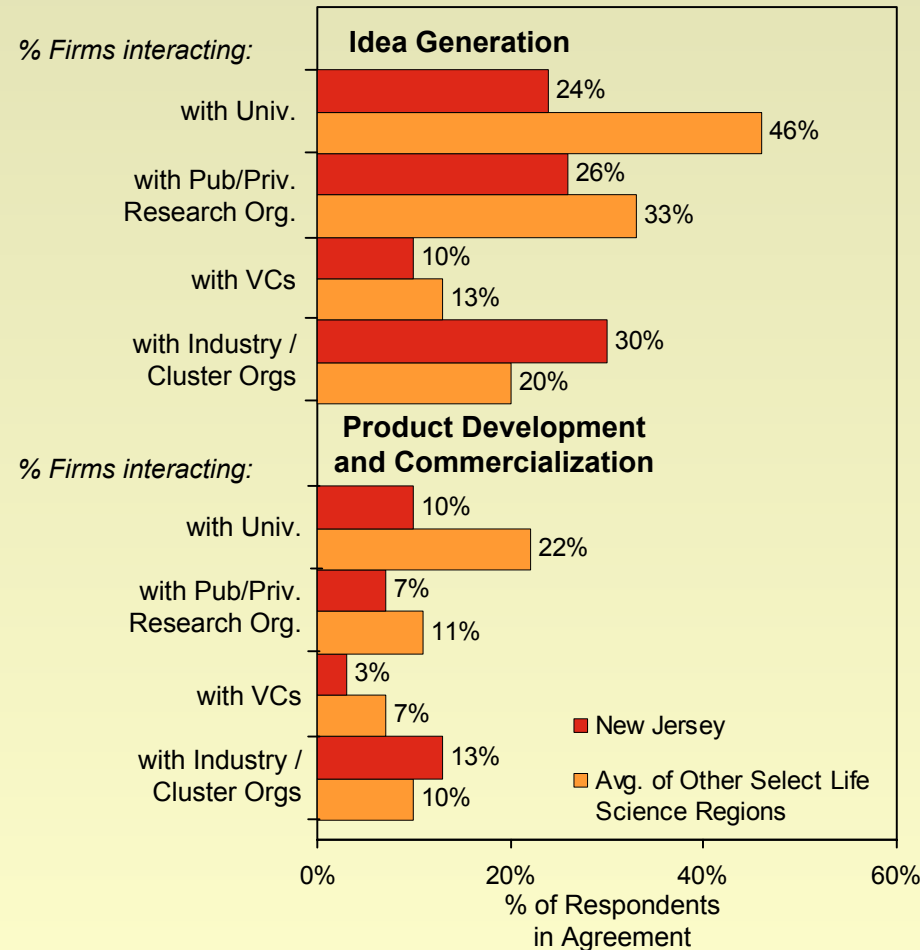
# Frequency of Firm Interaction with Local Partners

## Survey and Interview Results

### Highlights from the Survey and Interviews

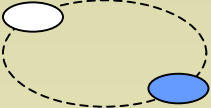
- In New Jersey, there is **little interaction between firms and universities** and **between firms and public/private research organizations** on idea generation, product development and commercialization
  - *“One of the complaints of the state is that **our industry sector does not act together with our university sector like it does in California.** There needs to be a fair amount of interaction because the universities need to train people for those jobs.”*
- There is potential for improvement in industry-university and industry-venture capital collaboration in the cluster
  - *“At a minimum, **we need attitude change.** It’s not just about scientists doing the research that they want to do; we need to bring the entrepreneurs in, bring the community in and find out what research they want done.”*
  - *“**New Jersey VCs are currently not investing in New Jersey companies.** . . . There are other companies in other states that they think are better investments.”*

### New Jersey vs. Average of Select Regions: % of Firms that Interact Frequently with Local Partners on Idea Generation and Product Development and Commercialization



Note: “Idea Generation” avg. of other select LS regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, CA Bay Area; “Product Development and Commercialization” avg. of other select LS regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, CA Bay Area; Life science averages are weighted by survey sample; n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002



# Vagelos Commission Overview

## Corroboration from this Study

### Recommendations from The Commission on Health Science, Education, and Training

- Increase opportunities for attracting research funding.
- Create and enhance centers of excellence
- Establish a concentration of health sciences faculty
- Ensure best practices for processes and funding
- Create institutional identity, scope, and excitement
- Establish stronger corporate links
- Enhance collaboration within health science disciplines

### Corroboration from this Study

- *“The medical school would make Rutgers **eligible to go for larger NIH awards**. We would instantly be able to get some of these large awards that don’t go to us now.”*
- *“New Jersey needs to highlight what we have at our universities, and the universities can only become more prominent if the **research done at UMDNJ is hooked up with the research at Rutgers.**”*
- *“I think the Vagelos Commission is the first good thing to come around in a long time. . . . **Recruiting a few good people creates a snowball effect . . . the students will follow . . . and the research dollars will follow.**”*
- *“We need to **catalogue all of the research being done and then we can make connections.**”*
- *“Usually, there is a very fertile innovation process moving from universities to industry. That usually happens at universities in California and Massachusetts where they have a **more sophisticated licensing and outreach program.**”*
- *“**The university system is currently inconsiderate of business. It’s independent. It’s been insular. It’s been protected. It’s been isolated.**”*
- *“The consolidation of the universities in New Jersey is a great idea. It puts all of NJIT together with the medical school. It will really help all of NJIT. It gives us a little more equal status. It’s starting to seep in that we’re all part of the same university, and the consolidation will **bring a lot more collegiality.**”*

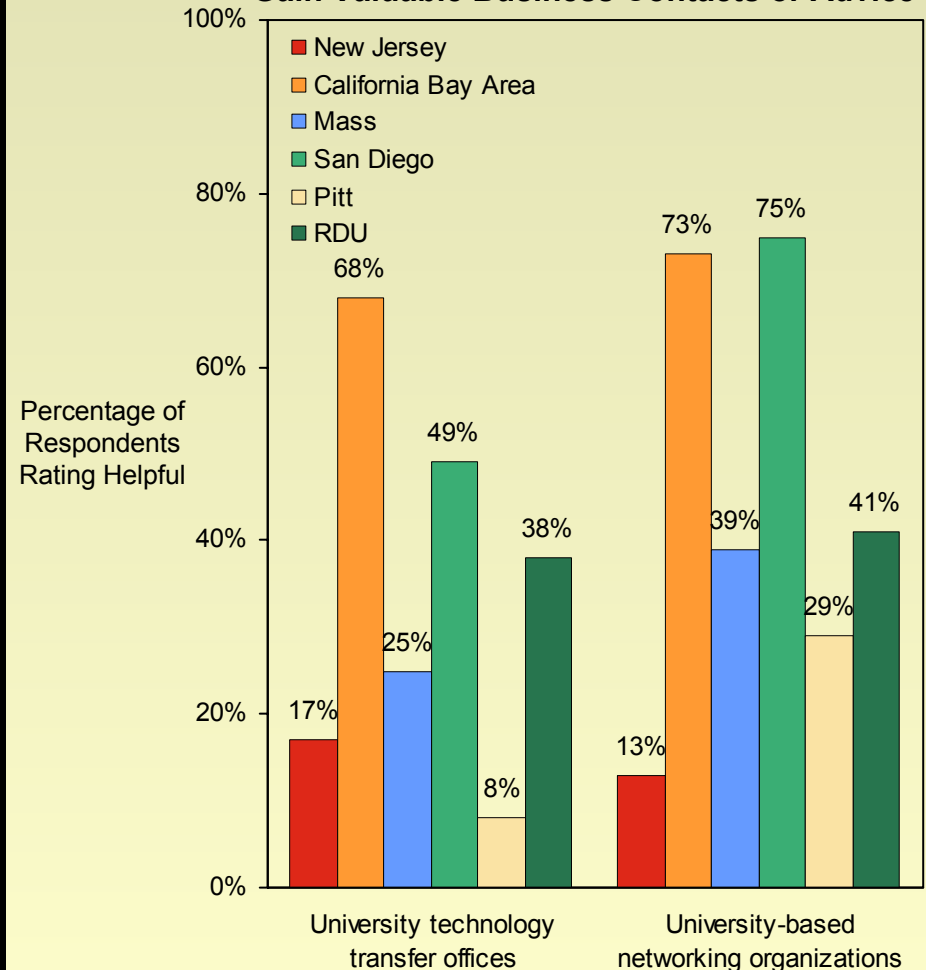
# Helpfulness of Select Institutions for Entrepreneurs

## Survey and Interview Results

### Highlights from the Survey and Interviews

- New Jersey's university **technology transfer** offices do not provide entrepreneurs with adequate business contacts or advice
  - *“The university **tech transfer offices are not looking to spin-out companies.** If this is the case, how can we expect to be a biotech center?”*
  - *“We’ve been here since 1999 and **nobody from the university has ever called me.** . . . We tried to get some interns in here in the summer and we had **no success.** It was advertised at Rutgers and there was **no response.**”*
- New Jersey's university-based networking organizations are **behind their peers** in their ability to provide entrepreneurs with valuable business contacts or advice
  - *“If a company comes to our universities, it is **not warmly welcomed;** it is not: ‘come in, let’s work together’.”*
  - ***Rutgers has a one-way door** - - - to protect the intellectual property of the university, to get as much as they can out of their patents. They need to know that the value is in getting in more deals, not in **locking their door.** . . . Universities say they open their doors but, when you go there, you see that they are only open for limited hours.”*

### New Jersey vs. Select Regions : Degree to Which Local Institutions Help **Entrepreneurs** Gain Valuable Business Contacts or Advice



Note: n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

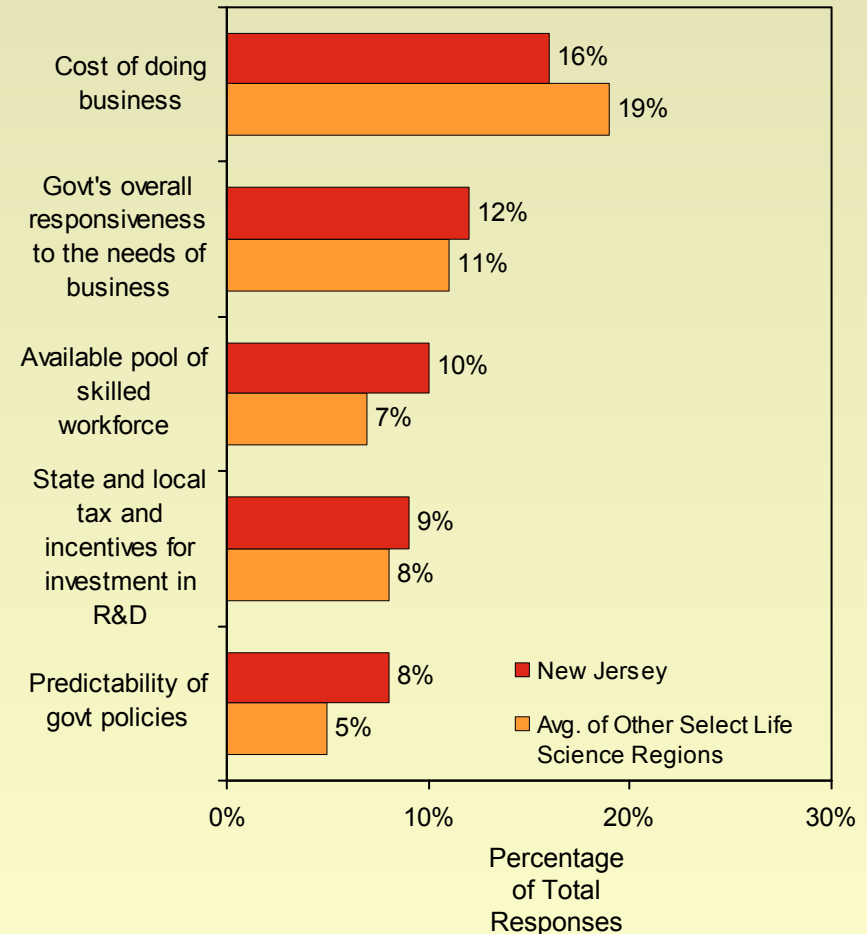
# Future Threats to Businesses

## Survey and Interview Results

### Highlights from the Survey and Interviews

- **Cost of doing business** is less of a concern in New Jersey than in other leading life science regions, but it is the biggest future threat among cluster participants
- **Government's responsiveness to the needs of business and predictability of government policies** are top concerns in New Jersey's life science cluster
  - *“Compared to Pennsylvania, New Jersey is not as attractive; the EDA could certainly do more.”*
  - *“The New York EDC is building labs throughout the city, which may take some of the attractiveness away from New Jersey, and though Pennsylvania has been behind New Jersey in the number of companies, some New Jersey companies are thinking of moving to Pennsylvania.”*
  - *“The start-ups that were in the state are moving out of the state and we no longer have the ability to attract those from out of state.”*
  - *“I think we're one of the only states that doesn't use pension funds - - It's a token of the state's interest. The issue of capital in New Jersey is terrible.”*

**New Jersey vs. Average of Select Regions:  
Top 5 Elements of the Business  
Environment Considered to be Future  
Threats to Businesses if not Addressed**



Note: Average of other select life science regions reflect data from the life sciences super-clusters of Massachusetts, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

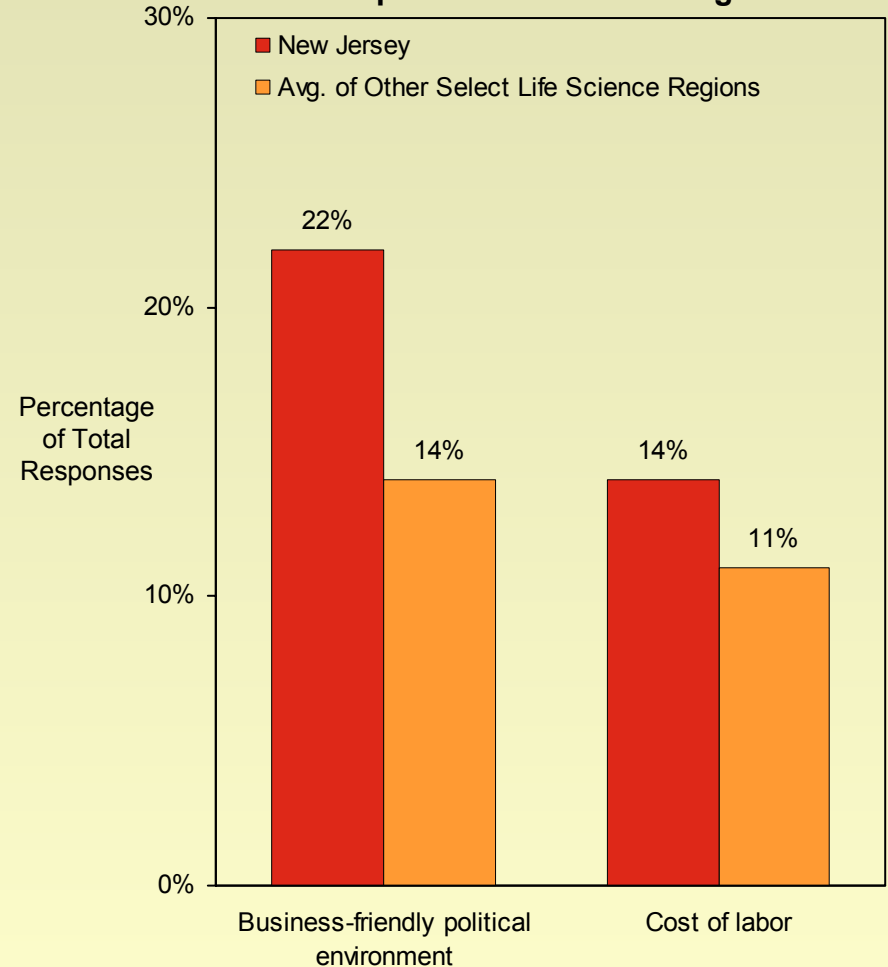
# Barriers to Firm Expansion in Future

## Survey and Interview Results

### Highlights from the Survey and Interviews

- New Jersey firms indicate that **business growth will be hindered by the political environment** over the next 5 years
  - *“There are fewer and fewer programs so I rarely go to contract meetings anymore because there’s nothing to put out on the table.”*
  - *“The new companies that are coming up with the new biotech products are being **discouraged from coming to New Jersey**. If you **don’t support the seeds**, the whole industry is going to go away.”*
- **Cost of labor** is also perceived as an obstacle of firm expansion in New Jersey for firms located in up-and-coming states such as North Carolina and Michigan
  - *“The **cost of living**, cost of housing, cost of insurance are challenges. We’ve relocated people from Michigan and the cost of living here is more than two-times as expensive here as opposed to Michigan so we have to compensate them.”*

New Jersey vs. Average of Select Regions: Top 2 Elements of the Business Environment Considered to be Significant Barriers to Firm Expansion Within the Region



Note: Average of other select life science regions reflect data from the life sciences super-clusters of San Diego, Massachusetts, Pittsburgh, RDU, California Bay Area. Life science averages are weighted by survey sample. n to date for New Jersey: 80, CA Bay Area: 26, Massachusetts: 53, San Diego: 45, Pittsburgh: 22, RDU: 40.

Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002



# Agenda

- Overview of the New Jersey Life Sciences Initiative
- Conceptual Framework and Methodology
- Economic Performance and Innovation Output of New Jersey
- Performance, Evolution and Composition of New Jersey's Life Sciences Super-Cluster
- Assessment of the Business and Innovation Environment of New Jersey's Life Sciences Super-Cluster
- **Findings and Implications**



# Summary

- Strong **historical performance** of the state in the 1990s and strong existing position
  - New Jersey's economy has outpaced the national average along several measures, and innovation output is strong on an **absolute basis**
  - Over 85,000 net new jobs were created between 1990-2000 in New Jersey's traded industries
- Rich **tradition** in the life science cluster
  - Large, well-paying cluster with many companies represented

## *However....*

- Data and respondents suggest that large pharmaceutical companies seem fairly entrenched, but **slowing** in employment growth in certain industries points to the need for a strategy to attract and retain more plant and manufacturing capacity
- Few **university research** engines generating a stream of **start-ups** point to a lack of a robust technology base and scientific commercialization infrastructure in the cluster
- Lack of culture supporting **entrepreneurship** has led to relatively low numbers of spin-off companies from pharmaceutical industries
- Respondents to interviews and survey indicated need for greater government organization and **collaboration** with life sciences companies

# Strengths and Challenges

## New Jersey's Life Sciences Super-Cluster

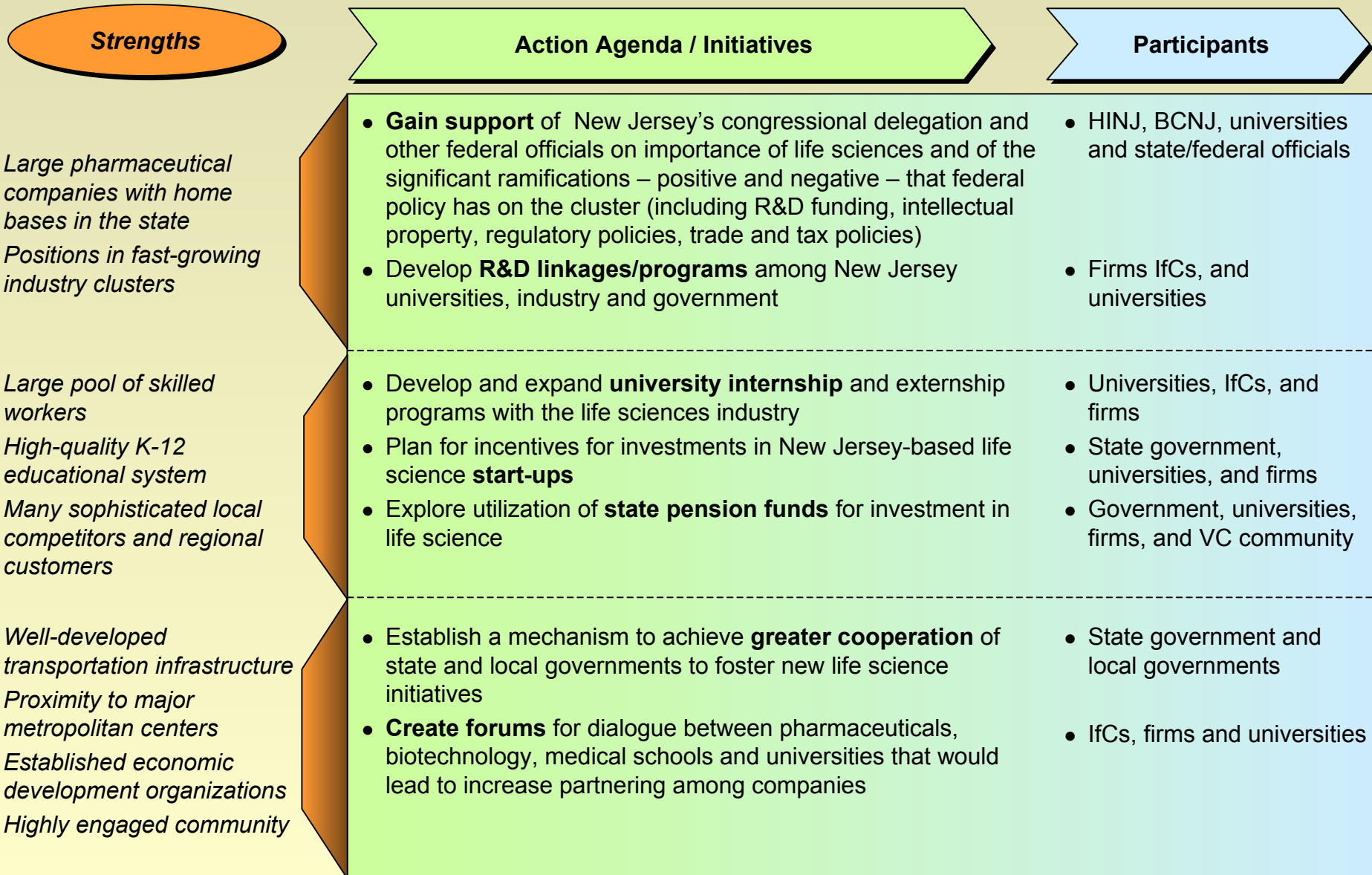
### Strengths

- Large pharmaceutical companies with home bases in the state
- Positions in fast-growing industry clusters
- Large pool of skilled workers
- High-quality K-12 educational system
- Well-developed transportation infrastructure
- Many sophisticated local competitors, regional customers, and specialized suppliers
- Proximity to major metropolitan centers
- Established economic development organizations
- Highly engaged community

### Challenges

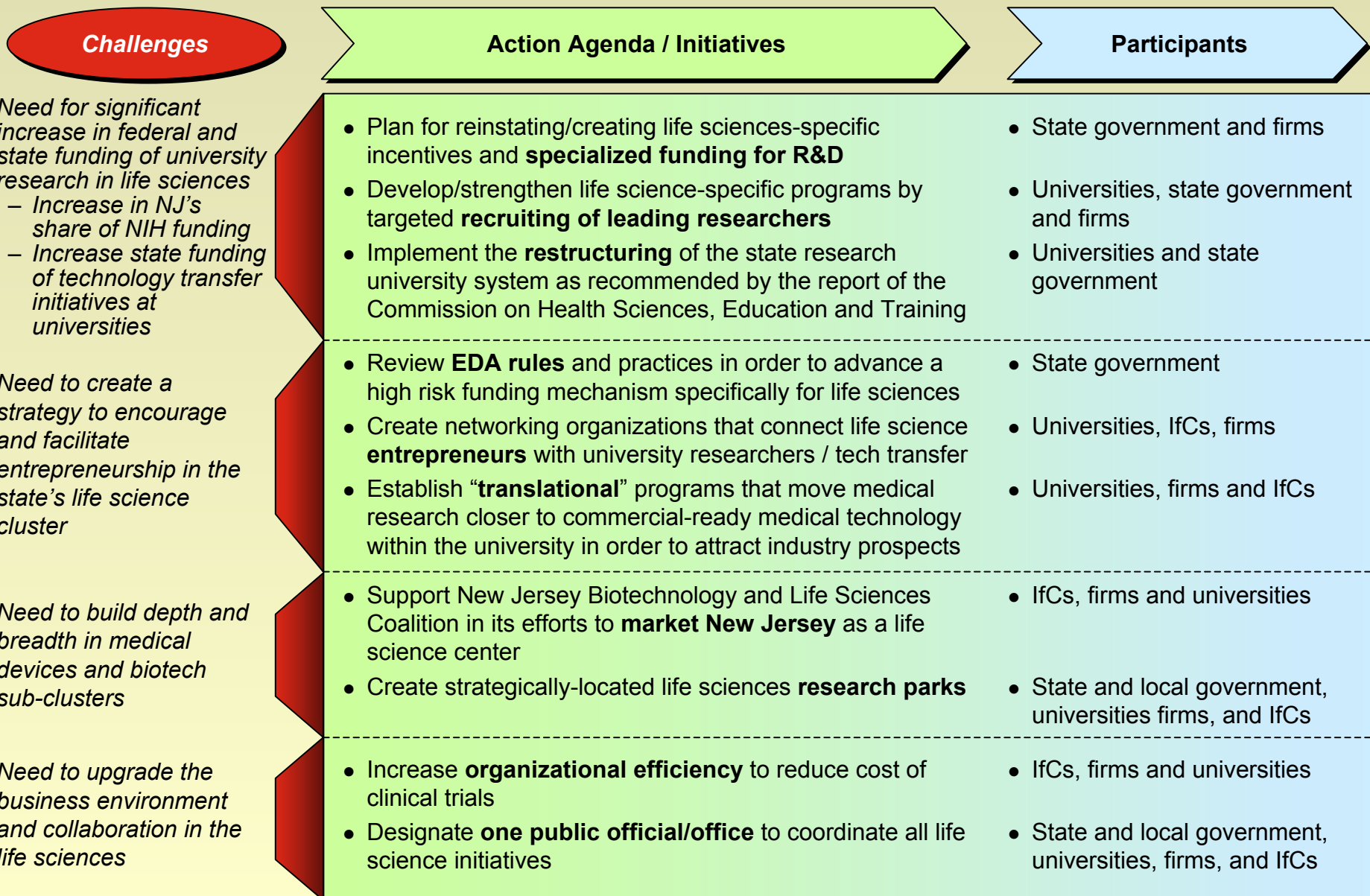
- Need for significant increase in federal and state funding of university research in life sciences
  - Increase in New Jersey's share of NIH funding
  - State funding of technology transfer initiatives at universities
- Need for government to create a strategy to encourage and facilitate entrepreneurship in the state's life science cluster
- Need to build depth and breadth in medical devices and biotech sub-clusters
- Need to upgrade the business environment and collaboration in the life sciences

# Toward an Action Agenda for New Jersey Life Sciences Super-Cluster: Building on Strengths



Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

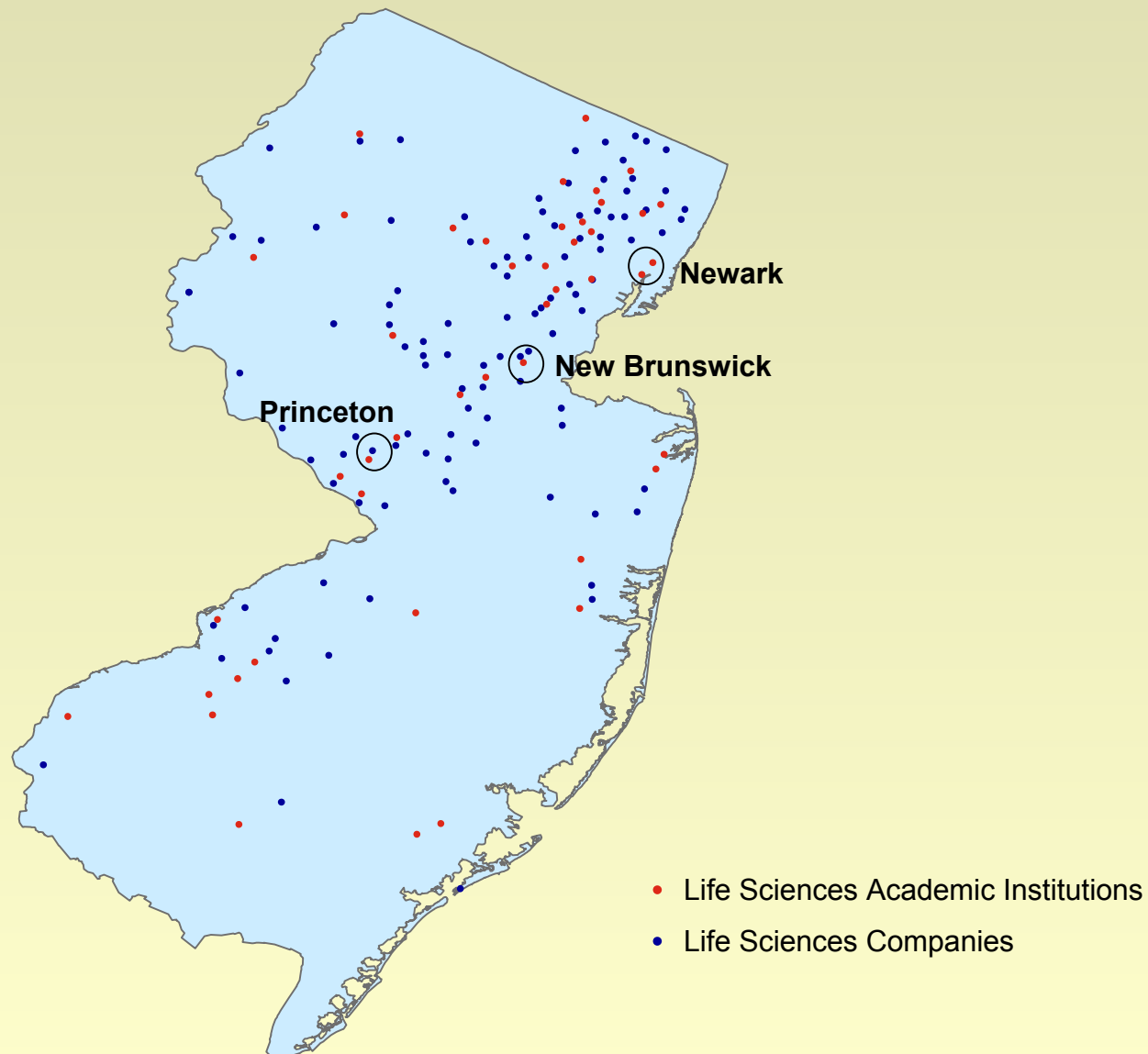
# Toward an Action Agenda for New Jersey Life Sciences Super-Cluster: Addressing Challenges



Source: Monitor analysis, in-depth interviews and survey of key industry, academic and government leaders; October–December, 2002

# New Jersey Life Science Cluster

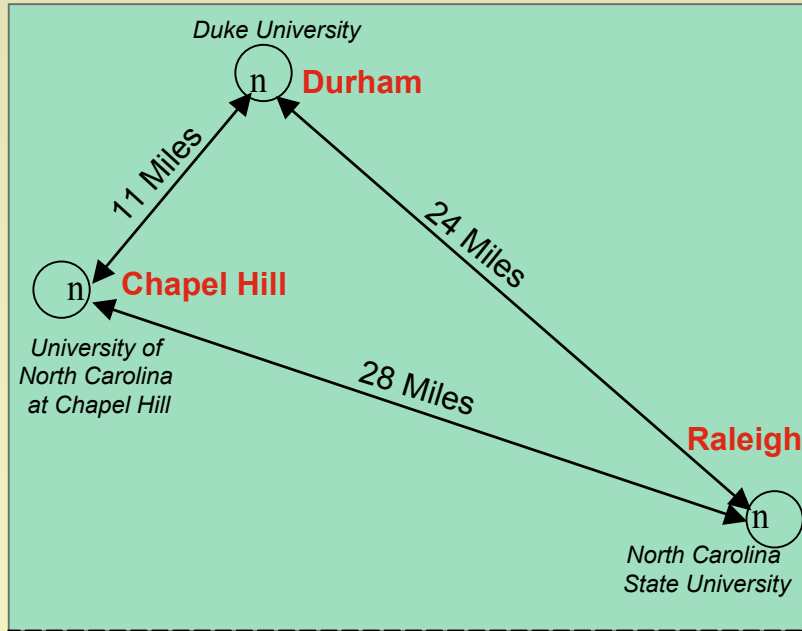
## Location of Life Sciences Academic Institutions and Companies



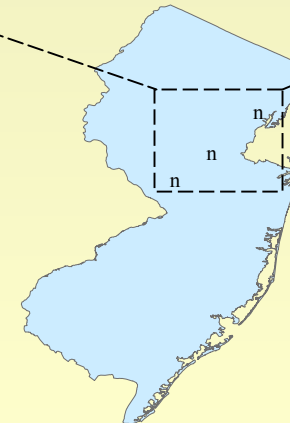
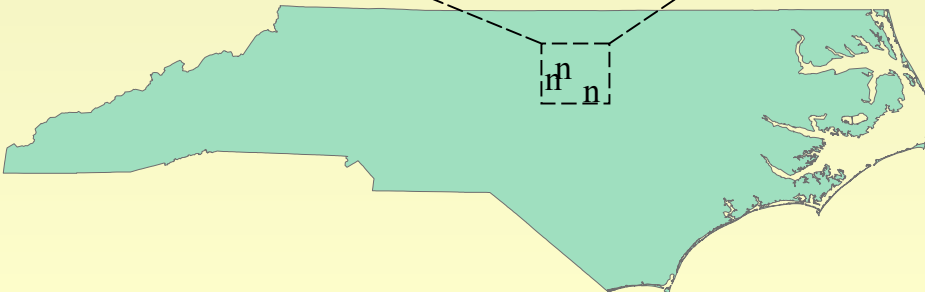
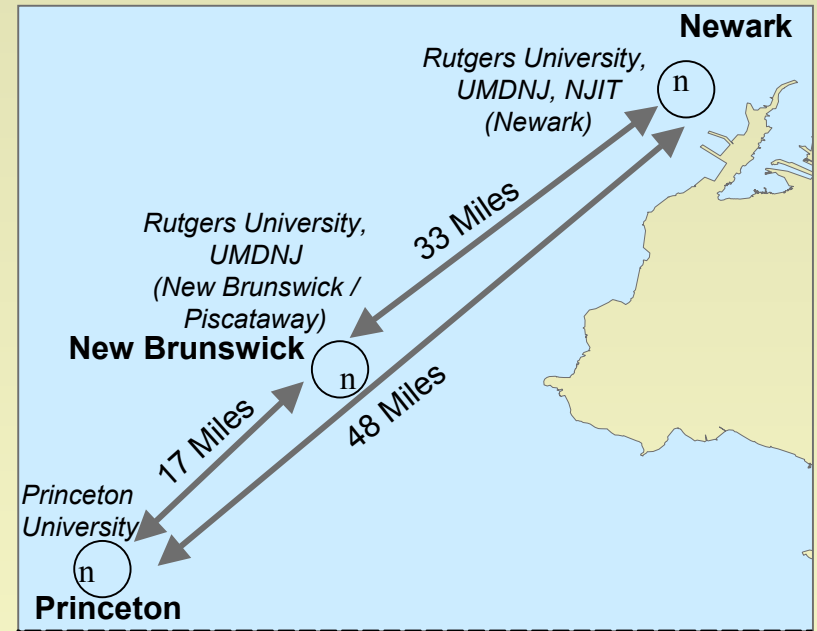
# Example of Benefits of Geographic Proximity

## Research Triangle Park, NC vs. "Research Corridor, NJ"

Research Triangle Park, North Carolina

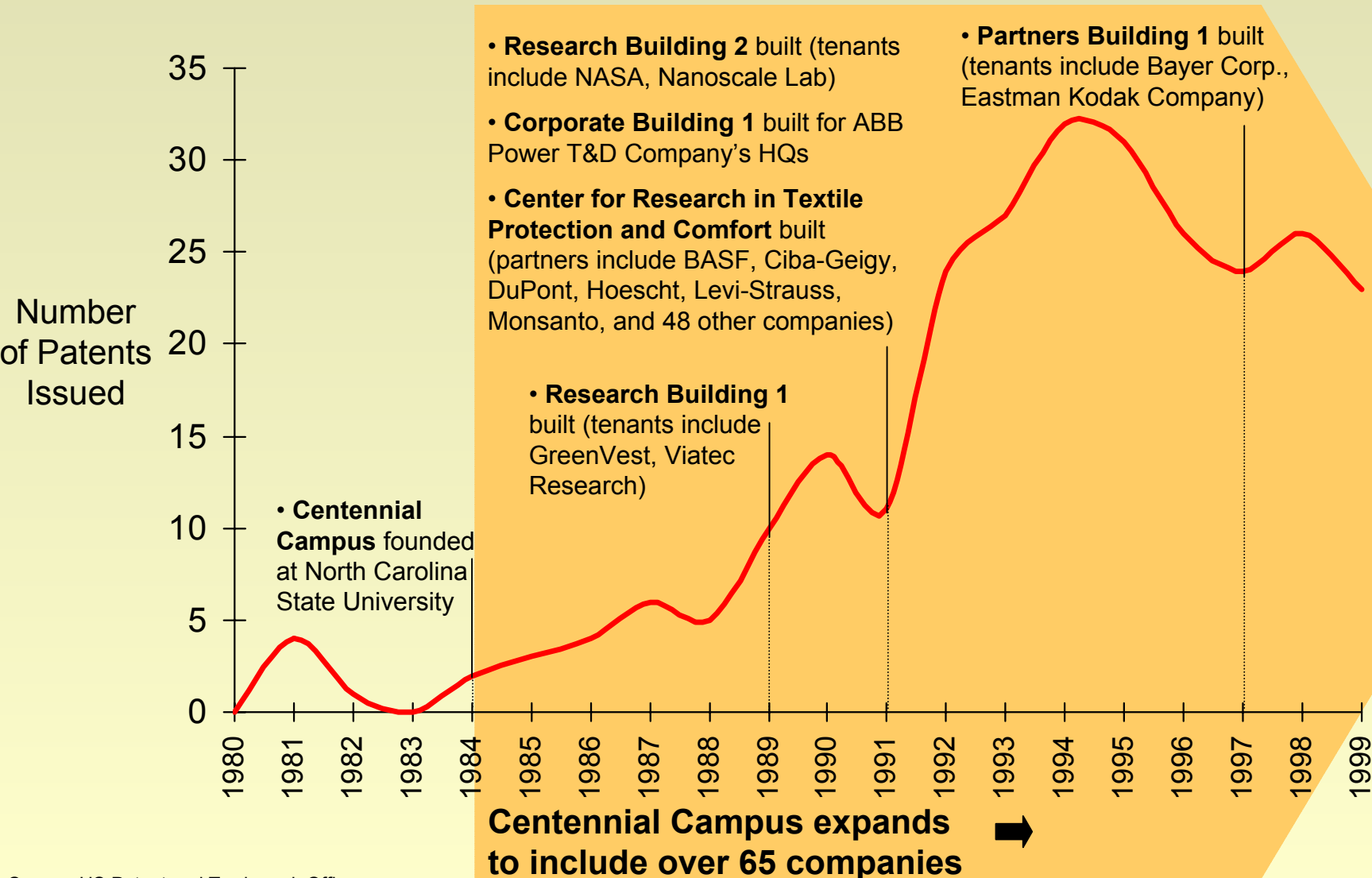


"Research Corridor, New Jersey"



# Example of Benefits of Geographic Proximity

## Patents Issued to North Carolina State University, 1980-1999



# Examples of “One-Stop-Shopping” Offices of Life Sciences

## Texas

### Governor's Council on Science and Biotechnology Development:

#### Structure

- Senior Advisor to Governor acts as chair

#### Other Members:

- 14 statewide representatives
- 20 regional representatives
- 9 ex officio members

#### Committees:

- Capital Formation Committee
- Research Funding Committee
- Tech Transfer Committee
- Workforce Committee

#### Goals / Duties

- Create seamless system of innovation from laboratory to marketplace in rapidly developing areas of biotechnology
- Bring research dollars to Texas higher education institutions, and create biotech jobs and across Texas
- Secure early-stage seed, angel, and venture capital for biotechnology and life sciences
- Increase federal research grant awards (e.g. NIH, DARPA)
- Move R&D to commercialization by improving efficacy and efficiency of technology transfer
- Promote establishment / expansion of scientific career preparation programs

## Massachusetts

### Governor's Council on Economic Growth and Technology -- Sub-Committee on Biotech and Pharma Development:

#### Structure

- “Point-Person” on Pharmaceutical and Biotechnology Issues from the Executive Office

#### Goals / Duties

- Facilitate the planning, permitting, siting and expansion of businesses in biotechnology within the state
- Serve as a centralized liaison for businesses in biotechnology across the state government agencies
- Provide a single-source advocate for business development in the Commonwealth
- Attract new businesses in biotechnology to Massachusetts

Source: Office of the Governor, Rick Perry, Texas; Massachusetts' Governor's Council of Economic Growth and Technology: Subcommittee on Biotechnology and Pharmaceutical Development



# An Economic Vision for New Jersey's Life Sciences Cluster

## New Directions

### Successes of Current Development Strategies

- **Large multinationals:** Large, global companies
- **Firms are self-contained:** Integrated organizations that conduct many activities and most research in-house
- **Improve the general business environment:** Invest in general infrastructure and lowering the cost of doing business



### Targets of New Development Strategies

- **Environment for entrepreneurship:** Improve the environment for, and the support the growth of, small and medium-sized firms
- **Collaboration across firms and institutions:** Increase exchange, partnerships and technology transfer across firms, universities, and other institutions
- **Universities as technology engines:** Bolster research and technology transfer at New Jersey universities
- **Upgrade the cluster:** Address constraints to growing the cluster
- **Foster innovation:** Strategy for enhancing the state's innovative companies

# Next Steps

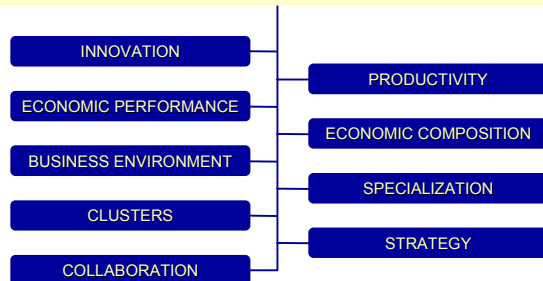
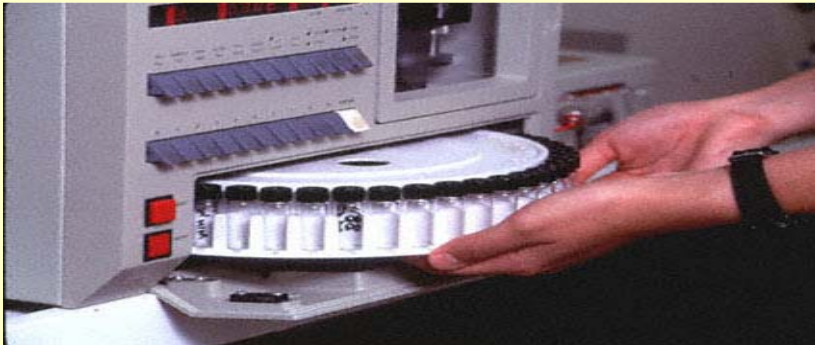
## Life Sciences

- Gain consensus from key state cluster participants on these suggested action agenda
  - Implement proposed initiatives at the state government through an executive order
  - Vet these findings with wider corporate audience

## Overall Economy

- Address cross-cutting challenges facing the state economy, e.g.,
  - Information technology infrastructure
  - Vagelos Commission initiative at the state universities
- Tackle other core clusters, e.g.,
  - Financial Services
  - Hospitality and Tourism
  - Business Services
  - Plastics

# New Jersey Life Sciences Super-Cluster Initiative



Princeton, New Jersey  
February 14, 2003

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