THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Commentary

The Global Financial Crisis: Why universities are critical to our recovery

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In previous issues of Commentary we discussed the characteristics of research-led universities, and the importance of supporting and investing in such institutions in New Zealand. In this issue, we look at the research undertaken by our universities and the positive contribution that this research makes to economic growth. We do so with particular awareness of the current financial climate.

The pressing issue of growth

'In a time of crisis, it is not the moment to take a break in research investments and in innovation.'[1]

The effects of the financial crisis currently underway are being felt in many countries, including New Zealand. Declining consumption and growth, growing unemployment, falling property values, and dwindling investor confidence are common symptoms of a period of economic history predicted to last for at least several years to come.

The exact course of this recessionary period is unknown; however it need not be all bad news. The traditional view of economists is that, because of lower opportunity costs due to reduced productivity, recessionary times allow firms to invest in research and development.[2] Studies show that countries experiencing a large and rising share of growth, and hence living standards, over recent decades have achieved this significantly as a result of innovation.[3]

With this in mind, and with a strong desire to mitigate the worst outcomes, world leaders are taking bold steps to keep their economies afloat and the majority of people employed.

Common to stimulus packages being announced in China, Europe, and the US, amongst others, is an emphasis on tax relief, job protection and creation, a commitment to improving infrastructure – and a focus on research and development. China is focusing its US$600 billion stimulus package on retraining migrant workers, enabling its companies to better serve domestic and international markets, and dramatically expanding its subsidies for research and development in key areas, such as new energy, new materials, and biotechnology.[4] Under a stated goal of moving science and technology to the forefront of the economy, the US has allocated more than US$15 billion to basic and applied research, science facilities and infrastructure.[5] Included within this is a significant financial boost for health research (US$10 billion), coupled with a lifting of restrictions on the funding of research using stem cells.

Such measures are designed to encourage innovation and continuous improvement, and to ensure the advancement of knowledge and of human capital for more prosperous times ahead.

Issues for New Zealand

New Zealand needs to make a similar connection between research and long-run growth because we have several unique challenges:

- We are one of the most isolated nations in the world. A 3.5-hour flight (typical one-day business return flight) from Auckland reaches only 0.4 percent of world population and 1 per cent of world GDP.[6] By way of comparison, a 3.5-hour flight from Hong Kong will reach 42 percent of the world's population and 32 percent of the world's GDP.
- Our exports have changed little over the last 25 years. In 1980, our top five exports were meat, wool, butter, milk/cream and aluminium. Today they are meat, milk/cream, aluminium, cheese and fruit/nuts.[7]

[1] Joint statement by Janez Potočnik and Gunter Verheugen, European Union Commissioners for R&D and Industry. Reported in Science Business, 22 January 2009.

[2] Aghion, P and Saint-Paul, G, 1991. 'On the virtue of bad times: An analysis of the interaction between economic fluctuations and productivity growth'. Centre for Economic Policy Research Discussion Papers 578.

[3] Australian Government, Treasury, 2003. 'Sustaining growth in Australia's living standards'.

[4] New York Times, 16 March 2009. 'In downturn, China sees path to growth'.

[5] Committee on Appropriations, US House of Representatives. Released 15 January 2009. Available online: http://appropriations.house.gov/pdf/PressSummary01-15-09.pdf

[6] The New Zealand Institute, July 2006. The flight of the Kiwi: going global from the end of the world.

- The value to weight ratio of our goods has remained largely unchanged for 20 years, while over the same period costs of shipping and air freight have not declined in real terms.[8] Thus we continue to be exporters of high volume/low value commodities but can anticipate no reductions in the costs of exporting those commodities to distant markets.
- The real prices achieved by our major exports continue to. The real prices obtained for agricultural commodities have fallen by nearly 50 per cent since the 1960s. While some commodity markets, most notably dairy, have recently enjoyed improved conditions, intense global competition and the efficiencies flowing from technological improvements mean there is unlikely to be a reversal of the historical decline in commodity pricing levels.[9]

What all this means is that, as well as building innovation into our primary and existing manufacturing industries, we must create new opportunities for economic growth via novel services and products developed from high quality research. What is needed is a balanced approach to the economic development of New Zealand, including the role of research - across the spectrum from basic to applied research and development.

University research and economic development

There is a view in some quarters that most university research is done to support teaching and thus is of little value in its own right. The reality is that universities are one of the most important sectors contributing to research that is of real economic, as well as social and environmental benefit.

International evidence over many years has shown the relationship between university education and research, and economic growth. Within the United States, this relationship is well documented: 'Without question, the most important institution in American basic research is the research university.'[10] Studies into the impact of education on US economic growth found that more than half of the economic growth between 1929 and 1969 could be attributed to growth in education.[11] Improvements in average levels of schooling are estimated to be responsible for 10 - 25 percent of this, with the remainder attributable to the creation of new knowledge.[12]

A 2006 study into regional performance in the UK confirmed the economic impact of university research, correlating degree - level qualifications and patent applications, and supporting the proposition that 'dynamic knowledge - driven economies that rely on ideas, innovation, institutional and organisational change and adaptability need high calibre human capital'.[13]

A proven source of radical innovation is the fundamental research conducted at universities, because it is the new knowledge generated by investigator-led research that has the greatest chance of producing fundamental new insights. To cite just one example, of the 16 drugs produced in New Zealand that have gone through FDA - approved clinical trials, 13 came out of university research.[14]

These represent new opportunities created by fundamental research. The OECD has confirmed the importance of the basic untargeted research undertaken within universities, estimating that the spillover effects from public research have a 40 percent greater impact on the entire economy than those resulting from private sector research.[15]

The New Zealand university contribution to research

The New Zealand research sector is significant, with approximately $1.8 billion spent each year on research and development spanning a variety of areas including agriculture, forestry and fishing, health, infrastructure, and industrial development.

Approximately 40 percent of the research performed each year is 'applied research' (ie original investigation to acquire new knowledge, directed towards a specific practical aim and developed into operational form). A further third is what is termed 'basic targeted' (experimental or theoretical research to acquire new knowledge focused on a strategic need). The remainder is research drawing on existing knowledge directed towards producing new materials, products and devices (22 percent) or basic untargeted research - that is, experimental research to acquire new knowledge (6 percent).[16]

New Zealand's universities are active in all of these forms of research. The contribution of the university sector to research can be assessed by looking at both inputs (research expenditure, personnel engaged in research) and outputs (research publications, patents, commercialisation of intellectual property, new researchers).

Research expenditure

As shown in Figure 1, approximately 37 percent of New Zealand's total gross expenditure on R&D in 2005/06 was undertaken by the universities, up from 28 percent in 1995/96. A further 37 percent was accounted for by the business sector and the remaining 26 percent by the Crown Research Institutes (CRIs).[17]

Research personnel

As shown in Table 1, approximately 13,800 full-time equivalent research staff are employed in the higher education (predominantly the universities), government, and business sectors. Nearly twice the numbers of researchers are employed in each of the higher education and business sectors as are employed in the government sector (including CRIs).

In addition, the universities educate large numbers of research postgraduates engaged in original supervised research. In some cases these students are jointly supervised by university and CRI staff (or clinical researchers in hospitals). Many research students also work in collaborative projects with business. Although there are no data on graduates specifically 'produced' for the research workforce, as shown in Table 2, the vast majority of postgraduates are from within the university sector.

[7] The New Zealand Institute, September 2007. Creating a weightless economy: positioning New Zealand to compete in the global economy.

[8] The New Zealand Institute, March 2007. So far yet so close: connecting New Zealand to the global economy.

[9] FAO, 2005. The State of Agricultural Commodity Markets (SOCO) 2004.

[10] Committee for Economic Development, 1998. America's Basic Research: Prosperity through Discovery.

[11] Denison, E, 1974. Accounting for United States Economic Growth, 1929-1969.

[12] Joint Economic Committee Study, (2000). Investment in Education: Private and Public Returns.

[13] Office of the Deputy Prime Minister, 2006. State of the English Cities.

[14] MoRST Biotechnology Roadmap, 2007.

Table 1: Full-time equivalent research staff by sector (2006)[18]

Occupation	Higher education	Business	Government	All sectors
Researcher	3,277	3,690	1,814	8,781
Technician	629	1,512	1,005	3,146
Support	1,549	16	298	1,863
Total staff	5,455	5,218	3,117	13,790
Research postgraduates	8,454	-	-	8,454

Figure 1: Composition of Gross Expenditure on R&D by sector 1995/6 - 2005/06

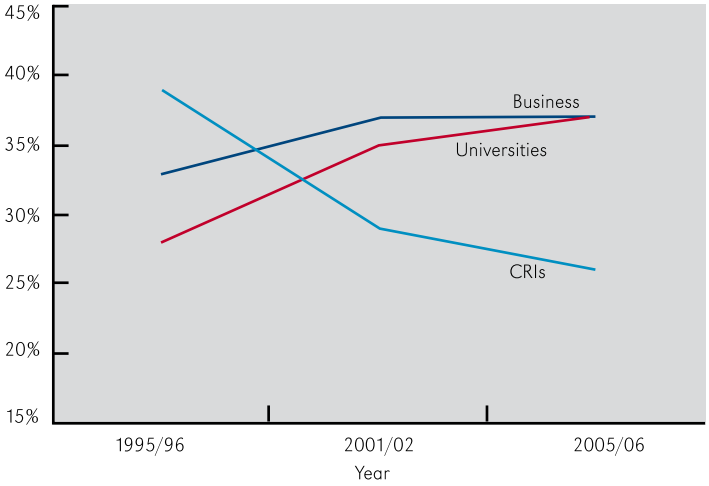

Figure 2: Number of papers published by New Zealand sector (1997, 2000 and 2003)[20]

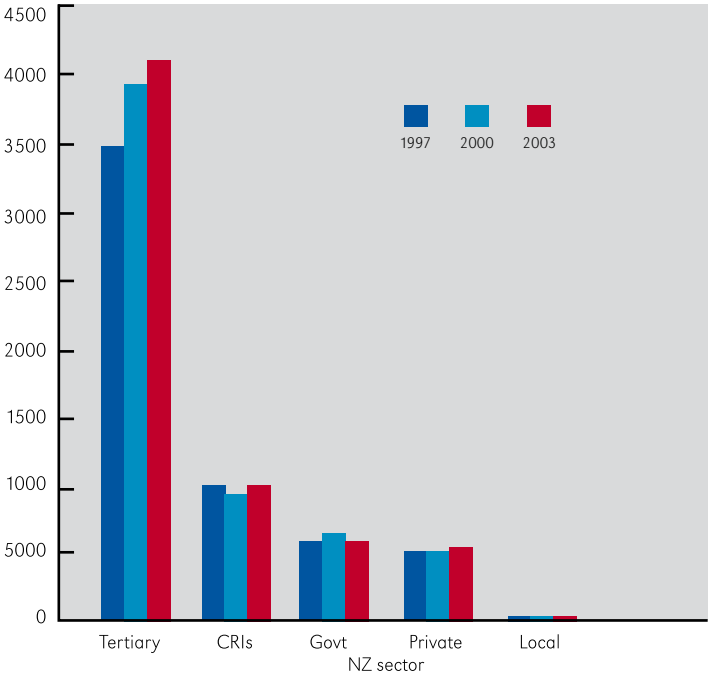

Table 2: New Zealand masters and doctoral graduates by institution type (2007)[19]

Type of tertiary institution	Masters graduates	Doctoral graduates
Universities	3,578	756
Institutes of Technology and Polytechnics, and Wānanga	120	1

Research publications

As shown in Figure 2, the tertiary sector (predominantly universities) produces about three times the number of publications of the CRI sector and twice the number generated by the whole government sector. While CRI/government publications output was essentially static in the period 1997-2003, it increased by 14 percent in the tertiary sector.

Patents and commercialisation

One common response to the publications data presented here is the claim that publications are an inherently academic activity (the term here being used in a pejorative sense), and the assertion that the real value comes from exploiting intellectual property. The university sector fully appreciates the importance of exploiting intellectual property – indeed the track record of the sector demonstrates how universities have very successfully contributed to New Zealand's intellectual property landscape. For example, in the seven years to 31 December 2008 a total of 191 patent applications were filed in the name of the universities and 217 in the name of CRIs.[21]

Over the last 20 years the commercialisation arms of New Zealand's universities have grown to become a business worth $350 million a year.[22] These organisations are involved both in contract research that supports business development and in the commercialisation of intellectual property generated from universities through such activities as licensing and the creation of start-up companies. Between 2003 and 2006, over

[15] Dominique Guellec and Bruno van Pottelsberghe de la Potterie, 'R&D and Productivity Growth: Panel Data Analysis of 16 OECD Countries,' OECD Economic Studies, No. 33 (2001).

[16] Data included in RS&T Scorecard November 2007; A Decade in Review, New Zealand R&D Survey 2006. Published by MoRST.

[17] Data included in RS&T Scorecard November 2007; A Decade in Review, New Zealand R&D Survey 2006. Published by MoRST.

[18] MoRST and Statistics New Zealand, 2007. Research and Development in New Zealand 2006.

[19] Ministry of Education, 2008. Gaining Qualifications, Education Counts.

[20] Ministry of Research, Science and Technology, 2006. National Bibliometric Report 2001 to 2004: International Benchmarking of New Zealand Research.

[21] Source: Database search conducted by Auckland UniServices Ltd of PCT filings in the Intellectual Property Office of New Zealand and Delphion databases.

[22] ibid

$155 million of capital was raised by universities for start-ups. In the same period, 29 new start-ups were formed, bringing the number operating to 44. The recent creation of the Trans Tasman Commercialisation Fund, which provides access to A$40 million to support commercialisation of intellectual property, is an example of what can be achieved by a New Zealand university.[23]

A 2006 study showed that per dollar invested, New Zealand universities produced more than twice as many new companies as the US average and over 50 percent more than Canada.[24] It is clear, therefore, that the universities are strongly involved in generating and capturing intellectual property. What is also clear, however, is that without adequate investment and strong connections between universities and the wider community - enabling the sharing of ideas and the uptake of innovation - university research represents a potentially undervalued resource for New Zealand.

What needs to be done?

New Zealand's science and innovation profile is ahead of the OECD average in key areas, including number of scientific articles, patents with foreign co-inventors and the number of researchers. We have an open economy, with highly competitive firms, a flexible workforce and established markets – all important foundations for advancing an innovative economy.[25]

We have already taken strong and positive steps toward creating a balanced and cooperative platform for research. Initiatives such as the Centres of Research Excellence (CoREs) have done much to encourage world-class research, while the Health Research Council, the Marsden Fund and the New Economy Research Fund, amongst others, provide the funding basis for many of our most successful research projects and programmes. Strategic and competitive funding mechanisms help ensure that investment is clearly linked to the high quality research most likely to be of benefit to New Zealand.

However, our national investment in research and development remains low by international standards at 1.14 percent of GDP. This is approximately half the OECD average (2.25 percent) and places New Zealand in the bottom third of all OECD countries.[26] Despite modest improvements in the last decade or so, we need a higher level of investment in research and development, including investment by and within the business sector.

New Zealand needs a much greater commitment to investment in fundamental research. It is a mistake to believe that a country can develop new business opportunities other than by significant investment in fundamental research. Existing companies are (not surprisingly) focused on what they already do well. Spinouts, on the other hand, must develop the new areas on which they are founded if they are to survive and grow. In this regard, it is important to see fundamental research as just as much a key component of New Zealand's infrastructure as road, rail and broadband.

It is in the universities that fundamental research is concentrated, along with the training and development of many of this country's best researchers. New Zealand is an increasingly globally connected country. Ideas and people travel, and the advances we put in place reflect not only our own research efforts, but also those made abroad. As such, we also need to continue to invest in a highly educated workforce and research leadership with the capacity to identify, import, adapt and implement new ideas and technologies.

Starting from a low base, we have no time to lose. Many countries already well ahead of us are expanding their investment in research, despite the current economic climate.[27] A recent report on Australia's research capacity made strong recommendations on research funding and training to 'help ensure that Australia is building its national research to the level required to support further growth'.[28] This includes a recommendation that funding for R&D be incrementally raised over the next ten years to match the OECD average. New Zealand's ability to compete will be further reduced unless we similarly increase our activities and level of investment. Recent initiatives like the PreSeed Accelerator Fund and the International Investment Opportunities Fund (IIOF) are good starts – we need to continue to grow such funds and ensure their responsiveness to market needs.

Finally, as the world seeks to recover the fundamentals of a strong economy from the remains of the consumption-fuelled and ultimately illusionary growth experienced over the past 7 years or so, it may be worth recalling the following statement from 2004:

'Since the end of World War II, university research funded by the [US] federal government and industry has improved the quality of life for every American through inventions and innovations. This university research is one of the driving forces behind the United States' rise to its position as the world's only superpower.'[29]

Clearly the time has come for New Zealand, like the US, to rebuild its economy through investing in its fundamental knowledge institutions, the research universities.

[23] Auckland UniServices Limited, 16 June 2008. 'Trans Tasman Commercialisation Fund'. Available online: http://www.uniservices.co.nz/pageloader.aspx?page=1415d3d0d1

[24] Canterprise, 29 October 2006. 'Figures show NZ universities leaders in creating wealth'. Available online: http://www.cant.canterbury.ac.nz/news/UCONZ.shtml

[25] OECD Reviews of Innovation Policy: New Zealand 2007.

[26] OECD Reviews of Innovation Policy: New Zealand 2007.

[27] University World News, 22 March 2009. 'Australia: The global research race'.

[28] Commonwealth of Australia, December 2008. Building Australia's Research Capacity. Available online: http://www.aph.gov.au/house/committee/isi/research/report.htm

[29] Lynch, T and Aydin, N, 2004. Literature Review of the Economic and Social Impact of Higher Education Research Funding.

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