To Whom it May Concern:

Boosting the commercial returns from research

Thank you for the opportunity to provide the attached submission on the policy and program changes the federal government is proposing to make in order to boost the commercial returns from publicly funded research.

I am responding, principally, to “research” issues. I understand my colleague, Professor Pip Pattison, Deputy Vice-Chancellor (Education), will respond separately focussing on “research training” issues.

The University of Sydney shares with the government the ambition for our research to underpin innovation, thus boosting national productivity, building new knowledge-based industries and delivering social and economic benefits for the community.

In the most recent Excellence in Research Australia rankings, the University did very well, with 75 percent of our fields of research rated above or well above world standard. We also have a strong record of commercialising our research, or otherwise translating it for public benefit, with many recent success stories such as the Qantas flight optimisation program; NuFlora International ornamental plant research and licensing; Sirtex Technology Pty Ltd polymer encapsulation of cancer therapeutics; a multi-year engagement with Rio Tinto, since 2007, to work on autonomous mining; and a significant collaboration with Microsoft on quantum computing.

We have extensive collaborations with industry across our research capabilities reflected in our relationship agreements. Our most recently signed significant relationship include those with partners such as Northrop Grumman, GE Healthcare and the Defence Science and Technology Organisation.

We agree, however, that on a national scale, Australia can do better when it comes to translating research into commercial outcomes.

Successive reviews into this topic, most recently by the Productivity Commission and the National Commission of Audit, have recognised the importance of the research done in our universities, including the increasingly small percentage of basic research. Indeed, when compared to the United States, a country widely recognised as having one of the most successful innovation systems in the world, we note that the basic research share of total publicly funded research activity in Australia’s universities is low, at 29 percent compared to their 75 percent.¹²

The Australian industry sector is also very different to those countries to which we most often compare ourselves. It is overwhelmingly dominated by small to medium sized enterprises, with 99.7 percent of companies having fewer than 200 employees and 95.6% having fewer than 20. In this environment, significant growth in the research and development capacity of industry is challenging.

¹ Group of Eight, Backgrounder, Complementarity between University and Business Research, October 2014, p.7
² Group of Eight, Backgrounder, World University Rankings: ambiguous signals, October 2012, p.46
The federal government's intention to drive collaboration and cooperation between industry and university-based researchers should increase industry demand for research, and we expect a steadily increasing investment by industry in industry-relevant research being conducted in universities, where outcomes are predictable and potentially profitable. This should reduce the need for government investment in R&D, and, we believe, provides an opportunity for the government to rebalance its investment of available public funding towards basic research as is recommended by the Productivity Commission3.

For this to happen, however, there must be incentives for industry (demand) and universities (supply). For example: higher rates for taxation incentives for industry research expenditure with public research organisations would encourage industry to collaborate with university-based researchers, rather than conduct research in-house; and, the recognition of engagement with industry in internal university processes such as promotions to complement traditional academic measures like publications and research grant income, and favourable IP policies, as incentives for researchers.

We note, also, the recent benchmarking report, Mapping the Humanities, Arts and Social Sciences in Australia, co-funded by the Department of Industry, found that while the Humanities, Arts and Social Sciences produce 34 percent of the sector’s research outputs, these fields are excluded from significant research support aimed at increasing industry collaboration, such as the R&D Tax Incentive, and are unlikely to be supported through programs such as NCRIS and the CRC program. With appropriate reforms to incentives and funding programs, we see significant potential to boost collaboration between business and the humanities, social sciences and arts disciplines.

We look forward to engaging with the Government, industry and other stakeholders about these important issues as the policy development process continues.

Should further information be required from the University in relation to any of the matters raised, please do not hesitate to contact me.

Yours sincerely,

Signature removed for electronic distribution

Professor Jill Trewhella  
Deputy Vice-Chancellor (Research)

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3 National Commission of Audit, Toward Responsible Government – Phase 1 Report, February 2014, p.169
Submission to the Federal Government’s, Boosting Commercial Returns from Research Discussion Paper, November 2014

Executive Summary

The University of Sydney supports the government’s goals to increase the commercial returns from research, allowing that such programs do not put at risk fundamental research. Fundamental research makes research universities unique participants in the national innovation system. In the words of the Hefei Statement:

“Much of what governments and the broader community prize in universities derives from their deeper capabilities and more intangible outcomes that this kind of instrumentalist approach can devalue and even lose” 4

Multiple reviews, including those by the Productivity Commission and the National Commission of Audit, have emphasised the importance of this fundamental, or basic, research to the innovation system. 5,6 This contribution has sometimes been characterised as a knowledge pool, wherein ideas and people interact to produce innovation in unexpected ways and at unpredictable times. It is this knowledge pool into which those in search of novel solutions may dip, also in an unpredictable pattern, and from which they may draw a product mixed across many different disciplines. 7

In that context, our recommendations are as follows:

1. Ensure that the proportion of funding awarded based on metrics such as industry engagement is appropriately balanced with that supporting fundamental research – a significant source for large-impact innovation.
2. Ensure ongoing funding is available for research infrastructure, in line with the recommendations of the National Commission of Audit.
3. Increase funding for programs such as the NHMRCs Development Grants that support industry engagement and the commercialisation of new discoveries.
4. Ensure any move towards open IP addresses commercialisation cost-recovery and researcher incentives.
5. Consider including policy engagement as a measure of impact

Creating stronger incentives for research-industry collaboration

The University of Sydney has the highest amount of HERDC category 3 income 8 among the Group of Eight universities and has a patent portfolio consisting of approximately 250 families with around 35% of licensed out to industrial partners.

Across research disciplines we see large differences in both the amount of commercialisation and the time to market for many inventions. In the health and medicine fields commercialisation lead times are particularly long as novelty, and therapeutical effects via animal and early clinical trials, must be proven before commercial value is established. By contrast, in Engineering, the University’s strongest performer in terms of industrial engagement, the pathway to market is much shorter and more straightforward and we have research developments deployed in industry.

4 AAU, LERU, Go8 and C9, Hefei Statement on the Ten Characteristics of Contemporary Research Universities, October 2013
5 Group of Eight, Backgrounder, Complementarity between University and Business Research, October 2014, p.7
6 Group of Eight, Backgrounder, World University Rankings: ambiguous signals, October 2012, p.46
8 HERDC Category 3: Industry and other research income includes: Australian contracts, grants, and donations, bequests and foundations; and, International competitive, peer-reviewed research grant income and other income, and HDR fees for international students.
In our experience medical research, is a significant source for research commercialisation success, but much of our funding in this field is for clinical trials for drugs that were developed from basic research undertaken internationally. The University of Sydney was involved in approximately 250 clinical trials last year. Pharmaceutical discovery is much more likely to take place offshore due to the fact that pharmaceutical companies do fundamental R&D outside Australia, whereas the Australian regulatory framework encourages clinical trials here. The low chance of success and long time to market (an average of about 12 years) makes pharmaceutical discovery a relatively risky target for commercialisation.

By contrast, medical devices provide good commercialisation opportunities as they have much shorter time to market, with approximately 5 years to regulatory approval. However, at present, medical device inventions suffer greatly from the ‘valley of death’ funding gap, the proof of concept and prototyping stages that must be undertaken between research and cash flow. The excellent NHMRC Development Grant program addresses this to a degree, but the total funding available is only $15 million per year. Increasing the amount of funding available to this program would have a significant impact on realising economic returns from the government's research investment.

The University supports changes to some competitive research grants to recognise industry-relevant experience. However, we would suggest that grants which recognise industry-relevant experience should represent some proportion of the total research funding available. Were all competitive researchgrant funding to be awarded in this fashion, basic science would suffer. As discussed above, the evidence shows that while basic science has some of the lowest levels of engagement with industry, it is the primary source for serendipitous, break through discoveries of the kind that can lead to large-scale innovations and ‘step-changes’. Thus, a major loss of funding to basic science is likely to significantly decrease Australia’s capacity for innovation.

Like Medicine, basic science inventions can also have a long time to market, sometimes because they are ahead of the market. A good example of this is the University of Sydney’s ARC Centre of Excellence in Photonics. This Centre has already produced a number of patents, but the time to commercialisation for this research can be delayed some years as the market finds uses for the technology. It is in the pursuit of fundamental research that is sometimes ahead of the market, that universities play a significant role. Only major corporations, such as 3M, Apple, Samsung, BP and Dupont are also able to fulfil such a function.

The government can facilitate industry collaboration with publicly funded research organisations and the translation of publicly funded research by developing a suite of programs that provide a continuum of support at different scales and through all life-stages of the commercialisation pipeline.

Our delegate at the Sydney forum on the proposed Industrial Growth Centres (IGC), and the industry representatives there, were of view that as currently formulated the IGCs are not an appropriate vehicle for the medium- to long-term development of collaborative relationships with SMEs and or as a translational bridge for basic research to the market. Nor can the IGCs be considered a viable replacement for the Cooperative Research Centres program. We support the continuation of the CRC program. The diversion of CRC funding into the IGCs would be premature, and such a move would need to be evaluated once their place and purpose in the system is clarified and credentials established with industry and publicly funded research organisations.
Supporting research infrastructure

The University of Sydney strongly supports the establishment of long-term research infrastructure investment. The National Commission of Audit recognised the essential role of national research infrastructure and recommended that the government establish ongoing funding for these facilities, following a reassessment such as that proposed. We would be pleased to assist with any such review, noting that stop-start funding for the NCRIS program has likely had significant productivity impacts. Medium- to large-scale research facilities are one of the key products we have to share with industry, and we note that we are already undertaking this sort of collaboration in our Medical Research Institutes and across the health system more generally.

Providing better access to research

In our experience, the length of time taken to agree IP arrangements has less to do with IP negotiations and is more likely to be a function of the number of partners to the agreement. Thus, we do not see significant value in a move to strengthen IP guidelines and consider that an IP toolkit is most likely to be of use to those within the higher education sector who do not have the resources to put towards specialist commercialisation functions. In negotiations with industry partners, we most often find publication rights (including the rights of students) to be a significant issue, and one that is often new to Australian industries in particular. Other complications are that industry sometimes prefers the use of trade secrets to patents, and academics are strongly motivated to publish, and this can lead to extended negotiation of contracts.

The costs of patent protection are significant: the University of Sydney spends between $1.5M and $2M a year to protect patents. These are costs that individual inventors are very unlikely to be able to bear, and thus the assignment of IP to the University allows the University to make an investment in those patents we believe are worthwhile. In recognition of the need to provide an incentive for inventors, we are moving to a model like that of the University of Cambridge’s whereby inventors will receive at least $100,000 of proceeds after commercialisation costs are recovered. The University also invests in commercialisation infrastructure and expertise on behalf of its inventors, assisting with negotiations.

We agree that IP developed with public funding must be exploited, and preferably while it is fresh to have the greatest impact. To that end the University includes provisions in licenses that IP be developed within a reasonable time or is freed for others to use.

While we acknowledge the need for universities to provide more information to industry about the IP available, and are working to do so ourselves, any such moves would need to be compatible with the need to protect IP through patenting activities.

The benefits claimed for Easy Access IP as a model for commercialisation of IP need to be substantiated. Usually only a small portion of the institutions’ IP portfolio is available as Easy Access IP; we need to know if this model has genuine potential for commercial impact.

In our experience partnerships and IP licencing are far more effective paths to successful commercialisation of research than the formation of public research spin-off companies. Such companies have a significant failure rate ranging from 25% in the first year to 50% by year four. Where partnerships are pursued instead, the expertise of industry can be leveraged to ensure time to market is as short as possible.

The University strongly supports moves to increase access to the outcomes of publicly funded research as are reflected in the dissemination policies of the ARC and NHMRC. We endorse the Go8 Statement on Open Access and have an institutional Open Access policy in development which encourages OA for publications and research data.

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9 Entrepreneur Weekly, Small Business Development Center, Bradley Univ, University of Tennessee Research, 1.1.2014
Increasing industry relevant research training

The University is supportive of increasing industry relevant research training. We currently have 13 PhDs and 3 postdoctoral fellows placed within the ARC Industrial Transformation Training Centre for the Australian Food Processing Industry in the 21st Century and many more in the CRCs with which the University is associated. CRCs have had mixed success in this field, most likely due to the nature of the industries with which they have been engaged. Intern programs are another useful way to create new partnerships with industry – the University of Sydney’s successful partnership with Qantas on flight optimisation grew out of our internship program.

One important way universities contribute to industry is through the production of high quality graduates, and it is worth noting that many more of our PhD students go on to work for industry, commercialising ideas, than continue to work in academia. In that context, and noting the success of the Capital Markets CRC in working with industry, we would like to highlight the contribution of the Humanities, Arts and Social Sciences disciplines to the production of those graduates, whose skills and knowledge industry clearly finds valuable.

Measurement of outcomes

We are broadly supportive of moves to improve metrics on engagement and knowledge transfer with industry, as well as research outcomes and impact. As always the value of the information collected needs to be weighed against the collecting and reporting costs.

To be acceptable, metrics intended to measure impact or industry engagement must be: valid, balanced and reliable; drive appropriate behaviours; use existing data wherever possible; and seek to minimize administrative and reporting burden. They must be resistant to gaming. Universities must be given the opportunity to verify data from external sources. Metrics and processes must be thoroughly trialled and implications modelled and discussed with the sector before implementation, particularly where funding flows are, or may in future be, involved.

We note that a significant area of research impact that is not currently well-measured is the input of researchers into public policy at every level of government and in the not-for-profit sector. This metric would be particularly important to demonstrate the contribution to our community and economic well-being by researchers in the Humanities, Arts and Social Sciences.

Priority investments

This review presents an opportunity to look forward to enable future commercial outcomes, to build industry linkages and to address persistent systemic issues that impede research.

For example, additional funding could be deployed to address system level issues, such as indirect costs of research, valley of death, translation into medical practice, research training, medical related research infrastructure, etc.). Funding could be dedicated specifically to covering the ‘valley of death” between IP and exploitation focusing where key priorities in the industrial landscape align with areas of research excellence, for example medical devices where Australia has a proven track record and where there is a relatively short time to market, and to extend the $15 million currently available to the NHMRC Development Fund each year. There could be funding that focuses on knowledge translation, not just commercialisation, for example by funding programs of multidisciplinary research and research platforms addressing the diseases that most heavily burden the Australian health care system and where translation of research into policy, prevention and treatment, will generate the greatest savings and improvements in health outcomes (e.g., mental health including dementia, obesity and diabetes & cardiovascular disease).

These should be priority areas for ARC and NHMRC, and could be funded from the Medical Research Future Fund (MRFF) should it be implemented.