SCIENCE DEGREE GRADUATE PATHWAYS IN AUSTRALIA

from application to employment

Insights from ACOLA and beyond

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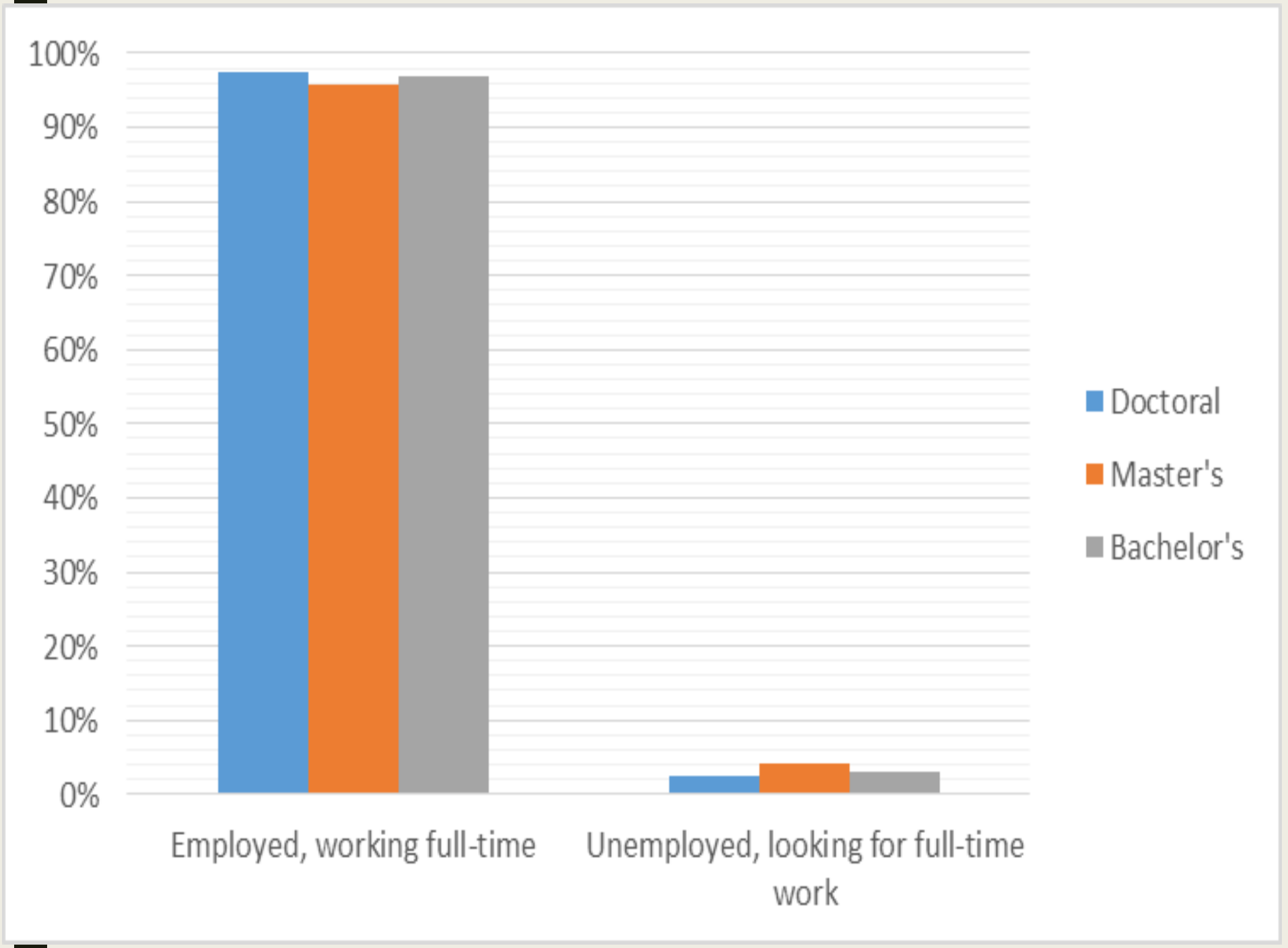
Key Findings of ACOLA: System NOT broken but……

- Entry pathway
  - *Employment outcomes not transparent*
  - *Preparation often inadequate*
- Candidature pathway
  - *Concerns about transferable skills training*
  - *Industry links underdeveloped*
  - *Supervision not always professional*
  - *Indigenous candidates undervalued and inadequately supported*
  - *Examination of thesis not candidate*

Most doctoral graduates did not report occupation as tertiary teachers in 2011 Australian census

Occupation type	%
Tertiary Education Teachers	25
Natural and Physical Science Professionals	17
Professionals not further defined	7
Social and Welfare Professionals	5
Medical Practitioners	4
Information and Organisation Professionals	4
Engineering Professionals	3
Business Administration Managers	3
All other occupations	32



Employment status good but are doctoral graduates under-employed?

Source: ABS census data 2011

Broad Field of Education	% HDR candidates international
Engineering & related technologies	53
Information Technology	49
Agriculture Environmental & related studies	43
Management & Commerce	40
Natural & Physical Sciences	37
Architecture and building	28
Education	21
Health	20
Society & Culture	19
Creative Arts	10

International candidates critical component of some disciplines

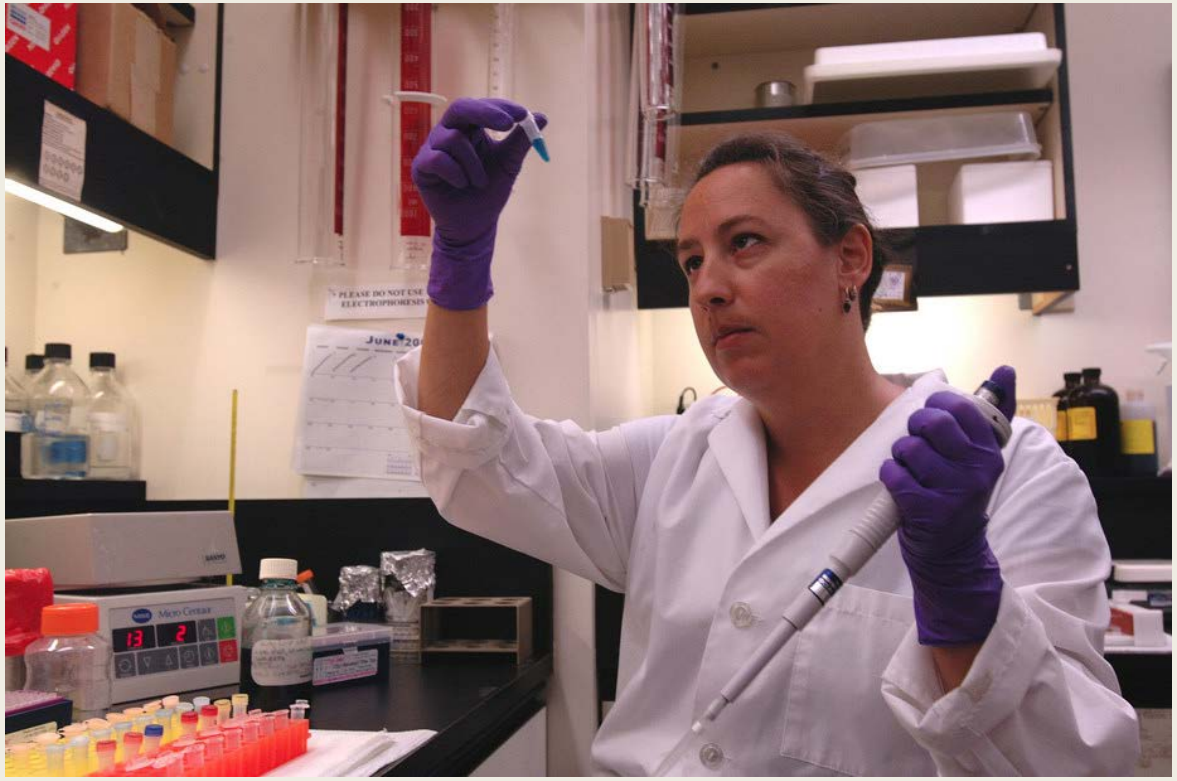
Source: Department of Education and Training 2015

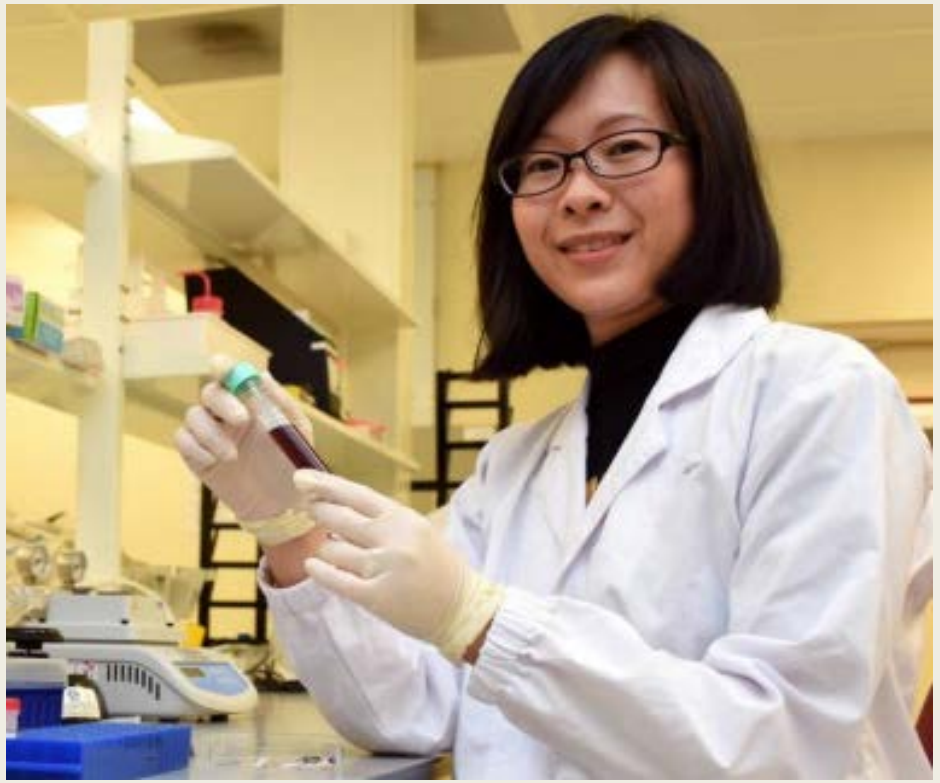
The good news and the bad news

- Most current Australian PhD candidates will not become academics and if they do, will not spend their whole career as academics
- A high proportion of international PhD candidates will become academics
- Most PhD graduates can get interesting jobs and have fulfilling careers

On average, 2017 US PhD graduate will have 9 careers (careers not jobs)

Universities need to be upfront about career prospects of different cohorts and cater for these differences





The entry pathway

Current arrangements limit internationally-recognised entry pathways to research education

- Bologna cycles 3+ 2+ 3
- Australia 4+ 3.....

ACOLA supported research training coursework Masters degree but CSP places unlikely

Several universities replaced/replacing honours with hybrid funded ‘Macquarie Masters’:
additional advanced disciplinary knowledge, research methods and project work

The candidature pathway:

Need to improve transferable skills training with increased emphasis on career development tailored to aspirations of individual research candidates

Key Words from advice from PhD graduates employed in academia

McLeod and Chen unpublished

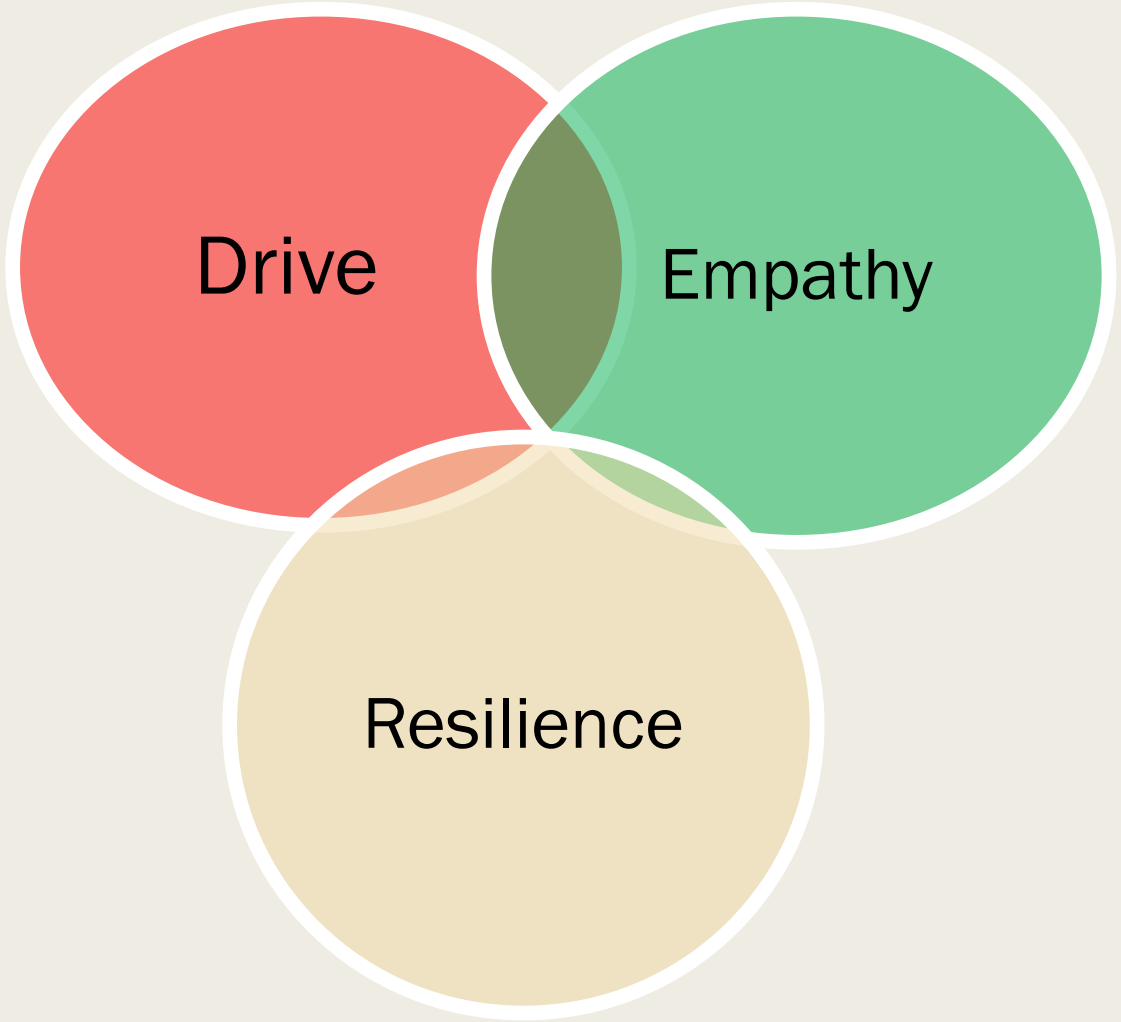
Key words from advice from PhD graduates employed in Industry / Consulting

McLeod and Chen unpublished

Key Words from advice from PhD graduates employed in Government

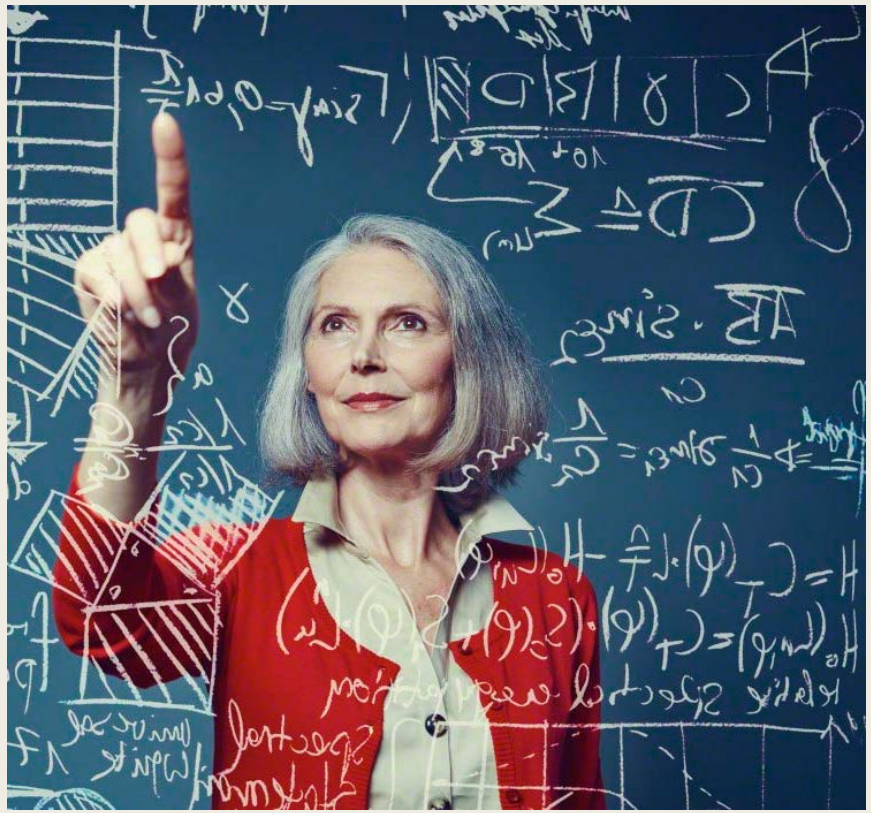
McLeod and Chen unpublished

Rio-Tinto selection criteria for jobs for which PhD essential criterion

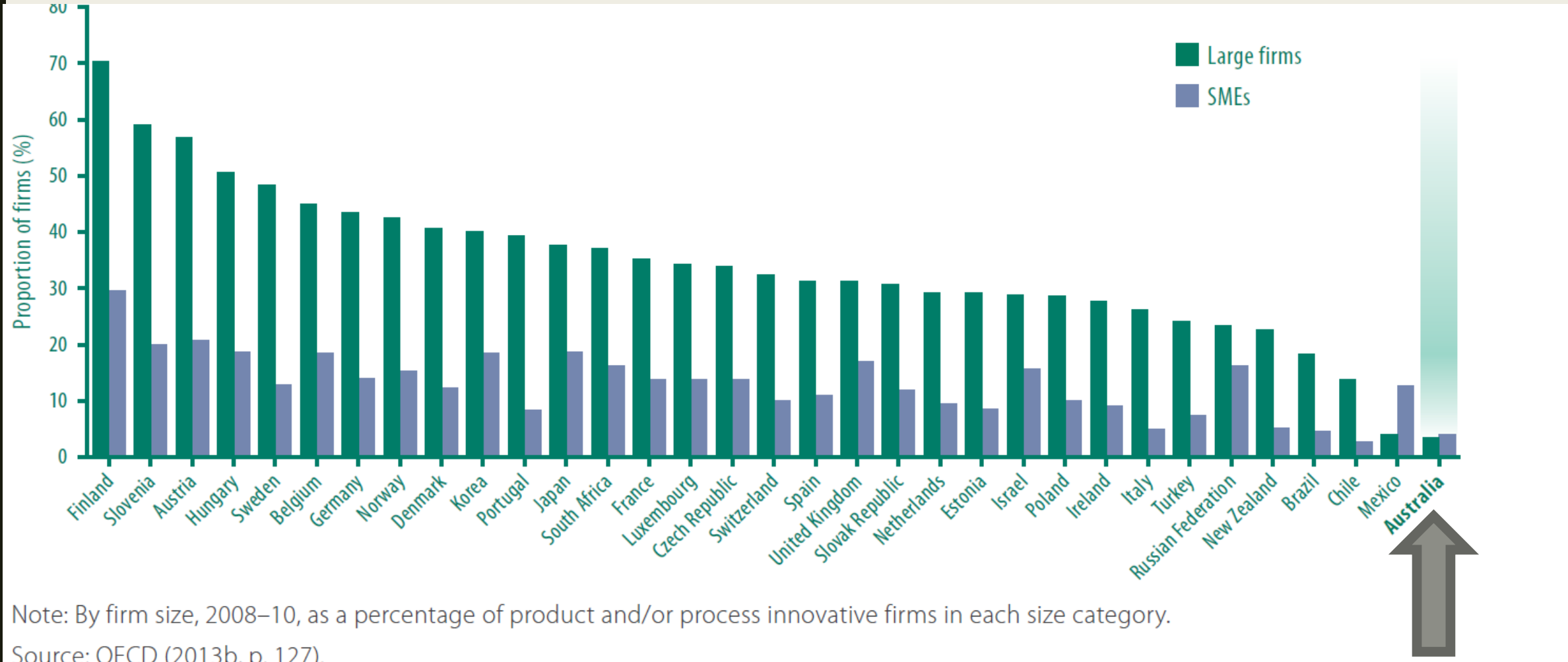


The post-graduation pathway: need accessible evidence of transferable skills and agreed typology

Several indicators demonstrate poor knowledge transfer between university research & industry in Australia



% firms collaborating on innovation with universities



Note: By firm size, 2008–10, as a percentage of product and/or process innovative firms in each size category.

Source: OECD (2013b, p. 127).

Improve industry-engagement

- A higher proportion of doctoral education should be:
  - focused on externally-defined research problem
  - take place in external settings; *or*
  - involve an non-academic supervisor
- Government requires universities to collect statistics from 2018

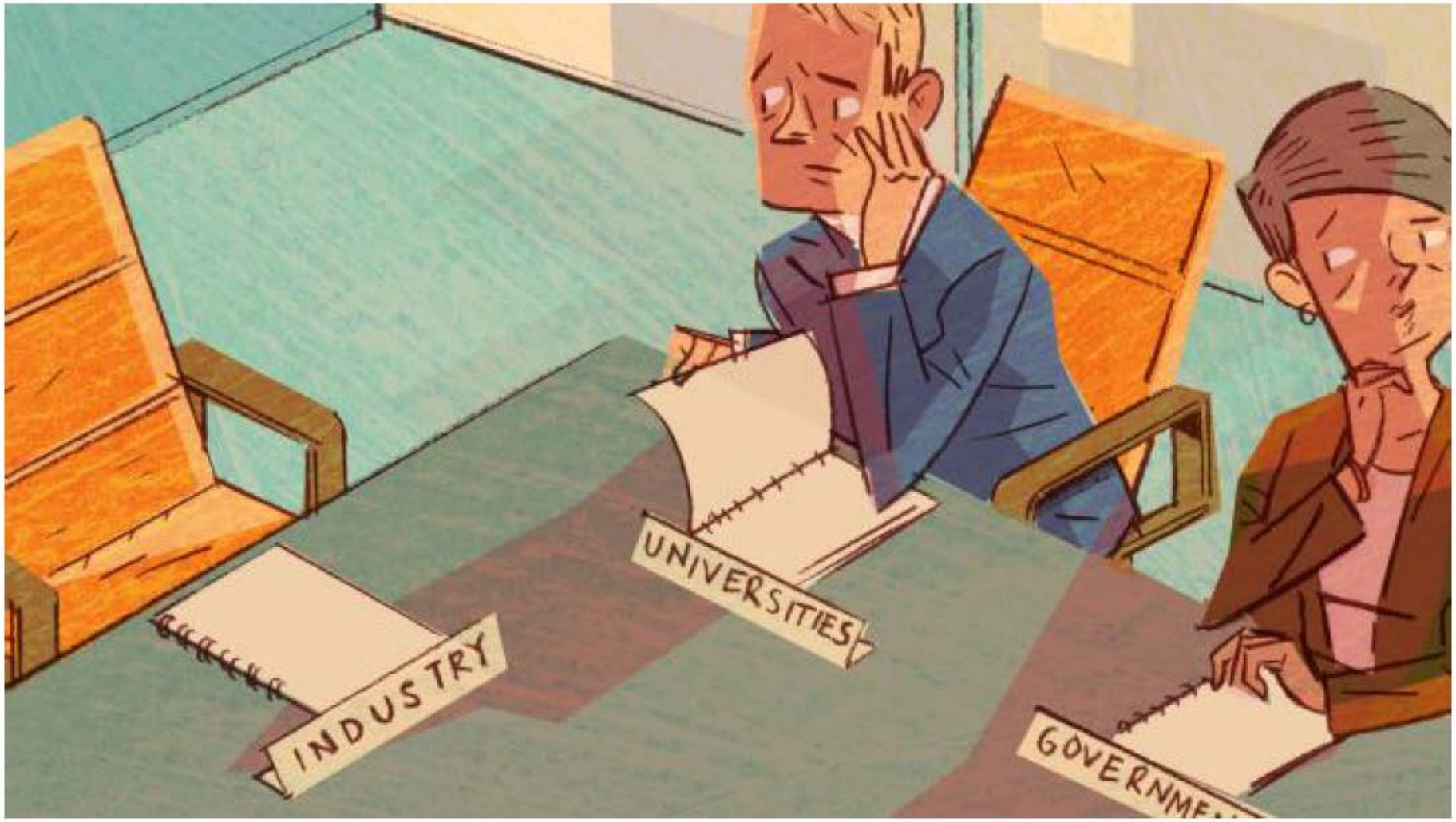
Numerous responses

- AMSI Intern
- CSIRO iPhD with UNSW
- Numerous university initiatives

THE AUSTRALIAN

Innovation: There's no action without industry at the table

DENISE CUTHBERT THE AUSTRALIAN APRIL 20, 2016 12:00AM



Without industry, government and the sector will have the same old conversation. Illustration: Tom Jellett.

Industry Demand for Australia's Advanced Research Workforce

Job Explorer read 500 job ads and assessed 'research skills intensity'

- *Creative approach to problems*
- *Ability to perform high level analysis and synthesis*
- *Comfortable with uncertainty*
- *Deep learning and self reflective*
- *Trusted expert advisor*
- *Ability to work with minimal supervision*
- *Ability to act with integrity in relation to external governance requirements*
- *Emotional orientation to the work*: the "dog with a bone".
- *Attention to detail, quality, and accuracy*

(Mewburn et al. 2016

Industry Demand for Australia's Advanced Research Workforce

- Large 'hidden job market' for PhD graduates in the Australian workforce
- 43% job ads analysed required high level of research skills and capabilities, indicative of PhD
- **Only 21 % non-academic job ads asked for PhD qualification**
- Demand for research skills in industries traditionally assumed to have low demand for PhD graduates

Mewburn et al. 2016

‘Weather report’ of the demand for high-level researchers in the Australian economy for Department of Industry

Industry category	Number of non academic jobs requiring high levels of research skills in 2015 sample	% ‘PhD shaped’ jobs
Banking and finance	144	34%
CEO and management	94	52%
Consulting and strategy	129	36%
Design and architecture	74	28%

Scientific fields underrepresented

Mewburn et al. 2016

Assist supervisors to cope with new norms

Good supervision is the most important contributor to HDR success

I need students to progress my research

I don’t know how to train a student who wants to work outside academia

Change supervisory culture

My supervisor doesn't want me to go to skills workshops

She needs to be in the lab where I can supervise what she does

Universities should acknowledge supervisors who help candidates develop industry links and educate them for diverse careers

Indigenous researchers have much to offer Australia –essential to ‘Closing the Gap’

- Government
  - Doubled the Indigenous completion weighting from 2017
  - Enabled stipend scholarships to $41682

Grow the pipeline at all levels to increase Indigenous research candidates by x 6 to achieve parity

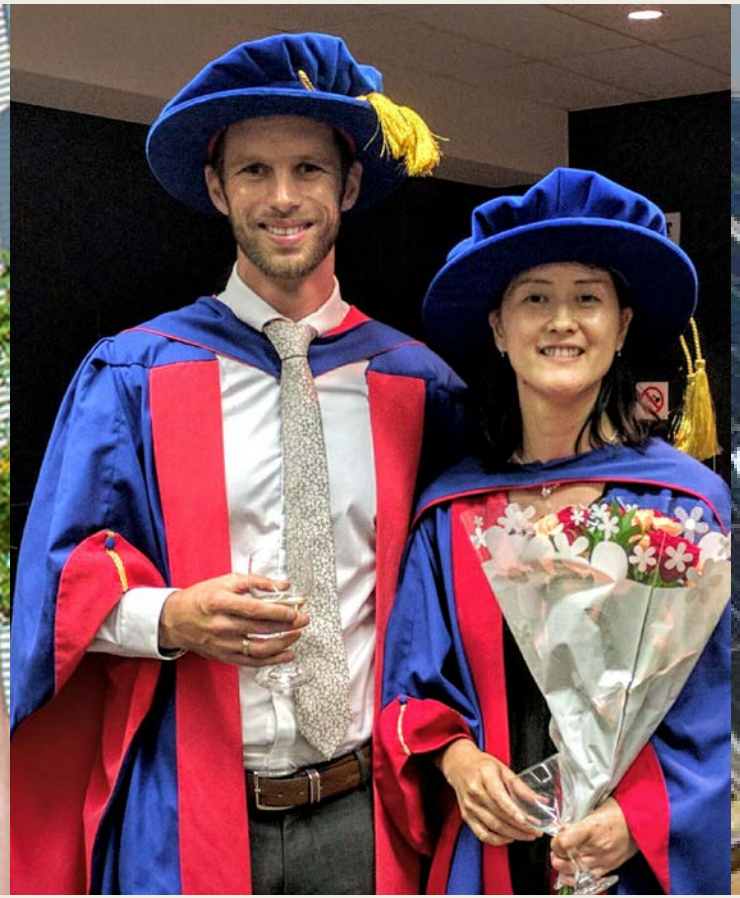
Primary
Secondary
Bachelors
Masters
Doctoral

Involve Indigenous undergraduates in research projects to increase interest in research

Should we be examining the candidate as well as the thesis?

Oral examinations?

Doctoral Education: an investment in human capital for the knowledge economy,


Reconsider the pathways from application to employment

Better engage with industry to understand their needs

Please ask questions

Doctoral graduates the human capital for the knowledge economy