



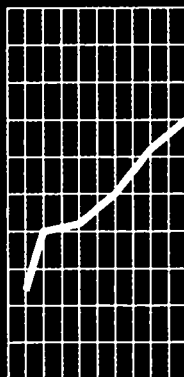
1995-96

EMBARGO: 11:30 AM (CANBERRA TIME) FRI 16 MAY 1997

Research and Experimental Development

Business Enterprises

Australia



NOTES

COMPARABILITY

Data classified by Field of research are included for the first time. The results are shown in Table 10 on page 15.

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SYMBOLS AND OTHER USAGES

n.a. not available
n.e.c. not elsewhere classified
n.p. not available for separate publication
(but included where applicable)
— nil or rounded to zero
r revised since previous issue
mfg manufacturing

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INQUIRIES

For information about other ABS statistics and services, please refer to the back of this publication.

For further information about statistics in this publication and the availability of related unpublished statistics, contact Derek Byars on Canberra (06) 252 5627 or any Australian Bureau of Statistics (ABS) office.

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MAIN FEATURES

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EXPENDITURE ON R&D

Business expenditure on R&D (BERD) in 1995-96 was estimated to be \$4,243m at current prices, an increase of 22% over 1994-95. Capital expenditure rose 17%, labour costs rose 10% and other current expenditure rose 33%.

There were large increases of \$213m (74%) in the Mining sector and \$498m (26%) in the Manufacturing sector. Other industries increased by \$42m (3%). Most industries recorded rises from 1994-95.

BERD in 1995-96 was estimated to be \$3,637m at average 1989-90 prices, an increase of 19% over 1994-95.

BERD as a percentage of Gross Domestic Product (GDP) was 0.87% for 1995-96. This was the highest level recorded, significantly up on the 0.76% recorded for 1994-95.

HUMAN RESOURCES

Human resources devoted to R&D in 1995-96 was estimated to be 26,570 person years. This was a 3% increase compared with 1994-95.

SOURCE OF FUNDS

The business sector provided 92% of funding for research in 1995-96. Overseas funding provided 3% with the Commonwealth Government providing a further 2%.

EXPECTED R&D

Businesses reported that they expected BERD to be \$3,750m in 1996-97. This is 12% lower than the actual expenditure incurred in 1995-96. However, it should be noted that for the previous two years actual expenditure exceeded the expectations by 16% and 21%.

PURPOSE OF RESEARCH

Most R&D expenditure by businesses was directed towards Economic development (91%). Of this, 56% was towards Manufacturing, 15% towards Information & communication services and 10% towards Mineral resources excluding energy.

FIELD OF RESEARCH

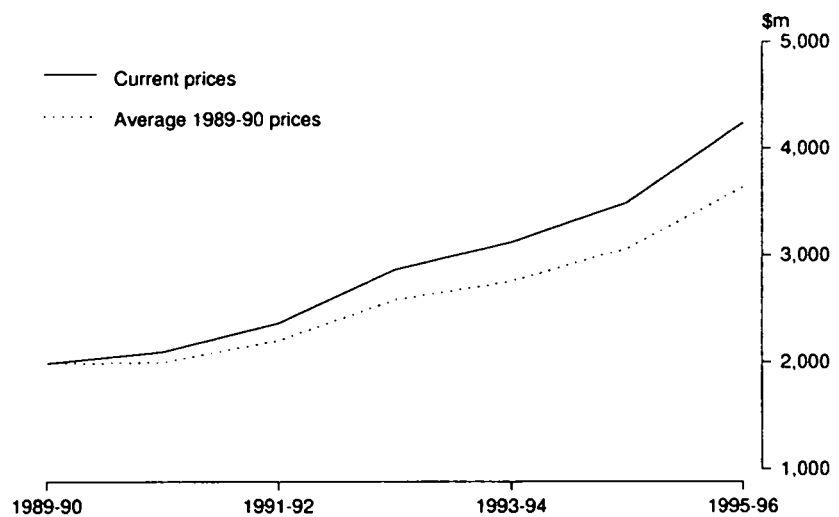
Almost all BERD is in the Natural sciences, technologies and engineering fields. Manufacturing and process technologies and engineering (17%), Computer software (11%) and Mechanical and industrial engineering (10%) are the three most important groups.

EXPENDITURE ON R&D

BERD has increased every year since 1989-90 in both current and average 1989-90 prices with the largest increases of 22% and 19% occurring between 1994-95 and 1995-96.

The average annual rates of growth since 1991-92 have been 15.7% in current prices and 13.3% in constant prices.

Between 1994-95 and 1995-96, expenditure by private sector businesses increased by 29% in current prices and 26% in average 1989-90 prices, while expenditure by public sector businesses decreased by 47% and 50%.



1 EXPENDITURE ON R&D(a)

	1989-90	1990-91	1991-92r	1992-93r	1993-94r	1994-95r	1995-96
	\$m	\$m	\$m	\$m	\$m	\$m	\$m
AT CURRENT PRICES							
Private sector	1 802.6	1 896.1	2 148.3	2 617.8	2 886.7	3 153.3	4 063.3
Public sector	187.0	203.6	216.4	244.8	233.3	336.3	179.6
Total business enterprises	1 989.6	2 099.8	2 364.6	2 862.6	3 120.0	3 489.5	4 242.9
AT AVERAGE 1989-90 PRICES							
Private sector	1 802.6	1 811.6	2 005.8	2 368.6	2 549.1	2 762.6	3 485.4
Public sector	186.9	190.8	198.0	220.5	207.8	302.5	151.9
Total business enterprises	1 989.5	2 002.4	2 203.8	2 589.1	2 756.9	3 065.1	3 637.3

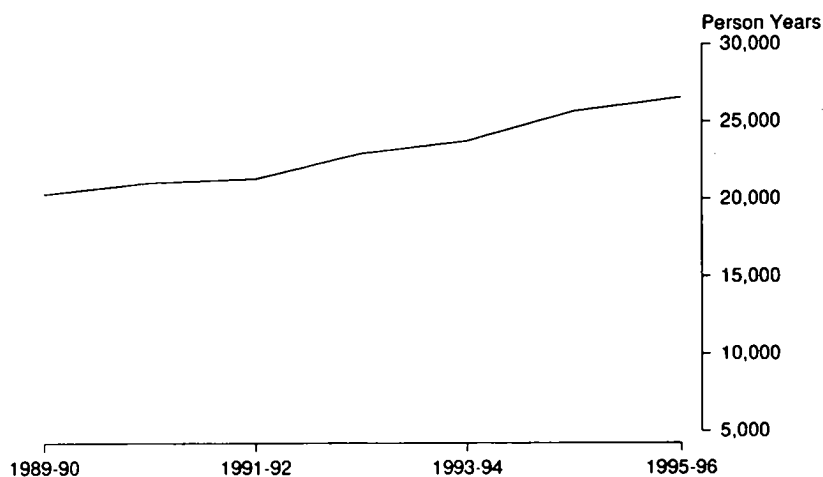
(a) Excludes enterprises in ANZSIC Division A.

HUMAN RESOURCES DEVOTED TO R&D

Human resources devoted to R&D carried out in Australia in 1995-96 was estimated to be 26,570 person years. This represented a 3% increase over 1994-95. Human resources devoted to research has steadily increased since 1989-90.

The average annual rate of growth since 1991-92 has been 5.7%, significantly lower than the 13.3% annual rate of growth in expenditure in average 1989-90 prices.

Private sector businesses increased their person years of effort devoted to R&D by 6% over 1994-95, while public sector businesses decreased by 24%.



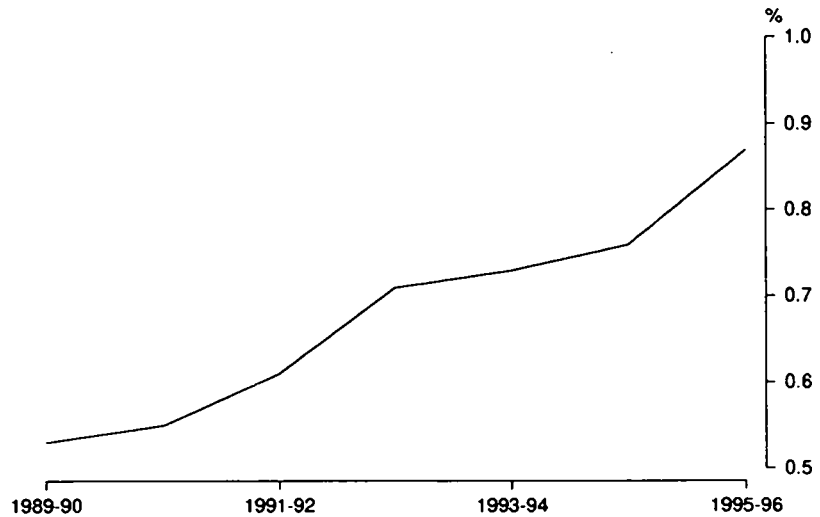
2 HUMAN RESOURCES DEVOTED TO R&D(a)

	1989-90	1990-91	1991-92 ^r	1992-93 ^r	1993-94 ^r	1994-95 ^r	1995-96
	person years	person years	person years	person years	person years	person years	person years
Private sector	18 572	19 158	19 211	20 721	21 655	23 509	24 921
Public sector	1 729	1 867	2 088	2 219	2 105	2 175	1 650
Total business enterprises	20 301	21 025	21 299	22 940	23 761	25 684	26 570

(a) Excludes enterprises in ANZSIC Division A.

COMPARISON WITH GDP

BERD as a percentage of GDP increased sharply from 0.55% in 1990-91 to 0.71% in 1992-93. The rate of increase levelled off for the next two years before increasing sharply again to 0.87% in 1995-96.



The BERD/GDP ratio remained relatively low when compared with other OECD countries as shown in the table below.

3 BERD/GDP RATIOS OF OECD COUNTRIES

Country	1994-95	1995-96
Japan	1.87	n.a.
United States of America	1.80	1.85
Germany	1.54	1.50
Finland	1.46	1.46
France	1.47	1.44
Ireland	0.97	1.05
Canada	0.94	0.96
Australia	0.76	0.87
Czech Republic	0.84	0.75
Italy	0.65	0.65
Iceland	0.43	0.45
Turkey	0.09	0.09

INDUSTRY COMPARISON

Mining industries accounted for \$501m (12% of total R&D expenditure), a rise of 74% over 1994-95. Human resources in Mining at 975 person years (4% of total human resources), only rose 8% over 1994-95. In comparison, Manufacturing industries at \$2,430m (57% of total R&D expenditure) and 15,650 person years (59% of human resources) rose 26% and 5% respectively over 1994-95. Other industries at \$1,313m (31%) and 9,945 person years (37%) rose 3% and 0.4%.

4 R&D, Industry of Enterprise(a)

Industry of enterprise	ANZSIC code	Description	ENTERPRISES.....			EXPENDITURE ON R&D.....			HUMAN RESOURCES DEVOTED TO R&D.....		
			1993-94r	1994-95r	1995-96	1993-94r	1994-95r	1995-96	1993-94r	1994-95r	1995-96
			no.	no.	no.	\$m	\$m	\$m	person years	person years	person years
B		Mining (including services to mining)	86	99	130	330.9	287.3	500.5	840	903	975
		Manufacturing									
21		Food, beverage and tobacco	130	178	193	140.2	141.8	292.6	1 156	1 132	1 319
22		Textile, clothing, footwear and leather	51	62	64	18.0	28.0	21.0	182	211	203
23		Wood and paper product	33	45	36	106.2	79.3	182.1	230	256	258
24		Printing, publishing and recorded media	34	44	51	10.8	15.1	20.3	121	174	197
25		Petroleum, coal, chemical and associated product	305	363	368	272.9	320.1	348.0	2 140	2 460	2 498
26		Non-metallic mineral product	50	77	87	31.3	45.3	80.3	274	427	376
27		Metal product	182	244	249	301.9	324.1	335.0	1 803	2 020	2 030
281-282		Motor vehicle and part and other transport equipment	124	144	148	269.7	336.5	408.9	1 915	2 025	2 275
283		Photographic and scientific equipment	110	114	119	105.0	126.3	134.0	1 008	1 128	1 253
284-285		Electronic and electrical equipment and appliance	444	444	445	370.7	415.1	480.3	3 788	3 880	4 005
286		Industrial machinery and equipment	251	291	312	78.3	80.8	107.0	852	932	1 018
29		Other manufacturing	62	94	97	14.6	19.2	20.5	161	233	218
C		Total manufacturing	1 776	2 100	2 169	1 719.6	1 931.6	2 429.9	13 629	14 876	15 650
		Other industries									
F-G		Wholesale and retail trade	266	263	250	229.2	207.4	233.9	1 786	1 689	1 705
K		Finance and insurance	29	36	33	119.1	100.9	113.1	1 198	979	1 095
77,782-786		Property and business services	584	673	739	449.9	583.3	578.2	4 160	4 916	4 893
781		Scientific research	71	77	83	90.5	118.4	147.4	810	933	917
(b)		Other n.e.c.	109	136	148	180.7	260.7	239.9	1 338	1 388	1 335
D-Q		Total other industries	1 059	1 185	1 253	1 069.4	1 270.6	1 312.5	9 292	9 905	9 945
		Total all industries	2 921	3 384	3 552	3 120.0	3 489.5	4 242.9	23 761	25 684	26 570
		Private sector contribution	2 886	3 335	3 511	2 886.7	3 153.3	4 063.3	21 655	23 509	24 921
		Public sector contribution	35	49	41	233.3	336.3	179.6	2 105	2 175	1 650

(a) Excludes enterprises in ANZSIC Division A.

(b) ANZSIC codes D, E, H-J, M-Q.

TYPE OF EXPENDITURE

Labour costs (37%) have dropped from 41% as a proportion of total R&D expenditure compared with 1994-95. The Finance and insurance industry has the highest labour costs as a proportion of total R&D expenditure (66%) and Mining has the lowest (13%). The Food, beverage and tobacco industry has the highest capital expenditure as a proportion of total expenditure (27%) and at \$78m, the highest capital expenditure of all industries.

5 TYPE OF R&D EXPENDITURE(a)

Industry of enterprise		Total	Capital expenditure	Labour costs(b)	Other current expenditure
ANZSIC code	Description	\$'000	\$'000	\$'000	\$'000
B	Mining (including services to mining)	500 454	67 541	66 890	366 023
	Manufacturing				
21	Food, beverage and tobacco	292 585	77 593	77 926	137 067
22	Textile, clothing, footwear and leather	20 981	1 154	9 266	10 562
23	Wood and paper product	182 123	n.p.	n.p.	142 440
24	Printing, publishing and recorded media	20 277	2 787	10 687	6 803
25	Petroleum, coal, chemical and associated product	347 951	49 313	136 894	161 744
26	Non-metallic mineral product	80 313	n.p.	n.p.	36 949
27	Metal product	334 979	41 818	120 560	172 601
281-282	Motor vehicle and part and other transport equipment	408 884	25 942	153 881	229 062
283	Photographic and scientific equipment	134 045	9 303	70 842	53 900
284-285	Electronic and electrical equipment and appliance	480 315	35 359	222 623	222 333
286	Industrial machinery and equipment	106 974	6 207	46 667	54 100
29	Other manufacturing	20 504	2 085	9 224	9 196
C	Total manufacturing	2 429 933	298 377	894 801	1 236 755
	Other industries				
F-G	Wholesale and retail trade	233 918	22 559	106 235	105 124
K	Finance and insurance	113 089	15 279	74 241	23 569
77,782-786	Property and business services	578 243	53 052	285 253	239 937
781	Scientific research	147 394	15 832	60 104	71 458
(c)	Other n.e.c.	239 885	30 297	88 097	121 491
D-Q	Total other industries	1 312 530	137 020	613 931	561 579
	Total all industries	4 242 916	502 937	1 575 622	2 164 357
	Private sector contribution	4 063 286	477 826	1 473 128	2 112 333
	Public sector contribution	179 630	25 112	102 494	52 024

(a) Excludes enterprises in ANZSIC Division A.

(b) Includes wages and salaries, overtime allowances, penalty rates, leave loadings, bonuses, commission payments, all paid leave, employer contributions to superannuation and pension schemes, payroll tax, fringe benefits tax, payments to contract staff on the payroll, severance, termination and redundancy payments and workers compensation insurance.

(c) ANZSIC codes D, E, H-J, M-Q.

SOURCE OF FUNDS FOR R&D

The business sector provided most of the funds itself: 86% from Own funds and 6% from Other business enterprises, totalling \$3,923m. The Commonwealth Government provided \$95m (2%) in funding, \$17m from the Grants for Industry R&D (GIRD) Scheme and \$78m from Other Commonwealth Government sources. Overseas funding contributed \$130m or 3%.

The Scientific research industry provided only 31% of funds itself, with another 30% provided from Other businesses and Other Australian sources providing 19%.

6 SOURCE OF FUNDS FOR R&D(a)

Industry of enterprise	Total	Own funds	Other business enterprises	GIRD Scheme(b)	Other Cwealth govt	State and local govt	Other Aust.(c)	Overseas
ANZSIC code Description	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
B Mining (including services to mining)	500 454	472 480	n.p.	—	380	360	497	n.p.
Manufacturing								
21 Food, beverage and tobacco	292 585	285 433	4 258	1 144	n.p.	n.p.	287	—
22 Textile, clothing, footwear and leather	20 981	n.p.	—	n.p.	—	—	—	—
23 Wood and paper product	182 123	n.p.	—	—	—	—	n.p.	—
24 Printing, publishing and recorded media	20 277	19 201	n.p.	135	n.p.	—	590	—
25 Petroleum, coal, chemical and associated product	347 951	323 781	4 280	474	15	n.p.	n.p.	n.p.
26 Non-metallic mineral product	80 313	79 467	n.p.	n.p.	n.p.	n.p.	—	—
27 Metal product	334 979	330 128	2 879	323	774	n.p.	n.p.	439
281-282 Motor vehicle and part and other transport equipment	408 884	380 839	n.p.	358	n.p.	87	n.p.	n.p.
283 Photographic and scientific equipment	134 045	107 408	2 337	1 324	n.p.	275	3 923	n.p.
284-285 Electronic and electrical equipment and appliance	480 315	380 186	60 384	4 572	n.p.	n.p.	5 547	3 665
286 Industrial machinery and equipment	106 974	102 137	3 509	401	n.p.	n.p.	n.p.	n.p.
29 Other manufacturing	20 504	19 544	243	364	n.p.	n.p.	n.p.	—
C Total manufacturing	2 429 933	2 231 158	95 777	9 373	46 179	1 839	14 550	31 057
Other industries								
F-G Wholesale and retail trade	233 918	198 112	3 740	989	1 436	—	n.p.	n.p.
K Finance and insurance	113 089	106 678	107	n.p.	—	—	n.p.	—
77,782-786 Property and business services	578 243	435 847	57 742	5 151	5 023	1 677	32 451	40 352
781 Scientific research	147 394	46 012	44 904	n.p.	21 908	n.p.	27 302	3 883
(d) Other n.e.c.	239 885	177 957	n.p.	1 319	3 219	n.p.	1 079	n.p.
D-Q Total other industries	1 312 530	964 606	n.p.	7 682	31 587	9 352	67 782	n.p.
Total all industries	4 242 916	3 668 244	255 251	17 054	78 146	11 551	82 829	129 840
Private sector contribution	4 063 286	3 498 766	253 046	n.p.	n.p.	n.p.	81 861	n.p.
Public sector contribution	179 630	169 478	2 206	n.p.	n.p.	n.p.	968	n.p.

(a) Excludes enterprises in ANZSIC Division A.

(b) Grants for Industry R&D Scheme.

(c) Includes Higher Education and Private Non-profit sectors.

(d) ANZSIC codes D, E, H-J, M-Q.

STATE COMPARISONS

The leading States in terms of R&D expenditure were New South Wales at \$1,558m and Victoria at \$1,443m, accounting for 37% and 34% of total expenditure respectively. New South Wales' proportion of total R&D remained the same compared with 1994-95 while Victoria's decreased 3%. Queensland increased its share of total R&D from 8% in 1994-95 to 10% in 1995-96.

In Victoria and South Australia the main industry undertaking R&D was Motor vehicle and part and other transport equipment mfg and in Queensland and Western Australia it was Mining. The main industry in New South Wales was Property and business services.

7 LOCATION OF R&D EXPENDITURE(a)(b)

Industry of enterprise		Total	NSW	Vic.	Qld	SA	WA	Other Aust. States and Territories	Overseas
ANZSIC code	Description	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
B	Mining (including services to mining)	500 454	138 834	51 337	117 912	7 083	171 702	11 152	2 434
	Manufacturing								
21	Food, beverage and tobacco	292 585	83 328	110 226	44 513	4 965	n.p.	2 343	n.p.
22	Textile, clothing, footwear and leather	20 981	4 932	8 631	2 130	2 542	2 666	n.p.	n.p.
23	Wood and paper product	182 123	37 466	n.p.	n.p.	7 051	n.p.	n.p.	17
24	Printing, publishing and recorded media	20 277	7 092	8 619	167	325	2 855	n.p.	n.p.
25	Petroleum, coal, chemical and associated product	347 951	118 114	134 589	27 282	39 783	22 407	3 165	2 611
26	Non-metallic mineral product	80 313	46 307	10 187	12 952	2 216	7 745	n.p.	n.p.
27	Metal product	334 979	137 238	116 041	22 121	7 237	51 706	n.p.	n.p.
281-282	Motor vehicle and part and other transport equipment	408 884	44 188	275 286	24 882	40 829	10 878	2 312	10 510
283	Photographic and scientific equipment	134 045	67 271	22 386	6 718	30 722	4 200	n.p.	n.p.
284-285	Electronic and electrical equipment and appliance	480 315	197 348	157 697	48 119	35 019	21 566	n.p.	n.p.
286	Industrial machinery and equipment	106 974	36 279	27 458	22 817	7 875	10 329	1 194	1 022
29	Other manufacturing	20 504	6 985	n.p.	n.p.	449	n.p.	175	62
C	Total manufacturing	2 429 933	786 548	960 621	250 102	179 012	188 160	36 465	29 025
	Other industries								
F-G	Wholesale and retail trade	233 918	110 695	67 521	10 530	29 545	9 529	4 913	1 184
K	Finance and insurance	113 089	68 060	40 832	n.p.	—	4 025	n.p.	—
77,782-786	Property and business services	578 243	336 284	118 900	37 597	14 873	54 251	10 595	5 745
781	Scientific research	147 394	66 067	49 325	15 716	6 753	4 827	n.p.	n.p.
(c)	Other n.e.c.	239 885	51 511	154 431	n.p.	2 324	5 182	16 188	n.p.
D-Q	Total other industries	1 312 530	632 617	431 008	74 080	53 495	77 813	35 175	8 341
	Total all industries	4 242 916	1 557 999	1 442 966	442 094	239 590	437 675	82 792	39 800
	Private sector contribution	4 063 286	1 493 374	1 354 165	438 886	238 508	431 810	66 824	39 720
	Public sector contribution	179 630	64 625	88 801	3 208	1 082	5 865	15 968	80

(a) Location of the expenditure. This may not be the location of the organisation's head office.

(b) Excludes enterprises in ANZSIC Division A.

(c) ANZSIC Codes D, E, H-J, M-Q.

EXPENDITURE BY SIZE OF BUSINESS

The largest enterprises, employing 1,000 or more, accounted for 35% of total R&D expenditure. On average this was more than \$9m per business undertaking R&D. Businesses employing less than 10 people accounted for only 4% of the R&D. This averaged out at about \$160,000 for each business undertaking R&D.

The ABS defines small business as those employing less than 100 in Manufacturing industries and less than 20 in other industries. Small businesses accounted for 23% of Manufacturing R&D and 10% of R&D by other industries.

8 EXPENDITURE ON R&D, By Size of Business(a)(b)

ENTERPRISE EMPLOYMENT SIZE.....

Industry of enterprise	Total	Less than 10	10-19	20-49	50-99	100-199	200-499	500-999	1000 or more
ANZSIC code Description	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
B Mining (including services to mining)	500 454	10 666	7 481	31 207	36 157	50 856	165 217	58 015	140 855
Manufacturing									
21 Food, beverage and tobacco	292 585	3 075	2 744	49 492	22 348	8 068	50 669	26 962	129 227
22 Textile, clothing, footwear and leather	20 981	627	519	1 323	4 998	5 758	1 468	6 288	—
23 Wood and paper product	182 123	735	n.p.	920	602	1 994	n.p.	23 992	n.p.
24 Printing, publishing and recorded media	20 277	892	2 234	5 640	1 725	n.p.	n.p.	n.p.	6 591
25 Petroleum, coal, chemical and associated product	347 951	8 850	11 799	24 253	41 310	25 802	85 336	85 870	64 732
26 Non-metallic mineral product	80 313	1 382	n.p.	2 440	n.p.	n.p.	5 612	16 255	19 105
27 Metal product	334 979	12 706	26 541	18 210	10 031	14 140	69 462	99 181	84 708
281-282 Motor vehicle and part and other transport equipment	408 884	4 190	3 449	4 431	3 626	10 737	30 023	48 848	303 581
283 Photographic and scientific equipment	134 045	7 274	5 608	12 447	n.p.	29 630	n.p.	41 410	24 201
284-285 Electronic and electrical equipment and appliance	480 315	21 191	67 418	53 917	33 406	36 297	43 218	72 928	151 939
286 Industrial machinery and equipment	106 974	8 697	11 590	23 511	21 057	11 825	20 247	n.p.	n.p.
29 Other manufacturing	20 504	4 533	1 730	3 639	2 519	2 352	4 796	935	—
C Total manufacturing	2 429 933	74 153	135 125	200 223	147 523	179 024	321 950	428 104	943 832
Other industries									
F-G Wholesale and retail trade	233 918	6 773	13 515	23 279	31 186	n.p.	36 479	n.p.	76 505
K Finance and insurance	113 089	2 041	—	1 065	n.p.	n.p.	7 233	n.p.	79 620
77,782-786 Property and business services	578 243	52 700	54 249	90 404	116 919	68 340	57 539	53 451	84 641
781 Scientific research	147 394	12 794	11 985	84 361	20 290	6 175	11 789	—	—
(c) Other n.e.c.	239 885	7 255	4 720	3 758	n.p.	n.p.	5 443	7 451	151 309
D-Q Total other industries	1 312 530	81 563	84 469	202 868	175 713	148 981	118 483	108 378	392 075
Total all industries	4 242 916	186 381	227 075	434 298	359 393	378 860	605 650	594 497	1 476 762
Private sector contribution	4 063 286	166 381	n.p.	434 298	n.p.	377 404	598 942	589 445	1 311 121
Public sector contribution	179 630	—	n.p.	—	n.p.	1 456	6 708	5 052	165 641

(a) Excludes enterprises in ANZSIC Division A.

(b) Employment size is based on the number of persons employed by the enterprise.

(c) ANZSIC Codes D, E, H-J, M-Q.

SOCIO-ECONOMIC OBJECTIVE

Most business R&D was directed towards Economic development, \$3,864m or 91%. Of this, \$2,177m (56%) was directed towards Manufacturing. Approximately 3% each was directed towards Defence and Society while approximately 1% each was directed towards Environment and Advancement of Knowledge.

9 RESOURCES DEVOTED TO R&D, By Socio-Economic Objective(a)

	TYPE OF EXPENDITURE.....				
	Total	Capital expenditure	Labour costs(b)	Other current expenditure	Human resources
<i>Socio-economic objective</i>	\$'000	\$'000	\$'000	\$'000	person years
Defence	119 123	4 280	49 956	64 887	741
Economic development					
Plant — production and primary products	31 004	3 959	14 514	12 531	303
Animal — production and primary products	43 813	6 592	16 083	21 138	281
Mineral resources (excl. energy)	384 329	35 014	63 468	285 847	1 056
Energy resources	205 983	42 756	41 779	121 448	628
Energy supply	99 918	10 702	27 838	61 379	511
Manufacturing	2 176 842	286 945	767 616	1 122 282	13 504
Construction	52 315	6 734	20 394	25 186	387
Transport	139 964	5 839	58 279	75 846	965
Information and communication services	576 867	55 503	306 664	214 700	4 675
Commercial services	141 173	13 637	93 194	34 342	1 536
Economic framework	11 300	473	8 066	2 761	129
Total economic development	3 863 508	468 153	1 417 895	1 977 460	23 975
Society					
Health	129 560	10 587	53 439	65 534	869
Education and training	4 168	502	2 838	828	61
Social development and community services	11 852	1 395	5 974	4 482	113
Total society	145 579	12 484	62 251	70 844	1 043
Environment					
Environmental knowledge	18 911	2 942	8 312	7 657	157
Environmental aspects of economic development	24 775	2 617	7 466	14 691	143
Environmental management and other aspects	19 674	5 255	6 058	8 360	104
Total environment	63 359	10 814	21 837	30 708	404
Advancement of knowledge	51 347	7 205	23 685	20 458	407
Total	4 242 916	502 937	1 575 622	2 164 357	26 570

(a) Excludes enterprises in ANZSIC Division A.

(b) Includes wages and salaries, overtime allowances, penalty rates, leave loadings, bonuses, commission payments, all paid leave, employer contributions to superannuation and pension schemes, payroll tax, fringe benefits tax, payments to contract staff on the payroll, severance, termination and redundancy payments and workers compensation insurance.

FIELD OF RESEARCH

Most R&D expenditure, \$4,235m or almost 100%, took place in Natural sciences, technologies and engineering. Within this division \$713m (17%) was in Manufacturing and process technologies and engineering, \$466m (11%) in Computer software and \$415m (10%) in Mechanical and industrial engineering.

10 RESOURCES DEVOTED TO R&D, By Field of Research(a)

Field of research	TYPE OF EXPENDITURE.....				Human resources person years
	Total	Capital expendi- ture	Labour costs(b)	Other current expend- iture	
	\$'000	\$'000	\$'000	\$'000	
Natural sciences, technologies and engineering					
Mathematical sciences	9 820	663	3 279	5 879	57
Physical sciences	44 529	3 387	15 918	25 223	258
Chemical sciences	151 946	19 047	49 260	83 639	891
Earth sciences	137 822	18 757	38 177	80 889	519
Information systems and technologies	268 601	24 518	144 629	99 453	2 300
Computer software	466 321	32 100	263 624	170 597	4 308
Communications technologies	351 239	30 621	153 055	167 563	2 450
Other information, computers and communication technologies	155 365	16 688	80 015	58 663	1 295
Manufacturing and process technologies and engineering	712 666	105 979	177 769	428 918	3 092
Industrial biotechnology and food sciences	191 069	33 621	62 005	95 443	1 042
Material sciences and technologies	208 155	33 486	72 777	101 892	1 226
Other applied sciences and technologies	120 377	15 378	49 375	55 623	899
Mechanical and industrial engineering	414 823	32 233	164 156	218 433	2 803
Mining and mineral processing	348 720	49 038	41 150	258 532	688
Other general engineering	308 588	45 429	123 405	139 753	2 274
Biological sciences	72 285	4 582	25 590	42 113	423
Agricultural sciences	75 121	11 066	29 752	34 303	575
Medical and health sciences	197 571	24 677	77 591	95 303	1 390
Total natural sciences, technologies and engineering	4 235 018	501 271	1 571 527	2 162 219	26 488
Social sciences and humanities					
Social sciences	6 902	800	3 991	2 111	79
Humanities	997	866	104	27	4
Total social sciences and humanities	7 898	1 666	4 095	2 138	83
Total	4 242 916	502 937	1 575 622	2 164 357	26 570

(a) Excludes enterprises in ANZSIC Division A.

(b) Includes wages and salaries, overtime allowances, penalty rates, leave loadings, bonuses, commission payments, all paid leave, employer contributions to superannuation and pension schemes, payroll tax, fringe benefits tax, payments to contract staff on the payroll, severance, termination and redundancy payments and workers compensation insurance.

EXPECTED R&D EXPENDITURE

The 'actual' data in the table below are the business expenditures reported in the 1993-94, 1994-95 and 1995-96 surveys.

In each of these surveys, businesses were asked to report the level of expenditure they expected to incur in the following 12 months. These estimates are respectively in 1994-95, 1995-96 and 1996-97 'expected' data in the table below.

These estimates should be used with caution because:

- only some businesses have long-term R&D projects and can provide a fairly accurate forecast; and
- many business perform R&D on a 'needs be' basis or have projects nearing completion. For these businesses any forecast expenditure is a best guess.

11 EXPECTED AND ACTUAL EXPENDITURE ON R&D(a)

		1993-94	1994-95.....	1995-96.....	1996-97		
<i>Industry of enterprise</i>		<i>Actual</i>	<i>Expected</i>	<i>Actual</i>	<i>Expected</i>	<i>Actual</i>	<i>Expected</i>
<i>ANZSIC code</i>	<i>Description</i>	<i>\$'000</i>	<i>\$'000</i>	<i>\$'000</i>	<i>\$'000</i>	<i>\$'000</i>	<i>\$'000</i>
B	Mining (including services to mining)	330 909	173 043	287 296	331 263	500 454	414 994
	Manufacturing						
21	Food, beverage and tobacco	140 246	131 275	141 831	145 415	292 585	203 132
22	Textile, clothing, footwear and leather	18 037	17 564	27 976	35 647	20 981	19 865
23	Wood and paper product	106 223	52 860	79 252	67 184	182 123	70 975
24	Printing, publishing and recorded media	10 787	10 056	15 062	13 575	20 277	18 326
25	Petroleum, coal, chemical and associated product	272 914	281 384	320 139	314 593	347 951	325 170
26	Non-metallic mineral product	31 299	29 674	45 260	45 466	80 313	51 645
27	Metal product	301 869	293 333	324 129	302 400	334 979	315 706
281-282	Motor vehicle and part and other transport equipment	269 675	282 552	336 524	306 388	408 884	387 411
283	Photographic and scientific equipment	104 964	111 014	126 332	123 671	134 045	118 053
284-285	Electronic and electrical equipment and appliance	370 732	412 458	415 083	436 203	480 315	526 006
286	Industrial machinery and equipment	78 286	72 886	80 817	86 392	106 974	95 459
29	Other manufacturing	14 618	17 529	19 188	20 109	20 504	21 136
C	Total manufacturing	1 719 649	1 712 586	1 931 592	1 897 043	2 429 933	2 152 885
	Other industries						
F-G	Wholesale and retail trade	229 222	242 804	207 391	214 109	233 918	220 904
K	Finance and insurance	119 122	114 938	100 880	103 500	113 089	111 623
77,782-786	Property and business services	449 906	480 831	583 287	538 257	578 243	484 312
781	Scientific research	90 460	97 478	118 384	134 775	147 394	162 104
(b)	Other n.e.c.	180 729	174 710	260 695	290 397	239 885	203 581
D-Q	Total other industries	1 069 439	1 110 761	1 270 636	1 281 037	1 312 530	1 182 523
	Total all industries	3 119 997	2 996 389	3 489 524	3 509 343	4 242 916	3 750 402
	Private sector contribution	2 886 695	2 765 803	3 153 265	3 148 262	4 063 286	3 578 933
	Public sector contribution	233 302	230 586	336 259	361 081	179 630	171 469

(a) Excludes enterprises in ANZSIC Division A.

(b) ANZSIC codes D, E, H-J, M-Q.

HUMAN RESOURCES BY SIZE OF BUSINESS

The largest enterprises, employing 1,000 or more, contributed 29% of the human resource effort. However only 1% of their total employment was devoted to R&D. On the other hand, businesses in the smallest size category (less than 10 employees) devoted 41% of their total employment to research, but this contributed only 7% of the total human resources undertaking R&D.

Using the ABS definitions of small business (see page 13) small business contributed 30% of human resource effort in Manufacturing and 17% in other industries.

12 HUMAN RESOURCES DEVOTED TO R&D, By Size of Business(a)(b)

		ENTERPRISE EMPLOYMENT SIZE.....								
Industry of enterprise		Total	Less	10-19	20-49	50-99	100-199	200-499	500-999	1000
ANZSIC code Description		person	than 10	person	person	person	person	person	person	or more
		years	person	years	years	years	years	years	years	person
			years	years	years	years	years	years	years	years
B	Mining (including services to mining)	975	31	55	53	50	107	209	175	297
	Manufacturing									
21	Food, beverage and tobacco	1 319	20	14	114	163	97	173	208	530
22	Textile, clothing, footwear and leather	203	8	9	19	51	49	14	53	—
23	Wood and paper product	258	14	n.p.	5	n.p.	16	n.p.	49	163
24	Printing, publishing and recorded media	197	21	n.p.	63	21	8	5	n.p.	n.p.
25	Petroleum, coal, chemical and associated product	2 498	90	122	239	276	221	564	596	391
26	Non-metallic mineral product	376	11	15	34	35	34	41	104	102
27	Metal product	2 030	72	88	143	108	138	304	691	487
281-282	Motor vehicle and part and other transport equipment	2 275	35	49	77	25	66	213	421	1 389
283	Photographic and scientific equipment	1 253	100	88	127	n.p.	245	n.p.	332	255
284-285	Electronic and electrical equipment and appliance	4 005	299	373	509	324	312	436	580	1 173
286	Industrial machinery and equipment	1 018	78	140	236	233	97	188	n.p.	n.p.
29	Other manufacturing	218	40	26	53	42	16	30	12	—
C	Total manufacturing	15 650	788	957	1 619	1 315	1 298	2 045	3 091	4 537
	Other industries									
F-G	Wholesale and retail trade	1 705	84	134	223	202	183	270	183	426
K	Finance and insurance	1 095	8	—	15	n.p.	n.p.	n.p.	65	923
77,782-786	Property and business services	4 893	680	577	926	752	517	488	391	561
781	Scientific research	917	92	79	435	194	43	75	—	—
(c)	Other n.e.c.	1 335	67	51	37	n.p.	n.p.	n.p.	65	924
D-Q	Total other industries	9 945	931	841	1 635	1 193	916	891	704	2 834
	Total all industries	26 570	1 749	1 852	3 307	2 558	2 322	3 145	3 970	7 668
	Private sector contribution	24 921	1 749	n.p.	3 307	n.p.	2 308	3 078	3 928	6 147
	Public sector contribution	1 650	—	n.p.	—	n.p.	14	66	42	1 522

(a) Excludes enterprises in ANZSIC Division A.

(b) Employment size is based on the number of persons employed by the enterprise, whereas human resources data are person years of R&D effort.

(c) ANZSIC Codes D, E, H-J, M-Q.

TYPE OF HUMAN RESOURCES

There was a 3% increase in total human resources devoted to R&D in 1995-96 compared with 1994-95.

The proportion of Researchers to total R&D staff ranged from 70% in Printing, publishing and recorded media to 41% in both Non-metallic mineral product and Motor vehicle and part and other transport equipment mfg. In Total manufacturing, 55% of the R&D staff were Researchers and 29% were Technicians compared with Mining (44% Researchers, 31% Technicians) and Other industries (64% Researchers, 25% Technicians).

13 HUMAN RESOURCES DEVOTED TO R&D, By Type of Employee(a)

<i>Industry of enterprise</i>		<i>Total</i>	<i>Researchers</i>	<i>Technicians</i>	<i>Other supporting staff</i>
<i>ANZSIC code</i>	<i>Description</i>	<i>person years</i>	<i>person years</i>	<i>person years</i>	<i>person years</i>
B	Mining (including services to mining)	975	426	304	246
	Manufacturing				
21	Food, beverage and tobacco	1 319	666	392	261
22	Textile, clothing, footwear and leather	203	86	82	34
23	Wood and paper product	258	116	107	36
24	Printing, publishing and recorded media	197	138	34	25
25	Petroleum, coal, chemical and associated product	2 498	1 363	753	382
26	Non-metallic mineral product	376	154	113	110
27	Metal product	2 030	1 061	628	341
281-282	Motor vehicle and part and other transport equipment	2 275	938	709	629
283	Photographic and scientific equipment	1 253	787	318	147
284-285	Electronic and electrical equipment and appliance	4 005	2 688	953	364
286	Industrial machinery and equipment	1 018	437	326	255
29	Other manufacturing	218	106	73	40
C	Total manufacturing	15 650	8 541	4 487	2 622
	Other industries				
F-G	Wholesale and retail trade	1 705	1 104	357	244
K	Finance and insurance	1 095	582	366	148
77,782-786	Property and business services	4 893	3 278	1 164	451
781	Scientific research	917	564	235	118
(b)	Other n.e.c.	1 335	795	339	201
D-Q	Total other industries	9 945	6 322	2 461	1 162
	Total all industries	26 570	15 288	7 251	4 031
	Private sector contribution	24 921	14 390	6 739	3 792
	Public sector contribution	1 650	898	513	239

(a) Excludes enterprises in ANZSIC Division A.

(b) ANZSIC Codes D, E, H-J, M-Q.

FOREIGN OWNERSHIP

Australian owned businesses contributed \$2,252m (53%) of total R&D expenditure. Businesses which have 50% or more of their equity directly owned by foreigners contributed \$1,320m (31%) of total R&D expenditure.

In the Mining industry 46% of R&D expenditure was by Australian owned businesses, 15% by businesses up to 10% foreign owned, 25% by businesses 11% to 49% foreign owned and only 14% by those 50% or more foreign owned. In Manufacturing the percentages were 51%, 3%, 9% and 38% respectively, while in Other industries they were 61%, 4%, 9% and 26%.

14 FOREIGN OWNERSHIP(a)

Industry of enterprise		Total.....		Australian owned		Up to 10% foreign owned		11% to 49% foreign owned		50% to 100% foreign owned	
ANZSIC code	Description	no.	\$'000	no.	\$'000	no.	\$'000	no.	\$'000	no.	\$'000
B	Mining (including services to mining)	130	500 454	75	228 009	14	73 736	22	127 590	19	71 119
	Manufacturing										
21	Food, beverage and tobacco	193	292 585	125	220 727	2	n.p.	6	n.p.	60	64 881
22	Textile, clothing, footwear and leather	64	20 981	48	14 889	—	—	2	n.p.	14	n.p.
23	Wood and paper product	36	182 123	30	67 203	1	n.p.	1	n.p.	4	n.p.
24	Printing, publishing and recorded media	51	20 277	41	14 928	—	—	3	n.p.	7	n.p.
25	Petroleum, coal, chemical and associated product	368	347 951	237	103 114	8	n.p.	13	n.p.	110	205 957
26	Non-metallic mineral product	87	80 313	64	69 454	2	n.p.	3	n.p.	18	9 542
27	Metal product	249	334 979	201	183 442	5	n.p.	9	n.p.	34	52 416
281-282	Motor vehicle and part and other transport equipment	148	408 884	101	125 967	2	n.p.	4	n.p.	41	274 701
283	Photographic and scientific equipment	119	134 045	91	71 106	1	n.p.	8	n.p.	19	58 202
284-285	Electronic and electrical equipment and appliance	445	480 315	373	258 896	5	16 080	16	6 822	51	198 518
286	Industrial machinery and equipment	312	106 974	272	85 062	1	n.p.	5	n.p.	34	19 880
29	Other manufacturing	97	20 504	85	14 392	1	n.p.	4	n.p.	7	3 460
C	Total manufacturing	2 169	2 429 933	1 668	1 229 179	28	75 219	74	212 854	399	912 680
	Other industries										
F-G	Wholesale and retail trade	250	233 918	185	69 841	4	910	5	6 363	56	156 804
K	Finance and insurance	33	113 089	24	44 692	4	n.p.	2	n.p.	3	1 796
77,782-786	Property and business services	739	578 243	657	342 589	8	5 844	19	73 472	55	156 337
781	Scientific research	83	147 394	68	119 313	5	19 733	3	n.p.	7	n.p.
(b)	Other n.e.c.	148	239 885	137	218 466	1	n.p.	3	n.p.	7	n.p.
D-Q	Total other industries	1 253	1 312 530	1 071	794 902	22	58 811	32	122 656	128	336 161
	Total all industries	3 552	4 242 916	2 814	2 252 090	64	207 767	128	463 100	546	1 319 960
	Private sector contribution	3 511	4 063 286	2 773	2 072 460	64	207 767	128	463 100	546	1 319 960
	Public sector contribution	41	179 630	41	179 630	—	—	—	—	—	—

a) Excludes enterprises in ANZSIC Division A.

(b) ANZSIC Codes D, E, H-J, M-Q.

EXPLANATORY NOTES

INTRODUCTION

- 1** This publication presents statistics on expenditure and human resources devoted to R&D carried out in Australia by enterprises within the Business enterprise sector during 1995–96.
- 2** For details of R&D statistics available for the General government, Private non-profit and Higher education sectors see paragraph 25.

DATA SOURCES

- 3** The 1995–96 data presented in this publication have been compiled from data collected from business enterprises in the Survey of Research and Experimental Development in respect of the year ended June 1996. This survey was based on a complete enumeration of businesses identified by the Australian Bureau of Statistics (ABS) as likely R&D performers. The survey was conducted by mailed questionnaires and a 92% response was obtained. The ABS believes that the non-respondents were non-R&D performers.
- 4** The 1990–91 to 1994–95 statistics in this publication were derived from similar surveys. The 1989–90 statistics were derived from a stratified random sample of businesses identified as likely R&D performers.
- 5** The GDP(I) figures used to derive BERD/GDP ratios are current at the time of manuscript finalisation (*Australian National Accounts: National Income, Expenditure and Product, December Quarter 1996*, (Cat. no. 5206.0)), and, at current prices, are as follows: \$370,189m (1989–90); \$378,716m (1990–91); \$387,067m (1991–92); \$404,798m (1992–93); \$429,785m (1993–94); \$457,667m (1994–95) and \$488,967m (1995–96). The available BERD/GDP ratios for other OECD countries are current at the time of manuscript finalisation and are sourced from *Main Science and Technology Indicators, 1996–2*, OECD, Paris, 1997.

STATISTICAL UNIT

- 6** For large businesses the unit from which information is collected and published is the management unit. The management unit is the highest-level accounting unit within a business, having regard for industry homogeneity, for which accounts are maintained; in nearly all cases it coincides with the legal entity owning the business (i.e. company, partnership, trust, sole operator, etc.) In the case of large diversified businesses, however, there may be more than one management unit, each coinciding with a 'division' or 'line of business'. A division or line of business is recognised where separate and comprehensive accounts are compiled for it.
- 7** For small businesses the statistical unit is the enterprise. An enterprise is defined broadly as the unit comprising all the operations in Australia of a single operating legal entity (e.g. company, partnership or sole proprietor).

DEFINITIONS

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

EXPLANATORY NOTES *continued*

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SCOPE

10 The scope of this survey is all enterprises within the Business enterprise sector of Australia which have undertaken R&D.

11 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 costs of production, and the private non-profit institutions mainly serving them.

12 The vast majority of enterprises in this sector are private businesses. The remainder are public business enterprises mainly engaged in trading or financial activities.

COVERAGE

13 The 1995-96 R&D survey comprised a complete enumeration of business enterprises identified by the ABS as likely to have carried out R&D activity.

14 The Business enterprise sector for the R&D survey 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* (Cat. no. 1292.0)), 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).

15 Within the scope of the survey, enterprises were included in the collection if they satisfied any of the following criteria:

- enterprises which, in previous R&D surveys, reported R&D activity;
- units applying for the 150% Tax Concession Scheme and the Grants for Industry R&D Scheme; or
- enterprises identified from reports in newspapers, industrial journals, research compendia etc. as likely to have R&D activity.

16 The ABS continues to investigate enhancement of the above criteria, or the introduction of additional criteria, with the aim of further improving the coverage of the R&D survey.

INDUSTRY CLASSIFICATION

17 The statistics in this publication are classified to industry in accordance with the 1993 edition of the *Australian and New Zealand Standard Industrial Classification (ANZSIC)*.

18 Each management unit or 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. In cases where an enterprise group sets up a dedicated research unit, that is classified to the predominant industry of the group rather than research, in accordance with standards laid down in the *Frascati Manual*.

SOCIO-ECONOMIC OBJECTIVE AND FIELD OF RESEARCH CLASSIFICATIONS

19 Statistics of business enterprise R&D classified by Socio-economic objective (SEO) and Field of research (FOR) have been collected and presented in this publication. Each business undertaking R&D was asked to categorise its R&D expenditure according to the purpose of its research projects (SEO) and the fields in which its research was undertaken (FOR). For more information on these classifications see the *Australian Standard Research Classification (ASRC), 1993* (Cat. no. 1297.0).

EXPLANATORY NOTES *continued*

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CONSTANT PRICE ESTIMATES

20 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.

21 Prior to 1995–96 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). For 1995–96 a new method has been introduced. This involves deflating the current price value of wages by a wage rate index. 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.

22 For a more comprehensive description of constant price concepts and estimation procedures see *Australian National Accounts: Concepts, Sources and Methods* (Cat. no. 5216.0).

RELIABILITY OF STATISTICS

23 The statistics in this publication should be used with caution for the following reasons:

- many respondents had to make estimates because their accounts do not separately record data on R&D activity; and
- the OECD standard definition of R&D used in this survey differs in some respects from what data providers may regard as R&D activity. This is because the definitions used within the Grants for Industry R&D scheme (for the allocation of grants), and the 150% Tax Concession scheme (for tax deductibility for specific R&D activities) are slightly different from the international standard.

UNPUBLISHED STATISTICS

24 Limited additional detailed R&D statistics are available at a charge from the ABS.

RELATED PUBLICATIONS

25 Users may also wish to refer to the following publications:

Main Science and Technology Indicators 1996–2, OECD, Paris, 1997

Research and Experimental Development, All Sector Summary, Australia, 1994–95 (Cat. no. 8112.0)

Research and Experimental Development, General Government and Private Non-Profit Organisations, Australia, 1994–95 (Cat. no. 8109.0)

Research and Experimental Development, Higher Education Organisations, Australia, 1995 (Cat. no. 8111.0)

The Measurement of Scientific and Technological Activities ('Frascati Manual' 1993) OECD, Paris, 1994

EXPLANATORY NOTES *continued*

26 Current publications issued by the ABS are listed in the *Catalogue of Publications and Products* (Cat. no. 1101.0). The ABS also issues, on Tuesdays and Fridays, a *Release Advice* (Cat. no. 1105.0) which lists publications to be released in the next few days. The Catalogue and Release Advice are available from any ABS office.

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

GLOSSARY

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BERD—Business expenditure on R&D	The sum of intramural R&D expenditure incurred by all organisations in the survey.
Capital expenditure	Expenditure on the acquisition of fixed tangible assets such as land, buildings, vehicles, plant, machinery and equipment attributable to R&D activity.
Field of research	Field in which the R&D activity was performed. The FOR classification is primarily structured around disciplines or activities. It describes what research is being performed.
FOR	Field of research.
GDP	Gross Domestic Product.
GIRD	Grants for Industry R&D Scheme.
Human resources devoted to R&D	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	R&D carried out by an organisation on its own behalf or on behalf of other organisations, institutions or individuals.
Labour costs	Wages and salaries, overtime allowances, penalty rates, leave loadings, bonuses, commission payments, all paid leave, employer contributions to superannuation and pension schemes, payroll tax, fringe benefits tax, payments to contract staff on the payroll, severance, termination and redundancy payments and workers compensation insurance.
OECD	Organisation for Economic Co-operation and Development.
Other current expenditure	Expenditure on materials, fuels, rent and hiring, repairs and maintenance, data processing etc. and the proportion of expenditure on general services and overheads which is attributable to R&D activity.
Other supporting staff	Skilled and unskilled craftpersons, secretarial and clerical staff directly associated with R&D activity.
R&D activity	In the business context is systematic investigation or experimentation involving innovation or technical risk, the outcome of which is new knowledge, with or without a specific practical application or new or improved products, processes, materials, devices or services. R&D activity extends to modifications to existing products/processes. R&D activity ceases and pre-production begins when work is no longer experimental.
Researchers	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.
SEO	Socio-economic objective.

GLOSSARY *continued*

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Socio-economic objective The area of expected national benefit rather than 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 the purpose of the research; i.e. why the research is being performed.

Technicians 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.