Forfás

Survey of Research and Development in the Higher Education Sector, 2000

THE NATIONAL POLICY AND ADVISORY BOARD FOR ENTERPRISE, TRADE, SCIENCE, TECHNOLOGY AND INNOVATION

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Foreword

Forfás acknowledges with gratitude the information supplied by those in the finance and personnel offices of third level colleges who supplied us with the data on which our analysis was based.

If you require further information about this survey please contact:

Dr. Rhona Dempsey,
S&T Indicators Unit,
Science & Technology Division,
Forfás,
Wilton Park House,
Wilton Place,
Dublin 2,
Ireland

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Summary

This paper presents the results from the survey of research and development performed in the higher education sector in Ireland in 2000. The higher education (HE) sector includes universities and institutes of technology, the programmes in advanced technologies (PATs) and the technology centres. The year 2000 was the last year before the new investments in research via the Programme for Research in Third Level Institutions (PRTLI) and Science Foundation Ireland began to make a significant impact; their impacts will boost HERD in subsequent years.

The key findings of the 2000 survey are as follows;

- The total expenditure on research and development in the higher education sector (HERD) reached €238m in 2000, up from €204m in 1998. In constant prices this represents a real increase of 9% over the period 1998 to 2000, or a real annual growth rate of 4.4%. This compares with a real increase of 55% over the period 1994 to 1998, equivalent to a 7.6% real annual growth rate.
- HERD amounted to 0.27% of GNP (0.23% of GDP) in 2000, compared to an OECD average of 0.38% GDP. In 1998 HERD in Ireland peaked at 0.30% of GNP (0.27% of GDP). The late 1990's saw a rapid expansion of GDP and GNP in Ireland.
- All Fields of Science (FOS) experienced real increases in expenditure over the six-year period to 2000. The most significant increase occurred in Social Sciences which has increased its relative share of total R&D expenditure from 12% in 1994 to 20% in 2000. The relative share of Natural Sciences decreased from 42% in 1994 to 36% in 2000. Engineering increased its share of expenditure over the two year period 1998 to 2000, in contrast to Agricultural Sciences which decreased its relative share.
- Expenditure on R&D in the institutes of technology almost doubled between 1998 and 2000 and they increased their share of HERD from 7% to 10%. This continues a strong growth trend for the institutes, as expenditure also doubled over the 1996 to 1998 period.
- In terms of the type of research, 'Experimental development' increased its share of total expenditure from 14% to 15% over the 1998 to 2000 period. The level of 'Basic research' also slightly increased its relative share from 41% in 1998 to 42% in 2000, whereas 'Applied research' decreased slightly from 45% in 1998 to 43% in 2000.
- Two-thirds of funding of R&D in the HE Sector came from government sources in 2000. The share of total funding saw a slight decrease in indirect government funds (block grants) from 43% in 1998 to 42% in 2000 and a corresponding increase in the relative share of direct government funds from 23% in 1998 to 24% in 2000.
- There was a significant increase in the funding category 'Other and own funds', which now accounts for 13% of all funding in 2000, a rise from a comparative share of 8% in 1998. In contrast, EU funds decreased by almost one fifth over 1998 figures, occupying a relative share of 12% in 2000. The relative share of funding from Irish businesses dropped from 7% in 1998 to 5% in 2000, whereas funding from 'foreign sources' increased its share from 3% in 1998 to 4% in 2000.
- The total number of researchers (full-time equivalent) employed in the HE sector reached 2,148 in 2000 or 0.6 researchers per 1000 population. These data appear to be unreliable and are difficult to reconcile with the relative increase in pay-costs evident in 2000. Responses from the educational institutions on this question were very variable.

The methodology and definitions used in this survey comply with OECD best practice and are comparable to other OECD countries.

1 Introduction

It is now widely accepted that economic productivity and international competitiveness are contingent on the effective production, use and application of knowledge. The higher education sector catalyses both the production and application of new knowledge through the R&D it performs and through the skilled people it produces.

The higher education sector is a key component of the national R&D effort in all developed countries. It provides a national base of skills and knowledge through the more fundamental nature of its R&D supporting and complementing the generally more applied R&D functions of the private and public sectors.

Forfás monitors the R&D system in Ireland on a regular basis. This biennial survey is part of that effort and relates to R&D performed in the higher education sector in 2000. These data feed into wider OECD and Eurostat work as well as informing policy-makers and practitioners of the state-of-play at a given point in time.

The population for this survey includes all universities and institutes of technology, the programmes in advanced technologies (PATs) and the technology centres located in colleges. The survey covers all fields of knowledge, not just science and technology.

2 General Trends In Expenditure

Table 1 shows the total expenditure on R&D in the higher education sector (HERD) and the distribution between the main R&D performers for the period 1994 to 2000. The total expenditure on HE sector R&D reached €238m in 2000.

The universities are the dominant performers of R&D and the 2000 data show that the universities continue to account for just over 80% of total expenditure (HERD). The institutes of technology have increased their relative share of HERD representing 10% of HERD in 2000. This continues strong growth since 1996. In contrast, the PATs continued a slow decline in terms of their relative share of HERD which now accounts for 9% of HERD.

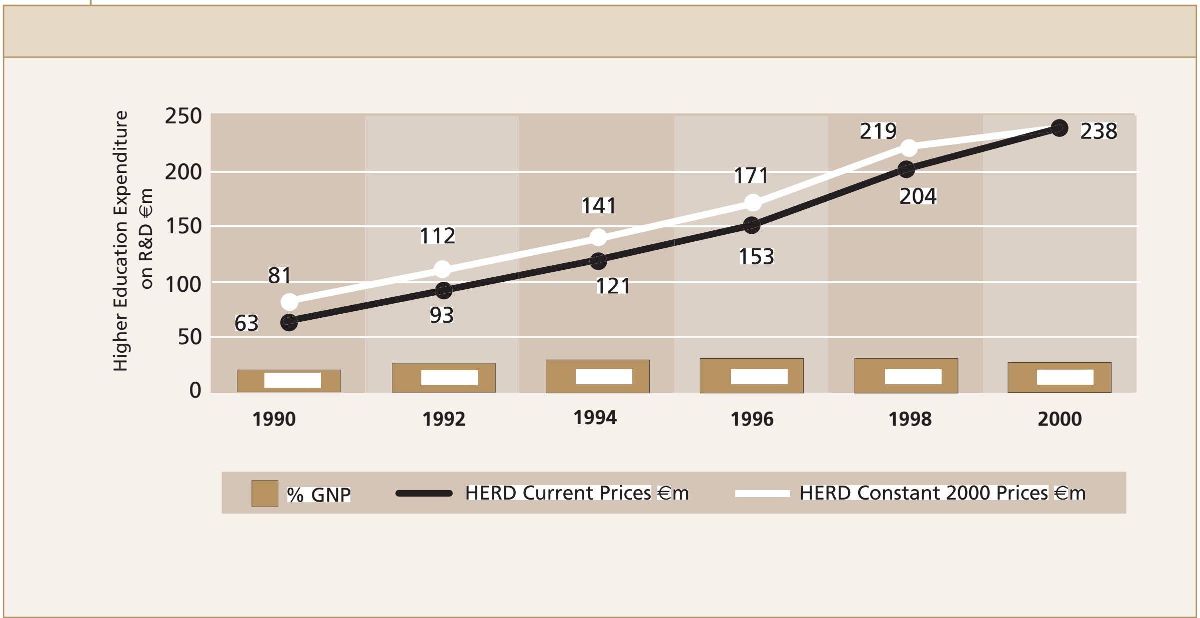
Table 1: *Higher Education Research Expenditure (HERD) analysed by performer, 1994 - 2000, (€m), current prices*

	1994		1996		1998		2000	
	€m	%	€m	%	€m	%	€m	%
Universities	99.4	82%	129.8	85%	169.2	83%	191.6	81%
PATs	16.0	13%	16.9	11%	21.0	10%	22.4	9%
Institutes of Technology	5.7	5%	6.4	4%	13.5	7%	24.0	10%
Total (HERD)	121.1	100%	153.1	100%	203.7	100%	238.1	100%
HERD (constant prices)	140.8	-	170.7	-	218.6	-	238.1	-

Figure 1 illustrates the trends in expenditure on R&D over the period 1990 to 2000. Expenditure on HE sector R&D reached €238m in 2000, up from €204m in 1998. This represents a real increase of 9% over the period 1998 to 2000, or a real annual growth rate of 4.4%. This compares with a real increase of 82% over the period 1994 to 2000, equivalent to a 9.2% real annual growth rate.

The ratio of HERD to Gross Domestic Product (GDP) is a key indicator used for international comparisons. The use of Gross National Product (GNP) for Ireland is preferred as GDP data are inflated by the transfer pricing policies of large multinationals. Very few other developed economies have such high levels of net factor payments. Accordingly, the differences between their GNP and GDP figures are, in fact, insignificant in most cases. HERD as a percentage of GDP shows a slight decrease from 0.27% in 1998 to 0.23% in 2000. Figure 1 charts HERD as a percentage GNP and shows a slight decrease from 0.30% in 1998 to 0.27% in 2000. These data compare with an OECD average of 0.38% GDP. These data relate to a period of rapid GDP expansion in Ireland.

Figure 1: *Higher Education Expenditure on Research and Development, as % of GNP, 1990 - 2000*



3 Fields of Activity

Expenditure on R&D was recorded into six broad fields of academic activity. These six categories are defined by the OECD as 'fields of science' and include humanities and arts. The six main fields of activity are Natural Sciences, Engineering, Social Sciences, Humanities, Medical Sciences, and Agricultural Sciences. Expenditure by sub-fields were collected within the fields of science categories, using OECD classifications.

All six broad fields of academic activity experienced real increases in expenditure over the six-year period to 2000 but some more than others. The most significant increase occurred in Social Sciences which has increased its relative share of total R&D expenditure from 13% in 1994 to 20% in 2000, Engineering increased its share from 22% to 25% over the period. The relative share of Natural Sciences decreased from 44% in 1994 to 36% in 2000. Relative shares of other fields remained broadly unchanged between 1998 and 2000. These data are depicted in Figures 2 and 3.

Figure 2: *Expenditure on R&D by field of science 1994 - 2000 (2000 prices)*

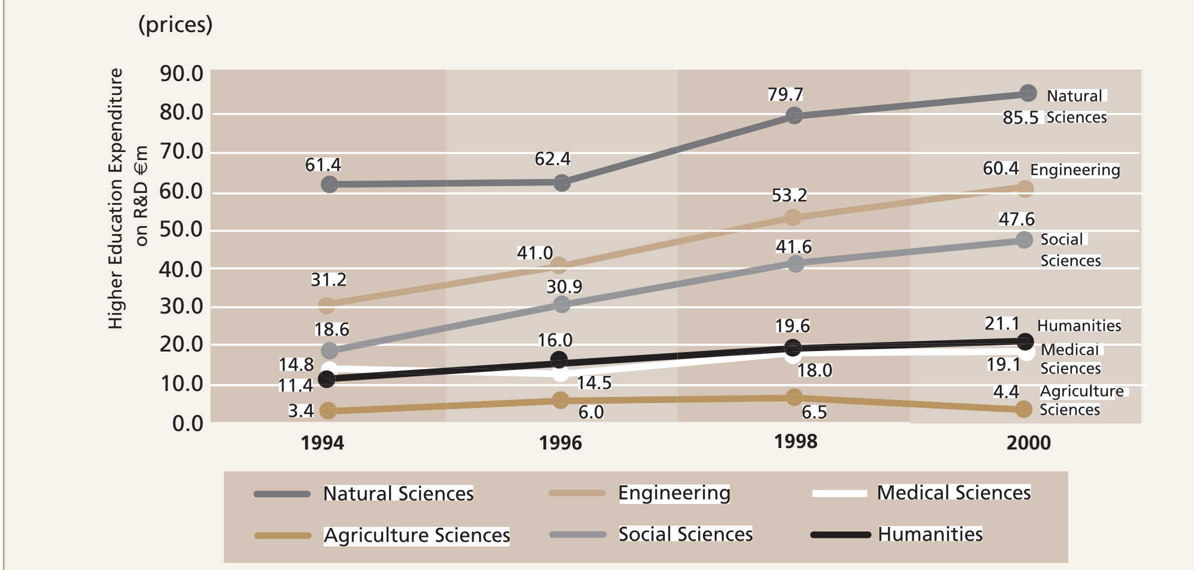
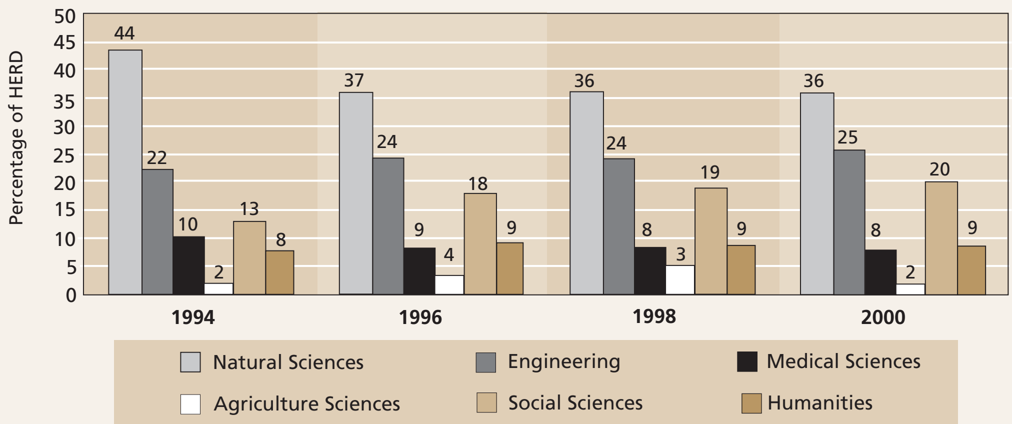


Figure 3: *Share of total R&D expenditure by Field of Science*



Note: Data rounded to nearest whole number

The OECD Field of Science classifications break down further to reveal that:

- Within 'Natural Sciences', Biological Sciences accounted for €37.8m expenditure on R&D in 2000 and did not increase over its 1998 expenditure. Mathematics and computer sciences at €16.3m in 2000 increased markedly by €3.7m over the 1998 level. Both Chemical Sciences (€15.9m in 2000) and Physical Sciences (€11m in 2000) also showed significant increases of €4.5m and €2.6m, respectively, over their corresponding 1998 expenditures.
- Within 'Engineering', electrical engineering and electronics reached an expenditure of €32.8m in 2000, an increase of €5.6m over 1998 figures. The category 'Other Engineering Sciences' increased by €4m from 1998 to an expenditure of €21.2m in 2000.
- Within 'Medical Sciences', the major expenditure was on basic medicine R&D, which increased by €1.7m over 1998 levels to reach €12.3m in 2000.
- Within 'Social Sciences', the major performer 'Other social sciences' increased by €6.3m from 1998 to €30.5m in 2000. This category includes subjects such as sociology, law, management and others.
- Finally, the major increase in 'Humanities' was reported in 'Languages and Literature' which increased by €2.3m to reach €13m in 2000. A detailed breakdown of the expenditure by Fields of Science is available in Appendix 2.

4 Sources of Funds

Table 2 shows the sources of funding for Higher Education (HE) research in Ireland. The government funds two-thirds of HE expenditure on R&D through direct and indirect funds.

Table 2: *Sources of Research Funding by Field of Science, 2000 (€m)*

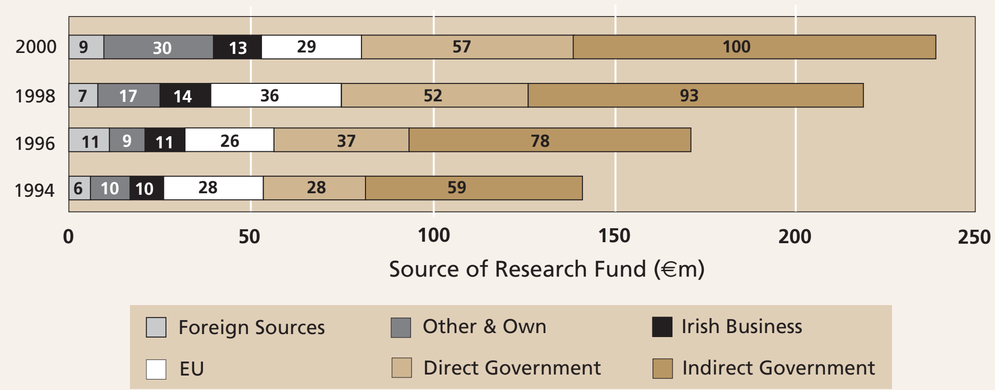
	Direct sources of funds €m					Indirect €m	€m
	Direct Government	Other & Own	EU	Irish Business	Foreign	Government	Total
Natural Sciences	25.6	8.8	13.3	3.6	3.9	30.2	**85.5**
Engineering	20.9	6.4	10.6	6.8	2.3	13.4	**60.4**
Medical Sciences	4.1	3.2	0.7	0.6	2.7	7.8	**19.1**
Agricultural Sciences	1.5	0.3	0.2	0.0	0.1	2.2	**4.4**
Social Sciences	3.7	9.5	3.5	1.7	0.1	29.1	**47.6**
Humanities	1.7	2.1	0.5	0.0	0.0	16.9	**21.1**
Total	**57.5**	**30.2**	**28.8**	**12.7**	**9.1**	**99.7**	**238.1**
% of Total	24%	13%	12%	5%	4%	42%	**100%**
% Real change 1994 – 2000	105%	206%	3%	30%	58%	68%	**69%**
% Real change 1998 – 2000	11%	79%	-19%	-11%	28%	8%	**9%**

Table 2 also illustrates differences in the sources of research income according to field of science. The areas of 'Social Sciences' and 'Humanities' received 61% and 80% of their respective funding from the Government indirect funds. 'Agricultural Sciences' received half of its total funding through indirect Government support, whereas 'Medical Sciences' received 41% through indirect Government funds. 'Natural Sciences' and 'Engineering' are least dependent on indirect Government funds and received 35% and 22%, respectively. It is interesting to note the increased capacity of the Higher Education sector to source funds independently of the usual direct sources, as is evident by noting the funding classified under the category 'Other and Own' in Table 2. 'Social Sciences' attributes 20% of its total funding to this category followed by 'Medical Sciences' (17%). Each of the other fields received around 10% of total R&D funds through this funding source.

The indirect sources derive from the annual 'block grant' from the Department of Education and Science / Higher Education Authority (HEA); funds for R&D are allocated to academic staff based on estimating their time devoted to R&D. These time budgets are applied to the operating costs for a department which are obtained from colleges financial offices to obtain each departments' indirect funding. This is standard OECD practice in all countries operating a dual system of HE funding. The overall average figure for research time used in this survey was 25 per cent of the standard working week. This figure is obtained from a detailed census of individual researchers last conducted in 1996. These indirect funds reached €100m in 2000 and are the single largest funding source for higher education R&D in Ireland. The funds are distributed by the Higher Education Authority on behalf of the Department of Education and Science. These funds, however, do not provide for incremental costs associated with individual projects. Direct Government funding of individual projects comes through various departments and their agencies. These direct funds contributed over €57m, almost one-quarter of total funding in 2000. Enterprise Ireland and the Health Research Board were the main state agencies involved in providing direct research funds. Both direct and indirect government funding showed real increases in 2000 of 11% and 8%, respectively over the two year period from 1998.

Figure 4 indicates the trends in sources of research income from 1994 to 2000. The doubling of direct Government funding over this six-year period is evident from this graph. 'Other and Own' has also risen markedly in this time and represents the next major source of funding after Government funds.

Figure 4: *Sources of Research Funds in 2000 prices (€m)*



The 2000 data show a significant decrease in EU funds over 1998 figures. In 2000, EU funding contributed €28.8m, representing a share of 12% of total funds. This compares to €36m (2000 prices), a share of 16% in 1998. In contrast, the colleges 'Other and Own' funding increased its relative share from 8% (€17m, 2000 prices) in 1998 to 13% (€30.2m) in 2000. Business firms in Ireland accounted for a 5% share of all funding in 2000 at €12.7m which indicates a decrease over 1998 (€14m, 2000 prices). Finally, foreign sources increased their relative share to 4% from 3% (€7m, 2000 prices) in 1998 and came to over €9m in 2000.

5 Types of Research

The categories of R&D are defined according to OECD (2002) classifications as:

BASIC RESEARCH: Experimental or theoretical work undertaken primarily to acquire new knowledge without any particular application or end-use in view.

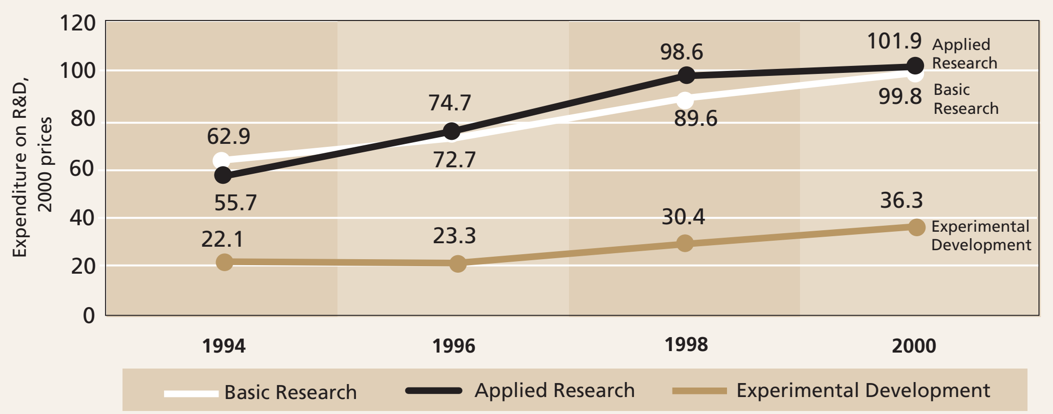
APPLIED RESEARCH: Original investigation undertaken to acquire new knowledge primarily directed towards a specific practical aim or objective.

EXPERIMENTAL DEVELOPMENT: Systematic work drawing on existing knowledge gained from research and practical experience that is directed to producing new materials, products and devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

Figure 5 indicates the type of research – Basic, Applied or Experimental development – conducted by the HE sector over the six year period to 2000. Table 3 breaks this down according to Field of Science classifications (FOS). Basic research is traditionally performed in the Higher Education Sector. The proportions of Basic research performed in the public sector laboratories and the private sector are small. The increasingly multi disciplinary nature of science has led to the need for co-operation across the different fields of science. This is best suited to the HE environment which supports all fields of science and thus lends itself to appropriate and fruitful collaborations. Basic research is also an essential component of training undergraduates and thus providing a skilled workforce for the knowledge-based economy to which Ireland aspires.

Figure 5 illustrates that 'experimental development' increased its share of total expenditure marginally from €30.4m, or 14%, to €36.3m, or 15%, over the 1998 to 2000 period. The level of 'basic research' also slightly increased its relative share from €89.6m, or 41%, to €99.8m, or 42%, over the 1998 to 2000 period, whereas 'applied research' as a share of total expenditure fell from €98.6m, or 45%, to €101.9m, or 43%, over the 1998 to 2000 period.

Figure 5: *Types of Research, 1994 - 2000; in 2000 prices (€m)*



As can be seen from Table 3, basic research accounted for an expenditure of €100m in 2000. Natural Sciences and Social Sciences/Humanities contributed almost 80% of the Basic research effort in terms of expenditure. Applied research has increased by €46m in real terms since 1994 to reach an expenditure of €102m in 2000 or 43% of total funds. Experimental development represented 15%, or €36.3m, of all research funds in 2000. Engineering Sciences are the major performers of this type of research. Engineering Sciences spent 80%, or €48.3m, of their budget on either Applied or Experimental development R&D in 2000.

Table 3: *Research Expenditure distributed across Types of Research in 2000.*

	Basic		Applied		Experimental		Total	
	€m	**%**	**€m**	**%**	**€m**	**%**	**€m**	**%**
Natural Sciences	42.1	49.2%	33.8	39.5%	9.7	11.3%	85.5	100%
Engineering	11.8	19.5%	27.4	45.4%	21.2	35.1%	60.4	100%
Medical Sciences	8.1	42.4%	9.4	49.2%	1.6	8.4%	19.1	100%
Agricultural Sciences	0.8	18.2%	3.1	70.5%	0.5	11.3%	4.4	100%
Social Sciences	21.1	44.3%	23.5	49.3%	3.1	6.5%	47.6	100%
Humanities	16.0	75.8%	4.8	22.7%	0.3	1.4%	21.1	100%
Total	**99.8**	**41.9%**	**101.9**	**42.8%**	**36.3**	**15.3%**	**238.1**	**100%**

	Basic		Applied		Experimental		Total	
	€m	**%**	**€m**	**%**	**€m**	**%**	**€m**	**%**
Real Change 1994 - 2000	36.9	59%	46.2	83%	14.3	65%	97.3	69%

6 Types of Cost

The component costs of Research and Development in the HE sector are pay, non-pay and capital costs. Figure 6 illustrates the trend for each cost category from 1994 to 2000. Pay costs represented 63% of all costs in 2000, continuing a strong upward trend and accounting for €151m of total Research and Development funding. By comparison, non-pay costs grew in a more erratic fashion while capital costs increased strongly since 1996 albeit from a low base. Non-pay costs increased significantly from 1994 to 1998 reversing to a downward trend over the 1998 to 2000 period when these costs represented 26% of all funds or €62m. Capital costs increased substantially between 1998 and 2000 rising from €14m (€15.4m, 2000 prices) to €25m in 2000, representing a share of 11% of all funds. This reflects the establishment of the PRTLI (Programme for Research in Third Level Institutions) stream of funding which was set up to build capacity in the Third Level Sector. The PRTLI is funded under the National Development Plan (NDP) 2000 – 2006. It is a research capacity development programme for the Higher Education sector managed by the Higher Education Authority (HEA). Further details of the PRTLI can be found in Appendix 1 and on the HEA website www.hea.ie .

Figure 6: *Distribution of types of costs, 1994 - 2000 in 2000 prices (€m)*

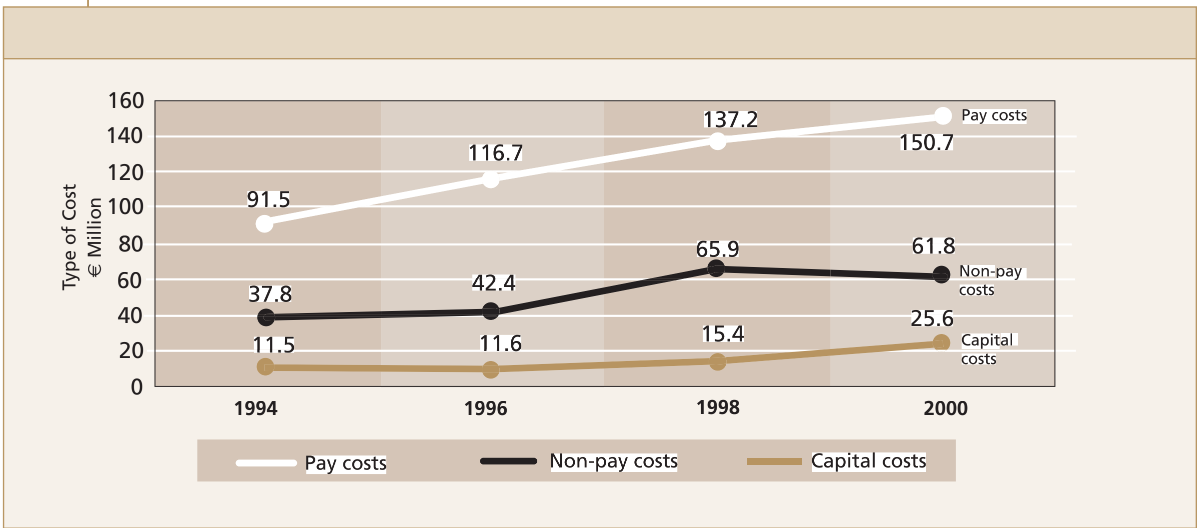


Table 4 details the types of costs according to field of science. The key fields of academic activity associated with the capital investment included Natural Sciences, Engineering and Social Sciences.

Table 4: *Type of Costs by Field of Science, 2000 (€m)*

	Pay costs €m	Non-pay costs €m	Capital costs €m	Total €m
Natural Sciences	50.9	26.0	8.6	85.5
Engineering	33.9	18.0	8.5	60.4
Social Sciences	33.4	9.2	5.0	47.6
Humanities	17.6	2.9	0.6	21.1
Medical Sciences	11.9	4.7	2.5	19.1
Agricultural Sciences	3.1	0.9	0.4	4.4
Total	**150.7**	**61.8**	**25.6**	**238.1**
% Total	63%	26%	11%	100%
% Real change 1994 - 2000	65%	64%	123%	69%
% Real change 1998 - 2000	10%	-6%	66%	9%

7 Human Resources

These data measure the human resources involved in research in the HE Sector in Ireland. The research effort includes all associated support staff in addition to researchers and technical staff. The time spent on research is taken into consideration and personnel data are supplied as full-time equivalents for this survey (where 1 FTE works 40 hours a week on Research & Development). Following OECD recommendations, postgraduate students are not included in Research and Development personnel data. Table 5 shows the data for the year 2000.

Unfortunately, the quality of the data in Table 5 is compromised by a mixed response from the colleges on this question. One major research university did not supply research personnel data at all and an estimate had to be made. Overall, the number of researchers (estimated at 2,148) is down from the level in the 1998 survey (2,425), although pay costs rose significantly in the period. This casts considerable doubt over the data and consequently no further analysis is provided. This is most unfortunate, as reliable information about researcher numbers is absolutely essential for future planning.

Table 5: *Research Personnel by Status of Employment, 2000, Full Time Equivalents*

	Academic Staff (FTE)	Post-doctoral Fellows (FTE)	Research Assistants (FTE)	Total Researchers (FTE)	Technicians (FTE)	Other Staff (FTE)	Total Research Personnel (FTE)
	A	B	C	D (A+B+C)	E	F	G (D+E+F)
Natural Sciences	332	161	238	731	93	53	879
Engineering	169	37	166	372	118	52	542
Medical Sciences	71	37	44	152	50	16	218
Agricultural Sciences	21	1	8	30	26	11	67
Social Sciences	479	14	36	529	5	18	552
Humanities	307	17	9	333	6	5	343
Total FTE	**1,380**	**267**	**501**	**2,148**	**298**	**156**	**2,602**
% Total	53%	10%	19%	82%	11%	6%	100%

Note: Data for TCD personnel have been estimated

8 International Comparisons

It is useful to benchmark Ireland's relative position compared to other OECD countries in order to assess our performance. The appropriate indicators are a useful tool when used in conjunction with a detailed knowledge of the underlying research system. Table 6 shows the two key indicators used in international comparisons - HERD as a percentage of GDP, and HE researchers per thousand population.

Table 6: *International Ranking of Higher Education Sector R&D 1996 – 2000, €m*

	1996	**1998**	**2000**
Higher Education Expenditure on R&D (HERD) €m	154	203	238
HERD as a % of GDP *(GNP used for Ireland)*	0.30	0.30	0.27
Rank among 26 OECD countries *	**16**	**18**	**22**
Total researchers in HE Sector (FTE)	2,066	2,425	2,148**
HE Researchers (FTE) per 1000 population	0.6	0.7	0.6
Rank among 26 OECD countries	**19**	**19**	**22**

**GNP used for Ireland*

*** confidence is not high due to poor response rate*

Ireland's position in terms of relative HE expenditure in 2000, at 0.27% of GNP, is 22nd out of 26 OECD countries and has slipped from 18th position in 1998. The numbers of researchers in the third level sector decreased in the 1998 to 2000 period and Ireland is ranked in the lower third of OECD countries, with 0.6 researchers per thousand population. The average OECD level of HERD is 0.38% of GDP and 0.8 Higher Education researchers per thousand population. The average EU level is 0.40% of GDP and 0.9 Higher Education researchers per thousand population. Ireland's GNP and GDP were expanding at a rapid rate during the period leading up to 2000 and this will obviously impact on the corresponding R&D intensity level. In Ireland the higher education sector accounts for an estimated 23% of all Research and Development performed across the National Innovation System (2001).

As noted, HERD in Ireland is below the EU average and this is reflected in the number of scientific publications per million inhabitants as seen in Table 7.

Table 7: *Scientific Publications per Million Inhabitants [1], 1997 to 1999.*

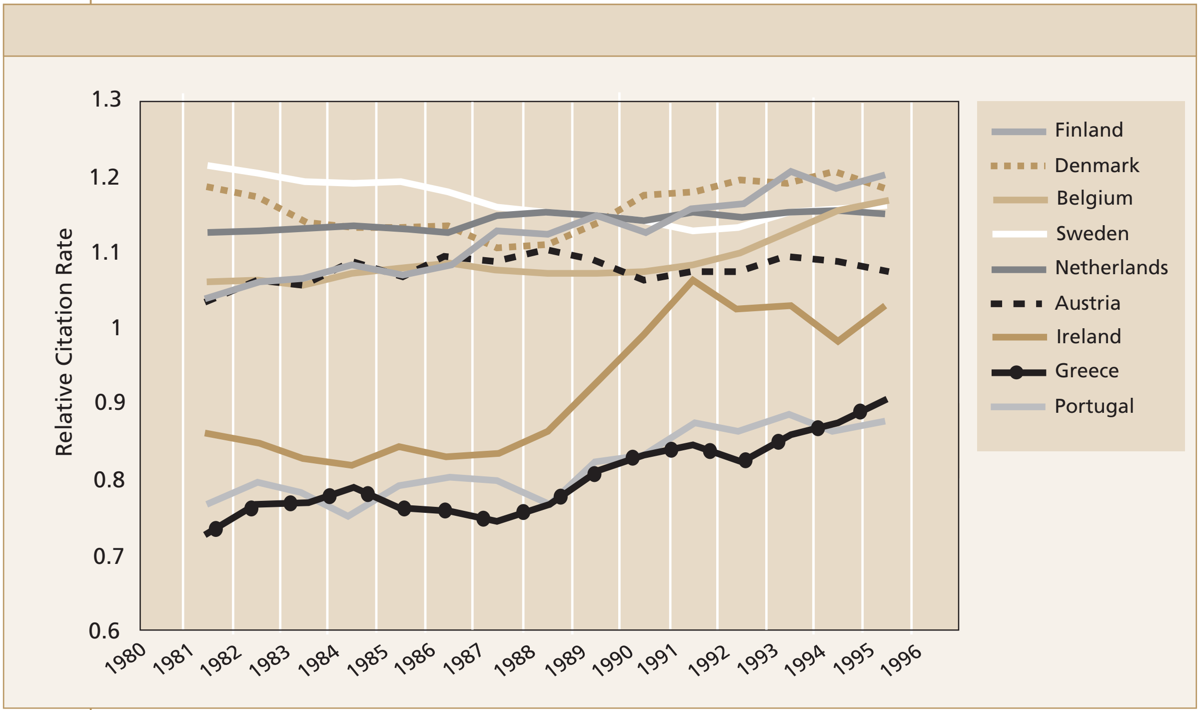
	1997	1998	1999
Sweden	1,335	1,402	1,431
Denmark	1,117	1,200	1,214
Finland	1,408	1,080	1,157
United Kingdom	896	929	949
Netherlands	972	977	963
Belgium	741	788	810
Austria	657	696	717
United States	709	709	708
Germany	608	661	657
France	618	653	652
Ireland	**479**	**527**	**542**
Japan	448	485	498
Spain	415	446	471
Italy	424	453	457
Greece	297	336	340
Portugal	179	199	248
European Union	**577**	**607**	**613**

This indicator, however, provides an insufficient picture, as countries invest differently in scientific production and these differences should be taken into account. More appropriate indicators would relate the number of papers to the number of researchers or to the expenditure on research in the higher education sector (HERD), which is a good proxy because the overwhelming majority of scientific publications stem from this sector. In Europe, the UK, Finland, Denmark, Spain and Ireland had the highest ratings in 1999 in terms of total scientific publications per million HERD. Thus, despite relatively low funding in this period, the academic research community performed quite well in terms of research outputs.

As a measure of research quality one reasonably widely accepted indicator is *Relative Citation Rates (RCR).* Country data using this indicator were presented in the *European Report on Science and Technology Indicators (1997)*. Figure 7 shows the findings for the small and medium-sized countries. A value of 1.0 for the RCR indicates that the publications obtain the average global number of citations expected considering the journals in which the set is published. The improvement in the Irish performance since 1988 is very noticeable; this reflects the greater availability of research funding from that time for Irish researchers, mainly from the EU Framework Programmes but also to some extent from national initiatives such as the Programmes in Advanced Technologies (PATs). It is to be hoped that recent dramatic increases in funding for research will lead to another step change in research performance such as occurred in the late 1980s.

[1] *Source: Science Citation Index, through CWTS*

Figure 7: *Relative Citation Rates (RCRs) for the small and medium-sized EU countries*



Source: CWTS

Appendix 1 - Recent Developments in HE Funding

In the National Development Plan 2000-2006 (NDP) some €2.5 billion is allocated for Science & Technology. The scale of the NDP allocation for scientific research represents a major upward step-change in the funding available to implement S&T policy in Ireland.

PRTLI Funding

In 1998 the Department of Education and Science, through the Higher Education Authority which is the agency of the department with responsibility for the higher education sector, modified its policy priorities (which had previously concentrated on teaching) and launched a major drive to strengthen research in the HE Sector. Its major vehicle for doing so is the Programme for Research in Third Level Institutions (PRLTI). Its objective is to enhance the research capabilities of third level institutions through the funding of *institutional* research strategies. The programme requires the institutions to develop and implement their own research strategies based on a self-assessment of their existing and emerging research strengths. The higher education institutions have to prioritise their research and, in seeking PRTLI funding, make proposals that are consistent with the research strategy being adopted.

Key objectives of the PRLTI are (a) to promote the development of high quality research capabilities in the third level sector, (b) enhance the quality and relevance of graduate output and (c) encourage inter-institutional collaboration, particularly in the Irish context.

Science Foundation Ireland

Science Foundation Ireland has been allocated €646m in the National Development Plan 2000 - 2006 to develop a strong research capability in Ireland in biotechnology and ICT. Its strategy is to invest in research leaders (Principal Investigator Awards/Fellows) and research teams (Centres for Science, Engineering and Technology) who are most likely to generate new knowledge, leading edge technologies, and competitive enterprises in the fields underpinning Biotechnology and ICT. The centres are likely to contain a mixture of long-term research (greater than 10 years) and shorter-term projects, and are expected to achieve industrial co-funding.

Research Councils

Other important changes include the establishment of two Research Councils, IRCSET (Irish Research Council for Science, Engineering and Technology) and IRCHSS (Irish Research Council for Humanities and Social Sciences). IRCSET has been in operation since November 2001. Its mission is to train researchers and to promote excellence across a broad range of research in science, engineering and technology. It aims to employ three mechanisms to achieve its mission:

- Postgraduate scholarships: For the first time a well-funded scholarship programme is in place, awarding at least €12,000 per year for three years. There were over 1,000 applicants for the first call, of which 200 received funding. A post-doctoral programme is to be introduced shortly;
- Project support for young researchers and small teams;
- Joint operation of the Basic Research Grants Scheme with Enterprise Ireland in 2001/02.

IRCHSS was established in 1998 to promote research in the humanities, social science, business and law faculties of third-level institutions in Ireland. It now operates a range of mechanisms to support research at post-graduate and post-doctoral levels.

In addition to priorities included in the National Development Plan there is to be further investment in health research administered via the Health Research Board.

Appendix 2 - Detailed Tables

Table A2.1 - *HERD as a percentage of GDP**

	1994		1996		1998		2000	
	Value %	Rank	Value %	Rank	Value %	Rank	Value %	Rank
Australia	0.39	11	0.44	7	0.43	10	0.41	11
Belgium	0.44	7	0.43	8	0.46	7	0.47	6
Canada	0.48	5	0.45	5	0.49	6	0.56	5
Czech Republic	0.05	25	0.09	25	0.12	25	0.19	24
Denmark	0.40	10	0.40	12	0.41	11	0.44	8
Finland	0.43	8	0.46	4	0.57	3	0.60	2
France	0.38	14	0.39	13	0.38	14	0.41	11
Germany	0.41	9	0.42	9	0.40	12	0.40	13
Greece	0.19	23	0.22	21	0.26	21	0.33	17
Hungary	0.23	21	0.16	24	0.17	24	0.19	24
Iceland	0.33	15	0.42	9	0.51	5	0.44	8
Ireland (GNP)	**0.29**	**16**	**0.30**	**16**	**0.30**	**18**	**0.27**	**22**
Italy	0.27	18	0.27	18	0.34	17	0.33	17
Japan	0.57	3	0.41	11	0.44	8	0.43	10
Korea	0.20	22	0.24	20	0.28	19	0.30	19
Netherlands	0.56	4	0.58	3	0.53	4	0.57	4
New Zealand	0.29	16	0.30	16	0.40	12	0.35	16
Norway	0.47	6	0.45	5	0.44	8	0.47	6
Poland	0.18	24	0.20	23	0.20	23	0.22	23
Portugal	0.27	18	0.21	22	0.25	22	0.29	20
Slovak Republic	0.05	25	0.05	26	0.07	26	0.06	26
Spain	0.26	20	0.27	18	0.27	20	0.28	21
Sweden	0.84	1	0.76	1	0.79	1	0.81	1
Switzerland	0.65	2	0.66	2	0.63	2	0.60	2
United Kingdom	0.39	11	0.37	15	0.35	16	0.38	14
United States	0.39	11	0.38	14	0.36	15	0.38	14
EU Average	0.38	-	0.38	-	0.39	-	0.40	-
OECD Average	0.38	-	0.37	-	0.37	-	0.39	-

** GNP used for Ireland*

Source: OECD MSTI Volume 2, 2002

Nearest year used where current data was not available

Table A2.2 – *Expenditure by Field of Science*

Field of Science	1990 €'000	1992 €'000	1994 €'000	1996 €'000	1998 €'000	2000 €'000
Natural Sciences	26,338	39,110	52,803	55,922	74,224	85,497
Engineering	16,070	22,304	26,828	36,755	49,544	60,401
Medical Sciences	5,946	8,971	12,702	13,016	16,816	19,065
Agricultural Sciences	2,705	2,588	2,931	5,373	6,073	4,355
Social Sciences & Humanities	12,256	19,677	25,810	42,027	57,014	68,741
Total	**63,314**	**92,650**	**121,075**	**153,093**	**203,671**	**238,058**

Table A2.3 – *Expenditure by Areas of R&D Activity and by Field of Science (excluding Arts and Humanities) 2000*

Field of Science	Electronics	ICT	Production Engineering	Biotechnology	Food	Materials	Environment	Energy	Instrumentation	Medical Sciences	Natural Resources	Marine	Economics & Social Sciences	Other	Total
Maths & Computer Science	54	11,566	300	131	163	79	244	138	24	145	30	56	311	3,026	16,268
Physical Science	368	588	231	297	12	2,531	491	254	1,728	760	73	71	69	3,590	11,063
Chemical Science	288	720	293	1,129	655	2,247	1,603	341	601	943	589	140	268	6,154	15,972
Environmental Science	31	89	19	101	0	50	752	48	32	8	1,441	351	26	1,434	4,379
Biological Science	218	1,560	286	12,667	1,153	348	2,596	42	167	7,044	3,346	1,923	221	6,244	37,815
Civil Engineering	54	525	265	23	0	286	1,467	300	916	8	112	20	895	1,543	6,413
Electrical Engineering & Electronics	22,513	6,534	396	11	92	929	52	362	891	231	29	11	11	726	32,788
Other Engineering Sciences	298	1,136	1,543	573	3,231	7,586	499	1,263	836	1,024	462	15	125	2,607	21,200
Basic Medicine	120	370	180	630	11	195	74	0	170	9,694	208	7	202	448	12,309
Clinical Medicine	5	49	5	211	293	2	0	0	48	3,292	0	0	202	118	4,223
Health Science	3	27	4	24	87	5	21	0	1	2,163	2	0	126	71	2,533
Agricultural Science	0	66	0	270	31	0	145	0	30	0	1,519	0	470	149	2,680
Veterinary Medicine	3	86	4	111	107	6	27	0	7	462	387	0	1	473	1,674
Psychology	6	455	15	9	0	5	15	15	174	753	2	0	2,616	549	4,614
Economics	3	69	4	4	333	5	35	0	0	2	118	11	4,923	44	5,552
Educational Science	0	127	0	0	61	0	82	0	10	513	0	0	4,105	2,023	6,922
Other Social Science	28	1,250	133	67	37	43	1,338	58	0	340	541	80	19,913	6,696	30,524
Total	23,992	25,219	3,677	16,258	6,268	14,317	9,440	2,820	5,633	27,382	8,857	2,685	34,482	35,897	216,929
% Total	11%	12%	2%	7%	3%	7%	4%	1%	3%	13%	4%	1%	16%	17%	100%

Table A2.4 - *Expenditure by Source of Funds and Field of Science 2000*

Field of Science	HEA Indirect Funds €'000	Direct Government Sources €'000	Irish Business Sector €'000	EU €'000	Foreign Sources €'000	Other & Own Funds €'000	Total €'000
Mathematics & Computer Science	7,474	3,520	930	2,047	579	1,717	16,268
Physical Science	3,116	3,930	162	3,398	153	305	11,064
Chemical Science	7,274	3,526	538	1,184	328	3,123	15,972
Environmental Science	1,694	1,261	271	446	311	397	4,379
Biological Science	10,670	13,377	1,687	6,259	2,552	3,271	37,815
Civil Engineering	2,593	688	366	482	23	2,261	6,413
Electrical Engineering & Electronics	4,213	13,525	4,649	7,060	1,263	2,077	32,788
Other Engineering Sciences	6,626	6,695	1,754	3,038	1,063	2,024	21,200
Basic Medicine	5,553	3,046	289	401	1,656	1,364	12,309
Clinical Medicine	1,472	543	317	185	962	742	4,222
Health Science	795	499	9	135	36	1,059	2,533
Agricultural Science	1,436	808	37	137	0	262	2,680
Veterinary Medicine	803	669	0	60	67	74	1,674
Psychology	2,020	340	56	703	34	1,460	4,614
Economics	4,456	132	95	453	1	415	5,552
Educational Science	3,814	1,945	10	229	19	905	6,922
Other Social Science	18,844	1,298	1,504	2,105	44	6,729	30,524
History	3,365	600	21	65	5	434	4,491
Languages & Literature	11,153	920	17	166	1	770	13,026
Other Humanities	2,374	147	6	225	6	853	3,613
TOTAL	99,745	57,469	12,717	28,778	9,105	30,244	238,058
% TOTAL	42%	24%	5%	12%	4%	13%	100%

Table A2.5 - *Expenditure by Types of R&D Activity by Field of Science 2000*

Field of Science	Basic Research		Applied Research		Experimental Research		Total	
	€'000	% Total	€'000	% Total	€'000	% Total	€'000	% Total
Mathematics & Computer Science	5,526	34%	6,789	42%	3,953	24%	16,268	100%
Physical Science	5,808	53%	3,871	35%	1,384	13%	11,063	100%
Chemical Science	8,135	51%	6,579	41%	1,258	8%	15,972	100%
Environmental Science	2,438	56%	1,599	37%	342	8%	4,379	100%
Biological Science	20,145	53%	14,921	39%	2,749	7%	37,815	100%
Civil Engineering	925	14%	2,526	39%	2,963	46%	6,413	100%
Electrical Engineering & Electronics	6,251	19%	14,394	44%	12,142	37%	32,788	100%
Other Engineering Sciences	4,632	22%	10,468	49%	6,099	29%	21,200	100%
Basic Medicine	5,999	49%	5,468	44%	841	7%	12,309	100%
Clinical Medicine	1,717	41%	1,939	46%	566	13%	4,223	100%
Health Science	386	15%	1,992	79%	155	6%	2,533	100%
Agricultural Science	253	9%	2,091	78%	337	13%	2,680	100%
Veterinary Medicine	503	30%	1,053	63%	118	7%	1,674	100%
Psychology	1,478	32%	2,473	54%	662	14%	4,614	100%
Economics	1,370	25%	4,047	73%	134	2%	5,552	100%
Educational Science	3,117	45%	2,984	43%	821	12%	6,922	100%
Other Social Science	15,090	49%	13,955	46%	1,479	5%	30,524	100%
History	4,001	89%	490	11%	0	0%	4,491	100%
Languages & Literature	9,528	73%	3,210	25%	288	2%	13,026	100%
Other Humanities	2,495	69%	1,079	30%	39	1%	3,613	100%
TOTAL	99,797	42%	101,931	43%	36,331	15%	238,058	100%

Table A2.6 - *Expenditure by Type of Cost and Field of Science 2000*

Field of Science	Labour €'000	Other Current €'000	Total Current €'000	Capital €'000	Total €'000
Mathematics & Computer Science	8,781	4,188	12,968	3,299	16,268
Physical Science	6,675	3,637	10,312	751	11,063
Chemical Science	10,454	3,829	14,283	1,688	15,972
Environmental Science	2,806	1,205	4,012	367	4,379
Biological Science	22,152	13,136	35,287	2,528	37,815
Civil Engineering	3,926	1,318	5,243	1,170	6,413
Electrical Engineering & Electronics	17,174	11,030	28,204	4,584	32,788
Other Engineering Sciences	12,789	5,684	18,473	2,727	21,200
Basic Medicine	7,830	2,474	10,304	2,005	12,309
Clinical Medicine	2,537	1,361	3,898	325	4,223
Health Science	1,531	878	2,409	124	2,533
Agricultural Science	2,001	493	2,493	187	2,680
Veterinary Medicine	1,084	403	1,487	188	1,674
Psychology	3,046	1,317	4,364	250	4,614
Economics	4,476	916	5,393	159	5,552
Educational Science	5,020	1,656	6,677	245	6,922
Other Social Science	20,815	5,344	26,160	4,364	30,524
History	3,683	732	4,415	76	4,491
Languages & Literature	11,130	1,683	12,813	213	13,026
Other Humanities	2,775	491	3,266	347	3,613
TOTAL	150,685	61,775	212,460	25,598	238,058
% TOTAL	63.3%	25.9%	89.2%	10.8%	100%

Table A2.7 - *R&D Personnel (Full-Time Equivalent) by Field of Science 2000*

Field of Science	Full Time Academic Staff FTE	Post Doctoral Fellows FTE	Research Assistants FTE	Technicians FTE	Administrative FTE	Other Staff FTE	Total FTE
Mathematics & Computer Science	65.9	2.6	42.8	5.8	2.1	7.0	126.2
Physical Science	52.2	38.8	20.4	14.7	5.5	0.0	131.6
Chemical Science	74.8	39.9	17.6	9.3	2.5	1.0	145.1
Environmental Science	16.6	5.9	14.5	11.4	1.9	0.0	50.3
Biological Science	123.0	74.1	142.7	52.3	4.3	29.2	425.5
Civil Engineering	25.6	0.0	15.0	5.1	1.5	0.0	47.2
Electrical Engineering & Electronics	53.9	34.8	86.5	92.0	10.2	28.6	306.0
Other Engineering Sciences	89.6	1.9	64.8	20.6	1.3	10.5	188.7
Basic Medicine	49.7	15.1	24.0	43.0	12.8	0.3	144.9
Clinical Medicine	13.1	21.9	11.1	6.2	1.9	0.0	54.2
Health Science	8.7	0.0	8.7	0.5	1.6	0.0	19.4
Agricultural Science	14.2	1.0	0.0	10.2	0.2	5.6	31.2
Veterinary Medicine	6.6	0.0	8.0	15.9	4.8	0.0	35.3
Psychology	27.0	4.3	20.6	3.3	0.9	0.0	56.0
Economics	78.2	0.0	2.0	0.0	1.3	0.0	81.5
Educational Science	62.7	0.0	0.0	0.5	0.7	0.0	63.8
Other Social Science	311.3	10.2	13.5	1.2	14.8	0.0	351.1
History	53.2	0.0	8.6	0.3	1.4	0.0	63.5
Languages & Literature	194.3	6.6	0.0	5.4	3.4	0.0	209.7
Other Humanities	59.6	10.0	0.0	0.2	0.5	0.0	70.3
TOTAL	1,380.1	266.9	500.9	298.1	73.4	82.1	2,601.6
% TOTAL	53%	10%	19%	11%	3%	3%	100%

Note: R&D Personnel data was estimated for Trinity College

Table A2.8: *HE researchers per 1000 population*

	1996		1998		2000	
	Value	Rank	Value	Rank	Value	Rank
Australia	1.9	1	2.0	1	2.1	1
Belgium	1.0	10	1.1	9	1.2	8
Canada	1.2	6	1.1	9	1.1	10
Czech Republic	0.3	26	0.3	26	0.4	25
Denmark	1.1	8	1.2	8	1.1	10
Finland	1.3	4	1.9	2	2.1	1
France	0.9	11	0.9	12	1.0	13
Germany	0.8	12	0.8	16	0.8	17
Greece	0.6	19	0.7	19	1.0	13
Hungary	0.4	24	0.4	24	0.6	22
Iceland	1.4	2	1.7	3	1.7	3
Ireland	**0.6**	**19**	**0.7**	**19**	**0.6**	**22**
Italy	0.6	19	0.4	24	0.4	25
Japan	1.4	2	1.4	5	1.4	5
Korea	0.4	24	0.5	23	0.5	24
Netherlands	0.8	12	0.8	16	0.8	17
New Zealand	0.8	12	1.3	6	1.3	6
Norway	1.1	8	1.1	9	1.2	8
Poland	0.8	12	0.9	12	0.9	15
Portugal	0.6	19	0.7	19	0.8	17
Slovak Republic	0.7	18	0.9	12	0.9	15
Spain	0.8	12	0.9	12	1.1	10
Sweden	1.3	4	1.5	4	1.6	4
Switzerland	1.2	6	1.3	6	1.3	6
United Kingdom	0.8	12	0.8	16	0.8	17
United States	0.5	23	0.8	19	0.7	21
EU Average	0.8	-	0.8	-	0.9	-
OECD Average	0.7	-	0.8	-	0.8	-

Source: OECD MSTI Volume 2, 2002

Nearest year used where current data was not available

Appendix 3 - Methodology

Introduction

The survey was carried out following OECD/Frascati Manual (1993, 2002) guidelines for estimating levels of research and development in the higher education sector and the results for Ireland are comparable to those from other OECD countries.

There were two elements to this survey of research and development in higher education colleges:

- An analysis of financial data received from administrative staff in each college;

- An analysis of personnel data received from administrative staff in each college.

Coverage

The coverage included all academic departments, in the seven universities*, eleven institutes of technology**, as well as the Dublin Institute of Technology, Royal College of Surgeons, St. Patrick's College Drumcondra and Mary Immaculate College.

** Universities: NUI Dublin, NUI Cork, NUI Galway, NUI Maynooth, University of Dublin (Trinity College), University of Limerick and Dublin City University.*

*** Institutes of Technology (IT): Athlone IT, Carlow IT, Cork IT, Dundalk IT, Galway-Mayo IT, Letterkenny IT, Limerick IT, Sligo IT, Tallaght IT, Tralee IT and Waterford IT.*

Timing of Survey and Subsequent Follow-Up

Questionnaires were sent out in mid November 2001 to the various colleges. There was intensive follow-up of non-respondents by telephone from January 2002 until the end of July 2002. Final outstanding information was received in December 2002.

Financial Data

Detailed departmental income and expenditure was obtained from the finance office in each university. Industrial liaison offices provided similar information for the Institutes of Technology.

This information comprised total capital and current expenditure from the colleges' block grant for all departments, from which a research proportion was derived, based on the amount of research-time reported by respondents in the 1996 Higher Education census survey.

Research income for each department was provided by source of funds and types of costs.

Personnel data

Detailed departmental headcounts were obtained from the personnel offices, categorised by academic staff, post-doctoral fellows, research assistants, technicians, administrative and other staff. In order to calculate full-time equivalent totals for each category, the co-efficients of total research time derived from the 1996 survey were applied accordingly. The data for Trinity College Dublin were estimated using financial data for 2000 and personnel data for 1998 (latest data available).

Appendix 4 - Definitions of Fields of Activity and of Types of Research

FIELDS OF RESEARCH ACTIVITY

Natural Sciences

1.1 Mathematics and computer sciences

(Mathematics and other allied fields: computer sciences and other allied subjects (software development only; hardware development should be classified with the engineering fields)

1.2 Physical Sciences

(Astronomy and space sciences, physics, other allied subjects)

1.3 Chemical Sciences

(Chemistry, other allied subjects)

1.4 Earth and related environmental sciences

(Geology, geophysics, mineralogy, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, oceanography, vulcanaology, palaeoecology, other allied sciences)

1.5 Biological sciences

(Biology, botany, bacteriology, microbiology, zoology, entomology, genetics, biochemistry, biophysics, other allied sciences excluding clinical and veterinary sciences)

Engineering and Technology

2.1 Civil Engineering

(Architecture engineering, building science and engineering, construction engineering, municipal and structural engineering and other allied subjects)

2.2 Electrical Engineering and Electronics

(Electrical engineering and electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects)

2.3 Other Engineering Sciences

(Such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other allied subjects)

Medical Sciences

3.1 Basic medicine

(Anatomy, cytology, physiology, genetics, pharmacy, pharmacology, toxicology, immunology and immunohaematology, clinical chemistry, clinical microbiology, pathology)

3.2 Clinical medicine

(Anaesthesiology, paediatrics, obstetrics and gynaecology, internal medicine, surgery, dentistry, neurology, psychiatry, radiology, therapeutics, otorhinolaryngology, ophthalmology)

3.3 Health sciences

(Public health services, social medicine, hygiene, nursing, epidemiology)

Agricultural Sciences

4.1 Agriculture, forestry, fisheries and allied sciences (Agronomy, animal husbandry, fisheries, forestry, horticulture, other allied subjects)

4.2 Veterinary medicine

Social Sciences

5.1 Psychology

5.2 Economics

5.3 Educational sciences

(Education and training and other allied subjects)

5.4 Other social sciences

(Anthropology (social and cultural) and ethnology, demography, geography (human, economic and social), town and country planning, management, law, linguistics, political sciences, sociology, organisation and methods, miscellaneous social sciences and interdisciplinary, methodological and historical S&T activities relating to subjects in this group. Physical anthropology, physical geography and psychophysiology should normally be classified with the natural sciences)

Humanities

6.1 History

(History, prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeography, genealogy, etc.)

6.2 Languages and Literature

(Ancient and modern)

6.3 Other humanities

(Philosophy (including the history of science and technology), arts, history of art, art criticism, painting, sculpture, musicology, dramatic art excluding artistic "research" of any kind, religion, theology, other fields and subjects pertaining to the humanities, methodological, historical and other S&T activities relating to the subjects in this group)

Source: Proposed Standard Practice for Surveys on Research and Experimental Development, OECD (Frascati Manual1993, 2002)

TYPE OF RESEARCH DEFINITIONS

Basic research

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

Applied research

Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

Experimental development

Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

Source: Proposed Standard Practice for Surveys on Research and Experimental Development, OECD (Frascati Manual 1993, 2002)

Appendix 5 - Acronyms

ACRONYMS

EU	European Union
FTE	Full-time equivalent (1 FTE = R&D 40 hours per week)
GDP	Gross Domestic Product
GNP	Gross National Product
HE	Higher Education
HEA	Higher Education Authority
HERD	Higher Education Expenditure on R&D
OECD	Organisation for Economic Co-operation andDevelopment
PAT	Programme in Advanced Technology
R&D	Research and Development

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State Expenditure Priorities for 2004 ***Irish Council for Science, Technology & Innovation***	**July 2003**
Annual Report, 2002	**July 2003**
A Comparison of Starting Salaries for Science and Engineering Graduates ***Irish Council for Science, Technology & Innovation***	**August 2003**

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Expert Group on Future Skills Needs **September 2003**

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Expert Group on Future Skills Needs **October 2003**

Functions of Forfás

Is é Forfás an bord náisiúnta um polasaí agus comhairle le haghaidh fiontraíochta, trádála, eolaíochta, teicneolaíochta agus nuála. Is é an comhlacht é a bhfuil comhactaí dlíthiúla an stáit maidir le cur-chun-cinn tionscail agus forbairt teicneolaíochta dílsithe ann. Is é an comhlacht é freisin trína dciomnaítear cumhachtaí ar Fhiontraíocht Éireann le tionscail dúchais a chur chus cinn agus ar ghníomhaireacht Forbartha Tionscail na hÉireann (GFT Éireann) le hinfheistíocht isteach sa tir a chur chun tosaight. Is iad feighmeanna Fhorfáis:

- comhairle a chur ar an Aire ó thaobh cúrsaí a bhaineann le forbairt tionscail sa Stát
- comhairle maidir le forbairt agus comhordú polasaithe a chur ar fáil d'Fhiontraíocht Éireann, d'GFT Éireann agus d'aon fhoras eile dá leithéid (a bunaíodh go reachtúil) a d'fhéadfadh an tAire a ainmniú trí ordú
- forbairt na tionsclaíochta, na heolaíochta, na nuála agus na teicneolaíochta, na margaíochta agus acmhainní daonna a spreagadh sa Stát
- bunú agus forbairt gnóthas tionsclaíoch ón iasacht a spreagadh sa Stát, agus
- Fiontraíocht Éireann agus GFT Éireann a chomhairliú agus a chomhordú ó thaobh a gcuid feidhmeanna.

Forfás is the national policy and advisory board for enterprise, trade, science, technology and innovation. It is the body in which the State's legal powers for industrial promotion and technology development have been vested. It is also the body through which powers are delegated to Enterprise Ireland for the promotion of indigenous industry and to IDA Ireland for the promotion of inward investment. The broad functions of Forfás are to:

- advise the Minister on matters relating to the development of industry in the State
- advise on the development and co-ordination of policy for Enterprise Ireland, IDA Ireland and such other bodies (established by or under statute) as the Minister may by order designate
- encourage the development of industry, science and technology, innovation, marketing and human resources in the State
- encourage the establishment and development in the State of industrial undertakings from outside the State, and
- advise and co-ordinate Enterprise Ireland and IDA Ireland in relation to their functions.

Board Members

Peter Cassells	*Chairman*
Martin Cronin	*Chief Executive, Forfás*
Sean Dorgan	*Chief Executive, IDA Ireland*
Dan Flinter	*Chief Executive, Enterprise Ireland*
Paul Haran	*Secretary General, Department of Enterprise, Trade & Employment*
Dr William C. Harris	*Director General, Science Foundation Ireland*
Professor Michael Hillery	*Chair of Manufacturing Engineering University of Limerick*
Rody Molloy	*Director General, FÁS*
William Murphy	*Partner, Tynan Dillon and Company*
Feargal O'Rourke	*Partner, Taxation Pricewaterhouse Coopers*
Dr Don Thornhill	*Chairman, Higher Education Authority*
Toni Wall	*Managing Director, Wall-2-Wall Ltd*
Jane Williams	*Managing Director, The Sia Group Ltd*