

Technology Policy and Economic Structure

Summary of advisory report 16

The question

The Minister of Economic Affairs in the Netherlands has asked the Advisory Council for Science and Technology Policy (abbreviated to AWT in Dutch) to make a recommendation on the relationship between the economic structure of the Netherlands and the innovative potential of industry. The minister refers to an uneven economic structure resulting from the relatively large number of extremely big companies and the relatively small number of large and medium-sized companies. Since the lion's share of R&D work is concentrated in the giant companies, the minister believes that the base for technological innovation is too narrow.

Is this uneven structure a cause for concern? Is the situation becoming more worrying given the shifts in business and industrial activity at global level? What consequences should this have for the body of knowledge residing in such organisations as the Institute for Applied Research in the Netherlands (TNO), the major technological institutes, universities and the like? How can technology policy be geared more to the economic structure and how can its dynamism within this be strengthened?

The importance of technology policy

The Dutch economy is being faced with huge challenges. In the first instance it is up to companies themselves to make a move. In this respect the Council points to the importance of a good entrepreneurial climate. Technology policy is, as it were, the layer of humus enriching the soil or basic structure and making it more fertile. That basic structure is created by general social and economic policy.

The thicker the layer of humus, the bigger and better the yield. One would expect, given the major political parties' election programmes, that there will be substantial political support for more money for technology policy in the coming government period of office. The Council would naturally applaud such an increase. But it is not just a question of the size of the technology budget, so much as what this involves. It is the latter aspect that the Council wishes to stress in this report, hoping, by doing so, to contribute to the new government's technology policy.

Part 1 Analysis

Economic profile: globalisation, emphasis on process industry, intertwining of industry and services
Dutch business and industry is highly internationally oriented. There is no other country in the OECD which combines such relatively high exports with such extensive cross-border investment. The reverse of this is that one cannot take it for granted that Dutch companies will launch or retain their activities in the Netherlands. We have to pull out all the stops if the Netherlands is to be an attractive place for businesses, both domestic and foreign, to locate.

The Netherlands has an industrial profile that deviates from that of other countries, partly because of the presence of a number of major multinationals. Those sectors which are over-represented, by comparison with the OECD average, are in the process industry: chemicals, food, beverages and tobacco and oil. Another is the electronics industry. Under-represented sectors include construction materials, machine engineering, transport equipment and the steel industry. The climate for industry in the south of the Netherlands is reasonable, but in the Randstad urban agglomeration it is mediocre. The services sector in the Netherlands is relatively large and expanding fast, as it is in other OECD countries. The Dutch profile deviates barely at all. The climate for service companies to locate in the Netherlands is excellent.

Industry and services are highly dependent on each other. The development of the one also has an

impact on the other. There is no question of choice; we are talking about the Netherlands as an industrial country and the Netherlands as a services country.

From coexistence to collaboration

The Council has some queries regarding the idea that the Netherlands' economic structure is uneven in terms of the size of companies. The Netherlands does indeed have quite a lot of large companies and few companies in the category below this (between 5,000 and 15,000 employees). But a high proportion of the activities of the giant companies take place outside the Netherlands. Nor is this surprising in view of the small home market. Besides this, the Netherlands has a lot of foreign companies; establishments that themselves have fewer than 5,000 employees, but which are part of large companies. The workforce employed by branches of 'Dutch' multinationals in the Netherlands is approximately the same size as the workforce of subsidiaries of foreign companies in the country. Given this international intermingling it is consequently difficult to make useful comparisons. Ownership - even if it does happen to coincide with the country where the head office is established - is becoming less and less relevant. It is a question of the location where the activities take place. It is not important how many companies operate under a Dutch flag, but whether there is a sound investment climate for enterprises of whatever nationality.

To be able to survive a company has to go on innovating. The possibilities of doing so are partly determined by the size of the company. This differs, however, by sector. In the transport equipment industry a number of Dutch companies have proved too small to cope independently with the competition. But in other sectors companies of similar size have not been affected by such problems of scale or to a lesser extent. It is sometimes precisely the small companies which can forge ahead with new developments.

The scale factor, however, is becoming less important because companies are coming to concentrate more and more on core activities and are contracting out more. Large companies resemble networks of business units. And a network of distributors and suppliers is increasingly coming to resemble a large enterprise. It is not so much the number of large or medium-sized enterprises which has priority, as the collaboration between big and small, between distributor and supplier, contractor and subcontractor.

And it is precisely here where the danger lies. It has emerged from various studies that small and medium-sized subcontracting businesses in the Netherlands are having difficulty in elevating themselves beyond the status of jobbers. Manufacturers are becoming more inclined to resort to co-makership with their subcontractors. An innovative SME not only serves a function in its own right, but constitutes one of the incentives for multinationals to locate to an area.

Many SMEs are not subcontractors, but final producers. With the dissolving of the internal frontiers in the European Union these companies are increasingly having to deal with competition from foreign companies, both on the Dutch market and on export markets. Here, too, innovation is one of the weapons in the battle. Companies following in the wake of developments experience technology as a major bottleneck to innovation. The small-scale technology leaders, including innovative starters, have problems in particular with finding finance for their innovations.

From R&D management to technology assets management

R&D spending, expressed as a percentage of GNP, is low in the Netherlands by comparison with many OECD countries. Spending has also fallen, as it has in some other countries as well. The drop in spending in companies in the Netherlands is entirely attributable to the large multinationals; all other companies have kept their spending up to scratch.

The figures for the Netherlands do not mean that large Dutch companies do little or less R&D. Dutch companies are in the vanguard when it comes to cross-border R&D investment. It is not so much that they do less R&D, but that they do a relative large amount of research and development abroad. This can be perfectly well explained because of the many activities abroad. For the companies themselves, this international spread is a strength in the face of growing globalisation. Globalisation, however, is jeopardising employment in the R&D sector in the Netherlands itself. But globalisation, together with the creation of a common European market, also offers opportunities for attracting the R&D of foreign companies.

Corporate management pursues an R&D strategy prompted by what the competition is doing and by the position which the company wishes to keep or command: to lead or to follow in technology's wake. This strategy illustrates that no standard can be given for the level of R&D spending. The sum of all the strategic positions of companies in the various sectors is a product of management decisions and not a statistic which can be compared with those of other countries just like that.

R&D spending only reveals how much effort a company has put into its in-house research and development. Technological knowledge which is available outside the company, however, is playing an increasingly bigger role. That knowledge is, for example, embodied in patents and scientific publications. And that knowledge resides too with customers, at TNO, universities, companies, foreign institutions etc. Companies are increasingly resorting to systematic use of technology assets as part of management's domain, which is why the Council refers to technology assets management. Know how & who. Technology assets management is essential to companies, certainly if they do little R&D themselves. Technology policy must respond to this as well as it can.

Part 2 Vision and recommendations

A technology policy geared to the economic structure

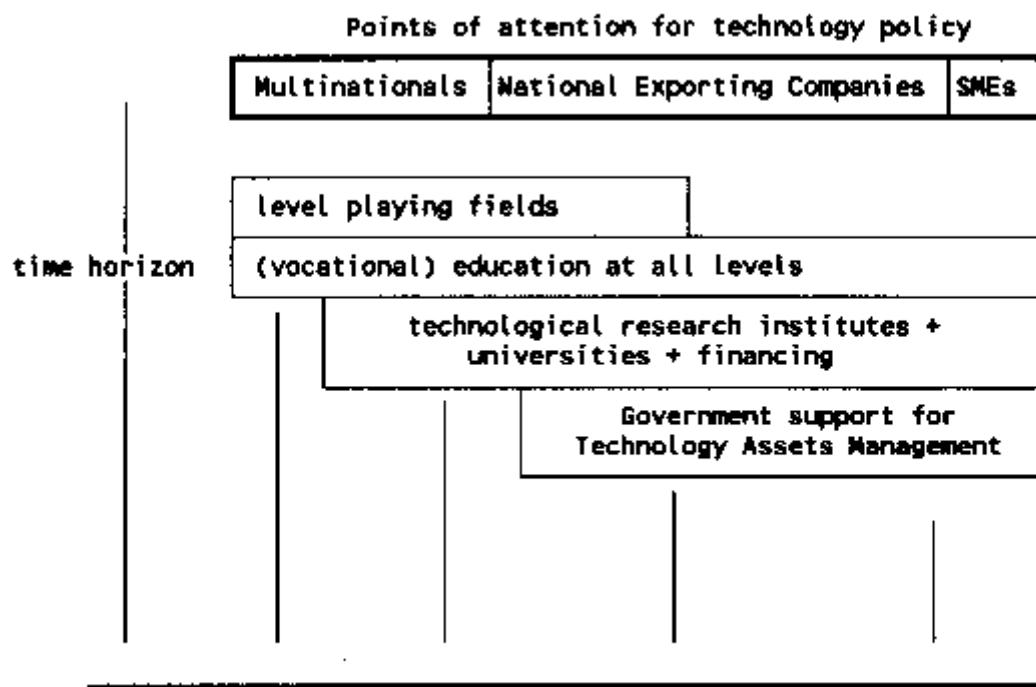
Innovation requires investment. Investment generally only pays in due course. The potential for such investment differs by (type of) company. In other words: companies have a different time horizon. A technology policy that is geared to the economic structure of the Netherlands has to take this into account. The Council distinguishes between three groups of companies: multinationals, national companies active on the world market and small- and medium-sized enterprises (SMEs).

The majority of multinationals notably the industrial ones, invest a lot in R&D and can resort to a worldwide pool of knowledge resources. There are two site-bound conditions for encouraging businesses to locate where the government can play a role i.e. in ensuring that there is well-educated working population at all levels and creating general social and economic conditions which are more attractive than in other countries. In the event of unfair policy competition, government is justified in compensating.

National exporting companies are located in the Netherlands but are geared to the world market. They have a wide horizon but must primarily rely on national resources when it comes to acquiring know-how and obtaining finance. Besides the points of attention mentioned above - good education, and the endeavour to achieve level playing fields and in appropriate cases matching, - national exporting companies primarily need a body of market-oriented knowledge and know-how. Joint financing of strategic research by the government is desirable because of the relatively short time horizon of these companies.

Small and medium-sized enterprises are highly diverse: technologically advanced companies, the companies that follow in the wake of technology, jobbers, superior consultancy services, starters etc. Most small and medium-sized businesses have their customers in their neighbourhood, they employ workers from the region and are focused on schools and suppliers in the immediate vicinity. Given their size, SMEs' time horizon is generally short and their potential for in-house R&D limited.

Consequently they often have to rely on know-how available elsewhere. Hence government promotion of technology assets management is desirable above all for SMEs.



The government can reinforce the dynamics of the economic structure mainly by latching on to companies' own initiatives. This means, for one thing, that it is not up to the government in the first instance to choose certain technology areas as spearheads. It is not a question of picking the winners but letting the winners pick.

General promotion of R&D throughout industry

Latching on to companies' own initiatives has consequences for the present set of instruments of the Ministry of Economic Affairs.

The main instruments for promoting R&D in companies are the fiscal facilities which have just been introduced in the Act to Promote Research and Development Work, [Wet ter Bevordering van Speuren en Ontwikkelingswerk], WBSO) and the Business-oriented Technology Promotion Programme [Programmatische Bedrijfsgerichte Technologiestimulering], PBTS. Under the WBSO, 12.5% of R&D wage costs are compensated by reductions in wages tax; up to NLG 100,000 the reduction is 25%. Under the PBTS, 37.5% of the costs of R&D projects are subsidized; the projects must relate to one of the four technology areas: information technology, material technology, bio-technology and environmental technology.

The Council is very keen on the general tax relief provided by the WBSO. It is an instrument which fits in well with its advocacy of a policy to promote technology which latches on to the initiatives throughout industry as a whole. An increase in the deductible percentage, especially over the first NLG 100,000, would be advisable.

There is scarcely any justification to be found for the PBTS being geared to particular areas and the Council would recommend abolishing it altogether. The funds thus released could be used for other instruments, for one thing the WBSO.

Enhancing Technical Development Loans and Innovation Centres for SMEs

The Council's analysis reveals the need to promote innovation notably in SMEs. The Council has a number of proposals to make.

Companies should be eligible for Technical Development Loans (TDLs) amounting to 40% of the development costs, which have to be paid back in the event of successful development. At the

moment about 40 companies a year are receiving loans and the Council recommends them to be given greater currency. At the moment the only projects eligible are those which are new to the Netherlands. The raised loans ought to apply to projects which are innovative for the companies in question, irrespective of whether they are technically advanced. Such loans ought to be more accessible to new companies. The Innovation Centres (ICs) ought to play a more encouraging role here. The Council would recommend that the Innovation Centres award the raised technical development loans and should be given a mandate up to NLG 100,000; larger loans should be assessed by SENTER (the Dutch technology agency). The Council advocates raising the loans budget for this purpose.

There are diverse instruments to help companies implement technology, assets management. Examples which spring to mind are the Innovation Centres which play an important role in advising, referring and guiding companies, the technology centres in the various branches of industry, the KIM programme for SMEs which seeks to encourage those with technical, higher vocational or university qualifications to work in small and medium-sized businesses and the MiToe programme which promotes the application of micro-electronics and the like. The Council endorses this policy and would propose that the ICs should do more. The ICs should each have a small budget of a few million guilders at their disposal which would enable them to reach more companies and call in experts to screen companies. But other activities could be undertaken, too, by ICs with these additional responsibilities: joint financing of exchange of staff among companies and research organisations, forming of business networks, the financing of small-scale demonstration projects and the like.

Better match between supply and demand for knowledge and know-how

The major technological institutes (GTIs) and TNO can become more market-oriented. The Council proposes that the triple division should be consistently adhered to i.e.: basic financing (to explore new developments), target financing (for preparing specific markets) and research assignments for third parties. Basic and target financing have to be decided on every four years, partly on the basis of the agreed strategy, the set of tasks and success on the market.

The Council also recommends that a discount fund be set up for strategic research. The fund could provide a discount on strategic research that companies contract out to TNO, the GTIs and the universities etc.. This will improve cooperation between the latter and the corporate community. What this recommendation basically entails is widening the spread of the present clustering policy and increasing its budget. The policy aims at linking up TNO and a number of major companies. The spread of such policy can be widened by involving other research organisations, institutes and universities as well as all kinds of technologically-oriented companies.

Applied research for groups of companies is paid for by two programmes: the TNO stimulation programme and the Subsidy Scheme for Business-oriented Technology Research by Collectivities [Bedrijfsgericht Technologisch Onderzoek door Collectiviteiten] (BTOC). The stimulation programme is earmarked for research carried out by TNO for groups of companies or the like. Under the BTOC programme, companies are free to choose their research organisation. The largest possible majority of the Council thinks that to enhance competition among research organisations, the stimulation programme should be transferred to the BTOC.

As to the universities, the Council advocates a clearer division of responsibilities between the government and the universities. A further definition of priorities is desirable. The Council considers it undesirable for the government to be involved in determining the contents of research programming by means of reallocating the first flow of funds. Adjustments can be made through separate funds. The government does have responsibility with regard to structural changes within the university system with a view to efficiency and the universities' profile. The Council has proposed that the universities should indicate structural changes to disciplines, policy on chairs and major investments in strategic documents to be published every four years. The total scenario emerging from these plans is assessed by the Minister of Education and Science. Allocation of the first flow of funds depends on this assessment.

Vocational education for innovation

Vocational education is indispensable in building up industry's knowledge and skills. Improvements

are continually being made to the match between vocational education and the needs of industry. The Council would add two proposals to this.

First of all, the Council endorses the recommendation of the Advisory Council for Education (ARO) on 'learning in networks'. Vocational students have to learn by example in the companies themselves and from their networks of clients, suppliers, consultants and the like. They have to be prepared for technology assets management. The Council recommends using the innovative funds of the Ministry of Education and Science for this purpose.

Second, the Council advocates upgrading vocational education. A title should be attached to each final level attained in preliminary vocational education, the apprenticeship system and senior vocational education. These titles should also be obtainable by working people by means of refresher courses and special practical examinations.

Lastly, the Council wants attention to be paid to the training of engineers. Now that it looks as if the universities of technology will be able to add another year to their study programmes, the Council would urge that design subjects should be given priority in deciding on the syllabus. Engineers have to be trained to be designers who can integrate and synthesize insights from various disciplines.

Technology policy with wide government support

The government, as the organisation that draws up rules and drafts legislation, has a major impact on technological development in the Netherlands. The Council would advocate that explicit attention be devoted to possible constraints deriving from (new) legislation and regulations on innovation in industry. New legislation and regulations may be unavoidable. But then, new criteria have to be announced in good time and technological development promoted through flanking policy so that companies can meet the new requirements on schedule.

The government can also promote innovation as investor. It is thus that NLG 250 million has been set aside for technological innovation for a period of five years from the Economic Structure Reinforcement Fund [Fonds Economische Structuurversterking]. The Council would recommend that a substantial portion of the said fund should be deployed for another five years to back centres of knowledge in domains of national importance.

Innovation very frequently involves the application of existing technologies. This applies certainly to the services sector. In some instances many parties are involved in innovation, as was the case with the introduction of the chip card. Innovation of this kind is an organisational rather than a technical problem. The government can play a stimulatory role by bringing together the various parties involved.