Revisiting knowledge dynamics and the issue of scientific commons

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Positioning the issue

- Starting point: Knowledge as a variable mix of tacit and codified dimensions
- A rationale for both university-industry relations and university patenting
- Two lines of discussion:
- Changing balance between tacit and codified (through IT), but does not change the situation at the “frontier”
- Excessive patenting (especially on methods and tools) drive to a “privatisation of the scientific commons” endangering the effectiveness of the scientific enterprise as an engine of discovery”

Objective and Contents

- My central point: these assumptions forget the very different knowledge dynamics associated to the successive “leading sciences”
- The focus of the presentation:
  - mobilise Bonaccorsi (2005) for an approach to knowledge dynamics
  - propose a characterisation of the knowledge dynamics of successive leading sciences
  - show on how variety and selection were arrived at differently
  - and derive preliminary conclusions about critical issues for the health of “academic research” and the role of the public-private divide in the emergence of new science-based industries

Knowledge dynamics: 3 key attributes

- The rate of growth - e.g. publications in WoS 1%/year on average, 8% for genomics, 14% for nano
- Degree of convergence and divergence - normal science/ dominant paradigm and cumulativeness; e.g. also variety of explorations in IT
- Complementarities
  - technical: e.g. large facilities (big science), technological platforms
  - cognitive: i.e. inter / pluri / multi disciplinarity
  - institutional: university-industry, academic-clinical…

--> different fields exhibit different “search regimes” (Bonaccorsi, 2005)

Leading sciences: Stylising knowledge dynamics

'Dominant science'	Physics	Computer science / IT	Molecular biology	Nano 'convergence'
Dynamics Crystallisation	Large objects or technical systems	Distributed IP (patent pools…) Strong industry-university relations	Science based / 'individual' IP, transfer / licences	Hybridisation of 'long distance' disciplines
Trajectory	Early selection of a design / cumulative improvements	Adoption of standards and design tools	Competition between paradigms	(initially) based on previous trajectory of 'central' discipline
Critical infrastruc-tures	Specific very large equipments	Generic infrastructures	No (limited) entry barriers	Technological Platforms + 'interdis-ciplinary gatherings'
Modes of coordination	'Large programme' (product oriented)	Technological programmes	Networks & clusters (bottom-up)	Multi actors poles (PPP) : 'Nanodistricts'
Main industrial actors	national champions (specialising in public infrastructures)	MNFirms (oriented toward mass markets). Specialised NTBF (B to B)	Start-up & venture capital in initial phases / (concentration around large established firms during diffusion)	Central role of 'incumbents' (global firms 'B to B' et 'B to C', ex start-up from previous waves)
Typical 'industries'	Nuclear energy, Space, civil aero-nautics, digital wired telecoms	Information technolo-gy, mobile telecom-munications (GSM)	Biotechnologies	Nano ???

Variety and exploration

- Learning from the “war against cancer” about the limitations of top-down approaches
- The lab / unit / institute model … de facto marginalised
- Issues raised by competitive approaches in fund allocations
  - the conservative behaviour of committees: frontier science as a leftover of mainstream science
  - thus an organisational problem and an issue of ‘relative size’: the European fragmented landscape (see next slide)
  - The ERC but as the “agency of agencies”
- Other approaches can be thought of, e.g. the EC OMI programme and “asynchronous logics”)

--> organisational threats to the scientific commons

EU-US difference in breakthrough science: a conjecture

- Take one field and suppose equivalent investments between EU and US (e.g. chemistry and catalysis)
- US intervention concentrated at Federal level with 3 agencies (e.g. NSF, DoD & DoE), used to collaborate (e.g. National Nanotechnology Initiative); In Europe, at least 10 agencies & programmes, loosely coupled.
- Suppose US spends 100, 70 on ‘mainstream’ agenda, and 30 on multiple heterodox alleys
- EU has similar ‘mainstream’ agenda and professional agencies that want to insure critical mass: overall result: 85% of total funds on mainstream agenda.
- EU agencies do not coordinate about the choice of heterodox alleys and thus aggregate on the most likeky.
- Overall result: 4 times less alleys explored and thus 4 times less potential ‘Nobelisable’ science!

Selection and “crystallisation” (1)

- “Market shaping” and the role of standards, norms, customer values and regulatory frameworks = a public-private venture.
- Different public framing linked to the successive leading sciences
  - Post WWII physics and Large programmes
  - ICT, collaborative programmes and standards setting
  - Biotech, massive investment in academic research, patents and start-ups
  - Nano, ‘science districts’ and ‘ethical’ shaping (though public debates)

Selection and “crystallisation” (2)

- A lasting feature: the difficult transition by policies to face changing “leading sciences”
  - e.g. the use of large programmes for coping with both the bio revolution (Nixon’s war against cancer) or the IT one (French ‘plans calcul’)
  - e.g. the enlargement of patent sphere as a panacea and its potential effects on the access by academic research to tools and methods the privatisation of scientific commons)
- Nano convergence and the challenges of both agglomeration dynamics (with new emerging locations) and “risk and ethics” market shaping

Provisional conclusions (1)

- The open science / property knowledge issue cannot be separated from the context of knowledge production
- Different knowledge dynamics entail different institutional settings and policies for the “scientific enterprise” to be “an engine of discovery”
- In an evolutionary mode two issues should be considered: nurturing variety, enabling selection to take place.
- Variety in Europe is clearly an organisational issue, that is not solved by the present ERC frame

Provisional conclusions (2)

- The linkage between selection and patenting was mostly an issue for biotechnology (probably wrongly assumed) and its generalisation is a policy mistake associated with potential collateral damages to address.
- Selection is a public-private venture focused on standards, customer values & regulatory frameworks that requires “substantive” policies (and not only “procedural” ones as fashionable today)
- The ‘productivity’ of the scientific commons in fostering the emergence of new science-based industries is linked to the ability of public policies to promote “crystallisation”, that is adequate agglomerations that promote the required tangible and intangible infrastructures