1992-93

Research and Experimental Development All-Sector Summary Australia

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RESEARCH AND EXPERIMENTAL DEVELOPMENT ALL-SECTOR SUMMARY AUSTRALIA 1992-93

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INQUIRIES

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- *for further information about constant price estimates* contact Paul Curran on Canberra (06) 252 6801.
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Gross Expenditure on R&D (GERD)

Gross expenditure on R&D (GERD) carried out by organisations in Australia during 1992-93 is estimated to be $6,309 million at current prices. This represents an increase of 23 per cent over the two years since 1990-91.

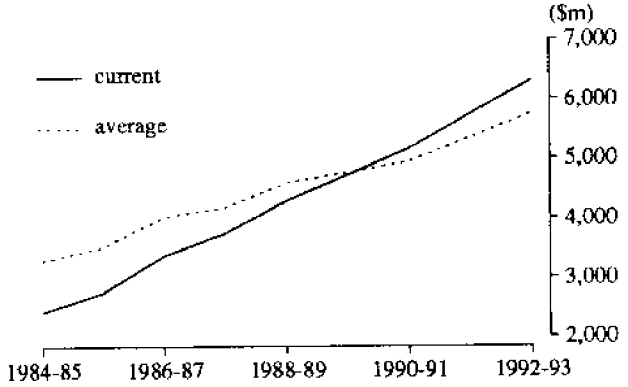
In 1992-93, 44 per cent of GERD was expended in the Business enterprise sector, 28 per cent in the General government sector, 27 per cent in the Higher education sector and 1 per cent in the Private non-profit sector. In comparison, in 1990-91 40 per cent, 32 per cent, 26 per cent and 1 per cent of GERD was expended in these sectors respectively.

GERD at average 1989-90 prices is estimated to be $5,753 million. This represents an increase of 16 per cent when compared with 1990-91. At average 1989-90 prices, both the Business enterprises and Higher education sectors increased their R&D expenditure substantially over the two years since 1990-91; by 28 per cent ($552 million) and 23 per cent ($296 million) respectively.

GERD at $6,309 million represents 1.55 per cent of Gross Domestic Product (GDP), compared to 1.36 per cent in 1990-91. Australia's GERD/GDP ratio, compared with other OECD countries, is shown in the table below.

Japan	2.99
USA	2.68
Germany	2.53
France	2.36
Finland	2.18
UK	2.12
AUSTRALIA	**1.55**
Austria	1.54
Canada	1.51
Iceland	1.39
Italy	1.38
Ireland	1.11
Spain	0.85

GERD AT CURRENT AND AVERAGE 89-90 PRICES



GROSS EXPENDITURE ON R&D AS A PERCENTAGE OF GDP

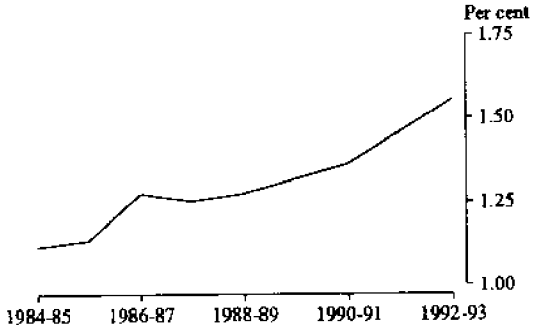


TABLE 1. GROSS EXPENDITURE ON RESEARCH AND EXPERIMENTAL DEVELOPMENT (GERD), AUSTRALIA ($m)

Sector	*1984-85*	*1985-86*	*1986-87*	*1987-88*	*1988-89 r*	*1990-91 r*	*1992-93*
AT CURRENT PRICES							
Business Enterprises							
Private Sector	653.8	852.2	1,165.1	1,388.2	1,649.1	1,878.7	2,544.0
Public Sector	77.3	95.7	123.5	117.6	149.2	203.6	243.9
General Government							
Commonwealth	669.4	729.0	786.5	797.0	869.6	1,025.8	1,128.2
State	285.9	315.8	368.4	394.6	482.7	638.5	615.5
Higher Education	685.7	(a) 707.6	881.7	983.6	1,076.8	1,332.8	1,695.2
Private non-profit	43.5	47.1	49.1	53.9	53.3	70.3	81.9
Total	**2,415.6**	**(a) 2,747.4**	**3,374.3**	**3,734.9**	**4,280.7**	**5,149.7**	**6,308.8**
AT AVERAGE 1989-90 PRICES							
Business Enterprises							
Private Sector	919.8	1,110.1	1,403.2	1,527.0	1,783.2	1,798.1	2,319.2
Public Sector	102.9	117.9	141.0	129.4	159.6	191.1	221.5
General Government							
Commonwealth	891.2	910.9	925.7	883.3	894.4	956.9	969.7
State	391.3	404.3	438.7	447.9	524.4	615.3	562.1
Higher Education	925.3	(a) 909.9	1,043.7	1,120.8	1,165.7	1,312.5	1,608.5
Private non-profit	59.9	60.1	60.6	63.1	58.8	67.4	72.2
Total	**3,290.4**	**(a) 3,513.2**	**4,012.9**	**4,171.5**	**4,586.1**	**4,941.3**	**5,753.2**

(a) Estimates for Colleges of Advanced Education are excluded as they were not collected for this year

Human resources devoted to R&D

Human resources devoted to R&D carried out by organisations in Australia during 1992-93 are estimated to be 78,538 person years. This represents an increase of 15 per cent over 1990-91.

Human resources devoted to R&D increased at an annual rate of 7.2 per cent between 1990-91 and 1992-93, compared to an annual increase of 4.9 per cent for the period of 1984-85 to 1990-91.

Of the 78,538 person years of human resource effort devoted to R&D in 1992-93, higher education organisations accounted for 35,418 person years of effort (45%), business enterprises 22,811 person years (29%), general government 19,188 person years (24%), and private non-profit organisations 1,120 person years (1%).

From 1990-91 to 1992-93, human resources devoted to R&D by higher education organisations increased by 8,337 person years (31%), by business enterprises by 1,904 person years (9%), and by private non-profit organisations by 48 person years (4%). Over the same period, human resources devoted to R & D by general government organisations decreased by 97 person years (1%).

HUMAN RESOURCES DEVOTED TO R&D

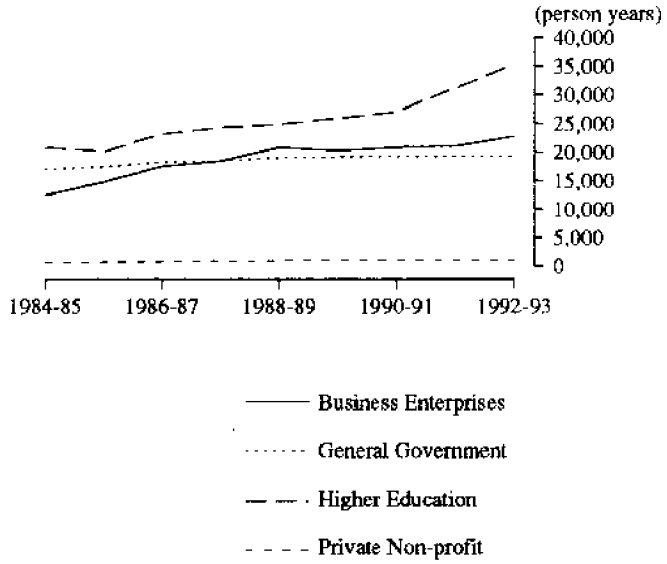


TABLE 2. HUMAN RESOURCES DEVOTED TO R & D, AUSTRALIA
(person years)

Sector	*1984-85*	*1985-86*	*1986-87*	*1987-88*	*1988-89 r*	*1990-91 r*	*1992-93*
Business Enterprises							
Private Sector	11,324	13,431	16,198	16,952	19,206	19,040	20,592
Public Sector	1,238	1,353	1,393	1,527	1,597	1,867	2,219
General Government							
Commonwealth	11,119	11,182	11,529	11,491	10,863	10,660	10,964
State	6,018	6,337	6,796	7,133	8,335	8,625	8,224
Higher Education	20,844	(a) 20,143	23,219	24,323	24,902	27,081	35,418
Private non-profit	712	812	945	1,016	1,023	1,072	1,120
Total	**51,255**	**(a) 53,258**	**60,080**	**62,442**	**65,926**	**68,345**	**78,538**

(a) Estimates for Colleges of Advanced Education are excluded as they were not collected for this year

Type of expenditure

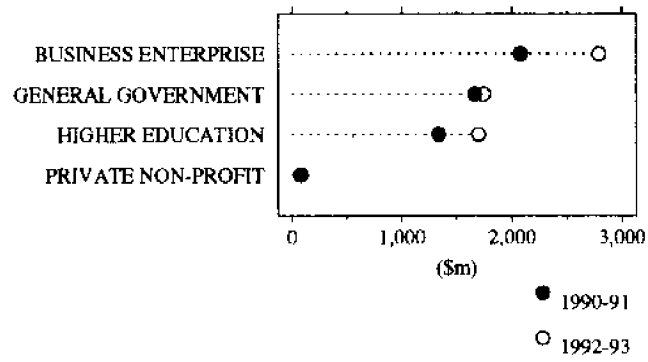
Labour costs continue to be the major component of gross R&D expenditure (53%). However, labour costs as a percentage of total gross expenditure has decreased from 56 per cent in 1990-91. Other current expenditure has increased as a percentage of total gross expenditure from 31 per cent in 1990-91 to 34 per cent in 1992-93. Expenditure on land and buildings fell from 4 per cent of gross expenditure in 1990-91 to 3 per cent in 1992-93, while other capital expenditure increased from 9 per cent to 10 per cent.

Expenditure by the Business enterprise sector on land and buildings decreased by 23 per cent between 1990-91 and 1992-93, compared to an increase of 74 per cent in other capital expenditure. Increases of 15 per cent and 53 per cent respectively, were recorded in labour costs and other current expenditure by the Business enterprise sector.

The Higher education sector recorded increases for all types of expenditure between 1990-91 and 1992-93. The largest percentage increase was recorded for other capital expenditure with 34 per cent.

The increase in gross expenditure by the General government sector (5%) was due to increases of 7 per cent in both labour costs and other current expenditure.

R&D EXPENDITURE BY SECTOR



R&D EXPENDITURE BY TYPE OF EXPENDITURE

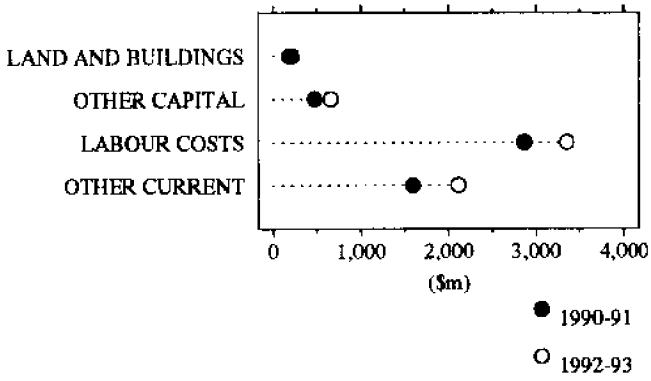


TABLE 3. GROSS EXPENDITURE ON RESEARCH AND EXPERIMENTAL DEVELOPMENT (GERD), AUSTRALIA SECTOR BY TYPE OF EXPENDITURE
($'000)

Sector	*Total*	*Land and buildings*	*Other capital expenditure*	*Labour costs(a)*	*Other current expenditure*
			1990-91 r		
Business Enterprises					
Private Sector	1,878,740	40,292	167,495	946,951	724,003
Public Sector	203,629	5,578	31,207	108,438	58,406
General Government					
Commonwealth	1,025,800	38,971	91,704	553,470	341,655
State	638,463	58,130	40,855	383,543	155,935
Higher Education	1,332,799	67,974	134,985	834,675	295,165
Private non-profit	70,312	2,694	6,147	41,058	20,414
Total	**5,149,743**	**213,638**	**472,393**	**2,868,134**	**1,595,578**
			1992-93		
Business Enterprises					
Private Sector	2,544,013	32,700	322,577	1,071,849	1,116,888
Public Sector	243,913	2,823	22,747	140,069	78,274
General Government					
Commonwealth	1,128,206	46,038	88,807	618,261	375,100
State	615,546	29,151	37,920	388,825	159,651
Higher Education	1,695,209	75,747	180,954	1,079,602	358,907
Private non-profit	81,929	1,611	6,166	48,613	25,539
Total	**6,308,817**	**188,070**	**659,171**	**3,347,219**	**2,114,359**

(a) Includes wages and salaries, payroll tax, payments to contract staff on the payroll, fringe benefits tax and workers compensation insurance, overtime earnings, shift allowances, penalty rates, bonuses, commission payments, holiday pay, long service leave payments, sick pay, employer contributions to superannuation and pension schemes.

Source of funds for R&D

The sources of funds for R&D expenditure in Australia in 1992-93 were Business enterprises $2,761m (44%), up from 41 per cent in 1990-91, Commonwealth government $2,648m (42%), down from 44 per cent in 1990-91, State government $530m (8%), down from 11 per cent in 1990-91, Private non-profit and other Australian $254m (4%), up from 3 per cent in 1990-91, and Overseas $116m (2%) up from 1 per cent of R&D expenditure in 1990-91.

SOURCE OF FUNDS FOR R&D EXPENDITURE

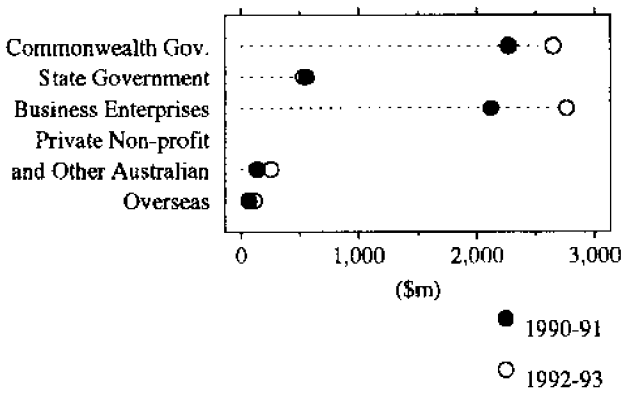


TABLE 4. GROSS EXPENDITURE ON RESEARCH AND EXPERIMENTAL DEVELOPMENT (GERD), AUSTRALIA SECTOR BY SOURCE OF FUNDS
($'000)

Sector	*Total*	*Commonwealth government*	*State government*	*Business enterprises*	*Private non-profit and other Australian(a)*	*Overseas*
			1990-91 r			
Business Enterprises						
Private Sector	1,878,740	48,501	5,480	1,778,992	5,775	39,992
Public Sector	203,629	5,611	3,319	194,491	208	—
General Government						
Commonwealth	1,025,800	931,474	8,232	74,515	2,471	9,107
State	638,463	70,528	500,517	34,926	28,851	3,641
Higher Education	1,332,799	1,190,555	29,556	29,917	73,438	9,334
Private non-profit	70,312	21,656	10,586	5,971	29,323	2,776
Total	**5,149,743**	**2,268,325**	**557,691**	**2,118,812**	**140,065**	**64,850**
			1992-93			
Business Enterprises						
Private Sector	2,544,013	n.p.	n.p.	2,394,357	10,411	84,696
Public Sector	243,913	n.p.	n.p.	229,180	7,479	—
General Government						
Commonwealth	1,128,206	965,475	11,378	74,655	62,727	13,971
State	615,546	53,133	464,642	15,920	77,888	3,963
Higher Education	1,695,209	1,544,754	34,771	41,684	63,488	10,512
Private non-profit	81,929	30,943	10,930	5,440	31,635	2,982
Total	**6,308,817**	**2,648,093**	**529,735**	**2,761,235**	**253,628**	**116,125**

(a) Includes funds provided via government levies.

Type of activity

Experimental development replaced applied research as the predominant activity on which R&D funds were expended, accounting for $2,399m (38%) of gross expenditure on R&D. Applied research accounted for $2,103m (33%) of gross R&D expenditure, strategic basic research accounted for $1,028m (16%) of expenditure and pure basic research accounted for $778m (12%) of gross R&D expenditure.

The Higher education sector contributed $676m (87%) to expenditure on pure basic research to be the major contributor to this activity. The General government sector contributed $443m (43%) to strategic basic research and $871m (41%) to applied research to be the main contributor to both of these activities. Business enterprises undertook the major portion of experimental development activity with expenditure of $1,921m (80%).

GERD BY TYPE OF R&D BY SECTOR, 1992-93

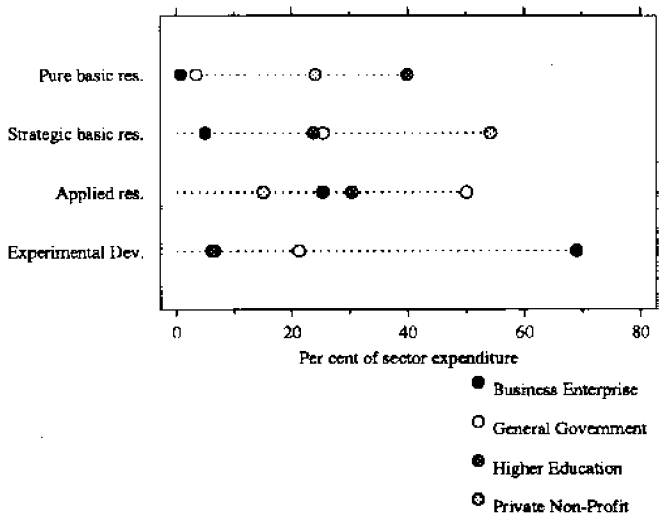


TABLE 5. GROSS EXPENDITURE ON RESEARCH AND EXPERIMENTAL DEVELOPMENT (GERD), AUSTRALIA SECTOR BY TYPE OF ACTIVITY(a)
($'000)

Sector	*Total*	*Pure basic research*	*Strategic basic research*	*Applied research*	*Experimental development*
			1990-91 r		
Business Enterprises					
Private Sector	1,878,740	15,857	82,110	517,942	1,262,832
Public Sector	203,629	929	25,678	92,849	84,173
General Government					
Commonwealth	1,025,800	33,105	292,936	466,203	233,554
State	638,463	28,795	119,974	398,818	90,875
Higher Education	1,332,799	547,703	292,262	411,827	81,006
Private non-profit	70,312	15,092	36,909	13,816	4,495
Total	**5,149,743**	**641,480**	**849,868**	**1,901,456**	**1,756,935**
			1992-93		
Business Enterprises					
Private Sector	2,544,013	21,827	118,225	638,362	1,765,600
Public Sector	243,913	396	21,131	66,649	155,737
General Government					
Commonwealth	1,128,206	34,521	348,173	485,242	260,270
State	615,546	25,824	94,920	386,227	108,574
Higher Education	1,695,209	675,864	401,524	514,177	103,645
Private non-profit	81,929	19,755	44,382	12,396	5,396
Total	**6,308,817**	**778,187**	**1,028,355**	**2,103,053**	**2,399,222**

(a) Data within this classification are subjectively allocated by respondents at the time of reporting, using OECD/ABS definitions. Analysts using this classification should bear the original subjectivity in mind. See Paragraph 9 of the Explanatory Notes.

State comparisons

The leading States in terms of location of gross R&D expenditure in 1992-93 are Victoria at $1,955m and New South Wales at $1,904m, accounting for approximately 31 per cent and 30 per cent of total expenditure respectively. Next in order are Queensland (11%), Western Australia (9%), South Australia (8%), the Australian Capital Territory and External Territories (7%), Tasmania (2%), Overseas and the Northern Territory (1% each).

LOCATION OF R&D EXPENDITURE

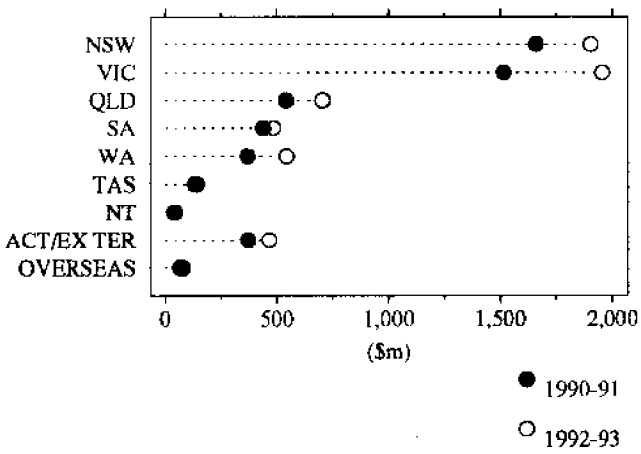


TABLE 6. GROSS EXPENDITURE ON RESEARCH AND EXPERIMENTAL DEVELOPMENT (GERD), AUSTRALIA, SECTOR BY LOCATION OF EXPENDITURE(a)
($'000)

Sector	*Total*	*NSW*	*Vic.*	*Qld*	*SA*	*WA*	*Tas.*	*NT*	*ACT and Ext. Terr.*	*Overseas*
					1990-91 r					
Business Enterprises										
Private Sector	1,878,740	772,320	648,366	134,321	111,404	126,904	32,767	1,646	17,239	33,774
Public Sector	203,629	97,492	88,682	6,281	3,189	5,073	751	—	1,994	167
General Government										
Commonwealth	1,025,800	192,247	290,816	73,888	162,994	36,004	49,248	12,620	165,876	42,105
State	638,463	162,813	119,419	154,703	72,480	85,801	20,076	21,594	668	908
Higher Education	1,332,799	414,440	321,852	170,982	87,831	115,860	33,448	2,989	185,396	—
Private non-profit	70,312	19,882	44,771	1,207	1,116	992	88	12	1,996	249
Total	**5,149,743**	**1,659,193**	**1,513,906**	**541,382**	**439,014**	**370,633**	**136,378**	**38,862**	**373,168**	**77,203**
					1992-93					
Business Enterprises										
Private Sector	2,544,013	918,968	953,873	191,537	138,350	276,751	26,970	2,166	20,309	15,089
Public Sector	243,913	107,171	118,934	3,385	9,234	3,711	544	—	908	26
General Government										
Commonwealth	1,128,206	206,852	316,144	86,343	148,199	38,374	56,364	13,606	212,887	49,437
State	615,546	148,404	124,737	149,155	69,353	79,460	20,240	23,137	128	931
Higher Education	1,695,209	503,189	385,695	271,653	118,247	144,574	35,650	5,732	230,471	—
Private non-profit	81,929	19,458	55,527	1,489	1,157	1,613	180	62	2,336	107
Total	**6,308,817**	**1,904,042**	**1,954,910**	**703,562**	**484,540**	**544,483**	**139,948**	**44,703**	**467,040**	**65,589**

(a) Location of the expenditure. This may not be the location of the organisations head office.

Type of employee

Total person years of effort for 1992-93 was 78,538, an increase of approximately 15 per cent over 1990-91 (68,345 person years). The effort by researchers increased by approximately 20 per cent from 42,762 to 51,506 person years, that by technicians increased by approximately 8 per cent from 16,169 to 17,468 person years and the effort by other supporting staff increased by approximately 2 per cent from 9,413 in 1990-91 to 9,564 person years in 1992-93.

Researchers were the predominant type of employee in total person years for all sectors, accounting for approximately 79 per cent of higher education person years, 61 per cent of business enterprise person years and 48 per cent of both general government and private non-profit person years of effort. The next major contributor for all sectors was technicians followed by other supporting staff.

HUMAN RESOURCES BY TYPE OF EMPLOYEE BY SECTOR, 1992-93

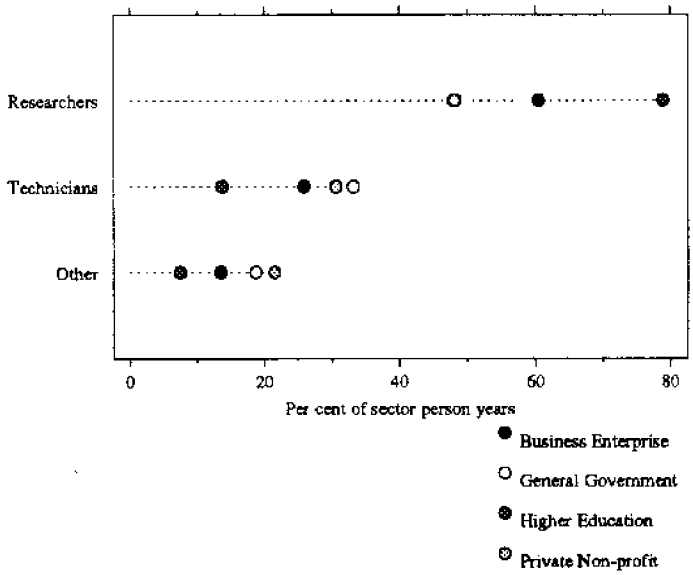


TABLE 7. HUMAN RESOURCES DEVOTED TO RESEARCH AND EXPERIMENTAL DEVELOPMENT, AUSTRALIA SECTOR BY TYPE OF EMPLOYEE
(person years)

Sector	*Total*	*Researchers*	*Technicians*	*Other supporting staff*
		1990-91 r		
Business Enterprises				
Private Sector	19,040	11,358	5,119	2,564
Public Sector	1,867	1,181	433	253
General Government				
Commonwealth	10,660	4,951	2,976	2,732
State	8,625	4,110	3,134	1,381
Higher Education	27,081	20,666	4,166	2,249
Private non-profit	1,072	497	341	234
Total	**68,345**	**42,762**	**16,169**	**9,413**
		1992-93		
Business Enterprises				
Private Sector	20,592	12,418	5,340	2,835
Public Sector	2,219	1,386	578	255
General Government				
Commonwealth	10,964	5,448	3,257	2,260
State	8,224	3,804	3,093	1,327
Higher Education	35,418	27,914	4,858	2,646
Private non-profit	1,120	536	343	241
Total	**78,538**	**51,506**	**17,468**	**9,564**

Purpose of R&D activity (expenditure)

The Business Enterprise, General Government, Higher Education and Private Non-profit sectors' R&D expenditure data are classified by Socio-economic Objective (SEO). In 1992-93, this R&D expenditure was directed towards Economic development ($3,917m or 62%), Advancement of knowledge ($835m or 13 per cent), Society ($754m or 12%), Environment ($464m or 7 per cent) and Defence ($339m or 5%). Manufacturing and Information and communication services were the major sub-divisions within the Economic development division accounting for $1,778m or 28 per cent and $448m or 7 per cent of total expenditure respectively. Health was the major sub-division within the Society division with $557m or 9 per cent of total expenditure and Natural sciences, technologies and engineering was the major sub-division within the Advancement of knowledge division contributing $554m or 9 per cent of total expenditure on R&D. Environmental knowledge was the major sub-division within the Environment division with $238m or 4 per cent of total expenditure.

The SEO division of Economic development accounted for the majority of the Business enterprise sectors expenditure on R&D with $2,500m or 90 per cent of Business enterprise expenditure on R&D. The major subdivisions of Business enterprise expenditure were Manufacturing and Information and communication services with $1,483m or 53 per cent and $380m or 14 per cent of total Business enterprise expenditure respectively.

In the Commonwealth government sector, the SEO division of Economic development accounted for the majority of the expenditure on R&D with $603m or 53 per cent. The major SEO sub-divisions were Manufacturing and Environmental knowledge with $201m or 18 per cent and $110m or 10 per cent of total commonwealth government expenditure respectively.

PURPOSE OF R&D EXPENDITURE

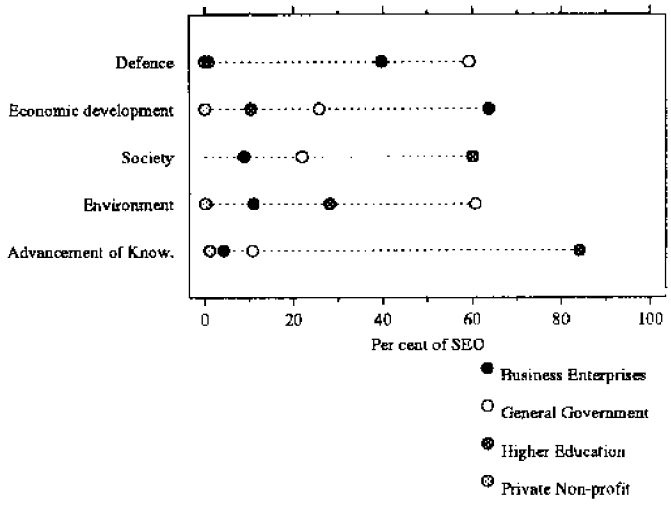


TABLE 8. GROSS EXPENDITURE ON RESEARCH AND EXPERIMENTAL DEVELOPMENT (GERD) BY SOCIO-ECONOMIC OBJECTIVE BY SECTOR, AUSTRALIA, 1992-93
($'000)

			General Government			
Socio-economic objective	*Total*	*Business Enterprise*	*Common-wealth*	*State*	*Higher Education*	*Private non-profit*
Defence	**338,959**	**134,725**	**201,287**	**22**	**2,926**	**—**
Economic development						
Plant — production and primary products	351,655	45,428	75,211	172,280	58,537	201
Animal — production and primary products	346,291	25,906	103,636	173,568	42,239	942
Mineral resources (excl. energy)	193,111	100,496	59,740	10,912	21,900	64
Energy resources	176,519	115,334	50,919	1,054	9,170	43
Energy supply	104,676	55,384	16,364	1,861	30,882	184
Manufacturing	1,777,623	1,483,092	200,869	18,368	75,018	277
Construction	103,323	25,747	28,528	10,210	38,513	325
Transport	91,434	65,392	12,188	9,286	4,536	32
Information and communication services	447,816	380,306	30,060	2,821	34,607	21
Commercial services	219,170	198,056	4,316	888	14,232	1,678
Economic framework	105,306	5,112	21,628	983	76,339	1,244
Total Economic development	**3,916,924**	**2,500,252**	**603,458**	**402,231**	**405,971**	**5,011**
Society						
Health	556,900	54,801	21,006	102,651	318,975	59,468
Education and training	98,965	4,457	1,397	5,509	81,286	6,317
Social development and community services	97,944	8,088	27,605	7,490	53,731	1,031
Total Society	**753,810**	**67,345**	**50,007**	**115,649**	**453,992**	**66,816**
Environment						
Environmental knowledge	237,933	12,302	109,638	30,340	84,780	873
Environmental aspects of economic development	172,197	20,922	87,737	27,728	35,800	10
Environmental management and other aspects	53,564	17,617	14,825	10,805	9,959	358
Total environment	**463,694**	**50,841**	**212,200**	**68,873**	**130,539**	**1,241**
Advancement of knowledge						
Natural sciences, technologies and engineering	553,930	34,752	60,653	27,581	422,316	8,628
Social sciences and humanities	281,500	10	601	1,190	279,466	234
Total advancement of knowledge	**835,430**	**34,762**	**61,254**	**28,771**	**701,782**	**8,862**
TOTAL	**6,308,817**	**2,787,926**	**1,128,206**	**615,546**	**1,695,209**	**81,929**

Purpose of R&D activity (expenditure) - *continued*

The Economic development division also accounted for the majority of expenditure by the State government sector with $402m or 65 per cent of total state government R&D expenditure. The major sub-divisions of expenditure were Animal production and primary products and Plant production and primary products with $174m and $172m respectively or 28% each of total state government R&D expenditure.

The Higher education sector directed $702m or 41 per cent of total Higher education R&D expenditure towards Advancement of knowledge. The subdivision of Health accounted for a further $319m or 19 per cent.

In the Private non-profit sector, the SEO division of Society accounted for $67m or 82 per cent of total Private non-profit expenditure.

Purpose of R&D activity (human resources)

The Business enterprise, General government, Higher education and Private non-profit sectors R&D human resources data are also classified by Socio-economic Objective (SEO). The divisions of the SEO to which these resources were devoted were Economic development (40,773 person years or 52%), Advancement of knowledge (14,940 person years or 19 per cent), Society (14,288 person years or 18%), Environment (6,003 person years or 8%) and Defence (2,533 person years or 3%). Within the Economic development division the major subdivisions were Manufacturing, and Information and communication services, with 15,665 person years or 20 per cent and 4,693 person years or 6 per cent of total human resources respectively. The major sub-division within Society was Health with 9,627 person years or 12 per cent of total human resources.

In the Business enterprise sector, the Economic development division accounted for the majority of human resources devoted to R&D with 21,038 person years (92%). The major subdivisions were Manufacturing and Information and communication services with 11,776 (52%) and 3,399 (15%) of total person years of effort respectively.

Similarly, within the Commonwealth government sector the Economic development division accounted for the majority of human resources devoted to R&D with 5,945 person years (54%). The major sub-divisions were Manufacturing and Animal production and primary products with 1,870 person years (17%) and 1,060 person years (10%) of Commonwealth government human resource effort respectively.

Economic development was also the main division in which State government devoted the majority of human resources with 4,908 person years (60%). The subdivision of Health accounted for a further 1,837 person years (22%).

Advancement of knowledge was the main division to which human resources were devoted in the Higher education sector with 13,662 person years (39%). The divisions of Society and Economic development accounted for 10,120 person years (29%) and 8,823 person years (25%) respectively.

The Private non-profit sector devoted the majority of its human resource effort to the Society division with 927 person years (83%).

TABLE 9. HUMAN RESOURCES DEVOTED TO R & D BY SOCIO-ECONOMIC OBJECTIVE BY SECTOR, AUSTRALIA, 1992-93
(person years)

Socio-economic objective	*Total*	*General Government*			*Higher Education*	*Private non-profit*
		Business Enterprise	*Common-wealth*	*State*		
Defence	**2,533**	**351**	**2,104**	—	**78**	—
Economic development						
Plant — production and primary products	4,513	388	767	2,151	1,204	3
Animal — production and primary products	4,356	198	1,060	2,147	939	12
Mineral resources (excl. energy)	1,758	675	521	130	431	—
Energy resources	1,671	996	439	11	225	—
Energy supply	1,154	413	154	18	567	2
Manufacturing	15,665	11,776	1,870	222	1,794	3
Construction	1,471	269	290	102	808	2
Transport	984	620	166	75	124	—
Information and communication services	4,693	3,399	326	27	941	—
Commercial services	2,664	2,240	43	14	350	17
Economic framework	1,843	64	309	12	1,439	19
Total Economic development	**40,773**	**21,038**	**5,945**	**4,908**	**8,823**	**59**
Society						
Health	9,627	479	259	1,837	6,187	865
Education and training	2,625	69	23	85	2,402	46
Social development and community services	2,036	107	289	92	1,531	17
Total Society	**14,288**	**654**	**572**	**2,015**	**10,120**	**927**
Environment						
Environmental knowledge	3,312	134	985	408	1,770	15
Environmental aspects of economic development	2,016	149	815	321	731	—
Environmental management and other aspects	675	136	149	150	234	6
Total environment	**6,003**	**420**	**1,949**	**880**	**2,734**	**21**
Advancement of knowledge						
Natural sciences, technologies and engineering	9,190	348	385	411	7,936	110
Social sciences and humanities	5,750	—	10	11	5,726	3
Total advancement of knowledge	**14,940**	**349**	**395**	**421**	**13,662**	**113**
TOTAL	**78,538**	**22,811**	**10,964**	**8,224**	**35,418**	**1,120**

Field of Research (FOR) (expenditure)

The General government, Higher education and Private non-profit sectors' R&D expenditure data are classified by Field of Research. The expenditure on R&D activity by these sectors in 1992-93 is estimated to be $3,521m of which $2,922m (83%) was directed towards the Natural sciences, technologies and engineering and $599m (17%) towards Social sciences and humanities. Agricultural sciences, Medical and health sciences and Applied sciences and technologies were the main sub-divisions within the Natural sciences, technologies and engineering division with 18 per cent ($637m), 14 per cent ($493m) and 12 per cent ($430m) of total R&D expenditure respectively. The main contributor to the Social sciences and humanities division was Humanities with 5 per cent ($167m) of total R&D expenditure.

The Natural sciences, technologies and engineering division accounted for the majority of Commonwealth government expenditure with $1,089m (97%). The major sub-division was Applied sciences and technologies with $351m (31%) of Commonwealth R&D expenditure. The Social sciences and humanities division accounted for $39m (3%) of Commonwealth government R&D expenditure.

State government expenditure on R&D was predominantly expended in the Natural sciences, technologies and engineering division with $600m (97%). The major sub-division was Agricultural sciences with $386m (63%) of State R&D expenditure. The Social sciences and humanities division accounted for $16m (3%) of State government expenditure on R&D.

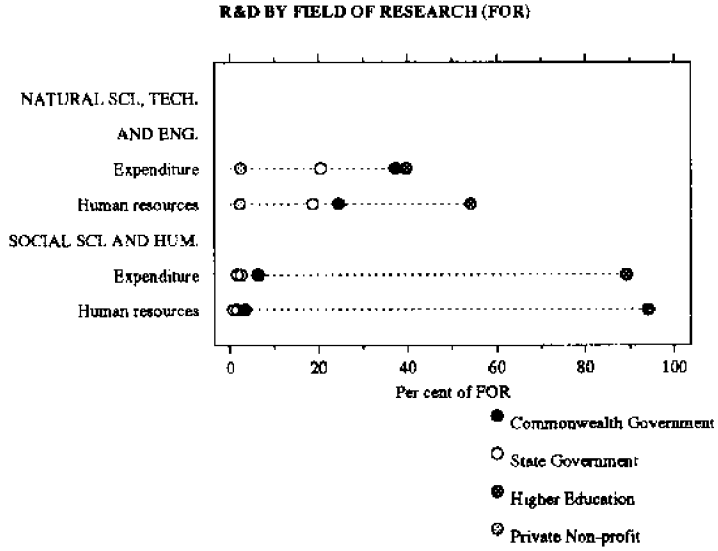


TABLE 10. RESOURCES DEVOTED TO R & D BY FIELD OF RESEARCH BY SECTOR, AUSTRALIA, 1992-93 (a)

	Expenditure ($'000)					*Human resources (person years)*				
		General Government					*General Government*			
Field of research	*Total*	*Common-wealth*	*State*	*Higher Education*	*Private non-profit*	*Total*	*Common-wealth*	*State*	*Higher Education*	*Private non-profit*
Natural sciences, technologies and engineering										
Mathematical sciences	65,148	19,370	687	45,091	—	1,040	281	12	747	—
Physical sciences	138,516	56,598	383	80,214	1,321	1,998	528	4	1,454	11
Chemical sciences	165,046	67,621	4,618	92,364	442	2,461	547	50	1,859	5
Earth sciences	259,180	152,017	30,845	76,265	53	3,103	1,308	394	1,400	1
Information, computers and communication technologies	129,091	44,728	9,457	74,876	30	2,354	466	92	1,795	1
Applied sciences and technologies	430,273	351,065	6,871	71,030	1,307	5,180	3,538	79	1,548	15
General Engineering	216,836	76,874	23,813	115,787	362	3,391	715	231	2,441	3
Biological sciences	388,210	133,768	43,505	194,370	16,567	5,835	1,238	645	3,717	235
Agricultural sciences	636,826	152,868	386,232	97,151	576	8,275	1,530	4,793	1,946	7
Medical and health sciences	493,101	34,228	93,475	314,309	51,090	8,990	352	1,697	6,196	744
Total natural sciences, technologies and engineering	**2,922,228**	**1,089,138**	**599,886**	**1,161,457**	**71,747**	**42,628**	**10,503**	**7,997**	**23,103**	**1,024**
Social sciences and humanities										
Accounting and finance	21,709	—	12	21,697	—	430	—	—	429	—
Economics	73,776	17,037	2,048	52,567	2,124	1,210	239	29	923	19
Political sciences	34,212	281	352	33,512	68	688	3	6	678	1
Sociology	25,345	4,976	1,177	19,125	68	480	27	21	431	1
Law	31,028	3,660	353	26,969	47	612	29	7	575	1
Psychology	37,933	1,276	308	36,326	24	877	13	2	861	1
Education	84,317	263	4,106	73,594	6,352	2,170	2	62	2,059	47
Other social sciences	123,125	11,223	4,003	106,717	1,183	2,753	145	58	2,530	21
Humanities	167,218	352	3,301	163,247	318	3,879	3	42	3,828	6
Total social sciences and humanities	**598,663**	**39,068**	**15,661**	**533,753**	**10,182**	**13,099**	**461**	**227**	**12,315**	**96**
TOTAL	**3,520,891**	**1,128,206**	**615,546**	**1,695,209**	**81,929**	**55,727**	**10,964**	**8,224**	**35,418**	**1,120**

(a) Business enterprise data is not classified by Field of Research

FOR (Expenditure) - *continued*

The Natural sciences, technologies and engineering division accounted for $1,161m (69%) of Higher Education R&D expenditure. The major sub-divisions within this division were Medical and health sciences and Biological sciences with $314m (19%) and $194m (11%) of Higher education R&D expenditure respectively. The Social sciences and humanities division accounted for $534m (31%) of R&D expenditure with Humanities accounting for $163m (10%).

The majority of the Private non-profit sectors R&D expenditure was in the Natural sciences, technologies and engineering division with $72m (88%) of expenditure. The major sub-division was Medical and health sciences with $51m (62%) of R&D expenditure. The Social sciences and humanities division accounted for $10m (12%) of Private non-profit R&D expenditure.

Field of Research (FOR) (human resources)

The total human resource effort for the General government, Higher education and Private non-profit sectors for 1992-93 is estimated to be 55,727 person years. These resources were mainly devoted to the Natural sciences, technologies and engineering division with 42,628 (76%) person years of effort. The Social sciences and humanities division accounted for 13,099 (24%) person years of effort. The major sub-divisions were Medical and health sciences and Agricultural sciences with 8,990 (16%) and 8,275 (15%) person years of effort respectively.

The Commonwealth government sectors human resource effort was mainly directed towards the Natural sciences, technologies and engineering division with 10,503 (96%) person years of effort. The major sub-division within this division was Applied sciences and technologies which accounted for 3,538 (32%) person years of the Commonwealth government sectors human resource effort.

Natural sciences, technologies and engineering was also the major FOR division to which the State government sector devoted the majority of human resources with 7,997 (97%) person years of effort, the largest portion of which was attributed to the Agricultural sciences sub-division which accounted for 4,793 (58%) person years of effort.

The Higher education sector devoted the majority of R&D human resources to the Natural sciences, technologies and engineering division with 23,103 (65%) person years of effort devoted to R&D. The major sub-divisions within this division were Medical and health sciences and Biological sciences with 6,196 (17%) and 3,717 (10%) person years of effort devoted to R&D. The Social sciences and humanities division accounted for 12,315 (35%) person years of effort with Humanities accounting for 3,828 (11%) person years of effort devoted to R&D.

The Private non-profit sector devoted almost all of its R&D human resources to the Natural sciences, technologies and engineering division with 1,024 (91%) person years of effort being devoted to R&D. The major sub-division was Medical and health sciences with 744 (66%) person years of effort devoted to R&D.

Business Enterprises

Business expenditure on R&D in 1992-93 is estimated to be $2,788m. Of this expenditure, 60 per cent ($1,667m) is in Manufacturing industries. The largest other industries are Property and business services (12% of total expenditure) and Wholesale and retail trade (8%).

The average expenditure on R&D per person year of R&D effort in 1992-93 for all enterprises which conducted R&D was approximately $122,000, an increase of approximately $22,000 (22%) per person year of R&D effort over 1990-91.

The proportion of effort by Researchers to total human resource effort ranged from 85 per cent in Finance and insurance to 38 per cent in Motor vehicle and part and other transport equipment manufacturing.

TABLE 11. R & D BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1992-93 BY ANZSIC INDUSTRY OF ENTERPRISE

Industry of enterprise ANZSIC Code	*Description*	*Enterprises (number)*	*Expenditure ($'000)*	*Human resource effort (person years)*	*Researcher effort (person years)*
B	**Mining (including services to mining)**	**86**	**160,041**	**1,133**	**699**
	Manufacturing —				
21	Food, beverage and tobacco	121	136,880	1,125	671
22	Textile, clothing, footwear and leather	49	28,413	212	105
23	Wood and paper product	25	29,414	212	100
24	Printing, publishing and recorded media	34	14,281	140	90
25	Petroleum, coal, chemical and associated product	309	269,603	2,042	1,190
26	Non-metallic mineral product	47	30,791	298	135
27	Metal product	175	346,681	1,778	941
281-282	Motor vehicle and part and other transport equipment	112	307,667	1,694	643
283	Photographic and scientific equipment	96	96,478	931	625
284-285	Electronic and electrical equipment and appliance	451	333,825	3,405	2,316
286	Industrial machinery and equipment	236	62,905	772	355
29	Other manufacturing	55	10,374	139	56
C	**Total manufacturing**	**1,710**	**1,667,312**	**12,747**	**7,226**
	Other industries —				
F-G	Wholesale and retail trade	255	218,665	1,645	1,089
K	Finance and insurance	27	119,517	1,458	1,248
77,782-786	Property and business services	507	345,943	3,525	2,265
781	Scientific research	63	83,111	811	441
(b)	Other n.e.c.	118	193,337	1,492	836
D-Q	**Total other industries**	**970**	**960,573**	**8,930**	**5,878**
	TOTAL ALL INDUSTRIES	**2,766**	**2,787,926**	**22,811**	**13,804**
	Private Sector Contribution	2,724	2,544,013	20,592	12,418
	Public Sector Contribution	42	243,913	2,219	1,386

(a) Excludes enterprises in ANZSIC Division 'A' (b) ANZSIC codes D,E,H-J,M-Q.

Extramural R&D expenditure

Details of extramural R&D payments (ie payments made to other organisations to conduct R&D on behalf of the organisation) were collected for the General Government, Business Enterprise and Private Non-profit sectors. Total extramural payments for R&D for these sectors in 1992-93 are estimated to be $1,242m, or equivalent to 20 per cent of GERD. $1,128m (91%) of these payments were received by organisations within Australia. The next largest recipient of extramural payments was the USA with $26m (2%) of total extramural receipts.

The General government sector accounted for $926m (75%) of total extramural payments, the Business enterprise sector $264m (21%), and the Private non-profit sector $52m (4%) of total extramural payments.

EXTRAMURAL R&D EXPENDITURE BY SECTOR

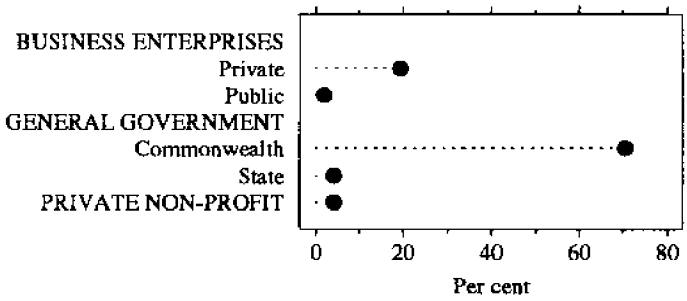


TABLE 12. EXTRAMURAL R & D EXPENDITURE(a), AUSTRALIA, 1992-93(b)
PAYMENTS BY SECTOR BY COUNTRY OF RECIPIENT
($'000)

		Country of recipient									
Sector	*Total payments*	*Australia*	*Africa*	*Asia*	*Canada*	*Europe*	*New Zealand*	*Oceania*	*U.K.*	*U.S.A.*	*Other Countries*
Business Enterprises											
Private Sector	240,387	179,063	—	2,634	2,387	20,534	1,734	—	10,239	23,552	244
Public Sector	23,942	23,586	—	—	—	—	—	—	178	178	—
General Government											
Commonwealth	874,444	830,257	340	16,675	10	1,434	1,006	3,758	438	463	20,063
State	51,237	50,982	—	27	—	150	1	—	40	37	—
Private non-profit	51,865	44,586	442	3,620	78	697	36	—	191	1,777	438
Total	**1,241,875**	**1,128,474**	**782**	**22,956**	**2,475**	**22,815**	**2,777**	**3,758**	**11,086**	**26,007**	**20,745**

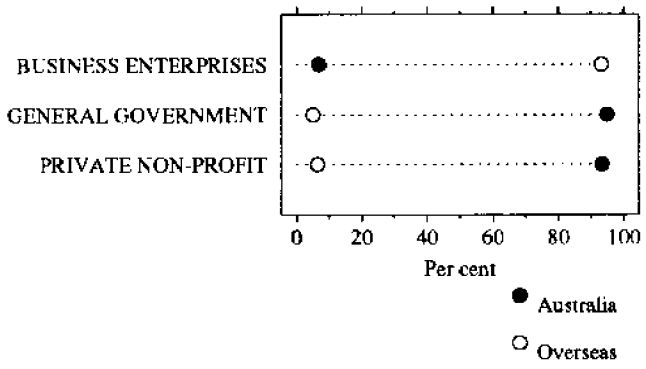
(a) Expenditure on R & D which is funded by an organisation but carried out by other organisations. (b) Extramural R&D expenditure is not available for the Higher Education sector.

Payments for technical know-how

Details on payments for technical know-how were collected for the General Government, Business Enterprise and Private Non-profit sectors. Payments for technical know-how for these sectors in 1992-93 are estimated to be $481m, of which $445m (93%) were payments made to overseas. These payments are equivalent to 8 per cent and 7 per cent of GERD respectively.

The Business enterprise sector accounted for $479m or almost 100% of these payments, $271m (56%) of which was for patent licence fees and royalties and $207m (43%) for other technical know-how.

PAYMENTS FOR TECHNICAL KNOW-HOW



PAYMENTS FOR TECHNICAL KNOW-HOW

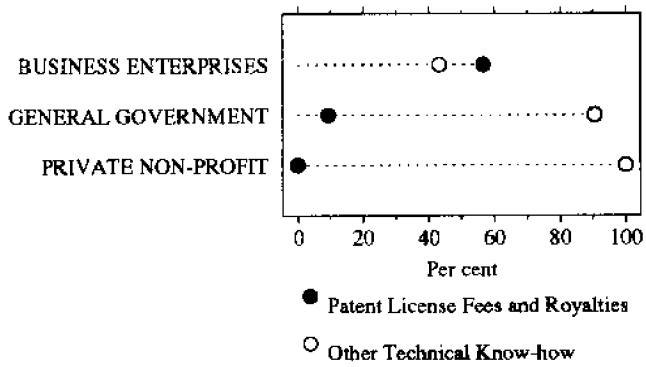


TABLE 13. PAYMENTS FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1992-93(a)
PAYMENTS BY SECTOR BY TYPE OF TECHNICAL KNOW-HOW AND LOCATION OF RECIPIENT
($'000)

		Type of technical know-how		*Location of recipient*	
Sector	*Total*	*Patent licence fees and royalties*	*Other technical know-how*	*Australia*	*Overseas*
Business Enterprises					
Private Sector	474,611	271,194	203,417	29,834	444,777
Public Sector	3,907	83	3,824	3,348	559
General Government					
Commonwealth	153	63	90	90	63
State	1,885	128	1,757	1,844	41
Private non-profit	122	—	122	114	8
Total	**480,678**	**271,468**	**209,210**	**35,230**	**445,448**

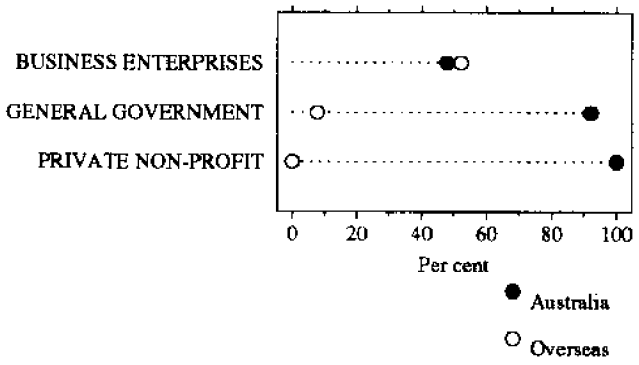
(a) Payments for technical know-how are not available for the Higher Education sector.

Receipts for technical know-how

Details on receipts for technical know-how were collected for the General Government, Business Enterprise and Private Non-profit sectors. Receipts for technical know-how for these sectors in 1992-93 are estimated to be $282m, of which $145m (51%) were received from overseas. These receipts are equivalent to 4 per cent and 2 per cent of GERD respectively.

The Business enterprise sector accounted for $276m (98%) of total receipts for technical know-how of which $81m (29%) were for Patent licence fees and royalties and $196m (71%) were for other technical know-how.

RECEIPTS FOR TECHNICAL KNOW-HOW



RECEIPTS FOR TECHNICAL KNOW-HOW

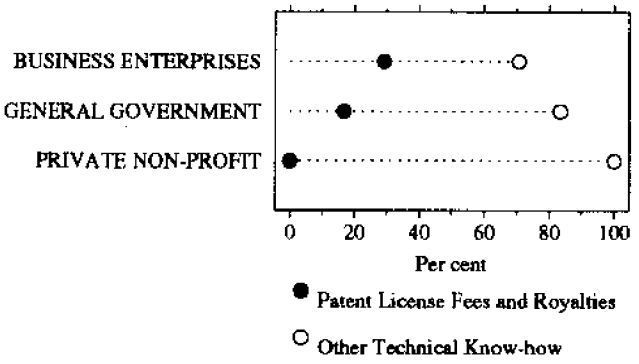


TABLE 14. RECEIPTS FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1992-93(a)
RECEIPTS BY SECTOR BY TYPE OF TECHNICAL KNOW-HOW AND LOCATION OF PAYING ORGANISATION.
($'000)

		Type of technical know-how		*Location of paying organisation*	
Sector	*Total*	*Patent licence fees and royalties*	*Other technical know-how*	*Australia*	*Overseas*
Business Enterprises					
Private Sector	273,687	80,526	193,162	130,722	142,965
Public Sector	2,706	67	2,639	1,126	1,580
General Government					
Commonwealth	3,536	648	2,888	3,267	269
State	1,350	164	1,186	1,242	108
Private non-profit	881	—	881	881	—
Total	**282,160**	**81,405**	**200,756**	**137,238**	**144,922**

(a) Receipts for technical know-how are not available for the Higher Education sector.

Patent activity

Details of patent activity were collected for organisations with R&D activity within the General Government, Business Enterprise and Private Non-profit sectors during 1992-93. These organisations lodged 1,244 patent applications in Australia and 11,954 overseas, during the period 1 July 1991 to 30 June 1993. The majority of these, 1,072 and 8,025 respectively, were lodged by organisations in the Business enterprise sector. During this period 1,140 patents were granted in Australia and 1,936 were granted overseas. The majority, 985 and 1,641 respectively were granted to organisations in the Business enterprise sector.

TABLE 15. PATENT ACTIVITY, BY ORGANISATIONS WITH R & D ACTIVITY DURING 1992-93, AUSTRALIA(a)
PATENT ACTIVITY BY SECTOR, JULY 1991 — JUNE 1993
(number)

	Australia				*Overseas*	
Sector	*Standard patents lodged*	*Petty patents lodged*	*Standard patents granted*	*Petty patents granted*	*Patents lodged (b)*	*Patents granted*
Business Enterprises						
Private Sector	914	128	862	101	7,476	1,626
Public Sector	30	—	22	—	549	15
General Government						
Commonwealth	139	1	134	1	3,168	250
State	8	1	10	1	407	18
Private non-profit	10	13	9	—	354	27
Total	**1,101**	**143**	**1,037**	**103**	**11,954**	**1,936**

(a) Patent activity is not available for the Higher Education sector. (b) See paragraph 10 of the Explanatory Notes.

EXPLANATORY NOTES

Introduction

This publication presents summary statistics of expenditure and human resources devoted to R&D carried out in Australia by enterprises/organisations within the Business Enterprise, General Government and Private Non-profit sectors during 1992-93 and the Higher Education sector during the 1992 calendar year.

2. Also included are statistics of extramural R&D activity, payments and receipts for technical know-how, and patent activity.

3. The statistics presented in this publication have previously been published (at a detailed level) on an individual sector basis (see paragraph 22).

Data sources

4. The R&D statistics presented in this publication were compiled from data collected in the ABS Survey of Research and Experimental Development and in the Department of Employment, Education and Training (DEET) finance and research collection.

5. Information relating to data sources for the individual sectors is contained in the individual sector publications (see paragraph 22).

6. The GDP(E) figures used to derive GERD / GDP ratios quoted in the Summary of Findings are taken from (National Income, Expenditure and Product, September Quarter 1994) and are as follows: $216,249m (1984-85); $241,574m (1985-86); $264,316m (1986-87); $297,735m (1987-88); $335,234m (1988-89); $377,591m (1990-91) and $405,794m (1992-93. The available GERD / GDP ratios for other OECD countries are current at time of manuscript finalisation and are sourced from "Main Science and Technology Indicators, 1994:1", OECD, Paris, 1994.

Definitions

7. Research and Experimental Development is defined in accordance with the Organisation for Economic Co-operation and Development (OECD) standard as comprising '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'.

8. For a more comprehensive interpretation of the definition of R&D, contact the ABS or refer to the OECD publication, "The Measurement of Scientific and Technical Activities ("Frascati Manual" 1993)" OECD, Paris 1994.

9. Type of R&D activity (TOA) comprises pure basic research, strategic basic research, applied research and experimental development. Data in this classification are subjectively allocated by respondents at the time of reporting, using OECD/ABS definitions. ABS makes every effort to ensure correct and consistent interpretation and reporting of this data and applies consistent processing methodologies. Analysts using this classification should bear the original subjectivity in mind.

10. The questions on patents have been revised for the 1992-93 survey. In particular, the question relating to lodgement of patent applications overseas now specifically asks for the number of countries in which protection was initially sought. For example, if four countries were designated in an application (a PCT application or a European Patent application) then the business was asked to record the number of patent applications lodged as four. In previous surveys, it is possible that the patent application would have been recorded as only one lodgement. For this reason the number of patent applications lodged overseas shown in Table 14 of this publication is considerably higher than those shown in earlier publications.

Scope

11. The sector classification used in the compilation of these statistics is adapted from the guidelines specified by the OECD for use in the conduct of R&D surveys.

Four sectors are recognised: Business Enterprise, Higher Education, General Government and Private Non-profit.

(a) The Business Enterprise sector includes all enterprises whose primary activity is the production of goods or services for sale to the general public at a price intended to cover at least the cost of production, and the private non-profit institutions mainly serving them.

(b) The General Government sector includes all Commonwealth, State and Local Government departments and authorities.

(c) The Higher Education sector is defined by OECD as including all universities and other institutions of post-secondary education whatever their source of finance or legal status.

(d) The Private Non-profit sector includes private or semi-public incorporated organisations which are established with the intention of not making a profit.

Coverage

12. Exclusions from the survey coverage are:

(a) Business Enterprise sector for the R&D surveys excludes enterprises mainly engaged in agriculture, forestry, and fishing (i.e. industries in Division A of the Australian and New Zealand Standard Industrial Classification (ANZSIC), 1993), partly because of collection difficulties and partly because such enterprises are believed to have very low R&D activity (agricultural R&D activity is generally carried out by specialised research institutes not included in ANZSIC Division A).

(b) General Government sector excludes local government organisations because it is considered that their contribution to total R&D activity would be minimal. Public sector organisations mainly engaged in higher education (e.g. universities) are included in the Higher Education sector whilst those mainly engaged in trading or financial activities are included in the Business Enterprise sector.

(c) Higher Education sector excludes Technical and Further Education colleges and other post-secondary institutions because it is considered that their contribution to total R&D activity would be minimal.

Socio-economic objective and field of research classifications

13. Statistical information for the General Government, Higher Education and Private Non-profit sectors is classified by both Socio-Economic Objective (SEO) and Field Of Research (FOR). Statistical information for the Business Enterprise sector is only classified by SEO. For a more detailed description and explanation of SEO and FOR classifications, please see the glossary or contact the ABS.

Comparability with previous statistics

14. The latest statistics presented in this publication may not be strictly comparable with those for previous years, as both the SEO and FOR classifications were slightly revised prior to the 1992-93 surveys.

Australian and New Zealand Standard Industrial Classification (ANZSIC)

15. In Table 10, Research and Development by the Business Enterprise sector has been classified by the industry of the enterprise in accordance with the 1993 edition of the ANZSIC.

16. Each enterprise is classified by the ABS to the industry in which it mainly operates even though one or more of its component establishments (factories, shops, etc.) may be classified to other industries.

17. The ANZSIC has replaced the Australian Standard Industrial Classification (ASIC) used previously.

Constant price estimates

18. Estimates of total R&D expenditure are shown at average 1989-90 prices in Table 1. In concept, constant price estimates are measures from which direct effects of price change have been eliminated. Although expressed in monetary terms, the constant price measures shown vary only with changes in the underlying quantities of inputs purchased (including labour). In effect, quantities of broadly defined categories of inputs are weighted by their prices in the base year (1989-90). Because the measures relate to input quantities, they do not reflect changes in the efficiency with which labour, capital and other inputs are used.

19. The estimate of the labour costs component was obtained by multiplying each broad category of labour used in each period by the relevant average labour costs in the base year (1989-90). The non-labour costs components were estimated by deflating each by a composite price index of relevant materials or capital expenditure items. In revaluing R&D non-labour expenditure, extensive use has been made of price series used in deriving constant price national accounts estimates.

20. For a more comprehensive description of constant price concepts and estimation procedures see *Australian National Accounts: Concepts, Sources and Methods* (5216.0).

Reliability of Statistics

21. The statistics contained in this publication must be interpreted with caution for the following reasons:

(a) Many respondents had to make estimates because their accounts do not separately record data on R&D activity, receipts and payments for Technical know-how or patent activity.

(b) The OECD standard definition of R&D differs in some respects from what respondents may regard as R&D activity, particularly since the definitions used within the Grants for Industry R&D scheme for the allocation of grants, and the 150 per cent Tax Concession Scheme for tax deductability for specific R&D activities undertaken within Australia, differ slightly from the R&D survey definition.

Related publications

22. Users may also wish to refer to the following publications:

Research and Experimental Development, Business Enterprises, Australia, 1992-93 (8104.0)

Research and Experimental Development, General Government and Private Non-Profit Organisations, Australia, 1992-93 (8109.0)

Research and Experimental Development, Higher Education Organisations, Australia, 1992 (8111.0)

Main Science and Technology Indicators 1994:1, OECD, Paris, 1994

The Measurement of Scientific and Technical Activities ("Frascati Manual" 1993) OECD, Paris, 1994

The Australian Standard Research Classification (ASRC) 1993 (1297.0)

23. Current publications issued by the ABS are listed in the Catalogue of Publications and Products (1101.0). The ABS also issues, on Tuesdays and Fridays, a Publications Advice (1105.0) which lists publications to be released in the next few days. The Catalogue and Publications advice are available from any ABS office.

Symbols and other usages

n.p.	not available for separate publication (but included in totals where applicable)
-	nil or rounded to zero
r	revised since previous issue

24. Where figures have been rounded, discrepancies may occur between sums of the component items and totals.

GLOSSARY

Applied research is original work undertaken in order to acquire new knowledge with a specific application in view. It is undertaken either to determine possible uses for the findings of basic research or to determine new methods or ways of achieving some specific and pre-determined objectives.

Basic research is experimental and theoretical work undertaken primarily to acquire new knowledge without a specific application in view. It consists of pure basic research and strategic basic research. *Pure* basic research is carried out without looking for long term benefits other than the advancement of knowledge. *Strategic* basic research is directed into specified broad areas in the expectation of useful discoveries. It provides the broad base of knowledge necessary for the solution of recognised practical problems.

Capital expenditure is expenditure on the acquisition (less disposals) of fixed tangible assets such as land, buildings, vehicles, plant, machinery and equipment attributable to R&D activity.

Current expenditure is expenditure on labour costs, materials, fuels, rent and leasing, repairs and maintenance, data processing etc. and the proportion of expenditure on general services and overheads which is attributable to R&D activity.

Experimental development is systematic work, using existing knowledge gained from research or practical experience for the purpose of creating new or improved products/processes.

Extramural R&D statistics refer to R&D activity *funded* by an organisation but *carried out by other* enterprises, organisations, institutions or individuals.

Field of Research (FOR) refers to the field in which the R & D activity was performed rather than the fields used in the research program. The FOR classification is primarily structured around disciplines or activities. It describes 'what' research is being performed.

GERD - Gross expenditure on R&D is the sum of intramural R&D expenditures incurred by all organisations in the survey.

Human resources devoted to R&D measures the effort of researchers, technicians and other staff *directly* involved with R&D activity. *Overhead staff* (e.g.administrative and general service employees such as personnel officers, janitors, etc.) whose work *indirectly* supports R&D, are *excluded.*

Intramural R&D activity is R&D carried out by an organisation on its own behalf or on behalf of other organisations, institutions or individuals.

Other supporting staff are those skilled and unskilled craftspersons, secretarial and clerical staff directly associated with R&D activity.

Researchers are those involved with the conception and/or development of new products/processes e.g. executives and directors involved in the planning or management of scientific and technical aspects of R&D projects, and software developers/programmers. They exclude executives and directors concerned primarily with budgets and human resources rather than project content.

Socio-Economic Objective (SEO) refers to the *area of expected national benefit* rather than to the immediate objectives of the researcher. The SEO classification defines the main areas of Australian economic and social activity to which the results of research programs are applied. It describes 'why' the research is being performed.

Technical know-how (TKH) is the specialised technical knowledge required to successfully produce a product or implement a process, etc. (e.g. patent licences; technical data and information; scientific, technical or engineering assistance) that increases technical knowledge and understanding in an enterprise. Payments are those made directly to the holders of TKH which is new to a business enterprise. They exclude non-monetary transfers, and costs incurred by an enterprise in obtaining TKH, such as overseas travel costs.

Technicians are those performing technical tasks in support of R&D activity, normally under the direction and supervision of a researcher. These tasks include preparation of experiments, taking records, preparation of charts and graphs and coding computer programs.

Type of R&D activity comprises pure basic research, strategic basic research, applied research and experimental development.

Australian Bureau of Statistics

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