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COMMUNITY R&D FUNDING – THE US SHOWS A BETTER WAY

The provision of research and development funding in the US via the Small Business Innovation Research programmes is used as an example of how the European Commission could further develop coordinated research amongst SMEs. A clearly defined procedural framework, similar to that of the US system, could be implemented without the need for national legislation.

The European Commission's own economists have quantified how the Community has been losing ground in world high-technology trade and have related this to inadequate innovation. In searching for solutions to this problem, there is no shortage of evidence that for successful commercial innovation, it is *private sector* investment in R&D that counts. Moreover, within this sector, empirical studies show an innovative power in small- and medium-sized firms that is quite disproportionate to their financial resources. These considerations all point in one direction: policies which shift resources for R&D from the public to the private sector, especially in the direction of small- and medium-sized firms (SMEs), could be of quite exceptional value.

Both these objectives are currently being achieved in a particularly interesting way in the United States. On the basis of experience of a scheme developed by the National Science Foundation over sever-

al years, the Small Business Innovation Act was passed – enthusiastically – in 1982. This requires that every Federal Department or Agency with an extramural R&D budget of more than \$100 million annually, *must* establish a Small Business Innovation Research (SBIR) programme. Such a programme diverts a target proportion of 1.25% of each budget to the financing of R&D projects in firms with no more than 500 employees, specifically directed towards the eventual production of marketable products and processes. Because of the size of its external budget, about \$23 billion, the Department of Defense was allowed 5 years to reach this target; other Agencies had to reach it within 4 years. The total amount 'set aside' in this way is expected to be as much as \$400 million in the current fiscal year.

The Small Business Administration (S.B.A.) is responsible to Congress for the SBIR program in the 11 qualifying Agencies. There is a standard format for

these programmes, shaped by the earlier NSF experience, but each Agency decides on the topics it will support and also has complete autonomy in administering its own programme. The object is to marry Agency funding and research expertise to private firms' initiative and perception of markets.

The programme has a clearly defined structure. In phase I of a three-phase Programme, grants of about \$50,000, equivalent to 6 man-months and adjusted for inflation, are made for feasibility studies. Firms which win these are eligible for Phase II, with awards of up to \$500,000 (2 man-years) to bring projects to the prototype stage. In Phase III, it is intended that private financing of projects will take over from SBIR financing. The better projects are expected to be able to obtain a commitment from external financial sources or from larger firms on the basis of Stage I results, subject to the achievement of defined objectives in Stage II. Advance commitments of this kind for Stage III count favourably in consideration of Stage II awards.

The 'Solicitation' is the basic document of each Agency's SBIR programme. Most Agencies issue one Solicitation per year, although the Department of Health and Human Services, because of its range of topics, issues as many as four. The Solicitation advises the number of Stage I awards, and their value. In 1987, for example, the Department of Commerce made 14 Stage I awards, Health and Human Services 356 and Defense 1270. An Agency's Solicitation also designates the topics in respect of which it will consider proposals. The Department of Energy's 1987 list covers 28 topics, but there are no fewer than 889 in that of the Department of Defense. The number of days between publication

of a Solicitation and the closing date for applications ranged from 45 (Environment) to 131 (Agriculture).

No proposal for a Phase I award may be longer than 25 typewritten pages. This is not only to enable large numbers of proposals to be assessed relatively quickly; it also ensures that firms with good projects do not suffer in comparison with those which are merely skilled in proposal-writing.

Consultants encouraged

Firms are actively encouraged to obtain specialist help in their projects through use of external experts and especially by cooperation with University researchers. Up to one-third of a Phase I award and up to half of a Phase II award may be spent in this way.

SBIR programmes recognize that R&D has an opportunity cost, which is especially burdensome to smaller firms. For this reason, budgets can not only include provision for the firm's normal overhead element, but also for a fee - the latter being typically around 7%. This, like the limitation of proposal length, reflects the realistic approach of the SBIR programmes which has contributed to their success.

Except in Agencies such as the Department of Defense and N.A.S.A., where assessment is 'in-house', proposals are first ranked by two or three external experts. In general, evaluation is according to the following criteria:

- importance of the problem or opportunity identified (20%);
- adequacy of research objectives to establish feasibility (20%);
- qualifications of proposer and consultants and access to necessary instrumentation (20%);

- scientific and technical quality of the research plan (40%).

Final selection is always made by an Agency's own SBIR assessors. Assessment is completed and results published within six months at most and unsuccessful applicants can be 'debriefed' and advised of the assessors' comments (though not their identity).

Intellectual property rights remain with the awardee, subject to a royalty-free licence for the Government's own use and to the condition that any exclusive licensee must manufacture in the US. Successful proposals and reports are kept confidential for two years but are then published through the National Technical Information Service.

Although each Agency is autonomous in respect of topics, awards and administration, it must of course comply with the legal requirement of the percentage diversion of its funds to its SBIR programmes. It must also report comprehensively to the S.B.A. whose monitoring role is extremely valuable. For example, it has already called attention to 'about 20%' of SBIR Phase I awards which have not been meeting the objectives of the scheme. Some of these were too 'basic' - 'considerations of agency (research) need overly dominating considerations of commercialization potential' - whilst others were 'studies of existing situations with little or no thrust towards technological innovation'.

The S.B.A. is also charged with responsibility for promoting the SBIR programmes, and it provides another useful service in its quarterly 'Pre-Solicitation Announcements'. These summarize the number of awards, the topics, and the Solicitation release and application closing dates for all Agen-

cies. The S.B.A. also studies and reports on the general impact of the Programme.

Results to date

It is clear that even in the short time since their establishment, the SBIR programmes have massively increased the funds available for innovation at the vital pre-venture capital stage, as the following summary of 1987 results from the 11 participating Agencies indicates:

Extramural R&D budgets (total-million)	\$29,861
SBIR awards target (million)	\$373
No. of research topics in Solicitations	1,588
No. of Phase I applications	14,723
No. of Phase I awards	2,189 (15%)
No. of Phase II applications	2,390
No. of Phase II awards	768 (32%)
Total value of Phase I awards (million)	\$110
Average value of Phase I awards	\$50,000
Total value of Phase II awards (million)	\$241
Average value of Phase II awards	\$313,650

Not only is SBIR providing massive new funding for innovation in the US, it is also providing it in new areas, geographical as well as technological. External research commissioned by the S.B.A. revealed, as Figure 1 illustrates, that in 1982-4 less than one fifth of all US venture capital went into areas other than information processing and electronics.

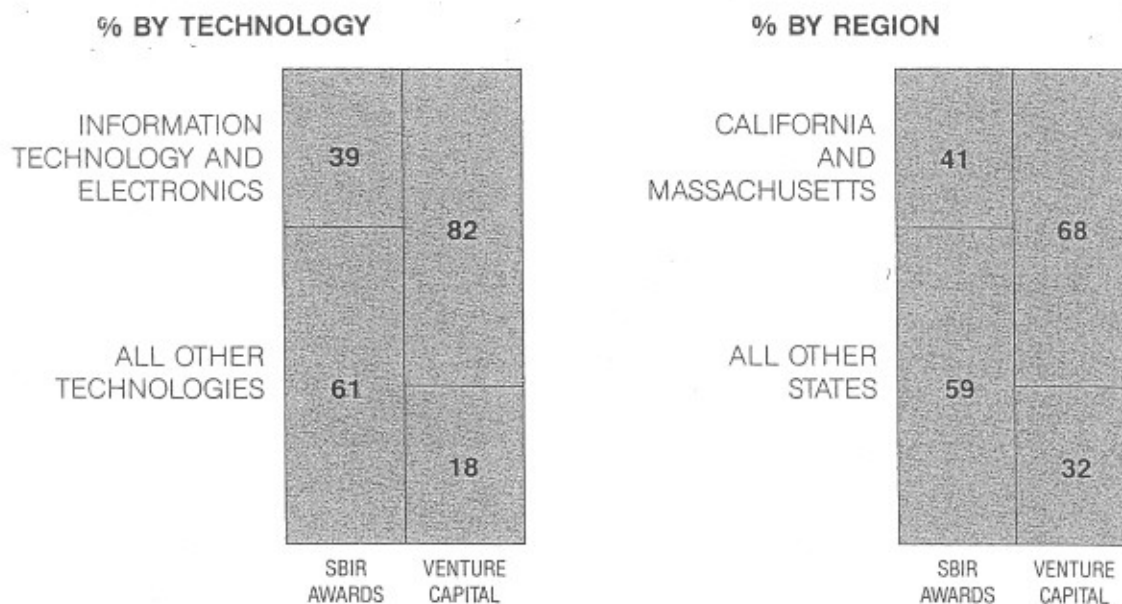


Fig. 1 SBIR awards and venture capital funding 1980-1982
(Source: Small Business Administration)

The comparable proportion for SBIR awards was *over three-fifths*. Similarly, 68% of all venture capital was raised in only two of the 50 States, California and Massachusetts, but these only gained 41% of the SBIR awards.

Research on actual outcomes shows that within four years, one in ten of Stage II award projects had become products actually on the market. For another 30%, commercialization was either 'in hands' or 'likely'. The S.B.A. is active in matching award-winning firms to venture capital, and over 7,000 SBIR project and 550 capital sources are currently listed in its database for this purpose.

Relevance to Europe

The SBIR programme has already aroused interest in European countries, and the 'SMART' scheme in the UK, and the EC's own 'BRITE' scheme, have some similar features. The crucial difference is that neither of these diverts tax-

payers' money that would otherwise be spent on R&D under public sector direction, to private firms. A very much higher proportion of publicly funded R&D is actually carried out by public sector employees in Europe than in the US. It is some of that proportion which should be the target for diversion to SME's, so that it can be better spent in terms of producing commercial products. Secondly, legislation in European countries for SBIR programmes would probably be more difficult and certainly more time-consuming than similar legislation was in the US. Thirdly, even if national SBIR programmes were established in certain EC countries, the size of their awards might not reach the 'critical mass' required for the development of products which would succeed in world-wide markets. Fourthly, in the smaller countries of the EC, copying the US scheme would merely add to the 'noise' in the industrial system and actually provide a new opportunity for the

bureaucracy to meddle in areas where it can do nothing but harm.

European Commission initiative

There are strong arguments for copying the SBIR Programme in Europe, but all of these reasons add up to an inexorable requirement for success that this should be done, not nationally, but *as a result of an initiative by the European Commission*. This would be fully in accordance with the latter's own plan of action for creating a real Community innovation market. Through the existing institutions and *as a better way of deploying* some of the substantial funds already approved for developing innovation within the EC, the European Commission could offer to match funds 'set aside' for an SBIR programme within a Community framework by any publicly-funded R&D institution in a Member State. Access to each such programme would be open - on a transnational basis - to all SME's within the Community. The core of participating institutions would be those such as CNRS in France, the Fraunhofer Gesellschaft in Germany, the Dutch TNO, the National Laboratories in the UK and the RISØ Laboratory in Denmark. The value of the programme would be much greater if R&D institutions which depend partly upon funds subscribed by national industries, such as the de Groote Centres in Belgium, could also be included.

Since national legislation would not be required, the long delays associated with this would be eliminated. The European Commission would designate the target 'set aside' rate and the speed with which this is to be achieved, if the voluntary programmes of R&D institutions are to qualify for matching funding from

EC resources. Secondly, national administrations could be expected to encourage their R&D institutions to participate, since to the extent that they failed to do so, the development of new commercial products would gravitate towards countries whose institutions do take part.

Since imagination plays such an important part in decisions to finance innovation and since the imaginations of individuals are limited to their own experience, the effective provision of finance for innovation depends heavily upon the existence of a wide range of 'imaginings' - which means that the number of decision points must be as large as possible.

The fact that any firm located within the EC could apply to and obtain an award from any participating institution, would inevitably result in the growth of transnational links between groups of innovating firms all over the Community and individual research institutions. The result could only be to bring European firms closer to the leading edges of their technologies and to improve the division of labour between EC Community institutions. In the US, prevention of the same work from being funded more than once is through inter-agency contact, but in Europe it could be a part of the monitoring function of the appropriate EC institution.

The European Commission would presumably be active in disseminating information about the interests and objectives of participating institutions. Also, limiting the size of applications (for example, to the 25 pages of the US scheme) would mean that translation, even into several languages, would not deter applicants from applying to institutions outside their own country. It

could also be expected that rivalry between institutions to capture the most interesting projects would have those beneficial effects that competition will always deliver, as a counterweight to chauvinism in making awards.

There is empirical evidence that the factories to produce new products tend to be located close to where the earlier innovatory work has been done. Consequently the figures quoted above (Fig. 1) which show how SBIR funding gets to areas that other types of venture capital apparently can not reach, have important implications for EC Regional and Employment policies, in addition to its Innovation policy.

In considering these ideas, two fundamental points about innovation should be borne in mind:

- the capacity for technological innovation depends, amongst other factors, upon anterior *social* innovation. For example, much of the new tech-

nology of the nineteenth century was made possible by legislation for Limited Liability and the structure of Companies;

- in the present stage of intellectual property, the ability to imitate rapidly is at least as important as the ability to innovate; creative imitation is an aspect of innovation.

SBIR is a social innovation of the highest value, and European innovatory capacity will be reflected in the speed with which it is copied. It should be recalled that the US scheme is now providing no less than \$400 million a year for Small Business Innovation Research, specifically to produce new advanced commercial products with which European industries will have to compete.

For Europe, therefore, copying of SBIR is not just another option, it is a necessity. The best way to copy it is through European Commission initiative and coordination.