

# Clusters and Regional Competitiveness: Recent Learnings

Professor Michael E. Porter  
Institute for Strategy and Competitiveness  
Harvard Business School

*International Conference on Technology Clusters*  
*Montreal, Canada*  
7 November 2003

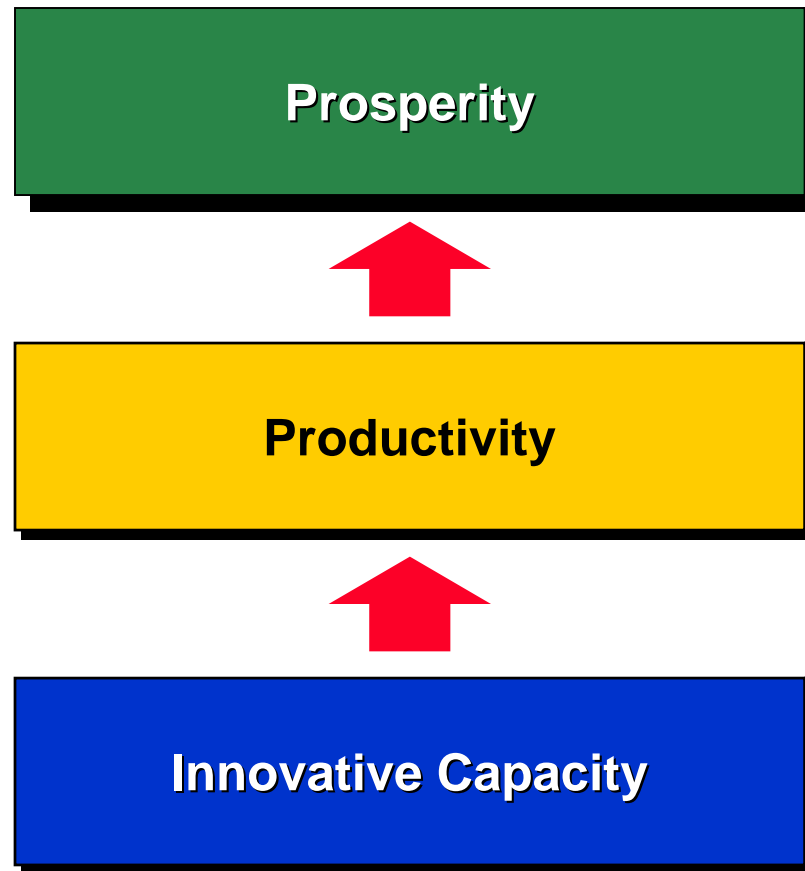
---

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 2002](#), (World Economic Forum, 2003), "Clusters and the New Competitive Agenda for Companies and Governments" in [On Competition](#) (Harvard Business School Press, 1998), and the *Clusters of Innovation Initiative* ([www.compete.org](http://www.compete.org)), a joint effort of the Council on Competitiveness, Monitor Group, and Professor Porter. 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.

Additional information may be found at the website of the Institute for Strategy and Competitiveness, [www.isc.hbs.edu](http://www.isc.hbs.edu)

---

# Sources of Prosperity

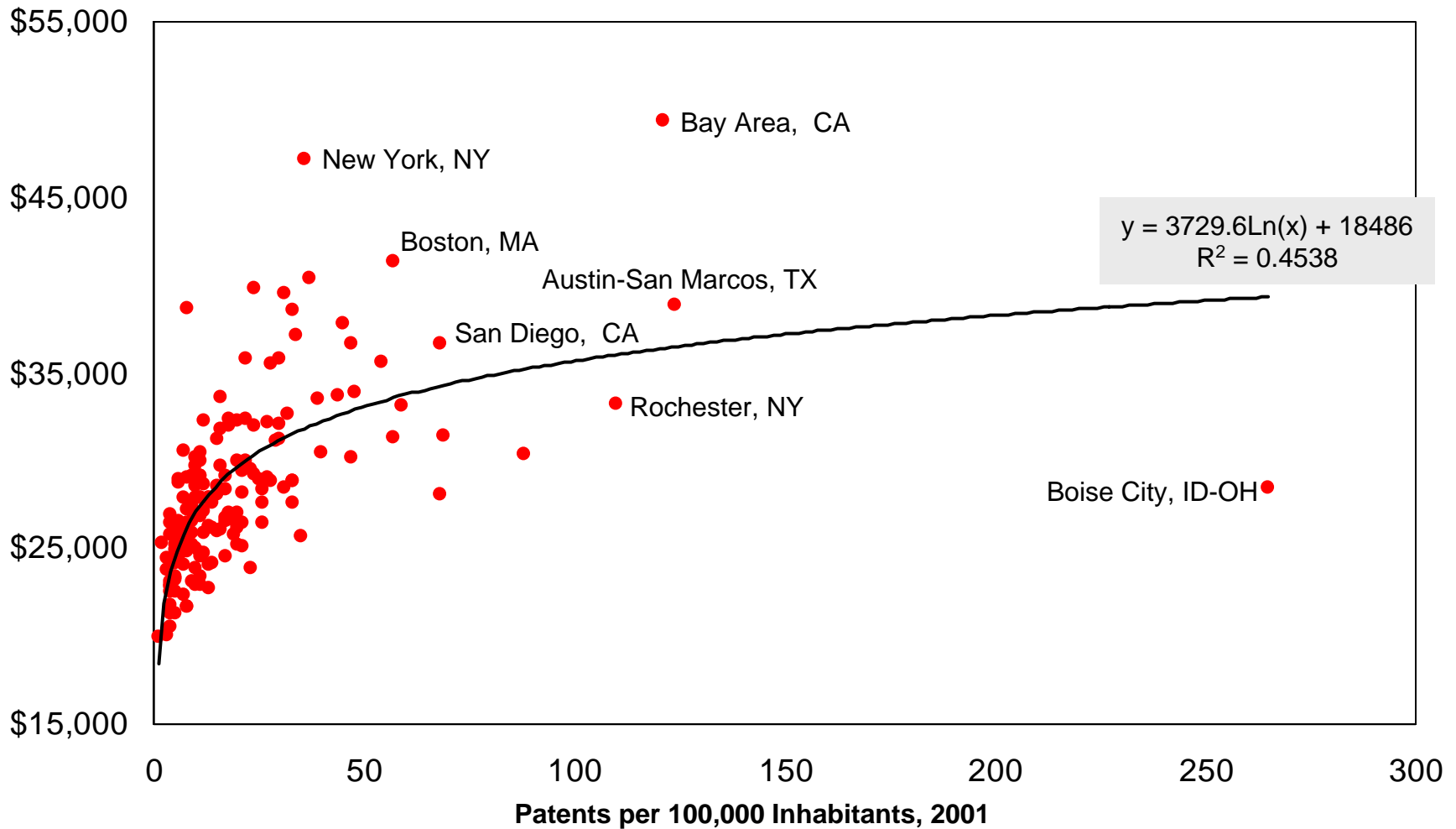


*Competitiveness*

# Innovation Performance of Regions

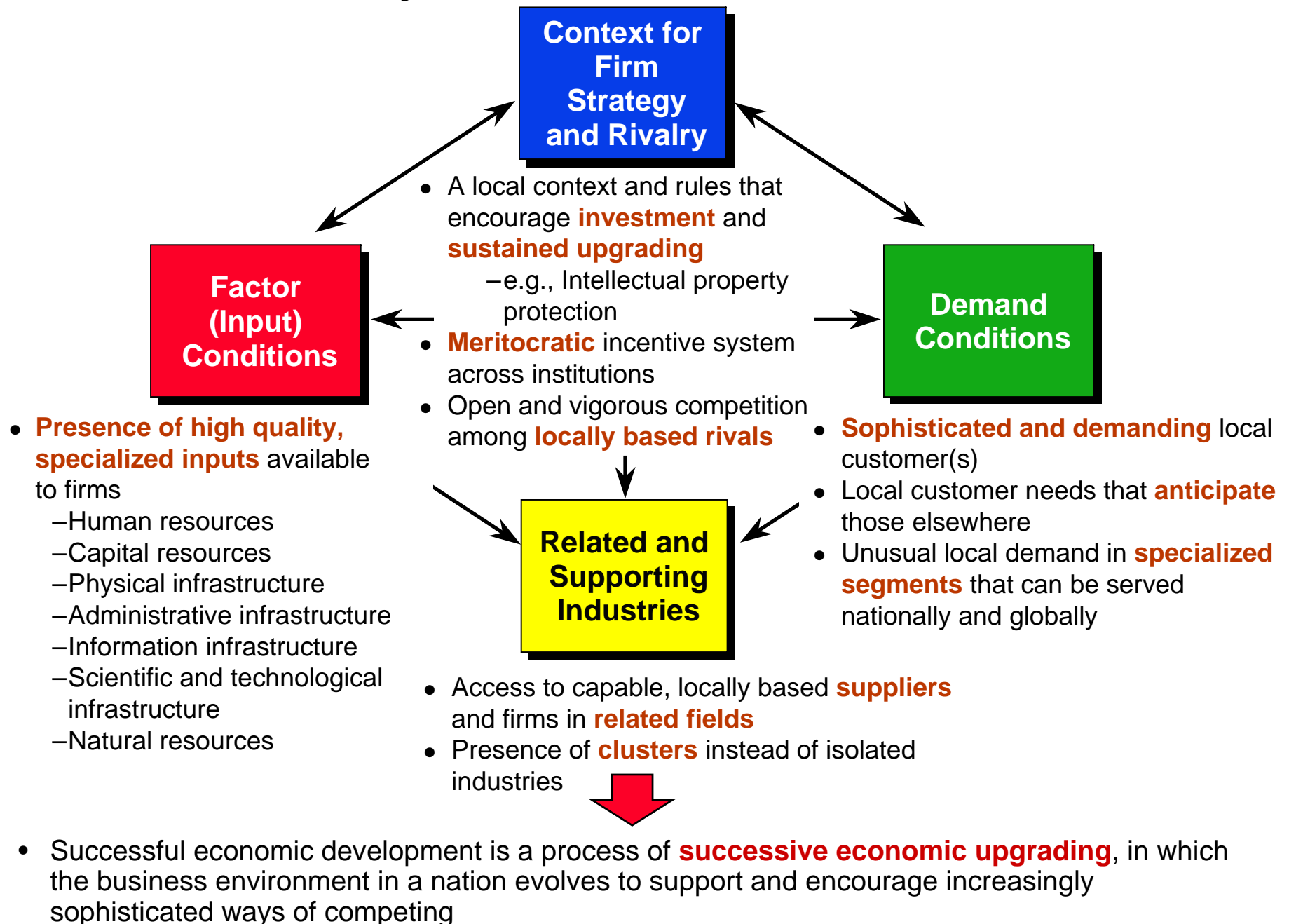
## Patenting Intensity and Wage Level, U.S. Economic Areas

Average Wage, 2001

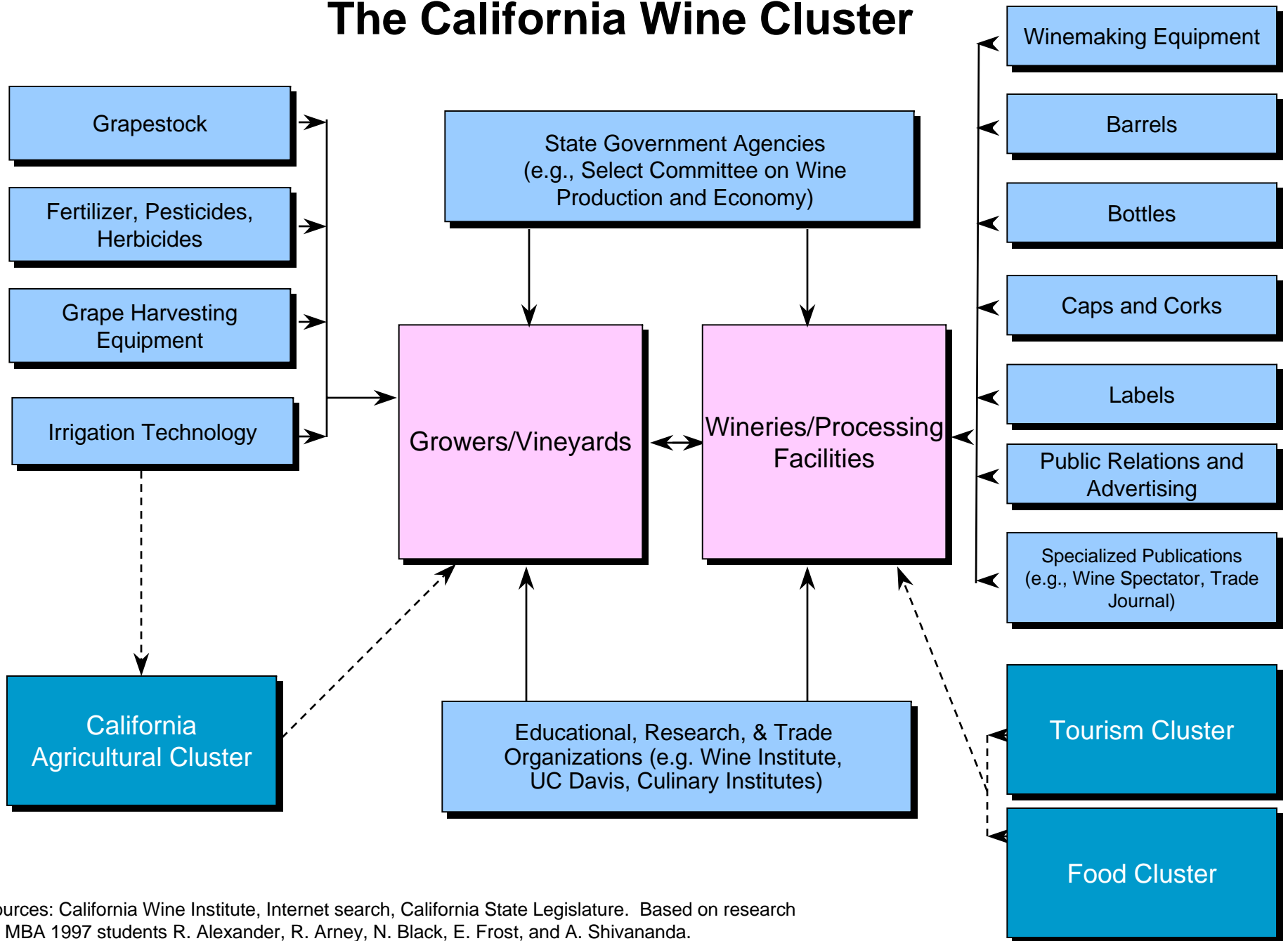


Source: U.S. Patent and Trademark Office; CHI Research; County Business Patterns;  
Michael E. Porter, "The Economic Performance of Regions", *Regional Studies*, Vol. 37, 2003

# Productivity and the Business Environment

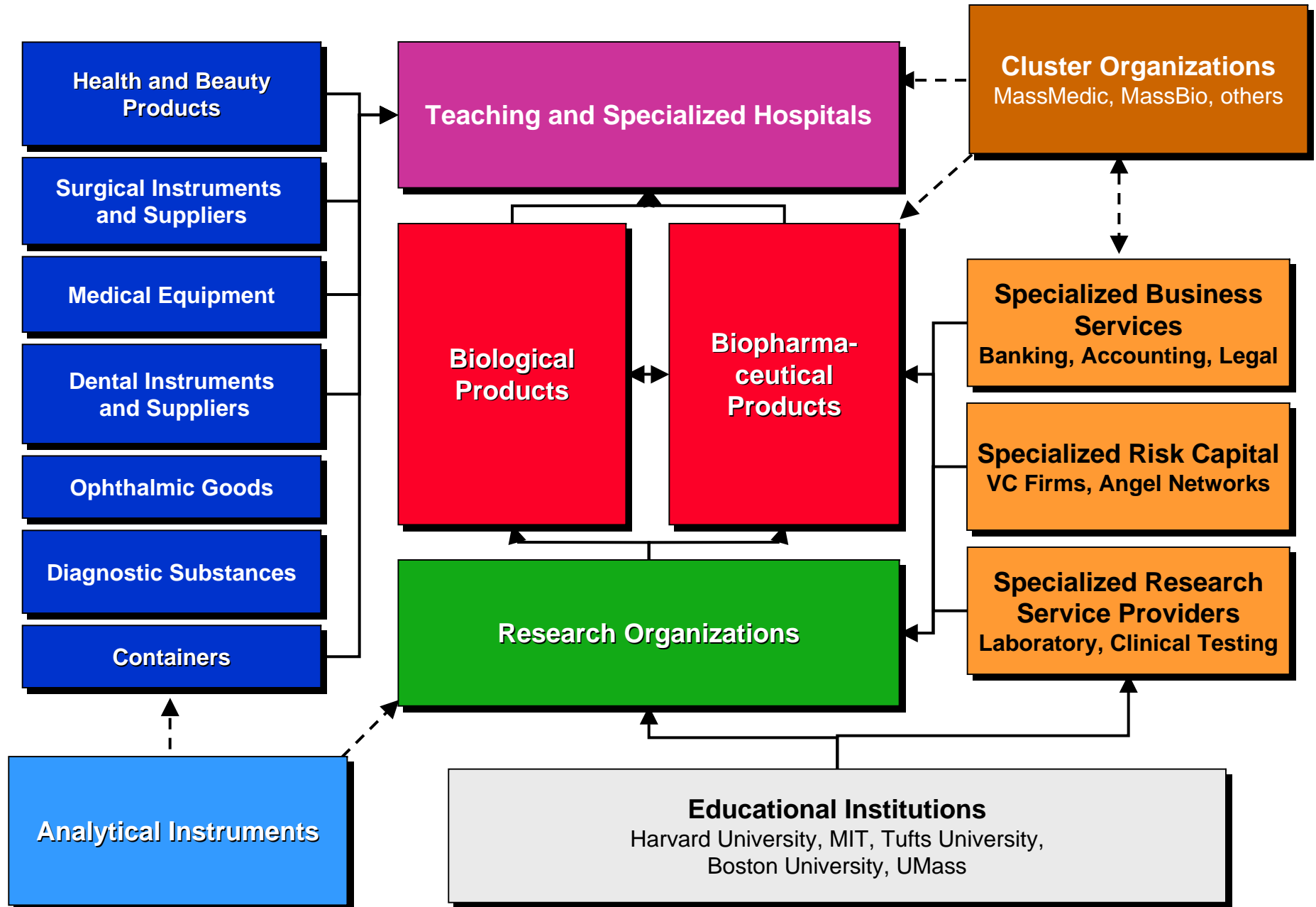


# The California Wine Cluster



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.

# The Boston Life Sciences Cluster



# Why Clusters Matter

- **Clusters Increase Productivity / Efficiency**

- Efficient **access** to specialized inputs, services, employees, information, institutions, and “public goods” (e.g. training programs)
- Ease of **coordination** and transactions across firms
- Rapid **diffusion** of best practices
- Ongoing, visible **performance comparisons** and strong incentives to improve vs. local rivals

- **Clusters Stimulate and Enable Innovations**

- Enhanced ability to **perceive innovation opportunities**
- Presence of multiple suppliers and institutions to assist in **knowledge creation**
- Ease of **experimentation** given locally available resources

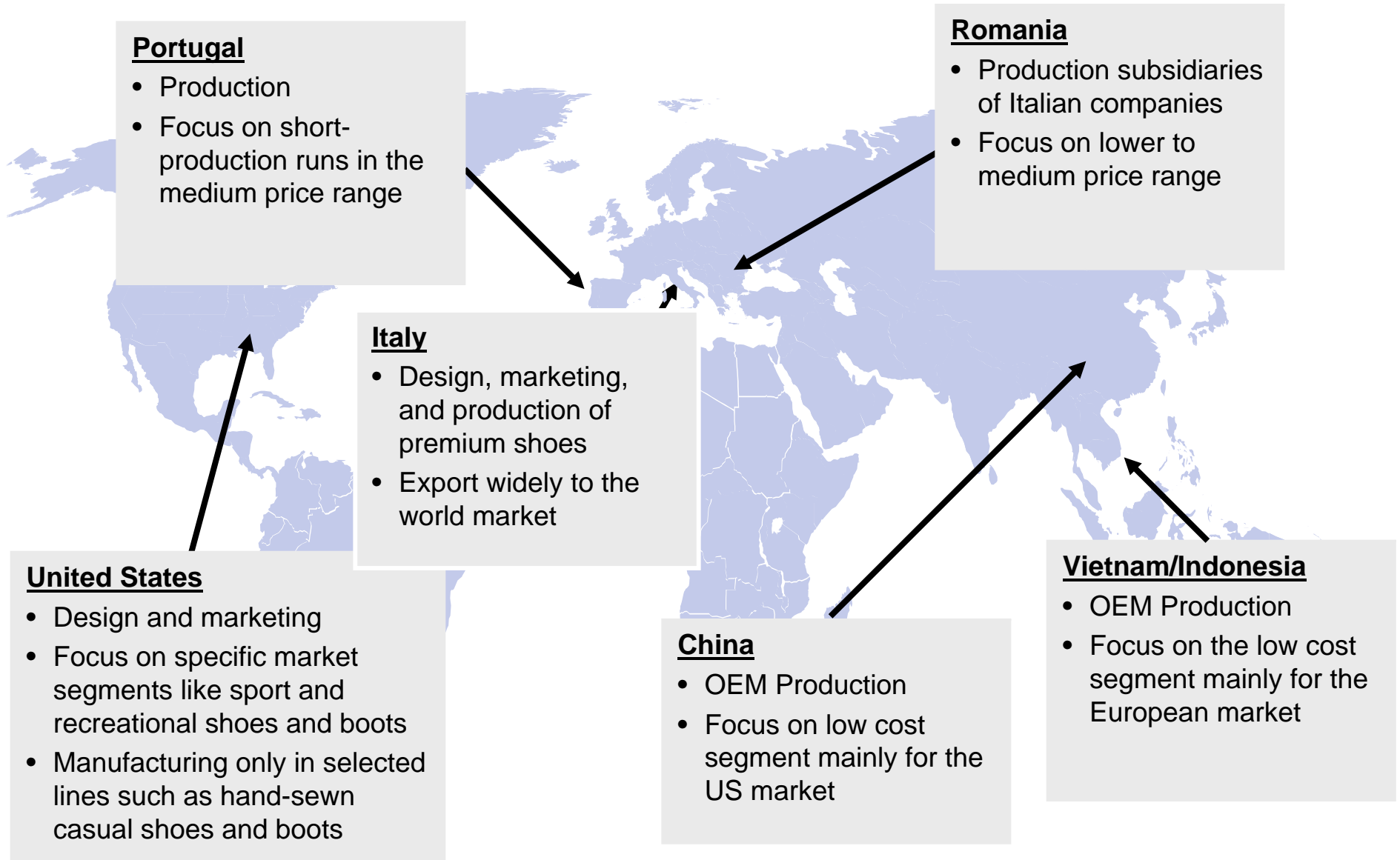
- **Clusters Facilitate Commercialization**

- Opportunities for **new companies** and **new lines of established business** are more apparent
- **Commercializing** new products and starting new companies is easier because of available skills, suppliers, etc.



Clusters reflect the fundamental influence of **externalities / linkages** across firms and associated institutions in competition

# Leading Footwear Clusters



# Levels of Clusters

- There is often an **array of clusters** at different locations in a given field, each with different levels of specialization and sophistication
- Global **innovation centers**, such as Silicon Valley in semiconductors, are few in number. If there are multiple innovation centers, they normally **specialize** in different market segments
- Other clusters focus on **manufacturing**, outsourced **service functions**, or play the role of **regional** assembly or service centers
- Firms based in the most advanced clusters often **seed or enhance clusters** in other locations in order to reduce the risk of a single site, access lower cost inputs, or better serve particular regional markets
- The challenge for an economy is to move from **isolated firms** to an array of **clusters**, and then to **upgrade the breadth and sophistication** of clusters to more advanced activities

# Patents by Organization

## Commonwealth of Massachusetts

	Organization	Patents Issued from 1997 to 2001
1	<b>MASSACHUSETTS INSTITUTE OF TECHNOLOGY</b>	<b>518</b>
2	<b>GENERAL HOSPITAL CORPORATION</b>	<b>296</b>
3	EMC CORPORATION	269
4	DIGITAL EQUIPMENT CORPORATION	261
5	POLAROID CORPORATION	213
6	ANALOG DEVICES, INC.	167
7	MILLENNIUM PHARMACEUTICALS, INC.	165
8	<b>HARVARD UNIVERSITY</b>	<b>150</b>
9	COMPAQ COMPUTER CORPORATION, INC.	147
10	SUN MICROSYSTEMS, INC.	143
11	BOSTON SCIENTIFIC CORPORATION	135
12	ACUSHNET COMPANY	130
13	GENETICS INSTITUTE, INC.	127
14	GILLETTE COMPANY	112
15	<b>BRIGHAM AND WOMEN'S HOSPITAL</b>	<b>107</b>
16	RAYTHEON COMPANY	101
17	GENERAL ELECTRIC COMPANY	99
18	HEWLETT-PACKARD COMPANY	96
19	<b>CHILDREN'S MEDICAL CENTER CORPORATION</b>	<b>93</b>
20	QUANTUM CORP. (CA)	93
21	COGNEX CORPORATION	90
22	<b>DANA-FARBER CANCER INSTITUTE</b>	<b>90</b>
23	JOHNSON & JOHNSON PROFESSIONAL INC.	90
24	<b>BOSTON UNIVERSITY</b>	<b>84</b>
25	SEPRACOR INC.	84

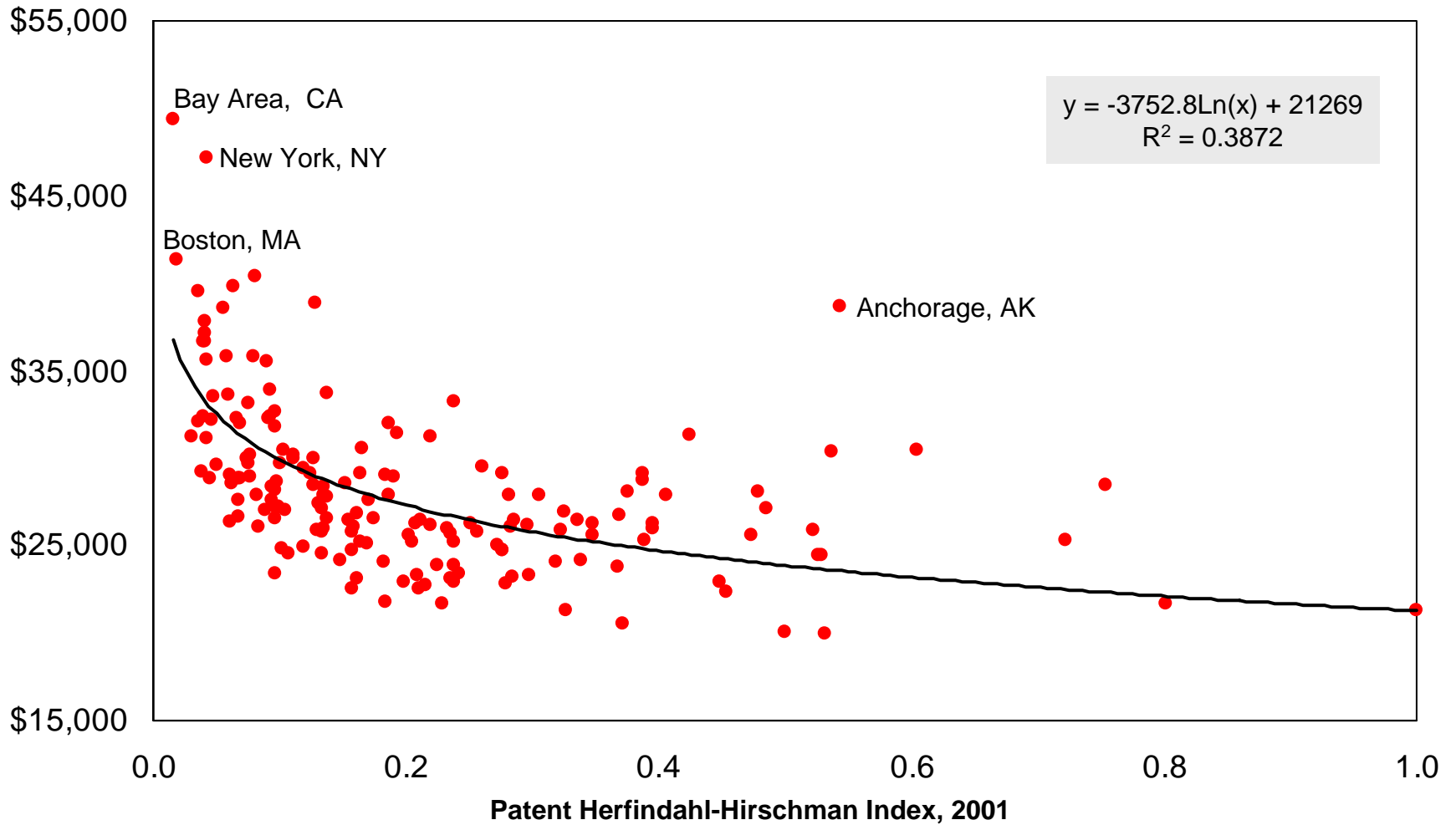
Note: Shading indicates universities, research institutions, and other government agencies

Source: US Patent and Trademark Office ([www.uspto.gov](http://www.uspto.gov)). Author's analysis.

# Innovation Performance of Regions

## Patent Concentration and Wage Level, U.S. Economic Areas

Average Wage, 2001



Source: U.S. Patent and Trademark Office; CHI Research; County Business Patterns;  
Michael E. Porter, The Economic Performance of Regions", *Regional Studies*, Vol. 37, 2003

# Institutions for Collaboration

## Selected Massachusetts Organizations

### Life Sciences Industry Associations

- Massachusetts Biotechnology Council
- Massachusetts Medical Device Industry Council
- Massachusetts Hospital Association

### General Industry Associations

- Associated Industries of Massachusetts
- Greater Boston Chamber of Commerce
- High Tech Council of Massachusetts

### Economic Development Initiatives

- Massachusetts Technology Collaborative
- Mass Biomedical Initiatives
- Mass Development
- Massachusetts Alliance for Economic Development

### University Initiatives

- Harvard Biomedical Community
- MIT Enterprise Forum
- Biotech Club at Harvard Medical School
- Technology Transfer offices

### Informal networks

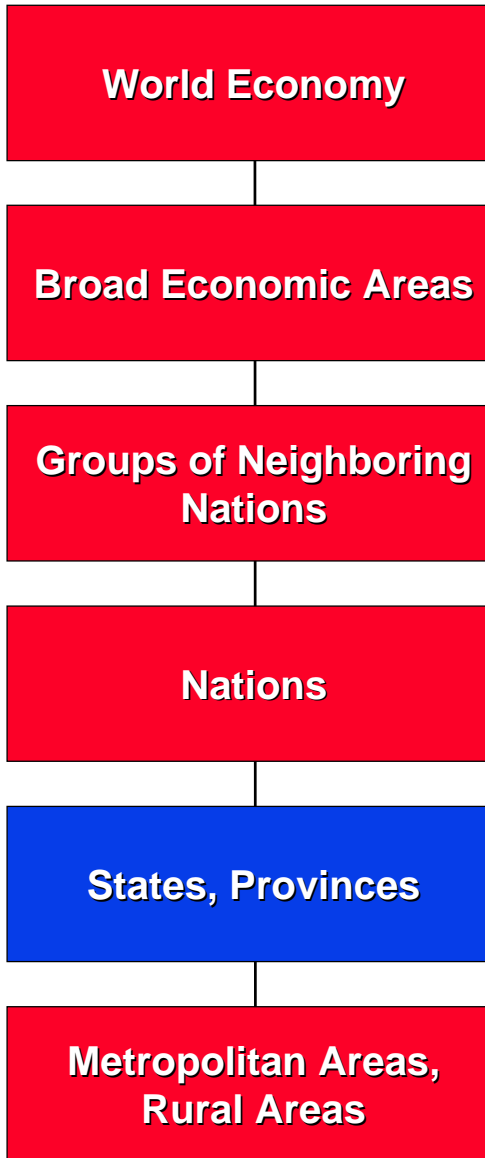
- Company alumni
- VC community
- University alumni

### Joint Research Initiatives

- New England Healthcare Institute
- Whitehead Institute For Biomedical Research
- Center for Integration of Medicine and Innovative Technology (CIMIT)

# Influences on Competitiveness

## Multiple Geographic Levels



# Composition of Regional Economies

## United States, 2001

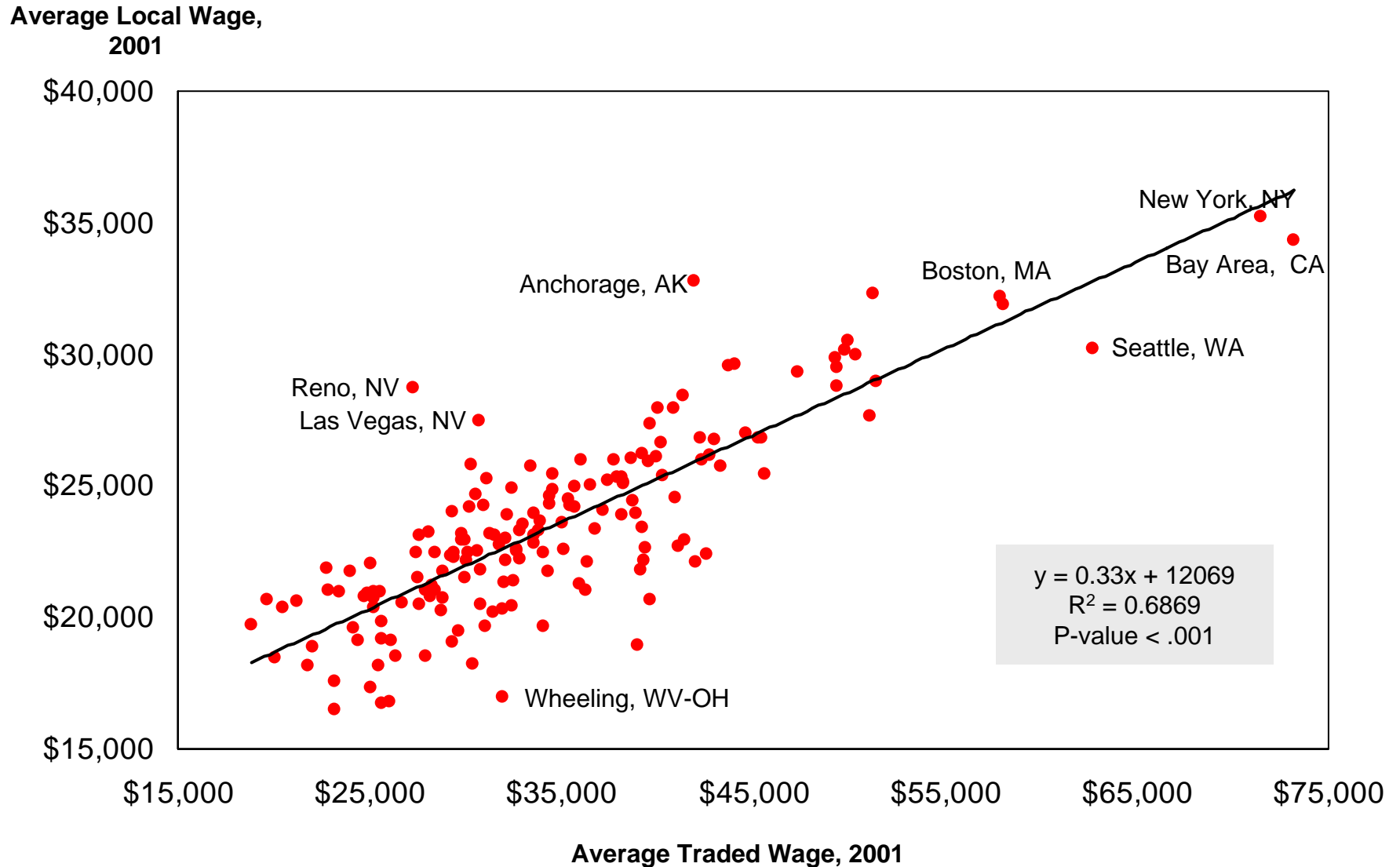
	Traded Clusters	Local Clusters	Natural Resource-Driven Industries
<b>Share of Employment</b>	<b>31.6%</b>	<b>67.6%</b>	<b>0.8%</b>
<b>Employment Growth, 1990 to 2001</b>	<b>1.7%</b>	<b>2.8%</b>	<b>-1.0%</b>
<b>Average Wage</b>	<b>\$44,956</b>	<b>\$28,288</b>	<b>\$33,245</b>
<b>Relative Wage</b>	<b>133.8</b>	<b>84.2</b>	<b>99.0</b>
<b>Wage Growth</b>	<b>4.5%</b>	<b>3.7%</b>	<b>2.0%</b>
<b>Relative Productivity</b>	<b>144.1</b>	<b>79.3</b>	<b>140.1</b>
<b>Patents per 10,000 Employees</b>	<b>21.7</b>	<b>1.3</b>	<b>7.2</b>
<b>Number of SIC Industries</b>	<b>590</b>	<b>241</b>	<b>48</b>

Note: 2001 data, except relative productivity which is 1997 data.

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

# Broad Composition of Regional Economies

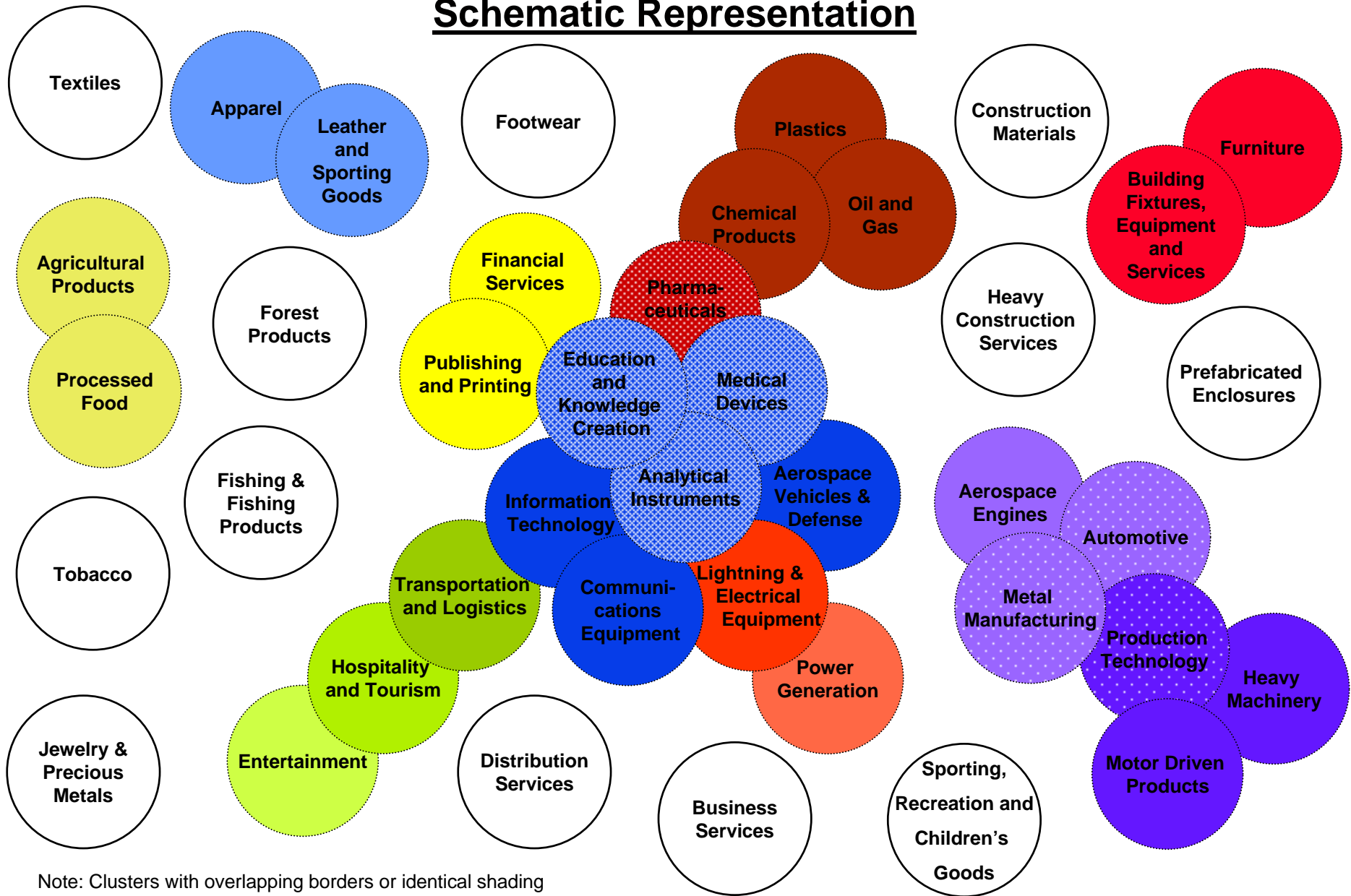
## Local versus Traded Wages



Source: County Business Patterns; Michael E. Porter, "The Economic Performance of Regions", *Regional Studies*, Vol. 37, 2003

# Traded Cluster in the U.S. Economy

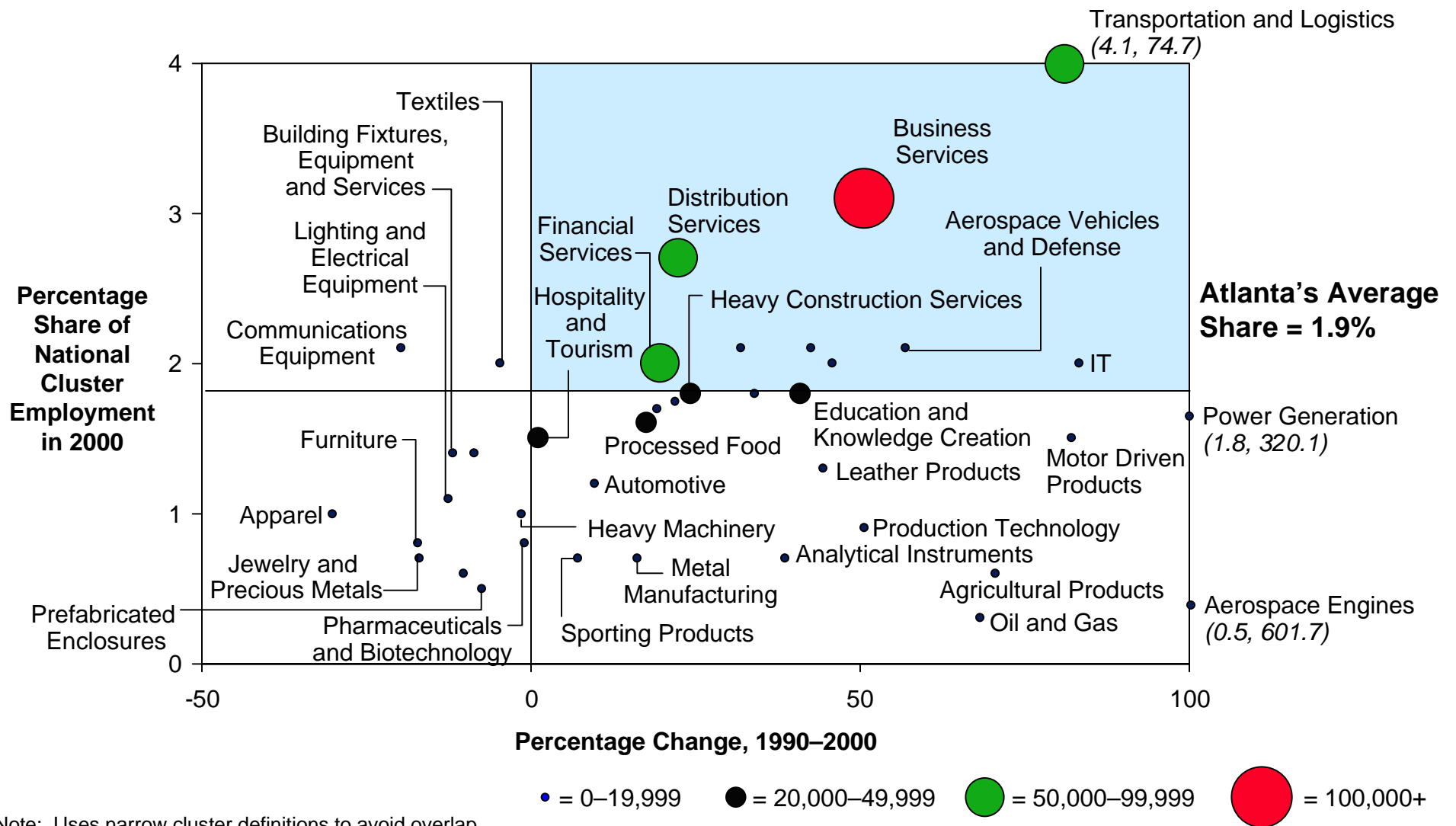
## Schematic Representation



Note: Clusters with overlapping borders or identical shading have at least 20% overlap (by number of industries) in both directions

# Traded Specialization of Regional Economies

## Atlanta Metro Area



Note: Uses narrow cluster definitions to avoid overlap

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

Cluster Conference Canada - 11-07-03 CK

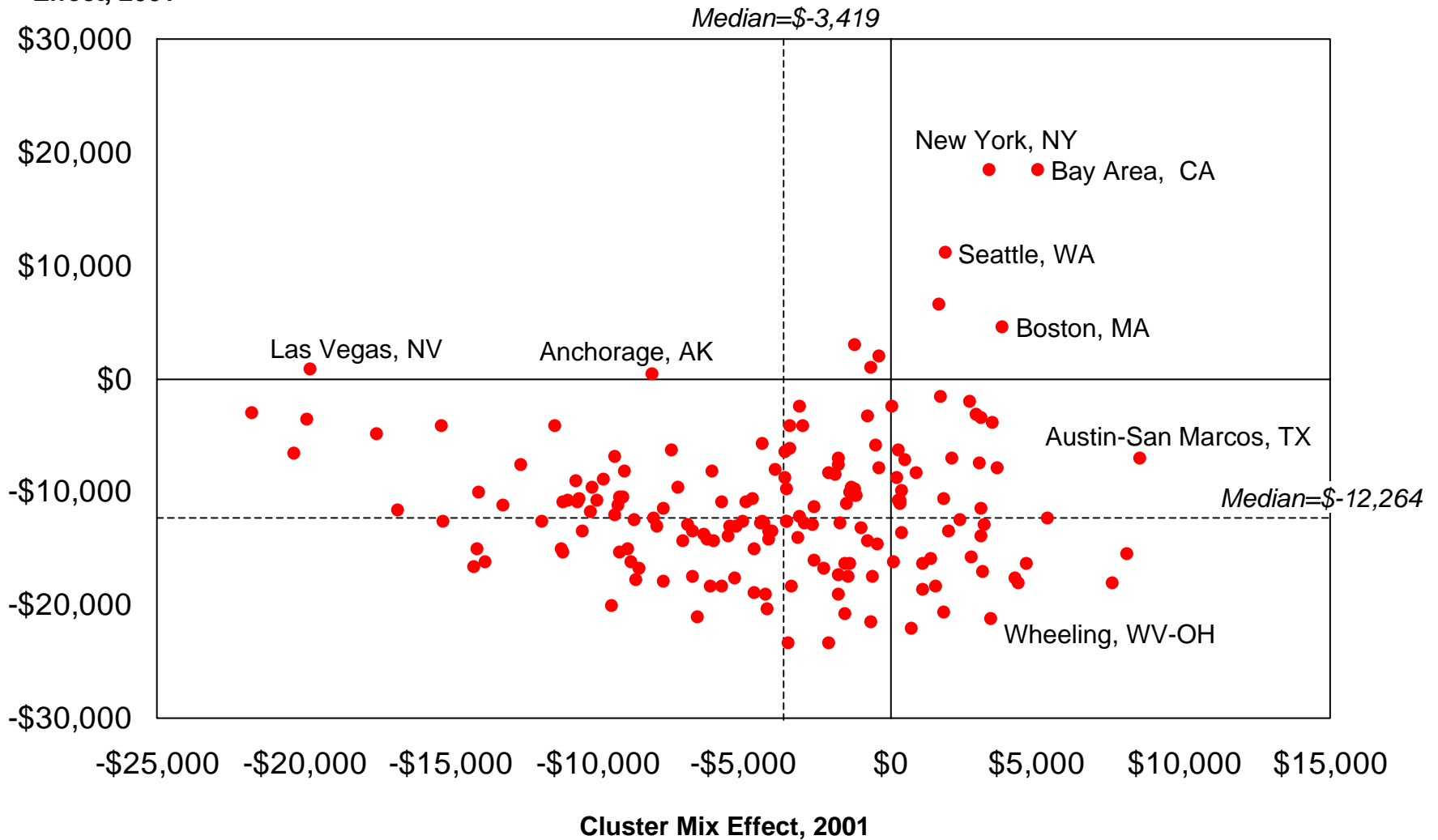
17

Copyright 2003 © Professor Michael E. Porter

# Determinants of Regional Prosperity

## Level versus Mix Effect

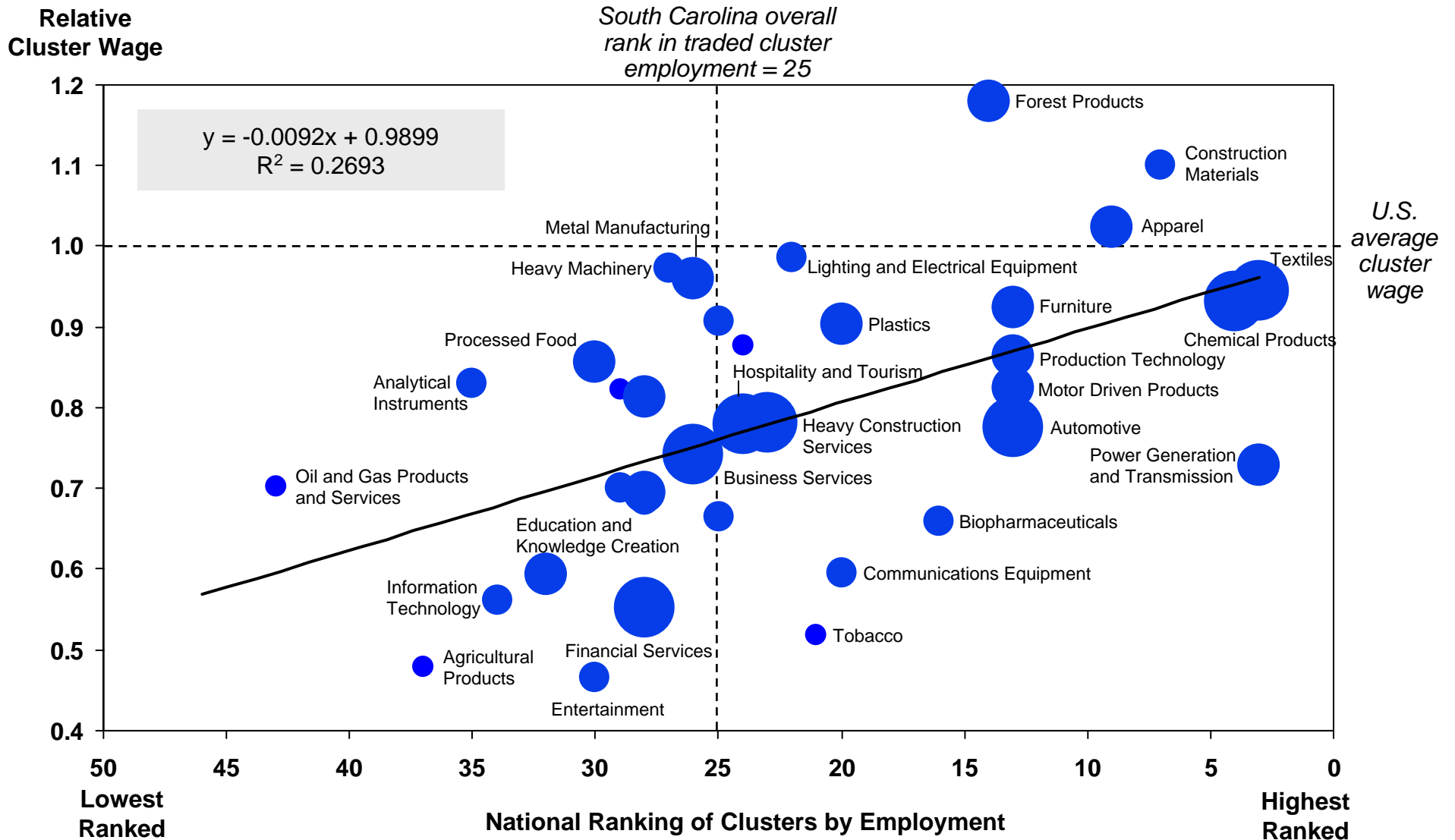
Cluster Wage Level  
Effect, 2001



Source: County Business Patterns; Michael E. Porter, "The Economic Performance of Regions", *Regional Studies*, Vol. 37, 2003

# Traded Cluster Specialization and Relative Wage Levels

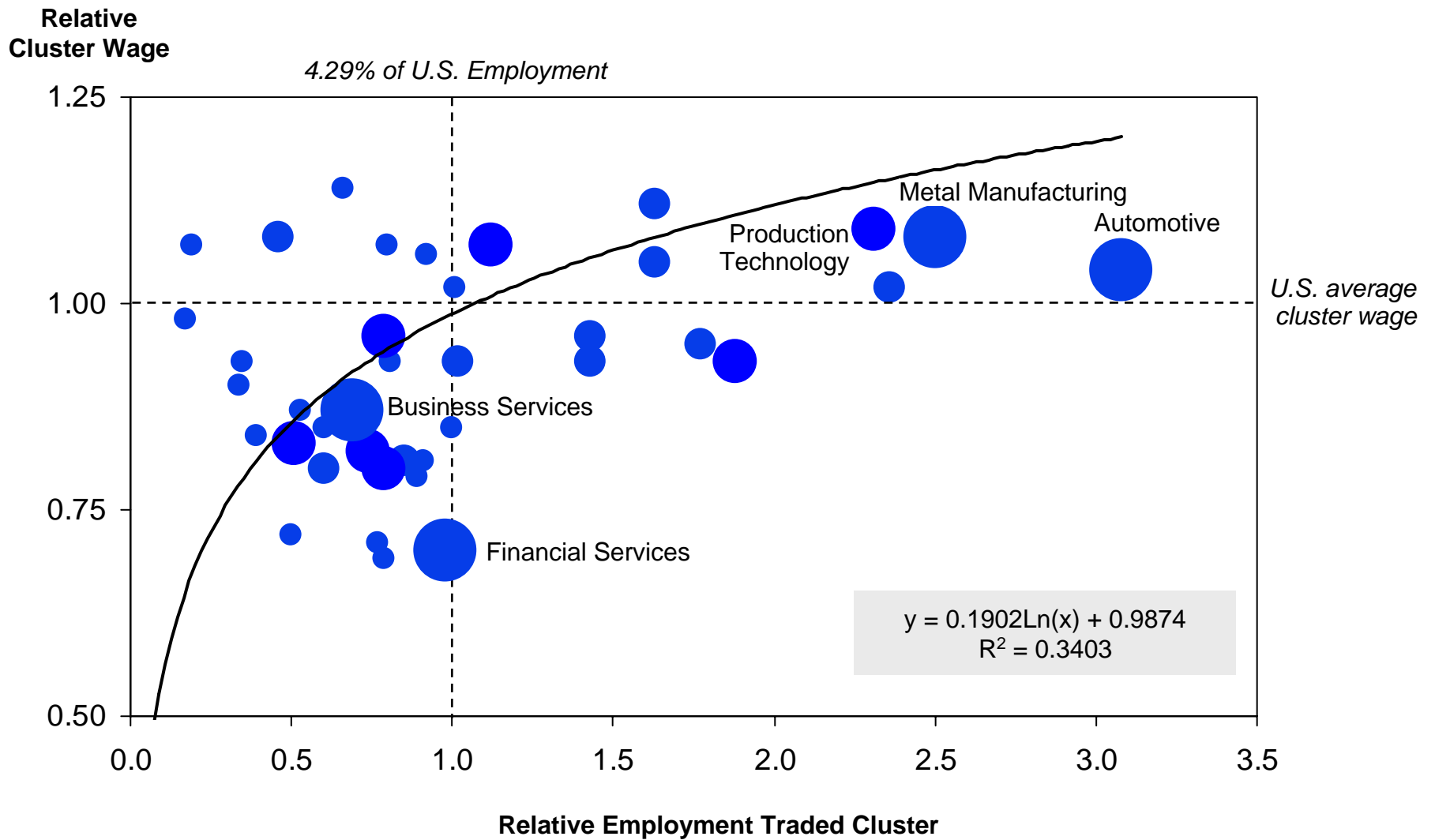
## South Carolina, 2001



Note: Uses narrow cluster definitions to avoid overlap, bubble size proportional to employment bracket  
 Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Traded Cluster Specialization and Relative Wage Levels

## Ohio, 2001

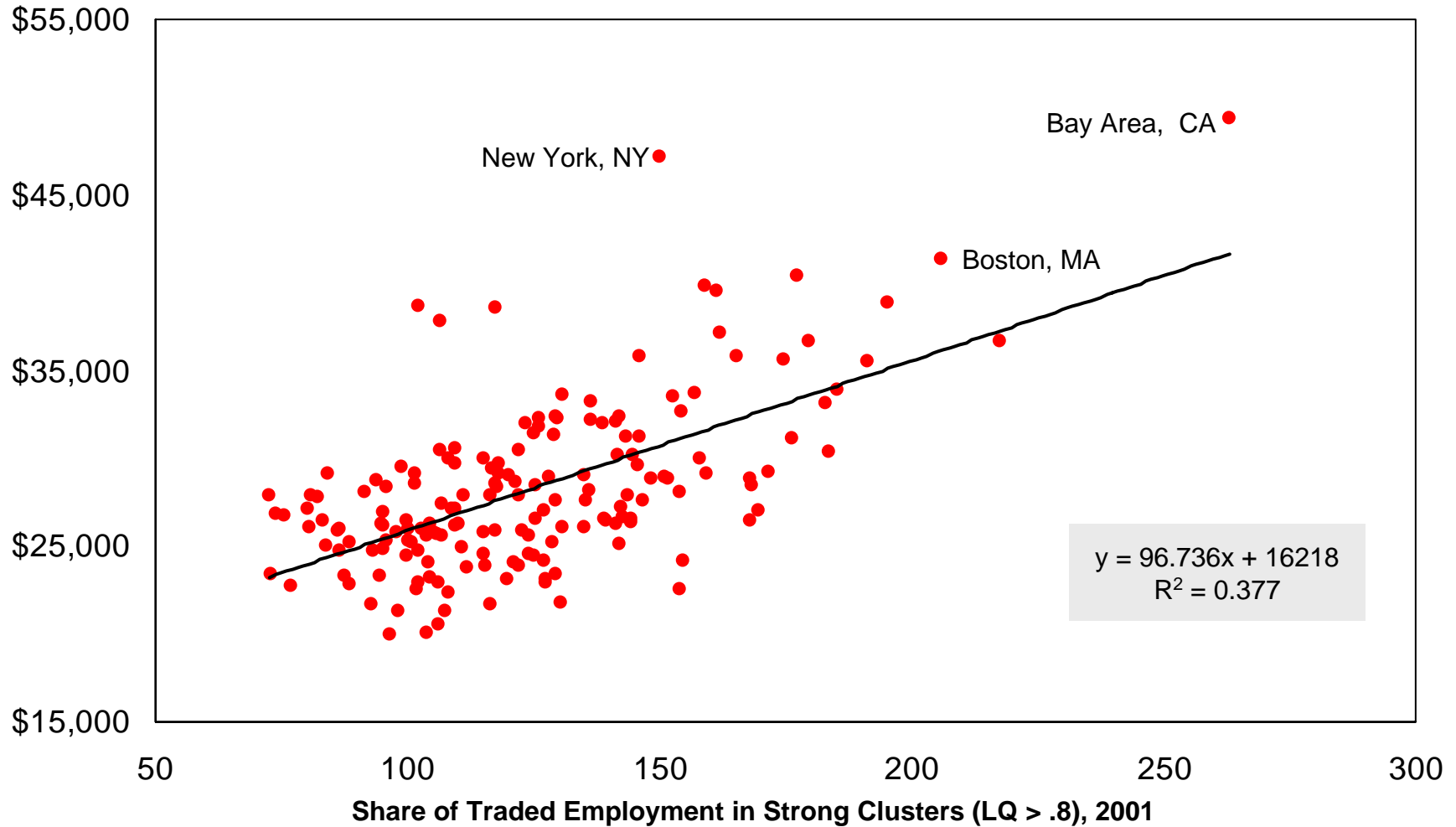


Note: Uses narrow cluster definitions to avoid overlap, bubble size proportional to employment bracket  
 Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

# Determinants of Regional Prosperity

## Cluster Strength and Wage Levels

Average Regional  
Wage, 2001

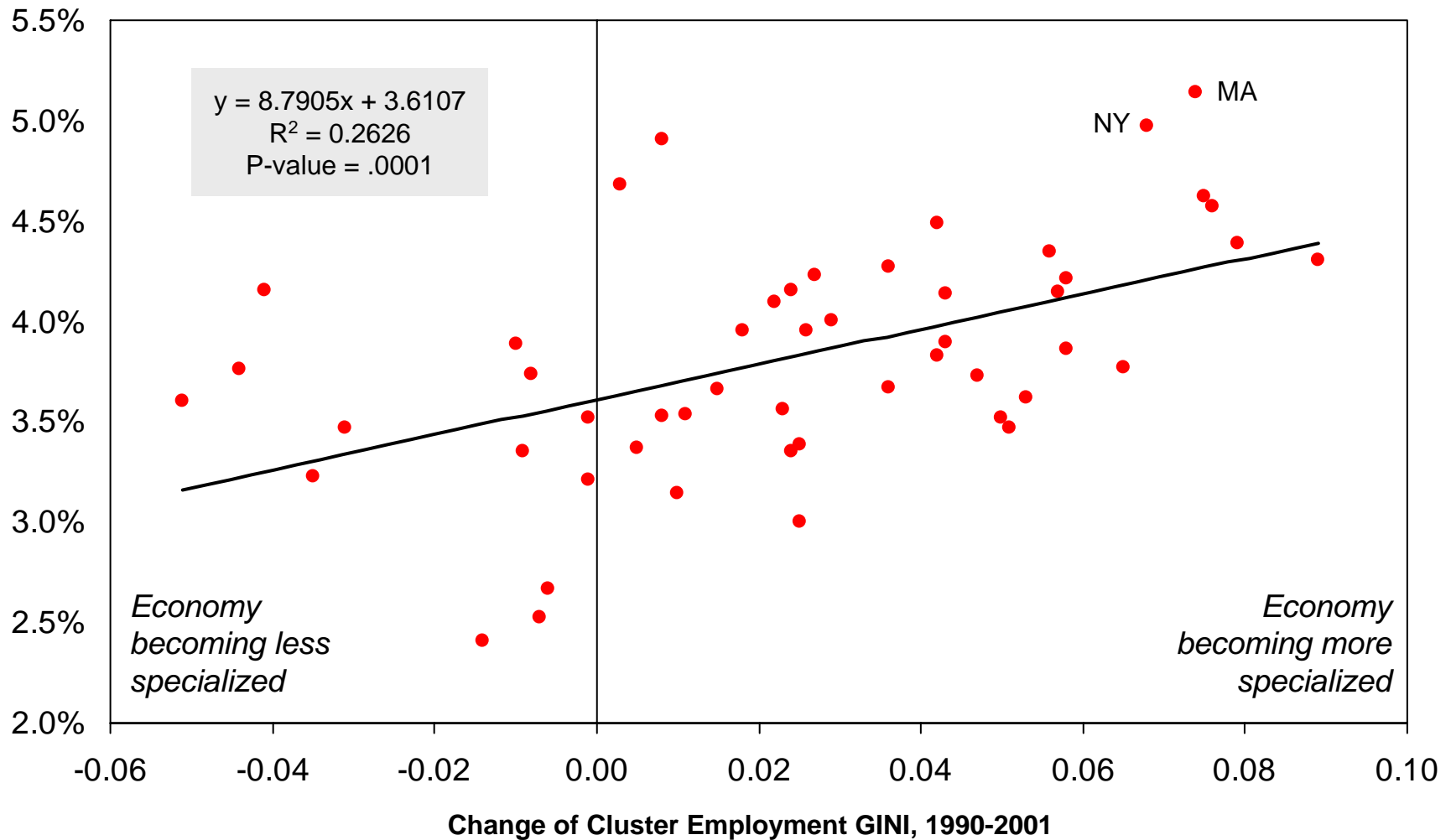


Source: County Business Patterns; Michael E. Porter, "The Economic Performance of Regions", *Regional Studies*, Vol. 37, 2003

# Determinants of Regional Prosperity

## Change in Cluster Specialization and Wage Growth

Annual Regional Wage  
Growth Rate, 1990-2001

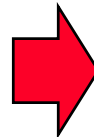


Source: County Business Patterns; Michael E. Porter, "The Economic Performance of Regions", *Regional Studies*, Vol. 37, 2003

# Shifting Responsibilities for Economic Development

## Old Model

- **Government** drives economic development through policy decisions and incentives

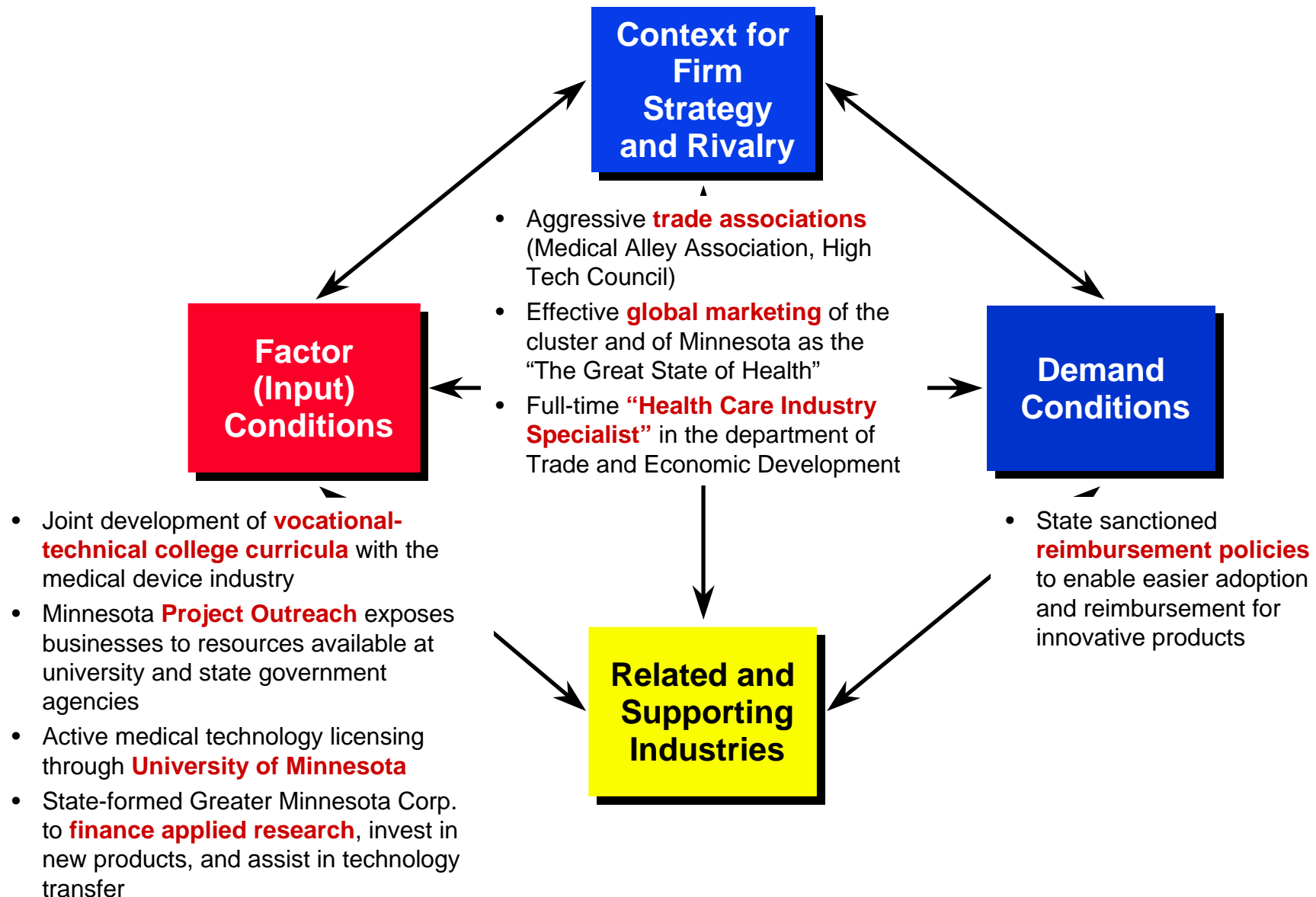


## New Model

- Economic development is a **collaborative process** involving government at multiple levels, companies, teaching and research institutions, and institutions for collaboration

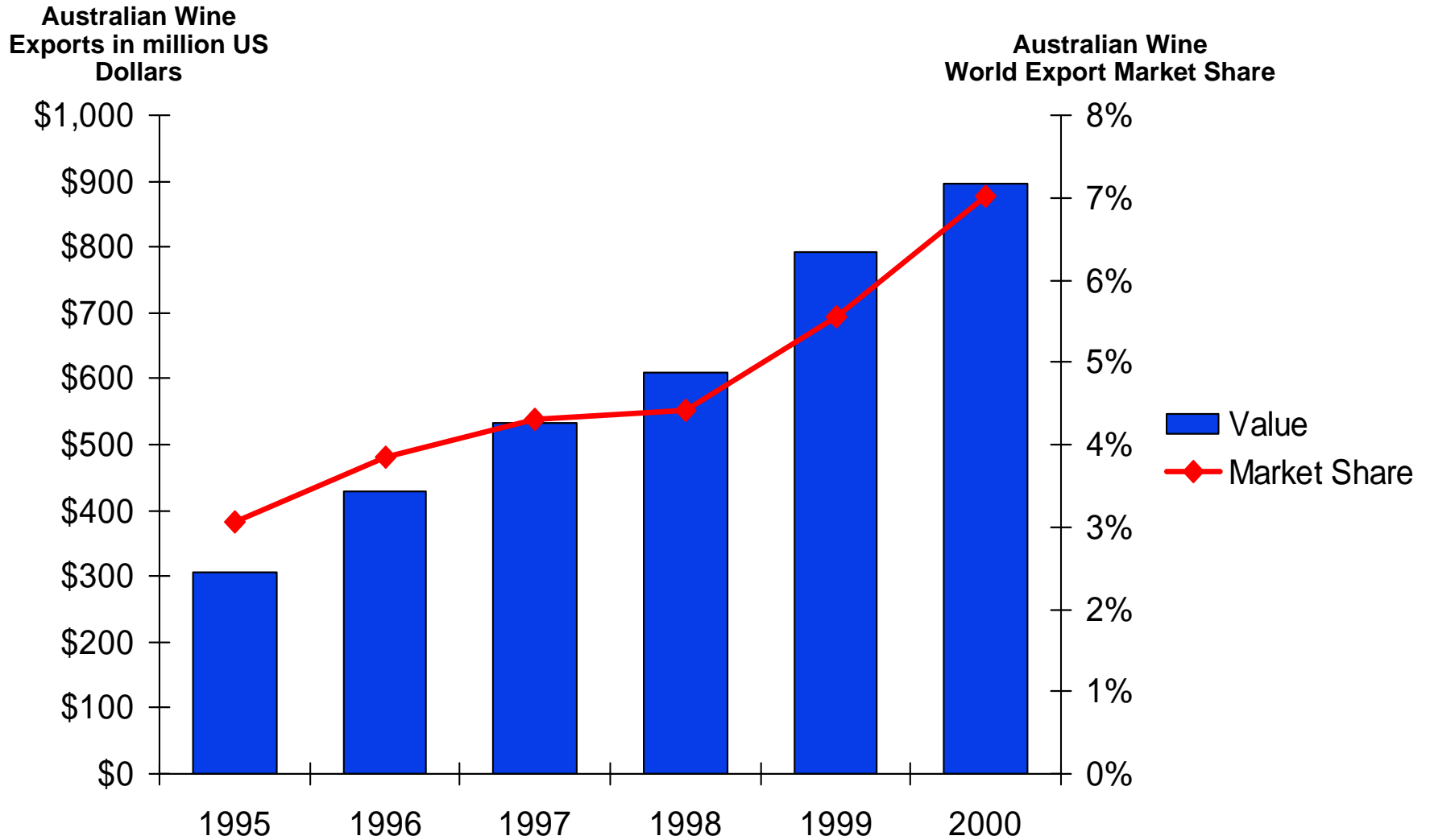
# Public / Private Cooperation in Cluster Upgrading

## Minnesota's Medical Device Cluster



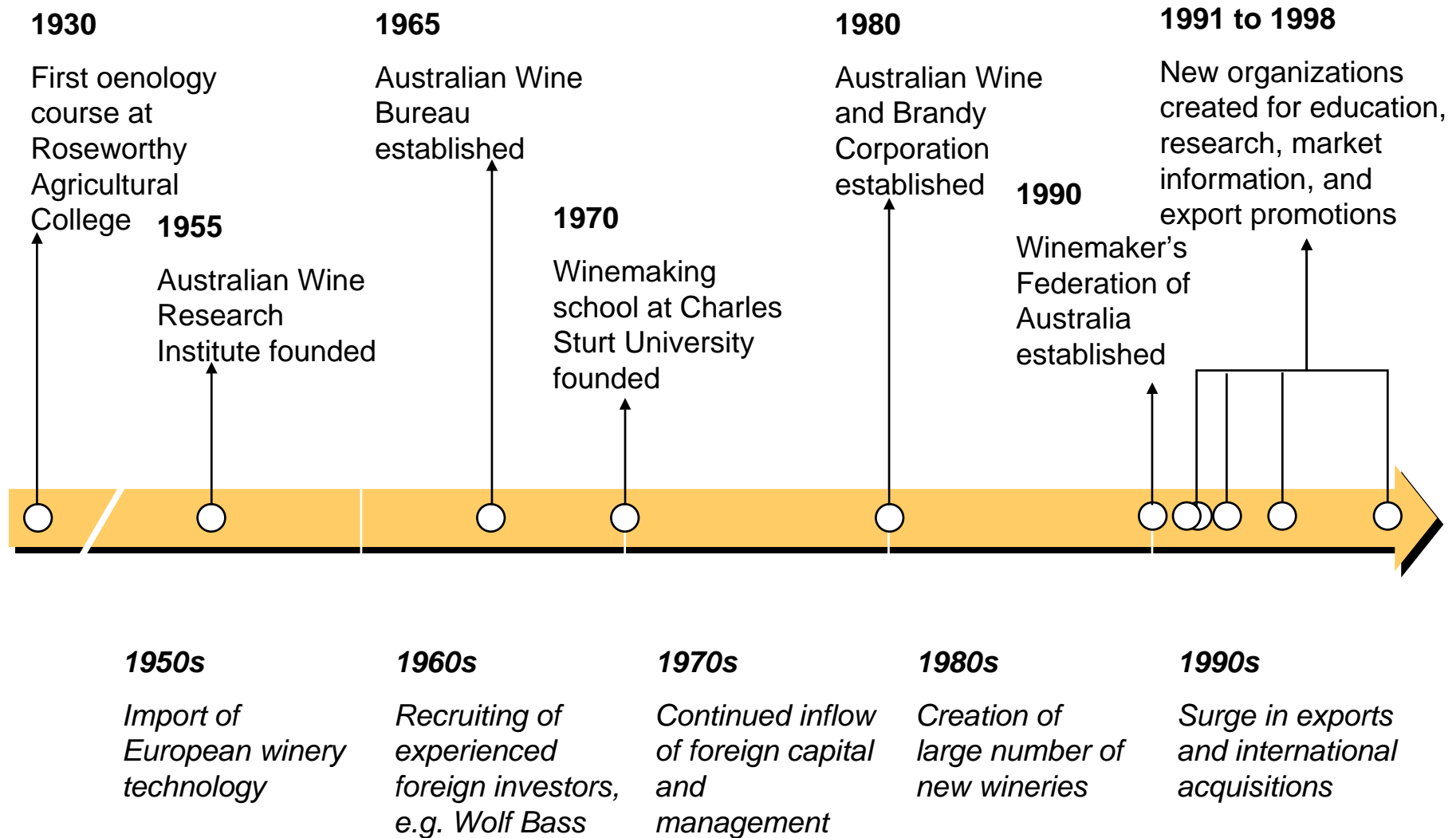
# The Australian Wine Cluster

## Trade Performance



Source: UN Trade Statistics

# The Australian Wine Cluster History



Source: Michael E. Porter and Örjan Sölvell, The Australian Wine Cluster – Supplement, Harvard Business School Case Study, 2002

# The Australian Wine Cluster

## Recently founded Institutions for Collaboration

### Winemakers' Federation of Australia

- Established in 1990
- Focus: Public policy representation of companies in the wine cluster
- Funding: Member companies

### Cooperative Centre for Viticulture

- Established in 1991
- Focus: Coordination of research and education policy in viticulture
- Funding: other cluster organizations

### Australian Wine Export Council

- Established in 1992
- Focus: Wine export promotion through international offices in London and San Francisco
- Funding: Government; cluster organizations

### Grape and Wine R&D Corporation

- Established in 1991 as statutory body
- Focus: Funding of research and development activities
- Funding: Government; statutory levy

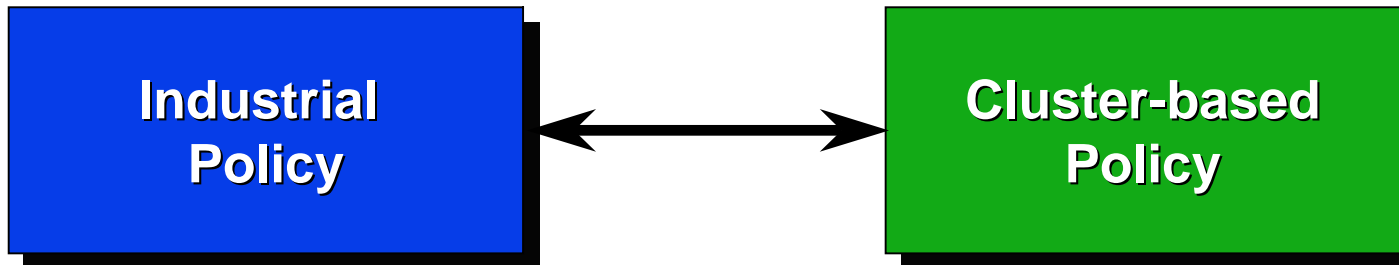
### Wine Industry Information Service

- Established in 1998
- Focus: Information collection, organization, and dissemination
- Funding: Cluster organizations

### Wine Industry National Education and Training Council

- Established in 1995
- Focus: Coordination, integration, and standard maintenance for vocational training and education
- Funding: Government; other cluster organizations

# Cluster Policy versus Industrial Policy



- Target desirable industries / sectors
- Focus on domestic companies
- Intervene in competition (e.g., protection, industry promotion, subsidies)
- Centralizes decisions at the national level



**Distort competition**

- **All** clusters can contribute to prosperity
- Domestic and foreign companies both enhance productivity
- Relax impediments and constraints to productivity
- Emphasize cross-industry linkages / complementarities
- Encourage initiative at the state and local level



**Enhance competition**

# Cluster Development Initiatives

- Cluster definition
  - Cluster definitions need to be **broad enough** to include all relevant industries and institutions that have material linkages with the core activities of the cluster
  - Cluster definitions need to be **narrow enough** to cover companies that face a common set of barriers to upgrade productivity and performance
- Cluster selection
  - Competitiveness depends on **all clusters** a region or nation is active in
  - Prioritization of cluster efforts should be based upon the **potential and willingness to upgrade** of the regional cluster instead of generic, location-independent factors
- Structure of the cluster initiative
  - Only **sustained, private sector-led** cluster initiatives can be sufficiently specific and persistent in their activities to achieve real improvements in cluster performance
  - All relevant parts of public administration and the legislature need to be involved to insure **broad backing** and **quick implementation** of recommendations
  - **Leadership** by a committed individual is need to keep momentum and integrate individual constituencies into a common upgrading process

# Different Approaches to Cluster Development

## Cluster Creation

- Targets areas of perceived **market demand**
- Is driven by **public sector intervention**
- Requires sustained **financial commitment** by the public sector
- High **failure rate**



- **Deepens** the dependence on public sector intervention

## Cluster Activation

- Leverages **existing assets**, history, and geographic location
- Builds on **coalitions** of private and public sector actors
- Requires sustained **participation** by all actors
- Level of success is increasing over **time**; quick returns are possible



- **Transforms** the roles of private and public sector

# Clusters as a Tool For Economic Policy

## Overview

- A **new way of thinking** about an economy and organizing economic development efforts
- Better aligned with the **nature of competition and sources of competitive advantage**. Clusters capture important **linkages** in terms of technology, skills, information, marketing and customer needs that cut across firms and industries. Such linkages are fundamental to competition and, especially, to the **direction and pace of innovation**
- **Recast the role** of the private sector, government, trade associations and educational or research institutions
- Brings together **firms of all sizes**
- Creates a **forum** for constructive business-government dialog
- A means to identify **common opportunities, not just common problems**
- Provides guidance for both **economic and social policies**

# Future Empirical Research Agenda

## Current Efforts

- Develop cluster data at the national level using international trade patterns
  - Launch of new data website at [www.isc.hbs.edu](http://www.isc.hbs.edu) before the end of 2003
- Roll out the methodology to countries besides the United States
  - Canada, 2001 ([www.competeprosper.ca](http://www.competeprosper.ca))
  - Sweden, 2003 ([www.cluster-research.org](http://www.cluster-research.org))
- Analysis of rural regions and their relationships to nearby metropolitan areas
  - On-going effort with the Economic Development Agency (EDA – Department of Commerce) in the United States
- Collection of further data on the regional business environments to understand the drivers of cluster composition and performance
  - Studies in selected U.S. regions in the *Clusters of Innovation*-project
  - New initiative to collect cluster data via the *Cluster Competitiveness Report* offered by the “Fundacio Clusters I Competitivitat” ([www.clustercompetitiveness.org](http://www.clustercompetitiveness.org))

# Selected References on Clusters, Competition, Innovation, and Regional Economies

**Professor Michael E. Porter**

- “The Economic Performance of Regions”, Regional Studies, Vol. 37, 2003
- “UK Competitiveness: Moving to the Next Stage”, with Christian Ketels, DTI Economics Papers, No.3, London: 2003
- “The Competitive Advantage of Corporate Philanthropy,” with Mark Kramer, Harvard Business Review, December 2002
- “Building the Microeconomic Foundations of Prosperity: Findings from the Microeconomic Competitiveness Index” in The Global Competitiveness Report 2002-03, New York: Oxford University Press, New York: Oxford University Press, 2002
- “Clusters of Innovation Initiative: Research Triangle Report,” (with the Council on Competitiveness, Monitor Group, and ontheFRONTIER), Washington, DC: Council on Competitiveness, 2002
- “Clusters of Innovation Initiative: Pittsburgh Report,” (with the Council on Competitiveness, Monitor Group, and ontheFRONTIER), Washington, DC: Council on Competitiveness, 2002
- “Clusters of Innovation Initiative: Atlanta Report,” (with the Council on Competitiveness, Monitor Group, and ontheFRONTIER), Washington, DC: Council on Competitiveness, 2002
- “Clusters of Innovation Initiative: Wichita Report,” (with the Council on Competitiveness, Monitor Group, and ontheFRONTIER), Washington, DC: Council on Competitiveness, 2002
- “Enhancing the Microeconomic Foundations of Prosperity: The Current Competitiveness Index” in The Global Competitiveness Report 2001-02, New York: Oxford University Press, 2001

# Selected References on Clusters, Competition, Innovation, and Regional Economies (continued)

## Professor Michael E. Porter

- “U.S. Competitiveness 2001,” with Debra van Opstal, Washington, DC: Council on Competitiveness, 2001
- “Innovation Lecture,” published by the Dutch Ministry of Economics, 2001
- “National Report: Clusters of Innovation Initiative,” (with the Council on Competitiveness, Monitor Group, and ontheFRONTIER), Washington, DC: Council on Competitiveness, 2001
- “Clusters of Innovation Initiative: San Diego Report,” (with the Council on Competitiveness, Monitor Group, and ontheFRONTIER), Washington, DC: Council on Competitiveness, 2001
- “The Current Competitiveness Index: Measuring the Microeconomic Foundations of Prosperity” in The Global Competitiveness Report 2000-01, New York: Oxford University Press, 2000
- “Location, Competition, and Economic Development: Local Clusters in a Global Economy,” (Economic Development Quarterly, February 2000, 15-34)
- “Locations, Clusters, and Company Strategy” in The Oxford Handbook of Economic Geography, (G. L. Clark, M.P. Feldman, and M.S. Gertler, eds.), New York: Oxford University Press, 2000
- “Attitudes, Values, Beliefs and the Microeconomics of Prosperity,” in Culture Matters: How Values Shape Human Progress, (L.E. Harrison, S.P. Huntington, eds.), New York: Basic Books, 2000
- “Clusters and the New Competitive Agenda for Companies and Governments” in On Competition, Boston: Harvard Business School Press, 1998
- The Competitive Advantage of Nations, New York: The Free Press, 1990

# Web resources

- Institute for Strategy and Competitiveness
  - Cluster Mapping Project [www.isc.hbs.edu  
data.isc.hbs.edu/isc](http://www.isc.hbs.edu/data.isc.hbs.edu/isc)
  - Cluster Profiles [data.isc.hbs.edu/cp](http://www.isc.hbs.edu/data.isc.hbs.edu/cp)
- Canada: Institute for Prosperity and Competitiveness  
[www.competeprosper.ca](http://www.competeprosper.ca)
- *Clusters of Innovation Initiative*
  - Council on Competitiveness [www.compete.org](http://www.compete.org)
  - Monitor Company [www.monitor.com](http://www.monitor.com)
- *Cluster Competitiveness Report*
  - “Fundacio Clusters I Competitivitat” [www.clustercompetitiveness.org](http://www.clustercompetitiveness.org)