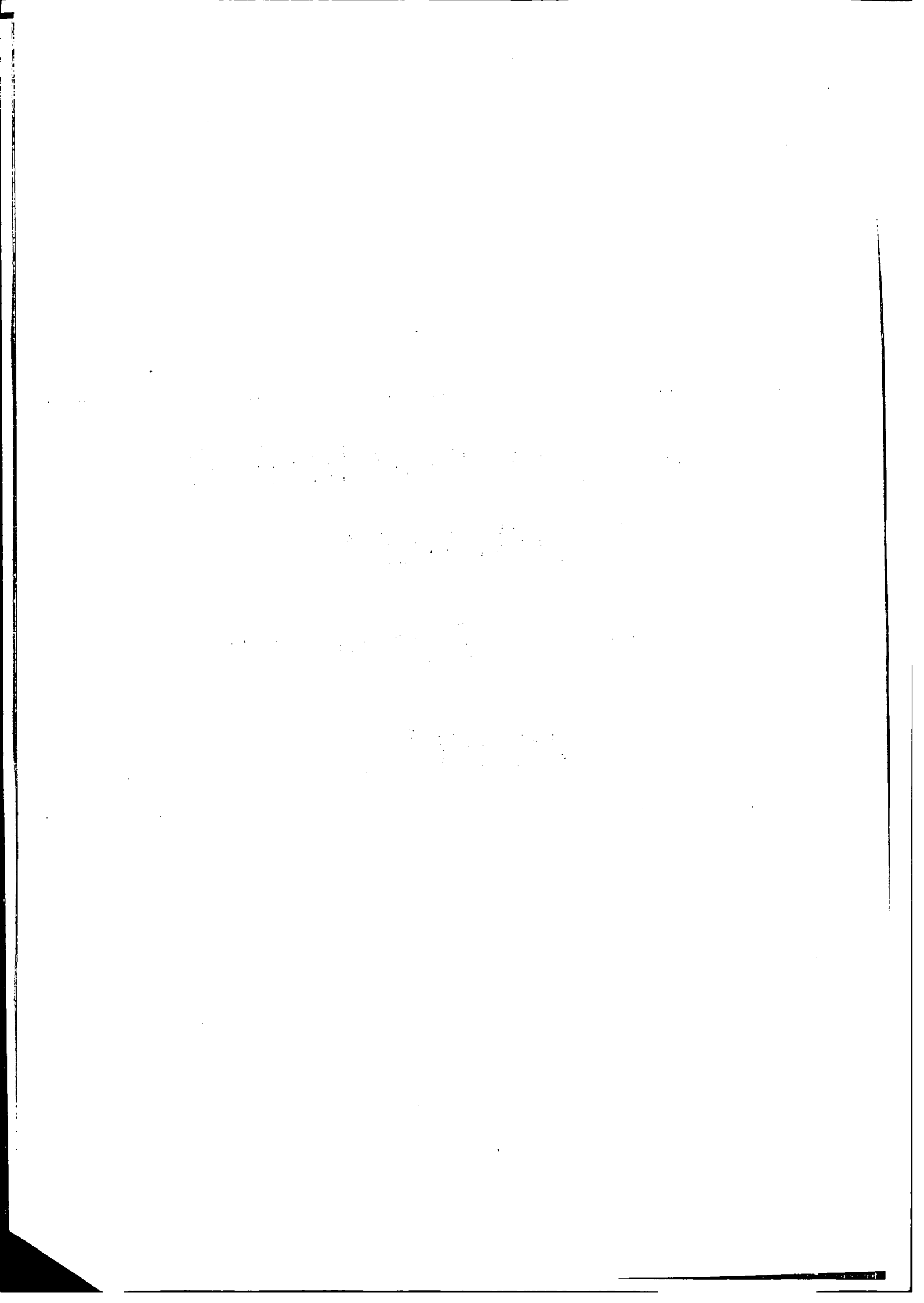


NEW ISSUE

**RESEARCH AND EXPERIMENTAL
DEVELOPMENT
PRIVATE ENTERPRISES
1976-77**

CATALOGUE NO. 8104.0

AUSTRALIAN BUREAU OF STATISTICS Canberra



INQUIRIES

If you want to know more about these statistics ring Mr Brian Thorp on Canberra 525614 or our State office, or write to Information Services, ABS, P.O. Box 10, Belconnen, A.C.T. 2616. For copies of this publication contact Information Services, Canberra 526627 or State offices.

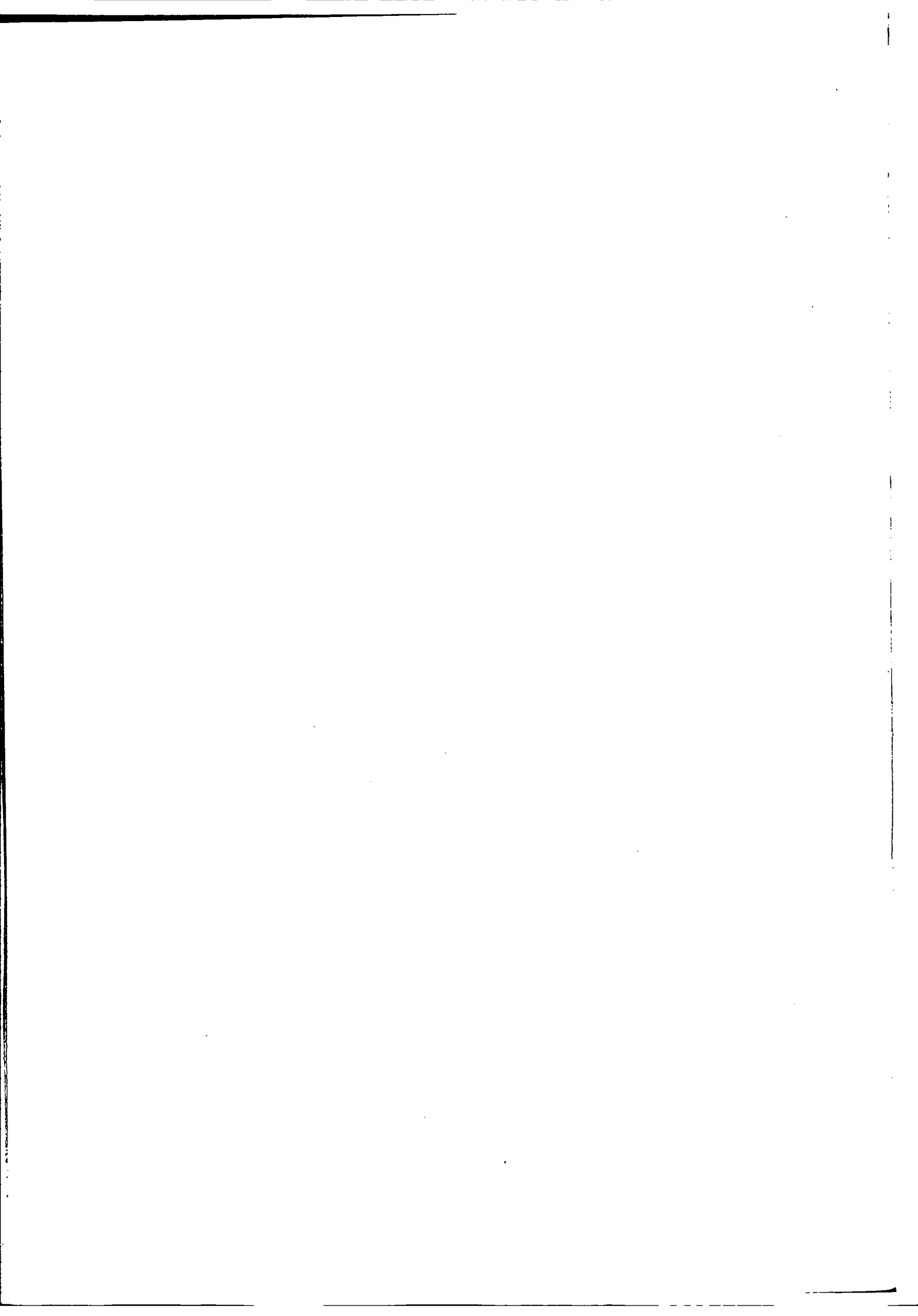
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NOON 26 FEBRUARY 1979

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**RESEARCH AND EXPERIMENTAL DEVELOPMENT
PRIVATE ENTERPRISES
1976-77**

PREFACE

This bulletin presents the first statistics on research and experimental development (R & D) published by the ABS. They have been compiled mainly from data collected in a survey of private enterprises in Australia in respect of 1976-77. The survey was conducted by the ABS at the request of the Department of Science (now the Department of Science and the Environment) and forms part of that Department's Project SCORE (Survey and Comparisons of Research Expenditure). The main purpose of Project SCORE is to measure the financial and manpower resources devoted to Australian R & D.

The Department of Science has recently collected comparable information for 1976-77 from the Commonwealth Government, State Government, Higher Education and Private Non-profit Sectors. It is expected that the Department will shortly publish statistics for these sectors and for all sectors combined.

Previous Project SCORE surveys were conducted for 1968-69 and 1973-74. Future surveys are planned for 1978-79, and thereafter biennially.

The ABS invites comments on the usefulness and appropriateness of these statistics. Such comments would be of assistance in planning future surveys.

R. J. CAMERON
Australian Statistician

MAIN FEATURES

Note. R & D is defined in paragraph 11 below.

- Expenditure on research and experimental development (R & D) performed by private enterprises in Australia during 1976-77 was \$156.6 million. At current prices, this represents a 18% decrease in expenditure compared with 1973-74.
- The manpower effort devoted to R & D performed by private enterprises in Australia during 1976-77 was 7,895 man years. This represents a decrease of 40% compared with 1973-74.
- Payments during 1976-77 by private enterprises in Australia for R & D performed overseas on their behalf was \$4.8 million, a 61% decrease compared with 1973-74.
- Payments during 1976-77 by private enterprises in Australia for technical know-how was \$66.8 million, a 13% decrease compared with 1973-74.

EXPLANATORY NOTES

Introduction

The primary aim of this bulletin is to provide statistics on the level and distribution of resources devoted to R & D activity performed by private enterprises in Australia. Such statistics are contained in Tables 1 to 11. These statistics do not measure directly the amount of R & D activity funded by private enterprises, nor the amount of R & D activity performed on account of private enterprises. An approximate indication of these two measures can however be derived from the statistics of source of funds for R & D activities performed by private enterprises (Tables 3 and 7) and the statistics of payments by private enterprises for R & D performed outside the enterprise on their behalf (Tables 12 and 13).

2. Statistics of payments and receipts by private enterprises for technical know-how are shown in Tables 14 to 17. They can be considered as providing an indication of the value of purchases and sales of knowledge arising from previous R & D activity.

3. Statistics of patent applications by, and patents granted to, private enterprises with R & D activity are shown in Table 18. These figures might be regarded as providing an imperfect indication of the volume of output of the R & D process.

Data sources

4. Most of the statistics presented in this bulletin were derived from data collected from private enterprises in the Survey of Research and Experimental Development in respect of the year ended 30 June 1977. This survey was conducted by the ABS, by means of mailed questionnaires, between December 1977 and July 1978, and a full response was obtained.

5. The 1973-74 statistics shown in Table 1 and in footnotes to Tables 2, 12 and 14 were derived from a similar survey conducted by the ABS on behalf of the Department of Science during 1975. A number of revisions have been made to these statistics since they were first published by the Department of Science in 1976 (see paragraph 32).

6. The statistics of value added and turnover shown in Tables 2, 3, 5 and 6 were obtained from the ABS Mining and Manufacturing Censuses for 1976-77.

7. The industry classification of enterprises, which appears in the majority of tables of the bulletin, was obtained from the ABS's central register of economic units. This register was also the source of approximate data on the number of enterprises and persons employed relating to the whole industry (as opposed to R & D performers only) used in the calculation of the final two R & D intensity measures shown in Table 2.

Scope and units

8. The statistics in this bulletin relate, in principle, to all private enterprises. An *enterprise* is defined broadly as the unit comprising all operations in Australia of a single operating legal entity (e.g. company, partnership, sole proprietor).

9. Excluded from this bulletin are statistics relating to units within the scope of the other Project SCORE sectors, that is,

- (a) Higher Education Sector – universities, colleges of advanced education and associated research institutions.
- (b) Government Sector – all other public authorities, that is, units owned and/or controlled by Commonwealth, State or Local Governments.
- (c) Private Non-profit Sector – private sector organisations not established primarily with the aim of earning a profit, such as chambers of commerce, trade associations, technological design and testing institutions and voluntary scientific societies.

10. In the case of the patent applications statistics, shown in Table 18, the scope is restricted to those private enterprises that performed R & D, or made payment for R & D performed on their behalf, in 1976-77.

Definition of research and experimental development

11. *Research and experimental development* is defined in accordance with the Organisation for Economic Co-operation and Development (OECD) standard as comprising creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

12. To be classified as R & D, an activity should

contain an appreciable amount of novelty or innovation, should have investigation as a primary objective, and should have a potential to produce results that recognisably increase mankind's stock of knowledge. The concept of novelty is not associated with the actual creation of something which, although new, is made by artistry or by application of techniques that have already been established for that class of object. R & D ceases and pre-production begins when work is no longer experimental.

13. R & D activity extends to substantial modifications to existing products or processes. However, the following activities, sometimes regarded as R & D, are *excluded* (except where they are used primarily for the support of specific R & D programs or to develop new techniques):

- (a) market research or sales promotion
- (b) operations research
- (c) quality control or routine testing of materials, products or processes
- (d) prospecting, exploring or drilling for, or producing, minerals, petroleum or natural gas
- (e) development work on style changes or minor modifications to existing products or processes
- (f) computer programming or systems work
- (g) routine data collection
- (h) the commercial, legal and administrative aspects of patent or licence activity
- (i) scientific and technical information services.

Coverage and survey methodology

14. Statistics relating to enterprises mainly engaged in agriculture, forestry, fishing and hunting (i.e. industries in Division A of the Australian Standard Industrial Classification (ASIC), 1969 edition) are excluded from this bulletin, partly because of the collection difficulties which would have been involved in including them in the Survey of R & D and partly because such enterprises are believed to have very low R & D activity (agricultural R & D is performed predominantly in specialised research institutes not included in ASIC Division A).

15. For similar reasons, statistics relating to individual inventors working in their own time and with their own facilities are not, in general, included in the bulletin.

16. The 1976-77 Survey of R & D comprised a complete enumeration of private enterprises identified by the ABS as likely during 1976-77 to have:

- (a) performed R & D (Tables 1 to 11 and 18), or
- (b) made payments to other organisations for R & D work undertaken on their behalf (Tables 12, 13 and 18), or
- (c) had receipts or payments for patent rights or other technical know-how (Tables 14 to 17).

17. Within the scope and coverage of the survey, described in paragraphs 8 to 10, 14 and 15 above, enterprises were included in the collection if they satisfied any of the following criteria:

- (a) Enterprises recorded in the ABS's central register of economic units as:
 - 1 employing 140 persons or more, or
 - 2 mainly engaged in providing consultant engineering or technical services (ASIC Class 6333), or with establishments thus engaged, or
 - 3 mainly engaged in scientific research (ASIC Class 8411), or with establishments thus engaged, or
 - 4 having locations predominantly engaged in laboratory or testing work on behalf of establishments of the enterprise.
- (b) Enterprises which were members of major industrial research associations
- (c) Enterprises which had applied for grants from the Australian Industrial Research and Development Incentives Board between 1972 and 1977.
- (d) Enterprises responding to the 1973-74 Survey of R & D that reported R & D activity.
- (e) Enterprises identified from reports in newspapers, industrial journals, etc. as likely to be performing R & D.

18. To provide a coverage check of the enterprises included in the main 1976-77 survey collection, a separate sample survey of the remaining private enterprises on the central register was conducted. Data obtained from the returns of these 5,500 sample informants indicate that the main collection accounts for 97% of the total expenditure on R & D activity performed by private enterprises. Since this coverage percentage is an estimate derived from the returns of sample informants, it is subject to sampling variability. Measurement of the sampling variability indicates that there are 19 chances in 20 that the coverage in fact exceeds 93%. Coverage has not been estimated for individual industries or individual component items of total R & D expenditure, but for some of these more disaggregated statistics it may be considerably lower than 97%. Coverage of the number of enterprises performing R & D is much lower than the coverage of expenditure; the main collection is estimated to have covered 72% of enterprises (19 chances in 20 that it exceeds 58%).

19. It is estimated that the main collection accounts for 96% of payments by private enterprises for R & D performed outside the enterprise on their behalf (19 chances in 20 that it exceeds 91%), 95% of payments for technical know-how (19 chances in 20 that it exceeds 89%) and 99% of receipts for technical know-how (19 chances in 20 that it exceeds 97%).

20. *The R & D statistics for 1976-77 contained in*

this bulletin relate only to the enterprises included in the main collection (as described above in paragraphs 16 and 17). They do not include estimates based on the results obtained from the sample survey conducted for coverage checking purposes.

Classification

21. Most of the statistical information in this bulletin is classified by industry of enterprise in accordance with the 1969 edition of the Australian Standard Industrial Classification (ASIC). All of the activities of an enterprise are classified to a single industry, irrespective of any other industries in which particular establishments of the enterprise may operate. The ASIC is described in the publication *Australian Standard Industrial Classification (Preliminary Edition) 1969, Volume 1* (1201.0).

22. Tables 10 and 11 contain a supplementary classification of R & D expenditure by the industry of the product (or process) field towards which the R & D effort was directed. This involved asking each respondent to list the broad categories of product towards which his R & D was directed, and to apportion his expenditure on R & D to these categories. Each of these categories was then keyed to the ASIC industry by which it is mainly produced. For example, an enterprise (itself classified to the mining industry) may have performed R & D to develop a more efficient ore crusher. As manufacturing ore crushers is an activity primary to ASIC Class 3339, manufacturing of "Industrial machinery and equipment n.e.c.", in the 1969 edition of the ASIC, R & D expenditure directed towards this product would therefore have been classified to ASIC Class 3339 in Tables 10 and 11.

23. To enable the maximum amount of information to be presented without disclosing data relating to an individual enterprise, the ASIC rules for combining and ordering industries have not been adhered to strictly in every case. Also it was not possible in every instance to provide a full industry description in the tables. The full ASIC classification is shown in the publication referred to in paragraph 21.

Data definitions

24. The definitions of data items collected by the 1976-77 survey are provided in the survey questionnaire, a copy of which is shown as the Appendix. The definition of items not collected directly as part of the survey are shown below.

25. *Turnover* is defined as sales of goods to other enterprises, commission revenue and repair and service revenue received from other enterprises, government bounties and subsidies and all other operating revenue from outside the enterprise, except rent and leasing revenue, interest, royalties and dividends. Also included is the value of capital work done by the enterprise, and the value of equipment withdrawn from stocks for own use or for rental or lease outside the enterprise.

26. *Value added* is defined as turnover, plus increase (less decrease) in the value of stocks, less

purchases and selected expenses. It may be regarded as a basic measure of an enterprise's unduplicated contribution to total economic activity. For a fuller definition, and the relationship of value added to gross product at factor cost, see *Integrated Economic Censuses: 1968-69 Enterprise Statistics* (8103.0).

27. *R & D intensity of enterprises that performed R & D* is shown in this bulletin in two forms:

- (a) *R & D intensity (expenditure)* is defined as expenditure on R & D performed within the enterprise as a percentage of the turnover of those enterprises that performed R & D.
- (b) *R & D intensity (manpower)* is defined as man years of effort expended on R & D as a percentage of the number of persons employed by those enterprises that performed R & D.

28. *R & D intensity of all enterprises in industry* is also shown in two forms:

- (a) *R & D intensity (enterprises)* is defined as the number of enterprises that performed R & D as a percentage of the total number of enterprises in the industry.
- (b) *R & D intensity (manpower)* is defined as the number of man years of effort expended on R & D as a percentage of the number of persons employed by all enterprises in the industry. *Persons employed* comprises employees (including part-time and casual employees) on the payroll, working proprietors and working partners.

Accruals basis

29. Respondents were asked to report all expenditure data on an accruals, rather than cash, basis of accounting; that is, to report data relating to income earned during the year, whether received or not, and to expenditure incurred during the year, whether paid or not.

Reliability of statistics

30. The statistics contained in this bulletin should be interpreted with caution for the following reasons:

- (a) Many respondents do not record data on R & D activity and on receipts and payments for technical know-how separately in their accounts, and as a result needed to make estimates when completing the survey questionnaire. The accuracy of these estimates may have been affected in some cases because of the complex survey definition of research and experimental development (R & D), because this definition differs in some respect from what particular businesses may regard as research and development, and because grants by the Australian Industrial Research and Development Incentives Board are not available in respect of all the types of R & D that come within the OECD standard definition.

- (b) The industry classification for mining and manufacturing enterprises is considered to be reasonably reliable, although in some cases it may be out of date e.g. some enterprises may have been classified on the basis of their activities during 1975-76 rather than 1976-77. The industry classification for other enterprises may be less reliable because it is generally based upon data relating to their activities for earlier years.
- (c) The industry of product field classification in Tables 10 and 11 was obtained by the method described in paragraph 22. Because of the way in which products were described by the respondent, there were some instances where it was difficult to classify products (and particularly processes) to an ASIC industry. A degree of subjectivity is associated with the classification in these cases.
- (d) Estimates of numbers of all enterprises in an industry and total persons employed by these enterprises, which were used in the calculation of two of the R & D intensity measures shown in Table 2, were obtained from the ABS's central register of economic units. These data have been gathered over a period of time from a variety of sources primarily for use in maintaining the register, rather than for use as statistics. More reliable employment statistics on an enterprise basis classified in the required degree of industry detail were not available from other sources.
- (e) The statistics in Tables 12 and 13 of payments by private enterprises for R & D undertaken outside the enterprise on their behalf may be unreliable in those cases where the reporting enterprise is uncertain of the extent to which the activity of the performing enterprise is R & D according to the survey definition. These statistics may also contain a small element of double counting where R & D work is subcontracted out.
- (f) The source of funds statistics in Tables 3 and 7 were compiled from data relating to funds receivable for R & D activity undertaken within the enterprise during 1976-77. In some cases it was necessary for informants to base their response on expectations, and consequently the statistics may not correspond exactly with the funding which subsequently took place.
- (g) The 1973-74 statistics shown in Table 1 and in the footnotes to Tables 2, 12 and 14 are considered to be of lower reliability than those for 1976-77 because of indications that the 1973-74 survey questionnaire may have been misinterpreted by some informants, with the result that the 1973-74 statistics, despite revisions referred to in paragraph 5, may be slight over-estimates.
- (h) Additionally, the 1973-74 statistics are less accurate at the industry level as a result of the

different survey methodology employed for that year. The 1973-74 survey was based on a sample of private enterprises and thus the estimates may differ from the figures that would have been obtained by a collection of all private enterprises. A measure of the likely difference is given by the standard error of the estimate. There are 2 chances in 3 that the sample estimate will differ from results which would be obtained from a comparable complete collection by less than 1 standard error and 19 chances in 20 that the difference would be less than 2 standard errors. The estimates and their associated standard errors are shown where appropriate in the tables.

- (i) The statistics of value added and turnover in Tables 2, 3, 5 and 6 may be somewhat less reliable than statistics published elsewhere from the ABS economic censuses. The 1976-77 censuses aimed to produce statistics relating to mining and manufacturing *establishments*. For this bulletin, preliminary results from these censuses were used to derive estimates of the turnover and value added of mining and manufacturing *enterprises*.

Related publications

31. *Project SCORE, Research and Development in Australia, 1976-77*, (Department of Science, Canberra, Australia, 1979) is expected to be issued shortly. It will contain detailed statistics relating to sectors other than the private enterprise sector, and aggregates for all sectors combined.
32. *Project SCORE, Research and Development in Australia, 1973-74, Volumes 1 and 2*, (Department of Science, Canberra, Australia, 1976) presents statistics relating to all sectors.
33. *Project SCORE, Research and Development in Australia, 1968-69*, (Department of Science, Canberra, Australia, 1973) contains statistics relating to sectors other than the private enterprise sector, and to all sectors combined.
34. *R & D in Manufacturing Industry, 1971-72*, (Department of Manufacturing Industry, Canberra, Australia, 1974) contains statistics relating to the manufacturing sector only. It should be noted that the 1971-72 survey had an unknown coverage (considered to be approximately 95%), and collected data of the expenditure on R & D activity performed within the firm combined with, but not separately from, payments for R & D work performed outside the firm.
35. *Survey of Industry Research and Development Expenditure in Australia, 1968-69*, (Department of Trade and Industry, Canberra, Australia, 1972) contains statistics relating to the mining and manufacturing sectors. Note, however, that the 1968-69 survey had an unknown coverage (considered to be about 90%).

36. *Foreign Control in Research and Experimental Development, Private Enterprises, 1976-77* (5330.0) will contain statistics derived from the same primary sources as those in this bulletin. Statistics in Table 1 of the Foreign Control bulletin which will relate to R & D performed by private enterprises during 1976-77 will be identical to corresponding statistics in this bulletin; other tables will contain statistics appropriate to that study, which relate to R & D performed on account of private enterprises.

37. *Trends in Industrial R & D in Selected OECD Member Countries, 1967-75*, (OECD, Paris 1978 (SPT (78) 20)) contains statistics from other OECD countries which are broadly comparable with those in this bulletin. However, data from public enterprises are included in the Business Enterprise Sector by the OECD, but in the Government Sector by Project SCORE.

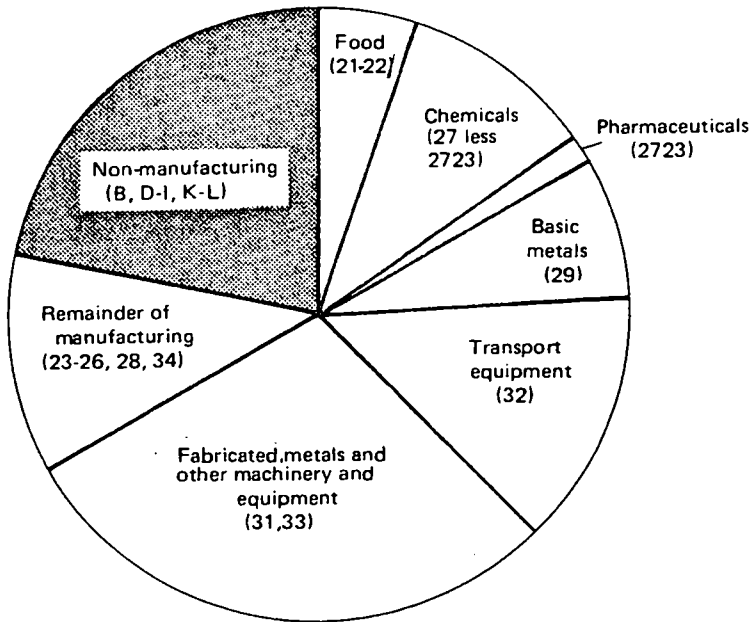
38. All publications produced by the ABS are listed in *Catalogue of Publications* (1101.0) which is available free of charge from any ABS office.

Symbols and other usages

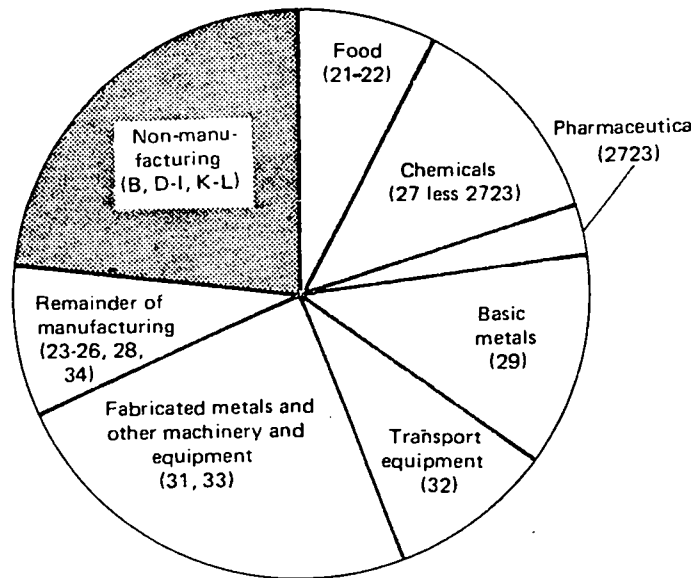
r	figure or series revised since previous issue
n.a.	not available
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n.p.	not available for separate publication (but included in totals where applicable)
—	nil or less than half the final digit shown.

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

**RESEARCH AND EXPERIMENTAL DEVELOPMENT
PERFORMED BY PRIVATE ENTERPRISES – AUSTRALIA 1973-74 AND 1976-77
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE (a)**



TOTAL EXPENDITURE, 1973-74 : \$190.4m



TOTAL EXPENDITURE, 1976-77 : \$156.6m

(a) Figures in brackets are ASIC codes

**TABLE 1. RESEARCH AND EXPERIMENTAL DEVELOPMENT
PERFORMED BY PRIVATE ENTERPRISES – AUSTRALIA 1973-74 AND 1976-77
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE (\$m)**

<i>Industry of enterprise</i>					
<i>ASIC code</i>	<i>Description</i>	<i>1973-74</i>		<i>1976-77</i>	
	Manufacturing	r	(a)		
21-22	Food, beverages and tobacco products	9.9	(0.9)	11.6	
23-24	Textiles, clothing and footwear	3.9	(0.3)	2.1	
26	Paper, paper products, printing and publishing	2.4	(-)	3.3	
2723	Pharmaceutical and veterinary products	2.8	(0.1)	4.5	
(b)	Chemicals, petroleum and coal products	19.5	(0.4)	19.7	
29	Basic metal products	14.6	(1.6)	19.0	
32	Transport equipment	25.4	(12.7)	14.6	
31,33	Fabricated metal products and other machinery and equipment	55.6	(3.3)	37.8	
25,28,34	Wood, wood products and furniture, non-metallic mineral products and leather, rubber and plastic products and manufacturing n.e.c.	15.6	(0.9)	8.3	
C	<i>Total manufacturing</i>	149.8	(12.8)	121.0	
B,D-I,K-L	Mining and other industries	40.6	(9.5)	35.6	
	All industries (c)	190.4	(16.0)	156.6	

(a) Figures shown in brackets are standard errors (expressed in \$m). (b) ASIC Sub-division 27 excluding ASIC Class 2723. (c) Excludes ASIC Division A.

TABLE 2. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
BROAD INDICATORS BY INDUSTRY OF ENTERPRISE

Industry of enterprise		Resources expended on R & D			Enterprises that performed R & D						All enterprises in industry	
		Expenditure \$'000	Manpower		Enterprises no.	Turnover \$'000	Value added \$'000	Persons employed at end June 1977 no.	R & D intensity		R & D intensity	
			Researcher effort man-years	Total R & D effort man-years					Expenditure (a) %	Manpower (b) %	Enterprises (c) %	Manpower (d) %
ASIC code	Description											
11	Mining											
	Metallic minerals	3,583	72.7	143.1	14	n.p.	n.p.	16,849	n.p.	0.9	5.0	0.4
12-15	Non-metallic minerals	517	7.1	14.8	8	n.p.	n.p.	5,470	n.p.	0.3	0.6	0.1
11-15	Total mining (excl. services to mining)	4,100	79.8	157.9	22	2,202,009	1,638,924	22,319	0.2	0.7	1.5	0.2
	Manufacturing											
211	Meat products	330	10.5	15.2	5	327,589	106,271	7,131	0.1	0.2	0.7	-
212	Milk products	1,484	52.0	83.6	8	520,758	201,343	10,065	0.3	0.8	3.8	0.3
213	Fruit and vegetable products	1,122	33.2	61.7	11	331,007	144,596	5,492	0.3	1.1	8.3	0.4
215-216	Flour mill and cereal products, bread, cakes and biscuits	1,754	45.5	90.1	15	374,567	146,770	8,457	0.5	1.1	1.0	0.2
214,217-218	Sugar, oils and fats and other food products	5,983	127.3	249.3	20	731,195	311,139	12,826	0.8	1.9	3.8	0.7
219-221	Beverages and malt and tobacco products	963	23.0	51.0	10	595,528	254,737	9,961	0.2	0.5	1.7	0.2
21-22	Total food, beverages and tobacco products	11,636	291.5	550.9	69	2,880,644	1,164,856	53,932	0.4	1.0	1.9	0.3
231-232	Textile fibres, yarns and woven fabrics	917	16.5	54.6	13	214,925	71,515	4,606	0.4	1.2	3.3	0.2
233,241-243	Other textile products, knitting mills, clothing and footwear	1,157	32.1	51.8	14	239,877	124,895	7,159	0.5	0.7	0.4	0.1
23-24	Total textiles, clothing and footwear	2,075	48.6	106.4	27	454,802	196,410	11,765	0.5	0.9	0.7	0.1
25	Wood, wood products and furniture	943	22.0	49.6	22	232,027	108,677	6,141	0.4	0.8	0.3	0.1
261	Paper and paper products	2,601	45.8	111.6	6	535,495	154,162	12,376	0.5	0.9	2.3	0.4
262	Printing and publishing	745	26.1	37.6	10	193,547	119,536	7,493	0.4	0.5	0.3	0.1
26	Total paper, paper products, printing and publishing	3,346	71.9	149.2	16	729,042	273,698	19,869	0.5	0.8	0.4	0.1
2713	Plastics materials	1,528	42.7	77.6	8	230,358	75,235	3,541	0.7	2.2	19.0	1.7
2714-2715	Organic and inorganic industrial chemicals n.e.c.	10,755	269.9	503.4	17	538,418	216,059	7,491	2.0	6.7	15.6	4.0
2722	Paints, varnishes and lacquers	3,732	98.5	243.9	16	277,839	122,478	6,760	1.3	3.6	10.8	2.9
2723	Pharmaceutical and veterinary products	4,490	81.1	172.7	20	251,478	136,142	4,861	1.8	3.6	15.4	1.6
(c)	Other chemicals, petroleum and coal products	3,687	145.1	222.1	52	764,687	372,558	14,124	0.5	1.6	9.8	0.6
27	Total chemicals, petroleum and coal products	24,192	637.3	1,219.7	113	2,062,780	922,472	36,777	1.2	3.3	11.7	1.6
283	Cement and concrete products	2,096	46.5	98.6	11	389,792	198,659	9,596	0.5	1.0	1.5	0.4
281-282,284	Glass and clay products and other non-metallic mineral products	1,738	34.6	70.5	21	302,140	192,144	8,718	0.6	0.8	3.0	0.3
28	Total non-metallic mineral products	3,835	81.1	169.1	32	691,932	390,804	18,314	0.6	0.9	2.2	0.3
291	Basic iron and steel	15,585	288.8	746.9	22	2,570,769	1,291,623	71,195	0.6	1.1	7.6	1.0
292-293	Non-ferrous metal basic products	3,431	96.8	156.0	14	1,093,996	546,471	16,069	0.3	1.0	6.0	0.6
29	Total basic metal products	19,016	385.6	902.9	36	3,664,766	1,838,094	87,264	0.5	1.0	6.9	0.9

For footnotes see next page.

TABLE 2. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
BROAD INDICATORS BY INDUSTRY OF ENTERPRISE - continued

Industry of enterprise		Resources expended on R & D			Enterprises that performed R & D					All enterprises in industry		
		ASIC code	Description	Expenditure \$'000	Manpower		Enterprises no.	Turnover \$'000	Value added \$'000	Persons employed at end June 1977 no.	R & D intensity	
					Researcher effort man-years	Total R & D effort man-years					Expenditure (a) %	Manpower (b) %
311	Fabricated structural metal products	1,409	22.2	72.6	17	171,734	83,779	5,356	0.8	1.4	0.9	0.3
312	Sheet metal products	557	18.8	41.2	13	198,572	105,309	4,418	0.3	0.9	1.1	0.1
313	Other fabricated metal products	2,019	44.9	114.3	44	240,389	139,516	8,582	0.8	1.3	1.6	0.2
31	Total fabricated metal products	3,985	85.9	228.1	74	610,695	328,605	18,356	0.7	1.2	1.3	0.2
321	Motor vehicles and parts	13,540	122.4	693.6	30	2,082,657	1,054,204	50,342	0.7	1.4	2.7	0.9
322	Other transport equipment	1,062	33.7	67.3	14	178,122	88,783	5,906	0.6	1.1	1.9	0.4
32	Total transport equipment	14,602	156.1	760.9	44	2,260,779	1,142,987	56,248	0.7	1.4	2.4	0.8
331	Photographic, professional and scientific equipment	4,561	98.1	231.5	20	173,467	83,872	5,542	2.6	4.2	5.2	2.0
3321	TV's, radios and electronic equipment	14,173	343.7	722.9	46	666,881	274,520	19,775	2.1	3.7	13.5	2.5
3322-3326	Refrigerators, household appliances and electrical equipment n.e.c.	6,890	195.2	486.3	83	968,438	435,728	31,000	0.7	1.6	6.8	0.7
332	Total appliances and electrical equipment	21,063	538.9	1,209.2	129	1,635,319	710,248	50,775	1.3	2.4	8.2	1.3
3331	Agricultural machinery and equipment	2,805	49.5	150.3	17	412,054	198,291	10,436	0.7	1.4	6.3	0.9
3333	Materials handling equipment	538	11.3	31.6	12	47,818	19,634	1,332	1.1	2.4	6.1	0.5
(f)	Other industrial machinery and equipment n.e.c.	4,893	127.4	243.5	112	456,428	231,607	15,640	1.1	1.6	3.9	0.5
333	Total industrial machinery and equipment	8,236	188.2	425.4	141	916,299	449,532	27,408	0.9	1.6	4.2	0.5
33	Total other machinery and equipment	33,860	825.2	1,866.1	290	2,725,085	1,243,652	83,725	1.2	2.2	5.5	1.0
342	Rubber products	1,768	43.4	80.3	12	399,759	201,057	15,741	0.4	0.5	9.8	0.4
343	Plastic and related products	1,289	34.3	75.1	29	273,482	110,246	6,605	0.5	1.1	2.8	0.3
341,344	Leather, leather products and manufacturing n.e.c.	463	18.4	29.3	16	99,395	49,336	3,566	0.5	0.8	0.6	0.1
34	Total leather, rubber and plastic products and manufacturing n.e.c.	3,520	96.1	184.7	57	772,636	360,639	25,912	0.5	0.7	1.5	0.3
C	Total manufacturing	121,010	2,701.3	6,187.6	780	17,085,187	7,970,893	418,303	0.7	1.5	2.1	0.5
Other industries												
E	Construction	915	25.0	51.6	22	n.a.	n.a.	4,440	n.a.	1.2	0.1	-
46-47	Wholesale trade	8,769	186.5	350.5	79	n.a.	n.a.	22,487	n.a.	1.6	0.2	0.1
48	Retail trade	388	8.9	25.2	9	n.a.	n.a.	2,644	n.a.	1.0	-	-
F	Total wholesale and retail trade	9,157	195.4	375.7	88	n.a.	n.a.	25,131	n.a.	1.5	-	-
63	Real estate and business services	9,059	181.0	573.1	37	n.a.	n.a.	4,672	n.a.	12.3	0.1	0.2
8411	Research and scientific institutions	10,935	189.2	470.6	29	n.a.	n.a.	711	n.a.	66.2	22.0	4.9
(g)	Other n.e.c.	1,456	41.8	78.9	19	n.a.	n.a.	9,852	n.a.	0.8	-	-
16.D-I.K-L	Total other industries	31,522	632.4	1,549.9	195	n.a.	n.a.	44,806	n.a.	3.5	-	-
Total all industries (h)		(i) 156,632	3,413.5	(j) 7,895.4	997	n.a.	n.a.	485,428	n.a.	1.6	0.3	0.2

(a) Expenditure on R & D expressed as a percentage of the turnover of those enterprises that performed R & D. (b) Man-years of effort expended on R & D as a percentage of the number of persons employed by those enterprises that performed R & D. (c) Number of enterprises that performed R & D expressed as a percentage of the total number of enterprises in the industry. (d) Man-years of effort expended on R & D as a percentage of the number of persons employed by all enterprises in the industry. (e) ASIC Classes 2711-2712, 2721, 2724-2740. (f) ASIC Classes 3332, 3334-3339. (g) ASIC codes 16, D, 61-62, 8111-8303, 8412-9334. (h) Excludes ASIC Division A. (i) The corresponding 1973-74 estimate is \$190.4m with a standard error of \$16.0m. (j) The corresponding 1973-74 estimate is 13,144 man-years, with a standard error of 736 man-years.

TABLE 3. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
DETAILS OF R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE (\$'000)

ASIC code	Industry of enterprise Description	Total expend- iture	Type of expenditure			Type of activity (a)		Enterprise turnover size (b)		Source of funds (a)		
			Capital expend- iture	Wages and salaries	Other current expend- iture	Basic and applied research	Experi- mental develop- ment	Less than \$20m	\$20m or more	Own funds	Government funds (c)	Other Aust. and overseas
	Mining											
11	Metallic minerals	3,583	253	2,378	952	1,876	1,707	421	3,162	n.p.	-	n.p.
12-15	Non-metallic minerals	517	56	257	204	350	167	105	411	517	-	-
11-15	Total mining (excl. services to mining)	4,100	309	2,635	1,156	2,226	1,874	526	3,574	n.p.	-	n.p.
	Manufacturing											
211	Meat products	330	n.p.	182	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	-
212	Milk products	1,484	n.p.	1,000	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
213	Fruit and vegetable products	1,122	69	832	221	282	840	377	745	1,111	12	-
215-216	Flour mill and cereal products, bread, cakes and biscuits	1,754	215	1,100	439	507	1,247	279	1,475	1,716	n.p.	n.p.
214,217-218	Sugar, oils and fats and other food products	5,983	381	3,588	2,014	2,478	3,505	616	5,366	4,823	n.p.	n.p.
219-221	Beverages and malt and tobacco products	963	289	634	40	632	331	n.p.	n.p.	n.p.	n.p.	-
21-22	Total food, beverages and tobacco products	11,636	1,105	7,336	3,194	4,726	6,910	1,509	10,127	10,349	n.p.	n.p.
231-232	Textile fibres, yarns and woven fabrics	917	42	693	182	n.p.	n.p.	n.p.	n.p.	857	n.p.	n.p.
233,241-243	Other textile products, knitting mills, clothing and footwear	1,157	208	694	256	n.p.	n.p.	n.p.	n.p.	1,094	64	-
23-24	Total textiles, clothing and footwear	2,075	250	1,387	438	204	1,871	959	1,115	1,951	n.p.	n.p.
25	Wood, wood products and furniture	943	34	729	181	245	698	738	205	852	91	-
261	Paper and paper products	2,601	n.p.	1,710	n.p.	n.p.	n.p.	-	2,601	n.p.	n.p.	-
262	Printing and publishing	745	n.p.	454	n.p.	n.p.	n.p.	117	628	n.p.	n.p.	-
26	Total paper, paper products, printing and publishing	3,346	164	2,164	1,018	1,566	1,780	117	3,229	3,315	31	-
2713	Plastics materials	1,528	114	1,088	326	n.p.	n.p.	n.p.	n.p.	1,487	n.p.	n.p.
2714-2715	Organic and inorganic industrial chemicals n.e.c.	10,755	479	7,817	2,460	3,571	7,185	894	9,861	10,225	n.p.	n.p.
2722	Paints, varnishes and lacquers	3,732	147	2,766	818	n.p.	n.p.	1,140	2,592	3,580	n.p.	n.p.
2723	Pharmaceutical and veterinary products	4,490	423	2,559	1,508	2,300	2,190	n.p.	n.p.	3,670	n.p.	n.p.
(d)	Other chemicals, petroleum and coal products	3,687	210	2,986	491	1,653	2,033	2,130	1,557	3,438	111	138
27	Total chemicals, petroleum and coal products	24,192	1,373	17,216	5,602	8,595	15,597	7,705	16,487	22,400	336	1,456
283	Cement and concrete products	2,096	124	1,444	528	1,208	889	249	1,847	n.p.	n.p.	n.p.
281-282,284	Glass and clay products and other non-metallic mineral products	1,738	477	999	262	782	956	1,078	660	n.p.	n.p.	n.p.
28	Total non-metallic mineral products	3,835	601	2,443	790	1,990	1,844	1,327	2,507	3,324	n.p.	n.p.
291	Basic iron and steel	15,585	1,705	9,855	4,025	6,301	9,284	745	14,840	13,638	n.p.	n.p.
292-293	Non-ferrous metal basic products	3,431	252	2,553	626	2,116	1,315	284	3,147	3,378	53	-
29	Total basic metal products	19,016	1,958	12,408	4,651	8,417	10,599	1,029	17,987	17,017	n.p.	n.p.

For footnotes see next page.

TABLE 3. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
DETAILS OF R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE (\$'000) - continued

ASIC code	Industry of enterprise Description	Total expend- iture	Type of expenditure			Type of activity (a)		Enterprise turnover size (b)		Source of funds (a)		
			Capital expend- iture	Wages and salaries	Other current expend- iture	Basic and applied research	Experi- mental develop- ment	Less than \$20m	\$20m or more	Own funds	Government funds (c)	Other Aust. and overseas
311	Fabricated structural metal products	1,409	45	1,023	342	345	1,064	n.p.	n.p.	1,309	101	-
312	Sheet metal products	557	18	446	93	219	338	n.p.	n.p.	529	29	-
313	Other fabricated metal products	2,019	172	1,573	274	468	1,551	n.p.	n.p.	1,778	n.p.	n.p.
31	Total fabricated metal products	3,985	234	3,042	709	1,033	2,953	3,314	671	3,615	n.p.	n.p.
321	Motor vehicles and parts	13,540	277	10,387	2,876	1,548	11,993	1,623	11,917	13,366	n.p.	n.p.
322	Other transport equipment	1,062	74	887	101	351	711	217	845	986	n.p.	n.p.
32	Total transport equipment	14,602	350	11,274	2,978	1,898	12,704	1,840	12,762	14,352	n.p.	n.p.
331	Photographic, professional and scientific equipment	4,561	153	3,018	1,390	1,572	2,989	n.p.	n.p.	4,411	150	-
3321	TV's, radios and electronic equipment	14,173	766	10,754	2,653	5,279	8,894	n.p.	n.p.	9,686	n.p.	n.p.
3322-3326	Refrigerators, household appliances and electrical equipment n.e.c.	6,890	297	5,619	974	1,825	5,065	3,341	3,549	6,541	n.p.	n.p.
332	Total appliances and electrical equipment	21,063	1,063	16,373	3,627	7,104	13,959	n.p.	n.p.	16,227	4,317	519
3331	Agricultural machinery and equipment	2,805	n.p.	2,049	n.p.	n.p.	n.p.	1,037	1,768	2,717	88	-
3333	Materials handling equipment	538	n.p.	381	n.p.	n.p.	n.p.	538	-	489	49	-
(c)	Other industrial machinery and equipment n.e.c.	4,893	679	3,195	1,019	849	4,044	4,597	296	4,403	339	152
333	Total industrial machinery and equipment	8,236	831	5,625	1,781	1,050	7,186	6,173	2,063	7,609	476	152
33	Total other machinery and equipment	33,860	2,047	25,016	6,797	9,726	24,134	14,591	19,269	28,248	4,943	671
342	Rubber products	1,768	109	1,448	211	n.p.	n.p.	n.p.	n.p.	1,676	92	-
343	Plastic and related products	1,289	127	1,020	142	305	984	1,106	183	1,168	n.p.	n.p.
341,344	Leather, leather products and manufacturing n.e.c.	463	10	382	71	n.p.	n.p.	n.p.	n.p.	427	35	-
34	Total leather, rubber and plastic products and manufacturing n.e.c.	3,520	247	2,849	424	1,031	2,488	1,833	1,687	3,272	n.p.	n.p.
C	Total manufacturing	121,010	8,364	85,864	26,782	39,431	81,579	34,964	86,046	108,693	7,244	5,074
	Other industries											
F	Construction	915	24	743	149	245	671	n.a.	n.a.	849	n.p.	n.p.
46-47	Wholesale trade	8,769	1,014	4,683	3,072	n.p.	n.p.	n.a.	n.a.	6,042	290	2,437
48	Retail trade	388	95	263	29	n.p.	n.p.	n.a.	n.a.	n.p.	n.p.	-
F	Total wholesale and retail trade	9,157	1,109	4,947	3,101	5,941	3,216	n.a.	n.a.	n.p.	n.p.	2,437
63	Real estate and business services	9,059	457	6,526	2,076	2,186	6,873	n.a.	n.a.	7,088	158	1,812
8411	Research and scientific institutions	10,935	873	6,422	3,640	7,202	3,733	n.a.	n.a.	2,388	161	8,385
(f)	Other n.e.c.	1,456	196	811	449	854	602	n.a.	n.a.	1,397	n.p.	n.p.
16, D-I, K-L	Total other industries	31,522	2,658	19,449	9,415	16,428	15,094	n.a.	n.a.	n.p.	1,807	n.p.
	Total all industries (g)	156,632	11,331	107,948	37,353	58,085	98,547	n.a.	n.a.	130,868	9,051	16,713

(a) See also Table 7. (b) See also Table 5. (c) Includes Higher Education Sector. (d) ASIC Classes 2711-2712, 2721, 2724-2740. (e) ASIC Classes 3332, 3334-3339. (f) ASIC codes 16, D, 61-62, 8111-8303, 8412-9334. (g) Excludes ASIC Division A.

TABLE 4. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
 DETAILS OF R & D MANPOWER BY INDUSTRY OF ENTERPRISE (man-years)

ASIC code	Industry of enterprise Description	Total man-years	Manpower by type of employee			Manpower by enterprise employment size (a)		Researcher effort by location (b)					
			Research- ers	Tech- nicians	Other supporting staff	Less than 200	200 or more	N.S.W.	Vic.	Qld	S.A.	Other Aust. and overseas	
11	Mining Metallic minerals	143.1	72.7	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
12-15	Non-metallic minerals	14.8	7.1	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
11-15	Total mining (excl. services to mining)	157.9	79.8	36.7	41.4	4.9	153.0	15.5	9.0	41.2	n.p.	n.p.	n.p.
211	Manufacturing Meat products	15.2	10.5	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	-	-	-	-
212	Milk products	83.6	52.0	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.	-	-	n.p.
213	Fruit and vegetable products	61.7	33.2	21.2	7.3	n.p.	n.p.	n.p.	20.2	n.p.	n.p.	-	-
215-216	Flour mill and cereal products, bread, cakes and biscuits	90.1	45.5	33.6	11.0	13.0	77.1	29.5	12.0	n.p.	n.p.	-	-
214,217-218	Sugar, oils and fats and other food products	249.3	127.3	68.2	53.8	17.6	231.7	78.6	16.1	29.4	n.p.	n.p.	n.p.
219-221	Beverages and malt and tobacco products	51.0	23.0	23.0	5.0	n.p.	n.p.	n.p.	n.p.	n.p.	5.0	-	-
21-22	Total food, beverages and tobacco products	550.9	291.5	180.0	79.4	50.8	500.1	147.6	n.p.	38.9	8.8	n.p.	n.p.
231-232	Textile fibres, yarns and woven fabrics	54.6	16.5	n.p.	n.p.	12.3	42.3	n.p.	11.7	n.p.	n.p.	-	-
233,241-243	Other textile products, knitting mills, clothing and footwear	51.8	32.1	n.p.	n.p.	6.2	45.6	13.6	18.5	-	-	-	-
23-24	Total textiles, clothing and footwear	106.4	48.6	42.1	15.7	18.5	87.9	n.p.	30.2	n.p.	n.p.	-	-
25	Wood, wood products and furniture	49.6	22.0	21.1	6.5	16.2	33.4	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
261	Paper and paper products	111.6	45.8	40.8	25.0	-	111.6	n.p.	n.p.	-	-	-	n.p.
262	Printing and publishing	37.6	26.1	10.0	1.5	5.4	32.2	n.p.	n.p.	n.p.	n.p.	-	-
26	Total paper, paper products, printing and publishing	149.2	71.9	50.8	26.5	5.4	143.8	19.8	26.6	n.p.	n.p.	n.p.	n.p.
2713	Plastics materials	77.6	42.7	n.p.	n.p.	n.p.	n.p.	18.2	24.5	-	-	-	-
2714-2715	Organic and inorganic industrial chemicals n.e.c.	503.4	269.9	n.p.	n.p.	n.p.	n.p.	43.6	211.8	n.p.	n.p.	n.p.	n.p.
2722	Paints, varnishes and lacquers	243.9	98.5	85.2	60.2	45.9	198.0	61.5	37.0	-	-	-	-
2723	Pharmaceutical and veterinary products	172.7	81.1	55.3	36.3	14.6	158.1	45.3	27.5	3.3	n.p.	n.p.	n.p.
(c)	Other chemicals, petroleum and coal products	222.1	145.1	61.0	16.0	79.7	142.4	73.1	59.4	n.p.	n.p.	n.p.	n.p.
27	Total chemicals, petroleum and coal products	1,219.7	637.3	371.4	211.0	191.9	1,027.8	241.7	360.2	7.9	16.8	10.7	10.7
283	Cement and concrete products	98.6	46.5	34.4	17.7	10.4	88.2	20.4	n.p.	n.p.	n.p.	n.p.	n.p.
281-282,284	Glass and clay products and other non-metallic mineral products	70.5	34.6	25.5	10.4	12.3	58.2	12.1	n.p.	n.p.	n.p.	n.p.	n.p.
28	Total non-metallic mineral products	169.1	81.1	59.9	28.1	22.7	146.4	32.5	38.4	4.2	2.2	3.8	3.8
291	Basic iron and steel	746.9	288.8	280.7	177.4	16.9	730.0	196.7	n.p.	n.p.	n.p.	n.p.	n.p.
292-293	Non-ferrous metal basic products	156.0	96.8	35.3	23.9	7.8	148.2	15.1	n.p.	n.p.	n.p.	n.p.	n.p.
29	Total basic metal products	902.9	385.6	316.0	201.3	24.7	878.2	211.8	76.9	32.4	25.6	38.9	38.9

For footnotes see next page.

TABLE 4. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
 DETAILS OF R & D MANPOWER BY INDUSTRY OF ENTERPRISE (man-years) - continued

ASIC code	Industry of enterprise Description	Total man-years	Manpower by type of employee			Manpower by enterprise employment size (a)		Researcher effort by location (b)				
			Research- ers	Tech- nicians	Other supporting staff	Less than 200	200 or more	N.S.W.	Vic.	Qld	S.A.	Other Aust. and overseas
311	Fabricated structural metal products	72.6	22.2	24.1	26.3	n.p.	n.p.	11.8	2.8	n.p.	n.p.	-
312	Sheet metal products	41.2	18.8	18.8	3.6	n.p.	n.p.	2.8	14.2	n.p.	n.p.	n.p.
313	Other fabricated metal products	114.3	44.9	56.8	12.6	41.4	72.9	17.5	17.2	10.2	-	-
31	Total fabricated metal products	228.1	85.9	99.7	42.5	102.8	125.3	32.1	34.2	17.6	n.p.	n.p.
321	Motor vehicles and parts	693.6	122.4	519.3	51.9	21.3	672.3	18.8	73.1	n.p.	26.7	n.p.
322	Other transport equipment	67.3	33.7	24.3	9.3	10.5	56.8	16.1	15.3	2.3	-	-
32	Total transport equipment	760.9	156.1	543.6	61.2	31.8	729.1	34.9	88.4	n.p.	26.7	n.p.
331	Photographic, professional and scientific equipment	231.5	98.1	89.2	44.2	43.7	187.8	23.8	n.p.	n.p.	n.p.	n.p.
3321	TV's, radios and electronic equipment	722.9	343.7	307.1	72.1	125.5	597.4	236.5	n.p.	n.p.	n.p.	n.p.
3322-3326	Refrigerators, household appliances and electrical equipment n.e.c.	486.3	195.2	222.1	69.0	154.0	332.3	101.1	65.8	8.0	17.3	3.0
332	Total appliances and electrical equipment	1,209.2	538.9	529.2	141.1	279.5	929.7	337.6	n.p.	n.p.	n.p.	n.p.
3331	Agricultural machinery and equipment	150.3	49.5	69.6	31.2	n.p.	n.p.	n.p.	n.p.	20.5	n.p.	n.p.
3333	Materials handling equipment	31.6	11.3	14.8	5.5	n.p.	n.p.	n.p.	n.p.	-	n.p.	n.p.
(d)	Other industrial machinery and equipment n.e.c.	243.5	127.4	88.6	27.5	172.0	71.5	54.6	53.7	5.6	n.p.	n.p.
333	Total industrial machinery and equipment	425.4	188.2	173.0	64.2	219.1	206.3	59.5	76.7	26.1	21.2	4.7
33	Total other machinery and equipment	1,866.1	825.2	791.4	249.5	542.3	1,323.8	420.9	284.7	38.1	66.5	15.0
342	Rubber products	80.3	43.4	n.p.	n.p.	10.9	69.4	n.p.	35.4	-	n.p.	n.p.
343	Plastic and related products	75.1	34.3	n.p.	n.p.	24.0	51.1	12.7	19.2	n.p.	n.p.	n.p.
341,344	Leather, leather products and manufacturing n.e.c.	29.3	18.4	8.4	2.5	13.1	16.2	n.p.	9.1	n.p.	n.p.	-
34	Total leather, rubber and plastic products and manufacturing n.e.c.	184.7	96.1	74.4	14.2	48.0	136.7	19.3	63.7	3.8	n.p.	n.p.
C	Total manufacturing	6,187.6	2,701.3	2,550.4	935.9	1,055.1	5,132.5	1,181.2	1,097.6	157.1	168.1	97.3
	Other industries											
E	Construction	51.6	25.0	15.2	11.4	29.5	22.1	13.3	7.8	n.p.	n.p.	n.p.
46-47	Wholesale trade	350.5	186.5	n.p.	n.p.	127.4	223.1	n.p.	n.p.	n.p.	n.p.	n.p.
48	Retail trade	25.2	8.9	n.p.	n.p.	6.1	19.1	n.p.	n.p.	n.p.	n.p.	n.p.
F	Total wholesale and retail trade	375.7	195.4	130.8	49.5	133.5	242.2	96.7	47.5	28.6	20.6	2.0
63	Real estate and business services	573.1	181.0	288.0	104.1	194.7	378.4	50.3	39.4	n.p.	n.p.	8.0
8411	Research and scientific institutions	470.6	189.2	171.2	110.2	470.6	-	111.8	25.2	n.p.	17.4	n.p.
(e)	Other n.e.c.	78.9	41.8	26.6	10.5	15.0	63.9	37.3	2.1	n.p.	n.p.	n.p.
16,D-I,K-L	Total other industries	1,549.9	632.4	631.8	285.7	843.3	706.6	309.4	122.0	140.7	n.p.	n.p.
	Total all industries (f)	7,895.4	3,413.5	3,218.9	1,263.0	1,903.3	5,992.1	1,506.1	1,228.6	339.0	216.9	122.9

(a) See also Table 8. (b) See also Table 9. (c) ASIC Classes 2711-2712, 2721, 2724-2740. (d) ASIC Classes 3332, 3334-3339. (e) ASIC codes 16, D, 61-62, 8111-8303, 8412-9334. (f) Excludes ASIC Division A.

TABLE 5. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
R & D EXPENDITURE OF MINING AND MANUFACTURING ENTERPRISES (a) BY ENTERPRISE TURNOVER SIZE (\$'000) (b)

Enterprise turnover size (\$m)	Less than 1.0	1.0-4.9	5.0-9.9	10.0-19.9	20.0-29.9	30.0-39.9	40.0-49.9	50.0-74.9	75.0-99.9	100.0-149.9	150.0-199.9	200.0 or more	Total
	6,468	10,681	7,062	11,278	4,753	8,297	4,481	9,568	9,675	7,941	5,081	39,825	125,110

(a) Excludes ASIC Sub-division 16. (b) See also Table 3.

TABLE 6. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
R & D EXPENDITURE OF MINING AND MANUFACTURING ENTERPRISES (a) BY ENTERPRISE VALUE ADDED SIZE (\$'000)

Enterprise value added size (\$m)	Less than 1.0	1.0-1.9	2.0-4.9	5.0-9.9	10.0-19.9	20.0-29.9	30.0-39.9	40.0-49.9	50.0-74.9	75.0-99.9	100.0 or more	Total
	10,884	4,041	8,090	11,667	11,711	11,400	6,950	6,174	14,804	4,253	35,134	125,110

(a) Excludes ASIC Sub-division 16.

TABLE 7. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
R & D EXPENDITURE BY INDUSTRY OF ENTERPRISE BY SOURCE OF FUNDS AND BY TYPE OF R & D ACTIVITY (\$'000)

Industry of enterprise		Total expenditure	Source of funds (a)						Type of activity (a)			
			Own funds	Private non-profit and public enterprises	A.I.R.D.I.B. grants (b)	Other Commonwealth Government	State and local government (c)	Other private enterprises in Aust.	Overseas	Basic research	Applied research	Experimental development
ASIC code	Description											
C	Manufacturing	121,010	108,693	-	2,755	n.p.	n.p.	3,501	1,573	2,681	36,750	81,579
B,D-I,K-L	Mining and other industries	35,622	22,175	-	717	n.p.	n.p.	8,996	2,644	3,147	15,507	16,968
	All industries (d)	156,632	130,868	-	3,472	4,925	651	12,497	4,217	5,828	52,257	98,547

(a) See also Table 3. (b) Australian Industrial Research and Development Incentives Board. (c) State and local government authorities and Higher Education Sector.
(d) Excludes ASIC Division A.

TABLE 8. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES – AUSTRALIA, 1976-77
R & D MANPOWER BY INDUSTRY OF ENTERPRISE BY ENTERPRISE EMPLOYMENT SIZE (man-years) (a)

Industry of enterprise		Enterprise employment size (persons)											
ASIC code	Description	Less than 10	10-19	20-49	50-99	100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000-9,999	10,000 or more	Total
C	Manufacturing	100.9	157.2	237.4	205.3	354.3	765.6	571.0	767.3	1,521.1	660.6	846.9	6,187.6
B,D-I,K-L	Mining and other industries	85.9	76.4	254.8	118.6	312.5	495.8	144.1	87.6	132.1	-	-	1,707.8
	All industries (b)	186.8	233.6	492.2	323.9	666.8	1,261.4	715.1	854.9	1,653.2	660.6	846.9	7,895.4

(a) See also Table 4. (b) Excludes ASIC Division A.

TABLE 9. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES – AUSTRALIA, 1976-77
RESEARCHER EFFORT BY INDUSTRY OF ENTERPRISE BY LOCATION (man-years) (a)

Industry of enterprise		Location of researcher effort									
ASIC code	Description	N.S.W.	Vic.	Qld	S.A.	W.A.	Tas	N.T.	A.C.T.	Overseas	Total
C	Manufacturing	1,181.2	1,097.6	157.1	168.1	29.9	61.0	n.p.	n.p.	n.p.	2,701.3
B,D-I,K-L	Mining and other industries	324.9	131.0	181.9	48.8	12.1	9.1	n.p.	-	n.p.	712.2
	All industries (b)	1,506.1	1,228.6	339.0	216.9	42.0	70.1	4.5	n.p.	n.p.	3,413.5

(a) See also Table 4. (b) Excludes ASIC Division A.

TABLE 10. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES -
AUSTRALIA, 1976-77
R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD (a)

Industry of product field		Enterprises no. (b)	R & D expenditure \$'000
ASIC code	Description		
	Agriculture, forestry, fishing and hunting		
011-013	Sheep, grain, cattle, pigs and poultry	4	452
014-042	Other agriculture, forestry, fishing and hunting	7	1,409
A	Total agriculture, forestry, fishing and hunting	11	1,860
	Mining		
11	Metallic minerals	13	3,875
12-15	Non-metallic minerals	10	2,818
11-15	Total mining (excl. services to mining)	21	6,693
	Manufacturing		
211	Meat products	11	697
212	Milk products	8	866
213	Fruit and vegetable products	22	1,400
215-216	Flour mill and cereal products, bread, cakes and biscuits	23	2,248
214,217-218	Sugar, oils and fats and other food products	38	5,653
219-221	Beverages and malt and tobacco products	12	1,587
21-22	Total food, beverages and tobacco products	81	12,450
231-232	Textile fibres, yarns and woven fabrics	13	820
233,241-243	Other textile products, knitting mills, clothing and footwear	13	570
23-24	Total textiles, clothing and footwear	24	1,390
25	Wood, wood products and furniture	33	1,008
261	Paper and paper products	11	2,424
262	Printing and publishing	7	283
26	Total paper, paper products, printing and publishing	18	2,707
2711	Chemical fertilizers	8	675
2713	Plastics materials	26	4,331
2714	Organic industrial chemicals n.e.c.	26	2,005
2715	Inorganic industrial chemicals n.e.c.	30	4,324
2722	Paints, varnishes and lacquers	32	4,026
2723	{ Veterinary products	16	3,714
	{ Pharmaceutical products	21	3,873
2724	Pest control and agricultural chemical products n.e.c.	18	4,275
2725	Soap and other detergents	18	745
2726	Cosmetics and toilet preparations	17	922
2727	Inks	9	975
2712,2721,2728	Industrial gases, ammunition and other chemical products	48	2,401
271-272	Total basic chemicals, other chemical and related products	191	32,266
273-274	Petroleum refining, petroleum and coal products n.e.c.	15	524
27	Total chemicals, petroleum and coal products	198	32,790
281	Glass and glass products	8	1,378
282	Clay products and refractories	16	1,104
283	Cement and concrete products	16	2,474
284	Other non-metallic mineral products	20	1,724
28	Total non-metallic mineral products	49	6,680
291	Basic iron and steel	34	7,595
292-293	Non-ferrous metal basic products	33	4,837
29	Total basic metal products	66	12,432

For footnotes see next page.

TABLE 10. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES –
 AUSTRALIA, 1976-77
 R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD (a) – *continued*

<i>Industry of product field</i>		<i>Enterprises no. (b)</i>	<i>R & D expenditure \$'000</i>
<i>ASIC code</i>	<i>Description</i>		
311	Fabricated structural metal products	35	1,323
312	Sheet metal products	15	539
313	Other fabricated metal products	76	3,536
31	Total fabricated metal products	114	5,398
321	Motor vehicles and parts	54	15,019
3221-3222	Ship and boat building and repair	6	195
3223	Railway equipment manufacture and repair	7	1,119
3224	Aircraft building and repair	7	255
3225	Transport equipment n.e.c.	7	185
322	Total other transport equipment	26	1,755
32	Total transport equipment	76	16,774
331	Photographic, professional and scientific equipment	41	4,413
3321	TV's, radios and electronic equipment A.D.P. equipment Other electronic equipment	40	8,398
		24	2,206
		48	6,420
3322	Refrigerators and household appliances	49	3,090
3323	Water heating systems	17	572
3324-3326	Cables, electric machinery and equipment n.e.c.	82	4,179
332	Total appliances and electrical equipment	213	24,866
3331	Agricultural machinery and equipment	27	2,696
3332	Construction and earthmoving machinery	10	322
3333	Materials handling equipment	48	1,965
3334	Woodworking and metal-working equipment	30	924
3335	Pumps and compressors	24	621
3336	Space heating and airconditioning equipment	10	364
3337	Dies, blades and machine tool accessories	8	432
3338	Food processing machinery	21	716
3339	Industrial machinery and equipment n.e.c.	178	7,376
333	Total industrial machinery and equipment	299	15,415
33	Total other machinery and equipment	499	44,694
341	Leather and leather products	5	242
342	Rubber products	21	1,841
343	Plastic and related products	58	2,578
344	Manufacturing n.e.c.	16	420
34	Total leather, rubber, plastic products and manufacturing n.e.c.	95	5,081
C	Total manufacturing	970	141,406
	Other industries		
16	Services to mining	9	3,649
E	Construction	9	464
D,F-L	Other n.e.c.	18	2,560
16,D-L	Total other industries	35	6,673
	Total all industries (c)	997	156,632

(a) The industry of product (or process) field towards which the R & D activity was directed. For further explanation see paragraph 22 in the explanatory notes. (b) Where the R & D performed by an enterprise was directed to more than one product, that enterprise is counted in each of the industries to which its products are keyed. Therefore, the enterprise counts shown in this table can not be summed to aggregates for combinations of industries. (c) ASIC Divisions A-L.

TABLE 11. RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED BY PRIVATE ENTERPRISES - AUSTRALIA, 1976-77
R & D EXPENDITURE BY INDUSTRY OF PRODUCT FIELD (a) BY LOCATION OF R & D ACTIVITY (\$'000)

<i>Industry of product field</i>		<i>N.S.W.</i>	<i>Vic.</i>	<i>Qld</i>	<i>S.A.</i>	<i>W.A.</i>	<i>Tas., N.T. and A.C.T.</i>	<i>Total</i>
<i>ASIC code</i>	<i>Description</i>							
11-15	<i>Mining (excl. services to mining)</i>	1,958	739	3,743	n.p.	n.p.	n.p.	6,693
	Manufacturing							
21-22	Food, beverages and tobacco products	7,242	2,632	2,118	n.p.	n.p.	n.p.	12,450
23-24	Textiles, clothing and footwear	n.p.	1,033	n.p.	-	-	-	1,390
25	Wood, wood products and furniture	n.p.	228	214	98	n.p.	n.p.	1,008
26	Paper, paper products, printing and publishing	331	1,511	-	n.p.	-	n.p.	2,707
2723	Pharmaceutical and veterinary products	5,329	1,967	1,336	968	190	766	7,587
(b)	Chemicals, petroleum and coal products	9,680	12,555					
28	Non-metallic mineral products	4,789	1,468	253	48	n.p.	n.p.	6,680
29	Basic metal products	5,015	3,389	1,839	738	281	1,170	12,432
31	Fabricated metal products	2,708	1,806	673	154	58	-	5,398
32	Transport equipment	2,567	10,062	432	3,055	n.p.	n.p.	16,774
331-332	Photographic, professional and scientific equipment, household appliances and electrical equipment	15,272	11,023	538	1,820	n.p.	n.p.	29,279
333	Industrial machinery and equipment	5,185	5,300	3,122	1,473	173	162	15,415
33	Total other machinery and equipment	20,457	16,323	3,660	3,294	n.p.	n.p.	44,694
34	Leather, rubber and plastic products and manufacturing n.e.c.	1,337	2,720	n.p.	830	n.p.	-	5,081
C	<i>Total manufacturing</i>	60,139	55,694	10,654	9,688	2,119	3,112	141,406
A,16,D-L	Agriculture and other industries	4,886	1,832	1,207	n.p.	n.p.	n.p.	8,533
	Total all industries (c)	66,983	58,266	15,604	9,833	2,279	3,668	156,632

(a) The industry of product (or process) field towards which the R & D activity was directed. For further explanation see paragraph 22 in the explanatory notes. (b) ASIC Sub-division 27 excluding ASIC Class 2723. (c) ASIC Divisions A-L.

TABLE 12. PAYMENTS BY PRIVATE ENTERPRISES FOR RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED ON THEIR BEHALF OUTSIDE THE ENTERPRISE - AUSTRALIA, 1976-77
PAYMENTS BY INDUSTRY OF ENTERPRISE MAKING PAYMENT BY LOCATION OF RECIPIENT

Industry of enterprise making payment		Location of recipient					
		Australia		Overseas		Total	
ASIC code	Description	Enterprises no.	Payments \$'000	Enterprises no.	Payments \$'000	Enterprises no.	Payments \$'000
11-15	Mining (excl. services to mining)	19	1,337	4	140	20	1,477
	Manufacturing						
21-22	Food, beverages and tobacco products	22	3,344	6	1,659	27	5,003
23-24	Textiles, clothing and footwear	n.p.	n.p.	n.p.	n.p.	7	95
25	Wood, wood products and furniture	n.p.	n.p.	n.p.	n.p.	6	108
26	Paper, paper products, printing and publishing	n.p.	n.p.	n.p.	n.p.	7	162
2723	Pharmaceutical and veterinary products	35	664	6	1,388	11	1,323
(a)	Chemicals, petroleum and coal products					28	729
28	Non-metallic mineral products	n.p.	n.p.	n.p.	n.p.	15	772
29	Basic metal products	14	283	5	179	14	462
31	Fabricated metal products	22	696	-	-	22	696
32	Transport equipment	n.p.	n.p.	n.p.	n.p.	8	38
331-332	Photographic, professional and scientific equipment, household appliances and electrical equipment	n.p.	n.p.	n.p.	n.p.	26	1,245
333	Industrial machinery and equipment	n.p.	n.p.	n.p.	n.p.	14	206
33	Total other machinery and equipment	36	546	6	905	40	1,452
34	Leather, rubber and plastic products and manufacturing n.e.c.	n.p.	n.p.	n.p.	n.p.	12	124
C	Total manufacturing	179	6,792	31	4,171	197	10,963
	Other industries						
F	Wholesale and retail trade	18	1,731	6	428	23	2,159
63	Real estate and business services	n.p.	n.p.	n.p.	n.p.	12	294
(b)	Other n.e.c.	n.p.	n.p.	n.p.	n.p.	20	760
16, D-I, K-L	Total other industries	47	2,724	12	489	55	3,213
	Total all industries (c)	245	10,853	47	(d)4,800	272	15,653

(a) ASIC Sub-division 27 excluding ASIC Class 2723. (b) ASIC codes 16, D-E, G-H, 61-62, K-L. (c) Excludes ASIC Division A. (d) The corresponding 1973-74 estimate is \$12.2m with a standard error of \$0.9m.

TABLE 13. PAYMENTS BY PRIVATE ENTERPRISES FOR RESEARCH AND EXPERIMENTAL DEVELOPMENT PERFORMED ON THEIR BEHALF OUTSIDE THE ENTERPRISE - AUSTRALIA, 1976-77
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		
		Manufacturing (a)	Mining and other industries (b)	All industries (c)
U.K.	Related enterprises	n.p.	n.p.	1,284
	Unrelated organisations	n.p.	n.p.	360
	Total	1,282	362	1,644
U.S.A.	Related enterprises	n.p.	n.p.	781
	Unrelated organisations	n.p.	n.p.	89
	Total	773	97	870
Other overseas	Related enterprises	n.p.	n.p.	2,158
	Unrelated organisations	n.p.	n.p.	128
	Total	2,116	170	2,286
Total overseas	Related enterprises	3,751	472	4,223
	Unrelated organisations	420	157	577
	Total	4,171	629	4,800
Australia	Related enterprises	n.a.	n.a.	n.a.
	Unrelated organisations	n.a.	n.a.	n.a.
	Total	6,792	4,061	10,853
Total	Related enterprises	n.a.	n.a.	n.a.
	Unrelated organisations	n.a.	n.a.	n.a.
	Total	10,963	4,690	15,653

(a) ASIC Division C. (b) ASIC Divisions B, D-I, K-L. (c) Excludes ASIC Division A.

TABLE 14. PAYMENTS BY PRIVATE ENTERPRISES FOR TECHNICAL KNOW-HOW - AUSTRALIA, 1976-77
PAYMENTS BY INDUSTRY OF ENTERPRISE

Industry of enterprise making payment		Payments made overseas										
		Enterprises making payments no.	Total payments \$'000	Type of technical know-how		Payments within Australia \$'000	Total payments made overseas \$'000	Relationship of recipient to enterprise making payment		Country to which payment made		
				Patent licence fees and royalties \$'000	Other technical know-how \$'000			Related enterprise \$'000	Unrelated organisation \$'000	U.K. \$'000	U.S.A. \$'000	Other overseas (a) \$'000
ASIC code	Description											
Manufacturing												
21-22	Food, beverages and tobacco products	16	2,949	687	2,262	n.p.	n.p.	2,123	n.p.	176	2,383	n.p.
23-24	Textiles, clothing and footwear	14	1,200	1,066	134	n.p.	n.p.	938	n.p.	n.p.	658	n.p.
25	Wood, wood products and furniture	6	78	2	77	2	592	403	189	n.p.	486	n.p.
26	Paper, paper products, printing and publishing	7	515	442	74							
2723	Pharmaceutical and veterinary products	9	5,001	3,715	1,286	283	15,788	13,302	2,486	3,350	10,233	2,204
(b)	Chemicals, petroleum and coal products	48	11,069	8,101	2,968							
28	Non-metallic mineral products	11	4,024	2,424	1,600	n.p.	n.p.	3,533	n.p.	3,110	858	n.p.
29	Basic metal products	16	3,073	2,430	643	241	2,833	509	2,323	44	2,469	320
31	Fabricated metal products	21	1,357	730	628	411	946	n.p.	n.p.	308	568	70
32	Transport equipment	15	4,713	1,395	3,318	n.p.	n.p.	n.p.	n.p.	n.p.	1,110	3,386
331-332	Photographic, professional and scientific equipment, household appliances and electrical equipment	47	12,445	7,147	5,297	276	12,169	7,925	4,244	3,202	8,140	827
333	Industrial machinery and equipment	44	3,846	2,202	1,644	39	3,806	1,288	2,518	83	2,979	744
33	Total other machinery and equipment	91	16,291	9,349	6,942	316	15,975	9,213	6,762	3,285	11,119	1,571
34	Leather, rubber and plastic products and manufacturing n.e.c.	20	3,061	757	2,304	142	2,919	1,760	1,159	714	2,002	203
C	Total manufacturing	274	53,332	31,097	22,235	1,441	51,891	36,044	15,847	11,706	31,887	8,298
Mining and other industries												
F	Wholesale and retail trade	26	9,756	5,849	3,907	n.p.	n.p.	9,435	n.p.	1,566	3,052	n.p.
(c)	Mining and other n.e.c.	21	3,686	417	3,269	n.p.	n.p.	3,362	n.p.	364	421	n.p.
B,D-I,K-L	Total mining and other industries	47	13,442	6,266	7,176	241	13,201	12,798	403	1,930	3,474	7,797
Total all industries (d)		321	(e)66,774	37,363	29,411	1,682	65,092	48,842	16,250	13,636	35,361	16,095

(a) See also Table 15. (b) ASIC Sub-division 27 excluding ASIC Class 2723. (c) ASIC Divisions B, D-E, G-I, K-L. (d) Excludes ASIC Division A. (e) The corresponding 1973-74 estimate is \$77.0m with a standard error of \$2.3m.

TABLE 15. PAYMENTS BY PRIVATE ENTERPRISES FOR TECHNICAL KNOW-HOW – AUSTRALIA, 1976-77
PAYMENTS BY COUNTRY OF RECIPIENT (a) (\$'000)

	Australia	Canada	Federal Republic of Germany	France	Japan	U.K.	U.S.A.	Other countries	Total
All industries (b)	1,682	1,169	4,854	2,800	2,045	13,636	35,361	5,227	66,774

(a) See also Table 14. (b) Excludes ASIC Division A.

TABLE 16. RECEIPTS BY PRIVATE ENTERPRISES FOR TECHNICAL KNOW-HOW – AUSTRALIA, 1976-77
RECEIPTS BY INDUSTRY OF ENTERPRISE

Industry of recipient enterprise		Recipient enterprises no.	Total receipts \$'000	Type of technical know-how		Receipts from within Australia \$'000	Total receipts from overseas \$'000	Receipts from overseas				
				Patent licence fees and royalties \$'000	Other technical know-how \$'000			Relationship of organisation making payments to recipient enterprise		Country from which payment received (a)		
								Related enterprise \$'000	Unrelated organisation \$'000	U.K. \$'000	U.S.A. \$'000	Other overseas \$'000
ASIC code	Description											
C	Manufacturing	97	7,492	4,289	3,203	1,460	6,031	2,787	3,244	858	1,495	3,679
B,D-I,K-L	Mining and other industries	27	3,131	310	2,821	2,059	1,072	390	682	299	510	262
	All industries (b)	124	10,623	4,599	6,024	3,519	7,103	3,177	3,926	1,157	2,005	3,941

(a) See also Table 17. (b) Excludes ASIC Division A.

TABLE 17. RECEIPTS BY PRIVATE ENTERPRISES FOR TECHNICAL KNOW-HOW – AUSTRALIA, 1976-77
RECEIPTS BY COUNTRY FROM WHICH PAYMENT WAS RECEIVED (a) (\$'000)

	Australia	Canada	Federal Republic of Germany	France	Japan	New Zealand	U.K.	U.S.A.	Other countries	Total
All industries (b)	3,519	246	123		358	1,471	1,157	2,005	1,743	10,623

(a) See also Table 16. (b) Excludes ASIC Division A.

TABLE 18. PATENT ACTIVITY BY PRIVATE ENTERPRISES WITH RESEARCH AND EXPERIMENTAL DEVELOPMENT ACTIVITY IN 1976-77 - AUSTRALIA, 1972 TO 1977
DETAILS BY INDUSTRY OF ENTERPRISE

Industry of enterprise with patent activity		Number of enterprises with patent activity during 1972-77				Patent activity during 1972-77			
		Enterprises lodging patent applications in Australia	Enterprises with patents granted in Australia	Enterprises lodging patent applications overseas	Enterprises with patents granted overseas	Patent applications lodged in Australia	Patents granted in Australia	Patent applications lodged overseas	Patents granted overseas
ASIC code	Description								
Manufacturing									
21-22	Food, beverages and tobacco products	12	12	9	7	41	32	141	53
23-24	Textiles, clothing and footwear	4	n.p.	n.p.	n.p.	10	n.p.	n.p.	n.p.
25	Wood, wood products and furniture	6	7	n.p.	n.p.	46	35	n.p.	n.p.
26	Paper, paper products, printing and publishing	5	n.p.	n.p.	n.p.	20	n.p.	n.p.	n.p.
2723	Pharmaceutical and veterinary products	5	22	17	13	14 243	182	1,263	533
(a)	Chemicals, petroleum and coal products	21							
28	Non-metallic mineral products	7	7	6	6	44	30	175	61
29	Basic metal products	17	15	12	11	101	83	449	302
31	Fabricated metal products	35	31	25	18	332	291	405	220
32	Transport equipment	16	14	10	5	41	31	52	14
331-332	Photographic, professional and scientific equipment, appliances and electrical equipment	53	42	34	25	444	344	686	310
333	Industrial machinery and equipment	52	38	28	14	182	174	208	76
33	Total other machinery and equipment	105	80	62	39	626	518	894	386
34	Leather, rubber and plastic products and manufacturing n.e.c.	12	11	11	8	96	77	288	64
C	Total manufacturing	245	207	159	113	1,614	1,303	3,750	1,696
Mining and other industries									
F	Wholesale and retail trade	22	20	13	10	70	54	160	73
63	Real estate and business services	16	13	13	11	100	68	343	206
(b)	Mining and other n.e.c.	23	21	16	12	65	65	184	83
B,D-I,K-L	Total mining and other industries	61	54	42	33	235	187	687	362
Total all industries (c)		306	261	201	146	1,849	1,490	4,437	2,058

(a) ASIC Sub-division 27 excluding ASIC Class 2723. (b) ASIC codes B, D-E, G-H, 61-62, K-L. (c) Excludes ASIC Division A.

In correspondence,
quote this number

AUSTRALIAN BUREAU OF STATISTICS

All communications should be directed to:
The Australian Bureau of Statistics
in your State or Territory
(For the address and telephone number see back page of form)

Please correct any errors in the name or mailing address of this enterprise

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SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT 1976-77

This return is required under authority of the *Census and Statistics Act 1905*. Under the provisions of this Act, the contents of individual returns are **CONFIDENTIAL**. They will be used only for statistical purposes and will not be disclosed to anyone except authorised officers of the Australian Bureau of Statistics.

All figures in this return should relate to the enterprise named on the address label above. For statistical purposes, **ENTERPRISES** are legal entities operating in Australia including branches of overseas companies operating in Australia. Overseas branches of Australian companies are excluded.

Explanatory Notes are provided at the back of this form for your assistance.

Where actual figures are not available from your accounts, please supply careful estimates.

If you encounter any difficulty in interpreting the instructions or definitions on this form (e.g. which of your enterprise's activities are R and D according to the definition on page 2), please contact 'Business Surveys' at the address, telephone number or telex number shown on page 8 for your State or Territory.

PLEASE FORWARD YOUR COMPLETED RETURN FOR THIS ENTERPRISE in the enclosed reply-paid envelope to reach the Australian Bureau of Statistics NOT LATER THAN 12 DECEMBER 1977.

AUSTRALIAN BUREAU OF STATISTICS

SignatureDate

Representative of your business who should be contacted if any queries arise regarding this return:

Name of RepresentativeTelephone No. /

(BLOCK LETTERS) STD code

TOTAL ENTERPRISE EMPLOYMENT, at the last pay period in June 1977.

- Employees of your enterprise on the payroll of the last pay period in June 1977 and working proprietors and working partners at end of June 1977. Include part-time and casual employees.

NO. OF PERSONS

INVESTMENT IN RESEARCH AND EXPERIMENTAL DEVELOPMENT

Answer each of the following three questions by ticking the appropriate box.

- In the year ended 30 June 1977, did your enterprise make any payments for the purchase of, or have any receipts from the sale of, patent rights and other technical know-how?

Yes	<input type="checkbox"/>	1 (Answer questions 3,4,15,16)
No	<input type="checkbox"/>	2
- In the year ended 30 June 1977, did your enterprise carry out any research and experimental development (as defined on page 2)?

Yes	<input type="checkbox"/>	1 (Answer questions 4-12, 14)
No	<input type="checkbox"/>	2
- In the year ended 30 June 1977, did your enterprise incur expenditure for research and experimental development projects to be done outside your enterprise?

Yes	<input type="checkbox"/>	1 (Answer question 13, 14)
No	<input type="checkbox"/>	2

If you answered 'no' to all three questions (2-4), ensure that you have completed all the required details on this page, then forward this return in the enclosed reply-paid envelope.

INTERPRETATION OF THE DEFINITION OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

The Organisation for Economic Co-operation and Development (OECD), which has laid down the international standards for research and experimental development (R and D) statistics, defines R and D as follows:

"Research and experimental development comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."

Any activity classified as R and D should contain an appreciable amount of NOVELTY or innovation, it should have INVESTIGATION as a primary objective, and should have a potential to produce results that are sufficiently GENERAL for mankind's stock of knowledge (theoretical and/or practical) to be recognisably increased. The concept of novelty is not associated with the actual creation of something which, although new, is made by artistry or by application of techniques that have already been established for that class of object. For example, the design and testing of a new type of amplifier is R and D, whereas the design and construction of an amplifier of an established type is not R and D.

R and D ceases and pre-production begins when work is no longer experimental. Once the primary objective is no longer investigation but rather production or preparation for production, the activity can no longer be considered as part of R and D even though it could be regarded as an important part of the total innovative process.

Note that R and D extends to substantial modifications to existing products and processes.

THE FOLLOWING ACTIVITIES, often regarded as research or development, are to be EXCLUDED EXCEPT where they are used primarily for the support of specific R and D programs or to develop new techniques.

- . market research or sales promotion
- . operations research
- . quality control or routine testing of materials, products or processes
- . prospecting, exploring or drilling for, or producing, minerals, petroleum or natural gas
- . development work on style changes or minor modifications to existing products and processes
- . computer programming or systems work
- . routine data collection
- . the commercial, legal and administrative aspects of patent and licence activity
- . scientific and technical information services

DIVERGENCE FROM THE AUSTRALIAN INDUSTRIAL RESEARCH AND DEVELOPMENT INCENTIVES BOARD'S DEFINITION OF R AND D

The definition of R and D applied by the Board is similar to that outlined above, except in two areas:

- . To be accepted as R and D by the Board, work need only be directed towards products and processes new to the enterprise, whilst this questionnaire seeks information on R and D activities that could increase mankind's stock of knowledge. R and D directed towards attaining a product or process that has already been developed elsewhere should not be included unless it is not possible to gain access to this new knowledge.
- . This questionnaire covers the complete range of R and D activities, not just those directed towards new products and processes e.g. R and D in the social sciences and humanities; basic research that is undertaken to increase the stock of knowledge but which has no particular application or use in view.

A. QUESTIONS 5-12 REFER ONLY TO R AND D PROJECTS UNDERTAKEN WITHIN YOUR ENTERPRISE, YEAR ENDED 30 JUNE 1977

Exclude R and D projects performed on your behalf by other enterprises, institutions or individuals (report this expenditure in Q.13) but *include* work done by others where it is in the form of a specialised service provided in support of an R and D project undertaken within your enterprise (report this expenditure in 'other current expenditure' in Q.8)

Include R and D projects performed by your enterprise on behalf of other enterprises, institutions or individuals.

FIGURES REPORTED SHOULD ONLY RELATE TO ACTIVITIES REGARDED AS R AND D BY THE DEFINITION ON PAGE 2.

5. MAN YEARS OF EFFORT EXPENDED DIRECTLY ON R AND D UNDERTAKEN WITHIN YOUR ENTERPRISE BY EMPLOYEES OF YOUR ENTERPRISE

Include the effort of all employees engaged directly on R and D even if only part of their time is spent on R and D.

Record man years of effort to one decimal place

TYPE OF EMPLOYEE	Number of man years of effort devoted directly to R and D during the year ended 30 June 1977
Researchers	
Technicians	
Other	
TOTAL	

(a)

6. LOCATION OF EFFORT BY RESEARCHERS

Allocate the man years of effort (to one decimal place) spent on R and D by researchers employed by your enterprise during the year ended 30 June 1977 according to where their effort was expended.

LOCATION	MAN YEARS OF EFFORT BY RESEARCHERS
New South Wales	
Victoria	
Queensland	
South Australia	
Western Australia	
Tasmania	
Northern Territory	
Australian Capital Territory	
Overseas	
TOTAL	

(as in (a) above)

7. FIELD OF SCIENCE OF RESEARCHERS

Allocate the man years of effort (to one decimal place) spent on R and D by researchers employed by your enterprise during the year ended 30 June 1977 according to the field of science in which they specialise.

FIELD OF SCIENCE	MAN YEARS OF EFFORT BY RESEARCHERS
Natural sciences (incl. engineering)	
Social sciences	
TOTAL	

(as in (a) above)

8. TYPE OF EXPENDITURE

- Record the expenditure incurred on R and D projects undertaken within your enterprise during the year ended 30 June 1977.
- Where significant expenditure is shared by R and D and non R and D activities (e.g. central administration costs, fuel, rates, computing expenses, etc.), the R and D proportion should be estimated and included in the relevant figure.
- Depreciation provisions, whether real or imputed, should not be reported in this question (report in Question 9)

TYPE OF EXPENDITURE		\$	Office Use Only
CAPITAL EXPENDITURE on new and second hand fixed tangible assets, less value of disposals	Land, buildings and other structures		
	Vehicles, plant, machinery and equipment		
CURRENT EXPENDITURE	Wages, salaries and other labour costs (including super., holiday pay, etc.)		
	Other current expenditure		
TOTAL			

(b)

9. DEPRECIATION

Record depreciation provided on the fixed tangible assets of this enterprise that is attributable to R and D. For assets used in both R and D and non R and D activities, estimate the proportion of depreciation attributable to R and D.

TYPE OF ASSET	DEPRECIATION \$
Buildings and other structures	
Vehicles, plant, machinery and equipment	
TOTAL	

10. SOURCE OF FUNDS

Record the direct source of all funds receivable for R and D projects undertaken within your enterprise during the year ended 30 June 1977.

SOURCE	FUNDS \$	Office Use Only
Own funds		W
Other Australian private business enterprises		X
Australian Industrial Research and Development Incentives Board Grant (expected)		Y
Other Australian source (specify)		
.....		
.....		Z
Overseas sources		(as in (b) above)
TOTAL		

11. TYPE OF ACTIVITY

Allocate the total expenditure on R and D projects undertaken within your enterprise according to the type of activity undertaken

TYPE OF ACTIVITY	EXPENDITURE \$
Basic research	
Applied research	
Experimental development	
TOTAL	

(as in (b) above)

12. PRODUCT OR PROCESS FIELD

- List the products or processes towards which the R and D projects undertaken within your enterprise were specifically directed. Identify separately products or processes towards which significant amounts of your enterprises R and D activities were directed and combine the remaining into groups of similar products or processes.
- Allocate the total expenditure on R and D projects undertaken within your enterprise according to these products or processes.
- Enter beside each product the State in which most of the R and D activities associated with that product or process were performed.

PRODUCT OR PROCESS (specify)	EXPENDITURE		STATE	
	\$	Office Use Only		Office Use Only
1. -----				
2. -----				
3. -----				
4. -----				
5. -----				
6. -----				
7. -----				
8. -----				
TOTAL				

(as in (b) above)

EXPENDITURE OF YOUR ENTERPRISE ON R AND D PROJECTS UNDERTAKEN OUTSIDE YOUR ENTERPRISE, YEAR ENDED 30 JUNE 1977

3. Record amounts paid by your enterprise specifically for R and D projects undertaken on your behalf by other enterprises, institutions or individuals, either in Australia or overseas. *Include* payments made in the form of grants as well as contract payments.
- Exclude* work done by your enterprise where it is in the form of a specialised service provided in support of an R and D project undertaken within the other organisation.

PERFORMED BY	COUNTRY (Specify)		EXPENDITURE \$
Enterprises, institutions or individuals located in Australia	Australia		
Related enterprises located abroad (for definition of a 'related enterprise', see Explanatory Notes)	Office Use Only	1. -----	
		2. -----	
		3. -----	
		4. -----	
Unrelated enterprises, institutions or individuals located abroad		1. -----	
		2. -----	
		3. -----	
		4. -----	
TOTAL			

C. NUMBER OF PATENT APPLICATIONS LODGED AND PATENTS GRANTED, 1 JULY 1972 TO 30 JUNE 1977

14. Record patenting of devices or innovations resulting from R and D projects undertaken within your own enterprise.
- Exclude* patent applications accompanied by provisional specifications.

YEAR	PATENT APPLICATIONS LODGED ABROAD		PATENTS GRANTED ABROAD	PATENT APPLICATIONS LODGED IN AUSTRALIA	PATENTS GRANTED IN AUST.		
	Gross number of applications	No. of devices or innovations involved			No. that have been used	No. that are exp. to be used	No. not expected to be used
1 July 1972 to 30 June 1973							
1 July 1973 to 30 June 1974							
1 July 1974 to 30 June 1975							
1 July 1975 to 30 June 1976							
1 July 1976 to 30 June 1977							
TOTAL							

D. RECEIPTS AND PAYMENTS FOR PATENT RIGHTS AND OTHER TECHNICAL KNOW-HOW, YEAR ENDED 30 JUNE 1977

15.

COUNTRY	Amounts payable for purchases of technical know-how		Amounts receivable from sales of technical know-how	
	Patent licence fees & patent royalties	Other technical know-how	Patent licence fees & patent royalties	Other technical know-how
Canada	\$	\$	\$	\$
Federal Republic of Germany				
France				
Japan				
U.K.				
U.S.A.				
Other (specify) -----				
TOTAL OVERSEAS				
Australia				
TOTAL				

(c)

16. Allocate the total overseas amounts payable for, and amounts receivable from, the purchases and sales of technical know-how according to the types of enterprises they were payable to or receivable from.

TYPE OF ENTERPRISE	Amounts payable for purchases of technical know-how		Amounts receivable from sales of technical know-how	
	Patent licence fees & patent royalties	Other technical know-how	Patent licence fees & patent royalties	Other technical know-how
Related enterprises located abroad	\$	\$	\$	\$
Unrelated enterprises, institutions and individuals located abroad				
TOTAL				

(as in (c) above)

Please comment on any special or unusual circumstances concerning the figures reported in this return (or difficulties encountered in completing it).

EXPLANATORY NOTES

- General Instructions**
- . Figures reported should be on an accrual basis of accounting rather than on a cash basis, that is, they should relate to income earned during the year, whether received or not, and to expenditure incurred during the year, whether paid or not.
 - . Record all R and D activities whether or not assigned to separate research units of your enterprise.
 - . Figures reported should be for the period 1 July 1976 to 30 June 1977. However, if figures are not available on a June year basis from your accounts, you may report for the period of your accounting year.

Question 5. MANYEARS OF EFFORT DEVOTED DIRECTLY TO R AND D

Include in your calculations of the manpower effort spent directly on R and D all persons employed directly on R and D.

The concept of manpower *directly* involved on R and D should generally be applied by *excluding* all central administration personnel together with personnel providing general services and maintenance, but *including* for consideration all staff of identifiable research groups together with staff of units providing technical or engineering support to research groups. Include also individual contributions to R and D by personnel not in research units.

Report only the manpower effort spent directly on R and D as defined on page 2. Do not report the total manpower effort of any research units where staff were involved in other research activities which are not regarded as R and D by that definition.

Manyears of effort: One person can work at the most one man year each year even though that person may have worked long hours and/or been extremely effective. For example, a full-time employee who devoted 40% of his working time to R and D during half of the survey year would contribute 0.4 man x 0.5 years = 0.2 man years to the R and D effort, even if his average working time per week were, say, 60 hours.

Researchers refer to persons actually engaged in the conception and/or creation of new knowledge, products, processes, methods and systems. Include also executives and directors responsible for administering the R and D programmes, but exclude executives and managers who are concerned primarily with budget and manpower constraints rather than programme content.

Technicians refer to persons performing technical tasks in support of R and D, normally under the direction and supervision of a researcher. These tasks include assisting with or performing experiments (under supervision), tests and analyses; preparing materials and equipment for experiments, tests and analyses; taking records, making calculations and preparing charts and graphs; maintaining and operating advanced machinery and equipment; interviewing in social science surveys; and computer programming.

Other supporting staff refers to skilled and unskilled craftsmen, secretarial and clerical staff working on or directly associated with R and D activity.

Question 7. FIELD OF SCIENCE OF RESEARCHERS

Natural sciences refer to biological sciences, physical sciences, chemical sciences, earth sciences, engineering and applied sciences, medical sciences, agricultural sciences and forestry

Social sciences includes economics, education, management, sociology, psychology, and the humanities.

Question 8. TYPE OF EXPENDITURE

Capital Expenditure: Only expenditure incurred in the 1976-77 financial year on fixed tangible assets, either new or second-hand, with an expected life of greater than one year should be reported.

- . Land, buildings and other structures: *Include* major alterations, but exclude repairs and maintenance which should be reported in "Other current expenditure".

Current Expenditure

- . Wages, salaries and other labour costs refer to gross earnings before taxation and other deductions. Include overtime earnings, shift allowances, penalty rates, bonuses and commission payments to employees, holiday pay, payments to employees absent on long service leave, sick pay and similar payments, and employer contributions to superannuation and pension schemes. An estimate of the proportion of the labour costs of those personnel providing indirect services (e.g. canteen staff, janitors and cleaners) that is attributable to the support of R and D should be included.
- . Other current expenditure: *Include* expenditure on items such as consumables, data processing, reference materials and special services in support of R and D (e.g. payments to outside organisations for use of specialised testing facilities). The estimated proportion of expenditure on general services and overhead costs (including repairs and maintenance) attributable to the R and D effort should be included.

Question 11. TYPE OF ACTIVITY

Basic Research refers to experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. It also includes research which is directed towards general areas in which discoveries with useful applications may well be expected.

Applied Research also refers to original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Applied research 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.

Experimental development refers to systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products and devices, to installing new processes, systems and services, and to improving substantially those already produced or installed.

Question 12. PRODUCT OR PROCESS FIELD

The products or processes listed should be those towards which the R and D activities were specifically directed, regardless of the end product(s) which may be affected and regardless of the main products produced by your enterprise. Be as specific as possible. For example, R and D work on developing a new type of a car head lamp should be classified as "motor vehicle electrical equipment" or "passenger car headlight", but not as "motor vehicles", "road transport services" or "electrical equipment".

Examples of the detail required in the description of the products, or processes, towards which the R and D activities were directed:

Leather working machinery	ceramic paints
linoleum floor coverings	intravenous preparations
industrial fans	abrasive cleansers
photographic light bulbs	iron ore beneficiation
household dish washing machines	control of waste material disposal
sheet metal tags	coal upgrading and liquification
motor vehicle brake components	

Question 13. R AND D PROJECTS UNDERTAKEN ON YOUR BEHALF OUTSIDE YOUR ENTERPRISE

A related enterprise located abroad refers to an enterprise:

- (i) which, either singly or in conjunction with a group of related enterprises located overseas, holds 25 per cent or more of the ordinary shares or voting stock of your enterprise; or
- (ii) which, either singly or in conjunction with a group of related enterprises located overseas, holds 25 per cent or more of the ordinary shares or voting stock of your parent company in Australia (where your company is a subsidiary as defined in Section 6 of The Companies Act); or
- (iii) which is the foreign head office of your enterprise (where your enterprise is a branch of an enterprise incorporated in a foreign country); or
- (iv) which holds directly or indirectly, more than 50 per cent of the ordinary shares or voting stock of the related foreign enterprises in (i), (ii), or (iii) above; or
- (v) in which the related foreign enterprises in (i), (ii), (iii), or (iv) above hold, directly or indirectly, more than 50 per cent of the ordinary shares or voting stock; or
- (vi) which is a branch of your enterprise; or
- (vii) in which your Australian enterprise group (i.e. your enterprise and enterprises related to your enterprise in terms of Section 6 of the Companies Act) holds 25 per cent or more of the ordinary shares or voting stock; or
- (viii) in which the foreign enterprises identified in (vi) or (vii) hold more than 50 per cent of the ordinary shares or voting stock.

Question 15. PURCHASE SALE OR LICENCE OF PATENT RIGHTS OR TECHNICAL KNOW-HOW.

Technical know-how is the specialised technical knowledge required to successfully implement a process or produce a product e.g. patent licences; technical data and information; scientific, technical, or engineering assistance (other than specific R and D projects performed by others on your behalf and reported in question 13) that increases technical knowledge and understanding in your enterprise.

Include only expenditure made directly to the holders of the technical know-how.

Exclude other costs incurred by your enterprise to obtain know-how e.g. overseas travel, periodical subscriptions. Exclude also scientific, technical, or engineering services that are not aimed primarily at increasing the technical knowledge of your enterprise; computer software (this is regarded as a product rather than technical know-how).

Question 16. A related enterprise located abroad: see explanatory notes to Question 13.

POSTAL ADDRESSES, TELEPHONE NUMBERS AND TELEX NUMBERS OF OFFICES
OF THE AUSTRALIAN BUREAU OF STATISTICS

The Deputy Commonwealth Statistician,
Box 796 G.P.O.,
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The Deputy Commonwealth Statistician,
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Telex : 58098

The Statistician, Northern Territory,
P.O. Box 3796,
DARWIN. N.T. 5794
Telephone : 802714
(Ask for Business Surveys)