



HARVARD | BUSINESS | SCHOOL

# Alaska Competitiveness: State and Cluster Economic Performance



Prepared for Governor Sean Parnell

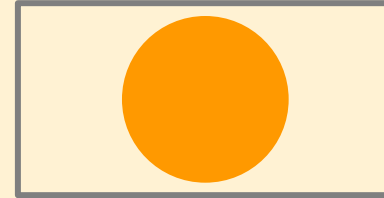
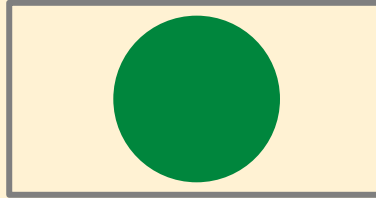
*Professor Michael E. Porter*  
*National Governors Association Winter Meeting*  
*February 26, 2011*

# Alaska Performance Snapshot

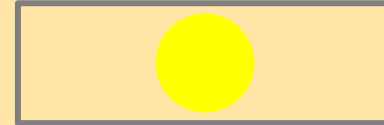
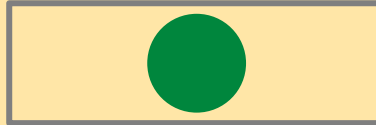
*Position*

*Trend*

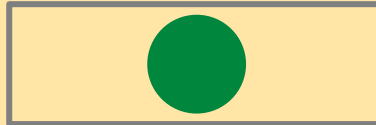
**Prosperity**



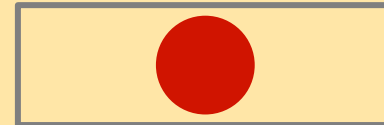
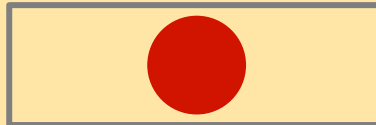
**Productivity**



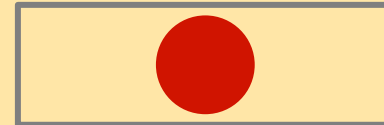
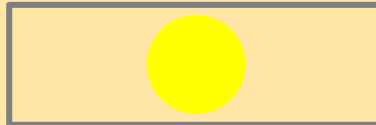
**Labor Mobilization**



**Innovation**



**Cluster Strength**



**Leading Clusters**

- Transportation and Logistics
- Oil and Gas Products and Services
- Fishing and Fishing Products

# State Comparative Performance

# Alaska Competitiveness

## Overall Economic Performance Indicators

Prosperity			
<b>Gross State Product per capita, 2009</b>			
• In Alaska:	\$65,441	Rank:	4
• In the US:	\$46,093		
• State difference to US:	42.0%		
<b>Growth in Gross State Product per capita, real annual rate, 1999-2009</b>			
• In Alaska:	0.65%	Rank:	35
• In the US:	0.86%		

Productivity			
<b>Gross State Product per labor force participant, 2009</b>			
• In Alaska:	\$126,174	Rank:	4
• In the US:	\$92,382		
• State difference to US:	36.6%		
<b>Growth in Gross State Product per labor force participant*, 1999-2009</b>			
• In Alaska:	0.53%	Rank:	43
• In the US:	1.09%		
<b>Average private wage, 2008</b>			
• In Alaska:	\$48,767	Rank:	6
• In the US:	\$42,435		
• State difference to US:	14.9%		
<b>Private wage Growth, annual rate, 1998-2008</b>			
• In Alaska:	3.34%	Rank:	24
• In the US:	3.32%		

Innovation Output			
<b>Patents Per 10,000 Employees, 2009</b>			
• In Alaska:	1.57	Rank:	44
• In the US:	6.83		
<b>Growth in total patents, annual rate, 1998-2009</b>			
• In Alaska:	-4.40%	Rank:	48
• In the US:	0.23%		
<b>Traded establishment formation, annual growth rate, 1998-2008</b>			
• In Alaska:	2.12%	Rank:	18
• In the US:	1.79%		

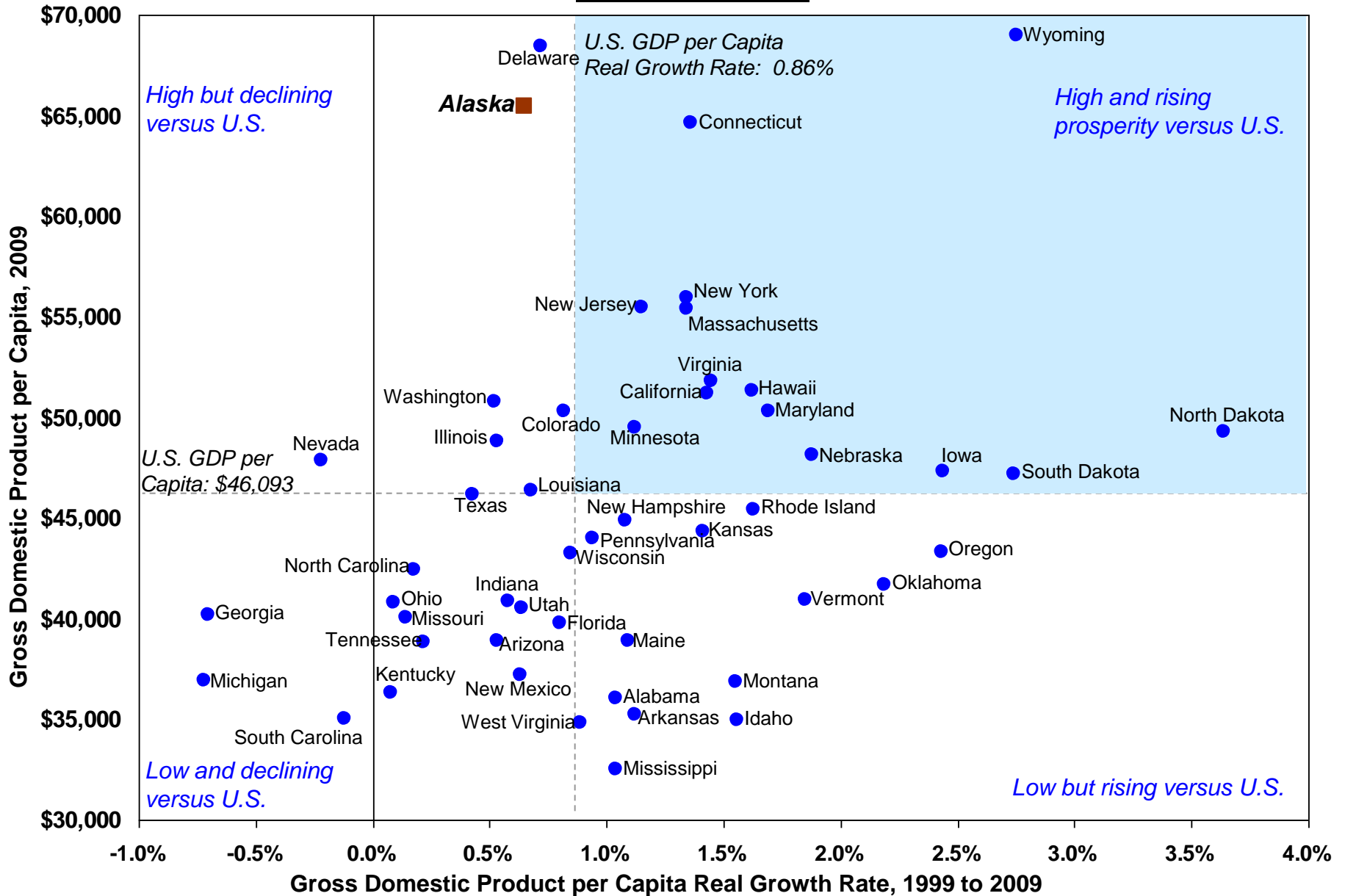
Cluster			
<b>Share of State Traded Employment in Strong Clusters, 2008</b>			
• In Alaska:	39.5%	Rank:	26
• In the US:	41.8%		
<b>Change in Share of National Employment in Strong Clusters, 1998-2008</b>			
• In Alaska:	-0.46%	Rank:	44
• In the US:	-0.06%		
<b>Share of Employment in Traded Clusters, 1998-2008</b>			
• In Alaska:	29.2%	Rank:	15
• In the US:	27.4%		
<b>Change in Share of Employment in Traded Clusters, 1998-2008</b>			
• In Alaska:	2.0%	Rank:	3
• In the US:	-2.2%		

Labor Mobilization			
<b>Population, 2009</b>			
• In Alaska:	698,481	Rank:	47
• % of US:	0.23%		
<b>Population growth, annual rate, 1999-2009</b>			
• In Alaska:	1.12%	Rank:	15
• In the US:	0.96%		
<b>Labor Force Participation, 2009</b>			
• In Alaska:	70.3	Rank:	10
• In the US:	65.4		
<b>Employment, 2010 (December)</b>			
• In Alaska:	334,022	Rank:	50
• % of US:	0.24%		
<b>Employment growth, annual rate, 2000-2010 (December)</b>			
• In Alaska:	1.03%	Rank:	5
• In the US:	0.11%		
<b>Unemployment, 2010 (December)</b>			
• In Alaska:	8.1%	Rank:	20
• In the US:	9.4%		
<b>Change in Unemployment, 2000-2010 (December)</b>			
• In Alaska:	2.0%	Rank:	4
• In the US:	5.5%		

Note: Ranks are among the 50 US states plus the District of Columbia. Growth calculated as compound annual growth rate. \*Real annual rate.

# Long Term State Prosperity Performance

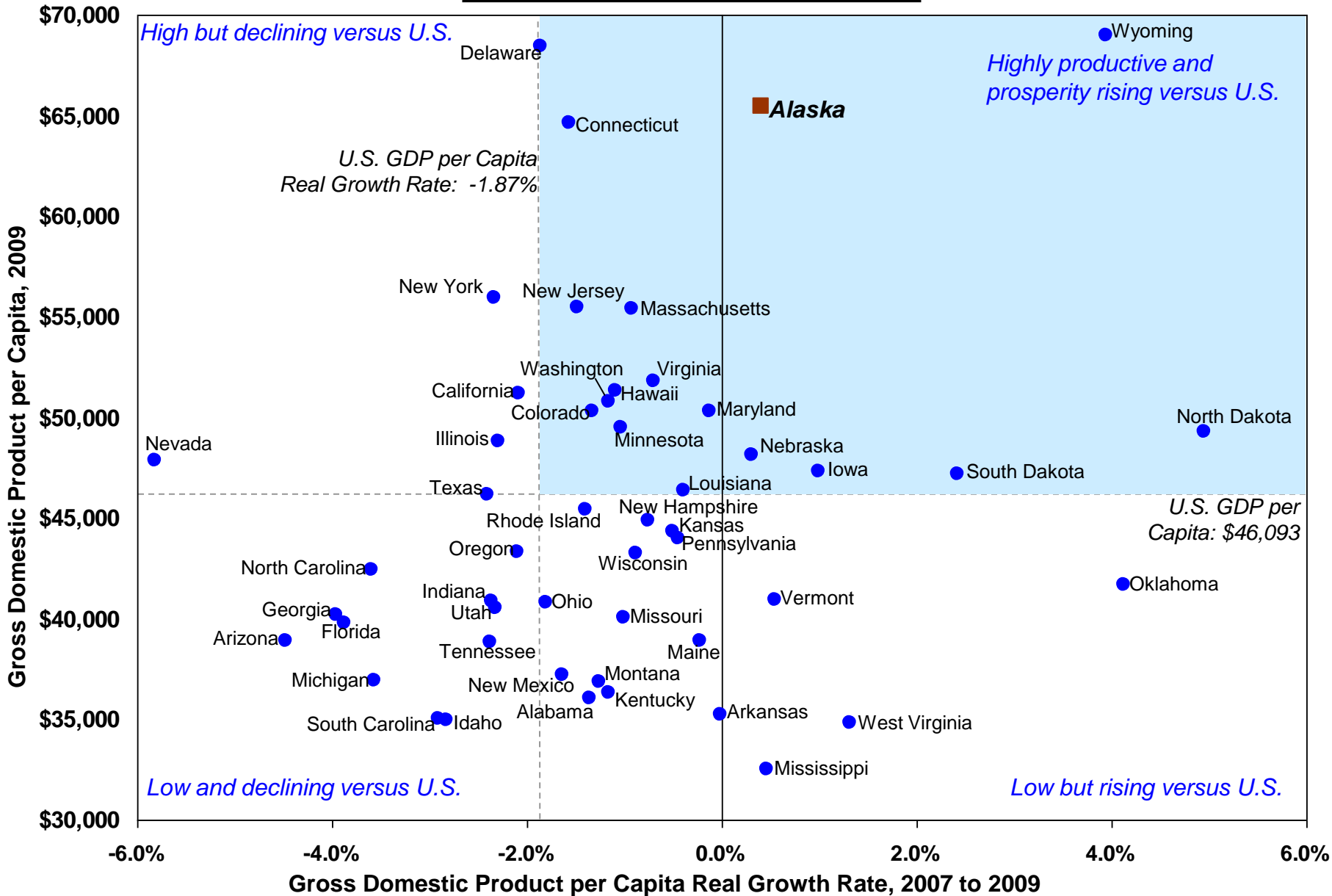
## 1999 to 2009



Notes: Real GDP figures in 2005 chained US dollars from the Bureau of Economic Analysis. Growth rate is calculated as compound annual growth rate. D.C. excluded

# Near Term State Prosperity Performance

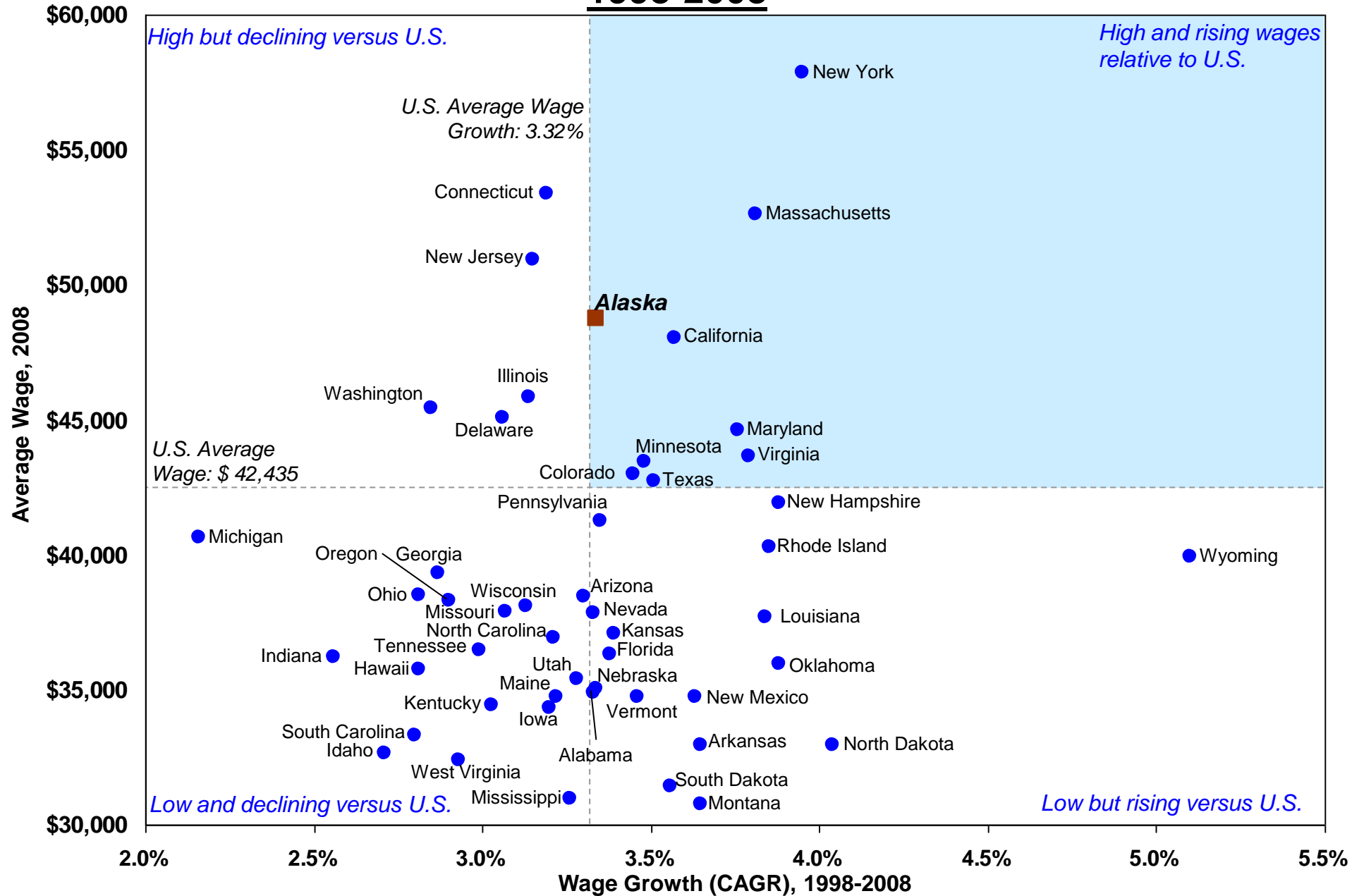
## U.S. States, 2007 to 2009



Notes: Real GDP figures in 2005 chained US dollars from the Bureau of Economic Analysis. Growth rate is calculated as compound annual growth rate.

# State Private Sector Wage Performance

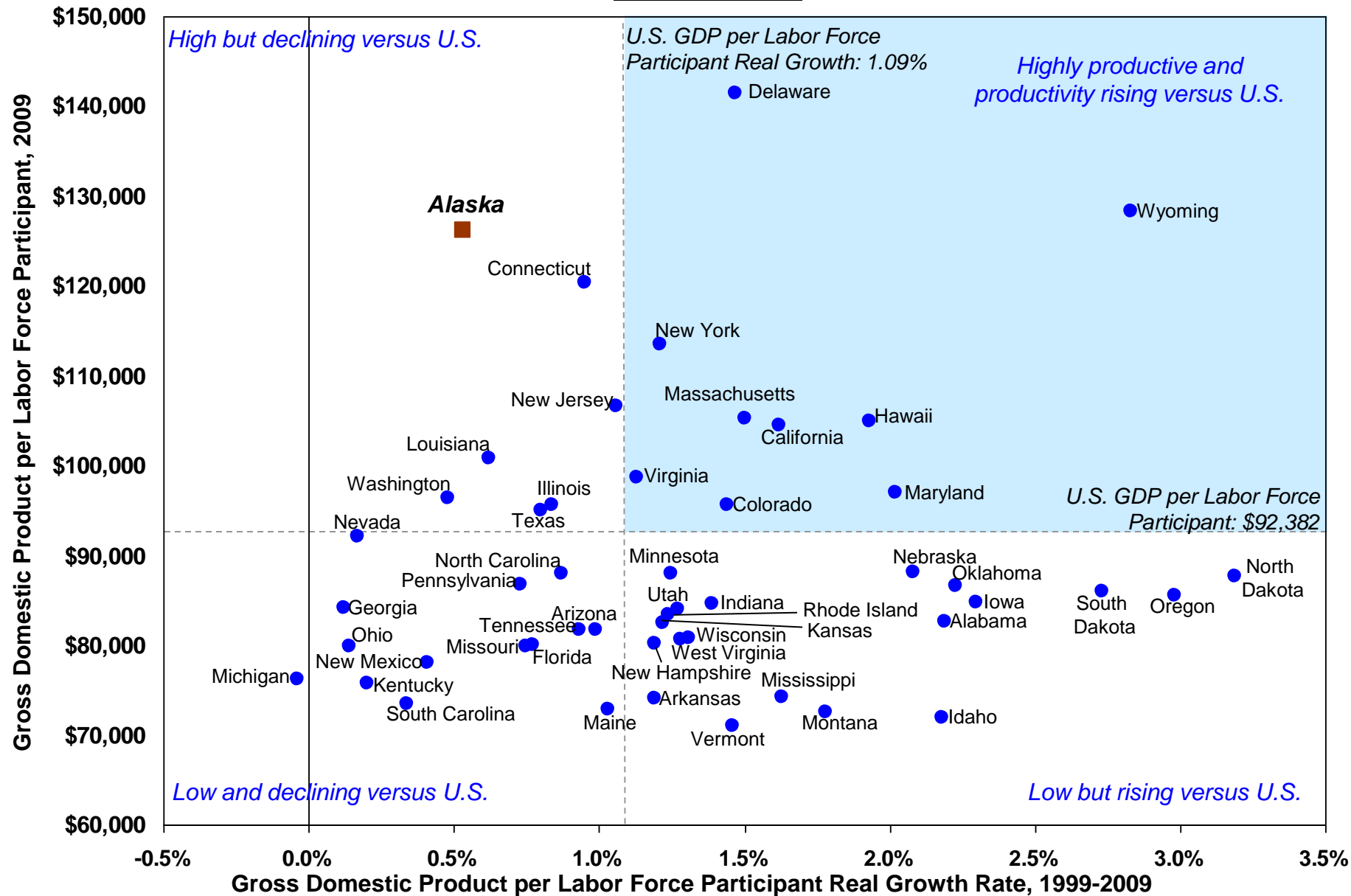
## 1998-2008



Source: Census CBP report; private, non-agricultural employment. Growth is calculated on nominal wage levels.

# Long Term State Labor Productivity Performance

## 1999-2009

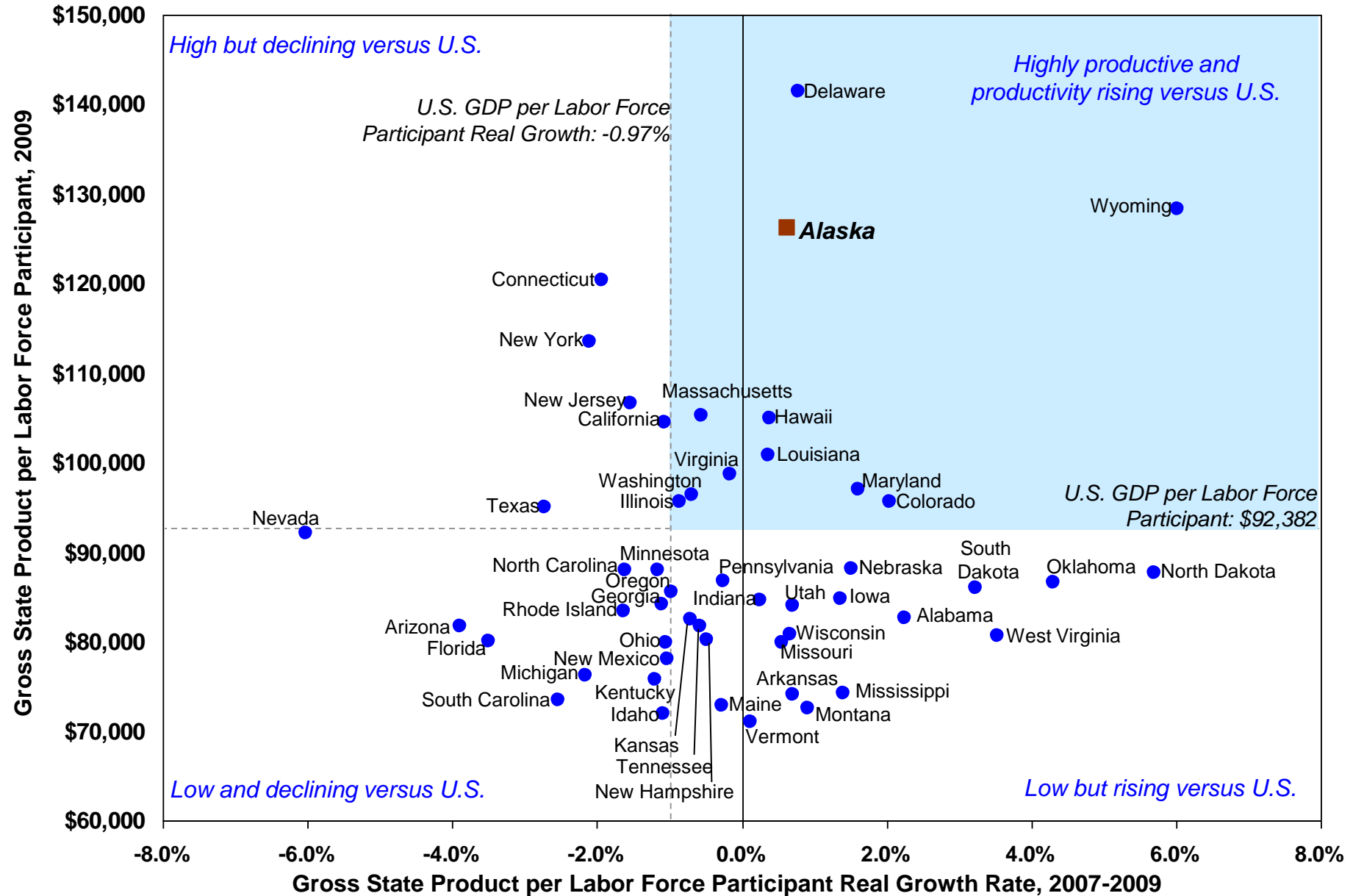


Source: Bureau of Economic Analysis. Notes: District of Columbia: \$xxx,xxx, %x.x. Growth rate calculated as compound annual growth rate (CAGR).



# Near Term State Labor Productivity Performance

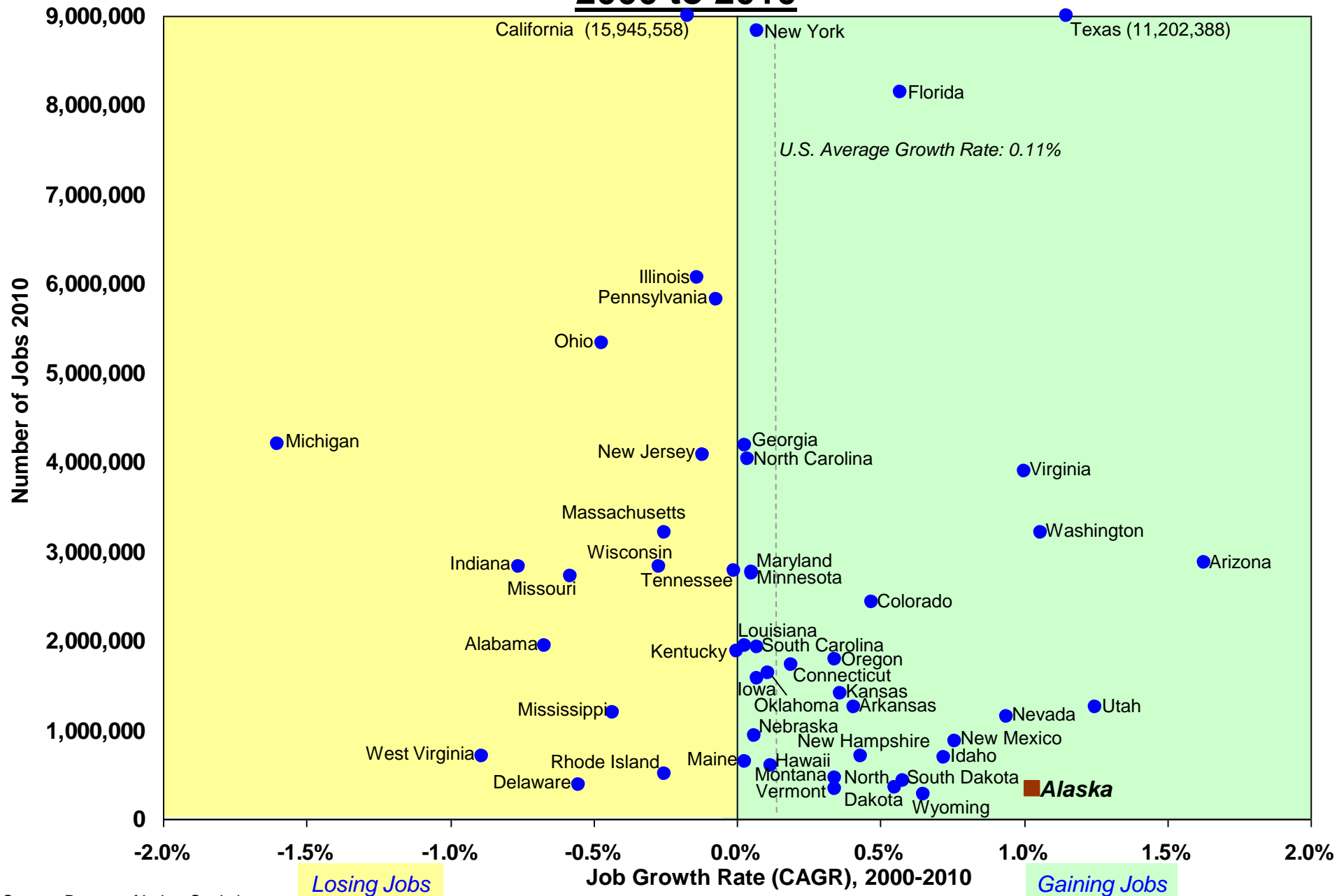
## 2007-2009



Source: Bureau of Economic Analysis. Notes: District of Columbia: \$xxx,xxx, %x.x. Growth rate calculated as compound annual growth rate (CAGR).

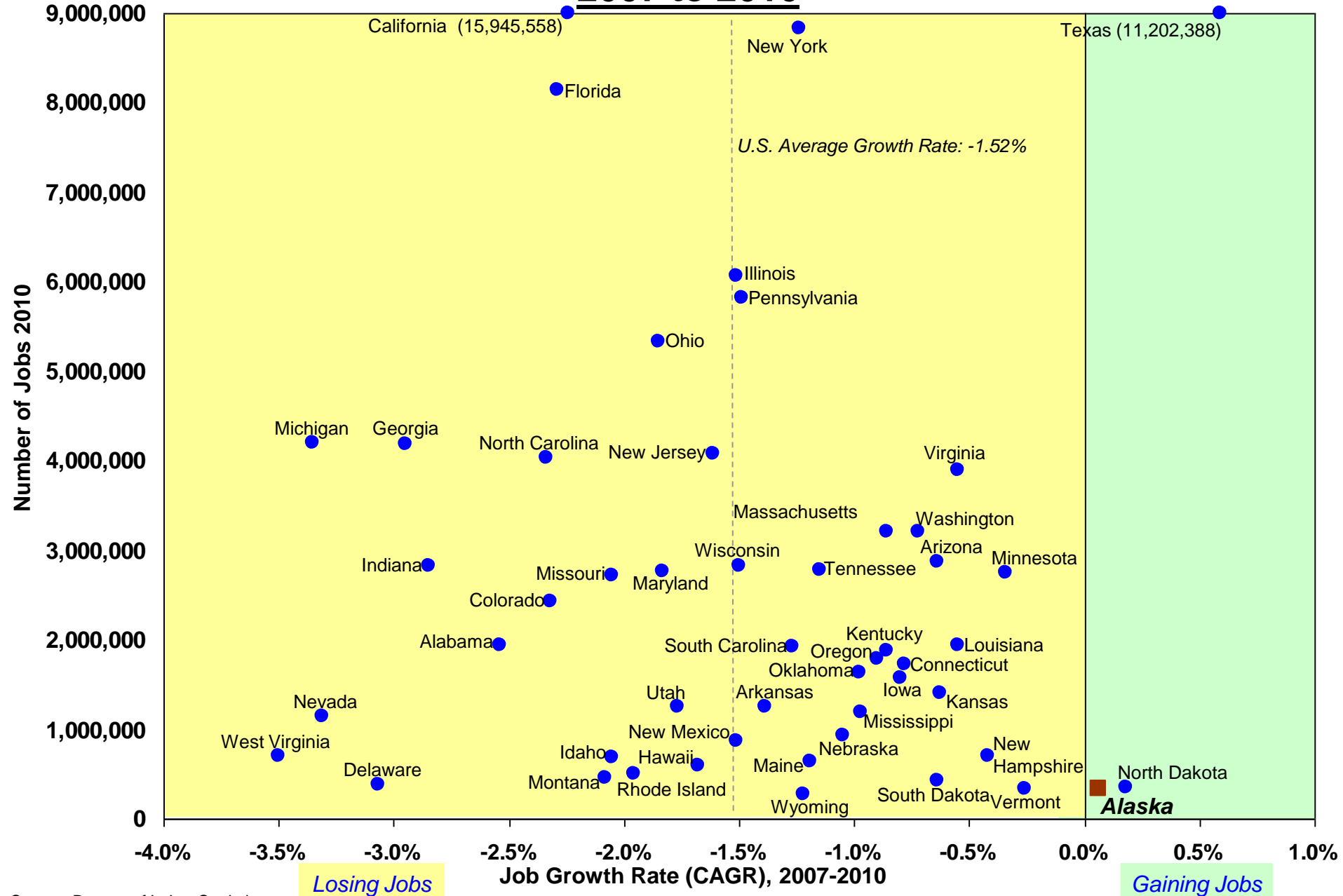
# Long Term State Job Growth

## 2000 to 2010



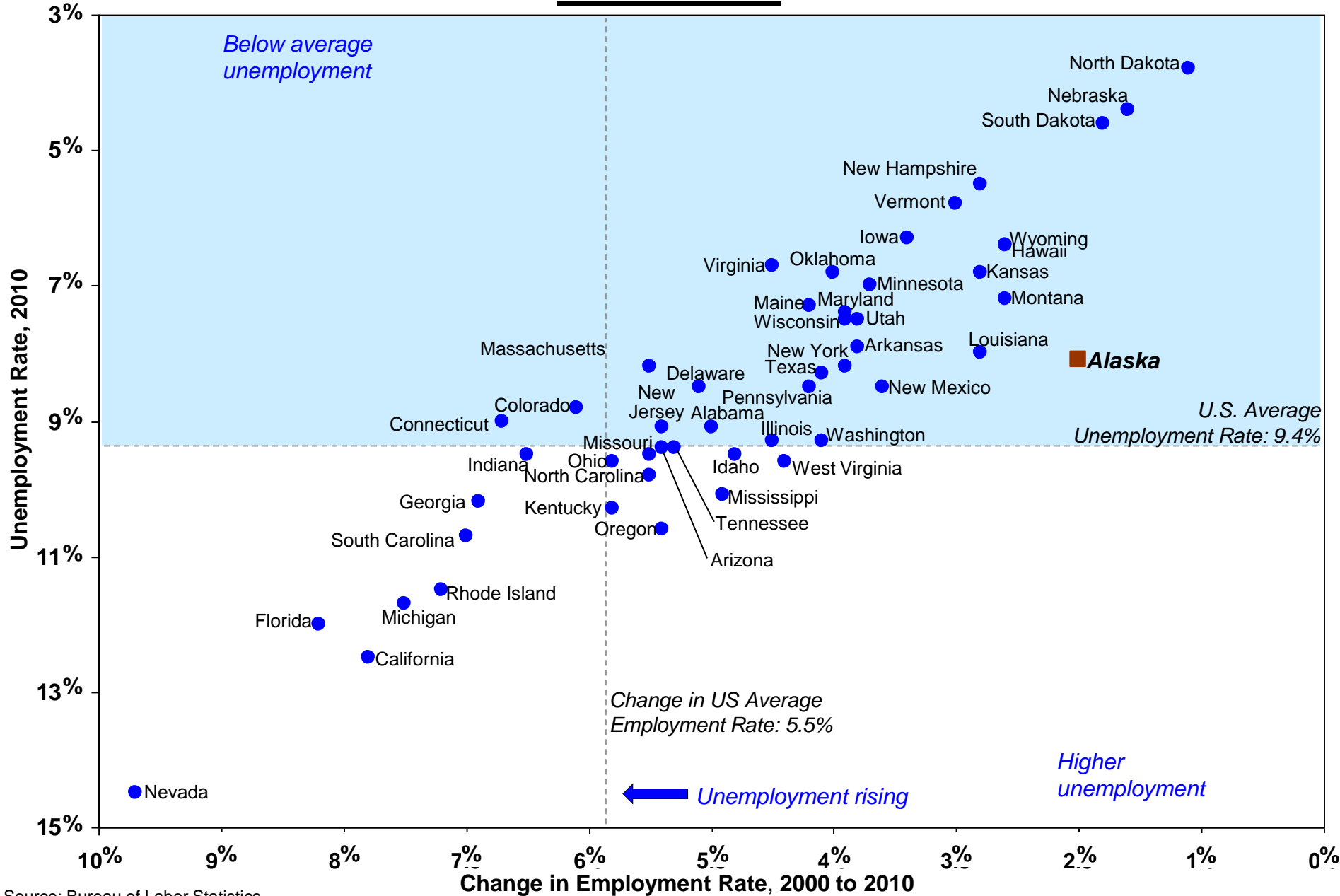
# Near Term State Job Growth

## 2007 to 2010



Source: Bureau of Labor Statistics  
NGA 2011 - Alaska

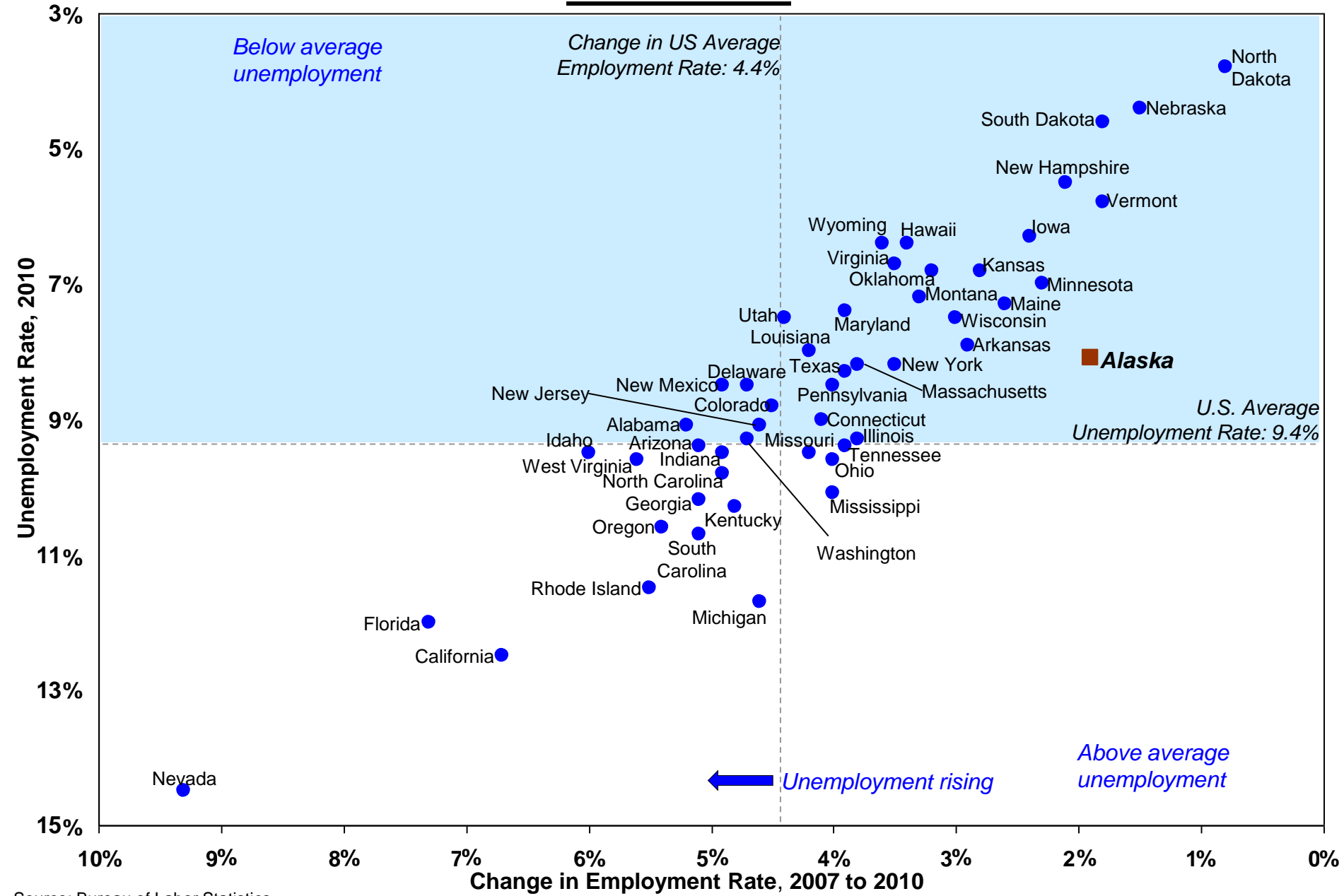
# Long Term State Unemployment Rate 2000 to 2010



Source: Bureau of Labor Statistics  
NGA 2011 - Alaska

# Near Term State Unemployment Rate

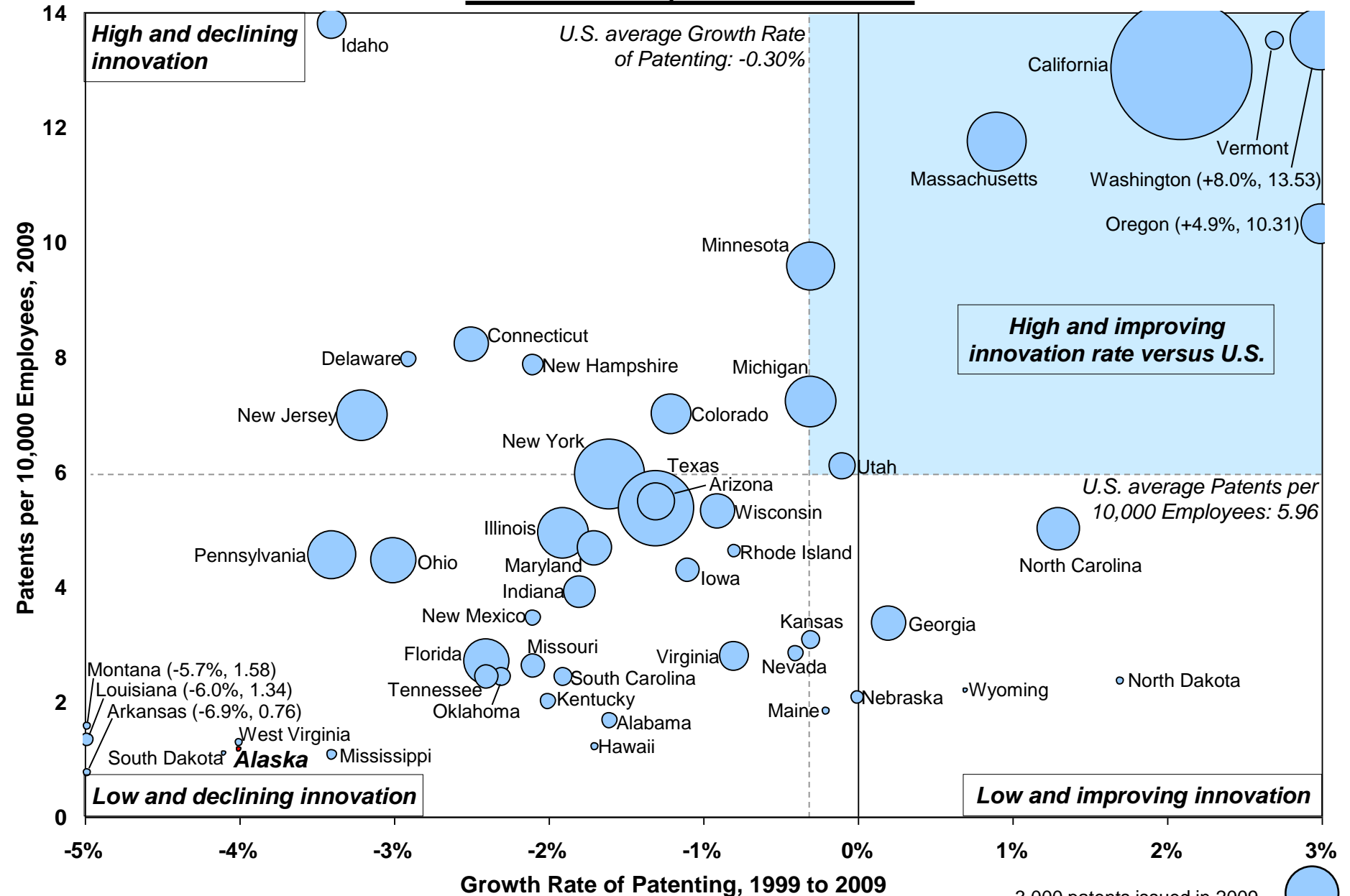
## 2007 to 2010



Source: Bureau of Labor Statistics  
 NGA 2011 – Alaska

# Long Term State Patenting Performance

## U.S. States, 1999 to 2009





Source: USPTO, Bureau of Labor Statistics. Note: Growth rate calculated as compound annual growth rate (CAGR).

3,000 patents issued in 2009 =

# Alaska Patents by Organization

Rank	Organization	Patents 2005-2009
1	Gunderboom, Inc.	4
2	Conocophillips Company	3
3	Microsoft Corporation	2
3	Schlumberger Technology Corporation	2
3	Spears Manufacturing Corp.	2
3	Brice Environmental Services Corporation	2
7	Baker Hughes Incorporated	1
7	Centec Corporation	1
7	International Business Machines Corporation	1
7	Peratrovich, Nottingham & Drage, Inc.	1
7	Weatherford/Lamb, Inc.	1
7	Chevron U.S.A. Inc.	1
7	Chronorx Llc	1
7	Dj Orthopedics, Llc	1
7	Montana State University	1
7	Tyco Thermal Controls Llc.	1
7	Cds Technologies, Inc.	1
7	Fluor Technologies Corporation	1
7	Flint Hills Resources, Llc	1
7	Alkan Shelter, Llc	1
7	Airespace, Inc.	1
7	Dynamic Taxoptimizer Llc	1
7	Alaska Ocean Products Corporation	1
7	Gis Data Resources, Inc.	1
7	Mfs, Llc	1

Rank	Organization	Patents 2005-2009
7	Lasher Sport, Llc	1
7	Efficient Tax Llc	1
7	Doyon Drilling, Inc.	1

 Universities and Research Institutions  
 Government Organizations

# The Impact of Cluster Mix and Cluster Strength on Wages

## U.S. States, 2008

State	State Traded Wage versus National Average	Cluster Mix Effect	Relative Cluster Wage Effect
New York	+34,578	5,188	29,390
Connecticut	+20,008	6,898	13,109
Massachusetts	+17,308	5,191	12,117
New Jersey	+12,157	4,638	7,519
California	+9,597	121	9,476
Maryland	+6,435	2,778	3,657
Washington	+4,827	3,058	1,769
Virginia	+2,550	945	1,605
Illinois	+2,501	-61	2,562
Alaska	+2,386	-3,044	5,431
Texas	+1,400	2,796	-1,396
Colorado	+753	2,292	-1,539
Delaware	+612	13,346	-12,733
Louisiana	-4,172	573	-4,745
Minnesota	-4,404	43	-4,448
Wyoming	-4,423	1,408	-5,831
Michigan	-4,981	-2,534	-2,447
Pennsylvania	-5,182	-1,064	-4,118
New Hampshire	-6,359	1,224	-7,584
Georgia	-7,262	-1,923	-5,338
Arizona	-8,662	1,557	-10,219
Kansas	-8,828	1,820	-10,648
Ohio	-9,766	-1,436	-8,330
Oregon	-9,774	-2,355	-7,420
Wisconsin	-10,479	-3,341	-7,138

State	State Traded Wage versus National Average	Cluster Mix Effect	Relative Cluster Wage Effect
North Carolina	-10,673	-5,131	-5,543
Missouri	-10,953	-1,634	-9,319
Rhode Island	-11,089	-1,370	-9,719
Florida	-11,780	-1,473	-10,307
Oklahoma	-12,225	1,533	-13,758
Alabama	-12,301	-4,713	-7,588
Tennessee	-13,063	-3,987	-9,076
Vermont	-13,095	-2,936	-10,159
Indiana	-13,309	-5,495	-7,814
Nebraska	-14,659	41	-14,699
Utah	-14,947	327	-15,274
South Carolina	-15,256	-5,694	-9,562
Nevada	-15,429	-2,829	-12,600
Maine	-15,826	-726	-15,100
North Dakota	-16,437	2,940	-19,378
Iowa	-16,963	-2,602	-14,361
New Mexico	-16,991	-125	-16,866
Kentucky	-17,303	-5,013	-12,291
West Virginia	-17,357	-4,290	-13,067
Arkansas	-17,616	-5,171	-12,445
Hawaii	-18,103	-14,124	-3,980
Idaho	-18,636	-1,567	-17,069
Mississippi	-20,859	-6,165	-14,694
South Dakota	-21,211	955	-22,166
Montana	-22,488	-3,494	-18,994

**Cluster mix:** a region's particular mix of lower and higher average wage clusters

**Relative cluster wage:** a region's cluster wage relative to the average national wage in that cluster

The cluster mix and the cluster wage level effects add up to the total difference between a region's average wage and the national average wage. On average, the wage level effect is responsible for 76.3% of the total difference in state wages to the national average.



# Effect of Urban and Rural Areas on Average State Wages

## U.S. States, 2008

State	Average Overall Wage Difference to U.S.	Metro-Rural Mix	Relative Metro Wage	Relative Rural Wage
New York	+15,412	982	14,078	353
Connecticut	+10,919	1,013	9,592	315
Massachusetts	+10,197	1,674	8,333	190
New Jersey	+8,488	1,631	6,765	92
Alaska	+6,538	-1,438	5,158	2,818
California	+5,584	1,476	3,844	265
Illinois	+3,427	411	3,277	-261
Washington	+3,013	832	2,122	58
Delaware	+2,664	-191	2,895	-40
Maryland	+2,201	1,159	775	267
Virginia	+1,182	509	709	-36
Minnesota	+1,024	-903	2,130	-202
Colorado	+539	-110	-66	714
Texas	+325	350	-234	209
New Hampshire	-504	-2,856	924	1,428
Pennsylvania	-1,184	262	-1,480	34
Michigan	-1,785	-165	-1,576	-44
Rhode Island	-2,143	1,720	-3,846	-17
Wyoming	-2,478	-6,929	-2,304	6,755
Georgia	-3,136	-120	-2,542	-475
Ohio	-3,925	-224	-3,799	98
Arizona	-3,962	937	-4,897	-2
Oregon	-4,116	-359	-3,505	-251
Wisconsin	-4,336	-910	-3,419	-7
Missouri	-4,540	-573	-3,103	-865

State	Average Overall Wage Difference to U.S.	Metro-Rural Mix	Relative Metro Wage	Relative Rural Wage
Nevada	-4,560	815	-5,752	377
Louisiana	-4,739	-630	-4,764	655
Kansas	-5,371	-2,175	-2,535	-661
North Carolina	-5,505	-1,262	-3,796	-446
Tennessee	-5,992	-538	-4,973	-481
Florida	-6,132	-128	-6,074	70
Indiana	-6,225	-630	-5,665	70
Oklahoma	-6,501	-2,030	-4,496	25
Hawaii	-6,583	-1,892	-4,871	179
Utah	-7,054	169	-7,273	50
Vermont	-7,280	-6,080	-968	-232
Nebraska	-7,419	-2,652	-3,621	-1,146
Alabama	-7,544	-1,206	-5,701	-636
Maine	-7,697	-2,479	-5,243	24
Kentucky	-7,978	-2,179	-5,285	-515
Iowa	-8,096	-3,123	-4,509	-464
New Mexico	-8,531	-1,843	-6,548	-140
South Carolina	-9,137	-609	-8,203	-325
Arkansas	-9,482	-2,207	-6,283	-992
Idaho	-9,766	-1,928	-6,872	-966
North Dakota	-9,973	-2,963	-6,607	-403
West Virginia	-10,074	-3,104	-7,013	43
South Dakota	-10,976	-3,811	-5,475	-1,690
Mississippi	-11,446	-4,569	-5,493	-1,383
Montana	-11,792	-5,468	-5,495	-829

**Metro-rural mix:** average wage impact from a state's relative proportion of metro and rural regions

**Relative metro wage:** average wage impact from state relative performance in metro regions

**Relative rural wage:** average wage impact from state relative performance in rural regions

On average 66.3% of the average wage gap in a state is due to the metro wage effect.

Note: Data are based on private, non-agricultural employment.

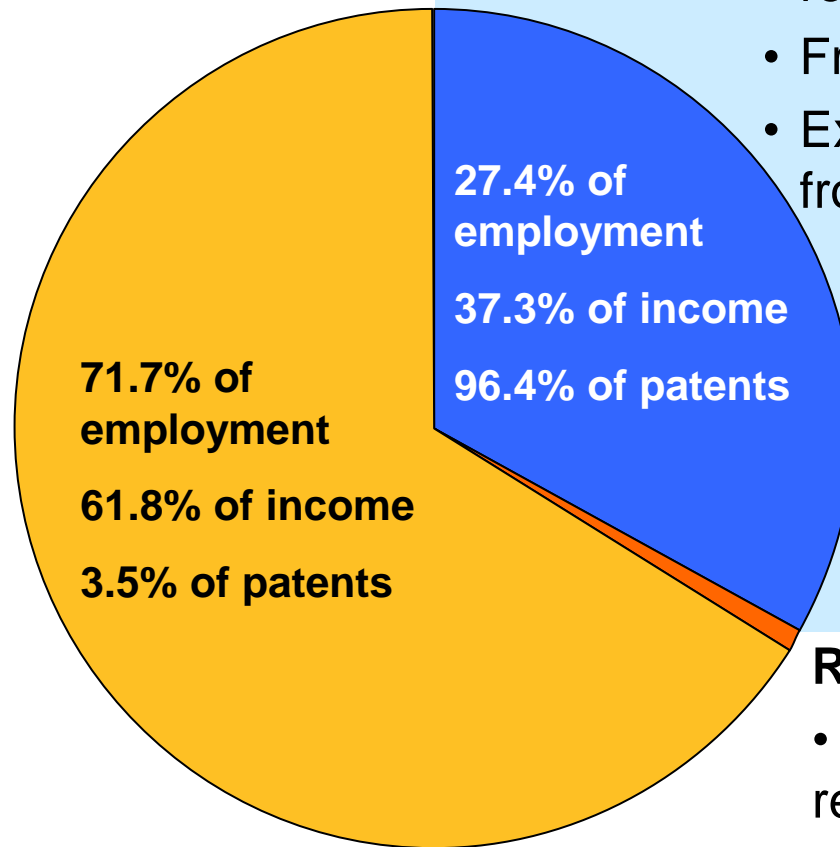
Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.

## **Composition of the Alaska Economy and Cluster Performance**

# Composition of Regional Economies, United States

## Local Clusters

- Serve almost exclusively the local market
- Not exposed to cross-regional competition for employment



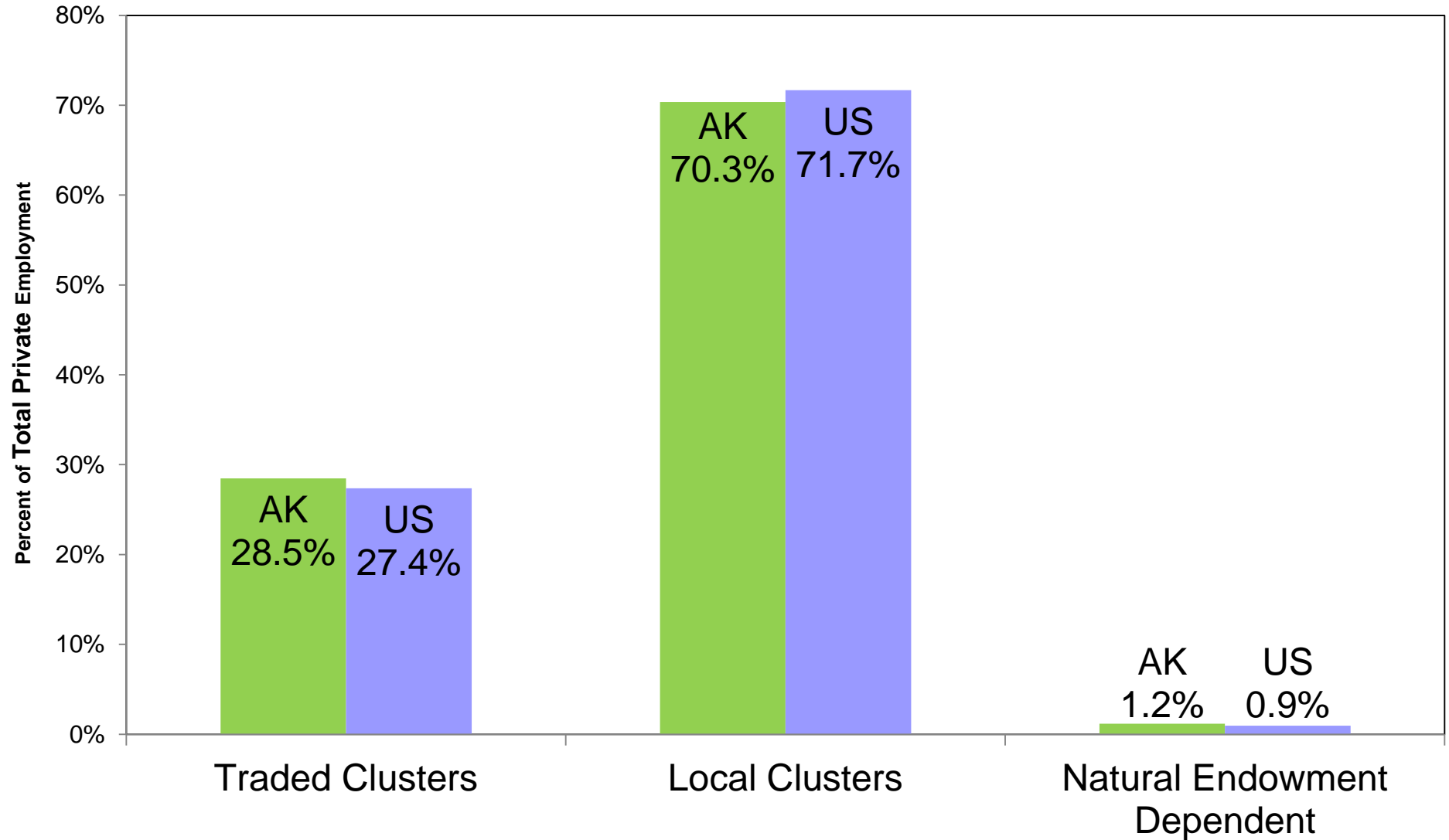
## Traded Clusters

- Serve markets in other regions and countries
- Free to choose location
- Exposed to competition from other regions

## Resource-based Clusters

- Location determined by resource availability
- <1% of income, employment, and patents in the U.S.

# Overall Composition of the Alaska Economy, 2008



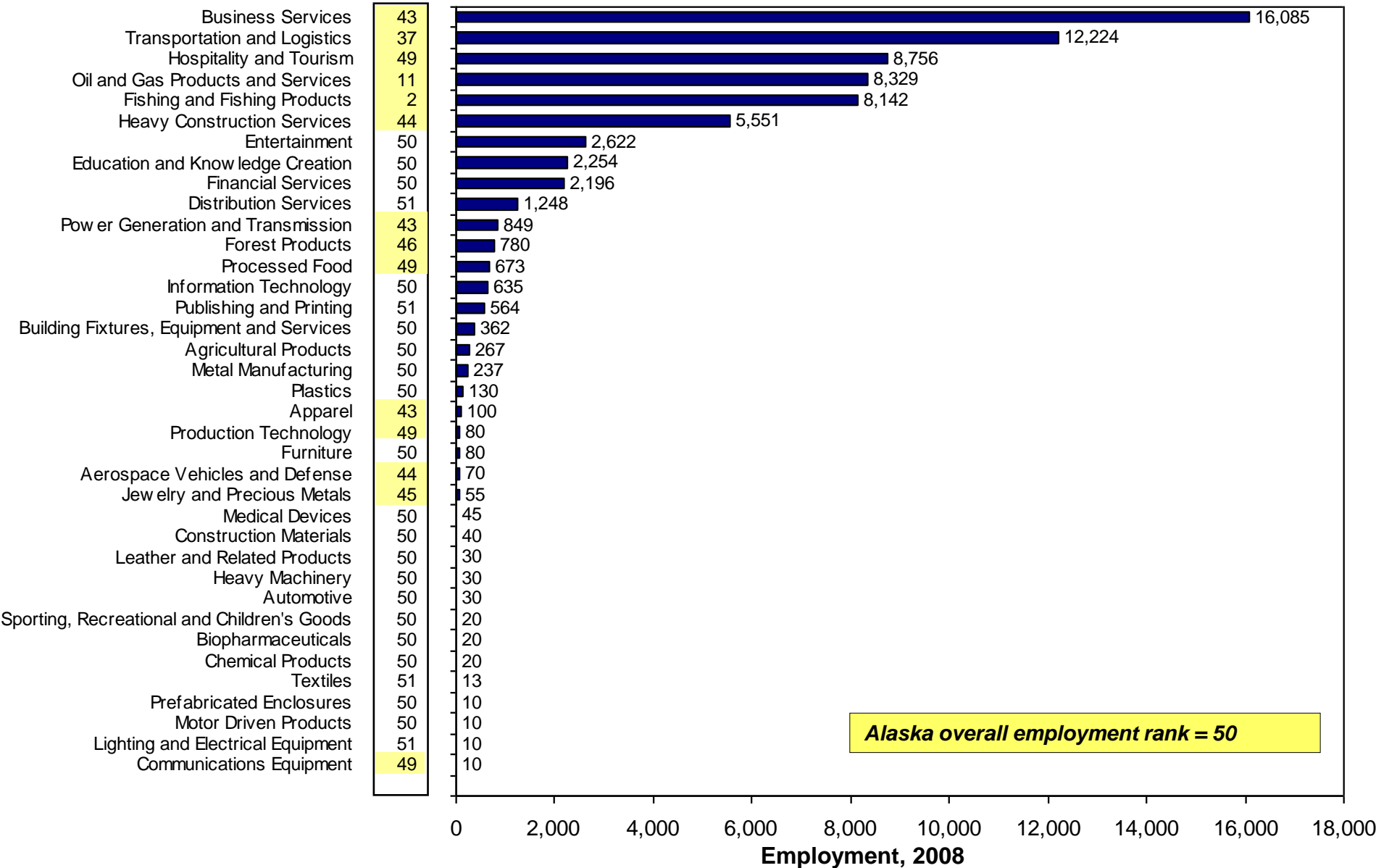
Note: Data throughout this section of the report are based on private, non-agricultural employment.

Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.

# Composition of the Alaska Economy

## Employment by Traded Cluster, 2008

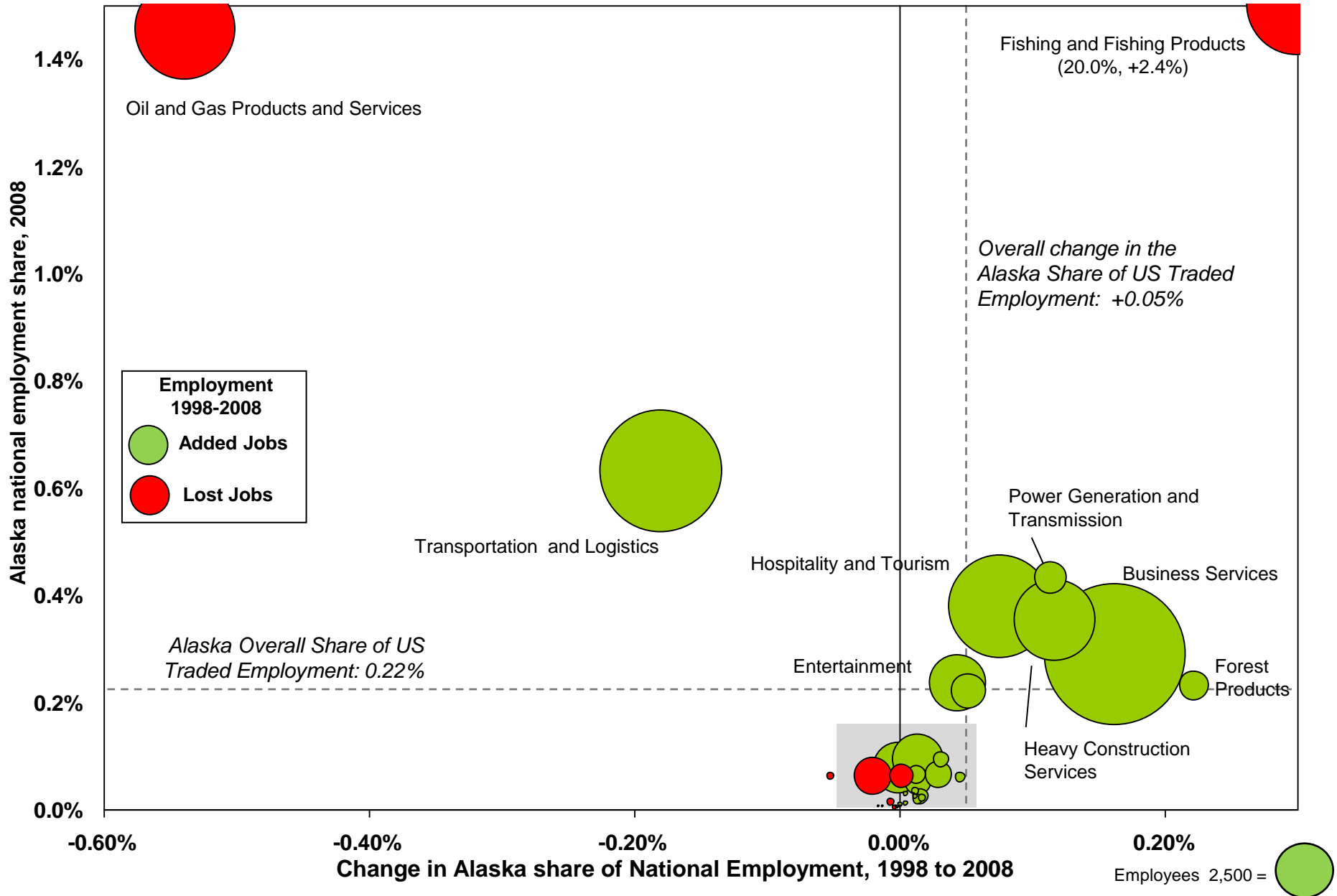
Rank in US



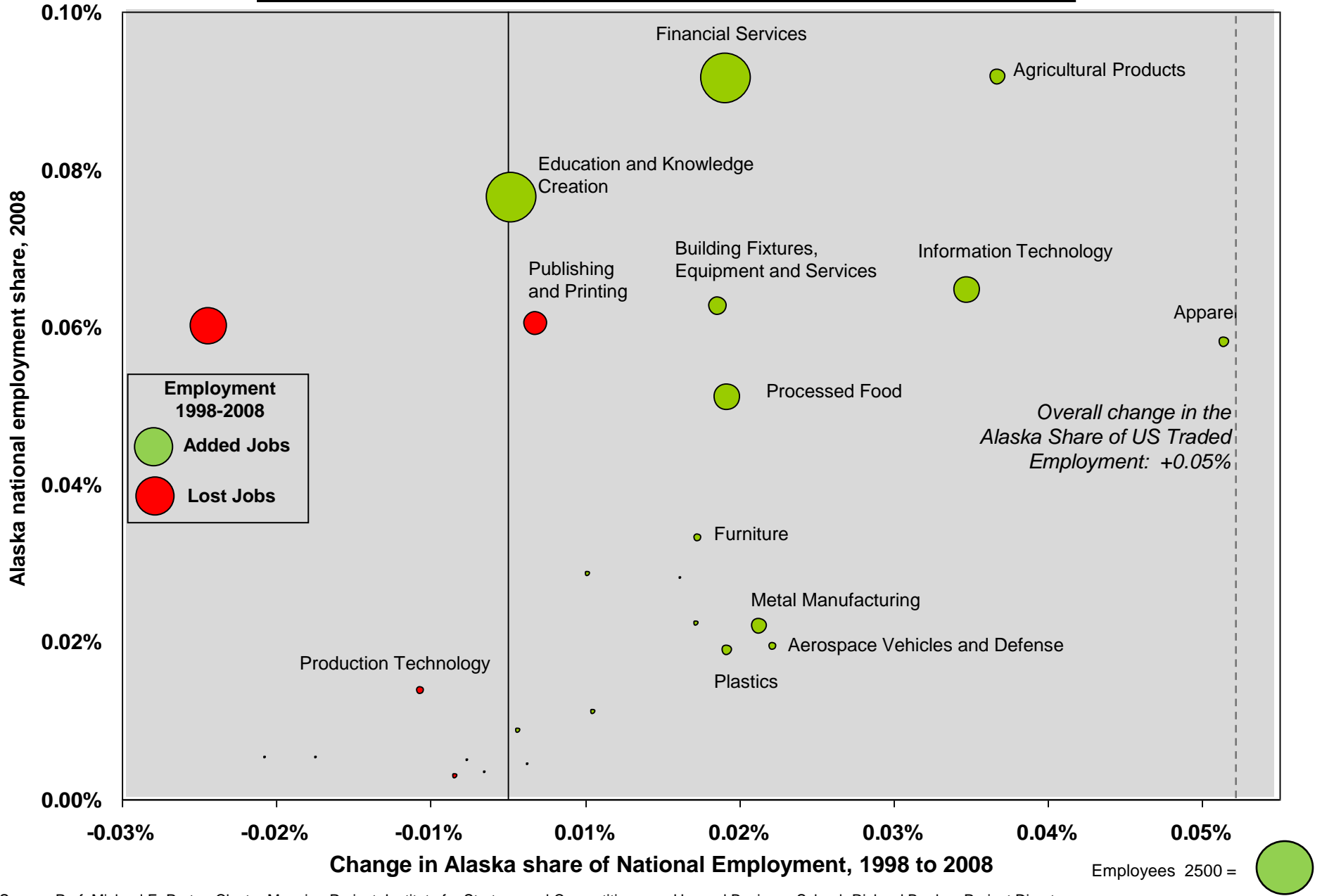
Note: Ranks are among the 50 US states plus the District of Columbia.

Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.

# Composition of the Alaska Economy Specialization by Traded Cluster, 1998 to 2008

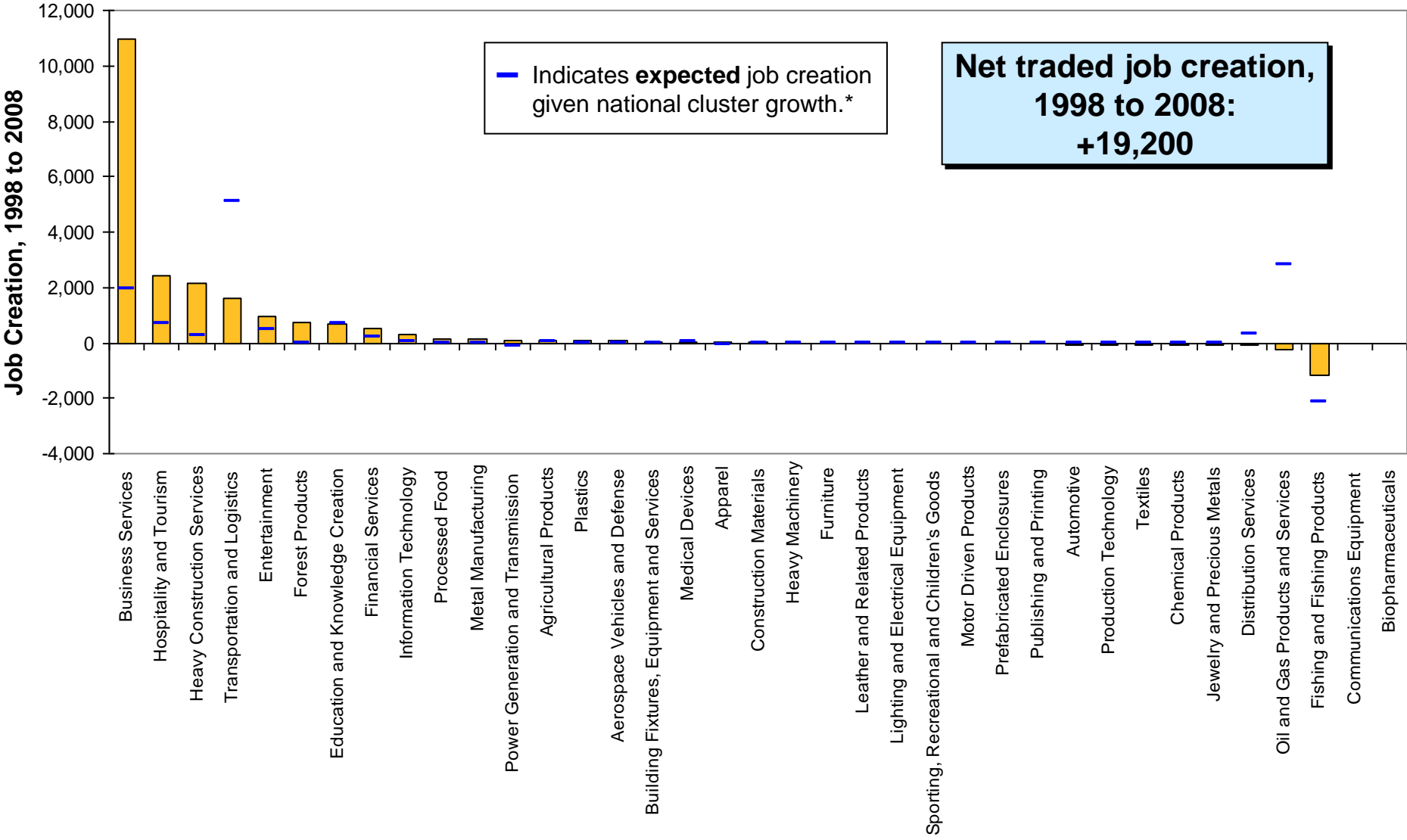


# Composition of the Alaska Economy Specialization by Traded Cluster, 1998 to 2008



# Alaska Job Creation by Traded Cluster

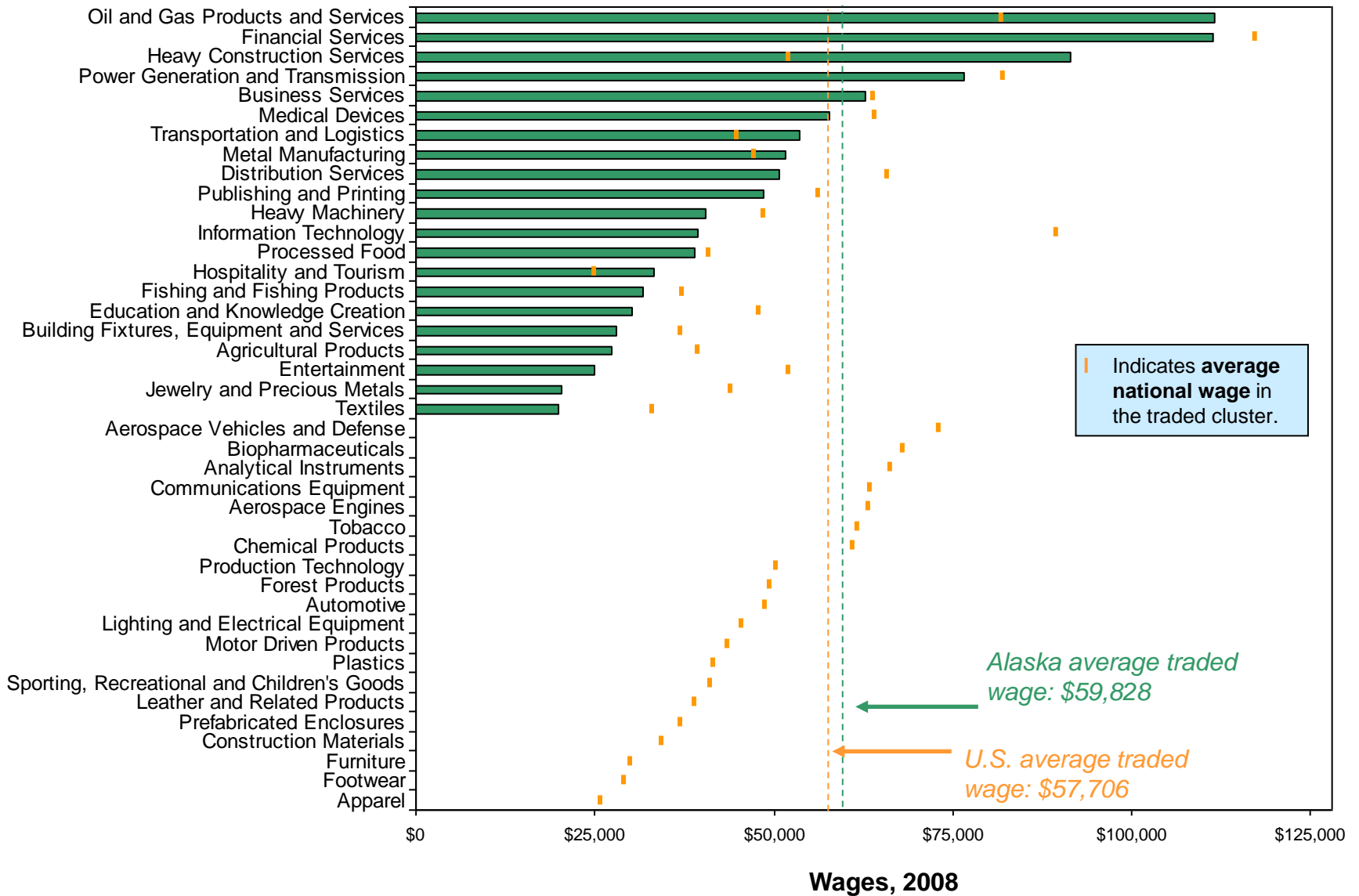
## 1998 to 2008



\* Percent change in national benchmark times starting regional employment. Overall traded job creation in Alaska, if it matched national benchmarks, would be +9,714  
 Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.



# Alaska Wages by Traded Cluster vs. National Benchmarks



Indicates average national wage in the traded cluster.

Alaska average traded wage: \$59,828

U.S. average traded wage: \$57,706

Wages, 2008

# Alaska

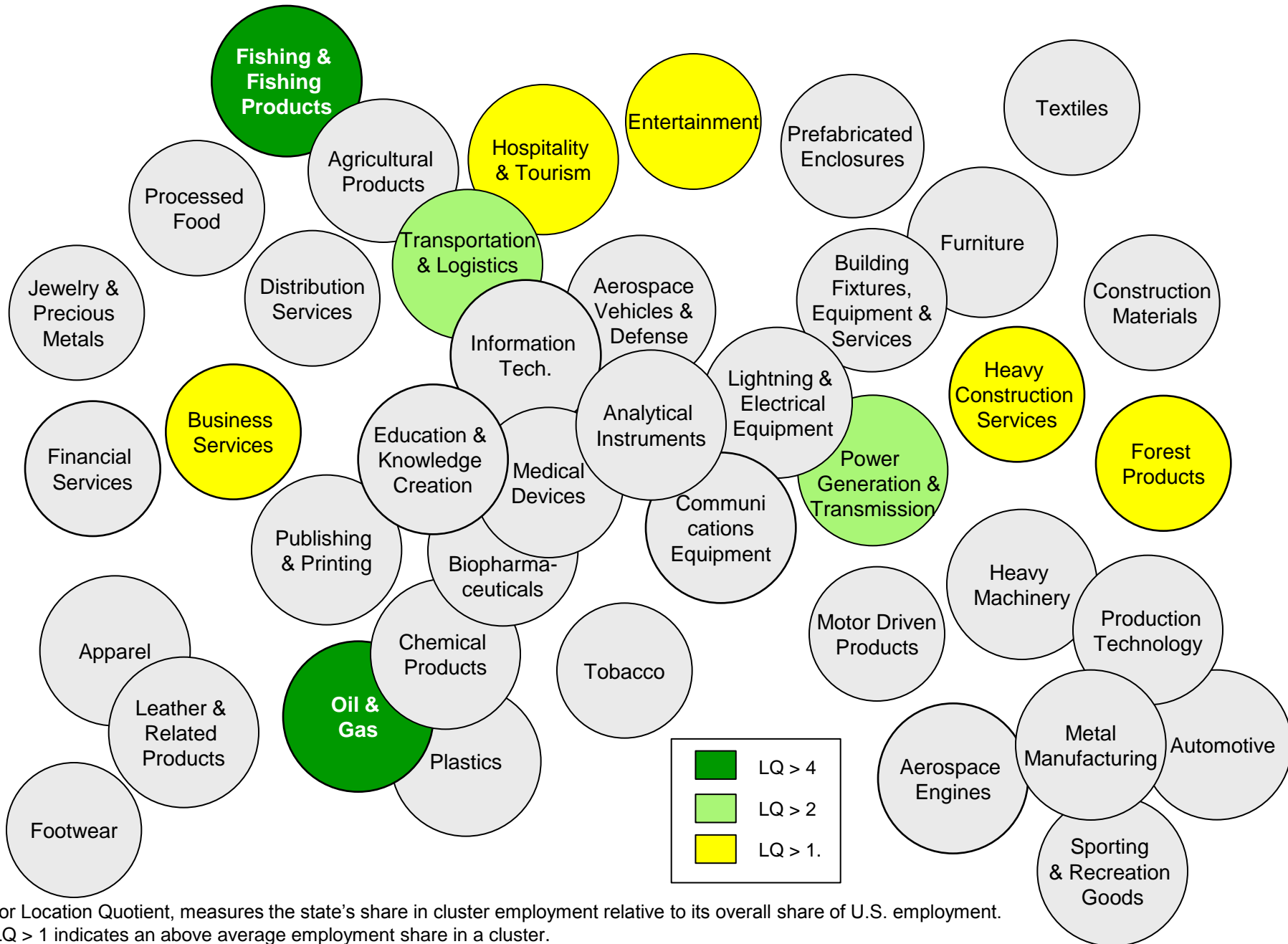
## Employment in Highest Wage Clusters, 2008



Total private, non-agricultural employment in Alaska: 248,387.

Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.

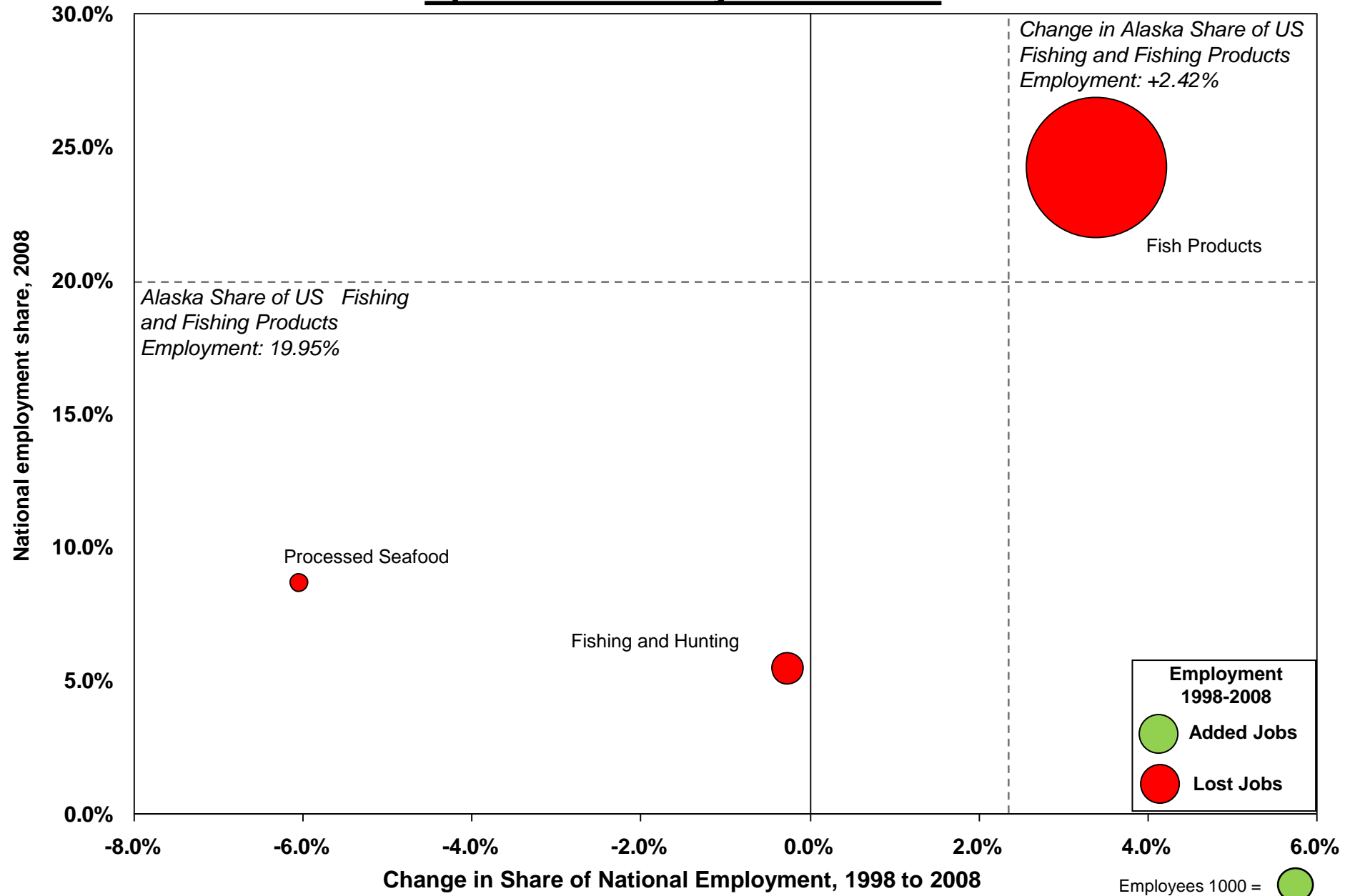
# Alaska Cluster Portfolio, 2008



LQ, or Location Quotient, measures the state's share in cluster employment relative to its overall share of U.S. employment. An LQ > 1 indicates an above average employment share in a cluster.

# Alaska Fishing and Fishing Products Cluster, 1998-2008



## Specialization by Subcluster



# Alaska

## Top 50 Subclusters by National Employment Share, 2008

	Subcluster	Cluster	Employment	Employment Rank in U.S.	Employment Share in U.S.	Change in Employment Share in U.S. 1998-2008
1	Fish Products	Fishing and Fishing Products	7,562	1	24.2%	3.4%
2	Processed Seafoods	Fishing and Fishing Products	175	7	8.6%	-6.0%
3	Fishing and Hunting	Fishing and Fishing Products	405	4	5.4%	-0.3%
4	Scenic & Sightseeing Transportation	Hospitality and Tourism	807	7	3.5%	1.7%
5	Facilities Support Services	Business Services	8,693	11	3.5%	2.6%
6	Bus Transportation	Transportation and Logistics	375	17	2.5%	2.5%
7	Pipeline Transportation	Oil and Gas Products and Services	820	13	2.0%	0.4%
8	Oil and Gas Exploration and Drilling	Oil and Gas Products and Services	5,323	10	1.7%	-1.4%
9	Marine Transportation	Transportation and Logistics	2,301	14	1.7%	0.3%
10	Hydrocarbons	Oil and Gas Products and Services	1,712	11	1.6%	-0.3%
11	Air Transportation	Transportation and Logistics	6,835	24	1.4%	0.3%
12	Packaging	Agricultural Products	60	35	1.0%	1.0%
13	Fertilizers	Agricultural Products	60	20	1.0%	1.0%
14	Electric Services	Power Generation and Transmission	839	39	0.7%	0.2%
15	Prefabricated Wood Products	Forest Products	770	34	0.6%	0.6%
16	Petroleum Processing	Oil and Gas Products and Services	414	23	0.6%	-0.1%
17	Airports	Transportation and Logistics	996	36	0.6%	-0.4%
18	Malt Beverages	Processed Food	140	23	0.5%	0.4%
19	Collectibles	Jewelry and Precious Metals	10	32	0.5%	0.2%
20	Environmental Controls	Metal Manufacturing	60	31	0.5%	0.4%
21	Equipment Distribution and Wholesaling	Heavy Construction Services	777	41	0.5%	0.1%
22	Transportation Support and Operations	Transportation and Logistics	245	38	0.5%	0.4%
23	Final Construction	Heavy Construction Services	3,897	41	0.4%	0.2%
24	Subcontractors	Heavy Construction Services	436	41	0.4%	0.0%
25	Accommodations and Related Services	Hospitality and Tourism	6,422	48	0.4%	0.1%

 Rising national employment share  
 Declining national employment share

# Alaska

## Top 50 Subclusters by National Employment Share, 2008 (continued)

	Subcluster	Cluster	Employment	Employment Rank in U.S.	Employment Share in U.S.	Change in Employment Share in U.S. 1998-2008
26	Engineering Services	Business Services	3,736	40	0.4%	0.1%
27	Entertainment Venues	Entertainment	1,515	47	0.3%	0.1%
28	Transportation Vehicle and Equipment Distribution	Distribution Services	183	38	0.3%	0.0%
29	Tourism Related Services	Hospitality and Tourism	835	40	0.3%	0.0%
30	Food Products Wholesaling	Distribution Services	357	41	0.3%	0.1%
31	Entertainment Related Services	Entertainment	1,052	42	0.2%	0.1%
32	Ground Transportation	Hospitality and Tourism	210	45	0.2%	0.0%
33	Leather Tanning and Finishing	Chemical Products	10	42	0.2%	0.1%
34	Cutlery	Jewelry and Precious Metals	10	34	0.2%	0.1%
35	Educational Facilities	Education and Knowledge Creation	313	49	0.2%	0.0%
36	Communications Services	Information Technology	625	43	0.2%	0.0%
37	Lessors of Other Nonfinancial Intangible Assets	Education and Knowledge Creation	60	42	0.2%	0.1%
38	Boat Related Services	Hospitality and Tourism	142	38	0.2%	0.0%
39	Irrigation Systems	Agricultural Products	60	47	0.2%	0.1%
40	Men's Clothing	Apparel	70	37	0.2%	0.2%
41	Heating and Lighting	Building Fixtures, Equipment and Services	60	46	0.2%	0.2%
42	Tourism Attractions	Hospitality and Tourism	326	44	0.2%	0.1%
43	Concrete, Gypsum and Other Building Products	Building Fixtures, Equipment and Services	70	47	0.2%	0.0%
44	Primary Construction Materials	Heavy Construction Services	316	50	0.2%	0.0%
45	Leather products	Leather and Related Products	20	48	0.1%	0.1%
46	Transportation Arrangement and Warehousing	Transportation and Logistics	1,472	45	0.1%	-0.2%
47	Oil and Gas Machinery	Oil and Gas Products and Services	60	30	0.1%	0.1%
48	Management Consulting	Business Services	788	47	0.1%	0.0%
49	Securities Brokers, Dealers and Exchanges	Financial Services	1,201	46	0.1%	0.0%



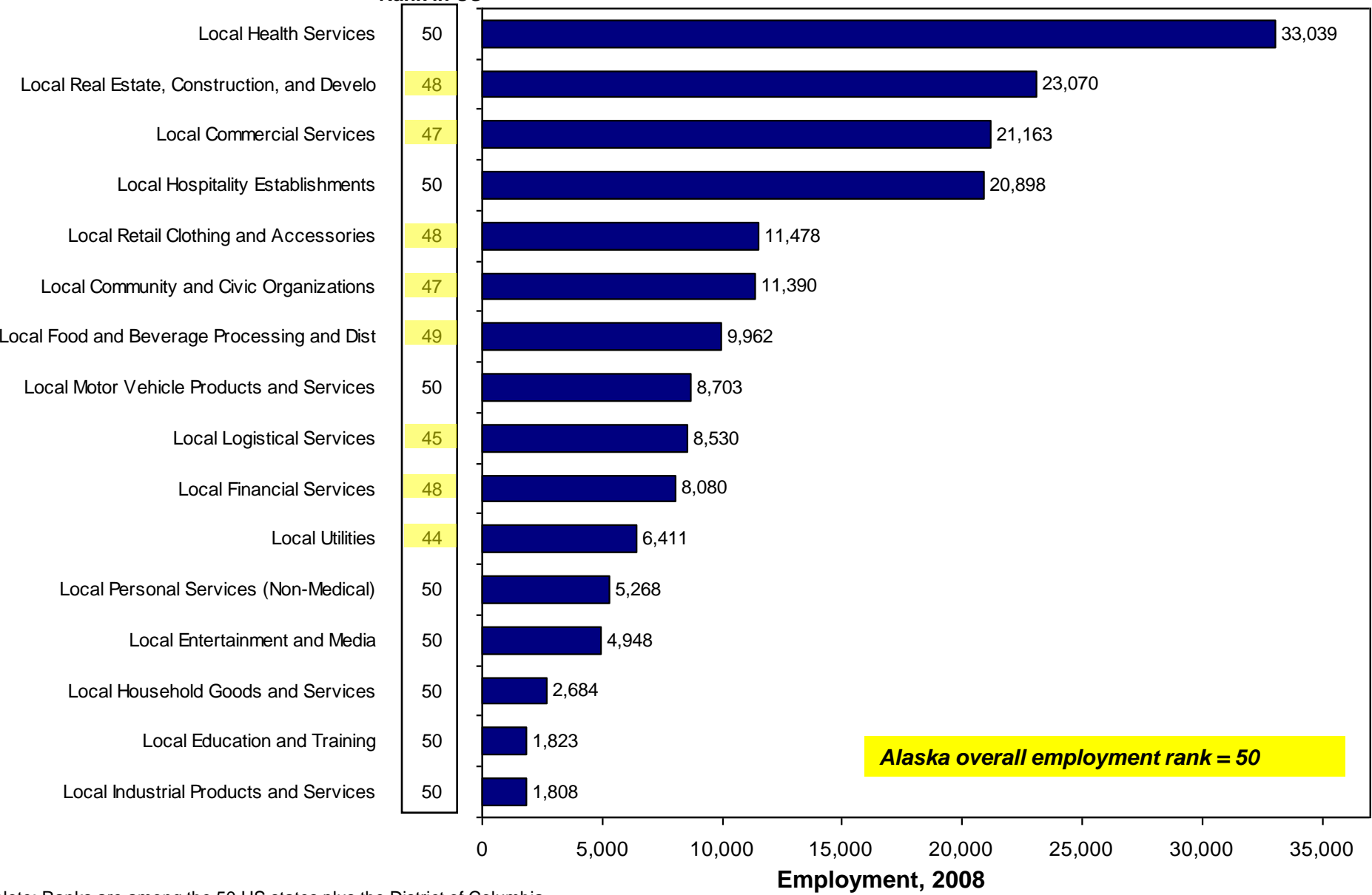
Rising national employment share

Declining national employment share

# Alaska Employment by Local Cluster

2008

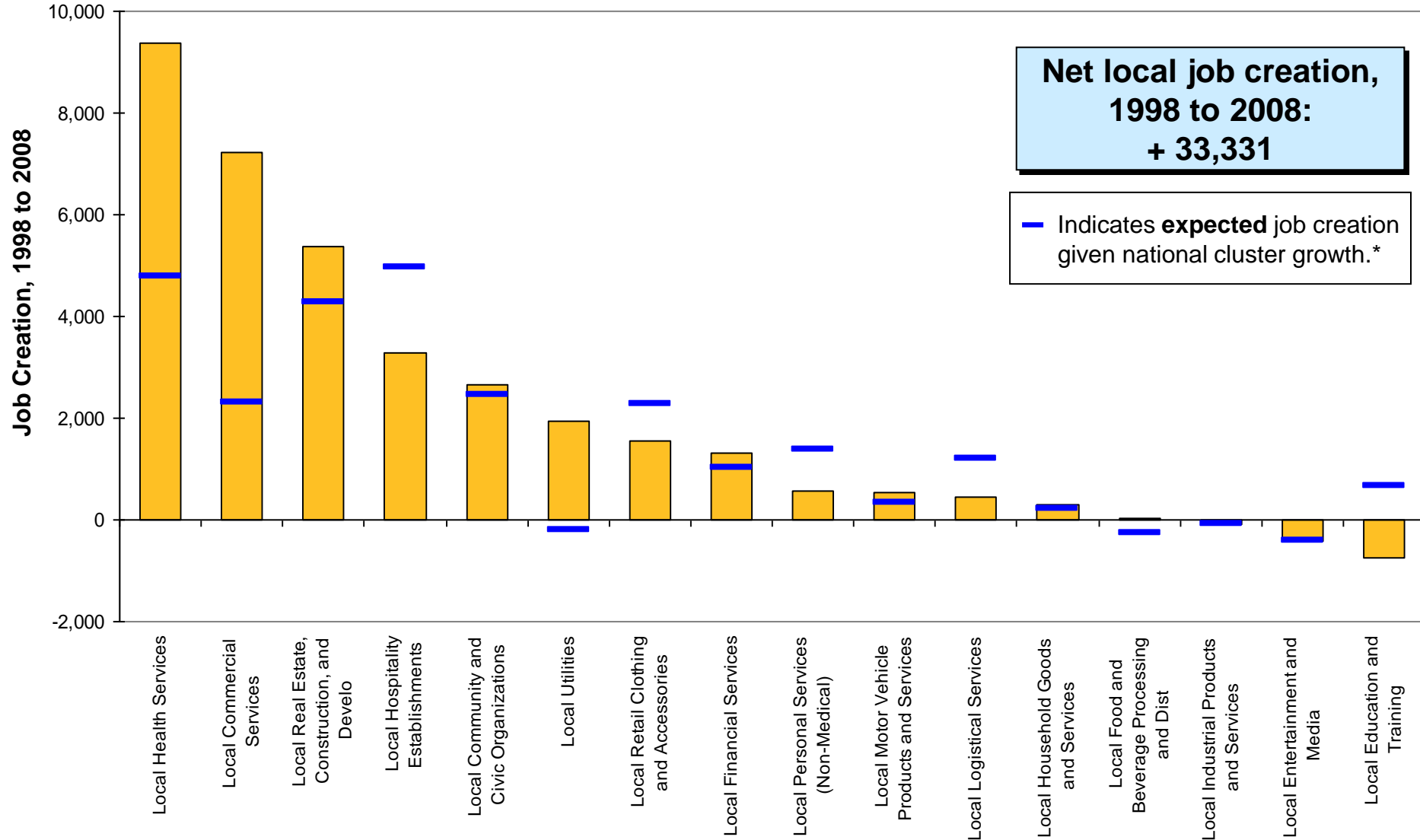
Rank in US



Note: Ranks are among the 50 US states plus the District of Columbia.  
 Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.  
 NGA 2011 – Alaska 31 Copyright © 2011 Professor Michael E. Porter

# Alaska Job Creation by Local Cluster

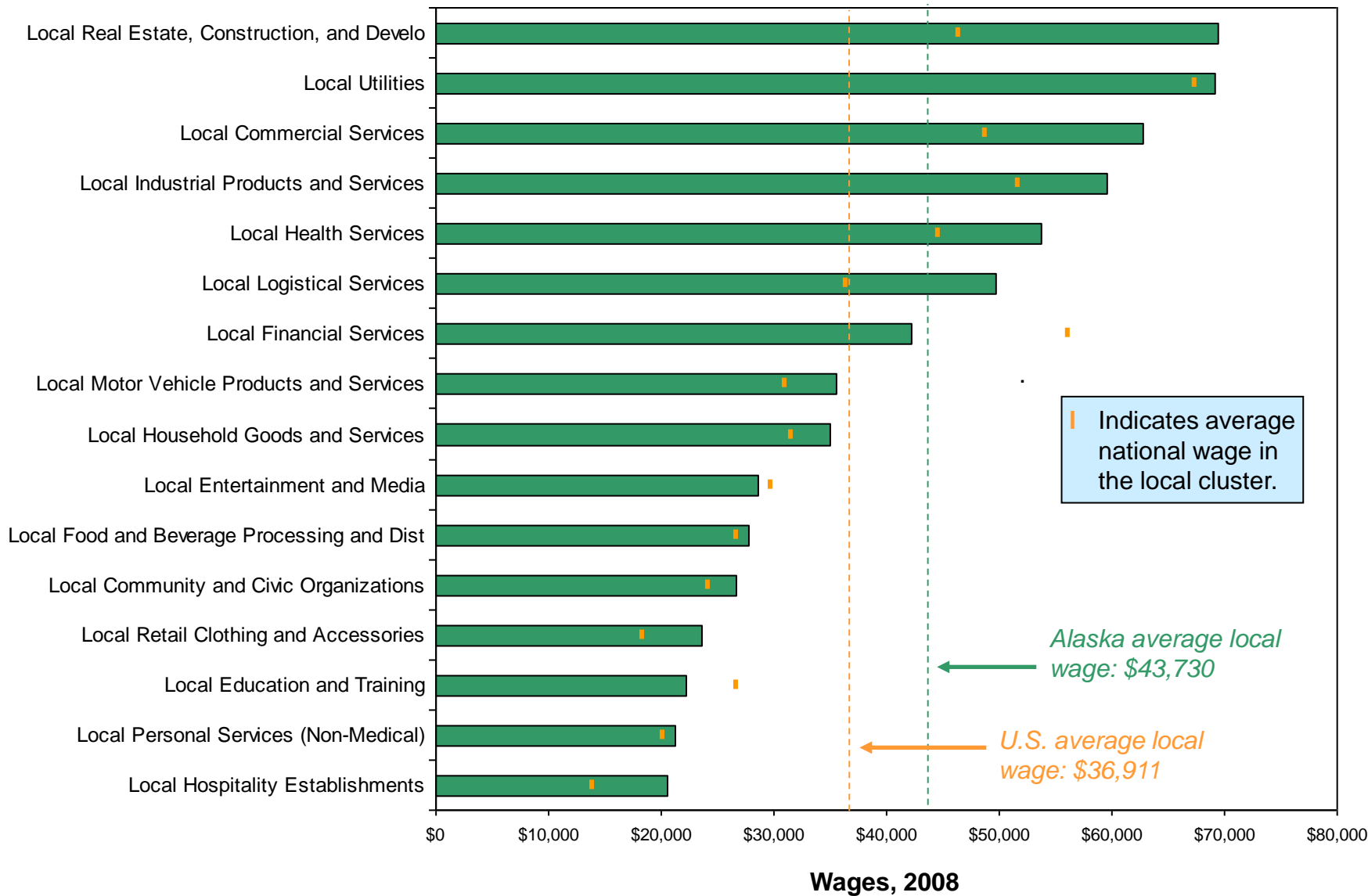
## 1998 to 2008



\* Percent change in national benchmark times starting regional employment. Overall local job creation in Alaska, if it matched national benchmarks, would be 24834.6  
 Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.



# Alaska Wages by Local Cluster vs. National Benchmarks



Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.

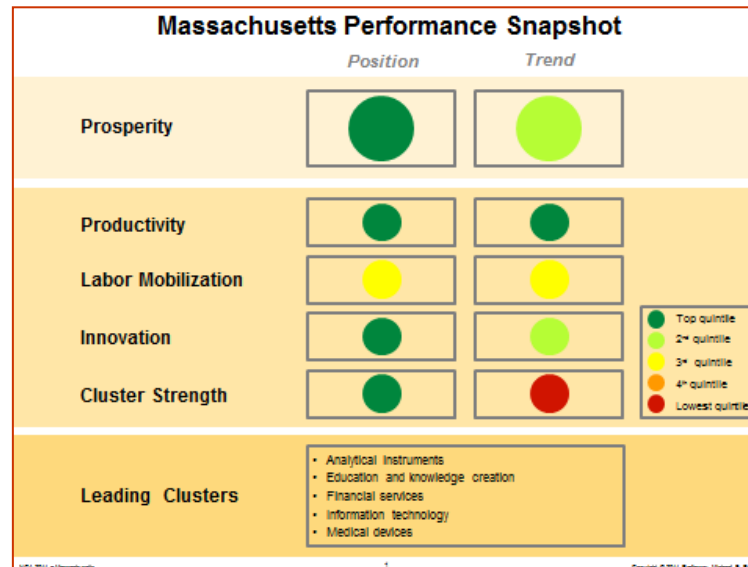
## **Appendix: Chart Descriptions, Interpretation, and Sources**

# State Snapshot

The snapshot chart summarizes the relative performance of a state on levels and trends in five key measures. The circles in the chart indicate quintile of performance as shown in chart legend.

1. **Prosperity:** State GDP per capita and 10-year trend
2. **Productivity:** Average private wage and 10-year trend
3. **Labor Mobilization:** Total labor force as a share of civilian population and 10-year trend
4. **Innovation:** Utility patents per 10,000 workers and 10-year trend
5. **Cluster Strength:**
  - A “strong cluster” is identified by relative employment rank in the top 20% across all states. A state’s “cluster strength” is in turn the state’s total share of traded employment in these strong clusters.
  - A positive trend in cluster strength is indicated by a state’s increasing national cluster share across these strong clusters.

**Leading Clusters:** A listing of the state’s strong clusters is included. A state may have more than five strong clusters; the top five by employment size in the state are shown in this section.



# Components of Regional Economies

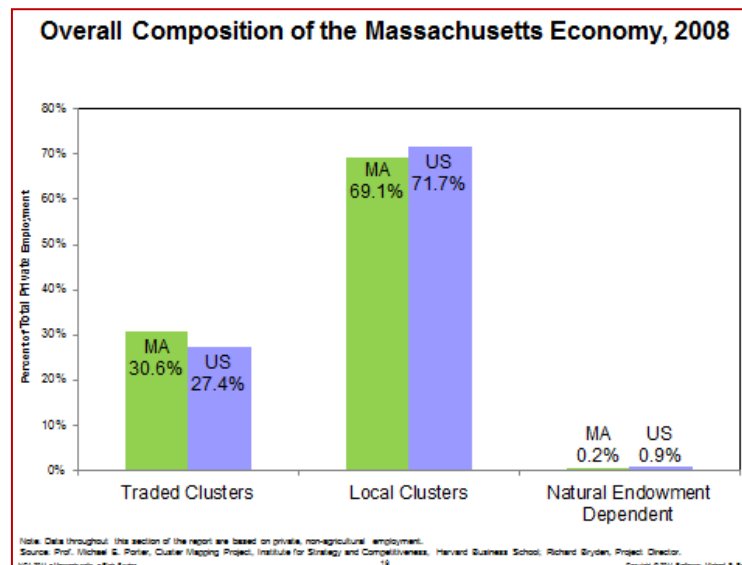
A state's or region's economy can be divided into traded clusters, local clusters, and natural endowment industries:

**Traded clusters** include those industries that compete across regions, and which tend to concentrate in particular locations. Traded clusters are the engines of regional economic competitiveness. While they account for only about a third of employment, they achieve the highest wages and productivity levels and drive demand for localized businesses.

**Local clusters** involve activities serving almost exclusively the local market. Local clusters are present in every region in roughly the same proportions. They employ the majority of people in any regional economy, so their efficiency is critical for competitiveness in traded clusters. However, they cannot prosper over the long run without success in the traded clusters.

**Natural Endowment-dependent industries** concentrate at natural resource sites. They account for a small and declining share of national employment but can be relatively high wage.

The Cluster Mapping Project data presented in this report focuses primarily on traded clusters, though it contains some information about other categories of industries. The performance of traded clusters holds the key to present and future competitiveness.



# Employment by Traded Cluster

Within the broad category of traded clusters, a state's economy can be divided into individual clusters. Clusters are geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. Examples include automotive producers in Michigan and Ohio, information technology in Silicon Valley, and money management in Boston.

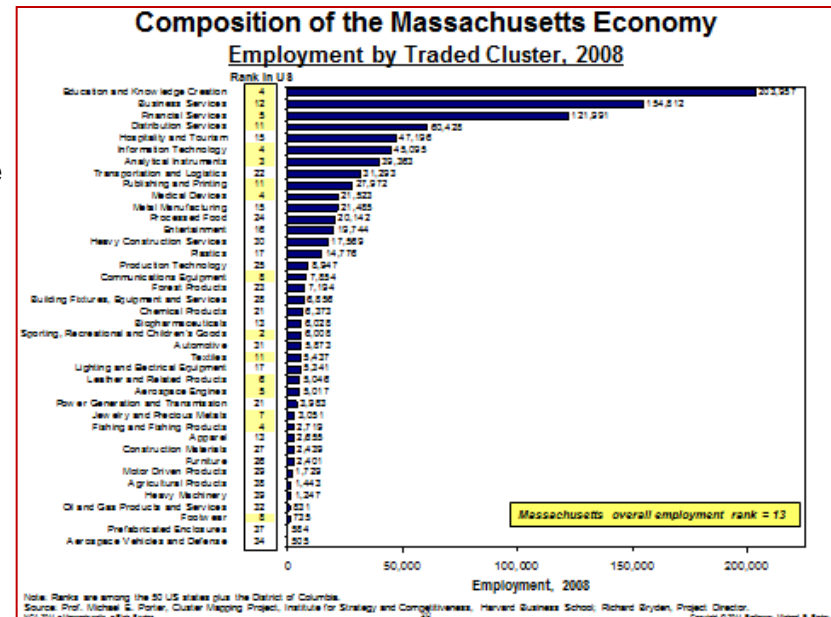
The 41 traded clusters (and their 264 component subclusters) utilized in the Cluster Mapping Project were developed using statistical analysis of the actual patterns of business location in the U.S. economy. Clusters and subclusters are listed at the end of this appendix.

## Interpretation:

This chart gives total employment in the state economy by each traded cluster.

Employment by cluster gives a more detailed profile of the activities in the state economy that make up the job base. It can be used to understand the importance of the health of various groups or industries on the overall prosperity of the region. z

Also shown on the chart are employment ranks for each cluster versus those in the 50 U.S. states plus D.C. Ranks above the region's overall share of national employment are an indication of cluster specialization in the state and are highlighted on the chart.



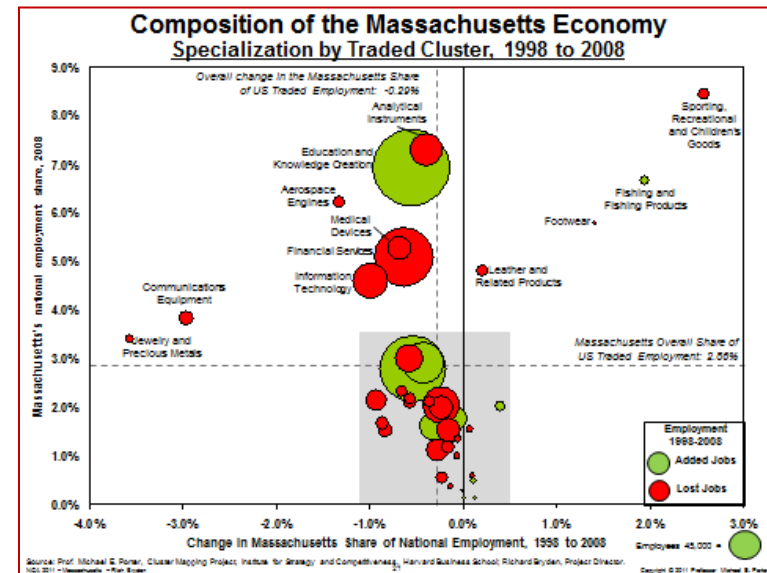
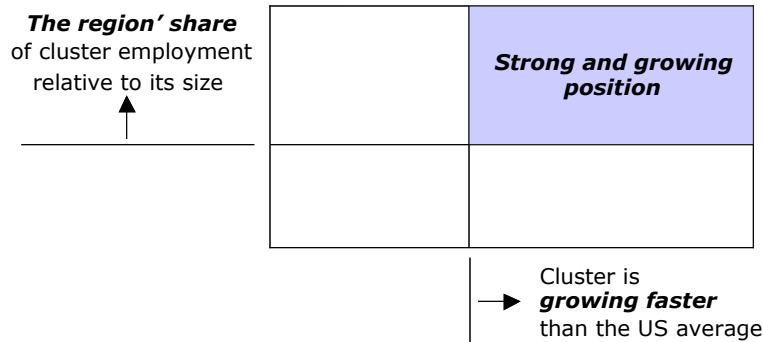
# Specialization by Traded Cluster

While other charts in this report focus on absolute employment and changes in employment, the Specialization chart shows the region's competitive position by traded cluster.

The size of each cluster "bubble" is proportional to the number of jobs in the region.

The location of each cluster bubble on the chart identifies a cluster's relative performance in the US economy:

- Clusters on the **top** half of the chart have local employment levels that are more than proportionate to the region's overall employment. These are clusters in which the region is relatively specialized.
- Clusters on the **right** half of the chart are growing employment at a faster rate than the national average for those clusters. These are clusters in which the region is gaining position in terms of relative employment.

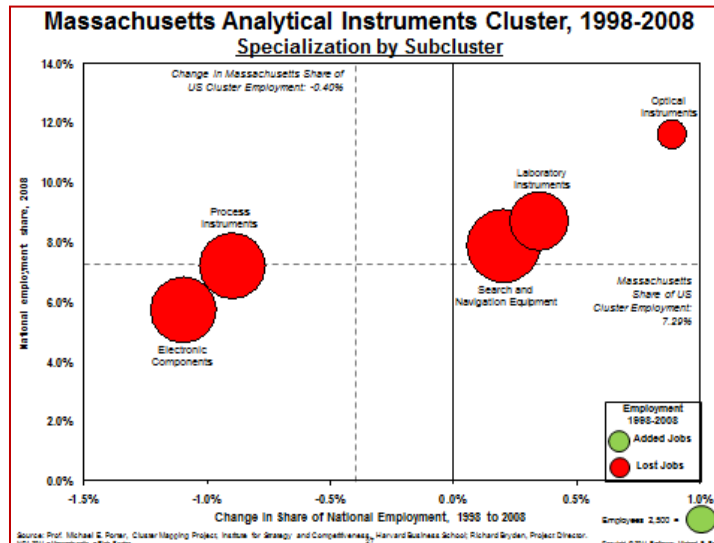
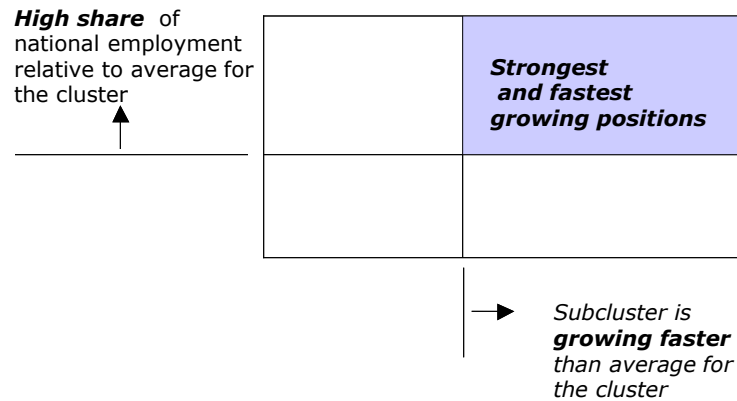


When present, a gray shaded area on the chart indicates that further detail is available on a second version of the chart immediately following the current page.

# Specialization by Subcluster

The specialization by subcluster chart is interpreted similarly to the specialization chart for all traded clusters. Additional insight on particular cluster strengths and trends in cluster composition can be observed.

**Please note** that only one or a few subcluster charts were included in this report. Specialization charts and other data for *all* subclusters are available online at the Cluster Mapping Project reached from [www.isc.hbs.edu](http://www.isc.hbs.edu).



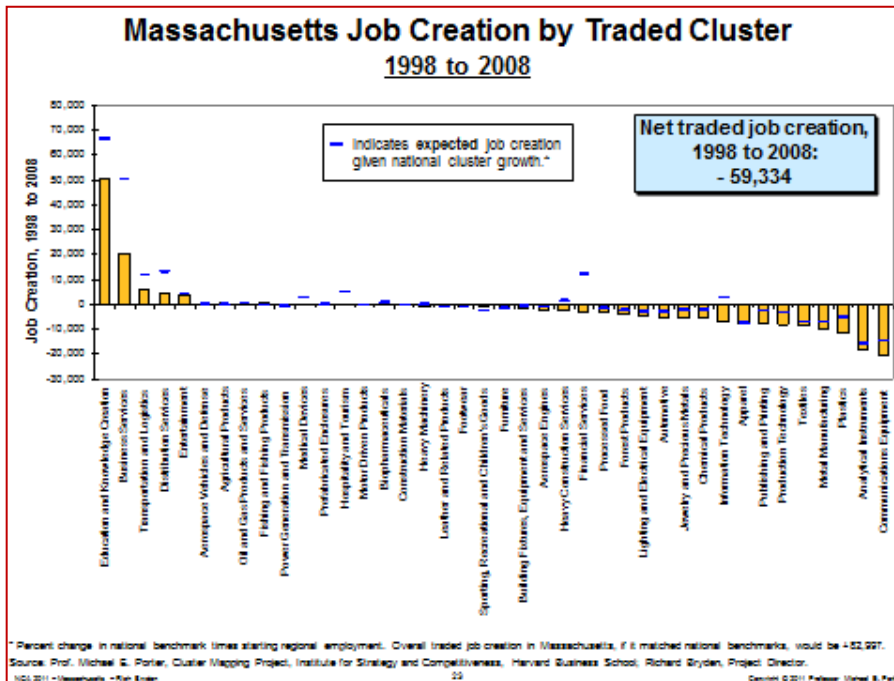
# Job Creation by Traded Cluster

This chart shows the overall net change in traded jobs in the state over the period from 1998 to 2008 and the net gain or loss by traded cluster. The clusters are arranged in order of net jobs created. The blue bars provide benchmarks for job creation based upon rates of growth in the cluster throughout the U.S.

## Interpretation:

This chart allows a state to identify its biggest job generators and job losers among traded clusters over the last decade. A few clusters often account for a large majority of the overall employment gain. Clusters with job losses are a cause for concern. It is helpful to compare job performance with the policy priorities a region has set.

Comparison of job growth relative to the U.S. benchmarks provides insights into the strengths and weaknesses in the region's economy and shifts in the region's competitive position. A region might not be participating in a cluster which is surging nation-wide; or a region might be gaining market position in an important cluster.





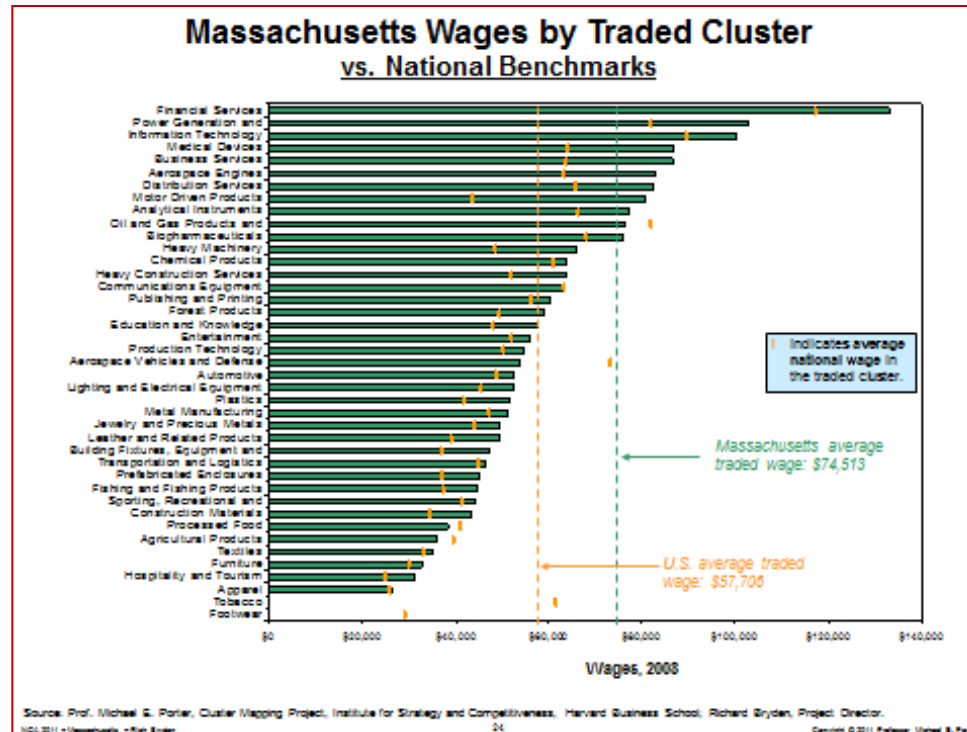
# Wages by Traded Cluster

The state's clusters are listed in order by average wage. The yellow bars show the benchmark average wage for the cluster nationally. The average wage across all traded clusters in the region is indicated by the green dashed line.

Wages are a direct measure of a cluster's productivity and competitiveness. Clusters that are exceptionally productive (the value of output produced per unit of labor) can sustain higher wages.

Note: The wages for some clusters may not be reported due to data suppression in the underlying government reports. When few employers in an industry are present in a given region, wage and precise employment figures are omitted to protect the confidentiality of the data.

Benchmark lines provide a comparison to wages in the cluster across the U.S.

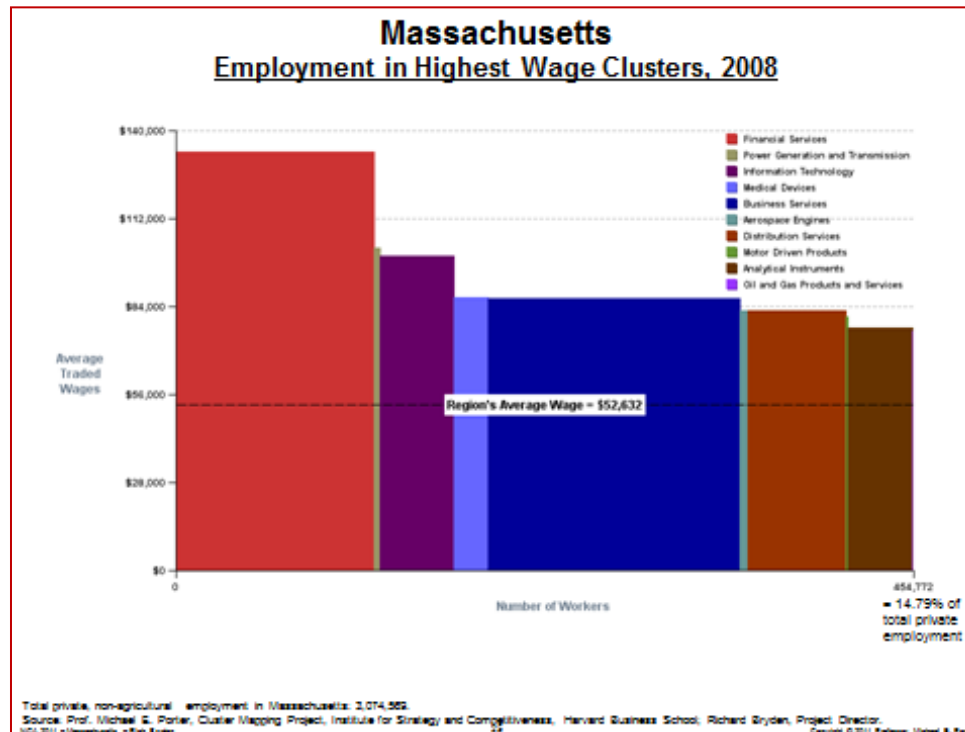


# Employment in Highest Wage Clusters

The ten highest wage traded clusters in the state are shown in decreasing order, with the width of the columns proportional to the number of workers in each cluster. The area of each cluster is thus equivalent to the overall wage sum the cluster generated in the state.

The chart displays how the average wage in the state's traded clusters is built up by highest wage clusters. Some high wage clusters may have a small impact on overall wage levels because of their small size, the case in some high wage clusters. Some large, high wage clusters are often those in services.

The comparison to the U.S. average wages by cluster (on the previous chart) gives an initial benchmark to evaluate the composition of average wages in the state economy. States can increase wages in two different ways: (1) increase the employment in high wage clusters relative to low wage clusters and/or (2) increase the state's relative wages in given clusters. In practice, the second effect dominates as the explanation for why state wages differ.



# Cluster Portfolio

## Cluster Linkages

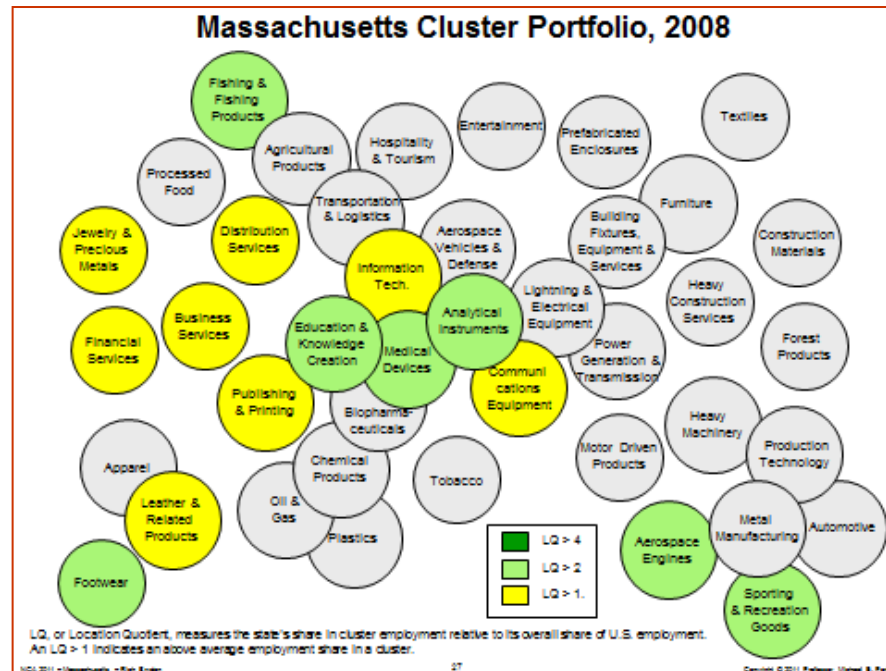
Our research on clusters, in addition to deriving a model of 41 distinct traded clusters, provides a measure for the strength of the links between these traded clusters. The strength of these links is summarized visually in the portfolio diagram below by the relative positioning and overlapping of cluster circles.

## Location Quotient (LQ)

The Location Quotient is a ratio measure of the concentration of a cluster in a state relative to that state's average share of employment in the U.S. traded economy. So, LQ is a measure of a cluster's level of concentration within a state, with an LQ > 1 indicating higher than average concentration in that state.

## Interpretation

Using Location Quotient as the measure of cluster concentration in the state, we overlay the state's cluster portfolio on the model of cluster linkages with three color levels as below. The pattern of a state's portfolio relative to the cluster linkages will often indicate paths of opportunity for development in clusters.



# Top Subclusters by National Employment Share

This chart selects the sub-clusters in the region with the highest National Employment Shares. The subclusters are grouped by cluster and ordered by subcluster National Employment Share.

Sub-clusters with a high share of national employment may form the basis for developing a competitive position in a cluster. Strengths in a breadth of related sub-clusters are an indication of an established position in a cluster.

**Massachusetts**  
**Top 50 Subclusters by National Employment Share, 2008**

	Subcluster	Cluster	Employment	Employment Rank in U.S.	Employment Share in U.S.	Change in Employment Share in U.S. 1999-2008
1	Saw Blades and Handaxes	Metall Manufacturing	1,770	2	38.8%	8.2%
2	Small Arms	Aerospace Engines	1,770	2	16.6%	4.2%
3	Specialty Footwear	Footwear	880	2	15.8%	2.7%
4	Cutlery	Leather and Related Goods	770	2	15.4%	3.1%
5	Games, Toys and Children's Vehicles	Sporting, Recreational and Children's Goods	1,919	1	14.4%	0.7%
6	Coated Fabrics	Leather and Related Products	1,128	2	13.0%	0.9%
7	Optical Instruments	Analytical Instruments	1,873	2	11.6%	0.9%
8	Swim and Non-sportswear	Sporting, Recreational and Services	197	2	9.7%	-1.0%
9	Sporting and Athletic Goods	Sporting, Recreational and Children's Goods	4,488	2	9.4%	5.2%
10	Medical Equipment	Medical Devices	7,221	2	9.1%	-0.6%
11	Office Equipment and Supplies	Printing and Printing	275	2	8.8%	4.4%
12	Laboratory Instruments	Analytical Instruments	7,389	2	8.7%	0.2%
13	Processed Seafood	Printing and Printing Products	175	2	8.6%	8.6%
14	Search and Navigation Equipment	Analytical Instruments	11,288	2	7.8%	0.2%
15	Securities, Brokers, Dealers and Exchanges	Financial Services	72,221	2	7.7%	-0.2%
16	Software	Information Technology	28,222	2	7.6%	-0.6%
17	Forklifts	Traffic	2,200	2	7.2%	0.8%
18	Research Concentrators	Education and Knowledge Creation	28,275	2	7.2%	1.2%
19	Process Instruments	Analytical Instruments	8,288	2	7.2%	-0.8%
20	Educational Institutions	Education and Knowledge Creation	140,718	2	7.1%	-1.2%
21	Leather Products	Leather and Related Products	992	2	7.0%	3.1%
22	Fish Products	Printing and Printing Products	2,121	2	6.8%	2.4%
23	Photographic Equipment and Supplies	Printing and Printing	1,421	2	6.3%	-1.2%
24	Diagnostic Substances	Medical Devices	1,770	2	6.2%	1.4%
25	Electrical and Electronic Components	Communications Equipment	4,661	2	6.1%	0.8%

Rising national employment share  
 Declining national employment share

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# Defining the Appropriate Region

## Massachusetts in BEA Economic Areas

This table lists by organization the top patent recipients in the region for the most recent five-year period. Patents are assigned to regions according to the inventor's address of residence. In the case of multiple inventors from different locations, the patent is assigned fractionally to each region. Universities and research institutes are highlighted in blue and government agencies in green.

### Interpretation:

Patenting is the best single measure of innovation output. States and regions with a healthy level of innovation tend to have patents originating from a variety of corporations across a number of fields as well as significant patenting from universities and research institutes. Concerns about innovative capacity arise when the patenting rate is low, patents originate principally from a government agency, or patenting is dominated by only a few large firms.

Rank	Organization	Patents 2006-2009	Rank	Organization	Patents 2006-2009
1	EMC Corporation	530	26	Link Corporation	87
2	Harvard University and Affiliated Hospitals	492	27	Veran Semiconductor Equipment Associates, Inc.	85
3	Massachusetts Institute Of Technology	447	28	Raytheon Company	81
4	Acushnet Company	280	29	Shiley Company Inc.	80
5	Sun Microsystems, Inc.	232	30	University Of Massachusetts	80
6	Analog Devices, Inc.	201	30	Wyeth	80
6	Intel Corporation	201	32	Qualcomm, Inc.	82
8	International Business Machines Corporation	178	33	Charles Stark Draper Laboratory, Inc.	81
9	Boston Scientific Scimed, Inc.	175	33	Maxtor Corporation	81
10	Mitsubishi Electric Research Laboratories, Inc.	172	33	Millipore Corporation	81
11	Cisco Technology, Inc.	157	36	Genetics Institute, Inc.	80
12	Hewlett-Packard Development Company, L.P.	140	37	Verizon Corporate Services Group Inc.	49
12	William Pharmaceutials, Inc.	138	37	The Math Works, Inc.	49
14	SchMed Life Systems, Inc.	112	39	MIA Com, Inc.	45
15	Gillette Company	112	39	Tereosys, Inc.	45
16	Callaway Golf Company	89	41	QSN Technologies Corp.	47
16	General Electric Company	89	42	Mitsubishi Electric Industrial Co., Ltd.	46
18	Veritas Pharmaceuticals, Inc.	82	43	Color Kinetics, Inc.	45
19	Noratel Networks Limited	82	44	Nokia Corporation	42
20	Bose Corporation	80	44	Sepracor Inc.	42
21	Coram Sylvanis Inc.	75	46	United States Of America, Navy	42
22	Wesco Corp. Of Indiana	74	47	MKS Instruments	41
22	Genzyme Corporation	72	47	Reado International, Ltd.	41
24	Accella Technologies, Inc.	71	47	American Power Conversion Corporation	41
25	Verizon Laboratories Inc.	70	47	Gracile International Corporation	41

Note: Universities, research institutes, and government organizations are highlighted.  
 Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School, Richard Bryden, Project Director.  
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# Traded Clusters and Subclusters in the US Economy

<b>Aerospace Engines</b> Aircraft Engines Precision Metal Products	<b>Chemical Products</b> Intermediate Chemicals and Gases Packaged Chemical Products Other Processed Chemicals Refractories Leather Tanning and Finishing Ammunition Special Packaging Treated Garments	<b>Furniture</b> Furniture Wood Materials and Products Furnishings Tableware and Kitchenware	<b>Metal Manufacturing</b> Fabricated Metal Products Metal Alloys Primary Metal Products Precision Metal Products Fasteners Wire and Springs Metal Processing Iron and Steel Mills and Foundries Nonferrous Mills and Foundries Metal Furniture Environmental Controls Pumps Saw Blades and Handsaws General Industrial Machinery Laundry and Cleaning Equipment Metal Armaments	<b>Processed Food</b> Milk and Frozen Desserts Baked Packaged Foods Coffee Processed Dairy and Related Products Meat and Related Products and Services Flour Specialty Foods and Ingredients Milling Candy and Chocolate Malt Beverages Paper Containers and Boxes Metal and Glass Containers Food Products Machinery
<b>Aerospace Vehicles and Defense</b> Aircraft Missiles and Space Vehicles Defense Equipment	<b>Communications Equipment</b> Communications Equipment Electrical and Electronic Components Specialty Office Machines	<b>Heavy Construction Services</b> Final Construction Subcontractors Primary Construction Materials Ceramic Tile Equipment Distribution and Wholesaling Fabricated Metal Structures and Piping Explosives	<b>Motor Driven Products</b> Motors and Generators Batteries Motorized Equipment Refrigeration and Heating Equipment Appliances Specialized Pumps Specialized Machinery Tires and Inner Tubes	<b>Production Technology</b> Machine Tools and Accessories Process Equipment Sub-systems and Components Hoists and Cranes Process Machinery Industrial Patterns Fabricated Plate Work Industrial Trucks and Tractors Ball and Roller Bearings
<b>Agricultural Products</b> Farm Management and Related Services Soil Preparation Services Irrigation Systems Packaging Fertilizers Agricultural Products Wine and Brandy Cigars Milling and Refining	<b>Construction Materials</b> Tile, Brick and Glass Plumbing Fixtures Wood Products Cut and Crushed Stone Gum and Wood Chemicals Rubber Products	<b>Heavy Machinery</b> Construction Machinery Farm Machinery Railroad Equipment and Rental Mining Machinery Machinery Components Valves and Pipe Fittings	<b>Oil and Gas Products and Services</b> Oil and Gas Machinery Hydrocarbons Oil and Gas Exploration and Drilling Oil Pipelines Petroleum Processing Oil and Gas Trading Water Freight Transportation Services	<b>Publishing and Printing</b> Publishing News Syndicates Signs and Advertising Specialties Photographic Services Photographic Equipment and Supplies Radio, TV, Publisher Representatives Printing Services Printing Inputs Paper Products Specialty Paper Products Inked Paper and Ribbons Office Equipment and Supplies
<b>Analytical Instruments</b> Laboratory Instruments Optical Instruments Process Instruments Search and Navigation Equipment Electronic Components	<b>Distribution Services</b> Merchandise Wholesaling Apparel and Accessories Wholesaling Catalog and Mail-order Food Products Wholesaling Farm Material and Supplies Wholesaling Transportation Vehicle and Equipment Distribution	<b>Hospitality and Tourism</b> Tourism Attractions Tourism Related Services Water Passenger Transportation Accommodations and Related Services Boat Related Services Ground Transportation	<b>Plastics</b> Plastic Materials and Resins Plastic Products Paint and Allied Products Synthetic Rubber	<b>Sporting, Recreational and Children's Goods</b> Sporting and Athletic Goods Games, Toys, and Children's Vehicles Motorcycles and Bicycles
<b>Apparel</b> Men's Clothing Women's and Children's Clothing Hosiery and Other Garments Accessories Knitting and Finishing Mills	<b>Education and Knowledge Creation</b> Educational Institutions Research Organizations Educational Facilities Patent Owners and Lessors Supplies	<b>Information Technology</b> Computers Electronic Components and Assemblies Peripherals Software Communications Services	<b>Power Generation and Transmission</b> Electric Services Turbines and Turbine Generators Transformers Porcelain, Carbon and Graphite Components Electronic Capacitors	<b>Textiles</b> Fabric Mills Specialty Fabric Mills Specialty Fabric Processing Textile Machinery Yarn and Thread Mills Carpets and Rugs Wool Mills Fibers Finishing Plants Specialty Apparel Components Women's and Children's Underwear Tire Cord and Fabrics
<b>Automotive</b> Motor Vehicles Automotive Parts Automotive Components Forgings and Stampings Flat Glass Production Equipment Small Vehicles and Trailers	<b>Entertainment</b> Video Production and Distribution Recorded Products Entertainment Equipment Entertainment Related Services Entertainment Venues	<b>Jewelry and Precious Metals</b> Jewelry and Precious Metal Products Costume Jewelry Cutlery Collectibles	<b>Prefabricated Enclosures</b> Recreational Vehicles and Parts Mobile Homes Trucks and Trailers Caskets Elevator and Moving Stairways Office Furniture Household Refrigerators and Freezers Aluminum Processing	<b>Tobacco</b> Cigarettes Other Tobacco Products Tobacco Processing Specialty Packaging
<b>Biopharmaceuticals</b> Biopharmaceutical Products Health and Beauty Products Containers	<b>Financial Services</b> Depository Institutions Securities Brokers, Dealers and Exchanges Insurance Products Health Plans Risk Capital Providers Investment Funds Real Estate Investment Trusts Passenger Car Leasing	<b>Leather and Related Products</b> Leather products Fur Goods Coated Fabrics Related Products Accessories	<b>Lighting and Electrical Equipment</b> Lighting Fixtures Electric Lamps Batteries Switchgear Electrical Parts Metal Parts	<b>Transportation and Logistics</b> Air Transportation Bus Transportation Marine Transportation Ship Building Transportation Arrangement and Warehousing Trucking Terminal Airports Bus Terminals
<b>Building Fixtures, Equipment and Services</b> Plumbing Products Drapery Hardware Fabricated Materials Heating and Lighting Furniture and Fittings Clay and Vitreous Products Floor Coverings Steam and Air-conditioning Stone and Tile Work Wood Cabinets, Fixtures and Other Products Concrete, Gypsum and Other Building Products	<b>Fishing and Fishing Products</b> Fish Products Fishing and Hunting Processed Seafoods	<b>Medical Devices</b> Surgical Instrument and Supplies Dental Instrument and Supplies Ophthalmic Goods Medical Equipment Diagnostic Substances Biological Products		
<b>Business Services</b> Management Consulting Online Information Services Computer Services Computer Programming Photocopying Marketing Related Services Professional Organizations and Services Engineering Services Laundry Services Facilities Support Services	<b>Footwear</b> Footwear Specialty Footwear Footwear Parts			
	<b>Forest Products</b> Paper Products Paper Mills Paper Industries Machinery Prefabricated Wood Buildings Wood Partitions and Fixtures			

See <http://www.isc.hbs.edu/cmp/help.html> for Excel listing.

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

# About This Report

This report was prepared in conjunction with Prof. Michael E. Porter's presentation before the National Governors Association Winter Meeting on February 26, 2011. It draws on data and analysis from the *Cluster Mapping Project* and other sources at the Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director. Additional information may be found at the website of the Institute for Strategy and Competitiveness, [www.isc.hbs.edu](http://www.isc.hbs.edu). None of this information may be duplicated, disseminated or copied without express written consent from the Institute for Strategy and Competitiveness.

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