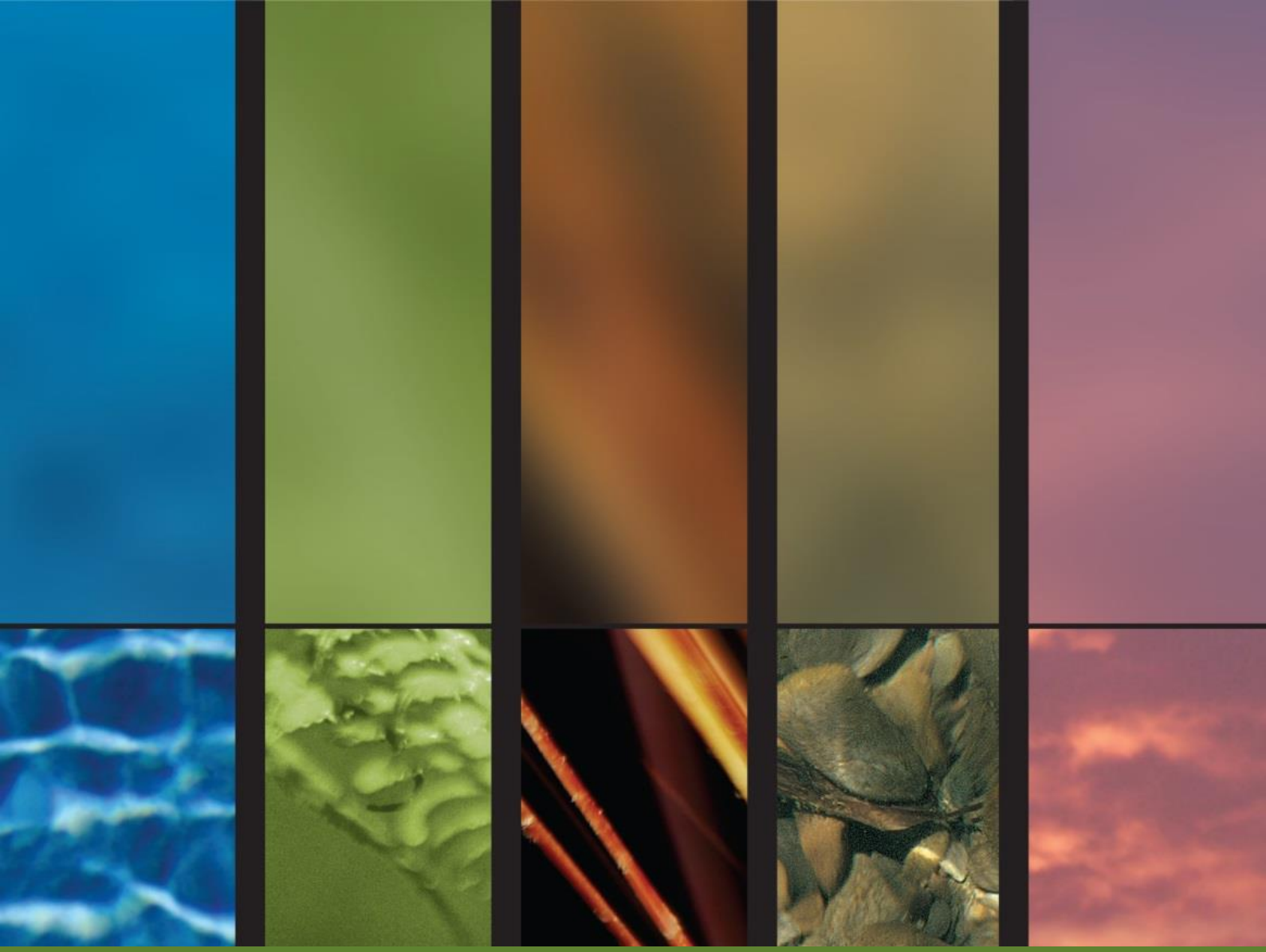

Profile & Trends

NEW ZEALAND'S TERTIARY EDUCATION RESEARCH

2015

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Published by:
Tertiary Sector Performance Analysis
Ministry of Education

For further information on this report visit:
www.educationcounts.govt.nz/publications/series/profile-and-trends

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September 2016

ISSN: 2422-9865

STATISTICS AND RESEARCH

Profile & Trends 2015: New Zealand's Tertiary Education Research has an associated set of statistical tables available on the Education Counts website: www.educationcounts.govt.nz/statistics/tertiary_education

The statistics in the web tables are used to inform the analysis in *Profile & Trends*. The tables provide comprehensive coverage of the trends in: doctoral enrolments, the characteristics of doctoral students, the academic impact of research, specialisation and research collaboration by New Zealand's universities, research funding, research contract income, and research expenditure at universities.

NEW ZEALAND'S TERTIARY EDUCATION RESEARCH

New Zealand's Tertiary Education Research is one of six reports to be published this year in the *Profile & Trends 2015* series.

The reports to be published in 2016 will contain data on tertiary education trends and changes for the year ended December 2015, unless otherwise stated. The other five reports are:

- *New Zealand's Annual Tertiary Education Enrolments*
- *Tertiary Education Outcomes and Qualification Completions*
- *New Zealand's Workplace-based Learners*
- *Tertiary Education Sector and Student Support,* and
- *New Zealand's Tertiary Education System.*

Most of the statistics in *New Zealand's Tertiary Education Research* are derived from returns provided by government-funded tertiary education organisations to the Ministry of Education and to the Tertiary Education Commission. The bibliometric measures used in this report are produced by the Ministry of Education using data from Thomson Reuters. A list of figures is included at the end of the report.

The report begins with the trend in doctoral enrolments and describes the characteristics of doctoral students. The first chapter also includes university doctoral enrolments and completions per academic staff member. The information on the academic impact of research and collaborations at universities includes comparisons with Australian universities. Chapter 2 covers information on the research funding of tertiary education organisations, including research contract income at universities, along with research expenditure at universities.

This year's *Profile & Trends* series represents the 18th annual survey of the tertiary education system to be published by the Ministry of Education.

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1. Unless otherwise stated, the data in this publication is for the year ended 31 December 2015 and has been sourced from the Ministry of Education.
2. Data in this report has been rounded. More detailed figures are provided in the analytical tables on Education Counts. The data published in previous years may have changed as tertiary education organisations can submit updates for previous years back to 2003.
3. The information in this report and the analytical tables needs to be used in conjunction with the technical notes provided on the Education Counts website.
4. A reference to the web tables associated with the data highlights is provided at the beginning of each chapter.

1 TERTIARY EDUCATION RESEARCH

This chapter includes:

- the trend in doctoral enrolments and completions
- characteristics of doctoral students
- the academic impact of research by New Zealand's universities, and
- trends in research collaboration at New Zealand's universities.

The research performance of the tertiary education sector improved in several areas in 2015. The volume of doctoral enrolments increased again, continuing a long-term trend. Since 2006, the upward trend has been driven by increases in international enrolments in response to a change in government policy to fund international doctoral students on the same basis as domestic students. With domestic enrolments in doctoral degrees decreasing slightly from 2011, international students comprised 45 percent of total doctoral students in 2015, compared to 35 percent in 2010. The number of Māori enrolled in doctoral degrees increased in 2015 and is well above 2010 levels. The number of Pasifika enrolments in doctoral degrees also increased in 2015.

As a result of the increased doctoral enrolments, the supervisory load placed on academics has continued to rise. The number of doctoral students per academic staff member at universities was around 12 percent higher, on average, in 2015 than in 2010.

Although the number of doctoral-degree completions declined in 2015, the timing of the reporting of these longer qualifications tends to be lumpy. The number of doctoral completions remained well above 2010 levels and the number of international students completing qualifications has more than doubled between 2010 and 2015.

The relative academic impact of research by New Zealand's universities (as measured by average rates of citation in indexed journal publications) has been increasing over time. There has also been an increase in the percentage of indexed journal publications featuring inter-institutional and international collaboration.

INTERNATIONAL COMPARISONS OF RESEARCH PERFORMANCE

In this chapter we compare the performance of New Zealand universities with that of Australian universities. There is bibliometric data for 39 Australian universities.

DEFINITION OF RESEARCH IMPACT

Research impact is the number of citations divided by the number of publications. In this case, the results are normalised to take into account the different rates of citation between subject areas. A value of 1 indicates that the impact of the research is equal to the world average. In this chapter, the impact presented is a weighted average of the 22 subject areas categorised by Thomson Reuters.

BIBLIOMETRIC DATA SOURCE

The bibliometric measures used in this chapter to assess the academic impact of research and collaboration are produced by Thomson Reuters.

Analytical tables: Data on the research performance of the tertiary education sector is available at: www.educationcounts.govt.nz/statistics/tertiary/education/research

DOCTORAL ENROLMENTS BY GENDER

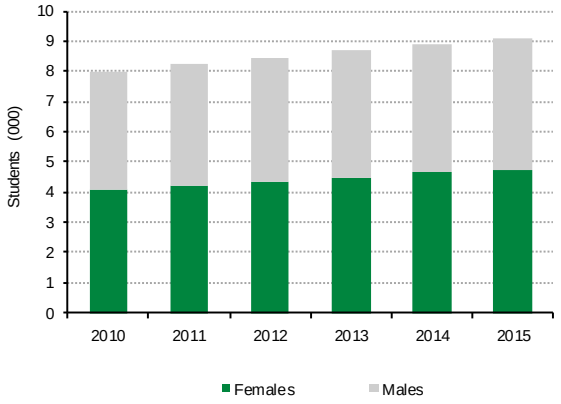
The number of students enrolling in doctoral degrees increased by 2.0 percent from 2014 to 2015. This was a smaller increase than in the previous five years. Total doctoral enrolments are now 14 percent above the 2010 level.

Fifty-two percent of doctoral enrolments were by women in 2015, up from 51 percent in 2010.

Doctoral enrolments in 2015

		% change 2010-15	% change 2014-15
Total	9,070	+14	+2.0
Females	4,750	+17	+2.3
Males	4,320	+10	+1.8

Figure 1.1 Doctoral enrolments by gender



DOCTORAL ENROLMENTS BY RESIDENCY STATUS

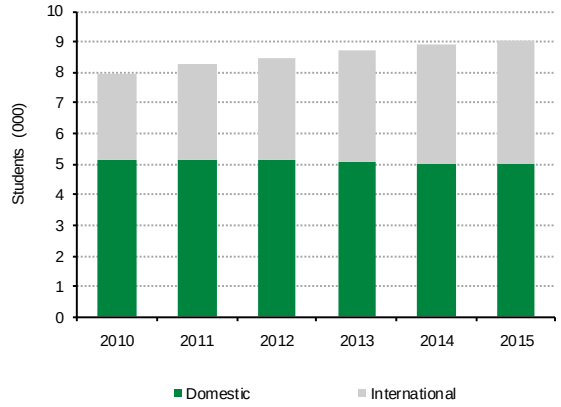
The number of doctoral enrolments by domestic students increased by 0.2 percent from 2014 to 2015, while those by international students increased by 4.4 percent. In 2015, international doctoral students made up 45 percent of total doctoral students, compared to 35 percent in 2010.

The higher growth rate in international doctoral enrolments reflects a change in the funding regime for international students introduced in 2006, which now treats them as domestic students.

Doctoral enrolments in 2015

		% change 2010-15	% change 2014-15
Total	9,070	+14	+2.0
Domestic	4,990	-3.2	+0.2
International	4,080	+45	+4.4

Figure 1.2 Doctoral enrolments by residency status



DOCTORAL ENROLMENTS BY SELECTED ETHNIC GROUPS

The number of Māori students enrolled in doctoral study increased by 6.2 percent in 2015, while the number of Pasifika doctoral students increased by 2.9 percent over the same period.

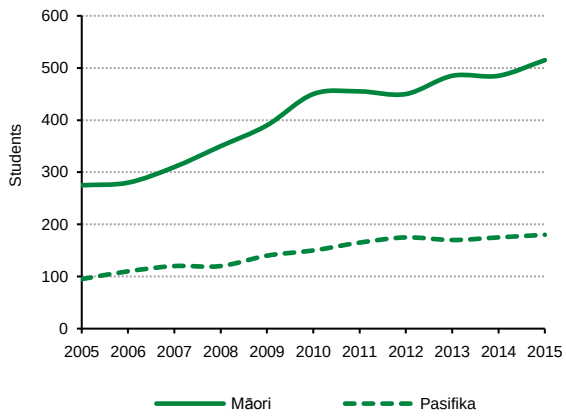
In 2015, enrolments by both Māori and Pasifika students were well above 2010 levels. Māori student enrolments were 14 percent higher than in 2010, while Pasifika student enrolments were 20 percent higher.

Domestic doctoral enrolments in 2015

		% change 2010-15	% change 2014-15
Māori	515	+14	+6.2
Pasifika	180	+20	+2.9

Note: Students who indicate more than one ethnic group are counted in each group.

Figure 1.3 Doctoral enrolments by selected ethnic groups



DOCTORAL COMPLETIONS BY GENDER[1]

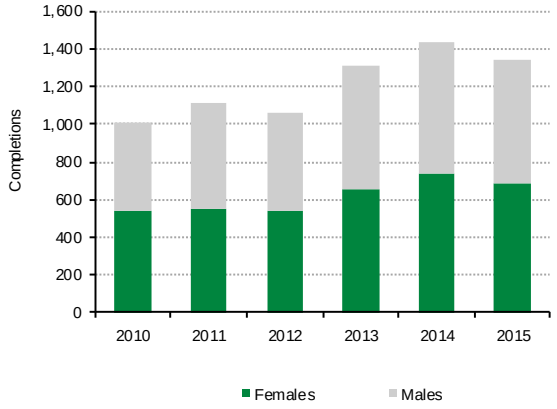
The number of students completing a doctoral degree decreased by 6.6 percent from 2014 to 2015. The decrease is likely to reflect the timing of the reporting of completions for these longer qualifications, given that doctoral degree enrolments have been steadily increasing over time. In 2015, 51 percent of doctoral degrees were completed by women, compared to 53 percent in 2010.

Doctoral completions in 2015

		% change 2010-15	% change 2014-15
Total	1,350	+33	-6.6
Females	690	+29	-6.1
Males	655	+36	-7.1

Notes:
1. The drop in the number of students completing a doctoral degree in 2012 and 2015 relates to the timing of reporting of qualification completion of these longer study programmes.
2. The gender counts may not add to the total due to rounding.

Figure 1.4 Doctoral completions by gender



DOCTORAL COMPLETIONS BY RESIDENCY STATUS

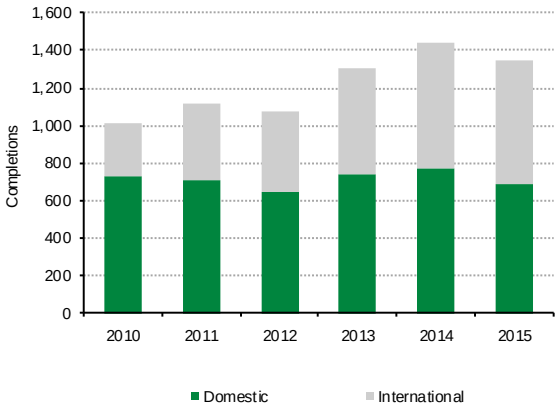
Although the number of domestic students completing doctoral degrees declined by 12 percent in 2015, the size of this decrease is likely to have been inflated by the timing of the reporting of these longer qualifications. The same issue would apply to international students, where the number of completions declined by 0.8 percent. In 2015, doctoral degrees completed by international students comprised 49 percent of all doctoral completions. This compared to 29 percent in 2010.

Doctoral completions in 2015

		% change 2010-15	% change 2014-15
Total	1,350	+33	-6.6
Domestic	685	-5.5	-12
International	660	+128	-0.8

Notes:
1. The drop in the number of students completing a doctoral degree in 2012 relates to the timing of reporting of qualification completion of these longer study programmes
2. The counts of domestic and international graduates may not add to the total due to rounding.

Figure 1.5 Doctoral completions by residency status



DOCTORAL COMPLETIONS BY SELECTED ETHNIC GROUPS

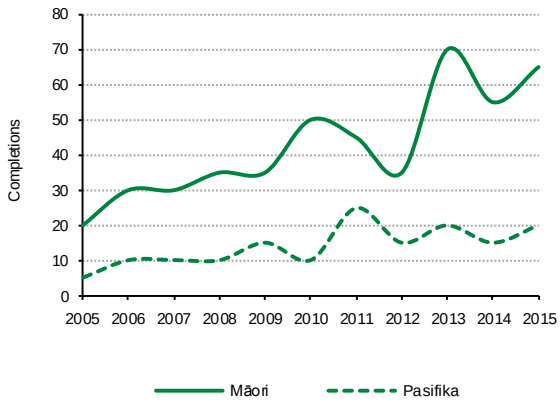
The number of doctoral degrees completed by Māori and Pasifika students increased from 2014 to 2015. As the numbers of graduates in these ethnic groups are small, there can be significant fluctuations between years. However, the long-term trend shows a steady increase in Māori doctoral completions.

Doctoral completions in 2015

		% change 2010-15	% change 2014-15
Māori	65	+30	+18
Pasifika	20	+100	+33

Note: Students who indicate more than one ethnic group are counted in each group.

Figure 1.6 Doctoral completions by selected ethnic groups



[1] Higher doctorates are excluded from the student counts in this chapter. A higher doctorate is awarded for independent work of special excellence, as judged by leading international experts. A higher doctorate does not require a learner to have enrolled for the degree, the research on which the awarding of the degree is based will have been completed, and may have been published, over many years.

DOCTORAL COMPLETIONS BY FIELD OF STUDY

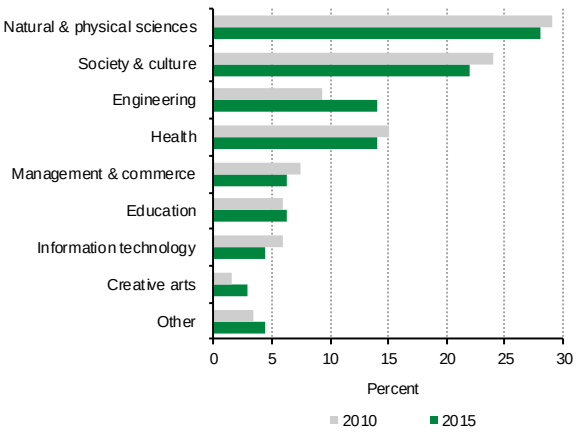
The largest proportion of students completing a doctoral degree in 2015 studied in the areas of the natural and physical sciences and society and culture. Since 2010, there has been an increase in the proportion of doctoral graduates in the areas of engineering, education and creative arts.

Proportions of doctoral degrees completed by field of study

	2010	2015
Natural & physical sciences	29%	28%
Society & culture	24%	22%
Engineering & related technologies	9.4%	14%
Health	15%	14%
Management & commerce	7.4%	6.3%
Education	5.9%	6.3%
Information technology	5.9%	4.5%
Creative arts	1.5%	3.0%
Other	3.5%	4.4%

Notes:
1. The total percentage may add to more than 100 percent as doctoral graduates may study more than one subject area.
2. The field of study data presented here is provisional.

Figure 1.7 Doctoral completions by field of study



UNIVERSITY DOCTORAL ENROLMENTS AND COMPLETIONS PER ACADEMIC STAFF MEMBER

The number of doctoral enrolments per academic staff member continued to rise in 2015. There were 1.54 enrolments per full-time academic staff member in 2014, compared to 1.38 in 2010.

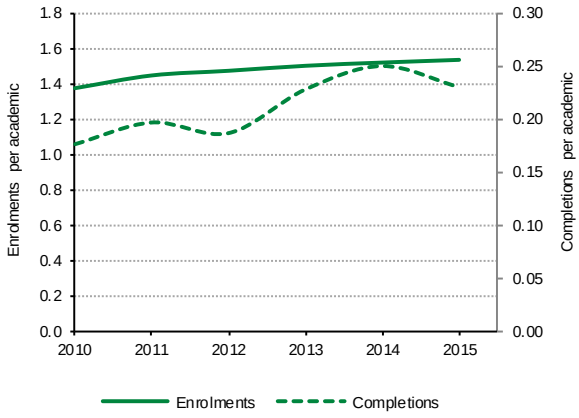
The rise in enrolments has generally flowed through to the number of doctoral degrees completed per full-time academic staff member. Although the figure of 0.23 completions per full-time academic staff member in 2015 represented a decrease from 0.25 in 2014, it is significantly above the value of 0.18 for 2010.

University doctoral enrolments and completions per staff member

	2010	2011	2012	2013	2014	2015
Enrolments	1.38	1.45	1.48	1.50	1.52	1.54
Completions	0.18	0.20	0.19	0.23	0.25	0.23

Notes:
1. 'Full-time equivalent academic' staff includes the following designations: professor, associate professor, senior lecturer and lecturer.
2. The drop in the number of doctoral degrees completed per academic staff in 2012, and the subsequent larger increase in 2013, relates to the timing of reporting of qualification completion of these longer study programmes.

Figure 1.8 University doctoral enrolments and completions per academic staff member



ACADEMIC IMPACT OF RESEARCH – UNIVERSITIES

One way of assessing the academic impact of research is to measure the rate of citation of research in indexed journal publications. The academic impact of research by New Zealand universities has been rising compared with the world average. In the 2010-14 publication period, the rate of citation of research was 1.26 times that of the world average. This compares with a relative impact of 1.10 in 2005-09 and 0.96 in 2001-05. However, one factor has been the impact of some highly cited papers with multiple authors in relation to the Hadron Collider. When we remove physics from the data the impact in 2010-14 is 1.23.

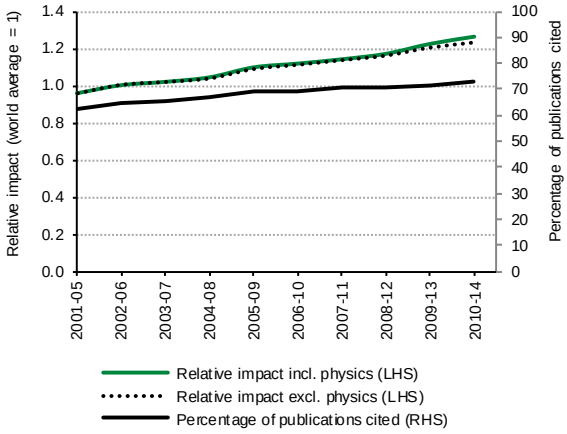
Also, the percentage of indexed publications that were cited has been increasing. Seventy-three percent of publications produced by New Zealand universities in 2010-14 were cited, compared to 69 percent in 2005-09 and 63 percent in 2001-05.

Rate of citation of research

	2001-05	2005-09	2010-14
Relative impact (world average = 1) – including physics	0.96	1.10	1.26
Relative impact (world average = 1) – excluding physics	0.96	1.09	1.23
Percent of publications cited	63%	69%	73%

Note: The relative impact presented here is a weighted average of 22 subject areas.
Source: Thomson Reuters and Ministry of Education.

Figure 1.9 Rate of citation of research by New Zealand universities



ACADEMIC IMPACT OF RESEARCH – AN AUSTRALIAN COMPARISON

The rate of citation of research in indexed publications by New Zealand universities is lower than that of the Australian universities.

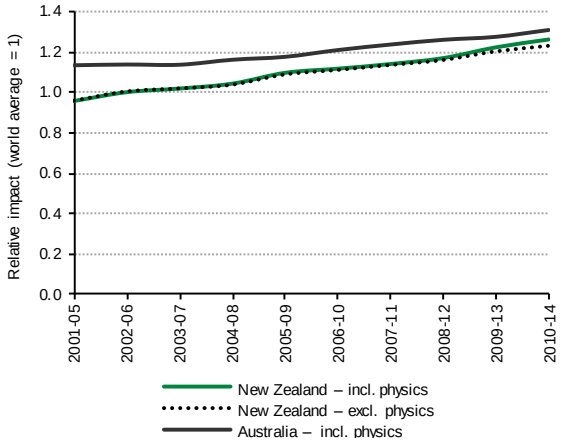
Over time, the relative impact of the two university groupings has been rising, but, in general, the gap between New Zealand universities and the Australian universities is closing. This is the case even after removing the impact of highly cited physics papers from the data.

Relative academic impact of research by Australasian universities

	2001-05	2005-09	2010-14
New Zealand – including physics	0.96	1.10	1.26
New Zealand – excluding physics	0.96	1.09	1.23
Australia – including physics	1.14	1.18	1.31
Australia – excluding physics	1.13	1.17	1.30

Source: Thomson Reuters and Ministry of Education.

Figure 1.10 Relative academic impact of research by Australasian universities



SHARE OF WORLD-INDEXED PUBLICATIONS

Although the share of world-indexed publications by New Zealand universities has been rising over time, the share by the Australian universities has been rising at a faster rate in recent years.

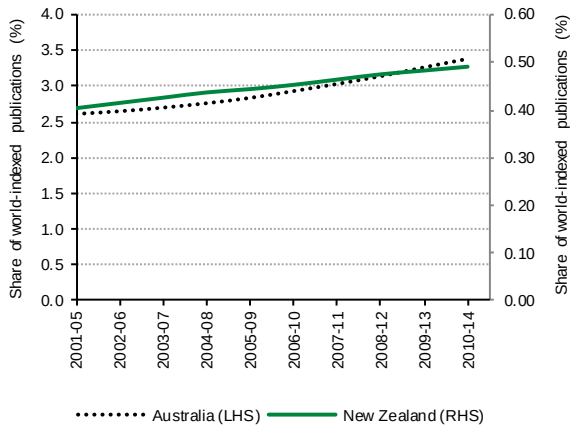
One of the factors in the disparate growth rate has been Australia's introduction of the Excellence in Research Australia evaluation. This has increased the focus on bibliometric performance in Australia and so there has been an associated increase in rates of publication.

Share of world-indexed publications by Australasian universities

	2001-05	2005-09	2010-14
New Zealand	0.40%	0.44%	0.49%
Australia	2.61%	2.84%	3.39%

Source: Thomson Reuters.

Figure 1.11 Share of world-indexed publications by Australasian universities



COLLABORATION

The rate of both inter-institutional and international collaboration has been rising in research carried out by New Zealand universities. This is part of a wider trend towards greater collaboration, as evidenced by similar rising rates in the Australian universities.

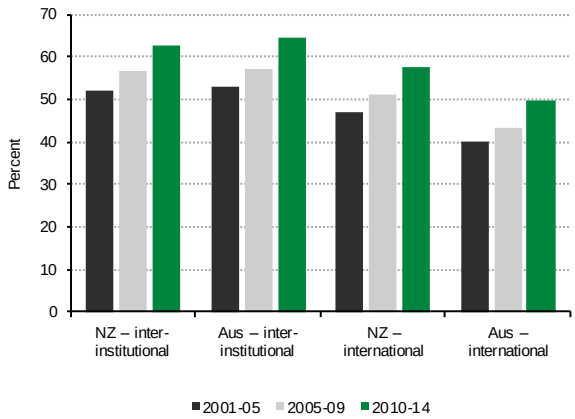
The rate of international collaboration was higher in New Zealand than in Australia, as Australia had a larger population of domestic researchers to collaborate with.

Rate of collaboration in indexed publications by Australasian universities

	2001-05	2005-09	2010-14
New Zealand – inter-institutional	52%	57%	63%
Australia – inter-institutional	53%	57%	64%
New Zealand – international	47%	51%	58%
Australia – international	40%	43%	50%

Source: Thomson Reuters.

Figure 1.12 Rate of collaboration in indexed publications



2 FUNDING RESEARCH IN TERTIARY EDUCATION

This chapter includes:

- research funding of tertiary education organisations
- research contract income in universities, and
- research expenditure at universities.

Government funding of research via Vote Tertiary Education continued to increase from 2014 to 2015 to reach $341 million.

External research contract income earned by the universities decreased from 2011 to 2013 to $415 million.[1] However, more recent data shows this is increasing. From 2014 to 2015, the amount of inflation-adjusted external research contract income earned by universities through the Performance-Based Research Fund increased by 8.0 percent. The amount of external research contract income earned by universities also increased from 2013 to 2014 and it is now 10 percent above its low point in 2013.

The largest source of research income for the universities was from government, with 72 percent of income coming from this source. The private sector contributed 8.0 percent to external research contract income in 2013.

Estimated expenditure by universities on research and development decreased by 2.3 percent between 2011 and 2013 to $817 million.

Analytical tables: Data on the research performance of the tertiary education sector is available at: www.educationcounts.govt.nz/statistics/tertiary/education/research

[1] This refers to data from the Statistics New Zealand's *Research and Development Survey*. Before 2009, the data for university commercial arms was not included in the university data so care should be taken in comparing between these time periods.

RESEARCH FUNDING VIA VOTE TERTIARY EDUCATION

Total research funding via Vote Tertiary Education increased by 10 percent from 2014 to 2015, as a result of an increase in the size of the Performance-Based Research Fund (PBRF) and centres of research excellence fund. Total funding was 19 percent above that in 2010.

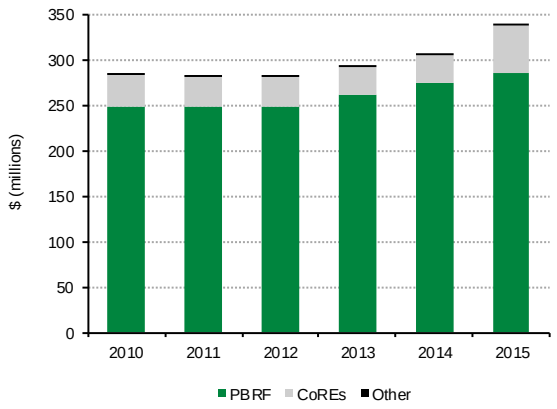
Funding for the centres of research excellence was 62 percent higher in 2015 than in 2014 as more centres of excellence were funded by the government.

Vote Tertiary Education research funding to tertiary education organisations in 2015

	$ (millions)	% change 2010-15	% change 2014-15
Performance-Based Research Fund	288	+15	+4.5
Centres of research excellence	52	+54	+62
Other	1.5	–39	No change
Total	341	+19	+10

Source: Tertiary Education Commission.

Figure 2.1 Vote Tertiary Education research funding to tertiary education organisations



DISTRIBUTION OF RESEARCH FUNDING VIA VOTE TERTIARY EDUCATION

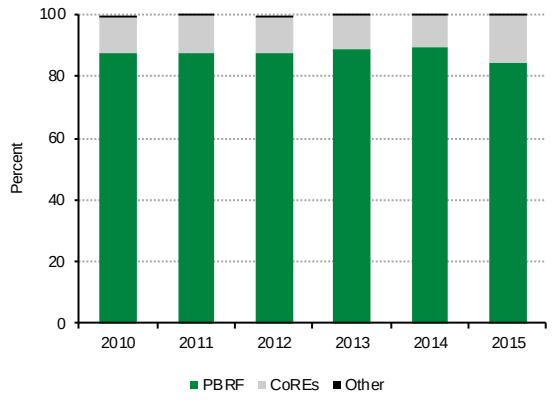
The latest increase in funding for centres of research excellence resulted in a shift in the distribution of research funding via Vote Tertiary Education with the proportion for the centres increasing from 10 percent in 2014 to 15 percent in 2015. In 2015, the Performance-Based Research Fund was 84 percent of total Vote Tertiary Education research funding, compared to 89 percent in 2014.

Distribution of Vote Tertiary Education research funding in tertiary education organisations

	2010	2014	2015
Performance-Based Research Fund	87%	89%	84%
Centres of research excellence	12%	10%	15%
Other	0.9%	0.5%	0.4%

Note: Figures may not add to 100 due to rounding.
Source: Tertiary Education Commission.

Figure 2.2 Distribution of Vote Tertiary Education research funding to tertiary education organisations



UNIVERSITY PERFORMANCE-BASED RESEARCH FUND EXTERNAL RESEARCH INCOME

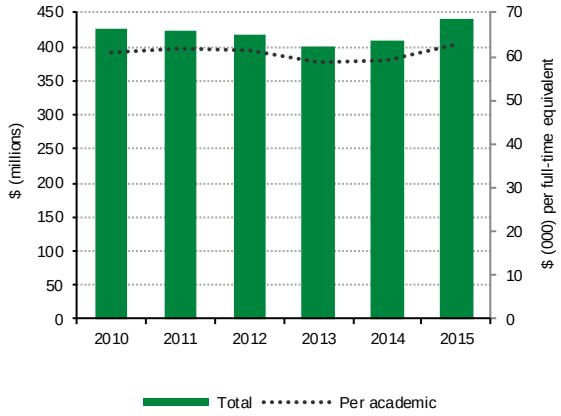
In 2015, the amount of inflation-adjusted Performance-Based Research Fund external research income increased for the second year in a row, following four years of decline. External research income is now 10 percent above its low point in 2013.

Inflation-adjusted external research income per academic staff in 2015

		% change 2010-15	% change 2014-15
Total $ (millions)	442	+3.7	+8.0
Per academic staff member $ (000)	63	+3.2	+6.5

Notes:
1. This measure is based on the minimum number of academic full-time equivalent staff with the following designations: professor, associate professor, senior lecturer, lecturer and research only staff. It uses external research income as reported in the Performance-Based Research Fund. This differs from the external research income figures reported above.
2. The Consumers Price Index had been used to deflate the external research income into 2015 dollars.
Source: Tertiary Education Commission and Ministry of Education.

Figure 2.3 University inflation-adjusted external research income per academic staff member



RESEARCH CONTRACT INCOME IN UNIVERSITIES

Research contract income in universities fell by 7.6 percent between 2011 and 2013. Income from government and overseas both fell, while income from the private sector remained unchanged. As a percentage of their operating revenue, the value of research contracts was 12 percent in 2013, down from 14 percent in 2011. A change in the way government distributes research funding via Vote Science and Innovation contributed to the decline in university external research income in 2013.

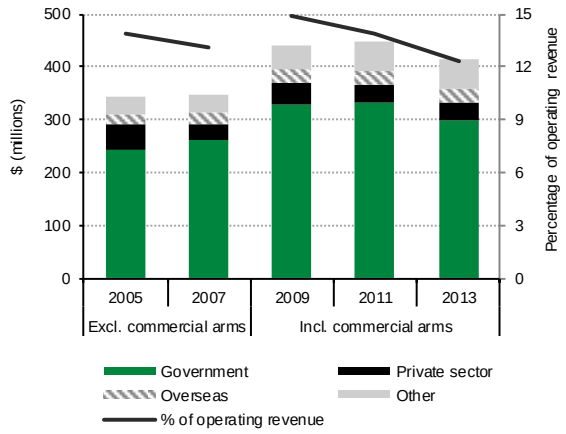
University research contract income by source in 2013

	$ (millions)	% change 2011-13
Government	298	-10
Private sector	33	No change
Overseas	27	-6.9
Other	56	No change
Total	415	-7.6

Notes:
1. 'Government' includes government agencies, Crown research institutes and local government.
2. 'Private sector' includes state owned enterprises.
3. 'Other' includes funding from other tertiary education institutions, gifts and endowments.
4. The Research and Development Survey is held biennially.
5. Before 2009, the data for university commercial arms was not included in the university data so care should be taken in comparing between these time periods.

Source: Statistics New Zealand, *Research and Development Survey*.

Figure 2.4 University research contract income by source



DISTRIBUTION OF RESEARCH CONTRACT INCOME IN UNIVERSITIES

In 2013, the government was the largest source of research contract funding for universities. The government funding reported here includes funding through Vote Science and Innovation administered by the Ministry of Business, Innovation and Employment, the Health Research Council and the Royal Society of New Zealand. Research contract funding from private businesses in New Zealand was the next largest single source of research contract funding.

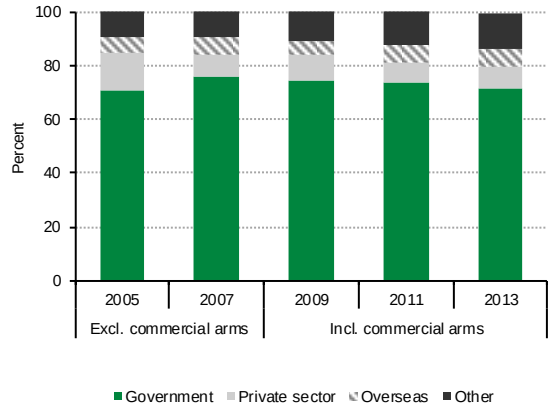
Percentage of university research contract income by source

	2009	2011	2013
Government	75%	74%	72%
Private sector	9.3%	7.3%	8.0%
Overseas	5.4%	6.5%	6.5%
Other	11%	12%	13%

Notes:
1. 'Government' includes government agencies, Crown research institutes and local government.
2. 'Private sector' includes state owned enterprises.
3. 'Other' includes funding from other tertiary education institutions, gifts and endowments.
4. The Research and Development Survey is held biennially.
5. Before 2009, the data for university commercial arms was not included in the university data so care should be taken in comparing between these time periods.
6. Figures may not add to 100 due to rounding.

Source: Statistics New Zealand, *Research and Development Survey.*

Figure 2.5 Distribution of university research contract income by source



UNIVERSITY RESEARCH EXPENDITURE

The value of the expenditure on research and development by universities decreased 2.3 percent between 2011 and 2013. As a percentage of gross domestic product, this represented 0.36 in 2013, compared to 0.40 in 2011.

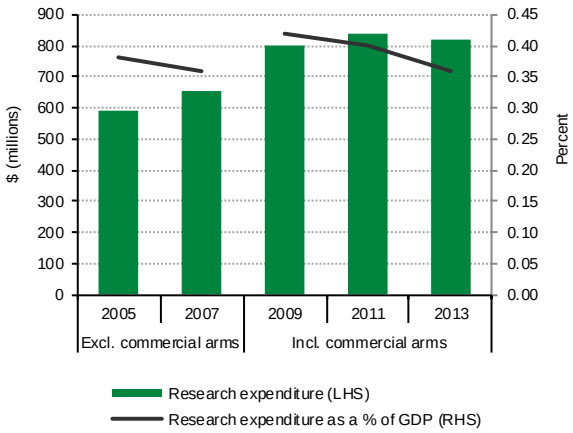
University research and development expenditure 2013

		% change 2011-13
Total $ (millions)	817	-2.3
	2011	2013
As a % of gross domestic product	0.40	0.36

Notes:
1. The Research and Development Survey is held biennially.
2. Prior to 2009, the data for the university commercial arms was not included in the university data so care should be taken in comparing between these time periods.

Source: Statistics New Zealand, *Research and Development Survey.*

Figure 2.6 University research and development expenditure



UNIVERSITY RESEARCH EXPENDITURE BY TYPE

In 2013, basic research was the largest type of expenditure on research and development in universities. As a proportion of total research expenditure, basic research increased from 49 percent in 2011 to 52 percent in 2013. Expenditure on experimental development decreased from 16 percent in 2009 to 9 percent in 2013.

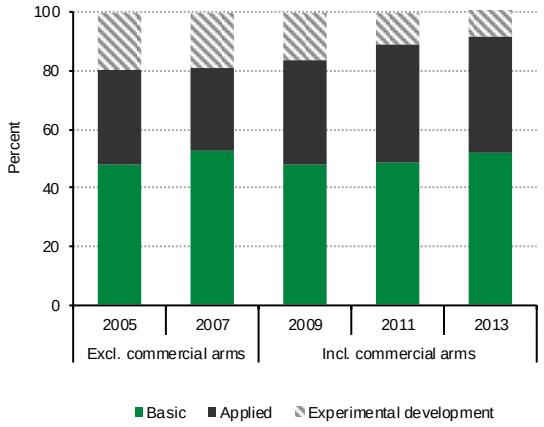
Distribution of university research and development expenditure by type

	2009	2011	2013
Basic	48%	49%	52%
Applied	36%	40%	40%
Experimental development	16%	11%	9%

Notes:
1. The Research and Development Survey is held biennially.
2. Before 2009, the data for university commercial arms was not included in the university data so care should be taken in comparing between these time periods.

Source: Statistics New Zealand, *Research and Development Survey.*

Figure 2.7 University research and development expenditure by type



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