Innovation Benchmarking Survey: New Findings on University Industry Relations and a UK Cambridge Policy Perspective

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UK Innovation: Causes for Concern

- Low and declining Business R&D by international standards
- Alleged absence of an entrepreneurial culture in universities
- Overemphasis on links with large as opposed to small firms
- Major regional disparity in innovation inputs and high tech activity

Solutions?

- Emphasise Developments in ‘High Tech’ Producing Sectors
- Emphasise Importance of Entrepreneurial Spin Outs from University Science Base
- Emphasise regional initiatives and integration of universities into regional innovation strategies
- Based on ‘lessons’ from the USA
Key Questions

- What weight should be placed on high-tech producing sectors compared with high tech users e.g. retail or financial services?

- What weight should be placed on spin outs and university commercialization and small firm R&D compared to innovation and productivity performance in existing firms?

- Small Firms, Large Firms, or Systems as the targets of policy?

- Can we identify good models for regional cluster policies based around university industry links?

Complementary Approach to LIS

Industry-Case Based Research

- Analysis of Key Sectors for Productivity Growth using experience of USA

- Analyse Significance of Start Ups versus performance change in Existing Firms for productivity growth

- Analyse Diversity of University Industry Links using Unique Large Scale Firm Survey Data for UK and USA
US Productivity Growth

- Analyses by Nobel Laureate Robert Solow of MIT and McKinsey
- US growth of real GDP per hour
  - 1947-1972 2.9%
  - 1972-1995 1.4%
  - 1995-2000 2.5%
  - 2000-2003 2.6%
- A return to trend?
- Turn round concentrated in 8 year period?

1995-2000

  - 6 of 59 industries account for ALL of the acceleration in productivity growth
  - Net contribution of other 56 was zero
  - Top three
    - wholesaling
    - retailing
    - security and commodity broking
The Second Three

- Electronic and electric equipment (semiconductors)
- Industrial machinery and equipment (computers)
- Telecomms
- Total contribution was one third of top three

2000-2003

- 7 sectors account for 85% of ALL of the productivity growth 2000-2003
- Top Four
  - Retailing
  - Finance and Insurance
  - Computer and electronic products
  - Wholesaling
- Next 3
  - Admin and Support Services, Real Estate, Miscellaneous Professional and Scientific Services
Services productivity growth and the performance differential

- Difference in services productivity growth accounts for most of the difference in national productivity performance between the USA the UK and Europe in the past decade
- Massive impact of investment in IT in using sectors
- Creation of new business models of service delivery

Policy Implications for Local Innovation Systems

- Focus on High Tech Producing Sectors too restricted
- ‘Catching up’ in services complex, requires major organisational change at firm level, closer links between services high tech producing sectors and the science base
Entrepreneurship, New Entry and Productivity Growth

• Productivity Growth
  – Productivity growth within firms
  – Reallocation of output between high and low productivity firms and impact of entry and exit

• Components vary across countries and industries

Labour Productivity Growth Components in EU and OECD

• The dominant component in lab prod. growth is within-firms growth (e.g. >55-95% in eighties/nineties)
• Net effect of entry and exit accounts for 20%-40% of lab prod. growth
• Net effect is dominated by exit of low labour productivity firms
• Only 30-50% new entrants survive for 5 years
• US new entry component is large and negative and survival rate is lower BUT survivors grow faster

Source OECD The Sources of Economic Growth in the OECD Paris 2003
New Entry ‘entrepreneurial’ Effects

- Entry effects bigger
  - Longer time periods (learning and output growth)
  - Information and communication technology sectors (rapid technical change and opportunities)
- It is not new entry per se but subsequent survival and growth that matters
- Very small proportion grow substantially

Local Innovation System Policy Implications

- Sector specific policies to allow for different competitive dynamics
- Address barriers to growth not just start up
- Look at small and large firms as part of a system that must be integrated to work effectively
- Design policies to make the ‘system’ work
Using New Survey Data on multi-faceted role of universities

Educating People
- Training skilled undergraduates, graduates & postdocs

Providing public space
- Forming/accessing networks and stimulating social interaction
- Influencing the direction of search processes among users and suppliers of technology and fundamental researchers
  - Meetings and conferences
  - Hosting standard-setting forums
  - Entrepreneurship centers
  - Alumni networks
  - Personnel exchanges (internships, faculty exchanges, etc.)
  - Visiting committees
  - Curriculum development committees

Increasing the stock of 'codified' useful knowledge
- Publications
- Patents
- Prototypes

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

CBR/IPC Target Sample Sizes
- 4000 companies drawn equally from UK and USA
- 60% from manufacturing and 40% from business services
- 75% companies with 10-499 employees and 25% large companies
- 25% from hi-tech sectors and 75% from conventional
- Have very recently achieved a sample of 3500 companies, 2000 from the UK and 1500 from USA
- Preliminary findings at this stage.
CBR/IPC Survey Questions

• General Characteristics
  – When and how formed, who is running the company and with what business objectives.

• Innovation and New Technology
  – Innovation input and output measures, sources of knowledge, collaboration, innovation expenditures, barriers to innovation, the role of universities.

• Principal Products and Competition
  – Competition and competitive advantage, business constraints, customer base, geographic orientation.

• Finance and Capital Expenditure
  – Accounting information, capex and funding sources.

Matched Sample of SMEs

• Matched pairs of companies drawn equally from UK and USA samples – 1900 companies in total each with fewer than 500 employees

• Matched by size and sector and by age of the business

• Focus today is on the answers to the questions relating to business-university links.
Business Formation

- Over time wholly new business start-ups becoming proportionately less significant in both UK and US as new types of business formation develop.
- Wholly new start-ups still represent about two-thirds of new business formation in each country.
- Management buy-outs are more common in the UK.
- Business spin-offs do not differ in their relative importance between the two countries.
- University spin-offs are more than twice as frequent in the US, but still represent a small fraction of business births.

Method of Business Formation

(companies formed in 1990 or later)

<table>
<thead>
<tr>
<th>Method of Business Formation</th>
<th>UK</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup</td>
<td>62.9%</td>
<td>67.0%</td>
</tr>
<tr>
<td>Business spin-off</td>
<td>15.7%</td>
<td>14.3%</td>
</tr>
<tr>
<td>Management buy-out</td>
<td>9.8%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Spin-off from university</td>
<td>1.4%</td>
<td>4.0%</td>
</tr>
</tbody>
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Sources of Knowledge

- Companies who had introduced any form of innovation within the previous 3 years were asked about their sources of knowledge or information.
- A higher proportion of UK companies claimed to have used all sources than did the US companies.
- In particular about two-thirds of UK companies, but only one-third of US companies used universities/HEIs.
- On the other hand US users of information regarded the information as more important in most cases, especially the public sector sources.
- About 10% of companies in both countries regarded universities/HEIs as important sources.

Use of Sources of Knowledge

(% of companies)
High Importance of Sources of Knowledge

(% of users of that source)

Technology Acquisition

- Licensing from other firms is more prevalent amongst the US companies, but other licensing activity does not differ much.
- About 6% of companies in each country engage in licensing activities with universities, with the number of licences held ranging from one to sixty.
- UK companies appear to be more likely to use university based consultants to help them acquire new technologies than is the case in the US sample.
- No evidence from this preliminary analysis of a lack of engagement by the UK university sector.
Licensing and Technology Acquisition
(% of companies)

Forms of Technology Acquisition
(% of companies)
Collaborative Activity

- Companies in each country are equally likely to collaborate with another firm or organisation.
- A significantly higher proportion of the UK sample collaborate with universities.
- US companies more likely to collaborate with early-stage technology-based companies and with private research institutes and consultants.
- About half of our sample companies in each country collaborate with customers and with suppliers.
The Contribution of Universities

- Companies are involved with universities across a range of activities.
- Recruitment of staff at post-doctoral level is more prevalent amongst the UK sample.
- A higher proportion of US companies make more use of internships.
- A higher proportion of US companies spend some of their innovation expenditure on university-related activities.
- A higher proportion of UK companies on the other hand are involved in joint R&D projects with universities.
- US companies value the contribution of universities more highly, particularly in relation to recruitment.
High importance of university contribution
(% of those who used the activity)

Purpose of collaboration
(% of those who collaborate)
Reasons for Collaboration

- Each of the reasons for collaboration was selected by between a quarter and three-quarters of those who collaborated in each country.
- The rankings within each country was very similar and the top three reasons were the same, but the US exhibits higher proportions in general.
- A higher proportion of those who collaborated with universities/HEIs selected each of the reasons, except for the joint purchase of materials or inputs.
- Collaboration with universities is multi-faceted with the development of specialised products/services and sharing in-house research most important.

Implications for LIS policy

- Keep University role in context
  – Importance of other sources of technology
- Multi-dimensional nature of University contributions
- Relative importance of ‘conventional’ university outputs
  – Graduates, publications, consultancy
- Relative quantitative unimportance of spin offs from university
Overall Conclusions

A one-size-fits-all economic development strategy for universities is not appropriate.

• All universities are not the same
• High tech use as important as high tech production
• Pay attention to services

• University economic development strategies should also be aligned with the particular development/innovation pathways of the industries in the region.
  • These change over time, differ across sectors
  • Hi tech spin-off activity is one part of a wider set of possible interactions

• It’s a long game