The current state of European research and development

European File

The European Community suffers from a lack of competitiveness in fighting the economic crisis in comparison with its major rivals in the industrialized world, Japan and the United States. New strategies proposed by the European Commission in the industrial, scientific and technological sectors have alerted the Member States to the dangers of thinking solely in national terms. European industry must be able to benefit from the continental scale of the common market if it is to meet new challenges – new information technologies, biotechnology, etc. – on an equal footing with its major competitors. Research and an effective diffusion of research results – in short a greater degree of osmosis between scientists and industrialists – has a key role to play between now and the end of the 1980s.

Statistics show that Europe is perfectly equipped, both in 'grey matter' and financial resources, to meet the challenge. The problem is to ensure that the human and financial resources are used coherently at a European level. At a time when all countries face budgetary constraints, it is worrying to see that a lack of coherence in European research is creating a less than effective use of public funds. With research and development (R&D) spending twice as high as Japan, European researchers produce four times fewer patents in high technology than their Japanese counterparts. This is one of the paradoxes that the research strategy proposed by the European Commission, and welcomed by the member governments, seeks to reverse.

What is the state of research and development in the Community today?

At the start of the 1980s, the Community has a formidable research potential, with:

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- 20% of the world's R&D spending, while accounting for only 6% of its population;

- more than one million scientists and technicians (including 350 000 researchers) engaged in R&D, costing in 1980 some 35 000 million ECU. [1]

Since 1970, the total R&D budget of the Ten has increased by a third (to reach 20 000 million ECU in 1980), while US spending stagnated and that of Japan doubled. Today, the Community's R&D capacity remains less than half that of the US, although only 16% less if civil research alone is taken. It is still twice as great as that of Japan. However:

- there are three times more university students in the US than in the Community, and a third more in Japan;

- while the technology gaps between the US and Europe have been narrowed considerably over the past 15 years, new gaps have been allowed to open *vis-à-vis* both the US and Japan in various leading fields of technology: informatics, biotechnology, etc. Europe has also been less successful in applying the results of research to the solution of socio-economic problems (development, innovation) than her major competitors. The gaps have been most evident in areas where cooperation between Community countries has yet to be developed: information technology and biotechnology, but they also exist in some of the more traditional sectors, such as the car and chemical industries. On the other hand, cooperation has allowed the European countries to remain in the mainstream of scientific development and industrial innovation in fields of basic research and high technology, like high energy physics, space and controlled thermonuclear fusion.

Research and development policies in the Community countries must concentrate on:

- promoting internationally competitive economic development;

- solving social problems such as the improvement of living conditions and protection of the environment;

- maintaining a proper balance between pure and applied research.

Under current budgetary constraints, the Ten pay particularly keen attention to ensuring the most effective use of available funds and increasing the chances of success in research, while avoiding duplication of effort at national level. They are trying to improve their understanding of the relationship between the different components of the R&D system from pure research to industrial development. They also consider that priority should be given to evaluating the choices and effects of technology, to training scientific and technical staff and users and to scientific and technical information.

[1] 1 ECU (European Currency Unit) = about £ 0.55, Ir. £ 0.69 or US $ 0.94 (at exchange rates current on 16 September 1982).

The main sectors of European research are:

- Defence, which accounts for 25% of public spending in the Ten (although with wide variations between Member States: from 10% to more than 50%), compared with 47% in the US and only 2% in Japan..

- Energy, which has been given high priority (11% of total R&D spending), justified by the high level of European imports in this sector. Since 1974, public funds have gone increasingly to fossil fuels (coal, etc.), to renewable energies and energy saving. Between 1975 and 1980, the proportion spent on nuclear fission fell by 20% in Germany and 7% in France, while spending on controlled thermonuclear fusion (6% of public expenditure on energy research) remained high.

- Industry, which has had less than 10% of research spending in some Member States. The development of the capacity of industry to innovate is one way to tackle the current economic crisis. After a drop at the start of the 1970s, industrial R&D has increased since 1978, although it has only regained its 1974 level.

- Raw materials supply – another weak point in the Community, which is forced to import more than twice its exports in this sector. The Member States, however, only allocate 7% of their industrial research spending to the optimum use and recycling of raw materials.

- The improvement of living standards, which has been given an increasing amount of attention. Between 1970 and 1979, the proportion of R&D spending devoted to improving the human environment, protecting and promoting health and dealing with problems of society at large increased from 7.5 to 11.2%. More recently, this trend seems to have stabilized and even fallen back with regard to spending on problems of society.

- Agriculture, which accounts for an average of only 3.7% of total spending, although this is unequally shared between the Member States: the Netherlands and Denmark 9%, France 4%, Germany 2%. Italy, hit by a substantial drop in its farming area, spends only 0.9 ECU per head of population on agricultural research, compared with 6.8 ECU in the Netherlands and 4.7 in Ireland, a country where agriculture holds a key position although it remains relatively weak in production terms.

- International cooperation, which covers mainly basic research, space and aid to developing countries. In the first two sectors, there has been a decline in spending over the last few years. In the third sector, France accounts for about two-thirds of total Community expenditure.

As has been frequently mentioned above, these trends are averages, which hide wide variations between the Community Member States. In 1980, total R&D spending represented 0.98% of the Community's gross domestic product (GDP), compared with 1.04% in 1975. While the Netherlands was very close to the average, Germany, France and the UK spent more and Belgium, Italy, Ireland and Denmark spent well below the

average – closer to 0.5%. Ireland, Italy and the Netherlands were the only three countries where research spending increased slightly in relation to GDP between 1975 and 1980. The structure of research policy and the priorities chosen also differ from one member country to another.

The national policies [1]

- In Belgium, priority is given to technologies which help speed up innovation and adaptation of industry to international competition (environment, information technology, non-nuclear energy, aeronautics). University research has been mainly directed towards specific social needs. Problems persist as far as the career and status of research workers are concerned and efforts have been made to solve these problems by improved management, increased mobility and better insertion in the various sectors of economic and social life. The recent regionalization of the country should lead to structural changes which might influence trends observed to date.

- In Denmark, the decentralized decision-making process has led to broader horizontal coordination, with the setting up in 1979 of a specialized interministerial committee, a research planning council and six national research councils. They draw up the guidelines but find it difficult to reconcile limited budget resources with the increasing number of applications for research aid. The councils have encouraged numerous projects in the social and energy sectors, for example. The Ministry of Education is currently looking into ways of developing recruitment in order to meet the problems of an ageing and less mobile research body.

- In Germany, the following research aims are being pursued: broadening and deepening scientific knowledge (with particular support for basic research), the maintenance and development of economic viability and competitiveness, better use of resources, improvement of living and working conditions and the study of the impact of technological change. An effort is also being made to modernize and enhance technological infrastructure. The government is also encouraging the recruitment of young research workers, exchanges and vocational training of research staff to overcome the problem of ageing researchers, often recruited between 1960 and 1974 and who have not been replaced because of budgetary constraints.

- Greece has to date had a centralized organization based around a special interministerial committee, an advisory committee and the Agency for Scientific and Technological Research. They have been in charge of coordinating R&D in Greece. The new government is giving priority to R&D. It plans to set up an infrastructure that will enable the country to develop its scientific and technological capacity, help use R&D to improve economic and social conditions, create systems and ways to preserve, exploit and improve human potential and establish a democratic institutional framework capable of responding to the requirements of technological developments while preserving the nation's cultural identity. The government has therefore set up a

[1] Situation at the beginning of 1982.

special ministry and has drawn up a five-year R&D programme, boosting spending to 1.5% of GNP by 1990. It will also develop the necessary R&D infrastructure through the creation of a national centre for information and documentation.

- France recently decided to give priority to research sectors which are of strategic importance to the independence of the country, the competitiveness of its economy and the introduction of a new model for development: biotechnology, rational energy use and new energy sources, electronics and the development of robots, the impact of R&D on employment and working conditions and cooperation with the Third World. A special effort is also being made to develop industrial research, exploit research results and innovation, particularly in small and medium-sized businesses. Control of public bodies involved in R&D is now in the hands of one ministry which has responsibility for the overall civil research budget (about two-thirds of total R&D spending). The government is studying the introduction of reforms with regard to research personnel and an effort is being made to recruit new scientists and rejuvenate the laboratories.

- Ireland is drawing up a national science and technology programme that will act as a constantly updated guide to public action in this sector. The main objectives of the programme are to reduce dependence on energy, develop industries using national resources and encourage advanced technologies (electronics, telecommunications, biotechnologies).

- Italy has expanded aid to university research and measures have been taken to boost industrial innovation, particularly after a recent slight fall-off in public contributions to industrial research. The National Research Council is responsible for running a series of projects adopted within the framework of economic planning. These projects cover energy, foodstuffs and human health, the environment, transport, advanced technologies, space, etc. The status of research staff is to be reviewed to encourage mobility.

- The Netherlands has given priority to multi-disciplinary technologies involving energy, the environment, hygiene and biotechnology, as well as research into new materials, information technology and social sciences. Science and technology now come under the Ministry of Education and Science. A memorandum approved in 1980 sets out the conditions for financing research. One major problem is the mobility of research workers, which is relatively low in applied sciences.

- In the United Kingdom, research is governed by several ministries: Energy, Agriculture, Health, etc. But it appears that efforts are being made to improve coordination. Amongst the current priorities in research, particular attention is being given to energy technologies, coal, nuclear, oil, solar and other renewable energy sources, energy saving, environmental protection and the spread of know-how and new technologies. There is a growing tendency to link university research and industry, particularly by centring industrial research institutes around universities and improving the status and training of scientists. The government is endeavouring to step up support for high-cost industrial innovation projects and those which bear an

element of technical risk. The National Research and Development Corporation backs innovation by exploiting the inventions of public services and supplying aid to industrial innovation.

Relaunching Community research policy

In order to maintain its position in the world and to improve the living and working conditions of its citizens, the European Community must strengthen its internal cohesion and affirm its common stance to the outside world, particularly in relation to the key question of developing the Third World. In the current economic crisis, which forces most Member States to concentrate on finding short-term solutions to their problems, the Community, with its role in responding to current problems, represents an instrument which Europeans can use to work out common solutions to common problems requiring medium to long-term answers.

In the field of research, the Community has already developed its own efforts through the Joint Research Centre establishments at Ispra, Geel, Patten and Karlsruhe, and by concluding contracts with national laboratories, thereby supporting and coordinating their research work. Finance for Community research has increased from 70 million ECU in 1974 to over 450 million ECU in 1982, buh this is still less than 2% of the total spent on research by the Member States. In addition, Community research, based on a sum of sectorial actions – mainly in industry, energy and the environment – and sometimes only adopted with difficulty by Member States over the years, lacks a global overview that would permit different actions to be drawn up and enable the European dimension to be better exploited.

This situation must be altered. The Ten face common problems that call for common solutions. Joint action would allow the Ten to launch, at shared cost, R&D programmes on a scale comparable to those of the US and Japan, guaranteeing the participation of the best scientists in all the Member States, financial resources that avoid national budgetary constraints and economic and industrial developments that span a continent.

The European Commission feels that the Community must concentrate its scientific and technical efforts over the next decade on:

- the promotion of agricultural competitiveness: improving productivity (soil, animal and vegetable produce, technology), and improving the quality and processing of produce;

- the promotion of industrial competitiveness: support for traditional industries (removal or reduction of barriers to free trade within the Community, improvement of production techniques), promotion and development of new technologies (informatics and biotechnologies);

- improved management of natural resources: optimum use and recycling;

- improved management of energy resources: ensuring safe conditions of development for nuclear fission, development of new energy sources (including controlled thermonuclear fusion), optimum use of fossil fuels (oil, coal) and energy saving;

- increased aid to developing countries, by implementing scientific and technological research that interests Third World nations.

- improvement of living and working conditions: better safety and health protection, environmental protection and prevention of pollution.

The Community's research effort must, of needs, be coupled with better evaluation and exploitation of results which alone guarantee the effectiveness of research. The implications for employment and regional development must also be seriously taken into account.

A framework programme for Community scientific and technological efforts should provide the necessary impetus to relaunch European R&D. Based on political options from which priority actions are drawn, the programme will outline the present and future R&D work for various fields, in the light of national policies and cooperation at international level. The programme would be designed to ease decision-making and would allow the Member States and Community institutions to decide on all joint actions and initiatives to be taken and on the means required. It would allow better coordination of European research, periodic readjustment of activities and their inclusion in longer-term R&D plans in line with aims outlined ■

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