



**BRIEFING PAPER**

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# Research and Development in the UK

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## Summary

Two main data series provide statistics on research and development in the UK.

The ONS's *gross domestic expenditure on R&D* (GERD) series provides gross expenditure for R&D performed specifically within the UK.

The *Science, Engineering and Technology* (SET) series, alternatively, provides net figures for government spending including net contributions to EU programmes.

In 2013 gross domestic expenditure on R&D (GERD) in the UK was £28.9 billion, or 1.67% of GDP.

Between 1985 and 2013 GERD grew by 52% in real terms, but because it has not grown as fast as the economy as a whole it has fallen as a proportion of GDP from 2.01% to 1.67%.

The South East, East of England and London account for a combined 52% of R&D performed in the UK. Other areas with large shares of R&D include the North West (8.7%), the South West (7.7%) and Scotland (7.2%).

Business enterprise performed £18.4 billion (64%) of UK GERD in 2013.

Pharmaceuticals comprised 22% of this total, motor vehicles and parts 11%, computer programming and information services 11% and aerospace 9%.

Net government expenditure on R&D was £9.7 billion in 2012, according to the ONS's SET statistics. This is a 13.5% rise, in real terms, on expenditure a decade previously.

Net expenditure comprised of £3.0 billion (31%) to research councils, £2.2 billion (23%) to higher education funding councils, £2.3 billion (24%) to civil departments and £1.5 billion (15%) to the Ministry of Defence.

# 1. Background to R&D statistics

Statistics showing public and private expenditure on research and development (R&D) in the UK are published by the Office for National Statistics (ONS) in their annual statistical releases on [Gross Domestic Expenditure on Research and Development](#), and their annual UK Government Expenditure on [Science, Engineering and Technology](#) series. This series, known as SET statistics, was [previously published](#) by the Department for Business, Innovation and Skills.

The concepts and definitions used to measure R&D in the UK are set out in the OECD's [Frascati Manual](#), which establishes a common basis for measuring R&D activity in different countries. Understanding R&D statistics means understanding these definitions and the activities they encapsulate.

## 1.1 The definition of R&D

The OECD defines R&D in the following way:

Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.<sup>1</sup>

R&D is distinguished from other scientific and technological activities related to the circulation and dissemination of knowledge by excluding activities that do not involve the production of new knowledge directed at solving specific problems:

The basic criterion for distinguishing R&D from related activities is the presence in R&D of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty, i.e. when the solution to a problem is not readily apparent to someone familiar with the basic stock of common knowledge and techniques for the area concerned.<sup>2</sup>

This definition of R&D therefore excludes things like education, training, bibliographic and referencing work, routine technological development (e.g. the deployment of software systems that are already well understood) and the management of existing knowledge and data.

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<sup>1</sup> OECD, [Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development](#), 2002, page 30

<sup>2</sup> *ibid.*, page 34

## 1.2 Gross Domestic Expenditure on R&D (GERD)

The total expenditure on R&D carried out within a given country is referred to as gross domestic expenditure on R&D, or GERD. It is defined in the following way:

GERD is total intramural expenditure on R&D performed on the national territory during a given period.<sup>3</sup>

Here, the word “intramural” means expenditure carried out by the research-performing units in a given country, irrespective of their source of funding. As the Frascati manual explains:

GERD includes R&D performed within a country and funded from abroad but excludes payments for R&D performed abroad.<sup>3</sup>

GERD is therefore measured by adding up the expenditure of individual research units. It measures expenditure by the units performing the research (firms, institutes, universities etc.) *not the organisations funding it*. Nevertheless, once GERD in a given country has been quantified in this way, it is possible to identify the sources of funding for that activity. GERD can therefore be broken down either by the funding or the performing sectors.

## 1.3 Funding Sectors

GERD is typically divided into five research funding sectors:

- Business enterprise
- Government
- Higher Education
- Private non-profit (PNP)
- Abroad

In the UK, the ONS also lists Research Councils and Higher Education Funding Councils as separate research funding categories. These categories are included in the Government sector in international comparisons.

## 1.4 Performing sectors

GERD is typically divided into four research performing sectors:

- Business enterprise
- Government
- Higher Education
- Private non-profit (PNP)

In the UK, the ONS also lists Research Councils as a separate research performing category. This category is included in the Government sector in international comparisons.

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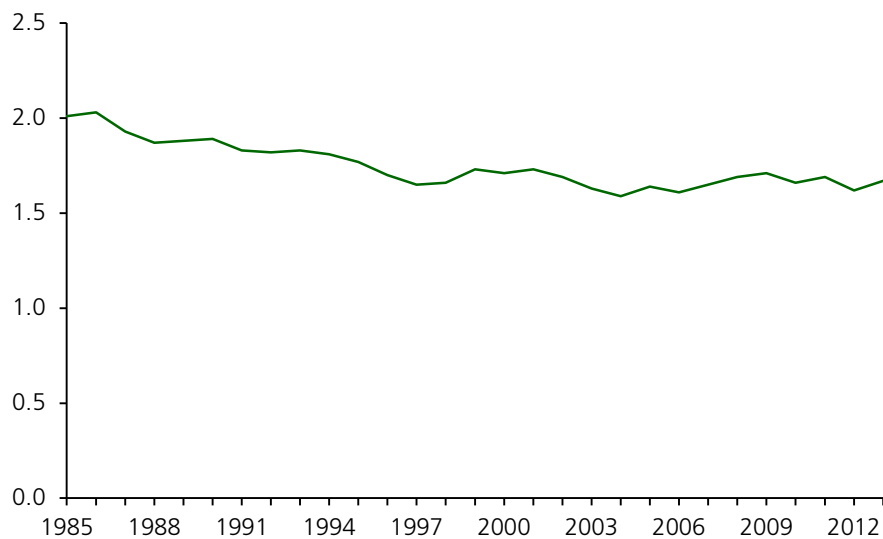
<sup>3</sup> *ibid.*, page 121

## 2. Gross Domestic Expenditure on R&D in the UK

In 2013, gross domestic expenditure on R&D in the UK was £28.9 billion, or 1.67% of GDP. Between 1985 and 2013 GERD grew by 52% in real terms, but because it has not grown as fast as the economy as a whole it has fallen as a proportion of GDP from 2.01% to 1.67%.

**Chart 1 GERD as a percentage of GDP, UK, 1985-2013**

*%, current prices*



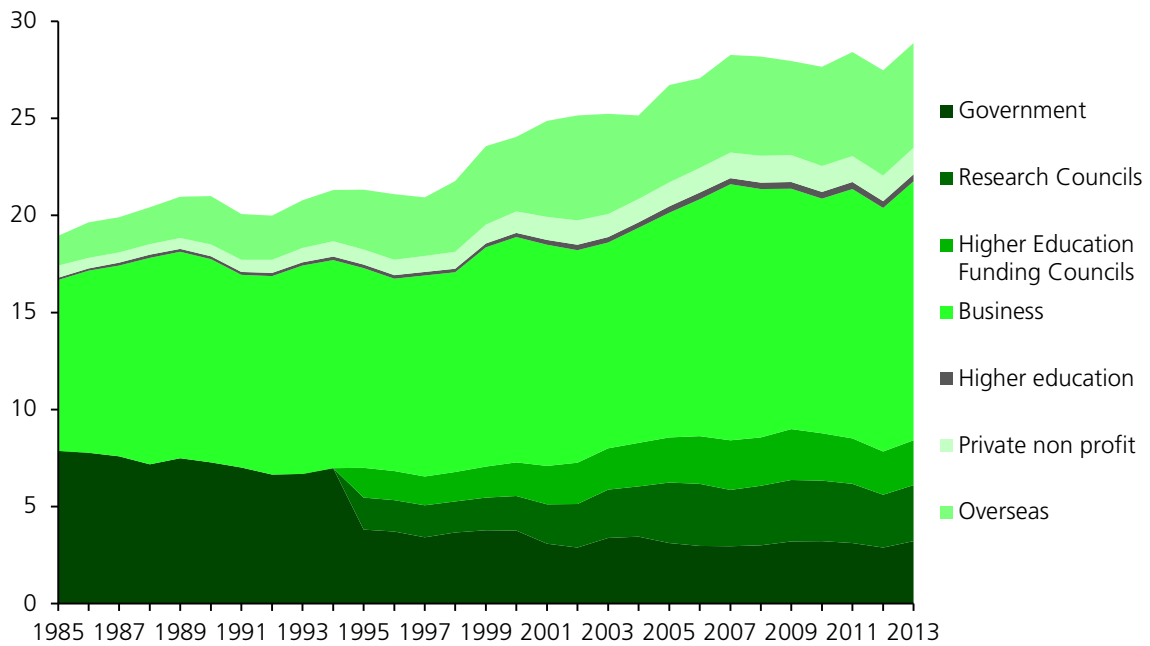
Source: [Gross Domestic Expenditure on Research and Development, 2013](#)

**Chart 2** shows a breakdown of GERD by funding sector from 1985 to 2013. During this period, the fastest growing sector of funding for R&D performed in the UK was funding from abroad, which grew by 251% in real terms. Funding from higher education also grew in real terms, by 199%, but from a very much smaller base. Funding from business enterprise grew by 52% in real terms. Total government funding (including Research Councils and Higher Education Councils) in 2013 was £8.4 billion, having peaked at £9.0 billion in 2009.

In 2013, business enterprise was the largest sector of funding for R&D, accounting for 46% of all funding for R&D performed in the UK, worth £13.3 billion. The government sector (including Research Councils and Higher Education Funding Councils) funded around 29% (£8.4 billion) of R&D performed in the UK; while funding from abroad accounted for 19% (£5.4 billion).

**Chart 2 Real terms GERD by sector of funding, United Kingdom, 1985-2013**

*£ billion, 2013 prices*

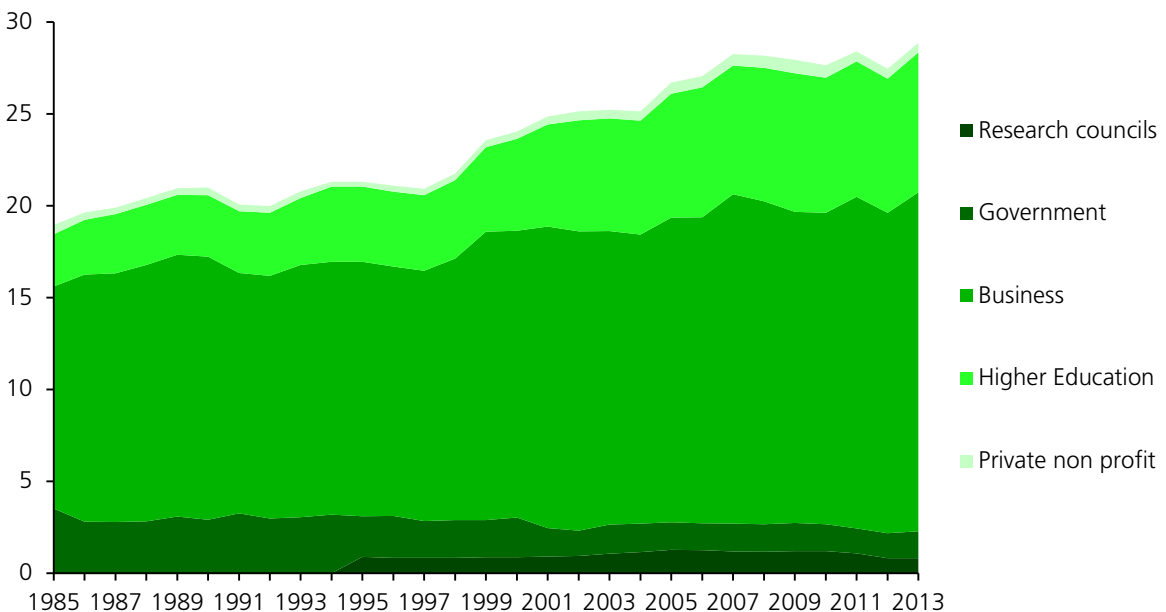


Source: [ONS, UK Gross Domestic Expenditure on Research and Development historical data](#)

**Chart 3** shows a breakdown of GERD by performing sector from 1985 to 2013. Business enterprise was the largest R&D performing sector during the period, accounting for 64% of R&D performed in the UK in both 1985 and 2013. In 2013, expenditure on research performed in the business enterprise sector was £18.4 billion. Higher education’s share of performance increased from 15% in 1985 to 26% in 2013.

**Chart 3 Real terms GERD by sector of performance, United Kingdom, 1985-2013**

*£ billion, 2013 prices*



Source: ONS, [ONS, UK Gross Domestic Expenditure on Research and Development historical data](#)

**Table 1** shows the relationship between the sectors funding and performing R&D carried out in the UK in 2013. This shows the relationship between the sources and destination of funding in the most recent year.

**Table 1: R&D performed in the UK in each sector according to source of funding, 2013**

Current prices, £ millions	Sector performing the R&D					Total	Overseas
	Government	Research Councils	Higher Education	Business Enterprise	Private Non-Profit <sup>1</sup>		
<b>Sector providing the funds</b>							
Government	1,050	77	380	1,646	61	<b>3,214</b>	547
Research Councils	60	600	2,121	3	115	<b>2,899</b>	200
Higher Education Funding Councils	-	-	2,297	-	-	<b>2,297</b>	-
Higher Education	1	13	300	-	54	<b>368</b>	-
Business Enterprise	239	25	313	12,750	16	<b>13,343</b>	3,305
Private Non-Profit	5	48	1,051	74	185	<b>1,362</b>	-
Overseas	112	51	1,167	3,975	87	<b>5,393</b>	-
<b>TOTAL</b>	<b>1,467</b>	<b>813</b>	<b>7,628</b>	<b>18,448</b>	<b>518</b>	<b>28,875</b>	-
of which:							
Civil	1,303	813	7,592	16,734	516	<b>26,959</b>	-
Defence <sup>1</sup>	164	-	37	1,713	2	<b>1,916</b>	-

<sup>1</sup> Private Non-Profit defence has been estimated using the 2012 data, as no survey data available for 2013.  
- denotes nil, figures unavailable or too small to display.

Source: [Gross Domestic Expenditure on Research and Development, 2013](#)

## 2.1 Expenditure by region

**Table 2** shows a breakdown of GERD by region and performing sector in 2013. The first section of the table shows the value of expenditure on R&D performed in each region, while the second section shows the percentage of expenditure on R&D performed in each region.

The South East, East of England, and London accounted for a combined 52% of R&D performed in the UK. Other areas with large shares of R&D were the North West (8.7%), the South West (7.7%) and Scotland (7.2%).



**Table 2: R&D performed in the UK by region and sector of performance, 2013**

*£ million - current prices*

	Government <sup>1, 5</sup>	Higher Education <sup>2</sup>	Business <sup>3</sup>	Private Non-Profit <sup>4, 5</sup>	Total
<b>United Kingdom</b>	<b>2,281</b>	<b>7,628</b>	<b>18,448</b>	<b>518</b>	<b>28,875</b>
<b>England</b>	<b>2,002</b>	<b>6,153</b>	<b>16,838</b>	<b>509</b>	<b>25,502</b>
<b>Wales</b>	<b>33</b>	<b>284</b>	<b>369</b>	<b>1</b>	<b>687</b>
<b>Scotland</b>	<b>223</b>	<b>1,041</b>	<b>798</b>	<b>8</b>	<b>2,070</b>
<b>Northern Ireland</b>	<b>23</b>	<b>150</b>	<b>443</b>	<b>-</b>	<b>616</b>
<b>Regions of England</b>					
North East <sup>5</sup>	..	250	309	..	576
North West <sup>5</sup>	..	600	1,784	..	2,509
<i>North East and North West<sup>5</sup></i>	<i>85</i>	<i>850</i>	<i>2,093</i>	<i>57</i>	<i>3,085</i>
Yorkshire and the Humber	74	531	644	4	1,253
East Midlands	87	338	1,369	2	1,796
West Midlands	4	371	1,697	-	2,072
East of England	212	699	4,071	260	5,242
London	335	1,874	1,317	148	3,674
South East	847	1,105	4,195	21	6,168
South West	358	385	1,452	17	2,212
<i>Expenditure by sector and region as a percentage of UK expenditure</i>					
	Government <sup>1, 5</sup>	Higher Education <sup>2</sup>	Business <sup>3</sup>	Private Non-Profit <sup>4, 5</sup>	Total
<b>England</b>	<b>87.8%</b>	<b>80.7%</b>	<b>91.3%</b>	<b>98.3%</b>	<b>88.3%</b>
<b>Wales</b>	<b>1.4%</b>	<b>3.7%</b>	<b>2.0%</b>	<b>0.2%</b>	<b>2.4%</b>
<b>Scotland</b>	<b>9.8%</b>	<b>13.6%</b>	<b>4.3%</b>	<b>1.5%</b>	<b>7.2%</b>
<b>Northern Ireland</b>	<b>1.0%</b>	<b>2.0%</b>	<b>2.4%</b>		<b>2.1%</b>
<b>Regions of England</b>					
North East <sup>5</sup>		3.3%	1.7%		2.0%
North West <sup>5</sup>		7.9%	9.7%		8.7%
<i>North East and North West<sup>5</sup></i>	<i>3.7%</i>	<i>11.1%</i>	<i>11.3%</i>	<i>11.0%</i>	<i>10.7%</i>
Yorkshire and the Humber	3.2%	7.0%	3.5%	0.8%	4.3%
East Midlands	3.8%	4.4%	7.4%	0.4%	6.2%
West Midlands	0.2%	4.9%	9.2%		7.2%
East of England	9.3%	9.2%	22.1%	50.2%	18.2%
London	14.7%	24.6%	7.1%	28.6%	12.7%
South East	37.1%	14.5%	22.7%	4.1%	21.4%
South West	15.7%	5.0%	7.9%	3.3%	7.7%

1 Government figures include Research Councils and estimates for those areas of Central Government not available from the Government Survey or from local authorities.

2 Higher Education regional data estimates provided by HEFCE.

3 Business regional estimates first published in the BERD publication on 20 November 2014.

4 Private Non-Profit estimates have been published using the 2013 survey data from the biennial survey.

5 North East and North West regions data have been combined due to confidentiality.

- denotes nil, figures unavailable or too small to display.

.. denotes disclosive figures.

Source: [Gross Domestic Expenditure on Research and Development, 2013](#)

## 2.2 Expenditure in the Business Sector

**Table 3** shows the percentage of expenditure on R&D performed in the UK business enterprise sector by the highest performing industries in 2013. Pharmaceuticals accounted for 22% of business enterprise R&D in 2013, with motor vehicles and parts (11%), computer programming and information services (11%) and aerospace (9%) also accounting for large shares of business enterprise R&D.

**Table 3 R&D performed in the UK business sector, 2013**

	£ billion	%
Pharmaceuticals	4.1	22.1
Motor vehicles and parts	2.1	11.2
Computer programming and information service activities	2.0	10.9
Aerospace	1.7	9.0
Machinery and equipment	1.0	5.6
Miscellaneous business activities; Technical testing and analysis	1.0	5.3
Telecommunications	0.8	4.6
Consumer electronics and communication equipment	0.8	4.5
Precision instruments and optical products; Photographic equipment	0.6	3.2
Other	4.3	23.6
<b>Total</b>	<b>18.4</b>	

Source: [Gross Domestic Expenditure on Research and Development, 2013](#)

The ONS's [Business Enterprise Research and Development](#) bulletins provide further analysis of these figures.

### 3. Government expenditure on R&D by departments

**Table 4** shows net government expenditure on R&D in 2012 broken down into the various research performing departments, including research councils, higher education funding councils, and civil and military government departments. **Table 5** provides a broad departmental breakdown of this funding in each year from 2001 to 2012.

These figures are taken from ONS statistics on SET rather than GERD. There are several differences between the two datasets. First, net expenditure on R&D is different to gross expenditure: it is equal to gross expenditure on R&D less any funding received for R&D. Second, SET statistics include the UK's net contribution to European Union R&D programmes. This contribution is typically excluded from GERD because it does not reflect research performed within the UK. Finally, SET statistics are for financial years, while ONS GERD statistics are for calendar years. These differences lead to small differences between government-funded GERD in ONS statistics and net government expenditure on R&D in BIS statistics. Nevertheless, SET statistics offer the most detailed breakdown of government funding for R&D.

**Table 4 Net Government expenditure on R&D by departments 2012**

	<i>Current Prices, £ million</i>	
	<i>£ million</i>	<i>%</i>
<b>Research Councils:</b>		
Engineering and Physical Sciences (EPSRC)	793	8.2%
Medical (MRC)	600	6.2%
Biotechnology and Biological Sciences (BBSRC)	478	4.9%
Science and Technology Facilities (STFC)	456	4.7%
Natural Environment (NERC)	378	3.9%
Economic and Social (ESRC)	179	1.9%
Arts and Humanities (AHRC)	90	0.9%
Pensions	37	0.4%
<b>TOTAL</b>	<b>3,010</b>	<b>31.1%</b>
<b>Higher Education Funding Councils (HEFCs):</b>		
England (HEFCE)	1,736	18.0%
Scotland (SFC)	312	3.2%
Northern Ireland (DELNI)	57	0.6%
Wales (HEFCW)	80	0.8%
<b>TOTAL</b>	<b>2,185</b>	<b>22.6%</b>
<b>Civil Departments:</b>		
Health (DH including NHS)	924	9.6%
of which: National Health Service (NHS)	892	9.2%
Business, Innovation and Skills (BIS)	729	7.5%
International Development (DFID)	229	2.4%
Scottish Government (SG)	164	1.7%
Environment, Food and Rural Affairs (DEFRA)	141	1.5%
Culture, Media and Sport (DCMS)	45	0.5%
Transport (DfT)	38	0.4%
Energy and Climate Change (DECC)	37	0.4%
Welsh Government (WG)	11	0.1%
Other Departments	26	0.3%
Northern Ireland Departments (NI)	21	0.2%
Work and Pensions (DWP)	21	0.2%
Home Office (HO)	18	0.2%
Education (DfE)	14	0.1%
Communities and Local Government (DCLG)	9	0.1%
Ministry of Justice (MoJ)	8	0.1%
Health and Safety Executive (HSE)	8	0.1%
Food Standards Agency (FSA)	7	0.1%
Foreign and Commonwealth Office (FCO)	~	~
Net Launch Investment	-150	-1.6%
<b>TOTAL</b>	<b>2,298</b>	<b>23.8%</b>
Ministry of Defence (MoD)		
of which: Research	565	5.8%
Development	895	9.3%
<b>TOTAL</b>	<b>1,460</b>	<b>15.1%</b>
Indicative UK contributions to EU R&D expenditure	718	7.4%
<b>GRAND R&amp;D TOTAL</b>	<b>9,671</b>	<b>100.0%</b>

~ denotes value too small to display.

Notes: 1. "Other departments" includes: HMRC, HMT, Forestry Commission, Ordnance Survey Research, GCHQ, Ofsted and OFFA. 2. Figures for the departments may not add up to the grand total shown due to rounding. 3. See Table 3 of ONS SET statistics for detailed footnotes.

Source: ONS, [Science, engineering and technology statistics 2012](#), Table 3

## 13 Research and Development in the UK

**Table 5: Net Government expenditure on R&D by departments, 2012**

	<i>£ million - current prices</i>											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Civil</b>	<b>5,109</b>	<b>5,785</b>	<b>6,127</b>	<b>6,076</b>	<b>6,777</b>	<b>6,994</b>	<b>7,060</b>	<b>7,709</b>	<b>8,287</b>	<b>8,215</b>	<b>8,357</b>	<b>8,211</b>
Research Councils:	1,649	1,870	2,143	2,281	2,763	2,883	2,714	2,984	3,148	3,201	3,194	3,010
Higher Education Funding Councils (HEFCs)	1,474	1,626	1,665	1,804	1,928	2,085	2,234	2,227	2,395	2,303	2,257	2,185
Civil Departments:	1,595	1,849	1,929	1,666	1,721	1,652	1,738	1,905	2,076	2,064	2,245	2,298
Indicative UK contributions to EU R&D expenditure	391	440	390	325	365	374	374	593	668	647	661	718
<b>Ministry of Defence</b>	<b>2,057</b>	<b>2,734</b>	<b>2,133</b>	<b>2,191</b>	<b>2,243</b>	<b>2,124</b>	<b>2,139</b>	<b>1,991</b>	<b>1,752</b>	<b>1,693</b>	<b>1,306</b>	<b>1,460</b>
Research	557	516	524	639	598	632	635	584	575	534	553	565
Development	1,500	2,218	1,609	1,552	1,645	1,492	1,505	1,406	1,177	1,159	753	895
<b>Total</b>	<b>7,165</b>	<b>8,519</b>	<b>8,260</b>	<b>8,267</b>	<b>9,021</b>	<b>9,119</b>	<b>9,199</b>	<b>9,699</b>	<b>10,039</b>	<b>9,907</b>	<b>9,664</b>	<b>9,671</b>
	<i>£ million - constant prices</i>											
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Civil</b>	<b>6,636</b>	<b>7,345</b>	<b>7,633</b>	<b>7,365</b>	<b>8,068</b>	<b>8,095</b>	<b>7,969</b>	<b>8,464</b>	<b>8,856</b>	<b>8,553</b>	<b>8,506</b>	<b>8,211</b>
Research Councils:	2,142	2,374	2,670	2,765	3,289	3,337	3,063	3,276	3,364	3,333	3,251	3,010
Higher Education Funding Councils (HEFCs)	1,915	2,065	2,074	2,187	2,296	2,413	2,522	2,445	2,559	2,398	2,297	2,185
Civil Departments:	2,072	2,348	2,403	2,019	2,049	1,912	1,962	2,092	2,219	2,149	2,285	2,298
Indicative UK contributions to EU R&D expenditure	507	558	486	394	434	433	422	651	714	673	673	718
<b>Ministry of Defence</b>	<b>2,673</b>	<b>3,472</b>	<b>2,657</b>	<b>2,656</b>	<b>2,671</b>	<b>2,458</b>	<b>2,415</b>	<b>2,185</b>	<b>1,872</b>	<b>1,763</b>	<b>1,329</b>	<b>1,460</b>
Research	723	655	653	775	712	732	716	642	614	556	563	565
Development	1,949	2,817	2,004	1,882	1,959	1,726	1,698	1,544	1,257	1,207	766	895
<b>Total</b>	<b>9,309</b>	<b>10,818</b>	<b>10,289</b>	<b>10,021</b>	<b>10,739</b>	<b>10,553</b>	<b>10,384</b>	<b>10,648</b>	<b>10,727</b>	<b>10,316</b>	<b>9,834</b>	<b>9,671</b>

Source: ONS, [Science, engineering and technology statistics 2012](#), Tables 3 and 4

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