Submission from the

Department of Industry, Tourism and Resources

to the

Productivity Commission Study into

Science and Innovation

September 2006

Introduction

The Department of Industry, Tourism and Resources (DITR) develops and implements a range of industry policies and business assistance programs designed to support the development of internationally competitive and sustainable businesses. The Department aims to contribute to increased prosperity by supporting initiatives to improve business productivity and growth.

The Department's activities seek to contribute to three key drivers of economic growth – innovation, investment and international competitiveness. Increasingly they also seek to facilitate integration of Australian businesses into the global economy.

Innovation has been identified as a key determinant in economic growth and competitiveness. The Australian Government, like most governments of developed economies, has sought ways to effectively foster innovation and to improve Australia's overall innovation performance. Through both the *Backing Australia's Ability* packages the Government has made a substantial additional investment in a range of initiatives to facilitate innovation. These, including building critical skills and infrastructure, supporting public sector R&D and supporting and encouraging innovation in the business sector. DITR plays a lead role in facilitating business innovation.

The initial chapter of this submission maps the various types of interventions that DITR undertakes to support innovation and their impact, as measured by program monitoring and evaluation. The discussion covers program rationales, design elements and decision-making principles that guide implementation and funding.

Chapter two provides an overview of the characteristics of industry innovation in Australia, primarily based on the 2005 ABS survey of Australian business innovation (survey covering three years to December 2003)[1] . It is only relatively recently that detailed survey data on business innovation in Australia has become available and that we have been able to analyse it and start to use such analysis as a basis for policy development and better program design. Chapter two also discusses economy-wide innovation indicators and looks at Australia's innovation performance with reference to our industrial structure and OECD norms.

Chapter three outlines the policy framework that underpins Australian Government support for innovation. It discusses overarching policy making conditions and some potential impediments to the effective functioning of the innovation system. It also identifies a number of priority areas requiring ongoing focus if we are to optimise innovation and growth of globally-oriented businesses.

[1] ABS, 2005, Innovation in Australian Business

Glossary of Acronyms

ABS	Australian Bureau of Statistics
ACIS	The Automotive Competitiveness and Investment Scheme
ARC	Australian Research Council
ASCC	Australian Stem Cell Centre
ASTEC	Australian Science and Technology Council
BCE	Biotechnology Centre of Excellence
BIF	Biotechnology Investment Fund
BITS ICTIP	Building on IT Strengths Incubator Program
BERD	Business Expenditure on Research and Development
COMET	Commercialising Emerging Technologies program
CR	Commercial Ready program
CRC	Cooperative Research Centre
DEH	Department of Environment and Heritage
DITR	Department of Industry Tourism and Resources
ESVCLP	Early Stage Venture Capital Limited Partnership
GDP	Gross Domestic Profit
ICIP	Industry Cooperative Innovation Program
ICT	Information and Communications Technology
IIF	Innovation Investment Fund
IP	Intellectual Property
IPO	Initial Public Offering
Intermediaries	Pilot programs - InnovationXchange and TechFast
IXC	InnovationXchange
LETDF	Low Emissions Technology Demonstration Fund
LBO	Leverage Buy Out
MBI	Management Buy In
MBO	Management Buy Out
MNC	Multinational Company
MNE	Multinational Enterprise
NIDP	New Industries Development Program
NHMRC	National Health and Medical Research Council
MNRF	Major National Research Facility
OECD	Organisation of Economic Cooperation and Development
P^3	Pharmaceuticals Partnership Program
PBR	Plant Breeders Rights
PDF	Pooled Development Fund
PIIP	Pharmaceutical Industry Investment Program
PMSEIC	Prime Ministers Science Engineering and Innovation Committee
PSF	Pre Seed Fund
RDC	Rural Development Corporation
R&D	Research and Development
REDI	Renewable Energy Development Initiative
REEF	Renewable Energy Equity Fund
SSHI	Skill shortage which hampered innovation
SME	Small and Medium Sized Enterprises
TCF SIP	Textile, Clothing and Footwear Post-2005 Strategic Investment Program Scheme 2005
VCLP	Venture Capital Limited Partnership

Chapter 1. The Impact of Activities undertaken by the Department of Industry, Tourism and Resources

1.1`Overview of Innovation Programs

DITR designs and delivers a wide range of innovation programs to Australian industry. These programs target different objectives and use different instruments including: tax concessions; competitive grants; provision of venture capital; and development of management skills for early-stage companies.

Table 1.1 lists the major industry innovation programs currently managed by DITR. It provides a summary of the objectives of each program, the quantum of funding involved and the number of companies assisted. Further details on DITR's innovation programs are at Attachment 1.

In addition to DITR programs, a range of other Australian Government programs also operate to assist industry innovation. Table 1.2 lists the range of innovation programs provided by the Australian Government and identifies the type of support provided.

Figure 1.1 is a diagrammatical representation of DITR's main industry innovation programs to illustrate where the concentration of funds is directed. It shows what type of innovation activity is supported (R&D, commercialisation, collaboration) and the type of instrument used to deliver the support (skills development, provision of equity capital, competitive grants, or entitlement-based support). It also indicates, via the size of the program bubble, the amount of funding support for each program per annum.

The R&D Tax Concession stands out as the largest program (in terms of funding and the number of businesses supported) with approximately $500 million per annum provided to 5500 businesses for R&D activities through taxation revenue foregone (except for the Tax Offset component). This is followed by Commercial Ready which provides around $200 million per annum for R&D, proof-of-concept and early stage commercialisation, supporting 564 businesses in 2005-06.[2]

Thirty five per cent of Australian businesses undertook one or more form of innovation activity in the three years to December 2003 (see Section 2.1).[3] This amounts to around 47,000 firms. DITR notes that the businesses to which DITR innovation programs are directed constitute a sub-set of the 47,000 firms, given the significant focus in these programs on increasing R&D and high technology growth firms.

While they are not the subject of this analysis, there are other programs administered by DITR which are not primarily focused on industry innovation but may boost

[2] The Commercial Ready funds not only support Commercial Ready projects but also REDI, ICIP and R&D Start projects.

[3] ABS, 2005, Innovation in Australian Businesses

innovation incidentally. This is particularly the case for the Department's small business and tourism programs. For example, the Australian Tourism Development Program provides grants for tourism businesses and organisations to develop niche tourism opportunities, create tourist attractions that complement existing industries, and pursue any other tourism projects that are likely to increase the numbers and reach of tourists across Australia. The Building Entrepreneurship in Small Business Program has been set up to encourage entrepreneurship, help small businesses access information, and encourage the development of incubators aimed at fostering the growth of start-up firms.

DITR also supports pilot programs to test the value of a new approach. One focus of pilot activity has been assisting the take-up and transfer of technology-related intellectual property between businesses, and between businesses and the research sector. DITR has provided funding for the Industry TechLink program and the InnovationXchange Intermediaries. These pilots use different approaches to encourage greater collaboration and exchange of intellectual property. DITR is reviewing the extent to which these pilots have met their policy goals.

DITR industry innovation programs primarily support business investment in R&D activities based on technology-based product innovation. The R&D Tax Concession, Pharmaceuticals Partnership Program (P^3), and the majority of funding provided by the Commercial Ready program support product-related R&D. Of the $200.9 million per annum allocated to the Commercial Ready program, some 50 per cent is being used to support R&D activities with 30 percent for early stage commercialisation and 20 percent for proof-of-concept activities.

Organisational and process innovation, such as improved marketing, financial management, and strategic planning, do not qualify for support under these programs, but they are supported by the Commercialising Emerging Technologies program (COMET), the Innovation Investment Fund (IIF) and the Pre Seed Fund (PSF). The COMET and IIF assist firms to develop or acquire the management skills and growth capital necessary for successful commercialisation of innovation. The IIF and PSF are equity-based programs which also provide management skills through an experienced fund manager, while the COMET program uses a business adviser and service providers to deliver targeted mentoring. This latter approach is also used by the InnovationXchange and TechFast.

Most of the programs support projects pursued by individual firms (eg Commercial Ready) while others support collaborative activity between Australian firms eg Industry Cooperative Innovation Program (ICIP) or between different companies in global supply chains (eg P^3). Programs can be further distinguished according to whether they are sector-specific or generic, the stage of business development for which they are intended, and whether the funds are allocated on a competitive basis or via an entitlement.

DITR operates sector-specific innovation programs in pharmaceuticals, biotechnology, renewable energy, automotive and textiles, clothing and footwear. Figure 1.3 shows that overall support is spread across sectors, with the majority of businesses supported in Property, Business, and Computing Services, and in Manufacturing of Machinery and Equipment.

Table 1.1: Summary of DITR Innovation Programs

Program	***Policy Objective***	***Administered Funding 2005-06***	***New firms assisted 2005-06***
R&D Tax Concession	Stimulate business expenditure on R&D activities	$535.000[4]m	5,830
Commercial Ready	Assist SMEs to undertake R&D, proof of concept activities and early-stage commercialisation.	$163.498m	564[5]
Pharmaceutical Partnerships Program	Encourages R&D and collaboration by pharmaceuticals and biotechnology companies.	$12.410m	12
Australian Stem Cell Centre	To establish critical mass in biotechnology research and commercialisation by linking institutions and businesses.	$7.100m	N/A[6]
Renewable Energy Development Initiative (REDI)	Addresses the funding gap for early-stage innovation, specifically in the renewable energy sector	$14[7]m	9[8]
Industry Co-operative Innovation Program (ICIP)	To increase innovation capability of industry sectors through supporting collaborative projects including transfer of new technologies	$1.271m	13
Textile, Clothing and Footwear Strategic Investment Program Scheme	Encourages innovation within the TCF industry to help it maintain competitiveness in an increasingly challenging global environment.	$142.535m	338
Low Emissions Technology Demonstration Fund	Demonstrate the commercial potential of new technologies or processes to deliver significant long-term greenhouse gas emission reductions.	$50m (2006-07)	30 applications received
Commercialising Emerging Technologies (COMET)	Assist small firms to achieve commercialisation by building management and commercial skills and attracting growth capital.	$8.400m	284
Pre-Seed Fund (PSF)	Assist commercialisation of public sector R&D through provision of capital and management skills.	$13.351m	36
Innovation Investment Fund (IIF)	Stimulate growth of early stage venture capital industry.	$16.502m	18
Renewable Energy Equity Fund	Stimulate growth of early stage venture capital industry in the renewable energy sector.		
Automotive Competitiveness and Investment Scheme – Motor Vehicle Producers	A scheme aimed at increasing the amount of research and development undertaken by MVPs in Australia.	$30[9]m	3

[4] Relates to estimated revenue foregone, figure drawn from the *Tax Expenditures Statement 2005.*

[5] CR figure also covers Start, ICIP and REDI so there is some double counting in the table, CR only figure not available

[6] The ASCC is sole recipient of funding.

[7] Average figure per year to 30 June 2011. REDI does not have an annual appropriation - it is included in the Commercial Ready appropriation. Customer figures are also included in the Commercial ready figures.

[8] Average figure per year to 30 June 2011. REDI does not have an annual appropriation - it is included in the Commercial Ready appropriation. Customer figures are also included in the Commercial ready figures.

[9] $150 million over 5 years. Assistance for projects is in the form of ACIS import duty credits

Table 1.2: Commonwealth Innovation Programs

	PSF	CRC	ARC Linkage Grants	IIF	COMET	Com Ready	R&D Tax Conc.	CSIRO Flagship	PDF	VCLP	ICIP	BITS ICTIP	NIDP	RDCs	NHMRC dev grants	REDI	REEF
Research & Development																	
Funds R&D and/or proof of concept *																	
Capital																	
Access to venture capital**																	
Provides grants for commercialisation***																	
Commercialisation Skills																	
Develop management & commercialisation skills****																	
Collaboration																	
Supports company & university collaboration																	
Specific sector focus (public/private)	*Both*	*Both*	*public*	*Private*	*Private*	*Private*	*Private*	*Public*	*Private*	*Private*	*Private*	Private IT	Private Agri-business	Both Agri-business	Public Health	Both Renew energy	Private Renew energy

Legend and Notes:
Black Cell: Main outcome
Grey Cell: Lesser, sometimes indirect outcome
* VC programs provide an equity injection into companies, other programs, such as Commercial Ready and Tax Concession, provide funding directly for R&D and/or proof of concept
** Programs provide access to venture capital for predominantly technology-based firms, except for PSF which can provide funds to projects
*** Programs provide grants for early-stage activities such as prototype development/market testing/demonstration projects and so forth
**** Program enables SMEs to develop management and commercialisation skills by providing access to mentors, advisers and "smart money" through venture capitalists, ARC indicates the development of management and commercialisation skills of researchers as an output

Source – DITR 2005

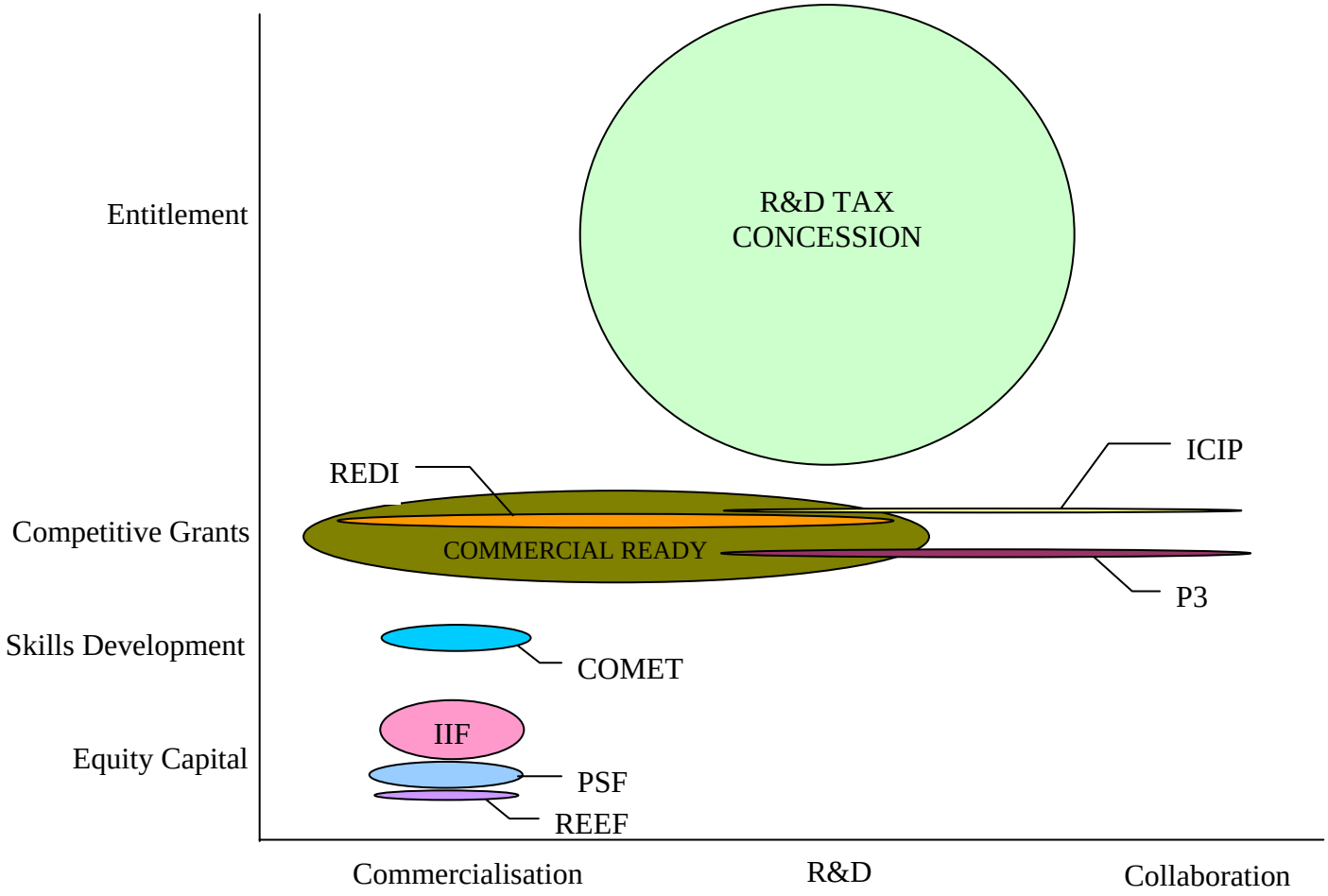

Figure 1.1 Spread of DITR innovation programs across activity supported (horizontal axis) and delivery mechanism (vertical axis). The size of the bubble indicates the relative amount of funding available per year. Figures based on average annual funding over period 2003-2006.

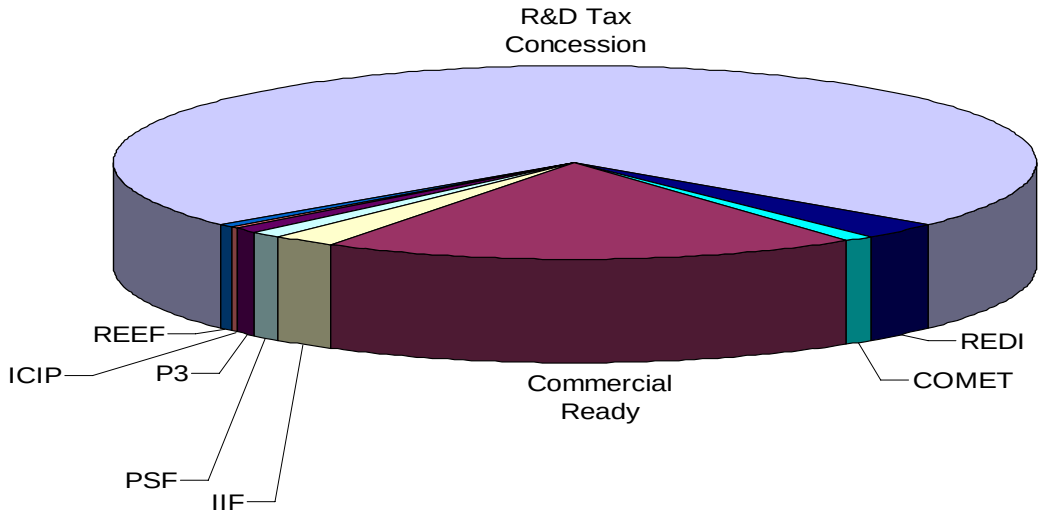

Figure 1.2 Relative annual expenditure per DITR innovation program. Figures based on average annual funding over period 2003-2006.

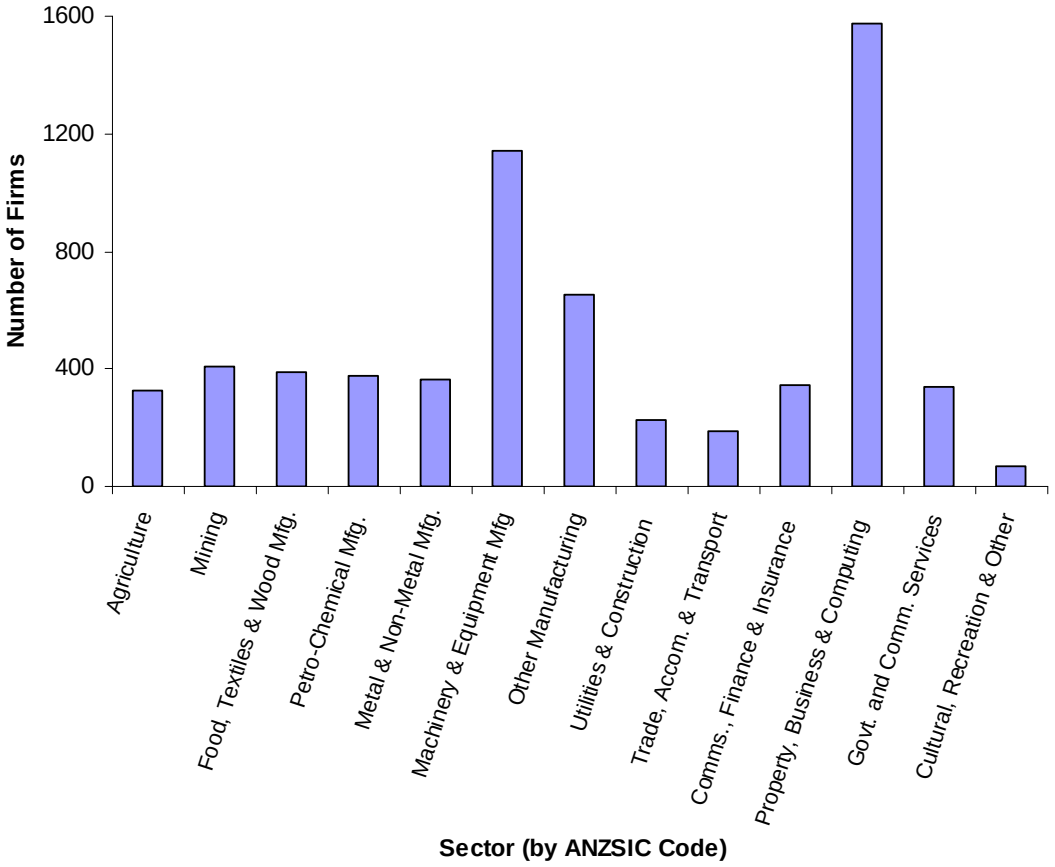

Figure 1.3 DITR support for industry innovation across sectors, 2004-05. Source: IR&D Board Annual Report, 2004-05.

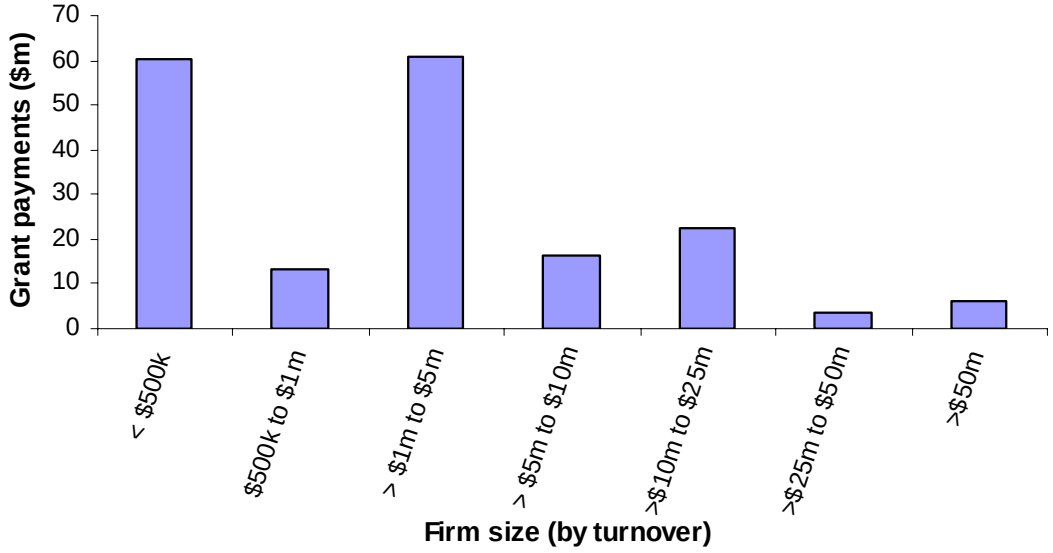

Figure 1.4 DITR industry innovation grant value to businesses by firm size. Source: IR&D Board Annual Report (2004-05).

DITR industry innovation grants are predominantly awarded to small companies (Figure 1.4) reflecting the view that there is strong justification for Government support for SMEs given the barriers they face in accessing growth capital and knowledge.

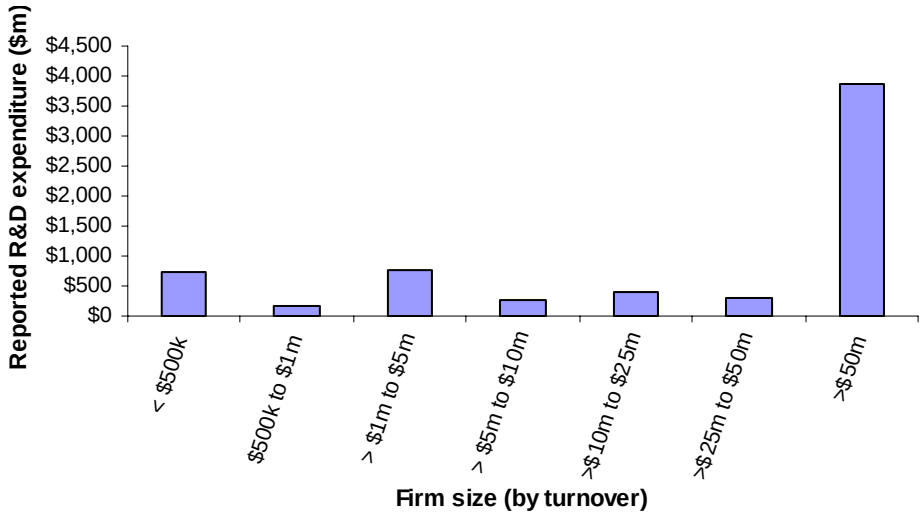

Figure 1.5: Reported expenditure on R&D for the R&D Tax Concession, by firm size, for 2003-04. Source: IR&D Board Annual Report (2004-05).

Figure 1.5 shows that most industry innovation expenditure recorded under the R&D Tax Concession in Australia is by firms with a turnover of greater than $50 million. In 2004-05, large businesses (>200 staff) increased their R&D accounted for 65.5% of total business R&D (See section 2.11).

Programs supporting only small to medium sized enterprises (SMEs) are Commercial Ready, COMET, IIF, the Pre-Seed Fund (PSF), and the R&D Tax Offset. Definitions of firm size for eligibility vary depending on the focus of the program and degree of targeting required. For example, the turnover limit for eligibility under the Commercial Ready program has recently been raised from $50 million to $100 million, while the Tax Offset supports businesses with turnover of up to $5 million and R&D expenditure below $1 million. Programs that support companies of any size include the 125 percent R&D Tax Concession and 175 percent Premium R&D Tax Concession, P^3, REDI, and ICIP.

There are advantages and disadvantages associated with competitive grant programs like Commercial Ready and entitlement programs like the R&D Tax Concession. Both are provided in order to meet different government policy objectives and the broad nature of the demand from industry.

- Competitive entry programs allow for targeting of support and allow for better performance monitoring of how taxpayer funds are spent. Criteria are used to ration support within a fixed funding allocation. However, these programs usually impose higher application and compliance costs for businesses and can give a perception of selection panels "picking winners"; while

- Uncapped entitlement programs allow the market to determine what is appropriate, ie businesses can determine the type and timing of their R&D activity, although their broad coverage means a wide range of type and quality of R&D is supported.

'Clawback' provisions ensure that no firm can get both the R&D Tax Concession and support from a competitive grants program for the same R&D activity.

Most DITR programs are designed to induce 'additionality' – that is, to induce an outcome or a behaviour that would not otherwise have occurred, or would have occurred more slowly, if government support had not been forthcoming. Competitive entry programs like Commercial Ready do this through the assessment process while the 175% R&D Tax Concession and P^3only subsidise activity above a historical base. A focus on additionality helps to ensure that the support provided by Government is economically efficient.

A feature of DITR programs is the requirement for matching funds from applicants to demonstrate their commercial commitment to the project. In the case of the 125 percent R&D Tax Concession, the additional support provided for each dollar expended by the firm is 7.5 cents after tax. In another example, P^3, the Government pays 30 cents (50 cents for Round 3) for each dollar spent on eligible R&D in addition to the applicant company's historical base.

1.1.1 Intellectual Property Protection

A number of Government programs allow intellectual property (IP) protection or management as an eligible expenditure, including the Commercial Ready Program, the P^3, and the Renewable Energy Development Initiative. The Commercialising Emerging Technology program allows some IP management advice as an eligible expense.

Some programs like Commercial Ready and the Tax Concession require the applicant to be the beneficial owner of the project's IP on the rationale that ownership maximises national benefit through securing royalty streams. P^3 does not require Australian IP ownership on the rationale that national benefit in globally integrated industries like biotechnology and pharmaceuticals is achieved by having the R&D activity take place in Australia. IP ownership and control is part of the P^3 assessment criteria.

1.1.2 Role of AusIndustry

Industry innovation support is primarily administered by AusIndustry, DITR's program delivery division. AusIndustry staff specialises in program management and implementation, and having a specialised delivery division enables coordination and efficiency in getting advice and assistance to businesses. Furthermore, the policy/program management separation means that policy areas focus on identifying market failures, assessing innovation strengths and weaknesses in Australian industry, conducting domestic and international innovation research and analysis, designing new policy initiatives, and evaluating the outcomes of current policy settings to ensure objectives are realised.

AusIndustry maintains a presence around Australia, with offices in every state and territory capital city, plus the following regional offices:

- New South Wales – Wagga Wagga, Wollongong, Tamworth, and Newcastle;
- Queensland – Townsville, Southport, and Gladstone;
- South Australia – Port Augusta and Mount Gambier;
- Tasmania – Launceston;
- Victoria – Traralgon, Bendigo, and Ballarat; and
- Western Australia – Bunbury.

This geographic spread enables businesses across Australia to get access to industry innovation support. The AusIndustry offices work closely with their state and territory counterparts, enabling referrals and complementary support where appropriate. Figure 1.6 illustrates the number of businesses being assisted in different states and territories through industry innovation programs.

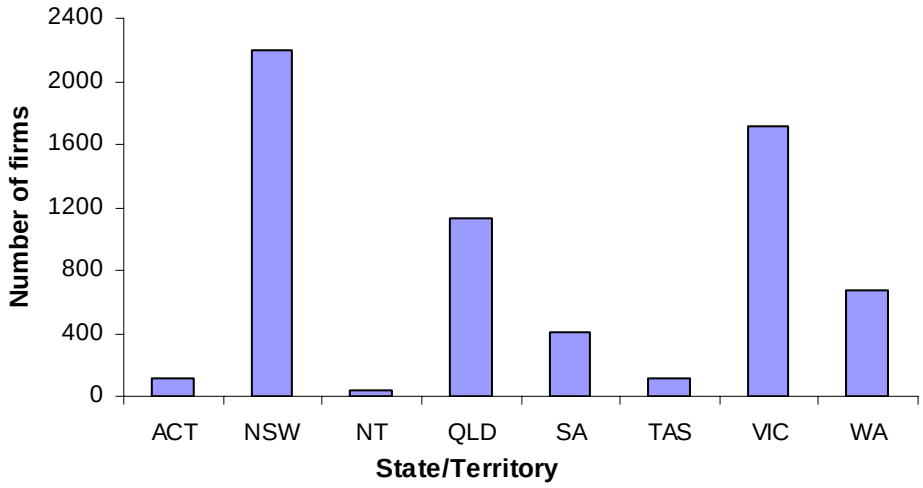

Figure 1.6: Businesses using industry innovation support, by State/Territory. Source: IR&D Annual Report, 2004-05.

AusIndustry provides hands-on guidance for businesses seeking support, which improves the chances that their assistance will translate into meaningful outcomes for businesses. AusIndustry monitors the performance of its programs by observing the progress in projects receiving assistance and the development of the business as a whole, including changes in turnover, employment and exports.

AusIndustry Offices work closely with innovative firms who use the innovation programs in various stages of their growth cycles.

1.1.3 The IR&D Board

Another feature of the delivery of industry innovation assistance is assessment by a group of experts – the Industry Research and Development Board. The Board and its committees number about 50 private sector or non-government experts who assess

and prioritise competitive applications and who also oversee the management and administration of the equity-based programs such as the IIF. In addition to assessing applications, the Board plays an important role in analysing key performance indicators and measuring the impact of programs on industry growth.

The Board regularly examines all aspects of assessment such as the guidelines used to determine national benefit, to ensure that up-to-date information is applied when applications are being assessed. An example is the Board's monitoring of 'change of control' requests – this is where an applicant asks to change the ownership of intellectual property funded through a program. The Board has published a document that sets out the principles by which these decisions are made.[10]

The Board also has a policy document that provides guidance on assessing whether applications meet national benefit criteria.[11] It assists the Board to determine which applications for competitive entry programs should receive financial support.

1.3 Outline of DITR Innovation Programs and their Impacts

Innovation includes R&D as well as non-R&D activities such as development of new techniques, organisational change, and acquiring new knowledge.

Innovation has become perhaps the most important source of competitive advantage in advanced economies, and building innovation capacity has a strong relationship to a country's overall competitiveness and level of prosperity.[12]

In advanced industrial countries, innovation and exploitation of scientific discoveries and new technology have been the principle source of long-run economic growth and increasing social well-being (OECD, 2005). In the future, the innovation performance of a country is likely to be even more crucial to its economic and social progress.

Countries whose firms fail to innovate will increasingly find themselves in direct competition with newly industrialising countries with lower labour costs and an increasing mastery of existing technologies and business methods. The development and exploitation of novel products, processes, services and systems, and the constant upgrading of those which a country already produces, is the only way in which OECD countries can maintain and increase their relative high levels of economic and social well-being.[13]

Australia competes with other developed economies and newly industrialising economies with lower labour costs and increasing mastery of existing technologies and business methods. The development and exploitation of novel products, processes, services and systems, and the upgrading of existing capabilities provides the means for Australia to remain internationally competitive.

[10] AusIndustry, 2006, Change in Control Guide to Meeting Contractual Obligations
[11] AusIndustry Policy No. 01 - National Benefits Operating Policy, www.ausindustry.gov.au.
[12] World Economic Forum, 2002, The Global Competitiveness Report, Oxford University Press, NY
[13] *OECD, 2005,* Innovation Policy and Performance - a cross country comparison

1.3.1 Program Rationale

The rationale for DITR programs is broadly based on 'market failure' and 'market immaturity' – that there are spill-overs[14] from private R&D and innovation which cannot be captured by the firms themselves, which in turn lead to a sub-optimal level of innovation, and that benefits will accrue too late or be lost for some (for example) new sectors unless there is intervention to speed up adoption. Commercial Ready and the R&D Tax Concession are largely based on this rationale.

Another relevant area of market failure is information failures. Consumers and suppliers in a market do not possess accurate or adequate information about factors such as prices, product quality, industry capability, market opportunities and developments or potential demand to make effective or efficient decisions. COMET, the IIF program and P^3 are examples of programs that seek to address this failure.

Australian industry can also suffer from a lack of 'critical mass' due to the small population, distance from key markets and geographically disparate companies and research institutes. The creation of a critical mass in an industry or area of innovation may be required to develop an adequate skills base, attract further participants for a viable supply chain or network, or support the provision of a common use facility which no individual user would have the incentive to provide. This may contribute to the rationale for government intervention in some cases such as the Australian Stem Cell Centre.

The rationale for government intervention can also relate to sector-specific needs, such as in the cases of the Renewable Energy Development Initiative, P^3, and the Australian Stem Cell Centre. These programs represent decisions by the Government to invest in areas where there are 'platform technologies' that provide a basis for broader industry innovation, or because there are particular features of the market that act as a barrier to accessing support or for an area of strategic focus.

The extent to which DITR programs meet their objectives in addressing market failures and/or meeting strategic objectives is evaluated in a number of ways:

- AusIndustry maintains regular contact with grantees and has in place reporting requirements to monitor progress with each project;
- Key performance data is collected at regular intervals for each project. This process monitors outputs such as the amount of new investment attracted, milestones achieved, and employees hired. A list of performance indicators for DITR programs is given at Attachment 2; and
- Formal reviews are carried out periodically for each program. They report on appropriateness, effectiveness and efficiency through a combination of econometric analyses, surveys and case studies, and where possible involve comparisons between firms that received assistance and those that did not.

Key DITR innovation programs are detailed below to illustrate the program rationale and findings from performance reviews.

[14] A common source of spillover is knowledge which has some of the characteristics of a 'public good': It can be used by many users simultaneously without reducing its usefulness to any one user, and it is difficult to exclude users from it.

1.3.2 R&D Tax Concession

Through the R&D Tax Concession, the Government spends approximately $500 million per year to encourage business expenditure on R&D, making it by far the largest program in the DITR suite. The Tax Concession is different from other Government innovation programs in that it is an entitlement program open to any Australian company conducting eligible R&D above a certain expenditure threshold. Companies claim the eligible R&D expenditure against a base concession rate of 125 percent for R&D activity already undertaken.

In a comparative study of R&D tax concessions in Australia, the United Kingdom, Ireland, Canada, and the United States, Australia has the most comprehensive regime offering a basic volume-based concession, a Tax Offset for small companies that may not yet incur a tax liability and a higher concession for incremental R&D. Australia, the UK and Canada offer volume-based tax concessions/credits, meaning that firms can claim all eligible R&D, whereas Ireland and the US only offer an incremental concessions (only activity which is above a base is eligible). The United States has recently legislated to make its R&D Tax Concession a permanent feature of its innovation system.

In the five country study, only Australia has a national benefit or exploitation requirement - other countries see the benefits from undertaking R&D will flow naturally into the economy, such as through new knowledge and intellectual property, location of facilities, job creation, new goods and services to the market, enhanced international competitiveness, and generation of profit[15]. This exploitation requirement in Australia may work against attracting multinational firms to locate in-country.

Arrangements in the UK, Ireland, Canada, and the USA comprised a 100% deduction for eligible activities and a tax credit of between 20% and 50%. The tax credit was highly regarded by business (particularly multinationals) as it was visible in the accounts and directly reduced tax payable.

While the rationale for R&D tax concessions and credits was similar across countries, there was a different emphasis in different countries:

- The US and Canada used the theoretical market failure and spillover rationale, that is the benefits of private investment generate a broader benefit to the community and economy;
- The UK introduced the concession to reward, retain and grow existing activity, given the broader spillovers which accrue to the economy;
- Ireland is seeking to encourage the location of additional R&D to the country, noting that there was a strong relationship between the location of R&D and manufacturing facilities. Ireland is also seeking to create more skilled jobs; and
- Australia is seeking to encourage additional investment in R&D, given that the Australian private sector traditionally under-invests in R&D. It provides an

[15] DITR, 2005, R&D Tax Concession – a comparative study,

additional return to firms in recognition that private returns may not be high and that there are broader knowledge spill-overs that accrue to the community.

Since 2001, the Australian R&D Tax Concession has provided two additional components that provide extra incentives to stimulate business investment in R&D:

- The Tax Offset provides cash to small firms operating in tax loss. The Offset recognises that capital is critical for these small firms – with turnover under $5 million and investment of less than $1 million per annum – if they are to sustain their research program and reach commercial success. Without the Tax Offset, such firms would not receive assistance for R&D until they are profitable; and
- The 175 percent Premium Tax Concession promotes higher additionality by offering this higher rate only to firms that increase their average investment in R&D. The higher level of additional support per dollar spent – 22.5 cents – is designed to induce a higher investment in R&D.

There has been increasing use of both the Tax Offset and the 175 percent Premium Concession since their introduction in 2001[16]. Figure 1.7 shows R&D expenditure by all firms for the three years before and the three years after the Offset was introduced. R&D expenditure by firms approximately doubled across most intervals below $1 million in the three-year period after the introduction of the R&D Tax Offset. By contrast, there was almost no increase in R&D expenditure where firms' annual expenditure was greater than $1 million. The Offset only applies to companies where the R&D expenditure is $1 million or less and turnover is less than $5 million.

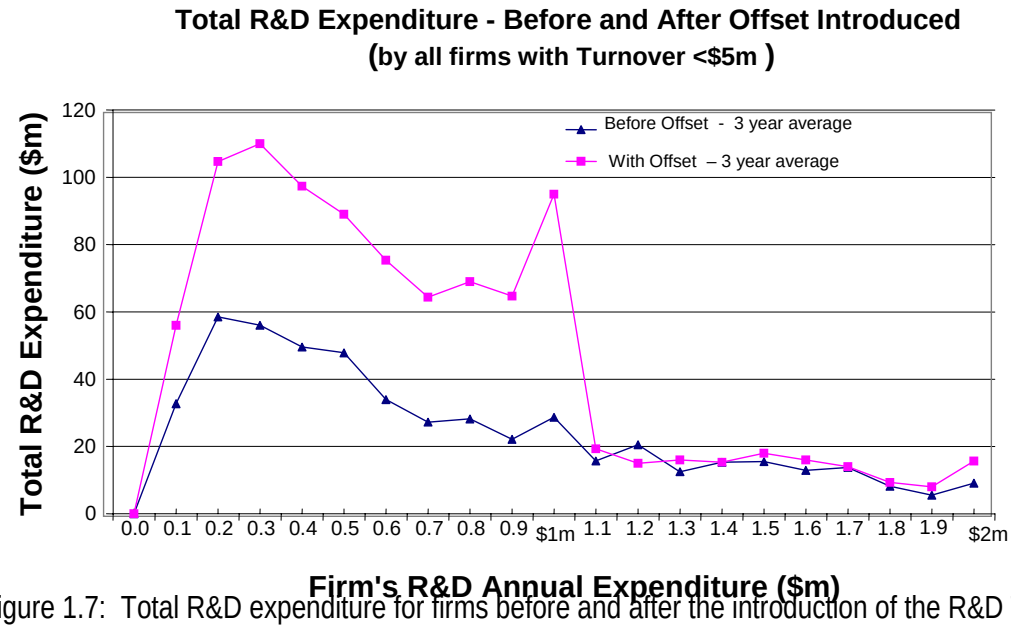

Figure 1.7: Total R&D expenditure for firms before and after the introduction of the R&D Tax Offset.

[16] DITR, R&D Tax Concession registration data.

In 2003-04, over 890 companies sought support under the 175 percent Premium - these firms spent $2 456.1 million on eligible R&D activities. The expenditure was supported by 125 per cent R&D Tax Concession for the three year average and at the 175 percent Premium rate for the R&D expenditure above the three year average.[1]

The R&D Tax Concession is administered by the Australian Taxation Office and AusIndustry. The IR&D Board's Tax Concession Committee has responsibility to oversee the types of activities claimed and ensure that they meet guidelines on what is defined as eligible R&D.
A 2003 review of the 125 percent Concession found[17]:

- High levels of satisfaction amongst users of the Concession
- The Tax Concession induced R&D activity in the range of 50 to 90 per cent

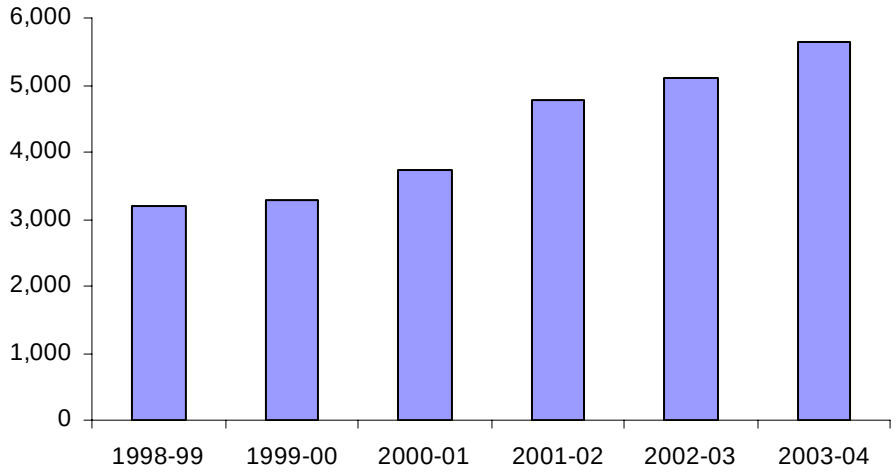

Figure 1.8 Number of firms registering for the R&D Tax Concession, by year of registration.
Source: AusIndustry data.

The Concession was found to be appropriate and effective. The review called for more research into what the expectations of the level of spill-overs from a program like this should be.

To obtain an understanding of how individual businesses use the Tax Concession, a survey of 116 firms was undertaken via interview in 2005. The study found that the R&D Tax Concession increases the size of investment in individual R&D projects, brings forward R&D expenditure on projects to enable faster completion with higher commercial results, and encourages investment in projects that otherwise would not be undertaken.

The investment in R&D induced by the Tax Concession indirectly produces longer-term benefits through positive behavioural change. Eighty-three percent of companies surveyed advised that performing R&D has resulted in a stronger understanding of the benefits of R&D and commercialisation, 73 percent stated an enhanced commitment

[17] 2003 Review of R&D Tax Concession by Centre for International Economics, report available on request

to R&D, and 80 percent indicated that they had made positive changes in the way they manage R&D projects.

The study further found that the R&D Tax Concession positively influences the R&D budget and timing of individual projects but does not appear to encourage companies to undertake R&D projects that have a poor business case, just to receive a tax benefit[18].

1.3.3 The Biotechnology Innovation Fund, R&D Start and Commercial Ready

Given the long development periods and significant regulatory hurdles characteristic of the biotechnology industry, it can be very difficult for biotechnology firms to attract investment capital for a product that is in only the earliest stages of development. The Biotechnology Innovation Fund (BIF) was designed to help biotechnology firms demonstrate proof-of-concept and thereby improve their chances of attracting private investment for the subsequent development of the product.

The BIF was introduced in July 2001 with $20 million allocated under the National Biotechnology Strategy and was soon doubled in size to $40 million under *Backing Australia's Ability*. Grants of up to $250 000 were allocated to each successful firm. The program was reviewed in 2003, at which time grants of $31 million had been awarded to 137 applicants[19]. The review concluded that:

- 86 per cent of survey respondents claimed that there was a lack of funding at the early-stages of biotechnology development
- The program induced additional innovative activity
- BIF-funded projects progressed faster and attracted higher levels of investment capital than non-BIF projects
- After only a short period of operation, there was a net economic benefit to the nation of $5.2 million.

This review confirmed that support for proof-of-concept was justified and that there had been value in providing sector-specific assistance in the case of the emerging biotechnology sector. In addition, the review identified a lack of private venture funding beyond the proof-of-concept stage, suggesting that grants of greater than $250 000 may be called for.

These findings contributed to the establishment of the Commercial Ready program. It provides grants of up to $5 million for R&D, proof-of-concept activities and early stage commercialisation across all sectors. The Commercial Ready program also combines activities previously supported by the R&D Start program and some elements of the Innovation Access Program. R&D Start was a competitive grants program that provided up to 50 percent of the R&D project costs for businesses with turnover of up to $50 million, and grants of up to 20 percent for larger businesses. An additional premium component was available for very high-quality projects, providing an additional repayable amount which 'topped up' the grant to 56.25 percent. Loans were also provided to support early-stage commercialisation activities for companies with less than 100 employees. It operated from 1996 to 2004 and was found to have

[18] DITR, 2005, The R&D Tax Concession - Impact on the Firm www.industry.gov.au
[19] BIF was reviewed by Allen Consulting Group 2003.

contributed to additionality by speeding up the rate at which R&D projects were undertaken and to result in larger and more ambitious projects (Box 1). Importantly, access to finance was identified as a major constraint to such activities.[20]

In 2004, Government combined the BIF, Start and Innovation Access Program into one in recognition of the variety of activities that constitute effective innovation in the market – ie R&D activities, proof-of-concept activities and early stage commercialisation activities. The consolidation of support under one program has made it easier for firms to identify and pursue appropriate avenues for assistance, and has reduced the delivery costs for oversight of the program.

In 2005, the Department participated in an OECD study of behavioural additionality. Behavioural additionality refers to ongoing changes in firms caused by involvement with a government assistance program. This research demonstrates that firms get progressively better as they gain experience and learn from their successes and failures. It also underlines the point that innovation programs are successful if they help establish profitable and sustainable firms rather than through shorter term measures of success in commercialising a particular piece of technology. The findings (Box 1.1) will be used in future design and reviews of DITR programs, and suggest:

- Longitudinal (longer term) data is required to measure the full impact;
- Use of government support programs builds innovation capacity in firms; and
- Spill-overs are likely to be greater than previous inducement formulae predict.

The IR&D Board and DITR continually monitor programs and modify guidelines as necessary. For example, the Commercial Ready program has been closely monitored since it commenced in October 2004. In mid 2005, following initial concern about the lower than expected uptake of the program, DITR undertook a review and a number of changes were made in relation to the timing of payments, changes to guidance material, increased promotion and AusIndustry staff training. As a result, by May 2006 Commercial Ready applications had risen to the level previously experienced under the R&D START programme.

[20] OECD, 2006, Government R&D Funding and Company Behaviour – measuring behavioural additionality.p.39

Box 1.1– Impact of R&D Start Grants

A study of recipients of R&D Start grants found that the grant generated an increased commitment to R&D, an increased understanding of the benefits of R&D, entrenched changes in project management, and facilitated new ongoing collaborations with other companies.

The study involved a survey of 100 firms receiving *R&D Start* grants to assess the affect of the grant on firm behaviour, culture and attitudes. It was part of an OECD study into a new approach to determining the effectiveness of government innovation funding called *behavioural additionality*. This approach recognises that firms undertaking subsidised research will learn new behaviours as a result of applying for the grant, conducting the project and interacting with a government agency for reporting and other purposes. Some changes due to the grant are immediate—such as being able to complete the project more quickly. Many changes, however, become deeply embedded in the firm and are retained after they have completed the grant project. They are quite separate from the technical or commercial success of a project and represent capacity building that will improve the chances of success of future projects.

One result of the comparative study is that the degree of improvement in business capability depends on how firms operated before being provided support through a grant or tax concession. Future studies will be developing and including questions to establish these prior skills.

Source: OECD, 2006, Government R&D Funding and Company Behaviour – measuring behavioural additionality.

1.3.4 Pharmaceuticals Partnerships Program

The Pharmaceuticals Partnerships Program (P^3) commenced in July 2004. It is a $150 million competitive entry program that aims to support additional high-quality pharmaceuticals and biotechnology R&D in Australia and to strengthen partnerships between biotech, pharmaceutical and generic companies, and researchers. In Rounds One and Two the Government paid 30 cents in the dollar for a net increase in eligible R&D undertaken in Australia over a three year base period. The benefits available through this program apply to the whole portfolio of R&D activity undertaken by the company. Its predecessor programs (PIIP and Factor (f)) also supported manufacturing and were only available to companies that supplied medicines through the Pharmaceutical Benefits Scheme. A review of the PIIP concluded that "…estimates of the amount of additional 'bang for a buck' are much higher than have been found for other R&D incentives in Australia and internationally." The review further found that these returns were accrued primarily via the support for R&D activity, so P^3 was established to support R&D only.[21]

[21] Evaluation of the Pharmaceutical Industry Investment Program, Productivity Commission, 2003. http://www.pc.gov.au/study/piip/finalreport/index.html.

P^3 payments are made in arrears, based on R&D actually undertaken by the program participant. This, combined with the unpredictability of R&D spends, has resulted in an under-spend on the program. Prior to contracts being let for the final round of the program, the under-spend from Rounds One and Two will be reallocated to Round Three in an effort to maximise industry utilisation of the available allocation for program.

Unlike most industry innovation programs, multi-national corporations (MNCs) are eligible participants under P^3. The role of MNCs is particularly critical to the pharmaceutical and biotechnology sectors because they can bring resources and expertise that can help the small domestic sector overcome the challenges involved in commercialising therapeutics in global markets. A rationale for P3 is that much of the research activity undertaken by foreign owned MNEs is not eligible for the R&D Tax Concession because of the beneficial ownership requirements of that program. P^3 is based on the rationale that spill-overs are derived from conducting R&D activity, rather than owning the IP, which is why P^3 has an emphasis on partnering and requires all R&D to take place in Australia.

A recent review of the first year of P^3 indicated that it made a small but significant net contribution to the economy[22]. That review, and subsequent advice from the Pharmaceuticals Committee of the IR&D Board, led to four changes to the design and implementation of the program for Round Three. They were:

- Increasing the rate of government support for eligible R&D from 30 per cent to 50 per cent;
- Increasing the amount that can be claimed to manage intellectual property;
- Strengthening partnering requirements; and
- Allowing the three-year track record to set the R&D base to be established outside Australia.

1.3.5 Australian Stem Cell Centre

The Australian Stem Cell Centre (ASCC) was the successful bidder in securing the Government's investment in a Biotechnology Centre of Excellence (BCE). These world class centres, one in biotechnology and the other in ICT, are intended to link companies and research institutions across Australia, build 'critical mass' in these important enabling technologies to the equal of other such centres internationally. Important aims include:

- Fostering the creation of spin-off companies and networks of commercial biotechnology activity;
- Attracting outstanding researchers from Australia and overseas;
- Developing an entrepreneurial culture; and
- Building Australia’s biotechnology skills base in research, education and training, and business management.

[22] Pharmaceuticals Partnerships Program - First Year Evaluation, Centre for International Economics, 2006. Available on request.

The ASCC commenced operations in 2003 with initial funding (from the Commonwealth Government (DITR and the Australian Research Council) of $43.55 million to 2006. This was subsequently increased to $98.55 million to 2011. In addition, $5.5 million was provided by Major National Research Facilities-program-and $11.38 million by the Victorian Government. The therapeutic use of stem cells is an experimental arm of biotechnology and any practical applications are likely to be a number of years away. It is therefore difficult at this stage to provide a clear indication as to the longer term economic benefit of the Centre.

Australia's competitiveness in the field of stem cell technology is mixed. On the one hand, our research is world class but our avenues for commercialising that research in Australia are diminishing, with two prominent stem cell companies, ES Cell and Stem Cell Sciences, having recently moved offshore.

However, in raising the profile of stem cell research, attracting additional investment and forging links to establish critical mass, there are encouraging indicators such as:

- The ASCC signed an agreement whereby Chemicon International Inc had obtained exclusive rights to commercialise, market and distribute stem cell reagents developed at the ASCC to scientists all over the world; and
- Scientists from Monash University and the ASCC will work with the University of California, San Diego, to create a powerful new international collaboration in stem cell research. It will bring together more than 300 leading scientists in regenerative medicine and stem cell science and will underpin major collaborations between Victoria and California.

A review of the ASCC was completed early in April 2006. [23] The Review was a scheduled, independent assessment of the ASCC's progress towards program objectives and compliance with its obligations under two Commonwealth programs – the Biotechnology Centre of Excellence program and the Major National Research Facilities programme.

The Review confirms that the ASCC has established a strong foundation, has been professionally established and is well managed. The ASCC is generally making sound progress towards meeting the Objectives and Purposes set out in the BCE and MNRF Deeds of Agreement. Overall the science was found to be of a high standard, the research capabilities of the ASCC were very competitive and the scientists were clearly world class. The Review also confirmed that the ASCC has excellent management and research staff with world-class research project management and IP management processes.

1.3.6 Initiatives to Assist Technology and Knowledge Transfer

Realising the commercial potential of innovation relies on the smooth transformation of new technologies into marketable products. There are a number of barriers to the transformation of technology, including the ability to identify and access the technology from researchers, and collaboration issues, both between researchers and companies, and between companies.

[23] Review of the Australian Stem Cell Centre, Growing Your Knowledge, 2006, unpublished.

Research based on the ABS Innovation Survey suggests that innovation with a high degree of novelty is correlated with collaboration.[24]

Most companies, especially SMEs do not have the resources, or time to spend trying to find relevant technology. This is exacerbated by the fact that such technology may well lie outside the company's industry sector, and there are few available sources of information that can assist in the search. Even if relevant technology is identified, it is often difficult to access as many companies lack experience in the collaboration processes.

A rationale for providing government support is based on the poor connectivity of SMEs to others from whom they can access knowledge, skills and technologies. The 2003 ABS Innovation survey found that only 27 percent of innovative firms were involved in some form of collaboration, the majority for joint marketing or distribution.

One mechanism to facilitate greater collaboration is the use of intermediaries. Intermediaries work with companies to assess the technological needs, identify sources of that technology, foster collaborations to access the technology, and ensure the successful integration of the technology within the company.

Since 2000, DITR has provided support for a number of technology transfer activities. The Innovation Access Program supported the InnovationXchange trusted intermediary and Industry TechLink services, and the TechFast program. These have provided assistance to businesses to identify, adopt and transfer new technologies and, to a lesser extent, knowledge to support innovation outcomes. The Innovation Access Program - Industry, also supported the Welding Institute of Australia by providing $2.8 million to diffuse welding technology and expertise throughout the industry sector. Over 2003-06, the Welding Institute estimates that more than 9000 individuals and 915 companies were influenced by their work, with direct value to industry of some $40 million.

InnovationXchange (IXC) and its trusted intermediaries network assists companies and research organisations to partner and collaborate with each other for business growth. The Department provided $1.22 million from the Innovation Access Program-Industry to help establish the network in 2003. The IXC has highly skilled, trusted intermediaries (specialist innovation, commercialisation and business development support staff) who work under a code of ethics to get confidential access to the strategic intentions and technological developments of participating firms and institutions. This enables them to seek out opportunities for collaboration. A firm of any size, or an institution, can participate in the network, including those based overseas. Because the trusted intermediaries are commercially neutral this reduces the risk that participants will not cooperate with each other for fear of breaches of commercial confidentiality.

IXC has grown from an initial life sciences cluster to include other domains such as manufacturing and construction, IT, medical devices, and material sciences. IXC intermediaries have completed 155 investigations, identified 115 opportunities and secured 20 engagements for collaboration. IXC now has linkages with the UK, the

[24] OECD/DITR, 2006, Patterns of Innovation in Australian Businesses

USA, and Denmark. In May 2006, the Birmingham Business School received a £3.6 million Higher Education Innovation Fund to partnership with the Birmingham Chamber of Commerce and the InnovationXchange Australia, to setting up the UK pilot of a new Innovation Exchange (IXC UK).

TechFast engages with SMEs who must be established, technology-based and willing to grow. It is project specific with the provision of funding and 'hands-on' advice to actively support the knowledge transfer and commercialisation processes. TechFast first identifies the technological needs of the SME and then searches through the IP from public sector research institutions to meet the firm needs. This is a 'market-pull' approach to innovation using technology developed by the Australian public research sector. TechFast then assists in the negotiation of the transfer of IP, develops a technology adaptation plan and prepares a path to market strategy. In 2004, the Department provided pilot funding of $2.5 million to help establish the service nationally. As at May 2006, TechFast had achieved the following results:

- 17 intellectual property, knowledge and/or technology transfers now commenced or completed between TechFast SMEs and research organisations.
- 3 Business-to-Business relationships facilitated by TechFast between SMEs and other Australian businesses.
- 10 intellectual property, knowledge and/or technology transfers currently in final contract negotiation between TechFast SMEs and research organisations.
- 15 Opportunities for technologies and expertise held by research organisations currently being technically and commercially assessed by TechFast SMEs for transfer into their business.
- 7 early stage discussions between TechFast SMEs and research organisations regarding a possible licence, collaboration or contract expertise relationship

TechFast has now facilitated commercial relationships between 30 different research organisations and TechFast SMEs. Six of the TechFast technology transfer projects have seen TechFast bring together 2 research organisations to collaborate in providing technology or expertise to the SME. Approximately 50 percent of the participating SMEs are regionally-based.

Industry TechLink was a $6 million, four year initiative funded through the Innovation Access Program-Industry, offering a free technology advice service for SMEs. It provided access to consultants to help diagnose specific technology problems and suggest a way forward. Assistance included over-the-phone and on-site face-to-face visits. DITR funding for the service ceased on 30 June 2006. It assisted over 3300 SMEs, with half of all enquiries from regional Australia.

The various intermediary pilot programs are now being evaluated and consideration will be given to future initiatives in this area.

1.3.7: Industry Cooperative Innovation Program

In 2004, the Government announced the $25 million Industry Cooperative Innovation Program (ICIP) to assist collaborative innovation including adoption and adaptation of new technologies. It aims to build sectors through assisting consortia with

collaborative projects where a consortium undertaking an innovation project can demonstrate spillover benefits to merit government funding.

In recognition of the importance of international alliances the Minister for Industry Tourism and Resources announced in June 2006, when he released the Advanced Manufacturing Action Agenda, that industry would be consulted on plans to broaden the guidelines for the program to increase international collaborative activity.

1.3.8 Innovation Investment Fund

Australia has a very competitive private equity market, but like many other countries it has an immature early-stage venture capital market. In terms of venture capital investment as a percentage of GDP, Australia ranked 17th out of 27 OECD countries for investment in early stages[25]. There are several reasons for this but it is broadly due to a lack of knowledge of the technology development sector and an aversion to risk amongst investors in Australia which, when combined with a lack of availability of skilled early stage fund managers, results in a shortfall of capital committed to early stage investments. In addition to this, technology developers do not know how to effectively package their product and/or their company into an 'investor-ready' form.

Innovation Investment Funds (IIF) are aimed at addressing this gap by providing Government funding to catalyse the establishment of early-stage venture capital funds, and through the experience of these funds, increase the level of investor and investee skills in the marketplace.

The Government has provided $221 million for the first two rounds of the IIF program (1997 and 2001). This has been augmented by $137 million in private sector funds, providing a total pool of $358 million.

The IIF program was reviewed in 2002[26] with findings qualified because Round One of the program had been operating for four years (of a 10 year program) and Round Two only one year at the time of the review. Key findings were

- The IIF program has made a 'significant contribution' to the introduction of a higher degree of professionalism and credibility in the early-stage venture capital industry;
- IIF fund managers have encouraged financial institutions to invest more heavily in early-stage companies;
- Round One delivered a $31 million net realisation and another nine companies had valuations $30 million in total above the cost of investment

The 2002 review found that only 9.4 per cent of IIF investments were at the seed stage, suggesting that even with Government funding mitigating risk, private investors are reluctant to invest at the very early stages and are instead investing in the less risky early-expansion stages.

[25] OECD Science, Technology and Industry: Scoreboard 2005
[26] Reviewed by Howard Partners, 2002, summary available at www.ausindustry.gov.au

A review was conducted by an Expert Group in 2005 and in May 2006, following consideration of the recommendations of the Review[27], the Government announced a 3rd round of the IIF program with $200 million of capital to support 10 new funds. This new round of IIF funding will appoint up to two new managers each year for 5 years with $40 million in funding available per annum for successful fund managers. The government funding will be matched at least dollar for dollar by the private sector.

The Department funds the publication of the ABS Venture Capital Survey[28] each year. The most recent survey found that there was a strong growth in funds committed to venture capital investment vehicles during 2004-05. As at 30 June 2005, investors had $11.2 billion committed to venture capital investment vehicles, an increase of twenty five per cent on the previous year, however a majority of this funding is targeted towards later stage investment.

New and follow-on investment of $1.0 billion was provided to investee companies in the financial year ended 30 June 2005, with the late stage sector of LBO/MBO/MBI[29] attracting the largest share of $329 million as compared to seed stage that only attracted $24 million. Early/start-up stage received $217 million, whilst expansion stage received $320 million.

Internationally, it has been acknowledged that public support of early stage venture capital needs to continue[30]. Even in the US, which is considered to have a mature venture capital market, seventy per cent of early stage venture capital funds were still supported by Government[31]. Furthermore, there is a case for public support on an ongoing basis to allow for ongoing development of the early stage venture capital market, including managers and related skills, and a steady supply of venture capital.

1.3.9 Pre-Seed Fund

The Pre-Seed Fund is a very early stage venture capital program aimed at assisting the translation of research in public sector research organisations into commercial outcomes. The program commenced in 2002 with some $72 million of Commonwealth funds. This has been augmented by private sector funds, providing a total pool of over $100 million. Eligible projects must be controlled by and have at least 50 percent of their intellectual property owned by a university, a public sector research organisation or qualifying researchers [AI]. Four funds were set up with private sector fund managers providing management and technical advice to develop the commercial potential of the research. A review of the program is currently underway.

1.3.10 VCLP and ESVCLP

The Venture Capital Limited Partnership (VCLP) vehicle was introduced as part of the Government's Venture Capital Regime in 2002. The regime was introduced to facilitate non-resident investment in the Australian venture capital industry by

[27] VC Review Expert Group was comprised of Brian Watson, David Miles and Gary Potts, 2005.
[28] ABS Venture Capital Survey. Available www.abs.gov.au
[29] LBO leverage buy out; MBO management buy out; MBI management buy in
[30] OECD, 2004, Venture Capital Summary. Venture Capital: Trends and Policy Recommendations
[31] NORFACE International Venture Capital Policy Research Seminar, London, 4-5 April 2006

providing incentives for increased investment which will support patient private equity capital investments in relatively high-risk start-up and expanding businesses that would otherwise have difficulty in attracting investment through normal commercial means. VCLPs are limited partnerships with flow-through income tax treatment. Eligible investors (from a select number of overseas countries) receive an exemption from income tax on profits or gains on equity investments made by a VCLP in Australian companies whose total assets are not more than $250 million. VCLPs may not invest in companies whose primary activity consists of (property development, financial services, insurance, infrastructure, and income from passive investments).

The Australian Government announced in its 2006-07 Budget that it proposed to enhance the existing VCLP vehicle by:

- removing the restrictions on country of residence of investors
- reducing the minimum partnership capital required for registration from $20m to $10m
- allowing investment in unit trusts and investment by way of convertible notes as well as shares
- allowing the appointment of auditors to occur at the end of the financial year rather than at the time of investment
- relaxing the requirement that 50 per cent of assets and employees must be located in Australia for 12 months after the making of the investment.

Following the recommendations of the Expert Group on Venture Capital the Government announced in its May 2006 Budget that an Early Stage Venture Capital Limited Partnership (ESVCLP) investment vehicle would be introduced. This was designed to assist more Australian technologies and innovations to be commercialised locally before going global. The ESVCLPs will provide flow-through income tax treatment and a tax exemption for income, both revenue and capital, received by its partners whether resident or non-resident. They will progressively replace the existing Pooled Development Fund (PDF) program which will be closed to new registrations after 31 December 2006. The ESVCLP program is expected to open late 2006-07.

To qualify for registration as an ESVCLP a partnership cannot have more than $100 million in committed capital and must invest in companies with total assets not exceeding $50 million immediately prior to investment. The ESVCLP must also divest itself of any holdings once the total assets of the investee company exceed $250 million. As the income will be exempt from tax, investors will not be able to deduct investment losses.

1.3.11 Commercialising Emerging Technologies

The Commercialising Emerging Technologies (COMET) program was established to address a gap identified by private fund managers when the IIF program was established – that most early-stage firms were not 'investment-ready' because they suffer from a poor grasp of the realistic market opportunity for their product and/or limited understanding of intellectual property and general business management skills. These high risk factors make it very difficult for venture capital funds to undertake due diligence and feel confident in the prospects for the business.

COMET is designed to build business innovation by providing support in the form of knowledge services (see Box 1.2) that are tailored for each grantee depending on their specific needs. It is available for individuals and small companies with ideas at the earliest stage of development, when assistance with devising a marketing plan, building a prototype, developing an intellectual property strategy, and other aspects of business planning can make a big difference in attracting investor confidence and growth capital.

The program provides around $80 000 – $100 000 to each firm via the services of 14 COMET Business Advisers now operating across Australia. Support is provided by Business Advisers[32], who assist applicants to access the appropriate knowledge services for their specific needs and identify possible growth paths and sources of funding. The COMET program is assisting to build availability, capacity and access for small firms to knowledge intensive services.

Box 1.2– Knowledge Intensive Services

As innovation becomes more complex, firms draw on a wider range of skills to bring products and services to the marketplace, often extending beyond their internal capabilities. In this environment the providers of knowledge intensive services are play an increasingly important role in providing firms with access to specialist knowledge.

The providers of knowledge intensive services play an intermediary role by packaging information and disseminating it in a form which can be used by firms when taking ideas to market.

The OECD Knowledge Intensive Service Activities Study found that knowledge intensive services have three main roles in the innovation process, serving as:

- Sources of innovation when they play a role in initiating and developing innovation activities within firms;
- Facilitators of innovation when they support an organisation in the innovation process; and
- Carriers of innovation when they aid in transferring existing knowledge among or within organisations.

Source: OECD, 2006, Innovation and Knowledge Intensive Service Activities.

A 2002 review[33] found that 27 percent of businesses assisted by COMET had secured equity funding through their experience in the program, with a further 31 per cent involved in negotiations for equity funding. Thirty-seven percent of clients had finalised one or more strategic alliances, with 31 percent involved in negotiations. Joint ventures had been completed by 16 percent of clients. The review concluded that the program was making a "…very important contribution to the entrepreneurial economy."

[32] Business Advisers are non-departmental staff who have skills in mentoring early stage firms to assist them bring their ideas to commercial reality and to assist them to be investor ready

[33] Review by Howard Partners, 2002. Summary available at www.ausindustry.gov.au.

In 2006, DITR conducted an analysis of the information provided by the Business Advisers on the investment sources of their customers over an 18 month period. According to the data, 77 companies sourced approximately $90 million from July 2004 to December 2005. Data analysis shows that around 65 percent of these companies sourced investment from Business Angels with a value at around 30 percent of the total capital sourced.[34]

Three companies went to IPO during this period, and these public listings were valued at one third of the total of the investments included in the study. The remainder consisted of equity sources such as venture capital and corporate investments, debt finance, and "other" investments (such as sale of IP and the acquisition of companies by ASX-listed companies).

Over 1170 companies have been supported since the program's inception in 1999. Over the life of the program, these companies have:

- Raised in excess of $380 million in capital;
- Created 265 strategic alliances;
- Made 446 licensing deals and agreements;
- Commenced 95 manufacturing projects; and
- Launched 211 products or services launched onto the market.

1.3.12 Energy Innovation Programs

In its white paper on energy, *Securing Australia's Energy Future*, the Government focussed on the importance of accelerating the development and demonstration of new energy technologies with reduced levels of greenhouse gas emissions. To support this, three programs were introduced aimed at energy technologies. Policy responsibility for the programs is shared by DITR and the Department of the Environment and Heritage (DEH). DITR has lead responsibility for the Renewable Energy Development Initiative (REDI), and DEH has lead responsibility for the Low Emissions Technology Demonstration Fund (LETDF) and Advanced Electricity Storage Technologies. AusIndustry delivers the first two programs.

REDI is a $100 million program which provides matching competitive grants of $50,000- $5 million for the development of renewable energy projects by Australian businesses. It operates in a similar manner to Commercial Ready. The program supports projects from early stage research and development through to commercialisation. The first two rounds of REDI have granted $33 million to sixteen projects covering wind, solar, geothermal, landfill gas extraction and biomass technologies.

LETDF is a $500 million fund to support the commercial demonstration of technologies that have the potential to deliver long-term large-scale greenhouse gas emission reductions in the Australian energy sector. The fund is expected to leverage at least $1 billion in additional private investment in new low emission energy technologies. LETDF is technology neutral, competitive and covers renewable and fossil fuel technologies. The technologies supported under the program would be

[34] DITR, 2006, Commercialising Emerging Technologies (COMET) Program Sources of Investment

commercially available by 2030 and must have the potential to lower Australia's energy sector greenhouse gas emissions by at least two per cent per annum from 2030 at a realistic uptake rate. Thirty applications were received for Round One, which closed on 31 March 2006. Subsequent rounds are subject to the outcome of round one.

In the energy white paper, the Government published its assessment of Australia's strategic interest in the development of different energy technologies. These Technology Assessments are to inform the strategic background for innovation programs that may support the development of energy technologies. Twenty-two energy technologies have been placed into one of three categories - Market Leader, Fast Follower or Reserve. Baseline data has been collected for the twenty-two energy technologies and departments and agencies have prepared action plans to use the Technology Assessments as a guide for priority setting and decision making on energy innovation grants. DITR is coordinating the collection of data for the Technology Assessments and the reporting by departments and agencies on the implementation of the assessments.

1.3.13 Automobile Competitiveness and Investment Scheme

The Automotive Competitiveness and Investment Scheme (ACIS) is a structural adjustment scheme directed towards encouraging new investment and innovation in the Australian automotive industry in order to achieve sustainable growth, both in the Australian market and internationally, in the context of trade liberalisation. The scheme rewards strategic investment, research and development, and the production of eligible motor vehicles through the issue of import duty credits to registered participants. The first $2 billion stage of the scheme commenced on 1 January 2001 and ended on 31 December 2005. On 13 December 2002, the Government announced a $4.2 billion, 10-year extension to the scheme to run from 1 January 2006 through to the end of 2015. The extension will assist the automotive industry to adjust to a lower tariff regime with tariffs on automotive imports falling from 10 percent to 5 per cent in 2010. In 2004/05 ACIS provided $123.7m toward R&D related activities within the industry.

From 2006-2010, there is a new $150 million component of ACIS, the ACIS Motor Vehicle Producer R&D Scheme, which is directed at encouraging Australian motor vehicle producers to invest in high-end R&D technologies.

1.3.14 TCF Strategic Investment Program

In November 2003, the Australian Government announced a long-term assistance package of $747 million for Australia's textile, clothing and footwear (TCF) industry. The main component of this package is an extension of the *TCF Strategic Investment Program* through to 2015. The *Textile, Clothing and Footwear Post-2005 Strategic Investment Program Scheme 2005 (TCF Post-2005 (SIP) Scheme)* provides funding of up to $575 million over ten years. The object of the *TCF Post-2005 (SIP) Scheme* is to foster the development of a sustainable and internationally competitive TCF manufacturing industry and TCF design industry in Australia.

The *TCF Post-2005 (SIP) Scheme* is open to TCF manufacturers and designers for manufacturing activities in Australia for the initial five years to 2010. Entities undertaking eligible clothing and finished textile activities will be able to benefit under the Scheme for an additional five years to 2015. SIP provides

incentives through two types of grants, paid annually and in arrears, for investment (Type 1) and for innovation (Type 2) activities. Type 2 grants support eligible expenditure that is directly attributable to research and development activities and product development activities (including innovative product design and innovative process improvements).

Chapter 2 Industry Innovation in Australia

Industry innovation involves the transformation of knowledge, through economic activity, into commercial outcomes [35] In advanced industrial countries, innovation and exploitation of scientific discoveries and new technology have been the principle source of long-run economic growth and increasing social well-being.[36]

Innovation activities include all scientific, technological, organisational, financial and commercial steps which actually lead, or are intended to lead, to the implementation of innovations. Some of these activities may be innovative in their own right, while others are not novel but are necessary to innovation.[37] An important development has been recognition of the wider scope of innovation activities as demonstrated by the expansion of the OECD Oslo Manual Guidelines for collecting and interpreting innovation data. The 3rd edition (2005) expanded coverage to include: greater emphasis on linkages with other firms and institutions in the innovation processes; recognises the importance of innovation in less R&D - intensive industries such as services and low technology manufacturing; and the inclusion of organisational and marketing innovation.[38]

This Chapter provides an overview of the characteristics of industry innovation in Australia, primarily based on the 2005 report of a survey of Australian business innovation over the period 2001-2003 and collaborative research between the Australian Bureau of Statistics and the Department of Industry, Tourism and Resources based on detailed analysis of the survey.[39]

The ABS survey of business innovation provides an essential source of data on which to frame policy. The availability of a time series of data as the survey is repeated will greatly improve our ability to track innovation trends and the impact of government policies. Joint ABS/DITR work analysing the innovation survey data has already cast new light on key drivers of business innovation in Australia. The continuation of similar analyses on subsequent data sets will provide enhanced information and understanding to underpin better informed policy initiatives.

2.1 R&D and non-R&D innovation activities

Thirty five per cent of Australian businesses undertook innovation in the three years to December 2003.[40] This number equates to some 47,000 businesses in Australia.

Australian businesses expend about $20.3 billion each year on innovation activities. The Australian Bureau of Statistics survey classified innovations according to whether they are based around product, process or organisation (see Box 2.1). It also asks businesses to advise the degree of novelty of an innovation, ie whether it is 'new to the firm', 'new to the industry', 'new to the country' or 'new to the world'.

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[35] Livingstone C (2000) Managing the Innovative Global Enterprise, the Warren Centre Innovation Lecture.
[36] OECD, 2005, Innovation Policy and Performance – a cross country comparison p7
[37] OECD/EUrostate, 2005, Oslo Manuel.3rd edition Guidelines for collecting and interpreting innovation data. p18.
[38] OECD/EUrostate, 2005, Oslo Manuel.3rd edition Guidelines for collecting and interpreting innovation data. p11.
[39] ABS, 2005, Innovation in Australian Businesses, and ABS/DITR, 2006, Patterns of Innovation in Australian Businesses.
[40] ABS, 2005, Innovation in Australian Businesses

Box 2.1.

Product innovation – means any good or service or combination of these which is new to a business. It characteristics or intended uses must differ significantly from those previously produced.

Process innovation – is a significant change for a business in its methods of producing or delivering goods or services.

Organisational innovation – is a significant change to the strategies, structures or routines of the business which aim to improve performance.

Innovation comprises a number of activities that are not included in R&D, such as later phases of development for preproduction, production and distribution, development activities with a lesser degree of novelty, support activities such as training and market preparation, and development and implementation activities for innovations such as marketing methods or new organisational methods which are not product or process innovations. Innovation activities also include acquisition of external knowledge or capital goods that is not part of R&D.[41]

Innovation expenditure is not primarily R&D expenditure. Almost one third of Australian industry innovation expenditure is on R&D activities and two thirds is expended on non-R&D innovation activities (see Figure 2.1). Firms carrying out R&D activities also undertake half of all non-R&D innovation activities.

R&D is traditionally supported by governments based on the recognition that the knowledge generated through this activity can be utilised by others at little cost. If firms cannot appropriate all the benefits of their investment in R&D they may then optimise their R&D below a socially desirable level.

The non-R&D innovation activities that constitute two thirds of innovating business expenditure (Figure 2.1) include:

- acquisition of machinery and equipment
- demonstration of commercial viability, tooling up and trial production runs;
- acquisition of intangible technology such as market research; and
- design work and acquisition of patents, licenses and other IP.[42]

Such non-R&D innovation activities are critical to getting an innovation such as a new product to commercial reality. However, the policy case for government intervention to support non-R&D innovation activities is less clear with relatively poor data collection and analysis. Non-R&D innovation is likely to generate less spillovers as the innovation is nearer to the market and most of the benefits can be appropriated by the firm undertaking the activity.

A rationale for government support for non-R&D innovation is that many Australian firms, particularly SMEs, have difficulty accessing capital to commercialise. This is due to an immature Australian capital market in relation to early stage and higher risk investments. There is a widely quoted 'rule-of-thumb' that for every dollar spent on

[41] OECD/ EUrostate, 2005, Oslo Manuel.3rd edition Guidelines for collecting and interpreting innovation data. p18

[42] The non-R&D activities refer to those listed in the ABS (2005) Innovation in Australian Business p 65.

research, $10 is needed for development and $100 for commercialisation).[43] There may be loss of market opportunity when firms cannot afford the costs of accessing knowledge and skills to build the commercial case.

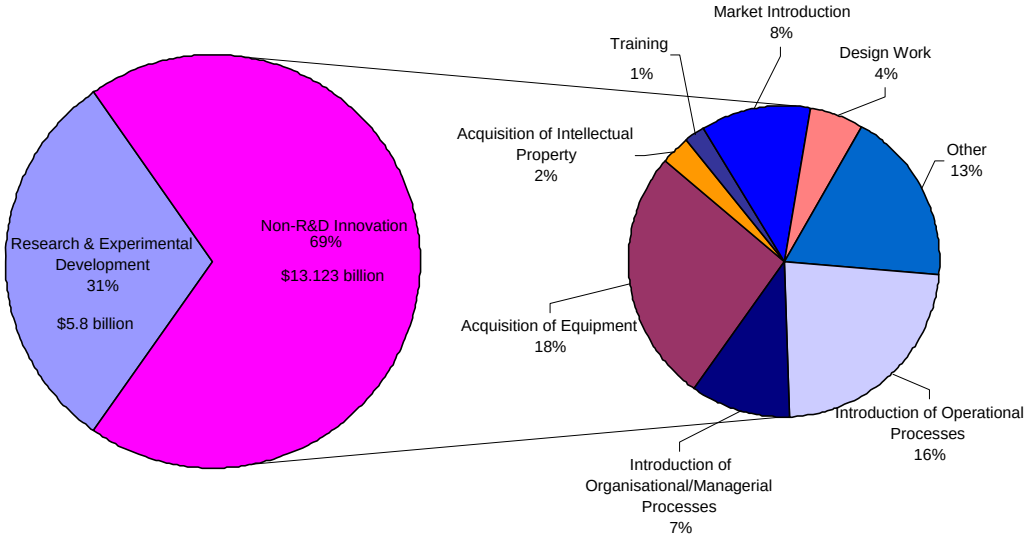


Figure 2.1 R&D and non-R&D innovation expenditure in Australian businesses who are innovating. (source: ABS, 2005, Innovation in Australian Business, p.64,65)

Evidence of the role for government in supporting the commercialisation activities of firms was demonstrated in a recent study of technology based SMEs assisted through the Commercialising Emerging Technologies (COMET) program. It showed that small firms faced significant barriers in accessing finance and the management expertise required to take innovations to market. [44]

2.2 Incremental innovation

Most Australian industry innovation is incremental – ie it does not involve the introduction of radical new products, processes or changes that may create a new industry, but poses improvements to existing products or systems. It generally does not involve a 'new to the world' technology, service, process or organisational change, but more commonly encompasses 'new to the business' or 'new to the industry' innovation.

Such innovation is primarily based on adapting existing products and processes or organisational techniques to the business, to the sector or to Australian conditions.

- 56% of innovative businesses produce *products and services* innovations that are 'new to the business'

[43] Industry Commission (1995), Research and Development
[44] DITR, 206, Study of Selected Firms assisted through the Commercialising Emerging Technologies (COMET) program (draft)

- 75% of innovative businesses produce *process* innovations that are 'new to the business'

A defining element of Australia's innovation performance is the capacity of businesses to develop new products, processes, and services and to diffuse innovations throughout the economy. Diffusion is the way in which innovations spread, through market or non-market channels, from their very first implementation to different consumers, countries, regions, sectors, markets and firms. Without diffusion, an innovation has no impact. The minimum requirement for a change in a firm's products or functions to be considered an innovation is that it is new (or significantly improved) to the firm.[45]

2.3 Radical innovation

Classification of an innovation as 'radical' relates to the impact of an innovation on the firm or industry, rather than its nature. This impact can be large based on innovation that is new to the world, new to Australia or new to the sector. The impact can for example, change the structure of a market, create new markets, or render existing products obsolete.[46] Because it might not be apparent that a new innovation is disruptive until some time after its introduction, data is not collected on radical innovation in innovation surveys.

Typical examples of radical innovation include nylon, the computer chip or organisational techniques such as Just In Time manufacturing. Such innovation can offer a quantum leap in productivity and deliver large commercial returns, but it represents a minority of overall business innovation activity.

In Australia, relatively few innovations are radical, - only 9% of goods and services innovators and 3% of process innovators are radical. By far the majority of innovation in Australia is incremental.

Foreign ownership and company size also have an impact on the types of innovation in firms. Businesses that are more than 10% foreign owned are about 60% more likely to achieve a 'new to the world' innovation' than businesses that are 100% domestically owned.[47] Large businesses are 50 per cent more likely to achieve a 'new to the world' innovation than smaller businesses.

2.4 Innovating firms

Industry innovation is not confined to high technology sectors such as pharmaceuticals and ICT but occurs across the economy. Figure 2.2 shows that industries that may be perceived as less likely to innovate such as utilities (ie Electricity, gas and water), have very similar proportions of innovating businesses to those in Communication services, which are frequently regarded as the cutting edge of modern innovation.[48]

[45] OECD/EUrostate, 2005, Oslo Manuel.3rd edition Guidelines for collecting and interpreting innovation data. p17.
[46] OECD/EUrostate, 2005, Oslo Manuel.3rd edition Guidelines for collecting and interpreting innovation data. p34.
[47] ABS, 2006, Patterns of Innovation in Australian Businesses 2003 p31.
[48] ABS/DITR, 2006, Patterns of Innovation in Australian Businesses 2003.p.11

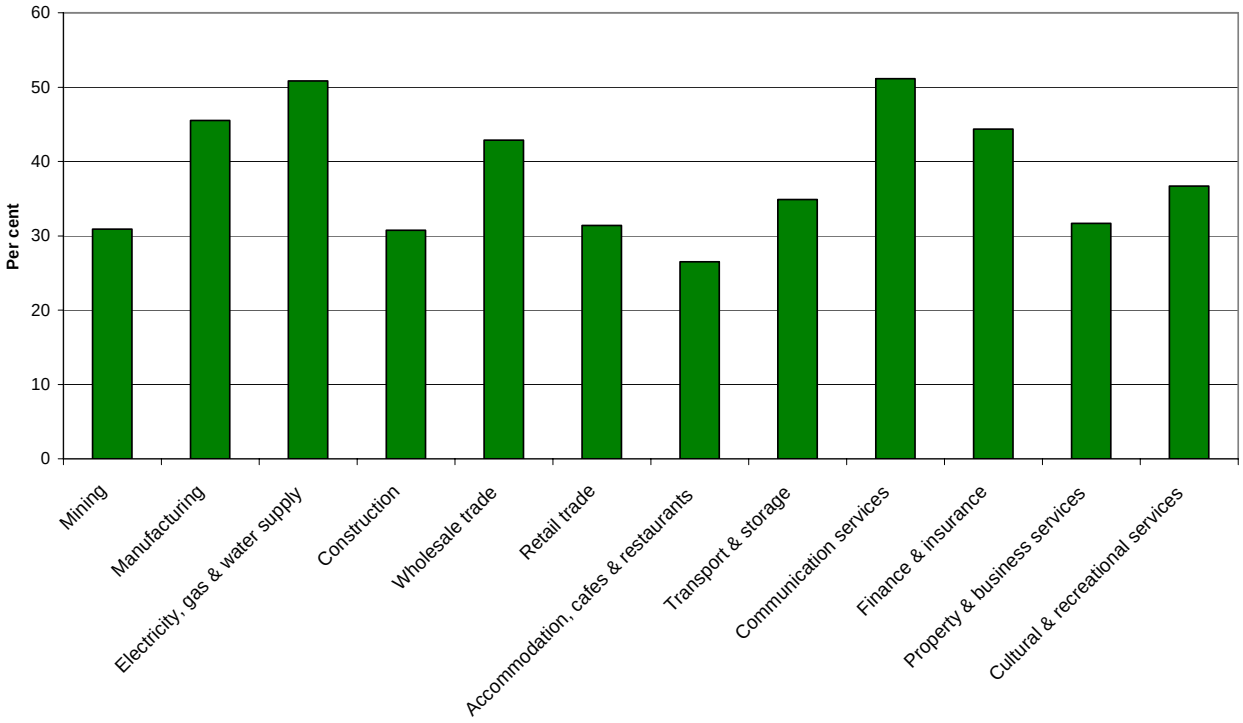


Figure 2.2. Proportion of businesses innovating by industry, 2001-03. (source: ABS/DITR, 2006, Patterns of Innovation in Australian Businesses 2003, p11)

While innovation is spread across different industry sectors, it is highly concentrated in relatively few companies

- approximately 7% of the Australian businesses who undertook innovation in the period 2001-03 were responsible for over 70% of expenditure on innovation
- only 1.7% of all businesses generate more than half of their turnover from new products.

2.5 Innovation and the size of firms

The percentage of businesses that innovate increases as firm size increases (See Figure 2.3).

- 28% of small businesses (5-19 employees) innovating and 60% of large businesses (250 plus employees) being innovators.
- 17% of businesses with 5-9 employees undertake operational process innovation compared to 47% of businesses with over 250 employees
- 12% of businesses with 5-9 employees undertake goods or services innovation compared to 41% of businesses with over 250 employees.
- 15% of businesses with 5-9 employees undertake organisational process innovation compared to 41% of businesses with over 250 employees.

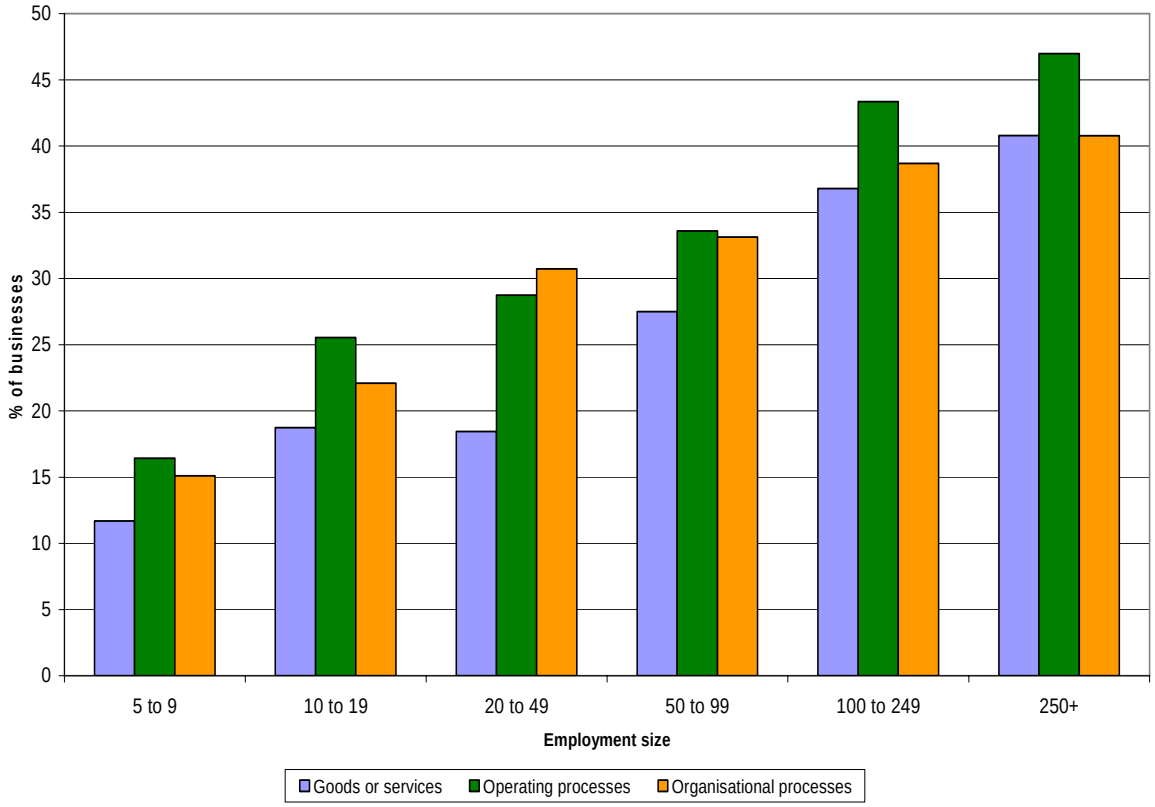


Figure 2.3. Proportion of businesses innovating by type of innovation and firm size. (source: ABS/DITR, 2006, Patterns of Innovation in Australian Businesses 2003, p27)

It appears that the size of the business also has an impact on the type of innovation carried out. Econometric evidence suggests that larger businesses are 50% more likely to achieve 'new to the world' innovation than small businesses, and medium sized businesses 20% more likely than small business.[49]

2.6 Intellectual Property Protection

Only one in five innovating businesses in Australia employ formal methods of intellectual property protection

- 17% of businesses using copyright and trademarks
- 4% of businesses using patents.

Services businesses use copyright and registration of design rather than patenting. While informal methods of protection such as secrecy are more commonly used by businesses, 68% of firms do not use any form of intellectual property protection. High technology industries use formal IP protection, such as patents and trademarks.

Intellectual property is critical in some sectors such as pharmaceuticals and biotechnology with long lead times to market, but for other large sectors (retail and tourism) it is less important. Firms in industries with short product cycles tend to use trade secrets or rely on speed to market to protect their inventions. This is supported

[49] DITR 2006 Collaboration and other factors influencing innovation novelty in Australian businesses

by the findings of a study on the use of the IP system by SMEs which was conducted by the Intellectual Property Research Institute of Australia (see figure 2.4).[50]

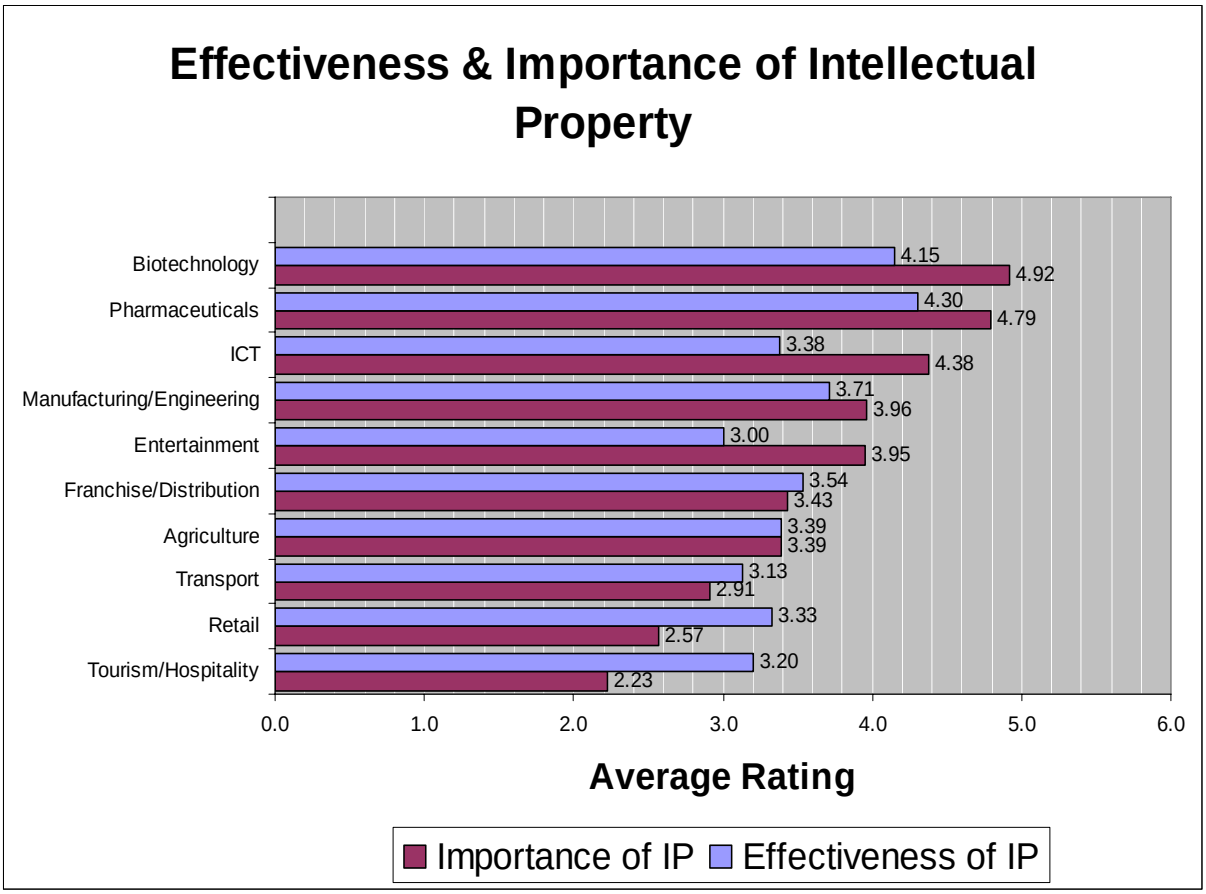


Figure 2.4 – Importance and effectiveness of IP protection by industry type.

Table 2.1 shows that Trade Marks continue to be the most common form of IP protection undertaken by Australians, with two of the top three most popular areas for trade mark activity relating to services. The number of Australian patents granted to Australian developers increased by 14 percent in 2004. Australia was one of the few developed countries to increase the number of patents granted in both the United States and the EU in 2004, and ranked 12th in the United States and 5th (of non-EU countries) in the EU for patents granted to foreign-based applicants.

Innovation patents were introduced in May 2001 as a relatively fast, inexpensive option to protect inventions that are considered innovative, but not sufficiently inventive to meet standard patent requirement. Innovation patent applications have increased by 6.6% from 2002, (the first full year that innovation patents were available) to 2004. In 2004, around 60% of innovation patents were granted to individuals (rather than companies), compared with around 10% of standard patents.

[50] IPRIA, 2005, Factors affecting the use of intellectual property (IP) protection by small and medium enterprises (SMEs) in Australia

Table 2.1: Intellectual Property Protection Applications and Grants in Australia, All Sources

	2000	2001	2002	2003	2004
Patent App.	**22003**	**22733**	**22565**	**21621**	**22906**
Patent Grant	**13548**	**13703**	**13702**	**13012**	**12739**
Innovation Patent App.	**N/A***	**667***	**1032**	**1038**	**1100**
Innovation Patent Grant	**N/A***	**515***	**766**	**1028**	**1086**
Trade Marks App.	**71804**	**63026**	**64590**	**74200**	**87062**
Trade Marks Grant	**29443**	**51250**	**51718**	**49931**	**53518**
Designs App.	**4255**	**4119**	**4111**	**4619**	**5601**
Designs Grant	**3108**	**3761**	**3842**	**3949**	**3323**
PBR App.	**350**	**381**	**377**	**378**	**337**
PBR Grant	**252**	**242**	**286**	**181**	**234**

* Innovation patents introduced in May 2001

Figure 2.5 shows the number of Triadic Patent Families associated with Australians. A Triadic Patent Family is a set of patents filed with the European Patent Office and the Japanese Patent Office, and granted by the United States Patent and Trademark Office, to protect the same invention. They cover inventions that are often regarded as having high economic value and so worth wide international coverage. Australia continues to rank 14th in the OECD in terms of the total number of Triadic Patent Families. Australian-owned Triadic Patent Families rose 19% from 2000-03, compared with the US (+10%) and EU (-0.1%).

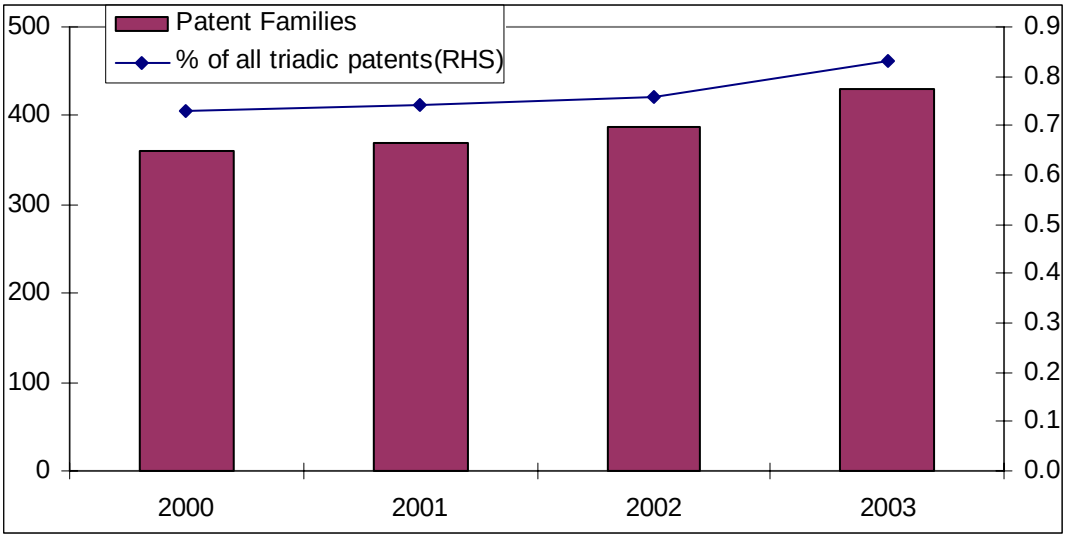


Figure 2.5 Triadic Patent Families associated with Australians. (Source: DITR IP Scorecard, 2006)

2.7 Process and organisational innovation

More Australian innovating businesses implemented new or significantly improved operational processes (22.9%) and new or improved organisational/managerial processes (21%), compared to those who introduced new or significantly improved goods or services (16.6%) in the period 2001-2003.

R&D is not only undertaken by innovating businesses introducing new goods and services. Australian businesses undertaking organisational process innovation also engage in R&D – a third of Australian businesses reporting organisational R&D expenditure also reported R&D expenditure.[51]

Given that over two in five Australian businesses are introducing process and organisational innovation (Box 2.1), models of innovation which focus exclusively on the transformation of science-based knowledge into new products do not accurately represent the nature of much Australian industry innovation[52]..

The importance of innovation related to process and organisational activities has been demonstrated in a 2006 global survey of Chief Executives which showed that:

- 30% concentrate on operational innovation to promote efficiency, revenue and market share
- 30% concentrate on business model innovation and within that 66% focus on organisational structure changes; and
- 53% concentrate on building strategic partnerships.[53]

Box 2.1

Woolworths – supply chain redesign
Under the banner of *Project Refresh*, Woolworths has reorganised its business processes freight and logistics operations. The company has introduced new technology to streamline inventory management throughout the supply chain, and, on the back of these changes, has rationalised its network of distribution centres from 31 to 11. It is expected that changes introduced under *Project Refresh* will result in savings of $1.3 billion in the 2005-06.

Bega Cheese Company
Bega Cheese Company focused on the continuous improvement of its production processes in order to develop a globally competitive cost structure. To meet this objective it has made significant investments in IT systems and the automation of its processing facilities including handling of pallets.

[51] ABS/DITR, 2006, Patterns of Innovation in Australian Businesses. P36
[52] *Patterns of Innovation in Australian Business 2003*, ABS/DITR, 2006.
[53] IBM, 2006, Expanding the Innovation Horizon – the Global CEO Study

2.8 Sources of innovation

Businesses draw on a many knowledge sources to innovate as shown in Figure 2.6.

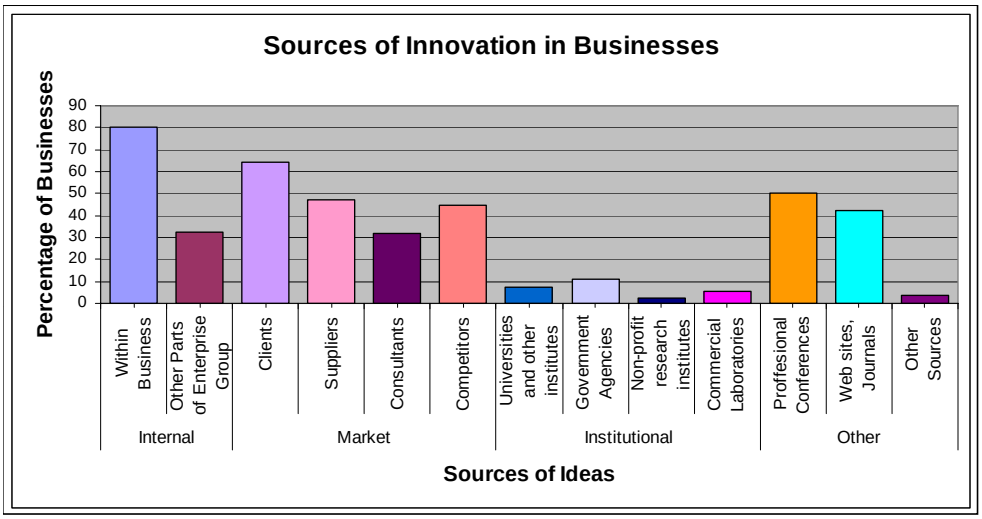


Figure 2.6 Sources of business innovation

Most ideas in innovating businesses arise from within the business, customers and professional conferences. Research on knowledge intensive services has shown customers to be significant sources of innovation ideas for the services industries.[54]

Figure 2.6 shows that for innovating businesses the sourcing of ideas from other institutions – public research organisations, government agencies and commercial laboratories – is low.[55]

While only 6.5% of innovating Australian businesses collaborate with universities, government and research institutions,[56] the amount of Australian business investment in university research and experimental development has increased from 3.45% ($63.940m) in 1994 to 5.08% ($174.093m) in 2002. [57]

The sources of innovation identified in Figure 2. 6 are not significantly different from those identified by international innovation surveys. In most economies, universities and public research organisations are low down on the sources of technological knowledge used by firms.[58] This is further illustrated by the global CEO survey which found that business partners and customers were cited as top sources of innovative ideas, while research and development fell much lower on the list.[59]

2.9 Innovation and collaboration

In a recent Global CEO Study by IBM, Chief Executive Officers stressed the overwhelming importance of collaborative innovation – particularly beyond company walls.[60]

[54] 2006, OECD, Knowledge intensive service activities
[55] A study of commercialisation by IRDB (2003) found similar low sourcing from public sector.
[56] ABS, 2005, Innovation in Australian Business p38.
[57] DEST, Research Expenditure: Selected Higher Education Statistics, 1994 & 2002)
[58] OECD, 2005, Innovation Policy and Performance – a cross country comparison p 17.
[59] IBM, 2006, Expanding the Innovation Horizon – the Global CEO Study
[60] IBM, 2006, Expanding the Innovation Horizon – the Global CEO Study

Increasingly, effective innovation is being associated with firms who collaborate. Many innovations, especially those of a more complex nature, commonly take place in conjunction with collaboration. The range of skills and knowledge required to successfully carry out innovation often means that an innovating business may be forced to seek complementary skills to those already held in-house. Such a business may seek external skills and experience in one or more of various areas including R&D, systems modification, specialist manufacturing, or branding and marketing.

There is a high correlation between innovation and collaboration in Australian manufacturing firms.[61] For example:

- 88% of innovating firms in the metal products industry
- 89% of innovative firms in the petroleum and chemicals industry

Collaboration also has an impact on the types of innovation carried out by firms. Evidence shows that businesses that take part in collaboration, such as joint marketing or manufacturing, have a 17% chance of achieving 'new to the world' or radical innovation This is 70% higher than for non-collaborating businesses, that have just a 10% chance of radical innovation.

It could also be expected that collaboration might be more common and more important to 'frontier' or 'radical innovation' (ie products or processes that are 'new to the world') than 'adaptive' or 'incremental' innovation (lesser modifications to goods and services or processes already existing elsewhere in global markets).

The invention, production and marketing of products and/or processes that are 'new to the world' is likely to require cooperative associations among a number of players, particularly for more modestly sized businesses which are unlikely to have the diversity of skill sets necessary for such innovation and which are also unlikely to have sufficient global presence to properly manage the branding and marketing of 'new to the world' products and/or processes.

Australian businesses is dominated by the number of small businesses [62]and has comparatively few large companies compared with other economies such as the US and the major European economies. This characteristic together with the additional burden on product dissemination imposed by the geographical isolation of Australia suggests that collaboration might be especially important for Australian businesses' innovations that are 'new to the world'.

2.10 Innovation and skills

The ABS innovation survey contained some questions relating to the type of skills generally sought by businesses to support their innovation activities, and also whether or not innovating businesses experienced a skill shortage which hampered innovation (SSHI). Initial results from an analysis of these matters indicate that:

- A significantly higher proportion of small and medium sized businesses experienced SSHI than large businesses. This is likely to reflect a number of

[61] Basri E., 'Technological Collaboration and Innovation in Australian Firms: Implications for Innovation and Public Policy' in OECD Innovative Networks: Cooperation in National Innovation Systems, OECD, Paris, 2001.

[62] 98.2% of Australian businesses are small (<20 employees), similar to Italy (98.1%), Sweden (96.7%), France (95.5%) and the UK (94.3%). Source: OECD Structural Business Statistics http://stats.oecd.org/wbos/default.aspx)

characteristics of smaller firms including the impact of generally small margins and intense competition on the ability of small firms to offer wages and conditions competitive with those offered by larger businesses. With the recent strengthening demand for skilled labour, and the associated perceived shortages, this phenomenon may be expected to have intensified more recently. The results of the 2005 innovation survey, to be released later in 2006 will confirm whether this is indeed the case.

- Manufacturing; Transport and Storage; Accommodation, Cafes and Restaurants; and Construction exhibited higher proportions of businesses experiencing SSHI than on average across all industries surveyed.
- Wholly domestically owned businesses exhibited a higher likelihood of experiencing SSHI than business that were part or fully foreign owned
- There is a higher proportion of businesses experiencing SSHI among those that carry out goods or services innovations and process innovations than among those that carry out only goods or services innovations or only process innovations
- Businesses that generally seek out skills in the 'trades' and in engineering were more likely to experience SSHI than those that generally seek skills in other areas

2.11 Measuring the performance of Australian industry innovation

Not withstanding the ABS survey of innovation in businesses, there are limitations on industry innovation data which make it difficult to draw conclusions about Australia's comparative innovation performance.

Performance measures such as R&D and patents are frequently used because they are easy to quantify and readily available across a number of countries. However, both are inputs to the innovation process, not innovation outputs or outcomes. Rates of patenting vary according to the type of business and industry sector. Further, R&D and patent focus on technological forms of innovation and do not give a complete picture of other innovation activity in industry – eg innovation in services which may have marginal technological input.

Measurement of the performance of innovation systems has been a focus of OECD studies and a variety of methodologies are used. Box 2.2 provides an example of the range of indicators

The OECD does not consider that any of the measures are additive or can be averaged to compare one country's performance with that of another.

Innovation performance measures must be carefully considered because of the different national context in which innovation systems operate. It is likely that each country has an innovation system characterised by its industrial structure and its history. So innovation policies are introduced and adapted to the specific needs of each country with limited capacity to simply copy what works in one country to another.

Box 2.2. OECD innovation indicators

i. **Macro-economic performance** – GDP per capita, annual growth of GDP, annual MFP growth

ii. **R&D activities** – R&D intensity, BERD intensity, public R&D intensity.

iii. **Human Resources in S&T** – population of professionals and technicians, population of business researchers, graduation at PhD level in science and engineering

iv. **Scientific output** - scientific publications, share of S & E articles in life sciences, share of S & E articles in physical sciences

v. **Innovative output** – density of innovation firms, concentration of triadic patent families

vi. **Scientific-industry linkages** – business funding of public R&D, business funding of higher education R&D, firm cooperation with universities, firm cooperation with government

vii. **International linkages** – breadth of international co authorship, share of patents with foreign co-inventors, contribution of foreign affiliates to R&D

viii. **Technological entrepreneurship** – intensity of venture capital investments, state of technology intensive exports

In an analysis of innovation policies in 10 countries (Canada, United Kingdom, Finland, Korea, Sweden, the Netherlands, Ireland, Israel, Taiwan an and New Zealand),[63] DITR found that there were a number of common issues irrespective of country size, productivity or industrial structure including:

- the need to increase the transfer of public sector research to industry;
- difficulties in attracting and retaining investment from multinational enterprises within their borders;
- a lack of early stage capital; and
- impediments to the development of an entrepreneurial culture.

A report on Australian innovation performance, the Innovation Scorecard, is published by DITR every second year (Figure 2.7). It shows that Australian industry innovation has a mixed performance.

- share of foreign affiliates in Australian manufacturing R&D is well above the OECD average, signifying that Australia is an attractive location for manufacturing R&D.
- level of investment in new equipment is also higher than the OECD average, an important indicator for the diffusion of existing technology throughout the economy.

[63] DITR Presentation to PMSEIC Standing Committee, April 2006.

- number of US patents per capita is lower than the OECD average.

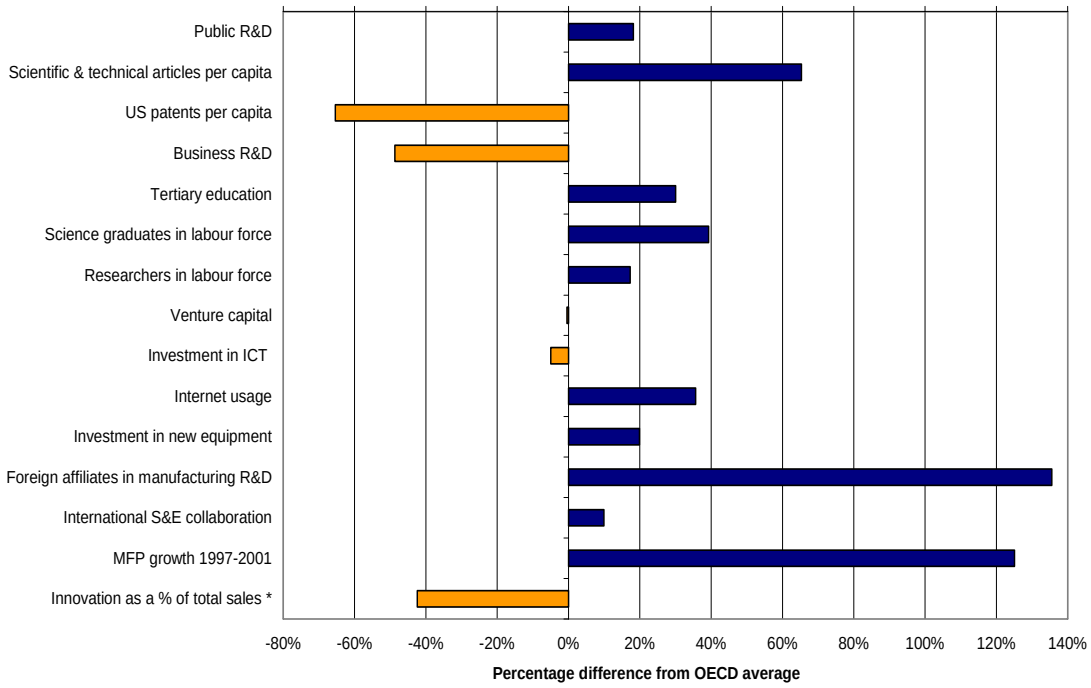


Figure 2.7. Innovation indicators for Australia.

2.11.1 Business Expenditure on R&D

Australian Business Expenditure on R&D [64] in 2004-05 increased for the sixth consecutive year to $8446.2 million (current prices), an increase of 10.4% on 2003-04, compared to a 10.2% increase the year before.

- In chain volume measures (adjusted for inflation), BERD increased by 7.1% in 2004-05 from $7885.2 million in 2003-04.
- BERD as a percentage of GDP increased to 0.95% reflecting Australia's continued strong growth in BERD while also experiencing strong growth in the economy. As a result, Australia has improved its BERD/GDP ranking in the OECD from 15th to 14th but remained below the OECD average of 1.53%
- The human resources devoted to BERD increased by 6.6% in 2004-05, this increase illustrates the influence BERD has on the up-skilling of the Australian labour force.
- 13.5% to total business R&D. Large businesses (>200 staff) increased their R&D expenditure by 15% and accounted for 65.5% of total business R&D.

The industries that experienced the largest increases in BERD included Mining 23%, Finance and Insurance 22% and Wholesale and Retail 25%. Reductions were recorded in Electricity -12%, non-metallic mineral product manufacturing -28% and textile clothing and footwear -14%. Figure 2.8 shows BERD by Major industry group.

[64] The Australian Bureau of Statistics (ABS) *Research and Experimental Development Businesses 2004-05 (BERD)* publication.

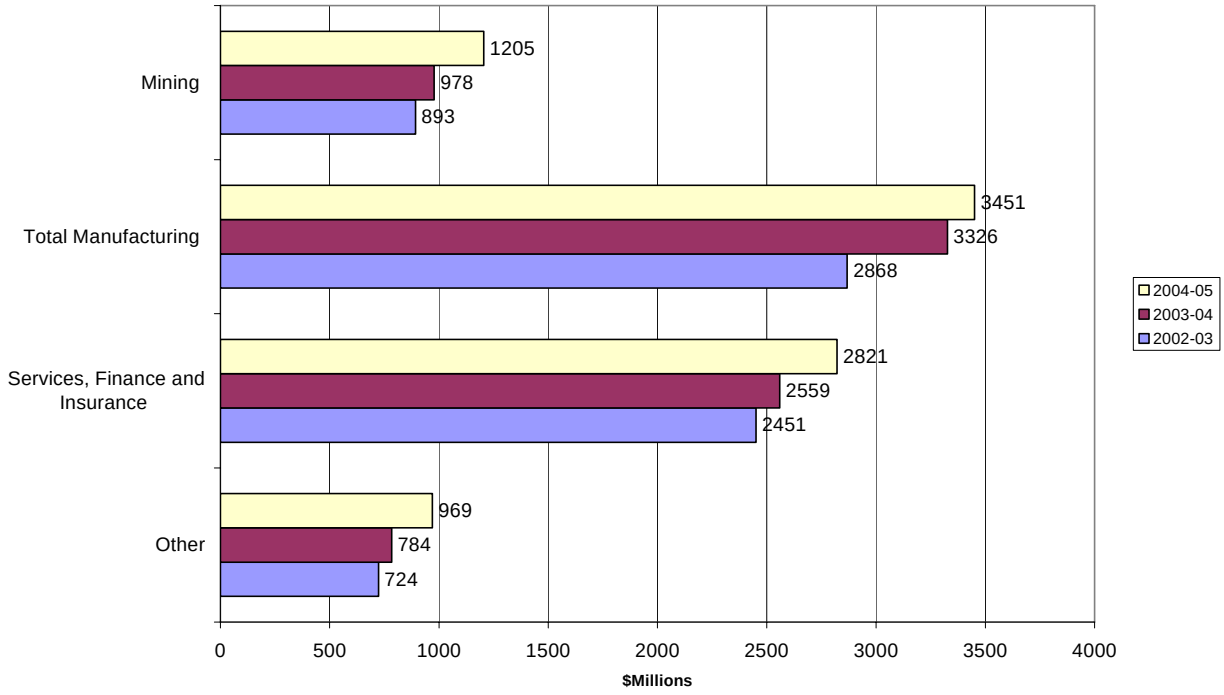


Figure 2.8 Trends in BERD by major industry Group

The movement in Australia's Business Expenditure on R&D is shown in Figure 2.9. The reasons for Australia having a relatively low BERD/GDP ratio include:

- globally, BERD is concentrated in a few high R&D intensity manufacturing industries in which Australia does not have a competitive advantage (eg. aerospace, defence, pharmaceuticals) ;
- BERD is dominated by the top 1000 global corporate R&D spenders and Australia is home to only two of these companies (CSL and Aristocrat Leisure); and
- the large number of small firms in our industrial structure lack the capacity to absorb the high risks associated with R&D. .

In OECD countries, the share of R&D performed by small and medium sized enterprises (firms with less than 250 employees) is generally greater in small economies than in larger ones. Comparing business R&D expenditure across countries shows that firms with fewer than 50 employees account for a significant share of business R&D (over 20%) in Norway, New Zealand, Ireland, Denmark and Australia. In comparison, these sized firms in USA, UK, France, Finland and Germany account for less than 10 per cent of R&D expenditure.[65]

Australian Business Expenditure on R&D data shows that larger businesses (with more than 200 employees) increased BERD performance by 15% from $4799 million in 2003-04 to $5536 million in 2004-05 (see figure 2.10). This increase demonstrates the increasing dominance of larger businesses on Australia's performance of BERD.

[65] OECD, 2005, Science, Technology and Industry Scoreboard

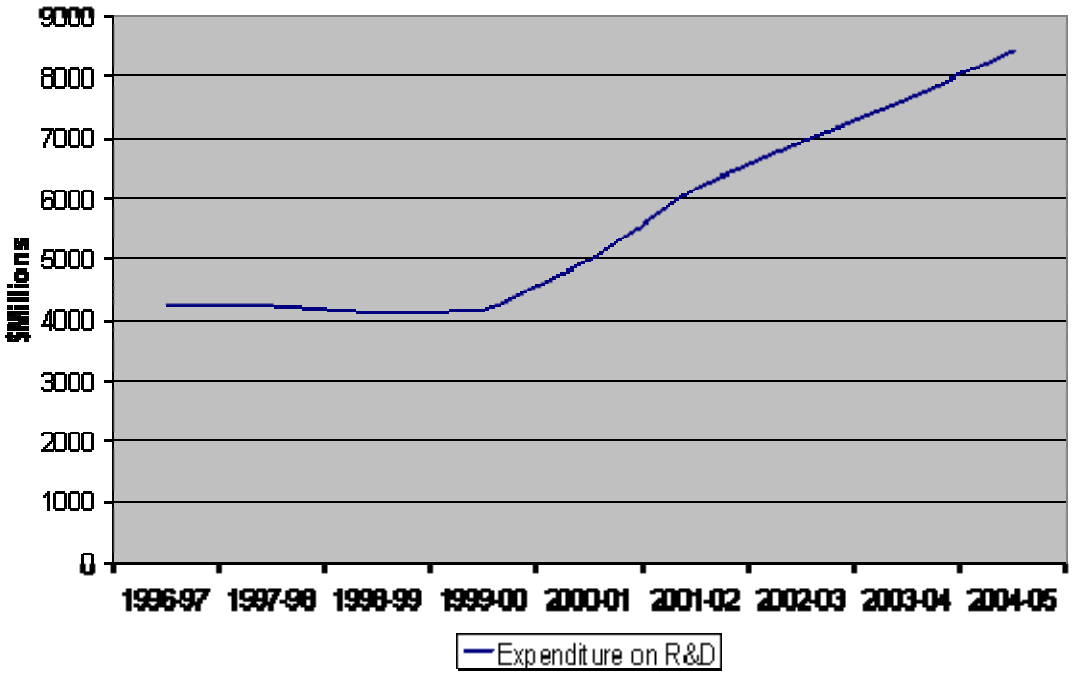


Figure 2.9. Change in Australian Business Expenditure on R&D – chain volume measure.

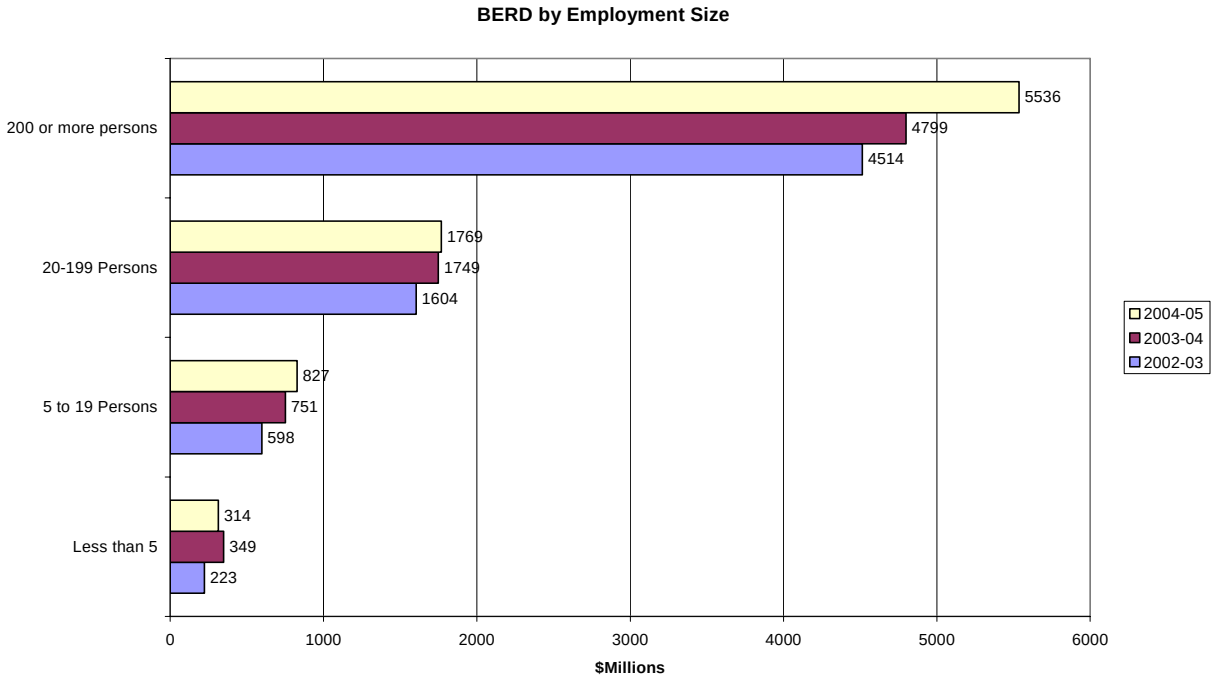


Figure 2.10: BERD by Employment Size

2.11.2 Other Measures of Business Innovation

However, innovation performance involves more than measurement of R&D activity. Research and development is an important aspect of innovation, but it alone will not result in high innovation performance. Increasingly, the importance of non-R&D innovation activities is being highlighted by the business sector.

The 2005 Booz Allen report[66] stated *'there is no discernable statistical relationship between R&D spending levels and nearly all measures of business success, including sales growth, gross profit, operating profit, enterprise profit, market capitalization, or total shareholder return.'* It advises that there is no easy way to achieve sustained innovation success-you cannot spend your way to prosperity. Successful innovation demands careful coordination and orchestration both internally and externally. How you spend is far more important than how much you spend.

Barlow argues that Australian businesses need to buy in more overseas technology and do everything they can to import talent, companies, customers and markets internationally in order to maximise their talents as technology scavengers.[67]

The OECD warns that while industrialising countries may achieve rapid growth rates by exploiting innovations developed abroad, this is not sufficient to sustain and increase the high standards of economic well-being currently enjoyed by many OECD countries.[68] The competitiveness of Australian businesses depends on both doing R&D, (which, as well as contributing to commercial outcomes assists firms to build their absorptive capacity) and adopting and adapting technology and knowledge from other sources.

Further, for a comprehensive understanding of the impact of innovation, more work is required outside the traditional measures of science, technology and R&D performance. Innovation in services and the impact of globalisation on innovation performance are important policy challenges. In the case of innovation in services the stock of academic work and official data is limited but growing. Knowledge intensive business services such as computer services, design engineering, and R&D services underpin and are increasingly involved in innovation by industrial firms, and they play an important role in the diffusion of technology.[69]

[66] Booz Allen Global Innovation 1,000, 2005
[67] Barlow, The Australian Miracle: An Innovation Nation Revisited, 2006
[68] OECD, 2005, Innovation Policy and Performance a cross country comparison p8.
[69] OECD, 2005, Innovation Policy and Performance – a cross country comparison.

Chapter 3. The Policy Framework for Australian Innovation and Priority Issues

3.1 Policy making and framework conditions

There has been significant evolution of innovation policy development in Australia over recent years. In the period 1989 to 1996, science and technology policy was managed in the Department of Prime Minister and Cabinet with policy advice being provided by the Australian Science and Technology Council (ASTEC). The Office of Chief Scientist and the Prime Minister's Science Council were established in 1989 to provide a forum for Ministers and the Prime Minister to be apprised of science and technology developments.

In 1997, the ASTEC was abolished and policy responsibility moved to the Department of Industry, Science and Technology. In 2000, the country's first National Innovation Summit was held followed in 2001 by a major $3 billion science and innovation package – *Backing Australia's Ability*. It was a milestone for science and innovation policy development in Australia in being a cross portfolio science and innovation statement resting on three themes - R&D, commercialisation and skills. A full report on the governance of Australian innovation policy including the decision making framework in the past 4 years is in Chapter 11 of the OECD report *Governance of Innovation Systems – Volume 2: Case Studies in Innovation Policy*.[70]

Following the National Innovation Summit in 2000, the Post Summit Implementation Committee was established by Government to prioritise the Summit recommendations. This ultimately led to the 2001 *Backing Australia's Ability* Innovation Statement where the Government committed $3 billion to science and innovation over 5 years. In 2004, a second Government *Backing Australia's Ability* Innovation Statement committed another $5.3 billion to 2010-11 to science and innovation. Figure 3.1 illustrates the cycle of policy development, evaluation and research, associated with the two major innovation statements, *Backing Australia's Ability* announced in 2001 and 2004.

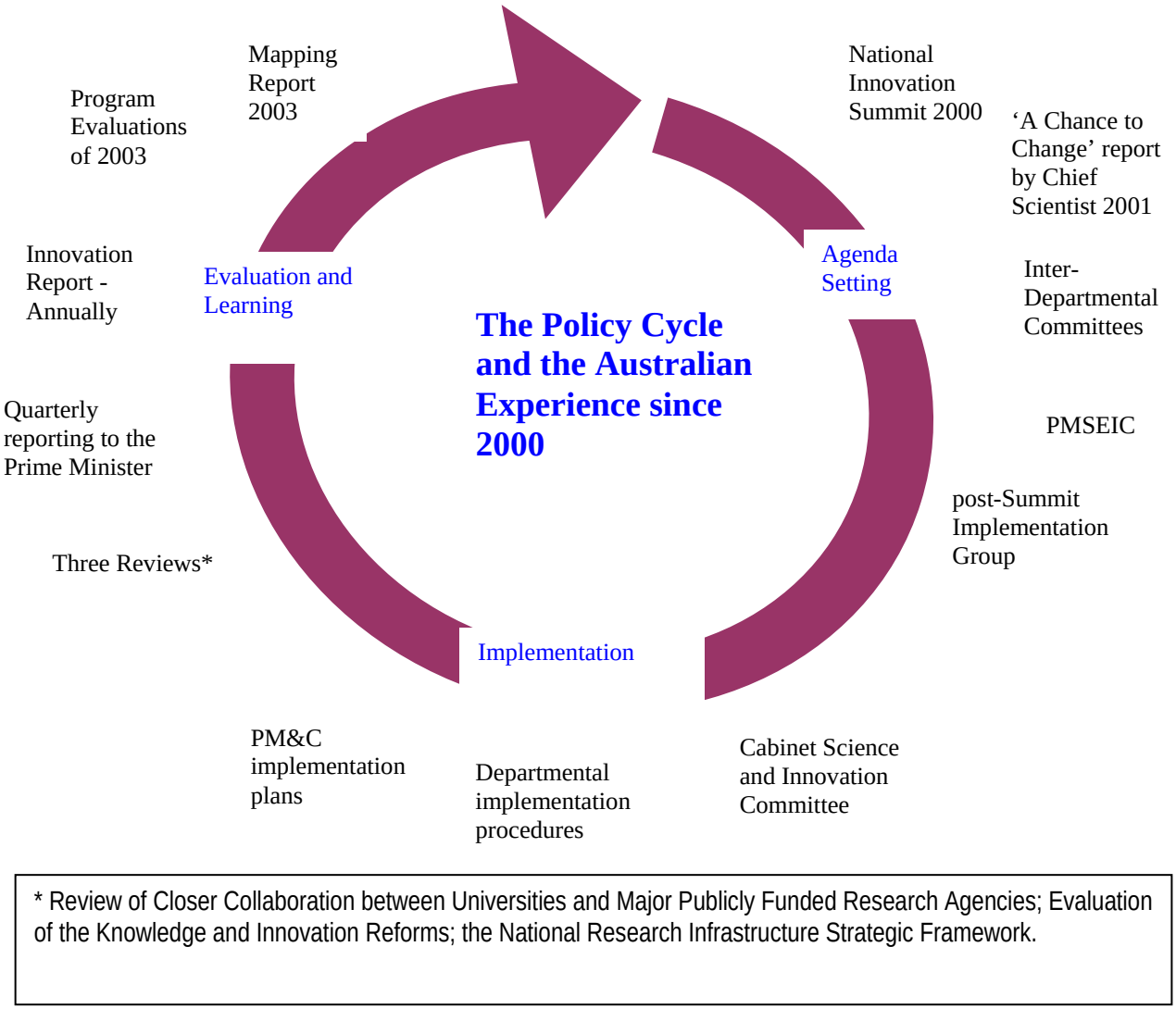
Under the current innovation policy making process:

- There is coordination across agencies/portfolios to evaluate, implement and report on outcomes;
- An annual science and innovation budget report identifies expenditure;
- There is an annual report on Australian Innovation which advises programs and policy developments;
- There is no specific body with responsibility to identify overall innovation priorities or to determine the ongoing balance of innovation expenditure;
- The Prime Minister's Science, Engineering and Innovation Council meets twice a year to share information about science and innovation and consider relevant issues and challenges;
- There are three major funding Councils – the Australian Research Council, the NHMRC and the Industry Research and Development Board – who are

[70] *Governing Innovation Policy: The Australian Experience*, Timpson and Rudder, 2005.

responsible for assessing applications from the university, medical and industry communities for innovation support;

- There is coordination of innovation policy developments with States, Territories, the Australian and New Zealand governments through the Commonwealth, State, Territory Advisory Council on Innovation;
- A Chief Scientist advises the Australian Government on science and innovation policy.



* Review of Closer Collaboration between Universities and Major Publicly Funded Research Agencies; Evaluation of the Knowledge and Innovation Reforms; the National Research Infrastructure Strategic Framework.

Figure 3.1: Australian Innovation Policy Development and the MONIT Cycle. Source:OECD, 2005, MONIT report.

Figure 3.2 provides a diagram of the Australian innovation system identifying the main actors and how they link with each other Support for business R&D, venture capital and commercialisation is provided through that part of the innovation system dealing with 'Building Innovation Capacity of Firms'. DITR is building innovation capacity through generic industry innovation programs and via sectoral programs and industry Action Agendas.

It is the interface between the various elements of the system that is critical to effective translation of ideas into commercial reality. The linkages between the Australian market and the international market, between large and small firms and between the research and industry communities are pivotal.

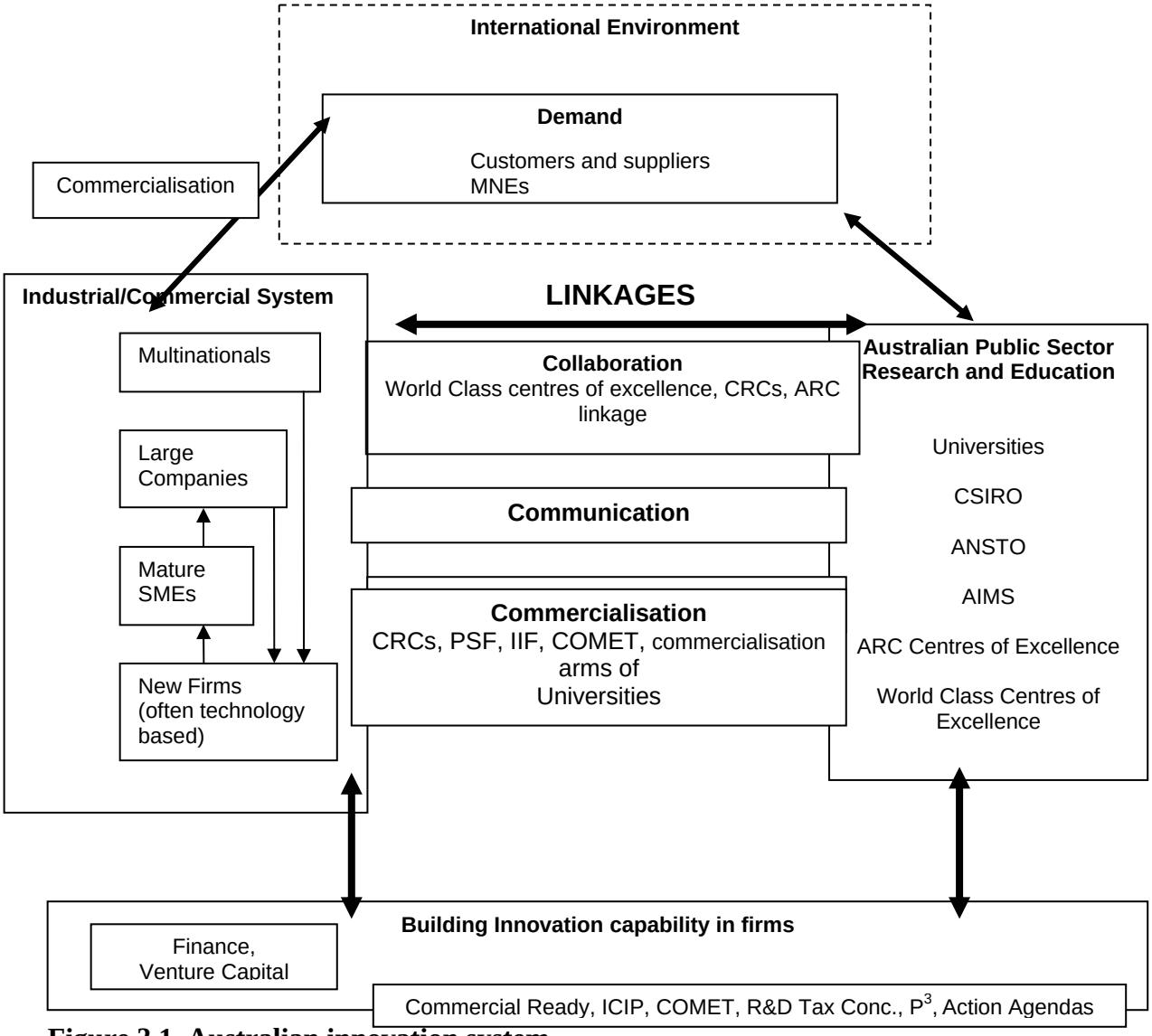


Figure 3.1. Australian innovation system

Significant support has been dedicated to improving the science-industry interface (eg: Cooperative Research Centres, ARC Centres of Excellence, World Class Centres of Excellence, Rural Research and Development Corporations and ARC Linkage Grants). Small and medium sized enterprises often have greater difficulty establishing effective partnerships and alliances, and especially in bridging the research-industry gap. The TechFast intermediary scheme, the Pre-Seed Fund and the commercialisation arms of universities are all aimed at addressing this gap.

A number of programs also seek to facilitate effective firm to firm linkages. There is a variety of mechanisms being employed ranging from single projects, eg under the Industry Cooperative Innovation Program, to longer term, multi year research

programs, such as under the Cooperative Research Centres program. Other programs such as the InnovationXchange intermediary model and P[3], focus on facilitating firm to firm collaboration.

Collaboration is identified as a critical driver of innovation in Chapter 2. Some Australian businesses have established effective linkages with the research sector. International experience suggests however that research-industry linkages is a problem area in many economies. Australia is no exception with industry criticism that collaborative programs are often researcher-driven and science-focused rather than focused on meeting the innovation needs of businesses. The CRC program has recently altered its guidelines to focus the program more strongly on research to achieve commercial outcomes.

3.2 Balance of support for innovation

Analysis of the Australian science and innovation budget was undertaken as part of the 2003 Mapping of Australia's science and innovation report[71]. It identifies the areas where support was directed (2003-04) as shown in Figure 3.3.

- Higher education research - $2.158 billion
- Major federal research agencies - $1.372 billion
- Innovation support - $1.006 billion
- Science and technology - $890 million

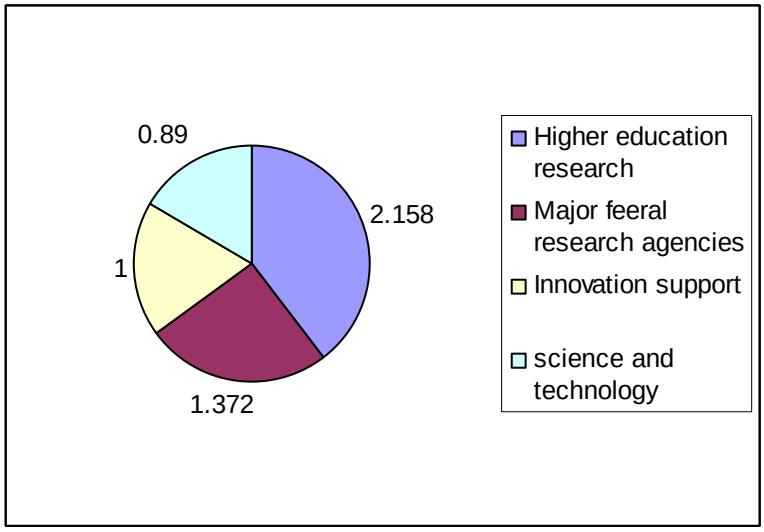


Figure 3.3 Australian science and innovation budget, 2003-04 ($ Billion).

It also examined the functional objectives of Commonwealth funding for science and innovation, and identified the major funding mechanisms for science and innovation (Figure 3.4)

[71] 2003 Mapping Australia's Science and Innovation report

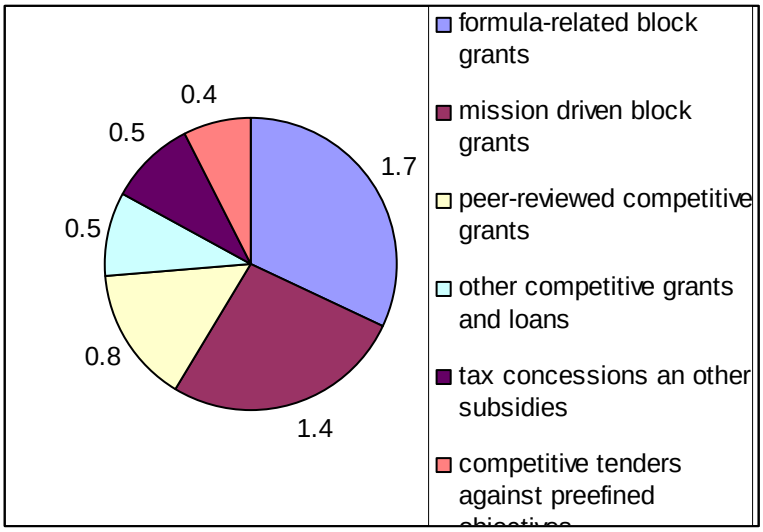


Figure 3.4 Major funding mechanisms for science an innovation ($billion).

Most support in the Australian innovation system is provided to R&D activity and education. A much smaller per cent is provided to build the knowledge and skills for effective commercialisation and less still to technology transfer activities between firms. Collaboration is supported primarily through centres and collaborative sector programs.

3.3 Innovation Data and Research

There is an ongoing need for high quality research and data collection to support effective decision-making and innovation program design. The 2005 ABS Business Innovation Survey has been an excellent tool to characterise innovating Australian businesses[72]. Continuation of such data collection is critical for government decision making as consecutive years of data are required to identify changes induced by policy interventions.

Until the ABS 2005 Innovation Survey, most information about business innovation in Australia focused on the manufacturing industry. The inclusion of services businesses is essential given they account for some 80% of Australia's GDP. Further, better understanding of services innovation is important as more frequently services are being bundled with products to provide competitive innovations and products for domestic and international markets.

DITR has also assembled case studies of innovative companies to illustrate the range of types of innovation – product, process and organisational[73].

The Commonwealth, State and Territory Advisory Council on Innovation has been examining the need for greater national capacity in innovation research and policy to ensure that future government decision making is based on long-term high quality data and well considered studies, research and analysis. The Commonwealth and State and Territory Governments are critical users of innovation data, including

[72] The survey excludes agriculture, fisheries and forestry industry.
[73] Thorburn, 2005, *Knowledge Management and Innovation in Service Companies – Case studies from Tourism, Software and Mining Technologies*; Thorburn L and Langdale J 2003 *Embracing Change: Case Studies on How Australian Firms Use Incremental Innovation to Support Growth*; and the PMSEIC 2005 *Final Report of the Working Group: Growing Technology-Based SMEs.*

program evaluation information, data on the innovation performance of Australian businesses, barriers to innovation, and new directions overseas.

3.4 Cross Cutting Themes and Innovation Support

Innovation research and program reviews, discussed throughout this submission, highlight relevant economic and structural change and point to new trends and challenges. They lead to a number of themes which characterise the type of innovation support which will be required into future. Key cross cutting themes with implications for innovation support into the future are outlined below.

3.4.1 Flexibility and Availability of Support

Innovation occurs in firms of all sizes, in all sectors and in high, medium and low technology companies. There is increasing convergence of technologies and business activities. Many businesses operate across sectors to target business opportunities, often on a global scale.

The backbone of innovation support should be generally available programs that are flexible enough to support a very broad range of businesses at various stages of the innovation cycle. Such programs are responsive to shifting business needs and minimise market distortions. Commercial Ready covers R&D, proof of concept and early stage commercialisation stages and the R&D Tax Concession is available to companies across the economy undertaking eligible R&D activity. Broad programs such as theses can also reduce transaction costs for applicants and implementation costs for the Government.

In addition, sector or technology specific programs can be appropriate to speed development in new areas, to address sector or market specific impediments or where strategic development of specific technologies or approaches, which can potentially impact across the economy, is warranted.

Platform technologies like biotechnology, nanotechnology and ICT will give rise to economic activity in their own right and to a range of applications across the economy that will help improve the productivity of businesses in end-use sectors like agriculture, health, environment and industry.

Specific programs have been developed to promote each of these platform technologies. They are designed to overcome information failures impeding the uptake of these new technologies, establish a critical mass in R&D and commercialisation and attract leading edge researchers and companies to Australia.

Governments also play a major role in establishing the regulations governing the use and adoption of these disruptive technologies and can assist to shape community perceptions of new technology by promulgating accurate public information. It is possible for regulatory frameworks to strike an appropriate balance between allowing commercial opportunities while meeting community standards for health and safety. Providing funding or other direct assistance is not the only means of supporting such innovative new technologies and an be less important than ensuring an appropriate regulatory regime.

3.4.2 Australia's Economic Opportunities are Global

Australia's future prosperity lies in producing products and services in global demand. Our current export performance depends heavily on primary products and tourism.

High technology products and services generally produce high rates of return on capital and labour. They require access to global markets to achieve scale and maximise returns on investment.

Trade in technology and intra-industry trade are growing rapidly often mediated by MNEs. The stages of the value chain are located where the work can best be performed, so Australian industry needs to focus its efforts on those areas where it is competitive and can add value. The need for scale in global markets has led to consolidation among leading firms in global value chains. This is particularly strong in industries such as automotive, pharmaceuticals and defence industries. The speed and significance of technological change means that even the largest MNEs now look beyond their own R&D laboratories for partners in new product development, providing opportunities for participation by smaller innovative companies.

For Australian firms to be attractive to international collaboration partners they need to provide a competitive product or service, have the size and capacity to participate in global value chains servicing potentially large demand, the resources to participate in projects that may take many years to become profitable and be focussed on delivering to international standards. These requirements are very challenging for most companies, and SMEs in particular.

There is a number of potential barriers for SMEs to access global markets either as part of a global supply chain or independently. The OECD[74] has identified a range of areas which can present challenges including, marketing and information exchange, supplier financing, IP management, compliance procedures and standards certification and capability building, such as skills development and technological upgrading.

To be successful in assisting innovative Australian firms to maximise their opportunities, innovation programs increasingly will need to facilitate collaboration and global engagement for Australian SMEs.

3.4.3 Partnerships and Collaboration Promote Innovation

Australia has a large number of small firms, and most of our medium and large firms are small by international standards. Small firms are usually unable to provide all the inputs needed to exploit global opportunities and so need to partner to utilise global value chains or achieve critical mass and meet market entry requirements.

As indicated in Chapter 2, research shows that collaboration, particularly collaboration diversity increases the likelihood of new to world innovation as does a significant degree of foreign ownership[75]. The intensity of these associations is fairly consistent across businesses of different sizes and across manufacturers of varying technological intensity.

The majority of collaborations are firm to firm, although collaborations with the research sector are also very important in achieving technology diffusion. A continued focus on more effective commercialisation of Australian public sector research is warranted. However, an approach based on commercialising Australian

[74] CFE/SME(2006)12 Working Party on Small and Medium-Sized Enterprises and Entrepreneurship -- Enhancing the Role of SMEs in Global Value Chains: Conceptual Issues Draft Report
6-7 June 2006

[75] *Collaboration and Other Factors Influencing Innovation Novelty in Australian Businesses,* DITR, 2006.

R&D is too narrow given 98% of innovative ideas and new technologies come from overseas.[76]. Australian business needs to take-up the best ideas, whatever their origin.

This new analysis on the impact of collaboration suggests there may be value in an increased focus in innovation programs on encouraging collaboration between firms and between firms and research providers both domestically and internationally. It should also be noted that collaboration can take many forms – research collaboration, trade, investment and other means to share knowledge and access markets. A domestic focus and poor links between the research community and industry mean that collaborations may be more difficult for many smaller Australian firms.

3.4.3 Building the Capacity of Australian Firms: skills and knowledge transfer

Australia has a relatively small number of large and medium sized companies, Large companies perform most R&D and large and medium sized companies play an important role in leading supply chains and in collaborating to commercialise ideas and products.

Australian businesses draw on a variety of sources to innovate (see Section 2.8), but mainly other businesses. The provision of assistance through trusted intermediaries to facilitate skills and knowledge transfer plays an important role in connecting smaller Australian companies with innovation partners.

Government innovation programs also play an important role. The reviews of COMET[77] and the OECD knowledge intensive services report[78] indicate that the transfer of knowledge and skills can build innovation capacity in small firms. Firms that use the government's programs are more likely to improve their management capability and continue to grow[79]. They are better able to pick up and adapt overseas technologies and undertake additional R&D and they do both of these activities at a faster rate.

The 2005 innovation survey shows that smaller businesses are generally more likely to experience skills shortages that hamper innovation than are larger businesses. Businesses that are entirely domestically owned are also more likely to experience skill shortages that hamper innovation.

This suggests that, to be successful in building the innovative capacity of firm, innovation programs increasingly need to facilitate the diffusion technologies and knowledge developed offshore; improve the business skills of SMEs in particular, cover technological and non-technological innovation that includes the bundling of technologies and services[80] and support intermediaries to facilitate commercialisation activity and collaboration, especially by SMEs.

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[76] "Australia produces only 1-2% of the world's technology". Mapping Australian Science and Innovation (2003) Australian Government p 108; "In 2001 Australia had a 2.3% share of total world scientific articles" OECD Science, Technology and Industry Scoreboard 2005 p.A41; and "Australia accounts for just 2% of the world's science which is roughly in line with the size of our economy. We're about 2% of the OECD, where most of the world's science is conducted." Thomas Barlow author of *"The Australian Miracle: An Innovative Nation Revisited"*

[77] Review by Howard Partners, 2002. Summary available at www.ausindustry.gov.au.

[78] *Innovation and Knowledge-Intensive Service Activities*, OECD, 2006.

[79] Behavioural Additionality of Business R&D Grant Programmes in Australia, in *Government R&D Funding and Company Behaviour*, OECD, 2006.

[80] OECD, 2005, Innovation Policy and Performance – a cross country comparison .p 16-17

3.4.4 Non-R&D innovation

The 2005 Innovation Survey shows that non-R&D innovation is important to firms. For every dollar business spends on R&D they spend two dollars on non-R&D innovation. Such non-R&D innovation activities are critical to getting an innovation such as a new product to commercial reality.

Some innovation programs like COMET and ICIP and the pilots of intermediary programs like Techfast and the InnovationXchange already support non-R&D innovation. Service providers are important participants in non-technology based innovation[81].

However, the economic justification for Government support for non-R&D innovation is not as clear as it is for R&D. A rationale for government support for non-R&D innovation is that many Australian firms, particularly SMEs, have difficulty accessing capital to commercialise due to an immature Australian capital market in relation to early stage and higher risk investments. Also, there is the opportunity cost when firms cannot obtain the knowledge and skills to access market opportunities.

Non-R&D innovation is likely to generate fewer spillovers as the innovation is nearer to the market and most of the benefits can be appropriated by the firm undertaking the activity. However, with increased inter-firm collaboration and convergence of technologies, the spillovers from improved technology, process and business practice innovation may be significantly higher than originally thought. This is an area requiring better data collection and more policy analysis.

[81] DITR internal working paper on services innovation, 2006

Attachment B

Key Performance Indicators for Selected Innovation Programs

Intermediate Outcomes	R&D Tax Concession (125%)	COMET	Australian Stem Cell Centre	Pre-Seed Fund
Knowledge creation	*PI: IP generated* Standard: Comparison with previous program year. Reporting: 2002-03, 2003-04 and 2004-05 data will be reported in December 2006. Performance: Number by type reported by respondents *PI: Increase in R&D* Standard: Comparison with previous program year Reporting: Reporting on an annual basis, each November. Performance: Percentage increase in both total in-house eligible R&D and contracted-out eligible R&D expenditure.	N/A	*PI: Number of scientific publications based on Centre's research.* Standard: Comparison with previous year Reporting: Annually Performance: Number reported by the Centre *PI: Number of patent applications filed in the USA and Australia* Standard: Comparison with previous year Reporting: Annually Performance: Number reported by the Centre	N/A
Human Resources	*PI: Changes in number of employees undertaking R&D* Standard: number in previous year Reporting: Reporting on an annual basis, each November. Performance: Changes in R&D staff.	*PI: Increase in number of staff* Standard: Comparison with number of full-time equivalent employees at commencement of COMET funding. Reporting: Annually in September Performance: Number of staff reported by grantees. *PI: Increase in number of people trained in management skills* Standard: Comparison with previous year. Reporting: Annually in September Performance: Number of applicants assisted under the Management Skills Development (MSD) stream of assistance of the COMET program.	*PI: Number of scientists resident overseas returning or joining the Centre* Standard: Number of returned scientists at commencement of Centre's operations Reporting: Annually Performance: Number reported by the Centre *PI: Increase in number of employees undertaking R&D* Standard: Comparison with number of full-time equivalent employees undertaking R&D at commencement of Centre's operations Reporting: Annually beginning 1 September 2004 Performance: Number of staff reported by the Centre *PI: Increase in number of PhD students graduating* Standard: Number of higher degree students at end of year 1 of Centre's	*PI: Number of new professionals engaged by Pre-Seed Fund managers* Standard: Comparison with year one. Reporting: Reporting will be on an annual basis, in September Performance: Number reported by Fund managers. (Professionals will largely be recruited at the outset of the program to staff each of the Pre-Seed Funds, but there may be staff turnover during the course of the program) *PI: Increase in number of staff in investee companies* Standard: Comparison with year one Reporting: Reporting will be on an annual basis, in September. Performance: Number reported by Pre-Seed Fund managers.

Intermediate Outcomes	R&D Tax Concession (125%)	COMET	Australian Stem Cell Centre	Pre-Seed Fund
			operations Reporting: Annually beginning 1 September 2004 Performance: Number reported by the Centre	
Finance	N/A	*PI: Success rate for capital raising by program participants* Standard: Comparison with previous year. Reporting: Annually in September Performance: Number of customers reporting and value of equity raised.	*PI: Additional funds obtained from other sources* Standard: Comparison with previous year funds additional to Commonwealth funding base. Reporting: Annually Performance: Funding reported by the Centre from non-commercial and commercial sources	*PI: Amount of capital obtained from sources other than Commonwealth Program funds* Standard: At least 25% of Pre-Seed Funds' capital to come from sources other than Commonwealth's appropriation for PSF program. Reporting: Reported in September 2003. Performance: Funds reported by Fund managers *PI: Valuation* Standard: Valuation of the portfolio of all Pre-Seed Fund investments compared to cost of investments Reporting: Reporting on an annual basis, in September Performance: Value reported by Fund managers.
Collaboration	*PI: Number and value of collaborative arrangements entered into through the activities (includes joint ventures, partnerships, confidential disclosure agreements, and domestic and foreign alliances)* Standard: Number and value of collaborative arrangements in previous survey. Reporting: 2002-03, 2003-04 and 2004-05 data will be reported in December 2006. Performance: increase in number and value of collaborative arrangements (both public and private sector), including R&D contracted to Registered Research Agencies and 'other' research agencies.	N/A	*PI: Number of collaborative arrangements entered into through the project (includes licences, joint ventures, partnerships, confidential disclosure agreements, domestic and foreign alliances)* Standard: Comparison with number of licences, joint ventures, partnerships, confidential disclosure agreements, domestic and foreign alliances, linkages with public sector organisations and collaborative arrangements with academic and/or research institutions at end of year 1 of Centre's operations. Reporting: Annually beginning 1 September 2004. Performance: Reported by the Centre	N/A

Intermediate Outcomes	R&D Tax Concession (125%)	COMET	Australian Stem Cell Centre	Pre-Seed Fund
Awareness	N/A	*PI: Number of people/organisations making initial inquiries to COMET business advisors* Standard: Number of new inquiries received compared with previous year Reporting: Annually in September Performance: Number of applications received.	*PI: Number of articles on the Centre in major science and review journals and newspapers* Standard: Comparison with previous year Reporting: Annually beginning 1 September 2004 Performance: Reported by the Centre	*PI: Number of people/organisations accessing the program* Standard: Number of proposals received compared with previous year Reporting: Reporting will be on an annual basis, each September Performance: Number of proposals received.
Market Outcomes	*PI: Additional R&D expenditure resulting from the program that otherwise would not have occurred* Standard: Comparison with previous surveys Reporting: 2002-03, 2003-04 and 2004-05 data will be reported in December 2006. Performance: percentage increase in R&D expenditure. *PI: Amount of sales of new products, processes, services* Standard: comparison with number and value of sales reported in previous survey Reporting: 2002-03, 2003-04 and 2004-05 data will be reported in December 2006. Performance: Number and value of sales (domestic and offshore) reported by respondents. *PI: Major process improvements* Standard: Number of firms reporting process improvements and the level of those improvements (ie. any increases in outputs or savings) in previous survey. Reporting: 2002-03, 2003-04 and 2004-05 data will be reported in December 2006. Performance: number of companies reporting process improvements and the level of process improvements (ie. any increases in outputs or	*PI: Number of new products, processes, services launched* Standard: Comparison with previous year Reporting: Annually in September Performance: Number of products and/or services launched. *PI: Number of collaborative arrangements entered into through the project (includes licences, joint ventures, partnerships, strategic alliances)* Standard: Number of licences, strategic alliances, joint ventures and partnerships entered into by COMET clients compared to previous program year Reporting: Annually in September Performance: Number reported by respondents.	*PI: Level of product/licensing revenue as a percentage of ITR/ARC funding base* Standard: Comparison with amount at end of Year 1 of Centre's operations Reporting: Annually beginning 1 September 2004 Performance: Percentage reported by the Centre	*PI: Sale proceeds of exited investments* Standard: Comparison with previous year Reporting: Reporting will be on an annual basis, each September. (It is unlikely that there will be much exit activity in the initial years of the Pre-Seed Fund as typical investments will take a number of years to develop to a stage whereby they can be sold.). Performance: value reported by Fund managers.

Intermediate Outcomes	R&D Tax Concession (125%)	COMET	Australian Stem Cell Centre	Pre-Seed Fund
	savings) reported by respondents.			