Research and Experimental Development (R&D) Statistics 1999

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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 1999 Gross Domestic Expenditure on R&D (GERD) was 1.84 per cent of GDP, very similar to 1998 (Table 2). In terms of international comparisons in 1999 the UK was just below the EU average of 1.85 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). The overall level of net government expenditure on defence R&D has fallen from 44 per cent in 1991 to 38 per cent in 1999 (Table 6).

- Expenditure in real terms performed by the business sector has increased by 8 per cent on the total in 1998 (Table 7).

- Within the manufacturing sector, the chemicals broad product group has the largest share of total R&D expenditure at 29 per cent . The services sector accounts for 22 per cent of total R&D expenditure (Table 8).

- Within the regions, spending is highest in the South East for both the business & government sectors (Table 14).

Background

This article is the latest in an annual series, the previous issue was published in the August 2000 edition of *Economic Trends*. Most of the figures have already been published by the Office for National Statistics[2,4], the Department of Trade and Industry (Office of Science and Technology)[1] or the OECD.[5] The purpose of this report is to bring together a range of data produced & published by ONS in a single annual article and our aim is to continue to inform and stimulate debate within the R&D community.

The R&D statistics published here 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. The latest detailed results will be published in OST's *Science, Engineering and Technology Statistics 2001* (SET 2001).[1] This document will be 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. As in previous years the 1999 survey 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 1999 Business Monitor.[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 will be contained in SET 2001.[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 1999 was £16.7 billion in cash terms. GERD is often quoted as a percentage of GDP when making international comparisons. In 1999 UK GERD was 1.83 per cent of GDP, similar to the previous year's figure, just below the provisional OECD estimate for the EU average of 1.85 per cent.

Table 1 shows the interaction between R&D funders and performers. For example, £11.3 billion was spent on R&D in the business sector. Of this, £1.2 billion was provided by the government, £2.6 billion came from abroad and £7.6 billion 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**

Gross Expenditure on R&D in the UK, by sectors, 1999

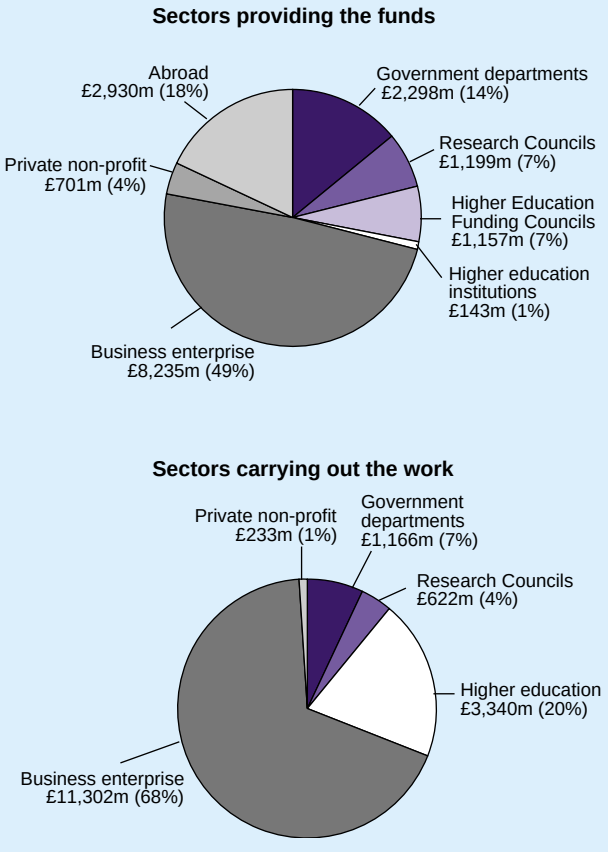


Figure 1 shows that the business sector is the most important sector of the economy in terms of providing funds for and carrying out R&D.

Government R&D expenditure (Tables 4–6)

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,[7] 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.

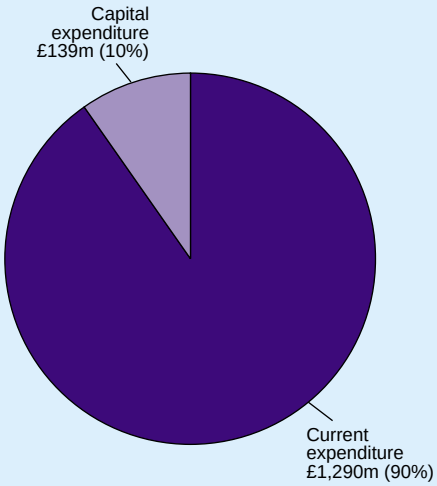
Table 4 shows a time series dating back to 1966/67. This shows that in 1999/00 the net Government expenditure on R&D (by civil and defence departments) was £5.7 billion, a 9 per cent increase on 1998/99. In real terms, spending on R&D was flat in the late sixties but rose in the seventies to a peak in 1980/81. Since then it has declined, although spending in 1999/00 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 90 per cent (£1.3 billion) of intramural expenditure is current expenditure. Applied research accounts for 64 per cent of the total intramural expenditure. Total intramural expenditure is further broken down in Table 5 into

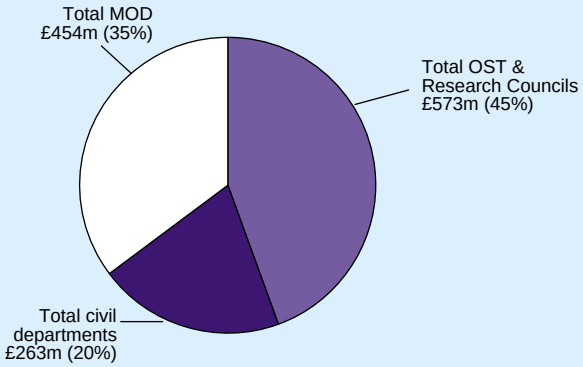
Figure **2**

Analysis of Central Government Intramural Expenditure 1999–2000

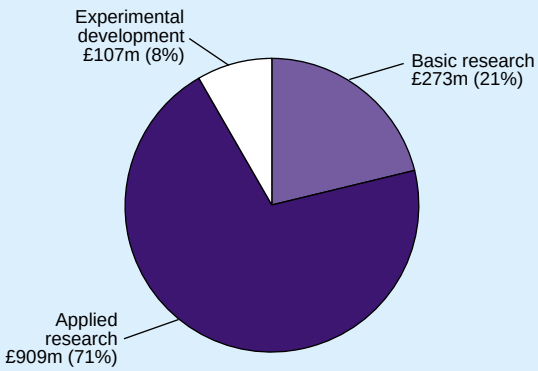
Breakdown of intramural current and capital expenditure



Departmental breakdown of current intramural R&D



Breakdown of current expenditure by Frascati type of research



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 1991–92 to 1999–00. The share of expenditure attributed to applied research has remained fairly constant over the nine-year period, whereas the share attributed to basic research has increased at the expense of the share attributed to experimental development. In 1990–91 defence expenditure accounted for 44 per cent of total expenditure. This share had declined to 38 per cent by 1999–00.

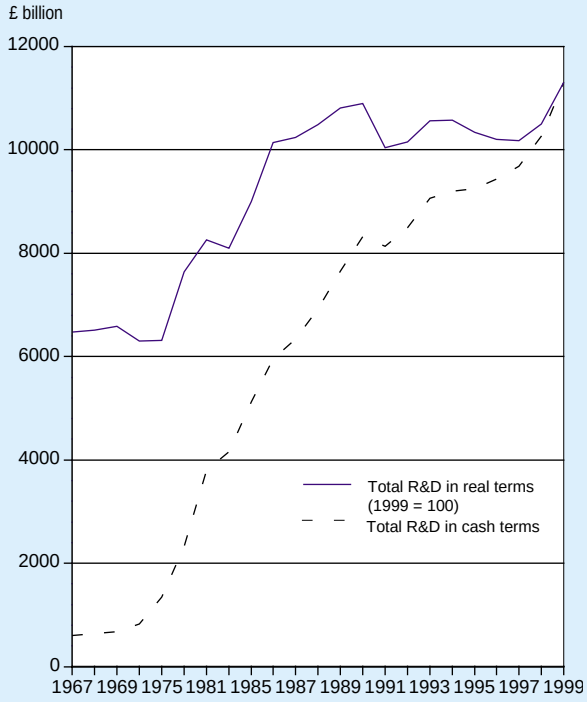
R&D performed by the Business Sector (Tables 7–12)

Table 7 and Figure 3 show a time series dating back to 1966 for expenditure performed by the Business sector. They show that in 1999 R&D expenditure was £11.3 billion. Expenditure in real terms has increased by 8 per cent in the business sector on 1998 figures and by 77 per cent on 1966 figures.

Table 8 shows that within the business sector, the services broad product group accounted for 22 per cent of the total expenditure in 1999. In the manufacturing sector the pharmaceuticals and chemicals

Figure **3**

Net Business enterprise expenditure on R&D, in cash and real terms, 1967 to 1999



broad product group had the largest share of R&D expenditure at 29 per cent of the total.

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

In 1999, civil R&D represented 85 per cent of all R&D expenditure performed by business (Table 9), compared to 82 per cent in 1991. Table 10 and Figure 4 show that, in 1999, 75 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 50 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 £2.5 billion in 1999, followed by Aerospace at £1.2 billion.

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)

Between 1998 and 1999, employment rates have remained at similar levels.

Regional R&D statistics (Tables 14–15)

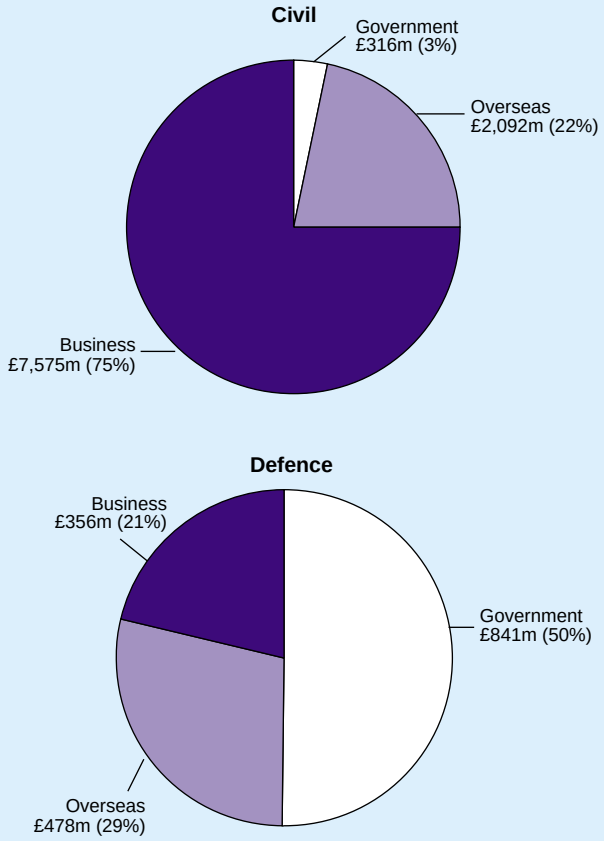
Regional estimates for the Government and Business sectors are derived from the ONS surveys of Government and Business Enterprises.

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.

Estimates are given for UK Government Office Regions (GORs). 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, the South East 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 the Business sector and the South East and South West are prominent in the Government sector.

Figure **4**

Sources of funds for Business Enterprise R&D, 1999

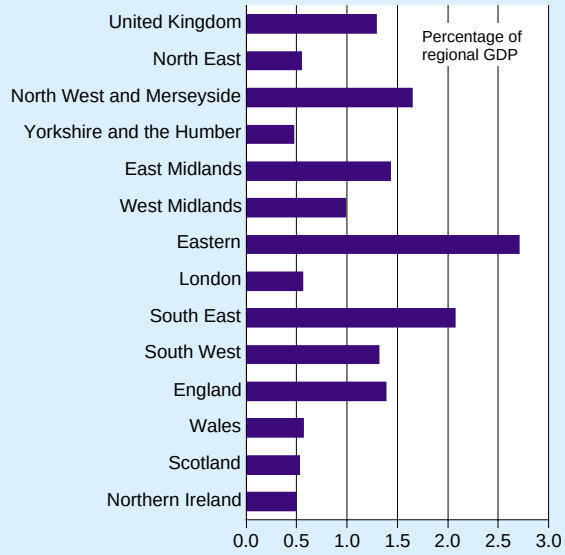


International comparisons of R&D (Tables 16–19)

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.

Figure 5

(i) Estimated regional (GOR) BERD in 1999



(ii) Estimated regional (GOR) GOVERD in 1999

(iii) Estimated regional (GOR) HERD in 1999

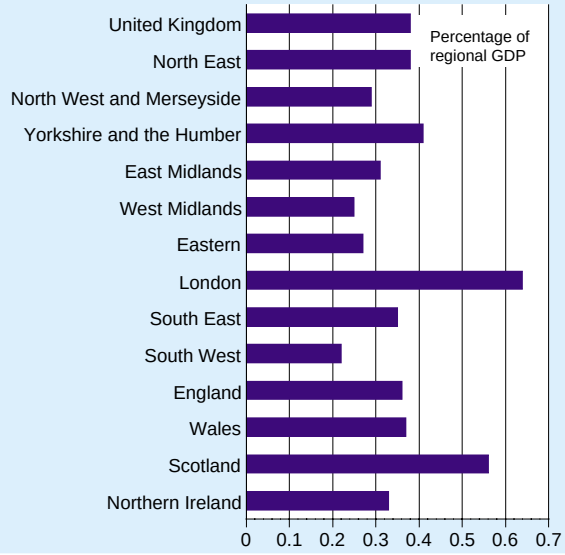
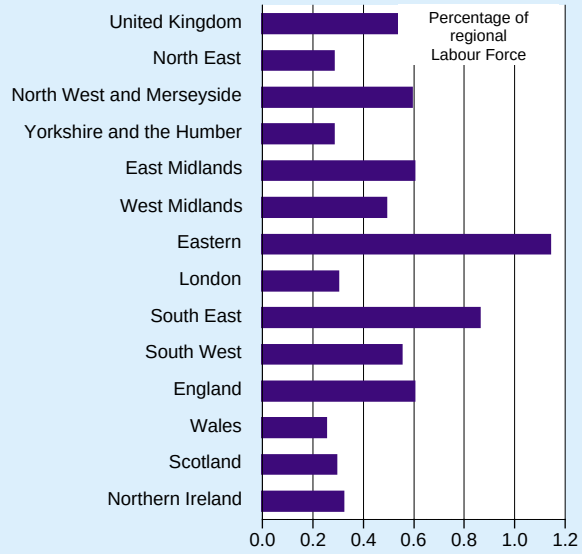
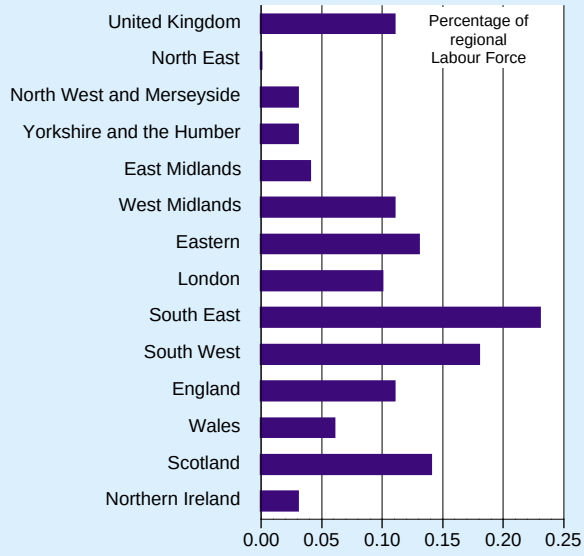


Figure 6

(i) Estimated regional (GOR) BERD in 1999



(ii) Estimated regional (GOR) Government R&D in 1999



The figures shown for Japan in the tables are estimated by OECD.

Table 16 shows the trend of R&D as a percentage of GDP for the G7 countries over the time period 1991 to 1999. The ratio for GERD has been fairly constant over this time for most of the countries. Figure 7 shows the position in 1999. The UK was ranked 5th. Table 16 also shows BERD and GOVERD as a percentage of GDP.

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 1999 by socio-economic objective is shown in

Figure **7**

Comparison of BERD,GOVERD, HERD and PNP as a percentage of GDP, 1999

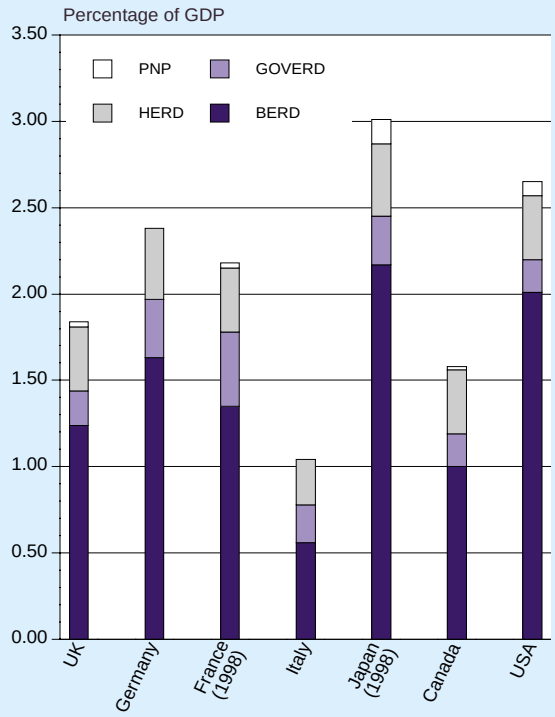


Table 19. Of the G7 countries, the USA and the UK devoted the highest proportion of their total Government funding of R&D to defence. For Germany, Italy and Japan about half of their total Government funding of R&D was classified as the advancement of knowledge compared to approximately a third for France.

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 1997 and 1998 Business Survey results have been revised where necessary to take account of company misreporting. There have also been some small changes due to misclassification and updated population information. Full details on the revisions were included in ONS's News Release published on 17 November 2000.[9]

Figures relating to gross expenditure on R&D published in the ONS First Release on 30 March 2001[4] have been revised slightly due to government department 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:

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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]	Jane Morgan Tel. 01633 813109
GERD[4]	Jane Morgan Tel. 01633 813109
General information on Science & Technology[1]	Steve Churchill Tel. 01633 812003
International comparisons[5, 6, 8]	Steve Churchill Tel. 01633 812003

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[1] DTI/OST. S*cience, Engineering and Technology Statistics 2001*. London: The Stationery Office (2001).

[2] ONS, Business Enterprise. *Research and Development in UK Businesses* (MA14). ONS, January 2001, ISSN 1463-6115.

[3] *Proposed Standard Practice for Surveys of Research and Experimental Development* (The Frascati Manual). OECD: Paris (1993).

[4] ONS First Release ONS (2000) 119, 30 March 2001. *Gross Domestic Expenditure on Research and Development 1999*.

[5] *Main Science and Technological Indicators 2001/1*. OECD: Paris (2001).

[6] *Research and Development: Annual Statistics 1988–1998*. Eurostat: Luxembourg (2000). ISBN 92 828 7822-8.

[7] *"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). London: The Stationery Office (1994). ISBN 0 11 321831 1.

[8] ONS, *Economic Trends*, No. 561, August 2000. London: The Stationery Office (2000, pp. 61-85. ISBN 0 11 621203 9.

[9] ONS First Release, 17 November 2000. *Business Enterprise Research and Development 1999*.

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 1999[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 departments[4]	765	76	273	1,152	31	2,298	167
Research Councils	17	424	743	5	10	1,199	109
Higher Education Funding Councils	-	-	1,157	-	-	1,157	
Higher education institutions	0	6	136	0	2	143	
Business enterprise	329	48	242	7,574	42	8,235	
Private non-profit	15	32	525	1	128	701	
Abroad	39	36	265	2,570	20	2,930	
TOTAL	**1,166**	**622**	**3,340**	**11,302**	**233**	**16,663**	**n/a**
Civil							
Government departments[4]	425	72	238	311	31	1,077	165
Research Councils	17	424	743	5	10	1,199	109
Higher Education Funding Councils	-	-	1,157	-	-	1,157	
Higher education institutions	0	6	136	0	2	143	
Business enterprise	225	48	215	7,217	42	7,747	
Private non-profit	15	32	525	1	128	701	
Abroad	10	36	265	2,092	20	2,423	
TOTAL	**692**	**618**	**3,278**	**9,626**	**232**	**14,447**	**n/a**
Defence							
Government departments[4]	340	5	35	841	0	1,221	2
Research Councils	0	-	-	-	-	0	-
Higher Education Funding Councils	-	-	-	-	-	-	
Higher education institutions	0	-	-	-	-	0	
Business enterprise	104	-	28	356	-	488	
Private non-profit	0	-	-	-	-	0	
Abroad	29	-	-	478	-	507	
TOTAL	**474**	**5**	**62**	**1,675**	**0**	**2,216**	**n/a**

Source: ONS

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 Gross Domestic Expenditure on Research and Development, published on 30 March 2001. 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.
0 Represents a value less than 0.5.
- Represents a nil value.

Table 2 Gross expenditure on R&D in the UK by performing sector, 1991 to 1999[1]

£ million

	1991	1992	1993	1994	1995	1996	1997r	1998r	1999
Expenditure in cash terms (£m):									
Performed by:									
Government	1,757	1,846	1,928	2,051	1,462	1,495	1,427	1,487	1,166
Research Councils	-	-	-	-	581	575	590	591	622
Business enterprise	8,135	8,489	9,069	9,204	9,254	9,431	9,680	10,261	11,302
Higher education	2,020	2,129	2,312	2,623	2,696	2,792	2,893	3,040	3,340
Private non-profit	219	224	232	168	177	177	190	203	233
TOTAL	**12,131**	**12,689**	**13,541**	**14,046**	**14,172**	**14,470**	**14,781**	**15,582**	**16,663**
Expenditure in real terms (1999=100)[2] (£m):									
Performed by:									
Government	2,170	2,208	2,247	2,356	1,633	1,617	1,501	1,522	1,166
Research Councils	-	-	-	-	649	622	621	605	622
Business enterprise	10,046	10,152	10,566	10,574	10,335	10,204	10,185	10,496	11,302
Higher education	2,495	2,547	2,694	3,013	3,011	3,021	3,044	3,110	3,340
Private non-profit	271	268	270	193	198	192	200	208	233
TOTAL	**14,982**	**15,175**	**15,776**	**16,137**	**15,827**	**15,656**	**15,551**	**15,940**	**16,663**
Total as percentage of GDP[3]	***2.05***	***2.06***	***2.09***	***2.04***	***1.96***	***1.88***	***1.81***	***1.81***	***1.83***

Notes:

1 See notes at Table 1.

2 GDP deflators are:

1991	1992	1993	1994	1995	1996	1997	1998	1999
81.0	83.6	85.8	87.0	89.5	92.4	95.0	97.8	100.0

3 Gross domestic product values are: £ million

1991	1992	1993	1994	1995	1996	1997	1998	1999
592,207	614,883	648,178	687,811	722,107	768,087	815,827	858,600	908,132

r = revised

Source: ONS

Table 3 Gross expenditure on R&D in the UK by source of funds, 1991 to 1999[1, 2]

£ million

	1991	1992	1993	1994	1995	1996	1997r	1998r	1999
Sector providing funds									
Expenditure in cash terms (£m):									
Funded by:									
Government	4,131	4,239	4,400	4,657	2,611	2,494	2,422	2,619	2,298
Research Councils	-	-	-	-	1,078	1,092	1,135	1,128	1,199
Higher Education Funding Councils	-	-	-	-	1,018	1,027	1,033	1,085	1,157
Higher education	92	99	103	116	119	120	123	130	143
Business enterprise	6,054	6,461	6,974	7,025	6,796	6,846	7,344	7,382	8,235
Private non-profit	397	435	451	495	511	546	578	621	701
Abroad	1,458	1,455	1,613	1,753	2,039	2,345	2,147	2,617	2,930
TOTAL	**12,131**	**12,689**	**13,541**	**14,046**	**14,172**	**14,470**	**14,781**	**15,582**	**16,663**
Expenditure in real terms (1999=100) (£m):									
Funded by:									
Government	5,102	5,069	5,126	5,350	2,916	2,698	2,548	2,679	2,298
Research Councils	-	-	-	-	1,204	1,182	1,194	1,154	1,199
Higher Education Funding Councils	-	-	-	-	1,137	1,112	1,087	1,110	1,157
Higher education	113	119	120	133	133	130	129	133	143
Business enterprise	7,477	7,727	8,125	8,071	7,590	7,407	7,727	7,551	8,235
Private non-profit	490	520	526	569	571	590	609	635	701
Abroad	1,800	1,740	1,880	2,014	2,277	2,537	2,259	2,677	2,930
TOTAL	**14,982**	**15,175**	**15,776**	**16,137**	**15,827**	**15,656**	**15,551**	**15,940**	**16,663**
Total as percentage of GDP	***2.05***	***2.06***	***2.09***	***2.04***	***1.96***	***1.88***	***1.81***	***1.81***	***1.83***

Notes:
1 See notes at Table 1.
2 See notes at Table 2.
r = revised

Source: ONS

Table 4 Total Net Government expenditure on R&D in cash terms and real terms, 1966–67 to 1999–2000

£ million

	Total Net Government R&D	
Year	In cash terms excluding NHS figures	In real terms (1999=100)[1]
1966–67	486	5,350
1967–68	503	5,379
1968–69	531	5,408
1969–70	562	5,442
1970–71	606	5,414
1971–72	755	6,183
1972–73	847	6,417
1973–74	964	6,814
1974–75	1,169	6,904
1975–76	1,495	7,049
1976–77	1,647	6,834
1977–78	1,814	6,628
1978–79	2,097	6,898
1979–80	2,601	7,326
1980–81	3,184	7,587
1981–82	3,395	7,388
1982–83	3,519	7,162
1983–84	3,730	7,259
1984–85	3,964	7,334
1985–86	4,175	7,335
1986–87	4,255	7,249
1987–88	4,408	7,130
1988–89	4,497	6,813
1989–90	4,772	6,744
1990–91	4,955	6,495
1991–92	5,027	6,209
1992–93	5,078	6,073
1993–94	5,402	6,294
1994–95	5,200	5,975
1995–96[2]	5,295	5,914
1996–97[2]	5,351	5,790
1997–98[2]	5,504	5,791
1998–99[2]	5,304	5,426
1999-00[2]	5,784	5,784

Notes: ***Source: ONS***

1 See note at Table 2.

2 Figures for NHS are available in SET 2001.[1]

Table 5 Analysis of Government Intramural expenditure, 1999–2000[1,2]

£ million

		Breakdown of current Frascati R&D expenditure						
	Current expenditure	Basic	Applied	Experimental development	Capital expenditure	TOTAL INTRAMURAL	SSH	NSE
OST - DTI	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Research Councils								
BBSRC	153.6	47.1	106.5	-	12.0	165.7	-	165.7
ESRC	4.3	4.3	-	-	0.6	4.9	4.9	-
MRC	165.1	101.1	64.0	-	23.6	188.7	-	188.7
NERC	115.1	24.8	83.5	6.7	8.1	123.2	-	123.2
EPSRC	16.3	8.6	7.7	-	0.4	16.7	-	16.7
PPARC	23.0	20.7	2.3	-	3.9	26.8	-	26.8
CCLRC	95.7	22.2	73.5	-	13.8	109.5	-	109.5
Total OST & Research Councils	**573.0**	**228.9**	**337.4**	**6.7**	**62.5**	**635.5**	**4.9**	**630.6**
Higher Education Funding Councils	-	-	-	-	-	-	-	-
Total Higher Education Funding Councils	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Civil departments								
MAFF	83.2	17.6	61.5	4.2	2.9	86.2	0.1	86.0
DFEE	8.0	-	3.4	4.6	-	8.0	8.0	-
DETR (formerly DOT & DOE)	11.1	-	10.1	1.0	-	11.1	1.9	9.3
DH (includes NHS)	33.0	1.7	25.7	5.6	2.9	35.9	2.5	33.3
NHS[3]	0.0	-	0.0	-	-	0.0	0.0	0.0
DSS	1.0	1.0	-	-	-	1.0	1.0	-
HSC	6.6	-	6.0	0.6	0.4	7.0	0.8	6.1
HO	18.6	-	17.1	1.5	1.3	19.9	12.5	7.5
DCMS (formerly DNH)	10.2	8.9	1.2	0.1	0.5	10.7	0.4	10.3
DFID (formerly ODA)	2.4	-	2.4	-	-	2.4	0.8	1.6
DTI (ex OST)	6.6	3.3	3.3	-	-	6.6	-	6.6
NI	7.9	0.4	6.8	0.6	0.5	8.3	1.7	6.6
SE (formerly SO)	49.8	10.9	37.9	1.0	0.4	50.2	2.5	47.7
NAW (formerly WO)	0.5	0.1	0.5	-	-	0.5	0.5	0.0
Other departments	23.7	0.7	19.5	3.6	1.7	25.4	8.0	17.4
Total civil departments	**262.8**	**44.5**	**195.4**	**22.9**	**10.6**	**273.4**	**40.9**	**232.5**
Total civil R&D	**835.8**	**273.4**	**532.8**	**29.6**	**73.1**	**908.9**	**45.8**	**863.1**
MOD	454.4	-	376.6	77.8	65.5	519.9	15.8	504.1
TOTAL	**1,290.3**	**273.4**	**909.4**	**107.4**	**138.6**	**1,428.8**	**61.6**	**1,367.2**

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.

Source: ONS

Table 6 Analysis of net Government R&D expenditure by Frascati type of research activity, 1991–92 to 1999–2000[1]

£ million

	1991–92	1992–93	1993–94	1994–95	1995–96[2]	1996–97[2]	1997–98[2]	1998–99[2]	1999–00[2]
Total Government R&D									
Basic	1,362	1,511	1,571	-	-	-	-	-	-
- pure	-	-	-	1,253	1,273	1,322	1,334	1,369	1,492
- orientated	-	-	-	472	504	524	523	535	563
Applied - strategic	850	953	1,019	879	1,004	1,109	1,079	1,020	1,171
- specific	884	870	1,050	1,075	1,322	1,224	1,198	1,178	1,065
Experimental development	1,931	1,744	1,762	1,492	1,530	1,570	1,757	1,592	1,883
Total £m	**5,027**	**5,078**	**5,402**	**5,171**	**5,634**	**5,750**	**5,891**	**5,695**	**6,173**
Civil R&D									
Basic	1,362	1,511	1,571	-	-	-	-	-	-
- pure	-	-	-	1,253	1,273	1,322	1,334	1,369	1,467
- orientated	-	-	-	472	504	524	523	535	563
Applied - strategic	815	907	962	810	839	948	923	875	988
- specific	508	403	454	479	813	681	698	704	673
Experimental development	129	177	137	126	136	131	102	116	138
Total £m	**2,814**	**2,997**	**3,124**	**3,140**	**3,565**	**3,606**	**3,580**	**3,599**	**3,829**
Defence R&D									
Basic	-	-	-	-	-	-	-	-	-
- pure	-	-	-	-	-	-	-	-	25
- orientated	-	-	-	-	-	-	-	-	-
Applied - strategic	35	46	58	69	166	160	156	145	183
- specific	376	467	596	596	510	544	500	475	392
Experimental development	1,802	1,568	1,624	1,366	1,394	1,439	1,655	1,476	1,745
Total £m	**2,214**	**2,080**	**2,278**	**2,032**	**2,070**	**2,144**	**2,311**	**2,096**	**2,345**

Notes: ***Source: ONS***

1 For the purpose of this analysis Research Councils expenditure for Pensions/Other costs have been excluded from 1994–95 onwards.
2 Includes NHS estimates (ref 1)

Table 7 Business Enterprise R&D, in cash terms and real terms, 1966–1999

£ million

Year	Total Business Enterprise R&D	
	In cash terms	In real terms (1999=100)[1]
1966	580	6,385
1967	605	6,469
1968	639	6,508
1969	680	6,584
1970	N/S	N/S
1971	N/S	N/S
1972	831	6,296
1973	N/S	N/S
1974	N/S	N/S
1975	1,340	6,318
1976	N/S	N/S
1977	N/S	N/S
1978	2,324	7,645
1979	N/S	N/S
1980	N/S	N/S
1981	3,793	8,254
1982	N/S	N/S
1983	4,163	8,102
1984	N/S	N/S
1985	5,122	8,998
1986	5,951	10,139
1987	6,335	10,247
1988	6,922	10,488
1989	7,650	10,812
1990	8,318	10,903
1991	8,135	10,046
1992	8,489	10,152
1993	9,069	10,566
1994	9,204	10,574
1995	9,254	10,335
1996	9,431	10,204
1997	9,680	10,185
1998	10,261	10,496
1999	11,302	11,302

Notes:
1 See notes at Table 2.

(N/S) = No survey carried out

Source: ONS

Table 8 Expenditure on R&D performed in UK businesses: broad product groups, in cash & real terms, 1991–1999

£ million

In cash terms	1991	1992	1993	1994	1995	1996	1997r	1998r	1999
Manufacturing: Total	6,118	6,305	6,741	6,848	6,917	7,035	7,383	7,908	8,783
Chemicals	1,906	2,166	2,400	2,509	2,514	2,479	2,831	2,926	3,253
Mechanical engineering	538	580	665	761	683	668	709	730	712
Electrical machinery	1,329	1,258	1,386	1,218	1,245	1,313	1,181	1,320	1,335
Transport equipment	638	670	717	710	833	977	990	1,020	1,235
Aerospace	1,005	898	782	860	886	812	893	1,039	1,237
Other manufacturing	702	733	791	790	755	787	779	874	1,010
Services	2,017	2,184	2,328	2,356	2,337	2,396	2,297	2,352	2,519
TOTAL	**8,135**	**8,489**	**9,069**	**9,204**	**9,254**	**9,431**	**9,680**	**10,261**	**11,302**

In real terms (at 1999 prices)	1991	1992	1993	1994	1995	1996	1997r	1998r	1999
Manufacturing: Total	7,556	7,540	7,854	7,867	7,725	7,611	7,768	8,090	8,783
Chemicals	2,354	2,590	2,796	2,883	2,808	2,683	2,978	2,993	3,253
Mechanical engineering	664	694	775	874	763	723	746	747	712
Electrical machinery	1,641	1,504	1,615	1,399	1,390	1,420	1,242	1,350	1,335
Transport equipment	788	801	835	816	930	1,057	1,041	1,043	1,235
Aerospace	1,241	1,074	911	988	989	878	940	1,063	1,237
Other manufacturing	867	877	922	908	843	851	820	894	1,010
Services	2,491	2,612	2,712	2,707	2,610	2,593	2,417	2,406	2,519
TOTAL	**10,046**	**10,152**	**10,566**	**10,574**	**10,335**	**10,204**	**10,185**	**10,496**	**11,302**

Notes:
1 1997 & 1998 data have been revised where necessary to take into account misclassification and updated population information.
r = revised

Source: ONS

Table 9 Expenditure on civil and defence R&D performed by Business Enterprises, 1991–1999

(i) in cash terms (£m)

	Civil									Defence								
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997r**	**1998r**	**1999**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
All product groups	**6,669**	**7,092**	**7,710**	**7,770**	**7,863**	**8,071**	**8,237**	**8,727**	**9,626**	**1,466**	**1,397**	**1,359**	**1,433**	**1,391**	**1,360**	**1,443**	**1,533**	**1,675**
All manufactured products	4,816	5,050	5,550	5,534	5,626	5,767	6,079	6,491	7,164	1,301	1,254	1,193	1,314	1,291	1,268	1,304	1,417	1,618
Chemicals and pharmaceuticals	1,980	2,238	2,473	2,590	2,511	2,477	2,829	2,926	3,252	17	20	26	10	3	2	2	-	1
Mechanical engineering	262	325	398	405	418	395	407	455	434	256	236	246	335	266	273	302	276	279
Electrical machinery	959	885	999	827	823	896	803	916	1,013	354	357	377	379	423	417	377	404	322
Transport equipment	548	574	622	661	823	967	979	983	1,159	59	64	59	14	10	10	11	36	77
Aerospace	477	403	374	380	413	359	412	485	535	525	493	412	481	473	453	481	554	701
Other manufacturing	590	625	684	671	639	673	648	727	771	90	84	73	95	116	113	131	147	239
Services	1,853	2,042	2,160	2,236	2,237	2,304	2,158	2,236	2,462	165	143	166	120	99	92	139	116	57

(ii) in real terms (£m 1999 prices)[1]

	Civil									Defence								
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997r**	**1998r**	**1999**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
All product groups	**8,236**	**8,482**	**8,982**	**8,927**	**8,781**	**8,733**	**8,666**	**8,927**	**9,626**	**1,810**	**1,671**	**1,583**	**1,646**	**1,553**	**1,471**	**1,519**	**1,568**	**1,675**
All manufactured products	5,948	6,040	6,466	6,358	6,283	6,240	6,396	6,640	7,164	1,607	1,500	1,390	1,510	1,442	1,372	1,372	1,450	1,618
Chemicals and pharmaceuticals	2,445	2,677	2,881	2,976	2,804	2,680	2,976	2,993	3,252	21	24	30	11	4	3	2	-	1
Mechanical engineering	324	389	464	465	467	428	429	465	434	316	282	287	385	297	295	318	282	279
Electrical machinery	1,184	1,058	1,164	950	919	969	845	937	1,013	437	427	439	435	472	451	397	413	322
Transport equipment	677	686	725	759	919	1,046	1,030	1,006	1,159	73	77	69	16	11	11	12	37	77
Aerospace	589	482	436	437	461	388	434	497	535	648	590	480	553	529	490	506	566	701
Other manufacturing	729	747	797	771	714	729	682	743	771	111	100	85	109	130	122	138	151	239
Services	2,288	2,442	2,516	2,569	2,498	2,493	2,271	2,287	2,462	204	171	193	138	111	100	146	119	57

Notes: ***Source: ONS***

1 See table 2 for deflators
(r) = revised

Table 10 Sources of funds for business enterprise R&D in cash terms, 1991–1999

£ million, cash terms

		Government £m	Overseas £m	Mainly own resources[1] £m	Total intramural R&D £m
1991		**1,189**	**1,299**	**5,647**	**8,135**
of which:	**Civil**	479	950	5,240	6,669
	Defence	710	349	407	1,466
1992		**1,171**	**1,270**	**6,048**	**8,489**
of which:	**Civil**	478	981	5,633	7,092
	Defence	693	289	415	1,397
1993		**1,129**	**1,398**	**6,542**	**9,069**
of which:	**Civil**	390	1,103	6,217	7,710
	Defence	739	295	324	1,359
1994		**1,088**	**1,474**	**6,642**	**9,204**
of which:	**Civil**	363	1,135	6,272	7,770
	Defence	726	338	370	1,433
1995		**1,050**	**1,748**	**6,456**	**9,254**
of which:	**Civil**	321	1,419	6,124	7,863
	Defence	729	329	332	1,391
1996		**934**	**2,031**	**6,465**	**9,431**
of which:	**Civil**	242	1,728	6,102	8,071
	Defence	693	303	364	1,360
1997r		**1,005**	**1,811**	**6,864**	**9,680**
of which:	**Civil**	288	1,486	6,462	8,237
	Defence	717	325	401	1,443
1998r		**1,190**	**2,245**	**6,826**	**10,261**
of which:	**Civil**	403	1,864	6,461	8,727
	Defence	787	381	365	1,533
1999		**1,157**	**2,570**	**7,575**	**11,302**
of which:	**Civil**	316	2,092	7,219	9,626
	Defence	841	478	356	1,675
		%	**%**	**%**	**%**
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	21	76	100
	Defence	51	22	27	100
1997		**10**	**19**	**71**	**100**
of which:	**Civil**	3	18	78	100
	Defence	50	22	28	100
1998		**12**	**22**	**67**	**100**
of which:	**Civil**	5	21	74	100
	Defence	51	25	24	100
1999		**10**	**23**	**67**	**100**
of which:	**Civil**	3	22	75	100
	Defence	50	29	21	100

Notes:

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

(r) = revised

Source: ONS

Table 11 Intramural expenditure on R&D performed in UK businesses: detailed product groups, 1991–1999

£ million

	1991	1992	1993	1994	1995	1996	1997r	1998r	1999
Total	**8,135**	**8,489**	**9,069**	**9,204**	**9,254**	**9,431**	**9,680**	**10,261**	**11,302**
Agriculture, hunting and forestry; Fishing	76	80	89	80	..	76	84	102	115
Extractive Industries	129	126	62	66	65	64	44	41	42
Food products and beverages; Tobacco products	196	225	191	228	189	198	180	242	237
Textiles, clothing and leather products	23	25	44	22	23	27	33	33	28
Pulp, paper and paper products; printing and publishing; Wood and straw products	43	44	40	44	39	57	44	49	45
Refined petroleum products and coke oven products; Processing of nuclear fuel	369	386	370	354	377	364	349	362	212
Chemicals, man- made fibres	707	720	721	689	701	627	680	688	718
Pharmaceuticals, medical chemicals and botanical products	1,199	1,446	1,679	1,820	1,813	1,852	2,151	2,238	2,535
Rubber and plastic products	35	25	67	72	60	67	60	66	72
Other non-metallic mineral products	44	43	42	56	54	60	47	56	59
Casting of iron and steel	40	43	50	51	46	39	39	47	41
Non-ferrous metals	24	22	16	15	20	15	15	20	22
Fabricated metal products	48	63	72	72	100	91	88	90	70
Machinery and equipment	490	517	593	689	583	577	622	640	642
Office machinery and computers	327	256	252	134	150	161	102	125	111
Electrical machinery and apparatus	518	523	576	567	494	490	424	423	357
Radio, television and communication equipment	484	479	558	517	602	662	655	772	867
Precision instruments	276	283	312	273	303	307	336	340	473
Motor vehicles and parts	605	636	682	669	795	926	924	913	1,060
Other transport equipment	17	18	17	24	18	30	50	72	99
Shipbuilding and repairs	16	16	18	17	20	20	15	36	76
Aerospace	1,005	898	782	860	886	812	893	1,039	1,237
Furniture; Other manufactured goods	20	22	28	28	21	16	25	20	33
Recycling	1	1	1	1	..	1	0	0	1
Electricity, gas and water supply	192	187	214	177	168	148	130	140	137
Construction	19	15	11	11	8	8	38	39	41
Wholesale and retail trade	4	4	5	6	8	4	5	8	25
Transport and storage	8	10	13	8	15	8	11	13	13
Post and telecommunications	317	386	389	408	414	455	496	449	565
Miscellaneous business activities; Technical testing and analysis	146	156	195	181	..	141	142	157	196
Computer and related activities	494	555	635	744	675	749	680	688	713
Research and development services	244	261	329	311	247	369	313	346	448
Public administration	19	18	16	10	14	10	6	8	11

Notes:

1 .. denotes disclosive figures.

2 Zero denotes a value less than 0.5

3 1997 & 1998 data have been revised where necessary to take into account misclassification and updated population information.

4 For 1991 and 1992 Furniture; Wood and straw products was included with Pulp, paper and paper products; Printing and publishing.

r = revised

Source: ONS

Table 12 Current and capital expenditure, and as a percentage, on R&D performed in the UK Businesses: detailed product groups, 1999

	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	**11,302**	**1,225**	**10,077**	**4,491**	**5,586**	***100***	***11***	***89***	***40***	***49***
Agriculture, hunting and forestry; Fishing	115	16	99	56	44	*100*	*14*	*86*	*48*	*38*
Extractive Industries	42	1	41	22	19	*100*	*2*	*98*	*53*	*45*
Food products and beverages; Tobacco products	237	29	209	117	92	*100*	*12*	*88*	*49*	*39*
Textiles, clothing and leather products	28	3	25	16	8	*100*	*11*	*89*	*59*	*30*
Pulp, paper and paper products; Printing and publishing; Wood and straw products	45	1	44	17	28	*100*	*2*	*98*	*37*	*61*
Refined petroleum products and coke oven products; Processing of nuclear fuel	212	44	169	63	105	*100*	*20*	*80*	*30*	*50*
Chemicals, man-made fibres	718	65	653	345	308	*100*	*9*	*91*	*48*	*43*
Pharmaceuticals, medical chemicals and botanical products	2,535	493	2,042	836	1,206	*100*	*19*	*81*	*33*	*48*
Rubber and plastic products	72	2	70	30	40	*100*	*3*	*97*	*41*	*56*
Other non-metallic mineral products	59	5	53	27	26	*100*	*9*	*91*	*47*	*44*
Casting of iron and steel	41	1	40	21	19	*100*	*2*	*98*	*51*	*46*
Non-ferrous metals	22	1	20	10	10	*100*	*6*	*94*	*47*	*48*
Fabricated metal products	70	9	61	28	33	*100*	*13*	*87*	*40*	*47*
Machinery equipment	642	20	622	271	351	*100*	*3*	*97*	*42*	*55*
Office machinery and computers	111	13	99	42	57	*100*	*11*	*89*	*37*	*51*
Electrical machinery and apparatus	357	26	332	141	191	*100*	*7*	*93*	*39*	*53*
Radio, television and communication equipment	867	97	770	351	419	*100*	*11*	*89*	*41*	*48*
Precision instruments	473	33	440	218	222	*100*	*7*	*93*	*46*	*47*
Motor vehicles and parts	1,060	115	945	413	532	*100*	*11*	*89*	*39*	*50*
Other transport equipment	99	1	98	12	86	*100*	*1*	*99*	*13*	*87*
Shipbuilding and repairs	76	1	75	40	35	*100*	*2*	*98*	*53*	*46*
Aerospace	1,237	112	1,124	375	750	*100*	*9*	*91*	*30*	*61*
Furniture; Other manufactured goods	33	6	27	14	13	*100*	*17*	*83*	*44*	*39*
Recycling	1	0	1	0	0	*100*	*3*	*97*	*68*	*29*
Electricity, gas and water supply	137	13	124	57	67	*100*	*10*	*90*	*41*	*49*
Construction	41	1	40	20	19	*100*	*3*	*97*	*50*	*47*
Wholesale and retail trades	25	0	25	13	12	*100*	*0*	*100*	*53*	*47*
Transport and storage	13	0	13	6	7	*100*	*2*	*98*	*49*	*49*
Post and telecommunications	565	20	545	239	306	*100*	*4*	*96*	*42*	*54*
Miscellaneous business activities; Technical testing and analysis	196	17	179	95	84	*100*	*9*	*91*	*48*	*43*
Computer related activities	713	64	649	365	284	*100*	*9*	*91*	*51*	*40*
Research and development services	448	15	432	227	206	*100*	*3*	*97*	*51*	*46*
Public administration	11	1	9	2	7	*100*	*12*	*88*	*22*	*66*

Notes:
1 Zero denotes a value less than 0.5

Source: ONS

Table 13 Government and business enterprise personnel engaged on R&D in the UK, 1991–1999

Full time equivalents, thousands

	1991	1992	1993	1994	1995	1996	1997	1998	1999	% change in 1999 from 1998
PERSONNEL ENGAGED ON R&D										
- Business Enterprise	159	159	164	157	146	143	138	150	153	*2*
- Research Councils	12	13	13	12	12	12	11	11	11	*1*
- Government Departments[1]	24	25	22	20	17	16	15	18	18	*2*
Total Civil	**153**	**157**	**166**	**154**	**145**	**142**	**136**	**147**	**149**	***2***
Total Defence	**42**	**40**	**33**	**35**	**31**	**29**	**28**	**32**	**33**	***4***
RESEARCHERS										
- Business Enterprise	80	82	86	83	83	83	84	92	92	-
- Research Councils	6	6	6	6	6	5	5	5	5	*3*
- Government Departments[1]	9	9	8	8	8	8	7	9	10	*5*
Total Civil	**77**	**79**	**83**	**79**	**79**	**79**	**79**	**88**	**87**	***-1***
Total Defence	**18**	**18**	**17**	**18**	**17**	**17**	**17**	**19**	**20**	***7***
TECHNICIANS										
- Business Enterprise	38	38	40	40	33	33	30	32	33	*2*
- Research Councils	2	2	3	2	2	3	3	3	3	*1*
- Government Departments[1]	4	4	4	4	4	3	3	4	4	*1*
Total Civil	**35**	**36**	**41**	**38**	**33**	**33**	**29**	**32**	**32**	***1***
Total Defence	**9**	**8**	**6**	**8**	**7**	**6**	**6**	**7**	**7**	***7***
ADMIN & OTHER STAFF										
- Business Enterprise	41	39	37	34	30	27	25	25	28	*10*
- Research Councils	5	5	4	4	4	4	3	3	3	-
- Government Departments[1]	11	11	9	8	5	5	4	5	5	*-3*
Total Civil	**42**	**41**	**40**	**37**	**33**	**30**	**28**	**27**	**30**	***11***
Total Defence	**15**	**14**	**10**	**9**	**7**	**6**	**5**	**6**	***6***	**-8**

Note:

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

Source: ONS

Table 14 Estimated GOR breakdown of expenditure on Intramural R&D in the Business, Government and Higher Education sectors, 1999

	R&D performed within business (BERD)		R&D performed Government Establishments (GOVERD)[1]		R&D perfomed within Higher Education Institutions (HERD)	
	£m	percentage of regional GDP	£m	percentage of regional GDP	£m	percentage of regional GDP
United Kingdom	**11,302**	**1.29**	**1,788**	***0.20***	**3,341**	**0.38**
North East	164	*0.55*	2	*0.01*	113	*0.38*
North West and Merseyside	1,476	*1.65*	48	*0.05*	260	*0.29*
Yorkshire and the Humber	309	*0.47*	40	*0.06*	270	*0.41*
East Midlands	838	*1.43*	48	*0.08*	182	*0.31*
West Midlands	724	*0.99*	164	*0.22*	180	*0.25*
Eastern	2,559	*2.71*	213	*0.23*	255	*0.27*
London	735	*0.56*	198	*0.15*	837	*0.64*
South East	2,916	*2.07*	557	*0.40*	493	*0.35*
South West	887	*1.32*	259	*0.39*	148	*0.22*
England	**10,607**	***1.39***	**1,529**	***0.20***	**2,737**	***0.36***
Wales	203	*0.57*	47	*0.13*	129	*0.37*
Scotland	393	*0.53*	200	*0.27*	411	*0.56*
Northern Ireland	99	*0.50*	12	*0.06*	64	*0.33*

Note: ***Source: ONS***

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, 1999[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	**152.9**	***0.55***	**29.7**	***0.11***
North East	3.0	*0.28*	0.0	*0.00*
North West and Merseyside	18.4	*0.59*	0.8	*0.03*
Yorkshire and the Humber	6.5	*0.28*	0.7	*0.03*
East Midlands	12.1	*0.60*	0.8	*0.04*
West Midlands	12.1	*0.49*	2.7	*0.11*
Eastern	30.3	*1.14*	3.5	*0.13*
London	10.1	*0.30*	3.3	*0.10*
South East	35.2	*0.86*	9.2	*0.23*
South West	13.1	*0.55*	4.3	*0.18*
England	**140.8**	***0.60***	**25.4**	***0.11***
Wales	3.1	*0.25*	0.8	*0.06*
Scotland	6.7	*0.29*	3.3	*0.14*
Northern Ireland	2.2	*0.32*	0.2	*0.03*

Notes: ***Source ONS***

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.
Labour Force figures relate to those in employment, rather than all those economically active.

4 Labour Force figures are for Spring 2000.

Table 16 OECD Science and Technology indicators
Gross Expenditure on R&D: International Comparisons, 1991–1999

	Year	UK	Germany[1]	France[2]	Italy[3]	Japan[4]	Canada	USA[5]
Gross Domestic Product (GDP)[6]	1991	592.2	891.2	671.5	625.4	1,508.1	331.9	3,767.6
(£ billion at ppp)[7]	1992	614.9	940.6	683.7	640.7	1,541.5	330.2	3,855.9
	1993	648.2	980.6	700.7	649.6	1,643.9	360.0	4,195.6
	1994	687.8	1,058.9	731.0	696.1	1,712.6	389.9	4,513.0
	1995	722.1	1,142.9	784.7	753.9	1,859.4	439.6	4,798.7
	1996	768.1	1,139.3	779.2	773.9	1,945.5	445.7	4,991.9
	1997	815.8	1,188.2	794.4	785.4	2,009.0	474.1	5,360.6
	1998	858.6	1,252.2	846.8	822.5	2,020.0	505.2	5,770.7
	1999	908.1	1,307.5	897.5	858.6	2,083.5	543.8	6,185.6 (e)
Gross Expenditure on R&D (GERD)	1991	12.1	22.6	15.9	7.7	42.5 (e)	5.1	102.1
(£ billion at ppp)[7]	1992	12.7	22.6 (e)	16.3	7.6	42.5 (e)	5.2	101.9
	1993	13.5	23.1	16.8	7.3	44.0 (e)	5.9	105.7
	1994	14.0	23.9 (e)	17.1	7.3	45.1 (e)	6.5	109.2
	1995	14.2	25.8 (e)	18.1	7.5	51.4 (e)	7.2	120.1
	1996	14.5	25.7 (e)	17.9	7.8	54.5 (e)	7.1	126.9
	1997	14.8	27.2 (e)	17.6	7.8	57.8 (e)	7.6	138.1
	1998	15.6	28.9 (e)	18.5 (p)	8.4 (p)	60.8 (e)	8.2 (p)	150.4 (p)
	1999	16.7	31.1 (e)	-	9.0 (p)	-	8.6 (p)	163.9 (p)
GERD as a percentage of GDP	1991	2.05	2.53	2.37	1.23	2.82 (e)	1.53	2.71
	1992	2.06	2.41 (e)	2.38	1.18	2.76 (e)	1.58	2.64
	1993	2.09	2.35	2.40	1.13	2.68 (e)	1.63	2.52
	1994	2.04	2.26 (e)	2.34	1.05	2.63 (e)	1.67	2.42
	1995	1.96	2.26 (e)	2.31	1.00	2.77 (e)	1.64	2.50
	1996	1.88	2.26 (e)	2.30	1.01	2.80 (e)	1.60	2.54
	1997	1.81	2.29 (e)	2.21	0.99	2.88 (e)	1.61	2.58
	1998	1.81	2.31 (e)	2.18 (p)	1.02 (p)	3.01 (e)	1.62 (p)	2.61 (p)
	1999	1.83	2.38 (e)	-	1.04 (p)	-	1.58 (p)	2.65 (p)
BERD as a percentage of GDP	1991	1.37	1.76	1.46	0.68	2.13	0.80	1.97
	1992	1.38	1.66 (e)	1.49	0.66	2.03	0.84	1.90
	1993	1.40	1.58	1.48	0.60	1.90	0.90	1.78
	1994	1.34	1.51 (e)	1.45	0.56	1.87	0.98	1.71
	1995	1.28	1.50	1.41	0.53	1.94	0.98	1.80
	1996	1.23	1.49 (e)	1.41	0.54	2.01	0.95	1.87
	1997	1.19	1.54	1.35	0.52	2.09	0.99	1.91
	1998	1.20	1.57 (e)	1.35 (p)	0.55 (p)	2.17	1.01 (p)	1.94
	1999	1.24	1.63 (e)	-	0.56 (p)	-	1.00 (p)	2.01 (p)
GOVERD as a percentage of GDP	1991	0.30	0.35	0.54	0.28	0.23	0.30	0.27 (e)
	1992	0.30	0.34	0.50	0.26	0.25	0.29	0.26
	1993	0.30	0.36	0.51	0.24	0.27	0.28	0.26
	1994	0.30	0.34	0.48	0.22	0.26	0.26	0.24
	1995	0.28	0.35	0.48	0.21	0.29	0.25	0.24
	1996	0.27	0.34	0.47	0.20	0.27	0.25	0.22
	1997	0.25	0.33	0.45	0.20	0.26	0.22	0.21
	1998	0.24	0.34	0.43 (p)	0.22 (p)	0.28	0.21 (p)	0.21
	1999	0.20	0.34 (e)	-	0.22 (p)	-	0.19 (p)	0.19 (p)
HERD as a percentage of GDP	1991	0.34	0.41	0.36	0.26	0.34 (e)	0.42	0.38
	1992	0.35	0.41 (e)	0.36	0.26	0.35 (e)	0.44	0.39
	1993	0.36	0.41	0.38	0.28	0.38 (e)	0.42	0.39
	1994	0.38	0.41	0.38	0.27	0.37 (e)	0.41	0.39
	1995	0.37	0.41	0.39	0.25	0.40 (e)	0.40	0.38
	1996	0.36	0.42	0.39	0.27	0.39 (e)	0.39	0.38
	1997	0.35	0.41	0.38	0.26	0.39 (e)	0.38	0.37
	1998	0.35	0.40	0.37 (p)	0.25 (p)	0.42 (e)	0.38 (p)	0.37 (p)
	1999	0.37	0.41 (e)	-	0.26 (p)	-	0.37 (p)	0.37 (p)

Notes:

1 There is a break in series between 1991 and 1992.
2 For government and business enterprise data there is a break in series between 1991 and 1992.
3 There is a break in series between 1993 and 1994.
4 Data for Japan are adjusted by OECD.
5 Excludes most or all capital expenditure.
6 The measure of GDP used is at market prices, based on the UN definition.
7 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
(p) = provisional
(e) = estimate

Source: OECD databank (February 2001)

Table 17 International comparison of gross expenditure on R&D by sector of performance and source of funding, 1999

Per cent

	UK	Germany[1]	France (p)	Italy (p)	Japan (e)[2]	Canada (p)	USA (p)[3]
Percentage by sector of performance[4]							
Government	*10.7*	*14.3*	*19.5*	*21.2*	*9.3*	*12.2*	*7.2*
Business enterprise	*67.8*	*68.6*	*62.0*	*53.8*	*71.9*	*63.0*	*75.7*
Higher education	*20.0*	*17.0*	*17.1*	*25.1*	*14.0*	*23.6*	*14.1*
Other	*1.4*	*-*	*1.4*	*-*	*4.8*	*1.2*	*2.9*
Total	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***
Percentage by source of funds[5]							
Government	*27.9*	*33.8*	*40.2*	*51.1*	*19.7*	*31.2*	*29.2*
Business enterprise	*49.4*	*63.5*	*50.3*	*43.9*	*73.4*	*49.2*	*66.8*
Abroad	*17.6*	*2.3*	*7.9*	*5.0*	*0.3*	*13.8*	*-*
Other[6]	*5.1*	*0.3*	*1.6*	*-*	*6.5*	*5.7*	*4.0*
Total	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

Notes: ***Source: OECD databank (February 2001)***

1 Data for "other" included elsewhere.
2 Data for Japan are OECD estimates.
3 Excludes most or all capital expenditure.
4 Sector of performance data for France are for 1998.
5 Source of funds data for France are for 1997.
6 For UK data, "Other" consists of Higher Education & Private Non-Profit expenditure. For the remaining countries, "Other" represents other national sources.
(p) = provisional
(e) = estimate

Table 18 R&D performed in the Business Enterprise sector (BERD), 1991–1999

£ billion at ppp[1]

Year	UK	Germany[2]	France[3]	Italy[4]	Japan[5]	Canada	USA[6]
1991	8.1	15.7	9.8	4.3	32.1	2.6	74.3
1992	8.5	15.6 (e)	10.2	4.2	31.3	2.8	73.3
1993	9.1	15.5	10.4	3.9	31.3	3.2	74.8
1994	9.2	16.0 (e)	10.6	3.9	32.1	3.8	77.2
1995	9.3	17.1	11.1	4.0	36.2	4.3	86.4
1996	9.4	17.0 (e)	11.0	4.2	39.1	4.2	93.2
1997	9.7	18.3	10.8	4.1	42.0	4.7	102.5
1998	10.3	19.6 (e)	11.5 (p)	4.5 (p)	43.8	5.1 (p)	112.2
1999	11.3	21.3 (e)	-	4.8 (p)	-	5.4 (p)	124.1 (p)

Notes: ***Source: OECD databank (February 2001)***

1 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
2 There is a break in series between 1991 and 1992.
3 There is a break in series between 1991 and 1992.
4 There is a break in series between 1993 and 1994.
5 Data for Japan are adjusted by OECD.
6 Excludes most or all capital expenditure.
(p) = provisional
(e) = estimate

Table 19 International comparison of Government funding of R&D in 1999 by socio-economic objective (percentage distribution)[1]

Per cent

		UK	Germany (p)	France (p)	Italy	Japan[2]	Canada (p)	USA (p)[3]
Agriculture, forestry and fishing		*4.2*	*2.6*	*3.0*	*1.9*	*3.5*	*14.4*	*2.2*
Industrial development		*0.9*	*12.7*	*6.2*	*8.1*	*6.5*	*16.3*	*0.5*
Energy		*0.5*	*3.6*	*4.9*	*5.0*	*19.3*	*7.0*	*1.5*
Infrastructure		*1.7*	*1.7*	*0.6*	*0.6*	*3.5*	*5.2*	*2.3*
Environmental protection		*2.4*	*3.5*	*1.6*	*3.4*	*0.7*	*4.0*	*0.7*
Health		*15.1*	*3.3*	*5.5*	*5.6*	*3.7*	*11.7*	*21.0*
Social development and services		*3.5*	*3.2*	*1.5*	*3.6*	*0.9*	*4.5*	*1.0*
Earth and atmosphere		*1.3*	*1.8*	*0.7*	*1.6*	*1.5*	*6.0*	*1.4*
Advancement of knowledge		*30.0*	*54.7*	*40.3*	*59.4*	*49.5*	*10.3*	*6.2*
Civil space		*2.3*	*4.5*	*11.0*	*8.3*	*6.3*	*11.3*	*10.7*
Defence		*37.9*	*8.4*	*22.7*	*2.6*	*4.6*	*6.1*	*52.5*
Not elsewhere classified		*0.3*	*0.2*	*2.0*	*-*	*0.0*	*3.2*	*-*
	%	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***
Total	**£ million[4]**	**6,194**	**10,761**	**8,621**	**4,754**	**13,283**	**1,822**	**51,739**

Notes: ***Source: OECD databank (February 2001)***

1 Data for Italy and Canada are for 1998.
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