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Secretariat
Review of Australian Higher Education
Location 023
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HEReview@deewr.gov.au

Dear Secretariat,

Please find attached my submission for the Review of Australian Higher Education. Given my particular expertise I have confined my comments to "Higher education's role in the national innovation system".

Best regards,

Ted Maddess
Head Centre for Visual Sciences

I would like to comment on the Higher Education Sector's role in the national innovation system. My work inventing and commercializing a popular medical instrument, the FDT perimeter, earned me an Australia Technology Prize in 1999, and the Clunies Ross Science and Technology Award in 2002.

The FDT is a popular eye test instrument used for diagnose some of the leading causes of blindness. Although highly effective the FDT is quite inexpensive. Nevertheless, since being brought to market in 1997 (by Carl Zeiss), the FDT has grossed US\$ 106 million. More recently we have been working on a more objective and rapid form of perimeter with an Australian Engineering Company, Seeing Machines Ltd. Our work has been assisted by a Biotechnology Industry Fund (BIF) Grant of \$250,000 and a DEST Commercial Ready Grant (\$2.1M). The new instrument, Truefield (<http://www.truefield-analyzer.com/>), was granted FDA approval in August 2007 and is scheduled to go on sale in late 2008.

On the basic research side I receive funding from the NHMRC and am a PI in the \$11M ARC Centre of Excellence in Vision Science. I have the rare privilege of holding a research only position at Australia's top research university the ANU (the ANU has 55% of Australia's Fellows of the Royal Society of London and 1/4 of its Fellows of the Australian Academy of Science and the 1/3 of Australia's Fellows of the USA Academy of Science). The experiences outlined above, coupled with my 27 years in the Australian Higher Education system, give me a reasonably unique perspective on the joint processes of research and innovation in Australia.

As the draft discussion paper rightly points out Australia's Gross Expenditure on R&D (GERD) as a function of GDP is 50% lower than the OECD average. While that is true the top performers, such as South Korea (3.6%), Iceland (5.8%), and Israel (5.7%) embrace 4 to 6 times our percentage GDP expenditure [1]. Hence the OECD mean is far from being indicative of best practice. Moreover the nations with larger %GDP GERD are those attempting to catch up in terms of their industrial sophistication. Australia falls into this class given its historical reliance on commodities rather than high-tech industry. In that sense we are very much behind the (relevant) pack. That Australia could perform better in the high-tech sector is underlined by its status as the number 3 producer of scientific papers in the 10% most highly cited scientific journals[1 & Fig. 1]. That being said the current success rate of the major research grants of about 20% means that a high proportion of our highly trained research staff in the Higher Education Sector are grossly underutilized.

Aside from our inadequate GERD Australia's Business expenditure on R&D (BERD) is an even bigger concern. At 1.04% of GDP, it is also well below the OECD average of 1.53% and well below the leaders: South Korea 4.9%, and Israel 7.8%. Australia's BERD is about half it's GERD, most

Contribution to the 10% most cited scientific publications, 2001-2004 – major world regions ⁽¹⁾

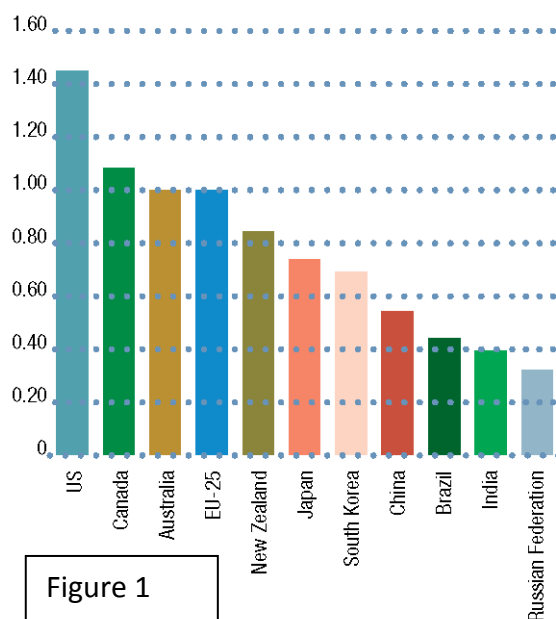
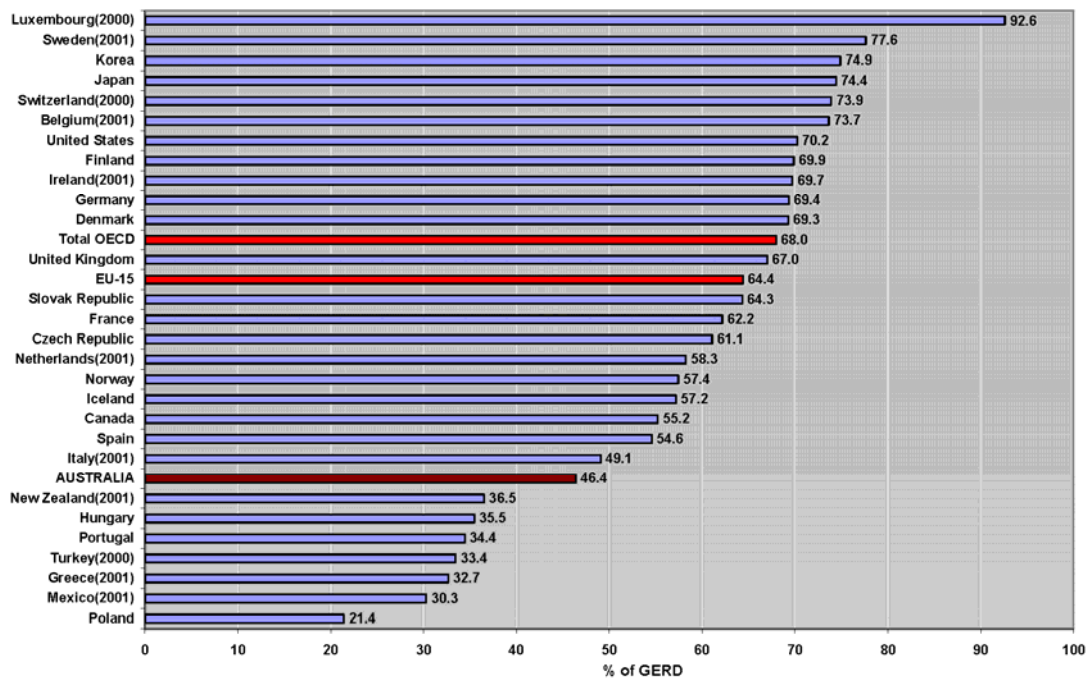


Figure 1

2.4.13 BERD as a percentage of GERD – by OECD country, 2002



Source: Science and Innovation Analysis Section, DEST, based on ABS R&D data and OECD MSTI Database.

Figure 2

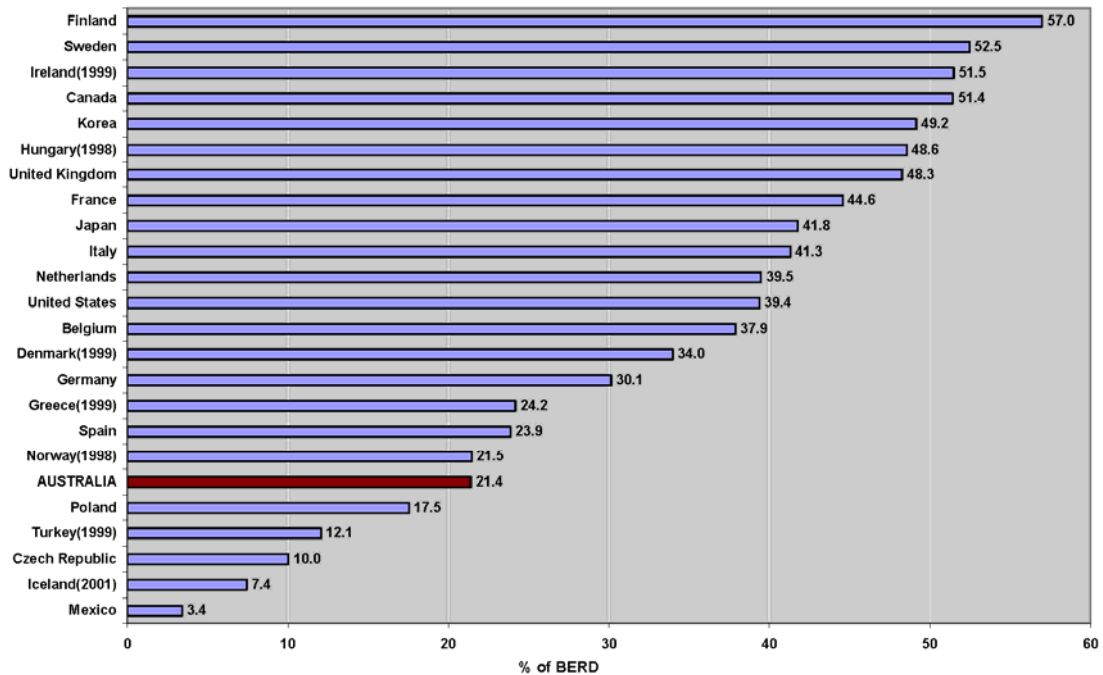
leading OECD countries are at about of GERD 75% while leaders such as Luxemburg are at 92% [2 & Fig.2].

The previous Australian government reduced tax breaks to industry for R&D while at the same time directing a higher proportion of the Higher Education Research (HER) budget to strategic/applied research in programs such as NHMRC Development Grants, ARC Linkage Grants, and ARC Cooperative Research Centres. Although effective in generating some engagement with industry, these programs have diminished the basic research budget. I am an advocate of strategic research and innovation but I do not support this approach as it undermines our future research capacity. The previous government should have maintained or increased the basic research budget while expanding the budget for strategic engagement with industry, something Australia's universities are now learning to do.

if we took the previous government's approach then, in order to achieve the levels of applied R&D seen in other countries with their 75 to 90% of GERD as BERD (Fig. 2), we would need to divert more than the entire HER budget to applied research. Clearly that would not be sensible. Instead we need to improve BERD through tax incentives. Some version of the much maligned, but in my experience effective, Syndicated R&D system should be looked at again to allow technically unsophisticated players to enter the field.

Given the previous government's behaviour it is now necessary to increase public sector expenditure on both basic and strategic research. At least a 50% increase is required. The basic research budget needs to be upped to keep pace with our competition. The strategic budget needs to be increased not only to keep up but also to further bootstrap the capacity of our university section to engage with industry. This is all the more critical during the coming years as we attempt to increase BERD. Major tax reform to permit larger expenditure by industry is needed. In particular while the resources boom continues money

2.4.19 Percentage of BERD performed in high-technology manufacturing industries – by OECD country, 2000



Source: Science and Innovation Analysis Section, DEST, based on ABS R&D data and OECD MSTI Database.

Figure 3

from that sector needs to be diverted to strategic research and the development of high-tech industries.

Finally we need to recognise that we don't yet have a Nokia, Eriksson or an Acer, as reflected by our low proportion of BERD expended in the high-tech sector (Fig. 3). Our research base is fully capable of supporting several such companies (Fig. 1). We should therefore consider adopting a research funding profile that mimics "catch up" nations like South Korea, particularly in respect of our BERD expenditure, which would not draw on the public purse.

The Higher Education Sector is up to the challenge we just need the funding.

References

- [1] Europe in the global research landscape (2007), European Commission report EUR 22956.
- [2] DEST BERD Stats Snapshot
http://www.dest.gov.au/sectors/science_innovation/publications_resources/documents/stats_snapshot04_p86_185_pdf.htm