

SCIENCE AND TECHNOLOGY POLICY IN CYPRUS: ECONOMIC AND POLITICAL ASPECTS OF THE EUROPEAN SCIENCE AND TECHNOLOGY POLICIES FOR THE 21st CENTURY*

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Abstract

Research, Technological Development and Innovation (RTDI) are high on the European Agenda, and it comes as no surprise the Research Commissioner Philippe Busquin has been outlining plans to exploit the potential of science and technology in the Member States through increased collaboration in a communication entitled "Towards a European Research Area". Within this framework it is important for Cyprus to develop a comprehensive Science and Technology policy which will be examined in the pre-accession framework. This paper examines the evolution of S&T policy framework and institutions in Cyprus, the containing factors and proposes guidelines for policy improvements. A short version of this paper was presented at Fourth Semmering Science and Technology Forum on "Institutional Changes: Efficiency and Effectiveness, Economic and Political Aspects of the European Science and Technology Policies for the 21st Century" organised by the Interdisciplinary Centre for Comparative Research in the Social Sciences (ICCR) and the European Association for the Advancement of Social Sciences (EA), in Vienna (3-5 December, 1999).

Introduction

In most nations, the concepts of science and technology policy have evolved over a number of years, reflecting domestic public needs as well as international trends. The representative concepts of the times regarding science and technology, reflect potential policy needs and the characteristics of the age.¹

Evolution in socio-political configurations includes changes in the S&T system and in the relationships between university, industry and government. In each nation's S&T system, the relations between these three domains and their boundary foundation are shaped historically and culturally.²

These boundaries are now under re-configuration as expressed by various models such as the Triple Helix model which considers Mode 2 research i.e. it portrays scientific activity in terms of networks spanning the interface between science and society, in contrast to Mode 1 where scientific activity occurs in a traditional communication structure, in the context of the knowledge based economy.³

Technological change plays an enormous role in shaping today's advanced societies whereby these societies are affected in many more ways than merely by economic development. Furthermore, technological change itself and, more generally innovation are complex processes beyond solely economic determinants.⁴

Moreover, it is evident that every society needs in order to advance further, a knowledge base which has to be designed with a view to the future through a long term strategy which must be supported by appropriate actions in the various policy areas. Therefore, it becomes clear why technology policy is increasingly established as an important policy field of its own, spreading its initiatives all over the various sectors which are seen as functioning separately.⁵

The main purpose of this paper is to describe the evolution of S&T policy in Cyprus (i.e. the policy and institutional frameworks), identify constraining factors and propose guidelines for policy improvements.

Evolution of S&T Policy in Cyprus

Policy Framework

Science and R&D related activities have not been one of the strongest traditions in Cyprus. Indicative of this is the absence of significant policy measures for establishing S&T policy through the years, until recently whereby notable improvements have been made.

In the Five Year Development Plan of 1989-1993, the issue was covered under the single title "Technology."⁶ Despite acknowledging the technological and research gap/deficit at the time, nothing notable was contained in the Plan regarding an overall policy and it was limited to minor actions.

Until 1992, there was limited utilisation of advanced technology in Cyprus in most of the economic sectors. The industrial sector was in a relatively poor technological state and limited applied Research and Development activities were undertaken (due to the fact that industry was mostly pre-occupied with labour intensive products).⁷ However, the state of technology in agriculture was stronger as a result of projects promoted by the Agricultural Research Institute (ARI) and the Fisheries Department, although there was considerable scope for further technological upgrading. In other sectors, such as energy, environment and medicine there were very limited research and development activities.

It was at this time (1992) that the first statistical survey on research in Cyprus was carried out by the Department of Statistics and Research (a similar study is being completed at the moment).⁸ Among the major findings of the study are, that gross expenditure on R&D in 1992 was estimated to be CYP 5,6 million, an increase of 15,4% over that recorded in 1991 but only 0,2%, as a share of Gross National Product (GNP), compared to an average 2,55% for the rest of the world.⁹

Most of the R&D expenditure in 1992 originated from the public sector. Only 15,6% of the total expenditure was made by the private sector, and most of this was as a result of activities in the manufacturing sector (industries in food and beverage, chemical products and fabricated metal products).¹⁰ In addition, the number of employees engaged in R&D activities in Cyprus in 1992 was estimated to be 366 persons, an increase of 7,3% over that recorded in 1991. Approximately 85,2% of these persons were from the public sector. The total number of persons engaged in R&D is 0,13% of the total gainfully employed population for the production of Gross Domestic Product.¹¹

The gap is again highlighted in the next Five Year Development Plan (1994-1998) under the chapter "Technology-Research". It must be noted that the developments in the 1994-98 period cannot be easily accounted for as there is not enough statistical data regarding the promotion of research activities in Cyprus. For this period it is stated that technology development is not a viable potential for the realities of Cyprus, and that Cyprus will continue to remain an importer of technology. Measures are again restricted mainly to enhancing cooperation between local and foreign research institutions especially in the EU and developing networks for transferring technology.¹²

The new feature of this Five Year Development Plan was fostering technological progress in certain areas of specialisation. As a result of this new approach, Government has increased its expenditure on research and technological development in recent years.¹³ This was also considered necessary within the framework of Cyprus' efforts to comply with the *acquis communautaire*.

In a revised document by the newly established Research Promotion Foundation published in 1998 it is stated that the policy objective of Cyprus concentrates on efforts to enhance the ability to identify appropriate technology, transfer, develop and install existing technology and to foster technological generation in certain niches of specialisation. Emphasis is also given to the creation of an effective institutional mechanism for promoting R&D activities.¹⁴ It is the first time that the concept of "technological generation" has been applied extensively.

The most important objectives for research and technological development set in this new framework are:

i) Strengthening the existing institutions which conduct research and technological development and promoting linkages between them.

ii) Establishing special funds/schemes for the encouragement of R&D and strengthening the institutional mechanisms for allocating resources available for science and technology activities as well as for the co-ordination, monitoring and prioritisation of R&D activities.

iii) Taking a more active role in promoting international cooperation in science and technology areas. Joint research projects, participation in European Union research programmes, e.g. SFP, scholarships, exchange of researchers' schemes, etc).

· As a result of the S&T policy objectives, certain actions were incorporated in the recently announced Industrial Policy. Of the twelve chapters of the New Industrial Policy, two emphasise the Technology generation. One refers to the creation of a Centre for Research and Technological Development which will contribute substantially to the development of new high tech products (applied research). Emphasis is given to information technology, new materials, microelectronics, energy, biotechnology and telecommunication technologies. The other chapter refers to the creation of incubators which, with the cooperation of the Centre for Research and Technological Development, will contribute to the creation of new business with innovative features.¹⁵

In the draft of the 1999-2003 Strategic Development Plan, the issues of Research and Technology are again covered but in different chapters. Apparently research is in one chapter on its own and technology is covered in another chapter on manufacturing, and in particular the section for the industrial policy.¹⁶

The policy objectives of the Plan on research, (among other things) are as follows:

- i) Systematic and in-depth awareness of the public for the importance of research.
- ii) Upgrading of research activity at all levels of the education system.
- iii) Upgrading of the training infrastructure for research.
- iv) Increasing of the funds allocated for research.
- v) Utilising the scientific resources of Cyprus as well as Cypriot scientists living abroad.
- vi) Promoting cooperation between the research institutes/groups in Cyprus.
- vii) Promoting cooperation with research institutes abroad.

Regarding technology, some of the policy objectives of the 1999-2003 Plan, as they are expressed within the framework of the New Industrial Policy, are:

- i) The introduction of high technology in Cyprus industry with the encouragement of innovation and research and development.
- ii) The restructuring, technological upgrading of existing production units with particular emphasis on design, quality of production and quick response to production to meet the needs of the markets. The specific measures proposed regarding technology follow approximately the same guidelines as those of the Industrial Policy mentioned previously.

Institutional Framework

There is no single authority/unit responsible for the coordination of S&T activities in the country. A number of bodies are assigned the responsibility for assisting in S&T and Research efforts. These institutions are making considerable efforts in assisting S&T activities on the island despite the problems they encounter on the way. The Planning Bureau, which is responsible for the overall economic planning, is also the national agency engaged in the co-ordination of research activities in the wider public sector. It is directly involved in the formulation of strategy, the identification of objectives and the introduction of policy measures aiming at the attainment of the research objectives. It also serves as the national contact point for promoting international scientific cooperation.

The Research Promotion Foundation was set up in 1996 to serve as the national institute for the promotion of scientific and technological research in Cyprus. The foundation aspires to become the bridging institution through which the Planning Bureau's strategy and policies in R&D are carried over to the research community. Currently, the Foundation's activities are limited to the formulation, launch and administration of a Grant Scheme for Research Programmes and the creation of a database containing information regarding the Cyprus Research community.

The Institute of Technology is a private non-profit institution, established in 1991 in order to promote the technological upgrading of the manufacturing sector. Its role is currently limited to coordinating a network of accredited industrial/business consultants and associates, in undertaking studies on strategic/operational issues relating to the strengthening of competitiveness of manufacturing units and in identifying potential technology providers abroad for the local industry.¹⁷

In addition to the above institutions, which are mainly for the coordination of S&T, there are Centres which engage in actual research activities, as independent operators, for which mention is made here below.

Constraining Factors

From the above it appears that the major factors constraining S&T development in Cyprus are the following:

- Lack of an integrated S&T strategy that links synergically the various economic and productive sectors with a wider national policy. Despite the notable efforts made lately, there is no coherent action plan coinciding with the priorities set for other important policies such as industrial policy, education policy, employment policy etc. Moreover there is no long-term strategy regarding the upgrading of the country's knowledge base. Whereas other countries can look back and emphasise phases of change in their S&T policy through the years, in the case of Cyprus this is not possible because there has been no structured policy - with the exception of the last few years.

- Lack of effective coordinating units for transpiring the S&T policy to the several groups of actors/stakeholders and of an appropriate monitoring system. Despite their well intended efforts, the previously mentioned institutes (Planning Bureau, Research Promotion Foundation and Institute of Technology) are like sub-departments, each one with its major role of emphasis (among their many other responsibilities) and with no substantial coordination influence over the activities carried out by public or government departments.

For example, notable applied research is carried out by the Agricultural Research Institute, the Geological Survey Department, the Higher Technological Institute (HTI), the Cyprus Institute of Neurology and Genetics and the recently founded University of Cyprus. However, all these are under various ministries and there is no method of coordinating and monitoring their activities and especially their research priorities. Coordination becomes even more difficult in the case of Research and Development in the private sector.¹⁸ The most notable research in the private sector comes from tertiary education institutions such as Intercollege, Cyprus College and Frederick Institute of Technology.

- Absence of important stakeholders in the Policy Toolbox for improving RTD performance

Government has in the last few years strengthened in an impressive manner its relationship, communication and policy with research institutions (private and public) and higher education. However, it has not done so with other important actors in the Policy Toolbox for R&D, such as industry and the wider productive fabric, and has not encouraged the interaction between industry and research institutions thus making the existing communication one way only. The bridging institution (Research Promotion Foundation) has strengthened its relations with the research society but not with industry (this is reinforced by the fact that industry, and especially manufacturing industry, does not have representation in the Foundation's Board). This naturally leads to problems in setting appropriate S&T/RTDI priorities as well as having effective channels for commercialising the result of Science and Research Activities.

There are only limited examples of effective commercialisation such as in the case of the Agricultural Extension Service of the Ministry of Agriculture which is responsible for going out to farmers and assisting in new techniques for improving quality, varieties etc. This service is in close contact with the Agricultural Research Institute and its Experimental Farm. Other examples relate to the interactions between the Higher Technological Institute and the Solar Heating manufacturing industries in association with the Applied Energy Centre, which is administered by the Ministry of Commerce, Industry and Tourism.

The University of Cyprus on the other hand is engaged in extensive research. However, there is little evidence of how the results of this research are transferred to industry except in two cases: one in neural networks and their application to industry and another in simulation modelling for the financial sector.¹⁹

- Poor performance of R&D and insufficient infrastructure. For years most of the research in Cyprus was concentrated in public institutes, there was limited funding for research and inadequate research networks. Indicative of the low performance

of Cyprus in this area, is the fact that only 0,5% of the GDP is now spent on R&D which represents about 1/4 (one quarter) of that spent in EU countries, that the number of research staff is only 0,5 individuals per thousand workers (whereas the respective EU figure is around 9,4) and that patents from innovations are only 0,012 per thousand inhabitants (the respective EU is about 0,25).²⁰

A hopeful sign, however, is that the percentage of investment spend on research has increased from 0,2% to 0,5% GNP between 1992 and 1998.²¹ There is an increase not only in Government expenditure in R&D but also in expenditure from the private sector. Furthermore, notable research activities are seen across most sectors of the economy and society. It appears that the various funding schemes have given alternative channels of fulfilment to the many research ideas that lay dormant for years.

Concluding Remarks

Despite the current efforts and notable improvements, Cyprus must strengthen and develop further its science base and RTDI activities so that it can improve its knowledge base and contribute to the increase of its competitiveness. It is an encouraging fact that S&T policy is beginning to develop.

In order to be able to redefine its S&T policy, it must carry out an analysis of the local and regional needs and examine the potential for such activity. A technology audit of the country may serve a useful purpose towards this direction. This will allow it to define a strategic framework within which an appropriate S&T policy, specific priorities and measures can be articulated. These must be linked with other related policies such as education policy, employment policy, industrial policy etc.

Furthermore, the policy toolbox must be strengthened so that it incorporates several groups of actors. In addition, the existing bridging institutions must improve their current system of communication so that there is two-way flow. Furthermore the cooperation between industry and the productive fabric of the country with Research institutes needs to be enhanced further and integrated into the main RTDI system.

Also, Cyprus will need to set up a monitoring and evaluation system to see if the S&T measures are appropriate and effective. Towards this direction it will be useful if a single unit is given enough authority to coordinate and monitor activities across the country. This can be done by assigning this role to one of the existing bridging Institutions or by an Advisory Council with representatives from all actors/stakeholders.

Finally, it is necessary for the government to allocate sufficient funds for imple-

menting the longer term S&T policy. Overall expenditure (public and private) on R&D must be increased gradually and steadily to at least the European average of approximately 2% of GNP as it should be looked at as a long-term investment for improving the society's knowledge base and the economy's competitiveness rather than as a mere cost. Also towards this direction it is necessary to encourage the private sector to increase funds allocated for research. This may be done by giving adequate tax and other incentives to private organisations for activities relating to research.

Within these guidelines Cyprus can redefine its S&T policy and improve its knowledge base. This becomes even more important as Cyprus attempts to enter the European family. It must be able to compete effectively in the Eurozone and also be able to fulfil its obligations.²² It is not irrelevant that the Commission, in its 1998 communication, has invited Cyprus along with each CEEC to develop appropriate RTD and Innovation strategies in order to be considered in the pre-accession framework.

Notes

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2. Ibid.
3. Ibid., pp. 387-388.
4. Pichler, Rupert 'Innovation and technology policy in the Austrian Context' in *The potential of R&D in Structural Support Schemes for the Enlargement of the EU*, Vienna, February 1999, p. 18.
5. Ibid., p. 19.
6. Planning Bureau, '*Five Year Development Plan 1989-1993*', p.53.
7. Research and Development Centre - Intercollege '*StrateG/C Plan for the Survival and Growth of the Manufacturing Industry in Cyprus - Analysis, Policy, Measures*' study commissioned by the Cyprus Industrialists Union, Vol. 1, April 1999, p.13.
8. Planning Bureau 'Five Year Strategic Development Plan' 1999-2003 (draft version) p. 110.
9. Department of Statistics and Research, *Research and Development Statistics 1991 & 1992*, pp. 10-11.
10. Ibid., pp. 11-21.
11. Ibid., p.11.
12. See previous note 6, pp.53-57.
13. European Commission 'Regular Report from the Commission on Progress towards Accession' November 1998.
14. Research Promotion Foundation, 'Science and Research Activities in Cyprus', 1998. See also European Commission '*New partners New opportunities*', Conference material, Brussels, February 1999, pp.107-110.
15. Konis, Costas 'Cyprus can become a Technology Center' (in Greek) Fileleftheros newspaper - *economicos*, 30 August 1999, p.5
16. See previous note 8.
17. See previous note 14 (Research Promotion Foundation).

18. Ibid.

19. Ibid.

20. PricewaterhouseCoopers 'DG XII Study on Analysis of the potential of Research, Technological Development and Innovation (RTDI) sector in Cyprus'. See also European Commission '*The Competitiveness of European Industry's 1998 Report*,' Brussels 1998, p. 17.

21. See previous note 14.

22. European Commission '*Reinforcing Cohesion and Competitiveness through Research, Technological Development and Innovation*' Com (98) 275, Brussels, 27 May 1998.

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