

THE IMPACT OF RESEARCH UNITS EVALUATION IN PORTUGAL

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CONTEXT

This communication is based on preliminary results of an impact assessment conducted by the Observatory of Sciences and Technologies – Portugal.

The science, technology and innovation system in Portugal is going through a period of very high sustained growth:

- Growth of individuals with PhDs at 10% per year in the last decade --- a trend that planned policies plan to maintain up to 2006. It corresponds to multiplying by 8 the number of PhDs in the country in only two decades (1987-2007). In 2000 the number of PhDs is already 4 times larger than in 1987 (see Figure 1).
- Average annual growth of researchers in 1995-97 at 8.2%, compared to 1.9% for the EU and 1.8% for the OECD.
- High growth of scientific production in publications in the *Science Citation Index (SCI)*. In the last decade (from 1989 to 1999) the number of publications in SCI increased by a factor of 4.6 while the number of researchers increased only by 2.8 (see Figure 2).
- Average rate of growth of publications in the *Science Citation Index* in the period 1990-95 triple of OECD and more than double of EU.
- Very high growth of the main research funding agency --- the Science and Technology Foundation --- budget: in 2001 more than the double of 1997 (actually 2.3 larger) (see Figure 3).

In spite of this growth, as the country begun developing from a very low research basis only recently, the share of researchers in the labor force in Portugal is still far away from more advanced countries: in 1997 it was only about 60% of EU average; between 35% and 40% of Australia, USA, Ireland, Iceland, Norway, Switzerland; between 31% and 32% of Finland and Sweden; about 27% of Japan. However,

maintaining the present trends, it is expected that Portugal will reach the EU average of researchers in the labor force within the next 7 years.

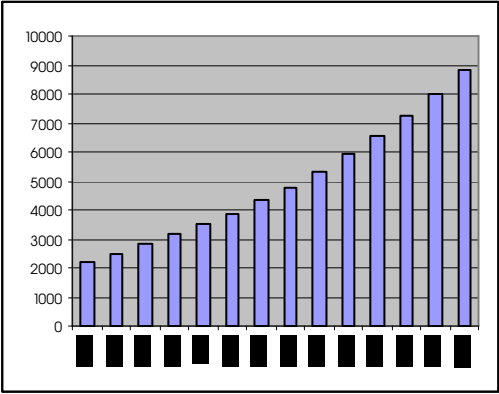


Figure 1: Evolution of the number of PhDs

Source: Observatory of Sciences and Technologies

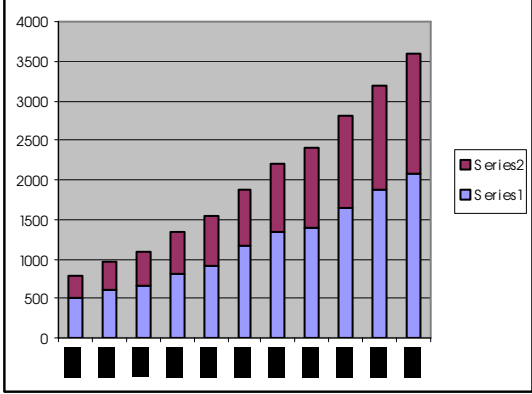


Figure 2: Evolution of the publications in the SCI

Series 1: solely Portuguese authors; Series 2: in coauthorship with foreigners

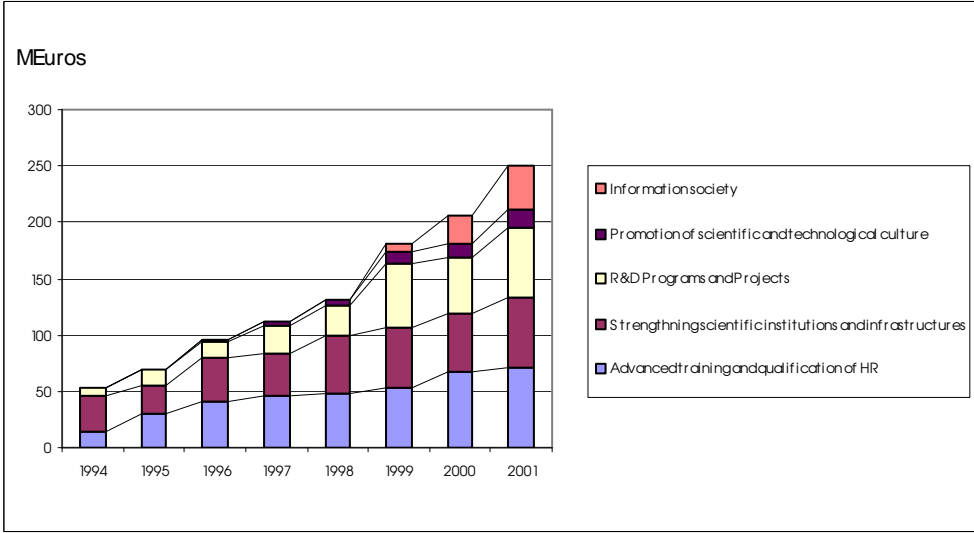


Figure 3: Evolution of the Science and Technology Foundation budget and its application in investment programs (values before 1997 refer to the former agency JNICT)

RESEARCH UNITS EVALUATION

The Science and Technology Foundation runs a funding program of research centers and institutes, most of them associated with universities. The program started in 1994. It presently accounts for a funding of 30 MEuros a year to about 340 research units of varied sizes in all areas of knowledge (including the social sciences and the humanities). These research units involve more than 2/3 of the PhDs working in Portugal.

All the research units in the program are assessed every three years by evaluation panels of foreign scientists who actually visit the sites of the research units and interact with their leaders and members. The evaluation criteria are applied adopting international terms of reference.

The evaluation methodologies developed were very much influenced by research centers assessment schemes of other countries, most notably of the Swedish Research Councils, the United Kingdom Universities Funding Council, and the USA National Science Foundation.

Two evaluation exercises took place so far --- in 1996 and 1999. About 160 foreign scientists were involved in each exercise. Following each evaluation exercise, the Science and Technology Foundation opens calls for proposals for new research units, also evaluated by panels of foreign scientists.

EVALUATION GOALS

The main goals set for each evaluation exercise are:

- Recommendations regarding each research unit activities.
- Recommendations regarding each research unit strategic orientation, leadership and organization.
- Assessment of results and rating of overall quality of each research unit, adopting international terms of reference in a scale "Excellent", "Very Good", "Good", "Fair", "Poor".
- Decision on funding of each research unit for the following three years period.
- General assessment of the state of research in each major field and policy advice.
- Public information on quality and competencies of the research units.

EVALUATION CRITERIA

The formal evaluation criteria are:

A) Documental evaluation

– Results - quality and quantity relative to number of doctorates

Publications in major research journals; innovative technological prototypes and patents (if applicable); supervising of post-graduate students and training of younger researchers; involvement of young researchers and/or post-docs in the research activity; Organization of scientific meetings and regular research and advanced training seminars.

– Relevance of the research activity

Breadth and depth of ongoing and planned research activity; current importance of the research teams; multidisciplinary and relevance for other research areas and/or technology; contribution to research activities in other institutions.

– Internationalization - quality and quantity

Joint publications with foreign researchers; participation in scientific and technological projects with foreign researchers; interaction with foreign researchers and/or research units abroad.

B) Site visit evaluation

– *Intrinsic merit of the unit activities*

Goals, ongoing and planned projects, strategic development in the near future; results obtained; training of young researchers and students; organization of workshops, colloquia, periodic seminars; interdisciplinary ventures; interactions with other national and international research units, and companies; knowledge and technology transfer, outreach activities

– *Attitudes and work environment*

Adequacy of unit organization and leadership; culture of creativity and opportunity/encouragement of younger researchers initiative

– *Resources for the research activity*

Facilities, Library (journals, books), Equipment, Technical support, Secretarial support, Funding.

IMPACT OF THE EVALUATION ON ACTIVITIES

The observed impact of the research units evaluation on their activities was mostly evident in:

- Increased activities oriented to international publication of research results (for the social sciences and humanities this accounted for almost the beginning of an organized concern for publication in international journals).
- Organized visiting programs and regular seminars in the research units to a much larger extent than before.
- Increased outreach activities: research applications, partnerships with external entities, organized participation in the promotion of scientific culture and the teaching of sciences in the K-12 system.
- Better integration of activities of subgroups within the research units.
- Improved collaboration with other research units.
- Reinforced autonomous recruitment of researchers, Post-Docs and PhDs (almost absent before 1996).

IMPACT OF THE EVALUATION ON STRATEGIC ORIENTATION

The observed impact of the research units evaluation on their strategic orientation involved the following aspects practically inexistent in 1996:

- Definition of missions and goals.
- Explicit formulation of growth and consolidation strategies.
- Identification of competitive advantages and of best achievements.

- Adoption of a global view of the national scientific system and of its international positioning when formulating each research unit strategies and goals.

IMPACT OF THE EVALUATION ON LEADERSHIP

A generalized change in the research units formal leadership occurred, with natural scientific leaders assuming formal leadership in the research units: the majority of research units changed formal leader between the 1996 and the 1999 evaluations. This accounted for a clear disruption of the former tradition of looking at the unit coordination as simply an administrative duty whose weight was to be rotationally assumed.

IMPACT OF THE EVALUATION ON OVERALL ORGANIZATION

The evaluation of research units had the following consequences for the overall organization of the science, technology and innovation system:

- Discontinuation of all research units rated “Poor”.
- Progressive correction of negative effects of previous policies of funding priorities directed to applied areas and larger units. Such policies resulted in artificially large units with subgroups almost without contacts among each other and basic sciences groups shying away from assuming their own research goals, artificially appearing under the heading of applied sciences (*e.g.*, biological sciences had taken shelter in health sciences and biotechnology, chemistry in material sciences and biotechnology).
- Reorganization of units membership: separation and joining of units, new units specially in the social sciences, humanities and clinical research, movement of researchers from low to high rated units, differentiation of units coincident with university departments.
- Clarification of advantages of organization of research units around common objectives, specially in the social sciences and the humanities where new research units proposals appeared following the evaluations, grouping together researchers who worked alone and were not associated with research centers before.
- Strengthening of the role of research centers and institutes in the science, technology and innovation system, accounting for a flexible organizational structure of research transversal to university departments.

IMPACT OF THE EVALUATION ON THE RESEARCH UNITS INTERNAL ORGANIZATION

The evaluation of research units had consequences on their internal organization along the following lines:

- Clarified internal organization (directors, research council, external advisory council, annual activities report and planning procedures).
- Improved annual reports and of their use as instruments for internal management.
- Clarification of administrative and financial management models, and increased accountability verified in the course of the regular monitoring activities of the funding agency and by external audits.
- Reinforcement of the research units position within the universities and their increased institutionalized participation in internal university management.

IMPACT OF THE EVALUATION ON RESULTS AND OVERALL QUALITY

The impact of evaluation on results and overall quality of the activities was mainly:

- Marked improvement of the international publication record — quality and quantity (for the social sciences and the humanities, it was almost the beginning of a visible effort of international publication).
- Reinforced internationalization:
 - recruitment of foreign researchers, Post-Docs and PhD students (almost absent before 1996); presently about 56% of Post-Docs in Portugal are foreigners, more than one third of them from other EU countries.
 - participation in international projects and networks.
 - organized visiting programs and seminars regularly involving foreign scientists.
- General improvement in overall quality. Presently, there are 66 research centers or institutes rated “Excellent” in international terms.

IMPACT OF THE EVALUATION ON FUNDING

The consequences of the evaluation in funding include:

- Discontinuation of funding to all units rated “Poor”.
- Basic funding depending on the rating of quality of the research unit and the number of PhDs it involves.

- Programmatic funding for special purposes: hiring researchers, fellowships, administrative and technical support, equipment maintenance, etc.
- Major reinforcement of funding to be administered directly by the research units (1996: 7.5 MEuros, 1997: 20 MEuros, 2000: 30 MEuros).

IMPACT OF THE EVALUATION ON POLICY

The evaluation of research units impacted in research policy in several ways:

- Increased decentralization of Human Resources recruitment to research units: researchers, Post-Docs, PhD students, administrative and technical staff.
- Contribution of critical information to legislative reform -- three decrees: Legal Framework of S&T Research Institutions, Public Research Career, Research Fellowships.
- Planning and policy setting: contribution to the White Book of the Portuguese Scientific and Technological Development (1999-2006). The evaluation reports assessing the state of research in each major field were a basis for debate in the numerous public consultation meetings that took place for the preparation of the White Book.
- Contribution to formulation of new programs: Associated Laboratories Program (2000-2006), Science Technology and Innovation Operational Program (2000-2006), Information Society Operational Program (2000-2006), Marine Sciences and Technologies Program (1998-2006), Computational Processing of the Portuguese Language Program (1998-2006), Scientific Re-equipment National Program (2001-2006).
- Formulation of universities internal research policies explicitly taking into account the evaluation ratings and recommendations: since 1997 U. Aveiro and U. Minho; now also U. Coimbra, U. Porto, U. Técnica Lisboa - IST.

IMPACT OF THE EVALUATION ON PUBLIC INFORMATION

The research units evaluations has had a major impact on public information:

- Comprehensive data base in the Science and Technology Foundation Internet site: research units scope, research teams, conventional and electronic contacts of research units and individual researchers, full evaluation reports and ratings, comments of the research units on the evaluation reports, awarded funding, evaluation panels composition.

- Construction of Internet sites by almost all research units describing their activities, membership and scope.
- Wide dissemination, on the daily press and the TV, of evaluation results, ratings and reactions of researchers and research units leaders to the evaluations.

MATTERS OF LITTLE PROGRESS

The 1996 evaluation of research units identified a number of aspects requiring improvement that did not exhibit a satisfactory development:

- Insufficient time of university professors for research --- excessive class loads and school year lengths (classes+exams).
- Inefficient management of Human Resources by the universities, failing to obtain the best benefit of human potential for research activities and for the scientific training of students.
- Excessively rigid Human Resources contract schemes, lack of national and international mobility --- inbreeding.
- Weak relationships research – education.
- Weak relationships university research – businesses.
- Lack of clearly assigned university base funding for research and post-graduate education.

CONCLUSIONS

The research units evaluations conducted in Portugal every three years by evaluation panels formed by foreign scientists of high standing has had a major impact in the Portuguese science, technology and innovation system along several lines: research units activities, strategic orientation, leadership, internal organization and funding; overall research system organization, research policy setting, public information on the research units activities and their performance.

The evaluations induced a self-reflection of the actors on the results and outcomes of the activities and the way they are performed, and a strategic orientation towards goals and a better leadership. They also provided credible information to “peers” and “customers” on quality and installed competencies, as well as accountability to the public administration and the citizens.

The periodic evaluation of university research centers and institutes conducted independently by the Science and Technology Foundation, with rigorous international standards, has proved to be instrumental for the improvement of the overall system. It allowed the emergence of a very flexible organizational layer, transversal to the departmental structure of the universities. This organizational layer is driven and organized according to research goals and administers directly research funding with increased autonomy and accountability.

Due to the regular updating of the research units membership every year, the external evaluations by panels of foreign scientists and their consequences on ratings, funding and discontinuation of insufficient quality units every three years, and the possibility of application of new research units following the evaluations, the organizational layer of the approved research centers and institutes is continuously adjusting its configuration and borders, cutting across the departmental rigid structures, and allows for an organization led by the most active researchers themselves and much more suitable to the requirements of the new modes of knowledge production.

This organizational model of university research is proving to have major advantages over alternative models found in other countries for building up a more effective science, technology and innovation system.

ACKNOWLEDGEMENTS

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