

PhDs in Australia, from the beginning

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The Australian PhD is a relatively recent phenomenon, the first three being awarded in 1948. Before that, most Australian scholars typically went to Britain (predominantly) or the USA to undertake their doctoral studies. The aim of this research note is to provide a brief statistical history of the Australian PhD, noting changes over time between study fields, universities, genders and citizenship groups.

Introduction and background

The life of the Australian PhD has been a relatively short one, with Australian institutions first granting PhDs in 1948 (CBCS, 1952). Collation of official statistical sources undertaken to prepare this paper reveals that by 2009, more than 94,000 PhDs had been awarded. The PhD is one of the three research degrees offered by Australian universities, the other two being the masters by research and the higher doctorate.

The purpose of this paper is to provide an enumeration the number of PhDs awarded by Australian universities, augmented by additional information available in official statistics. These official statistics come from the Commonwealth Bureau of Census and Statistics (CBCS) (for data from 1948 to 1972), its successor, the Australian Bureau of Statistics (ABS) (1973 to 1982), the Commonwealth Tertiary Education Commission (CTEC) (1976–1986), and the Commonwealth government's 'education' ministry (in its various guises, 1987 to the present). The overlapping dates are a reflection of the fact that more than one source was available in some years. Finding the sources of the statistics used in this paper was the principal challenge. A list of the sources is attached as Appendix 1.

Few studies have reported on the number of Australian PhDs awarded, but many reports and studies have reported on PhD graduations for particular periods. However, at least two scholarly studies on the Australian PhD

have had a statistical slant. A paper by Evans, Macauley, Pearson and Tregenza (2003) reported on Australian PhDs by 'reviewing the evidence from the bibliographic data held in library catalogues of PhDs in each Australian university' (p. 1). The other major source is a PhD thesis from the University of Adelaide, the principal aim of which was to describe the history of postgraduate education in Australia from 1851 to 1993 (Dale, 1997). The latter provides a detailed history of the development of the PhD and other postgraduate education right from the founding of Australia's first universities in the 1850s. It is interesting that these works confidently cite different PhDs as being the first awarded in Australia. Evans *et al.* (2003) state that the first was awarded by the University of Melbourne to a Joyce Stone, for her work entitled 'Virus haemagglutination: a review of the literature'. However, Dale says 'The first PhD at Melbourne [University] (and in Australia) was an arts PhD awarded to Erica Wolff (in French)' (Dale, 1997, p. 114). The second PhD, says Dale, was in science, awarded to Rupert Myers. CBCS statistics report that all of the PhDs awarded in 1948 were in arts (CBCS, 1952).

In looking to describe the brief history of the Australian PhD, it is reasonable to suggest that the main push came from 'science', and in the early years of the award in Australia, well over half were in science. After the first 20 years, science PhDs comprised 60 per cent of all PhDs awarded. Over time, other disciplines/fields also started to award PhDs and the proportion that were in science

gradually declined. By 2009, fewer than 30 per cent were in science. The importance of science at the advent of the Australian PhD is further affirmed in an Australian Vice-Chancellors' Committee publication: 'The introduction of PhD courses in Australia resulted in discussions in the Faculty of Science of the University of Melbourne.....By 1946 Melbourne had published its rules and three of its candidates (including two women) were awarded the degree in 1948. By 1949, all Australian universities were offering the degree' (AV-CC, 1990).

The initial push from 'science' is also suggested by an Australian Academy of Science (AAS) report that states that in the absence of well-established honours degrees, 'bright young scientists' worked on for an additional year after their BSc to for an MSc. After this, they competed for travelling scholarships, and then went to Britain for research and a PhD. In the absence of a local PhD, the AAS said that 'The immediate post-war period saw the extension of the masters degree...to a two-year period of research... Local theses began to appear from these extended masters studies that were clearly of comparable standard to those that were awarded a PhD abroad...' (AAS, 1974, p. 14). The AAS added that 'In the beginning, research studies for the PhD... universities clearly had in mind the need to provide within themselves the training that would formally equip persons to become university staff in Australia' (AAS, 1974, p. 14).

The situations described above present the early days of the development of formal doctoral research in Australia. A decade later, research training was boosted by two major examinations of universities and higher education: the Murray Report in 1957 and then the Martin Commit-

tee Report in 1965. The former noted 'a disquieting factor' within Australian universities to be 'the general weakness of honours and postgraduate research schools' (cited in AUC 1972, p. 57), whereas the latter said 'In view of future staffing needs, the universities cannot be complacent about the size of their postgraduate schools. Expansion and development off these schools should be given high priority' (cited in AUC 1972, p. 57). Dale (1997) has also noted the importance of the Murray Report in expansion of postgraduate education in Australia.

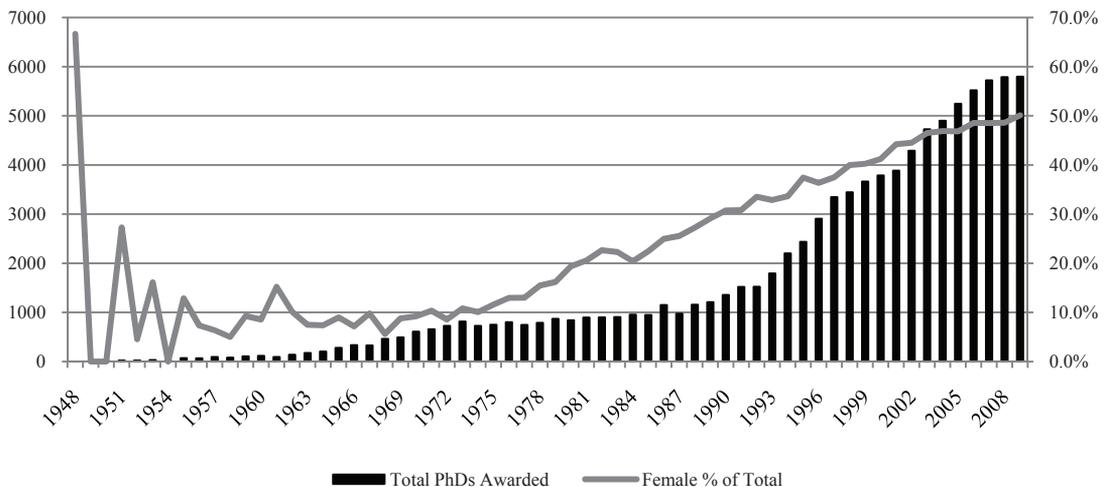
The reports outlined above go some of the way to explaining growth patterns in the number of PhDs produced by Australian universities (and other institutions in recent years). However, the real growth spurt started from the early 1990s, following the so-called Dawkins Reforms that saw radical changes in Australian higher education and a rapid expansion in student numbers at all levels.

The 'modern' Australian PhD was described by the National Board of Employment, Education and Training thus: '...it should be planned as a research degree of about three calendar years' full-time study following a four year undergraduate programme which itself includes research preparation' (NBEET 1989 p. 26). The fact that PhDs often extend to a fourth year was noted.

Lies and damned lies: How many PhDs?

Australian universities produced 94,423 PhD graduates between 1948 and 2009. Arriving at this figure came after laborious analysis of statistics from 'official' sources. The figure 94,423 is as accurate as any that can be produced from official statistical sources. The reason why it might

Figure 1: PhDs Awarded by Australian Universities 1948 – 2009 and Proportion of All PhDs Awarded to Women



not be perfect is because those responsible for collecting university statistics have changed the twelve-month period the statistics refer to several times. 'Year' has meant variously calendar year (1948-1961 and 1986 ff), August to July (1962-1968), and July to June (1969-1985). The figures for 1961 and 1962 were published in such a way that it is not possible to know exactly how many PhDs were awarded in each of those years, but we do know the total for both years, and a similar situation holds for 1985 and 1986.

The fascination some of us have for counting and measuring things is not shared by all, but keeping statistics can prove useful for many purposes, such as for various aspects of social planning. The scope of this paper, however, goes no further than merely establishing how many PhD graduates there have been and how the composition of the PhD graduate population is changing over time. However, compositional changes in the PhD graduate population might be of wider interest. This paper examines the expansion of the Australian PhD, noting particularly from whence that expansion emanated.

Who, what and where?

The number of PhD graduates has increased, and the composition of PhD graduates has changed over time. The charts and tables that follow summarise the growth, particularly strong since the 1990s, and the changing study field mix and universities, and the expansion in the number and proportion of women and overseas students. The recent history of Australian higher education is also the history of increasing participation by women and overseas students.

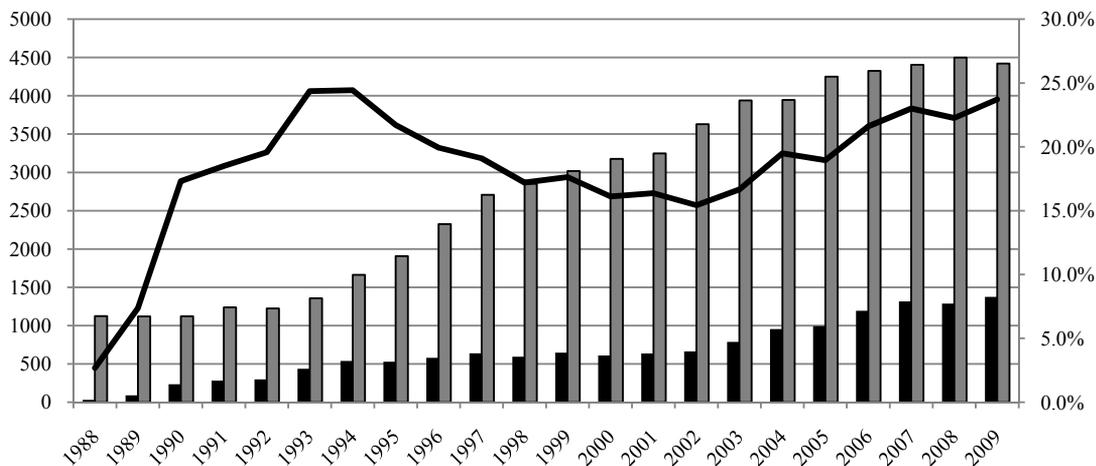
Who?

Figure 1 summarises the number of PhDs awarded in Australia since 1948, and the steady increase in the number of women among Australia's PhD graduates. The figure shows that PhD output started to top the 1,000 per year mark from the second half of the 1980s, and by the mid-1990s, annual awards exceeded 2,000 per year. This period from the late 1980s to the mid-1990s was also the time during which the number of PhD-granting institutions increased, one of the results of the so-called Dawkins reforms that saw the creation of a number of 'new' universities from antecedent 'teaching-only' colleges of advanced education. In the most recent years, a few PhDs have been awarded by small private non-university institutions, such as theology colleges.

Apart from 1948, when two-thirds of PhDs were awarded to women, they were in the minority until 2009. By 2009, ten more women than men were among the 5,796 PhD recipients (a female majority of 0.17 per cent). Of course, having climbed over the half-way barrier, it is likely that in future women will continue to be numerically superior as PhD recipients, just as they are at other qualification levels. The gender distribution is shown in Figure 1, a graph which allows the proportion of women being awarded a PhD to be compared with the total number of PhDs awarded in each year since the inception of the degree. The number of PhDs awarded to women in 1976 and 1977 has been estimated, because statistics did not provide a gender breakdown in those years.

One of the main areas in which the Australian higher education sector has expanded has been in numbers of overseas students. Looking at the sector overall, the proportion of overseas students enrolled at all course levels

Figure 2: PhDs Awarded by Australian Universities 1988 – 2009 by Citizenship Status



had increased to 321,000 or 28.3 per cent by 2009, up from about 63,000, or about 12 per cent a decade earlier. Numbers of PhD candidates from overseas also expanded. For the first 40 years of the history of the Australian PhD, information on citizenship status was not available. However, this information has been available since university statistics became more sophisticated in the late 1980s.

Figure 2 summarises the situation between 1988 and 2009, with the columns showing the number of PhDs awarded to domestic and overseas students (the darker column), respectively, and the line indicating the proportion of the total made up by overseas students. In 1988, 31 overseas students were awarded a PhD. By 2009, 1,375 or almost one-quarter of all PhDs were awarded to overseas students, replicating the pattern in the first half of the 1990s. The statistics shown here provide no explanation for the high proportion of PhDs awarded to overseas student in the 1990s, but analysis of DEEWR aggregated data sets reveals that a relatively high proportion of the PhDs awarded between 1992 and 1995 in health disciplines were awarded to overseas students.

What?

The Australian PhD started out as a product of science. However this has changed over time. In order to dem-

onstrate the changes over time in the number and proportion of PhDs awarded, Table 1 shows snapshots taken every ten years from 1949 of the PhDs awarded.

It is necessary to offer a comment on the classification used here, because the reported classification of awards into faculties, disciplines and fields of study and/or education have also changed over time. Between 1948 and about 1971, it would seem that universities reported PhD completions according to the faculty in which students had been supervised. Subsequently, this grouping morphed into an unofficial 'field of study' classification. By 1988 and the advent of electronic reporting, universities reported according to defined 'fields of study', and from 2001, fields of study became 'fields of education', another defined, but different classification. Unfortunately, discrete fields of study such as 'law' and 'veterinary science' were wound into fields of education 'society and culture' and 'health' respectively. Further, 'information technology' was split away from 'science', and economics, formerly linked with business and commerce, became part of 'society and culture'. This latter classification persists today.

Therefore, a hybrid 'study field' time series has been created to allow for the range of groupings that have been used over time (Dobson, unpublished). By adopting this approach, it is possible to link tabulated data back to the

Table 1: PhDs Awarded by Australian Universities 1949 – 2009 by Study Field

Year	Agriculture	Architec- ture	Arts, Law, Creative Arts	Business & Commerce	Education	Engineer- ing	Health	Science	Total
<i>No. PhDs Awarded</i>									
1949	2		1					5	8
1959	4		16	1		9	9	69	108
1969	35	2	60	5	5	50	35	298	490
1979	71	4	177	39	32	87	103	358	871
1989	62	6	263	43	90	106	165	474	1209
1999	172	40	782	264	275	430	549	1152	3664
2009	278	61	1546	446	374	704	802	1585	5796
<i>% PhDs Awarded</i>									
1949	25.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	62.5%	100.0%
1959	3.7%	0.0%	14.8%	0.9%	0.0%	8.3%	8.3%	63.9%	100.0%
1969	7.1%	0.4%	12.2%	1.0%	1.0%	10.2%	7.1%	60.8%	100.0%
1979	8.2%	0.5%	20.3%	4.5%	3.7%	10.0%	11.8%	41.1%	100.0%
1989	5.1%	0.5%	21.8%	3.6%	7.4%	8.8%	13.6%	39.2%	100.0%
1999	4.7%	1.1%	21.3%	7.2%	7.5%	11.7%	15.0%	31.4%	100.0%
2009	4.8%	1.1%	26.7%	7.7%	6.5%	12.1%	13.8%	27.3%	100.0%

Source: Dobson (unpublished)

Table 2: PhDs Awarded by Australian Universities 2001 – 2009 by Study Field and Proportion of Women

<i>Study Field</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>
Agriculture	33.9%	44.6%	38.9%	41.3%	41.1%	45.9%	43.6%	42.4%	51.1%
Architecture	34.4%	42.2%	37.8%	47.2%	41.3%	48.8%	42.9%	45.0%	42.6%
Arts, Law & Creative Arts	52.7%	51.1%	54.5%	56.8%	55.0%	56.6%	59.8%	57.2%	61.3%
Business & Commerce	38.8%	39.4%	38.1%	37.2%	40.0%	42.3%	41.8%	43.2%	40.8%
Education	56.1%	53.1%	61.1%	61.4%	59.2%	59.5%	65.3%	62.8%	64.7%
Engineering	19.1%	16.7%	21.1%	19.6%	20.0%	19.1%	20.3%	22.4%	20.7%
Health	57.2%	58.8%	57.5%	57.8%	63.7%	63.8%	61.4%	63.1%	64.0%
Science	40.4%	40.4%	43.5%	43.4%	41.6%	45.9%	45.1%	43.6%	44.4%
Total - Per Cent	44.2%	44.5%	46.5%	46.9%	46.8%	48.5%	48.5%	48.6%	50.1%
Total - No.	3884	4291	4728	4900	5244	5519	5721	5,786	5,796

Source: DEEWR: Aggregated Data Set UPAG, various years

original published statistics. It should also be noted that published statistics did not identify the study field of degrees awarded was in years 1983 – 1986.

In 1949, five of the eight PhDs awarded were in science, representing 62.5 per cent of all PhDs awarded. A similar proportion of PhDs were awarded to science candidates in 1959 and 1969, but in the 1970s, and 1980s, science PhDs declined in proportion to about 40 per cent. The most spectacular growth has been in arts, law and creative arts PhDs, which by 2009 the 1,546 PhD graduates represented 26.7 per cent of all PhDs awarded by Australian universities, just slightly fewer than were awarded to science candidates (1585, or 27.3 per cent of the total). PhDs awarded in health disciplines and engineering are the next two largest. Health numbers increased from nine in 1959 (8.3 per cent) to 802 (13.8 per cent) in 2009, whereas engineering PhDs increased from nine (8.3 per cent) to 704 (12.1 per cent) over the same period.

This information on study fields can also be broken down by gender and citizenship status. Change takes time to effect, and the PhD has been perhaps the last bastion of male majority in university education. The female majority in PhD completions in 2009 has been built on sixty years of increasing university enrolments by women, and a gradual expansion in the disciplines that tend to have a higher female enrolment. Of course, women’s presence among PhD awardees is not uniform across study fields. Examining gender distributions for the past decade, Table 2 shows that the relative female presence at award ceremonies increased in all but business and commerce, and engineering, in which the proportion of women remain at approximately the same levels.

Similarly, the participation by overseas students in PhD-level programmes is not consistent across all study fields. Table 3 shows that there has been strong growth in the proportion of overseas students being awarded an Australian PhD in all study fields. Overall, 16.4 per cent of all PhDs were awarded to overseas students in 2001, rising to 23.7 per cent by 2009. Growth between 2001 and 2009 was particularly strong in awards in education, growing by about 17 percentage points. By 2009, the proportion of PhDs awarded to overseas students in business and commerce, engineering and education was particularly high, approaching one-third.

Where?

There has also been considerable change in the number of PhDs awarded by different universities. Of course, there were only seven universities when the first PhDs were awarded, but in 2009, 41 institutions granted PhDs, ranging from 577 by the University of Melbourne, to eight by Bond University. Large universities award more PhDs than small ones, but access to individual universities’ records would be necessary to work out exactly how many each had awarded. Despite the best of efforts, it has not been possible to establish from centrally available sources the number of PhDs awarded by individual universities for years 1949, 1950 and 1987.

One way to examine these changes is by comparing the self-designated major research universities with the others. The Group of Eight (Go8) major research universities received over 70 per cent of ARC and NHMRC funding in 2006, and their academics produced about 52 per cent of all publications (calculated from tables produced by

Table 3: PhDs Awarded by Australian Universities 2001 – 2009 by Study Field and Proportion of Overseas Students

Study Field	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agriculture	22.3%	21.2%	19.1%	27.4%	27.3%	23.1%	29.5%	31.4%	27.7%
Architecture	21.9%	22.2%	31.1%	35.8%	32.0%	41.9%	30.2%	31.3%	27.9%
Arts, Law & Creative Arts	11.5%	10.9%	12.4%	15.0%	13.8%	17.2%	15.9%	17.9%	18.4%
Business & Commerce	23.6%	25.7%	30.9%	32.5%	30.3%	29.9%	35.9%	33.5%	33.2%
Education	13.2%	13.9%	21.3%	21.2%	24.1%	29.0%	22.3%	28.6%	30.5%
Engineering	23.4%	20.7%	20.5%	26.4%	29.1%	29.9%	32.8%	26.4%	32.1%
Health	11.7%	11.3%	12.1%	11.8%	11.1%	16.1%	16.9%	15.3%	15.2%
Science	18.1%	16.5%	16.1%	18.5%	17.1%	19.6%	22.6%	21.4%	24.4%
Total Per Cent	16.4%	15.4%	16.7%	19.5%	19.0%	21.6%	23.0%	22.3%	23.7%
Total Number	3884	4291	4728	4900	5244	5519	5721	5786	5796

Source: DEEWR: Aggregated Data Set UPAG, various years

Universities Australia, 2008). Up until the end of the 1960s, most of Australia's universities were eventual Go8 universities (the exceptions being the universities of Tasmania, New England, Newcastle and Flinders University). In 1989, 69.4 per cent of PhDs were awarded by the universities that subsequently made up the Go8, but with the expansion of the sector in the post-Dawkins years, the proportion had dropped to 55.7 per cent by 2009. However, it appears

that the Go8's proportion of PhDs awarded could have stabilised at about this level.

cent, but it is overshadowed by the growth of 593.2 per cent at other institutions.

Conclusion

The salient points that come out of this analysis are the growth in the number of women being awarded the PhD, the increase in the proportion of PhDs awarded to overseas students, the relative expansion of the non-science disciplines, and the strong growth in the number of PhDs awarded by universities other than those in the Group of Eight.

Table 4: PhDs Awarded by Australian Universities 1989 – 2009 by Go8, Other and All Universities

Go8 Universities †	1989	1994	1999	2004	2009	Growth 1989 - 2009	
Adelaide	81	142	170	191	213	132	163.0%
ANU	130	139	219	231	291	161	123.8%
Melbourne	168	206	339	496	577	409	243.5%
Monash	121	182	278	330	411	290	239.7%
Queensland	168	235	340	419	493	325	193.5%
Sydney #	5	244	342	444	535	530	
UNSW	88	213	284	368	451	363	412.5%
UWA	78	114	167	231	260	182	233.3%
Sub-total	839	1475	2139	2710	3231	2392	285.1%
Go8 % of Total	69.4%	67.0%	58.4%	55.3%	55.7%		
Other Institutions	370	726	1525	2190	2565	2195	593.2%
Other % of Total	30.6%	33.0%	41.6%	44.7%	44.3%		
Total Number	1209	2201	3664	4900	5796	4587	379.4%
Total Per Cent	100.0%	100.0%	100.0%	100.0%	100.0%		

Source: DEEWR: Aggregated Data Set UPAG, various years. †The Go8, operating as an informal network of vice-chancellors since 1994, formally incorporated in September 1999. # The figure for the University of Sydney in 1989 hardly seems feasible, but that is what is in DEEWR's aggregated data file for that year

Going back to 1988, women received about 27 per cent of all PhDs awarded, and they were in the minority in all study fields. The highest proportions of female PhD recipients were in education (43.2 per cent) and health (39.5 per cent). By 2009, there were more women than men among PhD recipients in agriculture, arts, law and creative arts, education and health. Women represented more than 40 per cent of PhD recipients in architecture (42.6 per cent – up from 33.3

per cent), business and commerce (40.8 per cent – up from 17.1 per cent) and science (44.6 per cent – up from 22.0 per cent). Only in engineering are women still grossly under-represented (at 20.7 per cent), but it is interesting to note that women received only 15.5 per cent of the undergraduate degrees awarded in engineering in 2009 (DEEWR, 2011). One might therefore argue that women are over-represented as recipients of PhDs relative to the rate at which they are awarded undergraduate qualifications in engineering!

Looking at overseas students as PhD recipients, the figures indicate that an average of about one-quarter of the 'effort' by Australian universities is devoted to education of overseas students. It is not possible to establish from the data used to write this paper whether these PhD graduates add to the supply of Australia's so-called knowledge workers by applying for and being granted permanent residency in Australia, or whether they go elsewhere to apply their skills. Although at least some of the overseas PhD graduates in Australia will have been fee-paying students, perhaps losing up to a third of highly-trained engineers (for example), could be seen as a major drain. However, the Australian situation with overseas doctorate recipients is behind the situation in the US. In 2007, 57.3 per cent of all US doctorate recipients were US citizens (down from 82.6 per cent in 1977), with only 28.9 per cent of PhD recipients in engineering and 43.4 per cent of those in the physical sciences being US citizens (Welch, 2008: Table 5).

Having identified the official data sources of statistics on PhD degrees awarded, it will be possible for more detailed analyses to be undertaken. Data such as these and are the starting point for dealing with issues relating to the supply and demand for PhDs in one or several study fields, the need to replenish the ageing academic workforce, and whether or not there is a PhD brain drain from Australia. Future researchers should also refer to the work by Evans *et al.* (2003) if they wish to examine the nature and development of PhDs in Australia and to Dale (1997) and the Australian Academy of Science (1974) for a deeper understanding of the history.

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Abbreviations

ABS	Australian Bureau of Statistics
CBCS	Commonwealth Bureau of Census and Statistics
DEET	Department of Employment, Education and Training
DEETYA	Department of Employment, Education, Training and Youth Affairs
DEEWR	Department of Education, Employment and Workplace Relations
DEST	Department of Education, Science and Training
DETYA	Department of Education, Training and Youth Affairs

Appendix 1: Data Sources

<i>Publication / Reference Year</i>	<i>Document Name</i>
1952 - 1956	CBCS University Statistics. Part 2. Degrees Conferred, Libraries and Finance. Various tables
1957 - 1960	CBCS University Statistics. Part 1. Staff, Students and Degrees Conferred Various tables
1958 - 1960	CBCS University Statistics. Part 1. Staff, Students and Degrees Conferred Various tables
1961 - 1964	CBCS University Statistics. Part 1. Students and Degrees Conferred Various tables
1965 - 1967	CBCS University Statistics. Part 1. Students (Part A) Degrees Conferred (Part B) Various tables
1968 - 1972	CBCS University Statistics. Part 1. Students and Degrees Conferred Various tables
1973 - 1975	ABS University Statistics. Part 1. Students and Degrees Conferred Various tables
1976 - 1979	ABS University Statistics. Part 1. Students Various tables. Tertiary Education Commission Selected University Statistics. Table 8 (or 9) Courses Completed by Level and University 1976 - 1979
1979 - 1982	ABS University Statistics Cat. No. 4208 During this period, ABS statistics included PhDs and Higher Doctorates as 'Doctorates'.
1980 - 1986	Commonwealth Tertiary Education Commission Selected University Statistics. Table 9 Courses Completed by Level and University
1987 - 1993	DEET Selected Higher Education Statistics 1988 Various tables
1988 – 2009	DEET / DEETYA / DETYA / DEST / DEEWR Aggregated Data Set 'UPAGyyyy' (where yyyy is the year of reporting). File for 1988 was a customised data set in UPAG format supplied by DEEWR. Files for some years between 1989 and 2007 were downloaded from the DEST website. Files with additional data elements relating to country of birth were purchased from DEST/DEEWR