Universities, Innovation, and the Competitiveness of Local Economies

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Four key points

- Universities should embrace their role as economic actors.
- The conventional view of this role is too narrow.
- A 'one-size-fits-all' approach to economic development is common but not wise.
- Universities need to approach economic development strategically.

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The question

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

3

The importance of innovation

Productivity growth

Resilience

Adaptability

4

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?

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New fears of a 'flat world'

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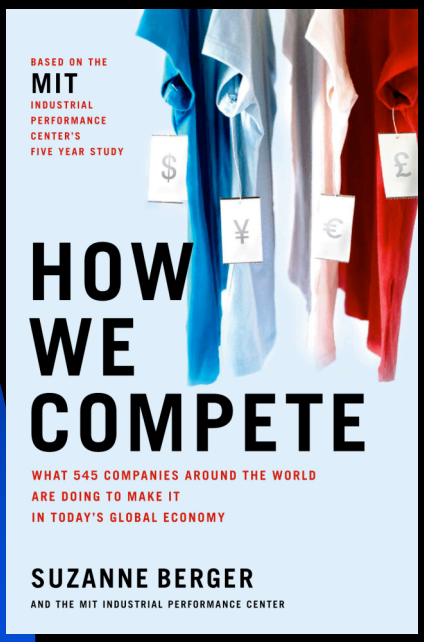

New fears of a 'flat world'

"There is nothing that guarantees that Americans or West Europeans will continue leading the way [in innovation.]"

--Tom Friedman, *It's a Flat World, After All* ,NYT, 3 April 2005

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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

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'Standard model' of university engagement in the local economy

- University-initiated technological entrepreneurship.
  - Inventions.
  - Patents.
  - Licenses.
  - Spinoffs.
  - Local SMEs.
- But the model is incomplete.
- University role isn't just about 'tech transfer'.

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Myth #1: Economic significance of university spin-offs

- Several well-known success stories
- But 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.):
  - Startups that license university IP: 400-500/yr
  - Total university-related startups: 8000-10,000/yr (??)
  - Total rate of new employer-firm starts: ~550,000/yr
  - Patents issuing to U.S. universities: ~3700/yr
  - Total U.S. patents granted: ~150,000/yr

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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.
- A few highly remunerative licenses . . .
  - But only 125 university licenses (out of >20,000 total) yield more than $1M/yr.
- Half of U.S. TLOs estimated to make net negative contribution to university finances
- Other benefits -- e.g., promoting entrepreneurial culture on campus
- But don't expect licensing to transform the finances of the university
  - (Administrators need to be clear about goals and expectations)

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Myth #3: Contribution of patenting & licensing to university tech transfer

- Licensing university patents is only one of several mechanisms that firms use to access university-developed science and technology
- Other mechanisms used by firms include:
  - Applying new university research in the open literature
  - Using university scientists as consultants to apply research conducted at other universities
  - Collaborating with academic scientists to apply new university research developed elsewhere
- Indirect mechanisms may be more important (e.g., industry hiring of university graduates)
- In most industries, patents are not the primary basis of competition

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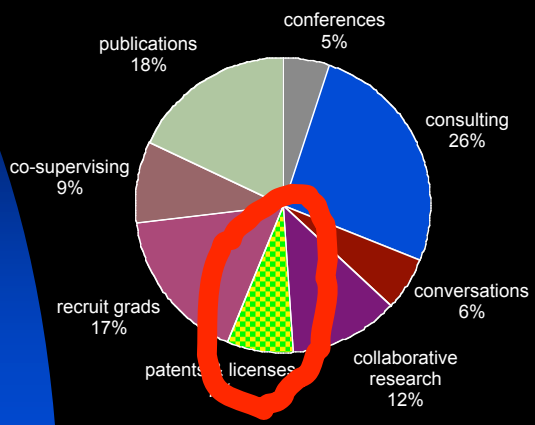
At MIT, even patent holders downplay the role of patenting and licensing in university tech transfer.



Source: Agrawal and Henderson, "Putting patents in context", Management Science, Jan. 2002.
Based on interviews with 68 MIT faculty in Mech E. and EECS with at least one patent and license.

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Local Innovation Systems Project

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The LIS Project: An international, interdisciplinary collaboration

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Alfred P. Sloan Foundation
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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

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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?

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LIS Case Portfolio

Country	Location	Industry/technology
USA	Rochester, NY	Opto-electronics
USA	Akron, OH,	Advanced polymers
USA	Allentown, PA	Opto-electronics/steel
USA	Boston, MA	Bioinformatics
USA	New Haven, CT	Biotechnology
USA	Charlotte, NC	Motor sports
USA	I-85 Corridor, NC/SC	Autos
USA	Alfred-Corning	Ceramics
USA	Youngstown, OH	Steel/autos
Finland	Tampere	Industrial machinery
Finland	Turku	Biotechnology
Finland	Seinajoki	Industrial automation
Finland	Pori	Industrial automation
Finland	Helsinki	Wireless
Finland	Oulu	Medical
UK	Central Scotland	Opto-electronics
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UK	Cambridge	Bioinformatics
Taiwan	Taipei-Hsinchu	Electronics
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LIS Interviews

	Number of interviews
United States	258
Finland	238
United Kingdom	103
Japan	84
Norway	31
TOTAL	714

An additional 117 interviews were carried out in Taiwan.

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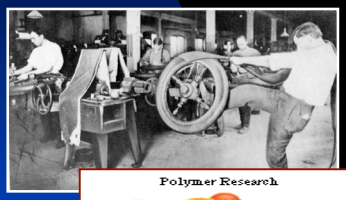
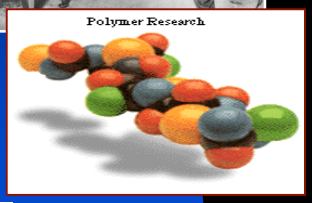
Akron, Ohio

"Out of the Ashes"





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

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Aberdeen (UK) & Stavanger (Norway)

"From 'black gold' to 'human gold'"

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

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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

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Tampere, Finland

"From 'old-tech' to 'high-tech"

- How the mechanical engineering industry was infused by ICT

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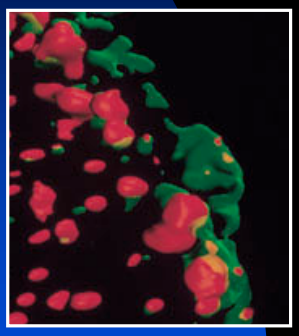
Cambridge, Massachusetts

"High-tech synthesis"



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

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Finding I: Multiple university roles in the local economy

- Create
- Attract
- Unlock
- Adapt
- Combine

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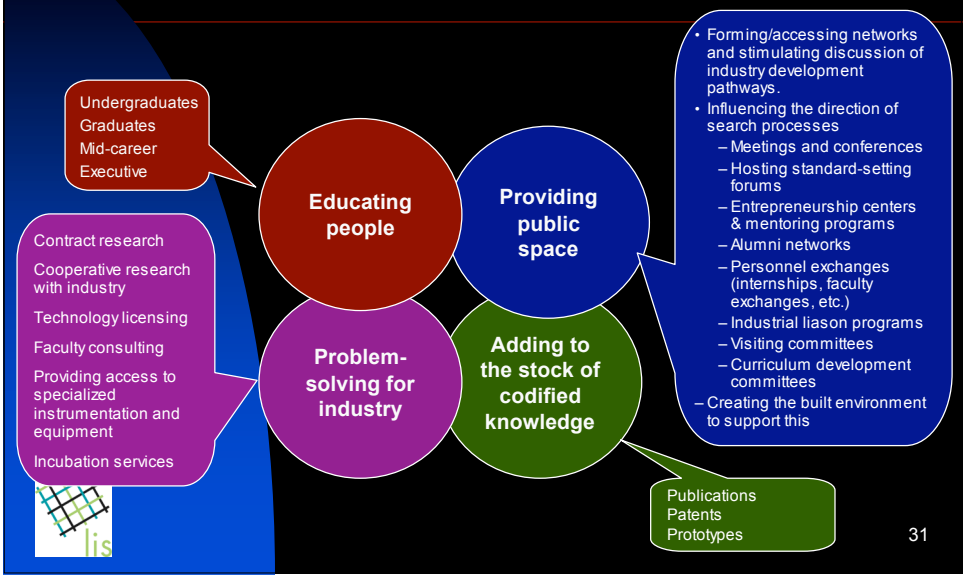
Finding I: Multiple university roles in the local economy



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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

I. Indigenous creation of new industry
   - Silicon Valley: Personal computers
   - Boston: Systems biology

II. Transplantation of new industry into region
   - I-85 corridor (NC/SC): Automotive industry
   - Taipei-Hsinchu corridor (Taiwan): Electronics industry

III. Diversification of existing industry into new
   - Akron, OH: Tires ➔ Advanced polymers
   - Rochester, NY: Cameras, copiers ➔ Opto-electronics

IV. Upgrading of existing industry
   - Tampere, Finland: Industrial machinery
   - Charlotte, NC: Motor sports (NASCAR)

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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

Type I: Indigenous creation of new industry

Type II: Transplantation of new industry

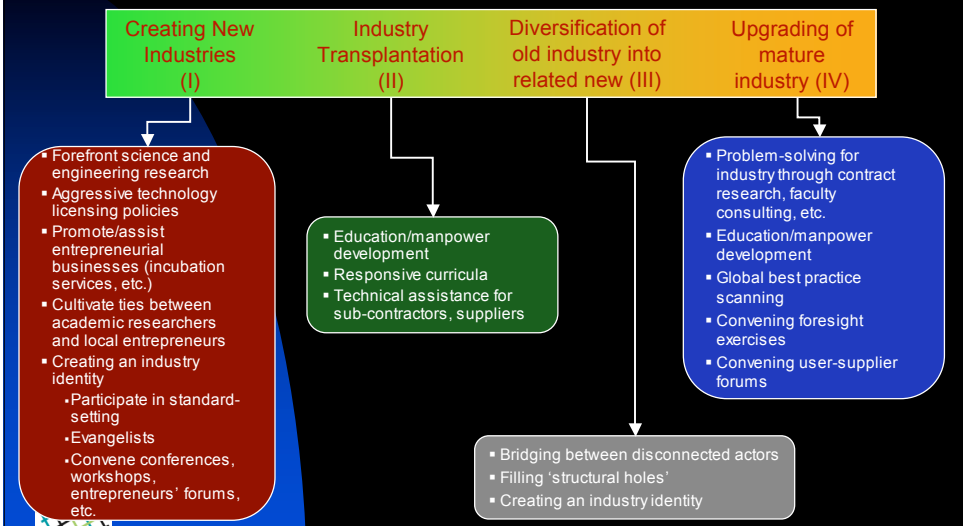
Type III: Diversification of old industry into related new

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

	TYPE I CREATING NEW INDUSTRIES	TYPE IV UPGRADING EXISTING INDUSTRIES
Financing	Angel/venture capital (private and public); active asset management	Internal financing, supplier financing, govt. financing for demonstrations
Innovation culture	Science-driven; entrepreneurial	Customer-driven; TQM; continuous improvement; 'best practice'
Local anchors	Research universities Government labs	Lead firms Lead customers/users
Education and training	Ph.D.-level scientists and engineers; entrepreneurial business education	BS/MS-level engineers; faculty-student knowledge of industry practices and business problems. Internships, rotations.
Leadership in the public space	Creating an identity ('evangelism'); standard-setting	Participate in regulatory processes; global scanning for best practice; 'foresight' exercises
Technology transfer	Proactive tech transfer from universities & gov. labs; startup-oriented	Long-term relationships between universities and established firms

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



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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 needed . . .

- From technology transfer to technology take-up
- From university problem-solving for industry to universities as public space
- From ‘fountains’ to ‘forums’
- From clusters to hubs

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Key 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

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- ***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.

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Key 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 should approach their role in local innovation processes strategically.*** This means aligning university efforts with what is actually happening in the local economy.

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