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REPORT

drawn up on behalf of the Committee on
Energy, Research and Technology

on the differences in technological development
between the Member States of the European
Community

Rapporteur: Mr G. LONGUET

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Or.Fr.

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By letter of 10 October 1984, the Committee on Energy, Research and Technology requested authorization to draw up a report on the technological problems facing Spain and Portugal and possible Community support.

On 14 January 1985, the Bureau authorized the committee to report on this subject. The Political Affairs Committee was asked for an opinion.

At its meeting of 28 February 1985, the Committee on Energy, Research and Technology appointed Mr LONGUET rapporteur.

Having been requested in the meantime to draw up an opinion for the Political Affairs Committee on the ratification of the Spanish and Portuguese Treaties of Accession, the Committee on Energy, Research and Technology decided to extend the scope of its own initiative report to cover the technological problems facing European countries with limited scientific potential.

At its meeting of 11 September 1985, the Committee on Energy, Research and Technology considered the draft report. It unanimously adopted the motion for a resolution as a whole on 27 September 1985.

The following took part in the vote: Mr PONIATOWSKI, chairman; Mr SALZER, first vice-chairman; Mr SELIGMAN, 3rd vice-chairman; Mr LONGUET, rapporteur; Mrs BLOCH von BLOTTNITZ (substitute), Mr BONACCINI (deputizing for Mr IPPOLITO), Mr CROUX (deputizing for Mr ESTGEN), Mr HABSBURG (deputizing for Mr MUNCH), Mr KILBY, Mr LINKOHR, Mrs LIZIN, Mr MALLET, Mr METTEN (deputizing for Mrs LIENEMANN), Mr PAPAPIETRO (deputizing for Mr VALENZI), Mr PRAG (deputizing for Mr TOKSVIG), Mr TURNER and Mrs VIEHOFF.

This report was tabled on 27 September 1985.

The deadline for tabling amendments to this report will be indicated in the draft agenda for the part-session at which it will be debated.

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The Committee on Energy, Research and Technology hereby submits to the European Parliament the following motion for a resolution, together with explanatory statement:

A
MOTION FOR A RESOLUTION

on the differences in technological development between the Member States of the European Community

The European Parliament,

- having regard to the OECD report on Science and technology indicators - resources devoted to R&D (Paris 1984),
 - having regard to the report of the Political Affairs Committee on the ratification of the Spanish and Portuguese Treaties of Accession (Doc. A 2-81/85)
 - having regard to the report of the Committee on Energy, Research and Technology (Doc. A 2-106/85),
- A. having regard to the importance of the technological challenge confronting Europe,
- B. having regard to the difficulties which may arise for certain European countries with more limited resources as a result of the need to adapt to technological change,
- C. whereas membership of the European Community must have a positive impact for the less-favoured countries,
- D. having regard to the forthcoming accession of Spain and Portugal,
1. Notes that at the present time there are vast disparities in technological development in the European Community, as evidenced by the level of research expenditure in the various European countries;

2. Believes that the accession of Spain and Portugal to the European Community offers new opportunities for association between Iberian universities and firms with those in other Member States for the acquisition of needed technologies;
3. Regrets that technological problems were not given closer consideration during the accession negotiations, as this might have made it more easily possible to start taking corrective measures at the present stage;
4. Wishes to see an improvement in the statistical machinery in Spain and Portugal, so that these countries can optimize their analysis of the level and progress of their public and private research;
5. Wishes to see Spain and Portugal begin to participate in European research programmes as soon as possible;
6. Points out that the preambles to the Treaties make explicit reference to the Community's duty to show solidarity towards the less-favoured regions;
7. Considers therefore that proper account must be taken of these differences in technological development when formulating a common research policy;
8. Considers, in this connection, that the Commission should lay down rules to ensure that the technologically less-advanced countries are genuinely able to participate in all Community research programmes;
9. Is therefore in favour of granting certain types of financial aid aimed in particular at creating research infrastructures which could be financed within the framework of the integrated Mediterranean programme (IMPs) and through loans from the European Investment Bank to encourage the development of new technologies;

10. Calls on the Commission to submit to it, with special reference to the creation of a European research area, a set of concrete measures designed to:
 - step up exchanges between researchers in different countries, and also long-term scientific traineeships,
 - facilitate access to higher education grants for Community students to pursue scientific studies in the most advanced European countries,
 - assist in the renewal of the structures of traditional research,
 - and, in general, encourage all technology transfer within the Community;
11. Calls on those European countries which do not have adequate scientific potential to increase national funding in this sector and to introduce more selective research policies, acting in liaison with the Community institutions;
12. Calls on the Commission to increase funding for research development and demonstration within the Community budget;
13. Calls on the Commission to submit to it every two years a report containing a technological assessment of the Member States, making it possible to evaluate the trends governing the development of the technology gap between the different Member States and the degree of convergence between different national research policies;
14. Instructs its President to forward this resolution to the Council and Commission of the European Communities.

EXPLANATORY STATEMENTI - INTRODUCTION

1. This report deals with the problems posed by the widely differing situation in the field of research and development in the various Member States of the European Community, including Spain and Portugal.
2. Initially, this own-initiative report was to deal only with the differences in technological development between Spain and Portugal and the Community at the time of their accession. However, apart from the fact that our committee was required to draw up an opinion for the Political Affairs Committee on the ratification of the accession treaties with Spain and Portugal,¹ it rapidly became apparent that very appreciable disparities in the development of research already existed within the Community of Ten and that, as a result, the accession of the countries of the Iberian peninsula to the Community would serve only to highlight the gravity of the problems already existing.
3. It should be stressed that the problems raised by this report, those of sectoral inequalities in development, are to some extent new to the European Parliament. Previously, disparities in development had mostly been considered by the Committee on Regional Policy and Regional Planning and thus in a very general light.
4. This new type of approach is justified by the growing heterogeneity of the Community, following its successive enlargements. Community policies have to be devised, but they must also correspond to the needs and expectations of all the Member States.
5. The research and technology sector appears particularly suitable for analysis, since national and Community policies in this field will be of vital importance for the further industrial development of Europe.

¹ HANSCH report - Doc.

6. After outlining the general situation as regards research in Europe and the world, your rapporteur proposes to analyse the disparities between Member States and their main features, envisage the likely consequences and, finally, suggest a certain number of measures to ensure greater coherence in the field of technological development in Europe.¹

II - GENERAL OUTLINE OF THE RESEARCH SITUATION IN EUROPE AND THE WORLD

7. Almost 200 000 million ECU was spent in 1983 on financing research and development in the OECD area, in other words in the most industrialized countries. Five countries (United States, Japan, Federal Republic of Germany, France and the United Kingdom) accounted for 85% of this sum.

8. The league table showing money spent on financing research by the Europe of Ten, the United States and Japan, is as follows:

<u>Million ECU</u>	<u>1984</u>	
Europe of 10	61 900x	
USA	125 573	
Japan	41 900x	x Estimates

9. This situation, which is fairly evenly balanced, alters considerably when looked at in terms of per capita spending:

<u>ECU</u>	<u>1984</u>
Europe of 10	227
USA	535
Japan	351

¹ The statistical information for 1975 to 1983 is taken mainly from the KINT report on R&D in the Member States of the EEC: achievements and perspectives, published by the Commission of the European Communities (January 1985). The 1984 figures are taken from the DG XII estimates. Other data is from the OECD publication, Science and Technology Indicators - resources devoted to R&D - 1984

10. With regard to development, for the period from 1975 to 1983 the situation is as follows (at 1975 prices and exchange rates; 1975 = 100)

	1975	1979	1980	1981	1982	1983
Europe of 10	100	113	114	118	122	128
USA	100	117.7	122.1	128.1	132.3	141
Japan	100	137.4	154.2	169.9	176.6	183

11. The percentage of research funds provided by the public sector (which includes R. and D. appropriations channelled abroad and to international organizations) and the private sector is similar for the Europe of the 10 and the USA.

1983

	Finance by private undertakings	Public finances	
Europe of 10	50.1	49.9	(1) Including private universities and charitable organizations
USA	54.0 (1)	46.0	
Japan	75.4	24.6	

12. The scale of the efforts devoted to research can be measured by the GERD/GDP ratio (ratio of gross domestic expenditure on R&D to gross domestic product). The trends are as follows:

OECD

	1975	1979	1980	1982
Europe of 10	1.86	1.88	2.00	2.07
USA	2.39	2.37	2.53	2.70
Japan	1.99	2.10	2.40	2.47

13. At European Community level, research finance from the Community institutions amounted to only 463 m ECU for 1983 (or 2.2% of the amount spent on civil research by the governments). The amount spent on multilateral cooperation by the same European countries, again for 1983, was 2 013 m ECU (9.1% of the amount spent on civil research by the governments), of which more than a third was accounted for by the budget of the European Space Agency.

14. It is not the aim of this report to comment on these figures and sets of statistics as a whole, which in any case speak for themselves. They are given only as points of reference and to illustrate the scale of research spending in the world. For the same reasons, no other indicators of research potential have been given, such as the number of researchers or the amount of finance by sector.

III - RESEARCH IN THE MEMBER STATES OF THE EUROPEAN COMMUNITY (INCLUDING SPAIN AND PORTUGAL)

15. In 1984 the total resources devoted to research and development by country were as follows:

	m ECU
<hr/>	
Federal Republic of Germany	21 913
France	13 679
Italy	5 237
Netherlands	2 885
Belgium	1 406
United Kingdom	15 854
Ireland	180
Denmark	652
Greece	69
<hr/>	
Sub-total EUROPE OF 10	61 875
<hr/>	
SPAIN (1983)	465
PORTUGAL (1984)	92
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Total	62 432
<hr/>	

Three countries, the Federal Republic of Germany, the United Kingdom and France, account for 83% of the sums spent on research and development in the European Community, spread evenly between them.

This table illustrates perfectly the research potential of each of these countries.

16. A less quantitative but more representative impression of each Member State's research efforts can be gained from looking at the amount spent on research as a percentage of gross domestic product (the GERD/GDP ratio already used in paragraph 12), which also reveals appreciable differences accentuated by trends in the period 1975-1983.

	1975	1979	1981	1982	1983
1983					
Germany	2.40	2.40	2.49	2.58	2.59
France	1.80	1.81	2.02	2.11	2.18
Italy	1.00	0.85	1.01	1.05	1.19
Netherlands	2.12	1.88	1.88	1.88	1.90
Belgium	1.33	1.40	1.48	1.5	1.46
United Kingdom	2.11	2.30	2.46	2.57	2.75
Ireland	0.85	0.74	0.79	0.79	0.81
Denmark	1.02	0.96	1.07	0.9	0.95
Greece	0.19	0.18	0.21	0.20	1.70
EUROPE OF TEN	1.86	1.88	2.00	2.0	2.147

For Spain and Portugal, the only figures available for this indicator are as follows:

SPAIN	1976	0.35
PORTUGAL	1978	0.32

17. The balance between public and private research funding is quite interesting and is also expressed below as a percentage.

1983

	Finance by private undertakings	Public finance
Germany	69.7	30.3
France	56.6	43.4
United Kingdom	61.2	38.8
Italy	53.4	46.6
Netherlands	54.7	45.2
Belgium	76.8	23.2
Denmark	57.2	42.8
Ireland	42	58
Greece (1977)	11.7	88.2
<hr/>		
EUROPE OF 10	62.3	37.7
<hr/>		
SPAIN (1976)	53	47
PORTUGAL (1978)	38	72

18. Similar comparisons can be made between the number of researchers per country, which once again confirm the trends already indicated.

19. These figures tell their own story, revealing that the situation across Europe is disparate and unbalanced, both in terms of the differences in size between the various countries and the differences in economic development.

20. These figures can be summarized, using as a basis the conclusions of the recent OECD study (1984) on science and technology indicators.¹ This study classifies the various member countries of the OECD according to the size and structure of their national research efforts. This breakdown gives the following results for the Member States of the Community:

¹ op cit, page 11

- countries which are major spenders on research and development Germany, France, United Kingdom
- countries which are medium spenders on research and development Italy, Netherlands, Belgium
- countries which are small spenders on research and development Denmark, Ireland
- countries which give only very low priority to research and development Greece, Spain, Portugal

21. This classification, which takes into account a much wider range of factors than is detailed here,

- confirms that:

Spain, Greece and Portugal are in a very unfavourable situation by comparison with the Community average (if a Community average can still be said to have any significance in this field), reflecting their general weakness in the field of economic development.

- reveals that:

Ireland, and above all Denmark, are in a rather unfavourable situation, reflecting in particular the problem of the financial threshold which must be exceeded in the research field in order to attain a certain level of efficiency. This shows that the disparities in technological development are not only Mediterranean, but also affect the north of Europe, although to a lesser extent.

22. At all events, this general analysis of the national technological capacities of the Community highlights the value of undertaking a study of this kind and the need to find solutions.

IV - MAIN CHARACTERISTICS OF COUNTRIES WITH LIMITED TECHNOLOGICAL CAPACITY

23. Needless to say, the main characteristic of these countries is the very low level of expenditure devoted to research. If in some research sectors, such as space or high energy physics, even countries like France and Germany have limited resources available, the difficulties for countries hampered by a general lack of resources are still greater. For instance, as the OECD report

points out, 'the smaller the country the lower the number of fields or industries in which it can hope to undertake R & D and the higher the number of those in which the minimum entry cost will become a barrier to entry'¹.

24. The disadvantage suffered by economically less-developed countries is further increased by the absence of precise research policy aims. This was particularly true of Spain until the middle of the 1970s, of Greece at the beginning of the 1980s and is still very much the case in Portugal.

25. Our economic system induces these countries to spend money in sectors which are common to all the developed countries (information technologies, biotechnology, new materials), but which remain relatively unproductive, since the amount of finance devoted by each individual country remains inadequate.

26. A second characteristic is the large role played by the public sector in funding research. In Portugal and Greece, the public sector accounts for more than 70% of research funding, whereas the situation is practically the opposite in the technologically advanced countries.

27. Mention should also be made of the status of researchers. Because of the absence of favourable working conditions (remuneration and general conditions of research), a large percentage of these scientists are no longer employed in their country of origin, a phenomenon which is even more pronounced in the case of researchers who have carried out their studies in countries other than their country of origin.

28. The structure of research funding in these countries is very unbalanced by comparison with that of the more developed European countries. Research funding, particularly in the public sector, is directed mainly towards agriculture, forestry and fisheries. Industrial development plays a significant role only in Spain.

29. Furthermore, higher education plays only a modest role in basic research, which is an additional structural handicap, since applied research and particularly experimental developments are financed in this sector on a much larger scale than in other European countries. In the case of the Iberian peninsula, this may well be a result of the heritage of a strong and venerable university tradition, but one which needs to be readjusted to the requirements of modern science.

¹ op cit, p. 20

30. One final aspect which is common to Spain, Portugal and Greece is the very poor quality of information available on the level and progress of research, both in terms of quality and quantity. Apart from the resulting difficulties as regards analysis and comparison with other countries, this situation also reflects the inadequate knowledge these countries have of their own research structures, particularly in the private sector. Despite the study facilities at its disposal, the Commission seems unable to obtain information of a quality much higher than the very incomplete statistics collected by the OECD. The Committee on Energy, Research and Technology takes note of the Commission's intention to launch a wide-ranging study into the technological potential of Spain and Portugal and wishes to be kept informed of its findings as soon as the work is at a sufficiently advanced stage.

31. The difficulty of keeping track of financial transfers overseas, particularly as regards the activities of multinational firms and their subsidiaries, makes it all the harder to devise research policies. In this connection, transfers of technology and requirements in this area also seem difficult to assess.

V - PROSPECTS FOR THE 1980s AND 1990s

32. The extent of the gap between the most advanced and the least advanced European countries, together with the needs of international economic competition, offer little scope for optimism. In any case, foreseeable developments are likely to vary in accordance with the country concerned.

33. In Portugal, the body responsible for coordinating research policy, the National Board for Scientific and Technological Research, is attempting to lay down the principles of a coherent policy, but seems to be running into problems which are endemic - the poverty of human and financial resources devoted to research and development, the absence of links between research bodies and the productive sector, fragmentation of research units and the shortcomings of higher education. The Portuguese Government, although aware of the need for research, seems incapable for the moment of creating the conditions for an effective policy.

34. Greece, like Portugal, faces a particularly unfavourable initial situation. In 1982, the Ministry for Research and Technology launched a very ambitious programme, whose success seems to depend on the financial resources to be allocated on a regular and expanding basis over a long period, and the training of research staff, particularly for small and medium-sized undertakings. Promising results have already been achieved by work on biotechnology in both the public and private sector.

35. The situation in Spain however is very different. Although from some points of view, such as the volume of expenditure devoted to research, there is a temptation to place it in the same category as the two previous countries, the reforms undertaken in the last few years and the adoption of a consistent and determined policy should bear fruit. Moreover, your rapporteur was able to hold discussions with the relevant Spanish authorities in Madrid, as well as with a number of members of the competent committees of the Cortes. A draft law on the promotion and general coordination of scientific and technical research is currently being considered in Parliament and is intended to strengthen the foundations for a genuine scientific policy.

With regard to applied research, the Centre for Industrial Technological Development is concerned mainly with aid for specific projects likely to lead to rapid production and marketing in a wide variety of fields including new materials, micro-electronics, biotechnology, lasers, robotics and so on. Spain must nevertheless deal with the problems posed by a number of obsolete research structures and the consequences of a regionalization policy which allows each of the 52 provinces the possibility of financing its own research programme.

36. With regard to the other Member States, whose size does not allow them to devote adequate financial resources in certain technological fields, it is difficult to see how greater progress at national level could be made, except by stepping up their financial resources and reviewing some of their priorities.

VI - NECESSARY STEPS FOR A COMMON RESEARCH POLICY

37. If it were necessary to end this report here, it would have to be said that the vast disparities in technological development between the Member States seem, with the exception perhaps of Spain, unlikely to diminish appreciably in the short or medium term, given the national policies followed at present.

38. In addition to the economic gap, a purely political gap is beginning to appear, directly linked to membership of the European Community and participation in the common research policy.

39. During your rapporteur's visit to Spain, some of the authorities he contacted stressed their reluctance to contribute financially to research with which they would not be associated scientifically and from which their own national technologies would derive only limited benefits.

40. We must take pains not to encourage this latent feeling of frustration and to see whether it is possible to respond to some of the ideas that have been put forward, such as those contained in the Greek memorandum of October 1983 on new Community industrial policies and the problem of convergence at Community level, raised in the study by G. KINT.¹ One of the proposals concerned the promotion of technological support programmes for the economies of those Member States which are least developed in the field of technology.

41. Because it groups together twelve very different countries, the European Community is faced by two separate technological challenges, on the one hand from the Americans and the Japanese and, on the other, the challenge presented by its own internal cohesion, and in particular its duty to show the solidarity required by the Treaties.

42. The solution proposed in some quarters, both for this and for other sectors, would be to establish a research policy with selective participation or variable geometry, in accordance with the degree of development of each Member State. However, surely this purportedly pragmatic solution would be likely to operate only to the benefit of the more advanced European countries, since the others would no longer have the opportunity to participate in the projects. On the contrary, should not a Community policy encourage the participation of the less-developed countries in the work undertaken, to enable them to strengthen their technological capacity while contributing directly to the research?

43. A policy of selective participation in certain types of projects could however be envisaged on the basis of the technological needs and the degree of expertise of the teams of researchers. But this must not be used as an alibi to ensure that the countries with the least technological capacity carry out

¹ op cit, Doc. XII 42 85 of the Commission

the least important research, since this would lead to some countries being relegated to dependent status. This danger is present to some extent in the current tendency to give priority in the Mediterranean countries to research into solar energy, wind energy and biomass, which, although undoubtedly of real value, will not enable them to make up ground on the technologically more advanced countries. For its part, Spain appears to have rejected this option, preferring to strengthen its capacity in the field of new materials or robotics, rather than solar energy. By taking too general a view, we often forget or are unaware that Spain, Portugal and Greece already have research teams of the highest quality, lacking only in resources. Measures clearly need to be taken to improve the scientific potential of these countries.

44. A policy of this kind undoubtedly requires both the Community and the less advanced countries to alter their strategies and adjust national research policies. It is vital to abandon the persistent tendency to spread resources too thinly, since this is incompatible with current research funding requirements, and to concentrate funds instead on priority areas, so as to attain the necessary expenditure threshold. Needless to say, overall expenditure on research and development must be increased and in the medium term, a target of 1% of gross domestic products should be set.

45. The effort which will thus be required of these countries must be seen in its proper context, since participation in a European technological community is not only a necessity but also a unique opportunity. It is a necessity because free trade in industry, agriculture and services requires a constant improvement of the productive apparatus, but it is also an opportunity which has already been seized by certain countries in the form of the COST and Airbus programmes, the European Space Agency or the CERN (European Organization for Nuclear Research), but also through detailed study together with the Commission of the general problems of organizing research.

46. The essential factor is the availability of resources to implement a Community support policy. Funds are necessary if only to develop research infrastructures, as is being done already in Crete (Greece) for the research institute in which the Community is participating. The Community research budget is already so small that it is difficult to see how any very significant measures can be taken to lay the foundations for a long term policy from this source of finance. On the other hand, it is possible to envisage the Community making a financial contribution to the Integrated Mediterranean Programmes (IMPs). There seem to be no obstacles to this course

of action - quite the contrary. Specific reference is made to the contribution of new technologies in the objectives of these programmes. It should be said however that some countries such as Ireland simply will not have access to this kind of funding. Use of the NCI and loans from the European Investment Bank must also be envisaged. In the latter case, Parliament should seek to urge this institution to play a more active role in supporting the development of research and new technologies in general.

47. A whole series of measures to promote, encourage and strengthen scientific structures is also desirable and perhaps equally as vital as financial aid. The Commission should examine the possibilities of:

- increasing exchanges of researchers between countries, as well as extended scientific training courses;
- providing easier access to higher education grants for scientific study in the more advanced European countries to students who are citizens of the Community;
- helping to renovate traditional research structures;
- generally promoting all transfers of technology within the Community.

This is a vast problem which requires detailed study, with particular reference to the research policies followed by subsidiary undertakings. Also feasible is the possibility of introducing Community legal provisions to assist the setting up of subsidiaries of European undertakings on terms favourable to the countries accepting them.

48. It is vital that membership of the Community be seen as a 'plus', though without acting as a brake on the necessary economic liberalism and the notion of Community preference must play its part in the field of research and technology as elsewhere. The structure of the Community market must induce governments and undertakings to realize that their interest lies in increasing the economic ties between European partners.

