Productivity in Australian Universities: Empirical Evidence

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HIGHER EDUCATION SUMMIT
August 28, 2018
Why this presentation is of value to you?

We seek to answer two questions of importance to higher education:

(1) What is the ‘productivity health’ of the Australian University sector?
(2) What is the ‘productivity health’ of individual institutions in the sector?

‘Productivity health’ is defined as:

The delivery of a *desired* level of education and research outcomes for a given level of resource inputs.
“Productivity Health” is not a theoretical or abstract construct.

At whole of sector level, it is defined by reference to the combinations of research and education outputs achieved by multiple institutions within the sector and measured empirically.

At individual institution level it is defined by reference to the desired benchmark being: (a) the sector’s productivity frontier, (b) that same institution in a preceding period, or (c) other institutions that act as a benchmark.
While it may be possible to define productivity health within the sector: The greater benefit is to provide a mechanism to diagnose and measure it. The tool has value for:

management of individual universities, and

policy makers and regulators in the sector.

The tool developed is the Research and Efficiency Frontier (REEF) Index. A tool agnostic as to an institution’s own choices in respect of research and education preferences.
Vertical Axis is Research as measured by number of uniquely authored publications per million dollars

**Research Efficiency**
Horizontal Axis is Equivalent Full Time Student Load per year (EFTSL) per million dollars

Education Efficiency
The 37 major public universities in Australia mapped across the two dimensions: efficiency in education and efficiency in research.
Go8 are shown in orange and clustered toward top left area, RUN institutions are green with most clustered toward the lower right. ATN universities are noted in red and are more distributed, IRU and also more distributed and shown in black. No aligned universities are shown in yellow.
The Efficiency Frontier is defined by reference to the “leading edge” institutions as at a point in time. In this example it is these four universities.
The Efficiency Frontier is defined by reference to the “leading edge” institutions and this defines the ‘efficiency frontier’.
The four institutions on the ‘efficiency frontier in 2016 are named:
UNSW
Univ. of Wollongong
RMIT
Victoria University
For a further introduction to the Efficiency Frontier construction see a video prepared for this purpose:

www.REEF-INDEX.com

(see also other material on this topic at www.HERG.com.au)
Some Initial Observations:

1. We provide empirical evidence that the higher education sector has delivered significantly increased efficiency.
2. The calibration of the average (mean) efficiency increase across the Australian system as a whole is approximately **3.25% annually** compound over the period 2011 to 2016.

Greater than growth in Australian GDP in the same period (2.79% – source: World Bank 2018).
3. This empirical evidence provides strong empirical evidence against non-targeted funding cuts.

4. However, there is wide dispersion of outcomes between universities. Varies from a high of over 30% in the six years to 2016, to a low of ‘negative growth’ over the same period.
5. Does quality of outcomes affect efficiency (productivity)?

The hypothesis is that higher quality will result in lower research volume (and therefore productivity).

Efficiency = \( a - b_1 \text{ResearchQuality} + b_2 \text{Size} + b_3 \text{Other Control Variables} + e \)

Expectation that this is both significant and negative.

The empirical result is that the variable QUALITY (measured certain ways) is not statistically significant in explaining ‘Efficiency’ score.

Further empirical work has been commissioned on this issue.
6. Two outputs currently included in the analysis:

(a) Research Publications (measured by unique authored publications – for example if a publication has two authors in two institutions this is equivalent to 0.5 publication for each person / institution), and

(b) Education (Equivalent Full Time Student Load - EFTSL)
7. Key input variable shown above in this presentation is: 

**Total University Expenditure**

Total University Expenditure is corrected for factors including but not limited to: expenditure not involved in academic outcomes – e.g. investment losses and asset impairments.

In the time-series analysis we deflate expenditure using the ABS index for education.
8. Second key input variable is:

**Total Academic Staff Resources**

*Academic Staff Resources* is the Equivalent Full Time (EFT) academic staff of each institution in each year.
9. **DIAGNOSTIC TOOL:**

Comparing relative efficiency of academic effort with total effort is a diagnostic tool to focus priorities for management effort.
Implication:
Type A: Enhancing the efficiency of academic staff is a priority
Type A institution: priority to focus on academic efficiency.

Sample of ten Type A Universities (alphabetical order):

Central Queensland University
Charles Sturt University
Curtin University
Deakin University
Flinders University
Murdoch University
University of New South Wales
University of South Australia
University of Southern Queensland
University of Tasmania

among a number of others
Implication:
Type B: Enhancing the efficiency of non-academic resources (use of non-academic staff, infrastructure, policies and procedures, etc.) is a priority.
Australian University Productivity: Empirical Evidence

Type B institution: focus on non-academic efficiency issues.

Sample of six Type B Universities (alphabetical order):

Australian National University
Edith Cowan University
Macquarie University
Monash University
Swinburne University of Technology
University of Sydney

among a number of others
INSTITUTIONAL SPECIFIC ANALYSIS:

Where each university is compared against its own previous performance. Useful when a university is a ‘special case’.

The analysis that follows is a view of a sample of Australian Universities from 2008 to 2016.

In this presentation, we do not include granular data, but other analyses can be done with more specific information.
University A: This case shows the empirical outcome of a university with almost continuous improvement in efficiency over the period - almost all directed at changes along the vertical (research) axis.
University A in greater detail from 2008 to 2016. Near continuous improvement in productivity other than for 2009 / 2010

University of Adelaide
University B
Over the period 2008 to 2016 this university also shows a consistent improvement in efficiency in an upwards direction mostly focused on research efficiency.
University B
in greater detail.
Similar to University A
but at a higher level on
the research axis.

University of New South Wales
University C has had mixed success in enhancing efficiency.
University C
In greater detail.

Mixed outcomes in respect of efficiency. Small net decline in efficiency between 2011 and 2016. This is one of only three universities experiencing negative growth.
University D:
This university achieved mixed success in enhancing efficiency with both increases and decreases – no clear trend in efficiency observed.
University D: This university was close to the efficiency frontier in 2011 but mixed outcomes thereafter.

The net change between 2011 and 2016 is negative.
University E:
There are efficiency improvements over the period. Notice a change in direction from a stronger education focus to a more research oriented position.
University E: The greater emphasis on research has not been without cost – notice the ‘backward’ slope since 2014. The ‘push’ for research has had negative efficiency effects.
Implications of Change of Direction: Management and policy changes can give rise to a number of outcomes. Three are:

1. Greater emphasis on research
2. Movement to the closest point on the frontier
3. Greater emphasis on education.
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Management and policy changes can give rise to a number of outcomes. Three are:

1. Greater emphasis on research
2. Movement to the closest point on the frontier.
3. Greater emphasis on education, or...

A majority of the 37 universities are moving forward generally in a linear fashion towards the frontier – a substantial cluster of these between lines 1 and 2.

There are several instances of a change in direction, often associated with a change in leadership (with a lag of approximately two years).

Where are you?
Implications of Change of Direction:

Management and policy changes can give rise to a number of outcomes. Three are:
1. Greater emphasis on research
2. Movement to the closest point on the frontier.
3. Greater emphasis on education, or

The foregoing time-series analysis compares the same institution over time. There can be added insight when this time-series analysis is applied to:

Comparing a university against its peers or an empirically derived benchmark.

Greater emphasis on education, or

Emphasis on Education
Concluding Remarks:

1. Many **Australian universities** have made exceptional progress in enhancing productivity (many like A and B).
2. The majority of the **improvement is in research productivity and not in education efficiency**.
3. While individual universities are efficient and improving, it is not, of itself, evidence that the system is efficient.
4. The efficiency improvement has resulted in **no cash saving** for funding agencies.
5. This analysis illustrates the challenges of cash flow as a tool of management. **Cash flow is not equal to efficiency**.
Concluding Remarks:

6. Certain universities improved their efficiency by 30% or more over the period 2011 to 2016 (in alphabetical order).

- Flinders University
- Griffith University
- Queensland University of Technology
- University of Adelaide
- University of New England
- University of New South Wales
- University of Newcastle
- University of Queensland
- University of South Australia
- University of Tasmania
- University of Technology, Sydney
- University of Western Australia
- University of Wollongong
Concluding Remarks:

7. There were three institutions that experienced an absolute decline in efficiency (productivity) in the period 2011 to 2016.

That is to say, at the conclusion of 2016, the three institutions declined in productivity both:

(a) relative to the (forward moving) frontier, and
(b) relative to their own position in 2011.

It is these universities that can be described as a ‘drag’ on the sector. Clearly they are in need of support.
Concluding Remarks:

8. The change between the 2011 and 2016 frontiers: the majority of the improved efficiency is directed towards research efficiency.

Why?
Concluding Remarks:

9. The analysis allows multiple ways of partitioning the relative costs of conducting research and education and finds that:

The average ‘exchange rate’ between teaching and research across the whole system in 2016 is around:

14 students = 1 unique authored publication.
Concluding Remarks:

9. The exchange rate varies – Exchange rate by ‘Zone’
Concluding Remarks:

9 (cont.) The exchange rate varies - Comparative Advantage:
EFTSL students to 1 publication

Zone A – <8 to 1
Zone B – >20 to 1

Policy implication: increased productivity would follow if university funding followed the principles of ‘comparative advantage’ (e.g. international trade).
Concluding Remarks:

10. Gaps in the ‘eco-system’. Creating a funding model that would support more focussed activity (‘comparative advantage’) is worthy of consideration and may support increased system-wide efficiency.
SYSTEM-WIDE ISSUES - SOME QUESTIONS

Does the funding system support a productive and efficient higher education system? (See KPMG Report refers to ‘eco-system’ – that is the eco-system fully diverse?)

How do we assess and support on-going ‘productivity health’ in this eco-system?
INSTITUTIONAL ISSUES - SOME QUESTIONS?

Is each university enhancing productivity at a rate equal to the movement of the frontier (i.e. not going backwards relative to its others)?

Are the comparative advantages of each institution being captured in the ‘values’ and ‘culture’ of the organisation?

Is the university, allowing for its special circumstances, providing excellent ‘value for money’ for the taxpayer?
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