Clustering and Competitiveness
Frameworks and Applied Research

Workshop on Applied Research
Centro de Investigación e Inteligencia Económica, UPAEP
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Institute for Strategy and Competitiveness
Leverage Model

Research and Publication

Information

Course Platform

Institution Building
Competitiveness and Economic Development

Main Activity Areas

- Institutions for Competitiveness
- National Economic Strategy
- Cluster policy
- Export diversification
- Location and company performance

- Competitiveness Index
- Cluster Mapping

- Microeconomics of Competitiveness
  - ITESM-EGAP
  - ITESM-Puebla
  - Universidad Panamericana
  - University of Sonora (UNISON)
  - UPAEP

Information
Course Platform
Institution Building
Research and Publication
MOC Network
What is Competitiveness?

A nation or region is competitive to the extent that firms operating there are able to compete successfully in the global economy while supporting rising wages and living standards for the average citizen.

- Competitiveness depends on the long term productivity with which a nation or region uses its human, capital, and natural resources.
  - Productivity sets sustainable wages, job growth, and standard of living.
  - It is not what industries a nation or region competes in that matters for prosperity, but how productively it competes in those industries.
  - Productivity in a national or regional economy benefits from a combination of domestic and foreign firms.

- Nations and regions compete to offer a more productive environment for business.
- Competitiveness is not a zero sum game.
Conceptual Framework for Competitiveness

Key Building Blocks

Microeconomic Competitiveness
- Sophistication of Company Operations and Strategy
- State of Cluster Development
- Quality of the National Business Environment

Macroeconomic Competitiveness
- Social Infrastructure and Political Institutions
- Macroeconomic Policy

Endowments
- Natural Resources
- Geographic Location
- Size
# Components of Macroeconomic Competitiveness

## Social Infrastructure and Political Institutions

- **Human development**
  - Basic education
  - Health

- **Political institutions**
  - Political freedom
  - Voice and accountability
  - Political stability
  - Government effectiveness
  - Decentralization of economic policymaking

- **Rule of law**
  - Security
  - Civil rights
  - Judicial independence
  - Efficiency of legal framework
  - Freedom from corruption

## Macroeconomic Policies

- **Fiscal policy**
  - Government surplus/deficit
  - Government debt

- **Monetary policy**
  - Inflation
What Determines Competitiveness?

The external business environment conditions that enable company productivity and innovation.
What Determines Competitiveness?

Microeconomic Competitiveness

- Quality of the National Business Environment
- State of Cluster Development
- Sophistication of Company Operations and Strategy

Macroeconomic Competitiveness

- Macroeconomic Policies
- Social Infrastructure and Political Institutions

Endowments

A critical mass of firms and institutions in each field to harness efficiencies and externalities across related entities
What Determines Competitiveness?

**Microeconomic Competitiveness**
- Quality of the National Business Environment
- State of Cluster Development
- Sophistication of Company Operations and Strategy

**Macroeconomic Competitiveness**
- Macroeconomic Policies
- Social Infrastructure and Political Institutions

**Endowments**

*Internal* skills, capabilities, and sophistication of management practices of companies
### What Determines Competitiveness?

<table>
<thead>
<tr>
<th>Microeconomic Competitiveness</th>
<th>Macroeconomic Competitiveness</th>
<th>Endowments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of the Business Environment</td>
<td>State of Cluster Development</td>
<td>Macroeconomic Policies</td>
</tr>
<tr>
<td>Sophistication of Company Operations and Strategy</td>
<td>Social Infrastructure and Political Institutions</td>
<td></td>
</tr>
</tbody>
</table>

- Macroeconomic competitiveness sets the **potential** for high productivity, but is **not sufficient**
- Productivity ultimately depends on improving the **microeconomic capability** of the economy and the **sophistication of local competition**
A New Definition of Competitiveness

Broad measure of productivity. Productivity ultimately drives prosperity, the key outcome policy makers are concerned about.

“GDP relative to the available labor force given the quality of a location to do business”

Captures both productivity of employees and of labor market institutions.

Linked to all ultimate drivers of productivity, in particular those amenable to policy action.
Test the Competitiveness Framework
An Empirical Approach

• Data
  – Broad set of data covering all dimensions of the framework
  – Unit of observation is the average response per indicator, country, and year
  – Data set is a panel across more than 130 countries and up to 8 years, using the
    World Economic Forum’s Global Executive Survey and other sources

• Approach
  – Step 1: Conduct separate, step-wise principal components analyses for MICRO, SIPI, to derive their averages per country-year; simple average for MP
  – Step 2: Comprehensive regression of MICRO, SIPI and MP on log GDP per capita with endowment controls and year dummies.

\[
\ln \text{Output per Potential Worker}_{c,t} = \alpha + \beta_{\text{MICRO}} \text{MICRO}_{c,t-1} + \beta_{\text{SIPI}} \text{SIPI}_{c,t-1} + \beta_{\text{MP}} \text{MP}_{c,t-1} + \\
\alpha_{\text{END}} \text{ENDOWMENTS}_{c,t-1} + \alpha_t \text{year}_t + \varepsilon_{c,t} \tag{1}
\]
Country Competitiveness Model
Subindex Impact at Various Stages of Development

<table>
<thead>
<tr>
<th>Subindex</th>
<th>Low</th>
<th>High</th>
<th>Linear Model (all Economies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICRO</td>
<td>0.21</td>
<td>0.48</td>
<td>0.31</td>
</tr>
<tr>
<td>SIPI</td>
<td>0.49</td>
<td>0.36</td>
<td>0.41</td>
</tr>
<tr>
<td>MP</td>
<td>0.30</td>
<td>0.16</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Note: Medium Stage weights are the average of Low and High weights.
Prosperity Performance in Mexican States

Mexico Real Growth Rate of GDP per Capita: 1.36%

Mexico GDP per Capita: $77,212

Source: INEGI. Sistema de Cuentas Nacionales de México.
The Changing Nature of International Competition

- Falling restraints to trade and investment
- Globalization of markets
- Globalization of value chains
- Shift from vertical integration to relying on outside suppliers, partners, and institutions
- Increasing knowledge and skill intensity of competition

- Nations and regions compete on becoming the most productive locations for business
- Many essential levers of competitiveness reside at the regional level
- Economic performance varies significantly across sub-national regions (e.g., provinces, states, metropolitan areas)
Mexico’s Competitiveness Profile 2011

Micro (49)

GDP pc (49)
GCI (61)

Macro (67)

Social Infrastructure and Pol. Institutions (77)

Rule of Law (99)

Human Development (55)

National Business Environment (50)

Related and Supporting Industries (36)

Demand Conditions (56)

Context for Strategy and Rivalry (62)

Factor Input Conditions (59)

Logistic (53)  Innov. (60)  Comm. (71)
Admin (57)  Capital (66)  Skills (80)


Significant advantage
Moderate advantage
Neutral
Moderate disadvantage
Significant disadvantage
What is a Cluster?

A geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (external economies)

- An end product industry or industries
- Downstream or channel industries
- Specialized suppliers
- Providers of specialized services
- Related industries (those with important shared activities, labor, technologies, channels, or common customers)
- Supporting Institutions: financial, training, trade associations, standard setting, research
A geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities.
The Evolution of Regional Economies
San Diego

Climate and Geography

U.S. Military


Hospitality and Tourism

Transportation and Logistics

Power Generation

Communications Equipment

Analytical Instruments

Information Technology

Aerospace Vehicles and Defense

Education and Knowledge Creation

Medical Devices

Bioscience Research Centers

Biotech / Pharmaceuticals
Clusters and Competitiveness

- Regions **specialize** in different sets of clusters
- **Cluster strength** directly impacts regional performance

- Each region needs its own distinctive **competitiveness strategy and action agenda**
  - Business environment improvement
  - Cluster upgrading
Assigning industries to clusters is challenging because there are numerous types of externalities and they are hard to measure directly.

Some studies measure industry relatedness, but do not define clusters:
- E.g., Ellison, Glaeser and Kerr (2010): input-output, skills and knowledge linkages for manufacturing industries

Very few studies define regional clusters:
- Feldman and Audretsch (1999) for science-based manufacturing clusters
- Feser and Bergman (2000) for input-output-based manufacturing clusters
- Porter (2003) for clusters of industries related by any type of externalities (in both manufacturing and service)

A major constraint to the analysis of clusters has been the lack of a systematic approach to defining the industries that should be included in each cluster and the absence of consistent empirical data on cluster composition across a large sample of regional economies. Lack of large sample empirical data is understandable, since knowledge spillovers and other positive externalities are difficult if not impossible to measure directly.

We proceed indirectly, using the locational correlation of employment across traded industries to reveal externalities and define cluster boundaries.
The 879 industries are grouped empirically into **3 types of industries** (and industries) with very different location drivers:

- **Local** clusters: utilities, retail clothing
- **Natural Resource Dependent** clusters: water supply, metal mining
- **Traded** clusters: footwear, biopharma, business services
## The Composition of Regional Economies

### United States

<table>
<thead>
<tr>
<th></th>
<th>Traded</th>
<th>Local</th>
<th>Natural Resource-Driven</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Employment</td>
<td>27.4%</td>
<td>71.7%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Employment Growth Rate</td>
<td>0.3%</td>
<td>1.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Average Wage</td>
<td>$57,706</td>
<td>$36,911</td>
<td>$40,142</td>
</tr>
<tr>
<td>Relative Wage</td>
<td>135.2%</td>
<td>86.5%</td>
<td>94.1%</td>
</tr>
<tr>
<td>Wage Growth Rate</td>
<td>3.7%</td>
<td>2.7%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Relative Productivity</td>
<td>144.1</td>
<td>79.3</td>
<td>140.1</td>
</tr>
<tr>
<td>Patents per 10,000 Employees</td>
<td>21.5</td>
<td>0.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Number of SIC Industries</td>
<td>590</td>
<td>241</td>
<td>48</td>
</tr>
<tr>
<td>Number of NAICS Industries</td>
<td>677</td>
<td>352</td>
<td>43</td>
</tr>
</tbody>
</table>

**Source:** Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director.
Porter’s (2003) US Cluster Mapping Project

• The 879 industries are grouped empirically into 3 types of clusters (and industries) with very different location drivers:
  – **Local** clusters: utilities, retail clothing
  – **Natural Resource Dependent** clusters: water supply, metal mining
  – **Traded** clusters: footwear, biopharma, business services

• The 592 traded industries are grouped into 41 traded clusters:
  – Relatedness between a pair of industries is based on the employment correlation of pairs of industries across regions. The **locational correlation captures any type of externalities** (e.g. technology, skills, demand, or others)
  – Industries are then grouped into clusters by **maximizing within-cluster relatedness**
  – Clusters often contain **manufacturing and service industries** and industries from different parts of the SIC system
## Automotive Cluster
### Broad Cluster Definition

<table>
<thead>
<tr>
<th>SUBCLUSTERS (16)</th>
<th>SIC</th>
<th>LABEL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NARROW CLUSTER DEFINITION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Vehicles</td>
<td>3711</td>
<td>Motor vehicles and car bodies</td>
</tr>
<tr>
<td>Automotive Parts</td>
<td>2396</td>
<td>Automotive and apparel trimmings</td>
</tr>
<tr>
<td></td>
<td>3230</td>
<td>Products of purchased glass</td>
</tr>
<tr>
<td></td>
<td>3592</td>
<td>Carburetors, pistons, rings, valves</td>
</tr>
<tr>
<td></td>
<td>3714</td>
<td>Motor vehicle parts and accessories</td>
</tr>
<tr>
<td></td>
<td>3824</td>
<td>Fluid meters and counting devices</td>
</tr>
<tr>
<td>Automotive Components</td>
<td>3052</td>
<td>Rubber and plastics hose and belting</td>
</tr>
<tr>
<td></td>
<td>3061</td>
<td>Mechanical rubber goods</td>
</tr>
<tr>
<td>Forgings and Stampings</td>
<td>3322</td>
<td>Malleable iron foundries</td>
</tr>
<tr>
<td></td>
<td>3465</td>
<td>Automotive stampings</td>
</tr>
<tr>
<td>Flat Glass</td>
<td>3210</td>
<td>Flat glass</td>
</tr>
<tr>
<td>Production Equipment</td>
<td>3544</td>
<td>Special dies, tools, jigs and fixtures</td>
</tr>
<tr>
<td></td>
<td>3549</td>
<td>Metalworking machinery, n.e.c.</td>
</tr>
<tr>
<td>Small Vehicles and Trailers</td>
<td>3799</td>
<td>Transportation equipment, n.e.c.</td>
</tr>
<tr>
<td>Marine, Tank &amp; Stationary Engines</td>
<td>3519</td>
<td>Internal combustion engines, n.e.c.</td>
</tr>
<tr>
<td>Related Parts</td>
<td>3364</td>
<td>Nonferrous die-casting, except aluminum</td>
</tr>
<tr>
<td></td>
<td>3452</td>
<td>Bolts, nuts, rivets, and washers</td>
</tr>
<tr>
<td></td>
<td>3493</td>
<td>Steel springs, except wire</td>
</tr>
<tr>
<td></td>
<td>3495</td>
<td>Wire springs</td>
</tr>
<tr>
<td></td>
<td>3562</td>
<td>Ball and roller bearings</td>
</tr>
<tr>
<td></td>
<td>3566</td>
<td>Speed changers, drives, and gears</td>
</tr>
<tr>
<td></td>
<td>3641</td>
<td>Electric lamps</td>
</tr>
<tr>
<td>Motors and Generators</td>
<td>3621</td>
<td>Motors and generators</td>
</tr>
<tr>
<td>Related Vehicles</td>
<td>3795</td>
<td>Tanks and tank components</td>
</tr>
<tr>
<td>Metal Processing</td>
<td>3316</td>
<td>Cold finishing of steel shapes</td>
</tr>
<tr>
<td></td>
<td>3398</td>
<td>Metal heat treating</td>
</tr>
<tr>
<td>Machine Tools</td>
<td>3541</td>
<td>Machine tools, metal cutting types</td>
</tr>
<tr>
<td></td>
<td>3542</td>
<td>Machine tools, metal forming types</td>
</tr>
<tr>
<td></td>
<td>3545</td>
<td>Machine tool accessories</td>
</tr>
<tr>
<td>Related Process Machinery</td>
<td>3543</td>
<td>Industrial patterns</td>
</tr>
<tr>
<td></td>
<td>3548</td>
<td>Welding apparatus</td>
</tr>
<tr>
<td>Industrial Trucks and Tractors</td>
<td>3537</td>
<td>Industrial trucks and tractors</td>
</tr>
<tr>
<td>Die-castings</td>
<td>3363</td>
<td>Aluminum die-castings</td>
</tr>
<tr>
<td><strong>WIDE CLUSTER DEFINITION</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Note: Clusters with overlapping borders or identical shading have at least 20% overlap (by number of industries) in both directions.
Specialization of Regional Economies
Leading Clusters in U.S. Economic Areas

- **San Diego, CA**
  - Medical Devices
  - Analytical Instruments
  - Hospitality and Tourism
  - Education and Knowledge Creation

- **San Jose-San Francisco, CA**
  - Business Services
  - Information Technology
  - Agricultural Products
  - Communications Equipment
  - Biopharmaceuticals

- **Seattle, WA**
  - Aerospace Vehicles and Defense
  - Information Technology
  - Entertainment
  - Fishing and Fishing Products

- **Los Angeles, CA**
  - Entertainment
  - Apparel
  - Distribution Services
  - Hospitality and Tourism

- **Chicago, IL-IN-WI**
  - Metal Manufacturing
  - Lighting and Electrical Equipment
  - Production Technology
  - Plastics

- **Pittsburgh, PA**
  - Education and Knowledge Creation
  - Metal Manufacturing
  - Chemical Products
  - Power Generation and Transmission

- **Boston, MA-NH**
  - Analytical Instruments
  - Education and Knowledge Creation
  - Medical Devices
  - Financial Services

- **New York, NY-NJ-CT-PA**
  - Financial Services
  - Biopharmaceuticals
  - Jewelry and Precious Metals
  - Publishing and Printing

- **Raleigh-Durham, NC**
  - Education and Knowledge Creation
  - Biopharmaceuticals
  - Communications Equipment
  - Textiles

- **Dallas**
  - Aerospace Vehicles and Defense
  - Oil and Gas Products and Services
  - Information Technology
  - Transportation and Logistics

- **Houston, TX**
  - Oil and Gas Products and Services
  - Chemical Products
  - Heavy Construction Services
  - Transportation and Logistics

- **Atlanta, GA**
  - Transportation and Logistics
  - Textiles
  - Motor Driven Products
  - Construction Materials

Automotive Cluster Specialization by Economic Area

Regions with high cluster specialization and high share of US employment (LQ>1.3 and top 10 employment)

Detroit-Warren-Flint, MI
(LQ=6.51, Share=13.8%)

Adjacent EAs tend to specialize in the same cluster

Regions with high cluster specialization and moderate share (LQ>1.3 and cluster employment > 1000)
Regions with high share of US financial services employment (in top 10% of all regions; share>2.5%) & high cluster specialization (LQ>1.01)

Regions with high cluster specialization (LQ>1.03; LQ_{c,r}>LQ_{c} 80-th Percentile)

Weak clusters with large employment size in high population areas
Clusters and Regional Prosperity: Leveraging the CMP data

• **Using a mix of databases:**
  – CMP, County Business Patterns (CBP) data, Census Bureau Longitudinal Business Database (LBD), USPTO data

• **Clusters, Jobs, Wages and Innovation**

• **Clusters and New Business Creation**

• **Evaluating U.S. Cluster Performance**
  – Using the CMP data, we can examine the cluster composition of regions: what are the strong clusters in a region? Which ones are creating jobs/innovations?
Clusters and Region-industry Growth in Employment, Patents, Establishments

\[
\ln \left( \frac{y_{ir2005}}{y_{ir1990}} \right) = \alpha_0 + \delta \ln(\text{Industry Spec}_{ir,1990}) + \\
\beta_1 \ln(\text{Cluster Spec}_{icr,1990}) + \beta_2 \ln(\text{Related Clusters Spec}_{cr,1990}) + \\
\beta_3 \ln(\text{Cluster Spec in Neighbors}_{cr,1990}) + \alpha_i + \alpha_r + \epsilon_{ir,t}.
\]

- Dep. variable is the EA-industry (ir) growth rate in y (employment/patents/…)
  - E.g., Pharmaceutical preparations industry in Raleigh-Durham-Cary (NC) EA

- Two types of explanatory variables (based on y):

  **Convergence** (\( \delta \)): Specialization of the EA in the industry
  **Agglomeration** (\( \beta \)): Cluster environment for the focal EA-industry:
  - Specialization of the EA in the cluster (\( \beta_1 \)) and in related clusters (\( \beta_2 \)) and strength of neighboring clusters (\( \beta_3 \))
  - E.g., Strength of the biopharmaceutical and related clusters (Medical devices, Analytical instruments) in the EA and strength of biopharma cluster in adjacent EAs

- Controls: Industry and EA FEs (\( \alpha_i, \alpha_r \))
Clusters and Region-industry Growth in Employment, Patents, Establishments

\[
\ln \left( \frac{y_{ir2005}}{y_{ir1990}} \right) = \alpha_0 + \delta \ln(\text{Industry Spec}_{ir,1990}) + \\
\beta_1 \ln(\text{Cluster Spec}_{icr,1990}) + \beta_2 \ln(\text{Related Clusters Spec}_{cr,1990}) + \\
\beta_3 \ln(\text{Cluster Spec in Neighbors}_{cr,1990}) + \alpha_i + \alpha_r + \varepsilon_{icr,t}.
\]

- For all measures of economic performance (employment, patents, establishments), we find that
  - Convergence (\(\delta < 0\))
  - Cluster-driven agglomeration benefits (\(\beta > 0\))
    - Regional Industries in stronger clusters are associated with higher growth
  - The positive impact of clusters on region-industry employment growth does not come at the expense of innovation, investments or wages but enhances them
Clusters and Region-industry Wage Growth

\[
\ln\left( \frac{\text{Wage}_{ir2005}}{\text{Wage}_{ir1990}} \right) = \alpha_0 + \delta \ln(\text{Industry Wage}_{i,r,1990}) + \\
\beta_1 \ln(\text{Cluster Wage}_{c,r,1990}^{\text{outside} i}) + \beta_2 \ln(\text{Related Clusters Wage}_{c,r,1990}^{\text{outside} c}) + \\
\beta_3 \ln(\text{Cluster Wage in Neighbors}_{c,r,1990}) + \alpha_i + \alpha_r + \epsilon_{i,c,r,t}.
\]

- Findings:
  - Convergence \((\delta < 0)\)
  - **Cluster-driven wage growth** \((\beta > 0)\):
    - Wages in the cluster \((\beta_1 > 0)\) and in neighboring clusters \((\beta_3 > 0)\)
    - The “productivity” of the cluster influences the “productivity” growth of the industries within the cluster
Clusters and Creation of New Regional Industries 1990-2005

\[
\text{New EA-industry}_{ir2005} = \alpha_0 + \beta_1 \ln(\text{Cluster Spec}_{c,r,1990}) + \beta_2 \ln(\text{Related Clusters Spec}_{c,r,1990}^{\text{outside c}}) + \\
\beta_3 \ln(\text{Cluster Spec in Neighbors}_{c,r,1990}) + \alpha_i + \alpha_r + \epsilon_{i,c,r,t}.
\]

- Sample: EA-industries non existing (zero employment) in the base year (1990)
- We examine the probability of the creation of a new EA-industry as of 2005
- Findings: \(\beta > 0\)
  - New regional industries emerge in regions with a stronger cluster environment
Clusters and Regional Growth

\[
\ln\left(\frac{\text{Employ}_{r,2005}}{\text{Employ}_{r,1990}}\right) = \alpha_0 + \delta \ln(\text{Employ}_{\text{strong clusters},r,1990}) + \beta \text{Reg Cluster Strength}_{r,1990} + \lambda \text{National Employ Growth}_{r,1990-05} + \alpha_{\text{Census Region}} + \epsilon_r.
\]

• Findings (\(\beta > 0\))

• The set of strong traded clusters in a region contribute to the employment growth of other activities in that region

• Same findings for regional patent and wage growth
This paper focuses on **early stage entrepreneurship**, using two indicators of **start-up activity**:
- count of new establishments by new firms in a EA-industry (i.e., **start-up establishments**), and the
- employment in these new firms (i.e., **start-up employment**)

We then compute the **growth rate in start-up activity** in regional industries

\[
\ln\left(\frac{y_{ir,t}}{y_{ir,t_0}}\right) = \alpha_0 + \delta\ln(y_{ir,t_0}) + \beta\ln(\text{Cluster Environment})_{icr,t_0} + \alpha_i + \alpha_r + \varepsilon_{icr,t}.
\]

We find that the **strength of the cluster environment contributes to**
- higher growth in new businesses formation in EA-industry
- higher growth in employment in new businesses in EA-industry
- higher survival rates of new business in EA-industry
Clusters and Economic Outcomes: Entrepreneurship
The Evidence

The stronger the cluster, the more likely new industries within the cluster are to emerge

The stronger the cluster, the higher the survival rate of new businesses

The stronger the cluster, the more dynamic is the process of new business formation

New Business Formation (+)

Survival Rates of New Businesses (+)

The stronger the cluster, the higher the job growth in new businesses

Job Growth In New Businesses (+)

Productivity Depends on How a State Competes, Not What Industries It Competes In

<table>
<thead>
<tr>
<th>State</th>
<th>State Traded Wage versus National Average</th>
<th>Cluster Mix Effect</th>
<th>Relative Cluster Wage Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>+27,171</td>
<td>7,028</td>
<td>20,142</td>
</tr>
<tr>
<td>New York</td>
<td>+24,102</td>
<td>3,628</td>
<td>20,474</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>+16,169</td>
<td>4,391</td>
<td>11,778</td>
</tr>
<tr>
<td>New Jersey</td>
<td>+13,535</td>
<td>3,761</td>
<td>9,774</td>
</tr>
<tr>
<td>California</td>
<td>+9,573</td>
<td>349</td>
<td>9,224</td>
</tr>
<tr>
<td>Maryland</td>
<td>+6,651</td>
<td>2,496</td>
<td>4,155</td>
</tr>
<tr>
<td>Washington</td>
<td>+5,652</td>
<td>2,692</td>
<td>2,960</td>
</tr>
<tr>
<td>Virginia</td>
<td>+5,319</td>
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On average, cluster strength is much more important (78.1%) than cluster mix (21.9%) in driving regional performance in the U.S.

Cluster Efforts Enhancing Competitiveness: The Case for Action

• Agglomeration largely driven by business environment conditions and ‘automatic’ cluster effects in a market process

BUT

• Exploitation of localized spill-overs not automatic
• Exploration of opportunities for joint action not automatic

• Cluster efforts enable locations to benefit more from what they have
Cluster initiatives provide a platform to discuss necessary improvements in competitiveness at the level where firms compete.

The organization of economic policies around clusters leverages positive spill-overs and mobilizes private sector co-investment.
Puebla Employment in Traded Clusters

Puebla Job Creation in Traded Clusters
2003 to 2008

Net traded job creation, 2003 to 2008:
+38,254

Indicates expected job creation given national cluster growth.*

* Percent change in national benchmark times starting regional employment. Overall traded job creation in the state, if it matched national benchmarks, would be +15,863

Mexico Cluster Mapping – Rich Bryden

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Traded Cluster Composition of the Puebla Economy

Overall change in the Puebla Share of Mexican Traded Employment: +0.09%

Puebla Overall Share of Mexican Traded Employment: 4.20%

LQ, or Location Quotient, measures the state’s share in cluster employment relative to its overall share of Mexican employment. An LQ > 1 indicates an above average employment share in a cluster.
**Puebla Wages in Traded Clusters vs. National Benchmarks**

- **Power Generation and Transmission**
  - Automotive
  - Chemical Products
  - Production Technology
  - Medical Devices
  - Agricultural Products
  - Motor Driven Products
  - Information Technology
- **Education and Knowledge Creation**
- **Heavy Machinery**
- **Transportation and Logistics**
- **Metal Manufacturing**
- **Analytical Instruments**
- **Biopharmaceuticals**
- **Business Services**
- **Textiles**
- **Heavy Construction Services**
- **Financial Services**
- **Plastics**
- **Forest Products**
- **Communications Equipment**
- **Furniture**
- **Publishing and Printing**
- **Apparel**
- **Processed Food**
- **Lighting and Electrical Equipment**
- **Hospitality and Tourism**
- **Prefab Enclosures**
- **Distrib Services**
- **Oil and Gas Products and Services**
- **Entertainment**
- **Fishing and Fishing Products**
- **Footwear**
- **Sporting, Recreational and Children's Goods**
- **Leather and Related Products**
- **Building Fixtures, Equipment and Services**
- **Construction Materials**
- **Jewelry and Precious Metals**
- **Tobacco**
- **Aerospace Vehicles and Defense**

![Graph showing wages in various clusters](image-url)

- **Puebla average traded wage**: 63,495 Pesos
- **Mexican average traded wage**: 86,006 Pesos

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

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*Mexico Cluster Mapping – Rich Bryden*
Mexico Value-Added and Wage Levels in Traded Clusters

Note: All values in current Mexican pesos
Mexico Value-Added and Wage Levels in Traded Clusters (continued)

Average Wage per Employee, 2008

Value-Added per Employee, 2008

Note: All values in current Mexican pesos

Mexico Job Creation in Traded Clusters

2003 to 2008

Job Creation, 2003 to 2008:

-150,000
-100,000
-50,000
0
50,000
100,000
150,000

Hospitality and Tourism
Business Services
Processed Food
Financial Services
Information Technology
Analytical Instrument
Heavy Construction Service
Power Generation and Transmission
Medical Devices
Chemical Products
Agricultural Products
Entertainment
Construction Materials
Forest Products
Footwear
Heavy Machinery
Lighting and Electrical Equipment
Aerospace Vehicles and Defense
Production Technology
Furniture
Tobacco
Prefabricated Enclosures
Apparel

Net traded job creation, 2003 to 2008:
+776,801

Mexico Traded Cluster Specialization within NAFTA

Change in Mexico’s Share of NAFTA Employment, 2003 to 2008

Overall change in the Mexico Share of NAFTA Traded Employment: +0.95%

Mexico Overall Share of NAFTA Traded Employment: 16.3%

Gracias

Please see:  
www.isc.hbs.edu/econ-clusters.htm  
www.isc.hbs.edu/econ-natlcomp.htm