



Australian Academy of Science

SUBMISSION TO THE

**REVIEW OF RESEARCH POLICY  
AND FUNDING ARRANGEMENTS**

FROM THE AUSTRALIAN ACADEMY OF SCIENCE / SEPTEMBER 2015

# Submission by the Australian Academy of Science to the Review of Research Policy and Funding Arrangements

## Executive Summary

The Australian Academy of Science (the Academy) is strongly supportive of the Australian Government's broad policy objective of increasing engagement between university researchers and industry. However, the Academy is of the view that the National Competitive Grant Programme (NCGP) and Research Block Grants (RBGs) are not the appropriate policy mechanisms to incentivise such collaboration.

Because the outcomes of research are uncertain, the Academy argues that the most appropriate basis on which to allocate public research funding is excellence of research. While there may be scope in some instances to pursue applied research outcomes through priority funding of broad issues or areas, this must not come at the cost of excellence in research, nor at the cost of excellent basic research such as that supported directly and indirectly through the NCGP and the RBG schemes.

Specifically, the Academy is concerned that making changes to the NCGP or the RBG schemes to prioritise research with either greater scope for industry collaboration or greater potential for commercial benefit risks damaging Australia's important basic research effort.

There are a number of systemic barriers to greater collaboration between university researchers and industry and to subsequent commercialisation of Australia's research discoveries. These barriers act collectively to impede the creation of business demand for research and innovation services, and the Academy is of the view that these factors must be considered and addressed before making changes to research policy and funding arrangements, which affect the supply of research and innovation services.

The Academy would welcome a new dedicated commercialisation strategy, or a reinvigoration of those research schemes that enhance academia–industry collaboration, such as the Cooperative Research Centres (CRC) program and the Australian Research Council (ARC) Linkage program.

The Academy would also support any moves to enhance the focus of the RBGs on the quality, rather than the quantity, of research outputs. It further suggests that any changes to current policy and funding arrangements should be phased in over five years to give universities a genuine chance to adapt to any new arrangements.

The Research Block Grant system is an effective way of funding the indirect costs of competitive grant research, although the quantum of RBG funding has now fallen a long way short of an appropriate level of support for these indirect costs. Although the Academy does not oppose changes to the current funding regime to reduce administrative burden or complexity, it is important that support is restored to levels that fully fund Australia's research program.

Finally, the Academy is of the view that care must be taken in making changes to the funding incentives within the system (such as the RBG performance indices), to avoid the possibility of creating perverse incentives. For that reason, any changes to performance indices must be based on metrics which are credible and verifiable.

## Recommendations

- 1. The Academy recommends that Australia's policy initiatives for the support of commercialisation and business R&D, particularly for small to medium enterprises, be significantly reviewed and enhanced before making amendments to the policy and funding arrangements for higher education research.**
- 2. The Academy recommends that any changes to current funding arrangements are based on clear supporting evidence, and that any changes incentivise the pursuit of excellence in research.**
- 3. The Academy recommends that any changes in funding arrangements should be phased in over five years, to provide institutions with sufficient time to adapt to any new arrangements.**
- 4. The Academy recommends that the ARC and National Health and Medical Research Council (NHMRC) provide a clear articulation of relevant industry performance evidence to assist industry researchers' participation in the NCGP.**
- 5. The Academy strongly recommends that support for existing programs that enhance collaboration between industry and the research sector is expanded, in addition to the implementation of a strategic commercialisation program.**
- 6. The Academy recommends that the application process for NCGP schemes that involve industry partners be reviewed with a view to reducing the administrative burden involved in preparing grant applications.**
- 7. The Academy recommends that peer review in NCGP schemes be retained in its current form.**
- 8. The Academy recommends that new systemic measures of impact and engagement of university research with industry should not be implemented until the objectives and methodology of such an exercise have been established as necessary, valid and credible.**

The Australian Academy of Science welcomes the opportunity to make a submission to the review of research policy and funding arrangements. The Academy promotes scientific excellence, disseminates scientific knowledge, and provides independent scientific advice for the benefit of Australia and the world. The Academy is made up of over 500 of Australia's leading scientists, each elected for their outstanding contribution to science. The Academy would be pleased to provide further information or explanation on any of the points made in this submission.

This submission is structured in two parts: the overview, which sets out the general position of the Academy in relation to research policy and funding arrangements; and responses to the specific questions asked in the issues paper.

## Overview

The Academy notes the intention of the government to increase the level of commercial return from Australian research, and is supportive of the broader policy objective of increasing engagement between university researchers and industry. However, the Academy believes that changes to the National Competitive Grants Program (NCGP) and Research Block Grant system are not the appropriate avenue to give effect to this objective.

It is the Academy's strong view that boosting returns from Australia's research effort would best be achieved through a commercialisation initiative that enhances and complements the high-quality research undertaken at Australian research institutions. Furthermore, the Academy is strongly of the view that the most appropriate policy objective to pursue in consideration of publicly funded research is the promotion of excellence in research. Simply put, the limited amount of public funds available to research must buy the highest quality research possible. The Academy is not convinced that the proposals canvassed in the review's issues paper would contribute to this outcome.

## Promoting research excellence in Australia

Australia has a strong research capability, with many universities performing significantly above world standard in a range of areas. As demonstrated by the summary results of the Excellence in Research for Australia (ERA) presented in Attachment A of the issues paper, 31 of Australia's 42 universities perform above, or well above, world standard in at least one field of research. Excellence in research in Australia is encouraged by the Sustainable Research Excellence (SRE) block grant initiative, which provides universities that score highly in the ERA with additional, flexible funding to support their research programs.

Excellence in research represents the most appropriate policy objective of publicly funded research. The outcomes and impacts of research are uncertain, therefore research must be judged on its quality—its intellectual rigour, novelty, integrity, and the degree to which it advances knowledge. At its heart, the best method for ensuring the quality of research is peer review—a frank and informed assessment of the merits of research by disciplinary experts and experts of standing in similar fields. In order to ensure the best value from research funding, peer review must be kept at the heart of evaluation of scientific endeavour, and must be kept free from influences which do not relate directly to the quality of the research being assessed.

## Basic and applied research in Australia

The Academy is particularly concerned that the issues paper canvasses a 'greater focus on competitive grant programs which specifically support early-stage commercial research endeavours'. While acknowledging the importance of such commercially applied research, the Academy is strongly of the view that NCGP schemes are not the appropriate avenue, and that commercially

applied research would more appropriately be supported by a long-term, well-resourced commercialisation initiative.

Appropriately, schemes in the NCGP focus on the scientific or intellectual quality of the research proposal, the track record of the researchers and the innovation or significance of the expected research outcomes to the field.<sup>1</sup> The Academy is concerned that prioritising commercial research would inevitably disadvantage research without an immediately foreseeable commercial benefit, detracting from Australia's overall knowledge capital and the medium- and longer-term economic and social benefits that it can deliver.

In effect, basic research is a vital component of Australia's economy. It provides the necessary foundational knowledge from which applied and translational research can deliver both predictable and unexpected social and economic returns for the community.

The outcomes of basic research also represent scientific capital in the form of knowledge about natural systems and processes, and also through the development of scientists' research and enquiry skills. Although Australia does import much of its basic scientific knowledge from overseas, it is important to maintain local expertise and capability as not all knowledge can be imported. For example, other countries are unlikely to conduct research on biological systems that occur only in Australia. Just as Australia relies on advances in basic knowledge made overseas, Australia has a responsibility to contribute to the global pool of basic scientific knowledge.

Through the NCGP, Australia invests in both basic and applied research, but the share of research expenditure devoted to basic research has declined from 40 per cent in 1992 to 24 per cent in 2012 (see Figure 1). The fastest growing segment of research expenditure over the last two decades has been applied research. This suggests that there is already a considerable portion of Australia's research effort directed towards those fields that have greater commercial potential. The Academy is concerned that any further move towards prioritising commercially driven research in NCGP schemes would risk impairing Australia's research capabilities.

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<sup>1</sup> Australian Research Council (ARC) 2015, *Discovery projects selection report for funding commencing in 2015*, ARC, Canberra, [http://www.arc.gov.au/sites/default/files/filedepot/Public/NCGP/DP15/DP15\\_Selection\\_Report.pdf](http://www.arc.gov.au/sites/default/files/filedepot/Public/NCGP/DP15/DP15_Selection_Report.pdf); National Health and Medical Research Council (NHMRC) 2015, *NHMRC funding rules for applications submitted in 2015*, NHMRC, Canberra, <https://www.nhmrc.gov.au/book/nhmrc-funding-rules-2015>

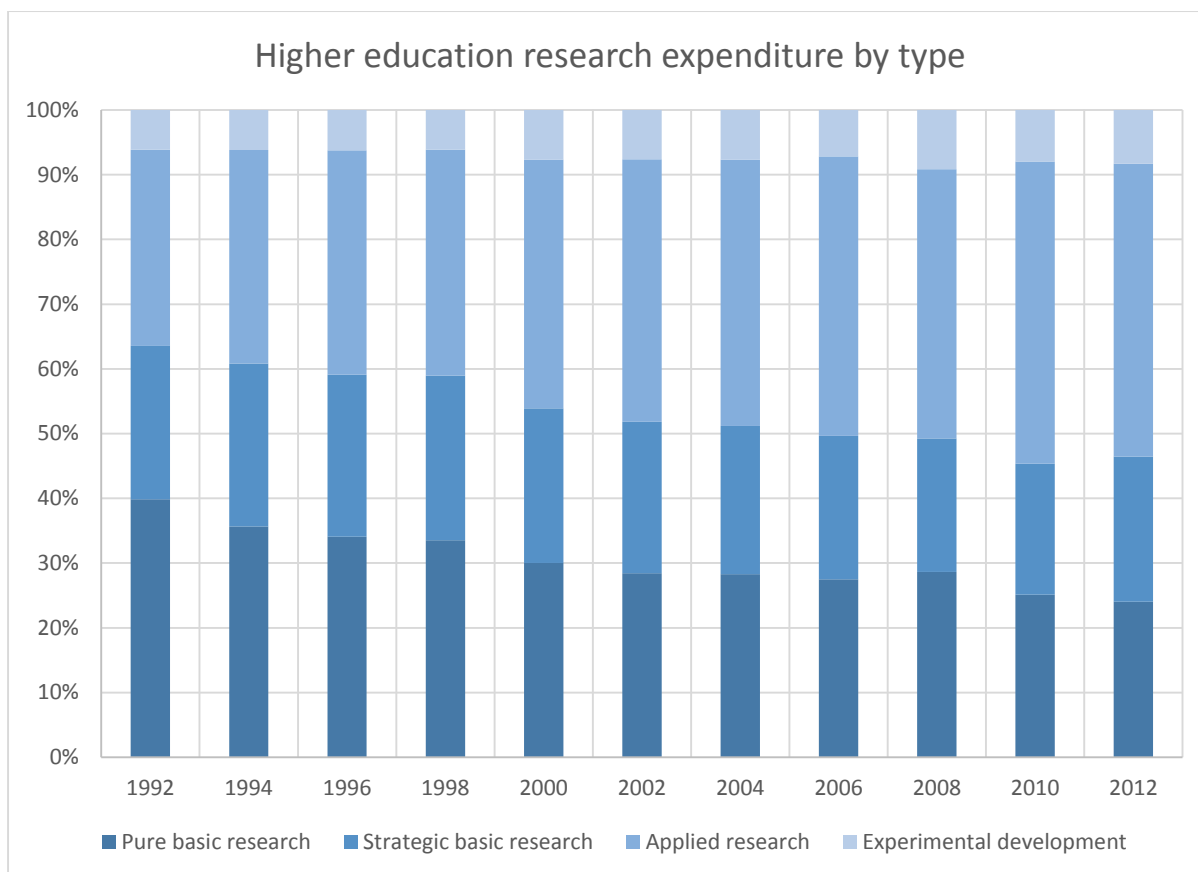


Figure 1 Share of expenditure in higher education research by research type. Source data: ABS, 2014.<sup>2</sup>

Australia's basic research effort is of high quality. The Chief Scientist's recent exercise of benchmarking Australian science, technology, engineering and mathematics (STEM) found that the best of Australian research is comparable with the best research around the world.<sup>3</sup> This is also reflected in the results of the ERA, which show that many institutions perform at or above world standard in a range of fields. Efforts in reforming Australia's research should be aimed at promoting excellence in research across the entire sector.

While commercial outcomes are usually not immediately obvious, basic research is nevertheless an essential activity which underpins broad sectors of the Australian economy. Knowledge from advances over the past 20 years in basic physical and mathematical sciences is estimated to directly underpin 11.2 per cent of Australia's economic output (\$145 billion) and to support 760,000 Australian jobs (7 per cent of the workforce).<sup>4</sup> The Academy therefore considers it extremely important that any changes to the national funding schemes for research do not risk damaging

<sup>2</sup> Australian Bureau of Statistics (ABS) 2014, *Research and experimental development, higher education organisations, Australia, 2012*, cat no. 8111.0, ABS, Canberra.

<sup>3</sup> Office of the Chief Scientist (OCS) 2014, *Benchmarking Australian science, technology, engineering and mathematics*, Australian Government, Canberra, [http://www.chiefscientist.gov.au/wp-content/uploads/BenchmarkingAustralianSTEM\\_Print\\_Nov2014.pdf](http://www.chiefscientist.gov.au/wp-content/uploads/BenchmarkingAustralianSTEM_Print_Nov2014.pdf)

<sup>4</sup> Centre for International Economics 2015, *The importance of advanced physical and mathematical sciences to the Australian economy*, Australian Academy of Science / Office of the Chief Scientist, Canberra, <http://www.chiefscientist.gov.au/wp-content/uploads/Importance-of-Science-to-the-Economy.pdf>

Australia's basic research capabilities, or dilute the primary policy objective of promoting excellence in publicly funded research.

### Funding the total costs of research

The Academy strongly recommends that arrangements for funding Australian research programs provide funding for both the direct and indirect costs of research. According to a study for the Department of Industry, Innovation, Science and Research in 2009, the indirect costs of NCGP research are essentially equivalent to its direct costs; the average indirect cost of research was 99 per cent of its direct cost.<sup>5</sup>

The direct costs of NCGP research include those costs directly attributable to a research project. Funding for these direct costs is provided through the NCGP granting process, such as ARC and NHMRC grants. Funding for the indirect costs of research comes from a limited set of the RBGs—specifically the Research Infrastructure Block Grants (RIBGs) and the SRE grants. The Joint Research Engagement (JRE) grant system also supports research infrastructure, but is expected to support research beyond that supported by the NCGP.

Even a cursory examination of the relevant figures shows a serious disparity between the amount of funding allocated directly for research and the amount of funding provided to support that research. The Science, Research and Innovation budget tables show that in 2014–15, the ARC and NHMRC provided about \$1.78 billion in direct funding for research, the majority going to universities.<sup>6</sup> However, the amount of funding available to support the indirect costs of research (the sum of SRE, JRE and RIBG amounts) was only \$758 million in 2014.<sup>7</sup> This discrepancy places universities in the unavoidable situation of having to fund the indirect costs of research programs through cross-subsidisation from other programs, particularly teaching, which is clearly an undesirable outcome.

The Academy is strongly of the view that each university's NCGP research program should be fully funded through the combination of competitive grant income and block grant funding. The Academy is concerned that canvassed changes to block grant funding to attempt to prioritise commercial research could exacerbate this funding gap, particularly in those institutions with a strong basic research program.

The Academy would draw the panel's attention to a report completed by the Royal Swedish Academy of Sciences which compared the research systems of Sweden, Denmark, Finland, the Netherlands and Switzerland, focusing on models of funding and research governance. The authors of that report suggest that providing a substantial quantum of a university's research budget by block grants enables a university to develop its own areas of quality:

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<sup>5</sup> Allen Consulting Group 2009, *The indirect costs associated with research funded through Australian Competitive Grants*, Department of Industry, Innovation, Science and Research, Canberra, <http://docs.education.gov.au/system/files/doc/other/acgindirectcostsuniresearch.pdf>

<sup>6</sup> Department of Industry and Science 2015, *Science, research and innovation budget tables*, Australian Government, Canberra, <http://www.industry.gov.au/innovation/reportsandstudies/Documents/2015-16ScienceResearchAndInnovationBudgetTables.pdf>

<sup>7</sup> Department of Education, *Research block grant allocations 2001–2014*, Australian Government, Canberra, [http://docs.education.gov.au/system/files/doc/other/rbg\\_allocations\\_2001-2014.xls](http://docs.education.gov.au/system/files/doc/other/rbg_allocations_2001-2014.xls)

*For a university to be capable of assuming more responsibility for its own quality development, our comparative observations indicate that its ratio of in-house to external funding must be at least 60/40.<sup>8</sup>*

Such a split would be consistent with a fully funded system of research in Australia, where the indirect costs of NCGP research would be fully funded (based on the indirect cost of research being equivalent to the direct costs), with a certain amount of flexible funding available to universities to invest in developing areas of research quality with a long-term view, beyond the cyclical nature of NCGP funding.

It should be noted that there are a number of differences between the research system in Australia and the countries studied in this report, which make the findings not directly applicable here. For instance, many of the countries studied lack an institutional or governmental research quality assessment. However, the Academy draws attention to the author's arguments that stability in university governance and funding, combined with a small number of clearly expressed expectations, have contributed to the research success enjoyed in a number of the countries under study. Stability of policy and funding allows for the development of long-term research capability at universities, which can lead to the foundation of new areas of excellence. The Academy is of the opinion that the stability of funding to universities should be viewed as a critical enabler of high-quality research.

### **Innovation, commercialisation and industry collaboration**

The Academy is supportive of an agenda to disseminate Australian research more widely in the community and of initiatives to encourage greater engagement between academia and industry. However, the Academy argues that encouragement for such activities should be additional to support provided for Australia's basic and applied research effort. The Academy recommends specifically that any new initiatives should complement Australia's existing areas of research excellence, rather than redirect focus and funding from Australia's high-quality basic research activities.

As outlined earlier, applied research has been assuming greater importance in Australia's research effort over the last two decades. It is the Academy's position that it would be most appropriate to evaluate Australia's approach to applied research to determine whether the increasing investment in applied research is delivering benefits to the wider community. Similarly, a systematic analysis is needed of Australia's commercialisation policy settings to determine those areas in which new support mechanisms would be most appropriate.

The Academy agrees that there is scope for greater collaboration between business and research institutions on innovation and commercialisation. However, there are significant systemic barriers to enhancing collaboration between universities and industry in Australia. The most important of these is that Australian businesses collaborate far less with other organisations on innovation (whether with universities or other businesses) than in other countries in the Organisation for Economic Co-operation and Development (OECD).<sup>9</sup>

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<sup>8</sup> Öquist, G and Benner, M 2012, *Fostering breakthrough research: a comparative study*, The Royal Swedish Academy of Sciences, Stockholm, Sweden, [https://www.kva.se/globalassets/vetenskap\\_samhallet/forskningspolitik/2012/akademirapport\\_breakthrough\\_research\\_121209.pdf](https://www.kva.se/globalassets/vetenskap_samhallet/forskningspolitik/2012/akademirapport_breakthrough_research_121209.pdf)

<sup>9</sup> Organisation for Economic Co-operation and Development (OECD) 2013, *Science, technology and innovation scorecard 2013*, OECD, Paris; Australian Bureau of Statistics (ABS) 2014, *Innovation in Australian business*,



Specifically, the OECD's 2013 Science, Technology and Innovation scorecard shows that Australia is ranked last for firms collaborating with suppliers and clients, and fourth last for firms collaborating on innovation activities at all. In contrast, Australian universities do collaborate at average levels; OECD data show that Australia's international scientific collaboration (and its impact) is comparable to Great Britain, Canada, Israel, Germany and France. Together, these data indicate that poor culture and a lack of incentives for industry collaboration generally, rather than specific barriers within universities, are the biggest roadblocks to better university–industry collaboration. For this reason, the Academy is concerned that changing research policy and funding arrangements to universities to incentivise collaboration with industry will not necessarily produce the desired result of additional collaboration. Instead, there is a risk that such measures would significantly affect the quality of Australia's research. International experience has shown that where measures designed to 'force' collaboration and other policy outcomes into university research have been imposed on universities, the quality and impact of research has suffered.<sup>10</sup> The Academy therefore recommends that the extent of, and reasons for, any unmet demand for collaboration from Australian business should be investigated prior to making any changes to research policy and funding arrangements.

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2012–13, cat. no. 8158.0, ABS, Canberra,  
<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/8158.0Main%20Features72012-13?opendocument&tabname=Summary&prodno=8158.0&issue=2012-13&num=&view>

<sup>10</sup> Öquist, G and Benner, M 2012, op. cit. pp. 24–25

## Responses to consultation questions

1.4.1 *What are the main factors impeding the commercialisation of the research output of Australia's universities?*

1.4.2 *What are the barriers to improving research–industry collaboration?*

1.4.3 *What are the best strategies to address these problems? What confidence should we have that they will make a difference?*

There are a number of systemic barriers that impede the commercialisation of Australia's research output and hinder collaboration between research institutions and industry. Engagement between industry and universities is most likely where a business wishes to innovate—that is, to employ new knowledge or technology that ultimately allows the business to produce a new good or service. This may be new to the world, new to the industry or region, or new to the firm. It is likely that the main factors impeding greater overall levels of collaboration between universities and industry are a lack of desire among business owners to engage innovative expertise available in Australian universities, or a lack of means and incentives for them to do so. This is supported by a number of observations:

**Relatively few Australian businesses are engaged in innovation.** OECD data have Australia ranked 23rd of 33 for large firms engaged in innovation.<sup>11</sup> Australian small and medium enterprises are more likely to innovate, but overall only 42.2 per cent of Australian businesses were engaged in innovation activity in 2012–13.<sup>12</sup> This means that few businesses were undertaking activities in which they could be assisted by Australian researchers.

**Business innovation in Australia lacks novelty.** ABS data show that of those Australian businesses that do introduce innovations, between 75 and 92 per cent of innovations were new-to-firm only, rather than being new to the region, industry or world.<sup>13</sup> Researchers are involved in the discovery of new knowledge and technologies, which is almost always new to world. Collaboration between academia and business, in those instances where a business wishes to introduce innovations that are already present in the industry or region, is unlikely to deliver significant benefits to either the innovating business or the collaborating institution.

**Australian businesses collaborate with value-chain partners.** For those businesses that do collaborate on innovation, there seems to be a clear preference to collaborate with entities in their own value chain. There were 43.8 per cent of innovation collaboration-active businesses collaborating with their clients, customers and buyers, while 42.1 per cent collaborated with suppliers. The next most popular collaboration was with consultants at 28.1 per cent.<sup>14</sup> This makes intuitive sense—if the predominant mode of innovation is to introduce products or processes that already exist in the industry (as in new-to-firm innovation), then the most appropriate innovation partners are those who might demand innovations already available from other firms (buyers), or those who can enable the introduction of a pre-existing innovations (suppliers). If the innovation is pre-existing in the marketplace, then the expertise of researchers in creating new-to-world

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<sup>11</sup> OECD, Science, technology and innovation scorecard 2013, op. cit, p.180

<sup>12</sup> ABS, Innovation in Australian business, op. cit.

<sup>13</sup> *ibid.*

<sup>14</sup> *ibid.*

innovations is unnecessary. Universities would seem like a less appropriate innovation partner in these scenarios.

Unfortunately, there are a number of barriers to Australian business engaging in innovative practices which could lead to higher utilisation of Australian research expertise. These are also barriers that inhibit commercialisation:

**Australia has a relative lack of venture capital investment.** A report from the Australian Council of Learned Academies (ACOLA) has highlighted that venture capital investment in Australia is declining sharply. Furthermore, the level of venture capital investment in Australia as a percentage of gross domestic product is low compared to other OECD countries.<sup>15</sup> Venture capital and other forms of finance that accept higher levels of risk compared to conventional financial institution debt instruments are essential for bridging the gap between research outcomes and commercial goods or services.

**Incentives for business research and development favour larger companies.** Australia's support for business research and development is mostly indirect, relying heavily on the R&D tax incentive. By its nature, this support favours those companies with sufficient existing capital to establish or undertake new research and development activities. However, commercialisation of research outcomes is frequently undertaken by small start-up or spin-out companies that usually lack such capital. Similarly, because the incentive is a tax offset (albeit partially refundable), it is of limited utility unless there is a strong expectation that the company will incur a tax liability from concurrent or future profit. This means that indirect support through a tax offset is of little use to a start-up company engaged in commercialisation of a novel technology, which may be wanting in capital to conduct its R&D program. Direct support for business R&D, particularly for small companies, could increase the ability of companies to conduct novel innovation and engage with new research and knowledge produced by Australian institutions. OECD data rank Australia 33 of 36 OECD countries for direct support to business research and development as a percentage of GDP. A strong and stable commercialisation program could be an effective vehicle for supporting early-stage commercialisation endeavours to help bridge the gap between the outputs of research and commercial goods and services.

**Lack of stability in policy settings for supporting commercialisation.** ACOLA has pointed out that Australia's schemes to support business R&D, and commercialisation, have not inspired confidence in the business community:

*Commonwealth Government measures to assist firms are fragmented and lack scale and continuity. Unlike most other OECD countries, Australia has a history of frequent changes to assistance measures. This makes it difficult for business to plan for or rely on government assistance.*<sup>16</sup>

A long-term, well-resourced commercialisation support program would provide confidence to business to invest in novel innovation and R&D, and assist in fostering a broader innovation culture among Australian business.

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<sup>15</sup> Bell, J, Frater, B, Butterfield, L, Cunningham, S, Dodgson, M, Fox, K, Spurling, T and Webster, E 2014, *Securing Australia's future 4: the role of science, research and technology in lifting Australian productivity*, Australian Council of Learned Academies, Melbourne, <http://www.acola.org.au/PDF/SAF04Reports/SAF04%20Role%20of%20SRT%20in%20lifting%20Aus%20Productivity%20FINAL%20REPORT.pdf>

<sup>16</sup> Bell et al., *Securing Australia's future 4*, op. cit., p. 56

Given the barriers to Australian business conducting novel innovation, which would permit greater collaboration between researchers and industry, the Academy is of the view that the best approach to the problem is to examine the possibility of enhancing and sustaining commercialisation programs in Australia. ACOLA argues that policies that focus on enhancing demand for research and innovation services have been shown to be an effective way of capturing benefits from publicly funded research.<sup>17</sup> There is no evidence to suggest that altering funding arrangements or policy for higher education research (effectively altering the drivers of research and innovation service supply) will have any impact on enhancing commercialisation or engagement in the absence of any measures to encourage or enhance demand.

**Recommendation 1: The Academy recommends that Australia’s policy initiatives for the support of commercialisation and business R&D, particularly for small to medium enterprises (SMEs), be significantly reviewed and enhanced before making amendments to the policy and funding arrangements for higher education research.**

*1.4.4 Is the dual funding system for competitive grants the most effective way of providing support for the indirect costs of these grants? Why is it? Would any other approach be more effective?*

The Academy does not have a position on the best funding mechanisms, but block grants provide a useful mix of flexibility and tied funding. It must be recognised that the strict funding rules applied to NCGP funding require a complementary flexible funding mechanism to provide for their indirect costs.

However, the current funding mechanisms are relatively complex. In the case of block grants, the majority of their focus is on the quantity of research inputs and outputs, rather than their quality. Additionally, the current regime does not fund the total cost of conducting NCGP research.

The Academy is of the view that consideration should be given to funding the entire cost of research through project grant processes, combined with a relaxation in restrictions on how these grants are used (permitting them to be used to contribute to the indirect research costs). This would reduce the administrative burden associated with funding research. As NCGP grants reward excellence in research, such a policy would have the benefit of encouraging the pursuit of high-quality research, rather than a high quantity of research outputs. However, a flexibility to support research capability development outside of NCGP processes should also be considered as essential to developing the wider Australian research system, and should be reflected in the funding arrangements.

*2.3.1 Does block grant funding still have a role to play in funding research?*

*2.3.2 Is block grant funding distributed by performance-based formulae still the most appropriate way to allocate funding? If not, what alternatives might be suitable?*

*2.3.3 Are the current allocation formulae still fit for purpose? If not, how might they be changed to improve alignment with policy objectives?*

Under the current arrangements, block grant funding is essential for the support of research, both basic and industry driven, and it must continue to support the general research enterprise. The

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<sup>17</sup> *ibid.*

Academy is of the opinion that block grants have generally provided an effective method of funding the indirect costs of NCGP research to date. If changes are to be made to block grant funding, they should reflect the policy outcome of providing the best value for money by ensuring research excellence.

Broadly speaking, the performance metrics currently used provide an appropriate assessment of the costs borne by each university in its execution of NCGP research. However, it should be noted that the current metrics are heavily based on quantity of research inputs and outputs (such as grant income, student numbers and publications). The Academy considers that it might be more appropriate to place less weight on these metrics, and more weight upon those metrics that consider the quality of research, such as the ERA results.

While the Academy is not necessarily opposed to changing the current funding arrangements, it is not clear that a substantial advantage would be derived from doing so. Any changes to current arrangements should be clearly justified by evidence, and provide a clear expectation of the intended results from the change to policy. Any changes should reaffirm the framework of encouraging excellence in research.

**Recommendation 2: The Academy recommends that any changes to current funding arrangements are based on clear supporting evidence, and that any changes incentivise the pursuit of excellence in research.**

*2.3.4 Would there be an advantage in reducing the number of programs from the existing six? If so, how might this be achieved?*

The Academy is broadly supportive of reducing the complexity of funding programs to reduce the administrative burden on both universities and government. However, the current flexibility afforded by the SRE block grants, which reward research excellence by providing universities with flexibility in spending should be retained in any changes to the structure of the block grant system. The Academy believes that individual universities are best placed to decide on their own priorities for supporting NCGP research. Similarly, the Academy is of the opinion that consideration should be given to expanding the role played by the SRE grants in funding research, as the SRE grants incentivise the most appropriate policy outcome of encouraging high-quality research.

*2.3.5 Do the current metrics provide appropriate and clear incentives for researchers and institutions for engagement with industry and commercialising research? If not, what other metrics would be suitable and how might the metrics be collected? Are there any metrics whose collection or use should be discontinued?*

The current metrics provide clear incentives for researchers and institutions to pursue excellence in their research, which is the most appropriate policy objective from publicly funded research. The current metrics also reward universities that collaborate with industry, through the Higher Education Research Data Collection (HERDC) metrics. For example, the performance index calculation of a university's grant under the JRE is comprised of 60 per cent of research income from sources other than competitive grants (other public sector research income, industry research income and CRC research income). Other grant types (except the RIBG) also include this income as part of the performance index. Given that income from NCGP processes is limited and finite, universities have a

clear incentive to pursue income from industry-based research, as it will not only provide direct research income, but also increase their share of block grant income.

Given that these incentives already exist in the system, the Academy suggests that the current metrics do provide appropriate and clear incentives for researchers and institutions to commercialise research and engage with industry, to the extent that such engagement is sought. Given the number of systemic barriers to industry engagement and commercialisation, the Academy is not convinced that further changes to the block and competitive grant system through metrics or other mechanisms to further favour engagement with industry would substantially improve these outcomes.

The Academy is also concerned that a shift in the metrics for allocating block grants to more heavily emphasise industry engagement will disadvantage Australia's important basic research effort, which has limited opportunity to engage with industry directly. Basic research has an important place in the Australian research effort and economy, particularly with regards to training researchers and workers who will fill STEM-related jobs.

*2.3.6 Are the funding rules still fit for purpose, especially in relation to delivering more effective and innovative Higher Degree by Research (HDR) training? What changes could be made to improve funding rules?*

The funding rules surrounding NCGP research are currently relatively restrictive and provide little scope for flexible arrangements. NCGP funding rules tie expenditure directly to research projects, often without capacity to support the salary of lead investigators, and therefore do not provide opportunity for any contribution to general research infrastructure at universities or partner organisations. While these rules are a simple method of ensuring that public research expenditure is appropriately used, they do require the complementary block grants funding mechanism to take account of the costs of research beyond those which can be tied to a specific project.

Any changes to funding rules would need to consider the balance between tied and flexible funding that is necessary to support the whole cost of research, but in general the Academy would welcome greater flexibility for universities and partner organisations to be able to fund research and research training in flexible ways.

As suggested earlier, the Academy suggests that consideration is given to reducing the complexity of the grant schemes by allowing greater flexibility in the spending of NCGP funding.

*2.3.7 For any changes canvassed in response to the above questions, will there be a need for any transitional arrangements? If so, what sort of arrangements and for how long?*

The block grant system includes a safety net mechanism, which ensures that funding to any particular institution remains at least 95 per cent of the previous year's funding. At a minimum, this safety net will need to remain in place if changes to the block grant system are made, to ensure that universities can plan effectively.

Beyond this, any changes to block grant systems should not be made effective until a bona fide consultation process has been completed, in which each institution likely to be affected is:

- provided with sufficient information to determine the impact of the proposed change to the block funding scheme, including the proposed new methods for allocation of block grants and an estimated block grant amount for the current year and future years
- provided with an opportunity to make a case for any special circumstances or strategic initiatives which may be compromised by the new funding arrangements
- provided with an opportunity to make an individual transitional arrangement with the Commonwealth where it appears that special circumstances or initiatives would be significantly affected by the new funding arrangements.

**Recommendation 3: The Academy recommends that any changes in funding rules should be phased in over five years, to provide institutions will sufficient time to adapt to any new arrangements.**

*3.3.1 What changes would support increased recognition of industry experience alongside research excellence in competitive grant processes?*

The Research Opportunity and Performance Evidence (ROPE) framework of the ARC already recognises relevant industrial experience and outputs as part of the NCGP application process. The Academy would welcome a more explicit treatment of relevant industry experience for applicants in the ROPE framework, making it clear that relevant industrial experience supported by evidence of relevant research performance is recognised in NCGP applications. Evidence of relevant research performance should provide a clear demonstration that applicants have experience in performing or supervising research projects and practice.

It is not clear that a significant number of industry-experienced researchers have been disadvantaged within the NCGP processes compared to researchers in academic settings. The Academy is of the view that evidence is needed to support any changes to the existing ROPE process.

**Recommendation 4: The Academy recommends that the ARC and NHMRC provide a clear articulation of relevant industry performance evidence to assist industry researchers' participation in the NCGP.**

**3.3.2 What changes would address any barriers to industry participation as partners in research funded through competitive grant programs?**

The Academy strongly believes that the best way for industry to participate in NCGP research is through appropriate, existing mechanisms such as the ARC Linkage program, the NHMRC Partnership program, the ARC Centres of Excellence and the ARC Industrial Transformation Research Hubs and Training Centres. Although not part of the NCGP, the CRC program also provides an important way for industry to partner in research with research institutions. These programs provide appropriate opportunities for academic and industry organisations to collaborate on research projects of mutual interest. However, despite the policy intention to improve commercialisation and engagement outcomes, the two avenues that provide the most appropriate vehicle for Commonwealth supported collaboration between industry and academia have been significantly cut in recent years, as the following table shows:

*Table 1 Budget allocation to CRC and Linkage project programs, 2008–09 to 2018–19 - \$ million. Source: Portfolio Budget Statements; SRI Budget tables. Italicised figures are projected appropriations.*

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
CRCs	182.3	178.9	172.6	165.5	155.6	147.1	146.1	146.7	<i>141.1</i>	<i>130</i>	<i>166.7</i>
Linkage	263.6	280.4	285.2	324	334.8	322.4	319.1	275.4	<i>262.4</i>	<i>268.4</i>	<i>274.8</i>

**Recommendation 5: The Academy strongly recommends that support for existing programs that enhance collaboration between industry and the research sector is expanded, in addition to the implementation of a strategic commercialisation program.**

The NCGP application process is complex and presents a significant administrative burden, with a relatively low expected return on investment for private sector participants. This presents a barrier to industry participation that could be reduced.

**Recommendation 6: The Academy recommends that the application process for NCGP schemes that involve industry partners be reviewed with a view to reducing the administrative burden involved in preparing grant applications.**



*3.3.3 What role/value would entrepreneurs and business representatives add in the competitive grant process, either as staff or as representatives on advisory and assessment bodies?*

*3.3.4 How could industry expertise play a more central role in the peer-review process for competitive grant programs to ensure research with the best potential for commercial outcomes is given greater priority in relevant programs?*

Each application funded through NCGP schemes must be judged outstanding on its academic merit, regardless of whether it has commercial potential or not. The selection of the highest quality research projects for funding under NCGP schemes remains the most appropriate way to fund scientific research—by selecting those projects that are likely to have the greatest impact on scientific knowledge.

Existing NCGP schemes should not be repurposed to support early-stage commercial research. Such a change would detract from Australia’s vital basic research effort, and would be unlikely to be as effective in its objectives as a properly resourced and long-term national commercialisation strategy.

Similarly, additional representation from business and industry at the peer-review stage is unlikely to be of significant benefit, especially for programs such as ARC Discovery that primarily support basic research. The fundamental principle concerning grant peer review is that it provides an assessment, by experts of standing, of the quality and feasibility of a research proposal. Where industry representatives possess that necessary expertise, they are already able to participate as peer reviewers. As the integrity of the application process requires reviewers to have appropriate expertise, broadening the involvement of industry beyond industry experts may not necessarily improve the outcome of the peer-review process and the Academy would recommend extreme caution in relaxing the expertise requirements for peer reviewers.

The Academy is strongly of the view that funding agencies should have the necessary resources and expertise to properly assess grant applications. This could involve access to industry or international expertise, where warranted.

There may be opportunities for greater representation of business and industry in schemes where commercialisation is a likely short- to medium-term outcome. The Academy would welcome the involvement of business and industry in any new commercialisation initiative. There could certainly be a role for business or industry experts in providing input to grant assessment processes in some grant programs where applicants may identify potential commercial outcomes. Similarly, there could be a role for industry or business experts in evaluating grant proposals to assist applicants connect with other avenues of support where appropriate. The Academy recommends that these opportunities are investigated as part of a new, well-resourced commercialisation strategy.

**Recommendation 7: The Academy recommends that peer review in NCGP schemes be retained in its current form.**

*3.3.5 Could assessment criteria in relevant grant schemes include greater weightings for likely predictors of commercial benefit such as 'record of commercial achievements' and 'commercial potential of research'?*

*3.3.6 Is there a need for a greater focus on competitive research programs which specifically support early-stage commercial research endeavours, such as proof of concept funding, and require tangible progress toward a commercial outcome within a five-year timeframe?*

The Academy does not support increased focus on commercial indicators in NCGP schemes.

NCGP schemes are designed to fund high-quality research, where future commercial benefit may or may not be predictable or apparent. The Academy is concerned that a research grant scheme system that favoured ideas with obvious commercial potential would risk confining scientific discovery to incremental advances, and would discriminate against the kind of excellent basic research that leads unpredictably and unexpectedly to very significant social and economic benefit. Publicly funded research allows researchers to pursue intellectual questions on behalf of the community that may not be possible in a commercial setting. Researchers pursuing these questions mostly produce incremental advances that build overall knowledge capital. However, occasionally researchers make revolutionary discoveries that enable whole new branches of knowledge, industry and technology in ways that could never have been anticipated when the research was being considered. The Academy considers that NCGP schemes are not the correct pathway for identifying research with a likely commercial benefit. The objectives of each of the NCGP schemes do not include commercial benefits, so including commercial potential as a key part of the NCGP process is inappropriate.

The Academy would welcome a review of the broader Commonwealth research grant system to identify more appropriate pathways for research with likely commercial benefit. This could include new schemes with a dedicated focus on pre-commercial research. However, the Academy would caution against imposing commercial benchmarks onto early- and mid-stage research, and considers that evaluation of research projects through assessment of progress and outputs is the most appropriate avenue for ensuring that NCGP grants return value to the community.

*4.3.1 Is there a better balance between competitive grants and Research Block Grants which would improve the commercial returns from research?*

As per earlier statements, the block grant system currently in place is an effective way of funding the indirect costs of research, although the quantum of funding for the indirect costs of research is currently not keeping pace with actual costs. Any reform must provide institutions with the necessarily flexibility and stability to effectively fund their general research fabric, and directly support excellence in research.

*4.3.2 Are there useful international models for increasing research–industry collaboration which could be implemented domestically?*

*4.3.3 What more can universities and industry do to enhance collaboration between them?*

The Academy is of the view that research–industry engagement is hindered by a lack of opportunity and by systemic barriers, including policy settings. In order to enhance engagement, it will be necessary for businesses in Australia to become more innovative—open to novel ideas and encouraged to take advantage of the research expertise available in Australia. It is the Academy’s view that the systemic and policy barriers that restrict and discourage Australian businesses from doing so must be addressed in order to promote greater engagement between researchers and industry.

There have been a number of studies undertaken on Australia’s innovation system which examine Australia’s performance and provide examples of practices in other countries. The Academy would draw the attention of the review to the Australian Council of Learned Academies’ report *Securing Australia’s future 4: the role of science, research and technology in lifting Australia’s productivity*, which provides an extensive list of examples of other countries’ successful innovation practices. Australia should learn from international best practice and from schemes which have been successful in other countries in fostering engagement between industry and the research sector.

The Academy is strongly of the view that efforts to improve collaboration between Australian business and the university sector should focus on enhancing demand for Australian research and innovation services.

4.3.4 *How could measurement of university–industry engagement be improved?*

4.3.5 *How could measurement of knowledge transfer of research outcomes to industry and other end users be improved?*

4.3.6 *How could research impact be measured?*

The issue of measuring the impact and engagement of university research has been raised a number of times, most recently for the 2013 *Assessing the wider benefits arising from university-based research* exercise undertaken by the then Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education. The Academy reiterates the arguments made in its submission to that consultation.<sup>18</sup>

The Academy:

- is not convinced of the utility of such an exercise. The objects and rationale for conducting such an exercise are not clear, and its expected benefits not stated
- is concerned that such an exercise would pose a considerable new administrative burden on universities. Collection of any type of meaningful engagement data would require an additional reporting process, with no clear benefit
- is concerned that no credible metrics exist for evaluating the quality or depth of engagement or collaboration between universities and industry. Collection of data without a credible and validated system of measurement could lead to policy-makers or institutions making decisions based on data which are meaningless at best, or spurious and misleading at worst
- is concerned that, given the significant lag that often exists between basic research and impact (which in some cases can be 20 years or more), any policy decisions based on data of research impact will necessarily either ignore some impacts that have not yet arisen, or will be based on circumstances that existed at research institutions decades ago. This highlights the importance of making the objects of such an exercise clear.

The Academy is concerned that any assessment exercise that influences reward will risk giving rise to perverse outcomes. Therefore, it is important to ensure that the assessment process is necessary, credible and robust before its deployment. The Academy is of the view that proposals to measure research impact and engagement with industry do not meet these tests.

The Academy reiterates its position that the most appropriate assessment of university research is its quality. The Academy is of the view that the ERA process remains the most suitable way to evaluate the Australian research effort, and policy decisions should be based on these data.

**Recommendation 8: The Academy recommends that new systemic measures of impact and engagement of university research with industry should not be implemented until the objectives and methodology of such an exercise have been established as necessary, valid and credible.**

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<sup>18</sup> Australian Academy of Science 2013, *Consultation response—Assessing the wider benefits arising from university-based research*, <https://www.science.org.au/sites/default/files/user-content/benefitsofresearchdiscussionpaper.pdf>

*4.3.7 Is it appropriate to require the application of consistent intellectual property (IP) management principles and processes across the sector? If so, how?*

*4.3.8 How are SMEs affected by IP issues? How do SMEs navigate the innovation system?*

*4.3.9 Would greater uniformity in IP arrangements be useful to end users? How would standard approaches constrain institutional policy choices?*

The Academy does not have a particular position on intellectual property (IP) matters, but welcomes moves towards high-level principles for appropriately managing IP. It would be dangerous to be overly prescriptive in mandating methods for dealing with IP since the landscape is complex and IP management usually needs to be dealt with on a case-by-case basis. The Academy considers that a uniform national model would best be developed by research institutions in collaboration with funding agencies and industry, so that a workable and relevant solution is developed.

*4.3.10 What role is there, if any, for international rankings in assessing the performance of the Australian research system? What options are there for developing an international rankings approach for engagement, collaboration and commercialisation that is suitable for time series analysis?*

The Academy strongly supports the current ERA model for assessing the performance of Australian universities and the research system. The ERA system provides a robust assessment of the areas of comparative strengths and weakness of Australian research, and it is these data that should be used to properly assess the performance of Australia's research system.

International comparisons or rankings are of limited utility, as they can be relatively arbitrary (in the case of the publicised Times Higher Education league tables or equivalents) or may not provide a complete picture of national circumstances. Although the OECD Science, Technology and Innovation scorecard (and equivalents) provides some indications of areas in which Australia could improve, over-reliance on these statistics could prove counterproductive. For example, although Australia's rankings in the scorecard for international collaboration on innovation are towards the lower end of OECD countries,<sup>19</sup> this ranking does not account for factors such as Australia's relative isolation, which presents greater challenges for Australian innovators than for other nations. Comparisons should focus on benchmarking Australian practice against world best practice, as occurs in the ERA process.

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<sup>19</sup> OECD, Science, technology and innovation scorecard, op. cit., p. 128

*5.3.1 How could research program structures and rules be improved to remove blockages to more flexible and innovative HDR delivery?*

*5.3.2 What changes to research funding structures reduce structural funding barriers affecting the movement from undergraduate to HDR studies?*

*5.3.3 Would a move away from institutional funding towards student-based funding improve HDR delivery?*

The Academy welcomes any move to provide greater flexibility in allowing universities to arrange HDR programs to best suit their needs and the needs of partner organisations. In any changes proposed to program structures to provide more flexible HDR programs, it must be taken into account that universities provide the framework for the award of degrees, and therefore must be able to impose relevant requirements on any new methods for delivering HDR programs, to ensure academic rigour and integrity are upheld in each program.

Although moves to give universities the ability to charge students for HDR programs funded by the Research Training Scheme (RTS) would provide welcome revenue, the Academy is concerned that additional student contributions could act as a barrier to the best and brightest undergraduate students undertaking an HDR program. Consideration should be given to ensuring equity of access for the best students to undertake HDR programs. The success of Australian research depends on an adequate pipeline of talented HDR students to carry out the majority of Australia's research, and any non-merit-based barriers to student entry into HDR programs should be minimised.

*5.3.4 Do university employment practices include drivers of promotion and IP ownership which work against researchers engaging in commercialisation opportunities?*

The Academy notes that researchers may stand to lose significant benefits should they transfer between industry and academia. For example, many employment benefits in academia reward length of service in research institutions and universities, such as defined benefit superannuation schemes, long-service and sabbatical leave benefits. While these benefits are generally portable across the higher education and research sector, they are usually not transferrable to or from the private sector. Similarly, researchers working at some research institutions may lose access to generous fringe benefits concessions should they transfer to the private sector. These circumstances can act as barriers to the movement of researchers between the public and private sectors.

The Academy would welcome any moves to make university employment practices more flexible to allow for a greater range of employment and advancement modes. Options could include greater use of temporary consultancy arrangements, secondments and revenue-sharing arrangements. However, the Academy recommends that these avenues be available in addition to traditional pathways for employment and promotion, depending on the circumstances that are most appropriate for each university and researcher.

## Further information and contact

For further information which may assist the panel, contact Dr Alex St John, Senior Policy Officer, Australian Academy of Science, on 02 6201 9464 or at [science.policy@science.org.au](mailto:science.policy@science.org.au).