Clustering for Competitiveness

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

May 23, 2017

National Academies of Science, Engineering and Medicine
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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
    - Source: NRC, "Rising to the Challenge, U.S. Innovation Policy for the Global Economy," 2012

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

AMD – New York's Successful Incentives Package	
Item	**Amount ($million)**
State grant for buildings and equipment	$ 500
State grant for R&D	150
Empire Zone tax credits/incentives	250 est.
Infrastructure (includes some federal funds)	300 est.
Total	$1,200

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

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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