Clustering for Competitiveness

New York’s Tech Valley: A Successful Regional Strategy for Innovation and Manufacturing

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Leading Countries and Regions are Responding to the Global Competitiveness Challenge

• They are providing:
  – High-level Focus on Growth and National Strength—not consumer choice...
  – Sustained Support for Universities
  – Rapidly Growing Funding for Research
  – Support for Innovative Small Businesses
  – Government-Industry Partnerships to bring new products and services to market
  – Substantial resources to create Innovation Clusters

What are Clusters?

- Geographic concentrations of knowledge and skills. In 1890, George Marshall called them “agglomerations” that co-locate tacit knowledge or know-how, that also:
  - Make available skilled labor & capitalize on lower transport costs
  - Share high fixed cost resources, eg, a lab or university, and
  - Enable rapid learning from competitors
What is an Innovation Cluster?

• 100 years later (1992), Michael Porter noted, clusters are “Geographic concentrations of interconnected companies and institutions in a particular field.”

• A self-reinforcing innovation system includes the “holy grail” of:
  – Linked industries, specialized services, connected universities, vocational training centers, research facilities, and supportive public and private organizations.
  – The Tech Valley complex has created a unique cluster that increasingly is achieving synergies.
Clusters in Innovation Ecosystems

• **A Dynamic Relationship:** The ecosystem concept captures the dynamic relationship between the different parts of an innovation system and underscores their ability to change and adapt through changes in incentives, leadership, and institutions.

• **Driving Growth:** The better the ecosystem, the better the support for both researchers and firms.

• **A Key Point:** Purposeful investments can create competitive advantage.
Global Competition has Renewed the Focus on Regional Innovation Clusters in the United States
The Policy Problem

The U.S. Manufacturing Sector is Under Stress:
A Severe Loss of Employment
A Growing Loss of Capacity with Implications for
Growth, Innovation, and Defense
CHALLENGES FACING US MANUFACTURING

• **Contraction:** U.S. manufacturing sector has contracted sharply since onset of 2007-09 financial crisis. Recovery in employment and value is substantial, but limited as is "reshoring".

• **Disaggregation:** Large vertically-integrated manufacturers that were traditional mainstays of U.S. manufacturing have disaggregated, moved many production functions offshore or turned to outsourcing.

• **Loss of Research:** Large industrial labs and other institutions that have supported U.S. manufacturing innovation have downsized or shut down major labs, e.g. Kodak & Bell labs.
CHALLENGES FACING US MANUFACTURING

• **Offshoring Innovation**: U.S. innovation moving offshore along with manufacturing.

• **Work Force Deterioration**: Work force has declined in size and often lacks necessary skills and know-how.
  
  - Insufficient attention to institutions providing middle skills training & links to industry

• **Globalization of Defense Supply Chain**: U.S. defense manufacturers increasingly reliant on foreign sources for components, materials, subassemblies.
What to do?

Look at Powerful Policy Models

• Past U.S. experience in addressing national manufacturing challenges was successful: the Sematech consortium was a key contributor to the recovery of the U.S. semiconductor industry.

• In a major change in U.S. attitudes, there is genuine interest in learning from other countries, e.g. the German Fraunhofer network and European vocational training.

• It is also important to draw on current best practice here in the United States.
The Albany Model: A Growing Success Story

The Albany-Malta corridor is a powerful policy model that draws on elements of both U.S. and foreign experience. Importantly, it reflects a long-term commitment at the state and regional level.
Albany’s CNSE is a Successful Hub for Cooperative Research and Innovation

• SUNY-Albany and RPI created the College of Nanoscale Science and Engineering (CNSE), in cooperation with IBM, now known as SUNY Polytech:
  – The State & IBM built a 300 nm fabrication facility
  – This advanced full scale facility, plus substantial funding incentives, attracted Sematech to CNSE
  – In turn, the region overcame international competitors to attract GLOBALFOUNDRIES which invested $6 Billion, and then $2 Billion more and now $15 Billion with more to come.

• CNSE/IBM cooperation created the R&D component but Global Foundries’ huge manufacturing investment capitalized on it to transform the region.
Key Features of this Successful Nano Cluster

- **CNSE:** An industry-oriented university, guided by entrepreneurial leadership, provided reputation, researchers, & resources, while serving as a neutral site for applied research.

- **Cutting Edge Equipment:** The construction of an up-to-date, 300nm fab in a university setting was unprecedented. It allowed for research, testing, and training on cutting-edge manufacturing equipment, attracted by the presence of a modern commercial scale fab.
Key Features of this Successful Nano Cluster

- **A strong corporate partner**: IBM brought reputation, resources and commitment to be an anchor tenant under the leadership of John Kelley.

- **New Investment**: The arrival of GlobalFoundries in Malta brought the region to a new level with one of the world’s largest and most modern fabs.

- **Regional Dynamism**: The Malta fab created large scale employment, drew in specialized suppliers, and significantly enhanced the region’s reputation as a center of advanced manufacturing, further contributing to regional growth.
What are some of the Lessons?

The mundane to the global...
Lessons from Albany: The Importance of Pre-Permitting

- **Pre-permitting:** This is an approach attributed to RPI President George Low, designed to address New York’s reputation for regulatory challenges for new manufacturing.

- **The Risk:** Potential investors worried that after substantial time, resources, and reputational capital were committed, the project could be blocked by the failure to obtain permit approvals.
  - These were often from multiple legal jurisdictions, some quite small, and most capable of unpredictable decisions.

- Pre-permitting is designed to obtain clearance for generic manufacturing projects and screen out regulatory or political showstoppers early on.
The Importance of Innovation Intermediaries

• The role of the **Center for Economic Growth (CEG)**, an umbrella group of businesses and regional leaders, was key in helping to brand the region, advocate for investments, share information, and finance studies.

• CEG’s ability to work above the fragmented political units of the region was a key contribution. This is an important consideration in other states such as Ohio and Pennsylvania that have many small jurisdictions.
Lessons from Albany: The Importance of Professional Proposals

- **Intermediary Institutions**: The Saratoga Economic Development Commission (SEDC) focused on attracting a semiconductor plant to tiny Malta, basically trying to land a whale.
- This effort was aided by the attractiveness of the region, the outstanding geology of the Luther Forest site and the presence of the CNSE research complex and the IBM fabs.
- CEG supported the entire process, backed by a steady stream of financing from the State Assembly for studies and infrastructure.
Lessons from Albany:
The Importance of Professional Proposals

• Quality Proposal: SEDC assembled a first-class engineering project team of planners, engineers, and technical experts to create a proposal that resonated with semiconductor executives.

• Luck Goes to the Diligent: One of the planners knew Hector Ruiz, the CEO of AMD, and further help was provided by the SARS epidemic, earthquakes, and distance from East Asia.

• A Robust Incentives Package: The $1.2 billion was seen as too much by some, but fortunately, it was more than the competition from Dresden.
New York’s Incentives Package for the AMD/GlobalFoundries Investment

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount ($million)</th>
</tr>
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<tbody>
<tr>
<td>State grant for buildings and equipment</td>
<td>$ 500</td>
</tr>
<tr>
<td>State grant for R&amp;D</td>
<td>150</td>
</tr>
<tr>
<td>Empire Zone tax credits/incentives</td>
<td>250 est.</td>
</tr>
<tr>
<td>Infrastructure (includes some federal funds)</td>
<td>300 est.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,200</strong></td>
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AMD Commitment: Create 1,205 jobs by 2014
- Maintain 1,205 jobs for 7 years

Source: “New York’s Big Subsidies Bolster Upstate’s Winning Bid for AMD’s $3.2-Billion 300-mm Fab,” *Site Selection* (July 10, 2006)

• The region realized the necessity of competing on a global scale.
Big Investment and Big Impact on Jobs

• One of the most salient measures of success for high-tech investments is the impact on job creation.

• The promised return for the incentives package for GlobalFoundries was some 1,205 jobs. This did not occur. GF created 3,538 on-site jobs.

• Given the multipliers for high-tech and industrial employment, i.e. just under 5x, this suggests a yield of some 17,300 indirect jobs.

• The CNSE complex employs 4,000+ jobs, which would yield another 20,000 jobs

• Induced employment in the region, the hospitality sector (restaurant/hotels/gaming), financial services, housing, and consumer goods, is substantial and growing.
Substantial Progress, but Real Challenges Remain

- **Sectoral concentration**: Tech Valley has achieved great progress, but it remains highly concentrated in one volatile sector, subject to strong global competition.
- **Funding for talent creation?**: Regional universities and community colleges face ongoing financial pressures.
- **Startup culture is emerging slowly**: Access to SBIR, angel and VC funds backed by incubators and accelerators is needed.
- **Pressure for diversification** (or dispersion) of state development resources has grown: This is understandable but it is important it not detract from the resources needed to sustain the continued development and growth of Tech Valley.
- **Leadership at Multiple levels**: Governors, State Assembly, University, and Corporate—all committed over time.
- **Global Challenges**: Innovation-based economic development can collapse under assault by state-supported firms that are unrestrained by normal market competition.
Lessons from U.S. and Foreign Models

• Key principles for a successful system to support manufacturing include:
  – Financial incentives for cooperation among universities, laboratories, and the private sector
  – Federal (or state) contributions have a disproportional catalytic effect in attracting private participation
  – Assuring a stable environment, i.e. bi-partisan support, is vital to maintaining industry and managerial commitments.

• Modifications will need to be made, but changes should be incremental, not stop and re-start.
Lessons from U.S. and Foreign Models

• Key principles for a successful system to support manufacturing include:
  – Providing substantial and sustained funding is necessary for the effective operation of consortia focused on mid-to-long term development of new materials, processes, and ultimately, products.
  – Maintaining a focus on applied research directly relevant to industry, including manufacturing process challenges.
  – Incentivizing firms to furnish prototype equipment for testing & validation can substantially enhance the value of common facilities and encourage cooperation across a broad and diverse group of participants.
Lessons from U.S. and Foreign Models

- **Successful support manufacturing includes focusing on the educational component.** This is where Fraunhofer excels. Centers need to provide training for the vocational level to graduate to post-doc.
  - U.S. students need more hands-on experience with real world problems.
  - Their exposure to small companies, large corporations, and universities in a cooperative research environment focused on manufacturing deepens the talent pool.
- **Ensuring cooperation with regional community colleges** is an essential component for the development of operators and technicians that are key elements in an effective manufacturing ecosystem
Lessons from U.S. and Foreign Models

• Key principles for a successful system to support manufacturing include:
  – Encouraging the creation of spinoffs needs to be a management priority with appropriate staff assigned or available
  – Entrepreneurial rhetoric needs to be backed by policies to provide entrepreneurial leave, seed funding, entrepreneurial training and assistance in applying to state and federal awards, e.g. the $3 billion SBIR program
    • Training is necessary in each of these areas
    • The culture needs to be genuinely supportive
  – **Startups are not automatic: they are driven by culture, policy, and funding**
Are we doing enough? Compared to What? Keep in mind the Intensity of the Competition

• The **Scale** of the German Fraunhofer System is impressive:
  – There are some 68 Institutes, often on university campuses.
  – It employs 22,000 skilled engineers, managers, fundraisers and grad students.
  – It invests some $2.2 billion annually with five year assured & increasing budgets.
  – It has an outstanding brand and deep links to both universities and industry.
The Case of ITRI

• ITRI (Industrial Technology Research Institute) in Taiwan is a tightly-linked innovation system:
  –It brings together two universities, a major research center, and a host of high-tech manufacturing companies in the Hsin-chu Park complex - many of which have spun out from ITRI itself

• Taiwan (pop. 23 million) spends $600 million a year on ITRI, plus the ITIC venture fund for promising startups
A Key Lesson: The Primacy of Place

The new institutions, the investments, the supply chains, the workforce training all need to be anchored in a local ecosystem, even as they interact nationally and globally.
Summary of Best Practices for Clustering from the New York Nanocluster

- **Leadership able to focus on new technological opportunities** and, as necessary, create new institutions to exploit them.
- **Maintain policy continuity** from government across administrations and election cycles.
- **Ensure industry leadership** as a partner, a co-funder, and a reputational anchor.
- **Provide substantial and sustained funding** to develop facilities not available elsewhere and to attract investment.
- **Make parallel investments** to encourage industry-oriented universities and researchers.
- Rely on active, **well-led regional development organizations** able to develop professional bids and carry-out pre-permitting.
- Encourage multiple **adaptable public-private partnerships**.
- Create cooperative programs to **develop a skilled workforce** with certificates and training directly relevant to industry needs.

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The Most Important Lesson

Federal, State and Regional investments in partnership with universities and industry can transform a region and the lives of those who live there
Thank You

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