Submission to Productivity Commission Study of Public Support for Science and Innovation in Australia

An argument for a 1% increase in GDP expenditure on science and R&D in the context of education

In the context of education a core innovation policy consideration is the complex and dynamic interplay of supply and demand. It is about addressing broad economic trajectories (internationally contextualised) and capacity building and what this means in terms of current trends in input (i.e. young people and trends in education choices). This requires longer-term policy objectives which link to policy frameworks that have regard to Australia's competitive and social prosperity. Market fluctuations in, for example, math and science skills, is not a simple matter of reading short-term indicators and setting policy targets accordingly. This is supported by the fact that young people do not make fully informed rational choices about wages and industry-led demand as the standard neo-classical economic view of the world would have us believe. The reality is that most kids want to go into something which excites and engages their imagination with fuzzy expectations of future earnings. Tweaking policy on fluctuating markets is a short-term sub-strategy (one which has been appropriately employed recently).

One half of the equation, therefore, must engage the imagination and fuzzy expectations of children and young adults - the seeds of targeted supply – through a greater focus on setting and achieving longer-term policy objectives (refer appendix A for an example of a suit of policy proposals in the context of math and science education).

An education strategy to increase the skill base across the secondary and post-secondary education sectors also requires an equally strong focus on the demand side. The other half of the equation, therefore, is an industry-led and R&D-dominated demand imperative contextualised by broad economic trajectories and existing/emergent competitive strengths. In the context of facilitating a sustained increase in innovative activity across the economy, a primary funding initiative through which the Government could facilitate the generation of demand over the long-term is a 1% increase in GDP expenditure on science and R&D. This would bring Australia up to about the OECD average (or a little above) and fill the elusive demand gap - as long as the publicly funded expenditure has clear objectives linked to policy frameworks which have regard to our competitive and social prosperity.

This proposal is not new of course but a standard economic logic has been used to summarily dismiss the proposal. There is little or no serious analytical assessment (within policy decision making circles) with regard to the specifics of the assumptions and knowledge sets being used to dismiss the proposal let alone an acknowledgement of the last few decades of innovation studies and robust economic rationalities which suggest an alternate and contextually more appropriate analytical approach. For the purpose of better assessing the merits of the proposal it needs to be acknowledged, at a deep level of the debate, that ***innovation creates asymmetric information, which creates market power, which in turn creates profits that drive the economic***

***system*[1].**

The strength of this argument warrants a tough new campaign on long-term sustainable strategic funding arrangements where, for example, the proposal for a 1% increase in GDP expenditure on science and R&D should support, over the long-term, other short, medium and long-term policy strategies, for example, infrastructure and education strategies.

Placing significant funding emphasis on science and R&D recognises that non-technological innovations are increasingly working in a matrix of interdependent relationships with technological innovations where, in the services sector for example, ICT innovations enable and catalyse a diverse range of non-technological and technological innovations that interact in complex and fluid feedback loops which, in turn, drive further innovation. Organisational structures and management processes, traditionally associated with non-technological innovation, are other examples where the rapid development and convergence of IT networks and communication systems have enabled and catalysed productive changes. The impact is pervasive and economy-wide, the revolutionary changes of which have been well recognised across the social science research spectrum.

In this context, it is also critical to consider how general purpose technologies, such as ICTs, serve to facilitate a wide range of technological and non-technological innovations which drive economic growth over the long-term. These enabling type 'general use' technologies make possible new kinds of wealth creation, scientific discovery and organisational structure. This is reflected in 'global markets which are increasingly dominated by a greater dependence on knowledge, information, high skill levels and an increasing need for and ready access to all of these.'[2]

This last point raises a broader policy framework issue at the core of the innovation policy challenge. That being, gaining a competitive advantage in this technology embedded knowledge economy increasingly demands more 'effective social and economic mechanisms and institutions to provide sustained investment in capabilities to manage collaboration and cope with risk and uncertainty and their implications for business development.'[3] In effectively addressing this complex policy challenge, it is necessary for policy makers across portfolios to take a longer-term integrated view of policy outcomes and build these objectives into departmental outcomes. In conjunction with a 1% increase in GDP expenditure on science and R&D, this also needs to be supported and driven by a whole-of-government integrated policy frameworks focus, which addresses higher level strategic and tactical imperatives. Significant hurdles exist, however, in developing and implementing an effective solution to this policy challenge and a systematic and wide-ranging assessment is required, canvassing a range of centrally focused, diffuse and hybrid policy options.

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[1] Refer: Richard G. Lipsey, Kenneth I. Carlaw, and Clifford T. Bekar, (2005) *Economic Transformations: General Purpose Technologies and Long-term Economic Growth*. Oxford: Oxford University Press

[2] Don Scott-Kemmis (2005) *Innovation Systems in Australia*, Innovation Systems Research network (ISRN), Working Paper

[3] Keith Smith and Jonathan West (2005) *Australia's Innovation Challenges: Building an effective national innovation system*, Submission to the House of Representatives Standing Committee on Science and Innovation into Pathways to Technological Innovation, pp.1-2

Despite the difficulties, however, the fact remains that there is a strategic need to better assess and monitor how the diverse range of institutional structures and policy and program level realities serve to facilitate or inhibit the generation of innovative activity across the economy. As a first step, this requires taking account of the last few decades of innovation studies and identifying existing strategic gaps in understanding.

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Appendix A

Proposal for a national youth science education network scheme

The proposal for a national youth science education network scheme could be administered under an expanded version of the existing Skills for the Future initiative. Under this option science and maths teachers would be able to pair with science-related industry and R&D professionals across the public and private sectors in classroom mentor partnerships, supported by an ongoing national web-based awareness and careers campaign, including a comprehensive suite of teaching aid materials.

Students could also engage in an on-line youth science network using blogs, video files and science topic chat rooms to enhance the interactive experience. Organisations such as CSIRO and Questacon need to play a vital role in working with a national steering committee in the development of web-based resources, teaching aid materials and interactive design and content solutions.

In addressing ongoing teacher motivation and teaching innovation, an on-line teacher network would also be valuable, combined with short-term industry placements for teachers in science and maths related areas about which they feel passionate. This reinforces the fact that the answer is not just about enticing good science and maths teachers back into the system but also changing what often amounts to cultures of institutionalised mediocrity.

Post-secondary education also provides another critical opportunity to develop targeted incentives that are well integrated with a school-based strategy. For example, targeted government funded HECS scholarships for broad-based maths and science fields not only bring a strong element of prestige but also look great on the CV when finding that first full-time job. Specialisation would progress in the later years of the qualification, combined with more comprehensive voluntary HECS-supported industry placement and industry supported cadetship programs.

The same HECS scholarship option can apply for teaching degrees with PELS scholarships offered to science and maths graduates who wish to become fully qualified teachers through postgraduate studies. Teaching scholarships could be tied to a commitment to teach for a certain period of time after completion of the degree. In addition, this could be combined with a range of competitively based prizes, awards and incentives aimed at lifting the status of maths and science teachers, providing both financial and emotional reward for outstanding effort.