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Innovating Australia

1. Introduction

Australia's national innovation system is the key driver of the level, and continual upgrading, of the nation's innovation competencies. These competencies create competitive capabilities at the firm level and thus underwrite economic growth. Hence the national innovation system is a critical influence on longer-term growth prospects and outcomes. The policies that frame the formation and operation of the national innovation system complement other institution-shaping policies, such as those covering microeconomic reform and competition policy that have, over the past two decades, opened up and liberalised the Australian economy. There is now a very strong case for a quantum step in the policy frameworks through which innovation is fostered and stimulated.

2. Policy Frameworks

2.1 Science Based Industries

The present almost wholly market based approach will not be sufficient to give Australia a significant presence in the most advanced industrial sectors, which are now science-based.

Australia had a place in the 'high tech' industries in the electro-mechanical era (for example the steel and auto industries). We are primarily a consumer country, not a substantial producer, in the first two cutting-edge sectors of the science-based era, software and electronics. We could be a producer in biotechnology and other science-based sectors – we have the research base, entrepreneurs, management skills, and capital resources. But to convert these to an outcome that is of an appropriate scale requires a debate about national ambitions that is not now occurring. It also requires a quantum step in the policy framework.

2.2 A Systems Perspective

The innovation policy framework needs to be split into two distinct sub-fields, innovation by discovery and innovation by application and dissemination.


The former involves innovation that is led by original scientific discoveries that originate in research laboratories. Here the policy framework needs to sustain and integrate the complex, demanding and costly activity of innovation by discovery. The second sub-field involves disseminating innovation to established sectors to facilitate upgrading and to leverage the global competitiveness of participating firms. Here a quite different framework is needed to sustain innovation by application and dissemination.

2.3 Innovation by Discovery

Successful innovation by discovery requires the capacity to manage and reduce risk, and the incentive of rewards commensurate with high risks. Risk management typically involves sharing risks with those more able to diversify and manage high risks. The tax system influences the risk reward equation.

2.4 Innovation by Application and Dissemination

Innovation by application and dissemination also needs to be comprehensively stimulated if the extensive SME sector is to attain the levels of international competitiveness that is government's declared aim.



Through industry collaboration, upgrading has occurred in some sectors, such as wine and engineering services. But such evidence as is available suggests that while overall growth performance has been excellent, innovation performance in established industries is much more mixed. Policy frameworks tailored to particular circumstances and opportunities in particular sectors need to be devised. This requires a significant jump in collaboration between firms, industry associations, professional bodies, governments and educational institutions.

2.5 Linkages with MNCs and Global Supply Chains

A policy focus on upgrading the innovation capabilities of Australian firms needs to be complemented by arrangements to build linkages to MNCs and global supply chains.

MNCs now dominate international trade. Australian firms must penetrate global supply chains if they are to achieve appropriate scale. Unfortunately present policy approaches are mostly characterised by multinational myopia.

3. Current Performance of the Innovation System

There is mixed evidence about the effectiveness of Australia's innovation system. On the one hand indicators point to weaknesses and a reliance on traditional industry specializations. On the other hand there are indications of flexibility and dynamism in the economy, with success in applying knowledge sourced internationally.

Some of the key features of Australia's innovation performance are summarized as follows:

- Australia is primarily a consumer in software, however there are strong but embryonic IT clusters that create adaptive capacities. Australia is also primarily a consumer of electronics with a growing ICT trade deficit. There are emerging clusters in several high tech areas in particular states.
- Data on research and development spending shows this activity is concentrated in the public sector system. This also shows Australia has potential in particular areas of the science-based sector, for example in relation to biotechnology and nanotechnology. This data is however a very inadequate guide to the level of innovation in established sectors (that is, by application and dissemination). Innovation here is driven by a variety of non R&D activity including new capital investment, marketing and training. Data about the links between these activities and innovation is not now collected.
- Australia has the capacity to become a substantial producer in a number of sub sectors of biotechnology and other science-based areas, however there is a relatively low level of interest in venture capital.
- Whereas overall economic performance has been very strong in recent years, the strength of innovation performance is much less clear:
 - international patenting per capita is growing but from a very low base
 - R&D gross expenditure is the third lowest in the OECD
 - eighty per cent of our 15 top export products are resource-based commodities.
- Australia relies for the majority of innovation on improvements to products and processes based on knowledge sourced internationally. It is well placed to capitalize on such innovation:

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- high FDI as a percentage of GDP
 - strong ICT and knowledge-based sectors, and ICT uptake
 - growth in niche markets in key manufacturing sectors
 - high and increased productivity
 - growing flexibility in labour markets
 - high level human resources and strong research organisations

4. Policy Implications.

Innovation policy in Australia has historically focused on research. There is a critical need to review and debate the perspectives and frameworks used to develop policy and the goals and ambitions against which we judge our success.

4.1 Review of Innovation Perspectives and Goals

Innovation policies are evolving in Australia. The roles of both federal and state government have been developing in recent years as research advances, start-ups multiply, new opportunities emerge and thinking about needs and possibilities advances.

The perspectives and analytical frameworks through which needs and opportunities are assessed are critical. These determine first, how the issues are understood and interpreted, second, the priority that they are accorded in the larger policy framework and third, what can be contemplated as feasible remedies.

4.2 Does Australia Want a Position in 'Platform' Industries?

It is imperative that strategic political debates focus not only on micro-economic reform, critical though that has been, but also embrace the desirability of Australia building a position in particular science based sectors. Australia is a consumer not producer in electronics and information technology. Biotechnology now presents an equivalent choice. But markets alone will not create a producer outcome. The challenges involved in moving forward on a more ambitious scale, the risks in such an approach, and the consequences of missing out, all need to be aired. Such issues should be part of the national debate. At present, they do not figure.


4.3 Adopt a Systemic Perspective

Most recent policy has focused specifically on the research system. Whilst this is important as a component of the broader innovation system, it is imperative that policy thinking moves to a system-wide focus. This is the approach adopted by our competitors – and it is the approach recommended by the OECD.

We must apply systemic thinking differentially to innovation by discovery and innovation by application and dissemination. Science based industries involve innovation by discovery. The risk-reward environment in this area requires a distinctive policy framework. By contrast, innovation by application and dissemination depends critically on linkage infrastructures, which are sector specific. Their encouragement also requires a distinctive policy framework.

4.4 Science Based Industries: Innovation by Discovery

Innovation by discovery involves risks that are orders of magnitude greater than in mainstream business activity. Similarly, for the few who achieve success, the rewards are also very large. This distinctive risk-reward environment creates a context that requires appropriately designed incentives and other measures to ensure levels of activity match potentials. In particular, this creates an imperative for government to play a catalytic role. In the complex and uncertain fields of software, electronics and the life sciences, the evidence is overwhelming that governments that have succeeded in establishing sets of institutions to achieve risk-sharing have succeeded in innovating. Those that haven't developed such 'national systems of



innovation' have failed to build those industries. Further, no successful innovating country today relies on free markets alone.

These special risk-reward factors create an environment wholly different from that applicable to more familiar 'replication-intensive' manufacturing industries. Policy frameworks must align with these conditions.

- A serious engagement requires a policy framework to encourage the mobilisation of appropriate levels of resources. This requires incentives that recognize the special risks. The cost of research and commercialisation are massive as concentration in the international pharmaceutical industry demonstrates. Outside Japan, Australia is best placed in the Asia-Pacific region to be a producer in biotechnology niches to an advanced developmental stage. This ambition is currently being determinedly pursued by Singapore, Taiwan and Korea, all of which have a track record of success in electronics and IT. For Australia's potential to be realised, very large capital commitments are required. But, despite the commitment of a number of governments to the development of significant activity in biotechnology, only 5 per cent of the already relatively small venture capital pool in Australia now goes to this area. Further, the differential risk of failure needs to be factored into tax and other arrangements.
- Similarly, there are potentials for substantial rewards for success – and these are underwritten by specific market-limiting policies such as intellectual property rights. Without diminishing incentives, tax and other creative funding arrangements also need to be devised to capture taxpayer contributions to final outcomes.

In Australia's case, the effort to reconfigure incentives in the area of basic research is arguably reducing, not enhancing national research capabilities. Similarly, stock market based funding plays an overly prominent role in generating capital investment. In almost no country other than Australia does the stock market attempt to finance the early stages of innovation.

The government can play a catalytic role in clearly defined cases where the market has been demonstrated to be ineffective in providing for diversification of risk, yet substantial social and other benefits derive from the project. However, governments should not make resource allocation or risk management decisions. They might, for example, share the risk with market exposed vehicles.


4.5 Established Industries: Innovation by Application and Dissemination

Innovation in established industries is critical if national ambitions for building the international competitiveness of Australian industry are to be realised. This includes industry sectors such as furniture making, autos, fishing, wine and engineering. Current data on research and development only partially, if at all, capture the range of relevant activities, which include training, market research, design, expenditures on patents and capital investment related to new product development.

The development of innovation-driven clusters is the key to encouraging innovation by application and dissemination. Innovating firms are most often collaborating firms. Activities that encourage collaboration are thus critical. These involve public-private partnerships as is evident, for example, in the case of the wine industry. Industry associations and other networks jointly promote such activities as research, best-practice dissemination, product development, capital raising, branding and marketing (including access to global supply chains), market and industry research etc.

The scope of innovation policy needs to be expanded to incorporate the model that offers the most widespread and immediate pay-offs, 'innovation by application and dissemination', rather than the current narrow focus on 'innovation by discovery'.

The role of universities as agents disseminating knowledge warrants attention. There is a strong case for reviewing the ways in which federal funding of higher



education research might be recast to better reflect the two distinctive forms of innovation. Present funding arrangements are oriented to discovery. The separation of research funding into distinct discovery, and application and dissemination streams, should be examined.

4.6 MNCs and Global Supply Chains

MNC subsidiaries that are integrated into global networks provide the greatest benefits to host countries in technology transfer and innovation. Relatively few MNC subsidiaries in Australia are globally integrated. Some operate merely as branches of the parent, while others operate with significant domestic autonomy, but few global linkages. The conditions necessary to attract integrated MNC subsidiaries need to be understood and developed.

Australian businesses need to position themselves to more effectively participate in MNC supply chains. 'Innovation clusters' incidentally create the unique local capabilities (so-called location-specific assets) that are critical if Australia wants to attract multi-national investment and gain access to MNC supply chains.

This Policy Statement draws on material contained in CEDA's publication: Innovating Australia, April 2004 (Growth 53).