MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

Analysing the performance of New Zealand universities in the 2010 Academic Ranking of World Universities

New Zealand Government

Tertiary education occasional paper 2010/07

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Acknowledgements
The author gratefully acknowledges comments provided by Brett Parker and Roger Smyth from the Ministry of Education. The author also gratefully acknowledges Mieke Wensvoort, who proof-read this report.

All views expressed in this paper, and any remaining errors or omissions, remain the responsibility of the author.

Published by
Tertiary Sector Performance Analysis and Reporting
Strategy and System Performance
MINISTRY OF EDUCATION

This paper is available from the Ministry of Education's Education Counts website:
www.educationcounts.govt.nz

September 2010

ISSN 1179-5026 (online)

ANALYSING THE PERFORMANCE OF NEW ZEALAND UNIVERSITIES IN THE 2010 ACADEMIC RANKING OF WORLD UNIVERSITIES

KEY FINDINGS

This occasional paper examined the results of the 2010 Shanghai Jiao Tong University Academic Ranking of World Universities (ARWU). The results showed that:

- The published 2010 ARWU results show that the overall ranking of The University of Auckland and the University of Otago was between 201 to 300 in the world top 500, while Massey University, the University of Canterbury and Victoria University of Wellington were ranked between 401 and 500.
- Analysis by the Ministry of Education of the underlying data used to generate the ARWU top 500 rankings shows that the top-ranked New Zealand university was The University of Auckland (210), followed by the University of Otago (295), Massey University (460), University of Canterbury (460) and Victoria University of Wellington (471).
- Focusing on the 'per capita' component measure in the ARWU, which attempts to take account of performance on a per academic staff member basis, analysis by the Ministry of Education shows that New Zealand universities are generally ranked higher among the top 500 universities, compared with the overall rankings.
- Analysis by the Ministry of Education of the underlying ARWU data shows that four of the five New Zealand universities dropped places in the 2010 top 500 overall rankings compared with the previous year, while the average ranking for the Australian Group of Eight universities improved. Using the ARWU 'per capita' component measure, which attempts to take into account of the performance of universities on a per academic staff member basis, the ranking of three out of the five New Zealand universities improved in the 2010 rankings.
- In terms of a country's share of universities in the ARWU top 500, once share of the world economy is taken into account, New Zealand ranked first in the world. When taking into account our share of the world's population, New Zealand ranked eighth in the world.

2010 Academic Ranking of World Universities

This occasional paper analyses the performance of the New Zealand universities in the 2010 Academic Ranking of World Universities (ARWU), published by the Shanghai Jiao Tong University. Each year, the release of these rankings generates worldwide interest. However, the focus on the overall rankings can mask important underlying trends in the performance of New Zealand universities, so a more comprehensive analysis of their performance is important.[1]

Like all systems that attempt to arrive at an overall ranking for institutions, the ARWU has a number of limitations.[2] On the other hand, the ARWU has the advantage of being built on a

[1] An earlier Ministry of Education report – *What do international rankings tell us about the performance of New Zealand universities?* – examined the performance of the New Zealand universities in the ARWU between 2006 and 2009.
[2] For a more detailed discussion of these limitations, see Smart (2010) *What do international rankings tell us about the performance of New Zealand universities?*

relatively stable suite of component measures over time. The university rankings are determined using a weighted score of six individual measures: the number of highly cited researchers, the number of alumni of the university who have received awards, the number of faculty of the university who have received awards, the number of indexed publications in *Nature* and *Science* and the number of publications in Thomson Reuters' *Science* and *Social Science indices*.[3] The sixth measure generates a weighted per academic staff member score for the preceding five measures.

There are two key points to note about the measures used in the ARWU. First, they all relate to research performance. Second, five of the six measures are based on totals of publications or people, with no adjustment for the size of the institution concerned. This biases the results in favour of larger institutions, who may, or may not be the most productive institutions.

The analysis that follows contains the results for five of New Zealand's universities. The Auckland University of Technology, Lincoln University and The University of Waikato sit outside the ARWU top 500, so no data is available to analyse their performance.

The analysis in this paper also includes the average performance of the Australian Group of Eight (G8) universities.[4] These are the largest research-intensive Australian universities and provide a useful benchmark for the New Zealand universities.

Ranking of New Zealand universities

The ARWU does not publish the individual rankings of universities that are outside of the top 500. The rankings for these universities are reported in blocks with the universities ranked in alphabetical order. As all of the New Zealand universities are ranked outside of the top 100, the methodology used to determine the rankings in the ARWU has been applied by the Ministry of Education to the published raw data to generate the derived rankings for the New Zealand universities.[5] This methodology applies a weighting to each of the six component measures to arrive at an overall weighted score. This weighted score is then rebased, with the top-performing university being assigned a score of 100.

The published results for the 2010 ARWU show that the University of Auckland and the University of Otago were ranked between 201 to 300 in the top 500 universities, while Massey University, the University of Canterbury and Victoria University of Wellington (VUW) were ranked between 401 and 500.[6]

The individual rankings of the New Zealand universities derived by the Ministry of Education from the underlying data published in the 2010 ARWU are presented in Table 1 and show that The University of Auckland (210) is the highest ranked New Zealand university, followed by the University of Otago (295). The lowest of the New Zealand universities within the top 500 is Victoria VUW, with a ranking of 471.

The University of Canterbury had the largest fall in ranking from 2009 to 2010, dropping by 38 places to 460. In total, three of the five New Zealand universities in the top 500 had a drop in ranking. The average fall in ranking for the New Zealand universities was 13 places. This compared with a rise of eight places in the average ranking of the Australian G8 universities.

Over the period between 2006 and 2010, the average drop in places by New Zealand universities was 18, with the largest individual drop exhibited by Massey University (55

[3] Each measure is defined in more detail in Table 3 in the Appendix.
[4] The Group of Eight are: University of Melbourne, University of Sydney, University of New South Wales, University of Adelaide, Monash University, University of Queensland, Australian National University and the University of Western Australia.
[5] The raw data used to derive these rankings can be found at www.arwu.org.
[6] Source: www.arwu.org.

places).[7] The University of Auckland is the only New Zealand university with a higher ranking in 2010 compared with 2006. During this period, the average ranking of the G8 universities improved by 13 places.

Table 1

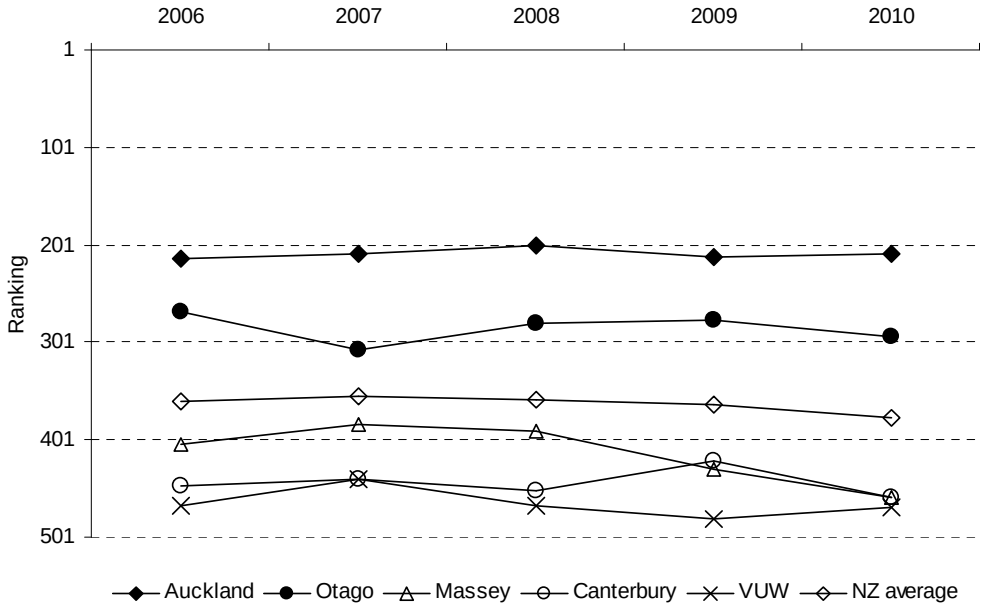
Overall ranking of New Zealand universities in the Academic Ranking of World Universities

University	2006	2007	2008	2009	2010	Δ ranking 2009-2010	Δ ranking 2006-2010
Auckland	216	210	202	214	210	↑ 4	↑6
Otago	270	308	281	279	295	↓ 16	↓ 25
Massey	405	385	393	431	460	↓ 29	↓ 55
Canterbury	448	441	453	422	460	↓ 38	↓ 12
VUW	468	441	468	482	471	↑ 11	↓ 3
NZ average	**361**	**357**	**359**	**366**	**379**	**↓ 13**	**↓ 18**
G8 average	134	132	133	129	121	↑ 8	↑ 13

Note: 1. The ARWU does not publish the individual rankings of universities that are outside of the top 100. The rankings for these universities are reported in blocks with the universities ranked in alphabetical order. As all of the New Zealand universities are ranked outside of the top 100, the methodology used to determine the rankings in the ARWU has been applied by the Ministry of Education to the published raw data to generate the derived rankings for the New Zealand universities. The raw data is available at www.arwu.org. 2. This table has been revised.

Figure 1

Overall ranking of New Zealand universities



[7] The reason for Massey University's drop in performance appears to be a result of a fall in their relative PUB measure.

Ranking of New Zealand universities based on the Academic Ranking of World Universities 'per capita' measure

The ARWU rankings include a component measure that attempts to represent the performance of universities on a per academic staff member basis.[8] This is the 'per capita' measure which is generated by taking the weighted scores of the other five component measures and dividing by the number of full-time equivalent academic staff. Note that in cases where there is no data available on the number of academic staff, the original weighted score of the five other ARWU components has been used. So the results discussed in this section should be viewed with this caveat in mind.

The results in Table 2 show that in this component measure, the University of Otago is the top-ranked New Zealand university in 2010 in 98th place, followed by the University of Auckland in 238th place. Between 2009 and 2010, three of the five New Zealand universities improved their ranking in this component measure, compared with just two New Zealand university in the overall rankings presented in Table 1. Notably, since 2007, the University of Otago has improved 63 places and it is now ranked within the top 100. In addition, the performance of the University of Otago in 2010 is above the G8 university average.

Table 2

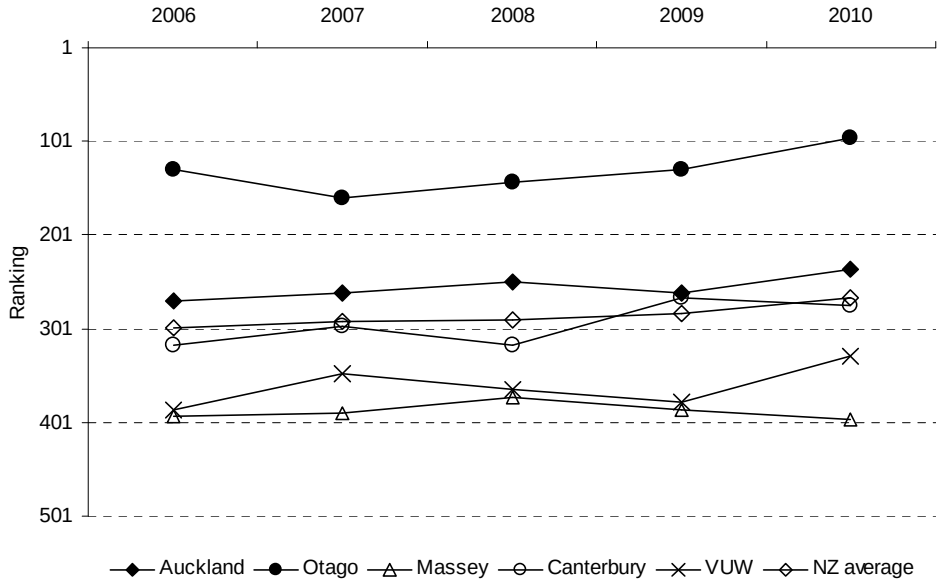
Ranking of New Zealand universities based on the Academic Ranking of World Universities 'per capita' measure

Universities	2006	2007	2008	2009	2010	Δ ranking 2009-2010	Δ ranking 2006-2010
Otago	131	161	144	131	98	↑ 33	↑ 33
Auckland	271	262	251	263	238	↑ 25	↑ 33
Canterbury	318	299	319	268	277	↓ 9	↑ 41
VUW	388	349	366	379	331	↑ 48	↑ 57
Massey	395	392	374	387	398	↓ 11	↓ 3
NZ average	301	293	291	286	268	**↑ 18**	**↑ 33**
G8 average	130	128	123	114	100	↑ 14	↑ 30

Note: 1. To generate the rankings, the universities in the ARWU top 500 have been ranked from highest to lowest based on their 'per capita' score. The 'per capita' score for each university can be found at www.arwu.org. 2. This table has been revised.

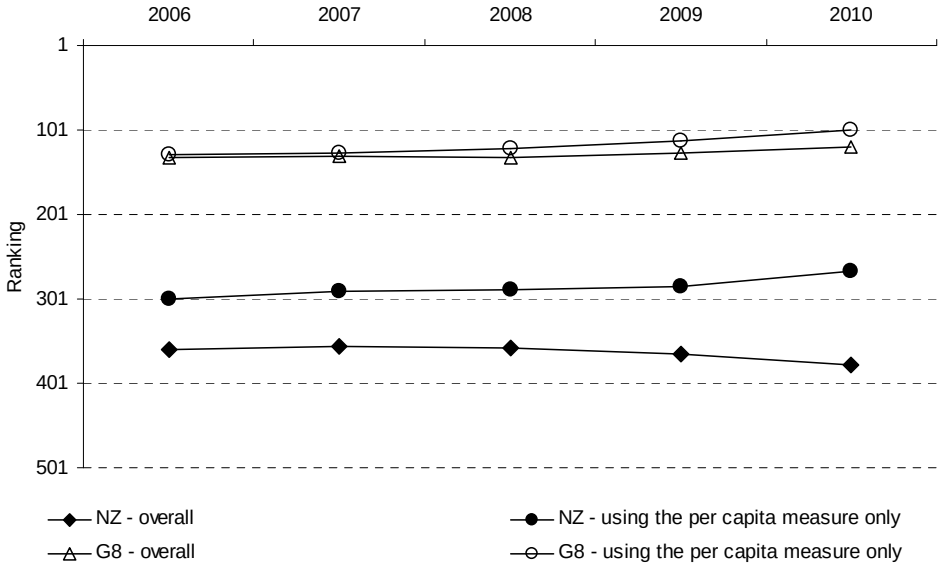
[8] This is the 'per-capita' measure in Table 3 in the Appendix.

Figure 2
Ranking of New Zealand universities based on the Academic Ranking of World Universities 'per capita' measure



The average ranking of the New Zealand universities in both overall and 'per capita' rankings is compared to the average performance of the G8 universities in Figure 3. The G8 universities have increased their average ranking in both the overall and 'per capita' rankings, with their biggest improvement coming in the latter measure. However, the smaller New Zealand universities have experienced a decrease in their average overall ranking, especially since 2008, while their 'per capita' ranking has increased over the same period. Clearly, once the size of an institution is taken into account, the performance of New Zealand universities has been much better than the indication given by the overall rankings.

Figure 3
Average ranking of New Zealand and G8 universities



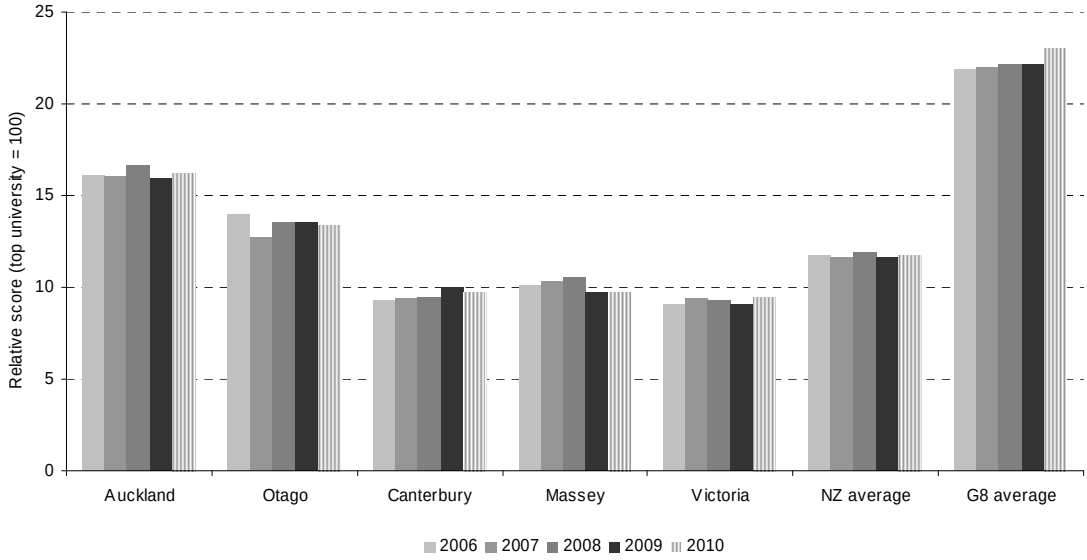
The performance of New Zealand universities relative to the world's top university

Instead of focussing on overall ranking, in Figure 4 we show the performance of the New Zealand universities relative to the world's top performing university (Harvard University) using the overall weighted score that determines the final ranking of universities. This gives a sense of how the New Zealand universities are performing compared to the top university, as opposed to focusing on their position in the overall rankings. The score for the top-performing university is set at 100, with the performance of the other universities placed relative to this benchmark. As all of the New Zealand universities are ranked outside of the top 100, the methodology used to determine the relative score in the ARWU has been applied to the published raw ARWU data to generate a derived relative score for each of the New Zealand universities.

A feature of Figure 4 is the relative stability of the performance of each of the New Zealand universities to the world's top-performing university. There is little evidence that the performance of the New Zealand universities has changed significantly over the period. However, the G8 universities have appeared to improve, on average, in 2010. A significant increase in the relative score in the Thomson Reuters journal publication measure influenced this result. This increase in journal publication may be related to the introduction of the Excellence in Research Australia (ERA) research measurement exercise.

Figure 4

Relative overall scores of New Zealand universities



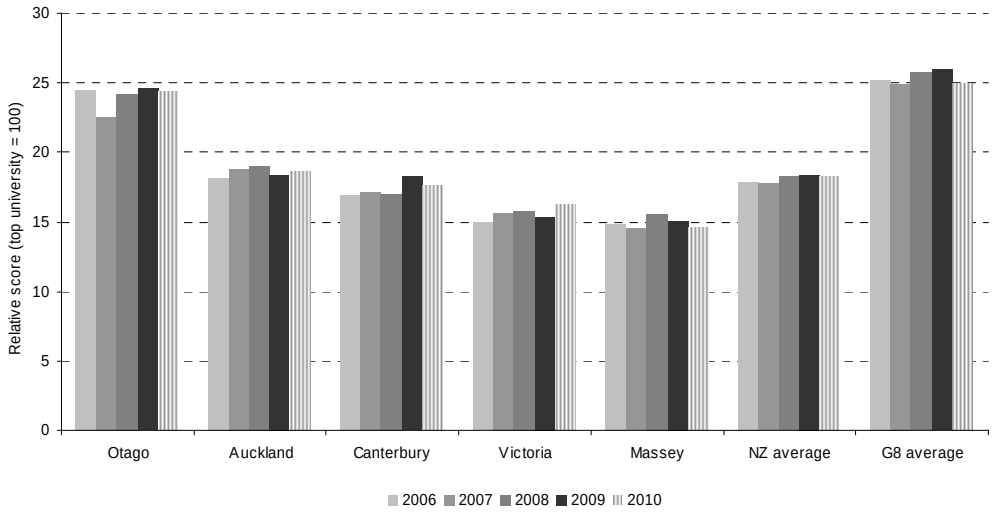
The performance of New Zealand universities relative to the world's top university based on the ARWU 'per capita' measure

The relative scores from the ARWU 'per capita' component measure for the New Zealand universities are presented in Figure 5. The score is relative to the top-ranked institution (in this case the California Institute of Technology) which received a score of 100. Note that in cases where there is no data available on the number of academic staff, the original weighted score of the five other ARWU components is used. So the results discussed in this section should be viewed with this caveat in mind.

In this measure the performance of New Zealand universities once again shows little evidence of any significant change over time. The average G8 universities per academic staff member score fell in 2010. One possible explanation is that the G8 universities improved their overall ranking through an increase in the size of their institutions in 2010, not necessarily by getting more productive.

Figure 5

Relative scores of New Zealand universities using the ARWU 'per capita' measure

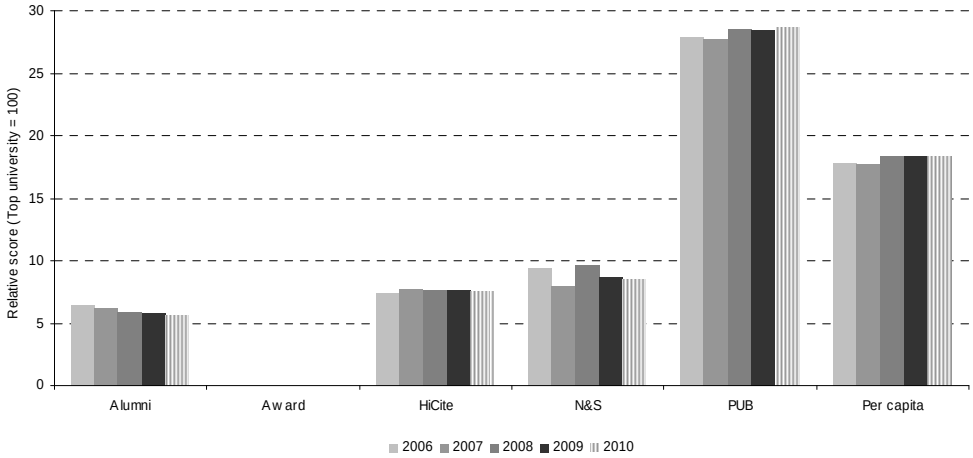


The average performance of New Zealand universities in the six measures used in the Academic Ranking of World Universities

The average performance of New Zealand universities in each of the six component measures of the ARWU is illustrated in Figure 6, with each score relative to the best performing university for each measure. The category titles in Figure 6 are allocated as follows: the number of highly cited researchers (HiCite), the number of alumni of the university who have received awards (Alumni), the number of faculty of the university who have received awards (Awards), the number of indexed publications in *Nature* and *Science* (N&S), the number of publications in the Thomson Reuters *Science* and *Social Science indices* (PUB) and a weighted per academic staff member score for all five measures (Per capita).

Figure 6 shows that the average performance of the New Zealand universities was stable in 2010, with little change in the average relative score in each of the six component measures.

Figure 6
Average performance of New Zealand universities in the six measures in the Academic Ranking of World Universities

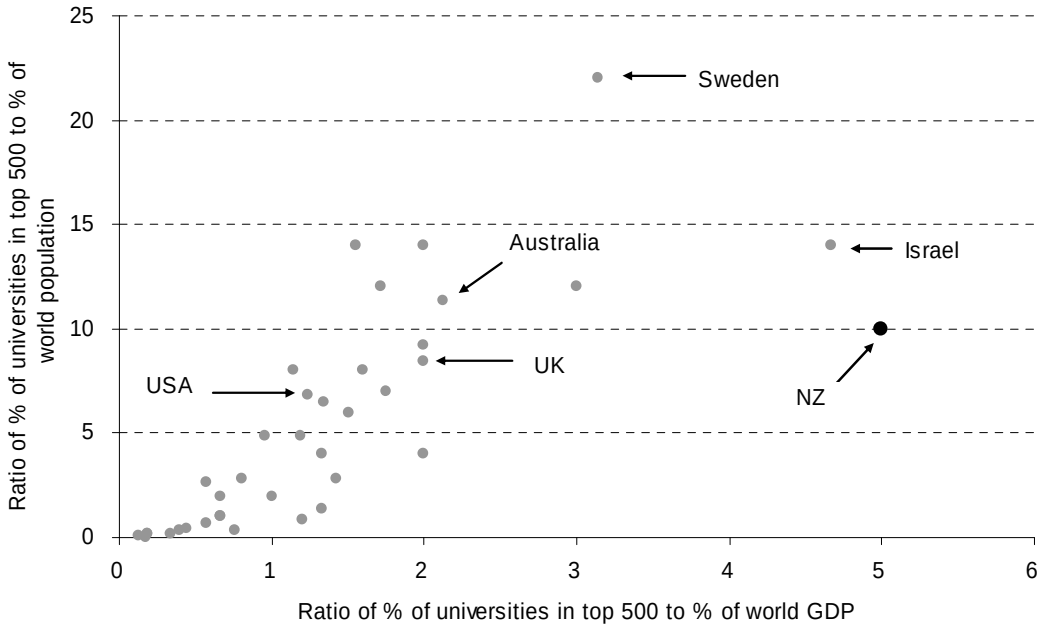


The performance of New Zealand universities taking into account the size of New Zealand's economy and population

Another way of interpreting the ARWU results is to take into account the size of an economy or the size of a country's population. Figure 7 presents country-level results with this adjustment. Figure 7 presents the ratio of a country's percentage share of universities in the top 500 by their share of world gross domestic product and world population.

The results in Figure 7 show that New Zealand has a share of universities in the top 500 of 1 percent, which is five times our share of world gross domestic product (0.2 percent) and makes it the top-performing country using this metric. Once you take into account the relative wealth of the economy, then New Zealand universities perform well. However, the performance of New Zealand is not as strong when taking account share of population. New Zealand is ranked eighth using this measure and is behind Australia.

Figure 7
Country performance in the 2010 Academic Ranking of World Universities



Conclusion

The performance of the New Zealand universities in the 2010 Academic Ranking of World Universities is once again reasonably strong, especially when the size of its economy is taken into account. Although the average ranking of listed New Zealand universities fell in 2010, the average ranking for New Zealand universities also fell over the last five years, whereas the average for the Australian G8 universities improved. When focusing on the rankings of universities using only the ARWU 'per capita' measure, the performance of the majority of New Zealand universities actually improved in 2010 and over the last five years.

Appendix

Table 3
Definitions of measures used in the 2010 Academic Ranking of World Universities

Component	Weight	Definition
Alumni	10%	The total number of the alumni of an institution winning Nobel Prizes and Fields Medals. Alumni are defined as those who obtain bachelors, masters or doctoral degrees from the institution. Different weights are set according to the periods of obtaining degrees. The weight is 100% for alumni obtaining degrees after 1991, 90% for alumni obtaining degrees in 1981-1990, 80% for alumni obtaining degrees in 1971-1980, and so on, and finally 10% for alumni obtaining degrees in 1901-1910. If a person obtains more than one degree from an institution, the institution is considered once only.
Award	20%	The total number of the staff of an institution winning Nobel Prizes in physics, chemistry, medicine and economics and Field Medals in mathematics. Staff is defined as those who work at an institution at the time of winning the prize. Different weights are set according to the periods of winning the prizes. The weight is 100% for winners after 2001, 90% for winners in 1991-2000, 80% for winners in 1981-1990, 70% for winners in 1971-1980, and so on, and finally 10% for winners in 1911-1920. If a winner is affiliated with more than one institution, each institution is assigned the reciprocal of the number of institutions. For Nobel prizes, if a prize is shared by more than one person, weights are set for winners according to their proportion of the prize.
HiCite	20%	The number of highly-cited researchers in 21 subject categories. These individuals are the most highly cited within each category. The definition of categories and detailed procedures can be found at the website of Thomson Reuters.
Nature & Science (N&S)	20%	The number of papers published in the journals Nature and Science between 2005 and 2009. To distinguish the order of author affiliation, a weight of 100% is assigned for corresponding author affiliation, 50% for first author affiliation (second author affiliation if the first author affiliation is the same as corresponding author affiliation), 25% for the next author affiliation, and 10% for other author affiliations. Only publications of 'Article' and 'Proceedings Paper' types are considered
Publications (PUB)	20%	Total number of papers indexed in Science Citation Index-Expanded and Social Science Citation Index in 2009. Only publications of 'Article' and 'Proceedings Paper' types are considered. When calculating the total number of papers of an institution, a special weight of two was introduced for papers indexed in Social Science Citation Index.
Per capita	10%	The weighted scores of the above five indicators divided by the number of full-time equivalent academic staff. If the number of academic staff for institutions of a country cannot be obtained, the weighted scores of the above five indicators is used.
Overall	**100%**	

Source: www.arwu.org

References

Smart W. (2010) *What do international rankings tell us about the performance of New Zealand universities?* Ministry of Education: Wellington.