

Cluster mapping – a valuable tool for policymaking?

**EU Clusters Seminar
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Studies
Council on Competitiveness
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Council on Competitiveness

- **Mission:** to set an action agenda that drives economic growth and raises the standard of living for all Americans
- **Membership:** corporate CEOs, university presidents and labor leaders
- **Focus:** benchmarking U.S. competitiveness, supporting national and regional innovation, maintaining competitiveness and security, and succeeding in the global marketplace

Clusters of Innovation Initiative Objectives

- Better understand the composition of regional economies
- Understand how clusters develop
- Develop lessons from regional case studies that inform key stakeholders
- Develop a methodology, process, and data infrastructure that can be utilized widely across America

Clusters of Innovation Initiative

Guiding Questions

- How are clusters configured and how are they distributed?
- How have regions succeeded in fostering innovative firms?
- What must regions do to continue to support innovative firms and clusters in the future?
- What are the policy implications for the local, state, and federal government?

Clusters of Innovation Initiative Project Structure

- Timeframe: Summer of 1998 through December 2002
 - Harvard Cluster Mapping Project was launched around the same time and is an ongoing effort at the Institute for Strategy and Competitiveness
- Leadership:
 - Co-chairs: Professor Michael Porter, Harvard Business School and F. Duane Ackerman, Chairman and CEO of BellSouth Corporation
 - National and regional steering committees
- Pilot regions: Atlanta, GA, Pittsburgh, PA, Research Triangle, NC, San Diego, CA and Wichita, KS

Clusters of Innovation Initiative Project Structure

- Research Team:
 - Professor Porter and the Institute for Strategy and Competitiveness
 - Council on Competitiveness
 - Monitor Company
 - ontheFRONTIER
- Policy Audience: business, academia, political leaders (at all levels), economic development organizations and chambers of commerce
- Funding: federal, state and local governments, companies, private foundations and in-kind consulting services

Clusters of Innovation Initiative Project Methodology

Cluster Mapping Project

- Consistent performance measures, 1990–1999
 - Employees
 - Wages
 - Establishments
 - Patents
- Systematic data on regional clusters, industries, and patenting
 - Empirically derived cluster linkages
 - Evolution of clusters over time
- Comparative data at multiple levels of geography
 - County
 - MSA
 - Economic area
 - State

Interviews

- Regional history
- View on networks
- Assessment of university, business and government ties
- Challenges for future growth

Surveys

- Network Linkages
- Mental Models
- Competitive environment

Clusters of Innovation Initiative Regional Survey – Competitive Environment

- **Factor Input Conditions:** high quality, specialized inputs available to firms
 - human resources
 - capital resources
 - physical, administrative, scientific and technological infrastructure
 - natural resources
- **Related and Supporting Industries:**
 - availability of capable, locally based suppliers and firms in related fields
 - presence of clusters instead of isolated industries

Clusters of Innovation Initiative Regional Survey – Competitive Environment

- **Demand Conditions:**
 - A core of sophisticated and demanding local customer(s)
 - Unusual local demand in specialized segments that can be served nationally and globally
 - Customer needs that anticipate those elsewhere
- **Context for Firm Rivalry and Strategy:** a local context that encourages investment and sustained upgrading
 - intellectual property protection
 - open and vigorous competition among locally based rivals

Clusters of Innovation Initiative

Quantitative Measures

Inputs

- Workforce Composition
- R&D investments
- Venture Capital
- Quality of the K-12 education

Outputs

- Employment
- Establishment growth
- Average Wages
- Productivity
- Exports
- Patents
- Initial Public Offerings
- Fast Growth Firms

Harvard Cluster Mapping Project Methodology

1. Selected data sets
 - County Business Patterns by Standard Industrial Classification (SIC) Code
 - 1992 Input-Output Accounts
2. Identified geographic unit of analysis
 - State
3. Determined degree of localization by industry
 - Concentration index
4. Separated concentrated industries from dispersed industries using degree of localization

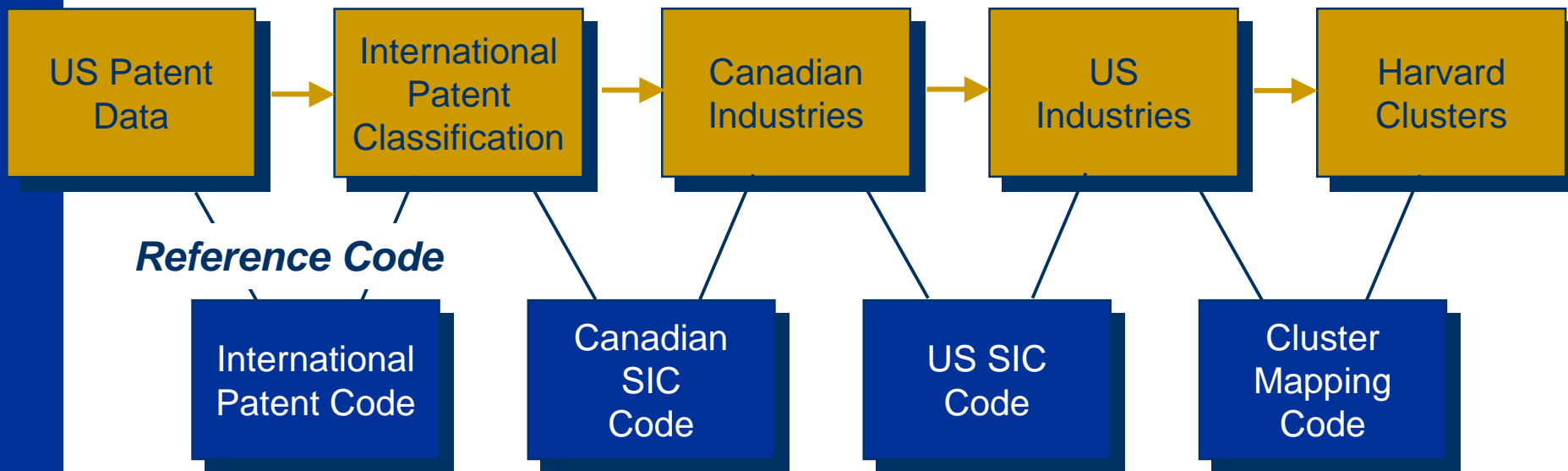
Harvard Cluster Mapping Project Methodology

5. Allocated dispersed industries to 'Local' clusters
6. For concentrated industries, identified potential clusters and selected 'core' industries
 - Industries with highest frequency of significant correlation with related industries designated as 'core'
7. Allocated remaining concentrated industries to clusters using correlation with core industries
 - Spurious correlations removed using Input-Output data

Cluster Mapping and Profiling Methodology for Patent Allocation

→ = Concordance established

Allocation Sequence



Harvard Cluster Mapping Project

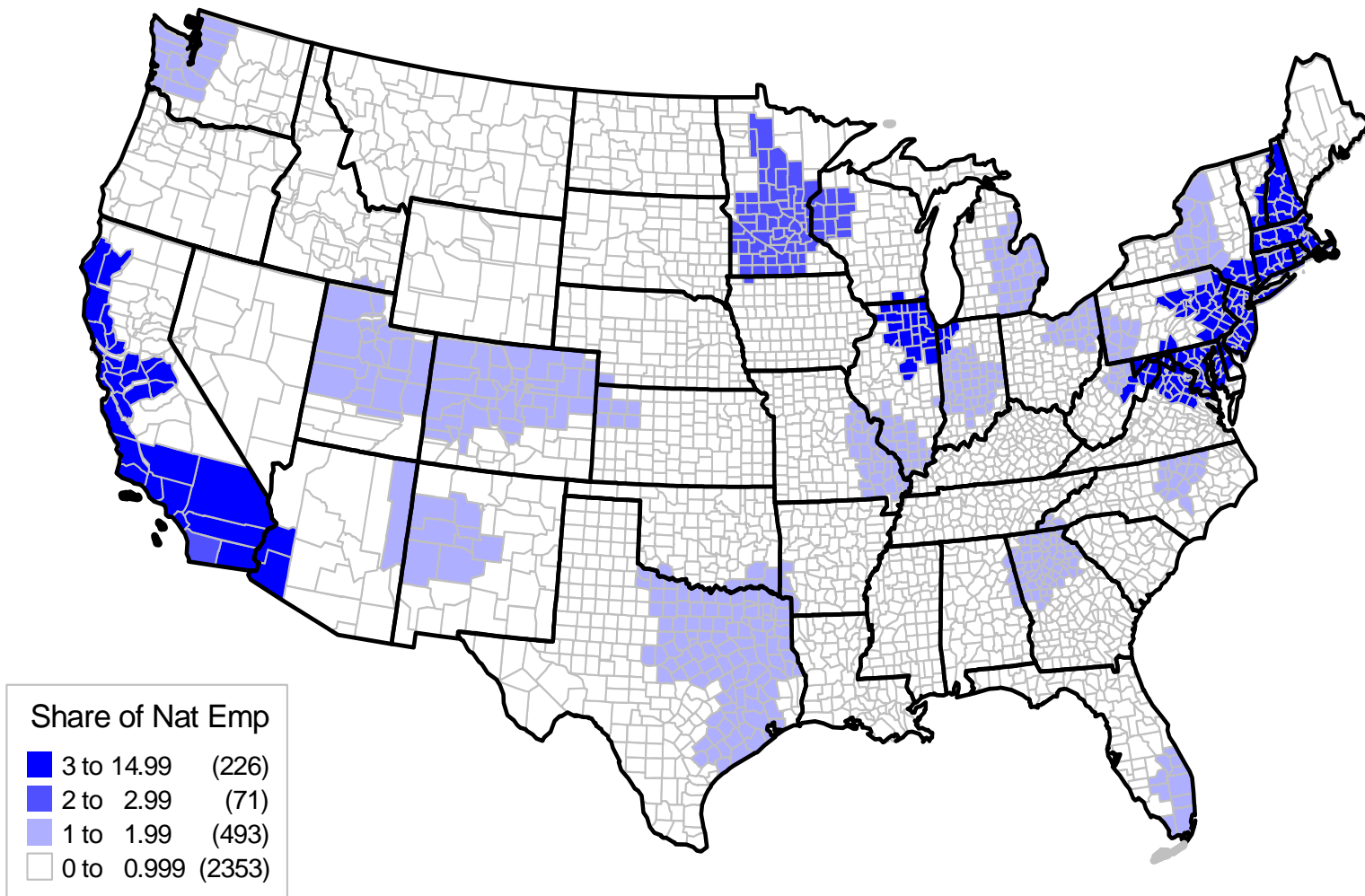
Broad Cluster Definitions

	Traded Clusters	Local Clusters	Natural Resource-Driven Industries
Share of Employment	31.8%	67.1%	0.8%
Employment Growth, 1990 to 2000	1.7%	2.8%	-0.1%
Average Wage	\$45,040	\$27,169	\$32,169
Relative Wage	137.0	82.6	97.7
Wage Growth	5.0%	3.6%	1.9%
Relative Productivity	144.1	79.3	140.1
Patents per 10,000 Employees	21.1	1.3	7.0
Number of SIC Industries	590	241	48

Note: 2000 data, except relative productivity which is 1997.

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

Biotechnology / Pharmaceutical Cluster Share of National Employment



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

Research Triangle Area Overall Composition of Employment and Wages, 2000

Traded Clusters

Total Employment: 199,004

Average Wages: \$47,455

Share of Region's Employment: 34.9%

Natural Resources

Total Employment: 3,478

Average Wages: \$24,748

Share of Region's Employment: 0.6%

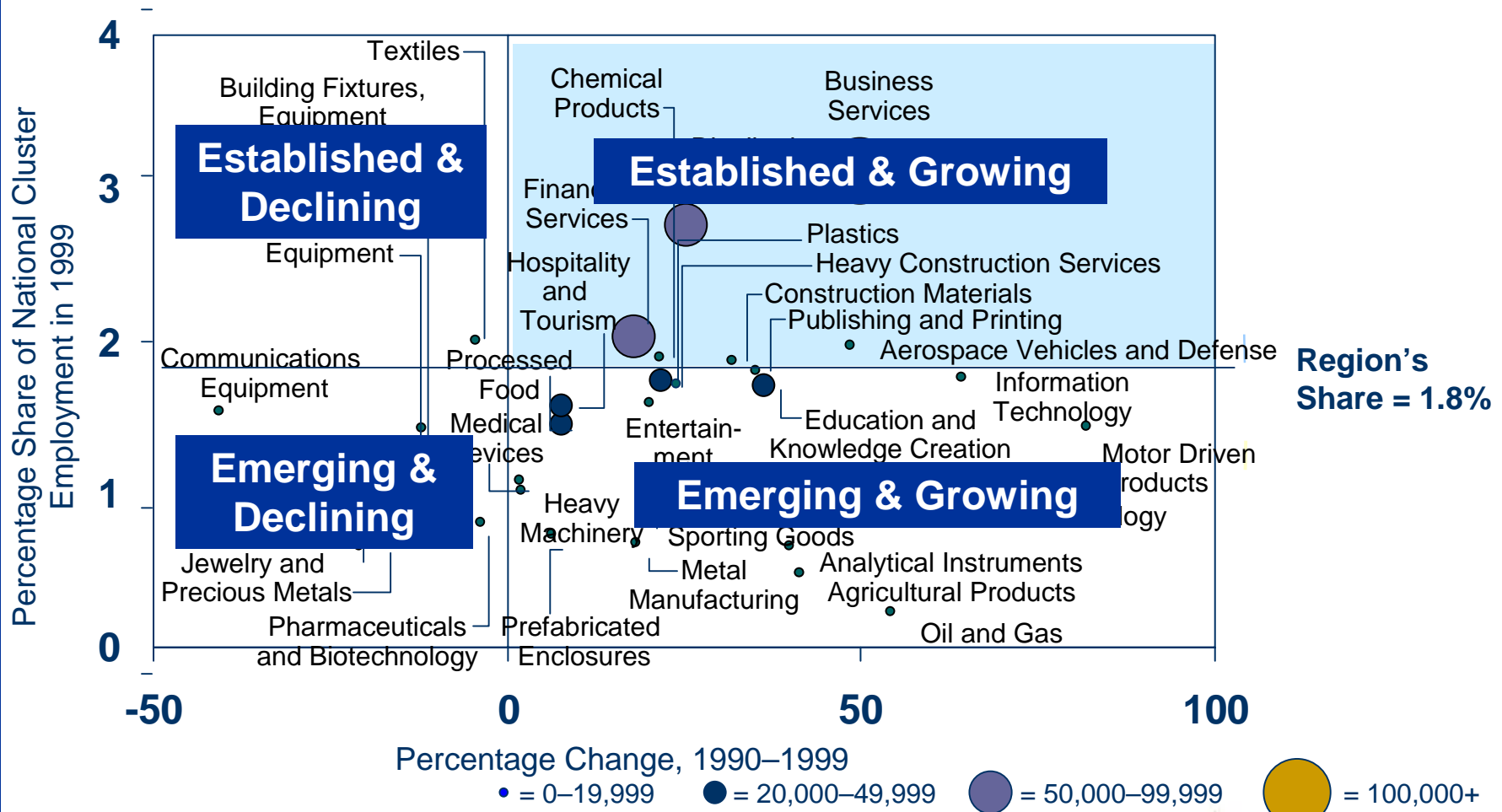
Local Clusters

Total Employment: 367,288

Average Wages: \$26,191

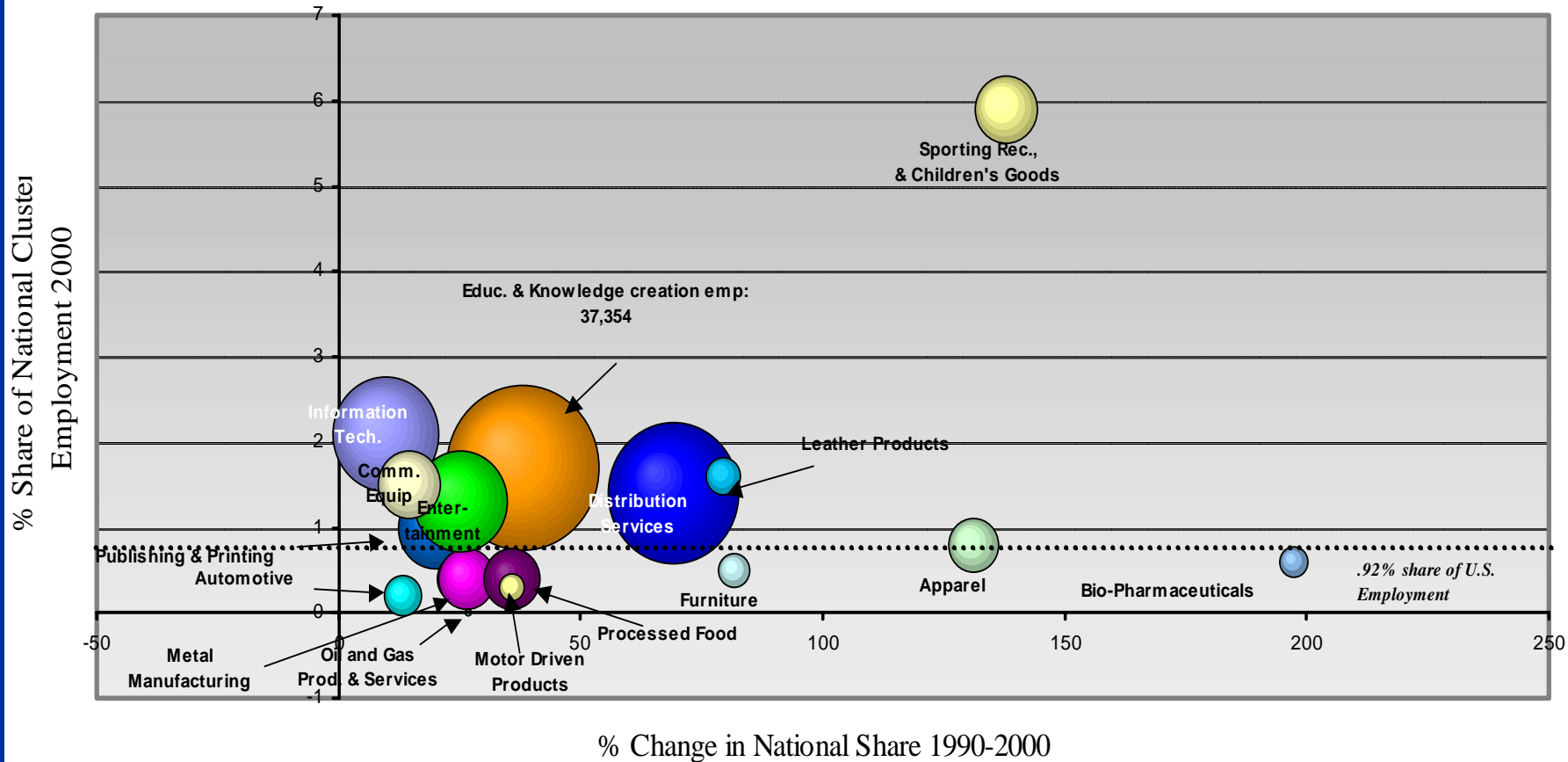
Share of Region's Employment: 64.5%

Traded Clusters by Relative Size and Growth Rate



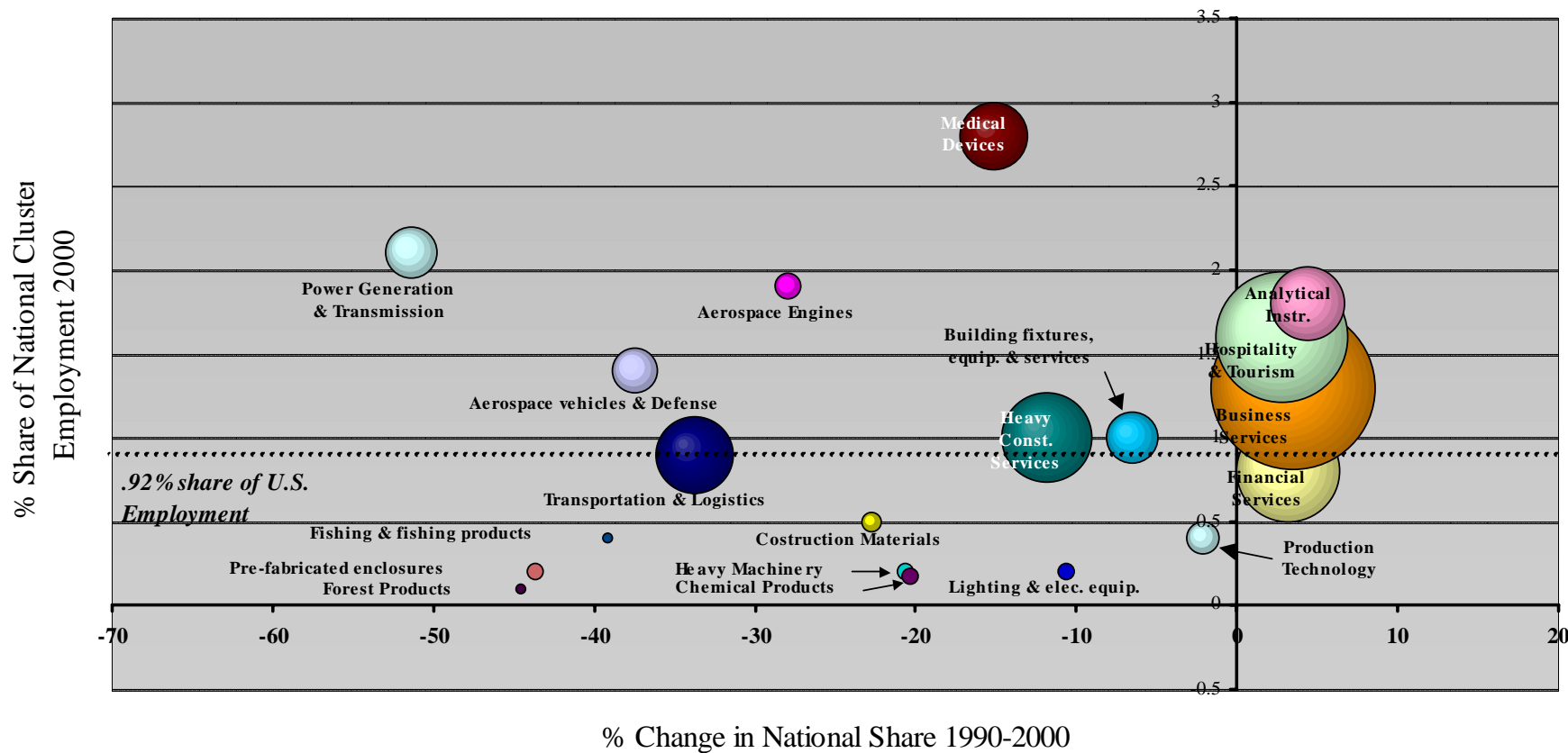
Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

San Diego MSA Specialization by Traded Cluster (Fast Growing)



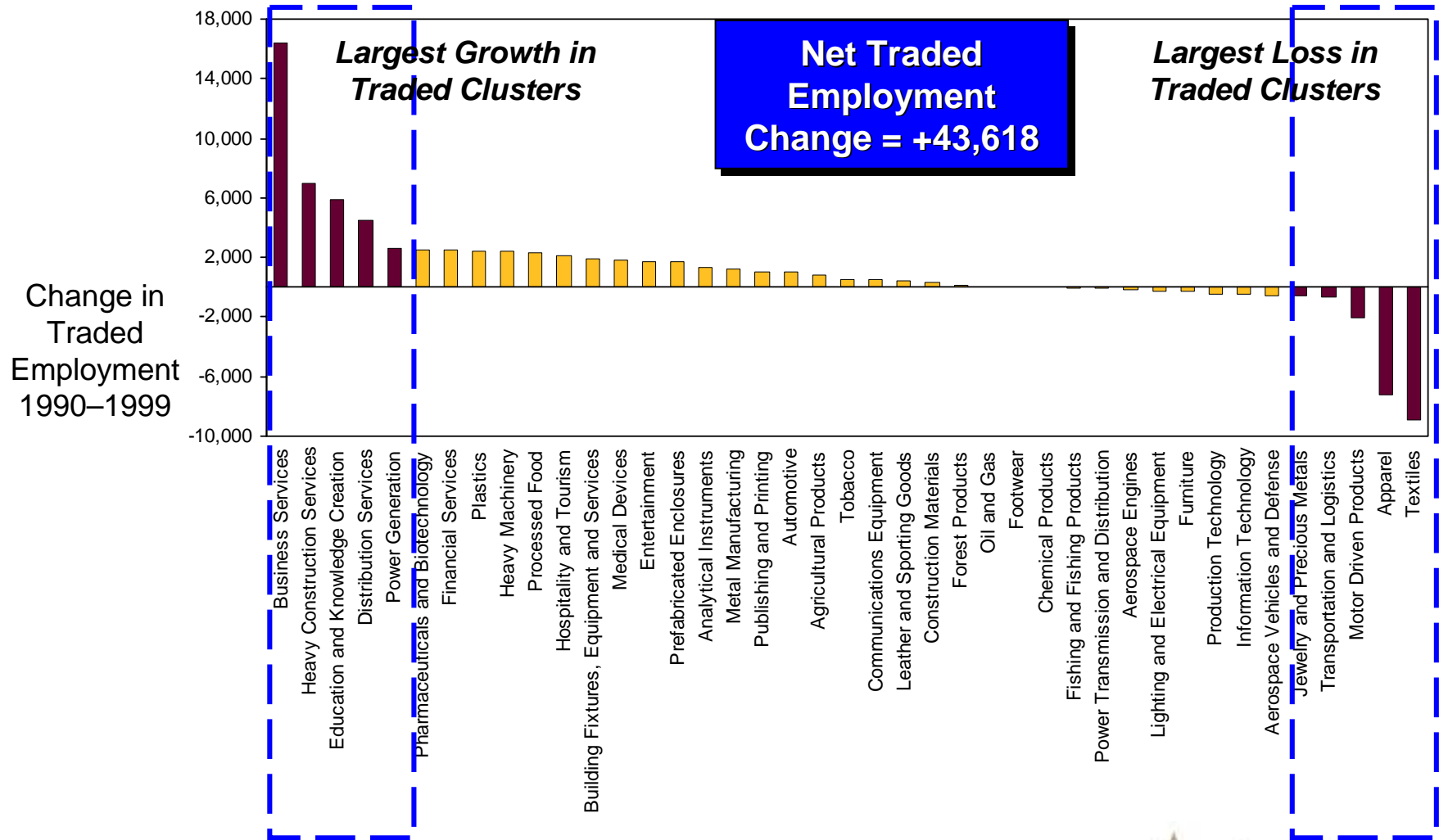
Source: Cluster Mapping Project at Institute for Strategy and Competitiveness, Harvard Business School

San Diego MSA Specialization by Traded Cluster (Slow Growing)



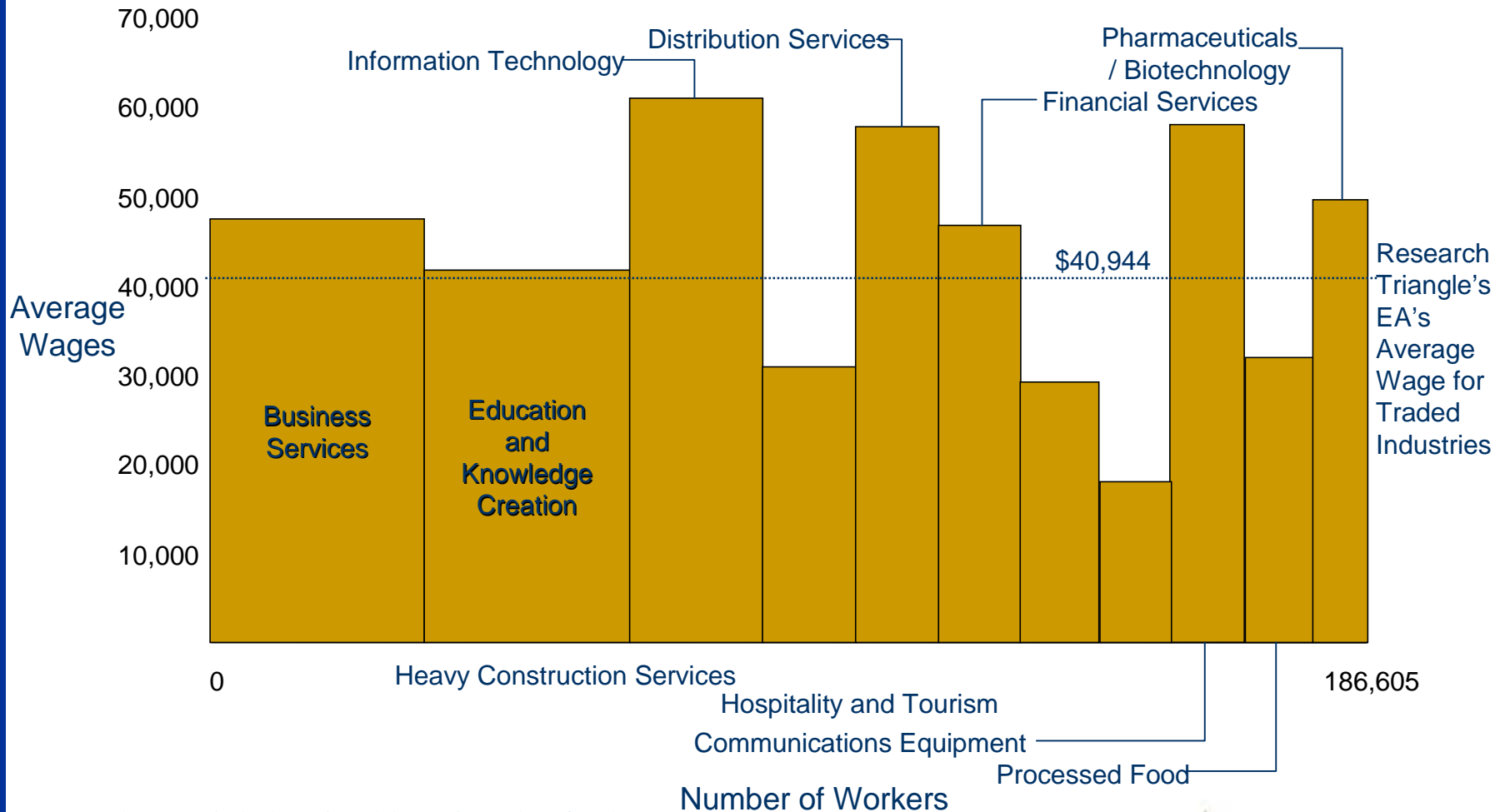
Source: Cluster Mapping Project at Institute for Strategy and Competitiveness, Harvard Business School

Research Triangle Job Creation 1990–1999



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

Average Wages of Leading Clusters in Research Triangle, 1999



Note: Pharmaceuticals cluster is 12th largest in number of workers

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

Research Triangle Patents by Organization 1995 to 1999

Organization	Patents Issued from 1995 to 1999
International Business Machines Corporation	495
Ericsson, Inc.	325
Becton, Dickinson and Company	128
North Carolina State University	128
Duke University	127
University of North Carolina – Chapel Hill	124
Square D Company	48
Novartis	46
ABB Power T&D Company, Inc.	44
Alcatel Network Systems, Inc.	43
Mitsubishi Semiconductor America, Inc.	41
Lord Corporation	36
Kennametal, Inc.	29
Rhone-Poulenc, Inc.	29
Telefonaktiebolaget LM Ericsson	28
Caterpillar, Inc.	26
Cree Research, Inc.	26
E.I. DuPont De Nemours and Company	26
MCNC	25
Benchmarks	Patents Issued from 1995 to 1999
Massachusetts Institute of Technology	509
John Hopkins University	233
Stanford University	204

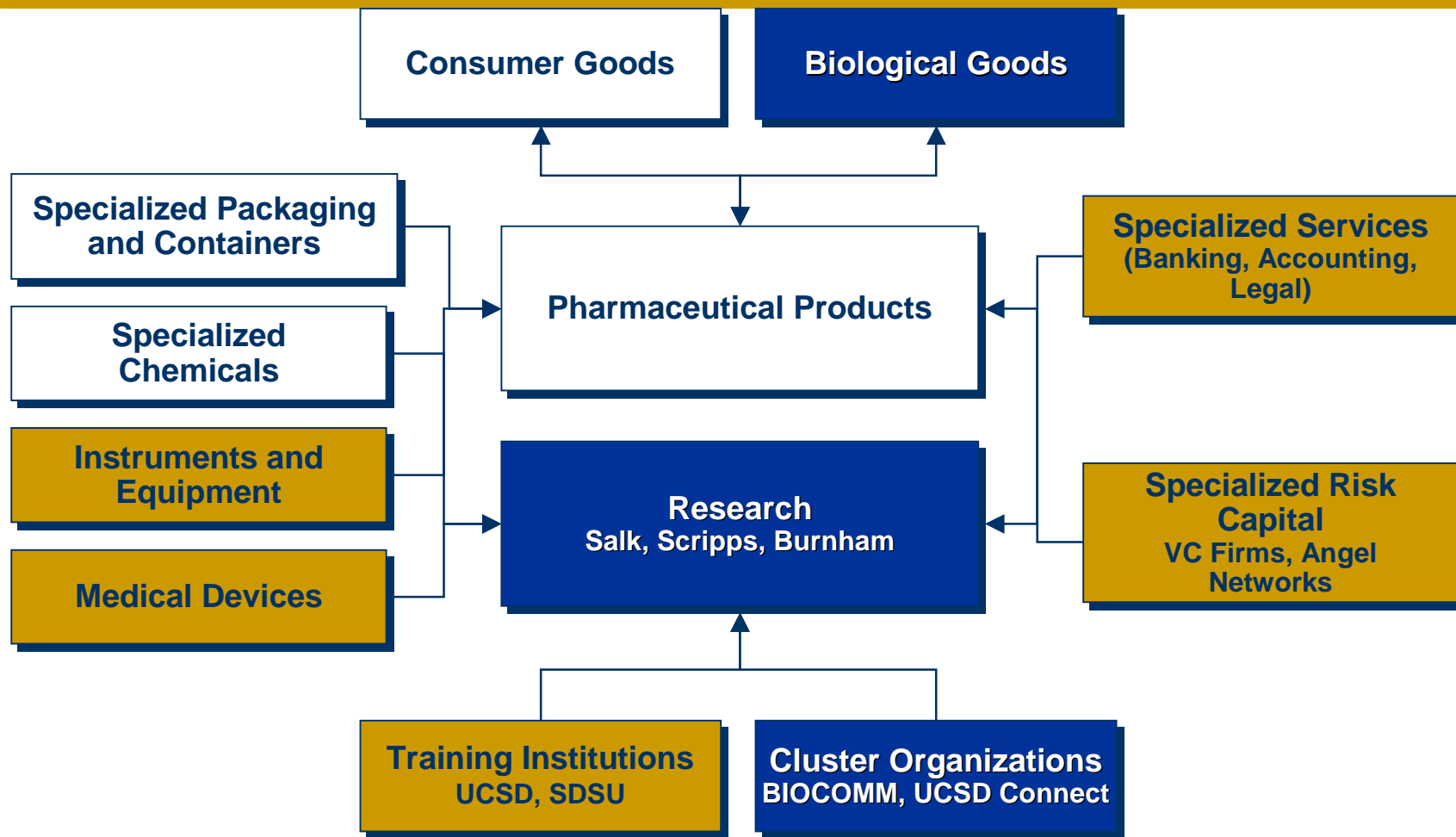
Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

Ten Largest U.S. Biotechnology / Pharmaceutical Clusters (1997)

Metropolitan Area	1997 Share of National Cluster Employment	1997 Total Employment	CAGR of Employment, 1988–1997	Total Patents, 1997	CAGR of Patents, 1988–1997
Boston-Worcester-Lawrence, MA	6.3	67,964	1.73%	995	14%
Chicago, IL	5.4	57,930	-0.53%	449	6%
Los Angeles-Long Beach, CA	3.5	37,992	-1.71%	278	7%
Washington, DC-MD-VA-WV	3.3	35,730	5.35%	344	14%
Newark, NJ	2.8	30,676	1.75%	353	4%
Philadelphia, PA-NJ	2.8	30,059	-2.77%	671	9%
San Jose, CA	2.7	29,185	5.80%	449	11%
Minneapolis-St. Paul, MN-WI	2.6	27,679	5.88%	342	11%
San Diego, CA	2.5	27,299	3.88%	360	19%
New York, NY	2.4	26,225	-0.29%	368	5%

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

Competitive Position of the San Diego Biotechnology / Pharmaceutical Cluster



■ Among National Leaders

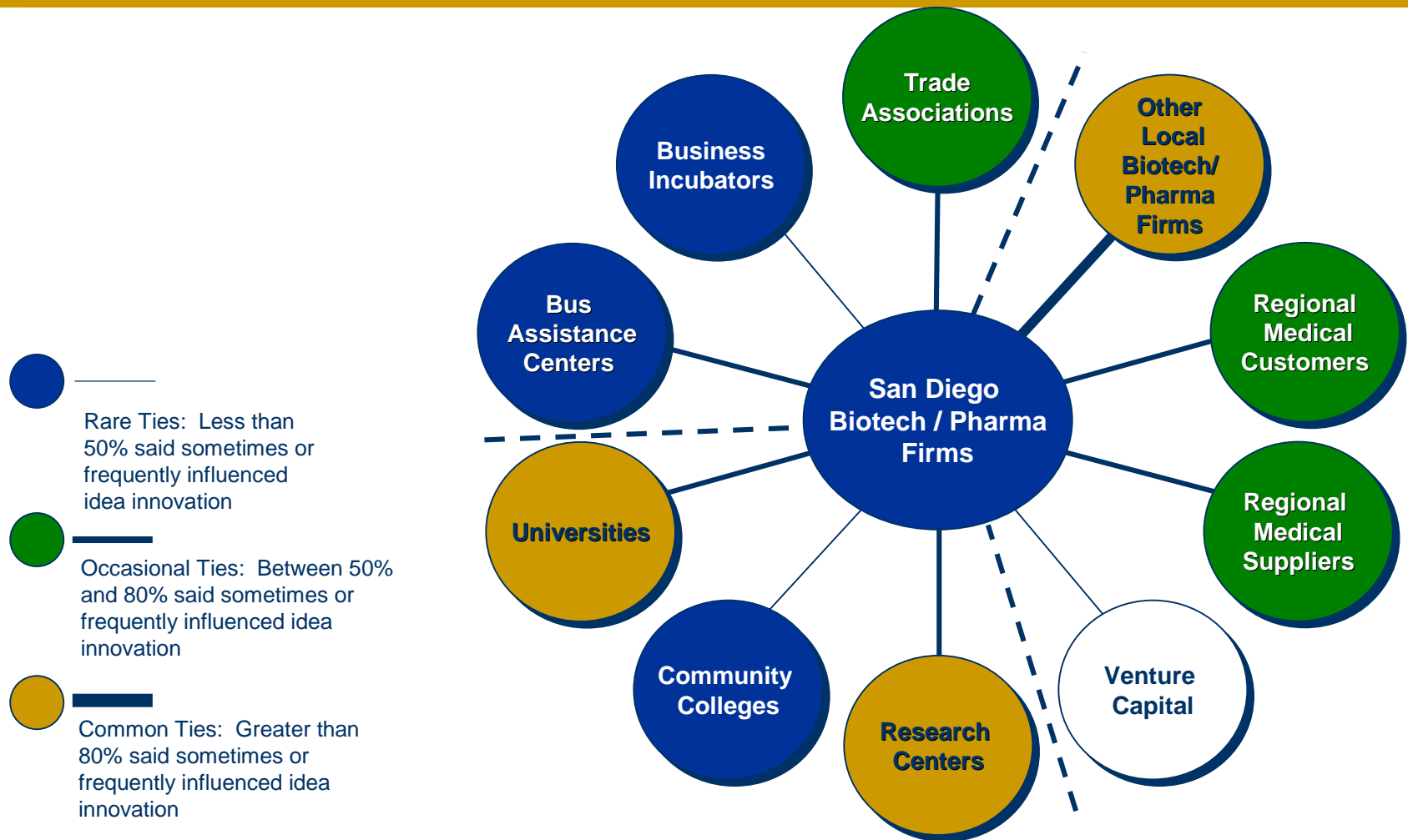
■ Position Established

□ Less Developed

Source: Regional Survey Data and In-person Interviews

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San Diego Biotechnology / Pharmaceutical Cluster Innovation Networks



Source: Regional Survey Data

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Benefits of Cluster Mapping

- Identify competitive strengths and weaknesses
- Categorize stage of cluster development
- Identify potential areas for growth (e.g. emerging clusters)
- Identify areas for cluster collaboration and location
- Leverage inherited and created assets



Organizing and prioritizing economic development efforts

Potential Shortcomings of Cluster Analysis

- Overly broad or narrow cluster definitions
- Ignoring the importance of qualitative data
- Incomplete data
 - Lagged
 - Censored
 - Predefined geographic definitions
- Viewed in isolation of other economic data
- Treated as a solution instead of a tool

Source: Professor Michael Porter, Council on Competitiveness, Monitor Company, ontheFrontier, Michael Luger and Edward Feser, UNC Chapel Hill

Things to Consider

- Cluster definition
- Intended audience
- Methodology (the quantitative and qualitative approach)
- Geographic focus
- Availability and integrity of the data
- Long-term commitment
- A broader strategic plan

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