

NATIONAL SCIENCE POLICY REVIEWS

PORTUGAL

Part II

EXAMINERS' REPORT

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R&D AND THE PRODUCTION SECTOR

108. Interaction between R&D and the production sector is very limited in Portugal. Despite some significant exceptions, "good intentions" are more in evidence than effective activities. Under these conditions, measures aimed at strengthening innovative capacity will remain without significant impact until the entire scientific and technological system -- and in particular the sub-system at the interface between industrial R&D and industry itself -- has reached a critical mass. This minimum threshold is difficult to define, but on average could be of the order of twice the current overall effort, and even more in the industrial R&D sub-systems.

109. R&D structures being virtually non-existent in firms, priority should be given to their creation in order subsequently to permit the development of technology transfer programmes to promote industrial innovation. This transition phase will require a certain minimum of guideline planning in order to strengthen existing R&D resources and re-orient their activities more in line with national interests. Almost all the institutions required for planning the R&D system and its development -- JNICT, INIC, IANPMEI or other bodies -- already exist. The problem is to proceed in a resolute and coherent fashion.

110. It will perhaps be considered that the proposals described in the following pages are too complex or too diversified and that they require too great a commitment in both resources and political will. But to adopt a laissez-faire attitude and wait for internal forces to develop is no answer to the problems raised and is even less of a way to meet the challenge. The general situation in the production sector means that this process will be very slow; it will be at least ten years before a viable R&D system can appear within firms and which will be capable of generating a substantial demand for scientific and technological activities.

111. In this field, even more than in any other aspect of the Portuguese research and development system, we have no hesitation in saying that incentive and modernisation measures need to be geared up considerably in both promptness and volume. Any programme aimed at accelerating the international dynamics of a system needs a large-scale effort which will give only a small return. But in the final analysis, even if the direct results are limited as regards, for example, the development of independent technologies, the indirect impact will be considerable to the extent that the overall technological level of the production sector will be increased, scientific and technological staff trained and the universities and pure research system

prevented from advancing further along a purely academic path.

112. A number of R&D systems have developed in the industrialised countries without there being any clear distinction between R&D supply and demand within public bodies. R&D institutes thus often find themselves having to define research needs, and this involves setting up a particularly cumbersome twofold mechanism. We strongly recommend that a very clear distinction should be made between measures tending to increase the capacity to undertake research (R&D supply) and measures aimed at promoting R&D demand. The following measures in particular seem important:

113. On the R&D supply side:

- long-term financial aid to promote the creation and development of research, development and design within industrial firms. This assistance measure should be applied automatically, for example in the form of tax relief;
- setting up of a network of non-profit research institutes (including existing institutions such as LNEC or LNETI) to carry out contract work in the fields of applied research and technical services in order to satisfy public and private R&D demand;
- help for the universities to develop a network of "inter-disciplinary centres" in new branches of research.

114. On the R & D demand side:

- promoting of R&D demand from the production sector by meeting up to 80 per cent of the cost of R&D projects proposed by firms from a "national R&D fund";
- encouragement for the development of R&D planned in line with the long and medium-term priorities of the national economic plan by means of a series of "guide R&D programmes";
- launching of a number of large public "demonstration projects" in order to establish new sectors of production or to restructure existing ones by extensive use of technological innovation.

1. Measures to strengthen R & D structures

115. The proportion of the labour force engaged in the R&D sector averages 5 per thousand in the highly industrialised countries; Portugal does not even reach the 2 per thousand mark. Quite apart from any other data on the way in which these human resources are distributed among the different sectors and their suitability for the country's specific needs, firms in Portugal are in an unfavourable situation due to the fact that they are operating in a country with a poor scientific and technological capacity.

116. The R&D sector labour force can only be increased slowly since the training of new researchers, technicians and engineers will be based on the available resources. It will take five to ten years to double the existing labour force and distribute it in a balanced fashion to enable Portugal to reach the average OECD country level.

117. A five year plan is proposed to encourage the creation of new jobs to the extent of 0.5 per thousand of the labour force in favour of existing and new R&D institutions and R&D services in industry.

a) Development of R & D services in firms

118. R&D services in industrial firms at present employ about 1,000 people. Even though this objective implies certain difficulties, it seems possible to create 700 to 800 jobs in five years in the research, development and engineering (R-D-E) sector. We have deliberately added engineering to R&D because the general situation of industrial firms in Portugal does not enable a clear distinction to be made between the different phases of technological operations.

119. To encourage Portuguese firms to step up their R&D effort and provide new resources, it is necessary for government incentive measures to be substantial and automatic.

120. The proposed measures consist of tax relief for a period of five years for each new person engaged in what is explicitly recognised as an R&D job. Over a period of five years this aid would amount to a total of about 2 billion escudos and would cover about 80 per cent of the direct cost of each employee and a certain sum for each new job created to cover the expenditure entailed in acquiring scientific and technological equipment and building special installations. The tax authorities should set up a monitoring system to ensure that the new people are in fact working in R&D services which are an integral part of a firm's structure and to check the fixed capital expenditure connected with the creation of these jobs.

121. It is essential that firms be able to rely on automatic and non-discretionary action by the authorities and that no prior authorisation should be required for setting up a new R-D-E service. A minimum threshold for job creation in such services could be imposed (i.e. ten people), and there could be a ceiling (which should be proportional to the size of the firm) on direct incentive measures. This mechanism should not be limited to firms in the industrial sector, but should extend also to agriculture (e.g. to cover the development of biotechnologies) and the service sector (e.g. in favour of firms specialising in software production).

b) Action in favour of contract research laboratories

122. LNEC is an interesting example of a large applied institute which has developed to a level of quality and competence comparable to that of similar institutes in bigger and more industrialised countries. It comes under the Ministry of Public Works and Transport and is subject to all the national administration rules. Nevertheless, it has succeeded in acquiring real independence that is almost the equivalence of the status of a "contract research institute". Even when the research demand comes from the Institute itself, the rules of the game are respected, which means that internal research projects are designed and managed just like external contracts.

123. LNETI seems to want to model itself on LNEC, but it is still too early to know whether it will succeed. Because of the heterogeneity of its different components -- and in particular the difficulties encountered by the old nuclear energy laboratory in reorienting its disciplines while maintaining

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170. In the medium and long term, the Fund should help qualitative and quantitative progress in high-technology industries through product and process innovation. The guided national R&D programmes should, in all the fields of priority action, favour the advance of knowledge and know-how and the development of technological innovation proposals. More precisely, they should help indicate new methods of exploiting local resources in the following areas: renewable energy sources, the agro-food industry, fishing, mining, etc.

171. In addition, the selection of a certain number of advanced technologies likely to be able to be exploited in the future in Portugal, should indicate the directions to be followed in large-scale applied research programmes, aimed for example at rationalising transport, developing communications, improving the education system, encouraging energy conservation, etc. Participation in international co-operation programmes through "guided national R&D programmes" would give Portugal the opportunity to evaluate its capacities and potential by comparing them with those of other countries, thus avoiding the danger of falling into the university illusion of autonomy and "prestige". In other words, this would lay the foundations for a national industrial development programme that would be both realistic and practical.

4. The conditions for success

172. Investment in R&D, especially industrial R&D, cannot alone ensure the country's economic development. Like any other strategic action, it must be accompanied by suitable economic and institutional measures. Successful implementation of the economic planning mechanisms would represent an assurance in this respect. Assuming that the economic growth of latter years continues, the development of the productive R&D system should be given the highest priority; otherwise, economic growth as such is liable to lose momentum. For this reason it is essential that the "users" of R&D should be in a position to influence the development of the R&D system.

173. The responsibility for gearing the R&D system to the economy's needs lies first and foremost with economic agents. There is no alternative to entrepreneurship. Public incentives to R&D, like the ones suggested here, should provide an opportunity for enterprises to alter radically the present situation in industrial R&D. But it is not at all certain that enterprises will automatically take that opportunity. A series of promotional schemes should be set in motion by such bodies as the Ministry of Industry, IAPMEI, IIE, the technical and manufacturing associations and so on, whose responsibility it is to improve the quality and competitiveness of the traditional manufacturing industries. The main purpose of these schemes should be:

- to improve the industrial design of traditional products (by hosting international exhibitions, organising prize competitions, alerting small local firms to developments abroad, and so on);
- to promote the transfer of foreign technologies and encourage joint ventures with foreign entrepreneurs as a means of improving productivity and product quality;
- to encourage co-ordinated intersectoral action (for example, the food processing industry would develop faster if entrepreneurs could be certain of the long-term supply of agricultural products);

- to improve existing technical services (like the Technical Information Centre of INETI) and to set up new ones (especially in the field of testing and standardization);
- to channel more student into non-university higher technical education and secondary technical education;
- to promote Portuguese products abroad, by means of trade fairs and technical exhibitions.