

Developing a Framework for the Assessment of the Australian Research System

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A Research Project undertaken for the Australian National Internship Program

Presentation Overview

1. Background information
2. Establishing the framework
3. Applying the framework
4. Future research & concluding remarks
5. Questions

THE NATIONAL INNOVATION AND SCIENCE

National system to measure engagement and impact of university research

\$9m

2016

Boosting the commercial returns from research



Measurement of outcomes

The Government will work with the research sector and industry to improve assessment of the research system, including improved metrics on engagement and knowledge transfer with industry, as well as research outcomes and impact.

Why do we need to assess the research system?



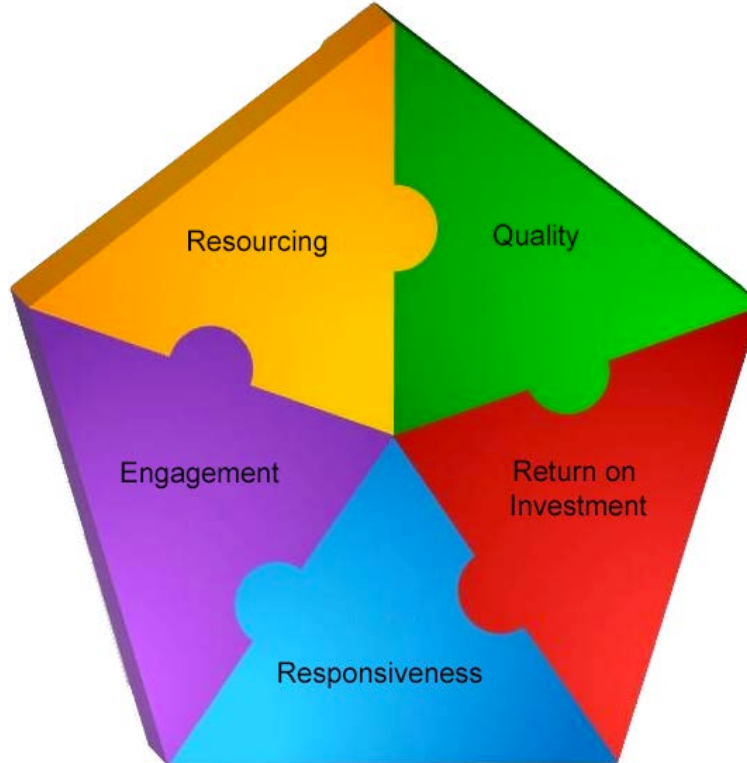
Problems with the current framework



Excellence in
Research for
Australia 2012



Establishing a holistic framework



Methodology



Country Profiles -
Allocation of public R&D
funds (Panel 4)

Science Technology and Industry Outlook 2012

- Comparative performance of
national science and
innovation systems
- Key figures
- Overview of national
innovation policy mix
- Revealed technology
advantage in selected fields
- Structural composition of
BERD

Patents Statistics

Research and Development Statistics

Expenditure

- Business enterprise R-D
expenditure by industry
(ISIC rev. 4)
- Business enterprise R-D
expenditure by industry
and by source of funds
(ISIC rev.4)
- Business enterprise R-D
expenditure by industry
and by type of cost (ISIC
Rev.4)
- Gross domestic
expenditure on R-D by
sector of performance
and source of funds
- Gross Domestic
Expenditure on R-D by
sector of performance
and type of cost
- R-D expenditure by
sector of performance
and type of R-D
- Gross domestic
expenditure on R-D by
sector of performance
and field of science
- Gross domestic
expenditure on R-D by
sector of performance
and socio-economic
objective

Gross domestic expenditure on R-D by sector of performance and field of science

Customise

Export

Draw chart

My Queries

Country: **Australia**

Sector of Performance: **Total Intramural**

Units for Expenditure: **National Currency**

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Field of Sciences																				
All fields of science	1 585	..	..	2 405.9	..	3 368.9	3 685.1	4 276.5	..	5 222	..	6 482.9	..	7 466.637	..	8 792.431	..	8 918.2	..	10 4
All fields of science	(*) 1 359.8	..	..	2 165.9	..	(*) 3 040.5	..	(*) 3 803.1	..	(*) 4 603	..	5 877.2	..	6 862.437	..	8 053.081	..	8 131.5	..	9 4
Natural sciences and engineering	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1 781.705	..	2 916.5	..	3 5
Natural sciences and engineering	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4 471.083	..	3 153	..	..
Engineering and technology	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	981.004	..	1 131.9	..	1 3
Medical and Health sciences	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	819.29	..	930.1	..	..
Agricultural Sciences	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Social sciences and humanities	(*) 162.4	..	..	239.9	..	(*) 307.4	..	(*) 383.4	..	(*) 488.3	..	605.7	..	613.8	..	739.35	..	786.7	..	9
Social sciences	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	548.305	..	590	..	..
and humanities	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	191.046	..	196.7	..	..
Not elsewhere classified (Fields of Science)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Legend:

c National estimate or projection

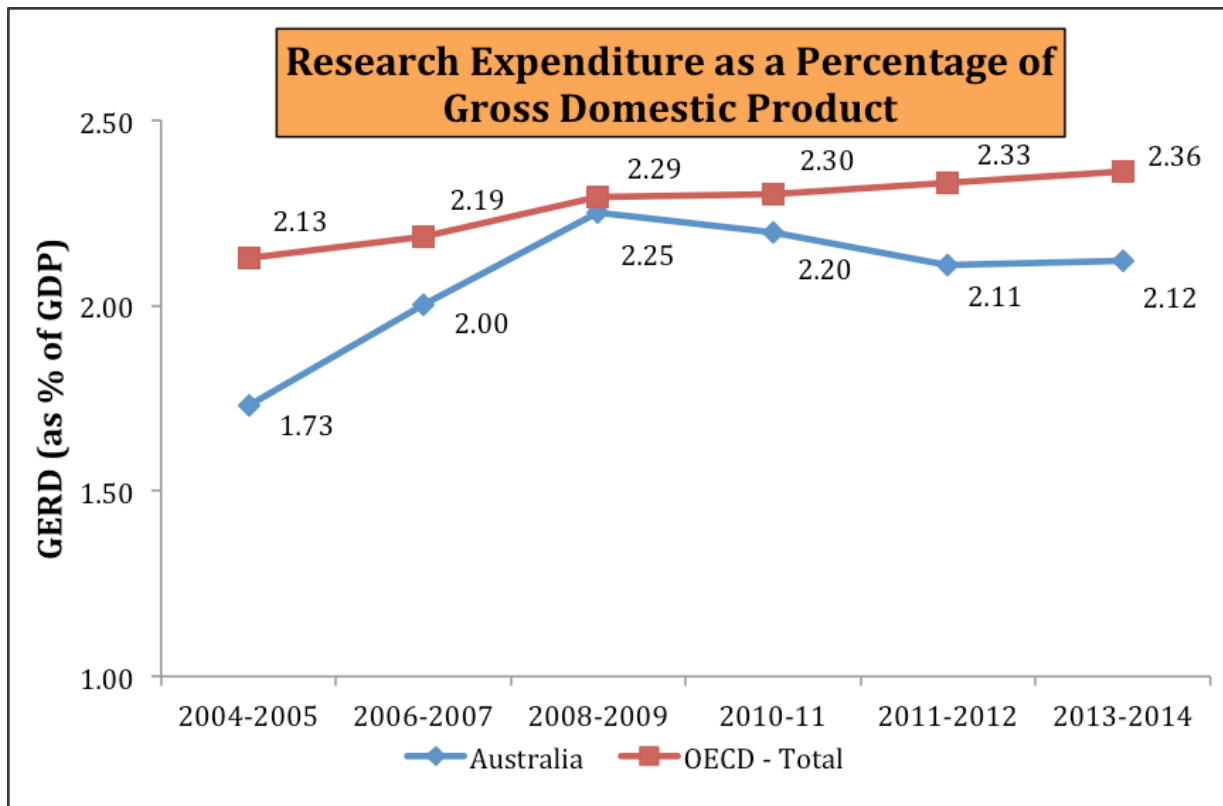
s Unrevised breakdown not adding to the revised total

x Confidential

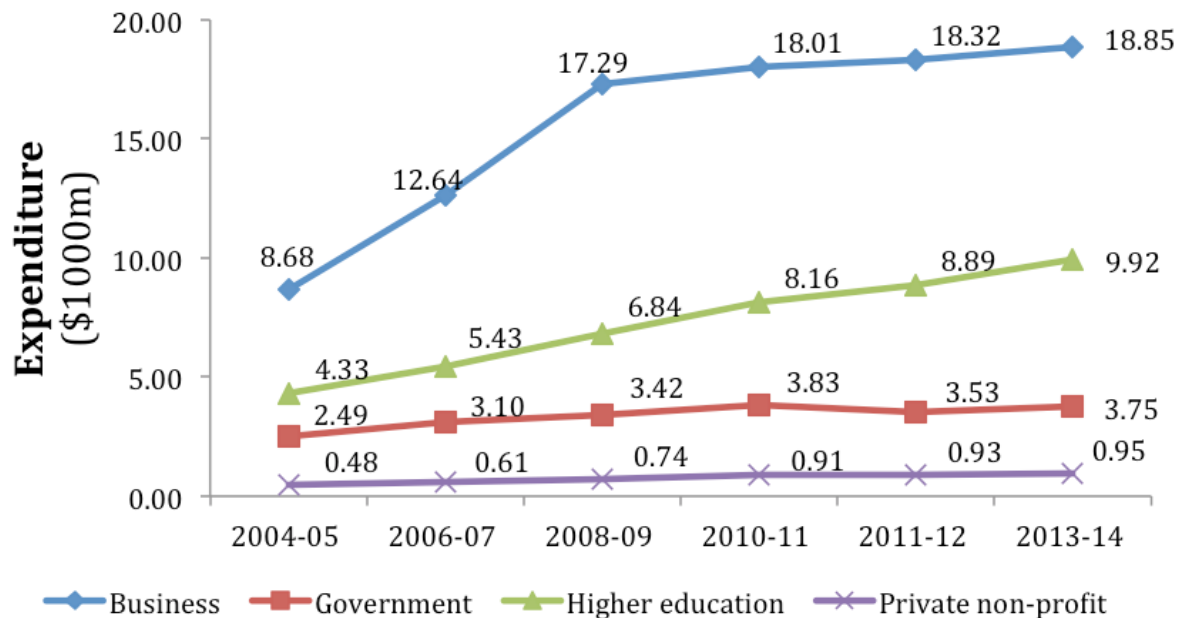
Data extracted on 25 Oct 2015 13:48 UTC (GMT) from OECD.Stat

Resourcing

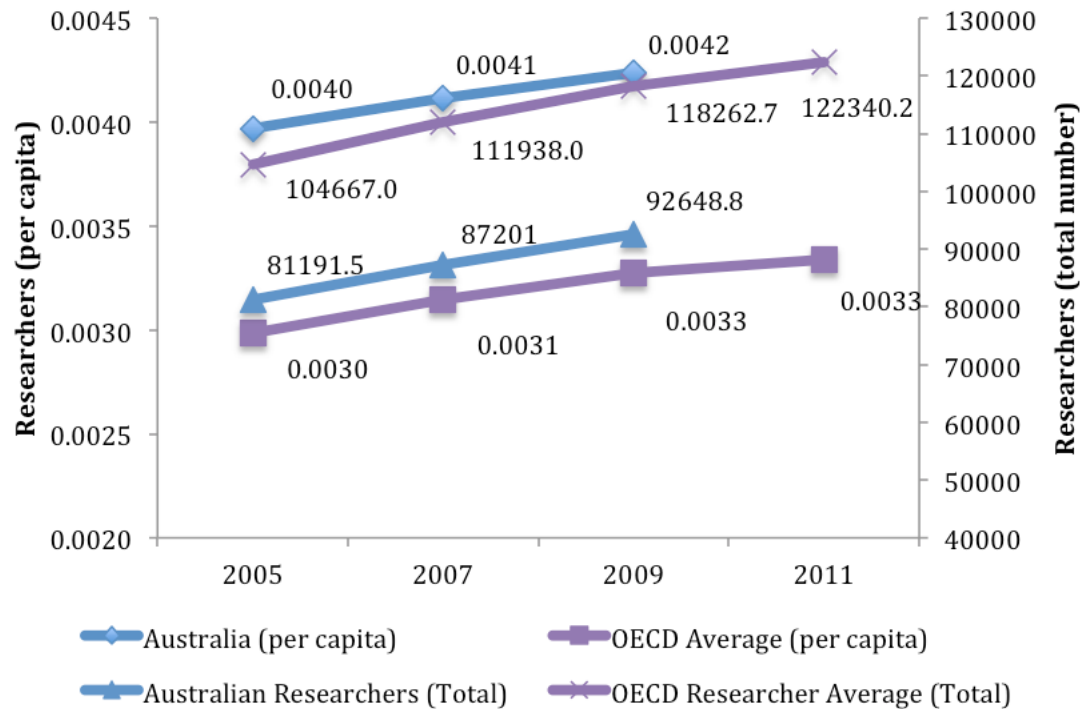




Research Expenditure by Sector



Researchers (Full Time Equivalent)

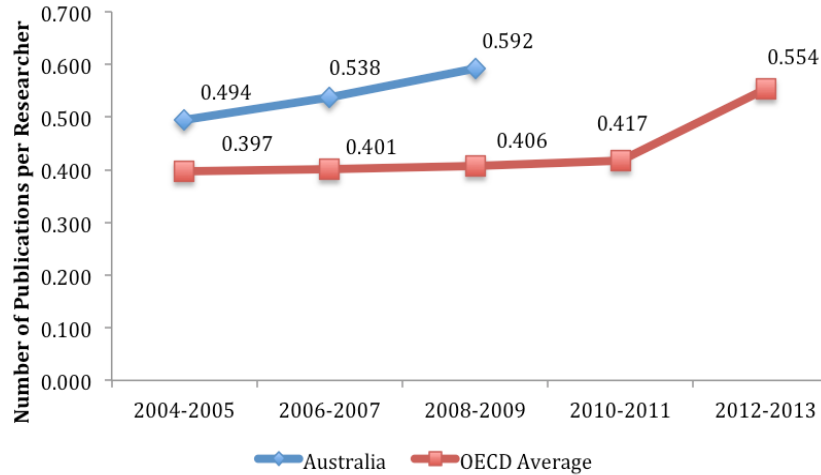


Quality

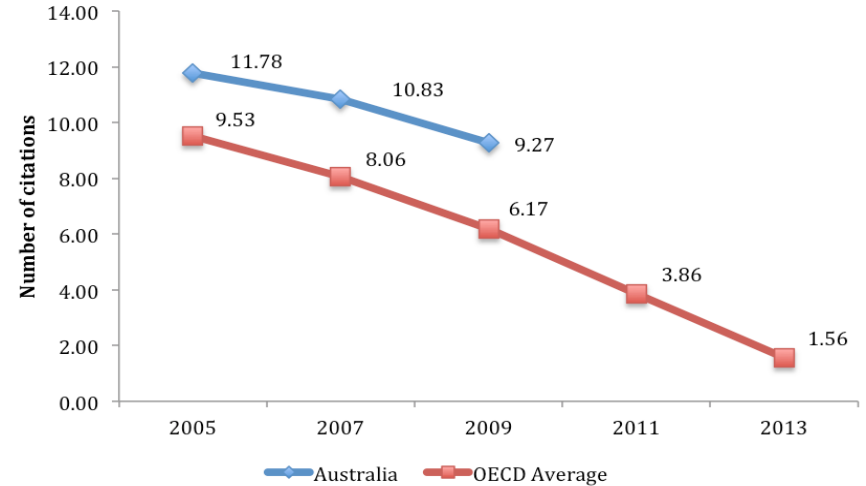




Publications per Resercher

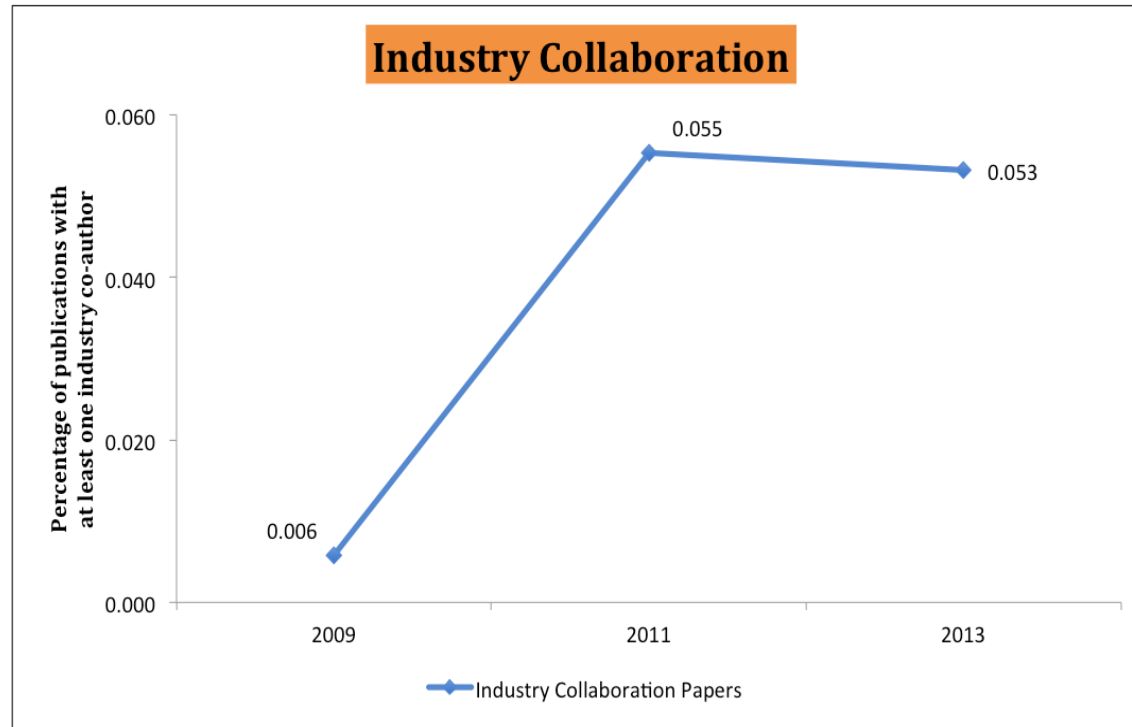


Citations Per Researcher

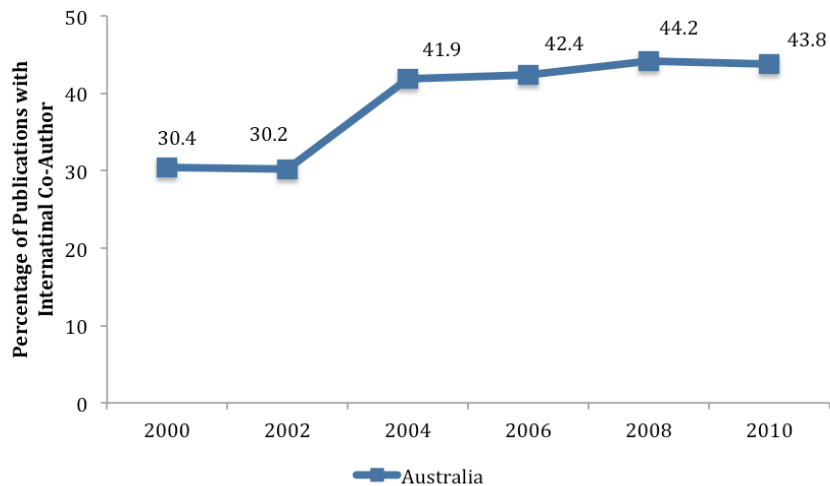


Engagement

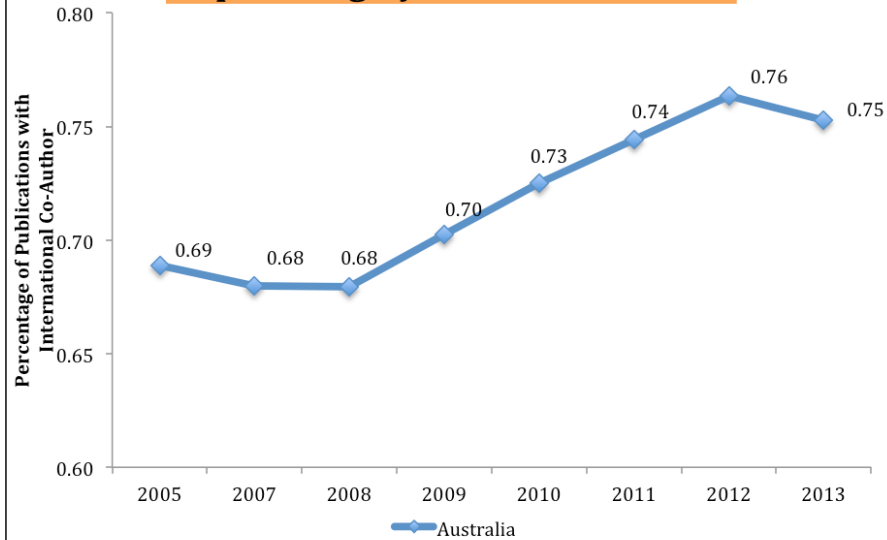




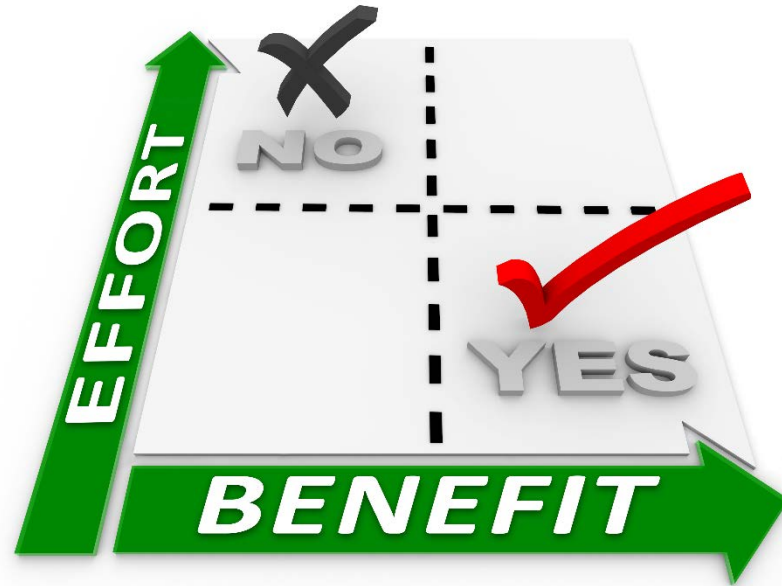
International Publication Collaboration



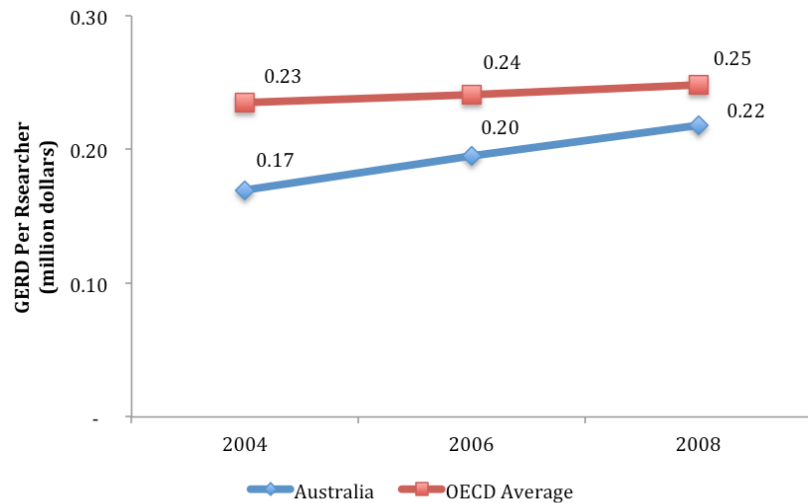
Top 1% Highly Cited Publications



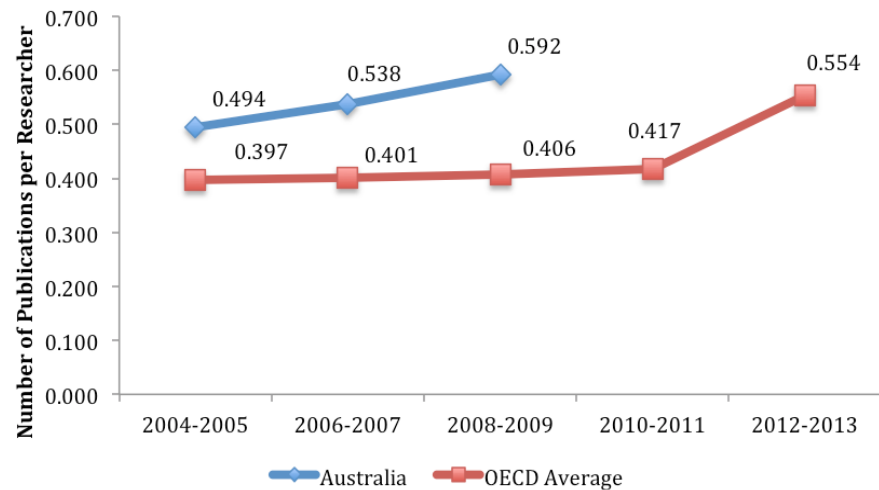
Return on Investment



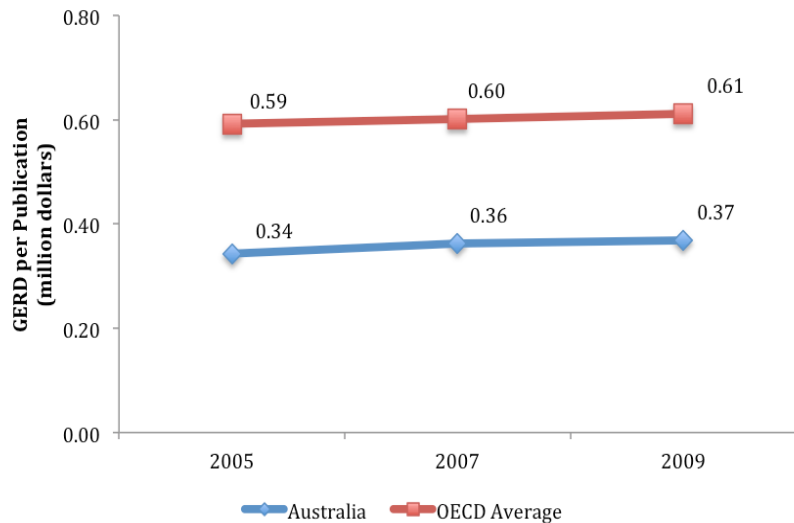
Researcher Efficiency



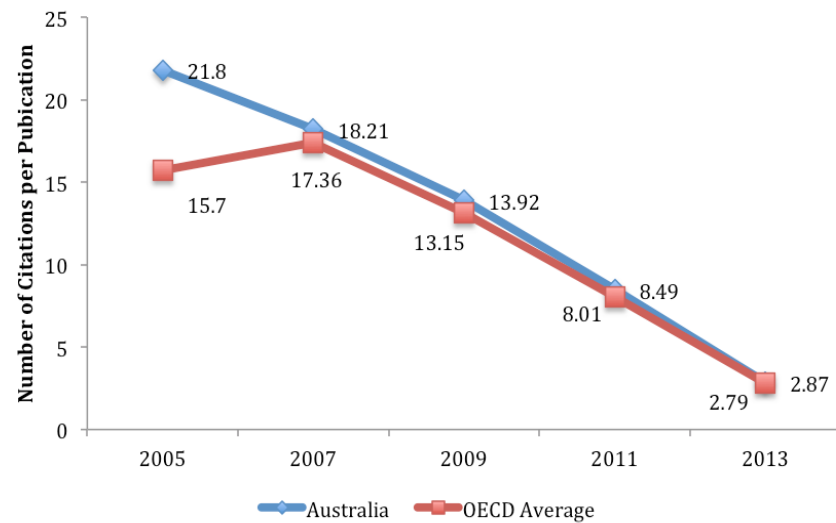
Publications per Resercher

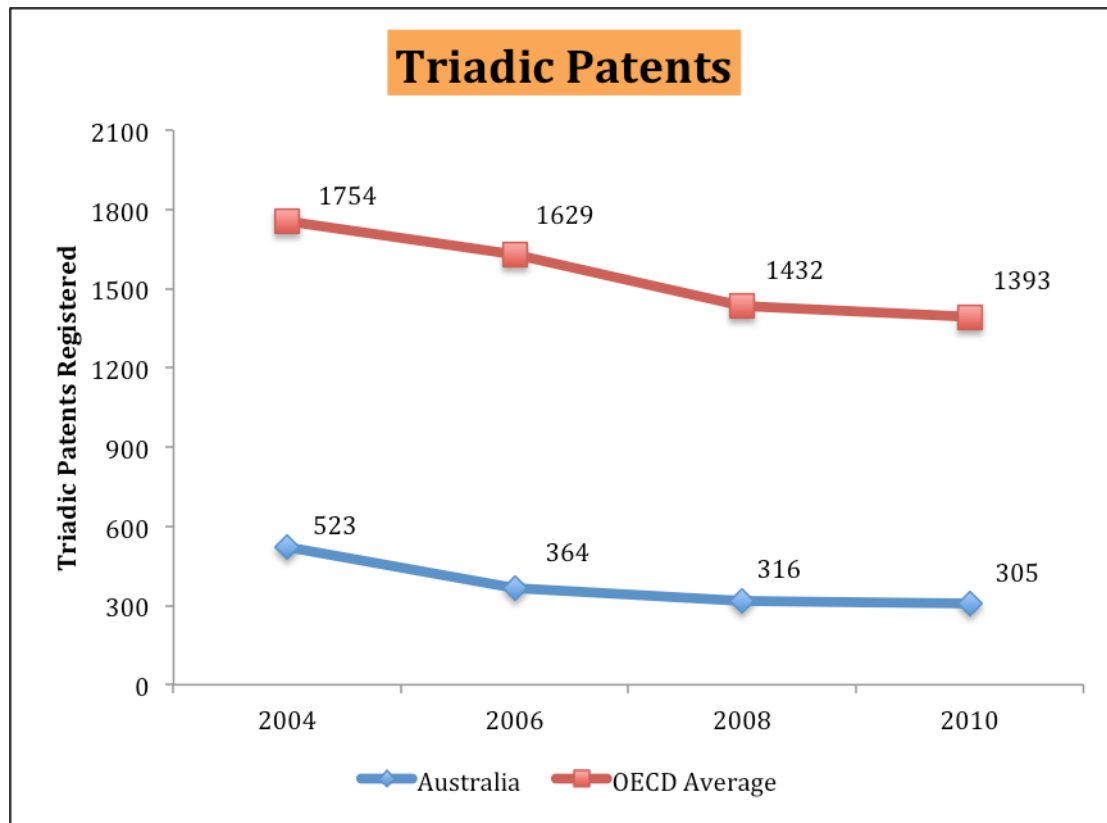


Publication Efficiency



Citations Per Publication



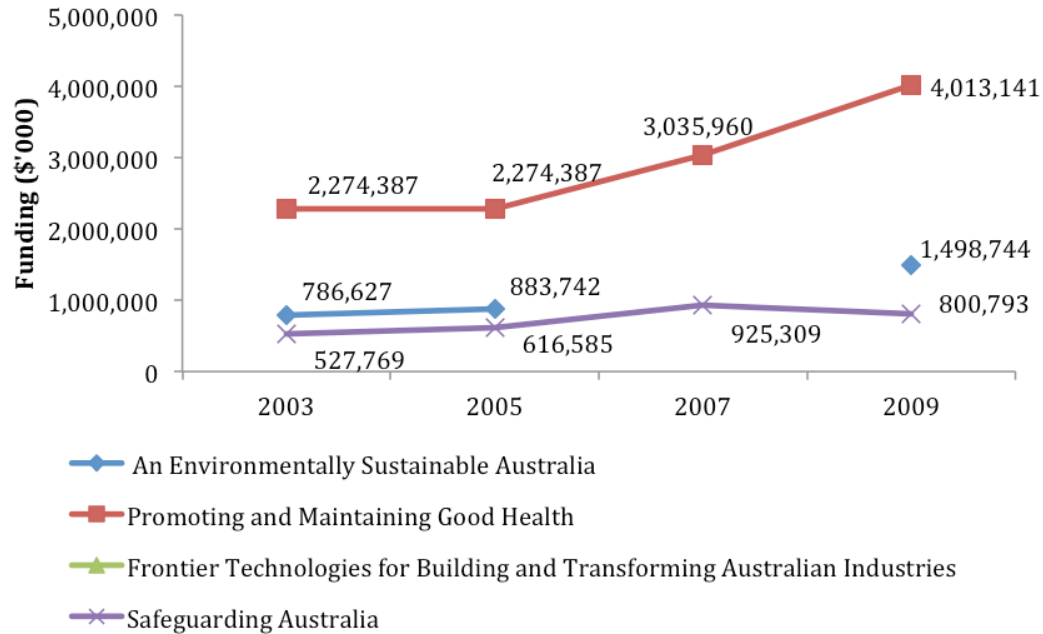


Responsiveness

Australia's
Science and Research
Priorities



Funding of National Research Priorities



Policy Outcomes

Strengths

- Researchers
 - The quality of researchers in Australia is shown to be higher than the OECD
 - Furthermore, there is a strong research pipeline (HDR students) in Australia
- Publication & Citations
 - The quality of the research produced in Australia is higher than the OECD
- Efficiency
 - The cost of research for higher output is less for Australia

Opportunities

- Industry Collaboration
 - Further collaboration with industry promotes greater commercialization
 - Australia has been doing well, but could continue to do better
- International Collaboration
 - It has been shown that greater international collaboration leads to higher quality research
 - Increasing international collaboration leads to greater outcomes such as more citations and commercial translation

Weaknesses

- Financing
 - Australia does significantly poorly with it's resourcing of the research sector.
- Commercialisation
 - There is a lack of translation of research into commercial outcomes.
- Intellectual Property
 - There is a decrease in the registration of Australian triadic patents, highlighting the issue of lack of commercialisation and IP innovation

Threats

- Sector Resourcing
 - Given that a large number of researchers work in the Higher Education sector and the Government sector, decreases in funding can significantly affect the research quality in Australia
- Citations
 - The number of citations per researcher has decreased. This could mean that the quality of research may be compromised if researchers begin to publish in lower journals to improve citation count.



Improving the framework

- Consistent data collection
- International comparison
- Centralised assessment centre

Future research?

- Indicator-indicator interactions
- Explaining trends



Synopsis: Developing a Framework for the Assessment of the Australian Research System

Albert Patajo

Research completed during an Australian National Internship Program internship

Introduction

This research was conducted as part of the Australian National Internship Program (ANIP) and was conducted at the Australian Government Department of Education and Training. The purpose of the research was to develop a framework to assess research in Australia and this research examined various indicators that could be used to determine the health of the research system.

In 2014, the Abbott Government presented the Boosting the commercial returns from research paper. This discussion paper outlined a number of goals to improve the translation of research into commercial outcomes and a need to improve the assessment of the research system.

Developing the Framework

The current approach is a fragmented one, that focuses mainly on outcomes of research. Generally, the three main indicators used are: Excellence in Research for Australia, university rankings and the the Higher Education Research and Data Collection.

There are a few issues with these tools, firstly, they mainly examine outputs, which means its difficult to use this information for further improvements. Secondly, they assess parts of the system, such as universities, rather than the system as a whole. Lastly, the timing of these tools differ, which makes it difficult to make annually assessments.

The Department outlined 5 key indicators that could be used to develop a holistic framework. These indicators are based on key strengths of research systems internationally, as well as indicators that have been used in research assessments by other countries. This framework is useful for a number of reasons. It examines all aspects of the research system, not just output. Furthermore, this framework allows us to examine the relationship between different indicators and how they affect each other.

The indicators were:

- Resourcing of the Research System
- Quality of the Research
- Engagement
- Return on Investment
- Responsiveness

Applying the Framework

Resourcing

Resourcing examined how well research was funded and the human capital behind the research system. Australia trails behind the OECD average every year in the last 10 years in research expenditure. Conversely, Australia has a higher number of Researchers per capita (FTE equivalent) than the OECD average.

Quality of the Research

Quality of research examined the the citations and publications of Australian research. The Australian Research system is of a much higher quality than the OECD average. Australian researchers have more publications per researcher and have a greater number of citations per publication.

Engagement

Engagement measured how well the research system engages with external stakeholders. Australia performs poorly when it comes to engagement with industry, with less than 1% of publications with an industry co-author. However, Australian researchers have consistently collaborated with international co-authors and this has produced strong publications that are in the 1% top highly cited publications.

Return on Investment

Return on Investment examined whether resourcing was being used efficiently or whether it was wasteful. Australia's ROI on research is quite strong. Australia spends less money per publication than the OECD average, but still retains a higher citation rate per publication. However, Australia does poorly in commercializing this research, with low levels of patent applications.

Responsiveness

Responsiveness measured how well a research system can adapt to changing research priorities and how quickly it addresses regional and global challenges. This was difficult to measure, and there are no real tangible conclusions that can be derived.

Outcomes and Recommendations

Firstly, we have a strong researcher base here in Australia. In terms of human capital, it is very strong and the Government should start to invest more money in training new scientists and promoting science amongst young people to instil a culture of science.

Secondly, the Government needs to promote links between university researchers and industry, as well as decreasing barriers to innovation. This has been somewhat done with the Innovation Agenda but as this is new, it is yet to be seen whether it is effective.

Lastly, Australia needs to ensure it develops a coherent science strategy based on the above two recommendations to ensure a sustainable and strong science background.