Science policy and competition reform

Imagine that you were required to spend several months of every year applying for your job in the following year, with only a 25% chance of success. What would happen to your productivity and morale?

Few individuals would accept this situation. What's more no business could survive such a process that put workers offline for long periods. Yet that is the system that currently confronts many young Australian scientific researchers, who are on a largely pointless treadmill of short term appointments funded by small grants to Universities and Research Institutes by funding bodies such as the Australian Research Council and the National Health and Medical Research Council.

It is a system of micro-management by a central agency with all the inefficiency that goes with such a system. It has huge transaction costs relative to funds disbursed – often larger than the grants themselves. Its narrow scope doesn't encourage long term thinking or a focus on significant public policy issues.

But what's worse is that it destroys the career paths of young researchers who, more than any other profession, need to make the long term commitment to research if they are to make significant discoveries. Instead, many are leaving research, disillusioned by the constant uncertainty and waste – one medical researcher recently commented that she had to leave in order to have a stable enough income to qualify for a mortgage!

A more constructive approach for the ARC and NH&MRC is to shift further down the path of competition between Institutions for long term, large scale funding. Larger grants over longer time frames would provide a more stable environment for researchers, allow much greater clarity in linking research to public policy goals and priorities, and free up significant time and resources for research. They would also enable the Leaders and Managers of research teams to manage and be held accountable for long term research performance, including the nurture of talent.

Competition policy for science: micro-management by Government an unintended outcome

Australian public policy has rightly pursued competition reform across a broad front over the past two decades, albeit with varying degrees of success. The focus has been on improving efficiency by dismantling monopolies and distancing Government from management through privatisation or corporatisation. Government has instead focused its efforts on achieving public good outcomes by appropriate regulation of competitive markets.

Competition reform in science on the other hand has proceeded in a piecemeal fashion that achieves none of these outcomes. Instead, it has been a gradually increasing process of government micro-management of research, with the NH&MRC and the ARC effectively becoming monopoly buyers of research – researchers in Universities have few alternatives for funding for pre-commercial and/or public good research other than the ARC, as do medical researchers with the NH&MRC. In economic terms a monopoly of purchase is as bad for the economy as monopoly of supply.

How did this situation develop? A brief review of the history of science funding in Australia provides part of the explanation. In the 1960s, to which many older scientists look back fondly as a golden age, science in Australia expanded rapidly. Support for science simply meant giving money to scientists to do with as they pleased via block grants to Universities, CSIRO and State research agencies. There was little accountability and almost no central direction.

The regular increases in funding stopped during the 1970s, as Australia's economy ran into difficulties. By the 80s, as economic restructuring became dominant in Australian public policy, pressure developed to link science more tightly to national needs. Proactive Science Ministers such as Labor's Barry Jones were particularly keen to have a say in developing priorities for science funding, recognising that as a small country, Australia could not maintain world class expertise across the ever-broadening horizon of scientific knowledge.

Governments became frustrated with the lack of responsiveness of research agencies to the emerging priorities of economic restructuring, and the lack of accountability of the scientific estate, which, rightly or wrongly, they suspected of simply indulging researchers' personal curiosities. In keeping with the competitive reform agenda of the times, the result was the emergence of competitive granting schemes for research.

However, these schemes only funded the marginal cost of a single researcher, with research Institutes having to meet the costs of overheads, research management and support and, in many cases, the costs of other researchers who work in a team with the researcher funded by the competitive grant. In effect, these grants were intended as a carrot to induce researchers into areas perceived as national priority and/or to improve accountability for the quality and relevance of research. Effectively, they were intended to give Government leverage over the block-grant research conducted in Universities and research Institutions, without the political bunfight of wholesale restructuring of research funding, which would have been denounced as an impossible restriction on academic freedom.

During the 1990s and into this decade, new funding initiatives in science inevitably went into the competitive schemes, rather than into block grants. The ARC and the NH&MRC emerged as the dominant players in pre-commercial and public good research. However, the bulk of their money continued to be disbursed through short term, small grants that fund the marginal costs of research.

In 2004, according to the NH&MRC Annual Report, the Council gave out approximately $300 million in 2,483 grants (827 new grants and 1656 continuing grants). This gives an average grant size of approximately $120k. The success rate of applicants was around 28% or approximately one in four.

Anecdotally, Post-Doctoral Fellows, who are typically engaged through such grants, spend anything between 10 and 30% of their time applying for the grants (based on an informal survey of approximately 200 researchers participating in an Australian Society of Medical Research Professional Development program). This time is funded from the public purse – either by the University or Research Institute employing the Post-Doctoral Fellow or via the ARC or NH&MRC itself when the researcher is applying for a follow-up grant on time funded by the original ARC grant.

Taking a low figure of 15% of a researcher's time and assuming a base salary for a post-doctoral Fellow of $60,000 and applying the research norm of indirect costs equal to 1.3 times salary (ie real cost is 2.3 times salary), the publicly funded effort that goes into the process is about $80,000. When we allow for the extensive review process involved in NH&MRC grants (there are over 1,000 senior researchers on the NH&MRC Committees and Review Panels) and the several million dollars per year of the Council's own administrative costs, the program becomes a ridiculously inefficient means of disbursing research funding.

The ARC fares a little better than the NH&MRC on this basis, but is also an incredibly inefficient mechanism for disbursing research funding. In 2004, the ARC disbursed over $300m of its funding through grants, which continue to be its dominant program. Most awards run for three years and in 2004, it issued 875 grants with an average size of about $271k (ie $90k pa), having risen from only $180k in 2001.

The success rate for researchers in these grants was also about one quarter, so costs for the bidders would be similar to the NH&MRC. The larger size of the ARC grants makes this more efficient but it is still a very costly way of disbursing funds. Indeed, several research intensive Universities, who are the main recipients of ARC grants, have noted privately that winning the grants costs the University more than they receive. Some may even be subsidising research from funds provided for teaching Government-funded students, a practice that would be illegal in the private sector.

The economic inefficiency is compounded by managerial dysfunction created by the micro-management implicit in the system. Those charged with managing the research estate – the senior staff of the Institutions – operate in a climate where competition for small grants impedes long range, goal focused science planning and priority setting. They are disempowered, because even their short term decisions on research activities are second-guessed via a convoluted, centralised process. In this climate many do not feel able to offer career paths to young researchers because of the uncertainty of funding and research direction. The development of capable research managers and leaders is consequently stymied.

But the worst feature of all is that the Schemes do not even deliver on public policy objectives. The ARC has published national research priorities which are, by their nature, very broad and therefore useful in defining long term research directions; for example, 'environmentally sustainable Australia' or 'promoting and maintaining good health'. These are big picture goals, but the ARC simply funds small projects on individual merit within these broad areas. It does not have the resources, or the mandate, to look for synergies between research projects and turn these individual projects into a cohesive national research effort.

This is not to say that the ARC and the NH&MRC have not funded good research. Both have certainly done so and can point to good research in terms of quality and return to the nation. This is not surprising given that their monopoly position enables them to cherry pick the best research. There would be something wrong if a review of their activities did not show they were picking the best research.

But from a public policy point of view, what is relevant is the impact they have on the overall research effort in Australia and how efficient the system is overall. The ARC, for example, has KPIs based on its own administrative performance, rather than on its

impact on the 'national innovation system' it ultimately purports to support. Returns are assessed against costs incurred by the ARC rather than on the public estate as a whole. The impact of the grants system on, say, researcher career paths, is simply left outside the ARC's mandate.

This may have been legitimate when the ARC (and its predecessors) and the NH&MRC were a minor part of the system designed to gain leverage over an unresponsive research estate. But it is inappropriate for dominant players in the system – literally, the tail is now wagging the dog.

Alternative models from industrial research

The approach of the NH&MRC and of the ARC is in stark contrast to what has happened in industrial research, where Government is not the monopoly buyer. Where Government has been seeking to induce companies to invest in research through schemes such as the Co-operative Research Centres or Industrial R&D Grants, the companies have demanded a better return from their efforts if they are to go through the process and cost of submitting competitive bids. Unlike Universities and Medical Research Institutes, companies can opt out of the system.

Inevitably, the industry grants have become larger and extended over longer periods of time. Government has set broad priorities but left decisions over individual research projects and overall management to the recipient Institution – public or private. This Institution has then been held accountable for expenditure and outcomes. Institutions that do not deliver, do not receive future funding.

For example, in the 2004 CRC Round, over $400 million of public money was on offer over a 7 year period (about $60 million per year). Around 70 Institutions submitted first round bids, probably spending about $100,000 each (internal staff costs and professional support) in preparing the relatively straight forward Expression of Interest for a total cost of $7 million at this stage. A little less than half of these went through to the second round, where they spent perhaps another $100,000, amounting to about another $3.5 million. If we allow another $1 million for the actual Secretariat costs and assessment panels, the total cost of disbursing the funds through a competitive process is about $11-12 million or only about 2-3% of the funds disbursed. (By contrast, the ARC notes in its 2004 Annual Report that its internal administration costs alone, without the costs of the bidders is around 3.75%)

The process is by no means perfect, and there were many who disagreed with the final decisions – especially existing CRCs that did not receive renewed funding. But it is clearly administratively far more efficient. Moreover, the Government is able to concentrate its attention on its sectoral and national development priorities rather than on attempting to direct individual researchers. Accountability and quality control are delivered at an Institutional level, with quality control over individual researchers exercised by Managers and the natural peer review processes for publications and/or patent processes. There is no evidence that the far more costly and cumbersome process of the ARC and NH&MRC leads to better quality of research.

The focus on long term funding allows the CRCs to offer a more stable research environment for young researchers and develop management systems and practices that ensure IP is identified, protected and eventually put into application. The Leaders of

the CRCs must articulate a clear long term vision for their research and be able to build bridges between the research community and stakeholders in industry, government and the community.

CSIRO is also able to allow Research Managers and Leaders to manage at the project level, rather than be second guessed by an external panel. It continues to produce high quality research. It has also invested heavily in the development of research managers and leaders, and offers better career paths to young researchers. Unlike the CRC model for disbursing funds, however, CSIRO's block funding is not subject to competitive forces and this can lead to poor accountability. It may contribute to the interminable debates within CSIRO on management issues and research direction that debilitate the organisation.

Competition policy for scientific research: what should it encompass?

There are some signs that the NH&MRC and the ARC seem to be recognising the value of larger, longer term grants. The ARC has initiated its Centre of Excellence and Special Centres program where several million dollars per annum is provided over 4-5 years through a competitive selection process. The ARC nominates the fields in which the nation needs to develop its research effort and infrastructure and selects from competitive bids. The NH&MRC, for its part, has introduced program grants that involve several million dollars in total funding over several years.

Unfortunately, both organisations still see the small grants as their core purpose and this remains their principal mechanism for disbursing funds. This is despite the administrative burden created by the grants process. The staffs of both bodies are grossly overstretched in time and resources when it comes to reviewing outcomes and reflecting on public policy imperatives because of the administrative load of the number of grants and assessment panels. Most assessors also groan under the volume of applications and are provided little by way of training or guidance in the Government research priorities they are entrusted to implement.

All concerned would be better off if they were to focus on where central bodies can add higher value – in the allocation of funds to broad areas of research through a competitive mechanism and in developing systems and procedures for holding recipient Institutions accountable for the quality and application of research outcomes. By leaving micro-management decisions to Research Leaders and Managers, they will have the time and resources to pursue these core national policy and regulatory functions.

In designing an alternative framework, it is worth starting from scratch and asking what should a science funding policy encompass. From a Government perspective, there are some obvious requirements, including:

- Clear frameworks and systems for accountability for expenditure of public money;
- Public Sector capabilities to assess, invest and monitor progress on national priorities (development of staff, advisors and knowledge systems);
- Efficiency of funds allocation and administration across the public sector;
- Protection and application of IP in the national interest (commercialisation);
- International competitiveness; and
- Quality control in resource allocation.

These require efficient management systems and decision-making processes. Consequently, they are best delivered by Institutions rather than by individuals. Competition for funds should thus be between Institutions rather than between individual researchers. As with the CRC scheme and indeed with competition reform in general, Government should focus on creating an environment of sound governance in which the competing Institutions act. These Institutions can develop the efficient management systems and be assessed on the quality of their resource allocations through their funding submissions.

The framework must also recognise some of the realities of scientific research. These include:

- The long time frames, high costs and overheads needed to deliver meaningful outcomes;
- The need for an economic balance between accountability requirements and risk;
- The need to nurture/attract young, capable researchers to innovate and push the frontiers;
- Recognition of the long established, peer-reviewed and competitive environment for individuals and teams, which creates a quality control on individuals – any grants process should complement this rather than duplicate it;
- Growth of interdisciplinary team research, which requires strong research leadership communication and management skills; and
- The need to develop and nurture commercialisation and application skills to ensure that the value of the research is captured for Australia.

All of these argue for a funding allocation based on long time frames and large quanta of money rather than small, short term grants. This also requires funding at an Institutional, rather than individual level, with scientific managers and leaders empowered to make decisions and be held accountable for the outcomes. Competition between Institutions for long term funding will avoid the problems of accountability inherent in the old block grant system.

The Institutional structure also must recognise the powerful culture of scientific research. This culture is already highly competitive as researchers seek peer recognition and acclaim for their work and creates a high level of quality control through the peer review publication process. This culture also creates a powerful intellectual hierarchy that can clash with an organisational hierarchy and makes many large scientific organisations unwieldy – a difficulty that has driven internal dissent in CSIRO over many years.

Competition at the Institutional level needs to complement this natural competitive culture of researchers. It may mean that Research Institutions need to balance the need to be large enough to undertake significant research projects and bid for large amounts of money, with the need to be small enough for researchers to feel that the intellectual hierarchy is respected.

The way forward

The first principles of competition policy, combined with the peculiarities of the research estate, suggest that the Government's focus for science policy should be neither block grants to Institutions nor small grants to individual researchers. Instead, the Government should view its research policy as a portfolio of long term investments in areas of national policy that are led and managed by professional Research Managers. New research programs and the link between research and national priorities can be driven by competition between Institutions for long term funding contracts. Meanwhile, decisions on micro-management of resource allocations and research projects within this framework should be left to the Managers.

The Government can hold Institutions accountable for their performance through sophisticated assessment and monitoring skills and systems, some of which have emerged in schemes such as the CRCs. The ultimate discipline for poor performers will be to wind them up when they fail to win further contracts.

The long term large money contracts will allow young researchers to be nurtured, unexpected avenues to be explored, and transaction costs to be kept low. The competing Institutions will have an incentive to develop efficient administrative systems and to develop effective leaders and managers.

Quality control and improvement would be driven at one level by the natural competition between researchers to be the first to publish in peer review journals. Competition between Institutions to deliver tangible outcomes and so win further funding would also provide a spur to succeed as well as to achieve long term efficiencies in administration, quality control of research that establishes Institutional reputation and develop systems that effectively manage both IP and communication with key stakeholders.

Implementing this alternative framework would not be especially difficult. It can be pursued by increasing program funding in NH&MRC and of the Centres of Excellence and Special Centre in the ARC, while reducing the number of small grants to a minor position. Eventually, all Government research funding could become contestable in this way.

To drive the process forward, the ARC and the NH&MRC should report their impact from the perspective of the national innovation system, rather than from the point of view of their own outcomes independent of costs generated elsewhere in the public estate. The National Audit Office could be tasked to carry out an initial cost assessment from this broader perspective to determine an appropriate cost basis.