Research and Experimental Development (R&D) Statistics 1997

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RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D) STATISTICS 1997
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Summary of trends

- Measuring expenditure and employment of R&D is difficult because of the subjective judgements that have to be made about the dividing line between R&D and other activities. There are discontinuities in the series arising from the interpretation of definitions, and because of changes in the actual or perceived status of organisations ([1], *chapter 1 details this*). Some general conclusions can be drawn, but significance should not be given to small percentage changes between years.

- In 1997 Gross Domestic Expenditure on R&D (GERD) was 1.80 per cent of GDP, a decrease on previous years (*Table 2*). In terms of international comparisons in 1997 the UK was ranked 5th amongst G7 countries and was just below the EU average of 1.83 per cent[5].

- Within the UK, net expenditure in real terms on R&D by government peaked in 1980/81. Since then there has been a gradual downward trend (*Table 4*).

  Net government expenditure on defence R&D has shown an increase as a percentage of the total since 1995. However the overall level has fallen from 45 per cent in 1989 to 39 per cent in 1997 (*Table 6*).

- Expenditure in real terms performed by the business sector in the UK peaked in 1990. Since 1994 expenditure has declined (*Table 7*).

- Within the manufacturing sector, the chemicals broad product group has the largest share of total R&D expenditure at 30 per cent. The services sector accounts for 23 per cent of total R&D expenditure (*Table 8*).

- In the government sector, spending as a percentage of regional gross domestic product is highest in the South East. In the business sector the proportion is highest in the Eastern region (*Table 14*).

Background

This article updates statistics published in the August 1998 edition of *Economic Trends*. Most of the figures have already been published by the Office for National Statistics, the Department of Trade and Industry (Office of Science and Technology) or the OECD[1,2,4,5]. Last year's article generated a great deal of interest within the R&D community and our aim is to continue to inform and stimulate debate.

The R&D statistics are consistent with OECD's Frascati Manual[3] which defines Research and Experimental Development (R&D) and gives guidelines on how to measure expenditure and employment on R&D. The manual is applied throughout the OECD so it is possible to make comparisons between countries[5,6].

R&D is defined as creative work undertaken systematically to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this knowledge to devise new applications.

Care should be exercised when using R&D statistics for economic analysis. R&D can lead to the technological inventions that are necessary for a successful innovative economy. However, such inventions are not a sufficient condition for success - many other economic and social factors are important. Undue weight should not be given to the economic significance of R&D's role as a generator of inventions. On the other hand, the economic benefit of R&D is not limited to that role: R&D develops skills and techniques that are important for any economy.

Sources of information

Performers and funders of R&D are divided into four economic sectors: Government, Business, Higher Education Institutions (HEIs), and the Private Non-Profit (PNP) sector. Definitions are provided at the end of this article.

The ONS conducts an annual survey of Central Government R&D, which is addressed to all Government departments. The survey collects data on expenditure and employment for outturn and planning years. Detailed recent results were published on 29th June 1999 in OST's *Forward Look 1999* (ISBN No. 0 10 143632 7) and in August 1999 in OST's *Science, Engineering and Technology Statistics 1999* (SET 1999) (*Ref. 1*). These documents are available on OST's web site at **http://www.dti.gov.uk/ost/**

The ONS also conducts an annual survey of R&D in businesses. The 1997 survey again used a sample survey to minimise burdens on contributors. The register of R&D performers is continually updated and results and detailed methodology notes can be found in the ONS publication *Research and Development in UK Business*[2].

Statistics on expenditure and employment on R&D in Higher Education Institutions (HEIs) are based on information collected by Higher Education Funding Councils and HESA (Higher Education Statistics Agency). In 1994 a new methodology was introduced to estimate expenditure on R&D in HEIs. This was based on the allocation of various Funding Council Grants. Full details of the new methodology are contained in SET 1999[1].

The Tables

Gross Domestic Expenditure on R&D (GERD) (Tables 1-3)

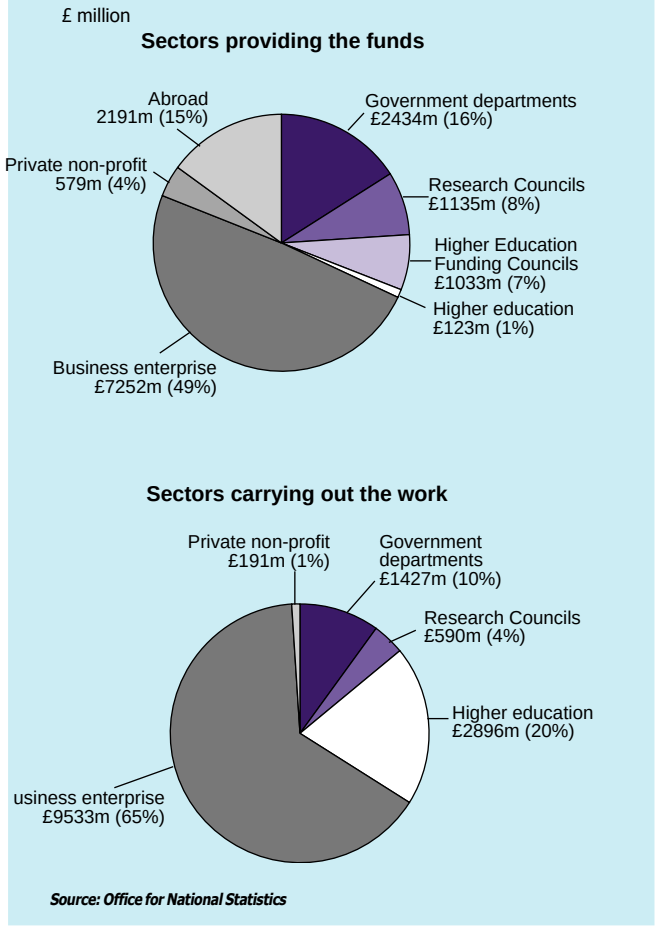
These tables show the performers and funders of R&D in the UK. Measuring expenditure on R&D performed within each sector avoids problems of omission and double counting that can arise when measuring funds provided for R&D. GERD is the sum of R&D performed in the four sectors. Tables 1 and 2 show that UK GERD in 1997 was £14.7 billion in cash terms. GERD is often quoted as a percentage of GDP when making international comparisons. In 1997 UK GERD was 1.80 per cent of GDP, a decrease on the previous year's figure, just below the EU average of 1.83 per cent.

Table 1 shows the interaction between R&D funders and performers. For example £9,553m was spent on R&D in the business sector. Of this, £919m was provided by the government, £1,856m came from abroad and £6,770m was funded by businesses from their own sources. Funds from abroad include those from overseas parent companies, contracts for R&D projects, support for R&D provided through European Union schemes and international collaborative projects typically for aerospace or defence projects.

Figure 1 shows that the business sector is the most important sector of the economy in terms of providing funds for and carrying out R&D.

Figure **1**

Gross expenditure on R&D in the UK, by sectors, 1997



Source: Office for National Statistics

Government R&D expenditure (Tables 4 to 6)

A department's net expenditure on R&D is its expenditure on R&D performed within the department (intramural) plus its expenditure on R&D outside the department (extramural) minus receipts for R&D.

The sum of a department's net expenditure is the R&D element of the government's budget expenditure. This is used for international comparisons of Government appropriations for R&D (e.g. Table 18). The UK has a high proportion of Central Government expenditure devoted to R&D for defence purposes.

Figures in Tables 4 and 6 for Government's net expenditure on R&D differ from Government funding figures in Tables 1 and 3. This is because Tables 1 to 3 are based on information supplied by R&D (**performers**) whilst Tables 4 to 6 contain expenditure figures reported by Government departments (**funders**). The gap is mainly accounted for by differences in the reporting of Government contracts with businesses for certain types of defence R&D and R&D performed abroad but funded by the UK Government. In addition the difference is also attributed to other factors such as time lag problems due to differences in accounting periods and not all monies given being used in that financial period, treatment of VAT and sub-contracting of R&D work.

R&D in NHS hospitals previously included in Table 5 on the basis of the Culyer Report[9], are now reported as extramural expenditure. The figures for Central Government intramural R&D in Table 5 are lower than those performed by the government sector in Tables 1 and 2. This is because the latter includes estimates for a small amount of R&D not available from the Government survey and R&D performed by local authorities.

Table 4 shows a time series dating back to 1966/67. This shows that in 1997/98 the net Government expenditure on R&D (by civil and defence departments) was £5.5 billion. In real terms, spending on R&D was flat in the late sixties but rose in the seventies to a peak in 1980/81. Since then it has declined although spending in 1997/98 was still more than in 1966/67.

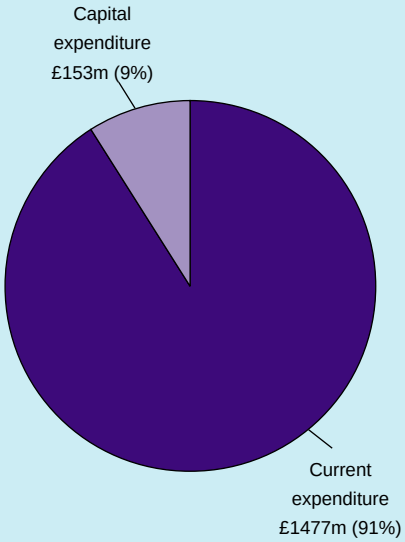
Table 5 shows the breakdown of departmental intramural expenditure (see figure 2); the current (which is also shown by Frascati type of research) and capital expenditure. Figure 2 shows that 91 per cent

Figure 2

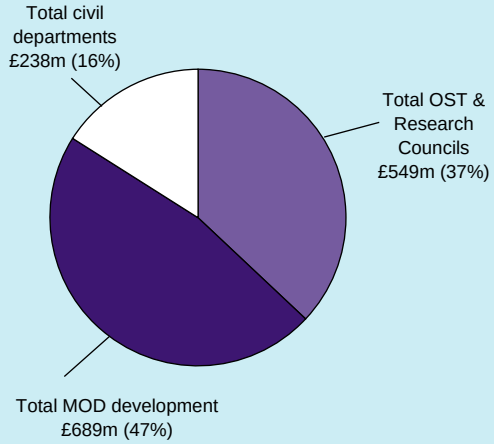
Analysis of Central Government intramural expenditure 1997-98

£ million

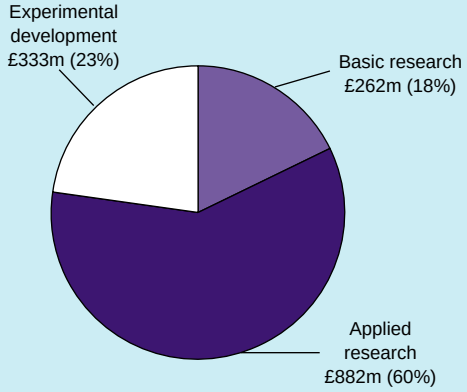
Breakdown of intramural current and capital expenditure



Departmental breakdown of current intramural R&D



Breakdown of current expenditure by Frascati type of research



(£1,477m) of intramural expenditure is current expenditure. Applied research accounts for 54 per cent of the total intramural expenditure. Total intramural expenditure is further broken down in Table 5 into Social Science & Humanities (SSH) and Natural Science & Engineering (NSE) research.

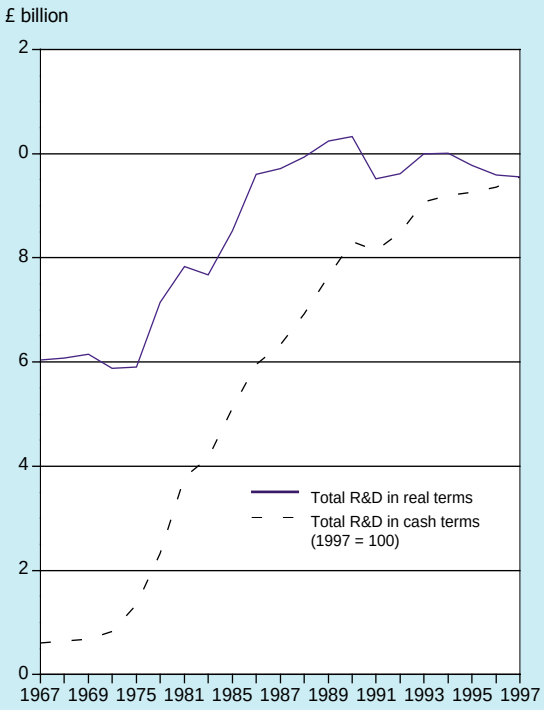
Table 6 provides an analysis of net government R&D expenditure by Frascati type of research activity for the period 1989-90 to 1997-98. The share of expenditure attributed to applied research has remained fairly constant over the ten year period, whereas the share attributed to basic research has increased at the expense of the share attributed to experimental development. – In 1989-90 defence expenditure accounted for 45 per cent of total expenditure. This share had declined to 39 per cent by 1997-98.

R&D performed by the Business Sector (Tables 7-12)

Table 7 and figure 3 show a time series dating back to 1967 for expenditure performed by the Business sector. They show that in 1997 R&D expenditure was £9.6 billion. Expenditure in real terms in the business sector peaked in 1990. After falling by 8 per cent in 1991, expenditure increased each year to 1994. Since then there has been a gradual decrease. R&D performed by business has increased in real terms by 60 per cent since 1966.

Figure 3

Net Business enterprise expenditure on R&D, in cash and real terms, 1967 to 1997



Source: Office for National Statistics

Table 8 shows that within the business sector, the services broad product group accounted for 23 per cent of the total expenditure in 1997. In the manufacturing sector the pharmaceuticals and chemicals broad product group had the largest share of R&D expenditure at 30 per cent of the total.

Statistics for civil and defence have been collected separately since 1989 (*see Table 9*). Defence includes all R&D programmes undertaken primarily for defence reasons, regardless of their content or whether they have secondary civil applications.

In 1997, civil R&D represented 86 per cent of all R&D expenditure performed by business (*Table 9*), compared to 77 per cent in 1989. Table 10 (and figure 4) show that, in 1997, 78 per cent of civil R&D performed by businesses was funded by businesses themselves. Government funded 3 per cent of civil R&D, whereas it funded 48 per cent of defence R&D.

The breakdown into detailed product groups is shown in Tables 11 and 12. The product group with the largest expenditure is pharmaceuticals, medical chemicals and botanical products, which accounted for £2,151m in 1997, followed by Motor Vehicles and parts at £963m.

Table 12 shows the split of current and capital expenditure on R&D performed by UK businesses. Current expenditure is the sum of salaries and wages, basic and applied research and experimental development. Capital is the expenditure on land, buildings, plant and machinery.

R&D employment - Government and Business Enterprise (Table 13)

Business Enterprise employment in R&D has fallen from 185 thousand in 1988 to 139 thousand in 1997. Between 1996 and 1997, employment in Business Enterprise R&D fell by 3 per cent and by 6 per cent in government departments. Research Councils' employment has remained fairly stable during the period 1988 to 1997.

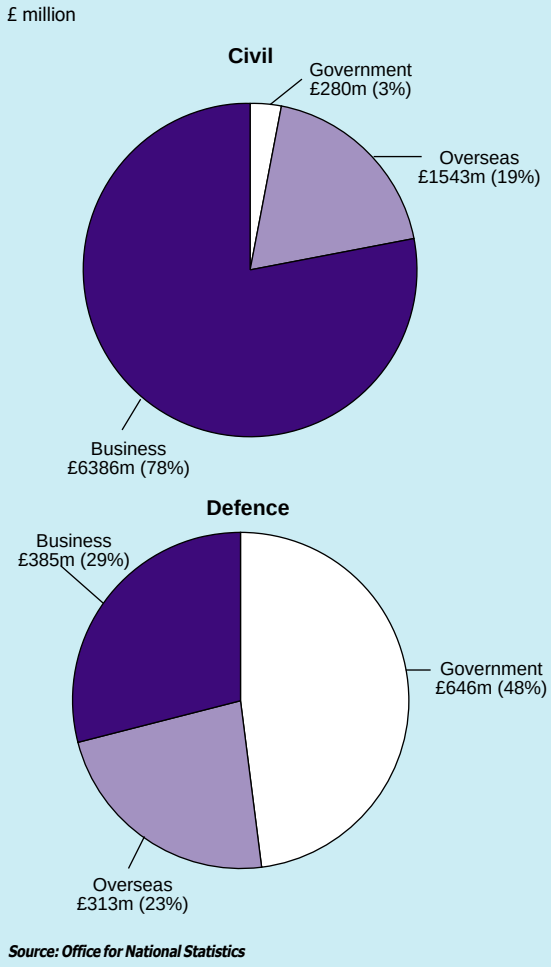
Regional R&D statistics (Tables 14-15)

Regional estimates for the Government and Business sectors are derived from the ONS surveys of Government and Business Enterprises.

The Higher Education Institutions (HEI) regional R&D estimates are less reliable and should be treated with special caution. The expenditure estimates are obtained by allocating total R&D performed by HEIs (HERD) to individual HEIs in proportion to their income from research grants and contracts. An estimate of the labour force in Full Time Equivalents (FTE) is not available.

Figure **4**

Sources of funds for Business Enterprise R&D, 1997

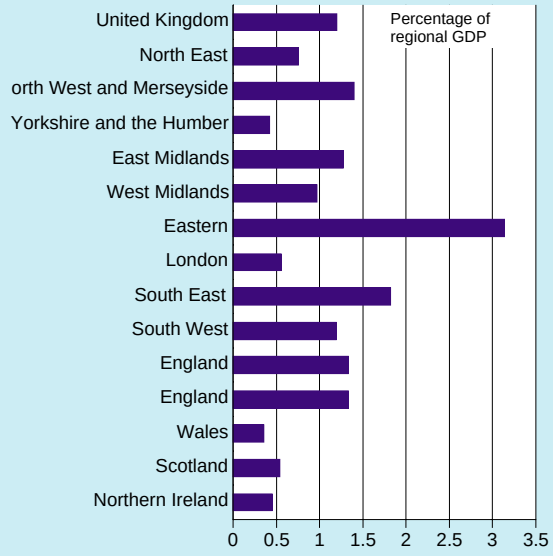


Source: Office for National Statistics

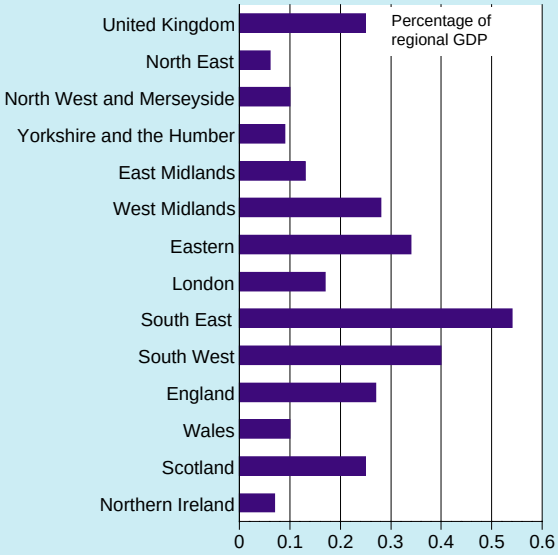
Estimates are given for UK Government Office Regions (GOR). Of the 12 GOR regions, the South East of England has the highest number of R&D personnel and the largest expenditure on R&D (this reflects in part the greater size of the South East). To adjust for this, the R&D expenditure estimates are also shown as a percentage of GDP and the personnel estimates as a percentage of the labour force (*see figures 5 and 6*). Tables 14 and 15 show that, within the UK, the Eastern and South East have the highest concentration of R&D expenditure performed by business. For the Government sector the highest regions are the South East, the South West and the Eastern region, whilst for the Higher Education Sector, London, and Scotland are prominent (*see figure* 5). In terms of personnel estimates as a percentage of the labour force (see *figure 6*), the South East and the Eastern region are prominent in both the Business and Government sectors.

Figure 5

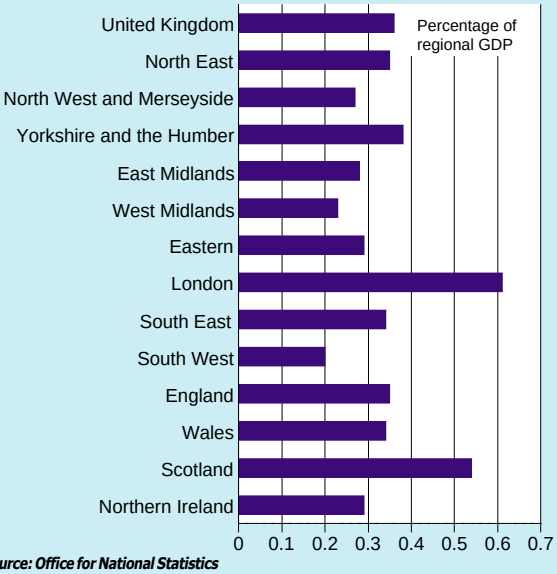
(i) Estimated regional (GOR) BERD in 1997



(ii) Estimated regional (GOR) GOVERD in 1997



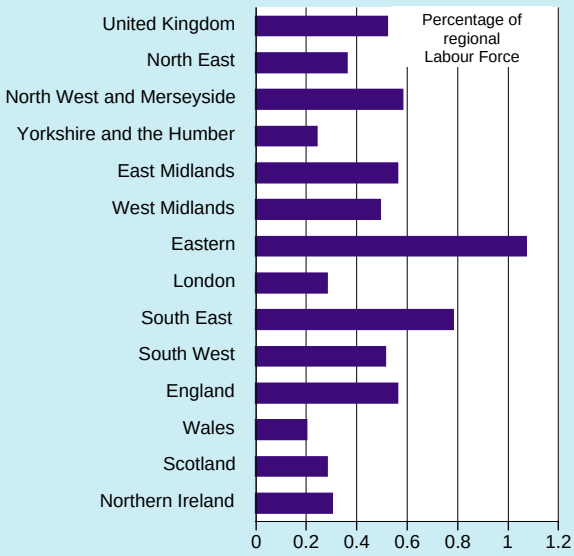
(iii) Estimated regional (GOR) HERD in 1997



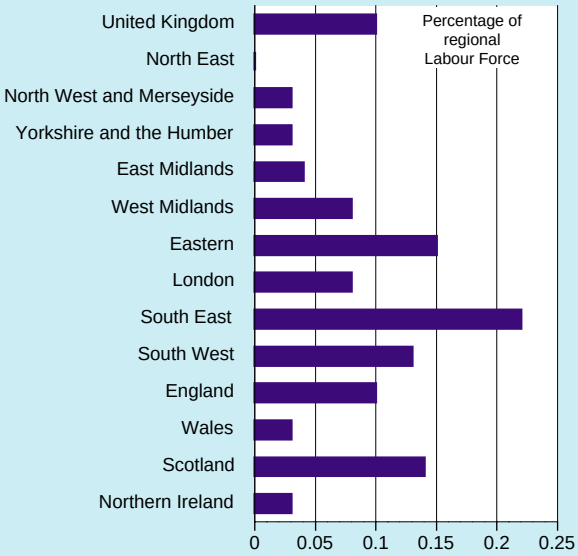
Source: Office for National Statistics

Figure 6

(i) Estimated regional (GOR) BERD in 1997



(ii) Estimated regional (GOR) Government R & D in 1997



Source: Office for National Statistics

International comparisons of R&D (Tables 16-19)

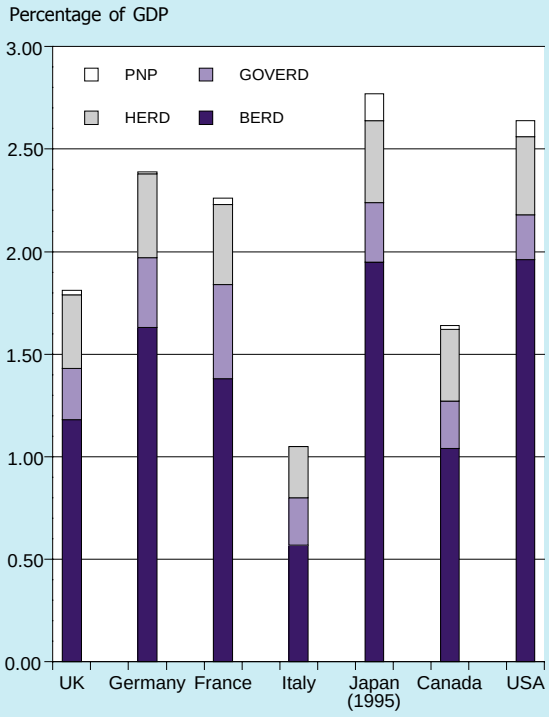
Although the guidelines in the Frascati Manual are generally followed, methods of collecting R&D data do vary from country to country ([5]discusses national variations). Therefore small differences should not be treated as significant when making international comparisons.

The figures shown for Japan in the tables are OECD estimates.

Table 16 shows the trend of R&D as a percentage of GDP for the G7 countries over the time period 1988 to 1997. The ratio for GERD has been fairly constant over this time for most of the countries. Figure 7 shows the position in 1997. The UK was ranked 5th. Table 16 also shows BERD and GOVERD as a percentage of GDP.

Figure **7**

Comparison of BERD, GOVERD, HERD and PNP as a percentage of GDP, 1997



Source: OECD

Table 17 shows the international comparisons of GERD by sector of performance and source of funding. Table 18 shows R&D performed in the business sector. Table 16 also shows this as a percentage of GDP; Japan and the USA are the top spenders with the UK holding a middle ranking position. International comparison of Government funding of R&D in 1997 by socio-economic objective is shown in table 19. Of the G7 countries, the USA and the UK devoted the highest proportion of their total Government funding of R&D to defence. For Germany, Italy and Japan about half of their total Government funding of R&D was classified as the advancement of knowledge compared to approximately a third for France.

Definitions

Type of R&D

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

Applied research is research undertaken with either a general or a particular application in view.

Experimental Development is the use of the results of basic and applied research directed to the introduction of new materials, processes, products, devices and systems, or the improvement of existing ones. It should include the prototype or pilot plant stage, design and drawing required during R&D and innovative work done on contracts with outside organisations, government departments, and public bodies. Firms in the aerospace industry are asked to include expenditure on development batches.

Sectors of the Economy

The four sectors of the economy are defined in an ONS publication[4]. However higher education is identified separately as recommended in the Frascati Manual.

Central Government includes the central government departments, research councils, higher education funding councils, NDPBs, and Executive Agencies.

Business Enterprises include private businesses, public corporations, and research associations serving businesses.

Higher Education includes the former polytechnics and central institutions in Scotland as well as the old universities.

Private Non-Profit sector makes up the remainder and includes medical research charities.

Regional data

Data is classified according to the Government Office Regions (GOR).

Rounding

Throughout the tables components of totals have been rounded independently of the totals. Therefore the rounded totals will not always be equal to the sums of the rounded components. Symbols follow the conventions used elsewhere in Economic Trends.

Revisions and Discontinuities

In the Government Tables, a new method for estimating Government funded R&D in HE was introduced in 1994/95, therefore 1993/94 figures have been revised. It is not possible to revise the data for prior years because of the structural changes in the HE sector.

Government figures in some tables (see table footnotes) for 1995/96 onwards, now include NHS Hospital R&D estimates for the first time.

The 1996 Business Survey results have been revised where necessary to take into account misclassification and updated population information. Full details on the revisions were included in ONS's First Release (98)390 published on 20th November 1998. The First Release figures have been revised slightly due to departmental amendments.

Regional data is published using GOR regions and these should not be compared to NUTS regional data previously published in this annual article.

Data Analysis Service

The ONS is now able to offer additional analysis concerning R&D statistics, e.g. Sizeband and regional breakdowns. The contact for this service is:

Jane Morgan
Tel: 01633 813109
E-mail: jane.morgan@ons.gov.uk

For further information on:	ONS Contacts:
Business R&D[2]	**Jane Morgan** Tel: 01633 813109
Information on aggregated R&D data	**Jane Morgan** Tel: 01633 813109
Definitions of R&D[3]	**Peter Jones** Tel: 01633 813063
GERD[4]	**Peter Jones** Tel: 01633 813063
General information on Science & Technology[1]	**Steve Churchill** Tel: 01633 812003
International comparisons[5,6,7]	**Steve Churchill** Tel: 01633 812003

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1 *Science, Engineering and Technology Statistics 1999*, DTI, OST. The Stationery Office, July 1999–.

2 ONS UK Business Reference, MA14 *Research and Development in UK Business*, MA14. ONS, January 1999, ISSN 1463 6115.

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4 ONS First Release ONS(99)107 19 March 1999, Gross Domestic Expenditure on Research and Development 1997.

5 *Main Science and Technological Indicators* 1998/2, OECD, Paris 1998.

6 *Research and Development: Annual Statistics* 1998 , Eurostat, Luxembourg 1997, ISBN 92 828 4876 0.

7 *Economic Trends*, No 537, August 1998, The Stationery Office, ISBN 0 11 620982 8.

8 *Supporting Research and Development In The NHS*, (A report to the Minister of Health by a research and development task force chaired by Professor Anthony Culyer), September 1994, ISBN 0 11 321831 1.

9 *Manual on the measurement of Human Resources devoted to Science & Technology* - the Canberra Manual, (OECD/EC DGX11 and EUROSTAT), Group of National Experts on Science & Technology Indicators, OECD, Paris 1995.

10 OST's 1999 *Forward Look of Government Funded Science, Engineering and Technology*, June 1999, ISBN 0 10 143632 7.

Abbreviations

BERD	Business Expenditure on R&D
EU	European Union
EUROSTAT	The Statistical Office of the European Communities
FTE	Full Time Equivalent
G7	Group of Seven countries, comprising: UK, Germany, France, Italy, Japan, Canada, USA
GDP	Gross Domestic Product
GERD	Gross (Domestic) Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D

GOR	Government Office Regions
HEFC	Higher Education Funding Council
HEIs	Higher Education Institutions
HERD	Higher Education Expenditure on R&D
HESA	Higher Education Statistics Agency
NDPB	Non-Departmental Public Body
NHS	National Health Service
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
OST	Office of Science and Technology (part of DTI since April 1996)
PPP	Purchasing Power Parities
PNP	Private Non-Profit
R&D	Research and (Experimental) Development

Table 1 Gross expenditure on civil and defence R&D performed in the UK in 1997(1)

£ million

Sectors providing the funds(2)(3)	Sectors carrying out the work(2)(3) Government departments(4)	Research Councils	Higher education	Business enterprise	Private non-profit	Totals	Abroad
Government(4)	1166	78	161	919	18	2343	236
Research Councils	21	405	691	8	10	1135	119
Higher Education Funding Councils	-	-	1033	-	-	1033	
Higher education institutions	0	3	118	-	1	123	
Business enterprise(5)	203	37	207	6770	35	7252	
Private non-profit	6	28	438	1	107	579	
Abroad	30	38	248	1856	19	2191	
TOTAL	**1427**	**590**	**2896**	**9553**	**191**	**14656**	**n/a**
Civil							
Government(4)	547	70	123	273	18	1032	160
Research Councils	20	405	691	8	10	1134	119
Higher Education Funding Councils	-	-	1033	-	-	1033	
Higher education institutions	0	3	118	-	1	123	
Business enterprise(5)	139	37	183	6385	35	6781	
Private non-profit	6	28	438	1	107	579	
Abroad	9	38	248	1543	19	1857	
TOTAL	**722**	**582**	**2834**	**8209**	**190**	**12538**	**n/a**
Defence							
Government(4)	619	8	38	646	0	1311	76
Research Councils	0	-	-	-	-	0	-
Higher Education Funding Councils	-	-	-	-	-	-	
Higher education institutions	0	-	-	-	-	0	
Business enterprise(5)	64	-	24	384	-	472	
Private non-profit	-	-	-	0	-	0	
Abroad	22	-	-	313	-	335	
TOTAL	**705**	**8**	**62**	**1343**	**0**	**2118**	**n/a**

Source: Office for National Statistics

Notes:

General Note:

These estimates are derived from the ONS surveys of government and business enterprise R&D and from information from the HEFC. More details are in the ONS First Release ONS(99)(107). The First Release has been revised slightly due to departmental amendments.

Notes:

1. Research in the social sciences and humanities is included.
2. The OECD terminology is used for describing the breakdown of GERD by sector.
3. Some of the numbers have been estimated.
4. The total for R&D performed by government includes estimates for a small amount of R&D not available from the Government Survey; R&D performed by local authorities. Since 1996 UK NHS figures have been obtained from the Department of Health and the Scottish Office on the basis of the Culyer report.

Table 2 Gross expenditure on R&D in the UK by performing sector 1989 to 1997(1)

£ million

	1989	1990	1991	1992	1993	1994	1995	1996r	1997r
Expenditure in cash terms (£m):									
Performed by:									
Government	1534	1566	1757	1846	1928	2051	1462	1495	1427
Research Councils	-	-	-	-	-	-	581	575	590
Business enterprise	7650	8318	8135	8489	9069	9204	9254	9362	9553
Higher education	1689	1873	2020	2129	2312	2623	2696	2792	2896
Private non-profit	196	234	220	224	232	168	177	177	191
TOTAL	**11069**	**11991**	**12132**	**12689**	**13541**	**14046**	**14172**	**14401**	**14656**
Expenditure in real terms (1997=100)(2) (£m):									
Performed by:									
Government	2055	1946	2055	2090	2127	2230	1545	1532	1427
Research Councils	-	-	-	-	-	-	614	589	590
Business enterprise	10247	10332	9515	9611	10002	10008	9778	9596	9553
Higher education	2262	2327	2363	2411	2550	2852	2849	2862	2896
Private non-profit	262	291	257	254	256	183	187	182	191
TOTAL	**14826**	**14895**	**14190**	**14366**	**14934**	**15273**	**14974**	**14761**	**14656**
Total as % of GDP(3)	**2.12**	**2.13**	**2.06**	**2.07**	**2.09**	**2.05**	**1.96**	**1.88**	**1.80**

Notes:

1 See notes at Table 1.

2 GDP and GDP deflators used have been revised in line with the new European System of Accounts (ESA95) definitions. (See ONS National Accounts First Release dated 24 September 1998).

The deflators are:

1989	1990	1991	1992	1993	1994	1995	1996	1997
74.7	80.5	85.5	88.3	90.7	92.0	94.6	97.6	100.0

3 Gross domestic product values are:

£ million

1989	1990	1991	1992	1993	1994	1995	1996	1997
522413	562674	589836	612630	647249	685805	722909	764566	812120

Source: Office for National Statistics

Table 3 Gross expenditure on R&D in the UK by source of funds 1989 to 1997(1)(2)

£ million

	1989	1990	1991	1992	1993	1994	1995	1996r	1997r
Sector providing funds									
Expenditure in cash terms (£m):									
Funded by:									
Government	3913	4123	4131	4239	4400	4657	2611	2458	2343
Research Councils	-	-	-	-	-	-	1078	1092	1135
Higher Education Funding Councils	-	-	-	-	-	-	1018	1027	1033
Higher education	82	86	92	99	103	116	119	120	123
Business enterprise	5631	5986	6054	6461	6974	7025	6796	6796	7252
Private non-profit	303	365	397	435	451	495	511	545	579
Abroad	1139	1433	1458	1455	1613	1753	2039	2361	2191
TOTAL	**11069**	**11991**	**12131**	**12689**	**13541**	**14046**	**14172**	**14401**	**14656**
Expenditure in real terms (1997=100)(3) (£m):									
Funded by:									
Government	5241	5121	4832	4799	4853	5064	2759	2520	2343
Research Councils	-	-	-	-	-	-	1139	1119	1135
Higher Education Funding Councils	-	-	-	-	-	-	1075	1053	1033
Higher education	110	107	107	113	113	126	125	123	123
Business enterprise	7542	7436	7081	7315	7692	7638	7181	6966	7252
Private non-profit	406	453	464	493	498	538	540	559	579
Abroad	1526	1779	1705	1647	1779	1906	2154	2420	2191
TOTAL	**14826**	**14895**	**14189**	**14366**	**14934**	**15273**	**14974**	**14761**	**14656**
Total as % of GDP(4)	**2.12**	**2.13**	**2.06**	**2.07**	**2.09**	**2.05**	**1.96**	**1.88**	**1.80**

Source: Office for National Statistics

Notes:

1 See notes at Table 1.

2 See notes at Table 2.

3 GDP and GDP deflators used have been revised in line with the new European Systems of Accounts (ESA95) definitions. (See ONS National Accounts First Release dated 24 September 1998).

Table 4 Total Net Government expenditure on R&D in cash terms and real terms 1966-67 to 1997-98

£ million

	Total Net Government R&D	
Year	In cash terms excluding NHS Figures	In real terms (1997=100)(1)
1966-67	486	5083
1967-68	503	5109
1968-69	531	5136
1969-70	562	5169
1970-71	606	5143
1971-72	755	5872
1972-73	847	6094
1973-74	964	6475
1974-75	1169	6556
1975-76	1495	6691
1976-77	1647	6486
1977-78	1814	6288
1978-79	2097	6544
1979-80	2601	6950
1980-81	3184	7195
1981-82	3395	7006
1982-83	3519	6791
1983-84	3730	6880
1984-85	3964	6947
1985-86	4175	6950
1986-87	4255	6868
1987-88	4408	6755
1988-89	4496	6454
1989-90	4772	6392
1990-91	4955	6155
1991-92	5027	5880
1992-93	5078	5749
1993-94	5402	5958
1994-95	5200	5655
1995-96(2)	5296	5595
1996-97(2)	5352	5486
1997-98(2)	5504	5504

Source: Office for National Statistics

Notes:

1 See note at Table 2.

2. Figures for NHS are available in SET 1999 (ref 1).

Table 5 Analysis of Government Intramural expenditure, 1997-98.(1)(2)

	Current expenditure	Breakdown of current Frascati R&D expenditure: Basic	Applied	Experimental development	Capital expenditure	TOTAL INTRAMURAL	SSH	NSE
OST - DTI	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Research Councils								
BBSRC	141.6	49.5	92.0	-	16.6	158.2	-	158.2
ESRC	3.6	3.6	-	-	0.3	3.9	3.9	-
MRC	145.2	87.0	58.2	-	15.9	161.1	-	161.1
NERC	112.2	27.0	79.3	5.9	6.2	118.4	-	118.4
EPSRC	19.4	9.5	9.9	-	0.2	19.5	-	19.5
PPARC	30.2	27.2	3.0	-	2.8	33.0	-	33.0
CCLRC	97.2	21.4	75.8	-	10.5	107.8	-	107.8
Total OPSS & Research Councils	**549.4**	**225.3**	**318.2**	**5.9**	**52.5**	**601.9**	**3.9**	**598.0**
Higher Education Funding Councils	-	-	-	-	-	-	-	-
Total Higher Education Funding Councils	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Civil departments								
MAFF	73.4	16.1	53.7	3.6	6.8	80.3	0.1	80.1
DFEE	5.5	-	2.3	3.2	-	5.5	5.5	-
DETR (formerly DOT & DOE)	8.4	-	7.6	0.8	0.0	8.4	1.2	7.3
DH	34.1	1.9	26.3	5.9	2.4	36.5	3.8	32.7
NHS(3)	0.0	-	0.0	-	-	0.0	-	0.0
DSS	0.8	-	0.8	-	-	0.8	0.8	-
HSC	9.4	-	8.5	0.9	0.4	9.8	0.4	9.4
HO	12.1	0.1	9.2	2.9	1.4	13.5	7.1	6.4
DCMS (Formerly DNH)	9.5	8.3	1.0	0.2	0.2	9.8	0.5	9.2
DFID (Formerly ODA)	2.3	-	2.3	-	-	2.3	0.8	1.4
DTI (ex OST)	5.4	2.5	2.9	-	-	5.4	-	5.4
NI	8.1	0.3	6.9	0.9	1.2	9.4	1.0	8.3
SO	48.9	7.4	40.8	0.7	0.5	49.4	3.1	46.3
WO	0.6	-	0.6	-	-	0.6	0.6	0.0
Other departments	19.4	0.1	17.7	1.6	1.9	21.3	5.8	15.5
Total civil departments	**237.9**	**36.6**	**180.7**	**20.6**	**15.0**	**252.9**	**30.8**	**222.1**
Total civil R&D	**787.3**	**261.9**	**498.9**	**26.5**	**67.5**	**854.8**	**34.7**	**820.1**
MOD	689.2	-	383.1	306.2	85.1	774.4	16.1	758.3
TOTAL	**1476.5**	**261.9**	**882.0**	**332.7**	**152.7**	**1629.2**	**50.8**	**1578.4**

Source: Office for National Statistics

Notes:

1 Excludes Research Councils' pensions/other costs.
2 Includes intramural R&D funded by other departments.
3 NHS expenditure figures are now reported as extramural.

Table 6 Analysis of net Government R&D expenditure by Frascati type of research activity 1989-90 to 1997-98 (1)

£ million

	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96(2)	1996-97(2)	1997-98(2)
Total Government R&D									
Basic	1188	1288	1362	1513	1572	-	-	-	-
- pure	-	-	-	-	-	1251	1273	1322	1334
- orientated	-	-	-	-	-	471	504	524	523
Applied - strategic	730	768	850	955	1021	879	1004	1109	1079
- specific	950	1031	885	868	1048	1076	1322	1224	1198
Experimental development	1899	1868	1931	1747	1761	1494	1530	1570	1757
Total £m		**4772**	**4955**	**5027**	**5078**	**5402**	**5171**	**5634**	**5750**
5891									
Civil R&D									
Basic	1188	1290	1363	1510	1571	-	-	-	-
- pure	-	-	-	-	-	1252	1273	1323	1334
- orientated	-	-	-	-	-	472	505	524	523
Applied - strategic	688	727	815	907	962	810	839	949	923
- specific	588	683	508	403	453	479	811	680	698
Experimental development	167	94	128	176	137	126	136	131	102
Total £m		**2631**	**2794**	**2814**	**2996**	**3123**	**3139**	**3564**	**3607**
3580									
Defence R&D									
Basic	-	-	-	-	-	-	-	-	-
- pure	-	-	-	-	-	-	-	-	-
- orientated	-	-	-	-	-	-	-	-	-
Applied - strategic	45	41	35	46	57	69	166	160	156
- specific	362	348	376	466	597	597	510	544	500
Experimental development	1733	1773	1802	1569	1625	1367	1394	1439	1655
Total £m		**2140**	**2162**	**2214**	**2081**	**2279**	**2032**	**2070**	**2144**
2311									

Source: Office for National Statistics

Notes:

1 For the purpose of this analysis Research Councils expenditure for Pensions / Other costs have been excluded from 1994-95 onwards.

2 Excludes NHS estimates (ref 1)

Table 7 Business Enterprise R&D, in cash terms and real terms

1966 to 1997

£ million

	Total Business Enterprise R&D	
	In cash terms	In real terms
Year		(1997=100)(1)
1966	580	5962
1967	605	6045
1968	639	6075
1969	680	6144
1970	N/S	N/S
1971	N/S	N/S
1972	831	5877
1973	N/S	N/S
1974	N/S	N/S
1975	1340	5909
1976	N/S	N/S
1977	N/S	N/S
1978	2324	7148
1979	N/S	N/S
1980	N/S	N/S
1981	3793	7828
1982	N/S	N/S
1983	4163	7679
1984	N/S	N/S
1985	5122	8526
1986	5951	9607
1987	6335	9709
1988	6922	9935
1989	7650	10247
1990	8318	10332
1991	8135	9515
1992	8489	9611
1993	9069	10002
1994	9204	10008
1995	9254	9778
1996	9362	9596
1997	9553	9553

Source: Office for National Statistics

Notes:

1 See notes at Table 2.

(N/S) = No survey carried out

Table 8 Expenditure on R&D performed in UK businesses: broad product groups, in cash & real terms 1989 to 1997

£ million

In cash terms	1989	1990	1991	1992	1993	1994	1995	1996r	1997
Manufacturing: Total	5773	6362	6118	6305	6741	6848	6917	6992	7329
Chemicals	1603	1928	1906	2166	2400	2509	2515	2479	2831
Mechanical engineering	635	532	538	580	665	761	683	605	639
Electrical machinery	1420	1566	1329	1258	1386	1218	1245	1313	1181
Transport equipment	576	620	638	670	717	710	833	997	1005
Aerospace	818	984	1005	898	782	860	886	812	893
Other manufacturing	721	732	702	733	791	790	755	787	779
Services	1877	1956	2017	2184	2328	2356	2337	2370	2224
TOTAL	**7650**	**8318**	**8135**	**8489**	**9069**	**9204**	**9254**	**9362**	**9553**

In real terms (at 1997 prices)	1989	1990	1991	1992	1993	1994	1995	1996r	1997
Manufacturing: Total	7733	7903	7156	7138	7435	7446	7308	7167	7329
Chemicals	2147	2395	2229	2452	2647	2728	2657	2541	2831
Mechanical engineering	851	661	629	657	733	827	722	620	639
Electrical machinery	1902	1945	1554	1424	1529	1324	1315	1346	1181
Transport equipment	772	770	746	759	791	772	880	1022	1005
Aerospace	1096	1222	1175	1017	862	935	936	832	893
Other manufacturing	966	909	821	830	872	859	798	807	779
Services	2514	2430	2359	2473	2568	2562	2469	2429	2224
TOTAL	**10247**	**10332**	**9515**	**9611**	**10002**	**10008**	**9778**	**9596**	**9553**

Source: Office for National Statistics

Notes:

1 1996 data have been revised where necessary to take into account misclassification and updated population information.

Table 9 Expenditure on civil and defence R&D performed by Business Enterprises, 1989 to 1997

(i) in cash terms (£m)

	Civil									Defence								
	1989	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
All product groups	**5923**	**6557**	**6669**	**7092**	**7710**	**7770**	**7863**	**8065**	**8209**	**1727**	**1761**	**1466**	**1397**	**1359**	**1433**	**1391**	**1297**	**1343**
All manufactured products	4222	4785	4816	5050	5550	5534	5626	5787	6094	1562	1598	1301	1254	1193	1314	1291	1205	1234
Chemicals and pharmaceuticals	1673	2013	1980	2238	2473	2590	2511	2477	2829	19	14	17	20	26	10	3	2	2
Mechanical engineering	257	237	262	325	398	405	418	395	407	360	277	256	236	246	335	266	210	232
Electrical machinery	869	1040	959	885	999	827	823	896	803	539	516	354	357	377	379	423	417	377
Transport equipment	491	525	548	574	622	661	823	987	994	57	65	59	64	59	14	10	10	11
Aerospace	335	357	477	403	374	380	413	359	412	483	627	525	493	412	481	473	453	481
Other manufacturing	597	613	590	625	684	671	639	673	648	104	100	90	84	73	95	116	113	131
Services	1701	1773	1853	2042	2160	2236	2237	2277	2115	165	163	165	143	166	120	99	92	109

(ii) in real terms (£m 1997 prices)(1):

	Civil									Defence								
	1989	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
All product groups	**7934**	**8145**	**7800**	**8029**	**8503**	**8449**	**8308**	**8267**	**8209**	**2313**	**2187**	**1715**	**1582**	**1499**	**1558**	**1470**	**1329**	**1343**
All manufactured products	5655	5944	5633	5717	6121	6017	5944	5932	6094	2092	1985	1522	1420	1316	1429	1364	1235	1234
Chemicals and pharmaceuticals	2241	2500	2316	2534	2727	2816	2653	2539	2829	25	17	20	23	29	11	3	2	2
Mechanical engineering	344	294	306	368	439	440	442	405	407	482	344	299	267	271	364	281	215	232
Electrical machinery	1164	1292	1122	1002	1102	899	870	918	803	722	641	414	404	416	412	447	427	377
Transport equipment	658	652	641	650	686	719	870	1012	994	76	81	69	72	65	15	11	10	11
Aerospace	449	443	558	456	412	413	436	368	412	647	779	614	558	454	523	500	464	481
Other manufacturing	800	761	690	708	754	730	675	690	648	139	124	105	95	81	103	123	116	131
Services	2278	2202	2167	2312	2382	2431	2364	2334	2115	221	202	193	162	183	130	105	94	109

Source: Office for National Statistics

Notes:

1 See table 2 for deflators

Table 10 Sources of funds for business enterprise R&D in cash terms, 1989 to 1997

£ million, cash terms

		Government £m	Overseas £m	Mainly own resources(1) £m	Total intramural R&D £m
1989		**1312**	**1023**	**5315**	**7650**
of which:	**Civil**	306	739	4879	5923
	Defence	1007	284	436	1727
1990		**1392**	**1289**	**5638**	**8318**
of which:	**Civil**	428	904	5227	6557
	Defence	964	385	411	1761
1991		**1189**	**1299**	**5647**	**8135**
of which:	**Civil**	479	950	5240	6669
	Defence	710	349	407	1466
1992		**1171**	**1270**	**6048**	**8489**
of which:	**Civil**	478	981	5633	7092
	Defence	693	289	415	1397
1993		**1129**	**1398**	**6542**	**9069**
of which:	**Civil**	390	1103	6217	7710
	Defence	739	295	324	1359
1994		**1088**	**1474**	**6642**	**9204**
of which:	**Civil**	363	1135	6272	7770
	Defence	726	338	370	1433
1995		**1050**	**1748**	**6457**	**9254**
of which:	**Civil**	321	1419	6124	7863
	Defence	729	329	333	1391
1996		**899**	**2047**	**6416**	**9362**
of which:	**Civil**	253	1755	6057	8065
	Defence	646	292	358	1297
1997		**927**	**1856**	**6771**	**9553**
of which:	**Civil**	280	1543	6386	8209
	Defence	646	313	385	1343
		%	%	%	%
1989		**17**	**13**	**69**	**100**
of which:	**Civil**	5	12	82	100
	Defence	58	16	25	100
1990		**17**	**15**	**68**	**100**
of which:	**Civil**	7	14	80	100
	Defence	55	22	23	100
1991		**15**	**16**	**69**	**100**
of which:	**Civil**	7	14	79	100
	Defence	48	24	28	100
1992		**14**	**15**	**71**	**100**
of which:	**Civil**	7	14	79	100
	Defence	50	21	30	100
1993		**12**	**15**	**72**	**100**
of which:	**Civil**	5	14	81	100
	Defence	54	22	24	100
1994		**12**	**16**	**72**	**100**
of which:	**Civil**	5	15	81	100
	Defence	51	24	26	100
1995		**11**	**19**	**70**	**100**
of which:	**Civil**	4	18	78	100
	Defence	52	24	24	100
1996		**10**	**22**	**69**	**100**
of which:	**Civil**	3	22	75	100
	Defence	50	23	28	100
1997		**10**	**19**	**71**	**100**
of which:	**Civil**	3	19	78	100
	Defence	48	23	29	100

Source: Office for National Statistics

Notes:

1 Mainly own resources includes Other Private sector funds which is shown separately in ONS's First Release for Business Enterprise R&D.

Table 11 Intramural expenditure on R&D performed in UK businesses: detailed product groups, 1989 to 1997

£ million

	1989	1990	1991	1992	1993	1994	1995	1996r	1997
Total	**7650**	**8318**	**8135**	**8489**	**9069**	**9204**	**9254**	**9362**	**9553**
Agriculture, hunting and forestry; Fishing	59	67	76	80	89	80	..	..	19
Extractive Industries	110	115	129	126	62	66	65	64	44
Food products and beverages; Tobacco products	178	196	196	225	191	228	189	198	180
Textiles, clothing and leather products	17	19	23	25	44	22	23	27	33
Pulp, paper and paper products; printing and publishing; Wood and straw products	46	48	43	44	40	44	39	57	44
Refined petroleum products and coke oven products; Processing of nuclear fuel	325	373	369	386	370	354	377	364	349
Chemicals, man- made fibres	657	722	707	720	721	689	701	627	680
Pharmaceuticals, medical chemicals and botanical products	946	1206	1199	1446	1679	1820	1813	1852	2151
Rubber and plastic products	41	46	35	25	67	72	60	67	60
Other non-metallic mineral products	60	53	44	43	42	56	54	60	47
Casting of iron and steel	45	50	40	43	50	51	46	39	39
Non-ferrous metals	25	31	24	22	16	15	20	15	15
Fabricated metal products	55	52	48	63	72	72	100	91	88
Machinery and equipment	580	480	490	517	593	689	583	514	552
Office machinery and computers	497	471	327	256	252	134	150	161	102
Electrical machinery and apparatus	426	502	518	523	576	567	494	490	424
Radio, television and communication equipment	497	593	484	479	558	517	602	662	655
Precision instruments	289	268	276	283	312	273	303	307	336
Motor vehicles and parts	545	571	605	636	682	669	795	946	963
Other transport equipment	14	16	17	18	17	24	18	30	27
Shipbuilding and repairs	17	33	16	16	18	17	20	20	15
Aerospace	818	984	1005	898	782	860	886	812	893
Furniture; Other manufactured goods	19	20	20	22	28	28	21	16	25
Recycling	1	1	1	1	1	1	..	1	-
Electricity, gas and water supply	187	188	192	187	214	177	168	148	130
Construction	29	19	19	15	11	11	8	8	10
Wholesale and retail trade	4	4	4	4	5	6	8	4	5
Transport and storage	6	7	8	10	13	8	15	..	12
Post and telecommunications	352	341	317	386	389	408	414	455	496
Miscellaneous business activities; Technical testing and analysis	142	144	146	156	195	181	..	141	112
Computer and related activities	404	435	494	555	635	744	675	749	703
Research and development services	239	244	244	261	329	311	247	389	333
Public administration	20	19	19	18	16	10	14	17	13

Source: Office for National Statistics

Notes:

1 .. denotes disclosive figures.

2 1996 data have been revised where necessary to take into account misclassification and updated population information.

3 From 1989 to 1992 Furniture; Wood and straw products was included with Pulp, paper and paper products; Printing and publishing.

Table 12 Current and capital expenditure, and as a percentage, on R&D performed in the UK Businesses; detailed product groups, 1997

	Total	Capital Total	Current Total	Salaries and wages	Other current	Total	Capital Total	Current Total	Salaries and wages	Other current
	£m	£m	£m	£m	£m	%	%	%	%	%
Total	**9553**	**1127**	**8426**	**3685**	**4741**	**100**	**12**	**88**	**39**	**50**
Agriculture, hunting and forestry; Fishing	19	2	17	8	9	100	11	89	42	47
Extractive Industries	44	2	42	21	20	100	5	95	48	45
Food products and beverages; Tobacco products	180	17	163	93	70	100	9	91	52	39
Textiles, clothing and leather products	33	3	29	18	11	100	9	88	55	33
Pulp, paper and paper products; Printing and publishing; Wood and straw products	44	1	43	14	29	100	2	98	32	66
Refined petroleum products and coke oven products; Processing of nuclear fuel	349	34	316	113	203	100	10	91	32	58
Chemicals, man-made fibres	680	71	609	301	309	100	10	90	44	45
Pharmaceuticals, medical chemicals and botanical products	2151	453	1698	628	1070	100	21	79	29	50
Rubber and plastic products	60	3	57	25	32	100	5	95	42	53
Other non-metallic mineral products	47	3	44	22	22	100	6	94	47	47
Casting of iron and steel	39	1	38	23	15	100	3	97	59	38
Non-ferrous metals	15	1	15	7	8	100	7	100	47	53
Fabricated metal products	88	11	77	33	44	100	13	88	38	50
Machinery equipment	552	23	528	278	250	100	4	96	50	45
Office machinery and computers	102	16	87	31	56	100	16	85	30	55
Electrical machinery and apparatus	424	25	399	167	231	100	6	94	39	54
Radio, television and communication equipment	655	54	600	277	323	100	8	92	42	49
Precision instruments	336	19	316	162	154	100	6	94	48	46
Motor vehicles and parts	963	204	759	334	425	100	21	79	35	44
Other transport equipment	27	-	27	8	19	100	-	100	30	70
Shipbuilding and repairs	15	-	15	7	8	100	-	100	47	53
Aerospace	893	28	866	308	557	100	3	97	34	62
Furniture; Other manufactured goods	25	4	21	9	12	100	16	84	36	48
Recycling	-	-	-	-	-	-	-	-	-	-
Electricity, gas and water supply	130	8	122	57	65	100	6	94	44	50
Construction	10	-	10	5	4	100	-	100	50	40
Wholesale and retail trades	5	-	5	2	3	100	-	100	40	60
Transport and storage	12	-	12	4	8	100	-	100	33	67
Post and telecommunications	496	29	467	192	275	100	6	94	39	55
Miscellaneous business activities; Technical testing and analysis	112	4	107	60	47	100	4	96	54	42
Computer related activities	703	84	619	301	317	100	12	88	43	45
Research and development services	333	27	306	164	141	100	8	92	49	42
Public administration	13	-	13	8	5	100	-	100	62	38

Source: Office for National Statistics

Notes:

1 - denotes a value less than 0.5

Table 13 Government and business enterprise personnel engaged on R&D in the UK, 1988 to 1997.

Full time equivalents, thousands

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	% change in 1997 from 1996
PERSONNEL ENGAGED ON R&D											
- Business Enterprise	185	176	171	159	159	164	157	146	143	139	-3
- Research Councils	13	13	13	12	13	13	12	12	12	11	-8
- Government Departments(1)	24	23	24	24	25	22	20	17	16	15	-6
Total Civil	**n/a**	**159**	**159**	**153**	**156**	**164**	**155**	**145**	**142**	**137**	**-4**
Total Defence	**n/a**	**53**	**49**	**42**	**40**	**33**	**35**	**31**	**29**	**28**	**-2**
RESEARCHERS											
- Business Enterprise	89	85	83	80	82	86	83	83	83	84	1
- Research Councils	6	6	6	6	6	6	6	6	5	5	0
- Government Departments(1)	9	9	9	9	9	8	8	8	8	7	-7
Total Civil	**n/a**	**76**	**77**	**77**	**79**	**83**	**79**	**79**	**79**	**80**	**1**
Total Defence	**n/a**	**24**	**21**	**18**	**18**	**17**	**18**	**17**	**17**	**17**	**0**
TECHNICIANS											
- Business Enterprise	46	46	43	38	38	40	40	33	33	30	-9
- Research Councils	2	2	2	2	2	3	2	2	3	3	15
- Government Departments(1)	4	4	4	4	4	4	4	4	3	3	-12
Total Civil	**n/a**	**40**	**38**	**35**	**36**	**41**	**38**	**33**	**32**	**29**	**-10**
Total Defence	**n/a**	**12**	**11**	**9**	**8**	**6**	**8**	**7**	**6**	**5**	**-17**
ADMIN & OTHER STAFF											
- Business Enterprise	50	45	45	41	39	37	34	30	27	26	-4
- Research Councils	5	5	5	5	5	4	4	4	4	3	-15
- Government Departments(1)	11	10	11	11	11	9	8	5	5	4	-19
Total Civil	**n/a**	**44**	**44**	**41**	**41**	**41**	**37**	**33**	**30**	**29**	**-3**
Total Defence	**n/a**	**17**	**17**	**15**	**14**	**10**	**9**	**7**	**6**	**5**	**-14**

Source: Office for National Statistics

Note:

1 Excludes NHS employment, as these figures were not available.

Table 14 Estimated GOR breakdown of expenditure on Intramural R&D in the Business, Government and Higher Education sectors, 1997

	R&D performed within business (BERD)		R&D performed within Government Establishments (GOVERD) (1)		R&D performed within Higher Education Institutions (HERD)	
	£m	percentage of regional GDP	£m	percentage of regional GDP	£m	percentage of regional GDP
United Kingdom	**9,553**	**1.20**	**2,018**	**0.25**	**2,891**	**0.36**
North East	216	0.75	17	0.06	101	0.35
North West and Merseyside	1,187	1.40	88	0.10	228	0.27
Yorkshire and the Humber	256	0.42	55	0.09	229	0.38
East Midlands	679	1.27	69	0.13	151	0.28
West Midlands	647	0.97	185	0.28	156	0.23
Eastern	2,303	3.14	250	0.34	214	0.29
London	659	0.55	205	0.17	729	0.61
South East	2,296	1.82	685	0.54	434	0.34
South West	760	1.19	257	0.40	129	0.20
England	**9,003**	**1.33**	**1,811**	**0.27**	**2,372**	**0.35**
Wales	113	0.35	33	0.10	111	0.34
Scotland	356	0.54	163	0.25	357	0.54
Northern Ireland	81	0.45	12	0.07	52	0.29

Source: Office for National Statistics

Note:

1 Figures include estimates for those areas of Central Government not available from the Government Survey and local authorities.

Table 15 Estimated regional breakdown of personnel engaged on R&D in the Business and Government sectors, 1997(1)

	R&D performed within business		R&D performed within Government establishments(2)	
	Full time equivalents 000's	% of the regional Labour Force(3)(4)	Full time equivalents 000's	% of the regional Labour Force(3)(4)
United Kingdom	**139.5**	**0.52**	**25.9**	**0.10**
North East	3.8	0.36	0.0	0.00
North West and Merseyside	17.1	0.58	0.8	0.03
Yorkshire and the Humber	5.5	0.24	0.6	0.03
East Midlands	11.1	0.56	0.8	0.04
West Midlands	12.0	0.49	2.0	0.08
Eastern	28.0	1.07	3.9	0.15
London	8.9	0.28	2.5	0.08
South East	30.4	0.78	8.4	0.22
South West	11.8	0.51	3.0	0.13
England	**128.6**	**0.56**	**22.1**	**0.10**
Wales	2.4	0.20	0.3	0.03
Scotland	6.5	0.28	3.3	0.14
Northern Ireland	2.0	0.30	0.2	0.03

Source: Office for National Statistics

Notes:

1 Regional breakdown is based on the GOR (Government Office Region) classification.

2 Government sector covers Central Government only. Local Authorities, NHS and those areas of Central Government not available from the Government survey are excluded

3 Labour Force figure used is a head count. An estimate of the Labour Force in full-time equivalents(FTE) is not available. Using the head count figure gives a lower percentage than a FTE would give.

4 Labour Force figures are for Spring 1998.

Table 16 OECD Science and Technology indicators

Gross Expenditure on R&D: International Comparisons, 1988 to 1997

	Year	UK	Germany(1)	France(2)	Italy	Japan(3)	Canada	USA(4)
Gross Domestic Product (GDP)(5) (£ billion at ppp)(6)	1988	479.1	560.2	488.7	463.6	1056.0	263.3	2807.5
	1989	522.4	623.6	544.0	511.0	1186.0	288.7	3106.8
	1990	562.7	699.8	592.8	555.5	1326.2	306.4	3345.2
	1991	589.8	865.6	661.0	619.8	1507.1	329.3	3625.7
	1992	612.6	917.7	671.6	634.3	1543.4	328.1	3715.2
	1993	647.2	958.9	686.3	644.2	1643.9	356.3	4041.9
	1994	685.8	1038.3	720.3	689.9	1712.0	383.6	4339.7
	1995	722.9	1122.4	775.6	747.5	1844.2	416.6	4713.3
	1996	764.6	1171.6	810.0	774.4	1973.6	435.3	4987.5
	1997	812.1	1229.0 (e)	850.9 (e)	806.1 (e)	2040.8 (e)	462.9 (e)	5315.4 (e)
Gross Expenditure on R&D (GERD) (£ billion at ppp)(6)	1988	10.0	16.0	11.1	5.6	28.0 (e)	3.7	78.0
	1989	11.1	17.9	12.7	6.3	32.8 (e)	4.0	84.8
	1990	12.0	19.2	14.3	7.2	37.9 (e)	4.5	93.0
	1991	12.1	22.6	15.9	7.7	42.5 (e)	5.0	102.0
	1992	12.7	22.7	16.3	7.6	42.6 (e)	5.1	102.0
	1993	13.5	23.2	16.8	7.3	44.0 (e)	5.7	105.6
	1994	14.0	24.1	17.1	7.3	45.1 (e)	6.2	109.1
	1995	14.2	25.8	18.1	7.5	51.0 (e)	6.8	123.0
	1996	14.4	26.8	18.8	8.0 (p)	-	7.1	130.8 (p)
	1997	14.7	29.3 (e)	19.2 (p)	8.5 (p)	-	7.6 (p)	140.3 (p)
GERD as a percentage of GDP	1988	2.09	2.86	2.28	1.22	2.7 (e)	1.39	2.78
	1989	2.12	2.87	2.33	1.24	2.8 (e)	1.39	2.73
	1990	2.13	2.75	2.41	1.30	2.9 (e)	1.47	2.78
	1991	2.06	2.61	2.41	1.24	2.8 (e)	1.53	2.81
	1992	2.07	2.48	2.42	1.20	2.8 (e)	1.55	2.74
	1993	2.09	2.42	2.45	1.14	2.7 (e)	1.61	2.61
	1994	2.05	2.32	2.38	1.06	2.6 (e)	1.62	2.51
	1995	1.96	2.30	2.34	1.01	2.8 (e)	1.62	2.61
	1996	1.88	2.29	2.32	1.03 (p)	-	1.63	2.62 (p)
	1997	1.80	2.39 (e)	2.26 (p)	1.05 (p)	-	1.64 (p)	2.64 (p)
BERD as a percentage of GDP	1988	1.4	2.1	1.4	0.7	1.9	0.8	2.0
	1989	1.5	2.1	1.4	0.7	2.1	0.8	1.9
	1990	1.5	2.0	1.5	0.8	2.2	0.8	2.0
	1991	1.4	1.8	1.5	0.7	2.1	0.8	2.1
	1992	1.4	1.7	1.5	0.7	2.0	0.8	2.0
	1993	1.4	1.6	1.5	0.6	1.9	0.9	1.9
	1994	1.3	1.5	1.5	0.6	1.9	1.0	1.8
	1995	1.3	1.5	1.4	0.5	1.9	1.0	1.9
	1996	1.2	1.5	1.4	0.6 (p)	-	1.0	1.9
	1997	1.2	1.6 (e)	1.4 (p)	0.6 (p)	-	1.0 (e)	2.0 (e)
GOVERD as a percentage of GDP	1988	0.28	0.36	0.57	0.27	0.25	0.28	0.30
	1989	0.29	0.37	0.56	0.27	0.24	0.28	0.29
	1990	0.28	0.35	0.58	0.27	0.23	0.30	0.29
	1991	0.30	0.36	0.55	0.28	0.23	0.30	0.28
	1992	0.30	0.35	0.51	0.26	0.25	0.29	0.27
	1993	0.30	0.36	0.52	0.24	0.27	0.28	0.27
	1994	0.30	0.35	0.49	0.23	0.26	0.27	0.25
	1995	0.28	0.35	0.49	0.21	0.29	0.26	0.25
	1996	0.27	0.35	0.47	0.22	-	0.26	0.23
	1997	0.25	0.34 (e)	0.46 (p)	0.23 (p)	-	0.23(e)(p)	0.22(e)(p)
HERD as a percentage of GDP	1988	0.33	0.42	0.34	0.25	0.35 (e)	0.33	0.42
	1989	0.32	0.41	0.35	0.25	0.35 (e)	0.34	0.42
	1990	0.33	0.41	0.35	0.27	0.35 (e)	0.37	0.43
	1991	0.34	0.43	0.36	0.27	0.34 (e)	0.40	0.40
	1992	0.35	0.43	0.37	0.27	0.35 (e)	0.40	0.40
	1993	0.36	0.44	0.39	0.28	0.38 (e)	0.40	0.40
	1994	0.38	0.43	0.38	0.27	0.37 (e)	0.39	0.40
	1995	0.37	0.42	0.39	0.26	0.40 (e)	0.37	0.39
	1996	0.37	0.42	0.39	0.25 (p)	-	0.36	0.39 (p)
	1997	0.36	0.41 (e)	0.39 (p)	0.25 (p)	-	0.35 (p)	0.38 (p)

Source: OECD databank (November 1998)

Notes:

1 There are breaks in series between 1990 and 1991, and 1991 and 1992.
2 For government and business enterprise data there is a break in series between 1991 and 1992.
3 Data for Japan are adjusted by OECD.
4 Excludes most or all capital expenditure. There is a break in series between 1990 and 1991.
5 The measure of GDP used is at market prices, based on the UN definition.
6 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
(p) = provisional
(e) = estimate

Table 17 International comparison of gross expenditure on R&D by sector of performance and source of funding 1997

Per cent

	UK	Germany (e)(1)	France (p)	Italy (p)	Japan (2)	Canada p)	USA(3) (p)
Percentage by sector of performance							
Government	13.8	14.3	20.4	21.6	10.4	14.0	8.3
Business enterprise	65.2	68.3	61.2	54.6	70.3	63.3	74.4
Higher education	19.7	17.4	17.1	23.8	14.5	21.5	14.3
Other	1.3	-	1.3	-	4.8	1.2	3.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Percentage by source of funds (4)							
Government	30.7	35.0	41.5	47.9	20.9	32.3	31.6
Business enterprise	49.5	63.0	48.6	46.1	72.3	49.0	64.6
Abroad	15.0	1.8	8.3	6.0	0.1	13.5	-
Other	4.8	0.2	1.6	-	6.7	5.2	3.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: OECD databank (November 1998)

Notes:
1 Data for 'other' included elsewhere.
2 Data for Japan are OECD estimates.
3 Excludes most or all capital expenditure.
(p) = provisional

Table 18 R&D performed in the Business Enterprise sector (BERD), 1988 to 1997

£billion at ppp(1)

Year	UK	Germany(2)	France(3)	Italy	Japan(4)	Canada	USA(5)
1988	6.9	11.6	6.6	3.3	20.4	2.0	55.8
1989	7.7	12.9	7.7	3.7	24.4	2.2	60.3
1990	8.3	13.8	8.6	4.2	28.6	2.4	66.1
1991	8.1	15.7	9.8	4.3	32.0	2.7	74.3
1992	8.5	15.6	10.2	4.2	31.3	2.8	73.4
1993	9.1	15.5	10.4	3.9	31.3	3.2	74.8
1994	9.2	16.0	10.6	3.9	32.1	3.6	77.2
1995	9.3	17.1	11.1	4.0	35.9	4.0	88.5
1996	9.4	17.7	11.6	4.3	-	4.3	95.7
1997	9.6	20.1 (e)	11.8 (p)	4.6 (p)	-	4.8 (p)	104.4 (p)

Source: OECD databank (November 1998)

Notes:
1 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
2 There are breaks in series between 1990 and 1991, and 1991 and 1992.
3 There is a break in series between 1991 and 1992.
4 Data for Japan are adjusted by OECD.
5 Excludes most or all capital expenditure. There is a break in series between 1990 and 1991.
(p) = provisional

Table 19 International comparison of Government funding of R & D in 1997 by socio-economic objective (percentage distribution)

Per cent

		UK	Germany (p)	France (p)	Italy(1) (p)	Japan(2)	Canada (p)	USA(3) (p)
Agriculture, forestry and fishing		4.6	2.6	3.6	2.3	3.4	14.9	2.4
Industrial development		1.7	12.9	5.2	9.1	6.6	16.8	0.6
Energy		0.7	3.5	4.8	4.0	20.2	8.5	3.2
Infrastructure		1.7	1.6	0.6	0.4	2.7	5.5	2.6
Environmental protection		2.3	3.7	2.0	2.5	0.6	4.4	0.7
Health		14.4	3.4	5.3	8.5	4.0	11.9	18.3
Social development and services		1.9	2.4	0.9	4.5	0.9	4.8	0.9
Earth and atmosphere		1.4	2.0	0.7	1.4	1.3	6.6	1.1
Advancement of knowledge		28.9	53.5	35.7	59.6	48.2	8.4	4.2
Civil space		2.8	4.8	11.0	4.0	6.3	7.9	11.0
Defence		39.2	9.6	27.7	3.5	5.8	6.5	55.0
Not elsewhere classified		0.4	-	2.4	-	0.0	4.0	-
	%	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Total	**£million(4)**	**5892**	**10498**	**8985**	**4093**	**12087**	**1721**	**48225**

Source: OECD databank (November 1998)

Notes:
1 Includes NHS net expenditure
2 Data for Japan are OECD estimates.
3 Excludes most or all capital expenditure.
4 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
(p) = provisional