Aspects of Cluster Development in Canada and Policy Implications

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Presentation to Canada-Japan Forum on Clusters
Tokyo, October 5, 2012
Key Elements of Clusters

- Established pillar companies with global reach
  - Firm linkages and networks
- Strong knowledge infrastructure
  - Research university, government labs etc.
- Strong, diverse and thick talent pool
  - Specialized education and training institutions
- Specialized support services such as
  - Tech-savy law and accounting firms
- Risk Tolerant Venture Capital and angel investors
- Governance regime
  - Civic leadership – ‘civic entrepreneurs’
- Supportive Policy Framework
Biopharma Clusters in Canada

- Average Annual Income:
  - $60,000
  - $50,000
  - $40,000
  - $30,000
  - $20,000

- Employment LQ:
  - 0.50
  - 0.75
  - 1.00
  - 1.25
  - 1.50
  - 1.75
  - 2.00

- Cities:
  - Toronto
  - Montreal
  - Ottawa
  - Vancouver
  - Saskatoon
  - Halifax
Aerospace Clusters in Canada

• Montreal
  – Aerospace capital, with Toulouse and Seattle;
  – $11.7 billion in sales in 2011;
  – 42,040 jobs;
  – 50 % of the Canadian workforce
  – 55 % of Canadian aerospace sales;
  – 70 % of Canadian R&D.

• Toronto
  – 2nd largest in Canada
    • Aircraft Systems & Equipment
    • Space Systems & Equipment
    • Aerostructures
    • Aircraft Integration
  – 22,000 jobs
  – 7 billion in revenues
    • 80% exports
    • 80% commercial
Enabling Factors in ICT Clusters

• Strong Local Research Infrastructure
  – Ottawa ICT – federal labs
  – Waterloo ICT – founding of university
  – Toronto – leading research university – ATI Technologies

• Critical trigger events
  – Ottawa – Bell Northern Research – US consent decrees
    • Failure of Microsystems International Ltd
  – Waterloo ICT – Waterloo Maple and early spin-offs
  – Toronto – core firms (ATI) and MNC headquarters (IBM)

• ‘Thick’ labour market supports cluster formation
  – Ottawa and Waterloo blessed with strong research infrastructure that fed growth of talent base
  – Toronto – diverse group of MNC’s and indigenous firms

• Challenge of finding management talent to support cluster growth
### Key Characteristics of Biopharma Clusters

<table>
<thead>
<tr>
<th>Specialization</th>
<th>Vancouver</th>
<th>Saskatoon</th>
<th>Toronto</th>
<th>Ottawa</th>
<th>Montréal</th>
<th>Halifax</th>
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</thead>
<tbody>
<tr>
<td>Human health (diverse)</td>
<td>Human health</td>
<td>Agriculture</td>
<td>Human health</td>
<td>Non-therapeutics; ICT-related</td>
<td>Human health</td>
<td>Human health and marine</td>
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<tr>
<td></td>
<td>(diverse)</td>
<td></td>
<td>‘megacentre’</td>
<td>ICT-related</td>
<td>‘megacentre’</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(diverse)</td>
<td></td>
<td>(pharma)</td>
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<tr>
<td>Characteristics</td>
<td>Rapidly growing</td>
<td>Ag-biotech centre</td>
<td>Scale &amp; diversity</td>
<td>Emergent</td>
<td>Drug discovery/pharma</td>
<td>Small ‘collection’ of firms</td>
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</table>

Catalysts in Biopharma Clusters

• Role of lead anchor firm sparked entrepreneurial activity & provided inspiration for the region
  – Vancouver: QLT Inc. (1981) working closely with UBC’s University-Industry Liaison Office (UBC-UILO) and resulting in spin-offs
  – Montreal: BioChem Pharma (1986) and a broad base of large pharmaceutical companies
  – Halifax: Biotech Working Group (1993); Ottawa: MDS-Nordion (1991); Toronto: Allelix (pioneering Canadian biotech company)

• Role of federal government through location of national laboratories
  – Saskatoon: NRC Plant Biotechnology Institute (NRC-PBI)
  – Montreal: NRC Biotechnology Research Institute (NRC-BRI)
Local Biotech Nodes in Global Networks

- Knowledge networks of innovative biotech firms are non-local
  - Firms that patent are more likely to draw upon global knowledge flows
  - Hire larger proportion of workers from outside Canada
  - More likely to grant IP rights to foreign firms
  - VC and capital from collaborative alliances more likely to come from non-local sources

- Canadian biotech firms more likely to have collaborative agreements with Canadian partners
  - Impact on patenting not as great as impact of international collaboration
Role of Government Policy

• Since 1997 Canada has introduced wide range of programs to support research and innovation
  – $13 billion in new funding
  – Canada Foundation for Innovation
  – Canada Research Chairs Program
  – Creation of Canadian Institutes for Health Research
  – Expanded support for Federal Granting Councils

• Strengthen public-private research & partnerships
  – Business-led Networks of Centres of Excellence
  – Centres of Excellence in Commercialization & Research
  – Strategic Aerospace and Defence Initiative

• Canada produces 4% of world scientific output with .5% of population
**Selected Cluster Initiatives**

- **National Research Council**
  - Industrial Research Assistance Program

- **Targeted Ontario Policies**
  - Sector strategies, 1992-1996
  - Office of Urban Economic Development
    - Support for Toronto, Ottawa cluster strategies
  - Biotechnology Cluster Innovation Program (BCIP)
  - Regional Innovation Networks/Ontario Network of Excellence

- **Quebec – early 1990s**
  - Industrial Atlas of Quebec
    - provincial economy as twelve industrial clusters

- **Lack of integration with federal strategy**
Cluster Strategies in Canada

- Clusters provide an effective means for policy support at the local and regional level
  - Need for ‘policy alignment’
  - Clusters as ‘focusing device’
- Problem of ‘missed opportunities’ (OECD)
  - Federal/provincial investments in research centres and programs
    - Lack of direct linkages to cluster strategies and policies
  - Lack of integration of science and industrial parks with cluster strategies
  - Lack of coordination of regional with national innovation systems
- Renewed interest
  - Industry Canada, FedDev (southern Ontario), Ontario government
## Mature Cluster Characteristics

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Total employment</th>
<th>Total firm count</th>
<th>% labour force with bachelor's degree or higher</th>
<th>Share of degrees in maths &amp; science</th>
<th>PhDs per 1,000 labour force</th>
<th>Average employment income (2005)</th>
<th>Unemp. rate</th>
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<td>$ 54,039</td>
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# Emerging Cluster Characteristics

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<th>Cluster</th>
<th>Total employment</th>
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