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.
The question

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

The importance of innovation

- Productivity growth
- Resilience
- Adaptability
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?

New fears of a ‘flat world’
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
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

‘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’.
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

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)
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.

- Publications: 18%
- Consulting: 26%
- Collaborative research: 12%
- Conversations: 6%
- Patents & licenses: 7%
- Recruiting grads: 17%
- Co-supervising: 0%
- Conferences: 5%

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The LIS Project: An international, interdisciplinary collaboration

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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

‘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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An additional 117 interviews were carried out in Taiwan.

LIS Interviews

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An additional 117 interviews were carried out in Taiwan.
Akron, Ohio

“Out of the Ashes”

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

Aberdeen (UK) & Stavanger (Norway)

“From ‘black gold’ to ‘human gold’”

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

Tampere, Finland

“From ‘old-tech’ to ‘high-tech’”

- How the mechanical engineering industry was infused by ICT
Cambridge, Massachusetts

“High-tech synthesis”

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

Finding I: Multiple university roles in the local economy

- Create
- Attract
- Unlock
- Adapt
- Combine
Finding I: Multiple university roles in the local economy

- Educating people
- Providing public space
- Problem-solving for industry
- Adding to the stock of codified knowledge

Undergraduates
Graduates
Mid-career
Executive

Contract research
Cooperative research
with industry
Technology licensing
Faculty consulting
Providing access to specialized instrumentation and equipment
Incubation services

- Forming/accessing networks and stimulating discussion of industry development pathways
- Influencing the direction of search processes
  - Meetings and conferences
  - Hosting standard-setting forums
  - Entrepreneurship centers & mentoring programs
  - Alumni networks
  - Personnel exchanges (internships, faculty exchanges, etc.)
  - Industrial liaison programs
  - Visiting committees
  - Curriculum development committees
  - Creating the built environment to support this

Publications
Patents
Prototypes

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)
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)

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

CREATING NEW INDUSTRIES

Customer-driven; TQM; continuous improvement; ‘best practice’
Science-driven; entrepreneurial
Internal financing, supplier financing, govt. financing for demonstrations
Customer-driven; TQM; continuous improvement; ‘best practice’

UPGRADING EXISTING INDUSTRIES

Angel/venture capital (private and public); active asset management
Science-driven; entrepreneurial
Customer-driven; TQM; continuous improvement; ‘best practice’

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

Proactive tech transfer from universities & gov. labs; startup-oriented
Long-term relationships between universities and established firms

Type I

Type IV

Financing

Innovation culture

Local anchors

Education and training

Leadership in the public space

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

Creating New Industries (I)
- Forefront science and engineering research
- Aggressive technology licensing policies
- Promote/assist entrepreneurial businesses (incubation services, etc.)
- Cultivate ties between academic researchers and local entrepreneurs
- Creating an industry identity
  - Participate in standard-setting
  - Evangelists
  - Convene conferences, workshops, entrepreneurs’ forums, etc.

Industry Transplantation (II)
- Education/manpower development
- Responsive curricula
- Technical assistance for sub-contractors, suppliers
- Bridging between disconnected actors
- Filling ‘structural holes’
- Creating an industry identity

Diversification of old industry into related new (III)
- Problem-solving for industry through contract research, faculty consulting, etc.
- Education/manpower development
- Global best practice scanning
- Convening foresight exercises
- Convening user-supplier forums

Upgrading of mature industry (IV)
- Responsive curricula
- Technical assistance for sub-contractors, suppliers
- Education/manpower development
- Global best practice scanning
- Convening foresight exercises
- Convening user-supplier forums

To sum up . . . . .

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

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
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.