

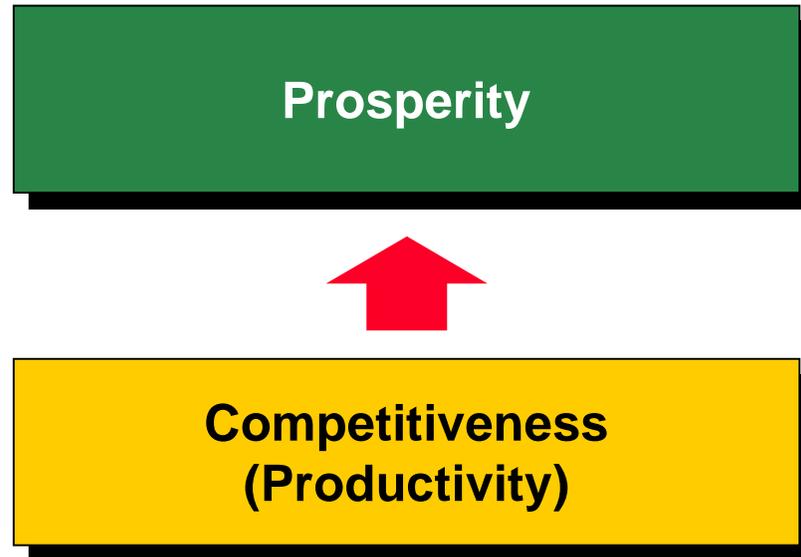
The Regional Foundations of U.S. Competitiveness: Findings from the Clusters of Innovation Project

Professor Michael E. Porter
Harvard Business School

National Innovation Summit
San Diego, California
April 5, 2001

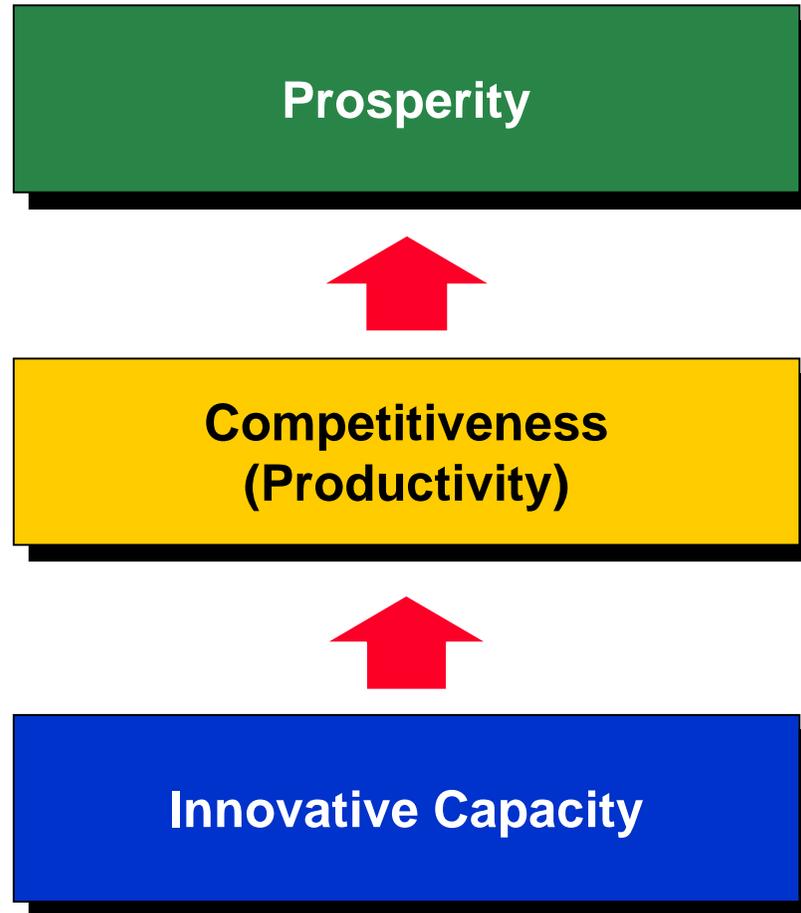
This presentation draws on ideas from Professor Porter's articles and books, in particular, The Competitive Advantage of Nations (The Free Press, 1990), "The Microeconomic Foundations of Economic Development," in The Global Competitiveness Report 2000, (World Economic Forum, 2000), "Clusters and the New Competitive Agenda for Companies and Governments" in On Competition (Harvard Business School Press, 1998) and ongoing statistical study of clusters, Competing for Prosperity: The Microeconomic Foundations of Development, forthcoming, and "What is Strategy?" (Harvard Business Review, Nov/Dec 1996). No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means - electronic, mechanical, photocopying, recording, or otherwise - without the permission of Michael E. Porter.

Sources of Prosperity

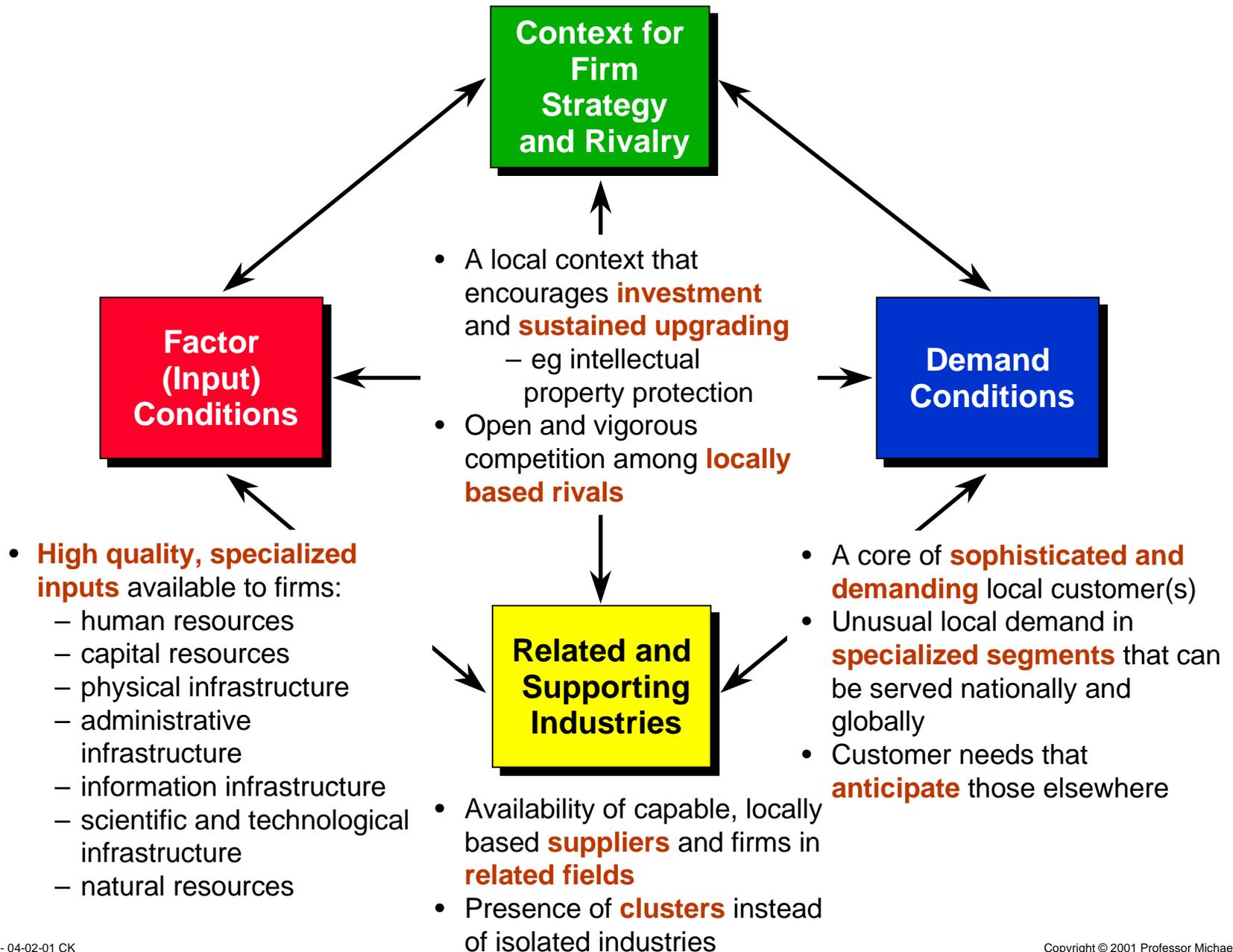


- The most important sources of prosperity are **created** not inherited
- Productivity does not depend on **what** industries a region competes in, but on **how** it competes
- The prosperity of a region depends on the productivity of **all** its industries.

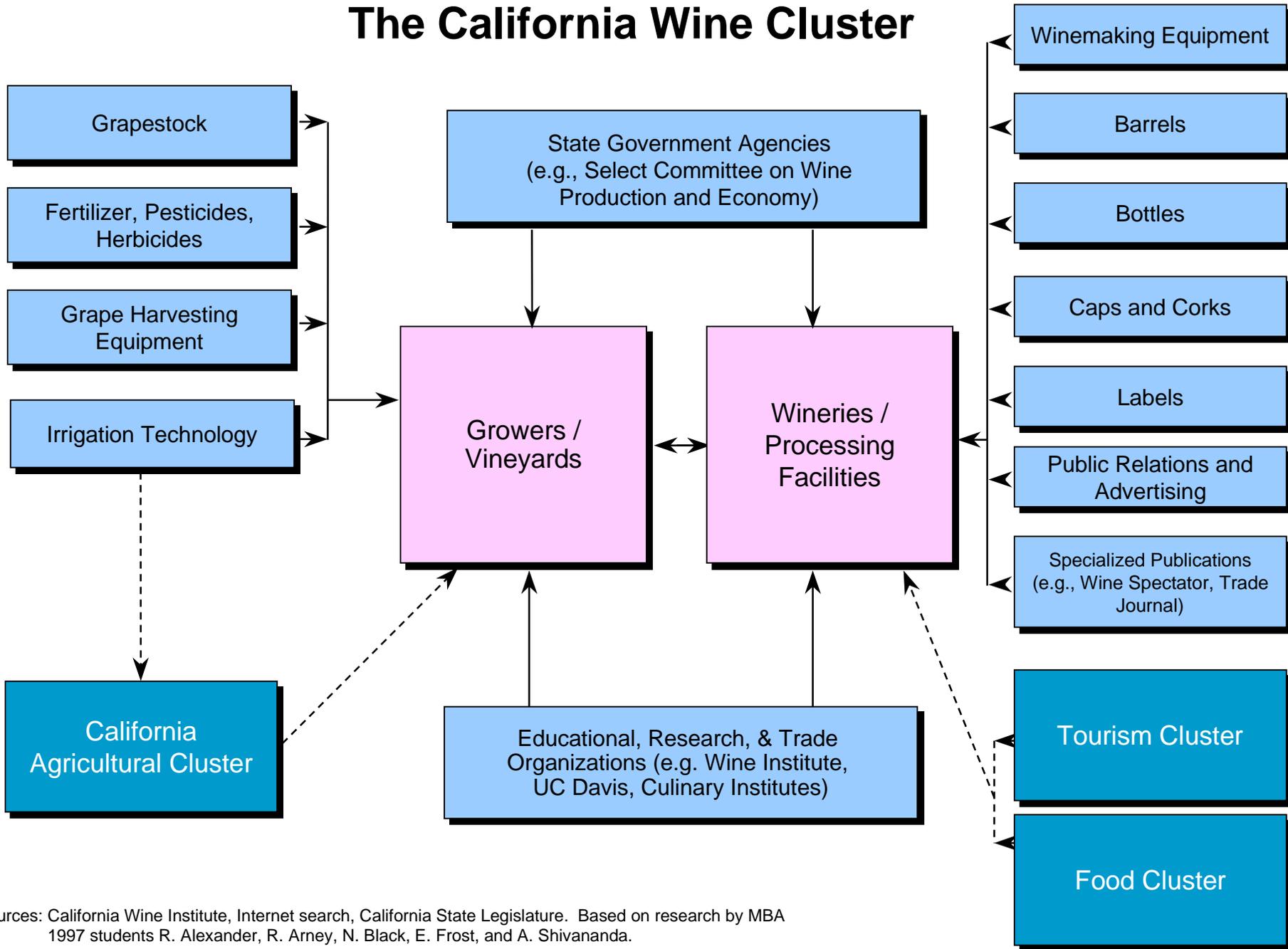
Innovation and Productivity Growth



Productivity and the Business Environment



The California Wine Cluster



Sources: 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.

Institutions for Collaboration

Selected Institutions

Private Sector

- UCSD CONNECT
- San Diego Chamber of Commerce
- San Diego MIT Enterprise Forum
- Corporate Director's Forum
- San Diego Dialogue
- Service Corps of Retired Executives, San Diego

Joint Private / Public

- San Diego Regional Economic Development Corporation
- Center for Applied Competitive Technologies
- San Diego World Trade Center

Informal Networks

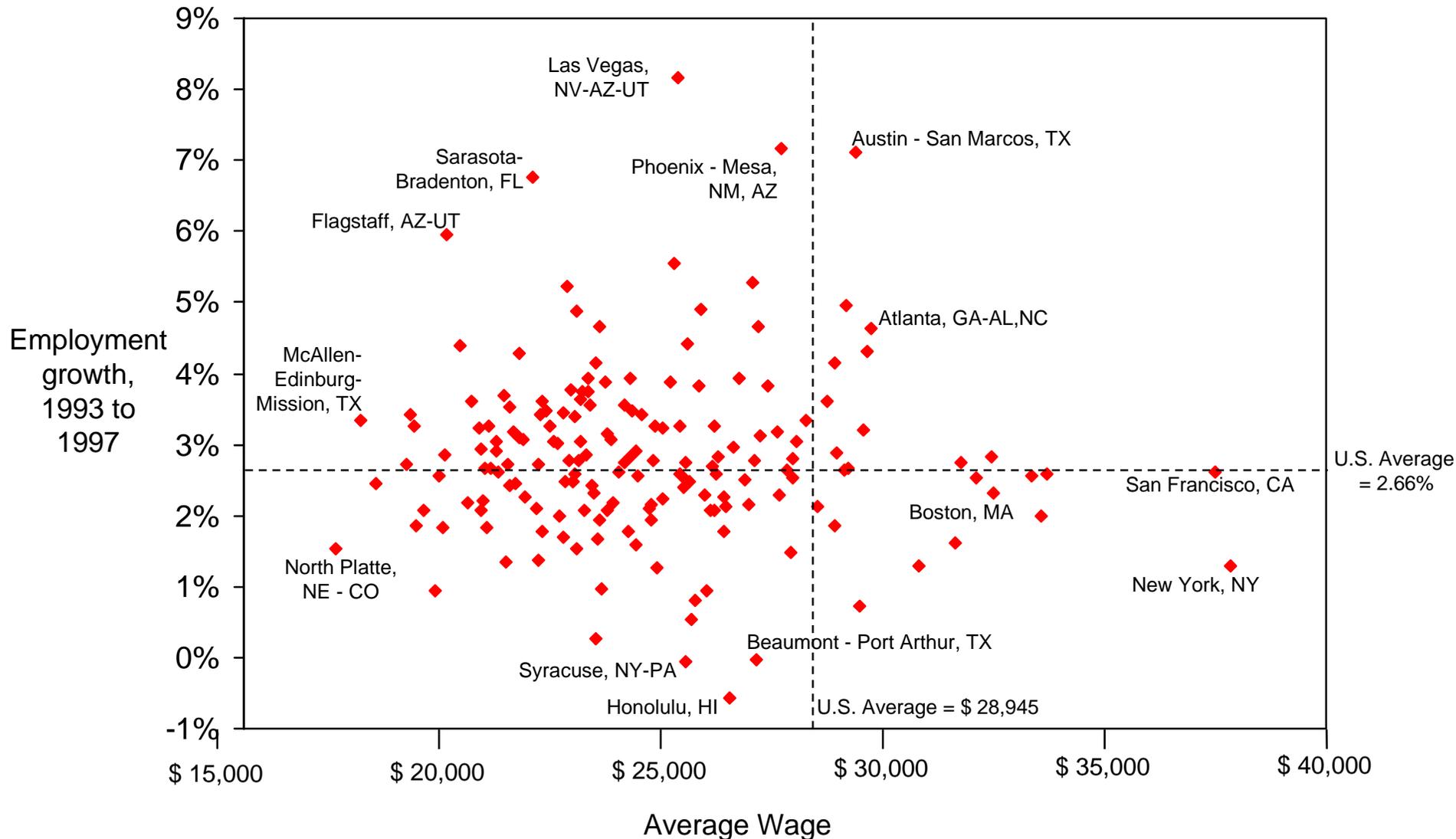
- Linkabit Alumni
- Hybritech Alumni
- UCSD Alumni
- Scripps Research Institute Alumni

Public Sector

- San Diego Association of Governments
- San Diego Regional Technology Alliance
- San Diego Science and Technology Council
- Office of Trade and Business Development
- Small Business Development and International Trade Center

Economic Performance Across Regions

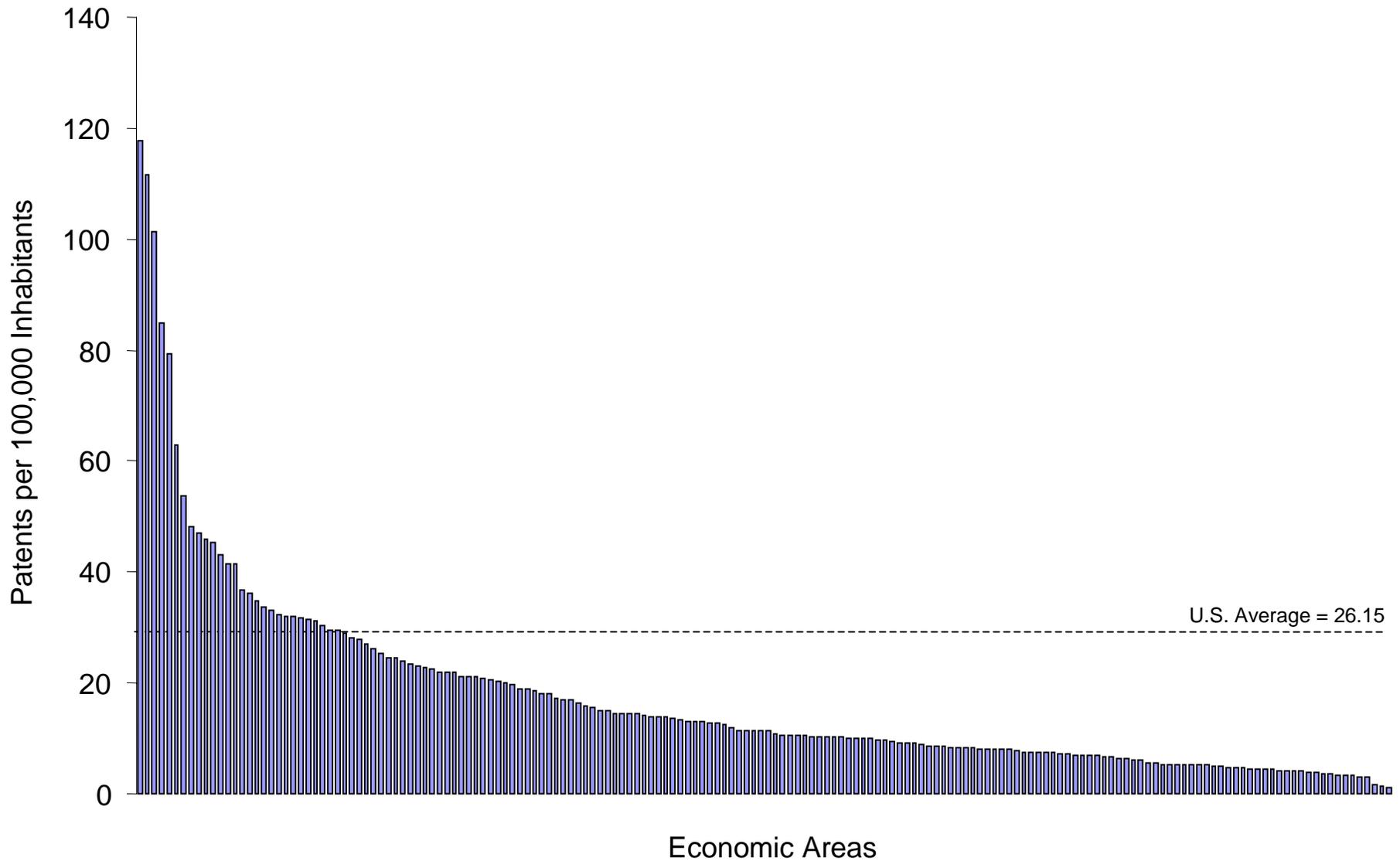
Compound Annual Employment Growth, 1993 to 1997



Note: There are 172 Economic Areas in the United States
 Source: Cluster Mapping Project, Harvard Business School

Economic Performance Across Regions

Patents per Capita, 1997

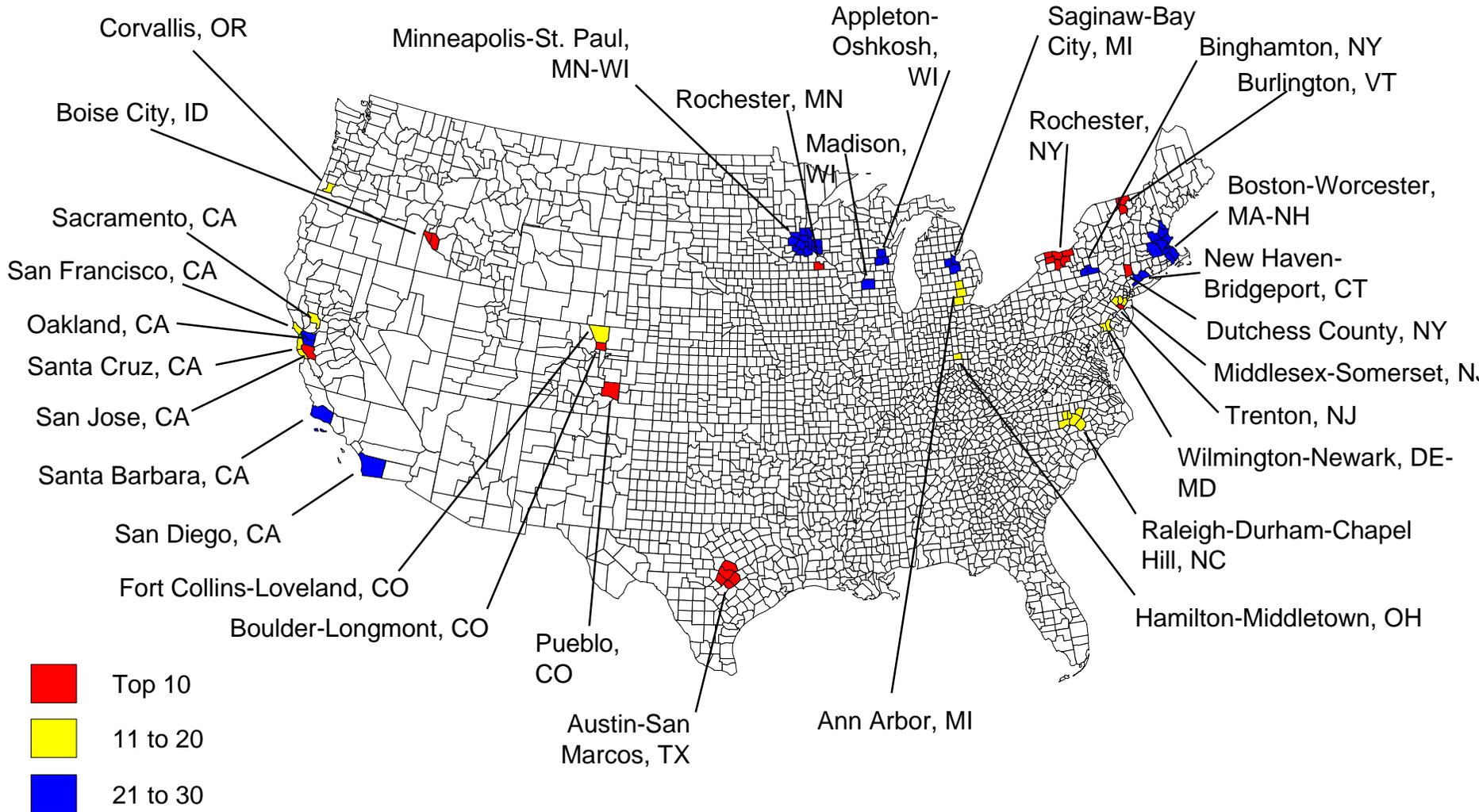


U.S. Average = 26.15

Note: There are 172 Economic Areas in the United States
Source: Cluster Mapping Project, Harvard Business School

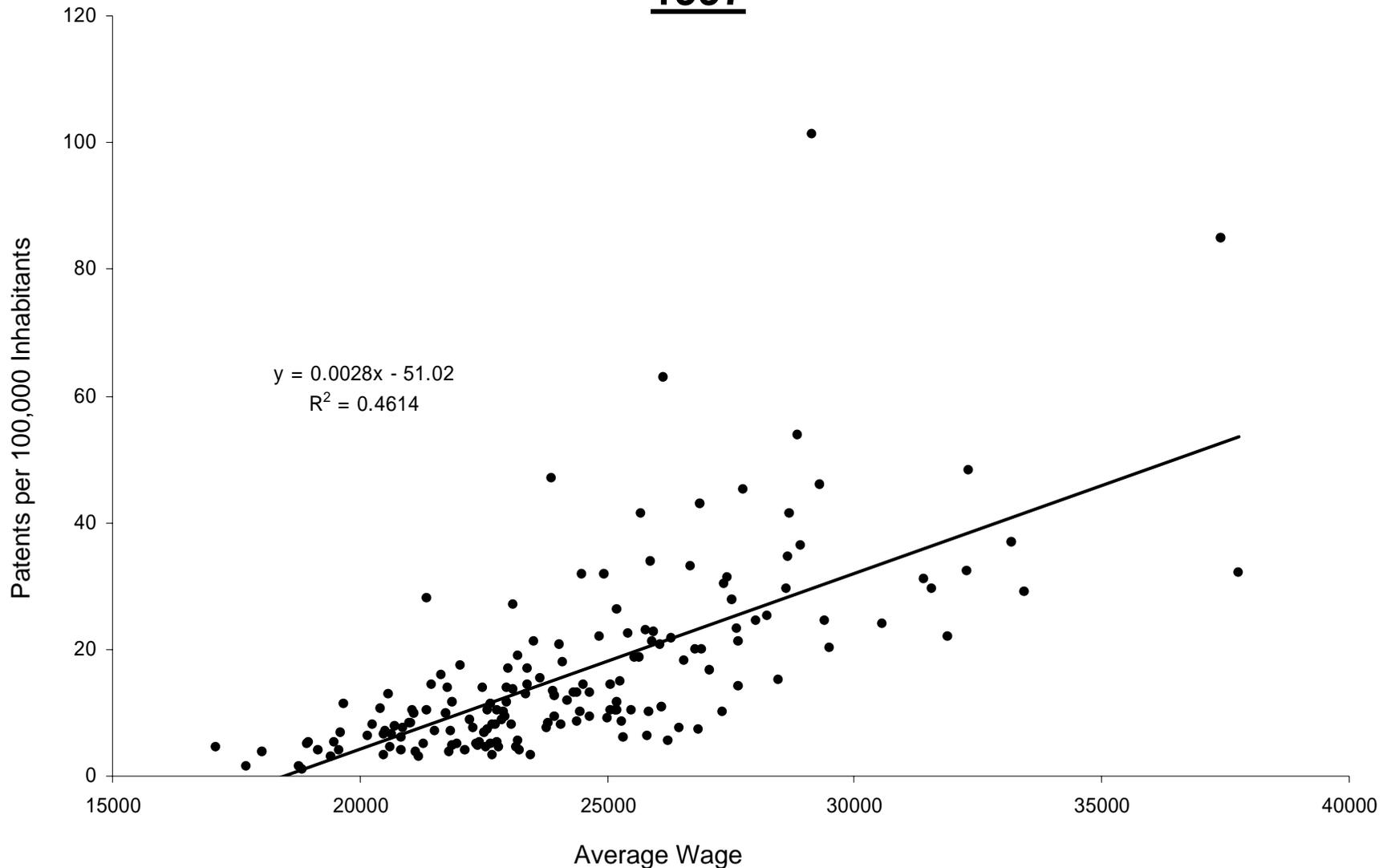
Top 30 Metropolitan Areas By Patenting Intensity

Patenting Per Capita, 1997



Patents per Capita vs Average Wage by Economic Area

1997



$y = 0.0028x - 51.02$
 $R^2 = 0.4614$

Note: Omits four small outlier areas: Boise, ID-OR, Rochester, NY-PA, Pueblo, CO-NM, and Anchorage, AK

Source: Cluster Mapping Project, Harvard Business School

Composition of Regional Economies

Traded Clusters (40)

e.g., Medical Devices, Financial Services

32.4% of employment

Natural Resource- Driven Industries

e.g., Forestry, Coal

0.9 % of employment

Local Clusters (19)

e.g., Personal Services, Local Construction and Development

66.7% of employment

Composition of Regional Economies (cont.)

	Traded Clusters	Local Clusters	Natural Resource-Driven Industries
Share of Employment	32.4%	66.7%	0.9%
Employment Growth, 1993 to 1997	2.2%	3.1%	0.8%
Average Wage	\$36,920	\$23,800	\$30,390
Relative Wage	131.4	84.7	108.2
Wage Growth	4.4%	3.4%	3.0%
Relative Productivity	126.2	87.5	138.2
Patents per 10,000 Employees	15.97	1.14	5.40
Number of SIC Industries	574	258	46

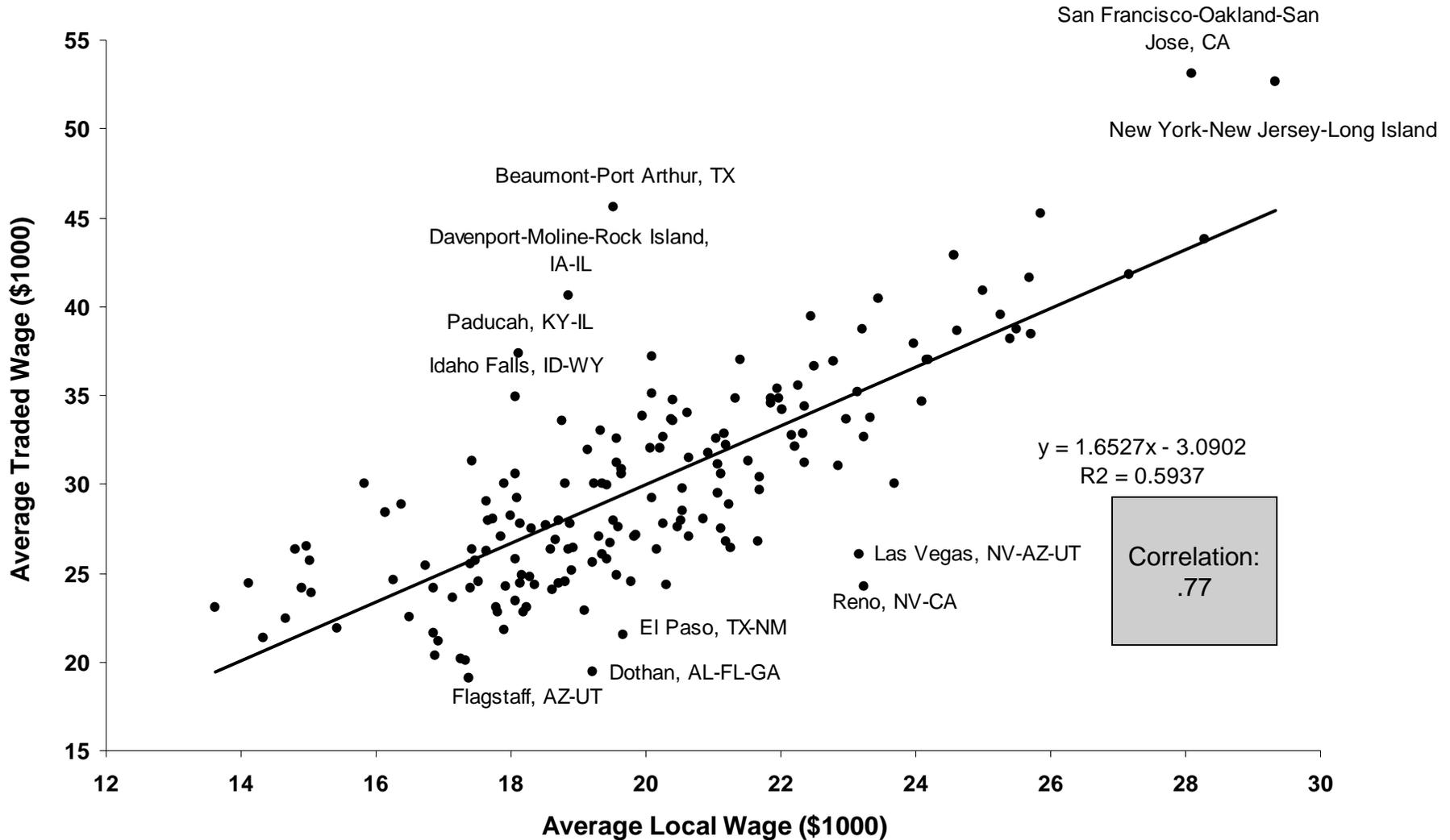
Note: 1997 data

Source: Cluster Mapping Project, Harvard Business School

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Economic Importance of Traded Clusters

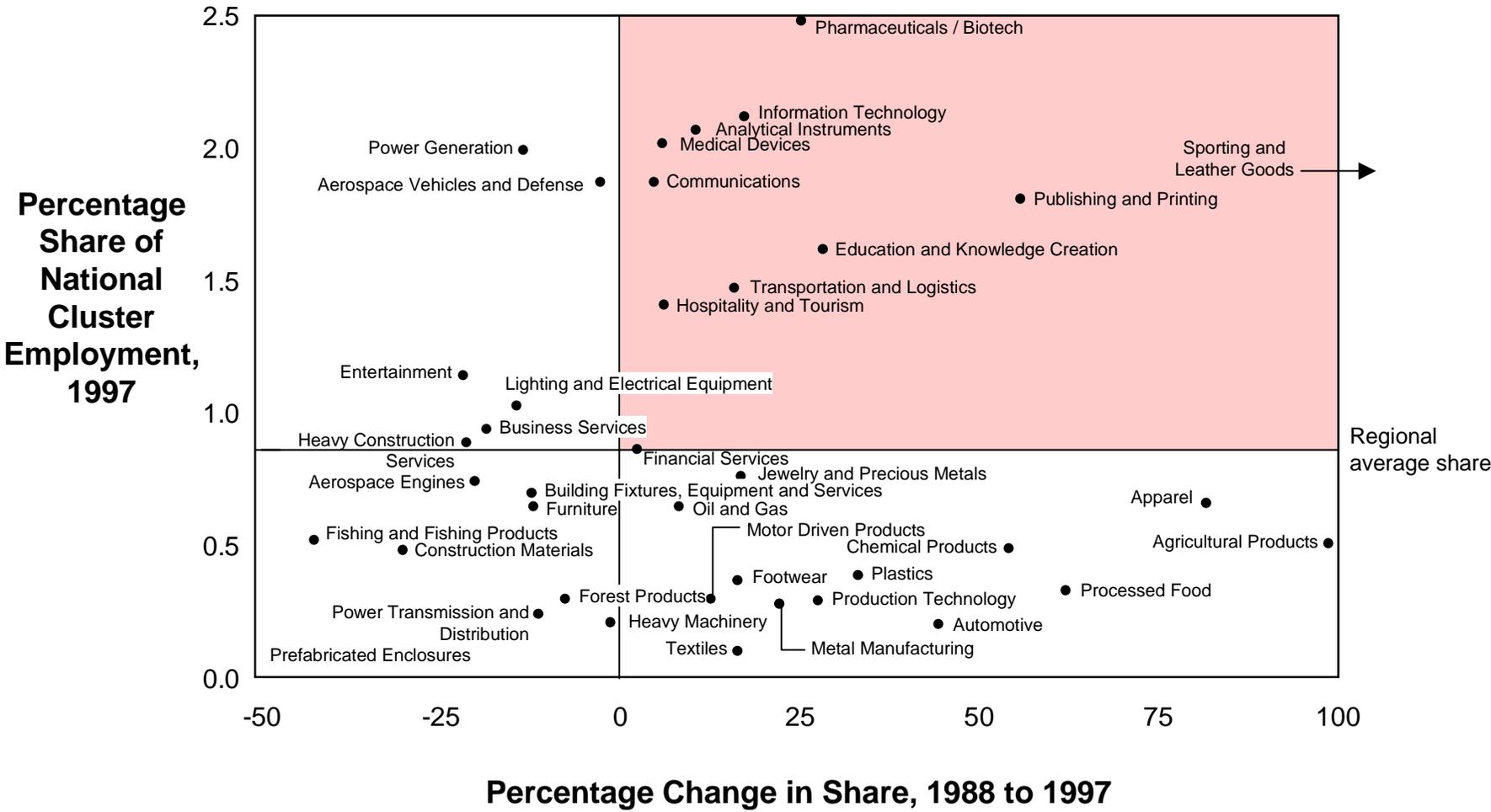
Traded vs. Local Wages by Economic Area, 1997



Note: There are 172 Economic Areas in the United States
 Source: Cluster Mapping Project, Harvard Business School

Specialization of the San Diego Economy

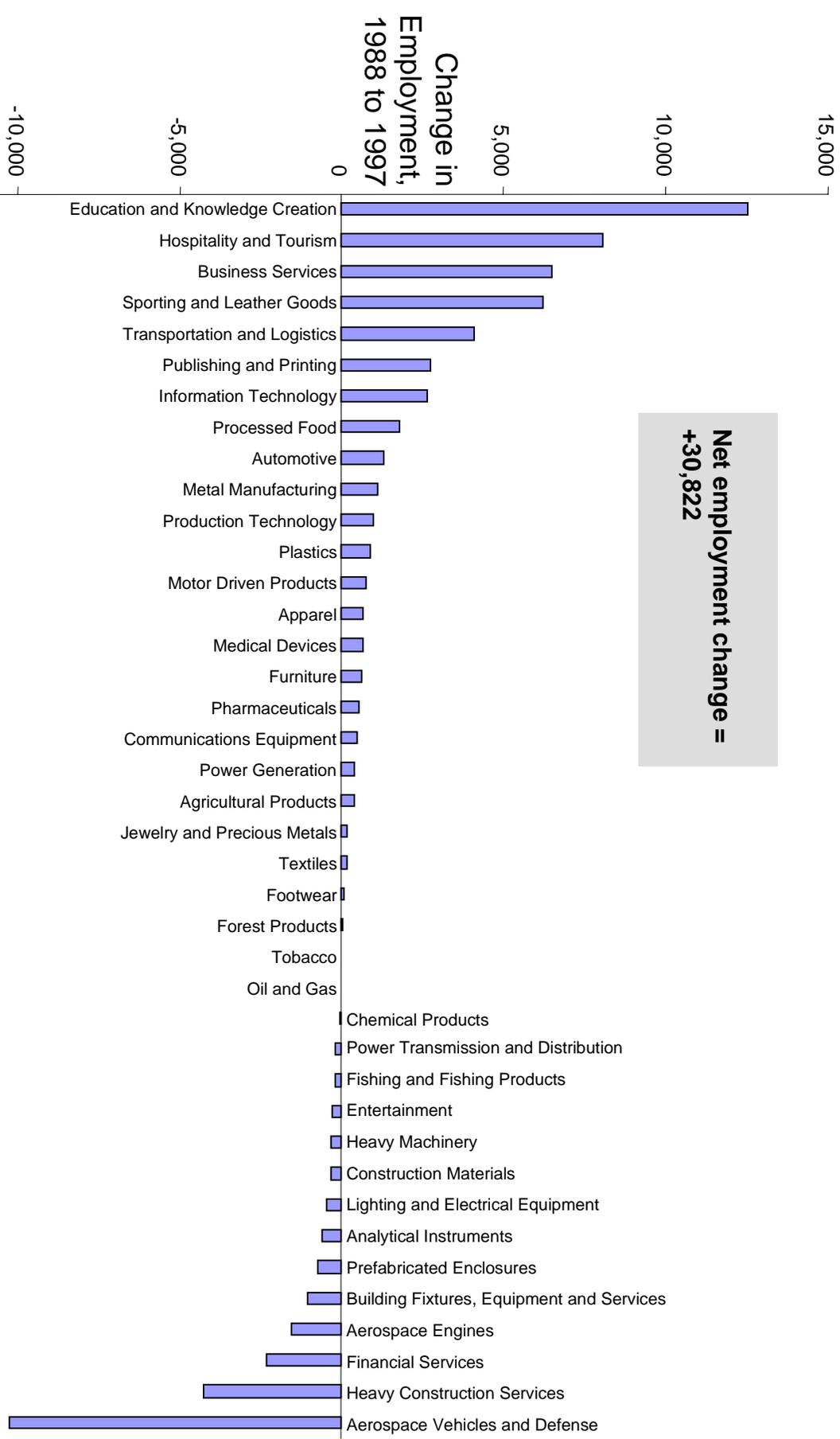
Traded Clusters by Size and Relative Growth Rate



Source: Cluster Mapping Project, Harvard Business School
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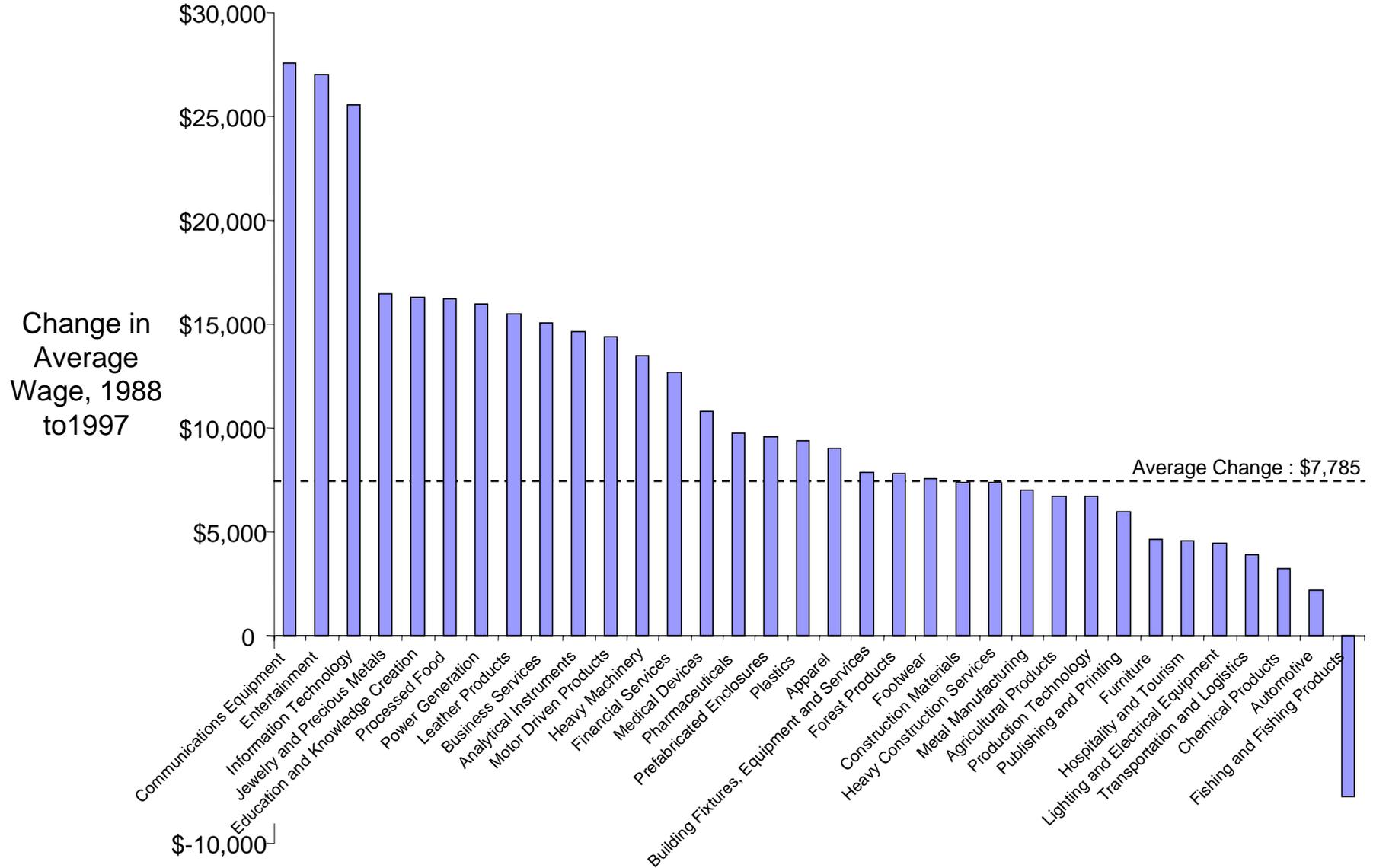
San Diego Regional Economy

Change in Employment by Traded Cluster



San Diego

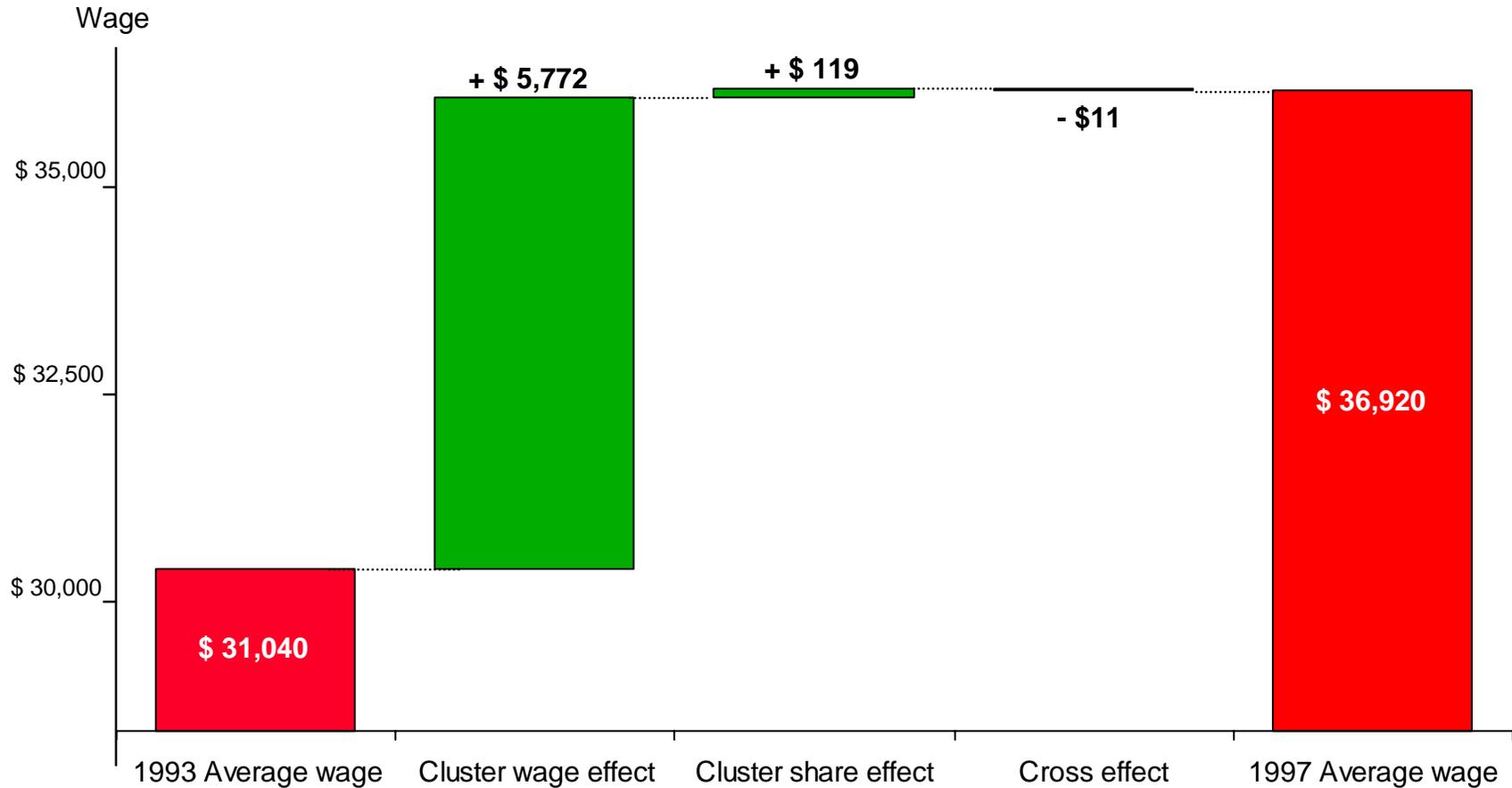
Change in Wages by Traded Cluster, 1988 to 1997*



*Note: Tier 1 Industries only; clusters omitted due to missing data: Aerospace Engines, Aerospace Vehicles and Defense, Oil and Gas, Power Transmission and Distribution, Textiles, and Tobacco

Determinants of Changes in U. S. Traded Cluster Wages

Cluster Wage Effect vs. Cluster Share Effect

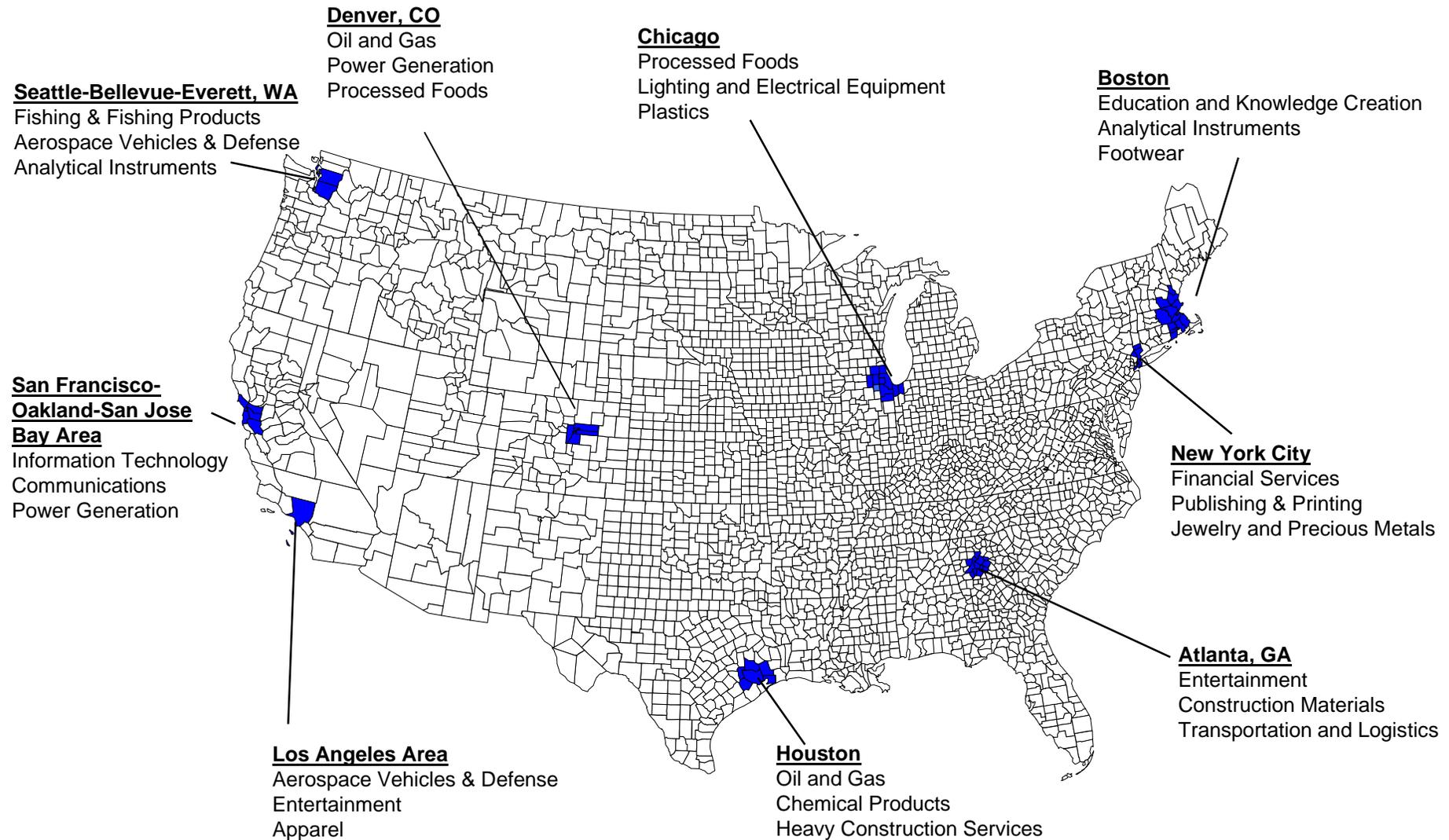


Note: Wage effect = change in average wages keeping cluster share constant; Share effect = change in average wages keeping cluster wages constant; cross effect is the residual effect of the interaction of changes

Source: Cluster Mapping Project, Harvard Business School

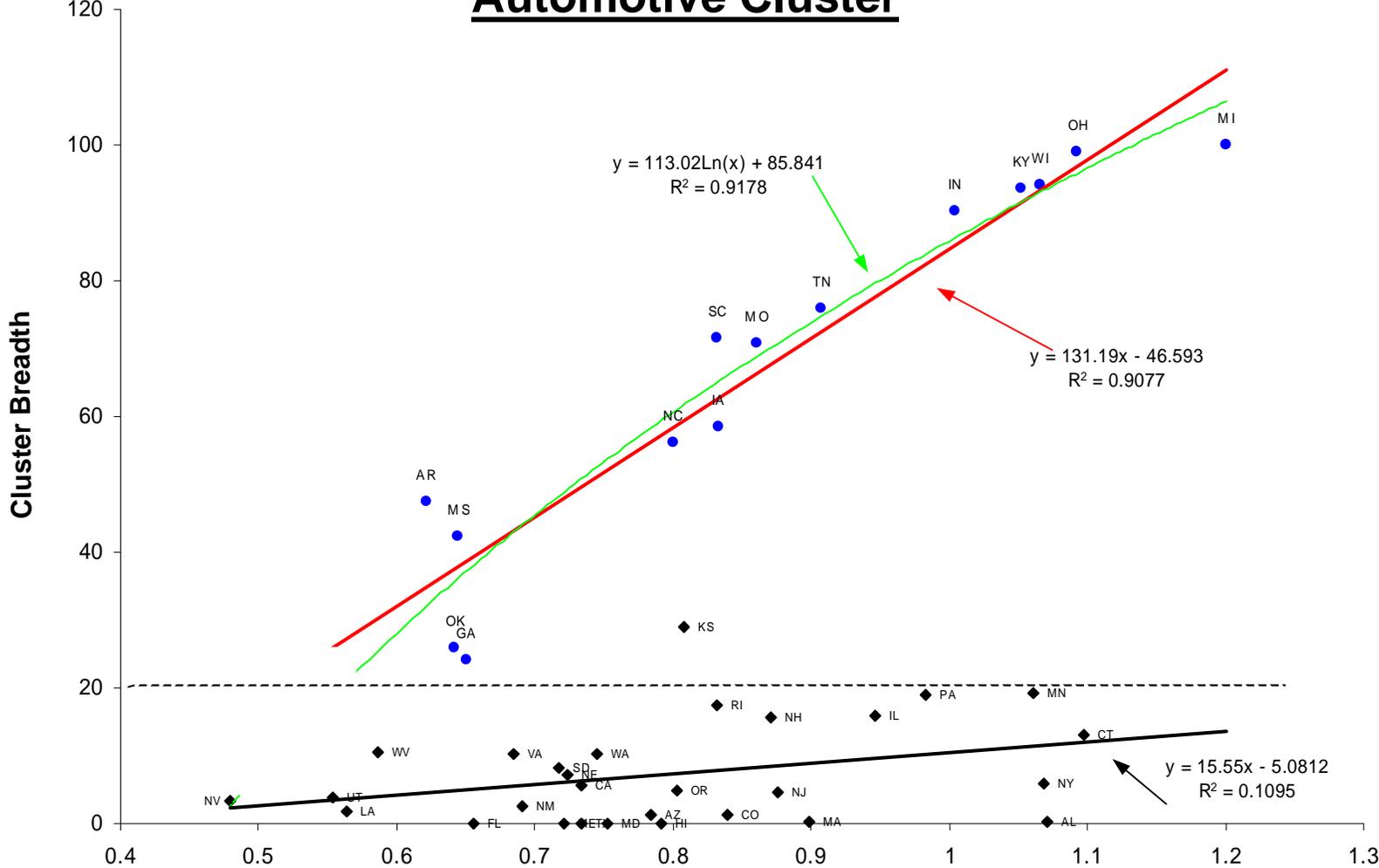
Top Three Clusters by Rank

Selected Metropolitan Areas



The Effect of Cluster Breadth on Wages

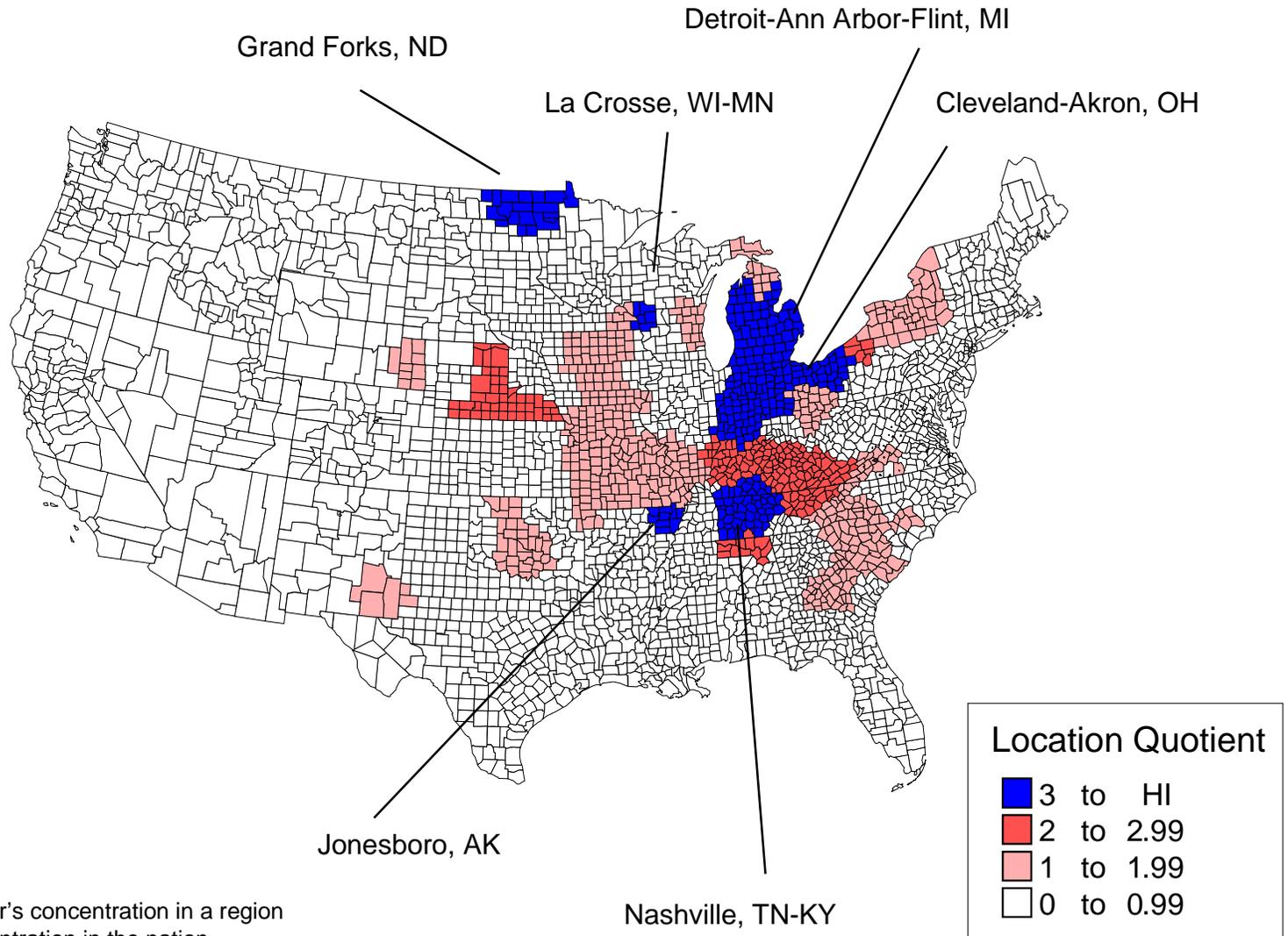
Automotive Cluster



State Automotive Cluster Wage vs. National Average Automotive Cluster Wage

*Cluster breadth = weighted percentage of number of industries in the cluster with location quotient ≥ 1 .
 **Tier 1 industries.

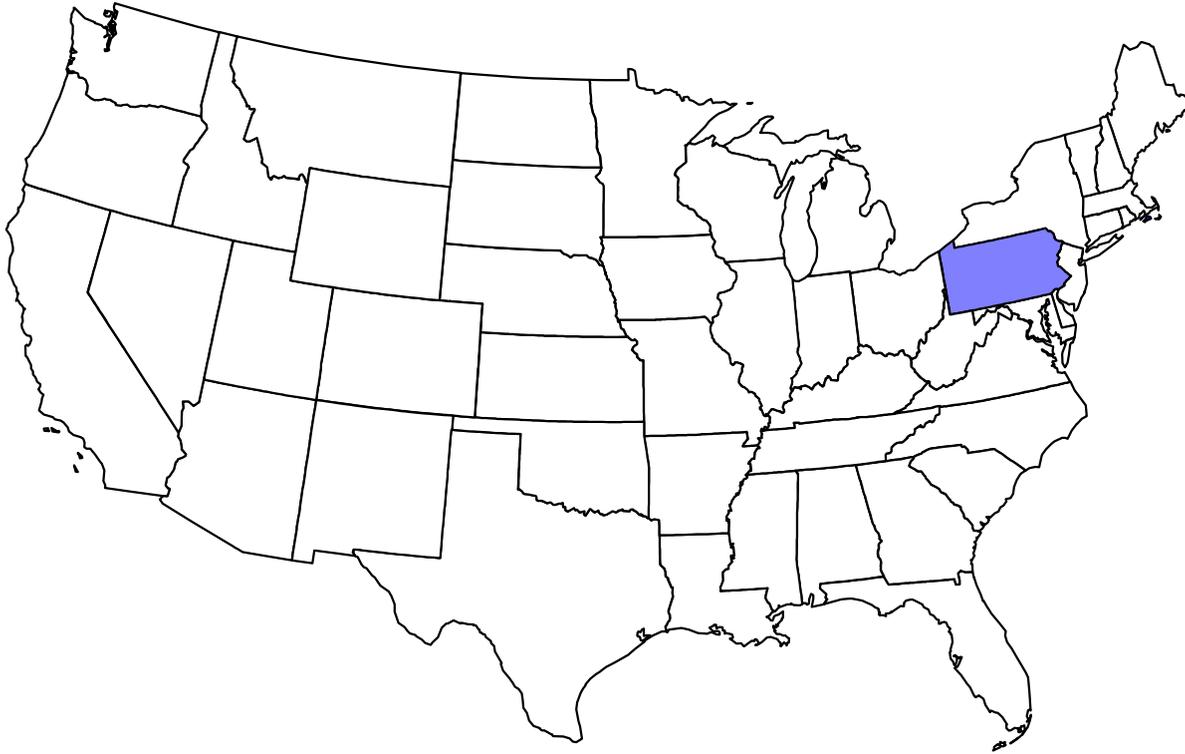
Automotive Cluster



Note: *Measure of a cluster's concentration in a region relative to a cluster's concentration in the nation

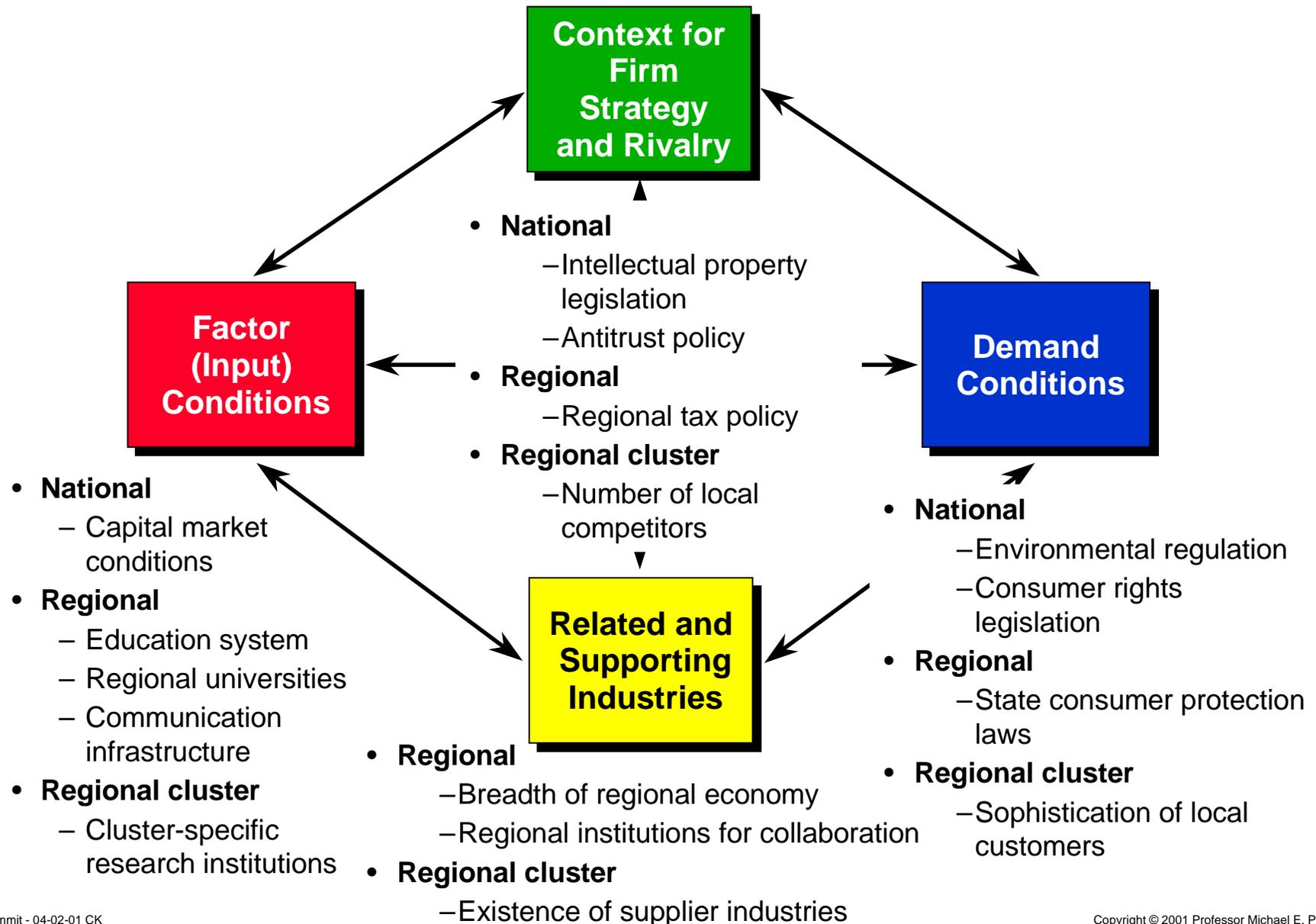
Specialization of Regional Economies

Pennsylvania



Determinants of Regional Competitiveness and Innovation

Levels of Influence



Priorities for Government

San Diego Survey Findings

Policy Recommendation	Public Sector Leaders	Communications Cluster Executives	Biotech / Pharma Cluster Executives
Promote World-Class Primary and Secondary Education	93%	80%	96%
Improve Transportation and Other Physical Infrastructure	88%	69%	75%
Promote Specialized Education and Training Programs to Upgrade Worker Skills	79%	49%	66%
Simplify Compliance Procedures for Government Regulations (e.g., One-Stop Filing, Websites, etc.)	73%	53%	68%
Speed Up Regulatory Approval Processes in Line with Product Life-Cycles	73%	33%	77%
Implement Tax Reform to Encourage Investment in Innovation (e.g., R&D Tax Credits)	64%	58%	74%
Strengthen and Modernize Intellectual Property Protections (Patents, Copyrights) at Home and Abroad	56%	61%	77%

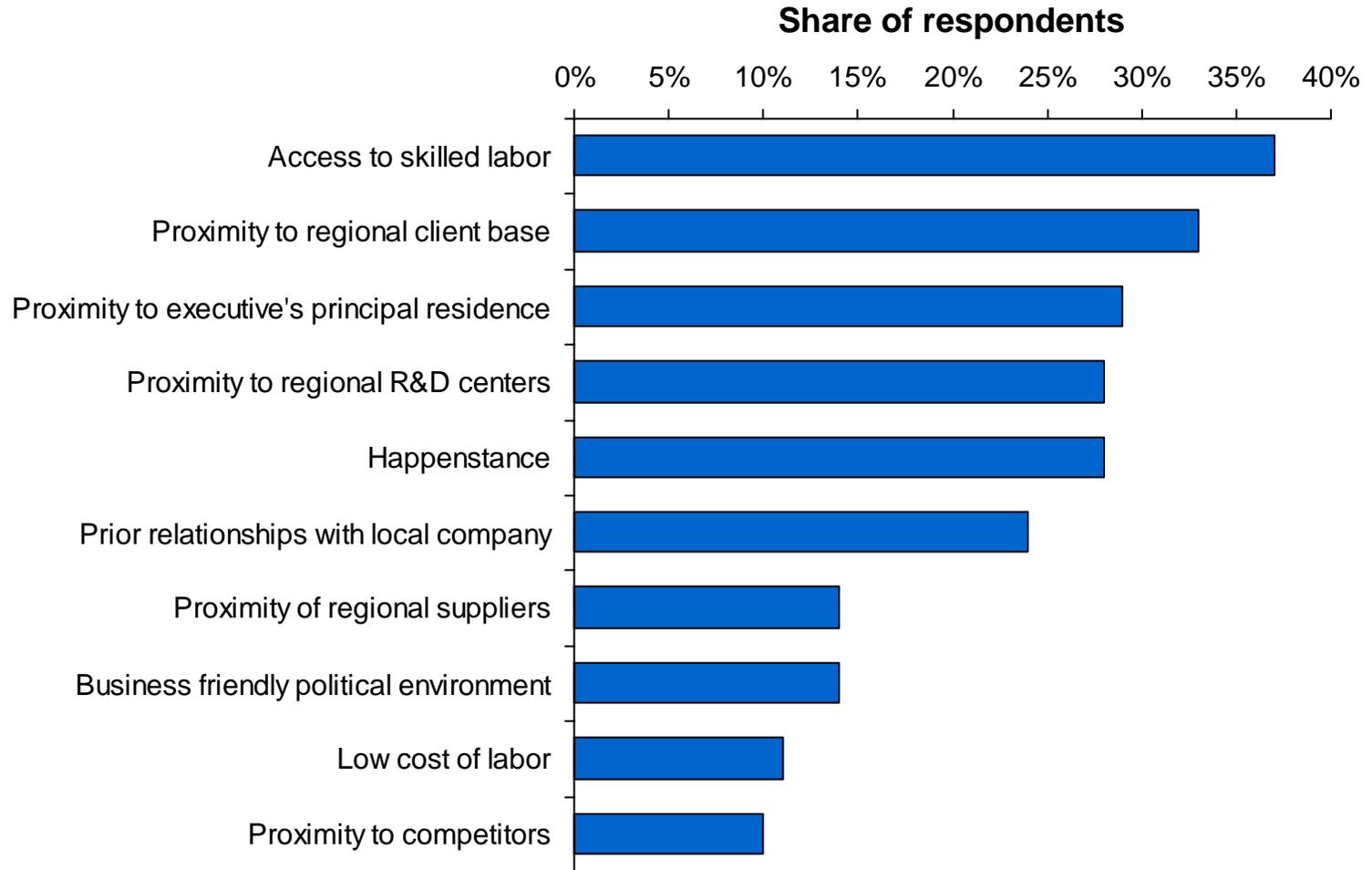
Summary Assessment of Regional Innovative Capacity

San Diego

Elements of Regional Innovation Environment	Assets	Challenges
Common Innovation Infrastructure	<ul style="list-style-type: none"> • High levels of investment in basic research • Many research institutes in a variety of sectors • Good quality of life • Good higher education • Large number of scientists and engineers in the workforce 	<ul style="list-style-type: none"> • Public K–12 educational system • Limited management and marketing talent • Small airport • High cost of living • Expensive and unreliable utilities • Limited internationalization
Role of Government	<ul style="list-style-type: none"> • High level of federal R&D funding • High level of state support for UCSD 	<ul style="list-style-type: none"> • High business and personal tax rates • Inadequate coordination among local political jurisdictions • Weak policies governing energy production and distribution
Quality of Linkages	<ul style="list-style-type: none"> • High quality university-business institution for collaboration (UCSD CONNECT) • Strong informal networks 	<ul style="list-style-type: none"> • Limited institutions focused on the needs of start-ups • Ineffective university technology transfer office
Attitudes Toward Business	<ul style="list-style-type: none"> • Entrepreneurial attitudes in academia 	<ul style="list-style-type: none"> • Signs of a shift back towards an ivory tower mentality

Determinants of the Attractiveness of a Region's Business Environment

All Survey Respondents



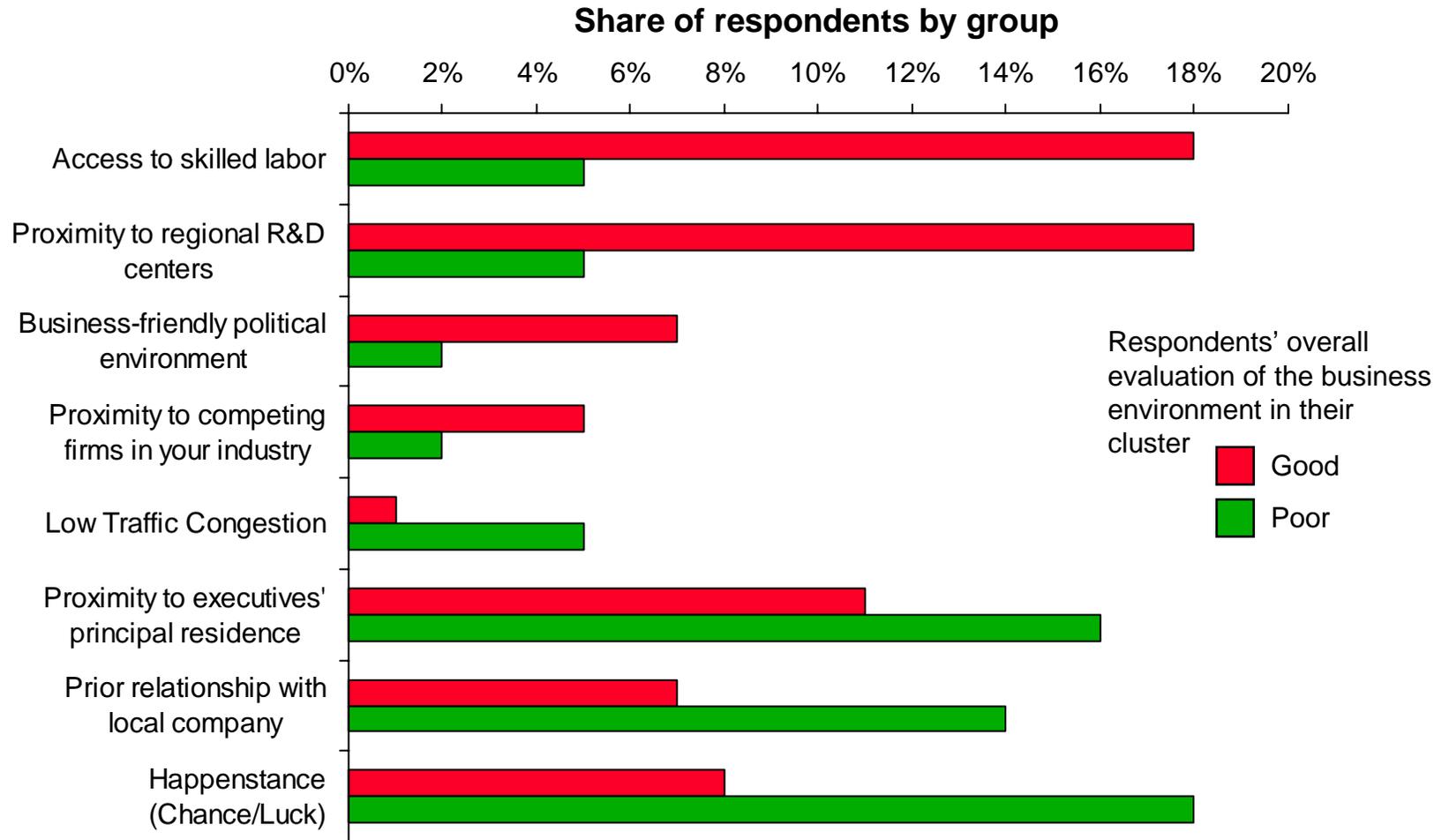
Note: Respondents were asked to name up to three important factors determining the quality of the business environment in their region

Source: Clusters of Innovation Project Survey

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Determinants of the Attractiveness of a Region's Business Environment

Respondents by Overall Quality of Business Environment



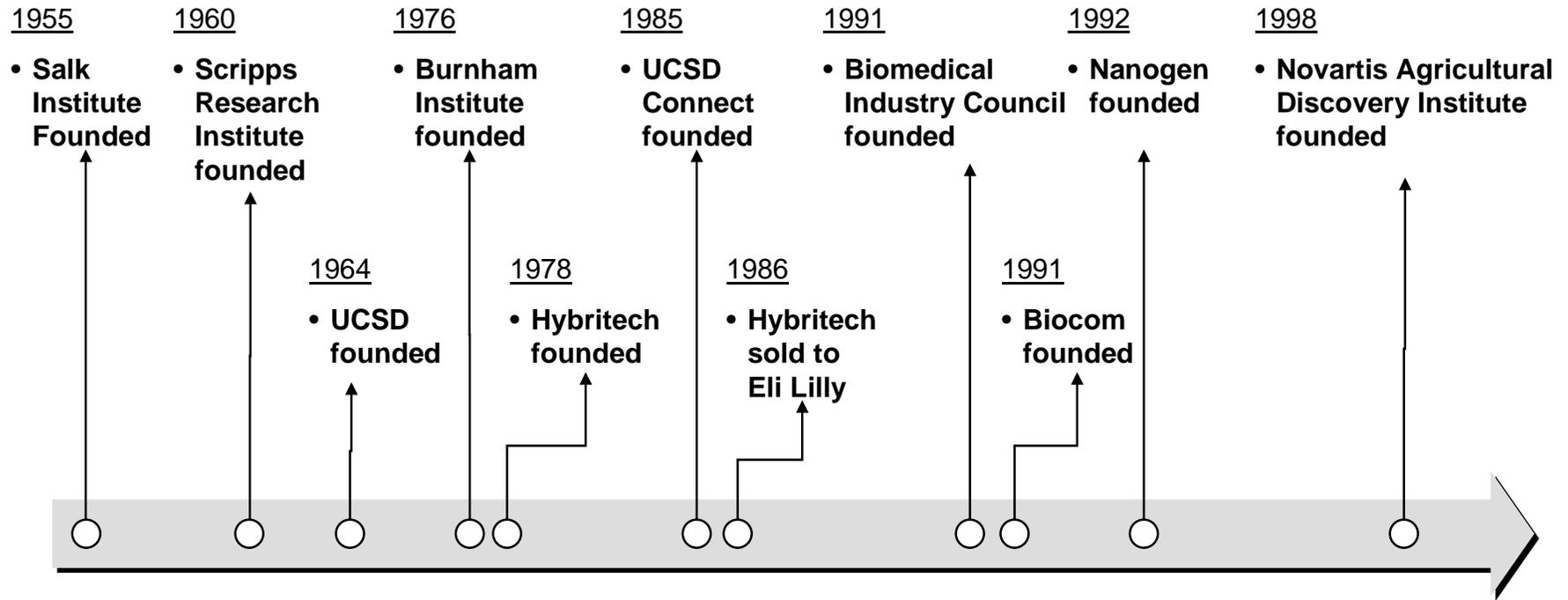
Note: Respondents were asked to name up to three important factors determining the quality of the business environment in their region

Source: Clusters of Innovation Project Survey

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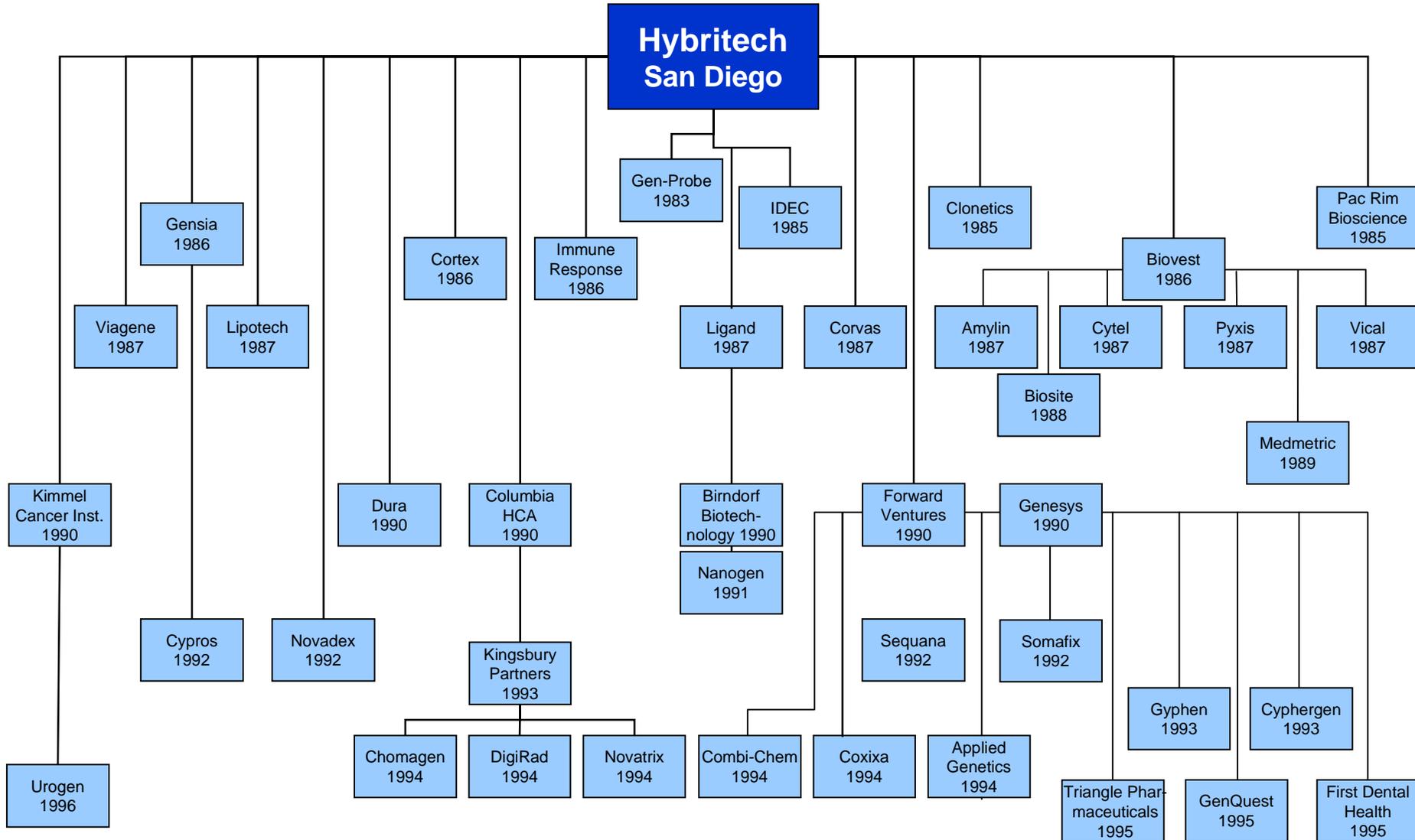
The Process of Cluster Development

History of the San Diego Biotech / Pharma Cluster



The Process of Cluster Development

The Role of Anchor Companies



Source: CONNECT, University of California, San Diego

Cluster Development

San Diego Biotech / Pharma Cluster

“One of the key drivers for the success of the San Diego biotech cluster has been the dramatic success of Hybritech - its original founders account for 75 percent of San Diego’s biotech industry.”

“The success of Hybritech gave the research community in San Diego a “success story” that demonstrated first class science could be done outside of the university laboratory.”

“CONNECT played a vital role during this period by serving as a broker for the development of partnerships among researchers and service providers in finance, management, and intellectual property.”

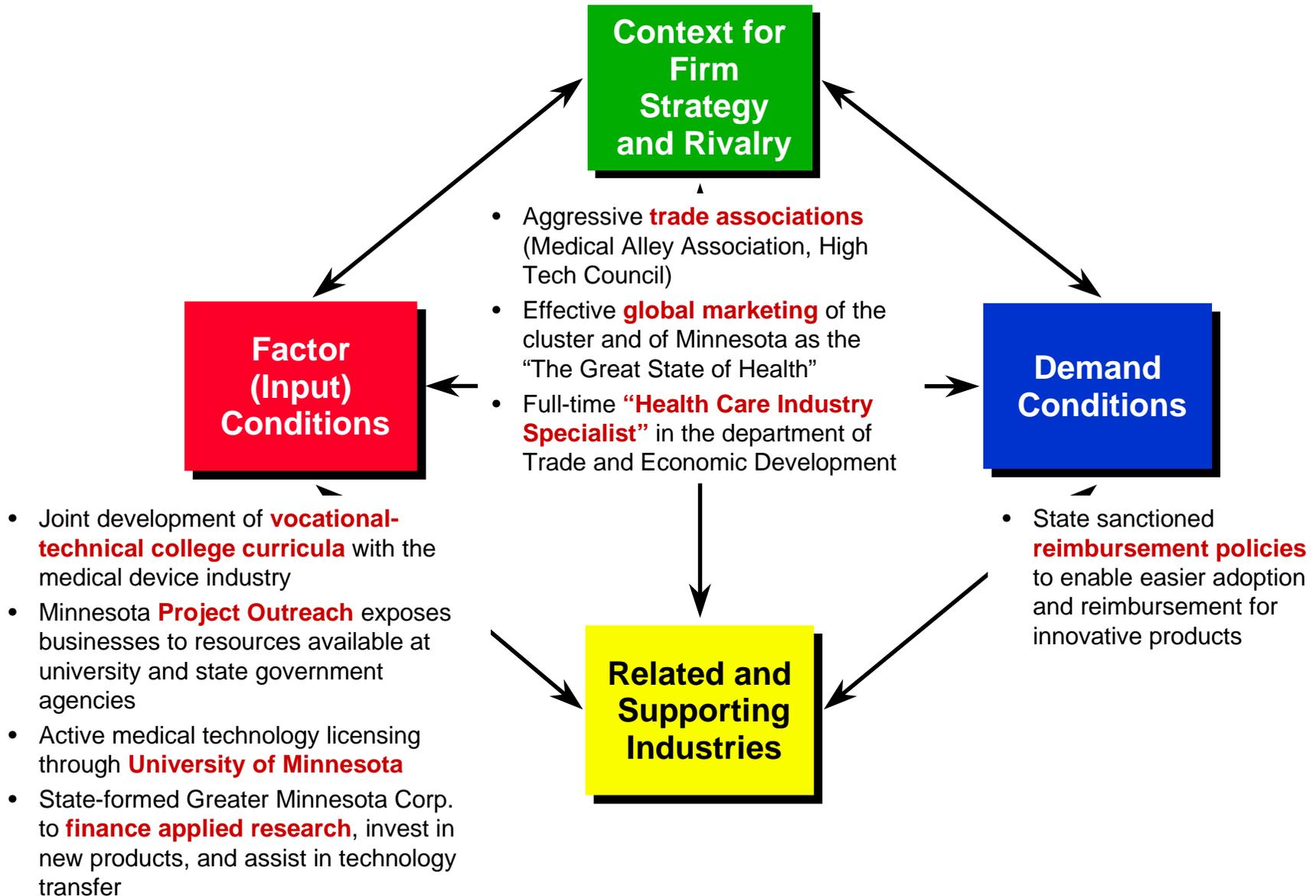
Board Chairman, San Diego biotech company

“Our company traces its roots back to one of the first companies spun out of Scripps. In addition to maintaining informal relationships with colleagues who were part of earlier ventures, we also maintain ties with UCSD, Burnham, Salk, Sydney Kimmel, etc. through employment of staff from these organizations, and participation in local research seminars.”

President, San Diego pharma company

Public / Private Cooperation in Cluster Upgrading

Minnesota's Medical Device Cluster



Organizing for Competitiveness

Commonwealth of Massachusetts

Governor's Council on Economic Growth and Technology

Functional Task Forces

- International Trade
- Marketing Massachusetts
- Tax Policy and Capital Formation
- Technology Policy and Defense Conversion

Issue Groups

- Cost of Doing Business
- Financing of Emerging Companies
- Health Care Restructuring
- Revitalizing Western Massachusetts

Industry Cluster Working Groups

- Advanced Materials
- Biotechnology and Pharmaceuticals
- Defense
- Marine Science and Technology
- Medical Devices
- Software
- Telecommunications
- Textiles

Building Regional Competitiveness and Innovative Capacity

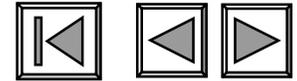
Some Emerging Lessons

- The foundation for regional prosperity is a sound general business environment
- Competitiveness and innovate capacity in regions are specialized around clusters
- Regional economic growth depends on the ability to grow and develop clusters
- The development of clusters takes a decade or more, building on a combination of preexisting assets, conscious policy choices, and chance events
- Regional success depends on the strength of linkages and the extent of collaboration within and across clusters
- Private sector leaders play an important role in upgrading their regions' business environment, both individually and as part of collective activities
- Over time, initial sources of competitive advantage are eroded and new advantages must be created
- Opportunities for growth often exist at the **intersection** of successful regional clusters

Appendix

Pennsylvania

Leading Clusters By Employment, 1997



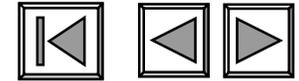
<u>Cluster</u>	<u>1997 Employment</u>	<u>Nat'I Rank*</u>
1. Business Services	211,493	6
2. Financial Services	168,452	6
3. Education and Knowledge Creation	154,174	4
4. Metal Manufacturing	111,550	4
5. Heavy Construction Services	82,701	5
6. Processed Food	76,277	4
7. Heavy Machinery	36,388	3
8. Forest Products	21,391	2
9. Construction Materials	14,303	3
10. Pharmaceuticals	12,499	6

* Note: National rank is the rank of national share of cluster employment. (N=50).

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

Education and Knowledge Creation Cluster

Ranking By State, 1997



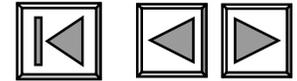
<u>State</u>	<u>1997 Employment</u>
1. New York	256,284
2. California	218,177
3. Massachusetts	154,787
4. Pennsylvania	154,174
5. Illinois	101,709
6. Texas	79,369
7. Ohio	73,062
8. District of Columbia	72,787
9. Florida	57,027
10. North Carolina	54,597

* Note: National rank is the rank of national share of cluster employment. (N=50).

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

Metal Manufacturing Cluster

Ranking By State, 1997



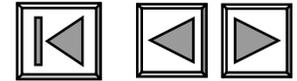
<u>State</u>	<u>1997 Employment</u>
1. Ohio	152,473
2. Michigan	121,854
3. Illinois	113,909
4. Pennsylvania	111,550
5. California	110,619
6. Indiana	94,366
7. Texas	70,837
8. Wisconsin	60,723
9. New York	43,842
10. Tennessee	37,017

* Note: National rank is the rank of national share of cluster employment. (N=50).

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

Heavy Machinery Cluster

Ranking By State, 1997



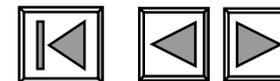
<u>State</u>	<u>1997 Employment</u>
1. Illinois	44,468
2. Iowa	36,667
3. Pennsylvania	36,388
4. Wisconsin	24,599
5. Texas	23,988
6. California	20,576
7. Ohio	19,526
8. Indiana	16,696
9. Nebraska	14,448
10. Kansas	13,873

* Note: National rank is the rank of national share of cluster employment. (N=50).

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

Pharmaceuticals Cluster

Ranking By State, 1997



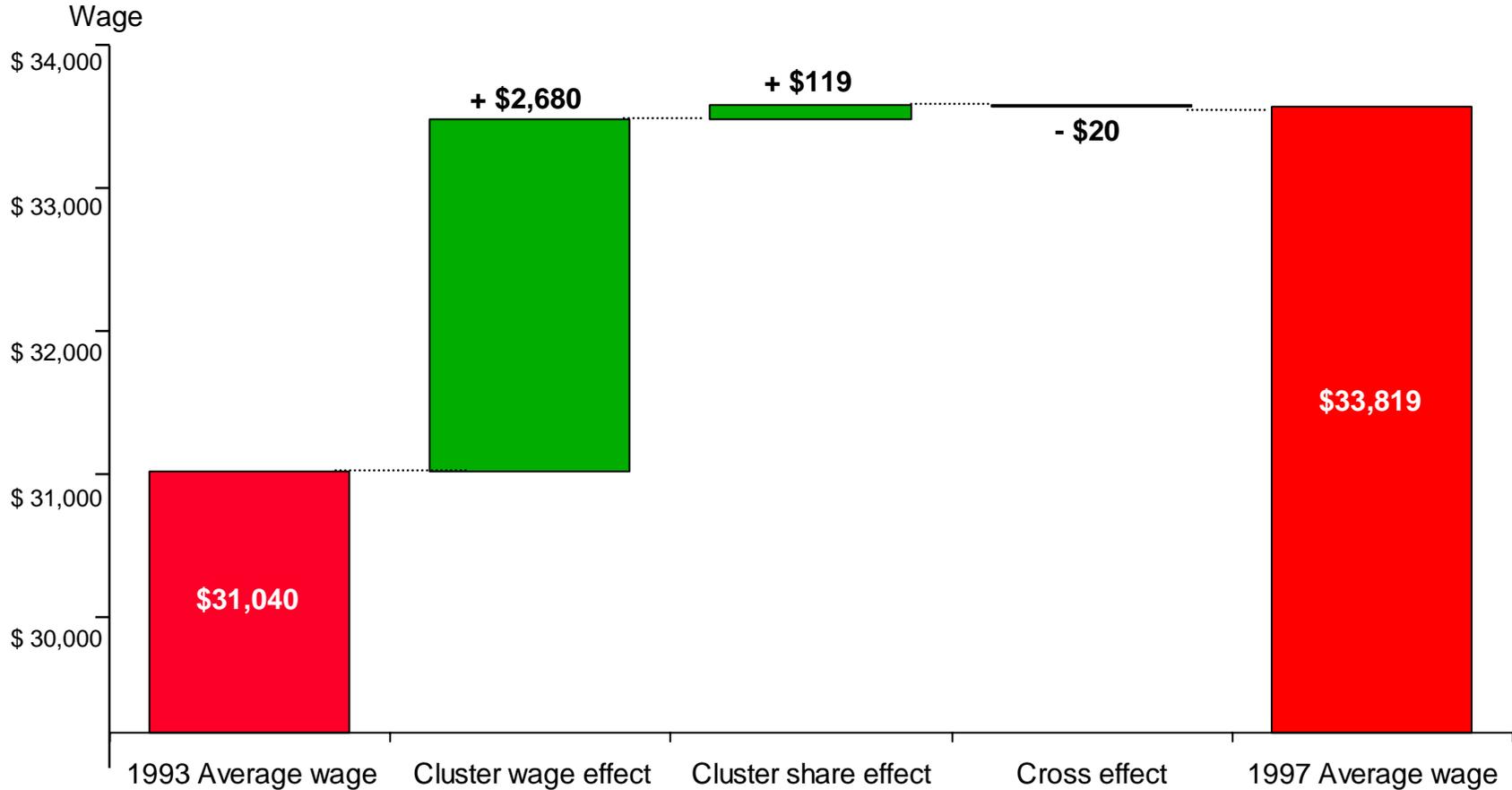
<u>State</u>	<u>1997 Employment</u>
1. New Jersey	43,438
2. California	28,097
3. New York	23,340
4. North Carolina	14,724
5. Illinois	12,825
6. Pennsylvania	12,499
7. Texas	10,207
8. Indiana	10,147
9. Connecticut	9,939
10. Tennessee	9,201

* Note: National rank is the rank of national share of cluster employment. (N=50).

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

Determinants of Changes in Real U. S. Traded Cluster Wages

Cluster Wage Effect vs. Cluster Share Effect



Note: Wage effect = change in average wages keeping cluster share constant; Share effect = change in average wages keeping cluster wages constant; cross effect is the residual effect of the interaction of changes; wages are in real terms

Source: Cluster Mapping Project, Harvard Business School