The globalization of inventive capabilities: a new landscape? Prof. Dominique Foray

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1 -Toward a new geography of invention?

- There is certainly a trend, but it is slow and quite localized trend
- A substantial portion of the design and development of new products has moved
- Positive drivers for invention relocation..
 - 1) Cost advantages for some portion of the R&D;
 - 2) Improved innovation capabilities (human capital, universities, infrastructures, users) in many new locations
 - 3) Vertical specialization in « new industries »
 - 4) Patent policy may influence global re-allocation in two ways
- ...but a <u>remarkable persistence</u> of the distribution of invention capabililities...
 - ...the example of R&D/innovation in pharma



	1995	2004
Total BERD Pharma (milli \$)	24.587	46.216
USA	41.5%	36.5%
EU15	36.3%	39.0%
Japan	14.9%	14.8%
Other developed eco	6.3%	8.0%
New Europe	0.8%	1.2%
Other emerging economies	0.1%	0.6%





 The less routinized and most science-based segment of inventive activity remains extremely concentrated in industries such as biotech, pharma, semiconductors, software



Figure 4. Biology/Chemistry/Medicine Star Scientists & Firm Entry, 25 Countries, 1981-2004

Collège du Mana Chaire en Econo



No substantial global relocation of activity in drug **discovery**

	1990	2002
Total number of USPTO patents	3.414	3.257
US located corp. %	55.1%	57.2%
EU15 %	24.6%	22.8%
Japan	15.3%	9.5%
Other OECD	2.8%	6.5%
India	0.0%	1.3%
China	0.1%	0.2%



Nanoscience



20% of total scientific production worldwide takes place within only 12 districts

Software research

- Increasing growth of IT services production in new locations but little evidence of global changes in the location of inventive activity
- Inventive activity continues to be concentrated in the U.S.
- In the short run, the US have still the highest stock of highly skilled programmers and software designers
- Proximity to the lead users provide the US innovators with a significant advantage



- One could expect that the double effect of the emergence of new fields (as nanoscience) and the emergence of new global leaders in S&T would result in escaping from a rapid concentration dynamics; invention capabilities spreading over more countries and regions
- Quite the contrary, spatial concentration reproduces itself even in new fields





- « When an industry has thus chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighbourhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously »
 - - A.Marshall, Principles of economics (1890)



D in R&D

- Global shift mainly concerns more routinized segments, that use large amount of relatively low-skilled labor and does not need to be tightly integrated or colocated with other R&D
- The question is: how much spillovers from these D-activities?



Development (clinical trials)

	2002	2006
North America	58.2%	49.5%
W.Europe	30.6%	27.6%
Africa	1.0%	1.0%
Latin America	1.7%	4.3%
Eastern Europe	3.8%	8.1%
Asia	1.1%	4.0%
Middle East	0.3%	0.6%



Software development











2 - A policy agenda : sequencing

- Building **D**-capacities
- Human capital and engineering education
- Engineering and applied science
- Technology infrastructure
- Entrepreneurship
- Supporting innovations at the frontier is not necessarily the best strategy



A policy agenda: partitioning

- Certainly, countries will benefit from « plugging » some of its innovative activities into the global market but..
- ...there is not only one game in town
- There is also a need to support locally oriented innovation – incremental, cumulative and mostly informal innovation to serve local demand
- Innovation should be widely distributed over the whole spectrum of economic activities, that is accross sectors (not just high tech) and types of innovation (not just formal R&D)
- A challenge for innovation policy



IPR policy

- There is no constant 'best form' of IP institutions
- Instead we might think in terms of finding a mix of solutions to support both:
 - radical innovation/FDI/trade by global players and;
 - incrementalism and adaptation by local entrepreneurs
- One size does not fit all : reverse engineering still needs to be promoted as an efficient way to learn the state of the art
 - Particularly in industries where reverse engineering is difficult and costly and is effective to get access to and discern the know how embedded in innovator's products

Technical assistance is critical but needs to be smart!



A policy agenda : smart specialization as a tool to create a shared vision, identify strategic areas and correlate efforts

- What is smart specialization?
- An entrepreneurial process of discovery
- General purpose technologies as a framework: again not only one game (inventing the generic technology) in town but a lot of value associated to the *co-invention of applications*
- The need to correlate the specialization of the economy with the R&D specialization
- A way to generate « systems of innovations »; i.e. to solve the many incentives and coordinations problems arising from linking R&D, industry and consumers



Smart specialization : a role for government policy?

- Supplying incentives to entrepreneurs and others that are involved in the discovery of the country's' R&D specialisations
- Improving correlations (complementary investments associated with the right specialisation)
- Assessing the outcome: bad versus good specialisation
 - R&D domains with growth opportunities, high innovation and spillover potential and well correlated to important sectors of the local economy
 - R&D domains with high connectedness to other domains will create greater opportunities for future structural transformation
 - need to occupy the rich parts of the forest where it is easier to jump to other trees (next slide)





Summary

- The less routinized and most science-based segment of inventive activity remains « homebound » : absolute advantage of Boston, SF area, etc..
- What counts is proximity to leading edge academic research clusters' externalities and thick local markets for specialized inputs and human capital : this creates an incredible inertia
- We can expect substantial increase in some countries but it will be many years before the share of locations change significantly
- Substantial relocation of core R&D effort will occur only if new locations develop their own critical mass of academic science and complementary infrastructure
- Global shift mainly concerns more routinized segments, that use large amount of relatively low-skilled labor and does not need to be tightly integrated or colocated with other R&D
- The question is: how much spillovers from these activities?
- This suggests implementing a specific sequence of policies while not neglecting other sectors focussing on local, incremental innovations
- Smart specialisation as a way to structure expectations, coordinate activities, build connections and as such create innovation systems



- A few countries have the potential to compete for global knowledge hub in certain fields
- They have strong educational programs in S-T&E
- They have pockets of academic excellence
- They can fund major programs to create research infrastructures and attract leading academic researchers
- They have already strong entrepreneurial activities that respond to market incentives
- They can benefit from sophisticated users
- The quality of the IP system is central
- Let's care not only to the current stock of « knowledge assets » ..but to the rate of change



Countries which implement new rules and

- Countries which implement new rules and reforms (TRIPS, trade and competition policy) in an « enthusiastic way » can succeed only if other conditions are also present.
- Some, such as international links, supply of skills, engineering applied science, technology infrastructures, entrepreneurial spirit, smart specialisation are not easy to create.
- However, the task for many developing countries is probably easier today than at any other time in the past



