I N D I N E W S

Newsletter on Science & Technology & Innovation Indicators

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In this issue :

This edition consists of a short and targeted article about the bilateral international R&D co-operation policies in the EU Member States, followed by an article covering venture capital in the emerging knowledge-based economy and the influence that it should have on the R&D performers.

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Bilateral International R&D Co-operation Policies in the EU Member States[1]

Long before the EC made international co-operation a cornerstone of R&D policy, the EU Members States, as all industrialised states, individually engaged in bilateral and multilateral R&D co-operation between themselves and technology leaders, developing countries, and countries with colonial ties. Science, because of its history of freedom of movement of knowledge, has always been used to open doors which often remained closed to other political co-operation. The purpose of this study was to gauge the strength and frequency of such relationships, after almost a generation of promotion of EU wide collaboration through the Framework Programmes. Only arrangements supported by legal acts signed by governments were taken into consideration[2].

By early 2001, EU Member States had no less than 1,000 bilateral S&T agreements[3], of which only 20 % were within the EU-15. This compares to the US which at this time had 800+ such agreements in place - though a significant number were apparently dormant, in terms of activity but politically alive.

Most “Agreements” are Memoranda of Understanding (MoU) rather than legal treaties, as these are very flexible. The EC uses this tool also in its relations with third countries and International Organisations. Often the MoU creates an “implementing” body or secretariat. The MoU is also used as a starter for deeper co-operation; it allows a “trial marriage” to take place. However, principally they express political goodwill and intentions, which then have to be developed in the spirit of the Agreement.

What do these agreements contain? Often they contain one or more of the following:

- exchange visits of researchers and students, mutual recognition of status;
- joint research projects often with common benefits of shared goals, forward looking activities with a common objective
- joint scientific meeting, for exchanges in a formal framework (less relevant in the Internet Age perhaps);
- exchange of information between researchers, without the related movement of people being necessary;
- opening up and mutual access to national activities;
- joint development of infrastructure, or systemic support to science as a whole (i.e. networks), or to specific sectors.

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[1] Final Report of a Study undertaken by Technopolis Group. Study contract ERB HPV2 CT 1999-0009. Full report also available in PDF format at http://www.cordis.lu/rtd2002/indicators/publications.htm

[2] The study did not review the individual technology areas where these agreements are applicable, nor those between regional authorities in different countries.

[3] of which 25 % may be dormant at any one time (i.e. not actively promoted)

The Mobility of researchers and/or information are by far the most frequent aims of such agreements. The EU has 15 % of its non-European active agreements with Asia, a surprising 10 % with South America and just 9 % with North America. Despite active promotion, just 50 % are in the ex-USSR block. China, Korea, Brazil are preferred as potential new markets.

Germany is most active – 25 % of all agreements, followed by France with 15 % and UK with 10 %. Within the EU, France leads; Germany, Spain follows and the UK is fourth, representing 60 % of all "within EU" activity. They are all very active within these four countries too.

Canada has relatively few agreements with any EU-MS. For the US, the EU is only secondary to the ex-USSR and Asia; tying in 3rd place with Africa and South America at 13 % of all agreements. In contrast, Japan sees the EU as the most significant partner with 38 % of all agreements with the EC compared to 7 % with the US (note though that no industrial agreements are included).

Those 1,000 EU-MS agreements add up to no more than 200m€ annually, suggesting an average annual budget of 200k€ only, but figures/budgets vary widely from zero to 5m€ annually (in Belgium), or a constant 3m€ in Finland. Goodwill agreements tend to have lower budgets; where joint infrastructure is concerned, budgets are usually strategic and scaled to purpose.

M.R. - K1

Venture Capital in financing the emerging Knowledge-based Economy

The emerging knowledge based economy depends crucially on the efficiency of the financial system to create and expand new high tech business activities that typically result from scientific and technological research. Yet, many of the most exciting and potentially highly rewarding business projects cannot get access to finance in the traditional capital markets because of the high risk involved.

The venture capital industry finances the seed, start-up and expansion phases of new businesses. In the context of knowledge based economy, however, it has an even more strategic function as the creation and expansion of new high tech start-ups simultaneously exploit the scientific and technological knowledge pool. The venture capital industry also provides the strategic management knowledge and competencies for the new high tech start-ups which are so vital for their survival.

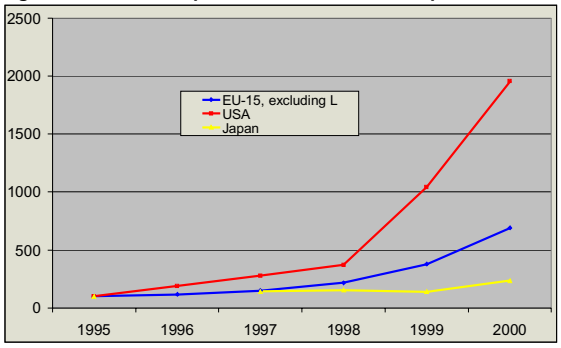
In particular, it is the creation and expansion of new high tech firms, i.e. new R&D performers, that is essential. This means that the central role of the venture capital industry is to create additional business sector R&D through new R&D performers. Simultaneously, venture capital finances research and development expenditure during the seed, start-up and expansion phases.

The insufficiency of the traditional financial markets is even more apparent when the commercialisation of publicly funded research results is seen as a process that evolves from the initial basic research to commercialisation through the creation of spin-offs. Obviously, a variety of financial and non-financial instruments is necessary.

Venture capital investment is necessary but Europe is still lagging behind the US

The absolute level of the EU venture capital investment is much lower than in the US in spite of the hard increase of such investment in the 1990s in several Member States. This indicates a huge investment gap - in 2000 the level of venture capital in the US (87bn€) is 4.5 times higher than in the EU. More serious is that the gap is continuously increasing (Figure 1). The persistently lower venture capital investment shows that Europe lags dramatically behind the creation and expansion of new business activities.

Figure 1 Venture capital[1] in the EU, US, and Japan, 1995=100



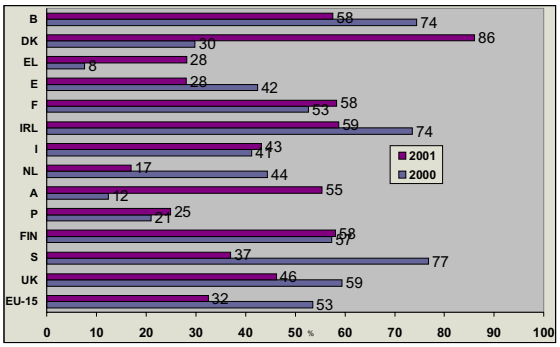
Source : DG Research, unit K-2 - Third European report on S&T Indicators, 2002 ; in preparation
Data : EVCA 1996-2001, NVCA 1996-2001, NISTEP
Notes : 1) Venture capital includes investment in seed, start-up and expansion stages. There are some differences in the definition of the early stages between the EU and USA data. The data for Japan has been harmonised with the EU but is available only from 1997.

Creation and expansion of new businesses in high tech sectors

The specific role of venture capital for an emerging knowledge-based economy is to finance the new high tech and knowledge intensive business start-ups that are based on knowledge assets and innovations. In this way, the scientific and technological knowledge pool is used and new R&D performers are created and expanded.

The allocation of the venture capital investment between the high tech sectors and the "old" economy is therefore essential for the emerging knowledge based economy. Due to the characteristics of new business projects in the high tech and knowledge intensive sectors - important role of intangibles and high degree of market uncertainty but high potential profits - one can expect that the share of venture capital is higher than in the non-high tech sectors.

Figure 2 Share of high tech sectors in venture capital (%), 1st semester 2000 and 2001



Source : DG Research - Third European report on S&T Indicators, 2002 ; in preparation
Data : EVCA Mid-year Survey 2000 and 2001
Note : D and L not available; D and L not included in EU-15

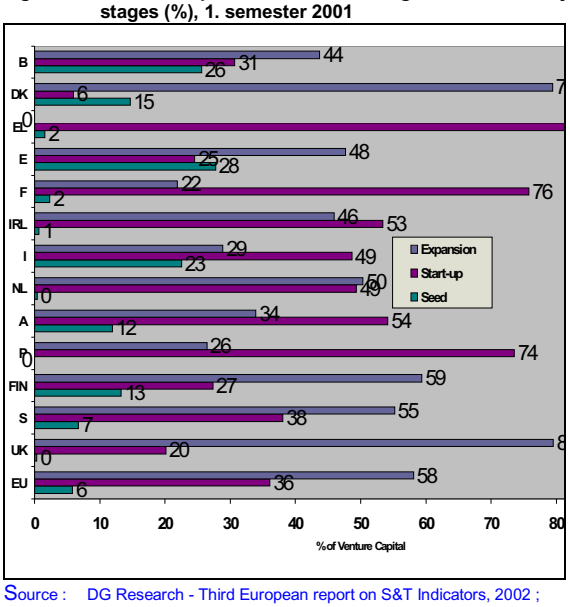
Indeed, the share of venture capital in the high tech sectors is higher than 50% in many countries (in 1st semester of 2000 and 2001 for Belgium, France, Ireland and Finland).[1] This can be taken as confirmation of its prominent role in financing new business plans created through innovations and knowledge assets. In some other countries like Greece, Spain and Italy, however, the venture capital is concentrated more strongly in financing the creation and expansion of the "old' economy for both periods.

Is venture capital focused on the creation or expansion of new R&D performers?

Furthermore, the allocation of venture capital investment in the high tech sector when looked at by stage (seed, start-up and expansion) indicates more directly whether venture capital industry is financing the creation of new R&D performers or rather their expansion.

Essentially, the seed capital investment reflects the commercialisation of innovations and knowledge assets and the creation of new high tech business activities, i.e. new R&D performers. However, in most countries the share of the seed capital is the lowest - exceptions being Denmark and Spain. Also the start-up capital reflects the creation of new business activities that already are at a later stage of a firm's life cycle. The firm is building up its initial production capacity usually with significant R&D activities. There are only a few countries - Greece, France, Ireland, Italy and Portugal where this phase dominates the venture capital investment.[2]

Figure 3 Venture capital investment in high tech sector by stages (%), 1. semester 2001



Source : DG Research - Third European report on S&T Indicators, 2002 ; In preparation
Data : EVCA Mid-year Survey 2001
Notes : D, L data not available, D, L not included in EU

The venture capital industry finances dominantly the expansion phase of the new R&D performers in the most Member States and in the EU. This reflects that the venture capital industry finances more the expansion of the knowledge based economy than the utilisation of the scientific and technological knowledge pool, i.e. the initial creation of new R&D performers in Europe.

It is important to recognise - when interpreting this indicator - that countries differ enormously with respect to their systems and instruments of financing new business activities. The relative

[1] Data are not available for the USA and Japan. As the data cover only the first semesters in 2000 and 2001 the results should be understood as first indication rather than as basis from which general conclusions can be drawn.

[2] Only the data for the 1. Half 2001 is presented here that again limits the generalisation of the results. They should be understood as first indication only.

role of venture capital may vary because of alternative instruments and not because of the level in investment.

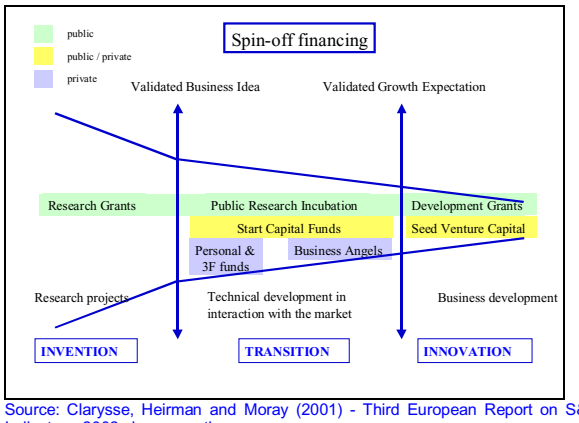
Yet, these empirical findings, foremost, give support to the idea that the science - venture capital link is fundamental for the emerging knowledge-based economy. But in many countries the venture capital industry comes into play at a later stage of a firm's life cycle.

Financing science-based spin-offs: Spin-off funnel

The creation of science-based spin-offs is a specific mechanism to exploit the scientific and technological knowledge pool and to create new R&D performers. The “founding” of a science-based spin-off is not a single moment but passes through different phases. First, there is the phase of validation of the business idea. This phase is identified as the “invention phase”. In the pre-start period, most research teams continue their activities within the parent organisation such as the university, research institute or embedded laboratory. Second, there is a phase of validation of the growth expectations, which was called the “start-up” phase and finally, there is the business development phase or “innovation” phase.

Figure 4 shows the empirical results of a case study about the variety of financial instruments starting from basic research results to final commercialisation through a spin-off. Also according to these empirical results the venture capital financing is coming into play at a relative late stage. Obviously, it is possible that there are "gaps" in the system of financing that destroy start-ups already long before the involvement of venture capital becomes theoretically possible.

Figure 4 Financial resources along the spin-off funnel



Source: Clarysse, Heirman and Moray (2001) - Third European Report on S&T Indicators, 2002 ; in preparation

However, - as these are only case study results in other countries, regions or sectors (like biotech) the venture capital financing may even enter earlier in the spin-off funnel. But the general and important result is that a variety of financial instruments are needed during the creation of a new R&D performer. Many Member States have already recognised the possibility of such gaps in financing high tech start-ups and have created various types of complementary financial instruments along the firm's stages. At the EU level the Joint Memorandum (7th June 2001) between the DG Research and EIB reflects this new understanding.

M.P.

Miscellaneous :

International Task Force on Patent Statistics

An international task force has been set up to try and improve the availability and comparability of patent statistics. Such data are often used by policy analysts to track technological change and specialisation patterns. However, there is currently a proliferation of different data, which lack harmonisation and often give very different pictures of inventive activity. The new task force brings together users and producers of patent data, its membership comprising the OECD (co-ordinator), the European Commission (DG Research and Eurostat), the European Patent Office, the US National Science Foundation, the Japanese Patent Office and the World Intellectual Property Organisation. Its first formal meeting took place in March 2002, and, as a support to its work, the task force will organise a conference on patent statistics in early 2003.

Biotechnology Definition

OECD's ad-hoc working group on setting up each a single and a list-based biotechnology definition, met in Espoo, Finland May 13-15. The preliminary single definition is more or less accepted by users, more difficulties are seen with the list-based one, which contains of a limited number of important biotechnologies, e.g., genomics and proteonics. However, as biotechnology is still emerging and will lead to new important techniques, the list is certain to be amended. However, it was decided by the OECD Secretariat to leave it for another year and gain more experiences through testing by the national statistical agencies.