

Regional Foundations of Competitiveness

Issues for Wales

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Future Competitiveness of Wales: Innovation, Entrepreneurship, and Technological Change
Wales (by video link)
April 3rd, 2002

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 1998, (World Economic Forum, 1998), "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.

Agenda

- **Foundations of Competitiveness**
 - The Role of Regions in Competitiveness
 - Issues for Wales

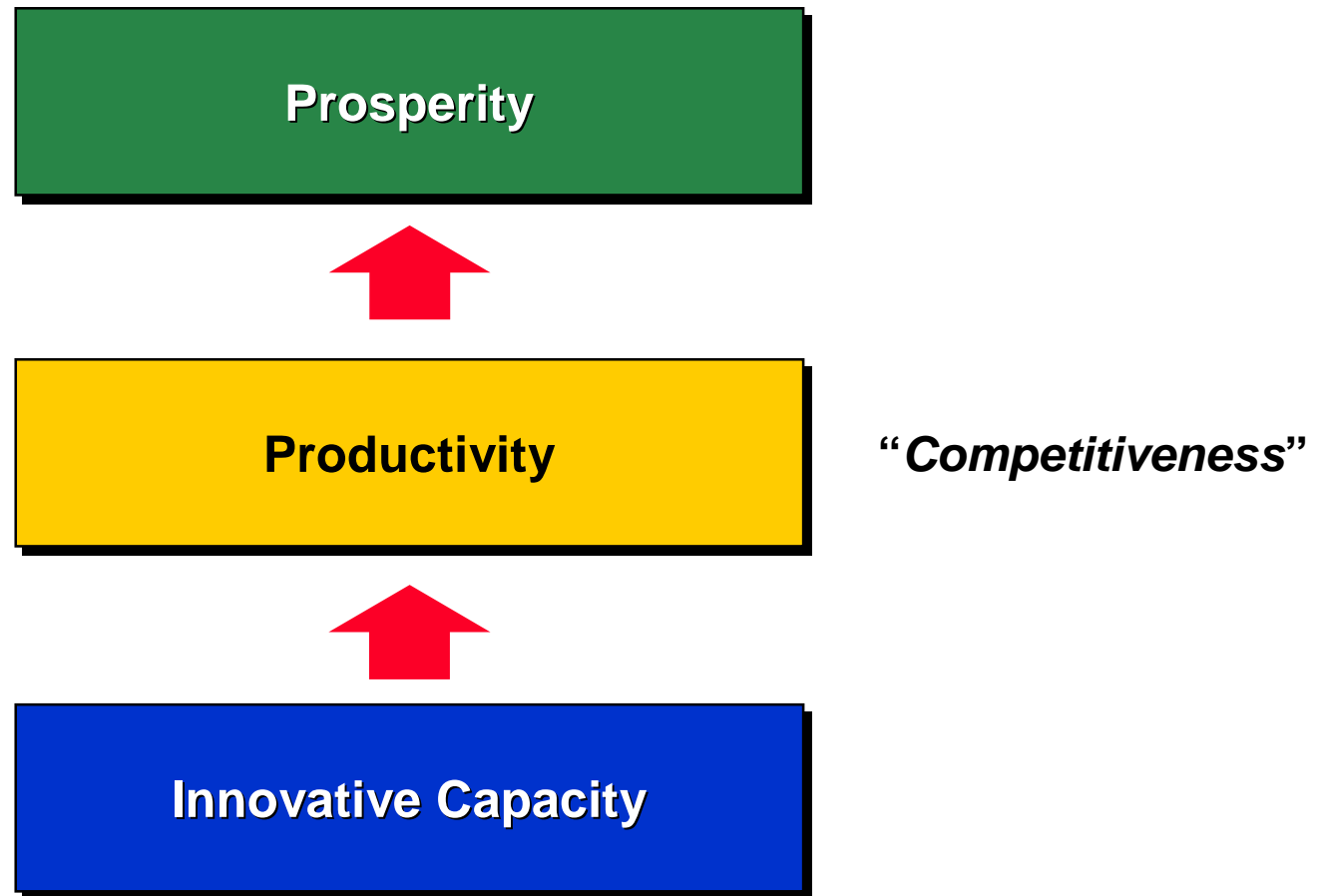
Sources of Rising Prosperity

- A region's standard of living (wealth) is determined by the **productivity** with which it uses its human, capital, and natural resources. The appropriate definition of competitiveness is **productivity**
 - Productivity depends both on the **value** of products and services (e.g. uniqueness and quality) as well as the **efficiency** with which they are produced
 - It is not **what** industries a region competes in that matters for prosperity, but **how** firms compete in those industries
 - Productivity in a region is a reflection of what both domestic and foreign firms **choose to do in that location**. The location of ownership is secondary for national prosperity
 - The productivity of **“local”** industries is of fundamental importance to competitiveness, not just that of traded industries



- Regions compete in offering the **most productive environment** for business
- The public and private sectors play **different but interrelated roles** in creating a productive economy

Innovation and Prosperity



- Innovation is **more than just scientific discovery**
- There are **no low-tech industries**, only low-tech firms

Determinants of Productivity and Productivity Growth

Macroeconomic, Political, Legal, and Social
Context for Development

Microeconomic Foundations of Development

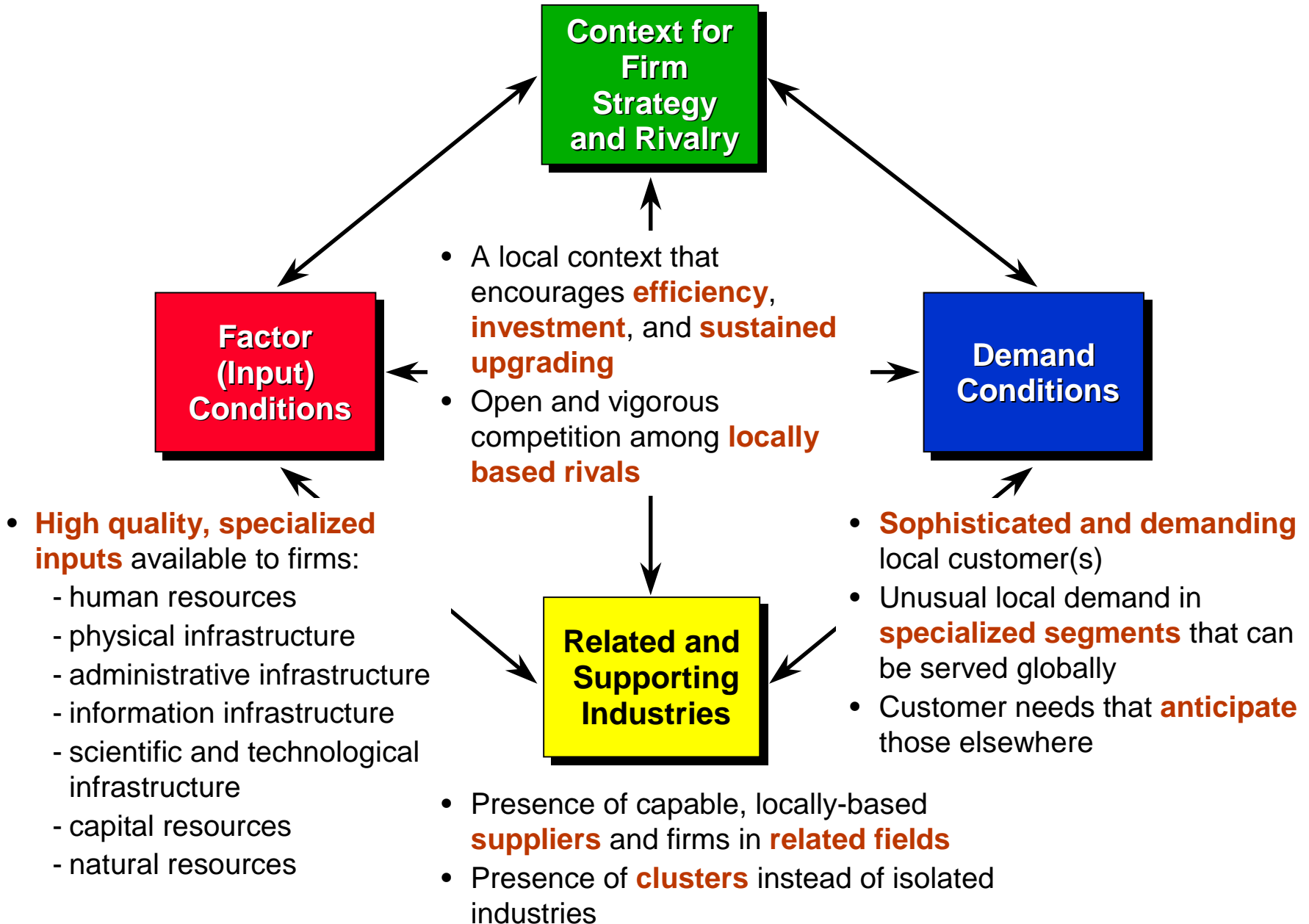
Sophistication
of Company
Operations and
Strategy



Quality of the
Microeconomic
Business
Environment

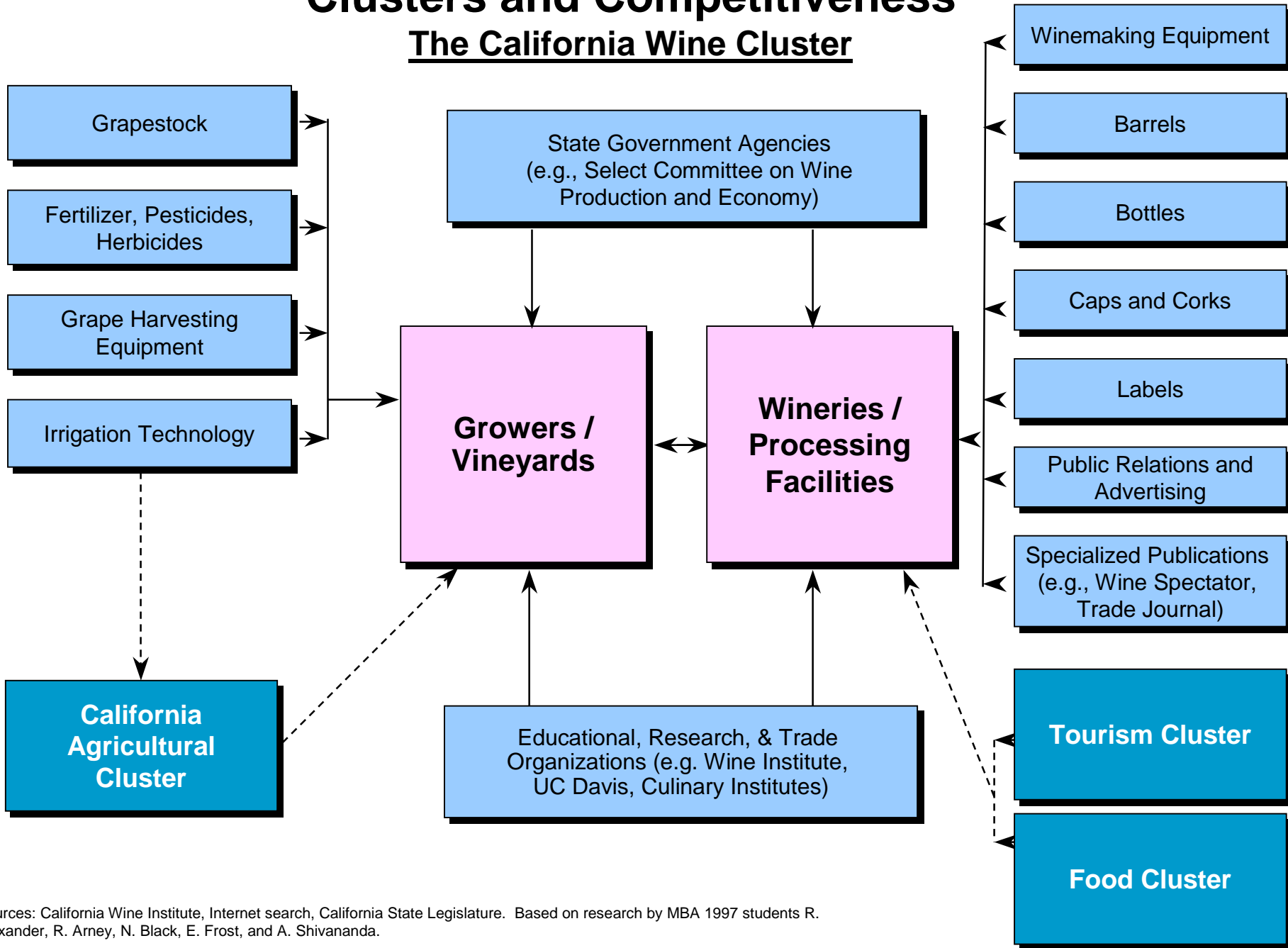
- Sound macroeconomic policies, a stable political environment, a trusted legal framework and progress in improving social conditions are **necessary** to ensure a prosperous economy, **but not sufficient**
- Competitiveness ultimately depends on improving the **microeconomic foundations** of competition

Productivity and the Microeconomic Business Environment



Clusters and Competitiveness

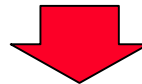
The California Wine Cluster



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.

Clusters and Competitive Advantage

- **Current Productivity / Efficiency**
- **Innovation and Productivity Growth**
- **New Business Formation**



- Competitive advantage is fundamentally enhanced by **externalities / linkages** across firms, industries, and associated institutions

Institutions for Collaboration

General

- Chambers of Commerce
- Professional associations
- School networks
- University partner groups
- Religious networks
- Joint private/public advisory councils
- Competitiveness councils

Cluster-specific

- Industry associations
- Specialized professional associations and societies
- Alumni groups of core cluster companies
- Incubators

- Institutions for Collaboration (IFCs) are **formal and informal organizations** that
 - facilitate the exchange of information and technology
 - foster cooperation and coordination
- IFCs can improve the business environment by
 - creating **relationships** and the level of trust supporting them
 - encourage the definition of **common standards**
 - facilitate the organization of **collective action**
 - support the definition and communication of **beliefs and attitudes**
 - providing mechanisms to develop a common economic or **cluster agenda**

Institutions for Collaboration

Selected Institutions for Collaboration in San Diego

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

Agenda

- Foundations of Competitiveness

- **The Role of Regions in Competitiveness**

- Issues for Wales

Regional Economic Performance Measures

Overall Economy

Employment Growth

- Rate of employment growth

Unemployment

- Percentage of persons unemployed

Workforce Participation

- Proportion of population in the workforce

Average Wages

- Payroll per person

Wage Growth

- Growth rate of payroll per person

Cost of Living

- Cost of living index

Productivity

- Output per employee or total factor productivity

Exports

- Value of manufactured and commodity exports per worker

Innovation Output

Patents

- Number of patents and patents per worker

Establishment Formation

- Growth rate of establishments

Venture Capital Investments

- Value of venture capital invested

Initial Public Offerings

- Number of initial public offerings

Fast Growth Firms

- Number of firms on the Inc. 500 list

Productivity growth

- Growth in output per employee or total factor productivity

Regional Economic Performance Measures

State of Michigan

Overall Economy

Employment growth per year,¹ 1990 to 1999

- in Michigan: 1.77% (rank 34)
- in the US: 1.90%

Average wages in 1999

- in Michigan: \$34,607 (rank 11)
- in the US: \$32,109

Wage growth per year, 1990 to 1999

- in Michigan: 3.97% (rank 22)
- in the US: 4.03%

Gross state product per employee in 1999

- in Michigan: \$55,511 (rank 19)
- in the US: \$56,882

Annual growth in exports, 1995-1999

- in Michigan: 2.83% (rank 32)
- in the US: 4.41%

Innovation Output

Patents per 10,000 employees

- in Michigan: 8.8 (rank 13)
- in the US: 6.3

Patents growth per year, 1990 to 1998

- in Michigan: 2.64% (rank 37)
- in the US: 3.19%

New establishment formation,² 1990 to 1999

- in Michigan: 4.55% (rank 27)
- in the US: 4.60%

Fast growth firms (Inc 500), 1991 to 2000

- in Michigan: 137 (rank 13)

Venture capital investments, \$ per worker, 1999

- in Michigan: \$13 (rank 38)

Initial public offering proceeds per 1,000 firms, 1999

- in Michigan: \$6,982 (rank 11)

Note: ¹Excludes government and agricultural employment. ²Refers to the formation of establishments in traded industries, competing across regions.

Data Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School (www.isc.hbs.edu).

Patents by Organization

Research Triangle MSA, 1995–1999

	Organization	Patents Issued from 1995 to 1999
1	International Business Machines Corporation	495
2	Ericsson, Inc.	325
3	Becton, Dickinson and Company	128
4	North Carolina State University	128
5	Duke University	127
6	University of North Carolina — Chapel Hill	124
7	Square D Company	48
8	Novartis	46
9	ABB Power T&D Company, Inc.	44
10	Alcatel Network Systems, Inc.	43
11	Mitsubishi Semiconductor America, Inc.	41
12	Lord Corporation	36
13	Kennametal, Inc.	29
14	Rhone-Poulenc, Inc.	29
15	Telefonaktiebolaget LM Ericsson	28
16	Caterpillar, Inc.	26
17	Cree Research, Inc.	26
18	E.I. DuPont De Nemours and Company	26
19	MCNC	25
20	Raychem Corporation	24
21	Reichhold Chemicals, Inc.	24
22	American Sterilizer Company	21
23	Siemens Energy and Automation, Inc.	21
24	Northern Telecom Limited	20
25	Research Triangle Institute	20

The Composition of Regional Economies

United States

	Traded Clusters	Local Clusters	Natural Resource-Driven Industries
Share of Employment	32.1%	67.1%	0.8%
Employment Growth, 1993 to 1999	2.5%	2.8%	-0.1%
Average Wage	\$41,678	\$26,049	\$31,264
Relative Wage	134.0	83.8	100.5
Wage Growth	5.0%	3.8%	2.5%
Relative Productivity	144.1	79.3	139.5
Patents per 10,000 Employees	20.48	1.38	6.40
Number of SIC Industries	592	241	46

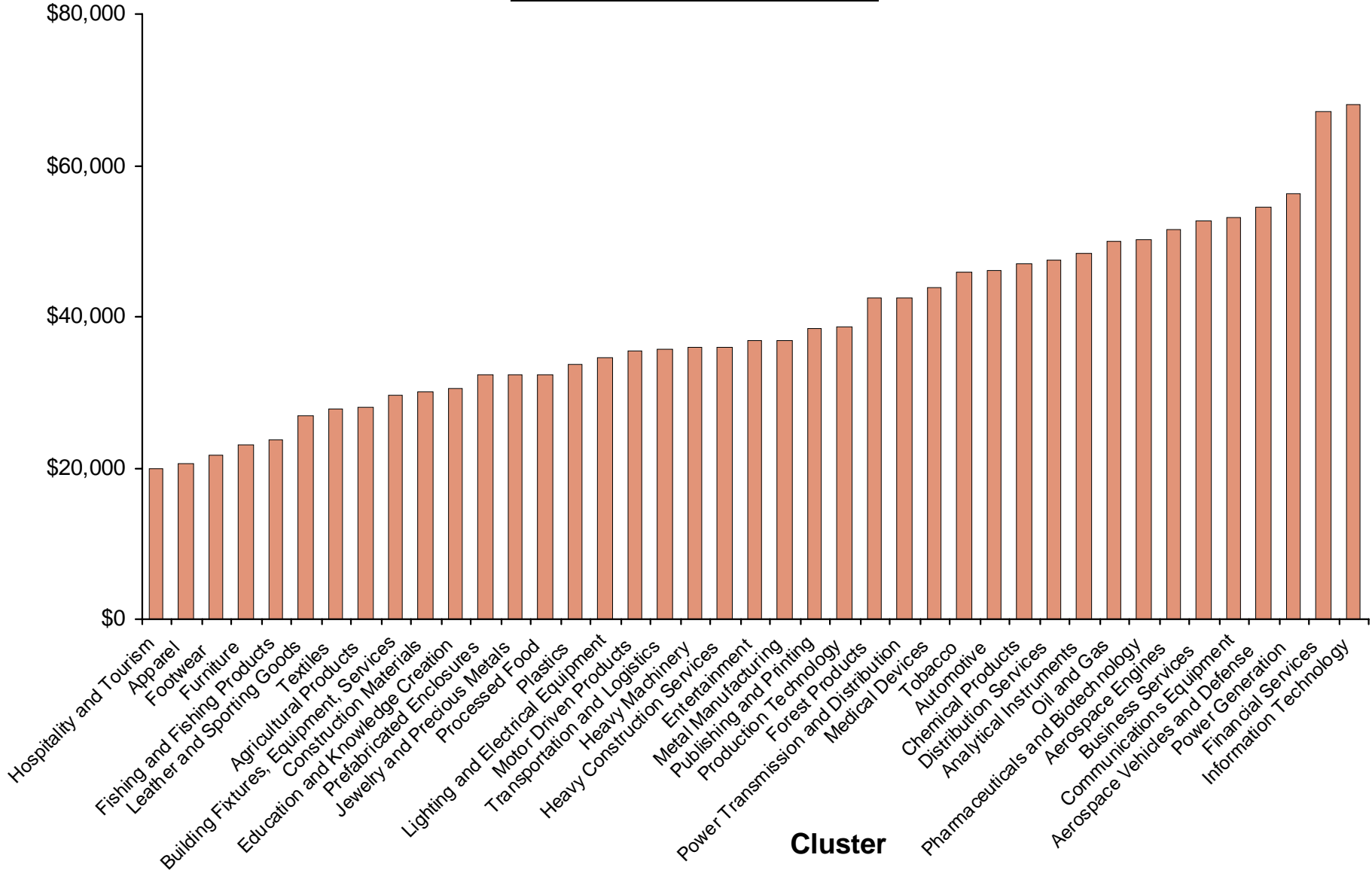
Note: 1999 data, except relative productivity which is 1997 data, and patents data which is 1998 data

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School, www.isc.hbs.edu

Average Wages in Traded Clusters

United States, 1999

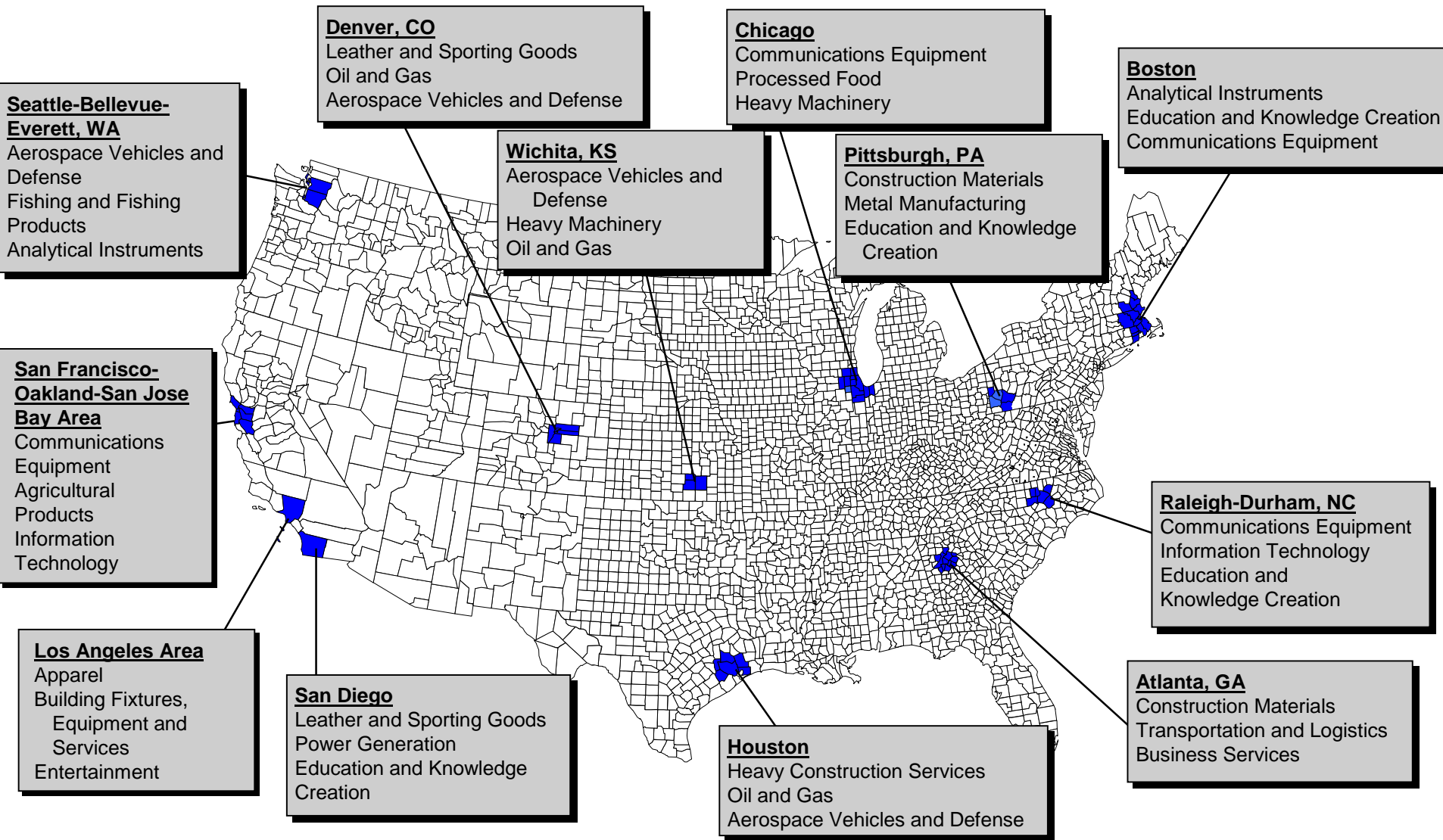
1999 Average Wage



Cluster

Specialization of Regional Economies

Selected U.S. Geographic Areas

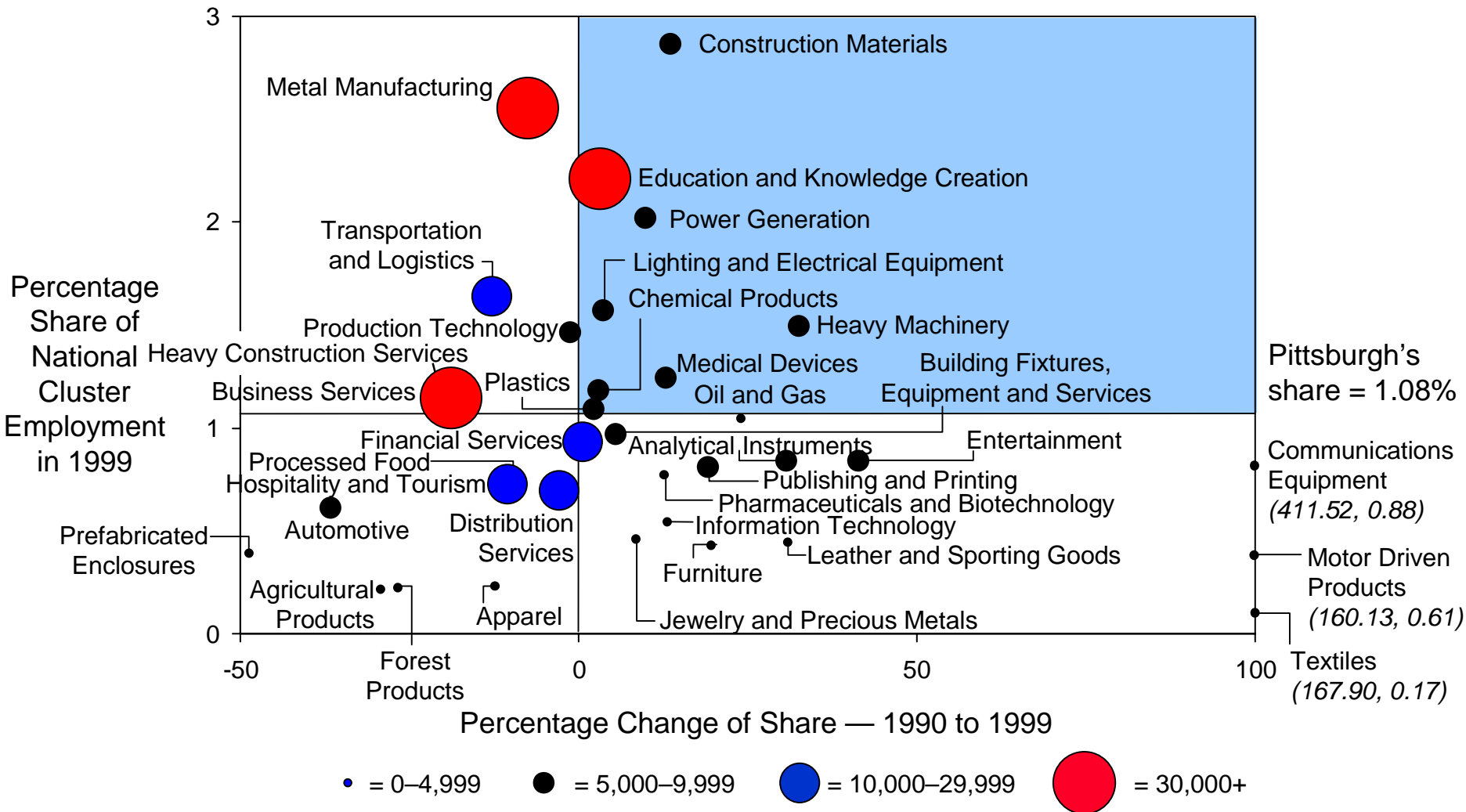


Note: Clusters listed are the three highest ranking clusters in terms of share of national employment

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School, www.isc.hbs.edu

Specialization of Regional Economies

Pittsburgh Metropolitan Area

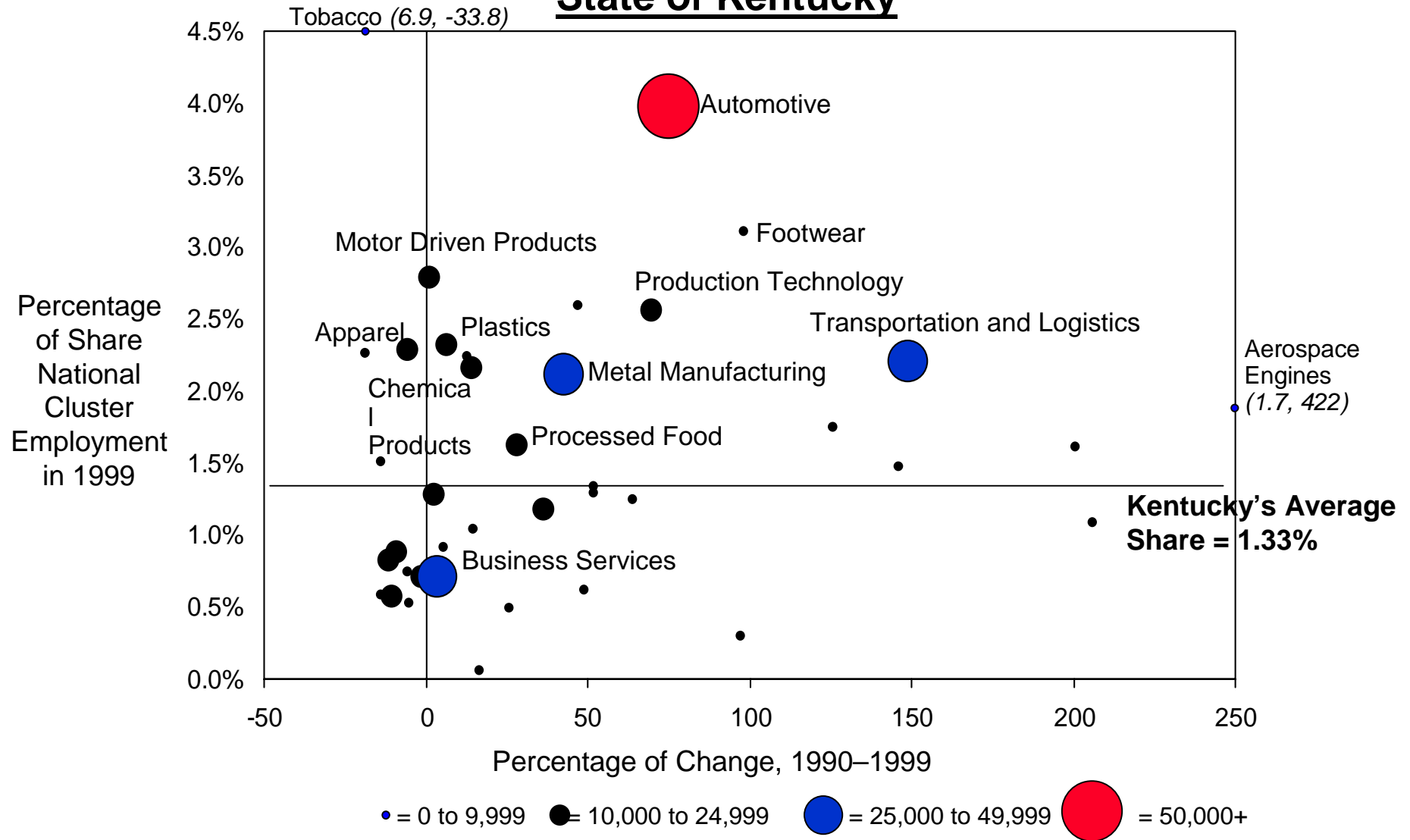


Note: Uses narrow cluster definitions that assign industries uniquely to one cluster each; data points that fall outside the graph are placed on the borders with their values given in parentheses (share, change)

Source: Cluster Mapping Project at Institute for Strategy and Competitiveness, Harvard Business School, www.isc.hbs.edu

Specialization of Regional Economies

State of Kentucky

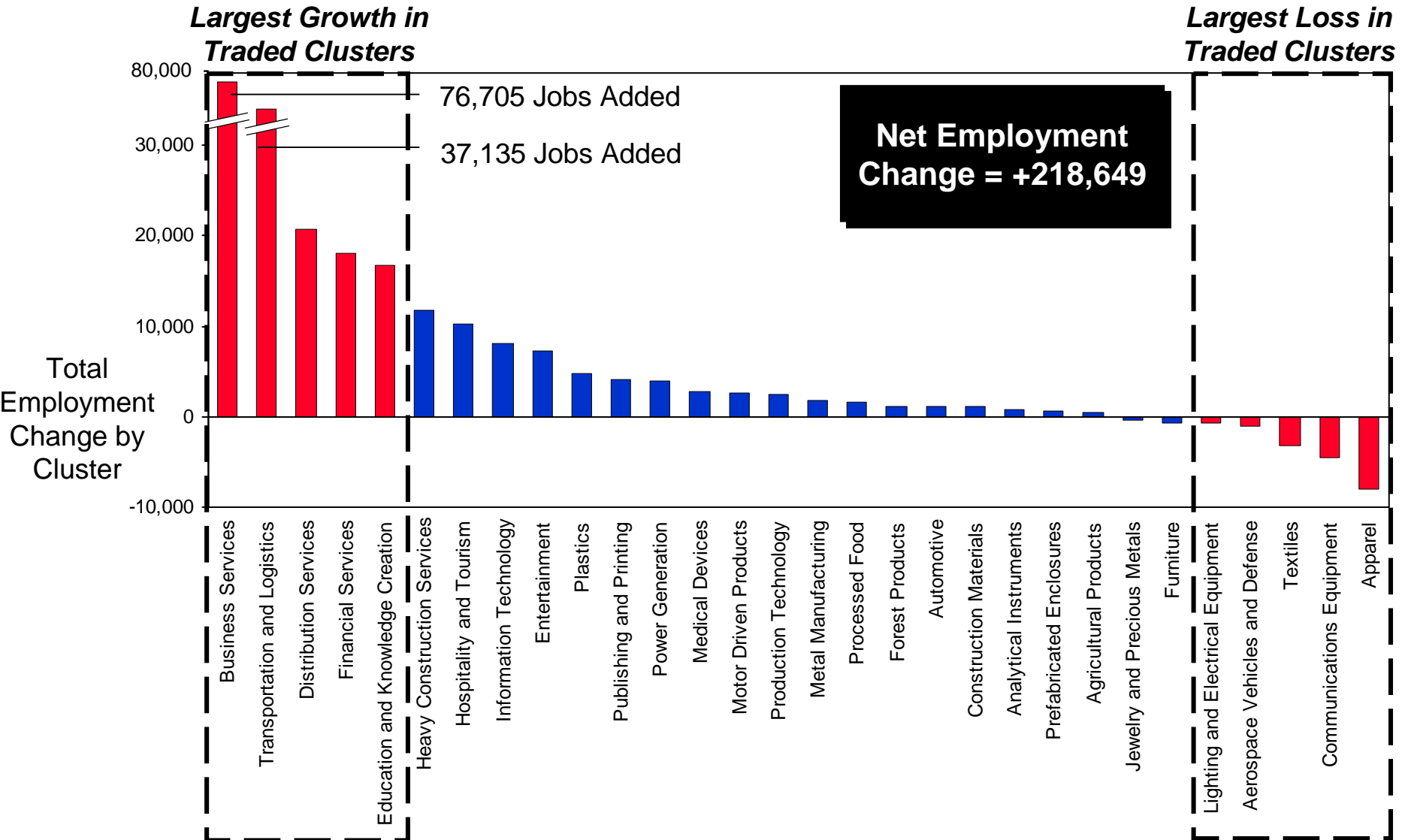


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Source: Cluster Mapping Project at Institute for Strategy and Competitiveness, Harvard Business School, www.isc.hbs.edu

Traditional Strengths of Atlanta Area

Job Creation by Cluster, 1990–1999

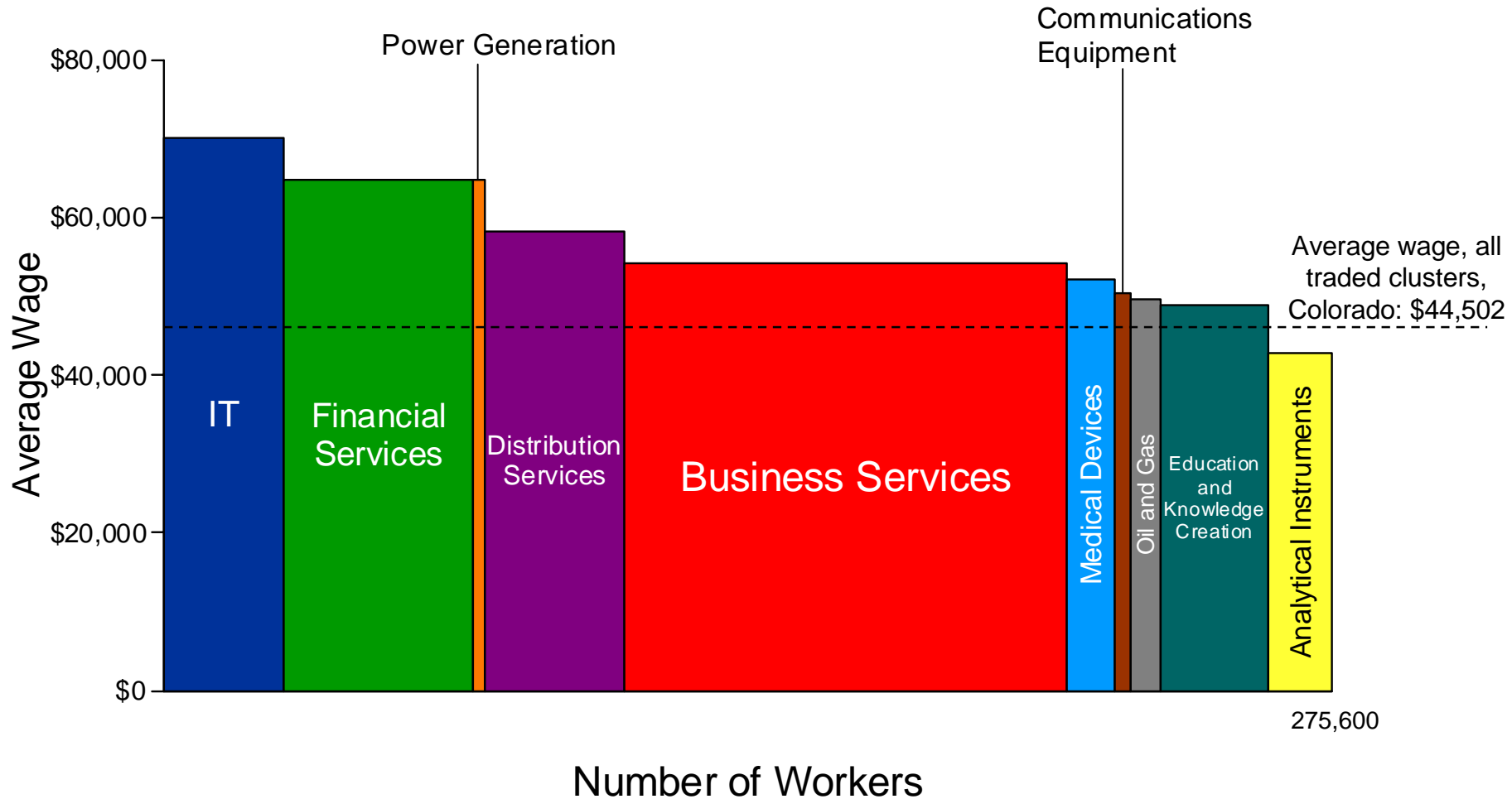


Note: Uses narrow cluster definitions that assign industries uniquely to one cluster each

Source: Cluster Mapping Project at Institute for Strategy and Competitiveness, Harvard Business School, www.isc.hbs.edu

Top 10 Highest Wage Traded Clusters, 1999

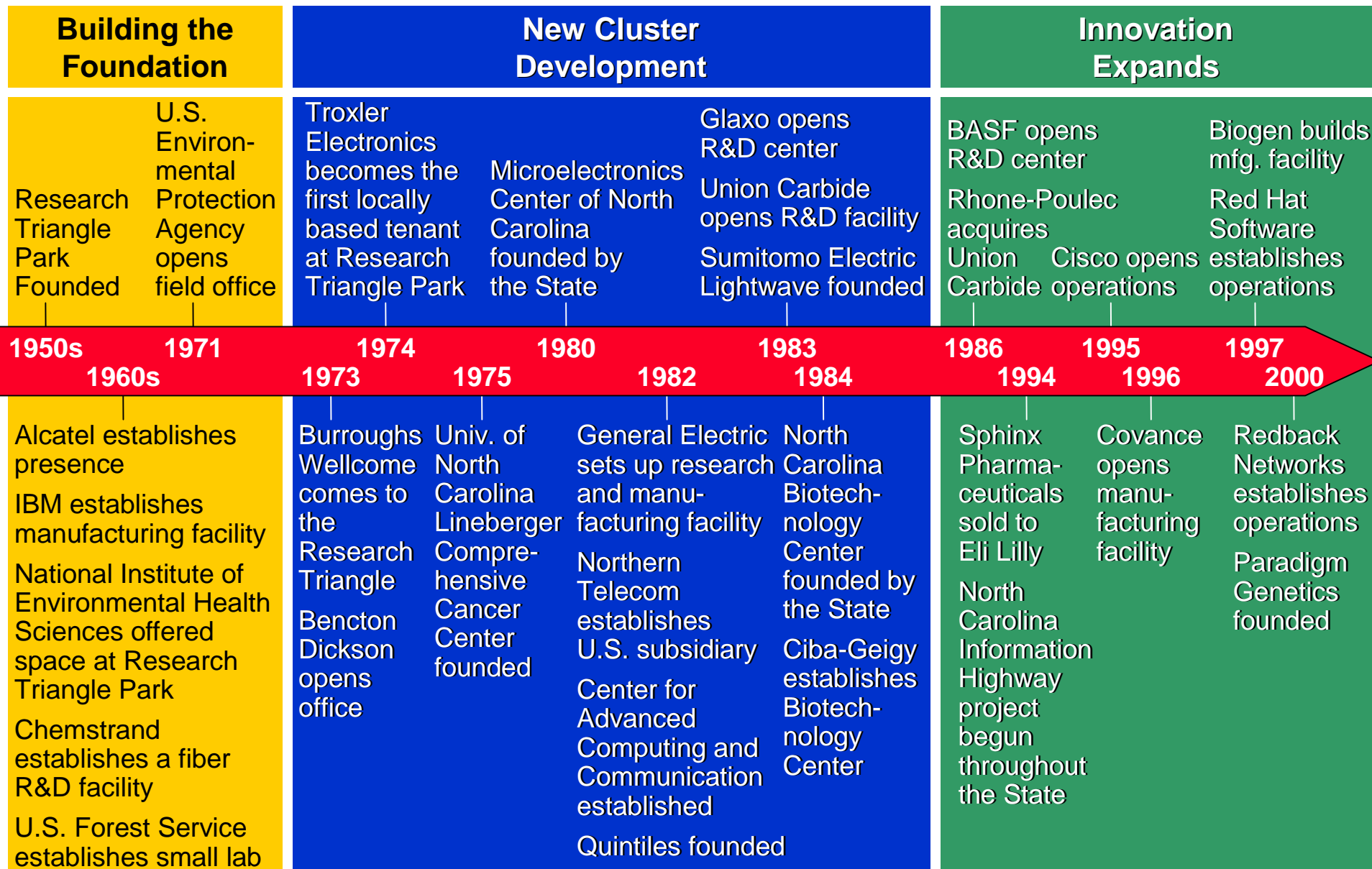
State of Colorado



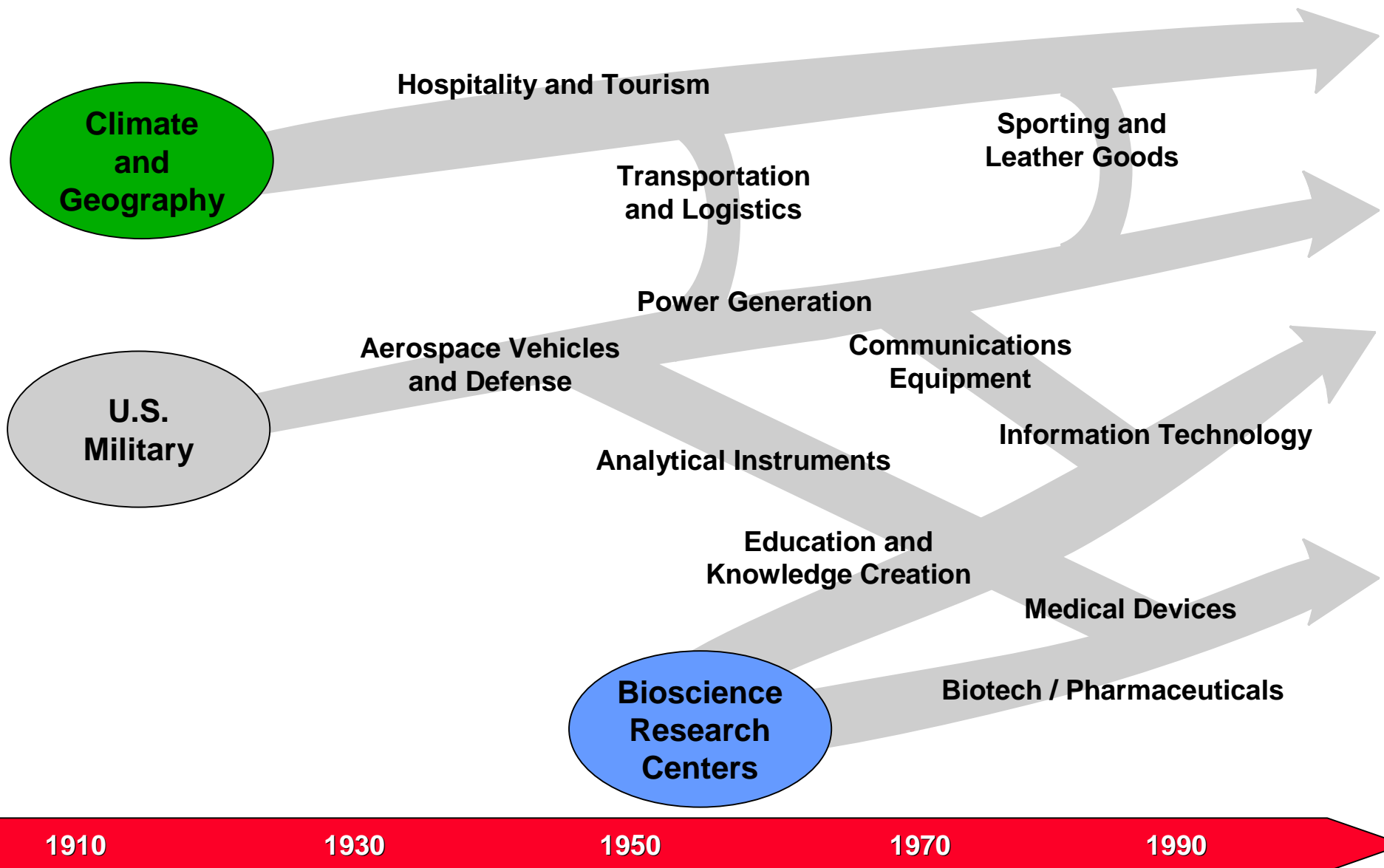
Note: Graph utilizes narrow cluster definitions to eliminate overlapping employment across clusters

The Evolution of Regional Economies

Research Triangle



The Military, Climate, and Research in San Diego



1910

1930

1950

1970

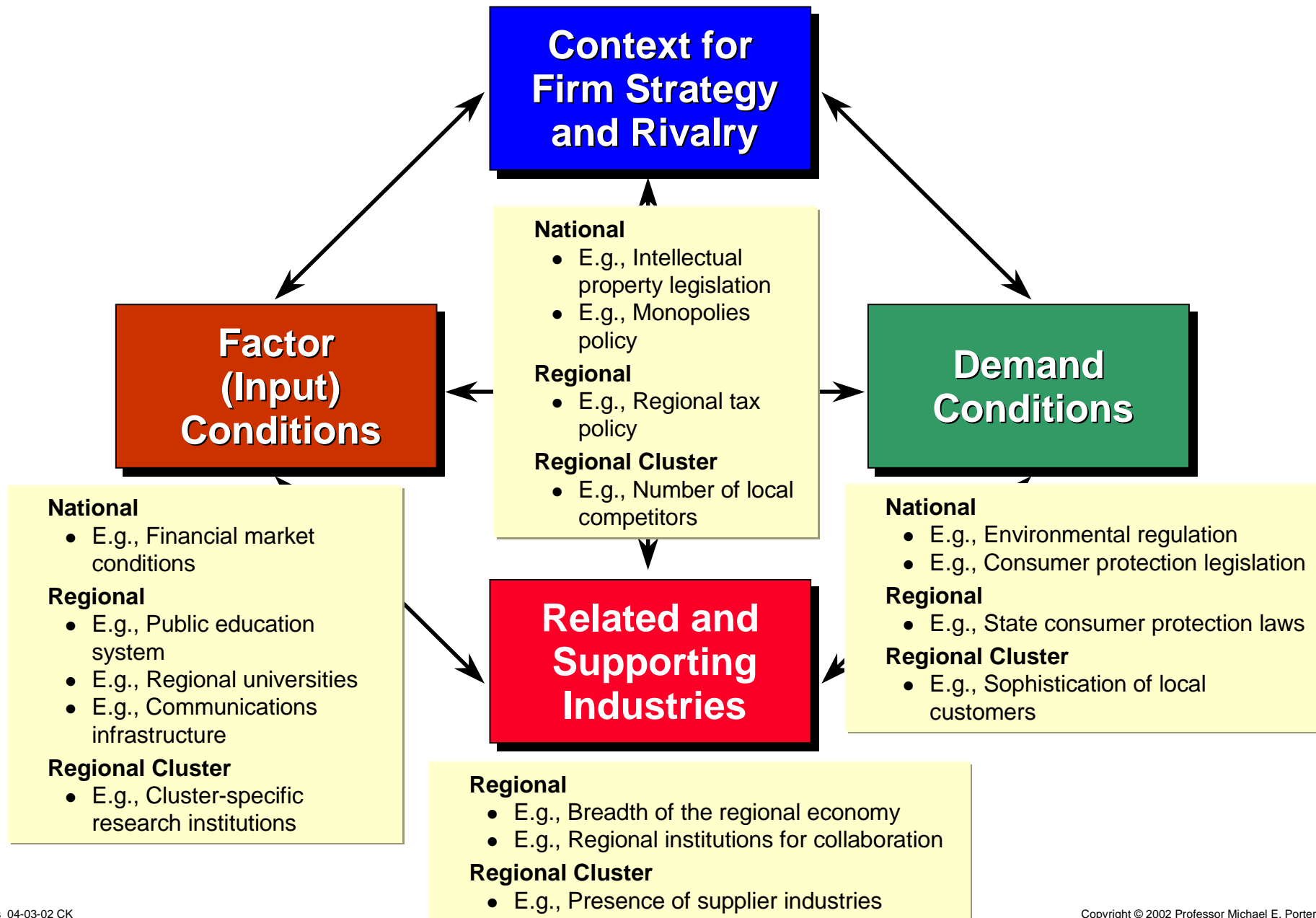
1990

The Evolution of Regional Economies

- Building strong regional economies takes decades
- Key influencing factors include
 - Natural endowments
 - Government actions
 - Civic leadership
 - Entrepreneurship
 - Specialized assets
- Successful regions leverage their unique mix of assets to build specialized clusters
- Regional development involves some inheritance and serendipity, but also purposeful action
- Institutions for Collaboration play an important role in building regional economies
- A coherent strategy is an important prerequisite for effective action

Determinants of Regional Competitiveness

Levels of Influence



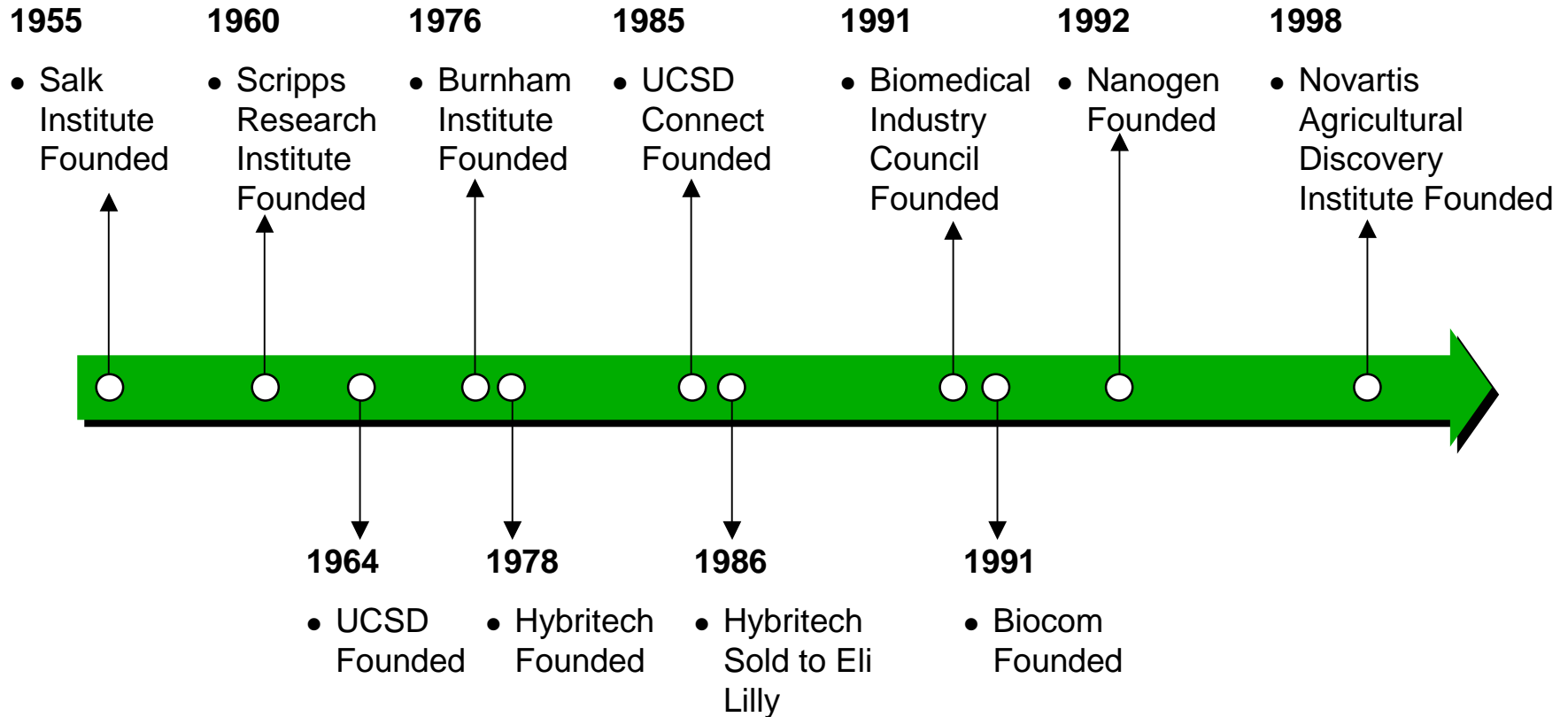
Regional Competitiveness and Innovative Capacity

Key Findings from the Clusters of Innovation Project

- A strong physical and information infrastructure is a baseline requirement to establish and sustain a prosperous regional economy
- A strong K–12 educational system is the foundation for developing local talent and attracting outside talent
- Specialized talent and training are more important than abundant labor
- Universities and specialized research centers are the driving force behind innovation in nearly every region
- Mechanisms for commercialization are essential if innovation is to translate to economic success
- Government can have a significant influence on the business environment, both positively and negatively
- Poor coordination among local jurisdictions often impedes efforts to improve the business environment
- Regions face the need for strategic transitions, when the limits of the past strategy create the need for a new strategy

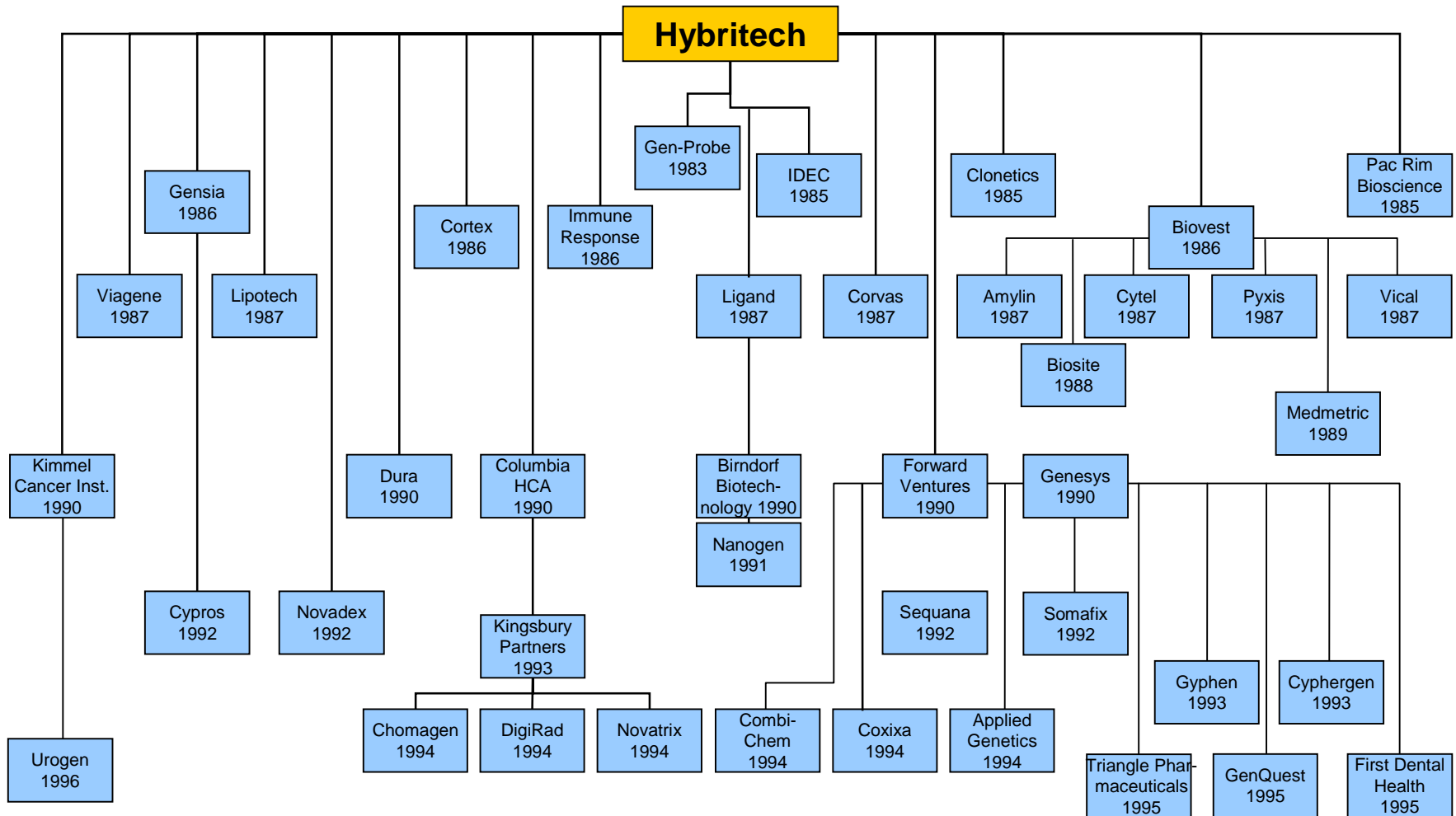
The Development of Clusters

History of the San Diego Biotech / Pharma Cluster



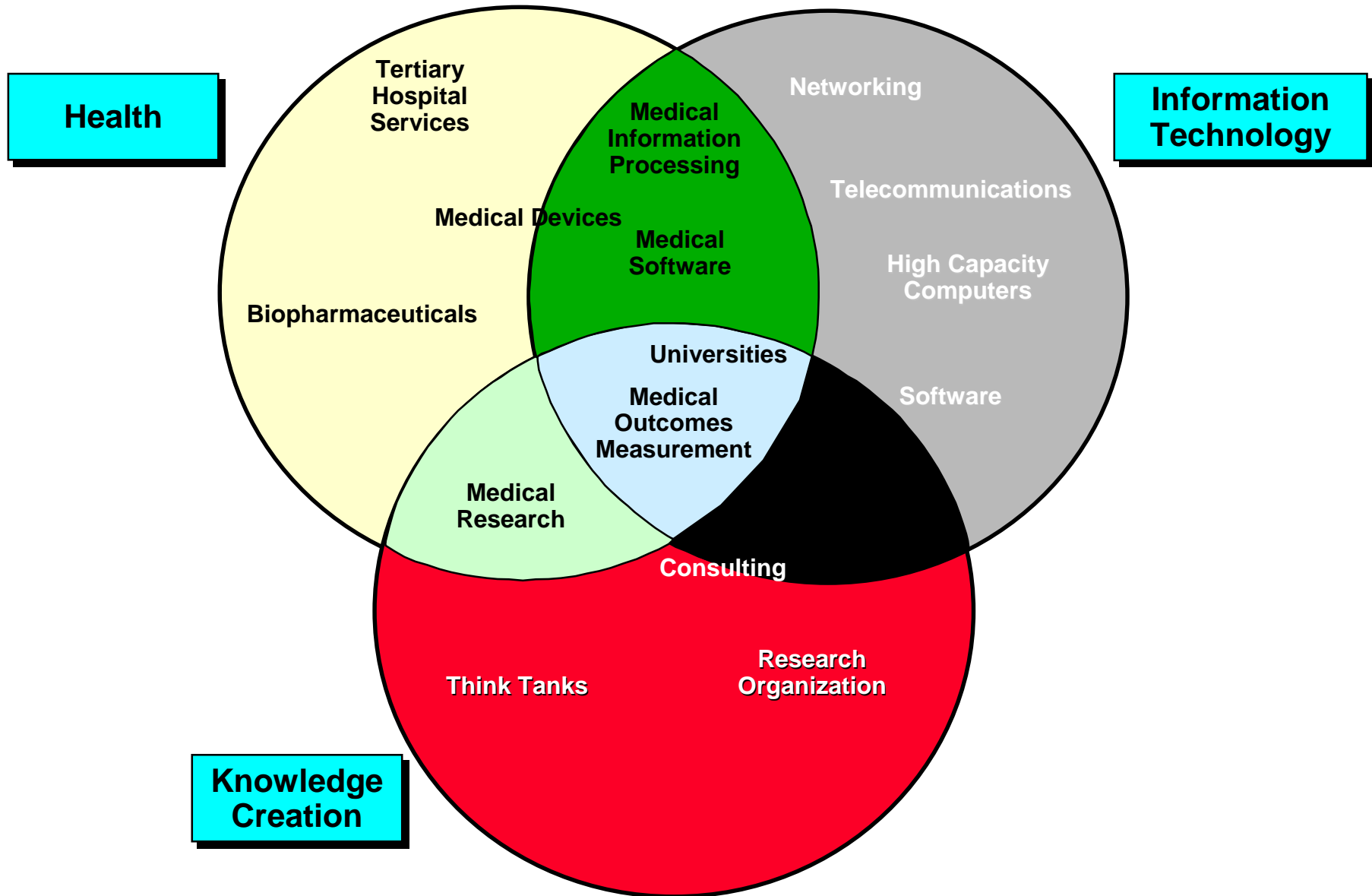
Anchor Companies

Spin-outs in the San Diego Biotech / Pharma Cluster



Opportunities at the Intersection of Clusters

Commonwealth of Massachusetts



Creating and Implementing a Regional Economic Strategy

Key Findings from the Clusters of Innovation Project

- A **shared economic vision** helps elicit broad support and coordinate activities
- Strong **leadership** is a necessary part of any successful economic development strategy
- **Broad-based collaboration** across business, government, universities, and other institutions is needed for development strategies to succeed
- An overarching **organized structure for economic development** helps coordinate and routinize the process
- Regions need to overcome **transition points** in the development of their economies
- Economic strategy must explicitly address **inequality and economically distressed areas**

Transitions in Economic Development

An Economic Vision for the Research Triangle

- **Research Triangle Park:**
Original vision of increasing employment narrow geographic area



- **New Strategy for the Region:**
An updated strategy is now needed after the success of the initial model

- **“High-tech” clusters:**
Concentrate efforts and resources on supporting a few specific clusters in technologically-intensive fields



- **Broader innovation economy:**
Develop new and existing clusters

- **Metro Area:** Gathering scarce assets in a concentrated geographic area

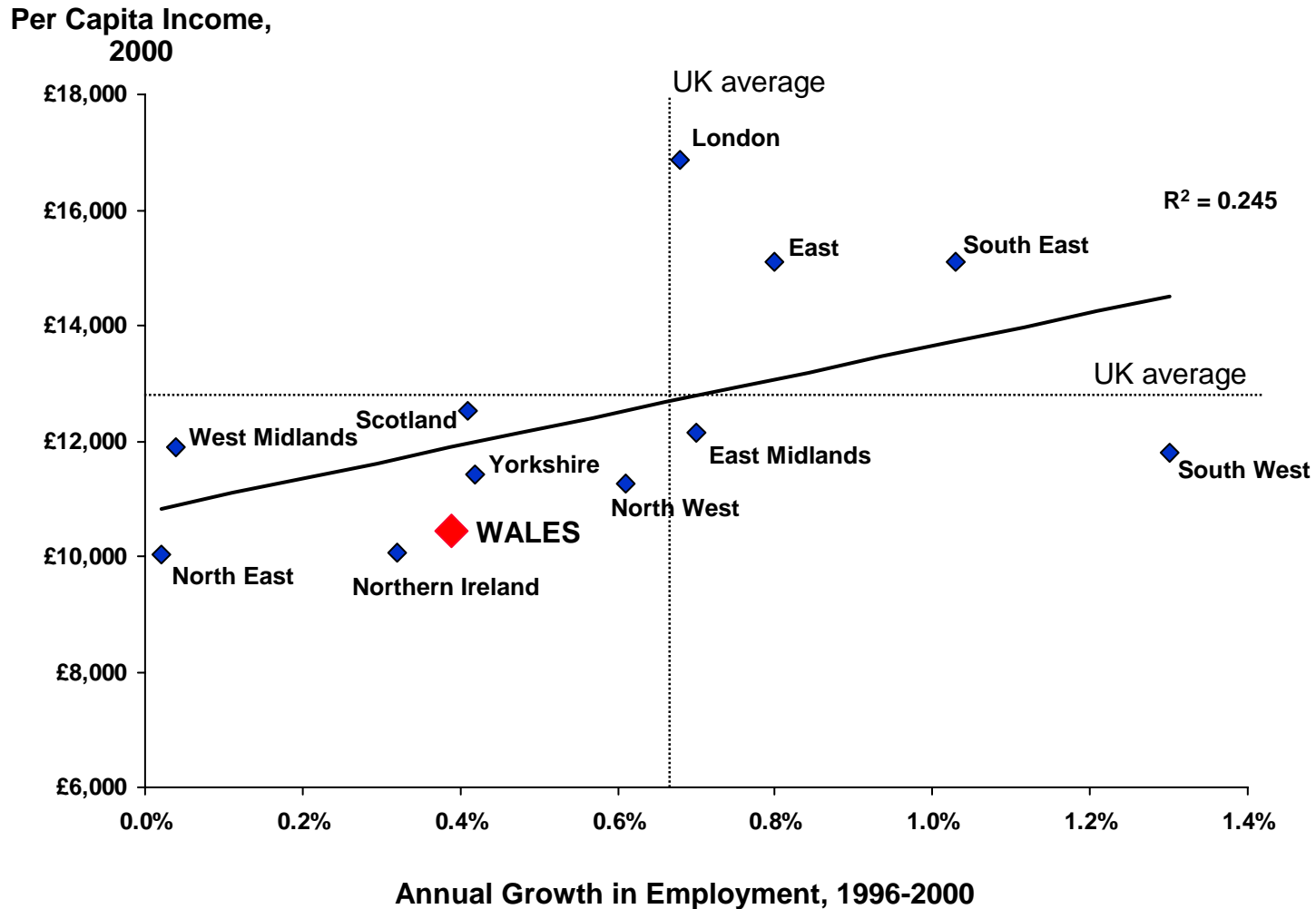


- **Economic Area:** Grow, attract, and support clusters relevant to a wider geographic region

Agenda

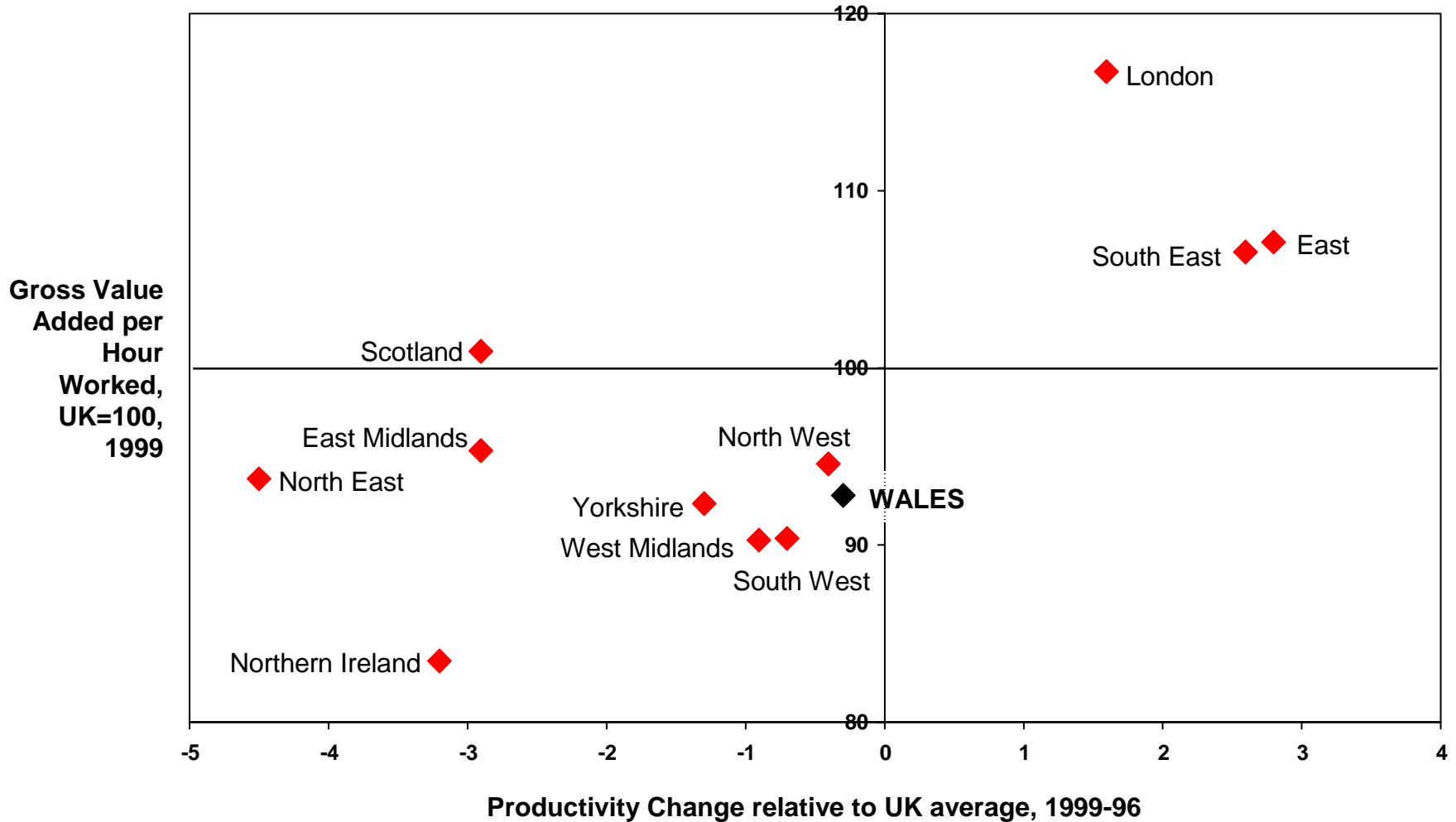
- Foundations of Competitiveness
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Welsh Economic Performance Prosperity and Growth by UK Region



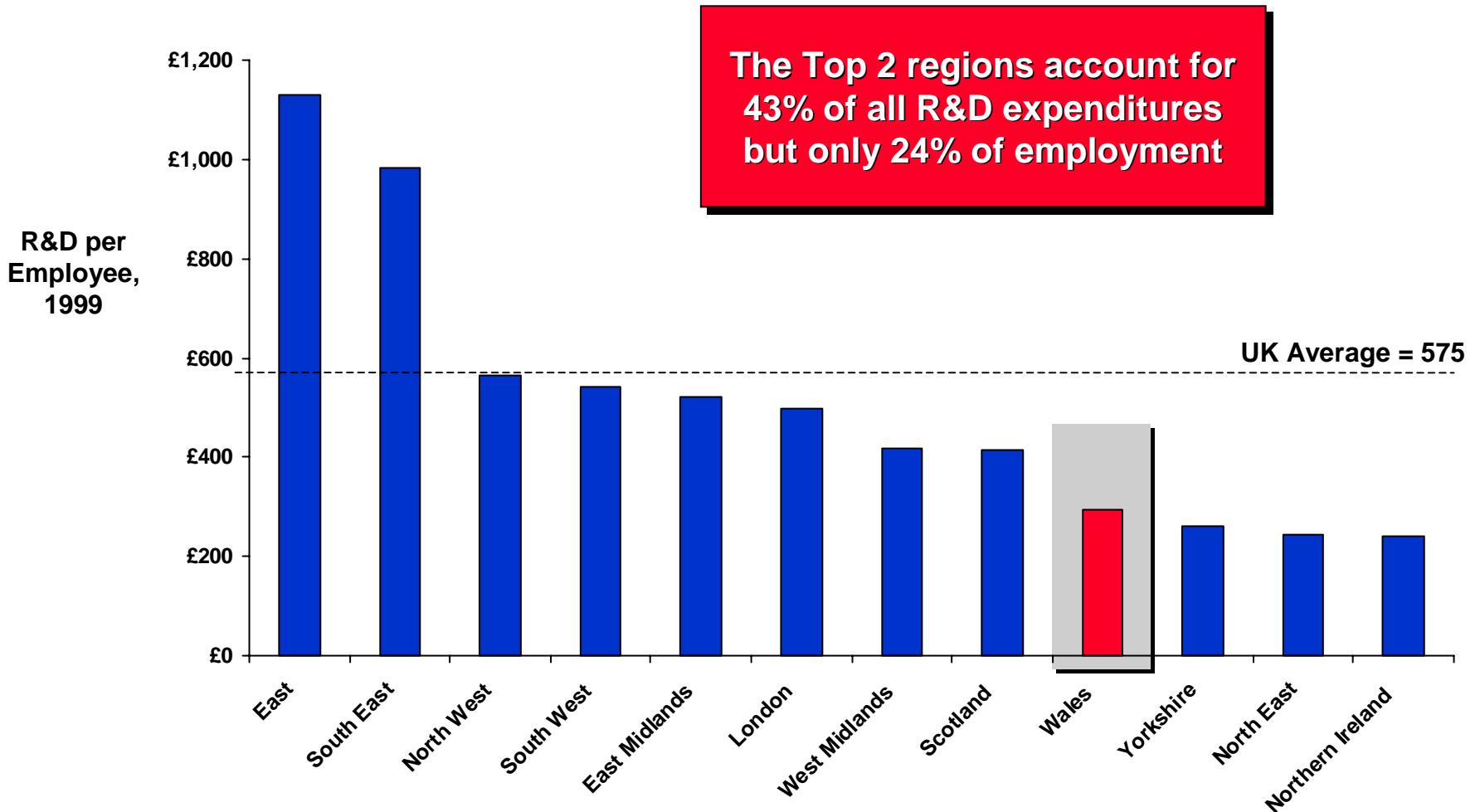
Welsh Economic Performance

Productivity Levels by UK Region



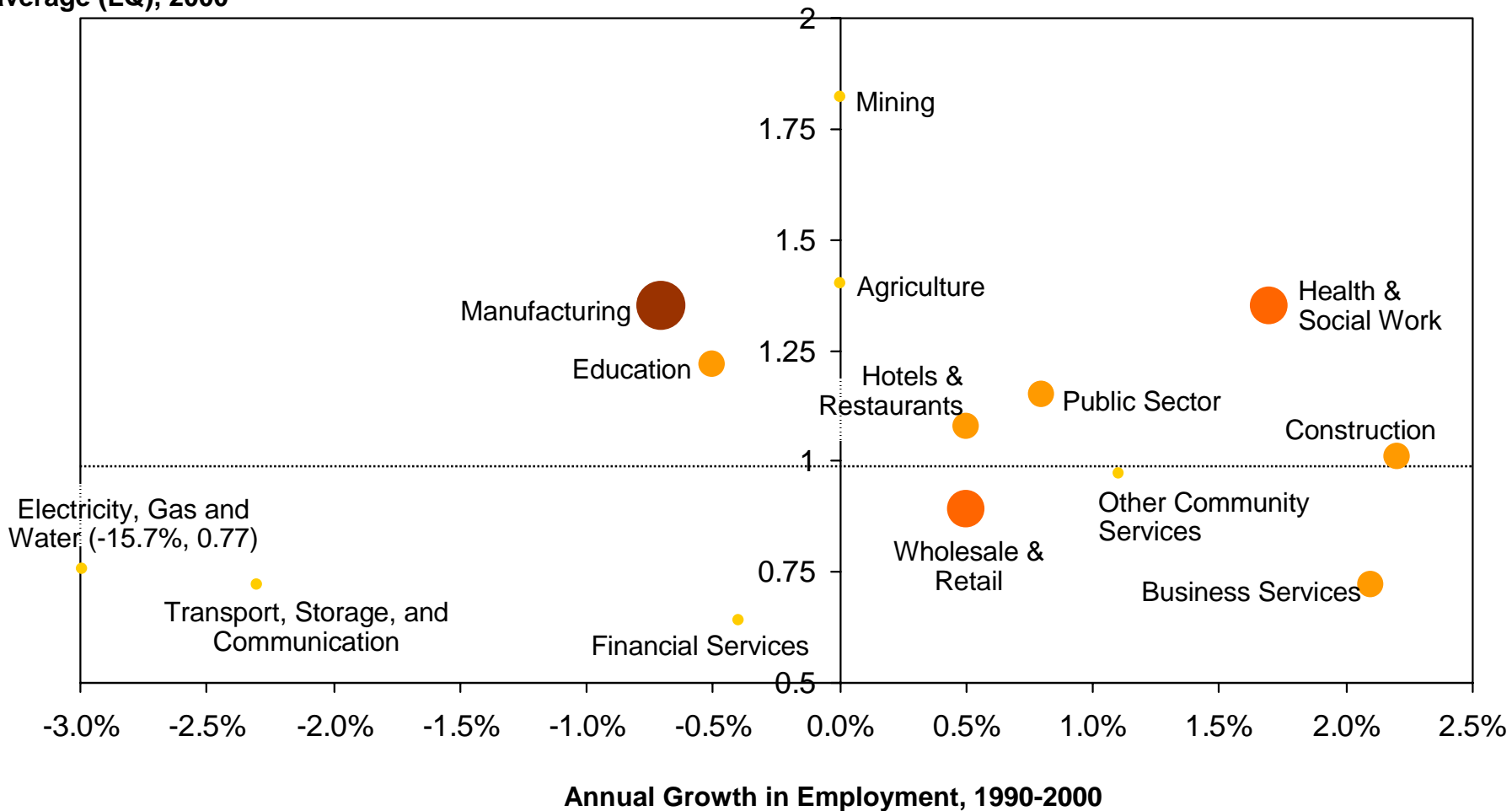
Welsh Innovation

Research & Development Activity by UK Region



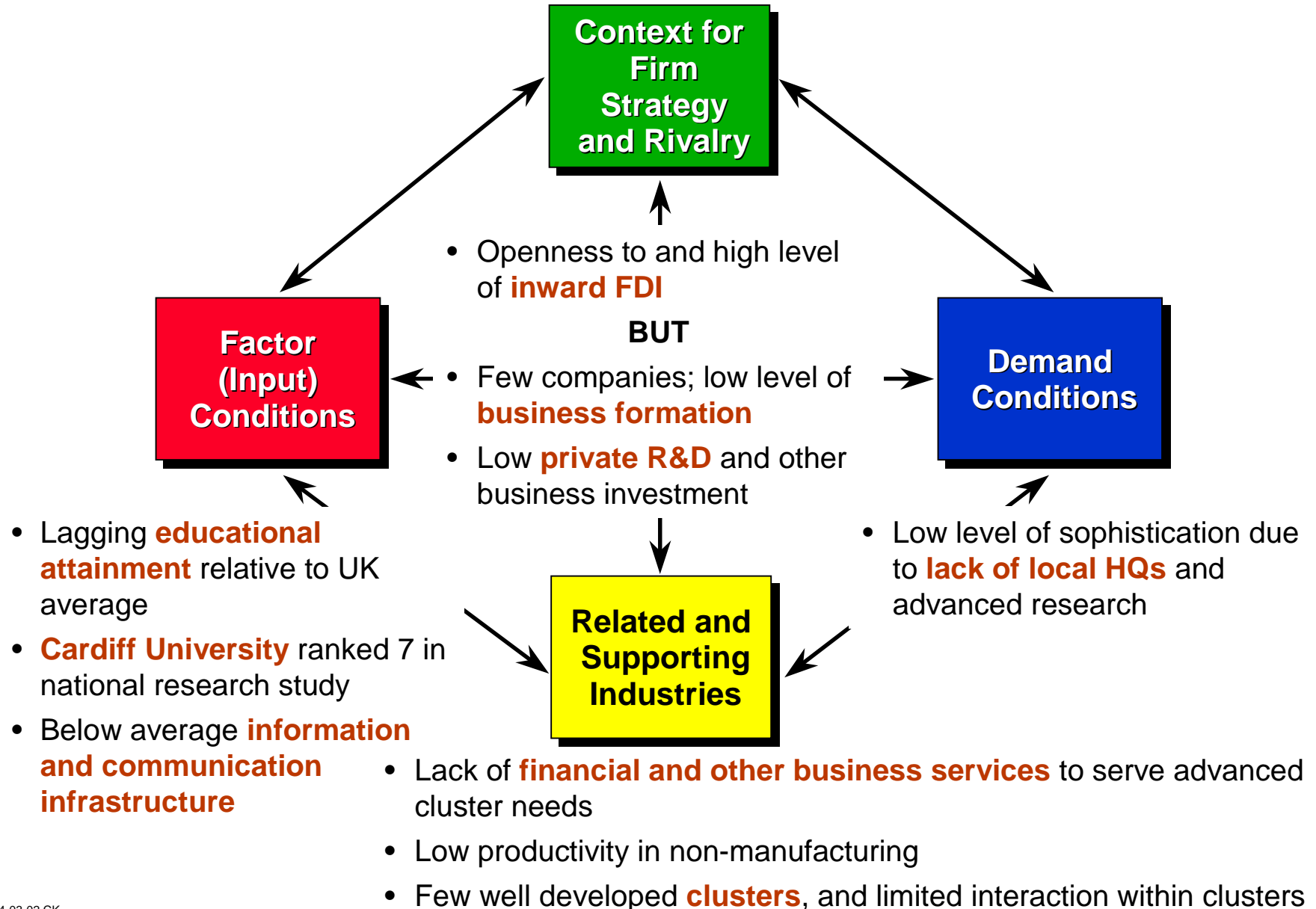
Composition of the Local and Traded Welsh Economy

Share of regional economy relative to UK average (LQ), 2000



● 0-50,000 employees ● >50,000 – 100,000 employees ● >100,000 – 200,000 employees ● >200,000 employees

Priorities in Enhancing the Microeconomic Business Environment



Leading Welsh Holders of U.S. Patents

Total Patents per Organization, 1996-2000

DOW CORNING LIMITED	12
GYRUS MEDICAL LIMITED	7
UNIVERSITY COLLEGE CARDIFF CONSULTANTS LIMITED	7
SPRAYFORMING DEVELOPMENTS LIMITED	4
LION LABORATORIES PLC	3
TRIKON TECHNOLOGIES LIMITED	3
UNIVERSITY OF WALES COLLEGE OF MEDICINE	3
MASSACHUSETTS INSTITUTE OF TECHNOLOGY	2
SOUTH GLAMORGAN HEALTH AUTHORITY	2
UNIVERSITY COLLEGE OF WALES ABERYSTWYTH	2
UNIVERSITY OF GLAMORGAN COMMERCIAL SERVICES LIMITED	2

...and 23 other organizations with 1 patent each

Welsh Innovative Performance

Total U.S. Patents per UK University, 1996-2000

55.	IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY & MEDICINE	36
102.	UNIVERSITY COLLEGE OF LONDON	23
102.	ISIS INNOVATION LTD. (OXFORD UNIVERSITY)	23
107.	VICTORIA UNIVERSITY OF MANCHESTER	22
137.	UNIVERSITY OF STRATHCLYDE	16
164.	UNIVERSITY OF SHEFFIELD	13
164.	UNIVERSITY OF SOUTHAMPTON	13
180.	UNIVERSITY OF MANCHESTER INSTITUTE OF SCIENCE AND TECHNOLOGY	12
213.	UNIVERSITY OF GLASGOW THE, UNIVERSITY COURT OF	10
237.	UNIVERSITY OF BIRMINGHAM	9
237.	UNIVERSITY OF WARWICK	9
261.	UNIVERSITY OF NOTTINGHAM	8
289.	UNIVERSITY COLLEGE CARDIFF CONSULTANTS LIMITED	7
289.	UNIVERSITY OF EDINBURGH	7
289.	UNIVERSITY OF KEELE	7
331.	DE MONTFORT UNIVERSITY	6
331.	ROYAL FREE HOSPITAL SCHOOL OF MEDICINE	6
331.	UNIVERSITY OF LIVERPOOL	6
395.	CAMBRIDGE UNIVERSITY TECHNICAL SERVICES LTD.	5
395.	KING'S COLLEGE LONDON	5
395.	NEWCASTLE UNIVERSITY VENTURES LIMITED	5
395.	UNIVERSITY COURT OF THE UNIVERSITY OF DUNDEE	5
395.	UNIVERSITY OF ABERDEEN	5
395.	UNIVERSITY OF LEEDS	5
395.	UNIVERSITY OF LEICESTER	5

Note: Rank is rank among all UK holders of U.S. patents

Source: US PTO, author's calculations

Patenting Performance of U.S. Universities

Rank	University	Total Patents, 1995–1999
1	University of California	1,585
2	Massachusetts Institute of Technology	605
3	University of Texas	444
4	Wisconsin University	339
5	Stanford University	335
6	California Institute of Technology	299
7	Johns Hopkins University	275
8	Cornell University	266
9	University of Pennsylvania	253
10	State University of New York	217
11	University of Michigan	209
12	Iowa State University	208
13	Michigan State University	200
14	Columbia University	196
15	University of Minnesota	180
16	University of Washington	173
17	Harvard University	164
18	University of North Carolina	154
19	Washington University	151
20	Duke University	139
21	University of British Columbia	137
22	North Carolina State University	129
23	University of Nebraska	122
24	University of Utah	121
25	Penn State University	116

Action Agenda for Wales

- Address Weaknesses in the Welsh Business Environment
- Mount an aggressive cluster development strategy which also drives investment momentum
- Charge subregions with developing distinct strategies
- Create an integrating Welsh economic vision and an organizational structure for implementing

Address Weaknesses in the Welsh Business Environment

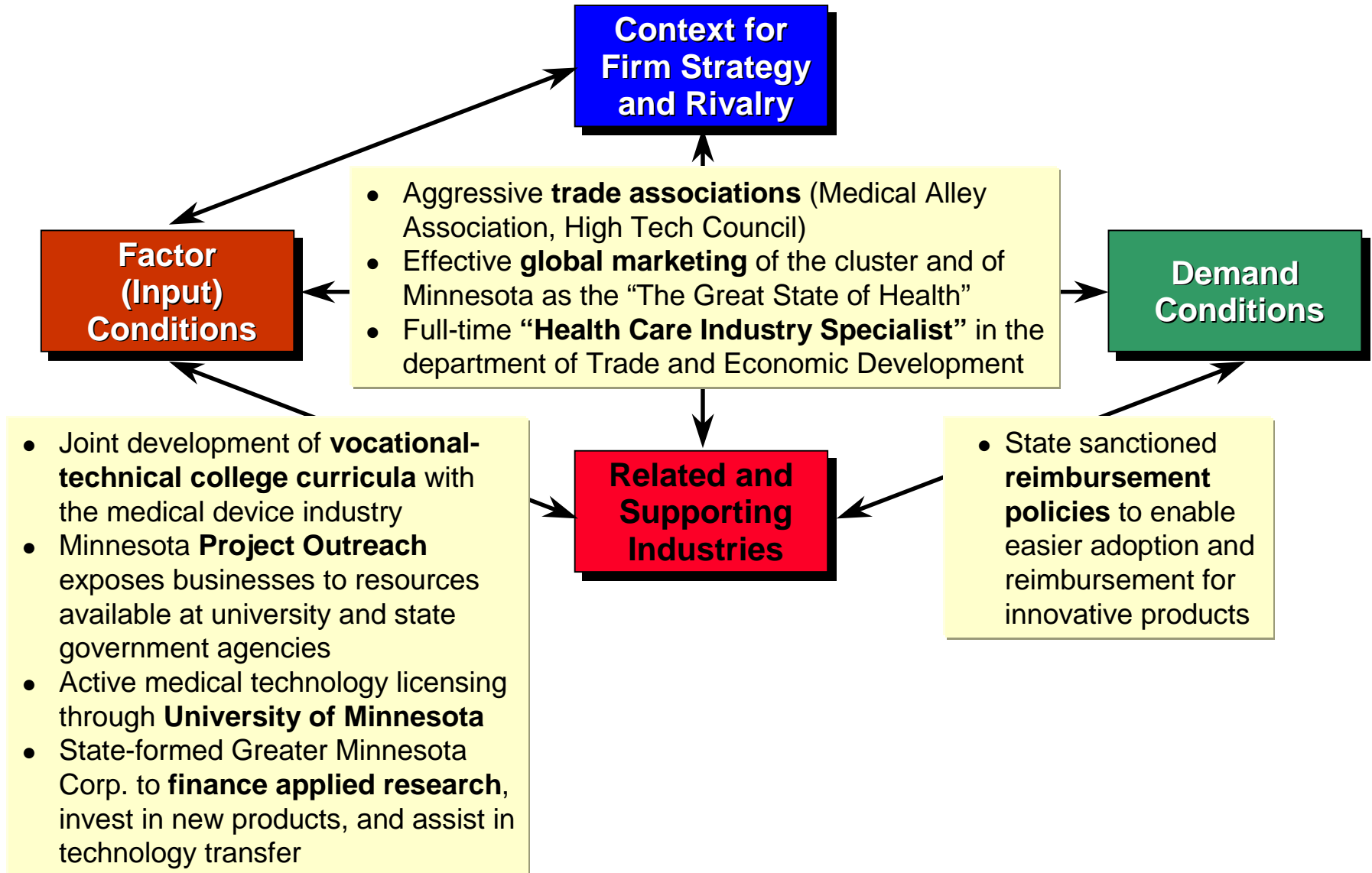
- Factor Conditions
 - Improve basic education
 - Programs to integrate the 45+ workforce
 - Link research and training to clusters
- Demand
 - Use public procurement as early / sophisticated demand
 - Harness multinationals as sophisticated buyers and focus on supplier development
- Related and supporting industries
 - Program to attract and develop business services serving specific clusters
 - FDI promotion focused on clusters

The Development of Clusters

- **Create an explicit cluster development program**
 - Conscious efforts can meaningfully raise cluster competitiveness and innovative capacity
- **Recruit for clusters**
 - Recruitment strategies should target strong and emerging clusters, not individual firms

Public / Private Cooperation in Cluster Upgrading

Minnesota's Medical Device Cluster



Organizing to Compete

Massachusetts Governor's Council on Economic Growth and Technology

Governor's Council on Economic Growth and Technology

Industry Cluster Committees

- Advanced Materials
- Biotechnology and Pharmaceuticals
- Defense
- Marine Science and Technology
- Medical Devices
- Software
- Telecommunications
- Textiles
- Information 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 Emerging Companies
- Health Care
- Western Massachusetts
- Business Climate
- Competitive Benchmarking

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