

Closing the R&D funding circle

About [Paul Klink](#) (Author)

I studied physics and maths at university and progressed into a career in software development. Across the last 27 years I have worked as CTO and then managing director of companies specialising in the development of brokerage and exchange trading platforms. Recently my interest has been drawn to 'productivity' and I developed the concept of a Productivity Exchange (<https://prodxchg.com>). My company, Xilytix (<https://xilytix.com>) is creating the productivity technology needed by such an exchange.

The work within Xilytix is heavily R&D oriented so it will apply for an AusIndustry Research and Development Tax Incentive¹. To improve upon my previous R&D TI applications, I decided to investigate how R&D subsidies improve the generation of innovation and creative destruction within an economy. This resulted in the article, "[Understanding R&D Subsidies - A software perspective](#)" which introduces the basics of how R&D subsidies work and also describes an approach which reconciles the use of scientific methodology within software R&D.

Researching R&D subsidies piqued my interest in the interplay between: knowledge, R&D and productivity. This, combined with my experience of trading markets, led me to consider how competition could be used to better exploit knowledge within R&D and better drive productivity within our economy.

Knowledge Competition

The NCP consultation paper refers to the changing nature of competition and the evolving focus of the NCP; from its focus on road and rail to information highways and digital platforms. With the current rapid advances in automation and AI and the growth of the knowledge economy, it is likely that the this focus will start to encompass 'knowledge'.

One of the benefits of introducing competition to a product or service, is that it increases the ability to price the product/service. This in turn, leads to the economy better exploiting that product or service for the benefit of the wider community. So ... could we use competition policy to better exploit 'knowledge' in our economy?

The funding gap

In Australia, we fund universities to undertake research for the purpose of creating new knowledge and developing expertise. We separately subsidise firms to undertake research and development (R&D). R&D is vital for our economy as it generates innovation which leads to creative destruction. However it is also has higher risk than normal business activities and subsidies are required to encourage firms to carry out R&D.

Knowledge is one of the key inputs into R&D. Its acquisition is an important part of any R&D project. There are numerous ways knowledge can be acquired: reading publications, browsing the internet, engaging specialists, innovation scouting², and collaborating with research partners/organisations. Collaboration is an effective way of acquiring knowledge however it also comes with the risk of knowledge leakage³.

Universities are the largest research organisations in Australia. Increasing collaboration between universities and firms undertaking R&D would greatly assist the development of innovation in Australia. Yet while we fund both of these parties, the funding does very little to promote collaboration (the gap).

This submission proposes a variation to the funding of research in Australian universities which uses competition to incentivise universities to increase collaboration with firms undertaking R&D. Figuratively, close the gap in the funding circle.

A knowledge market

For a market to work, both sides (buyers and sellers) need to:

1. Want what the other side is offering, and
2. Have confidence that the other side wants what you have.

Universities (sellers) have knowledge and expertise which many firms carrying out R&D (buyers), desire. However what can the firms offer in return, which the universities would want. To understand this, we need to better understand universities' business model.

¹ AusIndustry: [Research and Development Tax Incentive](#)

² Elena Molinaro: [What is innovation scouting and why every company should do it](#)

³ Jeff Reuer: [Four ways to stop knowledge leaking in R&D partnerships](#)

As discussed in my other NCP submission, “University competition - Exporting skills or improving domestic skills”, it seems universities are focused on growing their international business and use their research reputation and ranking to attract international students. Accordingly, their knowledge and expertise is highly valued internally in the pursuit of increasing their research reputations.

If firms wanted to ‘buy’ knowledge and expertise from universities for their own R&D projects, effectively they would need to compete against the “pricing” set by this high internal value. Large, well known, firms could potentially match this price by contributing their own funding and expertise. The brand association may also be a valued contribution. However small firms and start-ups with limited funds and low brand awareness probably could not compete with this internal price.

Confidence is also an important element in a market. A person needs to believe that their what they offer in a market is valued. Without that confidence, they will not try to participate. Let me illustrate this with my own personal experience.

When browsing the internet for research information for Xilytix, I came across an interesting and relevant paper from a researcher at a South Australian university. I was tempted to reach out but did not do so as I assumed the researcher would not be interested in communicating with me. Xilytix could not fund any research, my people networking skills are not very good and I have no experience in how to handle knowledge leakage. So I did not attempt to enter this market. If most other researchers in small firms are not affected by such a lack of confidence, then this is something I personally need to address. However if many other researchers are not entering this knowledge market because of similar confidence problems, then the problem is systemic and inhibiting the development of collaboration skills which would greatly benefit R&D within Australia.

Funding the market

In order to address the above issues, I propose the following:

1. AusIndustry is given responsibility for a significant proportion of the research funding provided to universities.
2. Universities compete for this funding by engaging with firms which are carrying out R&D subsidised by AusIndustry.
3. AusIndustry measures the engagements by requiring both firms and universities to record quantitative and qualitative information covering each engagement.
4. Universities receive a portion of the AusIndustry funding based on the level of engagement they achieved. The greater the engagement, the higher the funding.

This level of funding needs to be large enough to compete with the value universities assign to knowledge and expertise for their internal use. Only then will management encourage their researchers to search and engage with firms interested in their knowledge and expertise.

On the flip side, this will also give firms and their employees the confidence to engage in this knowledge market. They now are able to offer something that the universities value.

Benefits of an active Knowledge market

1. The obvious benefit is that knowledge can be better exploited by R&D within firms to generate more innovation, leading to greater creative destruction in our economy. Or more concisely, improve our economy’s productivity.
2. Universities will become more responsive to the knowledge demands of firms undertaking R&D.
3. People’s level of expertise in R&D will improve as they gain experience in networking and collaborating with knowledge providers. In the future, it is likely that firms will outsource more R&D activities so collaboration skills will become critical⁴.
4. As a side benefit, this will allay the growing sentiment that Australian Universities are out of touch with their local communities⁵. There is a perception that their heavy focus on international research reputation comes at the expense of engagement with local priorities.

⁴ Tom Brennan, Philipp Ernst, Joshua Katz, and Erik Roth: [Building an R&D strategy for modern times November 3, 2020 | Article](#)

⁵ Ray da Silva Rosa: Universities pay the price of being cut off from their communities

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University competition

Exporting skills or improving domestic skills

About [Paul Klink](#) (Author)

I studied physics and maths at university and progressed into a career in software development. Across the last 27 years I have worked as CTO and then managing director of companies specialising in the development of brokerage and exchange trading platforms. Recently my interest has been drawn to 'productivity' and I developed the concept of a Productivity Exchange (<https://prodxchg.com>). My company, Xilytix (<https://xilytix.com>), is creating the productivity technology needed by such an exchange.

To build up my knowledge of productivity (and improve my writing skills), I write [articles](#) in areas of productivity that interest me. The intersection of knowledge and productivity is one of those areas of interest. This submission combines this interest with competition policy.

Competition between universities

There is a perception¹ that Australian universities have a business model focused on exporting education. They use their research reputation and ranking to compete with other universities to attract overseas full fee paying students. It is a very successful business model for universities. For several universities, it brings in over 30% of their revenue; in Sydney University, it brings in 44% of its revenue (2022)². Income that universities can use to bolster their research and better compete in this market. Education is also one of our top export industries. In 2022/23 it was the 4th largest export at \$36.4 billion³.

However this industry exports skills. International students leave with skills supplied by Australian institutes. Skills that are highly valued in other countries. Skills that drive productivity. Considering that Australia (like many other countries) has a large problem with falling productivity⁴, this poses the following 2 questions:

- Is unrestrained competition which encourages the export of valuable skills beneficial to Australia?
- Can competition policy be used to better focus university leadership on the improvement of skills within Australia?

This submission explores some of the undesirable impacts of the competition environment in which Australian universities currently operate. It then presents a proposal for using a competitive market to incentivise the leadership of universities to improve domestic skill levels by improving teacher training.

Foundational skills are key to productivity

The skills of people in a country are the largest determinant of the long term growth of its economy⁵. Especially skills in mathematics and science. Skills could be considered as a country's most valuable resource. A perishable resource which constantly needs to be regenerated and improved. A resource that drives productivity.

While people can attain skills in many ways, the skills obtained during primary and secondary schooling education are foundational⁶. They lay the basis for the further skills needed to develop vocation and careers and participate in the workforce. So, the extent of foundational skills learnt during these schooling years, has a large impact on the level of skilling that an economy can achieve. Accordingly, they have a bit impact on productivity.

There are many factors which affect how well students in primary and secondary schools learn skills (student outcomes). However evidence from literature indicates the most influential factor is teaching efficacy (quality)⁷. Teaching efficacy can be separated into teacher attributes and teaching practice - both of which are developed as part of teacher training programs.

¹ Nico Louw: [MRC Report: Breaking Universities' Addiction to International Students](#)

² ABC News: [Group of Eight universities warn they are reliant on international student fees as government looks to cap enrolments](#)

³ Australian Government Department of Education: [Education export income - Financial Year](#)

⁴ Australian Government Productivity Commission: [Annual productivity bulletin 2024](#)

David Taylor: [Australians are working as hard as ever, but output is going backwards. Who's to blame?](#)

⁵ Eric A. Hanushek, Ludger Woessmann, Ludwig Maximilian: [Education and Economic Growth](#)

⁶ Australian Government Department of Employment and Workplace Relations: [Draft National Foundation Skills Framework 2022 to 2032](#)

⁷ Deloitte Access Economics: [School quality in Australia: Exploring the drivers of student outcomes and the links to practice and school quality](#)

Teacher training vs international students business

In Australia, teacher training is carried out in Initial Teacher Education (ITE) courses run (mostly) by Australian Universities. From the Universities Australia report in 2022⁸ I estimate that ITE courses approximately contribute 5% to universities' overall business⁹. The proportion of revenue from international students in Go8 universities range from 15% to 47%¹⁰ and in 2020, approximately 28% of students were international¹¹. From this, I estimate international students are approximately 30% of university business¹².

For universities, it makes a lot of sense to focus on a business model around exporting education and compete in this space. It is already a large part of their business, there is large demand with excellent growth potential, the margins are good¹³ and it is not dependant on government funding. The only significant constraint is Australian Government immigration policy.

The same does not apply to ITE courses. Competing in this space would provide universities with far lower growth potential¹⁴ compared with competing in the international space. ITE most likely provides a reliable revenue stream, the profits of which could be used to compete in the international space.

Perverse Incentives

The fact that universities compete in exporting skills rather than compete in developing local skill, can lead to some incentives that are detrimental to improving productivity in Australia.

- **Upper management not focused on growing productivity in Australia**
Competition is a powerful force to focus management on particular outcomes. Universities have strong and highly paid management teams. They also have access to some of the brightest minds in the country. Do we want these teams to be focused on exporting skills or improving domestic skills (and Australian productivity)?
- **Standardised accreditation of ITE courses provide little incentive for continuous improvement**
Once an ITE course has been accredited¹⁵, universities can generate cash flow from it. There is little incentive to improve it unless the nationally agreed Standards and Procedures change. If these courses were subject to competition, then universities would have an incentive to develop improved teacher training techniques and update their courses.
- **Are Universities sufficiently attempting to anticipate customer's future demand?**
Education bodies which employ graduate teachers are also monitoring advances in pedagogy. Ideally employers' expectations are incorporated in ITE courses as the pipeline covers several years. However it seems that employer input is limited¹⁶. Consider the recent Victorian Government announcement that government schools must employ the explicit teaching model when teaching reading¹⁷. This announcement generated considerable consternation amongst teachers. Yet, strong evidence supporting the benefits of a greater use of phonics had emerged in the previous decade¹⁸. Could this transition have been better facilitated if spearheaded by ITE courses rather than forced by government edict? Competition in the ITE space would encourage responsiveness to employers' wants.
- **Universities are rewarded for shortcomings in primary and secondary school teaching**
The government is funding universities to run 'FEE-FREE Uni Ready' courses for up to 30,000 students who wish to enter university but do not meet the usual academic entry standards¹⁹. However universities are key players in the supply chain that delivers students to universities. Providing universities with this extra business reduces their incentive to improve the supply chain.

⁸ UNIVERSITIES AUSTRALIA: [2022 HIGHER EDUCATION FACTS AND FIGURES](#)

⁹ Using the rounded numbers of total revenue, number enrolled in ITE courses, and total resourcing per student in education, we can estimate that ITE courses are approximately 5% of university business. We can also estimate based on student numbers (ignores research business) as being around 6%. Let's assume 5%.

¹⁰ Maani Truu, Jake Evans: [The true scale of Australia's international student industry — in four charts](#)

¹¹ From above Universities Australia report.

¹² The simple average of the proportion of revenue from international students in Go8 universities range is approximately 30%.

¹³ Assumption based on reports that international students subsidise teaching of domestic students
Sydney Morning Herald: [International student numbers not easy to cut without dire results](#)

¹⁴ UNIVERSITIES AUSTRALIA: [2022 HIGHER EDUCATION FACTS AND FIGURES](#) - Figure 51

¹⁵ aitsl: [Understand initial teacher education program accreditation](#)

¹⁶ Glenn Fahey, Rob Joseph: [Starting off on the wrong foot: How to improve Initial Teacher Education in Australia](#)

¹⁷ Bridie Smith: [Teachers told to ignore Victoria's phonics push as union lashes deputy premier](#) (paywalled)

¹⁸ Rachel M. Cohen: [The new "science of reading" movement, explained](#)

¹⁹ Parliament of Australia: [Universities Accord \(Student Support and Other Measures\) Bill 2024](#)

Government revenue and policy

The export revenue currently generated by university exports is likely to be highly valued by the Australian Government. Not only does it reduce Australia's current account deficit, it also reduces the government funding required by universities. However sometimes it is in the interest of the Government to restrict or regulate certain economic activity - despite these activities generating substantial revenue for the state. For example:

- **Smoking**

By the late 1950s, significant evidence had amassed regarding the link between smoking and lung cancer²⁰. In 1964, the US Surgeon General issued a significant report describing the health hazard and concluded that remedial action was required. In the subsequent decades, some government action was taken, mainly in restricting advertisement. However actions to denormalise smoking only commenced in the 1990s. One of the reasons for this long delay, was the tobacco industry's strategy of denying the harms of its products. This example is not meant to imply any equivalence in regards to protecting business models. There is no evidence supporting the notion that engaging in competition to export skills is detrimental to a country's productivity. However if such evidence should arise, I would hope that the Government responds more quickly than it did with smoking.

- **Resource Reservation and Royalties Policy**

Gas is a resource that is currently critical to our domestic economy however it is also in high demand overseas. If our local supply cannot meet this overseas demand, the price of gas can rise to a level where it becomes unaffordable to domestic customers²¹. One way of addressing this is for governments to implement a policy where a portion of gas is reserved for the domestic market. Western Australia already has such a gas reservation policy²². If we treat skills as a critical resource, we could potentially use reservation like policies to ensure that these are not exported at the expense of the Australian economy. We could even take this one step further and consider these as a public resource owned by all Australians and require royalties for their export.

Evaluating teacher training performance

The above criticisms of the current university competition environment serve little purpose unless an alternative can be made to work. If not, we may as well accept the benefits of the export income and rely on other fixes to our productivity problems.

One alternative is for universities to compete based on the effectiveness of the teachers they train. Measuring teacher effectiveness is a difficult task. Various methodologies, using different data sources such as test scores, classroom observations, surveys have been developed - each with advantages and limitations. To get an accurate assessment requires using multiple methodologies²³. This would be a costly endeavour.

However we do not need to calculate the effectiveness of individual teachers. We are looking for an aggregate effectiveness for all teachers from each ITE provider which allows us to rank ITE providers. Is there a combination of methodologies which could provide this at an affordable cost?

One potential candidate is Value-added modeling (VAM). It uses complex algorithms to predict a student's future test scores and then compares these against the actual scores. The difference is considered to be due to the teacher²⁴. While this methodology is not suitable for 'high stake' evaluations of teachers²⁵, with aggregation it may provide results sufficiently consistent to evaluate ITE courses.

Research would be needed to investigate whether teacher effectiveness evaluation methodologies could be used to measure performance of ITE courses. The application of machine learning/AI techniques may assist with this endeavour.

A teacher training competitive market

Assuming that that it is possible to score and rank ITE courses for the purpose of competition, how could those rankings be used to foster competition? It is unlikely that the reputational impact by itself would be sufficient to focus management's mind on improving ITE courses. ITE is not a major part of the business and its growth prospect is small. Adjusting government funding per student in these courses would be counter productive as it impacts the quality of the

²⁰ National library of Medicine: [The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General](#).

²¹ Australian Government, Department of Climate Change, Energy, the Environment and Water: [Gas Markets](#)

²² Brett Cohen, Armin Fazely: [Domestic gas reservation policies – are they a good thing or a bad thing?](#)

²³ RAND: [Measuring Teacher Effectiveness FAQ](#)

²⁴ Wikipedia: [Value-added modeling](#)

²⁵ Hannah Putman: [Teaching that goes beyond the test? How to measure the many accomplishments of great teachers](#)

courses. However the following financial adjustments may have a suitable impact:

1. **Reducing (or rebating) HELP loans**

Students graduating from ITE courses would have their HELP loans reduced (or provided with a credit payment where reduction is not possible) depending on the ranking of the ITE course at the time a student graduates. The size of a potential reduction needs to be large enough to be a serious factor affecting in-coming students' decision on which ITE course to take.

2. **Adjusting royalties for skills export**

If governments charged royalties for skills exported by universities, the ranking could be used to adjust a university's cost of royalties. The higher the ranking, the lower the royalty cost. This would have the effect of rewarding universities for improving Australian productivity, with higher profits from their international business.

Recommendation

Changing the competition environment in which universities operate would have huge ramifications on our education system, research capabilities and even the wider economy. Before contemplating such a change, much discussion, consultation and research would be required to determine if this is feasible, and if so, what options and approaches could be used. It would also be necessary to weigh the potential long term productivity benefits against likely short term export losses.

Some initial research which investigates feasibility together with approaches and options would assist with such community and stakeholder engagement.

Recommendation 1

Undertake research to investigate the feasibility of using a competition model based around performance of teacher training to better focus university management on improving Australian skills and productivity. Also investigate alternative competition models or options which could achieve this purpose. The outcome of the research should be used to stimulate and guide community discussion on the use of competition policy to encourage greater university management focus on improving skills and productivity within Australia.

Summary

Skills are the largest driver of productivity in a country. Universities are a key part of Australia's skills development infrastructure, with their ITE courses training teachers, who in turn, develop critical foundational skills in students. However it seems that universities operate in competitive environment which focuses university management on the export of skills - possibly at the expense of Australian productivity.

Competition policy could potentially be used to refocus university management on parts of their business which improve Australian productivity. Introducing competition to university ITE courses could possibly achieve this. Research into teacher effectiveness methodologies to enable this, and options for setting up such competition, would facilitate community discussions that can further explore this possibility.

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