Binational Industry Concentrations
Arizona-Sonora Region

Christopher Wilson and Alma Bezares
Cluster Based Economic Development:
A Pro-Competition and Data Driven Way to Focus Economic Development Resources

Note: relies heavily on concepts developed by Michael Porter and Christian Ketels
Competing Trends

- Globalization: stretching supply chains out across the world
- Agglomeration: Clustering industries in a small geographic area
- Regionalization/Reshoring/Nearshoring: Somewhere in between. Not quite clusters but a countercurrent to full blown globalization.
Why Do Businesses Cluster?

• Access to Inputs: Suppliers build specialized supply chains to feed inputs to the industry. Specialized workforce develops in the area.

• To take advantage of (and drive the construction of) shared resources--scientific, physical infrastructure, informational infrastructure, natural resources, regulatory environment, etc.

• To meet a large or specialized local or regional demand.

• To capitalize on existing complimentary industries (i.e. wine-tourism-food nexus)
Role of Innovation

- Innovation drives productivity, which drives competitiveness.
- Healthy clusters have significant innovation benefits.
- The move away from a closed, in-house lab, model to an open innovation model inherent in global value chains (OEM works with suppliers and outside experts to innovate) ironically strengthens importance of geographically clustered networks.
Where do Cluster-Based Strategies Fit into Overall Economic Development?

Anti-Competition "Industrial" Policy

Definitions and policies vary, but at its worst, can be:

- Firm Specific
- Weakens Competition and thus incentives to improve
- Politically driven
- Inconsistent across administrations

Examples: Subsidies, Tariff Barriers, Negotiated tax incentives

Cluster-Based Strategies

- Data reveals existing industrial clusters with roots (not politically driven)
- Industry/Cluster specific
- Pro-competition (seeks diversity and numerous firms competing within sector)

Examples: Specialized Education Programs, Industry Worker Training Programs, Specialized Infrastructure (port, pre-inspection), Business-Regulator Dialogue, Joint Marketing

Macro and Overall Business Environment Improvements (Cross-Cluster Strategies)

- Subregion, Region or Nation specific
- Pro-competition (robust business environment fosters competitive environment)

Examples: General Education, Responsible Fiscal and Monetary Policy, Trade Liberalization, Cutting Red-Tape, Simple Tax Code, General Infrastructure (overall highway network, broadband, etc.), Broad tax incentives
Supporting Cluster Development and Competitiveness

Principles:

• focus on improving productivity, not growing the size of the cluster
• Data-driven whenever possible
• Integrate cluster-based efforts with broader economic competitiveness enhancing efforts--complement and interact with, not replace other efforts
• Not creating clusters--facilitating their development
• Collaborative Government-Private Sector process. Also involving independent institutions, such as universities, is even better (Will be needed to support research and workforce development).
• In the border region, federal government may need to play a larger role given border management and other international issues. This is a good way to engage government as a partner.
Examples of Cluster-Enhancing Strategies

- Corporate Philanthropy to improve the business/social environment
- Trade Associations sharing costs (training facilities, some infrastructure investments, etc.)
- Courses for managers on regulatory affairs and best practices in the industry
- Create Industry-Based Groups/Trade Associations
- Create testing and standards infrastructure and organizations
- Government-Business dialogue on regulation of industry
- Businesses and trade groups work with local universities and technical schools to develop curricula
- Create university research centers and jointly fund research
- Support development of supplying industries and customer industries, strengthening the cluster-linkages across industries
- Joint marketing by trade associations
- Joint procurement
- Supporting focused scholarships to strengthen workforce and research/design/innovation capacity of the region
Industry-Based Groups

facilitate the flow of information and the definition of cluster-based strategies

- Industry Associations (company groups)
- Professional Associations (groups of individuals)
- Incubators, Accelerators, entrepreneurial networks
Cluster vs. Industry

- Clusters: Groups of firms and entities that are *linked* and *geographically proximate*
- We are identifying key industries, but we advocate the construction of strategies to support the clusters they are embedded in—upstream and downstream industries, educational institutions, etc.
Willingness to Upgrade

- With our methodology, we aim to identify binational, concentrated and dynamic industries as candidates to prioritize in economic development efforts
- Additionally, cluster-based prioritizations should take into account willingness to upgrade (Ketels, 2003)
### Some Basic Numbers

<table>
<thead>
<tr>
<th>Sonora</th>
<th>Arizona</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pop’n: 2,907,774 inhabitants (2014)</td>
<td>• Pop’n: 6,731,484 inhabitants (2014)</td>
</tr>
<tr>
<td>• Average wage: $87,016 pesos ~$6,846 USD (2014)</td>
<td>• Average wage: $46,797 USD (2013)</td>
</tr>
<tr>
<td>• Unemployment rate: 4.8% (April 2015)</td>
<td>• Unemployment rate: 6% (April 2015)</td>
</tr>
</tbody>
</table>
Ari-Son Region

• Definition
  – Sonora: San Luis Río Colorado, Puerto Peñasco, General Plutarco Elías Calles, Caborca, Altar, Sáric, Nogales, Santa Cruz, Naco, Agua Prieta
  – Arizona: Yuma, Pima, Santa Cruz, Cochise

• Total population: over 2 million people.
  • Mostly concentrated in Nogales, San Luis Río Colorado, Cochise County, Pima County and Yuma County.

• Border length: 360 miles.
## At the Border

### Table 1: Border Crossing/Entry Query Results at Port Level (Yearly)

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Year</th>
<th>Trucks</th>
<th>Trains</th>
<th>Buses</th>
<th>Bus Passengers</th>
<th>Personal Vehicles</th>
<th>Personal Vehicle Passengers</th>
<th>Pedestrians</th>
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<tbody>
<tr>
<td>AZ: Douglas</td>
<td>2009</td>
<td>25162</td>
<td></td>
<td>1979</td>
<td>13572</td>
<td>1514446</td>
<td>3893330</td>
<td>1314745</td>
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<td>33104</td>
<td></td>
<td>2267</td>
<td>13442</td>
<td>1571929</td>
<td>2821853</td>
<td>1011564</td>
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<tr>
<td></td>
<td>% Change</td>
<td>31.56%</td>
<td></td>
<td>14.55%</td>
<td>-0.96%</td>
<td>3.80%</td>
<td>-27.52%</td>
<td>-23.06%</td>
</tr>
<tr>
<td>AZ: Lukeville</td>
<td>2009</td>
<td>297</td>
<td></td>
<td>873</td>
<td>11896</td>
<td>322717</td>
<td>1087799</td>
<td>93815</td>
</tr>
<tr>
<td>AZ: Lukeville</td>
<td>2014</td>
<td>68</td>
<td></td>
<td>498</td>
<td>2679</td>
<td>316429</td>
<td>653483</td>
<td>44716</td>
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<tr>
<td></td>
<td>% Change</td>
<td>-77.10%</td>
<td></td>
<td>-42.96%</td>
<td>-77.48%</td>
<td>-1.95%</td>
<td>-39.93%</td>
<td>-52.34%</td>
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<tr>
<td>AZ: Naco</td>
<td>2009</td>
<td>1661</td>
<td></td>
<td>28</td>
<td>730</td>
<td>278960</td>
<td>660822</td>
<td>81815</td>
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<td>AZ: Naco</td>
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<td>3601</td>
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<td>12</td>
<td>451</td>
<td>298368</td>
<td>525988</td>
<td>79325</td>
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<tr>
<td></td>
<td>% Change</td>
<td>116.80%</td>
<td></td>
<td>-57.14%</td>
<td>-38.22%</td>
<td>6.96%</td>
<td>-20.40%</td>
<td>-3.04%</td>
</tr>
<tr>
<td>AZ: Nogales</td>
<td>2009</td>
<td>276877</td>
<td>563</td>
<td>11096</td>
<td>166567</td>
<td>2990497</td>
<td>7636384</td>
<td>4038356</td>
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<tr>
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<td>312010</td>
<td>795</td>
<td>9423</td>
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<td>3286532</td>
<td>6798080</td>
<td>2886022</td>
</tr>
<tr>
<td></td>
<td>% Change</td>
<td>12.69%</td>
<td>41.21%</td>
<td>-15.08%</td>
<td>1.32%</td>
<td>9.90%</td>
<td>-10.98%</td>
<td>-28.53%</td>
</tr>
<tr>
<td>AZ: San Luis</td>
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<td>39644</td>
<td></td>
<td>59</td>
<td>1394</td>
<td>2253331</td>
<td>4234176</td>
<td>2537177</td>
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<tr>
<td>AZ: San Luis</td>
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<td>31968</td>
<td></td>
<td>36</td>
<td>36</td>
<td>3028042</td>
<td>5536747</td>
<td>2287955</td>
</tr>
<tr>
<td></td>
<td>% Change</td>
<td>-19.36%</td>
<td></td>
<td>-38.98%</td>
<td>-97.42%</td>
<td>34.38%</td>
<td>30.76%</td>
<td>-9.82%</td>
</tr>
<tr>
<td>AZ: Sasabe</td>
<td>2009</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td>28002</td>
<td>66760</td>
<td>1013</td>
</tr>
<tr>
<td>AZ: Sasabe</td>
<td>2014</td>
<td>17551</td>
<td></td>
<td></td>
<td></td>
<td>31157</td>
<td>1369</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Change</td>
<td>-37.32%</td>
<td></td>
<td>-53.33%</td>
<td></td>
<td>35.14%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Bureau of Transportation Statistics
Industry Mapping

• **Objective:** The idea behind this study is that the industries along the U.S.-Mexico border cannot be delimited to the national arena as they interact with industries across the border and jointly develop.

• 5 subregions:
  • Cali-Baja
  • **Arizona-Sonora**
  • Paso del Norte
  • Coahuila-NL-Tamaulipas-Texas
  • Lower Rio Grande Valley

• The study intents to identify the **concentration** of the industries in the regions, analyze how **dynamic** are these industries across the time and verify if they are indeed **binational**.
Measuring Industrial Concentration

• What are the most important industries, in terms of employment, for the subregion of Cali-Baja?

**Location Quotient**

\[
LQ = \left( \frac{E_{ij}}{E_i} \right) \left( \frac{E_{fj}}{E_{fj}} \right)
\]

*A ratio equal to one means that the industry in that region has the same share of employment relative to the binational share.*

*A ratio greater than one indicates that the local economy has a greater share of that industry than the reference economy.*

– Important to promote regional competitiveness in industries that generate high levels of employment.
Methodology

- Analysis of industries by using the North American Industry Classification System (NAICS) 4-digit codes identifying industry groups.
- Binational study at the county/municipio level: Sources: US Census Bureau and INEGI (2009)
- Assumption: similar industries in both sides of the border have the same needs in terms of human resources.
SONORA

San Luis Río Colorado, Puerto Peñasco, General Plutarco Elías Calles, Caborca, Altar, Sáric, Nogales, Santa Cruz, Naco, Agua Prieta
Main Results

• 120 industries with LQ greater than 3
• 138 industries with LQ between 1.5 and 3
• 124 industries with LQ between 1 and 1.5
• These 382 industries concentrate almost 105 thousand jobs.
  – Nogales has 40 industries with LQ greater than 1 that employ more than 47 thousand people.
  – San Luis Río Colorado has 63 industries with high industrial concentration that offer 20,500 jobs.
Nogales- Most Concentrated Industries

- Hardware Manufacturing
- Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
- Other Electrical Equipment and Component Manufacturing
- Semiconductor and Other Electronic Component Manufacturing
- Agriculture, Construction, and Mining Machinery Manufacturing
- Medical Equipment and Supplies Manufacturing
- Other Support Services
- Other Specialty Trade Contractors
- Aerospace Product and Parts Manufacturing
- Office Administrative Services
Nogales - Employment in Most Concentrated Industries

- Hardware Manufacturing
- Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
- Other Electrical Equipment and Component Manufacturing
- Semiconductor and Other Electronic Component Manufacturing
- Agriculture, Construction, and Mining Machinery Manufacturing
- Medical Equipment and Supplies Manufacturing
- Other Support Services
- Other Specialty Trade Contractors
- Aerospace Product and Parts Manufacturing
- Office Administrative Services
San Luis Río Colorado - Employment in Most Concentrated Industries

San Luis Río Colorado

- Audio and Video Equipment Manufacturing
- Consumer Goods Rental
- Securities and Commodity Contracts Intermediation and Brokerage
- Outpatient Care Centers
- Retail of second-hand products
- Fishing
- Death Care Services
- Other Food Manufacturing
- Performing Arts Companies
- Cut and Sew Apparel Manufacturing

Y-axis: San Luis Río Colorado
X-axis: Employment in %
San Luis Río Colorado- Employment in Most Concentrated Industries

San Luis Río Colorado

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio and Video Equipment Manufacturing</td>
<td>1400</td>
</tr>
<tr>
<td>Consumer Goods Rental</td>
<td>100</td>
</tr>
<tr>
<td>Securities and Commodity Contracts</td>
<td>120</td>
</tr>
<tr>
<td>Intermediation and Brokerage</td>
<td>300</td>
</tr>
<tr>
<td>Death Care Services</td>
<td>400</td>
</tr>
<tr>
<td>Fishing</td>
<td>1600</td>
</tr>
<tr>
<td>Retail of second-hand products</td>
<td>200</td>
</tr>
<tr>
<td>Outpatient Care Centers</td>
<td>100</td>
</tr>
<tr>
<td>Other Food Manufacturing</td>
<td>300</td>
</tr>
<tr>
<td>Performing Arts Companies</td>
<td>100</td>
</tr>
<tr>
<td>Cut and Sew Apparel Manufacturing</td>
<td>1800</td>
</tr>
</tbody>
</table>
Other Results

• **Mining** is a concentrated industry, especially in the Caborca County.

• **Fishing** is also an activity that presents high levels of LQ in the Mexican side of the Ari-Son region.

• Not surprisingly, the **semiconductor and other electronic component manufacturing** industry is one of the most concentrated sectors in the municipios analyzed.

• Retail trade is also highly concentrated in the region.*
ARIZONA

Yuma, Pima, Santa Cruz, Cochise
Main Results

• 56 industries with a higher level of concentration than 3
• 122 industries with LQ between 1.5 and 3
• 142 industries with a level of concentration between 1 and 1.5
• These 320 industries employ almost 283,500 people
  – The Pima county accounts for 102 of the total industries with a level of concentration higher than one, generating more than 220 thousand jobs.
  – Meanwhile, the Yuma county has 81 industries with a level of concentration greater than one. These industries employ more than 30 thousand people.
Pima County- Most Concentrated Industries

- Metal Ore Mining
- Aerospace Product and Parts Manufacturing
- Other Leather and Allied Product Manufacturing
- Gambling Industries
- Urban Transit Systems
- Business Support Services
- RV Parks and Recreational Camps
- Rooming and Boarding Houses
- Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
- Clay Product and Refractory Manufacturing

Bar chart showing the concentration of these industries in Pima County.
Pima County- Employment in Most Concentrated Industries

Pima County

Metal Ore Mining
Aerospace Product and Parts Manufacturing
Other Leather and Allied Product Manufacturing
Gambling Industries
Urban Transit Systems
Business Support Services
RV Parks and Recreational Camps
Rooming and Boarding Houses
Clay Product and Refractory Manufacturing
Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
Yuma County- Most Concentrated Industries

Yuma County

- Business Support Services
- Land Subdivision
- Gambling Industries
- Basic Chemical Manufacturing
- Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing
- Other Food Manufacturing
- Support Activities for Crop Production
- Facilities Support Services
- RV (Recreational Vehicle) Parks and Recreational Camps
- Fiber, Yarn, and Thread Mills
Yuma County - Employment in Most Concentrated Industries

Yuma County
Other Results

• **Support activities for crop production** is a concentrated industry in the U.S. Side of the Ari-Son region.

• **Mining** is also present in other counties of this region, such as in the Cochise county.

• **Business support services** is a concentrated industry in the region.
Main Results

• 14 industries with LQ higher than 3
• 32 industries with industrial concentration between 1.5 and 3
• 75 industries with LQ between 1 and 1.5
• In total, these industries generate almost 350 thousand jobs.
  – This represents 64% of total employment in the Ari-Son region.
Ari-Son Region - Most Concentrated Industries

- Medical Equipment and Supplies Manufacturing
- Fishing
- RV (Recreational Vehicle) Parks and Recreational Camps
- Audio and Video Equipment Manufacturing
- Retail Trade of Used Goods
- Aerospace Product and Parts Manufacturing
- Semiconductor and Other Electronic Component Manufacturing
- Other Electrical Equipment and Component Manufacturing
- Other Furniture Related Product Manufacturing
- Hardware Manufacturing
- Metal Ore Mining
Ari-Son Region - Employment in Most Concentrated Industries

- Metal Ore Mining
- Hardware Manufacturing
- Other Furniture Related Product Manufacturing
- Semiconductor and Other Electronic Component
- Aerospace Product and Parts Manufacturing
- Retail Trade of Used Goods
- Audio and Video Equipment Manufacturing
- RV (Recreational Vehicle) Parks and Recreational
- Medical Equipment and Supplies Manufacturing
- Fishing
## Industries at the Binational Level

<table>
<thead>
<tr>
<th>NAICS</th>
<th>Employees</th>
<th>LQT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Ore Mining</td>
<td>2663</td>
<td>10.02487453</td>
</tr>
<tr>
<td>Hardware Manufacturing</td>
<td>1719</td>
<td>9.660238171</td>
</tr>
<tr>
<td>Other Furniture Related Product Manufacturing</td>
<td>1678</td>
<td>8.72804496</td>
</tr>
<tr>
<td>Other Electrical Equipment and Component Manufacturing</td>
<td>6229</td>
<td>7.852824255</td>
</tr>
<tr>
<td>Semiconductor and Other Electronic Component Manufacturing</td>
<td>12471</td>
<td>7.221379772</td>
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<tr>
<td>Aerospace Product and Parts Manufacturing</td>
<td>11760</td>
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<tr>
<td>Retail Trade of Used Goods</td>
<td>1166</td>
<td>6.691223619</td>
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<tr>
<td>Audio and Video Equipment Manufacturing</td>
<td>1452</td>
<td>5.490133338</td>
</tr>
<tr>
<td>RV (Recreational Vehicle) Parks and Recreational Camps</td>
<td>742</td>
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<tr>
<td>Fishing</td>
<td>2576</td>
<td>3.993249091</td>
</tr>
<tr>
<td>Medical Equipment and Supplies Manufacturing</td>
<td>6457</td>
<td>3.964800201</td>
</tr>
</tbody>
</table>
Relevant sectors

• **2122- Metal Ore Mining (greatest LQ):** although not the highest employer in the region, the metal ore mining industry has traditionally been one of the most important in Sonora and in Arizona
  – Sonora is the main producer of copper in Mexico.

• **3344-Semiconductor and Other Electronic Component Manufacturing (largest employer):** Although this sector has decelerated in recent years, it is still a strong employer in the Ari-Son region
  – Annual payroll Arizona: $649,136 thousand USD
  – Added value Sonora: $2,388,370 thousand pesos ~ $187,900 thousand USD
What’s next

• To identify how dynamic are those industries (changes in employment between 2009 and 2014)
• Analyze the binational interactions among the industries using trade data.

Limitations of the study

• Use of proxies for the total value of employment by industry for the United States
• Data not fully comparable (difference in codes 42,43, 44,45, and 46→ wholesale and retail trade; no government employees in the case of the U.S.)