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Science and Innovation Policy – growing together or growing apart?

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http://www.mbs.ac.uk/prest

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Outline

- Science and innovation policy
- Trends and drivers in research performing sectors
- Assessment, resources and incentives
- New wave demand side innovation policy

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The problem as stated in official reports

- "… a very large aggregate of smaller English businesses is carried on in a stupidly conservative fashion, with antiquated machinery, traditional modes of conduct, and methods which ignore the scientific advances of recent years."

- "numerous cases in which members of the the small band of British scientific men have made revolutionary discoveries in science; but yet the chief fruits of their work have been reaped by businesses in Germany and other countries , where industry and science have been in close touch with one another."

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  Mosely Commission, The Times, leading article, 28 November 1902

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  A. Marshall, Industry and Trade, Macmillan, 1919

Emergence of science policy

- Key distinction made by Harvey Brooks in 1971
- Policy for science
  - Funding levels for research and priorities, human resources, appropriate structures and incentives, linkages between institutions…
- Science for policy
  - Scientific advice on technological, economic, environmental, ethical, political issues faced by decision makers

Debate still current

- Dr John Marburger US President's Science Adviser called for
- "a social science of science policy"
- that would examine the effectiveness of federal science and technology (S&T) expenditures in ways not possible in the recent past
- His problem rising imbalance in Federal R&D expenditures and growing pressure to justify the overall level
- His proposed solution an econometric model of the role of science in the economy impractical

Policy for science and policy for innovation

- Since 1980s growing association with industrial competitiveness
  - Focus on industry-science linkages
- Innovation goes beyond application of science to encompass the introduction to application of new products, processes or services
- Innovation policy refers to the set of policies which address deficiencies in firms' or other organisations ability to innovate
  - Deficiencies may be in resources, incentives, capabilities or opportunities
  - Failure may be at the level of the organisation or in the national or other system in which the innovators operate

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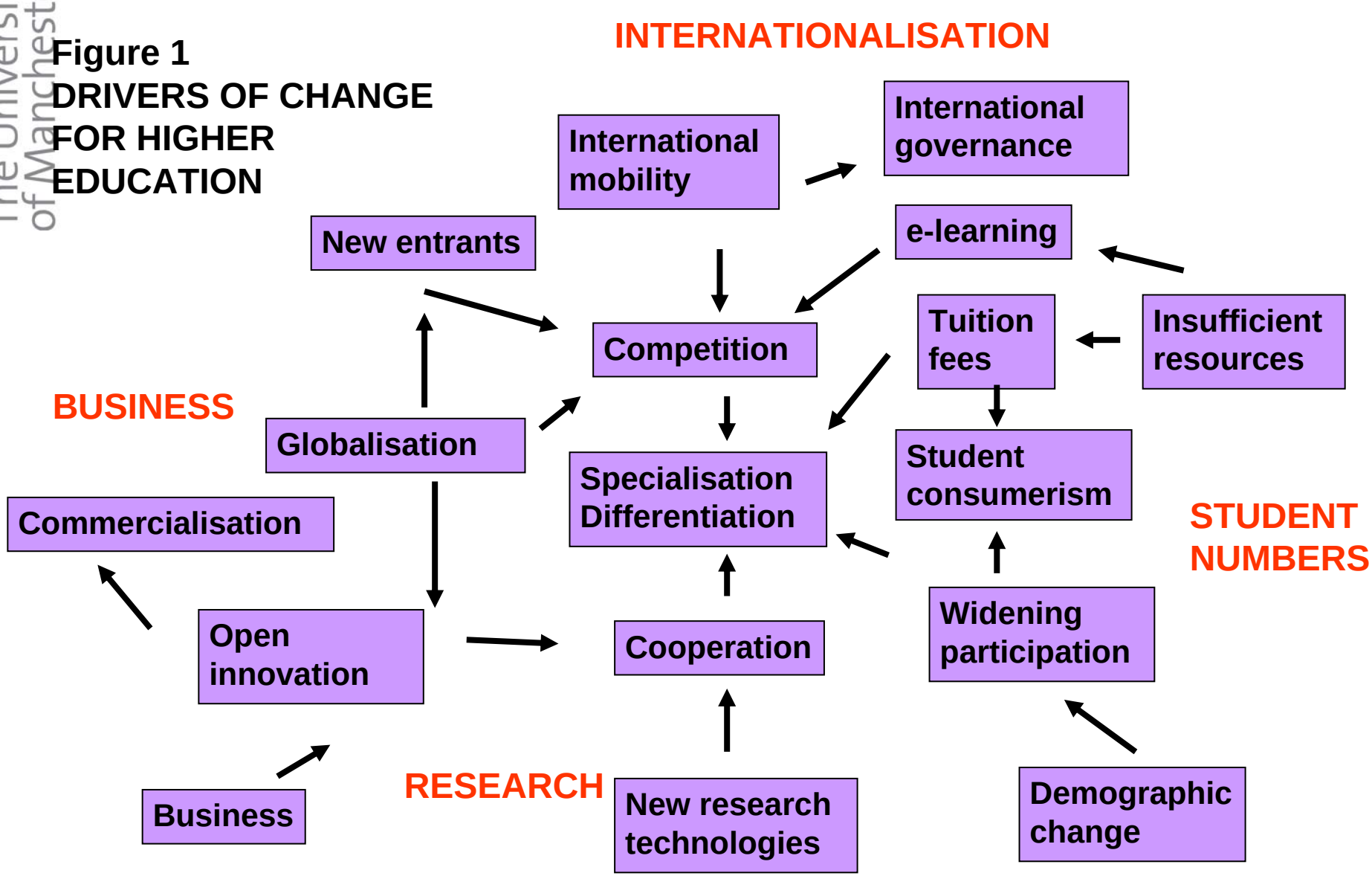
Changing world

- All research performers are in state of transition
  - Universities
  - Industry
  - Government laboratories

Universities in urgent need of reform

Figure 1
DRIVERS OF CHANGE FOR HIGHER EDUCATION



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Key trends in industrial R&D& innovation

- Globalisation of R&D followed globalisation of industry
  - Relocation to USA, China, India
- New conceptual frameworks of industrial ecosystem and open innovation
  - Step change in flow of ideas
  - Specific SME policies obsolete

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New ecology of industry*

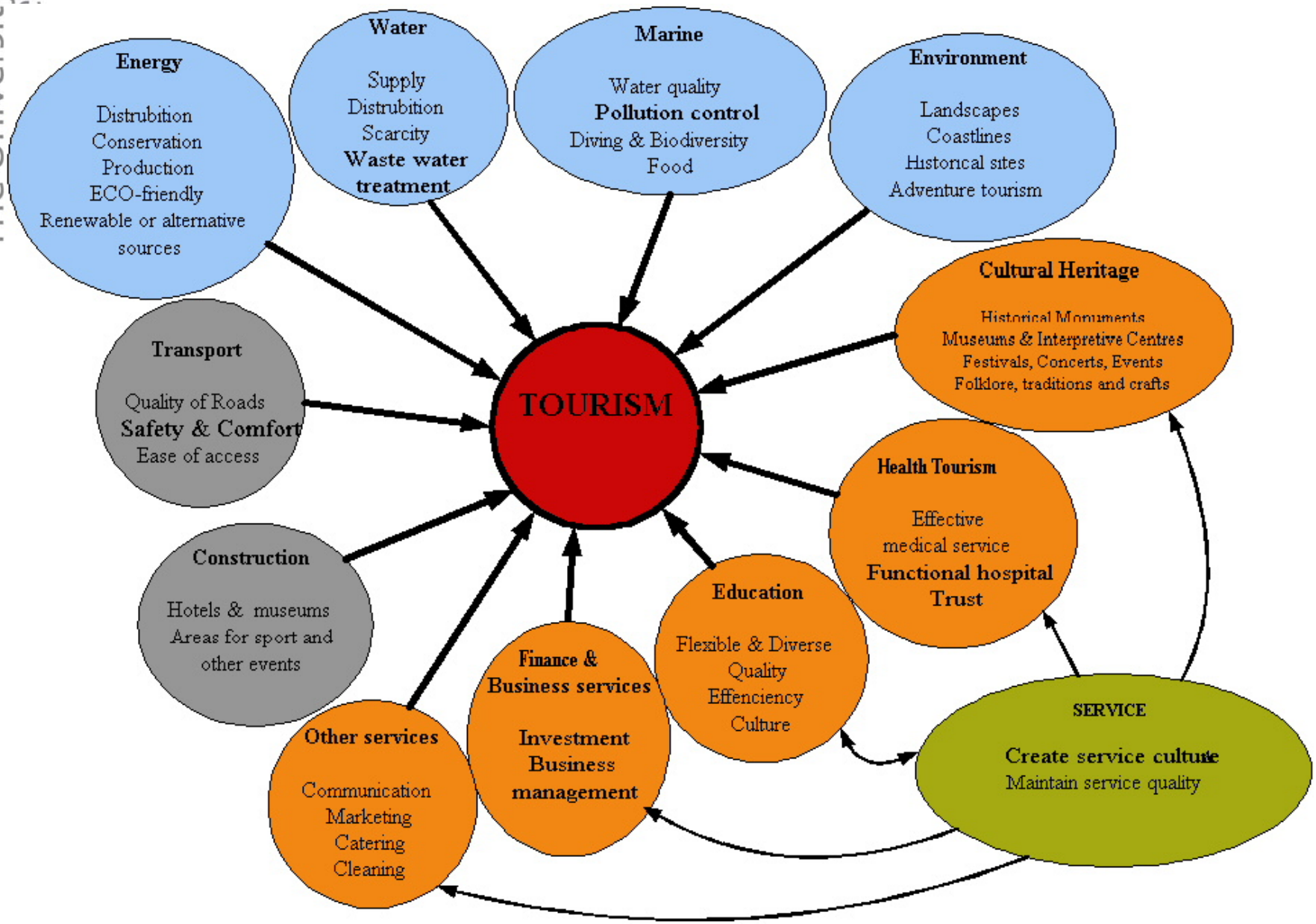
- Large firms complemented by dynamic population of smaller companies
- Complex pattern of birth, growth, acquisition of firms enables effective selection of technologies
- Trebling of outsourcing to private sector research houses and universities
- Broadband academic-industry links
- Collaborative ventures and alliances
- Globalisation of R&D following capabilities and markets
- Distributed innovation later termed open innovation

*Coombs and Georghiou, Science Vol 296 19 April 2002 471

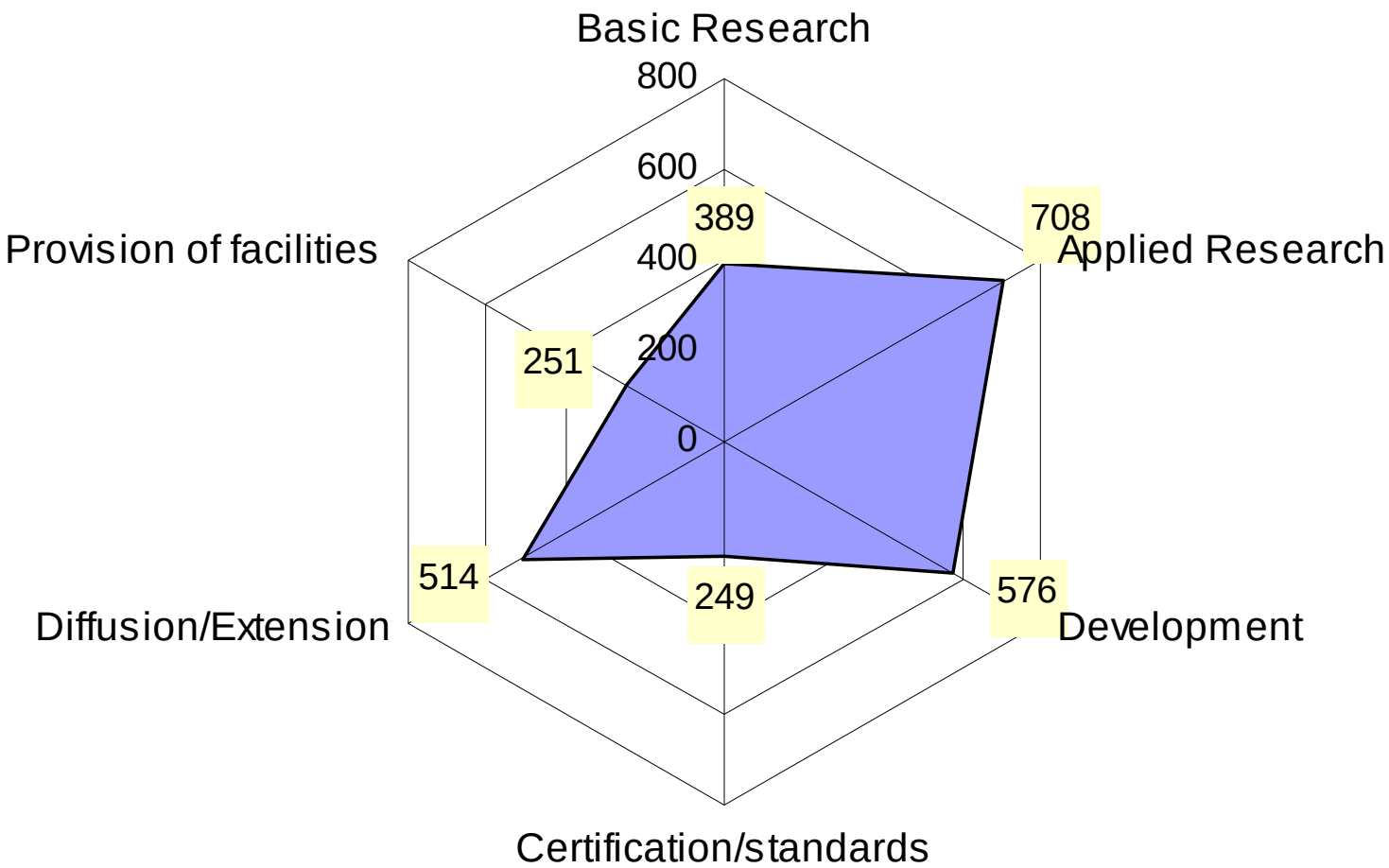
Service sector and "hidden innovation"

- ***NESTA* Report recently noted, "innovation is frequently found in the most unlikely places"**
- Significant technological improvements vs. not necessarily technology-based
  - New ways of handling a commodity commercially
  - Opening of a new market
  - Developing a new public service eg congestion charging
  - Re-structuring of an industry (breaking up a monopoly)
    - Examples: Easyjet, Skype, ***ZARA, eBay….***….
- Europe is primarily a service economy and will become more so but research policy does hardly anything for this sector
  - Are we in the steam engine era for services – business and technology preceding science

Sectoral focus



Public labs being squeezed away from research



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Some more key drivers of the research system*

- Interdisciplinarity – physical, bio, social science convergence in areas such as study of the brain
- Emergence of new key players – India and China +
- Scientific diplomacy
- Sustainability challenge, including energy
- Public trust in science
  - attractiveness of scientific careers
  - Absorptive capacity
- Equipment innovation changing economics of research – productivity growth

* Creative System Disruption – Towards a Research Strategy Beyond Lisbon

Contribution of science to the economy

- Six channels
  - Scientific discovery and publication
  - Production of trained people
  - Development of instrumentation and methods
  - Cumulative expertise available for problem-solving
  - Entry ticket to networks and access to external knowledge
  - Commercialisation and spin-offs
- All but first have clear tacit dimension and influenced by proximity
  - Hence strong policy interest in cluster policies especially if knowledge-based

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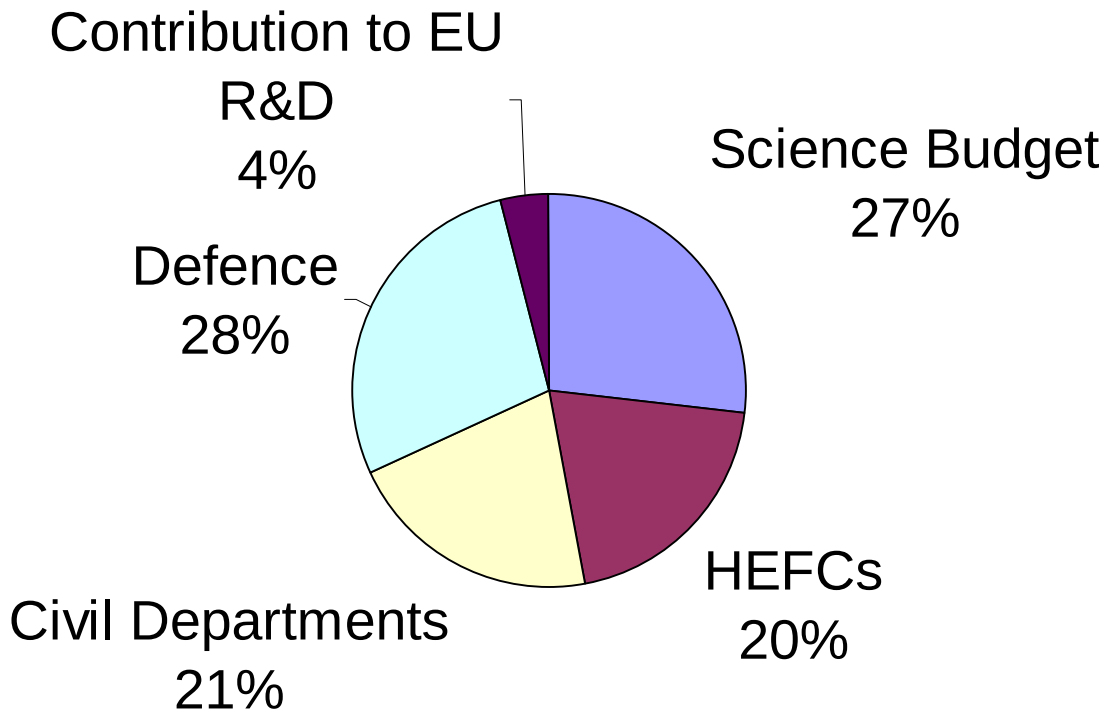
UK Case – a focus on incentives

- High performance science system in terms of overall productivity measures (citations per unit spend)
- Government's 10 Year Investment Framework has largely remedied past under-funding which was hollowing out labs
- Recent Next Steps document concealing fears that overall objective of solving economy's productivity problem was endangered by insufficient connection to industry
- Falling industrial R&D spend a strong concern
- What does this figure mean in a service economy and where does R&D productivity come in to the picture?

Allocating General University Funds – a case study



Total for 2004-5 about €13.25 billion
HEIs receive 36% of research budget from GUF, 25% from research councils, 14% from charities, 11% government departments, 5% UK industry, 5% EU and 4% rest

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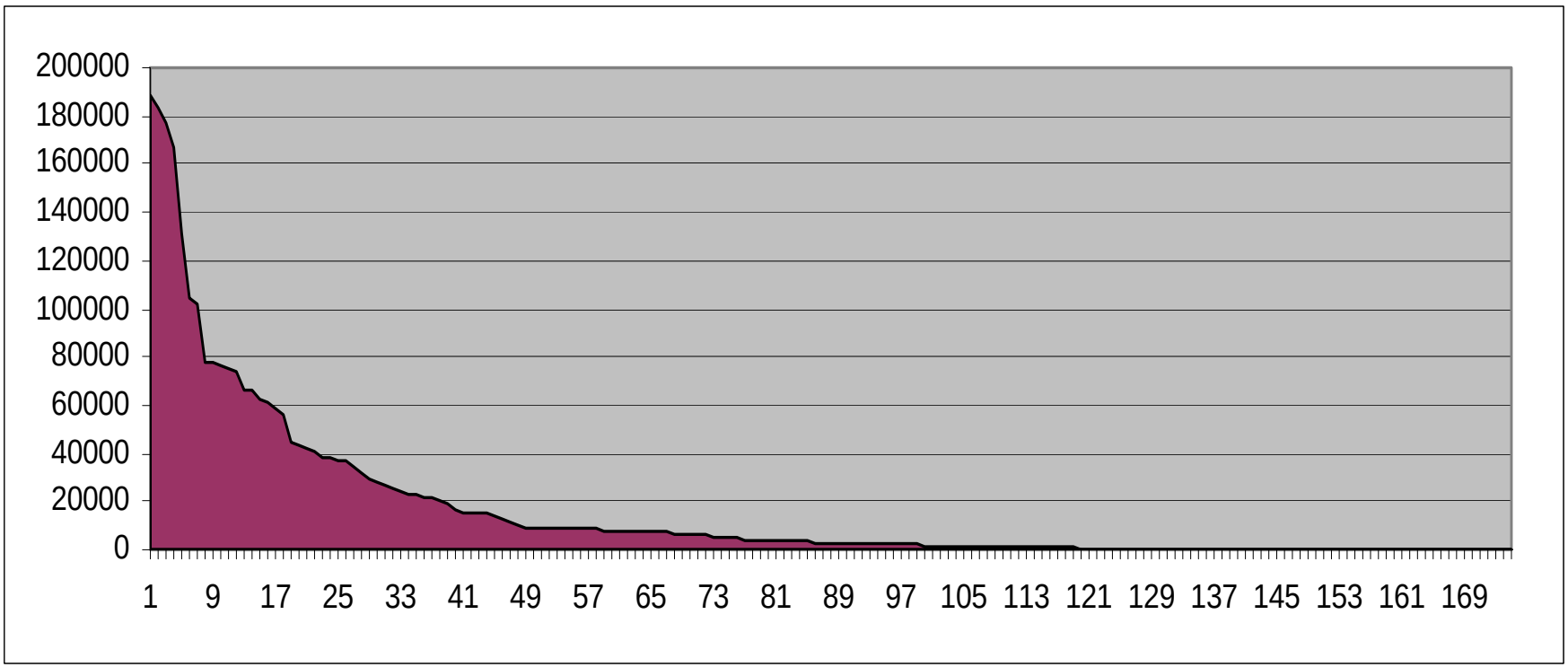
Distribution of Research Funding in UK Universities



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Research Assessment Exercise

- Exercise currently in its 6th iteration
- Gives quality rating which is used to distribute university block grant for research - non-project side of dual support system
- Basically peer review with 67 subject panels, mostly UK academics
- In past rating on 7 point scale but move to profile in current round
- Central focus on 4 “outputs” per person but also information on income, research students, environment, esteem
- 98% of GUF for research (QR) allocated this way in formula driven by rating/profile and strong geometric distribution favouring top categories

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+ve and –ve aspects of RAE

Positive

- directs funds selectively to highest rated
- maintains dual support by providing accountability
- raises profile of research and stimulates development of supporting infrastructure
- consequently improved quality of research

Negative

- Unintended & inappropriate uses made of results eg as guide to undergraduate education
- Reducing status of teaching among academics
- Concern that inhibits industry and community links
- Concerns about treatment of applied and interdisciplinary research
- Concerns about treatment of women and new entrants
- Emergence of “transfer market” for academics

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But Government not happy

- 1996 announcement that RAE to be replaced by metrics based on research income
  - Would have led to even stronger alignment of QR and competitive funding (but note that this was all income not just Research Council)
- Mixed but predominantly hostile reaction from academic community
- Current government statement that metrics will extend to “

  “research income, postgraduate numbers, and a quality indicator. For subjects in science, engineering, technology and medicine (SET) the quality indicator will be a bibliometric statistic relating to research publications or citations. For other subjects, the quality indicator will continue to involve a lighter touch expert review of research outputs, with a substantial reduction in the administrative burden. Experts will also be involved in advising on the weighting of the indicators for all subjects. “

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Underlying concern..

- Official reason was that RAE had become too bureaucratic and costly
- Real reason is that Government commitment was for10 Year Investment Framework for S&T offering 5.8% annual growth in budget in return for delivery against set of targets
- But while scientific targets being met little evidence of shift in impact on economy
- Industrial R&D declined when all competitors rising
- Crucially RAE is seen as incentivising traditional academic research and drawing academics away from links with business and society
- Could be seen as part of broader international trend of reduced political confidence in peer review

Misdiagnosis?

- Key question is whether stagnation in business R&D is a result of academic lack of interest
- Two important alternative explanations
  - UK is service economy and much innovative activity is not captured in R&D statistics – financial services alone accounts for 32% of Gross Value Added – double manufacturing
  - Main incentive for industrial R&D spend and location lies elsewhere

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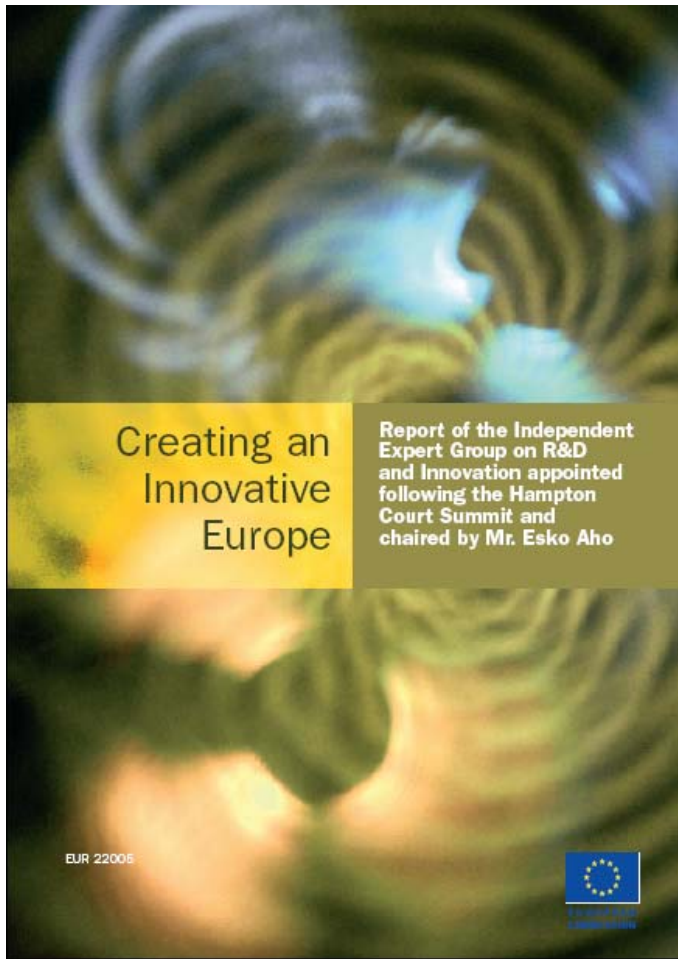
A different diagnosis at EU level



http://ec.europa.eu/invest-in-research/action/2006_ahogroup_en.htm

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Negative trends

- Productivity falling behind
- Failing to capitalise on the application of ICT
- Losing out as large firms globalise their R&D
- Locked into unmodernised traditional sectors and under-investing in services R&D
- Rising demographic challenges

Example in pharmaceuticals

- In 1990 Major European research based companies spent 73% of their worldwide R&D expenditure in EU territory
- By 1999 fallen to 59% with most of the transfer being to the USA.
- 1992 six out of top ten pharmaceuticals produced by European companies
- By 2002 two out of ten.

Four-pronged strategy

- Simultaneous and synchronous actions are needed at all levels in:
  1. Creation of a market for innovative products and services
  2. Providing sufficient resources for R&D and innovation
  3. Improving the structural mobility of Europe, and
  4. Building positive attitudes and a culture favourable towards entrepreurship and risk taking

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Specifically on University-Industry linkages

- Aho Group endorsed EIRMA et al Responsible Partnering report which emphasises need for high level commitment on both sides and maintaining distinctive missions
- Radical call for 10% annual cross-sectoral mobility
- But core theme was need for demand pull

Importance of markets

- Central position of market friendly to innovation
  - Direct negative evidence to panel about Europe's fragmented markets from major firms
  - EU 2005 Survey of R&D Trends shows:
    - Market demand for new products & services most important factor influencing level of R&D investment
    - Market access is most important factor influencing mobile R&D investments

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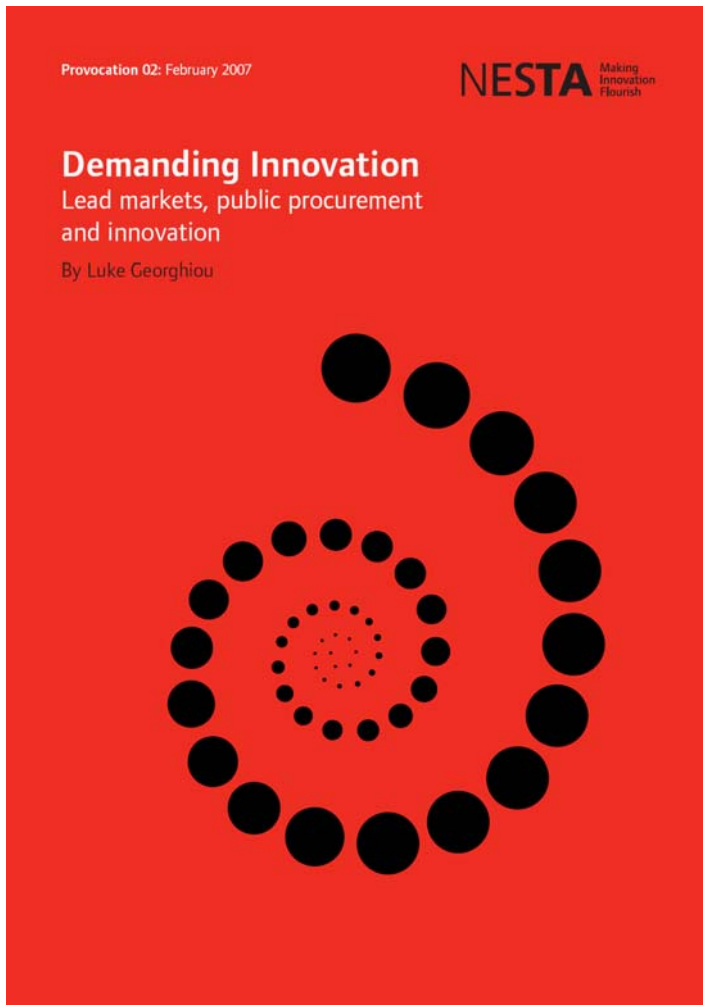
A new UK report

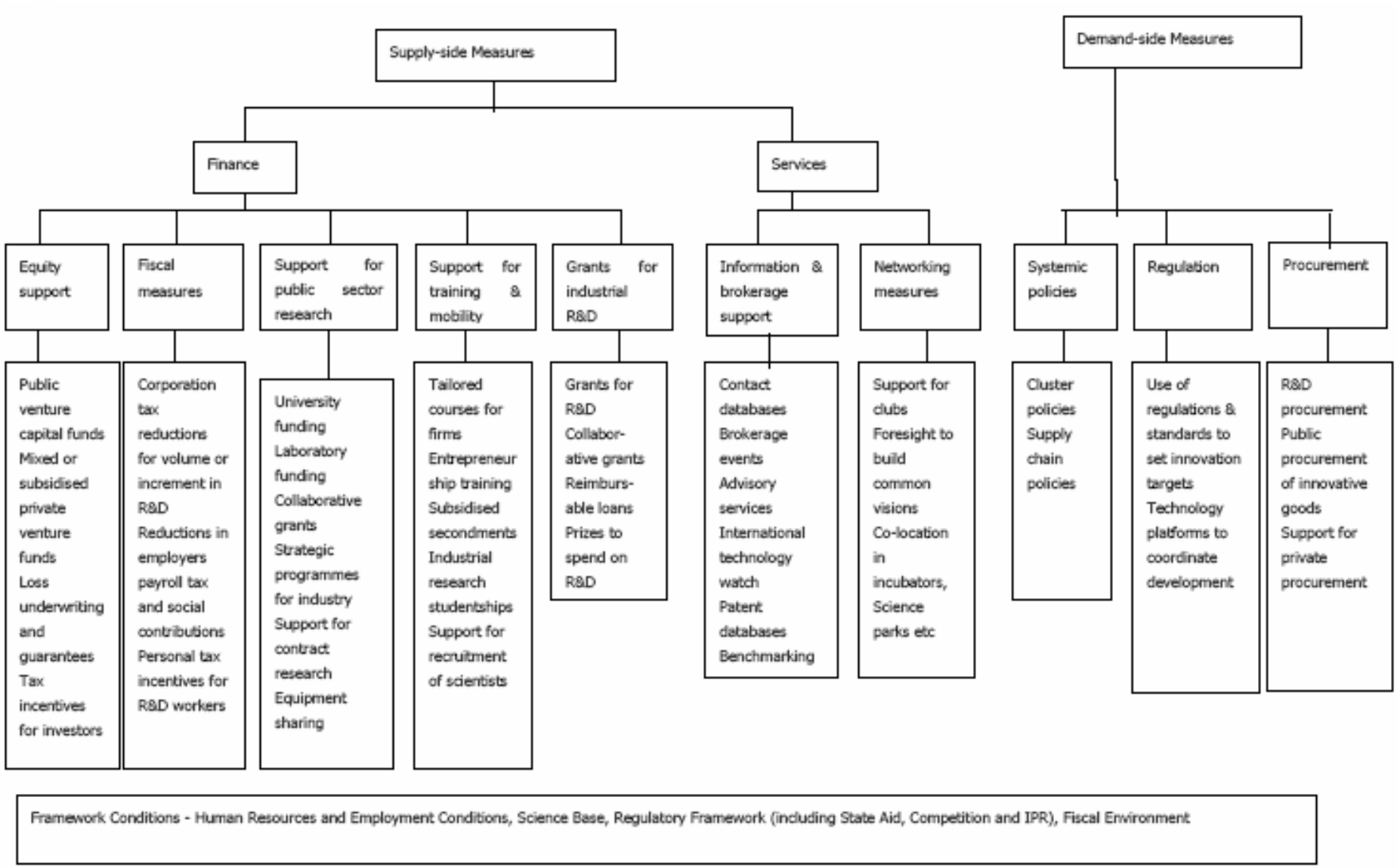


- UK National Endowment for Science, Technology and the Arts aims to transform national capacity for innovation and sponsors series of “Provocations”
- http://www.nesta.org.uk/informing/provocations/index.aspx

Lead users & markets

- Early users take the risk of working with a technology that may not be fully developed in return for access ahead of competitors or faster solution
- Innovators benefit from learning & feedback
- SMEs benefit from credibility as first installation on reference list
- For lead market early adoption needs to be widespread or large scale
- Learning benefits supplemented by reduction of risk in investment to perform R&D & innovate

A taxonomy of research and innovation policies



Focus on procurement

- Three categories
  - Public procurement of innovative goods & services
  - Public procurement of R&D
  - Stimulating innovative private procurement
- Public procurement of goods & services over 16% of European GDP, £125 billion pa in UK
- Key source of demand in markets such as health care, construction and transport
- Linked to demand for improved public services

Focus on regulation

- Europe in post-regulatory fragmentation through local variants or complementary rules & practices
- Need to harmonise regulation (and de-regulation)
- Regulation can slow innovation and raise costs
- Regulation may enhance innovation by setting performance standards
  - Particularly eco-innovation where markets are defined by regulatory framework
- Need much more agile regulatory system using foresight to anticipate technological development
  - Foster integration of new products & services through rapid approval and harmonised regimes
  - Depends upon bringing regulators into contact with innovators in another aspect of supply-demand coordination

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Conclusions

- Tension in the extent to which science policy can be used to drive innovation
- Research performers all facing major transitions and greater interdependency
- Policy challenge to foster ecology for innovation
- Linkages between players are manifold and respond to intended and unintended incentives
- Policy has tended to focus on what is more obviously visible and controllable even when it is not the main driver
- We need to rebalance innovation policy with measures to promote the demand side
- In turn this will have positive consequences for research and development and potentially for linkages with the science system