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University Bibliometrics

an analysis of publication outputs 1997-2003

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PO Box 5336, Wellington, New Zealand
Telephone: +64 4 472 6400
Facsimile: +64 4 471 1284
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Contents

List of figures

List of tables

Executive summary

This report uses the Thomson-ISI National Citation Report Database to analyse university research publications and their impact for the period 1997 to 2003.

Total publications

In 2003, the total number of indexed publications by university authors was 3,252, an increase of 21 percent from 1997. As a percentage of all New Zealand authored publications, university publications increased from 64 percent in 1997 to 69 percent in 2003.

Individual university publications

The University of Auckland produced the largest number of indexed publications. In 2003 they produced 31 percent of all university publications. They were followed by the University of Otago with 28 percent. In both of these universities the presence of medical schools boosts their share of indexed publications. With total indexed publications of 52, the Auckland University of Technology had the smallest output in 2003.

Between 1997 and 2003, the fastest growth in publications of 420 percent was achieved by the Auckland University of Technology, although this was off a very low base. Of the remaining universities, Victoria University of Wellington achieved the largest growth in indexed publications of 62 percent. Lincoln University had the smallest growth in publications of 13 percent between 1997 and 2003.

Productivity

A period of increasing university research productivity between 1997 and 1999 was followed by a decline. Productivity peaked in 1999 at 0.61 publications per full-time equivalent academic staff member before falling to 0.55 in 2003. This decline was due to the number of academic staff increasing at a faster rate than total publications.

Of the eight universities, only the Auckland University of Technology achieved a prolonged period of productivity growth between 1997 and 2003, with the growth at this university coming off a low base.

Publications by research area

The largest number of indexed publications is in the field of natural sciences. In 2003, 44 percent of indexed publications were in this area. This was followed by publications in the medical sciences with 22 percent. The coverage of the ISI database favours these areas.

The fastest growth in indexed publications occurred in the social sciences/humanities area. Between 1997 and 2003, publications grew by 34 percent. Medical sciences growth was 31 percent. The field of engineering and technology experienced the smallest growth of 15 percent over the period.

Citations as a measure of impact

The impact of university publications increased for papers and reviews published in 2002, compared with those published in 1999. In addition, the relative impact of university publications improved compared to the impact of all New Zealand authored papers. For papers and reviews published in 2002, the average number of citations for university authored publications was 3.5, compared with 3.4 for all New Zealand authored publications. This

compares with 2.9 average citations per university authored paper and review published in 1999 and 3.0 for all New Zealand authored publications.

In the area of the agricultural sciences, the University of Otago achieved the highest number of average citations for papers and reviews published in 2002. For publications in 1999, Lincoln University had the highest number of average citations.

In the area of engineering and technology, the University of Canterbury had the highest number of average citations for papers and reviews published in 2002. For papers and reviews published in 1999, the University of Auckland achieved the highest number of average citations per publication.

In the medical sciences the University of Otago achieved the highest number of average citations for papers and reviews published in 2002, while the University of Auckland achieved the highest number of average citations per publication in 1999.

In the natural sciences the highest number of average citations for papers and reviews published in 1999 and 2002 was achieved by the University of Otago. Similarly, the University of Otago achieved the highest average citations per publication in the area of the social sciences/humanities in 1999 and 2002.

1. Introduction

Previous National Bibliometric reports by the Ministry of Research, Science and Technology[1] have concentrated on the performance of the research and innovation sector as a whole. Those reports have included data on the tertiary sector as a whole. This new report uses disaggregated data from the Thomson-ISI New Zealand National Citation Report database to report on individual university performance. Specifically, this report analyses the research publications by New Zealand universities for the period 1997 to 2003 and the citations attached to those publications.

The objective of this report is to describe the production, productivity and impact of the research publications produced by the universities. This is achieved by:

- Determining the number of publications produced by universities and indexed by Thomson-ISI
- Determining the research productivity of universities by adjusting for size of the academic workforce
- Determining the number of publications produced by universities in various research fields
- Determining the impact of university publications through comparing citation rates
- Comparing the performance of the universities against the full New Zealand research and innovation sector

This report has the following structure. Section two presents the methodology used to generate the measures of research output and impact. The caveats and limitations that apply to the use of bibliometric methods to measure research performance are also discussed. Section three analyses the quantity of research publications produced by the universities and section four deals with the citations attached to these publications.

[1] See Ministry of Research Science and Technology (2003) and Ministry of Research Science and Technology (2006).

2. Data, methodology and limitations

The dataset used for this report was the Thomson-ISI New Zealand National Citation Report database. This database records all publications that have at least one author with a New Zealand address that have been indexed on Thomson's ISI database. There are several types of publications indexed in the database. For the purposes of this study, the publications that are counted as research outputs are journal papers and reviews. Other types of indexed publications, such as bibliographies and editorials, are omitted from the analysis.

A double counting issue arises with multi-authored papers when authors are from different universities. Summing the publications of each individual university results in an overcount of total university publications. In this study, the total number of papers and reviews by the universities has been adjusted for this overcounting problem and is reported as total number of publications with one or more university authors. The approach used to correct for double counting in Ministry of Research, Science and Technology (2006) was to report the share of sectors allocated rather than total papers. Therefore, the figures presented in this study are higher as no adjustment has been made for co-authorship with other sectors.

Due to the nature of the bibliometric data, there will always be some fluctuation in output from one year to the next. These fluctuations in the data are magnified for those universities with smaller numbers of research publications. Hence, changes in research publications at those universities with a relatively small number of research publications, such as Lincoln University and the Auckland University of Technology, should be treated with caution.

The use of the number of full-time equivalent academic staff to calculate research productivity has its limitations. There may be some academic staff at the universities that have teaching only roles. Also, staff employed in research only roles may not be counted as academic staff.

Publications that are indexed in Thomson's ISI database are assigned subject areas[2] which can be used to classify papers and reviews into broad research subject disciplines. In this study, papers and reviews are sorted into Organisation for Economic Cooperation and Development (OECD) major fields of science.[3] The fields are 'agricultural sciences', 'engineering and technology', 'medical sciences', 'natural sciences' and 'social sciences/humanities'.

To measure the impact of the publications, the average number of citations over a two year window for papers and reviews published in 1999 and 2002 are calculated. By choosing a similar citation window, a comparison can be made of the relative impact of papers published in 1999 and 2002. Note that no attempt has been made to adjust for self-citation.[4]

There are some important caveats surrounding the use of bibliometric data for comparing university research performance. There is a much better coverage of journals in the sciences and medical sciences fields in the database. In addition, the publishing of research through academic journals is more commonly a feature in the natural and medical sciences. In

[2] A full list of Thomson's subject areas can be found in Ministry of Research Science and Technology (2006) Appendix A.6, pp 47 to 48.

[3] The classification of Thomson's subject fields into the OECD major fields of science is shown in Appendix Table 11 (p 29). The same classification is used in Ministry of Research Science and Technology (2006). For the purposes of this report the social sciences and the humanities have been combined.

[4] See Ministry of Research Science and Technology (2003) and Ministry of Research Science and Technology (2006) for a discussion of the rationale for not removing self citations.

research fields such as the social sciences and humanities the publication of research in books or book chapters is a common feature.

Therefore, universities that have proportionately large natural sciences and/or medical sciences faculties are likely to have a higher research output count than a university of a similar size that concentrates in the social sciences/humanities. When comparing the research performance of universities, the presence of a medical school and/or the relative size of the sciences and health faculties should be taken into account.

The limitations of using citations as a measure of research quality have been widely discussed in the literature. The coverage issues discussed above still apply, as does the issue of self citation. There is also the issue that the citation may be negative, in that it may be pointing out weaknesses in the research findings of the paper. For a useful summary of these and other limitations of citations analysis see Coryn (2006). However, despite the limitations of citations, they are still a useful indicator of the impact of research.

For a more detailed discussion of the strengths and weaknesses of bibliometrics analysis in general see Ministry of Research Science and Technology (2003) and Research Evaluation and Policy Project (2005).

Finally, although the Auckland University of Technology was only granted university status in 2000, in this study it is treated as a university for the entire period of analysis.

3. Publications

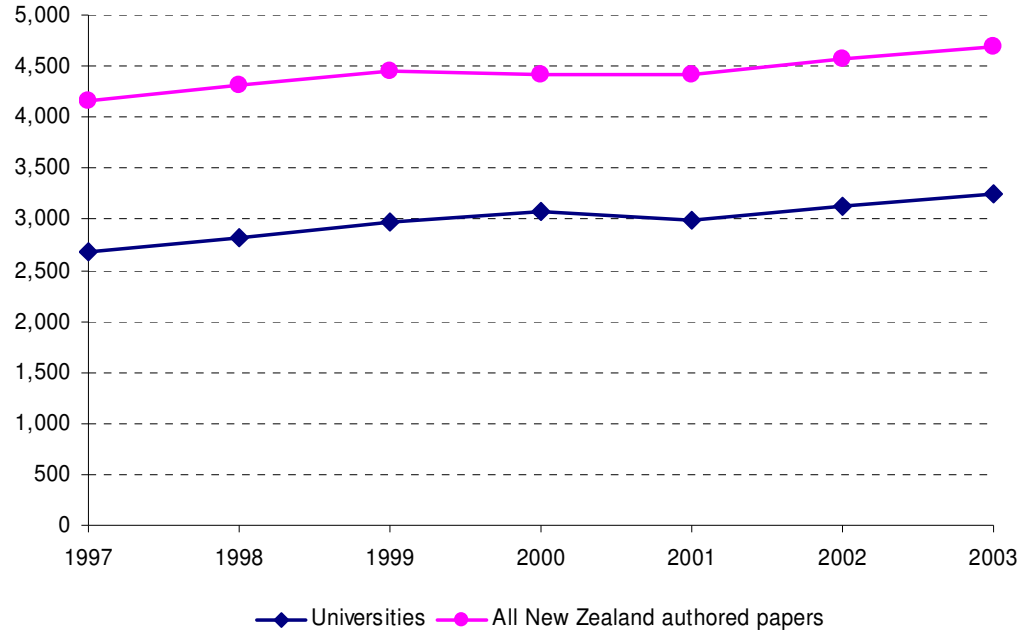
In this section the quantity of indexed research output produced by universities over the period 1997 to 2003 is examined. Initially, the quantity of publications produced by all universities is analysed, both in total and by subject field. Then the publications produced by each individual university are presented. An analysis of publications in each subject field by individual university completes the section.

3.1 Total university publications

In 2003, 3,252 papers and reviews by authors from New Zealand universities were indexed in the Thomson-ISI databases. This was an increase of 3.9 percent from 2002 and 21 percent from 1997. Papers and reviews by all New Zealand authors increased by 12 percent between 1997 and 2003.

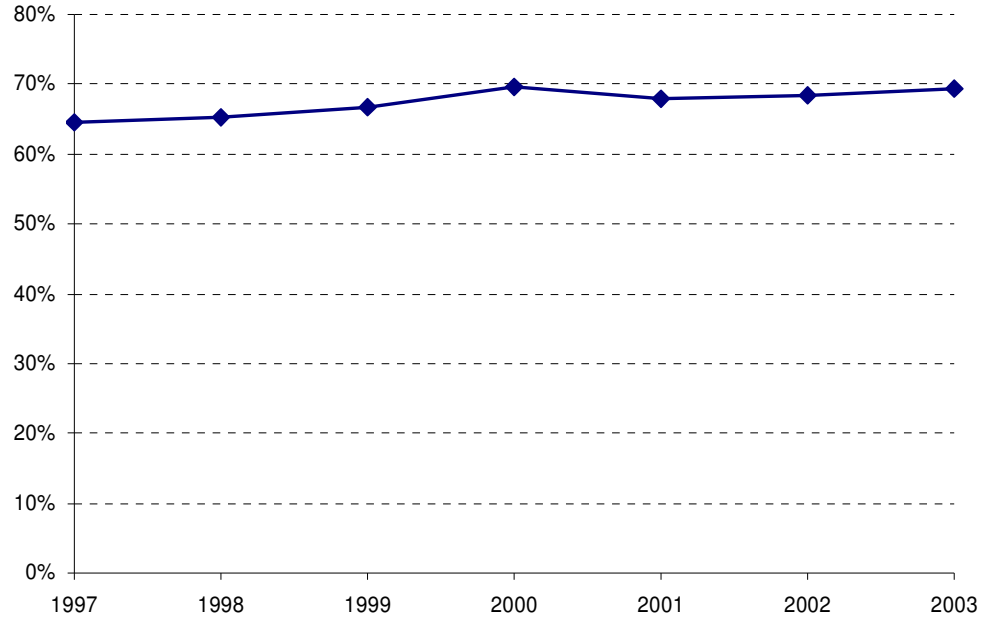
The number of papers and reviews produced by university authors has generally increased in each year, with the exception of 2001. Between 1997 and 2000, papers and reviews rose by a total of 15 percent. However, in 2001 the number of publications by university authors fell by 2.8 percent. The pattern of increases in each year then resumed with the number of indexed publications rising by 8.5 percent in total between 2001 and 2003.

Figure 1: Publications by authors from universities and by New Zealand authors in total 1997-2003



With the exception of 2001, the share of New Zealand papers authored by university staff has been rising between 1997 and 2003. The percentage of New Zealand papers and reviews that were authored by university staff increased from 64 percent in 1997 to 70 percent in 2000. The percentage then dropped to 68 percent in 2001 before recovering over the next two years to reach 69 percent in 2003.

Figure 2: Publications by universities as a percentage of all New Zealand authored publications 1997-2003

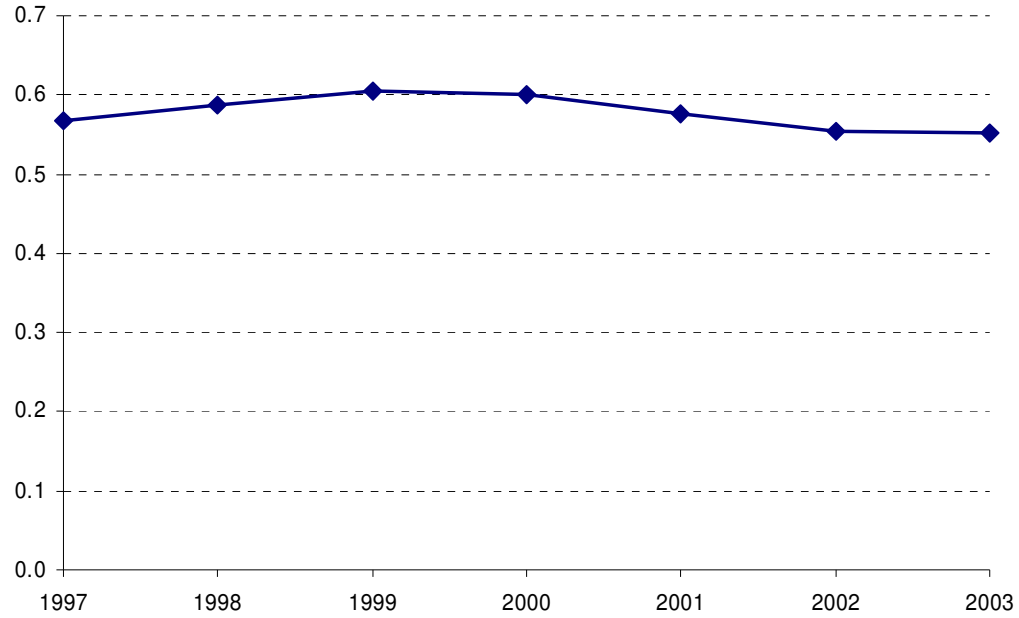


To adjust for the impact of a growing academic workforce, the total papers and reviews authored by university staff are divided by the number of full-time equivalent (FTE) academic staff in the universities. This provides a measure of the productivity of university researchers.[5]

Productivity increased between 1997 and 1999, reaching 0.61 publications per academic FTE. This was followed by a decline between 2000 and 2002, levelling off at 0.55 publications per FTE in 2003. This decline was due to academic staff numbers increasing at a faster rate than the total number of publications.

[5] See the discussion on the limitations of using academic staff to measure research productivity in section 2.

Figure 3: Publications by universities per full-time equivalent academic staff member 1997-2003

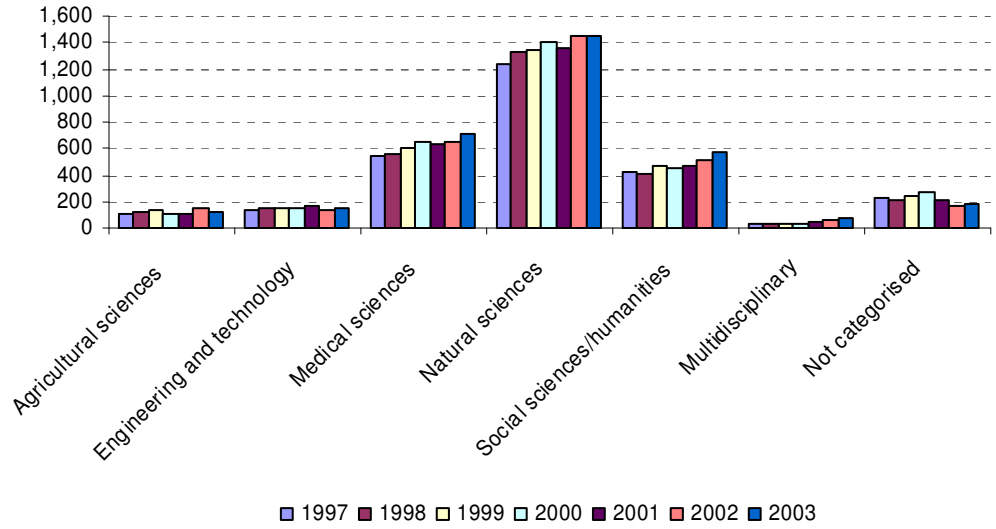


3.2 Total university publications by subject field

In the universities, the largest number of indexed papers and reviews are produced in the natural sciences. In 2003, 1,446 papers and reviews were published in the natural sciences, 44 percent of total university papers and reviews. This was followed by the medical sciences with 22 percent of total papers, social sciences/humanities 18 percent, engineering and technology 4.6 percent and the agricultural sciences 3.8 percent. However, as discussed earlier, the natural sciences and medical sciences receive better coverage in the Thomson-ISI databases. Hence, the research output in these areas will be inflated compared to areas of research such as the social sciences/humanities.

The field of research with the largest growth between 1997 and 2003 was the social science/humanities with 34 percent. The next largest growth occurred in the medical sciences (31 percent), followed by the natural sciences (17 percent), the agricultural sciences (16 percent) and engineering and technology (15 percent).

Figure 4: University publications by field of science 1997-2003



3.3 Publications by individual universities

The largest producer of indexed publications among New Zealand universities is the University of Auckland. In 2003, researchers at the University of Auckland published 1,015 papers and reviews. This was 31 percent of all university publications. They were followed closely by the University of Otago with 928 publications, or 28 percent of total university publications. The presence of medical schools at these two universities is a contributing factor to their relative high number of papers and reviews, compared with the remaining universities. The University of Canterbury produced 437 papers and reviews in 2003, Massey University 428, the University of Waikato 235, Victoria University of Wellington 220, Lincoln University 114 and the Auckland University of Technology 52.

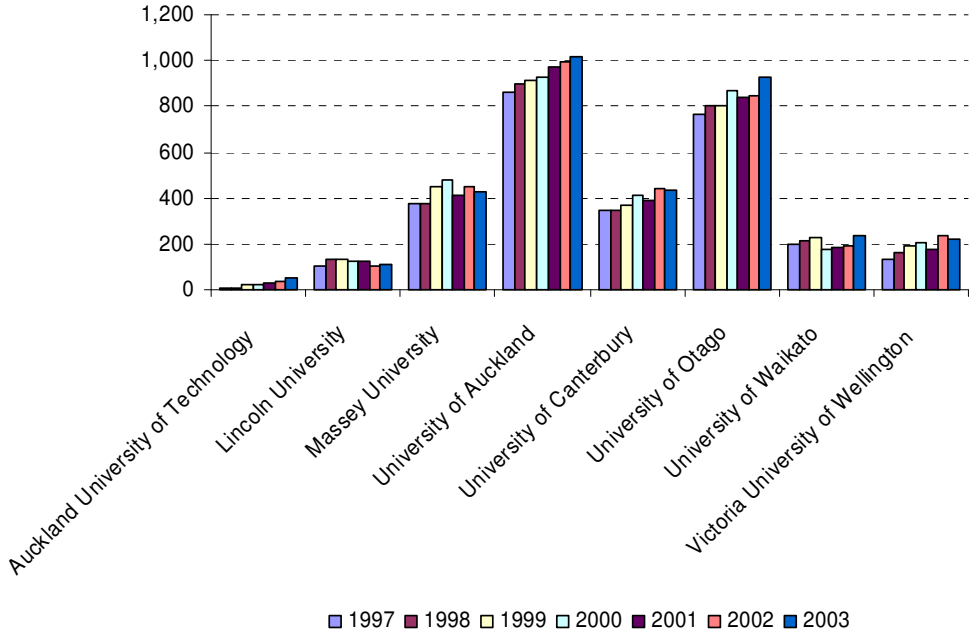
Although all the universities increased their research output between 1997 and 2003, there was wide variation in the scale of this growth. The largest increase occurred at the Auckland University of Technology where research publications increased by 420 percent between 1997 and 2003. However, there were only 10 publications by the Auckland University of Technology in 1997. Therefore, the large percentage increase is a result of a low starting base.

Of the remaining universities, the largest growth in publications was at Victoria University of Wellington where papers and reviews increased by 62 percent between 1997 and 2003. The University of Canterbury had the next largest increase of 27 percent, followed by the University of Otago 21 percent, the University of Auckland 18 percent, the University of Waikato 16 percent, Massey University 14 percent and Lincoln University with 13 percent.

For a number of universities the quantity of papers and reviews published in 2003 was below their peak for the period between 1997 and 2003. Publications of papers and reviews at Massey University in 2003 were 10 percent lower than when at their peak in 2000. However, as mentioned above, total publications by Massey University in 2003 were still 14 percent higher than in 1997. Similarly, although Lincoln University also experienced a drop in

research output, with research publications in 2003 being 15 percent below their peak in 1998, total publications in 2003 were still 13 percent higher than in 1997.[6]

Figure 5: Total publications by individual universities 1997-2003



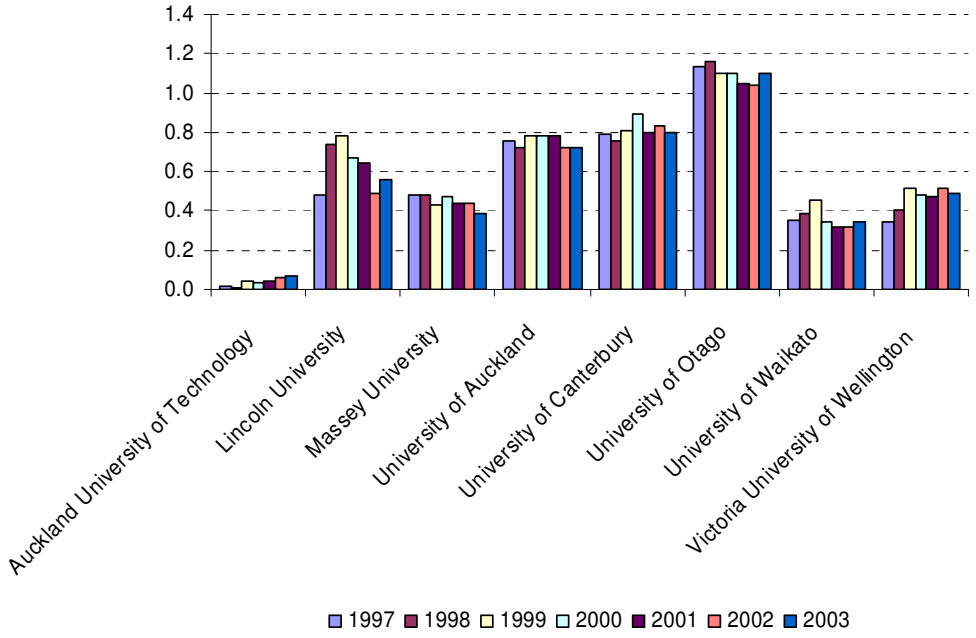
After adjusting for the size of the academic workforce, the University of Otago produced the highest number of papers and reviews per FTE academic staff. In 2003, the University of Otago produced 1.1 publications per FTE academic staff, well clear of the remaining universities. However, this figure is influenced to a degree by publications from the four medical schools attached to the university.

The University of Canterbury was the second best performing university with 0.8 publications per FTE academic staff. They were followed by the University of Auckland 0.72, Lincoln University 0.56, Victoria University of Wellington 0.49, Massey University 0.39 and the University of Waikato 0.34. The lowest research productivity of 0.07 papers and reviews per FTE academic staff was exhibited by the newest university, the Auckland University of Technology.

Since the presence of medical schools and/or large science faculties at some universities can make comparisons between universities difficult, it is perhaps of more relevance to measure how productivity at each university has changed over time. Between 1997 and 2003, only the Auckland University of Technology displayed any period of prolonged growth in productivity over the period, with this growth coming off a low base. In fact, four of the eight universities experienced a fall in research productivity between 1997 and 2003. These were Massey University, the University of Auckland, the University of Otago and the University of Waikato.

[6] In the case of Lincoln University, see the discussion on the effect of fluctuations in the data on smaller universities in section 2.

Figure 6: Publications per full-time equivalent academic staff member by individual universities 1997-2003



3.4 Publications by field of science at individual universities

Figure 7 shows the publications that each university produced in the various fields of science, as a percentage of the total publications they produced during the period 1997 to 2003. It shows that at all universities, with the exception of the Auckland University of Technology, the largest percentage of publications they produced were in the field of natural sciences.[7] Lincoln University had the highest percentage of publications in the natural sciences, with 57 percent of all Lincoln's publications being in this area.

The proportion of publications in the agricultural sciences was relatively high at Lincoln University (22 percent) and Massey University (13 percent), compared with the overall average for universities (4 percent).

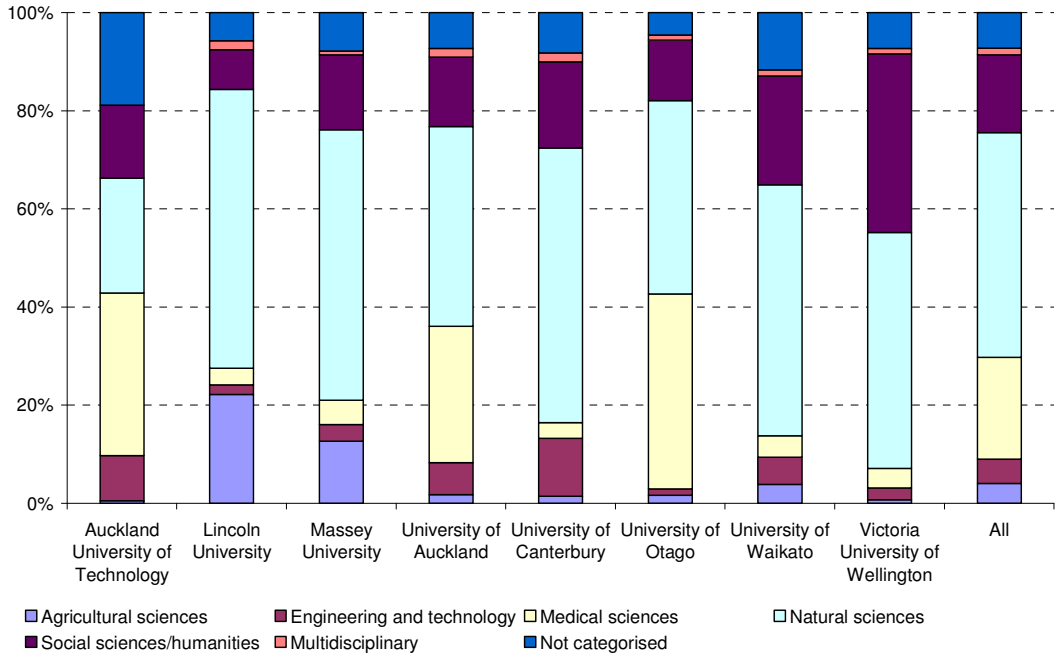
The percentage of total publications in the area of engineering and technology was the largest at the University of Canterbury (12 percent). This compares with the average for all universities of 5 percent.

Both universities with medical schools had a relatively high percentage of papers in the field of medical sciences. At the University of Otago, 40 percent of publications were in medical sciences. At the University of Auckland the figure was 28 percent, while the overall university average was 21 percent.

In the social sciences, Victoria University of Wellington had the largest percentage of publications in this area – 36 percent – compared to the average for all universities of 16 percent.

[7] The coverage of the Thomson-ISI database is likely to contribute to this finding (see section 2).

Figure 7: Share of total publications between 1997 and 2003 by field of science at individual universities



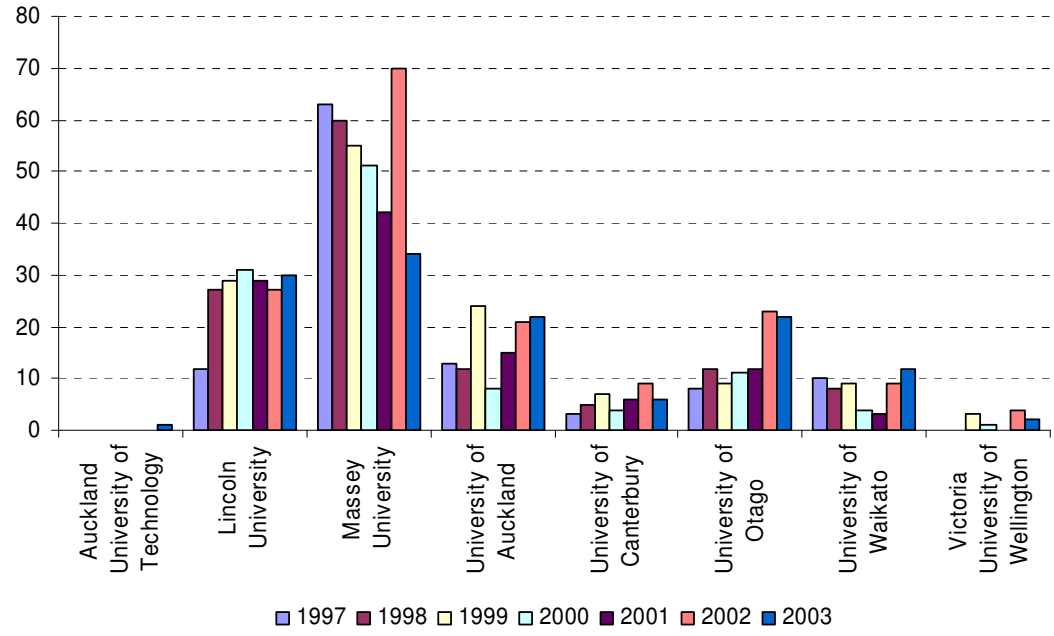
3.5 Publications in the agricultural sciences by individual universities

Massey University is the largest producer of papers and reviews in the field of agricultural sciences. In 2003, 28 percent of papers and reviews in this field were produced by authors from Massey University. The next biggest producer in this field was Lincoln University with 24 percent.

Although Massey University is the largest producer of papers and reviews in the agricultural sciences, the number of papers and reviews produced by this university fell by 46 percent between 1997 and 2003.[8] Although the number of publications by Lincoln University grew by 150 percent between 1997 and 2003, almost all of this growth occurred between 1997 and 1998. Since 1998, papers and reviews have increased by 11 percent.

[8] Although Massey University achieved their highest number of research publications of 70 in 2002.

Figure 8: Publications in agricultural sciences by individual universities 1997-2003



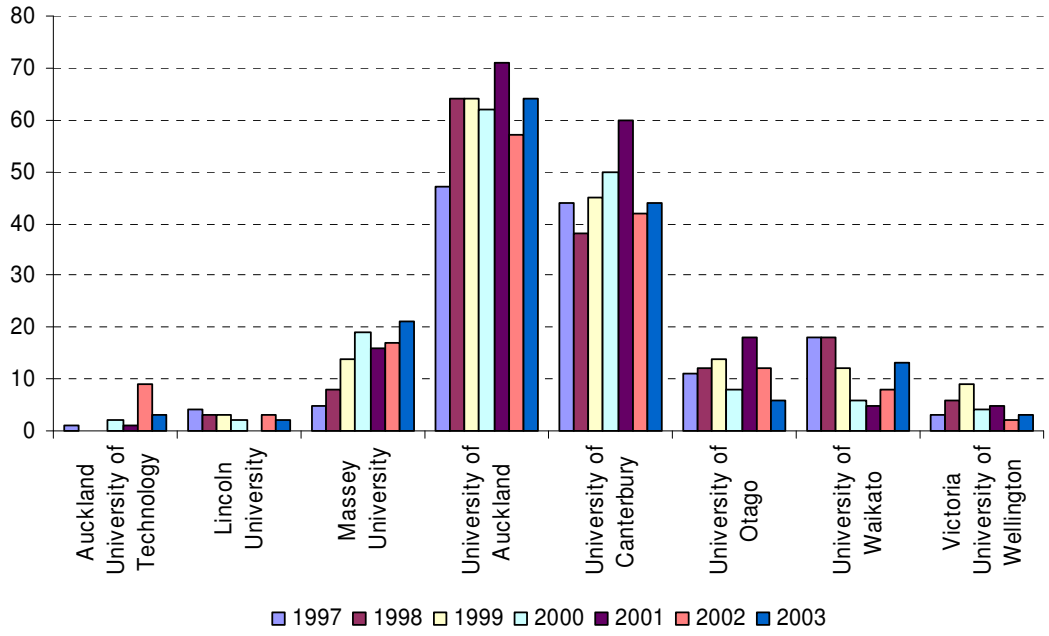
3.6 Publications in engineering and technology by individual universities

The University of Auckland and the University of Canterbury are the largest producers of papers and reviews in the field of engineering and technology. This is not surprising as they have long established engineering schools. In 2003, authors at these universities contributed to 72 percent of all university papers and reviews in this field.

However, the number of papers and reviews produced by the University of Auckland and University of Canterbury in engineering and technology in 2003 were down by 9.9 percent and 27 percent respectively, from their peak in 2001.

Of the other universities, the largest growth between 1997 and 2003 occurred at Massey University with papers and reviews rising by 329 percent from 5 to 21. This result is not surprising as Massey University is developing its capability in technology teaching and research and has recently introduced a full Bachelor of Engineering degree.

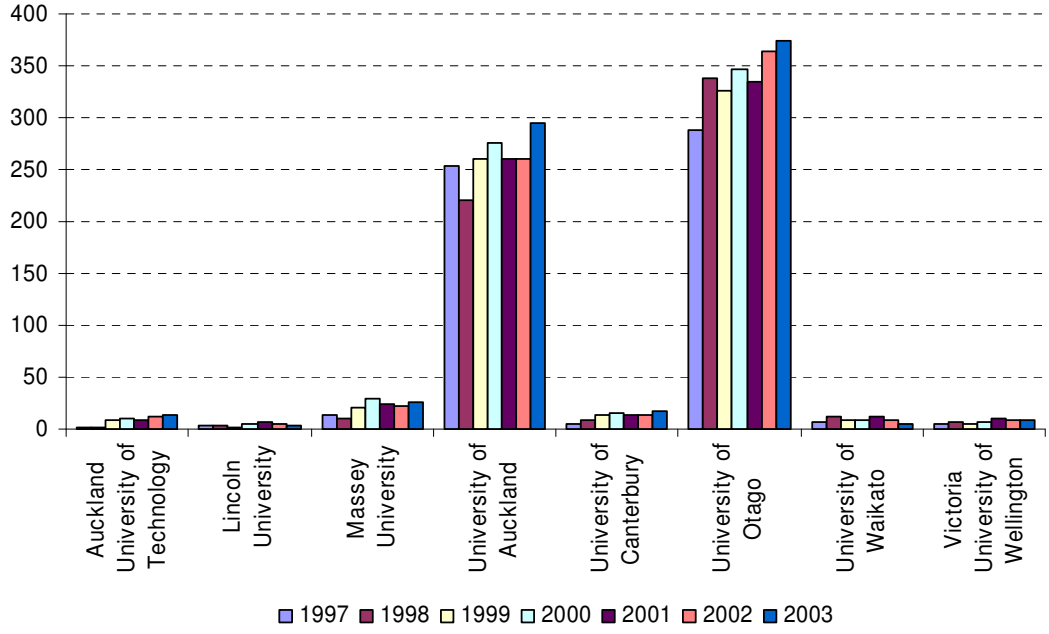
Figure 9: Publications in engineering and technology by individual universities 1997-2003



3.7 Publications in the medical sciences by individual universities

The two universities with medical schools, the Universities of Auckland and Otago, produce the overwhelming majority of papers in the medical sciences field. Between them they account for 95 percent of papers published in this area. The number of papers and reviews at these two universities has been steadily increasing, with growth of 30 percent at the University of Otago and 17 percent at the University of Auckland between 1997 and 2003.

Figure 10: Publications in the medical sciences by individual universities 1997-2003



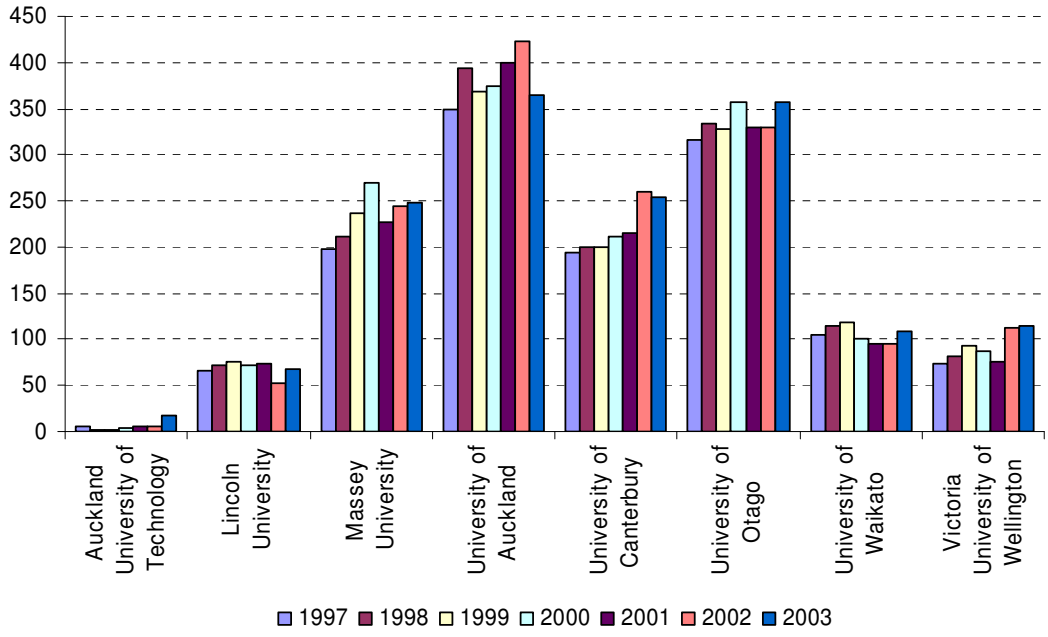
3.8 Publications in the natural sciences by individual universities

The University of Auckland produced the highest number of papers and reviews in the field of the natural sciences. In 2003, 25.2 percent of papers in this field had contributions by authors from the University of Auckland. The University of Otago had a slightly smaller share of 24.7 percent. The Auckland University of Technology had the smallest share of papers in this field of 1.1 percent.

The largest growth in papers and reviews between 1997 and 2003 was exhibited by Victoria University of Wellington. A significant increase in papers and reviews published in 2002 and 2003 resulted in a 55 percent increase in publications between 1997 and 2003. The next largest growth was at the University of Canterbury (31 percent) and Massey University (26 percent).

Notably, the number of papers and reviews published by authors at the Universities of Auckland and Waikato and Lincoln University were only marginally higher in 2003 than at the start of the study period in 1997. The papers and reviews published by authors at the University of Auckland, the University of Waikato and Lincoln University grew by 4.3 percent, 4.8 percent and 3.1 percent respectively, over this period.

Figure 11: Publications in the natural sciences by individual universities 1997-2003

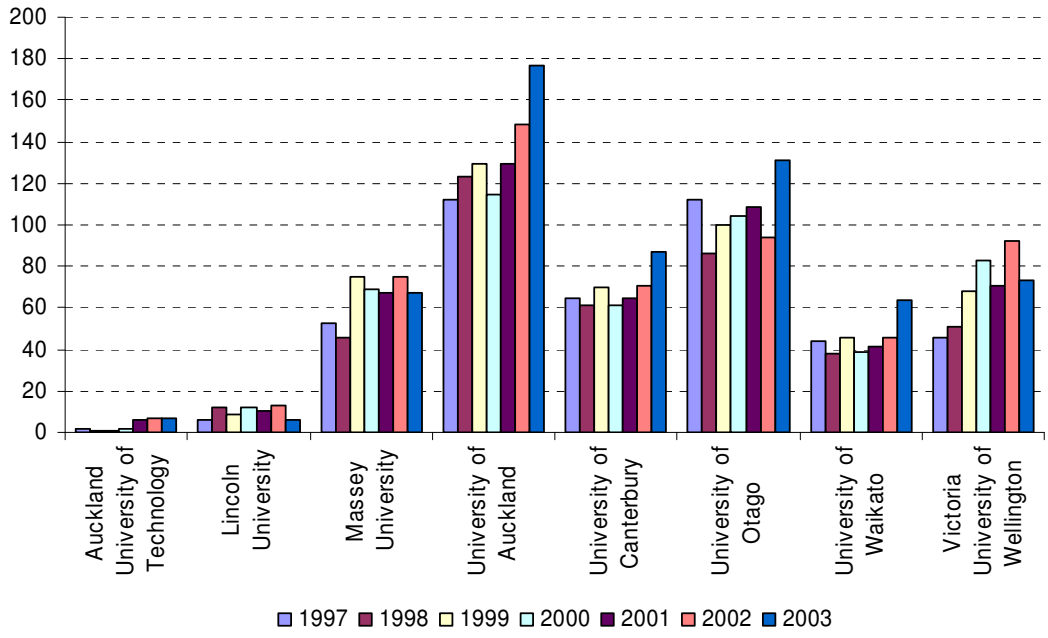


3.9 Publications in the social sciences/humanities by individual universities

The University of Auckland is the largest producer of papers and reviews in the social sciences/humanities. In 2003, 31 percent of university papers and reviews in this field were by authors from the University of Auckland. The University of Auckland also exhibited one of the fastest growth rates of publications in this field, with papers and reviews being 58 percent higher in 2003 than in 1997. Almost all this growth occurred between 2000 and 2003.

For the remaining universities performance was mixed. At the University of Otago, the number of papers and reviews surged by 39 percent in 2003, after a period of relatively static growth overall. The Universities of Canterbury and Waikato also displayed a similar surge in the number of papers and reviews in 2003 of 23 percent and 39 percent, respectively.

Figure 12: Publications in the social sciences/humanities by individual universities 1997-2003



4. Citations

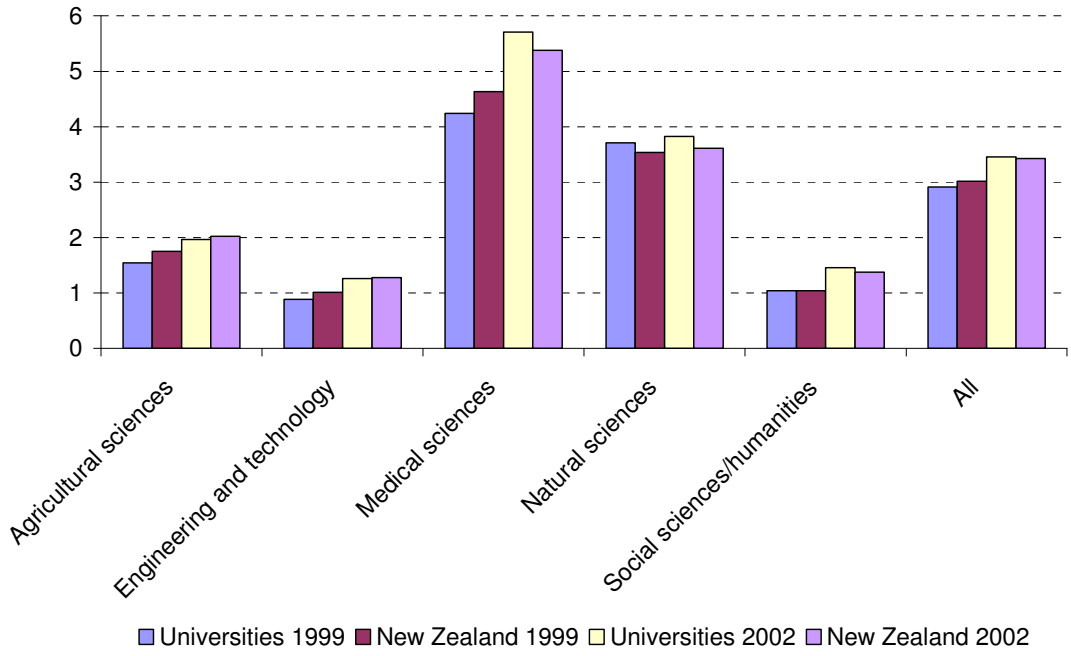
In this section the average number of citations over a two-year citation window of papers and reviews published by university authors in 1999 and 2002 are examined. Firstly, the average number of citations per publication at universities is compared to New Zealand publications as a whole in the various subject fields. Then, the average number of citations per publication by each individual university in the various subject fields is examined.

4.1 Citations by subject field

The impact of papers and reviews by university authors has improved, compared with the figures for New Zealand as a whole. For papers and reviews published in 1999, the average number of citations for university publications was 2.9 compared with 3.0 for all New Zealand publications. However, for papers and reviews published in 2002, the average number of citations was 3.5 for university authored papers and reviews and 3.4 for New Zealand authored papers and reviews. The increase in the relative impact of university publications was especially notable in the medical sciences, where the average number of citations went from being 8.4 percent lower than the New Zealand average in 1999, to 6.1 percent above the average in 2002.

All subject fields showed an increase in the average number of citations for papers and reviews published in 2002 compared with 1999. This would suggest that the impact of university publications improved. So, although the quantity of papers and reviews per FTE academic staff was lower in 2002 compared with 1999, the publications in 2002 had greater impact.

Figure 13: Average number of citations over a two-year window for papers and reviews published in 1999 and 2002 by subject field



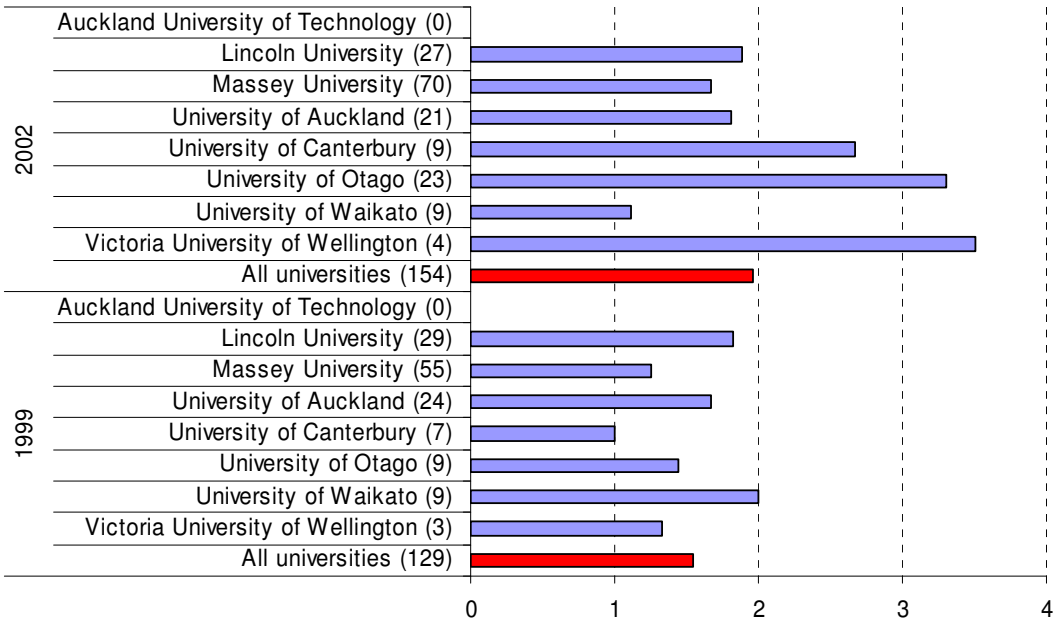
4.2 Citations in the agricultural sciences by individual universities

The average number of citations over a two year window for papers and reviews by universities in the agricultural sciences increased from 1.5 for papers published in 1999 to 2.0 for papers and reviews published in 2002.

Of those universities that produced more than 20 papers or reviews in this field, Lincoln University had the highest number of average citations with 1.8 in 1999 while the University of Otago had the highest average citations of 3.3 in 2002.

Although Massey University was the largest producer of papers and reviews in the agricultural sciences, the impact of their papers and reviews was below the university average in both 1999 and 2002.

Figure 14: Average number of citations over a two-year window for papers and reviews published in 1999 and 2002 in the agricultural sciences



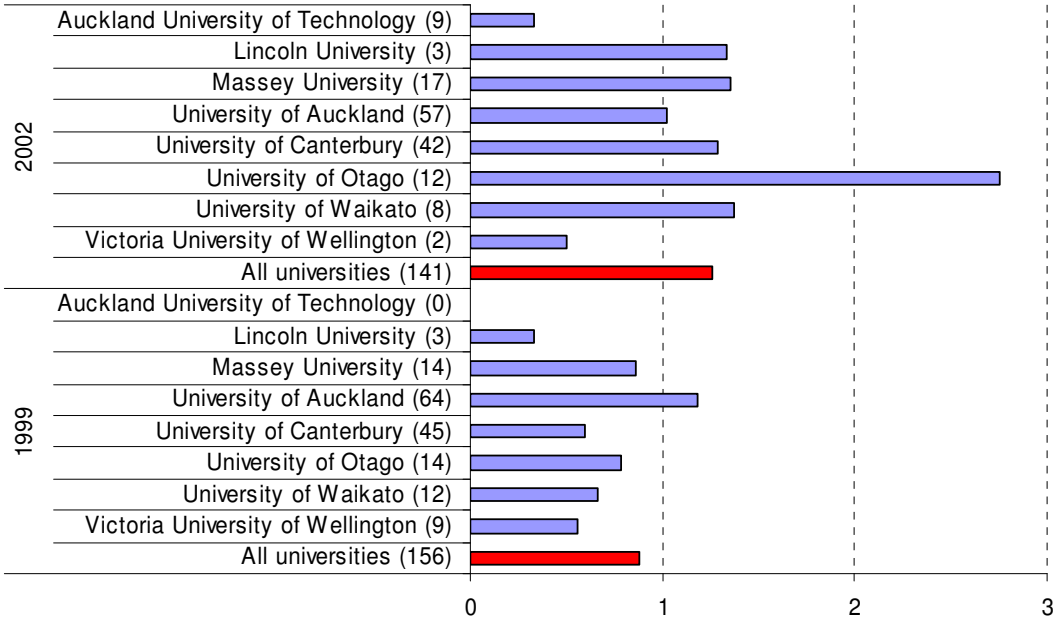
Note: The number of publications is presented in the brackets after the names of the universities.

4.3 Citations in engineering and technology by individual universities

There was a sizeable increase in the impact of papers and reviews in engineering and technology between 1999 and 2002. In 1999, the average number of citations for papers and reviews was 0.9, compared with 1.3 in 2002.

Of the two main producers of papers and reviews in engineering and technology, publications by the University of Auckland had the highest impact. In 1999, there were 1.2 citations on average for papers and reviews by University of Auckland authors, compared with 0.6 for the University of Canterbury. In 2002 the positions were reversed, following an increase in the impact of publications from the University of Canterbury and a decline in the impact of publications by the University of Auckland. The average number of citations per paper and review at the University of Canterbury was 1.3 compared with 1.0 for the University of Auckland.

Figure 15: Average number of citations over a two-year window for papers and reviews published in 1999 and 2002 in engineering and technology



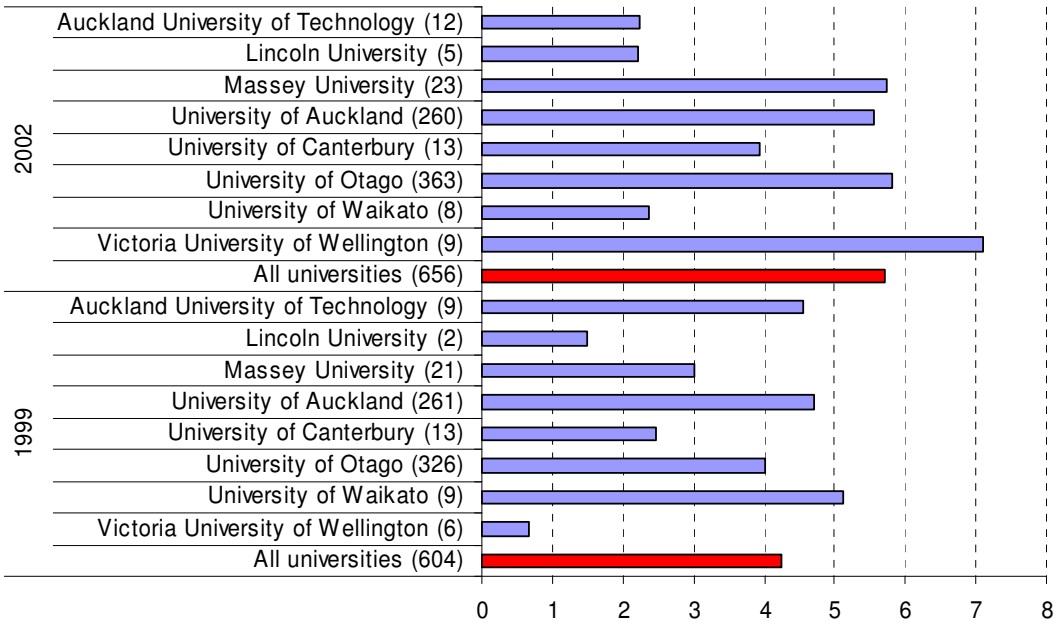
Note: The number of publications is presented in the brackets after the names of the universities.

4.4 Citations in the medical sciences by individual universities

The average number of citations for papers in the medical sciences increased from 4.2 in 1999 to 5.7 in 2002.

Of the two dominant producers of papers and reviews in this field the University of Auckland had the highest average number of citations per paper and review in 1999 with 4.7, compared with 4.0 for the University of Otago. Although the average citations at both universities increased in 2002, the rate of growth was higher at the University of Otago. This resulted in the average number of citations at the University of Otago rising to 5.8 in 2002, compared with 5.6 for the University of Auckland.

Figure 16: Average number of citations over a two-year window for papers and reviews published in 1999 and 2002 in the medical sciences



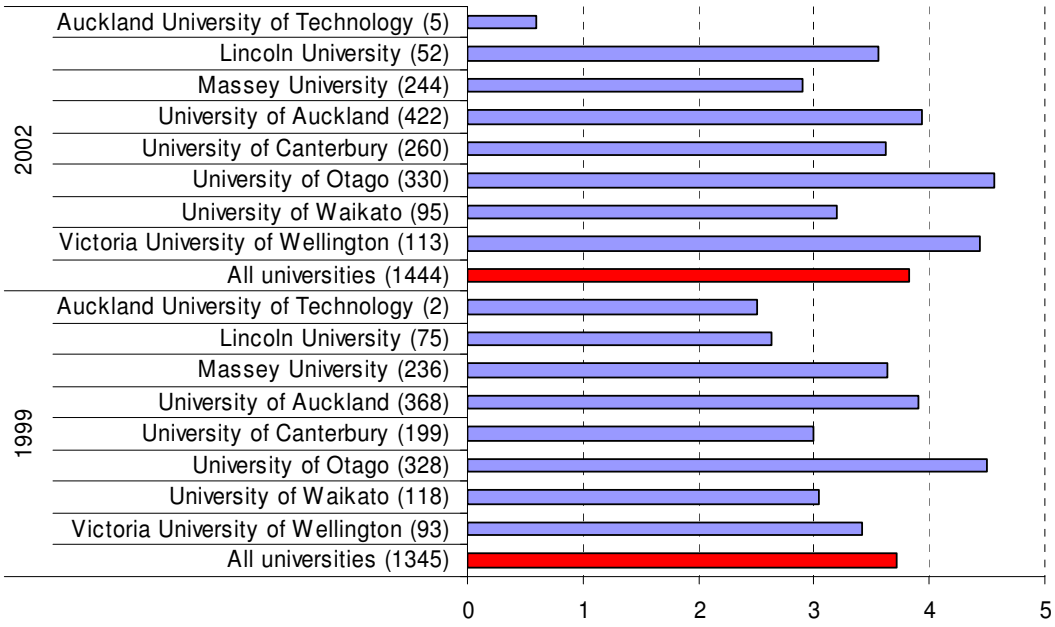
Note: The number of publications is presented in the brackets after the names of the universities.

4.5 Citations in the natural sciences by individual universities

Between 1999 and 2002, the average number of citations for papers and reviews in the field of natural sciences increased by 3 percent. This was the smallest increase in average citations over the various fields of science.

The University of Otago achieved the highest number of average citations in both 1999 and 2002 of 4.5 and 4.6 respectively. A notable increase in average citations was achieved by Lincoln University and Victoria University of Wellington with increases of 35 percent and 30 percent respectively. This compares with a decrease in average citations at Massey University of 21 percent.

Figure 17: Average number of citations over a two-year window for papers and reviews published in 1999 and 2002 in the natural sciences



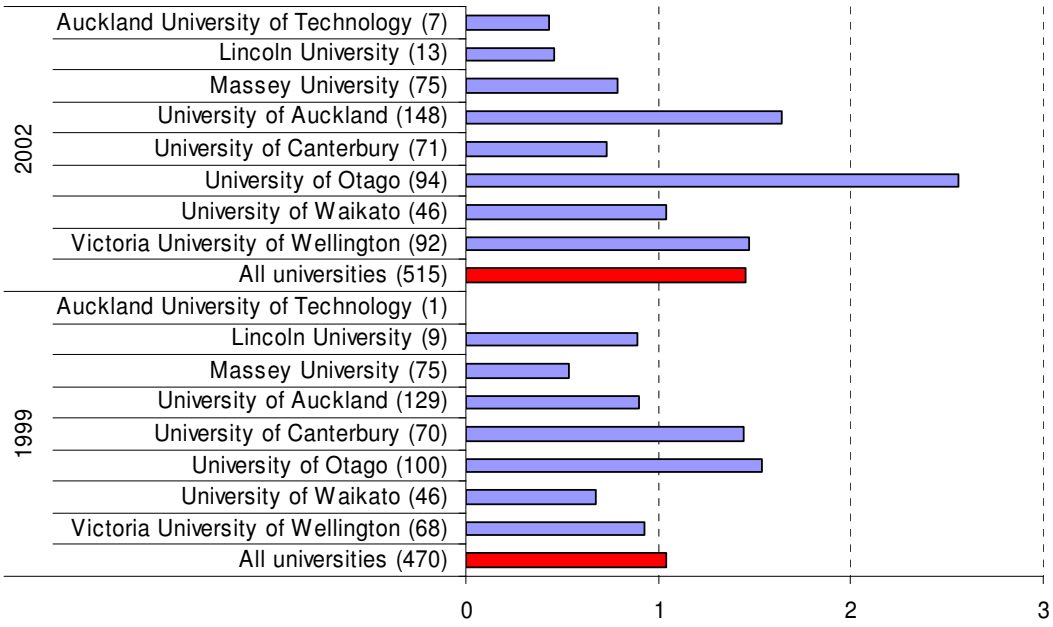
Note: The number of publications is presented in the brackets after the names of the universities.

4.6 Citations in the social sciences/humanities by individual universities

Average citations for papers and reviews by the universities in the social sciences/humanities field increased by 40 percent between 1999 and 2002.

The University of Otago achieved the highest number of average citations of 1.5 in 1999. They were followed closely by the University of Canterbury with 1.4 citations on average. In 2002 the University of Otago's average number of citations of 2.6 was well ahead of the remaining universities. The next best performing institution was the University of Auckland, with 1.6 citations on average.

Figure 18: Average number of citations over a two-year window for papers and reviews published in 1999 and 2002 in the social sciences/humanities



Note: The number of publications is presented in the brackets after the names of the universities.

Appendix

Table 1: Total indexed publications 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	10	8	23	21	26	34	52
Lincoln University	101	130	134	127	127	102	114
Massey University	377	374	447	477	410	448	428
University of Auckland	859	897	915	929	973	996	1,015
University of Canterbury	345	345	369	411	387	444	437
University of Otago	768	799	804	871	841	849	928
University of Waikato	202	216	230	177	186	192	235
Victoria University of Wellington	136	164	195	206	178	232	220
Universities	2,685	2,812	2,966	3,083	2,998	3,129	3,252
All New Zealand	4,164	4,307	4,444	4,423	4,417	4,571	4,696

Table 2: Full-time equivalent academic staff 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	692	655	642	726	763	827	881
Lincoln University	227	192	190	206	220	225	219
Massey University	968	964	1,231	1,204	1,138	1,166	1,283
University of Auckland	1,543	1,560	1,489	1,556	1,561	1,702	1,740
University of Canterbury	557	583	599	596	617	640	653
University of Otago	872	918	964	981	994	1,010	1,015
University of Waikato	696	679	662	651	723	739	756
Victoria University of Wellington	619	610	589	606	593	631	635
Universities	6,174	6,161	6,366	6,526	6,609	6,940	7,182

Source: Ministry of Education.

Table 3: Indexed publications in the agricultural sciences 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	–	–	–	–	–	–	1
Lincoln University	12	27	29	31	29	27	30
Massey University	63	60	55	51	42	70	34
University of Auckland	13	12	24	8	15	21	22
University of Canterbury	3	5	7	4	6	9	6
University of Otago	8	12	9	11	12	23	22
University of Waikato	10	8	9	4	3	9	12
Victoria University of Wellington	–	–	3	1	–	4	2
Universities	106	121	129	108	105	154	123

Table 4: Indexed publications in engineering and technology 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	1	–	–	2	1	9	3
Lincoln University	4	3	3	2	0	3	2
Massey University	5	8	14	19	16	17	21
University of Auckland	47	64	64	62	71	57	64
University of Canterbury	44	38	45	50	60	42	44
University of Otago	11	12	14	8	18	12	6
University of Waikato	18	18	12	6	5	8	13
Victoria University of Wellington	3	6	9	4	5	2	3
Universities	131	145	156	152	171	141	150

Table 5: Indexed publications in the medical sciences 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	1	2	9	11	9	12	14
Lincoln University	3	3	2	5	7	5	3
Massey University	14	10	21	29	24	23	26
University of Auckland	253	221	261	276	260	260	295
University of Canterbury	6	9	13	15	14	13	17
University of Otago	288	338	326	346	334	363	374
University of Waikato	7	12	9	9	12	8	6
Victoria University of Wellington	5	7	6	7	10	9	9
Universities	536	565	604	650	627	656	703

Table 6: Indexed publications in the natural sciences 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	6	2	2	3	6	5	17
Lincoln University	65	71	75	71	73	52	67
Massey University	197	211	236	269	227	244	249
University of Auckland	350	393	368	374	400	422	365
University of Canterbury	194	200	199	211	215	260	254
University of Otago	316	334	328	356	330	330	357
University of Waikato	104	115	118	100	95	95	109
Victoria University of Wellington	74	82	93	87	76	113	115
Universities	1,239	1,329	1,345	1,406	1,365	1,444	1,446

Table 7: Indexed publications in the social sciences/humanities 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Auckland University of Technology	2	1	1	2	6	7	7
Lincoln University	6	12	9	12	10	13	6
Massey University	53	46	75	69	67	75	67
University of Auckland	112	123	129	115	129	148	177
University of Canterbury	65	61	70	61	65	71	87
University of Otago	112	86	100	104	109	94	131
University of Waikato	44	38	46	39	41	46	64
Victoria University of Wellington	46	51	68	83	71	92	73
Universities	426	406	470	455	475	515	571

Table 8: University indexed publications in multidisciplinary fields and no assigned subject field 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Multi-disciplinary	23	30	23	37	42	53	74
No assigned subject category	224	216	239	275	213	166	185

Table 9: Average number of citations over a two-year window for papers and reviews published in 1999

	Agricultural sciences	Engineering and technology	Medical sciences	Natural sciences	Social sciences/ humanities	All
Auckland University of Technology	–	–	4.56	2.50	–	2.04
Lincoln University	1.83	0.33	1.50	2.63	0.89	2.01
Massey University	1.25	0.86	3.00	3.64	0.53	2.41
University of Auckland	1.67	1.19	4.70	3.91	0.90	3.28
University of Canterbury	1.00	0.60	2.46	2.99	1.44	2.14
University of Otago	1.44	0.79	4.01	4.50	1.54	3.70
University of Waikato	2.00	0.67	5.11	3.03	0.67	2.06
Victoria University of Wellington	1.33	0.56	0.67	3.42	0.93	2.06
Universities	1.54	0.88	4.24	3.71	1.04	2.91
All New Zealand	1.75	1.01	4.63	3.54	1.04	3.02

Table 10: Average number of citations over a two-year window for papers and reviews published in 2002

	Agricultural sciences	Engineering and technology	Medical sciences	Natural sciences	Social sciences/ humanities	All
Auckland University of Technology	–	0.33	2.25	0.60	0.43	1.12
Lincoln University	1.89	1.33	2.20	3.56	0.46	2.59
Massey University	1.67	1.35	5.74	2.89	0.79	2.40
University of Auckland	1.81	1.02	5.56	3.94	1.64	3.67
University of Canterbury	2.67	1.29	3.92	3.63	0.73	2.69
University of Otago	3.30	2.75	5.82	4.56	2.56	4.67
University of Waikato	1.11	1.38	2.38	3.20	1.04	2.14
Victoria University of Wellington	3.50	0.50	7.11	4.43	1.47	3.13
Universities	1.97	1.26	5.71	3.82	1.46	3.46
All New Zealand	2.02	1.28	5.38	3.61	1.37	3.43

Table 11: OECD classification of major fields of science and the corresponding Thomson-ISI classification

OECD classification	Thomson-ISI classification
Natural Sciences	Astrophysics
	Biology and Biochemistry
	Chemistry
	Computer Sciences
	Ecology/Environment
	Geosciences
	Mathematics
	Microbiology
	Molecular Biology
	Plant and Animal Sciences
	Physics
Engineering and Technology	Engineering
	Materials Science
Medical Sciences	Clinical Medicine
	Immunology
	Neuroscience
	Pharmacology
	Psychiatry (Deluxe)
Agricultural Sciences	Agricultural Sciences
Social Sciences	Economic and Business
	Education
	Law
	Psychology (Deluxe)
	Social Sciences (General)
Humanities	Arts and Humanities (General)

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