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**RESEARCH AND EXPERIMENTAL DEVELOPMENT  
BUSINESS ENTERPRISES, AUSTRALIA  
1988-89**

**IAN CASTLES**  
Australian Statistician

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## CONTENTS

<i>Table</i>	<i>Page</i>
.. Summary of Findings	1
<b>Intramural research and experimental development (R&amp;D) activity: R&amp;D carried out by business enterprises</b>	
1. R&D expenditure, 1984-85, 1985-86, 1986-87, 1987-88 and 1988-89 at current and average 1984-85 prices	4
2. Human resources devoted to R&D, 1984-85, 1985-86, 1986-87, 1987-88 and 1988-89	4
3. Details of resources devoted to R&D by industry of enterprise, 1984-85, 1986-87 and 1988-89	5
4. Broad indicators by industry of enterprise	6
5. R&D expenditure by industry of enterprise by type of expenditure, type of activity, and enterprise employment size	8
6. R&D expenditure by industry of enterprise by source of funds	10
7. R&D Expenditure by industry of enterprise by location of expenditure	11
8. R&D Expenditure by industry of enterprise by location of expenditure	12
9. Human resources devoted to R&D by industry of enterprise by type of employee and enterprise employment size	13
10. R&D expenditure by industry of enterprise by R&D expenditure size	15
11. R&D expenditure by R&D expenditure size	16
12. Number of enterprises performing R&D by industry of enterprise by enterprise employment size	17
13. R&D expenditure by industry of enterprise by enterprise employment size	18
14. Human resources devoted to R&D by industry of enterprise by enterprise employment size	19
15. Human resources devoted to R&D as a percentage of enterprise employment by industry of enterprise by enterprise employment size	20
16. R&D expenditure by industry of product field, 1986-87 and 1988-89	21
17. R&D expenditure by industry of product by enterprise employment size	24
18. R&D expenditure by industry of enterprise by industry of product field	25
<b>Extramural R&amp;D expenditure: Expenditure by business enterprises on R&amp;D carried out by others</b>	
19. Details of Extramural R&D Payments by industry of enterprise, 1986-87 and 1988-89	26
20. Payments by industry of enterprise making payment by location of recipient	27
21. Payments by country of recipient by relationship of recipient to enterprise making payment, 1986-87 and 1988-89	28
22. Payments by country of recipient	29
23. Payments by enterprise employment size	29
<b>Payments and receipts by business enterprises for technical know-how</b>	
24. Payments and receipts by industry of enterprise, 1984-85, 1986-87 and 1988-89	30
25. Details of payments by industry of enterprise	31
26. Payments made overseas by industry of enterprise	32
27. Payments by country of recipient	33
28. Payments by industry of enterprise by enterprise employment size	34
29. Payments by enterprise employment size	35
30. Details of receipts by industry of enterprise	36
31. Receipts from overseas by industry of enterprise	37

CONTENTS—*continued*

<i>Table</i>		<i>Page</i>
	<b>Payments and receipts by business enterprises for technical know-how—<i>continued</i></b>	
32.	Receipts by country of recipient	38
33.	Receipts by industry of enterprise by enterprise employment size	39
34.	Receipts by enterprise employment size	40
	<b>Patent activity by business enterprises</b>	
35.	Patent activity, July 1987 to June 1989, by industry of enterprise	41
	<b>Energy R&amp;D activity by business enterprises</b>	
36.	Details of resources devoted to energy R&D by industry of enterprise, 1986-87 and 1988-89	42

APPENDIXES

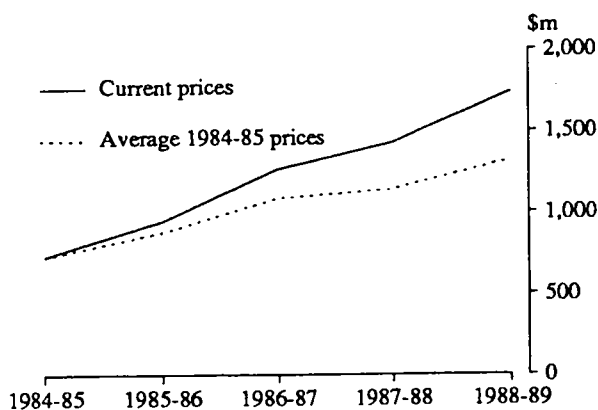
A	Glossary	43
B	Explanatory Notes	44

## SUMMARY OF FINDINGS

### Business expenditure on R&D

Business expenditure on R&D (BERD) carried out in Australia in 1988-89 is estimated to be \$1,738 million at *current* prices. This represents an increase of 22 per cent over 1987-88. At *average* 1984-85 prices, R&D expenditure is estimated to have increased 16 per cent over this period.

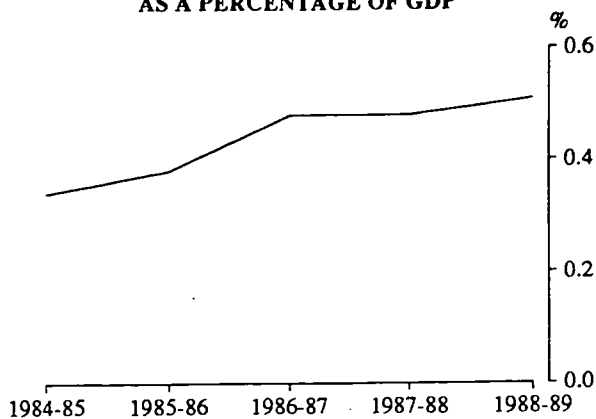
BUSINESS EXPENDITURE ON R & D



At *average* 1984-85 prices, private sector businesses increased R&D expenditure 15 per cent over 1987-88, while public sector businesses increased 18 per cent over this period. Private sector businesses now account for 92 per cent of R&D expenditure in the business sector.

Business expenditure on R&D carried out as a percentage of Gross Domestic Product (GDP) was 0.52 per cent in 1988-89. This is an increase of 7 per cent or 0.03 percentage points over 1987-88.

BUSINESS EXPENDITURE ON R & D AS A PERCENTAGE OF GDP



This ratio may be compared with that for some other OECD countries for which this ratio is available, e.g. Switzerland (2.24%), Germany (2.08%), United States (1.99%), Japan (1.98%), United Kingdom (1.48%), Finland (1.09%), Denmark (0.79%), Canada (0.72%), Italy (0.71%), Ireland (0.59%), Spain (0.42%).

Most of the funding for R&D expenditure came from the business sector itself: \$1,510m from 'own funds' and \$117m from 'other business enterprises', totalling \$1627m. The next major source of funding was the Commonwealth Government: \$25m from the Grants for Industry R&D (GIRD) Scheme and \$36m from other Commonwealth Government sources, totalling \$61m. Commonwealth Government funding was followed by 'overseas' funding at \$40m.

### Human resources devoted to R&D

Human resources devoted to R&D carried out in Australia is estimated to be 19,709 person years. This represents an increase of 10 per cent over 1987-88.

Private sector businesses account for 93 per cent of person years effort devoted to R&D in the business sector.

Human resources devoted to R&D by private sector businesses increased 1,707 person years: up from 16,650 person years to 18,357 person years; while for public sector enterprises the increase was 25 persons years: up from 1,327 person years to 1,352 person years. This represents increases of 10 per cent and 2 per cent respectively.

Human resource effort devoted to R&D as a percentage of the number of persons employed by those businesses that carried out R&D has increased: up from 1.31 per cent in 1986-87 to 1.49 per cent in 1988-89.

### Other features of interest in the breakdown of BERD include:

- Public sector businesses continue to maintain their percentage share of business sector R&D expenditure at 8 per cent.
- The 'Appliances and electrical equipment' (\$228m) and the 'Property and business services' (\$212m) industries remain the leading industries in terms of R&D expenditure, although their position is reversed from 1986-87.
- The leading states in terms of R&D expenditure are New South Wales (\$723m) and Victoria (\$598m).
- Labour costs continue to decline as a percentage of R&D expenditure costs: down from 51 per cent in 1986-87 to 48 per cent in 1988-89.
- While most R&D expenditure is still directed towards Experimental Development, businesses are directing relatively more of their research expenditure towards Basic Research: up from 2 per cent in 1986-87 to 6 per cent in 1988-89.

- Most R&D expenditure is directed towards 'computer software'. With a large (67%) increase in R&D expenditure, this product area improves its percentage share from 17 per cent of total R&D expenditure to 21 per cent. The next largest product areas continue to be 'motor vehicles and parts' (9.1% of the total) and 'telecommunications and broadcasting equipment' (8.6% of the total), although their positions are reversed from 1986-87.

#### Extramural R&D expenditure

Extramural R&D expenditure (i.e. R&D expenditure which is funded by a business but carried out by other organisations) is estimated to be \$271m, an increase of \$88m over that for 1986-87. This payment is equivalent to 16 per cent of BERD, up from 14 percent in 1986-87.

Other features of interest in the breakdown of Extramural R&D include:

- Extramural R&D expenditure within Australia continues to increase slightly: up from 71 per cent of total extramural expenditure in 1986-87 to 72 per cent in 1988-89.
- The 'Wholesale and retail trade' industry remains the leading industry funding extramural R&D: up \$20m from \$55m in 1986-87 to \$74m in 1988-89. The next largest industries funding extramural R&D are 'Property and business services' (\$40m) and 'Research and scientific institutions' (\$33m).
- The 'Wholesale and retail trade' industry is also the leading industry funding extramural R&D within Australia (\$65m), while the 'Chemical, petroleum and coal products' industry is the leading industry funding extramural R&D overseas (\$19m).
- Extramural R&D expenditure overseas is estimated to be \$75m, or 28 per cent of the total. The leading overseas recipient of extramural R&D expenditure is the U.S.A. (\$48m or 64% of the overseas total).
- Most of the overseas extramural R&D expenditure goes to related companies (\$64m or 85% of the overseas total).

#### Payments for technical know-how

Payments for technical know-how is estimated to be \$338m, of which \$314m (93%) were payments made overseas. These payments are equivalent to 19 per cent and 18 per cent of BERD, down from 22 per cent and 19 per cent respectively in 1986-87.

#### Other features of interest in the breakdown of Payments for technical know-how include:

- Payments for technical know-how within Australia has declined \$10m: down from \$34m in 1986-87 to \$24m in 1988-89.
- Payments for 'Patent licence fees and royalties' continues to decline in percentage share terms: down from 46 per cent of the total in 1986-87 to 42 per cent in 1988-89.
- The 'Chemical, petroleum and coal products' industry remains the leading industry making payments for technical know-how: up \$14m from \$53m in 1986-87 to \$68m in 1988-89. The next largest industries making payments for technical know-how continue to be the 'Transport equipment' (\$50m) and 'Appliances and electrical equipment' (\$35m), although their positions are reversed from 1986-87.
- The 'Chemical, petroleum and coal' industry is the leading industry making payments for technical know-how within Australia (\$4m).
- The 'Chemical, petroleum and coal products' and 'Transport equipment' industries remain the leading industries making payments for technical know-how overseas (\$64m and \$48m respectively).
- The leading overseas recipient of payments for technical know-how is the U.S.A. (\$139m or 44% of the overseas total).
- Most of the overseas payments for technical know-how goes to related companies (\$250m or 80% of the overseas total).

#### Receipts for technical know-how

Receipts for technical know-how is estimated to be \$125m, of which \$72m (57%) were receipts from overseas. These receipts are equivalent to 7 per cent and 4 per cent of BERD, down from 8 per cent and 5 per cent respectively in 1986-87. Receipts for technical know-how remain relatively stable, compared to 1986-87, at 37 per cent of payments for technical know-how.

#### Other features of interest in the breakdown of Receipts for technical know-how include:

- Receipts for technical know-how from within Australia has increased \$14m: up from \$39m in 1986-87 to \$53m in 1988-89.
- Receipts for 'Patent licence fees and royalties' has declined in percentage share terms: down from 57 per cent of the total in 1986-87 to 54 per cent in 1988-89.

- The 'Property and business services' industry remains the leading industry earning receipts for technical know-how (from within Australia and overseas): up \$23m from \$37m in 1986-87 to \$60m in 1988-89. The next largest industry earning receipts for technical know-how is the 'Research and scientific institutions' industry (\$14m).
- The leading overseas country making payments for technical know-how was the U.S.A. (\$35m or 49% of the overseas total).
- Most of the overseas receipts for technical know-how comes from unrelated companies (\$57m or 79% of the overseas total).

#### **Patent activity**

Businesses with R&D activity during 1988-89 lodged 1,864 patent applications within Australia, and 3,567 abroad during the period 1 July 1987 to 30 June 1989. During this period 919 patents were granted in Australia, and 1,694 granted abroad.

#### **Energy R&D**

Energy R&D carried out in Australia in 1988-89 by the Business sector is estimated to be \$103m, an increase of \$8m from that of 1986-87. This level of expenditure is equivalent to 6 per cent of BERD, down from 7 per cent in 1986-87.

#### **Other features of interest in the breakdown of Energy R&D include:**

- Government (and higher education sector) funding continues to decline in percentage share terms: down from 13 per cent of the total energy R&D effort in 1986-87 to 12 per cent in 1988-89.

TABLE 1. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA  
R & D EXPENDITURE AT CURRENT AND AVERAGE 1984-85 PRICES  
(\$m)

	1984-85r	1985-86r	1986-87r	1987-88r	1988-89
AT CURRENT PRICES					
Private Sector	653.7	852.2	1,147.0	1,317.5	1,602.5
Public Sector	77.3	95.7	122.6	111.0	136.0
<b>TOTAL BUSINESS ENTERPRISES</b>	<b>731.1</b>	<b>947.9</b>	<b>1,269.6</b>	<b>1,428.5</b>	<b>1,738.5</b>
AT AVERAGE 1984-85 PRICES					
Private Sector	653.7	793.9	983.8	1,051.4	1,214.0
Public Sector	77.3	89.2	105.8	91.6	108.1
<b>TOTAL BUSINESS ENTERPRISES</b>	<b>731.0</b>	<b>883.1</b>	<b>1,089.6</b>	<b>1,143.0</b>	<b>1,322.1</b>

(a) Excludes enterprises in ASIC Division 'A'

TABLE 2. HUMAN RESOURCES DEVOTED RESEARCH AND EXPERIMENTAL DEVELOPMENT  
BY BUSINESS ENTERPRISES(a), AUSTRALIA  
(person years)

	1984-85r	1985-86r	1986-87r	1987-88r	1988-89
Private Sector	11,324	13,431	16,070	16,650	18,357
Public Sector	1,238	1,353	1,395	1,327	1,352
<b>TOTAL BUSINESS ENTERPRISES</b>	<b>12,563</b>	<b>14,784</b>	<b>17,465</b>	<b>17,977</b>	<b>19,709</b>

(a) Excludes enterprises in ASIC Division 'A'



TABLE 3. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA  
DETAILS OF RESOURCES DEVOTED TO R & D BY INDUSTRY OF ENTERPRISE

Industry of enterprise		Enterprises (number)			Expenditure on R & D (\$m)			Person years of effort on R & D		
		1984-85r	1986-87r	1988-89	1984-85r	1986-87r	1988-89	1984-85r	1986-87r	1988-89
ASIC Code	Description									
11-15	Mining (excluding services to mining)	31	39	46	30.4	55.6	67.8	303	524	582
	Manufacturing —									
21	Food, beverages and tobacco	92	106	101	30.9	56.7	82.7	658	815	832
23-24	Textiles, clothing and footwear	27	35	41	5.6	12.9	7.8	57	119	107
25	Wood, wood products and furniture	29	47	45	3.4	6.4	9.8	69	118	111
26	Paper, paper products, printing and publishing	22	32	29	6.4	10.0	24.1	139	158	234
27	Chemical, petroleum and coal products	180	270	255	91.1	120.1	148.0	1,576	1,857	1,664
28	Non-metallic mineral products	33	39	45	12.9	15.3	22.3	223	178	206
29	Basic metal products	32	47	52	46.1	63.7	91.7	681	865	966
31	Fabricated metal products	92	129	131	15.6	23.0	25.7	309	392	376
32	Transport equipment	65	98	120	90.1	127.9	159.6	1,476	1,562	1,753
334	Photographic, professional and scientific equipment	30	67	69	16.5	25.7	37.5	283	433	512
335	Appliances and electrical equipment	286	590	560	84.4	174.5	228.3	1,611	2,835	3,319
336	Industrial machinery and equipment	177	254	252	28.5	43.3	54.9	566	720	783
34	Miscellaneous manufacturing	77	102	112	8.5	21.6	26.1	178	329	379
C	Total manufacturing	1,142	1,816	1,812	440.1	701.1	918.5	7,824	10,380	11,243
	Other industries —									
F	Wholesale and retail trade	194	293	290	36.5	96.8	152.3	641	1,230	1,642
63	Property and business services	450	588	503	82.0	178.5	211.8	1,352	2,376	2,553
8461	Research and scientific institutions	43	80	97	28.8	45.3	127.9	497	640	1,109
(b)	Other n.e.c.	126	213	217	113.3	192.4	260.1	1,946	2,315	2,580
16, D-L	Total other industries	813	1,174	1,107	260.6	513.0	752.1	4,436	6,561	7,884
	TOTAL ALL INDUSTRIES	1,986	3,029	2,965	731.1	1,269.6	1,738.5	12,563	17,465	19,709
	Private Sector Contribution	1,939	2,967	2,911	653.7	1,147.0	1,602.5	11,324	16,070	18,357
	Public Sector Contribution	47	62	54	77.3	122.6	136.0	1,238	1,395	1,352

(a) Excludes enterprises in ASIC Division 'A' (b) ASIC codes 16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 4. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
BROAD INDICATORS BY INDUSTRY OF ENTERPRISE

Industry of enterprise  ASIC Code Description	Resources devoted to R & D				R & D intensity	
	Enterprises (number)	Expenditure (\$'000)	Human resource effort (person years)	Researcher effort (person years)	Expenditure(b) (\$'000)	Human resource effort(c)(%)
Mining —						
11 Metallic minerals	19	51,086	502	174	101.79	2.11
12-15 Non-metallic minerals	27	16,744	81	32	208.00	0.30
<b>11-15 Total mining (excluding services to mining)</b>	<b>46</b>	<b>67,830</b>	<b>582</b>	<b>205</b>	<b>116.47</b>	<b>1.15</b>
Manufacturing —						
211 Meat products	11	7,489	67	36	111.61	0.80
212 Milk products	15	14,710	177	111	82.92	1.19
213 Fruit and vegetable products	11	2,695	36	25	74.64	0.76
214,217 Margarine, oils, fats n.e.c. and other food products	35	32,407	320	182	101.24	1.32
215,216 Flour mill and cereal food products, bread, cakes and biscuits	13	8,987	126	72	71.27	0.62
218,219 Beverages, malt and tobacco products	16	16,447	105	53	156.49	0.68
21 Total food, beverages and tobacco	101	82,735	832	478	99.45	0.95
234 Textile fibres, yarns and woven fibres	16	4,321	57	18	75.28	0.64
235,24 Other textile products, clothing and footwear	25	3,497	50	26	70.22	0.50
23,24 Total textiles, clothing and footwear	41	7,818	107	43	72.93	0.57
25 Wood, wood products and furniture	45	9,814	111	46	88.42	1.17
263 Paper and paper products	14	22,033	198	74	111.56	0.65
264 Printing and allied industries	15	2,087	36	20	57.66	1.43
26 Total paper, paper products, printing and publishing	29	24,121	234	94	103.21	0.71
2753 Synthetic resins and rubber	27	15,027	202	117	74.39	3.52
2754, 2755 Organic and inorganic industrial chemicals n.e.c.	39	22,254	203	113	109.52	4.56
2762 Paints	35	13,702	264	167	51.86	4.60
2763 Pharmaceutical and veterinary products	61	67,707	625	348	108.26	5.13
(d) Other chemical, petroleum and coal products	93	29,283	370	211	79.25	1.64
27 Total chemical, petroleum and coal products	255	147,972	1,664	956	88.91	3.29
287 Cement and concrete products	15	7,220	84	31	86.26	0.98
285,286, 288 Glass, clay and other non-metallic mineral products	30	15,040	122	66	123.38	0.97
28 Total non-metallic mineral products	45	22,260	206	97	108.27	0.98
294 Basic iron and steel	32	n.p.	n.p.	n.p.	n.p.	n.p.
295,296 Basic non-ferrous metals	20	n.p.	n.p.	n.p.	n.p.	n.p.
29 Total basic metal products	52	91,718	966	551	94.91	1.72
314 Structural metal products	22	3,424	55	21	62.15	0.63
315 Sheet metal products	29	6,199	88	33	70.37	1.11
316 Other fabricated metal products	80	16,076	233	111	69.00	2.02
31 Total fabricated metal products	131	25,700	376	165	68.31	1.33
323 Motor vehicles and parts	80	146,333	1,579	615	92.70	2.80

See footnotes at end of table.

TABLE 4. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
BROAD INDICATORS BY INDUSTRY OF ENTERPRISE —continued

Industry of enterprise		Resources devoted to R & D				R & D intensity	
		Enterprises (number)	Expenditure (\$'000)	Human resource effort (person years)	Researcher effort (person years)	Expenditure(b) (\$'000)	Human resource effort(c)(%)
ASIC Code	Description						
324	Other transport equipment	40	13,220	174	74	75.85	0.99
32	Total transport equipment	120	159,553	1,753	690	91.02	2.37
334	Photographic, professional and scientific equipment	69	37,496	512	320	73.22	8.49
3351, 3352	Radio and TV receivers, audio equipment and electronic equipment n.e.c.	372	170,243	2,467	1,745	69.00	12.92
3353	Refrigerators and household appliances	36	20,611	277	117	74.30	1.98
3354	Water heating systems	8	669	14	10	47.11	2.10
3355— 3357	Cables, batteries and other electrical machinery and equipment n.e.c.	144	36,771	560	286	65.62	3.14
335	Total appliances and electrical equipment	560	228,294	3,319	2,157	68.78	6.43
3361	Agricultural machinery	43	6,919	140	62	49.60	4.36
3362	Construction machinery	5	292	5	3	57.31	1.67
3363	Materials handling equipment	19	3,844	51	18	75.82	3.20
3364— 3369	Other industrial machinery and equipment n.e.c.	185	43,887	587	285	74.71	3.36
336	Total industrial machinery and equipment	252	54,943	783	368	70.20	3.47
33	Total other machinery and equipment	881	320,733	4,614	2,845	69.51	5.75
345,348	Leather, leather products and other manufacturing	40	12,200	175	98	69.59	5.70
346	Rubber products	10	3,370	46	12	72.94	0.84
347	Plastic and related products	62	10,540	158	81	66.79	1.30
34	Total miscellaneous manufacturing	112	26,109	379	191	68.84	1.83
<b>C</b>	<b>Total manufacturing</b>	<b>1,812</b>	<b>918,531</b>	<b>11,243</b>	<b>6,156</b>	<b>81.70</b>	<b>2.34</b>
Other industries —							
E	Construction	50	12,263	160	95	76.78	1.46
47	Wholesale trade	258	145,839	1,530	1,077	95.32	3.54
48	Retail trade	32	6,489	112	68	57.94	0.06
F	Total wholesale and retail trade	290	152,328	1,642	1,145	92.77	0.76
63	Property and business services	503	211,798	2,553	1,556	82.97	3.61
8461	Research and scientific institutions	97	127,892	1,109	585	115.33	50.98
(e)	Other n.e.c.	167	247,833	2,420	1,199	102.40	0.50
<b>16,D-L</b>	<b>Total other industries</b>	<b>1,107</b>	<b>752,112</b>	<b>7,884</b>	<b>4,580</b>	<b>95.40</b>	<b>1.00</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>2,965</b>	<b>1,738,474</b>	<b>19,709</b>	<b>10,941</b>	<b>88.21</b>	<b>1.49</b>
Private sector contribution to 'Total all industries' —							
1988-89		2,911	1,602,457	18,357	10,253	87.29	1.98
1986-87r		2,967	1,146,970	16,070	8,448	71.37	1.71

(a) Excludes enterprises in ASIC Division 'A' (b) Expenditure on R & D per person year of R & D effort. (c) Person-years of effort on R & D expressed as a percentage of the number of persons employed by those enterprises that carried out R & D. (d) ASIC Classes 2751-2752,2761,2764-2780. (e) ASIC codes 16,D,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 5. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY TYPE OF EXPENDITURE, TYPE OF ACTIVITY AND ENTERPRISE EMPLOYMENT SIZE  
(\$'000)

Industry of enterprise		Type of expenditure				Type of activity(b)			Employment size(c) (persons)		
		Total	Capital expenditure	Labour costs(d)	Other current expenditure	Basic research	Applied research	Experimental development	Less than 200	200 to 499	500 or more
ASIC Code Description											
Manufacturing —											
211	Meat products	7,489	904	3,029	3,556	n.p.	n.p.	3,808	n.p.	n.p.	6,889
212	Milk products	14,710	3,364	7,278	4,068	1,565	6,243	6,902	n.p.	n.p.	13,389
213	Fruit and vegetable products	2,695	483	1,406	806	n.p.	n.p.	2,092	n.p.	n.p.	1,915
214,217	Margarine, oils, fats n.e.c. and other food products	32,407	7,873	13,979	10,556	2,572	7,223	22,612	5,578	7,673	19,156
215,216	Flour mill and cereal food products, bread, cakes and biscuits	8,987	1,508	5,441	2,038	345	2,648	5,994	660	—	8,327
218,219	Beverages, malt and tobacco products	16,447	8,564	4,955	2,928	440	13,150	2,857	n.p.	n.p.	4,904
21	Total food, beverages and tobacco	82,735	22,696	36,088	23,952	5,704	32,766	44,265	16,508	11,647	54,580
234	Textile fibres, yarns and woven fibres	4,321	474	2,421	1,426	90	892	3,339	n.p.	n.p.	n.p.
235,24	Other textile products, clothing and footwear	3,497	996	1,462	1,039	n.p.	n.p.	2,160	n.p.	n.p.	n.p.
23,24	Total textiles, clothing and footwear	7,818	1,470	3,884	2,465	n.p.	n.p.	5,499	n.p.	2,692	n.p.
25	Wood, wood products and furniture	9,814	1,911	4,070	3,833	267	3,372	6,175	n.p.	n.p.	n.p.
263	Paper and paper products	22,033	6,792	8,052	7,190	n.p.	6,188	n.p.	658	n.p.	n.p.
264	Printing and allied industries	2,087	441	1,329	318	n.p.	1,107	n.p.	1,128	n.p.	n.p.
26	Total paper, paper products, printing and publishing	24,121	7,233	9,380	7,508	2,295	7,295	14,531	1,787	873	21,461
2753	Synthetic resins and rubber	15,027	2,082	8,462	4,483	n.p.	n.p.	11,207	4,392	n.p.	n.p.
2754, 2755	Organic and inorganic industrial chemicals n.e.c.	22,254	1,519	8,028	12,706	n.p.	n.p.	18,449	13,884	n.p.	n.p.
2762	Paints	13,702	813	9,668	3,221	527	3,254	9,922	3,540	n.p.	n.p.
2763	Pharmaceutical and veterinary products	67,707	9,020	25,230	33,457	15,271	23,635	28,801	25,105	25,645	16,957
(e)	Other chemical, petroleum and coal products	29,283	4,769	13,864	10,650	2,483	5,367	21,434	7,463	7,657	14,164
27	Total chemical, petroleum and coal products	147,972	18,203	65,252	64,517	18,757	39,403	89,813	54,383	46,977	46,612
287	Cement and concrete products	7,220	594	3,696	2,930	n.p.	n.p.	5,683	2,241	n.p.	n.p.
285,286, 288	Glass, clay and other non-metallic mineral products	15,040	5,257	4,954	4,829	n.p.	n.p.	12,090	6,711	n.p.	n.p.
28	Total non-metallic mineral products	22,260	5,851	8,650	7,759	n.p.	n.p.	17,773	8,952	1,863	11,445
294	Basic iron and steel	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
295,296	Basic non-ferrous metals	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
29	Total basic metal products	91,718	17,007	39,858	34,853	4,188	50,719	36,811	n.p.	n.p.	52,463
314	Structural metal products	3,424	207	1,794	1,424	n.p.	n.p.	2,512	2,160	n.p.	n.p.
315	Sheet metal products	6,199	303	3,805	2,091	n.p.	n.p.	5,177	1,603	n.p.	n.p.
316	Other fabricated metal products	16,076	2,469	7,905	5,702	485	4,211	11,380	11,391	1,297	3,388
31	Total fabricated metal products	25,700	2,979	13,504	9,217	648	5,983	19,068	15,154	2,527	8,019
323	Motor vehicles and parts	146,333	10,489	77,928	57,916	5,989	20,916	119,428	n.p.	n.p.	128,798
324	Other transport equipment	13,220	830	7,299	5,091	604	3,384	9,232	n.p.	n.p.	9,199
32	Total transport equipment	159,553	11,319	85,227	63,007	6,593	24,300	128,660	13,206	8,349	137,997
334	Photographic, professional and scientific equipment	37,496	3,176	20,213	14,107	1,596	7,098	28,802	15,427	n.p.	n.p.

See footnotes at end of table.

TABLE 5. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY TYPE OF EXPENDITURE, TYPE OF ACTIVITY AND ENTERPRISE EMPLOYMENT SIZE  
(\$'000) —continued

Industry of enterprise		Type of expenditure				Type of activity(b)			Employment size(c) (persons)		
		Total	Capital expenditure	Labour costs(d)	Other current expenditure	Basic research	Applied research	Experimental development	Less than 200	200 to 499	500 or more
ASIC											
Code	Description										
3351,	Radio and TV receivers, audio equipment										
3352	and electronic equipment n.e.c.	170,243	22,735	94,795	52,714	8,185	47,268	114,790	104,483	7,479	58,281
3353	Refrigerators and household appliances	20,611	n.p.	11,197	n.p.	n.p.	n.p.	18,526	n.p.	n.p.	13,270
3354	Water heating systems	669	n.p.	398	n.p.	n.p.	n.p.	450	n.p.	n.p.	—
3355—	Cables, batteries and other electrical										
3357	machinery and equipment n.e.c.	36,771	3,668	21,579	11,524	709	9,736	26,326	23,196	4,389	9,186
335	Total appliances and electrical equipment	228,294	28,656	127,968	71,671	9,019	59,183	160,092	134,834	12,723	80,737
3361	Agricultural machinery	6,919	501	3,886	2,532	n.p.	n.p.	4,397	4,929	1,990	—
3362	Construction machinery	292	n.p.	142	n.p.	—	n.p.	n.p.	292	—	—
3363	Materials handling equipment	3,844	n.p.	1,992	n.p.	n.p.	427	n.p.	n.p.	—	n.p.
3364—	Other industrial machinery and										
3369	equipment n.e.c.	43,887	3,585	22,283	18,020	2,368	13,989	27,531	n.p.	4,509	n.p.
336	Total industrial machinery and equipment	54,943	4,721	28,303	21,919	2,958	16,373	35,612	39,412	n.p.	n.p.
33	Total other machinery and equipment	320,733	36,553	176,484	107,696	13,572	82,654	224,507	189,673	26,286	104,774
345,348	Leather, leather products and other manufacturing	12,200	1,780	6,425	3,994	1,073	3,351	7,775	7,639	n.p.	n.p.
346	Rubber products	3,370	n.p.	2,133	n.p.	n.p.	n.p.	2,364	475	n.p.	n.p.
347	Plastic and related products	10,540	n.p.	5,822	n.p.	n.p.	n.p.	6,461	5,891	1,925	2,724
34	Total miscellaneous manufacturing	26,109	3,417	14,381	8,311	2,158	7,352	16,600	14,005	2,057	10,048
C	Total manufacturing	918,531	128,638	456,776	333,117	55,777	259,054	603,701	337,834	125,394	455,304
	Other industries —										
E	Construction	12,263	2,245	6,108	3,909	630	5,863	5,770	8,664	n.p.	n.p.
47	Wholesale trade	145,839	19,576	71,674	54,588	8,666	42,350	94,823	n.p.	n.p.	n.p.
48	Retail trade	6,489	467	4,811	1,212	120	1,318	5,052	n.p.	n.p.	n.p.
F	Total wholesale and retail trade	152,328	20,043	76,485	55,800	8,786	43,667	99,874	75,686	52,135	24,506
63	Property and business services	211,798	31,509	108,298	71,992	16,241	65,653	129,904	123,317	15,634	72,848
8461	Research and scientific institutions	127,892	22,305	49,194	56,393	9,645	76,457	41,790	n.p.	n.p.	—
(f)	Other n.e.c.	315,662	71,906	146,034	97,722	12,416	150,254	152,992	38,052	n.p.	n.p.
16,D-L	Total other Industries	819,942	148,008	386,118	285,816	47,718	341,893	430,331	346,221	131,142	342,579
	TOTAL ALL INDUSTRIES	1,738,474	276,646	842,894	618,934	103,495	600,947	1,034,032	684,055	256,536	797,883
	Private sector contribution to 'Total all industries' —										
	1988-89	1,602,457	247,109	778,833	576,514	93,827	536,984	971,647	n.p.	n.p.	687,196
	1986-87r	1,146,970	137,621	589,226	420,123	24,838	341,902	780,230	n.p.	n.p.	552,126

(a) Excludes enterprises in ASIC Division 'A'. (b) 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 11 of the Explanatory Notes. (c) Employment size is based on the no. of persons employed by the enterprise. (d) 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. (e) ASIC Classes 2751-2752,2761,2764-2780. (f) ASIC Codes 11-16,D,G,H,I,61-62,J,8141-8306,8462-8495,L.

TABLE 6. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY SOURCE OF FUNDS  
(\$'000)

Industry of enterprise		Source of funds							
ASIC Code	Description	Total	Own funds	GIRD Scheme(b)	Other Commonwealth Government	State and Local Government	Other business enterprises	Private non-profit and other Australian(c)	Overseas
Manufacturing —									
21	Food, beverages and tobacco	82,735	81,527	386	364	87	n.p.	n.p.	—
23-24	Textiles, clothing and footwear	7,818	7,561	n.p.	—	—	—	n.p.	—
25	Wood, wood products and furniture	9,814	9,795	—	n.p.	—	—	n.p.	—
26	Paper, paper products, printing and publishing	24,121	23,747	n.p.	n.p.	n.p.	n.p.	—	—
27	Chemical, petroleum and coal products	147,972	135,202	2,222	1,004	n.p.	8,343	n.p.	1,094
28	Non-metallic mineral products	22,260	21,549	n.p.	—	—	—	—	—
29	Basic metal products	91,718	88,061	291	n.p.	n.p.	793	n.p.	n.p.
31	Fabricated metal products	25,700	24,572	550	n.p.	—	n.p.	—	—
32	Transport equipment	159,553	146,536	355	7,408	n.p.	n.p.	n.p.	n.p.
334	Photographic, professional and scientific equipment	37,496	34,019	1,396	n.p.	—	n.p.	—	—
335	Appliances and electrical equipment	228,294	192,423	5,703	7,669	n.p.	16,465	831	n.p.
336	Industrial machinery and equipment	54,943	51,707	1,698	611	—	927	—	—
34	Miscellaneous manufacturing	26,109	23,977	780	n.p.	n.p.	242	n.p.	—
<b>C</b>	<b>Total manufacturing</b>	<b>918,531</b>	<b>840,675</b>	<b>14,506</b>	<b>19,946</b>	<b>1,155</b>	<b>33,266</b>	<b>1,634</b>	<b>7,350</b>
Other industries —									
F	Wholesale and retail trade	152,328	114,390	1,204	2,099	n.p.	3,019	n.p.	31,379
63	Property and business services	211,798	173,549	2,764	3,678	1,158	28,784	n.p.	n.p.
8461	Research and scientific institutions	127,892	72,902	4,613	5,678	n.p.	40,973	2,849	n.p.
(d)	Other n.e.c.	327,925	308,611	1,568	4,582	1,565	10,936	663	—
<b>11-16, D-L</b>	<b>Total other Industries</b>	<b>819,942</b>	<b>669,453</b>	<b>10,149</b>	<b>16,036</b>	<b>3,176</b>	<b>83,712</b>	<b>4,446</b>	<b>32,971</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>1,738,474</b>	<b>1,510,128</b>	<b>24,655</b>	<b>35,982</b>	<b>4,331</b>	<b>116,978</b>	<b>6,079</b>	<b>40,321</b>
Private sector contribution to 'Total all industries' —									
1988-89		1,602,457	1,382,003	24,532	33,205	2,689	n.p.	n.p.	40,321
1986-87r		1,146,970	1,013,212	22,915	30,455	n.p.	63,828	n.p.	12,903

(a) Excludes enterprises in ASIC Division 'A'. (b) Grants for Industry R & D Scheme. (c) Includes Higher Education Sector. (d) ASIC Codes 11-16, D, E, G, H, 61-62, J, 8141-8306, 8462-8495, L.

TABLE 7. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY LOCATION OF EXPENDITURE(b)  
(\$'000)

Industry of enterprise		Location of expenditure							Overseas
		Total	NSW	Vic.	Qld	SA	WA	Other Australian states and territories	
ASIC Code	Description								
	Manufacturing —								
21	Food, beverages and tobacco	82,735	34,795	30,504	14,422	n.p.	1,001	796	n.p.
23-24	Textiles, clothing and footwear	7,818	3,171	3,431	n.p.	n.p.	n.p.	—	—
25	Wood, wood products and furniture	9,814	5,096	1,470	1,226	n.p.	369	n.p.	n.p.
26	Paper, paper products, printing and publishing	24,121	1,740	9,732	n.p.	n.p.	430	n.p.	n.p.
27	Chemical, petroleum and coal products	147,972	58,618	57,954	4,362	5,114	3,550	17,172	1,203
28	Non-metallic mineral products	22,260	9,964	n.p.	n.p.	608	n.p.	—	—
29	Basic metal products	91,718	52,427	n.p.	2,733	3,376	n.p.	n.p.	—
31	Fabricated metal products	25,700	9,483	10,287	3,185	2,062	491	n.p.	n.p.
32	Transport equipment	159,553	16,962	113,146	6,797	18,734	n.p.	—	n.p.
334	Photographic, professional and scientific equipment	37,496	18,148	15,340	1,464	1,981	436	n.p.	n.p.
335	Appliances and electrical equipment	228,294	87,422	76,227	9,788	27,265	19,538	6,121	1,933
336	Industrial machinery and equipment	54,943	21,530	18,278	7,906	3,152	3,650	254	172
34	Miscellaneous manufacturing	26,109	9,200	5,771	1,996	7,158	n.p.	—	n.p.
<b>C</b>	<b>Total manufacturing</b>	<b>918,531</b>	<b>328,555</b>	<b>372,249</b>	<b>57,540</b>	<b>72,998</b>	<b>43,148</b>	<b>39,606</b>	<b>4,435</b>
	Other industries —								
F	Wholesale and retail trade	152,328	92,910	29,264	10,790	5,124	n.p.	8,970	n.p.
63	Property and business services	211,798	77,598	79,292	15,821	5,319	17,301	15,177	1,292
8461	Research and scientific institutions	127,892	65,575	25,321	8,709	10,420	n.p.	869	n.p.
(c)	Other n.e.c.	327,925	157,906	91,414	32,546	6,546	25,129	10,622	3,761
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>819,942</b>	<b>393,988</b>	<b>225,292</b>	<b>67,866</b>	<b>27,409</b>	<b>55,943</b>	<b>35,638</b>	<b>13,807</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>1,738,474</b>	<b>722,543</b>	<b>597,541</b>	<b>125,406</b>	<b>100,407</b>	<b>99,091</b>	<b>75,244</b>	<b>18,242</b>
	Private sector contribution to 'Total all industries' —								
	1988-89	1,602,457	677,242	520,578	120,994	97,249	93,703	74,514	18,177
	1986-87r	1,146,970	454,366	402,796	98,710	66,323	75,488	38,340	10,948

(a) Excludes enterprises in ASIC Division 'A' (b) Location of the expenditure. This may not be the location of the organisations head office (c) ASIC Codes 11-16,D,E,G,H,61-62,J, 8141-8306,8462-8495,L.

TABLE 8. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY LOCATION OF EXPENDITURE(b)  
(\$'000)

Industry of enterprise		Location of expenditure										
		Total	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Ext. Terr.	Overseas
ASIC Code	Description											
C	Manufacturing	918,531	328,555	372,249	57,540	72,998	43,148	33,867	160	5,579	—	4,435
B,D-L	Mining and other industries	819,942	393,988	225,292	67,866	27,409	55,943	13,170	n.p.	19,763	n.p.	13,807
	<b>TOTAL ALL INDUSTRIES</b>	<b>1,738,474</b>	<b>722,543</b>	<b>597,541</b>	<b>125,406</b>	<b>100,407</b>	<b>99,091</b>	<b>47,037</b>	n.p.	<b>25,342</b>	n.p.	<b>18,242</b>
	Private sector contribution to 'Total all industries' —											
	1988-89	1,602,457	677,242	520,578	120,994	97,249	93,703	46,307	n.p.	25,342	n.p.	18,177
	1986-87r	1,146,970	454,366	402,796	98,710	66,323	75,488	19,097	2,912	16,331	—	10,948

(a) Excludes enterprises in ASIC Division 'A'. (b) Location of the expenditure. This may not be the location of the organisations head office



TABLE 9. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES, AUSTRALIA(a), 1988-89  
HUMAN RESOURCES DEVOTED TO R & D BY INDUSTRY OF ENTERPRISE BY TYPE OF EMPLOYEE AND ENTERPRISE EMPLOYMENT SIZE  
(person-years)

Industry of enterprise		Type of employee				Employment size(b) (persons)		
		Total	Researchers	Technicians	Other supporting staff	Less than 200	200 to 499	500 or more
ASIC Code	Description							
	Mining —							
11	Metallic minerals	502	174	225	104	14	n.p.	n.p.
12-15	Non-metallic minerals	81	32	38	11	15	n.p.	n.p.
<b>11-15</b>	<b>Total mining (excluding services to mining)</b>	<b>582</b>	<b>205</b>	<b>262</b>	<b>115</b>	<b>29</b>	<b>59</b>	<b>494</b>
	Manufacturing —							
211	Meat products	67	36	17	15	n.p.	n.p.	58
212	Milk products	177	111	39	28	n.p.	n.p.	161
213	Fruit and vegetable products	36	25	8	3	n.p.	n.p.	20
214,217	Margarine, oils, fats n.e.c. and other food products	320	182	100	39	68	58	194
215,216	Flour mill and cereal food products, bread, cakes and biscuits	126	72	34	21	12	—	114
218,219	Beverages, malt and tobacco products	105	53	29	23	16	9	80
21	Total food, beverages and tobacco	832	478	226	128	116	90	627
234	Textile fibres, yarns and woven fibres	57	18	28	12	13	n.p.	n.p.
235,24	Other textile products, clothing and footwear	50	26	18	6	17	n.p.	n.p.
23,24	Total textiles, clothing and footwear	107	43	46	18	30	33	44
25	Wood, wood products and furniture	111	46	44	22	57	n.p.	n.p.
263	Paper and paper products	198	74	72	51	5	n.p.	n.p.
264	Printing and allied industries	36	20	13	4	20	n.p.	n.p.
26	Total paper, paper products, printing and publishing	234	94	85	55	26	16	192
2753	Synthetic resins and rubber	202	117	65	21	76	n.p.	n.p.
2754,	Organic and inorganic industrial							
2755	chemicals n.e.c.	203	113	45	45	102	n.p.	n.p.
2762	Paints	264	167	83	14	80	n.p.	n.p.
2763	Pharmaceutical and veterinary products	625	348	178	99	238	252	135
(c)	Other chemical, petroleum and coal products	370	211	103	55	129	119	122
27	Total chemical, petroleum and coal products	1,664	956	474	234	626	567	471
287	Cement and concrete products	84	31	38	15	n.p.	n.p.	60
285,286,	Glass, clay and other non-metallic							
288	mineral products	122	66	40	17	n.p.	n.p.	57
28	Total non-metallic mineral products	206	97	77	32	72	16	117
294	Basic iron and steel	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
295,296	Basic non-ferrous metals	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
29	Total basic metal products	966	551	259	157	212	n.p.	n.p.
314	Structural metal products	55	21	21	14	35	n.p.	n.p.
315	Sheet metal products	88	33	30	25	30	n.p.	n.p.
316	Other fabricated metal products	233	111	77	45	142	33	59
31	Total fabricated metal products	376	165	127	84	207	53	117

See footnotes at end of table.

TABLE 9. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES, AUSTRALIA(a), 1988-89  
HUMAN RESOURCES DEVOTED TO R & D BY INDUSTRY OF ENTERPRISE BY TYPE OF EMPLOYEE AND ENTERPRISE EMPLOYMENT SIZE  
(person-years) —continued

Industry of enterprise		Type of employee				Employment size(b) (persons)		
		Total	Researchers	Technicians	Other supporting staff	Less than 200	200 to 499	500 or more
ASIC								
Code	Description							
323	Motor vehicles and parts	1,579	615	696	268	n.p.	n.p.	1,351
324	Other transport equipment	174	74	58	42	n.p.	n.p.	111
32	Total transport equipment	1,753	690	754	309	164	127	1,462
334	Photographic, professional and scientific equipment	512	320	123	70	226	n.p.	n.p.
3351,	Radio and TV receivers, audio equipment							
3352	and electronic equipment n.e.c.	2,467	1,745	491	231	1,538	89	841
3353	Refrigerators and household appliances	277	117	111	50	n.p.	n.p.	199
3354	Water heating systems	14	10	3	1	n.p.	n.p.	—
3355—	Cables, batteries and other electrical							
3357	machinery and equipment n.e.c.	560	286	191	83	356	68	136
335	Total appliances and electrical equipment	3,319	2,157	796	366	1,967	176	1,176
3361	Agricultural machinery	140	62	38	40	86	54	—
3362	Construction machinery	5	3	n.p.	n.p.	5	—	—
3363	Materials handling equipment	51	18	n.p.	n.p.	n.p.	—	n.p.
3364—	Other industrial machinery and							
3369	equipment n.e.c.	587	285	186	117	n.p.	n.p.	n.p.
336	Total industrial machinery and equipment	783	368	242	173	577	n.p.	n.p.
33	Total other machinery and equipment	4,614	2,845	1,161	609	2,770	393	1,452
345,348	Leather, leather products and other manufacturing	175	98	60	17	116	n.p.	n.p.
346	Rubber products	46	12	n.p.	n.p.	8	n.p.	n.p.
347	Plastic and related products	158	81	n.p.	n.p.	86	26	46
34	Total miscellaneous manufacturing	379	191	137	51	210	29	140
C	Total manufacturing	11,243	6,156	3,390	1,697	4,489	1,570	5,184
	Other industries —							
E	Construction	160	95	39	25	n.p.	n.p.	n.p.
47	Wholesale trade	1,530	1,077	292	161	775	n.p.	n.p.
48	Retail trade	112	68	27	18	64	n.p.	n.p.
F	Total wholesale and retail trade	1,642	1,145	319	178	839	562	241
63	Property and business services	2,553	1,556	718	278	1,704	n.p.	n.p.
8461	Research and scientific institutions	1,109	585	300	224	n.p.	n.p.	—
(d)	Other n.e.c.	2,420	1,199	895	326	n.p.	n.p.	n.p.
16,D-L	Total other industries	7,884	4,580	2,272	1,032	3,876	1,020	2,988
	TOTAL ALL INDUSTRIES	19,709	10,941	5,924	2,843	8,394	2,649	8,666
	Private sector contribution to 'Total all industries' —							
	1988-89	18,357	10,253	5,519	2,586	8,371	2,504	7,482
	1986-87r	16,070	8,448	5,128	2,494	n.p.	n.p.	7,236

(a) Excludes enterprises in ASIC 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) ASIC Classes 2751-2752,2761,2764-2780. (d) ASIC Codes 16,D,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 10. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY R & D EXPENDITURE SIZE

Industry of enterprise		R & D expenditure size (\$'000)									
		Total		Less than 20		20 to 49		50 to 499		500 or more	
		Enterprises (number)	R & D Expenditure (\$'000)	Enterprises (number)	R & D Expenditure (\$'000)	Enterprises (number)	R & D Expenditure (\$'000)	Enterprises (number)	R & D Expenditure (\$'000)	Enterprises (number)	R & D Expenditure (\$'000)
ASIC Code	Description										
11-15	Mining (excluding services to mining)	46	67,830	9	81	3	99	20	4,813	14	62,837
	Manufacturing —										
21	Food, beverages and tobacco	101	82,735	4	39	8	289	53	10,108	36	72,300
23-24	Textiles, clothing and footwear	41	7,818	6	49	3	78	29	5,094	3	2,598
25	Wood, wood products and furniture	45	9,814	10	114	9	307	23	4,267	3	5,126
26	Paper, paper products, printing and publishing	29	24,121	2	n.p.	3	n.p.	19	4,074	5	19,927
27	Chemical, petroleum and coal products	255	147,972	29	287	38	1,269	128	21,989	60	124,427
28	Non-metallic mineral products	45	22,260	4	32	5	169	24	3,667	12	18,392
29	Basic metal products	52	91,718	3	n.p.	2	n.p.	30	5,086	17	86,541
31	Fabricated metal products	131	25,700	18	197	19	612	81	12,153	13	12,738
32	Transport equipment	120	159,553	9	112	16	542	60	9,625	35	149,274
334	Photographic, professional and scientific equipment	69	37,496	5	53	11	344	43	6,690	10	30,409
335	Appliances and electrical equipment	560	228,294	61	639	100	3,455	309	53,097	90	171,103
336	Industrial machinery and equipment	252	54,943	27	276	47	1,663	156	24,427	22	28,577
34	Miscellaneous manufacturing	112	26,109	12	132	15	547	76	12,262	9	13,169
C	<b>Total manufacturing</b>	<b>1,812</b>	<b>918,531</b>	<b>190</b>	<b>1,978</b>	<b>276</b>	<b>9,435</b>	<b>1,031</b>	<b>172,538</b>	<b>315</b>	<b>734,581</b>
	Other industries —										
F	Wholesale and retail trade	290	152,328	19	155	56	1,922	166	26,678	49	123,573
63	Property and business services	503	211,798	72	654	95	3,036	271	48,791	65	159,317
8461	Research and scientific institutions	97	127,892	9	88	13	398	39	6,319	36	121,087
(b)	Other n.e.c.	217	260,095	27	252	29	996	108	19,155	53	239,692
16, D-L	<b>Total other industries</b>	<b>1,107</b>	<b>752,112</b>	<b>127</b>	<b>1,148</b>	<b>193</b>	<b>6,353</b>	<b>584</b>	<b>100,943</b>	<b>203</b>	<b>643,669</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>2,965</b>	<b>1,738,474</b>	<b>326</b>	<b>3,207</b>	<b>472</b>	<b>15,886</b>	<b>1,635</b>	<b>278,294</b>	<b>532</b>	<b>1,441,087</b>
	Private sector contribution to 'Total all industries' —										
	1988-89	2,911	1,602,457	322	3,160	467	15,724	1,615	273,922	507	1,309,651
	1986-87r	2,967	1,146,970	475	4,573	545	18,002	1,564	248,475	383	875,919

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 16,D,E,G-H,61-62,J,8141-8306,8462-8495,L.

TABLE 11. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY R & D EXPENDITURE SIZE

<i>Expenditure size (\$'000)</i>	<i>Total all industries</i>		<i>Manufacturing</i>		<i>Mining and other industries</i>	
	<i>Enterprises (number)</i>	<i>R &amp; D Expenditure (\$'000)</i>	<i>Enterprises (number)</i>	<i>R &amp; D Expenditure (\$'000)</i>	<i>Enterprises (number)</i>	<i>R &amp; D Expenditure (\$'000)</i>
Less than 20	326	3,207	190	1,978	136	1,229
20 to 49	472	15,886	276	9,435	196	6,451
50 to 99	574	41,301	368	26,543	206	14,759
100 to 199	559	78,508	364	51,310	195	27,198
200 to 499	502	158,484	299	94,685	203	63,799
500 to 999	237	162,671	140	95,987	97	66,684
1000 to 1999	138	187,446	83	110,408	55	77,038
2000 to 4999	95	296,478	60	192,069	35	104,409
5000 to 9999	40	275,549	23	161,152	17	114,397
10000 or more	22	518,944	9	174,965	13	343,979
<b>TOTAL</b>	<b>2,965</b>	<b>1,738,474</b>	<b>1,812</b>	<b>918,531</b>	<b>1,153</b>	<b>819,942</b>

(a) Excludes enterprises in ASIC Division 'A'.

TABLE 12. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
NUMBER OF ENTERPRISES PERFORMING R & D BY INDUSTRY OF ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE(b)  
(number)

Industry of enterprise		Enterprise employment size (persons)								
		Total	Less than 10	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 to 999	1000 or more
ASIC Code	Description									
	Manufacturing —									
21	Food, beverages and tobacco	101	8	1	6	13	14	16	17	26
23-24	Textiles, clothing and footwear	41	1	—	8	8	6	10	4	4
25	Wood, wood products and furniture	45	7	2	9	5	14	4	2	2
26	Paper, paper products, printing and publishing	29	6	2	2	—	3	7	5	4
27	Chemical, petroleum and coal products	255	52	33	44	28	32	47	13	6
28	Non-metallic mineral products	45	11	5	2	6	1	5	9	6
29	Basic metal products	52	8	1	4	4	8	8	8	11
31	Fabricated metal products	131	29	19	27	19	14	9	6	8
32	Transport equipment	120	30	9	15	15	5	12	15	19
334	Photographic, professional and scientific equipment	69	30	13	9	5	7	3	1	1
335	Appliances and electrical equipment	560	245	105	89	50	26	19	12	14
336	Industrial machinery and equipment	252	85	36	51	38	21	13	5	3
34	Miscellaneous manufacturing	112	22	12	21	22	15	11	5	4
C	<b>Total manufacturing</b>	<b>1,812</b>	<b>534</b>	<b>238</b>	<b>287</b>	<b>213</b>	<b>166</b>	<b>164</b>	<b>102</b>	<b>108</b>
	Other industries —									
F	Wholesale and retail trade	290	77	49	54	31	30	29	11	9
63	Property and business services	503	267	85	75	27	16	15	4	14
8461	Research and scientific institutions	97	58	13	17	4	4	1	—	—
(c)	Other n.e.c.	263	66	27	29	24	17	26	25	49
11-16, D-L	<b>Total other industries</b>	<b>1,153</b>	<b>468</b>	<b>174</b>	<b>175</b>	<b>86</b>	<b>67</b>	<b>71</b>	<b>40</b>	<b>72</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>2,965</b>	<b>1,002</b>	<b>412</b>	<b>462</b>	<b>299</b>	<b>233</b>	<b>235</b>	<b>142</b>	<b>180</b>
	Private sector contribution to 'Total all industries' —									
	1988-89	2,911	999	411	461	298	227	232	137	146
	1986-87r	2,967	1,080	445	470	274	201	233	123	141

(a) Excludes enterprises in ASIC Division 'A'. (b) Employment size is based on the number of persons employed by the enterprise. (c) ASIC Codes 11-16,D,E,G-H,61-62,J,8141-8306,8462-8495,L.

TABLE 13. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE(b)  
(\$'000)

Industry of enterprise ASIC Code Description		Enterprise employment size (persons)								
		Total	Less than 10	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 to 999	1000 or more
Manufacturing —										
21	Food, beverages and tobacco	82,735	n.p.	n.p.	1,057	2,485	11,993	11,647	11,478	43,102
23-24	Textiles, clothing and footwear	7,818	n.p.	—	241	656	851	2,692	1,821	n.p.
25	Wood, wood products and furniture	9,814	398	n.p.	640	557	2,347	n.p.	n.p.	n.p.
26	Paper, paper products, printing and publishing	24,121	372	n.p.	n.p.	—	342	873	2,858	18,603
27	Chemical, petroleum and coal products	147,972	3,283	6,689	14,396	18,804	11,211	46,977	17,891	28,721
28	Non-metallic mineral products	22,260	1,486	n.p.	n.p.	n.p.	n.p.	1,863	2,750	8,695
29	Basic metal products	91,718	987	n.p.	n.p.	n.p.	n.p.	n.p.	7,842	44,621
31	Fabricated metal products	25,700	4,408	2,027	2,775	2,135	3,808	2,527	2,106	5,913
32	Transport equipment	159,553	2,855	1,027	6,220	1,862	1,243	8,349	10,769	127,228
334	Photographic, professional and scientific equipment	37,496	3,119	1,996	1,683	4,267	4,362	n.p.	n.p.	n.p.
335	Appliances and electrical equipment	228,294	22,459	22,068	42,574	29,558	18,175	12,723	25,270	55,467
336	Industrial machinery and equipment	54,943	7,098	2,759	8,349	9,504	11,701	n.p.	5,504	n.p.
34	Miscellaneous manufacturing	26,109	1,790	2,384	2,076	5,158	2,597	2,057	6,171	3,877
<b>C</b>	<b>Total manufacturing</b>	<b>918,531</b>	<b>49,231</b>	<b>43,444</b>	<b>82,177</b>	<b>79,458</b>	<b>83,523</b>	<b>125,394</b>	<b>106,045</b>	<b>349,260</b>
Other industries —										
F	Wholesale and retail trade	152,328	7,648	n.p.	10,984	n.p.	30,831	52,135	n.p.	n.p.
63	Property and business services	211,798	24,165	23,460	33,177	19,812	22,703	n.p.	n.p.	n.p.
8461	Research and scientific institutions	127,892	11,601	n.p.	33,534	n.p.	42,082	n.p.	—	—
(c)	Other n.e.c.	327,925	10,028	7,458	16,149	5,878	7,204	35,984	23,860	221,365
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>819,942</b>	<b>53,442</b>	<b>46,705</b>	<b>93,843</b>	<b>49,411</b>	<b>102,820</b>	<b>131,142</b>	<b>54,260</b>	<b>288,319</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>1,738,474</b>	<b>102,673</b>	<b>90,149</b>	<b>176,020</b>	<b>128,870</b>	<b>186,343</b>	<b>256,536</b>	<b>160,305</b>	<b>637,579</b>
Private sector contribution to 'Total all industries' —										
	1988-89	1,602,457	102,269	n.p.	176,001	n.p.	185,641	232,509	157,810	529,386
	1986-87r	1,146,970	83,476	74,653	131,732	n.p.	87,972	n.p.	86,522	465,604

(a) Excludes enterprises in ASIC Division 'A'. (b) Employment size is based on the number of persons employed by the enterprise. (c) ASIC Codes 11-16, D, E, G, H, 61-62, J, 8141-8306, 8462-8495, L.

TABLE 14. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
HUMAN RESOURCES DEVOTED TO R & D BY INDUSTRY OF ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE(b)  
(person years)

Industry of enterprise		Enterprise employment size (persons)								
		Total	Less than 10	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 to 999	1000 or more
ASIC										
Code	Description									
	Manufacturing —									
21	Food, beverages and tobacco	832	n.p.	n.p.	15	41	45	90	125	501
23-24	Textiles, clothing and footwear	107	n.p.	—	n.p.	10	15	33	n.p.	n.p.
25	Wood, wood products and furniture	111	n.p.	n.p.	10	7	28	n.p.	n.p.	n.p.
26	Paper, paper products, printing and publishing	234	7	n.p.	n.p.	—	5	16	23	169
27	Chemical, petroleum and coal products	1,664	53	64	155	174	181	567	211	260
28	Non-metallic mineral products	206	15	n.p.	n.p.	n.p.	n.p.	16	44	73
29	Basic metal products	966	13	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	476
31	Fabricated metal products	376	43	23	44	40	58	53	29	88
32	Transport equipment	1,753	48	20	42	41	14	127	169	1,293
334	Photographic, professional and scientific equipment	512	45	34	26	66	54	n.p.	n.p.	n.p.
335	Appliances and electrical equipment	3,319	367	351	604	411	234	176	321	855
336	Industrial machinery and equipment	783	104	50	128	170	127	n.p.	n.p.	56
34	Miscellaneous manufacturing	379	18	20	38	98	36	29	87	54
C	<b>Total manufacturing</b>	<b>11,243</b>	<b>734</b>	<b>600</b>	<b>1,092</b>	<b>1,101</b>	<b>962</b>	<b>1,570</b>	<b>1,247</b>	<b>3,937</b>
	Other industries —									
F	Wholesale and retail trade	1,642	121	n.p.	181	n.p.	239	562	n.p.	n.p.
63	Property and business services	2,553	406	322	364	272	341	n.p.	n.p.	n.p.
8461	Research and scientific institutions	1,109	139	n.p.	286	n.p.	367	n.p.	—	—
(c)	Other n.e.c.	3,162	92	99	86	75	57	262	276	2,216
11-16, D-L	<b>Total other industries</b>	<b>8,466</b>	<b>757</b>	<b>626</b>	<b>917</b>	<b>602</b>	<b>1,003</b>	<b>1,079</b>	<b>628</b>	<b>2,855</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>19,709</b>	<b>1,492</b>	<b>1,226</b>	<b>2,009</b>	<b>1,703</b>	<b>1,965</b>	<b>2,649</b>	<b>1,875</b>	<b>6,792</b>
	Private sector contribution to 'Total all industries' —									
	1988-89	18,357	1,483	n.p.	2,009	n.p.	1,953	2,504	1,843	5,639
	1986-87r	16,070	1,344	1,127	1,812	n.p.	1,274	n.p.	1,361	5,876

(a) Excludes enterprises in ASIC 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) ASIC Codes 11-16,D,E,G-H,61-62,J,8141-8306,8462-8495,L.

TABLE 15. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
HUMAN RESOURCES DEVOTED TO R & D AS A PERCENTAGE OF ENTERPRISE EMPLOYMENT BY INDUSTRY OF  
ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE(b)

Industry of enterprise		Enterprise employment size (persons)								
		Total	Less than 10	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 to 999	1000 or more
ASIC Code	Description									
	Manufacturing—									
21	Food, beverages and tobacco	0.95	n.p.	n.p.	6.62	3.87	1.57	1.16	1.07	0.78
23-24	Textiles, clothing and footwear	0.57	n.p.	—	n.p.	1.68	1.19	0.91	n.p.	n.p.
25	Wood, wood products and furniture	1.17	n.p.	n.p.	3.81	1.77	1.35	n.p.	n.p.	n.p.
26	Paper, paper products, printing and publishing	0.71	21.82	n.p.	n.p.	—	1.32	0.54	0.56	0.67
27	Chemical, petroleum and coal products	3.29	18.08	12.16	10.95	8.94	3.94	3.53	1.74	1.90
28	Non-metallic mineral products	0.98	25.93	n.p.	n.p.	n.p.	n.p.	0.83	0.68	0.63
29	Basic metal products	1.72	46.79	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	1.04
31	Fabricated metal products	1.33	30.72	7.78	4.12	3.11	2.26	1.81	0.80	0.54
32	Transport equipment	2.37	30.71	14.96	7.48	3.87	1.38	3.33	1.74	2.25
334	Photographic, professional and scientific equipment	8.49	30.97	20.48	7.86	11.35	5.46	n.p.	n.p.	n.p.
335	Appliances and electrical equipment	6.43	31.12	23.02	21.73	11.42	5.62	2.81	3.98	3.55
336	Industrial machinery and equipment	3.47	27.43	9.31	6.95	6.18	3.36	n.p.	n.p.	0.99
34	Miscellaneous manufacturing	1.83	15.33	10.77	4.60	5.60	1.48	0.82	2.56	0.63
C	<b>Total manufacturing</b>	<b>2.34</b>	<b>28.20</b>	<b>16.56</b>	<b>11.03</b>	<b>6.93</b>	<b>3.47</b>	<b>2.67</b>	<b>1.64</b>	<b>1.38</b>
	Other industries —									
F	Wholesale and retail trade	0.76	24.27	n.p.	8.22	n.p.	4.90	5.11	n.p.	n.p.
63	Property and business services	3.61	32.16	26.34	15.04	14.48	11.31	n.p.	n.p.	n.p.
8461	Research and scientific institutions	50.98	58.98	n.p.	58.57	n.p.	46.29	n.p.	—	—
(c)	Other n.e.c.	0.57	27.73	23.44	7.64	3.70	1.77	2.81	1.35	0.43
11-16, D-L	<b>Total other industries</b>	<b>1.01</b>	<b>32.56</b>	<b>24.11</b>	<b>14.72</b>	<b>8.98</b>	<b>8.44</b>	<b>4.24</b>	<b>1.99</b>	<b>0.38</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>1.49</b>	<b>30.26</b>	<b>19.71</b>	<b>12.46</b>	<b>7.54</b>	<b>4.96</b>	<b>3.15</b>	<b>1.74</b>	<b>0.65</b>

(a) Excludes enterprises in ASIC 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) ASIC Codes 11-16,D,E,G-H,61-62,J,8141-8306,8462-8495,L.



TABLE 16. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA  
R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD (b)

Industry of product field		1986-87r		1988-89	
		Enterprises(c) (number)	R & D expenditure (\$'000)	Enterprises(c) (number)	R & D expenditure (\$'000)
Agriculture, forestry, fishing and hunting —					
012,018	Poultry, cereal grains, sheep, cattle and pigs	12	5,109	26	11,695
013-014, 019-04	Other agriculture, forestry, fishing and hunting	41	7,590	43	11,505
<b>A</b>	<b>Total agriculture, forestry, fishing and hunting</b>	<b>53</b>	<b>12,699</b>	<b>64</b>	<b>23,200</b>
Mining —					
11	Metallic minerals	27	49,909	47	65,111
12-15	Non-metallic minerals	30	30,681	56	40,961
<b>11-15</b>	<b>Total mining (excluding services to mining)</b>	<b>51</b>	<b>80,590</b>	<b>88</b>	<b>106,072</b>
Manufacturing —					
211	Meat products	19	3,798	25	2,507
212	Milk products	17	12,953	26	10,572
213	Fruit and vegetable products	19	1,351	26	2,656
214,217	Margarine, oils, fats n.e.c. and other food products	69	21,874	64	25,158
215,216	Flour mill and cereal food products, bread, cakes and biscuits	17	7,999	32	15,129
218,219	Beverages, malt and tobacco products	19	5,358	31	17,716
21	Total food, beverages and tobacco	138	53,332	144	73,738
234	Textile fibres, yarns and woven fibres	14	1,736	21	3,595
235,24	Other textile products, clothing and footwear	34	4,877	31	3,403
23,24	Total textiles, clothing and footwear	48	6,613	51	6,998
25	Wood, wood products and furniture	65	5,624	59	5,459
263	Paper and paper products	23	n.p.	28	23,228
264	Printing and allied industries	4	n.p.	11	2,971
26	Total paper, paper products, printing and publishing	27	9,086	38	26,199
2751	Chemical fertilizers	13	2,666	12	1,407
2753	Synthetic resins and rubber	54	17,537	41	18,333
2754	Organic industrial chemicals n.e.c.	37	4,624	47	7,396
2755	Inorganic industrial chemicals n.e.c.	51	9,515	30	4,350
2762	Paints	65	12,582	58	15,041
2763	( Veterinary products	31	16,780	34	23,092
	( Pharmaceutical products	77	42,245	97	82,732
2764	Pesticides	29	15,760	37	18,675
2765	Soap and other detergents	36	3,918	35	5,263
2766	Cosmetics and toilet preparations	23	3,202	29	4,897
2767	Inks	12	1,835	7	1,891
2752,2761, 2768	Industrial gases, ammunition and other chemical products	97	20,463	86	18,104

See footnotes at end of table.

TABLE 16. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA  
R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD (b) —continued

Industry of product field		1986-87r		1988-89	
		Enterprises(c) (number)	R & D expenditure (\$'000)	Enterprises(c) (number)	R & D expenditure (\$'000)
275,276	Total basic chemicals and other chemical products	424	151,127	365	201,183
277,278	Petroleum refining, petroleum and coal products n.e.c.	40	7,800	35	10,533
27	Total chemical, petroleum and coal products	451	158,928	394	211,715
285	Glass and glass products	7	999	15	1,384
286	Clay products and refractories	30	12,930	29	3,650
287	Cement and concrete products	28	6,084	29	7,622
288	Other non-metallic mineral products	30	3,462	33	26,922
28	Total non-metallic mineral products	85	23,475	94	39,578
294	Basic iron and steel	65	45,077	40	58,672
295,296	Basic non-ferrous metals	53	26,835	45	34,003
29	Total basic metal products	114	71,911	77	92,675
314	Structural metal products	59	6,186	56	9,108
315	Sheet metal products	35	4,811	61	10,377
316	Other fabricated metal products	126	14,666	118	22,962
31	Total fabricated metal products	209	25,664	212	42,448
323	Motor vehicles and parts	112	126,279	120	158,382
3241,3242	Ships and boats	23	5,157	30	5,460
3243	Railway rolling stock and locomotives	12	8,693	14	3,392
3244	Aircraft	12	2,685	17	4,286
3245	Transport equipment n.e.c.	12	1,601	24	3,591
324	Total other transport equipment	58	18,137	78	16,729
32	Total transport equipment	163	144,415	191	175,110
3341,3342	Photographic and optical goods and photographic film processing	26	6,711	27	16,897
3343	( Medical and surgical equipment (excl. veterinary equipment)	63	21,451	74	22,067
334	( Other measuring, professional and scientific equipment	84	13,305	97	25,371
334	Total Photographic, professional and scientific equipment	171	41,468	186	64,335
3351	Radio and TV receivers and audio equipment	37	2,904	36	3,372
	( Telecommunications and broadcasting equipment	138	132,614	116	148,226
3352	( Other electronic equipment	226	32,240	219	43,657
	( Computer hardware	231	45,273	190	42,639
	( Computer software	575	213,238	550	356,657
3353	Refrigerators and household appliances	68	13,853	55	16,524
3354	Water heating systems	22	4,059	22	3,257
3355—	Cables, batteries and other electrical machinery and equipment n.e.c.	245	30,837	163	26,407
3357	Total appliances and electrical equipment	1278	475,017	1078	640,739
3361	Agricultural machinery	83	10,193	80	10,506
3362	Construction machinery	12	2,968	22	5,453
3363	Materials handling equipment	62	5,549	54	6,114

See footnotes at end of table.

TABLE 16. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA  
R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD (b) —continued

Industry of product field		1986-87r		1988-89	
		Enterprises(c) (number)	R & D expenditure (\$'000)	Enterprises(c) (number)	R & D expenditure (\$'000)
ASIC Code	Description				
3364	Wood and metal working machinery	48	5,416	39	10,792
3365	Pumps and compressors	33	3,320	35	4,190
3366	Commercial space heating and cooling equipment	28	5,184	29	4,317
3367	Dies, saw blades and machine tool accessories	5	112	8	2,315
3368	Food processing equipment	49	10,598	38	11,238
3369	Industrial machinery & equipment n.e.c.	323	46,433	238	54,498
336	Total industrial machinery and equipment	581	89,775	481	109,423
33	Total other machinery and equipment	1875	606,259	1626	814,496
345	Leather and leather products	8	1,151	11	1,157
346	Rubber products	26	2,047	21	2,818
347	Plastic and related products	113	17,522	122	20,882
348	Other manufacturing	48	5,814	65	13,522
34	Total miscellaneous manufacturing	185	26,533	208	38,379
<b>C</b>	<b>Total manufacturing</b>	<b>2,859</b>	<b>1,131,840</b>	<b>2,694</b>	<b>1,526,795</b>
	Other industries —				
16	Services to mining	21	7,603	47	9,917
E	Construction	42	3,778	31	2,635
D,F-L	Other n.e.c.	126	33,106	202	69,855
<b>16,D-L</b>	<b>Total other industries</b>	<b>186</b>	<b>44,487</b>	<b>266</b>	<b>82,407</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>3,029</b>	<b>1,269,615</b>	<b>2,965</b>	<b>1,738,474</b>
	Private sector contribution	2967	1,146,970	2911	1,602,457
	Public sector contribution	62	122,646	54	136,017

(a) Excludes enterprises in ASIC Division 'A'. (b) The industry of product (or process) field towards which the R & D activity was directed. For further explanation see paragraph 24 of the Explanatory Notes. (c) Where the R & D performed by an enterprise was directed towards more than one product, that enterprise is counted in each of the industries to which its products are coded. Therefore, the enterprise counts shown in this table cannot be summed to aggregates for combinations of industries.

TABLE 17. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD(b) BY ENTERPRISE EMPLOYMENT SIZE(c)

Industry of product field		Employment Size (persons)							
		Less than 200		200 to 499		500 or more			
		Enterprises(d) (number)	R & D expenditure (\$'000)	Enterprises(d) (number)	R & D expenditure (\$'000)	Enterprises(d) (number)	R & D expenditure (\$'000)	Enterprises(d) (number)	R & D expenditure (\$'000)
ASIC Code	Description								
Manufacturing —									
21	Food, beverages and tobacco	144	73,738	79	23,107	17	6,928	48	43,703
23-24	Textiles, clothing and footwear	51	6,998	33	2,220	12	2,404	6	2,374
25	Wood, wood products and furniture	59	5,459	43	2,878	7	386	9	2,195
26	Paper, paper products, printing and publishing	38	26,199	20	3,323	5	810	13	22,066
2763	Pharmaceuticals and veterinary products	116	105,824	85	63,947	24	26,349	7	15,528
(e)	Chemicals, petroleum and coal products	308	105,891	228	37,985	45	29,643	35	38,263
28	Non-metallic mineral products	94	39,578	57	26,065	12	4,629	25	8,883
29	Basic metal products	77	92,675	45	15,220	8	18,333	24	59,122
31	Fabricated metal products	212	42,448	161	18,738	21	7,075	30	16,635
32	Transport equipment	191	175,110	126	28,673	20	9,077	45	137,360
334	Photographic, professional and scientific equipment	186	64,335	171	38,337	8	n.p.	7	n.p.
335	Appliances and electrical equipment	1078	640,739	944	270,261	48	73,721	86	296,757
336	Industrial machinery and equipment	481	109,423	402	67,135	34	n.p.	45	n.p.
34	Miscellaneous manufacturing	208	38,379	159	14,784	28	4,268	21	19,328
C	<b>Total manufacturing</b>	<b>2,694</b>	<b>1,526,795</b>	<b>2,203</b>	<b>612,672</b>	<b>212</b>	<b>207,577</b>	<b>279</b>	<b>706,546</b>
A,16,D-L	<b>Agriculture and other industries</b>	<b>396</b>	<b>211,678</b>	<b>282</b>	<b>71,383</b>	<b>38</b>	<b>48,958</b>	<b>76</b>	<b>91,337</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>2,965</b>	<b>1,738,474</b>	<b>2,408</b>	<b>684,055</b>	<b>235</b>	<b>256,536</b>	<b>322</b>	<b>797,883</b>

(a) Excludes enterprises in ASIC Division 'A'. (b) The industry of product (or process) field towards which the R & D activity was directed. For further explanation see paragraph 24 of the Explanatory Notes. (c) Employment size is based on the number of persons employed by the enterprise. (d) Where the R & D performed by an enterprise was directed towards more than one product, that enterprise is counted in each of the industries to which its products are coded. Therefore, the enterprise counts shown in this table cannot be summed to aggregates for combinations of industries. (e) ASIC Subdivision 27 excluding ASIC Class 2763.

TABLE 18. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES (a), AUSTRALIA, 1988-89  
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY INDUSTRY OF PRODUCT FIELD (b)  
(\$'000)

Industry of enterprise		Industry of Product Field																
ASIC Code	Description	Total all industries (c)	Mining services (11-15)	Food, beverages and tob-acco (21)	Text-iles, cloth-ing and foot-wear (23-24)	Wood, wood prod-ucts and furn-iture (25)	Paper, paper prod-ucts, printing and pub-lishing (26)	Chem-icals, petrol-eum and coal prod-ucts (27)	Non-metallic mineral prod-ucts (28)	Basic metal prod-ucts (29)	Fabri-cated metal prod-ucts (31)	Trans-port equip-ment (32)	Photo-graphic, profes-sional and sci-entific equip-ment (334)	Appli-ances and elect-rical equip-ment (335)	Indus-trial mach-inery and equip-ment (336)	Misce-laneous manufa-cturing (34)	Total Manu-facturing (C)	Agric-ulture and other indust-ries (A,16 D-L)
Manufacturing —																		
21	Food, beverages and tobacco	82,735	—	60,689	—	n.p.	—	n.p.	—	—	n.p.	—	n.p.	n.p.	8,025	—	74,120	8,615
23-24	Textiles, clothing and footwear	7,818	—	—	5,798	n.p.	—	n.p.	n.p.	—	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	7,818	—
25	Wood, wood products and furniture	9,814	—	—	n.p.	3,250	n.p.	n.p.	—	—	957	n.p.	n.p.	n.p.	n.p.	680	n.p.	n.p.
26	Paper, paper products, printing and publishing	24,121	n.p.	—	—	n.p.	20,761	—	—	—	n.p.	—	n.p.	1,151	n.p.	720	23,089	n.p.
27	Chemical, petroleum and coal products	147,972	n.p.	906	n.p.	n.p.	384	127,566	n.p.	—	n.p.	—	n.p.	n.p.	84	6,401	147,594	n.p.
28	Non-metallic mineral products	22,260	—	—	—	n.p.	—	n.p.	15,120	n.p.	n.p.	—	—	—	n.p.	5,911	n.p.	n.p.
29	Basic metal products	91,718	3,950	—	—	—	—	n.p.	479	51,892	9,137	485	n.p.	n.p.	10,192	n.p.	84,242	3,526
31	Fabricated metal products	25,700	n.p.	—	n.p.	106	n.p.	n.p.	n.p.	n.p.	14,912	463	n.p.	2,372	3,928	870	25,340	n.p.
32	Transport equipment	159,553	n.p.	—	n.p.	n.p.	n.p.	369	n.p.	309	1,335	149,132	—	1,113	3,800	1,350	157,789	n.p.
334	Photographic, professional and scientific equipment	37,496	n.p.	—	—	—	—	n.p.	—	n.p.	—	34,588	1,316	n.p.	—	—	37,021	n.p.
335	Appliances and electrical equipment	228,294	136	n.p.	n.p.	n.p.	n.p.	205	n.p.	134	1,055	405	5,276	204,353	10,234	1,033	222,982	5,176
336	Industrial machinery and equipment	54,943	n.p.	n.p.	n.p.	—	—	582	n.p.	623	2,287	2,510	116	8,199	34,980	725	50,631	n.p.
34	Miscellaneous manufacturing	26,109	—	—	n.p.	—	624	483	1,660	—	n.p.	n.p.	297	4,196	671	16,211	24,757	1,352
C	<b>Total manufacturing</b>	<b>918,531</b>	<b>n.p.</b>	<b>62,075</b>	<b>6,401</b>	<b>4,712</b>	<b>23,425</b>	<b>143,112</b>	<b>28,355</b>	<b>54,845</b>	<b>32,177</b>	<b>153,597</b>	<b>44,458</b>	<b>224,678</b>	<b>73,804</b>	<b>34,481</b>	<b>886,120</b>	<b>n.p.</b>
Other industries —																		
F	Wholesale and retail trade	152,328	n.p.	1,629	132	—	n.p.	13,093	n.p.	n.p.	2,530	2,828	5,336	108,482	9,861	1,283	145,759	n.p.
63	Property and business services	211,798	2,836	n.p.	n.p.	n.p.	n.p.	7,944	1,412	27,050	6,006	n.p.	2,528	128,157	12,116	1,191	199,851	9,111
8461	Research and scientific institutions	127,892	n.p.	6,820	n.p.	n.p.	n.p.	43,864	n.p.	n.p.	n.p.	n.p.	9,055	4,377	6,750	n.p.	85,065	n.p.
(d)	Other n.e.c.	327,925	61,147	n.p.	n.p.	475	n.p.	3,701	8,103	1,749	n.p.	6,518	2,958	175,045	6,893	n.p.	210,001	56,777
<b>11-16, D-L Total other industries</b>		<b>819,942</b>	<b>97,836</b>	<b>11,663</b>	<b>597</b>	<b>747</b>	<b>2,774</b>	<b>68,603</b>	<b>11,223</b>	<b>37,830</b>	<b>10,270</b>	<b>21,513</b>	<b>19,877</b>	<b>416,061</b>	<b>35,619</b>	<b>3,898</b>	<b>640,675</b>	<b>81,431</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>1,738,474</b>	<b>106,072</b>	<b>73,738</b>	<b>6,998</b>	<b>5,459</b>	<b>26,199</b>	<b>211,715</b>	<b>39,578</b>	<b>92,675</b>	<b>42,448</b>	<b>175,110</b>	<b>64,335</b>	<b>640,739</b>	<b>109,423</b>	<b>38,379</b>	<b>1,526,795</b>	<b>105,607</b>

(a) Excludes enterprises in ASIC Division 'A'. (b) The industry of product (or process) field towards which the R & D activity was directed. For further explanation see paragraph 24 of the Explanatory Notes. (c) ASIC Divisions A-L. (d) ASIC codes 11-16,D,E,G,H,61-62,J,8141-8306, 8462-8495,L

TABLE 19. EXTRAMURAL R & D EXPENDITURE(a) BY BUSINESS ENTERPRISES(b), AUSTRALIA  
DETAILS OF EXTRAMURAL PAYMENTS BY INDUSTRY OF ENTERPRISE

Industry of enterprise making payment		1986-87r		1988-89	
		Enterprises (number)	Payments (\$'000)	Enterprises (number)	Payments (\$'000)
ASIC Code	Description				
11-15	Mining (excluding services to mining)	32	7,572	43	13,311
	Manufacturing —				
21	Food, beverages and tobacco	46	5,772	51	8,168
23-24	Textiles, clothing and footwear	6	n.p.	9	506
25	Wood, wood products and furniture	13	450	15	918
26	Paper, paper products, printing and publishing	11	774	8	1,211
27	Chemical, petroleum and coal products	63	24,116	75	31,262
28	Non-metallic mineral products	11	281	12	920
29	Basic metal products	16	7,240	22	5,178
31	Fabricated metal products	21	1,065	19	730
32	Transport equipment	11	1,531	16	6,734
334	Photographic, professional and scientific equipment	13	800	18	2,310
335	Appliances and electrical equipment	63	7,083	65	17,464
336	Industrial machinery and equipment	27	1,463	30	1,675
34	Miscellaneous manufacturing	22	n.p.	18	5,790
C	<b>Total manufacturing</b>	<b>323</b>	<b>53,042</b>	<b>358</b>	<b>82,865</b>
	Other industries —				
F	Wholesale and retail trade	65	54,520	79	74,410
63	Property and business services	74	34,717	82	39,792
8461	Research and scientific institutions	23	9,731	32	33,127
(c)	Other n.e.c.	78	23,271	83	27,208
16, D-L	<b>Total other industries</b>	<b>240</b>	<b>122,240</b>	<b>276</b>	<b>174,537</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>595</b>	<b>182,854</b>	<b>677</b>	<b>270,713</b>
	Private sector contribution	554	121,357	634	195,033
	Public sector contribution	41	61,497	43	75,679

(a) Expenditure on R & D which is funded by an enterprise but carried out by other enterprises. (b) Excludes enterprises in ASIC Division 'A'. (c) ASIC codes 16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 20. EXTRAMURAL R & D EXPENDITURE<sup>(a)</sup> BY BUSINESS ENTERPRISES<sup>(b)</sup>, AUSTRALIA, 1988-89  
PAYMENTS BY INDUSTRY OF ENTERPRISE MAKING PAYMENT BY LOCATION OF RECIPIENT

Industry of enterprise		Location of recipient					
		Total		Australia		Overseas	
ASIC Code	Description	Enterprises <sup>(c)</sup> (number)	Payments (\$'000)	Enterprises (number)	Payments (\$'000)	Enterprises (number)	Payments (\$'000)
11-15	Mining (excluding services to mining)	43	13,311	41	n.p.	5	n.p.
	Manufacturing —						
21	Food, beverages and tobacco	51	8,168	47	6,419	7	1,749
23-24	Textiles, clothing and footwear	9	506	7	n.p.	3	n.p.
25	Wood, wood products and furniture	15	918	15	n.p.	2	n.p.
26	Paper, paper products, printing and publishing	8	1,211	8	n.p.	2	n.p.
27	Chemical, petroleum and coal products	75	31,262	68	12,072	16	19,189
28	Non-metallic mineral products	12	920	12	748	4	172
29	Basic metal products	22	5,178	19	4,943	5	235
31	Fabricated metal products	19	730	17	n.p.	2	n.p.
32	Transport equipment	16	6,734	11	n.p.	5	n.p.
334	Photographic, professional and scientific equipment	18	2,310	18	n.p.	2	n.p.
335	Appliances and electrical equipment	65	17,464	58	9,930	13	7,534
336	Industrial machinery and equipment	30	1,675	28	n.p.	3	n.p.
34	Miscellaneous manufacturing	18	5,790	17	n.p.	2	n.p.
<b>C</b>	<b>Total manufacturing</b>	<b>358</b>	<b>82,865</b>	<b>325</b>	<b>44,860</b>	<b>66</b>	<b>38,005</b>
	Other industries —						
F	Wholesale and retail trade	79	74,410	71	65,346	13	9,064
63	Property and business services	82	39,792	72	31,268	15	8,524
8461	Research and scientific institutions	32	33,127	32	n.p.	3	n.p.
(d)	Other n.e.c.	83	27,208	80	24,299	12	2,909
<b>16, D-L</b>	<b>Total other industries</b>	<b>276</b>	<b>174,537</b>	<b>255</b>	<b>n.p.</b>	<b>43</b>	<b>n.p.</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>677</b>	<b>270,713</b>	<b>621</b>	<b>195,801</b>	<b>114</b>	<b>74,912</b>
	Private sector contribution to 'Total all industries' —						
	1988-89	634	195,033	580	122,172	108	72,861
	1986-87r	554	121,357	510	69,352	93	52,005

(a) Expenditure on R & D which is funded by an enterprise but carried out by other enterprises. (b) Excludes enterprises in ASIC Division 'A'. (c) Where the extramural R & D expenditure of an enterprise funded R & D both within Australia and overseas, that enterprise is counted in each of these recipient locations. Therefore, the enterprise aggregates obtained by summation of these location categories may be greater than the total enterprise count provided at each industry level. (d) ASIC codes 16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 21. EXTRAMURAL R & D EXPENDITURE(a) BY BUSINESS ENTERPRISES(b), AUSTRALIA, 1988-89  
 PAYMENTS BY COUNTRY OF RECIPIENT BY RELATIONSHIP OF RECIPIENT TO ENTERPRISE MAKING PAYMENT  
 (\$'000)

Country of recipient	Relationship of recipient to enterprise making payment	Industry of enterprise making payment					
		1986-87r			1988-89		
		Total all industries	Manufacturing	Mining and other industries	Total all industries	Manufacturing	Mining and other industries
U.K. —	Related enterprises	n.p.	3,430	n.p.	6,236	n.p.	n.p.
	Unrelated enterprises	n.p.	77	n.p.	1,563	n.p.	n.p.
	Total	13,054	3,507	9,547	7,799	4,330	3,469
U.S.A. —	Related enterprises	17,692	4,443	13,249	43,771	17,179	26,592
	Unrelated enterprises	3,425	569	2,856	3,826	799	3,027
	Total	21,117	5,012	16,105	47,597	17,978	29,619
Other overseas —	Related enterprises	n.p.	14,532	n.p.	13,629	n.p.	n.p.
	Unrelated enterprises	n.p.	1,232	n.p.	5,887	n.p.	n.p.
	Total	19,146	15,765	3,382	19,516	15,697	3,819
Total overseas —	Related enterprises	40,629	22,405	18,223	63,637	33,074	30,562
	Unrelated enterprises	12,688	1,878	10,810	11,275	4,931	6,345
	Total	53,317	24,284	29,033	74,912	38,005	36,907
Australia		129,537	28,759	100,779	195,801	44,860	150,941
TOTAL		182,854	53,042	129,812	270,713	82,865	187,848
Private sector contribution		121,357	52,856	68,500	195,033	82,679	112,355
Public sector contribution		61,497	186	61,311	75,679	186	75,493

(a) Expenditure on R & D which is funded by an enterprise but carried-out by other enterprises. (b) Excludes enterprises in ASIC Division 'A'.



TABLE 22. EXTRAMURAL R & D EXPENDITURE<sup>(a)</sup> BY BUSINESS ENTERPRISES<sup>(b)</sup>, AUSTRALIA, 1988-89  
PAYMENTS BY COUNTRY OF RECIPIENT  
(\$'000)

Industry of enterprise making payment	Total Payments	Enterprise employment size (persons)										Other	
		Australia	Canada	Federal Republic of Germany	France	Japan	Nether- lands	New Zealand	Sweden	Switzer- land	U.K.		U.S.A
C Manufacturing	82,865	44,860	148	n.p.	n.p.	n.p.	n.p.	248	—	—	4,330	17,978	5,557
B,D-L Mining and other industries	187,848	150,941	321	n.p.	n.p.	—	n.p.	729	—	—	3,469	29,619	1,338
<b>TOTAL ALL INDUSTRIES</b>	<b>270,713</b>	<b>195,801</b>	<b>469</b>	<b>2,385</b>	<b>467</b>	<b>n.p.</b>	<b>n.p.</b>	<b>977</b>	<b>—</b>	<b>—</b>	<b>7,799</b>	<b>47,597</b>	<b>6,895</b>
Private sector contribution to 'Total all industries' —													
1988-89	195,033	122,172	469	1,778	467	n.p.	n.p.	947	—	—	7,797	46,601	6,480
1986-87r	121,357	69,352	1,587	302	n.p.	205	n.p.	n.p.	—	922	12,912	20,882	5,377

(a) Expenditure on R & D which is funded by an enterprise but carried out by other enterprises (b) Excludes enterprises in ASIC Division 'A'.

TABLE 23. EXTRAMURAL R & D EXPENDITURE<sup>(a)</sup> BY BUSINESS ENTERPRISES<sup>(b)</sup>, AUSTRALIA, 1988-89  
PAYMENTS BY ENTERPRISE EMPLOYMENT SIZE<sup>(c)</sup>  
(\$'000)

Industry of enterprise making payment	Total Payments	Enterprise employment size (persons)								
		Less than 10	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 to 999	1,000 or more	
C Manufacturing	82,865	9,603	n.p.	n.p.	2,581	4,358	21,273	8,449	22,023	
B,D-L Mining and other industries	187,848	22,714	n.p.	n.p.	3,220	6,848	63,930	8,330	30,012	
<b>TOTAL ALL INDUSTRIES</b>	<b>270,713</b>	<b>32,316</b>	<b>41,473</b>	<b>25,901</b>	<b>5,801</b>	<b>11,206</b>	<b>85,203</b>	<b>16,779</b>	<b>52,035</b>	
Private sector contribution to 'Total all industries' —										
1988-89	195,033	32,139	n.p.	n.p.	5,797	10,521	47,757	16,468	40,527	
1986-87r	121,357	25,793	4,618	11,378	3,907	4,798	n.p.	n.p.	43,158	

(a) Expenditure on R & D which is funded by an enterprise but carried out by other enterprises (b) Excludes enterprises in ASIC Division 'A'. (c) Employment size is based on the number of persons employed by the enterprise.

TABLE 24. PAYMENTS AND RECEIPTS FOR TECHNICAL KNOW-HOW BY BUSINESS ENTERPRISES(a), AUSTRALIA  
 PAYMENTS AND RECEIPTS BY INDUSTRY OF ENTERPRISE  
 (\$m)

Industry of enterprise		Payments for technical know-how			Receipts for technical know-how		
		1984-85r	1986-87r	1988-89	1984-85r	1986-87r	1988-89
ASIC Code	Description						
	Manufacturing —						
21	Food, beverages and tobacco	16.8	23.6	26.7	1.1	2.8	2.6
23-24	Textiles, clothing and footwear	8.9	n.p.	n.p.	n.p.	n.p.	n.p.
25	Wood, wood products and furniture	0.1	0.2	1.6	n.p.	0.6	n.p.
26	Paper, paper products, printing and publishing	4.1	4.0	n.p.	n.p.	n.p.	n.p.
27	Chemical, petroleum and coal products	39.1	53.3	67.8	6.6	6.2	2.1
28	Non-metallic mineral products	7.8	1.8	7.8	n.p.	n.p.	1.0
29	Basic metal products	4.7	9.8	23.8	6.1	n.p.	2.6
31	Fabricated metal products	2.3	3.9	8.6	1.1	1.2	1.1
32	Transport equipment	17.4	35.5	49.8	n.p.	1.0	3.9
334	Photographic, professional and scientific equipment	n.p.	n.p.	3.1	n.p.	n.p.	n.p.
335	Appliances and electrical equipment	28.3	48.4	34.8	n.p.	3.8	13.5
336	Industrial machinery and equipment	n.p.	8.7	9.6	1.4	n.p.	5.3
34	Miscellaneous manufacturing	4.9	11.0	15.2	n.p.	n.p.	3.0
<b>C</b>	<b>Total manufacturing</b>	<b>146.6</b>	<b>236.5</b>	<b>258.6</b>	<b>23.8</b>	<b>48.6</b>	<b>36.2</b>
	Other industries —						
F	Wholesale and retail trade	4.3	11.3	14.7	0.5	4.2	6.6
63	Property and business services	8.0	7.7	n.p.	6.2	37.0	60.4
8461	Research and scientific institutions	n.p.	n.p.	n.p.	n.p.	3.0	13.5
(b)	Other n.e.c.	n.p.	n.p.	22.5	n.p.	8.7	7.9
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>19.9</b>	<b>41.0</b>	<b>79.2</b>	<b>12.3</b>	<b>53.0</b>	<b>88.5</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>166.5</b>	<b>277.5</b>	<b>337.8</b>	<b>36.1</b>	<b>101.6</b>	<b>124.7</b>

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 11-16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 25. PAYMENTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
DETAILS OF PAYMENTS BY INDUSTRY OF ENTERPRISE

Industry of enterprise		Type of technical know-how					
		Enterprises (number)	Total (\$'000)	Patent licence fees and royalties (\$'000)	Other technical know-how (\$'000)	Payments within Australia (\$'000)	Payments made overseas (\$'000)
ASIC Code	Description						
	Manufacturing —						
21	Food, beverages and tobacco	14	26,651	n.p.	n.p.	324	26,327
23-24	Textiles, clothing and footwear	9	n.p.	n.p.	n.p.	n.p.	n.p.
25	Wood, wood products and furniture	7	1,633	n.p.	n.p.	n.p.	n.p.
26	Paper, paper products, printing and publishing	5	n.p.	n.p.	n.p.	n.p.	n.p.
27	Chemical, petroleum and coal products	80	67,755	40,265	27,490	3,843	63,912
28	Non-metallic mineral products	20	7,843	2,888	4,955	360	7,483
29	Basic metal products	16	23,841	n.p.	n.p.	n.p.	n.p.
31	Fabricated metal products	22	8,561	5,615	2,946	270	8,292
32	Transport equipment	31	49,807	n.p.	n.p.	1,784	48,023
334	Photographic, professional and scientific equipment	15	3,146	2,707	439	n.p.	n.p.
335	Appliances and electrical equipment	76	34,766	17,269	17,497	1,200	33,566
336	Industrial machinery and equipment	41	9,627	5,258	4,369	1,378	8,250
34	Miscellaneous manufacturing	18	15,180	n.p.	n.p.	1,080	14,100
<b>C</b>	<b>Total manufacturing</b>	<b>354</b>	<b>258,619</b>	<b>108,085</b>	<b>150,533</b>	<b>12,094</b>	<b>246,524</b>
	Other industries —						
F	Wholesale and retail trade	51	14,681	8,731	5,949	604	14,077
63	Property and business services	68	n.p.	n.p.	n.p.	n.p.	n.p.
8461	Research and scientific institutions	14	n.p.	n.p.	n.p.	n.p.	n.p.
(b)	Other n.e.c.	42	22,548	7,775	14,773	8,450	14,098
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>175</b>	<b>79,213</b>	<b>34,052</b>	<b>45,161</b>	<b>12,025</b>	<b>67,188</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>529</b>	<b>337,831</b>	<b>142,137</b>	<b>195,694</b>	<b>24,119</b>	<b>313,712</b>
Private sector contribution to 'Total all industries' —							
	1988-89	519	337,027	141,752	195,274	23,728	313,299
	1986-87r	451	n.p.	n.p.	n.p.	n.p.	n.p.

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 11-16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 26. PAYMENTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
 PAYMENTS MADE OVERSEAS BY INDUSTRY OF ENTERPRISE  
 (\$'000)

Industry of enterprise		Payments made overseas	Relationship of recipient enterprise to paying enterprise		Country of recipient enterprise		
			Related	Unrelated	U.K.	U.S.A.	Other
ASIC Code	Description						
	Manufacturing —						
21	Food, beverages and tobacco	26,327	n.p.	n.p.	—	n.p.	n.p.
23-24	Textiles, clothing and footwear	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
25	Wood, wood products and furniture	n.p.	n.p.	n.p.	—	n.p.	n.p.
26	Paper, paper products, printing and publishing	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
27	Chemical, petroleum and coal products	63,912	55,594	8,318	16,367	34,409	13,136
28	Non-metallic mineral products	7,483	838	6,645	388	5,329	1,766
29	Basic metal products	n.p.	n.p.	2,315	n.p.	1,313	n.p.
31	Fabricated metal products	8,292	n.p.	n.p.	n.p.	3,769	n.p.
32	Transport equipment	48,023	45,323	2,700	1,419	2,363	44,241
334	Photographic, professional and scientific equipment	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
335	Appliances and electrical equipment	33,566	24,433	9,133	2,446	10,281	20,839
336	Industrial machinery and equipment	8,250	6,856	1,393	169	7,539	542
34	Miscellaneous manufacturing	14,100	n.p.	n.p.	n.p.	n.p.	1,140
<b>C</b>	<b>Total manufacturing</b>	<b>246,524</b>	<b>205,806</b>	<b>40,718</b>	<b>24,953</b>	<b>96,441</b>	<b>125,130</b>
	Other industries —						
F	Wholesale and retail trade	14,077	6,668	7,408	908	3,914	9,254
63	Property and business services	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
8461	Research and scientific institutions	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
(b)	Other n.e.c.	14,098	n.p.	n.p.	n.p.	n.p.	6,962
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>67,188</b>	<b>43,984</b>	<b>23,204</b>	<b>5,968</b>	<b>42,628</b>	<b>18,592</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>313,712</b>	<b>249,789</b>	<b>63,923</b>	<b>30,921</b>	<b>139,069</b>	<b>143,722</b>
	Private sector contribution to 'Total all industries' —						
	1988-89	313,299	249,789	63,509	30,897	138,686	143,715
	1986-87r	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 11-16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 27. PAYMENTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
 PAYMENTS BY COUNTRY OF RECIPIENT  
 (\$'000)

<i>Industry of enterprise</i>														
<i>ASIC Code</i>	<i>Description</i>	<i>Total Australia</i>	<i>Canada</i>	<i>Federal Republic of Germany</i>	<i>France</i>	<i>Japan</i>	<i>Nether-lands</i>	<i>New Zealand</i>	<i>Sweden</i>	<i>Switzer-land</i>	<i>U.K.</i>	<i>U.S.A</i>	<i>Other</i>	
C	Manufacturing	258,619	12,094	n.p.	15,451	n.p.	43,072	n.p.	201	n.p.	n.p.	24,953	96,441	n.p.
B,D-L	Mining and other industries	79,213	12,025	n.p.	2,629	n.p.	148	n.p.	323	n.p.	n.p.	5,968	42,628	n.p.
<b>TOTAL ALL INDUSTRIES</b>		<b>337,831</b>	<b>24,119</b>	<b>n.p.</b>	<b>18,080</b>	<b>5,768</b>	<b>43,220</b>	<b>8,324</b>	<b>524</b>	<b>n.p.</b>	<b>24,082</b>	<b>30,921</b>	<b>139,069</b>	<b>7,844</b>
Private sector contribution to 'Total all industries' —														
	1988-89	337,027	23,728	n.p.	18,080	5,768	43,220	8,318	524	n.p.	24,082	30,897	138,686	7,844
	1986-87r	n.p.	33,590	5,531	9,487	5,652	33,946	180	294	12,026	20,259	19,859	n.p.	9,765

(a) Excludes enterprises in ASIC Division 'A'.

TABLE 28. PAYMENTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
PAYMENTS BY INDUSTRY OF ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE(b)

Industry of enterprise		Enterprise employment size (persons)							
		Less than 200		200 to 499		500 or more			
ASIC Code	Description	Enterprises (number)	Payments (\$'000)	Enterprises (number)	Payments (\$'000)	Enterprises (number)	Payments (\$'000)	Enterprises (number)	Payments (\$'000)
Manufacturing —									
21	Food, beverages and tobacco	14	26,651	4	n.p.	2	n.p.	8	26,000
23-24	Textiles, clothing and footwear	9	n.p.	3	n.p.	2	n.p.	4	n.p.
25	Wood, wood products and furniture	7	1,633	2	n.p.	2	n.p.	3	n.p.
26	Paper, paper products, printing and publishing	5	n.p.	—	n.p.	2	n.p.	3	n.p.
27	Chemical, petroleum and coal products	80	67,755	43	8,973	24	28,818	13	29,964
28	Non-metallic mineral products	20	7,843	7	n.p.	3	n.p.	10	6,214
29	Basic metal products	16	23,841	8	n.p.	1	n.p.	7	22,509
31	Fabricated metal products	22	8,561	14	3,140	4	n.p.	4	n.p.
32	Transport equipment	31	49,807	11	n.p.	4	n.p.	16	46,987
334	Photographic, professional and scientific equipment	15	3,146	14	n.p.	1	n.p.	—	—
335	Appliances and electrical equipment	76	34,766	56	9,459	7	2,557	13	22,750
336	Industrial machinery and equipment	41	9,627	35	4,359	3	n.p.	3	n.p.
34	Miscellaneous manufacturing	18	15,180	12	2,365	3	n.p.	3	n.p.
C	<b>Total manufacturing</b>	<b>354</b>	<b>258,619</b>	<b>209</b>	<b>34,420</b>	<b>58</b>	<b>40,601</b>	<b>87</b>	<b>183,597</b>
Other industries —									
F	Wholesale and retail trade	51	14,681	43	8,409	4	n.p.	4	n.p.
63	Property and business services	68	n.p.	60	n.p.	5	n.p.	3	n.p.
8461	Research and scientific institutions	14	n.p.	14	n.p.	—	n.p.	—	n.p.
(c)	Other n.e.c.	42	22,548	29	13,934	3	n.p.	10	n.p.
11-16, D-L	<b>Total other industries</b>	<b>175</b>	<b>79,213</b>	<b>146</b>	<b>62,045</b>	<b>12</b>	<b>2,858</b>	<b>17</b>	<b>14,310</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>529</b>	<b>337,831</b>	<b>355</b>	<b>96,466</b>	<b>70</b>	<b>43,459</b>	<b>104</b>	<b>197,907</b>

(a) Excludes enterprises in ASIC Division 'A'. (b) Employment size is based on the number of persons employed by the enterprise. (c) ASIC codes 11-16,D,E,G,H,61-62,J,8141-8306, 8462-8495,L

TABLE 29. PAYMENTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
 PAYMENTS BY ENTERPRISE EMPLOYMENT SIZE(b)  
 (\$'000)

Industry of enterprise		Enterprise employment size (persons)								
		Total Payments	Less than 10	10 to 19	20 to 49	50 to 99	100 to 199	200 to 499	500 to 999	1,000 or more
ASIC Code	Description									
C	Manufacturing	258,619	1,915	6,820	3,840	6,027	15,818	40,601	59,285	124,312
B,D-L	Mining and other industries	79,213	9,771	5,460	29,665	1,637	15,513	2,858	1,569	12,741
<b>TOTAL ALL INDUSTRIES</b>		<b>337,831</b>	<b>11,686</b>	<b>12,280</b>	<b>33,505</b>	<b>7,664</b>	<b>31,331</b>	<b>43,459</b>	<b>60,854</b>	<b>137,053</b>
Private sector contribution to 'Total all industries' —										
	1988-89	337,027	11,686	12,280	33,505	7,664	31,319	43,383	60,804	136,386
	1986-87r	276,754	22,181	9,813	26,851	9,506	15,557	26,817	35,556	130,472

(a) Excludes enterprises in ASIC Division 'A'. (b) Employment size is based on the number of persons employed by the enterprise.

TABLE 30. RECEIPTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
DETAILS OF RECEIPTS BY INDUSTRY OF ENTERPRISE

Industry of enterprise		Type of technical know-how					Receipts from within Australia (\$'000)	Receipts from overseas (\$'000)
		Enterprises (number)	Total (\$'000)	Patent licence fees and royalties (\$'000)	Other technical know-how (\$'000)			
ASIC Code	Description							
Manufacturing —								
21	Food, beverages and tobacco	9	2,586	n.p.	n.p.	n.p.	n.p.	
23-24	Textiles, clothing and footwear	1	n.p.	n.p.	n.p.	n.p.	n.p.	
25	Wood, wood products and furniture	2	n.p.	n.p.	n.p.	n.p.	n.p.	
26	Paper, paper products, printing and publishing	2	n.p.	n.p.	n.p.	n.p.	n.p.	
27	Chemical, petroleum and coal products	27	2,086	1,133	953	171	1,915	
28	Non-metallic mineral products	7	979	n.p.	n.p.	n.p.	n.p.	
29	Basic metal products	5	2,644	n.p.	n.p.	n.p.	n.p.	
31	Fabricated metal products	12	1,058	740	318	609	449	
32	Transport equipment	11	3,934	n.p.	n.p.	n.p.	n.p.	
334	Photographic, professional and scientific equipment	1	n.p.	n.p.	n.p.	n.p.	n.p.	
335	Appliances and electrical equipment	56	13,477	5,136	8,341	4,995	8,483	
336	Industrial machinery and equipment	17	5,276	n.p.	n.p.	n.p.	n.p.	
34	Miscellaneous manufacturing	8	3,034	2,199	835	n.p.	n.p.	
<b>C</b>	<b>Total manufacturing</b>	<b>158</b>	<b>36,191</b>	<b>20,290</b>	<b>15,901</b>	<b>8,824</b>	<b>27,367</b>	
Other industries —								
F	Wholesale and retail trade	25	6,630	n.p.	n.p.	5,361	1,269	
63	Property and business services	101	60,433	29,265	31,168	22,351	38,082	
8461	Research and scientific institutions	16	13,531	n.p.	n.p.	12,010	1,521	
(b)	Other n.e.c.	26	7,926	4,335	3,592	4,572	3,354	
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>168</b>	<b>88,521</b>	<b>46,483</b>	<b>42,038</b>	<b>44,295</b>	<b>44,226</b>	
<b>TOTAL ALL INDUSTRIES</b>		<b>326</b>	<b>124,712</b>	<b>66,773</b>	<b>57,939</b>	<b>53,118</b>	<b>71,594</b>	
Private sector contribution to 'Total all industries' —								
	1988-89	317	124,130	n.p.	n.p.	52,557	71,573	
	1986-87r	230	101,588	57,770	43,818	38,844	62,744	

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 11-16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.



TABLE 31. RECEIPTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
 RECEIPTS FROM OVERSEAS BY INDUSTRY OF ENTERPRISE  
 (\$'000)

Industry of enterprise		Relationship of paying enterprise to recipient enterprise			Country of paying enterprise		
		Receipts from overseas	Related	Unrelated	U.K.	U.S.A.	Other
ASIC Code	Description						
	Manufacturing —						
21	Food, beverages and tobacco	n.p.	2,045	n.p.	n.p.	n.p.	1,113
23-24	Textiles, clothing and footwear	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
25	Wood, wood products and furniture	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
26	Paper, paper products, printing and publishing	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
27	Chemical, petroleum and coal products	1,915	719	1,196	680	316	919
28	Non-metallic mineral products	n.p.	n.p.	n.p.	n.p.	n.p.	800
29	Basic metal products	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
31	Fabricated metal products	449	—	449	n.p.	n.p.	340
32	Transport equipment	n.p.	n.p.	n.p.	n.p.	n.p.	3,282
334	Photographic, professional and scientific equipment	n.p.	—	n.p.	—	—	n.p.
335	Appliances and electrical equipment	8,483	2,913	5,570	n.p.	n.p.	4,041
336	Industrial machinery and equipment	n.p.	n.p.	n.p.	n.p.	n.p.	334
34	Miscellaneous manufacturing	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
<b>C</b>	<b>Total manufacturing</b>	<b>27,367</b>	<b>10,751</b>	<b>16,616</b>	<b>2,415</b>	<b>9,777</b>	<b>15,176</b>
	Other industries —						
F	Wholesale and retail trade	1,269	966	303	n.p.	n.p.	549
63	Property and business services	38,082	2,253	35,829	7,822	23,232	7,028
8461	Research and scientific institutions	1,521	n.p.	n.p.	n.p.	n.p.	281
(b)	Other n.e.c.	3,354	n.p.	n.p.	n.p.	n.p.	3,200
<b>11-16, D-L</b>	<b>Total other industries</b>	<b>44,226</b>	<b>3,946</b>	<b>40,280</b>	<b>8,051</b>	<b>25,118</b>	<b>11,058</b>
<b>TOTAL ALL INDUSTRIES</b>		<b>71,594</b>	<b>14,697</b>	<b>56,897</b>	<b>10,466</b>	<b>34,895</b>	<b>26,233</b>
Private sector contribution to 'Total all industries' —							
	1988-89	71,573	14,697	56,876	n.p.	n.p.	26,218
	1986-87r	62,744	29,463	33,281	2,484	26,315	33,946

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 11-16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 32. RECEIPTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
 RECEIPTS BY COUNTRY OF RECIPIENT  
 (\$'000)

<i>Industry of enterprise</i>				<i>Federal Republic of</i>										
<i>ASIC Code</i>	<i>Description</i>	<i>Total Australia</i>	<i>Canada</i>	<i>Germany</i>	<i>France</i>	<i>Japan</i>	<i>Nether-lands</i>	<i>New Zealand</i>	<i>Sweden</i>	<i>Switzer-land</i>	<i>U.K.</i>	<i>U.S.A</i>	<i>Other</i>	
C	Manufacturing	36,191	8,824	n.p.	n.p.	—	1,899	n.p.	1,753	n.p.	n.p.	2,415	9,777	10,191
B,D-L	Mining and other industries	88,521	44,295	n.p.	n.p.	163	3,330	n.p.	436	n.p.	n.p.	8,051	25,118	4,634
<b>TOTAL ALL INDUSTRIES</b>		<b>124,712</b>	<b>53,118</b>	<b>565</b>	<b>1,550</b>	<b>163</b>	<b>5,229</b>	<b>760</b>	<b>2,190</b>	<b>n.p.</b>	<b>n.p.</b>	<b>10,466</b>	<b>34,895</b>	<b>14,825</b>
Private sector contribution to 'Total all industries' —														
	1988-89	124,130	52,557	565	1,550	163	5,229	760	2,190	n.p.	n.p.	n.p.	n.p.	14,810
	1986-87r	101,588	38,844	1,077	2,703	n.p.	2,943	n.p.	4,325	n.p.	n.p.	2,484	26,315	9,368

(a) Excludes enterprises in ASIC Division 'A'.

TABLE 33. RECEIPTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89  
RECEIPTS BY INDUSTRY OF ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE(b)

Industry of enterprise		Enterprise employment size (persons)							
		Less than 200		200 to 499		500 or more			
		Enterprises (number)	Receipts (\$'000)	Enterprises (number)	Receipts (\$'000)	Enterprises (number)	Receipts (\$'000)	Enterprises (number)	Receipts (\$'000)
ASIC Code	Description								
	Manufacturing —								
21	Food, beverages and tobacco	9	2,586	2	n.p.	2	n.p.	5	n.p.
23-24	Textiles, clothing and footwear	1	n.p.	—	n.p.	—	n.p.	1	n.p.
25	Wood, wood products and furniture	2	n.p.	1	n.p.	1	n.p.	—	n.p.
26	Paper, paper products, printing and publishing	2	n.p.	—	n.p.	—	n.p.	2	n.p.
27	Chemical, petroleum and coal products	27	2,086	16	728	4	334	7	1,024
28	Non-metallic mineral products	7	979	2	n.p.	—	—	5	n.p.
29	Basic metal products	5	2,644	1	n.p.	1	n.p.	3	n.p.
31	Fabricated metal products	12	1,058	10	911	1	n.p.	1	n.p.
32	Transport equipment	11	3,934	3	n.p.	1	n.p.	7	3,712
334	Photographic, professional and scientific equipment	1	n.p.	—	n.p.	1	n.p.	—	n.p.
335	Appliances and electrical equipment	56	13,477	51	12,983	—	—	5	494
336	Industrial machinery and equipment	17	5,276	16	n.p.	1	n.p.	—	—
34	Miscellaneous manufacturing	8	3,034	8	3,034	—	—	—	—
C	<b>Total manufacturing</b>	<b>158</b>	<b>36,191</b>	<b>110</b>	<b>23,879</b>	<b>12</b>	<b>n.p.</b>	<b>36</b>	<b>n.p.</b>
	Other industries —								
F	Wholesale and retail trade	25	6,630	21	n.p.	4	n.p.	—	—
63	Property and business services	101	60,433	95	52,778	5	n.p.	1	n.p.
8461	Research and scientific institutions	16	13,531	16	13,531	—	—	—	—
(c)	Other n.e.c.	26	7,926	17	n.p.	—	—	9	n.p.
11-16, D-L	<b>Total other industries</b>	<b>168</b>	<b>88,521</b>	<b>149</b>	<b>76,438</b>	<b>9</b>	<b>n.p.</b>	<b>10</b>	<b>n.p.</b>
	<b>TOTAL ALL INDUSTRIES</b>	<b>326</b>	<b>124,712</b>	<b>259</b>	<b>100,317</b>	<b>21</b>	<b>6,553</b>	<b>46</b>	<b>17,842</b>

(a) Excludes enterprises in ASIC Division 'A'. (b) Employment size is based on the number of persons employed by the enterprise. (c) ASIC codes 11-16,D,E,G,H,61-62,J,8141-8306, 8462-8495,L

**TABLE 34. RECEIPTS BY BUSINESS ENTERPRISES(A) FOR TECHNICAL KNOW-HOW, AUSTRALIA, 1988-89**  
**RECEIPTS BY ENTERPRISE EMPLOYMENT SIZE(b)**  
(\$'000)

<i>Industry of enterprise</i>		<i>Enterprise employment size (persons)</i>								
		<i>Total Receipts</i>	<i>Less than 10</i>	<i>10 to 19</i>	<i>20 to 49</i>	<i>50 to 99</i>	<i>100 to 199</i>	<i>200 to 499</i>	<i>500 to 999</i>	<i>1,000 or more</i>
<i>ASIC Code</i>	<i>Description</i>									
C	Manufacturing	36,191	8,738	2,215	4,199	3,263	5,465	n.p.	1,124	n.p.
B,D-L	Mining and other industries	88,521	7,723	8,686	34,318	6,682	19,030	n.p.	—	n.p.
<b>TOTAL ALL INDUSTRIES</b>		<b>124,712</b>	<b>16,460</b>	<b>10,900</b>	<b>38,517</b>	<b>9,944</b>	<b>24,495</b>	<b>6,553</b>	<b>1,124</b>	<b>16,718</b>
Private sector contribution to 'Total all industries' —										
	1988-89	124,130	16,460	10,900	38,517	9,944	24,495	6,377	1,124	16,312
	1986-87r	101,588	6,123	10,804	28,666	n.p.	n.p.	1,745	5,393	16,749

(a) Excludes enterprises in ASIC Division 'A'. (b) Employment size is based on the number of persons employed by the enterprise.

TABLE 35. PATENT ACTIVITY BY BUSINESS ENTERPRISES(a) WITH RESEARCH AND EXPERIMENTAL DEVELOPMENT ACTIVITY DURING 1988-89  
PATENT ACTIVITY JULY 1987 — JUNE 1989 BY INDUSTRY OF ENTERPRISE

Industry of enterprise	Number of enterprises with patent activity				Patent activity			
	Australia		Overseas		Australia		Overseas	
	Patent applications lodged	Patents granted	Patent applications lodged	Patents granted	Patent applications lodged	Patents granted	Patent applications lodged	Patents granted
11-15 Mining (excluding services to mining)	5	2	2	3	8	n.p.	n.p.	n.p.
Manufacturing —								
21 Food, beverages and tobacco	13	4	9	3	15	n.p.	58	n.p.
23-24 Textiles, clothing and footwear	10	11	5	7	21	21	33	39
25 Wood, wood products and furniture	11	8	4	4	29	21	14	12
26 Paper, paper products, printing and publishing	7	3	4	1	23	n.p.	n.p.	n.p.
27 Chemical, petroleum and coal products	44	22	30	22	99	52	206	120
28 Non-metallic mineral products	12	8	6	4	23	10	n.p.	7
29 Basic metal products	24	13	17	14	90	37	153	57
31 Fabricated metal products	56	39	28	22	164	86	162	145
32 Transport equipment	33	24	20	13	87	41	143	55
334 Photographic, professional and scientific equipment	20	11	15	12	60	22	245	48
335 Appliances and electrical equipment	100	53	61	45	312	141	591	254
336 Industrial machinery and equipment	81	54	57	41	220	124	315	206
34 Miscellaneous manufacturing	33	19	28	22	141	40	175	50
<b>C Total manufacturing</b>	<b>444</b>	<b>269</b>	<b>284</b>	<b>210</b>	<b>1,284</b>	<b>613</b>	<b>2,228</b>	<b>1,037</b>
Other industries —								
F Wholesale and retail trade	65	41	30	24	150	n.p.	n.p.	86
63 Property and business services	76	44	48	40	194	113	381	211
8461 Research and scientific institutions	34	21	29	19	108	65	528	297
(b) Other n.e.c.	47	26	34	18	120	42	222	n.p.
<b>16, D-L Total other industries</b>	<b>222</b>	<b>132</b>	<b>141</b>	<b>101</b>	<b>572</b>	<b>n.p.</b>	<b>n.p.</b>	<b>n.p.</b>
<b>TOTAL ALL INDUSTRIES</b>	<b>671</b>	<b>403</b>	<b>427</b>	<b>314</b>	<b>1,864</b>	<b>919</b>	<b>3,567</b>	<b>1,694</b>
July 1985 — June 1987	607	337	388	278	1,750	793	4,905	1,970

(a) Excludes enterprises in ASIC Division 'A'. (b) ASIC Codes 16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

TABLE 36. ENERGY RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY BUSINESS ENTERPRISES(a), AUSTRALIA  
 DETAILS OF RESOURCES DEVOTED TO ENERGY R & D BY INDUSTRY OF ENTERPRISE  
 (\$'000)

Industry of enterprise	1986-87r			1988-89			
	ASIC Code	Description	Source of funds		Total Expenditure	Source of funds	
			Industry(b)	Government(c)		Industry(b)	Government(c)
11-15	Mining (excluding services to mining)	14,532	14,074	458	15,336	14,462	874
	Manufacturing —						
21	Food, beverages and tobacco	n.p.	n.p.	n.p.	120	120	—
23-24	Textiles, clothing and footwear	n.p.	n.p.	n.p.	341	n.p.	n.p.
25	Wood, wood products and furniture	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
26	Paper, paper products, printing and publishing	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
27	Chemical, petroleum and coal products	1,788	1,788	—	771	n.p.	n.p.
28	Non-metallic mineral products	409	409	—	246	246	—
29	Basic metal products	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
31	Fabricated metal products	1,687	n.p.	n.p.	1,234	1,234	—
32	Transport equipment	730	730	—	445	445	—
334	Photographic, professional and scientific equipment	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
335	Appliances and electrical equipment	7,944	7,105	839	7,824	7,282	542
336	Industrial machinery and equipment	2,627	n.p.	n.p.	2,644	2,454	190
34	Miscellaneous manufacturing	1,518	n.p.	n.p.	922	n.p.	n.p.
C	Total manufacturing	25,031	21,825	3,206	21,344	19,018	2,326
	Other industries —						
F	Wholesale and retail trade	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
63	Property and business services	19,137	17,495	1,642	22,485	19,952	2,532
8461	Research and scientific institutions	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
(d)	Other n.e.c.	25,733	23,025	2,708	28,243	26,284	1,959
16, D-L	Total other industries	55,210	46,432	8,778	66,190	57,041	9,149
	TOTAL ALL INDUSTRIES	94,772	82,330	12,442	102,870	90,521	12,350
	Private sector contribution	76,712	66,521	10,191	83,180	72,392	10,789
	Public sector contribution	18,061	15,810	2,251	19,690	18,129	1,561

(a) Excludes enterprises in ASIC Division 'A' (b) Includes private and public business enterprises and private non-profit organisations. (c) Includes Commonwealth and State Government organisations, universities and colleges of advanced education (d) ASIC Codes 16,D,E,G,H,61-62,J,8141-8306,8462-8495,L.

## 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.

*BERD* - Business expenditure on R&D is the sum of all intramural R&D expenditures incurred by all organisations in the survey.

*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.

*Energy R&D* statistics refer to R&D activity directed towards the producing, storing, transmitting, utilising and conserving of energy.

*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.

*GIRD* — Grants for Industry R&D Scheme.

*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.

*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* 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.

*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 basic research, applied research and experimental development.

## EXPLANATORY NOTES

**Introduction**

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 1988-89.

2. Statistics also included are R&D directed towards: extramural R&D activity; payments and receipts for technical know-how; patent activity, and energy R&D.

3. Comparable R&D statistics are produced for the General Government, Private Non-Profit and Higher Education sectors (see paragraph 29).

**Data sources**

4. The 1988-89 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 1989. 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 91% response was obtained. Non-respondents were expected to be non-R&D performers.

5. The 1984-85 and 1986-87 statistics in this publication were derived from similar surveys. The 1985-86 and 1987-88 statistics were derived from a stratified random sample of businesses identified as likely R&D performers. A number of revisions have been made to previous statistics.

6. Limited additional detailed R&D statistics will be available at a charge from the ABS when compiled. Revised details for previous R&D Surveys are also available at a charge.

7. The GDP figures used to derive BERD/GDP ratios quoted in the Summary of Findings are current at time of manuscript finalisation (National Income and Expenditure, 1989-90, Budget Related Paper No.2) and are as follows: \$214,467m (1984-85); \$238,118m (1985-86); \$261,869m (1986-87); \$296,423m (1987-88); and, \$337,592m (1988-89). For further information please see Australian National Accounts, National Income and Expenditure, 1988-1989 (5204.0). The available BERD/GDP ratios for other OECD countries are current at time of manuscript finalisation and are sourced from "Main Science and Technology Indicators, 1990-91", OECD, Paris, 1990, and "Australian Science and Technology Data Brief 1989-90".

**Definitions**

8. 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, includ-

ing knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications'.

9. The definition of R&D was extended for the 1984-85 survey, in accordance with a change in OECD standards, to include research into and development (or substantial modification) of computer software such as applications software, new programming languages and new operating systems.

10. For 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" 1980)" OECD, Paris 1981.

11. Type of R&D activity comprises 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.

**Scope**

12. The scope of this survey is all enterprises within the Business Enterprise Sector of Australia.

13. 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.

14. Prior to the 1988-89 survey the organisational unit for the collection of R&D statistics has been 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).

15. From the beginning of 1989, the ABS has introduced a new statistical unit known as the management unit. This unit is defined as the largest unit, within an enterprise group, which controls its productive activities and for which accounts are kept.

16. The management unit is being implemented on the ABS central register of economic units and included in surveys when reporting arrangements with the larger enterprises are finalised. Where the management unit has not been implemented the statistical unit is still the enterprise as presently recorded on the ABS central register of economic units.

**Coverage**

17. The vast majority of enterprises in this sector are private businesses. The remainder are public business



enterprises mainly engaged in trading or financial activities.

18. The 1988-89 R&D survey comprised a complete enumeration of business enterprises identified by the ABS as likely to have:

- (a) carried out R&D activity; or
- (b) funded R&D activity to be carried out by other enterprises, institutions or individuals.

19. The business enterprise sector for the R&D survey excludes enterprises mainly engaged in agriculture, forestry, fishing and hunting (i.e. industries in Division A of the Australian Standard Industrial Classification (ASIC), 1983 edition), 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 ASIC Division A).

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

- (a) Enterprises which, in previous R&D surveys, reported R&D activity, payments or receipts for technical know-how, or patent activity.
- (b) Units applying for the 150% Tax Concession Scheme and the Grants for Industry R&D Scheme.
- (c) Enterprises identified from reports in newspapers, industrial journals, research compendia etc. as likely to have R&D activity.

21. 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. In the past this coverage has been calculated as accounting for very high percentages, usually in the high nineties, of R&D activity.

#### **Australian Standard Industrial Classification (ASIC)**

22. The Statistics in this publication are classified by the industry of enterprise in accordance with the 1983 edition of the ASIC.

23. 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. For further comment see the *Australian Standard Industrial Classification, 1983, Volume 1* (1201.0).

24. Business enterprise sector R&D expenditure presented in Table 15 through 17 are classified by the industry of the product/process field towards which the R&D activity was directed. This involved asking each business to apportion its total R&D expenditure towards the products/processes to which it was directed. For example, an enterprise classified as being in mining may

have performed R&D activity into a more efficient ore crusher. As the manufacture of ore crushers would be classified to ASIC Class 3369 then this R&D expenditure would be classified to class 3369.

#### **Constant price estimates**

25. Estimates of total R&D expenditure are shown at average 1984-85 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 (1984-85). Because the measures relate to input quantities, they do not reflect changes in the efficiency with which labour, capital and other inputs are used.

26. 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 (1984-85). 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.

27. 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**

28. The statistics 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 deductibility for specific R&D activities undertaken within Australia, differ slightly from the R&D survey definition.

#### **Related publications**

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

*Research and Experimental Development, General Government and Private Non-Profit Organisations, Australia, 1988-89* (8109) (to be released shortly)

*Research and Experimental Development, Higher Education Organisations, Australia, 1988* (8111.0) (to be released shortly)

*Research and Experimental Development, All Sector Summary, Australia, 1988-89* (8112.0) (to be released shortly)

*Research and Experimental Development, All Sector Summary, Australia, (Inter Year Survey), Australia, 1987-88* (8122.0)

*Measures of Science and Innovation, Australian Science and Technology Indicators Report, Department of Industry, Technology and Commerce, Canberra, Australia, 1987*

*Australian S & T Data Brief 1989-90, Department of Industry, Technology and Commerce, Canberra, Australia, 1990*

*Main S & T Indicators 1990:1, OECD, Paris, 1990*

*The Measurement of Scientific and Technical Activities ("Frascati Manual" 1980) OECD, Paris, 1981*

30. Current publications issued by the ABS are listed in the *Catalogue of Publications and Products, Australia* (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.e.c. not elsewhere classified
- n.p. not available for separate publication  
(but included in totals where applicable)
- n.a. not available
- nil or rounded to zero

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

#### Electronic services

**DISCOVERY.** Key \*656# for selected current economic, social and demographic statistics.

**AUSSTATS.** Thousands of up-to-date time series are available on this ABS on-line service through PAXUS COMNET. For further information phone the AUSSTATS Help Desk on (06) 252 6017.

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