The core questions

How can we make globalization and rapid technological change work for our society?

What choices do we have to build an economy that is productive and competitive, and that provides opportunities for people in all parts of society to do well?
Three kinds of competition

FIRMS

PLACES

PEOPLE

Different rules; different strategies

Richard K. Lester

The Globally-Integrated Enterprise

“A globally integrated company locates operations and functions anywhere in the world based on the right cost, the right skills and the right business environment . . . . . .

Work flows to the places where it will be done best. It’s like water finding its own level. The forces driving it are irresistible. The genie's out of the bottle, and there's no stopping it.”

-- IBM CEO Sam Palmisano

Richard K. Lester
As the competition between **firms**
globalizes . . . .

. . . . the competition between **places** intensifies.

---

**The IPC’s research agenda**

How **FIRMS** compete to sell products and services.

How **PLACES** compete for the most desirable economic activities.

How **PEOPLE** prepare to compete, through education, skill development, etc.
Today’s topic

How can local economic communities prosper in the rapidly changing, increasingly open global economy?

Two competing innovation scenarios

‘Hollowing-out’
- Local companies reaching farther afield to tap into the global network of ideas and skills, and eventually moving out altogether.

‘Agglomeration’
- Local companies strengthening their local ties
- Local/regional economy emerging as a center of new knowledge creation and application, stimulating and attracting new enterprise.

What will determine the outcome?
Focus on universities as ‘engines’ of local economic development

◆ For national and local governments
  + Universities are a source of key assets in the innovation economy (skilled people, ideas, etc.)
  + They attract other key economic development resources (educated people, firms, VC, etc.)
  + They don’t move!
◆ For firms
  + Universities can provide key inputs into innovation process (also possibly at lower cost)
◆ For universities themselves
  + A new source of revenue
  + . . . . and also new challenges

“. . . the bell towers of academia have replaced smokestacks as the drivers of the American urban economy.”

-- Initiative for a Competitive Inner City/CEOs for Cities

Richard K. Lester
‘Standard model’ of university engagement in the local economy

- University-initiated technological entrepreneurship.
  - Laboratory research
  - Discovery/invention
  - Disclosure
  - Patenting
  - Licensing
  - Spinoffs

- But the model is incomplete.
- University role isn’t just about ‘tech transfer’.

Myth #1: Economic significance of university spin-offs

- New business formation around university technology, though increasing, is still a small contributor to the total number of business starts (2-3% or less in the U.S.)

<table>
<thead>
<tr>
<th></th>
<th>U.S. universities</th>
<th>U.S. total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startups</td>
<td>400-500/yr*#</td>
<td>550,000/yr</td>
</tr>
<tr>
<td>Patents</td>
<td>~ 3700/yr</td>
<td>~ 150,000/yr</td>
</tr>
</tbody>
</table>

*Startups licensing university IP
*Total number of university-related startups: 8,000-10,000/yr
Top U.S. Patent Award Recipients -- 2006

1. IBM 3621
2. Samsung 2451
3. Canon 2366
4. Matsushita 2229
5. Hewlett-Packard 2099
6. Intel 1959
7. Sony 1771
8. Hitachi 1732
9. Toshiba 1672
10. Micron Technology 1610

127. MIT 139
153. Caltech 116


Myth #2: Payoff from university technology transfer

- Total licensing revenue to universities is -- and will remain -- a small fraction of research revenues (4-6% in U.S.)
- Don’t expect licensing to transform the finances of the university.
Myth #3: Role of patenting & licensing in university tech transfer

- Licensing university patents is only one of several mechanisms that firms use to access university-developed science and technology
- Indirect mechanisms may be more important (e.g., industry hiring of university graduates)

“The most important contribution Stanford makes to Silicon Valley is to replenish the intellectual pool every year with new graduate students.”

-- Gordon Moore, Chairman Emeritus, Intel
The LIS Project: An international, interdisciplinary collaboration

**Sponsors**
- Alfred P. Sloan Foundation
- National Science Foundation
- TEKES
- Norwegian Research Council
- Cambridge-MIT Institute (UK)
- UTRI (Japan)

**Research Units**
- Industrial Performance Center, MIT
- SENTE, University of Tampere
- Helsinki University of Technology
- Center for Business Research, University of Cambridge
- Rogaland Research Institute
- University of Tokyo

**Disciplines**
- Management science
- Entrepreneurship studies
- Economics of innovation
- Engineering systems
- Urban and regional studies
- Political science

An innovative region is innovative because of . . .

- Strong local **generation** of new technologies

- Low resistance to **adoption** of new technologies (from all over)

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‘Outside-in’ perspective on university role

How can universities strengthen the abilities of local firms to *take up* and *apply* new technological and market knowledge productively?

(This is a broader question than just asking: how well are universities transferring their technology to industry?)
LIS Interviews

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>308</td>
</tr>
<tr>
<td>Finland</td>
<td>238</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>103</td>
</tr>
<tr>
<td>Japan</td>
<td>84</td>
</tr>
<tr>
<td>Norway</td>
<td>31</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>764</strong></td>
</tr>
</tbody>
</table>

An additional 117 interviews were carried out in Taiwan.

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Akron, Ohio

“Out of the Ashes”

- From car tires to advanced polymers
  - From mass production to customized production

Researcher: Sean Safford

Richard K. Lester
Charlotte, North Carolina

“Unplanned combustion”

- From a backyard hobby to a multi-billion dollar NASCAR motor sports/entertainment complex
  - From mechanical crafts to mechanical engineering science

Researchers: Carlos Martinez-Vela and Kimmo Viljamaa

Richard K. Lester

Tampere, Finland

“From ‘old-tech’ to ‘high-tech’”

- How the mechanical engineering industry was infused by ICT

Researchers: Carlos Martinez-Vela and Kimmo Viljamaa

Richard K. Lester
Cambridge, Massachusetts

“High-tech synthesis”

- How the integration of computational science, biology, and medicine is creating a new industry.

Aberdeen (UK) & Stavanger (Norway)

“From ‘black gold’ to ‘human gold’”

- Transitioning from a resource-based to a knowledge economy.

Researchers: Sachi Hatakenaka, Martin Gjelsvik, Richard Lester, Petter Westnes, & Wei Gao
Finding I: Multiple university roles in the local economy

- Create
- Attract
- Unlock
- Adapt
- Combine

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### Finding II: Firms seek different inputs from different universities

- Help with specific problems (‘analytical’)
- Staying current; participating in ongoing conversations about the direction of technologies, markets, curricula (‘interpretive’)

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### Four pathways of regional innovation-led growth

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Indigenous creation of new industry</td>
<td>Silicon Valley: Personal computers</td>
</tr>
<tr>
<td></td>
<td>Boston: Systems biology</td>
</tr>
<tr>
<td>II. Transplantation of new industry into region</td>
<td>I-85 corridor (NC/SC): Automotive industry</td>
</tr>
<tr>
<td></td>
<td>Taipei-Hsinchu corridor (Taiwan): Electronics industry</td>
</tr>
<tr>
<td>III. Diversification of existing industry into new</td>
<td>Akron, OH: Tires ➔ Advanced polymers</td>
</tr>
<tr>
<td></td>
<td>Rochester, NY: Cameras, copiers ➔ Opto-electronics</td>
</tr>
<tr>
<td>IV. Upgrading of existing industry</td>
<td>Tampere, Finland: Industrial machinery</td>
</tr>
<tr>
<td></td>
<td>Charlotte, NC: Motor sports (NASCAR)</td>
</tr>
</tbody>
</table>
Type I: Indigenous creation of new industry

Type II: Transplantation of new industry

Type III: Diversification of old industry into related new

Type IV: Upgrading of mature industry

- Success conditions (and failure modes) for each of these pathways are different.
- Patterns of innovation in each case are different
- Roles of educational institutions, financial institutions, government, and others for each pathway are different

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<table>
<thead>
<tr>
<th>TYPE I CREATING NEW INDUSTRIES</th>
<th>TYPE IV UPGRAADING EXISTING INDUSTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing</td>
<td>Internal financing, supplier financing, govt. financing for demonstrations</td>
</tr>
<tr>
<td>Innovation culture</td>
<td>Customer-driven; TQM; continuous improvement; ‘best practice’</td>
</tr>
<tr>
<td>Local anchors</td>
<td>Lead firms</td>
</tr>
<tr>
<td>Education and training</td>
<td>Lead customers/users</td>
</tr>
<tr>
<td>Leadership in the public space</td>
<td>BS/MS-level engineers; faculty-student knowledge of industry practices and business problems. Internships, rotations.</td>
</tr>
<tr>
<td>Technology transfer</td>
<td>Participate in regulatory processes; global scanning for best practice; ‘foresight’ exercises</td>
</tr>
</tbody>
</table>

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Finding III: University role in local innovation system depends on industry development pathway

<table>
<thead>
<tr>
<th>Creating New Industries (I)</th>
<th>Industry Transplantation (II)</th>
<th>Diversification of old industry into related new (III)</th>
<th>Upgrading of mature industry (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td> Forefront science and engineering research</td>
<td></td>
<td></td>
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<tr>
<td> Aggressive technology licensing policies</td>
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<tr>
<td> Promote/assist entrepreneurial businesses (incubation services, venture mentorship, etc.)</td>
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<tr>
<td> Cultivate ties between academic researchers and local entrepreneurs &amp; financiers</td>
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<tr>
<td> Creating an industry identity</td>
<td></td>
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<tr>
<td>• Participate in standard-setting</td>
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<tr>
<td>• Evangelists</td>
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<tr>
<td>• Convene conferences, workshops, entrepreneurs’ forums, etc.</td>
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<td></td>
<td></td>
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<tr>
<td> Education/manpower development</td>
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<tr>
<td> Responsive curricula</td>
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<tr>
<td> Technical assistance for subcontractors, suppliers</td>
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<tr>
<td> Problem-solving for industry through contract research, faculty consulting, etc.</td>
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<tr>
<td> Education/manpower development</td>
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</tr>
<tr>
<td> BS/MS engineers with industry knowledge</td>
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<td></td>
<td></td>
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<tr>
<td> Global best practice scanning</td>
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<td></td>
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</tr>
<tr>
<td> Convening foresight exercises</td>
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<td></td>
<td></td>
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<tr>
<td> Convening user-supplier forums</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td> Bridging between disconnected actors</td>
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</tr>
<tr>
<td> Facilitating links between startups and established firms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td> Creating local consortia and other forums for promoting local conversations</td>
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<td></td>
<td></td>
</tr>
<tr>
<td> Creating an industry identity</td>
<td></td>
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</tbody>
</table>

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To sum up . . . .

- Not all regions are like Silicon Valley.
- Not all industries are like biotech and software.
- Not all universities are like Stanford.

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New perspectives, new strategies

- From technology transfer to technology take-up
- From universities as problem solvers to universities as public space
- From ‘fountains’ to ‘forums’
- From clusters to hubs

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Conclusions

- The standard model of the economic role of the university is too narrow. Universities have many different ways to contribute to local innovation processes.
- Avoid a one-size-fits-all approach to the economic role. Different industries, and different development pathways, demand different kinds of university participation in local innovation processes.
- Universities can -- and should -- approach their role in local innovation processes strategically. This means aligning university efforts with what is actually happening in the local economy.

Richard K. Lester
For further information see: