TELECOMMUNICATIONS EQUIPMENT, SYSTEMS AND SERVICES

Report No. 61
9 April 1998

INDUSTRY COMMISSION

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Inquiries:

Media and Publications Officer
Industry Commission
Locked Bag 2
Collins Street East Post Office
Melbourne Vic 8003

Tel: (03) 9653 2244
Fax: (03) 9653 2303

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INDUSTRY COMMISSION

Canberra Office
Post Office Box 80
BELCONNEN ACT 2616

Level 3
Nature Conservation House
Cnr Emu Bank & Benjamin Way
BELCONNEN ACT 2617

Telephone **(02) 6240 3200**
Facsimile **(02) 6240 3399**

Head Office
Telephone **(03) 9653 2100**

9 April 1998

The Honourable Peter Costello MP
Treasurer
Parliament House
CANBERRA ACT 2600

Dear Treasurer

In accordance with Section 7 of the *Industry Commission Act 1989*, we have pleasure in submitting to you the Commission's final report on Telecommunications Equipment, Systems and Services.

Yours sincerely

Gary Banks
Acting Chairperson

Helen Owens
Commissioner

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ABBREVIATIONS AND GLOSSARY

Note: Some technical terms are defined in box 3.1 in chapter 3.

ABS	Australian Bureau of Statistics
ACA	Australian Communications Authority. Formed in mid 1997 by merger of Austel and the Spectrum Management Agency
ACIF	Australian Communications Industry Forum. A telecommunications industry body involved in industry self regulation of standards
AGP	WTO Agreement on Government Procurement. Aims to subject government procurement to greater international competition
AIIA	Australian Information Industry Association
ANZSIC	Australian and New Zealand Standard Industrial Classification
APEC	Asia Pacific Economic Cooperation [forum of nations]
ASIC	Australian Standard Industrial Classification (now superseded by the ANZSIC)
BIE	Bureau of Industry Economics. Now merged with the Industry Commission and the former Economic Planning Advisory Commission
CGT	Capital gains tax
CRC	Cooperative Research Centre
convergence	Technologically, refers to the increasing similarity of technologies and sectors that were previously distinct (see chapter 3)
customer premises equipment	Equipment located at the customer's premises, such as telephone handsets and facsimile machines
DIFF	Development Import Finance Facility scheme.

	Now ceased, previously provided grants to developing countries to enter into overseas development assistance contracts with Australian firms
DIST	Department of Industry, Science and Tourism
DSP	Digital signal processing (see box 3.1)
effective rate of assistance	Measures net assistance, taking into account both assistance on outputs and on inputs
EMDG	Export Market Development Grants program
ESA	Endorsed Supplier Arrangements program.
	Essentially a pre-qualification program for government procurement, with an industry development component
FMO	Future Mode of Operation.
	Telstra's $3.3 billion, five year, network modernisation program
FTA	Fixed Term Arrangements program.
	A government purchasing arrangement with medium sized MNEs and indigenous firms designed to encourage industry development
GATS	General Agreement on Trade in Services.
	An agreement, under the WTO, establishing rules for liberalising services trade
IDPs	Telecommunications industry development plans.
	Each carrier must have an IDP approved by the Minister for Industry, Science and Tourism before a carrier licence can be issued
indigenous firm	Australian owned firm
IPAC	Information Policy Advisory Council.
	Advises the Minister for Communication and the Arts on matters relating to online information and communication services
ISDN	Integrated services digital network (see box 3.1)

IT&T	Information technology and telecommunications
ITA	WTO Agreement on Information Technology.
	Provides for the phasing out of tariffs on specified IT&T products
MAI	Proposed OECD Multilateral Agreement on Investment
MNE	Multinational enterprise
modem	Modulator/demodulator used to send data between computers over the PSTN
NATA	National Association of Testing Authorities
nominal rate of assistance	Measures assistance on outputs, not taking into account assistance on inputs
OECD	Organisation for Economic Co-operation and Development
offsets	Arrangements whereby firms selling to government were required to commit to activities such as local investment, R&D, exports and technology transfer.
	The Commonwealth Civil Offsets program was terminated in 1992
PE65	A Commonwealth Government common use purchasing arrangement for voice, data and video communications equipment and services
PfD	Partnerships for Development program.
	A government purchasing arrangement with large MNEs designed to encourage industry development
PSTN	Public switched telecommunications network (see box 3.2)
R&D	Research and development
R&D Start	An R&D assistance program
SMEs	Small to medium sized enterprises

TE industries *or* telecommunications equipment industries	Used to refer collectively to the 'telecommunications equipment, systems and services industries' (unless the context otherwise determines)
TIDA	Telecommunications Industry Development Authority. Established in 1992 to monitor the telecommunications IDPs, ceased at the end of June 1997
venture capital	A generic term for investment in firms which are not well-established. Also can refer to investments by venture capital firms
WTO	World Trade Organisation

OVERVIEW

This inquiry into the telecommunications equipment, systems and services industries (TE industries for short) came at a time of renewed interest in the possibilities of a more targeted and activist industry policy.

- During 1997, a number of reports recommended special policies for the information technology and telecommunications (IT&T) sector, including the TE industries.
- In December 1997 the government announced a package of measures for Australian industry *(Investing for Growth)*, some of which will benefit the TE industries, though not being directed at them.
- These industries already benefit from some existing programs, one of which (the Industry Development Plans for carriers) is specific to them.

This report evaluates some of these policy proposals and programs, in the context of an examination of the wider economic environment for the TE industries.

Establishing a sound rationale for particular government interventions is a pre-condition for good outcomes. The Commission has therefore given some emphasis to this aspect in its review. It is also necessary to demonstrate that particular interventions not only help the TE industries, but also deliver net benefits to the Australian community at large. Indeed, this was highlighted in the Mortimer Report as a failing in many existing government business programs.

The TE industries

The Commission's inquiry relates to industries involved in the manufacture and supply of telecommunication equipment, and associated systems and services. The industries cover a wide range of products and activities (see box 1).

While typically included with the large and rapidly expanding IT & T sector, the TE industries represent a very small part of that sector. The bulk of activity in the wider sector is in applications and service delivery.

Local affiliates of large multinational enterprises (MNEs) dominate the industry, with the largest three firms — Ericsson, Alcatel and NEC — accounting for over half of total employment.

- A distinctive feature of the industries worldwide is their participation in strategic alliances with their customers (the carriers) and their suppliers. They are also relatively intensive R&D performers — a key determinant of competitiveness in the dynamic and sophisticated communications market — and their employees are relatively highly skilled.

Box 1: The Australian TE industries at a glance

Size:	Small relative to wider IT&T sector (5 per cent of employment) or manufacturing sector (1 per cent of employment).
Technology:	High average R&D intensity of around 8 per cent, compared with only 1 per cent for all manufacturing.
Products:	Core network equipment, radio communication equipment, customer premises equipment (voice and data), mobile phones, modems and cables. Also associated engineering services, software development and R&D.
Structure:	180 specialist firms, but dominated by affiliates of large foreign MNEs. Top three firms account for more than 50 per cent of employment; the top ten for over 80 per cent. No indigenous firms in the top eight.

Industries in transition

Rapid technological change and increasing competitive pressures stand out as features of the TE industries' market.

- Indeed the two are linked: the convergence in telecommunications and computing technology is generating new competitors for TE industries.
- At the same time, hardware is becoming increasingly standardised and 'commoditised', favouring firms and production locations which can reap economies of scale and benefit from lower wage rates.
- And product cycles are shortening, as today's innovative technology is outclassed by tomorrow's, in markets with highly responsive demand.

The competitive environment facing TE firms in Australia has been heightened significantly by two policy changes:

- the recent reduction of regulatory barriers to competition in the carrier business, bringing new discipline to the equipment purchasing decisions of the incumbents; and

- the phasing out of tariff protection by the year 2000.

The government has announced that the scheduled tariff removal for telecommunications equipment inputs and for some categories of telecommunications equipment will be brought forward.

- Extending this decision to cover all telecommunications equipment would have merit, as it could avoid significant administrative and compliance costs.

Domestic liberalisation has mirrored increased liberalisation in key foreign markets, including APEC, bringing both opportunities and threats for Australia's TE industries.

Understanding how well the industries are performing is impeded by lack of data. From the information we have been able to collect, the story is mixed, though positive overall — with some uncertainties for the future (see box 2).

- Indigenous Australian companies appear to have been coping less well than the large MNE affiliates.

Box 2: Recent trends in production and trade

- Output of Australia's TE industries jumped 23 per cent in nominal value in the three years to 1995–96, rising even faster in volume terms. This increase was overwhelmingly due to expansion in the production of cables, not equipment, although productivity performance was stronger in the latter sector. Cables growth was underpinned by the (now terminated) dual cable rollout of Telstra and Optus.
- Exports grew strongly after 1988–89, but peaked in 1993–94 and appear to have levelled out since. The destination of exports appears widely spread. Nevertheless, East Asian markets are collectively important — recent developments there may adversely affect future export demand.
- Imports grew more slowly than exports until 1993–94, but more quickly thereafter (in response to the cable rollout) so that the ratio of exports to imports rose and then fell.
- Despite significant output growth, the Australian TE industries' share of the domestic market has fallen from about 62 per cent in 1992–93 to 53 per cent in 1995–96, although performance has varied among different products.

Views within the sector about the strengths and weaknesses of Australia as a location for TE production differ, but the Commission found strong indications that the future was more likely to be in software and services than in hardware.

This is largely attributed to what are seen as our competitive strengths in R&D, software engineering and design capabilities:

- but also to an emerging shift in demand towards these products;
- and increasing scope through globalisation to undertake such niche activities for customers around the world.

Should government intervene in the TE industries?

Governments have a critical role to play in the development of Australian industry. As the Commission observed in its 1996–97 Annual Report, industry policy must address the key policy-related determinants of industry productivity, including more efficient labour markets, a better taxation system, improved economic and social infrastructure, and less regulatory red tape.

There is also a role for policy measures which can correct cost-effectively for failures of markets, firms and even the government's own policies.

- Whether such measures should have a sectoral focus, however, depends on the existence of special sectoral circumstances and the ability to target them without incurring excessive additional costs.

There are no clearly articulated economic rationales for the policies applying to the telecommunications equipment industries. Thus, it is difficult to assess the appropriateness of these policies, or to devise complementary or substitute programs which increase effectiveness or efficiency.

The Commission's examination of the TE industries suggests that the strongest 'in principle' justification for intervention directed at MNEs is the potential for generating technological and other knowledge transfers (spillovers) to local firms. Whether such intervention is likely to yield a net payoff to the community nevertheless requires detailed investigation of its costs and benefits.

- The Commission found that other potentially valid arguments for government involvement — based on possible ignorance by MNEs about the merits of local firms, or the extraction of monopoly profits from MNEs — did not withstand critical scrutiny.
- Other arguments, to do with reducing sectoral trade imbalances or the need to outbid foreign governments, involve basic misconceptions about the wider economic consequences of selective intervention.
- There is also little scope for Australia's pressing unemployment problems to be ameliorated in any sustained way by targeted support for the TE industries.

The Commission also gave careful consideration to the contention in the Goldsworthy report that Australia cannot achieve the important objective of being a leading edge *user* of information and telecommunications technology, unless it is also a leading edge *producer*. The notion of a strong link between production and use may have intuitive appeal, but is not supported by international evidence.

- Australia itself is already seen as a world class user of these technologies — the connection between ultimate consumer use and comparative advantage in telecommunications equipment manufacturing appears to be weak.

Carriers' Industry Development Plans

The national telecommunications carriers are the main customers for Australia's TE industries. Their activity levels and input sourcing decisions are thus key determinants of the local industries' development.

Traditionally, Telstra — or in its earlier forms, the PMG and Telecom — played what one participant described as a 'mother hen' role for local industry.

- It could readily assume that role because of its protected monopoly position, which allowed it to pass on any higher costs to the domestic users of its services.

The corporatisation (and now partial privatisation) of Telstra and the progressive opening of its market to competition, led the government to formalise these *de facto* industry policy arrangements in 'Industry Development Plans' (see box 3) which require the Industry Minister's approval as a pre-condition for obtaining a carrier's licence.

In part reflecting WTO constraints, the IDP requirements in the current Telecommunications Act 1997 would appear relatively benign:

- the degree of commitment by carriers to their IDPs is, in a formal sense, voluntary;
- the only commitments which a carrier must meet are those involving R&D;
- and there are no explicit penalties for under-performance:
  - although there are more detailed requirements in administrative guidelines and pressure to comply stemming from the Minister's ability to withhold a licence.

Box 3: What the Act says about IDPs

- A carrier licence cannot be granted by the Australian Communications Authority unless an industry development plan has been approved by the Minister for Industry, Science and Tourism.
- An industry development plan is a plan for the development in Australia, in connection with the carrier's business as a carrier of:
  (a) industries involved in the manufacture, development or supply of facilities; and
  (b) research and development activities relating to such industries.
- The plan must include any relevant particulars of the carrier's strategic commercial relationships, including with Australian and MNE suppliers.
- The plan must include any relevant particulars of the carrier's activities in relation to research and development, including investment and arrangements for technology transfers to Australian industry.
- The plan must include any relevant particulars of the carrier's export development plans.
- The plan must include any relevant particulars of the carrier's arrangements aimed at encouraging employment in industries involved in the manufacture, development or supply of facilities.
- A summary of an industry development plan must be made available to the public.
- A carrier must comply with its industry development plan, in so far as the plan relates to its research and development activities.

Source: Telecommunications Act 1997, Schedule 1, Part 2.

The strongest in-principle justification for IDPs relates to their potential — because of the leverage provided to the government by licensing — to induce actions which can generate spillovers from MNEs and learning by local firms.

- Such actions include additional R&D and alliances with local firms. But they do not include export or other local content requirements, which are ineffective mechanisms for generating spillovers (apart from any potential conflict with WTO obligations).

Whether IDPs can provide a net benefit to Australia depends on:

- the extent to which they induce more domestic activity than would otherwise take place; and
- the relative magnitude of the costs and benefits of any such inducement (or attempted inducement).

A central problem in attempting to make such an assessment is that an assistance scheme of this kind generates very little observable evidence about its effects. It is necessary to rely on the views and judgments of the participants themselves.

On the threshold issue of whether IDPs have induced additional domestic activity, the Commission's discussions with a range of carriers — and a survey of nine carriers — suggest that the effect has been marginal.

In particular, IDPs do not appear to alter carriers' intentions in relation to capital investment, export development, and expenditure on training. On the other hand, overall R&D expenditure under IDPs appears to be slightly higher than carriers would otherwise undertake. However, the amount involved is only a tiny fraction of carriers' total R&D expenditure.

- These results are consistent with the fact that the three carriers under the pre-1997 regime generally exceeded their IDP targets, sometimes by a large margin.

IDPs may provide also some benefits by encouraging carriers to recognise the capabilities of local telecommunications equipment suppliers, and by encouraging some strategic alliances that might not otherwise take place.

IDPs impose annual compliance, administrative and other burdens of around $1 million. While comparatively small, the costs nevertheless loom larger for smaller carriers relative to the benefits of the arrangements.

A key issue is the potential for the IDP negotiating process to impede and delay entry in a sector where speed to market can be critical.

- To date there is little evidence of such an effect with time to approval averaging only one to two months.
- However, with the prospect of an estimated 30 to 40 additional carriers in the near future, this could change, depending on the 'flexibility' of administrators and the resources available to them. If nothing else, the administrative costs of the arrangements are projected to increase.

The Commission has developed a methodology for estimating the net economic effects of IDPs. This, and the survey results, suggest that the program is on a knife's edge — either producing small net costs or small net gains. However, in a few years time, when entry rates will be lower and most incumbent carriers will be familiar with the capabilities of Australian telecommunications equipment suppliers, any benefits from information provision and alliances encouraged by the arrangements will wane. The costs of the IDP arrangements are then more likely to exceed the benefits.

The Commission therefore considers that:

- participation in IDPs should be voluntary for small new carriers. This would still allow potential new small carriers who would prefer to fulfil the IDP requirements to do so; and
- IDPs should ultimately be made voluntary for all carriers — one option is to do this by 30 June 2002, when all current plans will have lapsed.

Partnerships for Development/Fixed Term Arrangements

The TE industries are also affected by government purchasing arrangements, of which the most significant is the Partnerships for Development (PfD) program — although that program has wider application.

- Procurement-based programs generally have multiple objectives (including obtaining value for money and promoting local industry) which do not always sit easily with each other.

As in the case of the IDP arrangements, the PfD program (and its equivalent for companies with lower government sales, the Fixed Term Arrangements program or FTA) specify only objectives, not the *rationales* for their existence (see box 4).

Again, the reason why such programs have potential to generate a net social return (the conclusion in the 1994 BIE review) stems from the government's ability to use its purchasing power as leverage for inducing more R&D and generating additional spillovers to local firms.

Whether such programs are successful, however, depends on the extent to which MNEs' actions are influenced by the 'carrot' of the government market, and what costs and benefits ensue.

- As in the case of IDPs, a drawback of such schemes is the lack of transparency of their operation and effects.

The BIE's review was based on a survey of participants. There are questions about the potential for strategic response in such surveys and the need to take into account the impact on activity outside the targeted firms (including diversion of scarce skills). However, the Commission has obtained only limited additional information in this inquiry — and that only in relation to the TE industries — and has not been in a position to provide a detailed assessment.

The Commission considers that, as advocated by the Mortimer Report for all major business programs, there should be a further independent review of the PfD/FTA programs. (This had already been recommended in the BIE report and in an earlier report by the Commission.)

The Commission also considers that the government should clarify the underlying rationale for the programs, with a focus on sources of potential spillovers, rather than inducing exports or local content. As well, transparency should be improved by making available more information about partners' commitments and achievements.

Box 4: The PfD program

Stated objectives:

- to attract international investment capital and technology to grow and internationalise Australia's IT&T industries;
- to link Australia's IT&T industries into international R&D and marketing networks through using Australia as a base for selected corporate activities where Australia has competitive strength;
- to grow exports and export oriented import replacement activity through strategic long-term, commercially viable industry development activities, thereby reducing Australia's trade imbalance; and
- to facilitate development of mutually beneficial business relationships between international IT&T corporations and local IT&T firms and research institutions.

Eligible activities: export of Australian developed products and services including Regional Headquarter services; facilitation of new export market opportunities for local companies; research and development; training; technology transfer; strategic capital investment; and venture capital investment.

Commitments: companies 'volunteer' industry development commitments in areas of eligible activity. The commitments are expected to include exports and R&D. There are no set percentage targets for industry development. Neither are there local content requirements, except for exports under the PfD program where there is a 'suggested' requirement for local content.

Source: DIST.

Other policy-related issues

The Commission has considered a number of other policy proposals and issues which are seen as affecting the TE industries. Most of these are much wider in scope than the industries under reference.

International agreements and standards

Overall, the Australian community benefits from international agreements which liberalise trade and enhance competition. But with respect to the telecommunications equipment industries, the combined effect of existing and proposed international trade agreements is somewhat uncertain, although probably beneficial.

There is little justification for treating expenditure incurred in participating in meetings on international standards setting activities as R&D expenditure, as suggested by the Australian Communications Authority (ACA). However, there seems no in principle reason why the Australian Communications Industry Forum (ACIF) should not receive some government funding for industry participation, in similar terms to funding provided to Standards Australia and to the National Association of Testing Authorities (NATA).

Investment attraction?

The Goldsworthy report saw an 'incentives-based investment attraction regime' as potentially replacing the PfD/FTA programs. The Commission considers that large scale investment-attraction programs have more serious design limitations than either the PfD/FTA or IDP arrangements. The biggest risks are that revenue will be:

- either wasted by attracting multinationals that were going to come anyway (low additionality); or
- spent on projects where Australia has little long-run advantage.

In *Investing for Growth*, the government said that it would consider some limited provision of incentives for strategic projects on a case-by-case basis. The operating criteria (including funding) have yet to be announced and the Commission offers some principles for enhancing the prospect of net gains to Australia, including funding caps and the application of rigorous cost–benefit assessment.

Venture capital

A perceived lack of capital for promising hi-tech ventures is a common complaint, both in Australia and overseas, and has been highlighted by the Mortimer and Goldsworthy reports. However, other reviews of the capital market (including one by the Commission in 1992) have generally not found significant evidence of failure, other than a lack of 'investment readiness' in small enterprises. Nevertheless, a number of major government programs targeted at this area have been introduced recently and it will be important to

monitor and evaluate their effectiveness before considering any additional or alternative programs.

A particular concern has been issues to do with taxation of development capital, including that from foreign sources. The Commission supports calls for these issues to be considered in the wider context of reform of the tax system as a whole.

R&D assistance

The Mortimer and Goldsworthy reports proposed further changes to R&D assistance arrangements to enhance their effectiveness. Firms in the TE industries commonly expressed concern at the reduction in the rate of tax concession. While some had been provided with substantial financial assistance under the R&D Start Program — which has just had its funding boosted — there have been complaints also about the selectivity of that scheme. The general 125 per cent R&D tax concession remains of clear importance to telecommunications equipment suppliers and other R&D intensive industries.

However, it suffers from some design limitations. It provides:

- support to R&D that would have been undertaken anyway;
- transfers to foreign shareholders; and
- low incentives to firms with losses or limited franking credits.

The first two limitations could be addressed by introducing an incremental scheme in which firms would be able to obtain assistance only for R&D which exceeded some base level. The Commission suggests an administrative solution which overcomes the obstacles posed by tax evasion to the use of such an incremental scheme. The third limitation could be addressed by making the assistance available in a non-taxable form rather than as a tax concession.

The greater efficiency of an incremental scheme could allow the rate of concession to be increased above the present 125 per cent level — providing an added incentive for R&D.

The Commission did not undertake a full evaluation of the telecommunications equipment CRCs. However, it looked at how the centres were functioning, and found that they shared some desirable design features with the program as a whole. Longer term collaborative frontier research, strong networks and a substantial postgraduate training component increase the likelihood of spillovers arising from their activities. As well, the initial contestability of funds and the regular review process are disciplines on their performance.

RECOMMENDATIONS

1. Tariff removal scheduled for goods under reference covered by the WTO Agreement on Information Technology (the ITA) should be brought forward and take effect at the same time as the tariff measures announced by the Commonwealth Government in *Investing for Growth*.
2. The economic rationales for industry policies which affect the telecommunications equipment industries, such as the IDPs and the PfD/FTA programs, should be articulated clearly.
3. IDPs should be voluntary for small new carriers. The criterion of 'smallness' could be based on indicators such as capital expenditure, sales revenue, and/or market share.
4. Mandatory IDPs should not be a permanent feature of the carriers' regulatory regime, and should ultimately be made voluntary for all carriers. One option is to do this by 30 June 2002, when all current plans will have lapsed.
5. The PfD/FTA programs should be reoriented towards activities such as R&D and alliance formation, where spillovers are most likely, and away from local content for its own sake.
6. Greater transparency of individual partner's commitments and achievements should be introduced into the PfD/FTA programs, by requiring partners to publish public versions of their agreements and reports of their achievements.
7. There should be a full independent review of the PfD/FTA programs in the year 2000, taking account of the Commission's suggested guidelines for conducting such a review.
8. The Commonwealth Government should consider:
   - the merits of replacing the existing general tax concession for business R&D with an incremental scheme;
   - providing the incentive in a non-taxable form instead of a tax concession, at least for firms with tax losses or insufficient franking credits; and
   - the scope in an incremental scheme to increase the rate of assistance to R&D.

9. In implementing its plans for an investment attraction program, the Commonwealth Government should minimise the economic risks by following a number of principles:
   - the program should be designed to maximise the extent to which investments are truly new to Australia by, for example, establishing a transparent cap on the maximum amount of financial resources the Government will provide under the program;
   - any proposal should be subject to rigorous cost–benefit assessment, including examination of the sources of spillovers;
   - as the process of discerning beneficial investment opportunities will emerge only after trial and error, the effects of the program should be monitored regularly so that changes in its design can be made to increase its effectiveness early in its life;
   - the Office of the Strategic Investment Coordinator (OSIC) should consult with prospective investors to gain detailed intelligence about inappropriate microeconomic impediments to investment in Australia;
   - it is better to provide subsidies to fund specific improvements of Australian endowments (eg roads, skills, R&D) critical to foreign investments, than to provide subsidies direct to foreign shareholders; and
   - OSIC should use transparent processes and criteria for decision making.
10. Existing venture capital programs should be monitored for some time and then evaluated to determine their effectiveness, before any additional or alternative programs in this area are considered.
11. Any modifications to the taxation system to improve the availability in Australia of venture capital should be considered in the context of wider review of the tax system.

1 INTRODUCTION

This inquiry concerns the future development of the telecommunications equipment, systems and services industries. (In this report the contraction 'telecommunications equipment industries' is used to refer to these industries collectively.)

The Commission has been asked by the Commonwealth Government to report on a wide range of factors affecting the development of these industries including:

- their structure and competitiveness;
- local and global trends, particularly in technology;
- the effect of international trade agreements;
- impediments to improved efficiency; and
- factors assisting or hindering new high technology firms.

In addition, the Commission has been asked to evaluate current government programs for these industries and report on ways in which assistance could be better used.

The full terms of reference are set out in appendix A.

1.1 Scope of the inquiry

The reference relates mainly to the manufacture and supply of telecommunications equipment, and to systems and services associated with manufacture and supply. It covers such products as core network equipment, radio communication transmitting and receiving equipment (excluding broadcast equipment), customer premises equipment for voice and data, mobile phones, modems, and cables. It also includes associated engineering services, software development, and R&D.

Communications services such as those provided by carriers and carriage service providers are *not* under reference. However, the activities of carriers — such as Telstra and Optus — and service providers as *buyers* of equipment and associated systems and services are relevant.

A wide range of issues are potentially relevant to this inquiry. However, many market based, institutional and regulatory factors affecting telecommunications equipment systems and services extend more broadly than the industries under reference, some extending to the information technology and

telecommunications (IT&T) sector as a whole or even more widely. While the industries under reference make up only a small part of the IT&T sector (see chapter 2), as technology converges distinctions between telecommunications equipment, systems and services and IT equipment, systems and services — such as computers, multimedia and applications software — are becoming harder to make.

Nevertheless, the Commission has focussed its review on those market developments and government policies which have particular relevance to the telecommunications equipment industries. Even for those there are some, such as Partnerships for Development and venture capital availability, which could not be fully assessed within the scope of this inquiry and the information available to it.

1.2 Other reports and inquiries

A number of other recent government-initiated inquiries and reports have covered ground relevant to the Commission's current terms of reference. (Box 1.1 briefly indicates the scope of that other work.) In accordance with item 5(c) of the terms of reference, the Commission has drawn on this and other available material where appropriate, rather than undertaking work anew.

1.3 Inquiry issues and report structure

In its informal discussions with firms and other stakeholders (see below), in submissions, and in the recent reviews just noted, a number of themes emerged. These are listed briefly below, together with an indication of the terms of reference to which they relate.

Structure and competitiveness. (Items 3(a) and 3(b).) The Commission was informed by indigenous and multinational companies alike that, in the past, Telstra (previously Telecom) had supported local manufacturers and worked with them to develop new technologies and products. Indeed, many significant developments and investments apparently relied on the carrier's support — encouraged by industry development arrangements and traditionally high tariffs on imports. However, Telstra (and the other carriers) were now seen to be taking a more 'commercial' attitude to procurement, making telecommunications equipment manufacturing more difficult in Australia for many firms.

Box 1.1: Relevant recent reviews

Information Industries Taskforce. Under the chairmanship of Professor Ashley Goldsworthy this taskforce, consisting of industry representatives, commenced work in late-1996 on developing a National Information Industries Strategy, to replace that in effect since 1987.

The work of the taskforce was supported by a commissioned study from David Charles, Roger Allen and Roger Buckeridge into the competitiveness of the information industries sector. As well as examining the current competitiveness of those industries, *Competitiveness or Serious Player? Competitiveness of Australia's Information Industries* (released in March 1997) suggested some guiding principles for government policy, and a number of future directions for consideration.

The taskforce itself reported in August 1997. In developing a strategy intended to operate until 2010, *The Global Information Economy: The Way Ahead* (Goldsworthy report), examined major trends affecting the information industries, current policy settings, and developed an action agenda for implementation by government.

Review of Government Business Programs. A review, led by David Mortimer, reported to the government in July 1997 about ways to improve the efficiency and effectiveness of government business programs generally. *Going for Growth — Business Programs for Investment, Innovation and Export* found a number of shortcomings with existing programs — they lack focus and direction — and suggested ways for improvement. It highlighted five key areas for industry programs: investment, innovation, export, business competitiveness and sustainable resource management.

Information Policy Advisory Council. The council, chaired by Terry Cutler, reported in July 1997 on *A national policy framework for structural adjustment within the new 'Commonwealth of Information'*. The report suggested ways in which government can play a major leadership role in creating the environment and the best possible institutional settings for Australia's participation in the new world of information. It also covered priorities for industry and individual firms, and the scope for consumer and community initiatives.

In assessing the implications of this change and in considering the future prospects for telecommunications equipment manufacturing in Australia, a number of issues relating to structure and competitiveness are suggested:

- what are the advantages and disadvantages of Australia as a location for telecommunications equipment manufacture?
- what are the impacts of rapid technological change, convergence, and telecommunications deregulation?

- what are the effects of technical standards on industry development?
- what factors advantage or disadvantage indigenous firms compared with the multinationals?
- in what areas are local firms most likely to be successful?

These and other issues are covered in chapter 2, which also places the telecommunications equipment industries in the context of the wider IT&T sector. Other chapters of the report touch on particular aspects: for example, chapter 3 deals with technological change and convergence.

Industry policy. (Items 3(d), 3(f), 4 and 5(b).) Some of the recent reports identified in box 1.1 urged changes to industry policy, particularly in relation to the IT&T industries. Their proposals were often raised in meetings between the Commission and firms in the industries. A problem in assessing the merits of the proposals — as well as in evaluating existing programs — is the absence of any explicit rationale in terms of community-wide benefits. The government has responded to some of those proposals in *Investing for Growth*, announced by the Prime Minister on 8 December 1997. That document sets out strategies to encourage innovation, boost investment and improve Australia's trade performance. (A brief summary of the major new measures announced is given in box 1.2.)

The terms of reference, however, raise many issues relevant to industry policy and the development of the telecommunications equipment industries in Australia. So, chapter 4 establishes a broad framework for industry policy initiatives, while chapter 5 examines policy rationales. Chapter 6 examines the telecommunications industry development arrangements, and relevant aspects of government purchasing are covered in chapter 7 (particularly the Partnerships for Development scheme).

R&D. (Items 3(b), 3(d) and 3(e).) Concern was expressed about the reduction in the business R&D tax concession rate from 150 per cent to 125 per cent in August 1996, although there was some endorsement of the R&D Start program. Many participants emphasised the importance of R&D in these industries, and requested more government assistance. As well, there was support for the Cooperative Research Centre (CRC) arrangements. These matters are covered in chapter 9.

Encouraging new high technology firms. (Item 3(e).) A common view among industry representatives was that changes should be made to encourage investment in telecommunications manufacture, particularly in new high technology areas. Specific concerns covered in chapter 10 include the role of selective incentives, as well as venture capital and tax.

People issues. (Items 3(a) and 3(e).) Generally there was praise for the quality of Australian manufacturing, engineering and R&D personnel. However, some firms pointed to emerging shortages of skilled people in some areas. This is covered briefly in chapter 2.

Box 1.2: Major measures announced in *Investing for Growth*

Growth objective	An average annual growth rate of over 4 per cent during the decade to 2010.
R&D Start program	Major expansion in scope of program, with an additional $556 million in funding over the four years to 2001–02.
Venture capital	Additional funding of $43 million over four years for the Innovation Investment Fund.
Technology diffusion	Additional funding of $72 million over four years.
Investment	Establishment of Invest Australia to market Australia as an investment location, with funding of $11 million a year over four years.
Investment coordinator	Appointment of a Strategic Investment Coordinator to coordinate the case-by-case assessment of any need for investment incentives.
Export assistance	Extension of the EMDG scheme for a further two years at a total cost of $300 million.
TRADEX	The consolidation of existing duty drawback and tariff export concession schemes.
Financial centre	Initiatives to increase the competitiveness of the financial services sector.
Information age	A number of measures to promote development and use of IT including: electronic commerce; government as a leading-edge user; getting business online; online trade strategy; and an Information Industries Action Agenda to 'assist information industries in emerging areas where Australia can create sustainable competitive advantages' (p. 93).

Source: Howard 1997.

Implications of international agreements. (Item 3(c).) A number of international agreements, under the auspices of the World Trade Organisation, could have an effect on prospects for local industries. These include the Information Technology Agreement, the Agreement on Basic Telecommunications, and the

Agreement on Government Procurement. Australia is not a signatory to the latter agreement, but is actively considering its possible benefits and costs. As well, developments in APEC forums and working groups involving the telecommunications industries could have an impact in Australia. And many equipment and other relevant standards are developed in international forums in which Australia has a stake. These international issues are covered in chapter 8.

1.4 The inquiry process

In early August 1997, the Commission distributed an Issues Paper to individuals and organisations with a potential interest in the inquiry. The purpose of the paper was to assist participants by:

- outlining the scope of the inquiry, the Commission's approach and inquiry procedures; and
- identifying matters about which comment and information were sought.

To avoid adding to the demands imposed by the other recent and current inquiries and studies, the Commission indicated it would accept copies of relevant submissions to earlier reviews. Further, the Commission decided not to hold *formal* consultations — such as roundtables or public hearings — before its Draft Report was released. However, the Executive Director of AEEMA informed the Commission at the outset that the Association would not be participating in the inquiry.

While very few submissions were received before the Draft was released for public comment on 19 December 1997 (see appendix B), the Commission was fortunate in being able to discuss issues of interest to most of the key firms with their senior executives — such *informal* meetings were held prior to the Draft Report with 36 individuals, firms and organisations, including government agencies (appendix B). Where influential in the Commission's thinking, their views have been relayed in the report, but not necessarily with specific attribution.

Public hearings were held in February 1998 to receive comment on the Draft Report, and some further submissions were received (appendix B). Informal meetings were held with the Department of Communications and the Arts, the Department of Industry, Science and Tourism, and the Australian Communications Industry Forum to discuss the Draft. A survey of carriers was also conducted, to help assess the role and effects of the telecommunications industry development plans.

The Commission would like to record its appreciation to all those who have assisted by providing information or comment during the inquiry.

2 STRUCTURE, PERFORMANCE AND COMPETITIVENESS

The telecommunications equipment industries are generally considered to be part of the wider information technology and telecommunications (IT&T) sector. This sector is growing rapidly, and expanding its share of economic activity worldwide. However, the reference is narrow in scope and the activities under reference make up only a very small part of the Australian IT&T sector as a whole. Further, although most of the major telecommunications equipment multinational companies operate in Australia, and there are also some indigenous firms, the Australian industries are very small by international standards.

After placing the industries in perspective, an attempt is made in this chapter to describe the structure of the industries, including some distinctive features, and to provide indicators of their performance and competitiveness. Owing to data limitations, much of the data presented in this chapter relate to firms concentrating on telecommunications equipment and cables; data relating to firms concentrating on telecommunications systems and services is generally not available. As noted in chapter 1, communications services such as those provided by telecommunications carriers and carriage service providers are *not* under reference.

The chapter then examines factors which could affect future prospects, taking account of views from discussions between the Commission and telecommunications firms. The industries appear to be in a state of transition — anecdotal evidence suggests telecommunications equipment manufacturing in Australia is becoming more difficult. It is possible that, in the globally competitive environment now developing, only the largest firms in Australia will be able to continue to produce telecommunications equipment across a wide product range. Another possible outcome would be a switch in local activity to niche areas, not necessarily in equipment and cables, but possibly in areas such as R&D, software development, systems engineering, and services — this need not mean that local activity would decline overall, but firms would still need to be outwardly oriented to succeed.

2.1 The industries in perspective

The Australian telecommunications equipment, systems and services industries are very small in relation to the Australian IT&T sector, Australian

manufacturing in total, and by comparison with telecommunications equipment worldwide.

Domestically

The demand for telecommunications equipment, systems and services is derived from demand from people and firms for communications services. But demand for those communications services is much greater than demand for products of the telecommunications equipment industries — as table 2.1 indicates, those industries accounted for just over 5 per cent of the IT&T sector as a whole, in terms of employment. And they represented just over 1 per cent of Australian manufacturing activity.

Table 2.1: Comparisons of employment

Employment	*1992–93*	*1995–96*
Telecommunications equipment industries	8 792	10 704
IT&T[a]	136 788	203 653
Manufacturing	913 600	907 700

a Includes non-manufacturing activity.
Source: ABS cat. nos 8126.0 and 8221.0.

Another way to put the telecommunications equipment industries into perspective is to compare their activity with the providers of telecommunications services, such as Telstra and Optus. In 1995–96, the turnover for telecommunications services totalled just under $18 billion compared with turnover for telecommunications equipment (including cables) of $2.7 billion (see table 2.4).

A number of activities of a different nature are commonly included in the IT&T sector. They include:

- manufacture of equipment, such as computers and telecommunications equipment;
- development of software and services to operate this equipment;
- applications software;
- basic communication services, such as local and international voice and data calls; and
- value added services, including data services, multimedia and the provision of content and information.

Activities under reference in this inquiry centre on the manufacturing of equipment, together with associated systems and services. However, only a minority of value in the IT&T sector is associated with hardware manufacturing. Thus, within the IT&T sector, it is the *use* of equipment that generates by far the greater value, not its *manufacture*. As the recent Cutler report commented: 'there is ... a new premium accruing to content and information management relative to hardware' (Cutler report 1997, p. 12).

Even activity associated with telecommunications equipment manufacturing is far from homogeneous. Australian activity ranges from R&D, product design and development, fabrication, assembly, software development and writing, systems design, product installation and service. Not all firms undertake this full range of activity for all their products. Some firms mostly assemble to overseas designs, whereas others develop products in Australia. In general, most electronic components are imported.

The recent Cutler report suggested that, in view of characteristics such as these, it is not necessarily appropriate to treat the IT&T sector as a whole for the purpose of domestic policy formation:

> [the sector] is a grouping of very different activities, ranging from electronic components, hardware, computer software through to communications networks and content production ... it is [not] always useful to talk about strategies for the 'sector' as whole — what works for manufacturing assembly is not very relevant to content provision ... (Cutler report 1997, p. 5)

Worldwide

The IT&T sector worldwide, including its telecommunications equipment components, is in a state of rapid change and development. The main driving forces include rapid and ongoing technological change (see chapter 3), deregulation of communications activities within countries (see chapter 8), and increasing trade liberalisation (also see chapter 8). Together such forces act to reduce costs and increase demand worldwide, while increasing competitive pressure.

Most of the significant telecommunications equipment multinational companies (MNEs) manufacture in Australia. In addition, there are a large number of smaller indigenous companies operating in the telecommunications equipment industries. However, the Australian industries are very small, their total output being well below $5 billion — the worldwide activity (including non-telecommunications activity) of Siemens alone is almost 20 times greater (see table 2.2). Further, compared with the sector worldwide, the Australian telecommunications equipment industries appear relatively static. For example,

none of the indigenous Australian telecommunications equipment firms has developed into a major international operation, in the way that overseas firms such as Nortel, Nokia and Cisco have done.

Table 2.2: Major OECD telecommunications equipment manufacturers[a]

Manufacturer	*Country*	*Revenue*	*Employees*
		US$m	persons
Siemens	Germany	61 942	373 000
Fujitsu	Japan	39 978	165 056
Alcatel NV	France	32 141	191 830
NEC	Japan	46 729	152 719
Lucent Technologies	US	23 286	124 000
Motorola	US	27 037	142 000
LM Ericsson	Sweden	13 846	84 513
Northern Telecom	Canada	10 653	63 715
Nokia	Finland	8 429	31 948
Total		264 042	1 328 781

a These data cover all company activities including non-telecommunications business.
Source: OECD 1997, vol. 1, p. 16.

This raises issues about the nature and extent of any comparative advantage which Australia might have, especially in telecommunications equipment manufacture. In particular, can the existing Australian industries prosper in the more open markets emerging in the sector? Relevant factors are discussed in the final section of the chapter.

2.2 Structural features

Specific data for the industries under reference are limited. And different data sets —from the AIIA, DIST's 'pulse' survey, and the ABS — are different in coverage and sometimes contradictory. Wherever possible, the Commission has preferred to rely on ABS data.

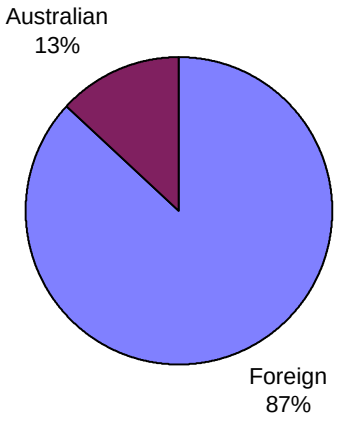
Despite data limitations, however, it is possible to indicate some of the main features of those industries, particularly for manufacturing activity, and to indicate recent trends.

Size, ownership and concentration

ABS data indicate that there were about 180 firms specialising in the telecommunications equipment (including cables) manufacturing industry in Australia in 1995–96. However, most were small, with relatively few firms of any significant size. Further, as indicated by table 2.3, most of the larger producers are the Australian subsidiaries or operating entities of large foreign-owned companies.

Of the 16 firms listed in the table, six have Australian ownership. Further, as reflected in employment levels, the indigenous firms are much smaller on average than those which are foreign owned (see figure 2.1).

Figure 2.1: Employment shares by ownership



Source: Derived from table 2.3.

The Australian telecommunications equipment industries are highly concentrated — with over 50 per cent of employment accounted for by the three largest firms, and over 80 per cent of employment by the top 10 firms (based on tables 2.3 and 2.4).

Table 2.3: Major Australian telecommunications equipment manufacturing firms[a]

Company	*Owner-ship*	*Year*	*Revenue*	*Exports*	*Employ-ment in Australia*	*R&D*
Ericsson Australia	Foreign	1997	$1057m	$130m	2275	$109m
Alcatel Australia	Foreign	1996	$579m	$123m	1888	$62m
NEC Australia	Foreign	1997 –98	$558m	$76m	1445	$43m
Motorola Australia	Foreign	1996	$259m	$5m	550	$6m
Nortel Australia	Foreign	1996	$232m	$55m	520	$12m
Fujitsu Australia	Foreign	1997 –98	$165m	$80m	500	$14m
Siemens	Foreign	1996 –97	$232m	$18m	408	$11m
Pirelli Cables Australia	Foreign	1997	$130m	$12m	400	$1m
ERG Telecommunications	Aust	1996 –97	$75m	$25m	330	$4m
JNA Telecommunications	Aust	1996 –97	$69m	$14m	279	$8m
Jtec	Aust	1996 –97	$27m	$6m	250	$12m
Lucent Technologies Australia	Foreign	1996 –97	$65m	$22m	200	$3m
Scitec Communication Systems	Aust	1996 –97	$40m	$13m	180	$3m
NetComm/Banksia	Aust	1996 –97	$67m	$1m	130	$3m
Nokia Telecommunications	Foreign	1995	$138m	$22m	105	$4m
Datacraft Technologies	Aust	1997 –98	$17m	$10m	70	$1m

a Includes 16 of the larger firms for which information is available to the Commission, ranked by employment level in Australia. For some firms, includes some non-telecommunications activity.

Source: Nokia information from Paul Budde Communication, other information direct from firms.

Snapshot information

Special ABS data collections about activity in the IT&T sector give snapshot information for 1992–93 and 1995–96 about the activities under reference. A range of structural data for telecommunications equipment firms (including cables) is set out in table 2.4.

Table 2.4: Structural data for telecommunications equipment and cables manufacturing[a]

		1992–93			*1995–96*		
Item	*Unit*	*Equipment*	*Cables*	*Total*	*Equipment*	*Cables*	*Total*
Employment	persons	7 705	1 087	8 792	7 335	3 369	10 704
Total income	$m	1 802.7	412.3	2 215.0	1 659.7	1 072.5	2 732.2
Turnover	$m	1 795.3	405.5	2 200.8	1 633.2	1 064.4	2 697.6
IT revenue	$m	1 752.4	404.6	2 157.0	1 564.7	1 035.6	2 600.3
Wages and salaries	$m	323.2	43.7	366.9	351.2	155.6	506.8
Total expenses	$m	1 730.1	316.4	2 046.5	1 347.0	1 040.0	2 387.0
Operating profit before tax	$m	93.8	124.3	218.1	284.5	53.7	338.2

a The data in this table were collected on a 'management unit' basis. It covers telecommunications equipment (including cables) units classified to ANZSIC 2842 (equipment) and ANZSIC 2852 (cables). The units for which data are included in this table correspond closely to the industries under reference.

Source: ABS cat. no. 8126.0.

Overall, total income of the industries under reference grew by nearly 25 per cent between 1992–93 and 1995–96. However, the trends in equipment and in cables differed markedly. In the case of equipment manufacturing, both income and employment fell over the period — by about 8 per cent and 5 per cent respectively. However, cables output grew strongly — reflecting the cable rollouts of Telstra and Optus — with an income increase of about 160 per cent, and employment growth of over 200 per cent.

As a result, the orientation of the telecommunications equipment industries moved markedly towards cables. In 1992–93, equipment accounted for about 80 per cent of total output, with cables accounting for about 20 per cent. By 1995–96, however, equipment had fallen to about 60 per cent, and cables increased to about 40 per cent, of total output.

Data from the AIIA Annual Survey 1997 show overall growth for the telecommunications equipment industries increasing strongly into 1996–97. However, the data do not distinguish between equipment, cables and services. Similarly, data from DIST's Communications Industry Pulse Survey show growth of about 14 per cent for 1997 over 1996 levels, but they also do not separate cables and services from equipment in accordance with the Commission's terms of reference. Thus available data do not show whether the share of equipment has rebounded since 1995–96, although this could be expected with the cable rollouts virtually at a standstill.

ABS data suggest that firms engaged in telecommunications equipment manufacturing (as distinguished from cables manufacturing) may be quite specialised. Thus in Australia, until 1995–96 at least, the traditional telecommunications equipment manufacturing firms appear to have faced little loss of sales to firms in other industries, such as computing (also see section 2.4 and chapter 3).

Distinctive features

As demonstrated in table 2.1 above, the industries currently under reference are small in the context of the Australian IT&T sector and of manufacturing as a whole, making up just over 5 per cent and 1 per cent of employment, respectively.

But are there particular characteristics which distinguish telecommunications equipment manufacturing from Australian manufacturing industries generally?

Alliances

One feature is the 'strategic alliances' entered into by firms operating in the telecommunications equipment sector. There are alliances — or 'cooperative corporate strategies' —between equipment manufacturers and their carrier customers, and between manufacturers and suppliers.

A 1996 study into the nature of strategic alliances in Australia's telecommunications sector gave examples of such alliances:

- Telstra with Siemens, Alcatel, Ericsson, Nortel and NEC;
- Alcatel with Jtec;
- Optus with DEC, Fujitsu, Leightons, Nokia, Nortel and NEC;
- Nokia with ERG; and
- Vodafone with Ericsson and Keycorp. (More and McGrath 1996, p. 20)

The study also notes (p. 8) that the telecommunications industry development plans, together with the PfD and FTA arrangements, place emphasis on the development of such strategic alliances (see chapters 6 and 7).

Another type of alliance, with potentially significant implications for telecommunications equipment manufacturers, and suppliers of related systems and services, is that between the various telecommunications carriers. For example, Telstra is a member of the World Partners alliance aimed at the global business customer market, and has been associated with alliances involving BT and with US Sprint. Optus' shareholders, Cable & Wireless and BellSouth, link it globally; and Vodafone is majority owned by Vodafone UK. If such alliances extend to the use of commonly preferred equipment, then particular equipment manufacturers (or those in some particular countries) might be advantaged.

Telecommunications equipment manufacturers are located mainly in Sydney and Melbourne. This would facilitate the formation of strategic alliances, particularly given the similar location of carriers such as Telstra, Optus and Vodafone. However, according to the 1997 report by Charles et al on the competitiveness of Australia's information industries the reasons for this concentration are similar to those for the concentration of manufacturing industry generally in New South Wales and Victoria:

> Manufacturing tends to be concentrated because of the importance of economies of scale; the need to be close to suppliers; the need to be close to customers (eg Telstra); and the need for access to a broad skills pool. (Charles et al 1997, p. 14).

There is nevertheless some activity outside Sydney and Melbourne. For example, ERG manufactures mobile telephony base stations, paging systems and rural telephony products in Perth, and Olex has a cable manufacturing plant in Brisbane.

R&D

Worldwide, the IT&T sector devotes significant resources to R&D. Indeed, IT&T is one of the leading sectors in terms of R&D, together with aerospace and pharmaceuticals. In Australia too that sector is one of the highest spenders on business R&D. As a percentage of sales, analysis of 1993–94 data shows that business R&D in Australia was highest in office and computing machinery, pharmaceutical products, communications equipment, and medical and scientific equipment (DIST 1996b, chart 1.9).

The major multinational telecommunications equipment firms devote a high proportion of worldwide revenue to R&D — see table 2.5. Such high expenditure is also generally characteristic of their Australian operations although, as noted by IBM (Sub. D4, p. 3), the proportion spent on R&D in

Australia is generally less than that spent worldwide. R&D expenditure in Australia may be influenced by commitments entered into under the PfD and FTA schemes, and the telecommunications industry development plans. Further, there is some evidence that Australia has advantages as a location for R&D in the IT&T sector (see section 2.4).

Table 2.5: R&D expenditure of major telecommunications equipment manufacturers

	Worldwide[a]		*Australia*
Manufacturer	*R&D expenditure*	*R&D as a percentage of revenue*	*R&D as a percentage of revenue*
	US$ million	%	%
Siemens	5 076	8.2	4.7
Fujitsu	3 681	9.2	8.5
Alcatel NV	3 246	10.1	10.7
NEC	3 174	6.8	7.7
Lucent Technologies	2 287	9.8	4.6
Motorola	2 197	8.1	2.3
LM Ericsson	2 116	15.3	10.3
Northern Telecom	1 577	14.8	5.2
Nokia	580	6.9	2.9

a These data cover all company activities including non-telecommunications business.

Source: OECD 1997, vol. 1, pp. 16, 47, and table 2.3 (above).

The major indigenous telecommunications equipment firms also spend a relatively high proportion of revenue on R&D: based on information in table 2.3, Jtec, JNA and Scitec respectively spent about 44 per cent, 12 per cent and 8 per cent of revenue on R&D in 1996–97. This compares with the average for Australian manufacturing generally of just over 1 per cent for 1995–96 (derived from data in ABS cat. nos 8104.0 and 8221.0).

Employment

Given the nature of the industry and its high R&D intensity, it could be expected that it would employ a higher proportion of skilled and professional people than manufacturing generally. Indeed, there is evidence to suggest that the availability of such people in Australia has been a factor supporting local R&D (see section 2.4).

No direct data on employment structures were available. But some indirect evidence is given by average wages. For telecommunications equipment manufacturing for 1995–96, average wages were relatively high at almost $48 000 (see table 2.4), compared with less than $34 000 for other electronic equipment, and about $33 000 for manufacturing overall (based on ABS data).

2.3 Performance and competitiveness

Performance and competitiveness for any industry are difficult to measure meaningfully, as the economic environment is continually changing in a number of important domestic and international respects. For example:

- fundamentals such as interest rates and exchange rates continually change, reflecting changes in domestic and overseas economic settings;
- regulatory and institutional changes are frequently made, domestically and overseas; and
- industry specific assistance measures change over time.

Thus, measured performance and competitiveness reflect not only changes internal to an industry (such as increased productivity, or better management) but these external factors as well.

Nevertheless, recent trends in some key areas can give some indication about performance and competitiveness. In this report, these terms are used in the following way:

- **Performance:** measures changes within an industry over time — for example, how much has output increased? have prices changed? and has productivity increased?
- **Competitiveness:** compares the performance of an industry with other industries, both its overseas counterparts and other domestic industries, allowing for the effects of assistance and other government interventions. Relevant indicators include market shares, and export:import ratios.

The report to the Information Industries Taskforce by Charles et al (1997), focussing on the competitiveness of the Australian IT&T sector, extended the notion of competitiveness to competition between nations. In particular, it examined ways of making Australia more attractive as an investment location for international capital. Some of the relevant issues are discussed in other chapters of this report.

Institutional settings and assistance measures

A number of government interventions within Australia affect the performance and competitiveness of the Australian telecommunications equipment, systems and services industries. These include the telecommunications industry development arrangements (see chapter 6), and government purchasing arrangements (see chapter 7). These aim to encourage local manufacture and exports, local R&D and product development, and strategic alliances between purchasers and suppliers.

At the same time, a number of international agreements and arrangements are serving to free up international trade in telecommunications equipment, systems and services, heightening foreign competition as well as enhancing access to overseas markets (see chapter 8).

In the past, local telecommunications equipment and cables manufacture have been protected by high tariffs, with some goods (eg modems and multiplexors) assisted by bounty. Over the last decade, tariff rates have gradually declined to 15 per cent at 1 July 1992, continuing down to the current level of 5 per cent (or less). In accordance with Australia's obligations under the Information Technology Agreement (see chapter 8), those tariffs are scheduled to be set to Free at 1 January 2000 (with the exception of some coaxial cables which will remain at 5 per cent). Bounty assistance ceased on 1 July 1997. With the exception of some electronic components which have not been protected, most parts have also been subject to high tariffs — now reduced to 5 per cent and also scheduled, under ITA obligations, to be set to Free at 1 January 2000. The previous high tariff on printed circuit boards was replaced by bounty in 1991 — as noted above, bounty ceased on 1 July 1997.

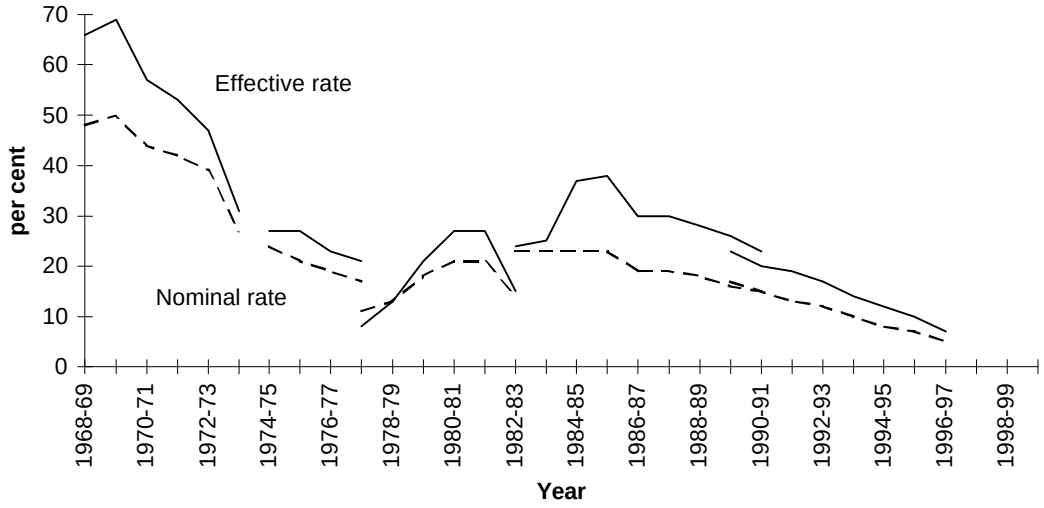
These assistance structures have meant that the goods currently under reference have traditionally received significant levels of nominal and effective protection. While figure 2.2 relates to a broader range of activity than is currently under reference, it illustrates how far protection levels have now fallen.

Should tariff reductions be brought forward?

Some participants argued that tariff reductions should be brought forward. IBM considered that all tariffs on IT&T related products should be removed on 1 July 1998 for two reasons:

- tariff and non-tariff barriers to trade impeded the flow of IT goods, services and capital to and from Australia; and
- the removal of the computer bounty had created an 'anomalous' tariff environment. (Sub. 2, p. 13)

Figure 2.2: Nominal and effective rates of assistance[a]



a As estimates are not available on an ANZSIC basis, this chart presents data for ASIC class 3352 'Electronic Equipment N.E.C.'. Data for 1968-69 to 1977-78 include ASIC class 3351 'Radio and TV receivers; audio equipment'. Data in this figure are for a much broader range of equipment than is currently under reference. Breaks reflect breaks in series as the estimates were rebased to reflect changes in the structure of the manufacturing sector.

Source: IC 1995c, tables 6.1, 6.3, 6.4 and 6.6.

The Australian Information Industry Association (AIIA) gave another reason why tariffs should be reduced earlier than planned — classification difficulties currently being experienced, given the current duty free entry of computing equipment and the substantive tariffs applying to telecommunications equipment. Its solution would be to remove tariffs on telecommunications equipment immediately:

> [tariffs] perpetuate a division between telecommunications equipment and computer equipment which is quite anachronistic. The field is converging and you can have unfortunate classification decisions at the waterfront that put your telecommunications equipment one day into computer and the next day into telecommunications. Then you can spend time arguing with the Australian Customs Service about it. It's a blurred line, it creates uncertainty and since we are heading towards zero, why don't we get bold and do it now. (Transcript, p. 55)

And Nortel indicated that LAN equipment is duty free, but the same equipment when used as WAN equipment is dutiable at three per cent (Sub. D7, p. 4).

However, the classification problem has already been addressed by the government. In its December 1997 policy statement *Investing for Growth* it announced that:

> the government will ensure that, whenever doubts over classification of information technology equipment arise, the lowest tariff will be applied. (Howard 1997, p. 79)

The government also announced that it:

> will remove tariffs on inputs to the manufacture of information industries equipment to reduce input costs and avoid a situation of 'negative assistance', after a short consultation process with local component suppliers to assess the likely impact on them. (Howard 1997, p. 79)

In the context of *Investing for Growth*, the telecommunications equipment industries are included in the scope of the 'information industries'.

The effect of implementing the government's two measures would be to:

- reduce tariffs on telecommunications equipment, where classification difficulties arise, in advance of the scheduled 1 January 2000 target; and
- remove tariffs on telecommunications equipment inputs in advance of that target.

The AIIA's comments about convergence suggest that the areas of classification difficulty could be wide and likely to increase. This would mean that the remaining areas subject to tariff should be narrow, given the government's decisions reported above. There would nevertheless be significant administrative and compliance costs, due to the subjective nature of any tariff classification dispute. These costs could be avoided if the reductions in tariffs for *all* telecommunications equipment were brought forward. Such action would also involve little difference in protective effect from the decisions already announced by the government.

Based on 1996–97 imports of about $1760 million, total revenue forgone from such reductions could be no more than about $85 million in each of 1998 and 1999. However, it is not possible to separate the cost of the reductions already announced by the government from the additional cost arising from bringing forward the other reductions.

Recommendation

Tariff removal scheduled for goods under reference covered by the WTO Agreement on Information Technology (the ITA) should be brought forward and take effect at the same time as the tariff measures announced by the Commonwealth Government in *Investing for Growth*.

Output

As indicated in table 2.4, output of telecommunications equipment and cables (as measured by turnover) increased by some 23 per cent in nominal terms between 1992–93 and 1995–96. This was due to a strong increase of about 160 per cent in cables manufacture, whereas there was a decline of about 8 per cent in equipment. However, given that prices for telecommunications equipment have been generally declining in recent years (a precise measure is not available), it is likely that the volume of equipment output could have increased, perhaps significantly.

Because of the cyclical nature of demand for much telecommunications equipment, including cables, future performance need not reflect the past (see section 2.4). For instance, the dual rollout of Telstra and Optus has come to a standstill, which will reduce domestic demand for cable. And, in the case of equipment, Telstra's FMO upgrading is now largely complete (see chapter 3). However, there could be some additional equipment demand arising from the licensing of new carriers.

Productivity

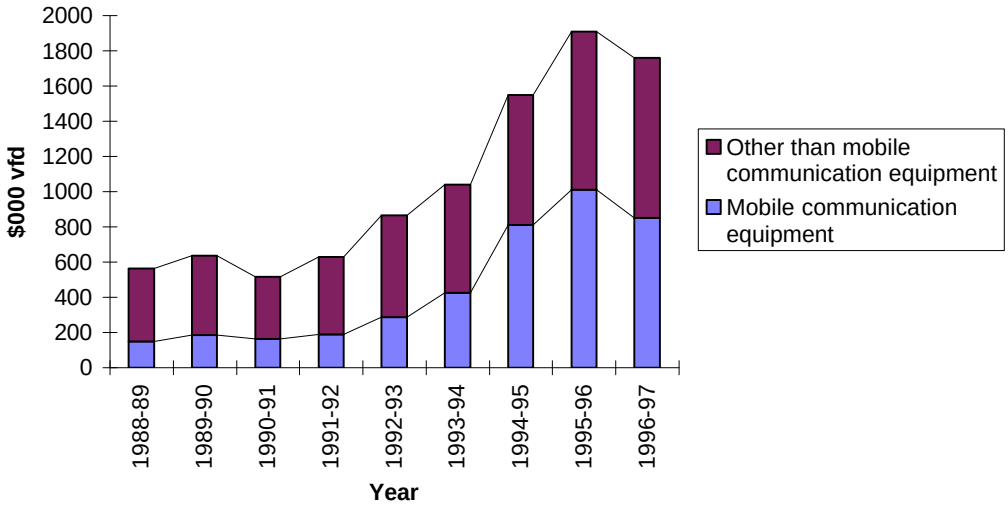
Useful data about productivity are unfortunately not available. However, the indications are that productivity performance over the 1992–93 to 1995–96 period has been stronger in the equipment sector than in the cables sector, despite the strong growth in cables output and the decline in equipment. For instance, table 2.4 indicates that turnover per employee in the equipment sector declined only marginally from about $230 000 to about $220 000 — possibly representing significant productivity growth if price changes could be taken into account — but that it declined in the cables sector from about $370 000 to $320 000.

Similarly, while operating profit per employee more than trebled over the period in the equipment sector, it declined by about 85 per cent in cables.

Imports

For the years since 1988–89, imports of telecommunications equipment (including telecommunications cables) have more than trebled. Import levels were stable in the first few years (see figure 2.3), but since then increased markedly, prior to a fall of some 8 per cent in 1996–97. (Appendix C sets out more detailed information about imports and exports.)

Figure 2.3: Imports of telecommunications equipment (including cables)



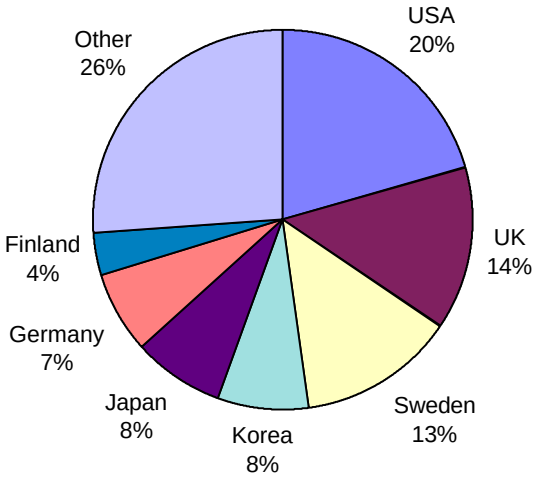
Source: Derived from ABS data.

A significant factor driving growth in imports has been the mobile communication market. Since 1991–92, annual imports of mobile phones and mobile radio communication equipment have increased fourfold to about $1 billion, while other imports have doubled to about $900 million. Parts make up the largest component of the 'other' category. The main sources of imports in 1996–97 are shown in figure 2.4.

Domestic market shares

With growth in imports exceeding growth in domestic production, the overall share of the domestic market obtained by local industry appears to have declined in recent years. Between 1992–93 and 1995–96 (see tables 2.6 and 2.7), the estimated total market share of the local industry declined from about 62 per cent to about 53 per cent.

Figure 2.4: Sources of imports 1996–97



Source: Derived from ABS data.

Table 2.6: Sales, exports, imports, and domestic market share, 1992–93

Item	*Revenue from domestic production*[a]	*Exports*[b]	*Imports*[b]	*Domestic market share*[c]
	$m	$m fob	$m vfd	%
Telephonic or telegraphic switching equipment	642.4	21.4	88.6	85
Coaxial communication cables, other coaxial electric conductors and optical fibre cables	410.4	72.1	19.0	93
Other communication cables	91.3	4.5	11.4	86
Communication equipment nes	1 302.2	379.8	831.5	47
Total	**2 446.3**	**477.8**	**950.4**	**62**

nes not elsewhere specified.

a Includes exports.

b Not strictly comparable with other export and import data shown in this report.

c Sales minus exports divided by the estimated domestic market. This equals sales minus exports plus imports, where imports have been adjusted to an estimated landed duty paid basis. Estimates ignore possible stock changes.

Source: Derived from ABS cat. no. 8126.0.

Table 2.7: Sales, exports, imports, and domestic market share, 1995–96

Item	*Revenue from domestic production*	*Exports*	*Imports*	*Minimum domestic market share*
	$m	$m fob	$m vfd	%
Telephonic or telegraphic switching equipment	813.7	71.5	41.4	94
Coaxial communication cable, other coaxial electrical conductors and optical fibre cables	433.4	51.0	88.4	79
Other communication cables	525.6	6.9	22.3	95
Other communication equipment	677.8	477.5	1 769.2	na
Unspecified	765.8	–	–	
Total	**3 216.3**	**606.9**	**1 921.3**	**53**

See footnotes for table 2.6.

Source: Derived from ABS cat. no. 8126.0.

The tables indicate that local industry market share:

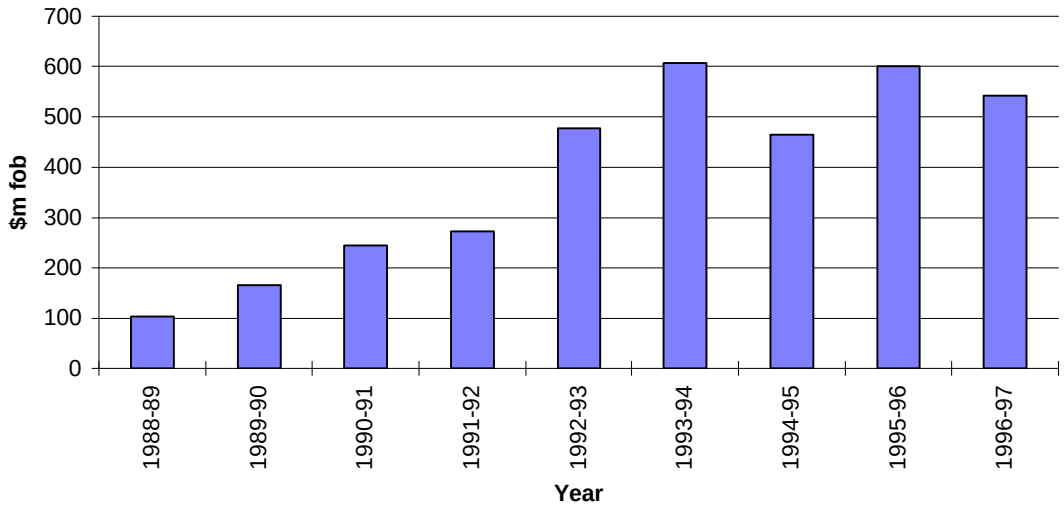
- increased for telephonic and telegraphic switching equipment, and for 'other communication cables';
- may have fallen for coaxial and optical fibre; and
- also may have fallen for 'communication equipment nes/other communication equipment'. The maximum possible market share for domestic producers in 1995–96 would have been about 35 per cent (allocating all 'unspecified' production to that category) — compared with 47 per cent for 1992–93.

The items 'communication equipment nes' and 'other communication equipment' include a wide range of equipment, including mobile phones and other mobile communications equipment, telephone sets, facsimile machines, modems and multiplexors. Local manufacturers do not compete in some of the important areas included in these items, such as facsimile machines. Excluding such equipment from the comparisons would, of course, increase the overall market share obtained by local producers, both for those categories and for domestic production in total.

Export performance

Exports have also grown strongly since 1988–89, increasing each year to 1993–94, with the total for the latter year being about six times that for the first. Since 1993–94, performance has been more variable, with declines in both 1994–95 and 1996–97. (See appendix C for more details.)

Figure 2.5: Exports of telecommunications equipment (including cables)



Source: Derived from ABS data.

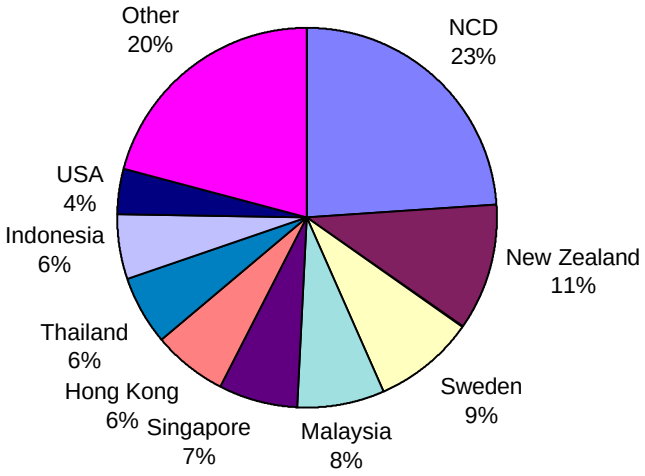
In 1996–97, the main areas of export activity appear to have been parts (about 42 per cent of the total), mobile communication equipment (24 per cent), and optical fibre cables (10 per cent).

Main export destinations for 1996–97 are shown in figure 2.6. Unfortunately, country of destination is not available for nearly 25 per cent of exports. At least one third of exports went to Asian countries. This suggests some possible future adverse effect, given the recent economic troubles in some of those countries. Indeed, a recent AIIA survey reported that more than 80 per cent of IT&T exporters active in the region are already suffering some adverse effects. Some exporters, however, see positive longer term opportunities as the situation eases.

Export:import ratios

Recent reports, including that by Mortimer (1997), have expressed concern at a growing gap between imports and exports in the IT&T sector. Chapter 5 discusses this from an industry policy perspective.

Figure 2.6: Export destinations 1996–97



Note: NCD = no country details available.
Source: Derived from ABS data.

The gap between imports and exports remained fairly constant over the period from 1988–89 to 1993–94, then increased significantly in the following three years (see table 2.8).

Table 2.8: Comparison of import and export values ($m)

Year	*Imports*	*Exports*	*Gap*
1988–89	562	104	458
1989–90	638	166	472
1990–91	517	245	272
1991–92	628	272	356
1992–93	867	478	389
1993–94	1 042	607	435
1994–95	1551	465	1086
1995–96	1 909	602	1307
1996–97	1 760	543	1217

Source: Derived from ABS data.

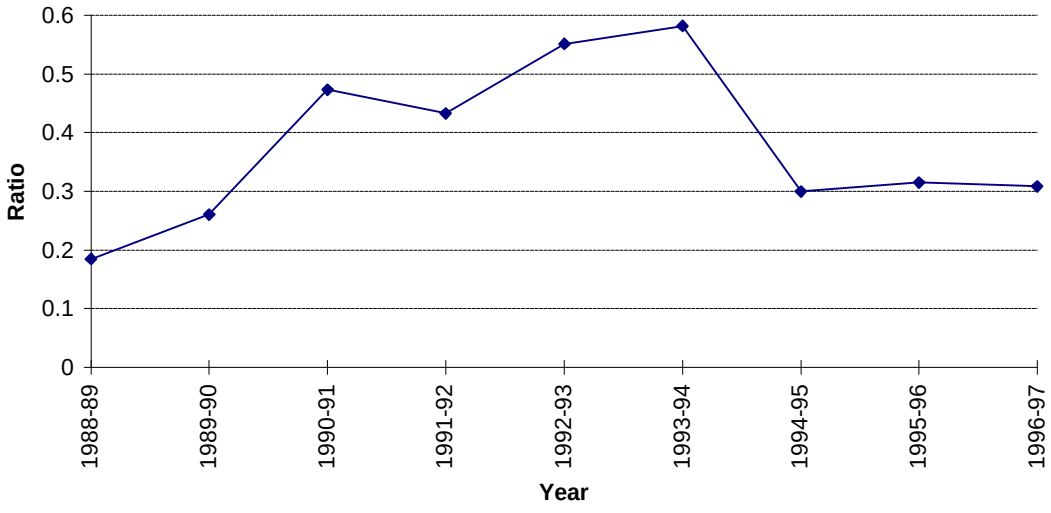
Over the period from 1988–89 to 1993–94, the *relative* gap between imports and exports of telecommunications equipment closed significantly. This is

illustrated in figure 2.7, which sets out export:import ratios. But this ratio has fallen significantly in the last three years, compared with earlier years.

Taken at face value, this information could indicate an improvement in competitiveness of the Australian telecommunications equipment industries over the 1988–89 to 1993–94 period, followed by a fall in 1994–95.

However, for a number of reasons, measures of the gap between imports and exports, whether absolute or relative, can be very misleading as indicators of changes in competitiveness (see chapter 5 which discusses whether a (growing) trade deficit in particular goods such as telecommunications equipment is cause for concern). For example, the telecommunications industry development plans and government purchasing arrangements such as the PfD and FTA may have encouraged exports to grow more quickly than otherwise. If this is the case, any improvement in underlying competitiveness could be overstated. Further, if commodities for which Australian industry has little production, or very little chance of producing competitively, together with parts and components, were to be excluded from the import data, export:import ratios would increase significantly — although the *pattern* shown in figure 2.7 would be largely unchanged.

Figure 2.7: Export:import ratio



Source: Derived from ABS data.

2.4 Outlook

Available data are incomplete. But it appears that although the Australian telecommunication equipment industries in total may have grown significantly

over the last five to ten years, much of this growth — at least in recent years — has been due to increases in cable production. In value terms, production of equipment appears to have fallen between 1992–93 and 1995–96. Paradoxically, however, productivity performance appears to have been better in the equipment sector than in the cables sector. Competitiveness data are also sketchy — imports have generally increased, but declined in 1996–97; similarly, exports increased to 1993–94, but have fluctuated since then; and the market share of domestic producers decreased overall between 1992–93 and 1995–96, but increased in some product categories.

The Commission's discussions with firms and industry representatives suggest that the next few years might be quite difficult for local manufacturers, multinational and indigenous firms alike.

Demand

Demand for telecommunications equipment responds to a number of different factors: for example, deregulation of communications services such as has occurred in Australia and other countries during the 1990s, growing demand for communications services from users, and changes in technology. Some factors translate into an intermittent cyclical demand for equipment (and associated systems and services), whereas others bring steadier growth.

In 1995, for example, domestic demand substantially increased, particularly for cables, due to competition between infrastructure providers rolling out new local access networks with broadband capabilities (OECD 1997, vol. 1, p. 57). This rollout is now virtually at a standstill, and Telstra's FMO project to digitalise most of its network is largely complete (see chapter 3).

Another example is provided by mobile phones: as the market approaches saturation, demand for mobiles would be expected to decline. But in the short term, this effect could be moderated by the phasing out of the analogue network.

Changes in demand can have significant implications. For instance, it has been reported that the cables group of Pacific Dunlop suffered more than a 40 per cent drop in profit in the first half of 1997–98, 'as the pay TV rollout came to an end and a weaker telecommunications market reduced demand for optical fibre cable' (AFR, 13 February 1998, p. 37).

It is likely that in at least some domestic market segments the current cycle of growth in demand for telecommunications equipment and cables has ended. According to Paul Budde Communication, growth in the equipment market will drop back to more 'normal' levels. It expected a fall in mid 1997, with further

significant drops in the 1998 to 2000 period. Some new developments are expected, but:

> while these projects might ease the pain in some corners, this development will not be enough to compensate for the dramatic fall of revenues in the total equipment industry. (Budde 1997b, section 2)

It is possible that there will be some additional demand arising from the licensing of new carriers in Australia, and through equipment needs from new technologies such as low earth orbiting satellites. Another offsetting factor could be increasing opportunities for Australian telecommunications equipment manufacturers arising from trade liberalisation in other countries (see chapter 8). But there, too, demand can be cyclical. For example, according to the OECD, digitalisation programs in a number of countries have been completed or are nearing completion (OECD 1997, vol. 1, p. 61). And the current Asian economic crisis could affect future export levels.

Competition

Reduced demand, or reduced demand growth, will heighten competitive pressures and place further downward pressure on prices. According to the OECD *Communications Outlook 1997* prices for telecommunications switching and transmission technology have been declining:

> this is due both to technological change and the pressure placed on equipment manufacturers by increasing competition. Much of this competition has developed as liberalisation of service markets has forced [telcos] to source more efficiently rather than rely on traditional links to 'home country' suppliers. (OECD 1997, vol. 1, p. 61).

Other factors likely to increase the competition faced by the local industries include:

- elimination in Australia of remaining tariff protection against imports by the year 2000 (however, earlier elimination of tariffs on inputs could offset this factor);
- deregulation and international agreements. Although these are demand expanding for communication services, they bring greater competitive disciplines to domestic equipment suppliers. For example, Telstra is adopting a more 'commercial' attitude towards suppliers, with less emphasis on buying Australian and more emphasis on value for money: 'increased competition has forced [Telstra] to look for the best and most competitive suppliers in an increasingly global market' (Budde 1997b, section 2);

- continuing convergence of telecommunications and other electronic equipment as technology advances can bring new competitors to the traditional telecommunications equipment manufacturing firms (see chapter 3); and
- the continuing move towards international standards, which could reduce any protective effect from domestic standards (see discussion in chapter 3).

At the same time, international deregulation and trade liberalisation should bring greater opportunities for Australian manufacturers to compete in export markets. To be successful in global markets, Australian suppliers will need to respond by developing suitable products at competitive prices.

The question arises as to whether indigenous firms will be able to cope as well as the multinationals with increasing competition. Jtec commented that:

> where there were 10 [indigenous] companies in [the telecommunications equipment] area about 18 months ago, there's three left. And in the period of the greatest growth in telecommunications in world history, that's an extraordinary thing. (Transcript, p. 4)

According to Paul Budde Communication, although the international big six companies operating in Australia had 'another bumper year in 1996', the Australian equipment companies were 'suffering badly':

> Local companies have made management mistakes they simply cannot afford and have lost from the often far more professional and certainly more experienced global players. (Budde 1997b, section 2)

A number of other senior executives saw the financial difficulties faced by companies such as Exicom, AWA and Stanilite in recent years as largely reflecting management problems. Other Australian companies are rationalising operations or considering extending offshore production.

If management is the key, there can be optimism that well managed Australia indigenous firms will do well despite increasing competition. But if factors such as scale and export orientation are also important, then the indigenous firms could find the competitive environment of the next few years more difficult than the multinationals. However, this is not to say that those firms could not prosper in particular niche activities or markets. The next section presents views about the possible strengths and weaknesses of the Australian telecommunications equipment industries.

Views about strengths and weaknesses

Between them, firms visited by the Commission canvassed a number of possible competitive advantages held by the Australian telecommunication equipment industries:

- high quality scientists, engineers and computer programmers;
- salaries generally below those of other countries with comparably skilled people;
- English speaking;
- leading edge customers in Australia;
- proximity to Asian markets;
- good public research infrastructure (including CRCs, telecommunications research institutes, the CSIRO and the universities); and
- an attractive lifestyle.

There seems broad agreement within the sector that Australian companies could continue to perform well in R&D, software and services. According to information in the report by Charles et al (1997), Australia has a strong competitive position in R&D (see table 2.9). Although spending on R&D by the multinational firms is not always as high as elsewhere (see table 2.3), the high levels of R&D expenditure in Australia by telecommunications equipment firms compared with the low levels for manufacturing generally support this proposition. The provisions of the PfD scheme and other industry development arrangements may have encouraged higher R&D expenditure than would otherwise occur (see chapters 6 and 7).

Some firms, however, noted some possible changes in these inherent advantages. For example, there was some indication of emerging skill shortages in some areas. Jtec commented that attracting multinational companies to invest in Australia was 'bidding up the price of local engineers in a market where there are none available anyway' (Transcript, p. 6). And the AIIA reported growing concern that skills shortages have the potential to limit the growth of the industry in Australia (Transcript, p. 62). Further, other countries were rapidly developing appropriate skills. There was also criticism of some recent government actions which could detract from the abilities of Australian firms to compete — for instance, the reduction in August 1996 in the rate of tax concession for business R&D expenditure, scrapping of the DIFF scheme, and changes to the EMDG arrangements. As well, there were concerns (discussed in other chapters of the report) about industry development arrangements, availability of capital, and tax. Recent reports, including the Goldsworthy report, have made recommendations aimed at strengthening the IT&T sector,

including the telecommunication equipment industries. The government has responded to some of these concerns and recommendations in its *Investing for Growth* industry statement.

Table 2.9: Comparative costs of R&D

Country	*Small research group*	*Large research group*
Australia	100	100
France	188	173
Germany	198	237
Hong Kong	178	192
Indonesia	80	92
Japan	244	257
Malaysia	85	90
Singapore	132	146
South Korea	123	125
Taiwan	122	131
UK	124	122
USA	141	144

S*ource:* Charles et al, p. 31, quoting the Strategic Industry Research Foundation, 1995.

There were some differences of view about the future prospects for telecommunications hardware manufacturing in Australia. AAPT viewed the opportunities for continuing local manufacture as 'medium' to 'high' (see table 2.10).

However, there are some indications that Australia's telecommunication equipment industries may be gradually shifting from production of hardware (including cables) towards software and services, in response to both competitive pressures and Australia's competitive advantages. Nortel considered that Australia should take advantage of the opportunities offered:

> Australia's competitive advantage in high skill, high value added industries must be exploited. Conversely, manufacturing activities characterised by low skill and low value added production, are unlikely to be competitive over time. Accordingly, the model envisioned by Nortel is one that sees concentration of value added in the early stages of the product life cycle (ie design, development, initial production) when the demand for intellectual content is high and sensitivity to labour costs is low. This model can accommodate offshore production to take advantage of offshore low cost labour markets in cases where greater sensitivity to labour costs emerges during the mature phase of the product manufacturing cycle. Nortel also emphasises that as the nature of our industry is dramatically shifting towards

> content that Australia's expertise in applications development will ensure that increasing value can be added at all stages of the product lifecycle and will ensure that Australia's share of production increases over time with competitive advantage linked to continuous innovation and applications development. (Nortel 1995, p. 88)

Table 2.10: AAPT's views about local opportunities

Product category	*Local design opportunity*	*Local manufacturing opportunity*	*Local support opportunity*
Information technology			
Hardware	Low/medium	Medium	High
Software	High	High	High
Services	High	High	High
Telecommunications			
Submarine cable	Low	High	Low
Toll switches	Low	Medium	High
Transmission equipment	Medium	Medium	High
Intelligent network	Medium	Medium	High
Regional cable	High	Medium	High
Mobile services	Medium	High	High
CBD fibre	High	High	High

Source: AAPT 1997c.

At its October 1997 'Technology Vendors Forum' Telstra commented on the 'growing importance of software':

> In the hardware world we will be looking for 'global standard' [off-the-shelf] products where we can maximise our position by achieving volume economies of scope and scale.
>
> We believe it is software which will be critical to achieving competitive differentiation through: enhanced connectivity services; network and service management superiority. (Telstra 1997a, D.C. Campbell, slide 9)

Jtec considered that indigenous companies, such as itself, could be severely affected if it were no longer able to produce hardware competitively or if purchasers such as Telstra were to redirect hardware purchases towards foreign firms:

> Two thirds of our product and seven eighths of our value is software, but we need the hardware to deliver it on. The hardware is the vehicle for getting it to market ... The chances of getting the core software and source code to modify someone else's system is zero, not even small, but zero. (Transcript, pp. 5–6)

A relative shift towards software and services need not mean an overall decline in activity in the Australian telecommunication equipment industries. First, as hardware is becoming increasing 'commoditised' with consequent pressure on price, those industries worldwide are shifting towards software and services, thus opening up greater opportunities for Australia in areas of relative advantage. Second, software and services need not be directly associated with manufacture of product. For example, with advances in the online economy and improved transport links between countries, it is possible to transfer quickly the results of R&D undertaken in one country into fabrication and manufacturing in another. Australian indigenous firms, for instance, could manufacture hardware offshore while developing the software 'seven eighths of value' in Australia. Further, some Australian operators are already taking the opportunity to undertake systems integration and software development programs for customers in Asia.

Summing up

The Australian telecommunications equipment systems and services industries appear to have grown significantly in total over the last five to ten years, despite an apparent reduction in the value of equipment produced over the 1992–93 to 1995–96 period. Multinational firms continue to dominate local activity. However, the future demand outlook in Australia is subdued as the cable rollout is now virtually at a standstill, and large equipment projects are largely complete. Further, competition is becoming more intense, prices are falling rapidly, and technological development continues to be somewhat unpredictable, with consequent needs for high levels of expenditure on R&D. As well, there is evidence of a shift in 'value added' in Australia away from hardware production towards software development, systems engineering and services. Although these factors need not necessarily mean that Australian activity will decline overall, the Australian equipment firms, both multinational and indigenous, will need to increase competitiveness and become more outwardly oriented to continue to grow.

It is plausible, as many have suggested, that in this globally competitive environment, only the largest firms in Australia will be able to continue to produce telecommunications equipment across a wide product range. Multinational firms might already have a head start, with linkages between their Australian and overseas operations. However, their response will depend on their assessment of the fundamentals of manufacturing in Australia — including the policy environment — compared with other countries.

Another trend could be for some firms, both multinational and indigenous, to switch local activity to niche areas, not necessarily in equipment and cables, but possibly in areas such as R&D, software development, systems engineering, and services. This need not mean that activity would decline overall. In this scenario, firms would still need to become outwardly oriented to succeed. Although indigenous firms could continue activities such as R&D and software development in Australia for hardware manufacture offshore, their chances of success could be enhanced through strategic alliances with the larger telecommunications equipment manufacturers.

Finally, there is the question of the role for government in the future development of the Australian telecommunications equipment industries. A number of relevant policies and programs are discussed in the succeeding chapters of the report. But the next chapter first discusses, as required by the terms of reference, technological developments and their implications.

3 TECHNOLOGICAL CHANGE AND CONVERGENCE

Rapid technological change is one of the more important factors influencing the development of the telecommunications equipment industries, both in Australia and overseas. In particular, 'convergence' is having a substantial impact. The terms of reference ask the Commission to examine and report on the implications of technological change and convergence for the industries.

In its most general sense, 'convergence' refers to the increasing similarity of technologies and sectors that were previously distinct (see box 3.1 for a brief glossary of technical terms). Thus, for example, the boundaries between telecommunications and computing are becoming blurred. And, within telecommunications, convergence is enabling different communication types — voice, text, data, images — to be carried effectively over a common network.

Technological change, by increasing the quality and reducing the cost of services provided, is bringing substantial benefits to users. There are also important implications for equipment manufacturers, as technological change affects the competitive environment in which they operate, as well as the nature of the products supplied. And there are implications for government — inappropriate regulation can be very costly where there is rapid and unpredictable technological change.

It is important to recognise the fundamental nature of some of these changes, and the rapidity with which they are occurring, before looking at some of the policy issues relevant to these industries. This chapter outlines some of the more important trends and their implications for users, equipment manufacturers and governments.

3.1 Some important trends

A number of broad interrelated trends are leading to improvements in the capability of telecommunications networks. These include:

- the falling price of computer processing power and memory;
- improvements in digital signal processing techniques; and
- the development of photonic technologies.

As a consequence, there is an increasing ability to carry many kinds of communications (voice, text, data, images) over a common network, rather than over separate networks as in the past. This is part of convergence.

Box 3.1: Some technical terms

Analogue signals: Signals for which the information content consists of continuously varying values, such as variable voltage.

Asynchronous Transfer Mode (ATM): A switching and multiplexing protocol which allows rapid integrated switching and multiplexing of voice, video and data traffic.

Broadband: Sufficient transmission capacity for large information flow rates, such as in video traffic.

Digital signals: Signals for which the information content consists of discrete values, usually represented by a series of the digits one and zero.

Integrated Services Digital Network (ISDN): A network and protocol that allows the integrated transmission of voice, text, data etc.

Multiplexing: A method for combining different signals and sending them over the same telecommunications line.

Photonics: Technologies which involve the storage, transmission and manipulation of information through the control of photons (packets of light).

Private Branch Exchange (PBX): A telephone switchboard located on user premises.

Switching: In telecommunications systems where every user does not have a direct line to every other user, switching is required. A switch connects an incoming line with a chosen outgoing line.

Telecommunications standard: A commonly used telecommunications protocol, technique or technology.

Telecommunications protocol: A set of instructions which prescribes the way in which telecommunications signals or systems are to be organised.

Source: Partly based on the glossary in BTCE 1995c and Prime Minister's Science Council 1992.

Further, these improvements in technology have also made the adoption of digital technologies — which offer a number of inherent advantages in telecommunications — more attractive. This is why Telstra is currently completely digitalising its public switched telecommunications network (PSTN — see boxes 3.2 and 3.3) and why Optus has adopted digital technologies in its network.

Finally, convergence and digitalisation are creating the ability to provide broadband multimedia services at widely accessible prices. The potential of these services, combined with the increasing demand for data communications, has fuelled a further increase in investment in the development of advanced telecommunications techniques and technologies, including technologies to upgrade the capacity of the local loop, and the rapid advance of wireless technologies.

Box 3.2: The basic PSTN network

The basic structure of the public switched telecommunications network (PSTN) network can be divided into a number of sub-networks. The first is the local loop or the Customer Access Network (CAN) which connects Customer Premises Equipment (phones, faxes, modems, computers, PBXs etc) in homes and offices to the local switch. If calls need to be directed to destinations that are not served by their local switch, then they will need to be passed through transit networks. There are metropolitan transit networks and there is the long distance network which consists of trunk lines connecting major metropolitan and regional switching centres (major transit networks are also referred to as the backbone network). In addition to these networks there are gateway switches which allow the interconnection of different networks and interconnection to international networks (Pizzica and Day 1995).

The falling costs of processing power and memory

Modern telecommunications increasingly relies on digital technology. There are two separate aspects: first, the switching and routing of information from sender to receiver; and second, the transmission of information in digital format.

The increased amount of available processing power, at lower cost, is leading to improvements in the capacity of telecommunications systems to carry and process information. Digital switches and transmission systems are faster; they can store more information, and offer more types of services. Greater processing power can also be used in conjunction with improving digital signal processing (DSP) techniques to allow more information to be carried over the same bandwidth.

Advances in digital signal processing methods

Advances in digital signal processing methods are one of the driving forces behind the improvements in the capacity of telecommunications systems. Data

compression software allows more information to be transmitted using the same amount of bandwidth.

Box 3.3: Modernisation of the PSTN

In the last few years there has been an immense amount of work done to improve Australia's telecommunications networks. This modernisation has included the upgrading of Telstra's network and the installation of a new network by Optus.

With the improvements in digital transmission technologies it became clear that moving towards digital networks could bring large efficiency gains in the provision of voice telephony services. It has been this technical change, coupled with moves towards deregulation in telecommunications in Australia, that was responsible for Telstra's decision in 1993 to accelerate the upgrading of its network. Optus's approach in rolling out its telecommunications network has also been to adopt digital technologies.

Telstra refers to this modernisation program, which commenced in December 1993, as its Future Mode of Operation (FMO) plan. The goals of the $3.3 billion, five year FMO plan, are to completely digitalise all switching and transmission equipment and to simplify the architecture of the network in the process. The resulting digital network has been designed to provide a switched 64 kbps voice telephony service and ISDN basic and primary rate services. (DCA 1996).

In early 1993 Telstra's network consisted of a mixture of analogue and digital switches. In addition while the higher capacity trunk network was digital, many exchanges were still connected via analogue transmission links. Telstra's switches were installed in nearly 5000 local exchanges which were connected via a complex three level architecture. By June 1996 74 per cent of the national network had been digitalised, with an aim of 85 per cent by December 1997 (Telstra 1996b). Progress had also been made in converting the architecture of the network to a simpler two level basis.

Progress is also being made in error correction software. This makes it easier to validate the information being received. One particular area benefiting from these improvements is mobile data communications, where more capable devices are becoming possible.

Photonic technologies

Optical fibre cables, which are now used for much telecommunications traffic, transmit messages by means of light rather than electricity. The development of these cables was made possible by the development of the laser in the 1960s. The high frequency of light allows optical fibres to provide higher bandwidths

than copper wire or coaxial cables. Recent comparisons indicate that an optical fibre can carry around a thousand times more information than a similarly sized coaxial cable and around a million times more than a copper wire (Linfield 1995).

Improvements in fibre-optic technologies are leading to increases in capacity each year — in the last decade their capacity has increased around 75 times (from around 45 Mbps to around 3 Gbps). Capacities will also continue to improve. Currently optical fibres need to be connected to the rest of the telecommunications network using opto-electronic devices and this limits the bandwidth that can be achieved. Research is now being undertaken which aims to develop a range of fully optical switching and transmission equipment. This would allow still higher transmission capacities to be achieved, without the need for expensive recabling in the current fibre-optic networks.

Convergence within telecommunications

In the past voice and data have been carried over separate networks designed to meet different objectives. Traditional analogue voice networks were designed, using available technology, to be optimal for transmitting voice signals. With the rising demand for data communications, separate public data (ie digital) networks were also established. These data networks needed to be designed to handle the particular characteristics of data traffic efficiently and to ensure the accuracy of the information being received.

The falling cost of digital technologies has led to their adoption on voice networks. Thus these have become more like the data networks (the networks have converged). The falling price of digital systems, combined with the availability of more effective DSP techniques, have meant that the incorporation of digital equipment is a cost-effective way of upgrading transmission and switching capacity. A number of other reasons have also made digital technologies more attractive in the voice networks:

- digital signals degrade less with distance than do analogue ones — so less amplification equipment is needed, and there is improved signal quality;
- digital systems require less maintenance than analogue systems;
- the network itself can be simplified, which reduces costs; and
- digital switches allow more automated, centralised and effective network management and control.

Although most large carriers still operate separate voice and data networks, data can be sent over voice networks and vice versa. For example, low volume users send data over the voice network using modems; and low quality voice can also

be sent over a backbone data network like the Internet. However, there is now a trend towards the merging of the voice and data networks. In fact it is envisaged that integrated networks will be developed which can carry a range of information types — such as voice, text, data and video.

Developing truly integrated networks requires: systems which are completely digital (no electronic analogue parts); enough switching and transmission capacity to handle voice and video; and the development of appropriate switching and transmission protocols. These standardised protocols are needed to guarantee that different communication types are treated in appropriate ways and that their transmission is efficient.

So far there has been only partial convergence. One example is the use of equipment using the Integrated Services Digital Network (ISDN) standard in the access network. ISDN is currently used by business customers as a way of transmitting voice or data to the separate core networks. Another example is the frame relay protocol which allows voice, text and data communications to be sent over data networks in an integrated way. At present, this is used mostly for LAN interconnection (Budde 1997c).

Telstra has stated that it will move towards more integrated networks — see box 3.3 (Pizzica and Day 1995). One major advantage is that this would allow the carriers to become more competitive in core data transmission and to be better positioned if broadband multimedia markets increase in importance, in business or in the home. It would also allow carriers some economies of scope.

Enhanced bandwidth

Advanced digital compression techniques are substantially increasing the transmission capacities of networks. For example, the maximum bandwidth available for many users is 64 kbps, but Broadband-ISDN (B-ISDN) systems under development will be able to cater for individual traffic streams from 2 to 155 Mbps (Newstead 1995).

Mobile communications

Wireless technologies are also advancing at a fast pace. Currently the capacity of digital mobile cellular networks is expanding and large investments are being made in the launching of networks of small low earth orbiting satellites — designed to allow mobile voice and data communications across the globe. Research is also producing better compression and error correction DSP techniques for mobile systems.

Developments in the local loop

A major factor currently inhibiting greater use of interactive multimedia is the restricted capacity of the local loop, and the expense of currently available alternatives. However there are a number of new technologies, currently being developed, which would allow the capacity of the local loop to be increased, in a cost effective way, without expensive recabling. These technologies include advanced DSP compression techniques and mobile telecommunications systems (see box 3.4).

Box 3.4: Competing approaches in the local loop

The local loop is the customer premises to the local exchange portion of the PSTN (it is also referred to as the Customer Access Network or the CAN). Cost-effectively enabling additional capacity in the local loop could open up broadband services.

A number of new technologies have potential. Which of these technologies will become accepted is uncertain at this stage: a range of technologies may well be used. Different strategies include:

- laying additional fibre optic cable in the local loop (early trials of broadband services offered using this strategy are showing that it is not currently cost-effective);
- the upgrading of the capacity of the existing copper cable local loop through the use of advanced compression techniques;
- the development of wireless local loop (WLL) technologies (these include cellular mobile systems and satellite systems); and
- the adaptation of cable TV Hybrid-Fibre-Coaxial (HFC) networks for use in the local loop (this would also involve the use of advanced compression techniques using cable modems).

3.2 Implications for users of telecommunications services

Continuing innovation in telecommunications technologies is leading to cheaper and higher quality voice and data services. A range of new services are now becoming available, with the prospect of the future development of a range of broadband multimedia services. In response, demands from users — particularly for data communications services — are expected to increase substantially.

The rising demand for data communications

The amount of capacity used for data communications is still relatively small compared to the amount used for voice. Worldwide, voice accounts for around 80 per cent of traffic and data for the rest. However, data traffic is growing rapidly, and the rate of growth is expected to increase still further. The data market in Australia has been growing at around ten per cent per annum — twice the growth rate for voice (Budde 1997c). Among the causes are the demand generated by the Internet and increasing demand for business networks, as well as falling prices due to new access technologies and the effects of deregulation. Within a decade the majority of network traffic is likely to consist of data communications.

Business is one of the biggest users of data communications. Digitalisation and the availability of higher capacity access will make it increasingly attractive for smaller businesses to use public data networks for LAN interconnect services. Access to external information through E-mail and Internet connections will become more affordable and the costs of services such as video-conferencing will continue to fall and quality rise.

Greater data capacity leads to greater innovation

Increasing telecommunications capacity will also lead to the introduction of innovative new services by software providers. (Further development of software for the Internet is an important example — see box 3.5.) It will also encourage the introduction of new devices designed to be connected to data networks (such as ISDN video-conferencing equipment).

Emerging broadband services

Enhanced bandwidth should make broadband networks more feasible. The kinds of capabilities such networks could provide include:

- the switched delivery of video transmission, including high quality video conferencing (Newstead 1995);
- the operation of extensive computer networks over national and international areas;
- more cost effective access to supercomputing facilities;
- more cost effective access to databases; and
- the delivery of multimedia education and health services along with an interactive capability.

These kinds of services have the potential to benefit users. One example is the increased access to high powered computing (HPC) applications. Access to HPC applications through communications networks decreases the costs and increases the use of processing. Costs fall because it is easier to find and use underutilised resources and because the need for organisations to purchase their own HPC is reduced. Such trends would lead to lower costs and higher productivity in a broad range of activities across the economy.

Box 3.5: Development of the Internet

In 1996 an estimated 9.4 million host computers were connected to the Internet, representing 93 671 networks. Some estimates put the number of users in the US alone at between 9.5 and 24 million (Egan 1996, p. 42).

The precursors to the Internet included the ARPAnet — which was established to test the basic ideas which Vint Cerf and Bob Kahn had published in 1969. A commercial version — the Telnet — was introduced in 1974. From 1977 to 1981 several research and education network consortiums were formed applying the packet network technology of the ARPAnet. In 1982, the transmission control protocol (TCP) and the Internet protocol (IP) were established (these are collectively referred to as the Internet protocol suite (TCP/IP)).

In 1985 the National Science Foundation Network (NSFnet) was established with a 56 kbps backbone for use mainly by university researchers. This became the core of the Internet. From 1987 the management of the network backbone was placed in private hands, in 1988 the NSFnet backbone was upgraded to T1 speed (1.544 Mbps), and in 1990 commercial dial-up access was introduced. In 1991 the backbone's capacity was further upgraded to T3 speed (44.736 Mbps). Following this, in 1992, the audio and video broadcast feature, the multicast backbone (MBONE), was introduced.

The subsequent success of the Internet was largely due to the introduction of a number of software packages designed to search the Internet. The more important of these include the World Wide Web (WWW), which was released in 1991 by the European Centre for Nuclear Research (CERN); the Gopher searching software also released in 1991; and the web browser Mosaic which was introduced in 1993.

Source: Egan 1996.

Mobile communications

The early beneficiaries of enhanced mobile technologies include remote users who will be better able to access data communications services such as the Internet.

There are two major areas where developing mobile technologies will bring future benefits. First, they promise to be a very cost-effective way of expanding the capacity of the local loop of a telecommunications network (see box 3.4). This could allow new carriers to enter more easily and increase competition and, as capacity increases, mobile technologies may also become a cost-effective way of delivering broadband services to homes and businesses. Second, systems being developed will allow the development of mobile computing — where remote PCs can be connected to computer networks such as LANs or the internet.

3.3 Implications for telecommunications equipment firms

Technological change in telecommunications is both rapid and ongoing. As noted above, within a decade it is likely that data transmissions will overtake voice as the major form of traffic. Worldwide, the telecommunications networks are becoming digital, mobile digital technologies are taking hold, and the capacity of telecommunications networks is rising rapidly. The combined effect of these and other technological changes has important impacts on the telecommunications equipment industries in terms of competition, expenditure on R&D, the need for strategic alliances, and risk and uncertainty.

Greater competition

Because of convergence, the 'traditional' telecommunications equipment industries are likely to face increasing competition from computer firms, both in hardware and software.

Telecommunications networks are increasingly relying on digital equipment to operate — the equipment and protocols used in the core of the PSTN and in computing networks are becoming increasingly similar. This is providing greater opportunities for computer firms to expand their operations into the communications areas, at the expense of telecommunications equipment firms. At the same time, hardware is becoming increasingly standardised and commoditised, pushing down prices and further increasing competitive pressure.

Developing technology is enabling networks other than traditional telecommunications networks, such as electricity grids, to be used for communications. While this primarily affects communications services providers, it can have some indirect effect on demand for equipment and cables, and competition in that sector.

While these changes are occurring in hardware, the importance of software and services is rising. Here too, there is growing competition between telecommunications equipment firms and computer firms. For example, much of the value of telecommunications equipment comes from the software that tells it how to perform its functions. Many recent advances in telecommunications equipment technology — for example compression techniques — rely on advanced software. This can bring opportunities for software firms to compete for telecommunications work.

Product cycles are shrinking

Another trend is the shortening of product cycles and the increasing pace of technological change. Innovative telecommunications technologies are having shorter lives in the market before being overtaken. An example of this is the development of an international standard by the company QPSX for metropolitan areas networks. This entered the market in 1990, but is already being overtaken by moves to the ATM protocol (Budde 1997c).

The faster turnover of technologies demands a strategy of continued innovation, to launch new products and to maintain technical leads.

The continuing importance of R&D

The telecommunications equipment industries have always been characterised by high R&D levels (see chapter 2). But as noted above, technology is developing rapidly and product cycles are shrinking. Thus, firms need to continue expenditure on R&D if they are to stay at the leading edge of technology. Increased collaboration with universities, CRCs or with other high technology firms may help to share the costs and risks of R&D, especially for smaller firms.

Risk and uncertainty

Factors such as rapid technological change, convergence, and shortening product life cycles are leading to greater uncertainty and turbulence in the industry.

A particular risk, especially for the smaller firms, is of backing the ‘wrong’ technology. Technical change in the telecommunications equipment industries appears to be becoming increasingly radical and unpredictable. Many approaches are being taken to solve technical challenges, but there is usually uncertainty about which will become dominant.

3.4 Implications for government policy

Developing appropriate government policy can be very difficult where there is rapid and significant technological change, such as characterises the telecommunications equipment industries. If governments discriminate against particular technologies — whether directly or indirectly — there is a risk that significant and continuing costs could be imposed on Australian users and on the Australian telecommunications industries alike.

Some examples of the potential impact of government policy serve to illustrate:

- The government has now significantly deregulated the provision of communication services in Australia, with significant potential benefits to the community. If this had not been done, however, the traditional communication services providers could have been disadvantaged, given the rapid development of the (largely unregulated) Internet.
- Similarly, as noted in chapter 8, Australia has moved away from compulsory standards to a situation of industry self-regulation and voluntary standards (except for matters such as safety and network integrity). Although there can be economic benefits from technical standards, making them mandatory in industries experiencing rapid and somewhat unpredictable technological change can be counterproductive.
- Analogue mobile phones are to be phased out in the next few years, at least in the cities. Whatever the underlying justification, it is inevitable that this move will impose significant transitional costs on many users.
- Under the R&D Start program, grants are awarded to firms in response to proposals for assistance with specific projects. This involves some judgment by the IR&D Board about which projects are most likely to succeed. However, as noted, telecommunications technology is evolving rapidly and unpredictably, with increasing risk and uncertainty. It may well be that the rejected applicant's technology would have ultimately been the successful one.
- The telecommunications industry development plans (chapter 6) encourage communications carriers to support local industry. This could come at a cost, if local firms do not have up-to-date cost effective technology, or the ability to keep up with technological developments.

Where regulation is necessary, governments should adopt approaches which, as far as possible, do not discriminate between differing technologies. Given rapid technological change, it is especially important that government policy be set in a clear and consistent framework — this is discussed in the next chapter.

4 THE FRAMEWORK FOR POLICY

4.1 Introduction

A broad view of industry policy sees 'industry' as a set of capabilities and relationships, whose performance is shaped by economic and policy fundamentals as well as by any particular industry-specific measures (IC 1997e). Such fundamentals include:

- the efficiency and nature of labour and capital markets, the education, innovation, regulatory and tax systems, and the legal framework for business (corporate law, competition policy, intellectual property protection);
- the quality and range of infrastructure services; and
- the nature of macroeconomic settings (inflation, monetary policy).

There is widespread agreement about getting the fundamental settings right (Mortimer 1997). This consensus view establishes a substantial role for government in forming and shaping institutions, managing the economy and in applying tens of billions of dollars to social and economic infrastructure. There is, however, divergence of opinion about priorities and expenditure levels for programs targeted at assisting specific industries, such as the telecommunications equipment industries, and it is this narrower debate which is the prime focus of this chapter.

A number of recent reports have recommended the implementation of special industry policies for the IT&T sector, including the telecommunications equipment industries. They have done so at a time when the appropriate settings for industry policy for all of Australian industry are again being contested (IC 1997e).

The principal objectives of this chapter are to:

- sketch the sets of policies which condition the structure and behaviour of the telecommunications equipment industries;
- summarise the policy implications for the telecommunications equipment industries of the more relevant recent reviews of Australian industry policy — including those by Goldsworthy (1997), Charles et al (1997), Cutler (1997), MTIA/EIU (1997) and Mortimer (1997); and

- establish some principles for evaluating policy proposals for the telecommunications equipment industries.

4.2 The current policy environment for the telecommunications equipment industries

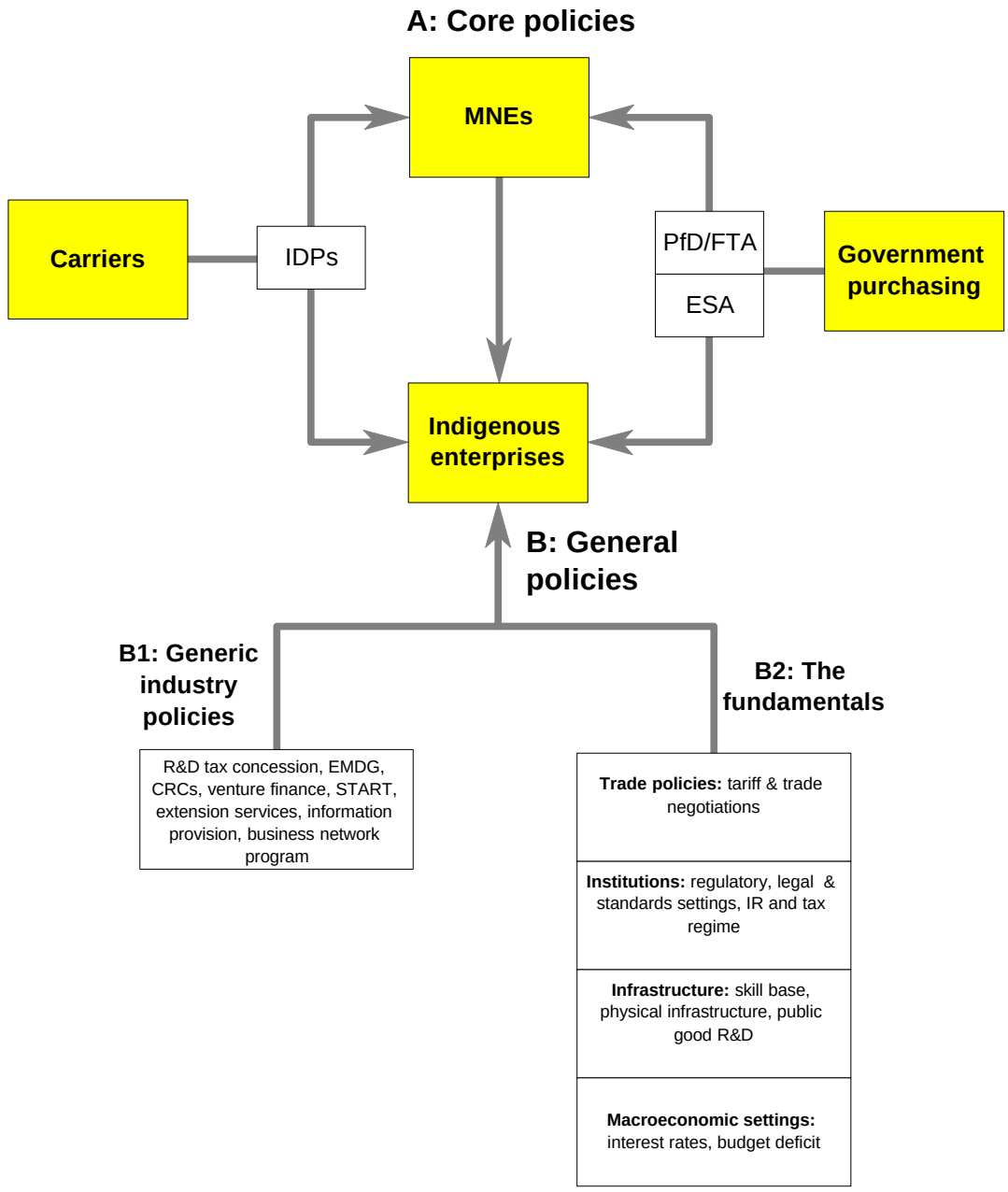
The Australian telecommunications equipment industries have long been the recipients of special purpose industry policy arrangements, stemming from the historical monopoly provision of carrier services, and defence and industry development objectives. It is a reflection of this heritage that the current policy environment for the telecommunications equipment industries is somewhat complex, lacking in transparency and sometimes inconsistent (figure 4.1).

On one level, there is a range of policies aimed at stimulating competitive pressures in carrier services. These aim to reduce prices and increase the *use* of telecommunications equipment and services (and other IT equipment and products), regardless of its country of origin:

- Telecommunications carrier services have been progressively deregulated to allow entry by new providers. The Commonwealth Government has also partly relinquished ownership of the main carrier. These moves were based on an acceptance that through competition and a greater commercial focus, Australians can get more innovative, flexible, lower cost, higher quality, and a greater variety of telecommunications services.
- Tariffs on telecommunications equipment, once high, are now 5 per cent (or less). They are due to fall to zero by the year 2000 under the WTO Agreement on Information Technology (or ITA), as part of a process to liberalise international trade in such enabling technologies.
- The government is considering signing an international agreement on government purchasing which, in exchange for more open access by foreign companies to sales to the Australian government, would make it easier for Australian companies to sell to foreign governments — though the specific terms for such improved access would be negotiated plurilaterally.

At another level, there has been a continuation of arrangements, the purpose of which is to support the local manufacture of telecommunications equipment (and therefore, to serve as some kind of barrier to foreign competition):

Figure 4.1: The policy environment for the telecommunications industries



a This is an elaboration of a diagram in Doddrell 1995.

- Carriers must have an Industry Development Plan (IDP) approved by government, as a condition of gaining a licence. The IDPs involve commitments by carriers in four areas of local industry development — strategic commercial relationships with indigenous firms and MNEs, R&D, export development, and employment opportunities and training.
- Large MNE suppliers of telecommunications equipment to the government or the carriers may be invited by government to gain endorsement as partners in the Partnerships for Development (PfD) program, which then establishes some industry development commitments for the partner.
- Other arrangements — such as Fixed Term Arrangements (FTA) or endorsed supplier status (ESA) are similar to the PfD program. *Any* telecommunications equipment supplier wishing to transact with government must qualify for endorsed supplier status.

This tension between the (recent) policy goal of liberalisation — which promotes use — and the (historical) goal of stimulating local production, persists in the most recent policy review of the sector, the Goldsworthy report. That report advocates industry–government market access groups to negotiate the removal of offshore market barriers (such as those posed by local content plans and government purchasing arrangements), yet also argues for a range of subsidy measures to shift telecommunications production and investment from other countries to Australia.

This policy environment has further important dimensions outside these core policies:

- there is a set of special regulatory concerns (particularly relating to standards);
- the telecommunications equipment industries are also key users of a set of generic policies for industry — such as the R&D Start program, the R&D tax concession, the Cooperative Research Centres (CRC) program, and the Export Market Development Grants (EMDG) scheme; and
- the industries are embedded in a wider economic policy environment which shapes their performance and conduct (such as government policy on education, intellectual property, taxation and macro settings).

This chapter provides a framework for assessing this policy environment, but the detailed assessment of the most important individual elements is left to subsequent chapters (IDPs in chapter 6, government purchasing in chapter 7, international agreements in chapter 8, R&D issues in chapter 9, and investment and related tax issues in chapter 10).

4.3 Recent reports and proposals

The recent re-evaluation of approaches to industry policy has partly been prompted by high unemployment, relatively modest per capita economic growth, fears of painful structural adjustment in some traditional industries, and a concern that orthodox micro and macroeconomic reforms are an insufficient basis for economic prosperity. But the re-evaluation also reflects other — not always soundly based — intellectual and economic perspectives. Some of these are particularly evident in the development of policy approaches to the telecommunications equipment industries. Examples include:

- the increasing global mobility of physical investment in certain key industries, such as the IT&T sector, and a desire by governments to extract some benefits from this investment by making their countries more attractive places in which to locate;
- an awareness that a number of our Asian neighbours — for example, Malaysia, Taiwan and Singapore — have performed very strongly, while adopting relatively interventionist industry policies, as has the Republic of Ireland in a more familiar cultural milieu. Such countries have exhibited not only rapidly rising productivity and incomes, but also rapidly increasing technological production capabilities in new industries (including telecommunications and computer equipment) that exceeds Australia in some dimensions. However, the recent financial crisis in Asia has shaken some of the confidence in those countries' industry policies as a sustainable strategy;
- rapid changes in certain technologies which are likely to have very widespread impacts on the economy — and particularly the growing importance of rapid remote information exchange (the Internet, multimedia, cable and satellite services); and
- the perspective that government policies should be guided by common-sense, managerial or 'firm's eye' views about how the economy works, rather than by what is seen as overly theoretical system-wide views.

Box 4.1 indicates the key orientation of the most recent major reports (ACSI/McKinsey, MTIA/EIU, Goldsworthy, Cutler, Charles et al, and Mortimer). None espouses a return to border protection, and all grant a role for markets and further trade liberalisation. But they all advocate a special role for government in: establishing a 'vision' for industry; attracting foreign investment through selective tax, or other financial, incentives (excepting the Cutler report); and reducing the cost of venture capital through taxation changes.

Box 4.1: Recent relevant reports

Mortimer report

Industry policy is fragmented and confused, with duplication and inconsistency between programs. Governments should determine industry policy using a systematic framework, involving identification of market failures and application of a net benefit test to any program. There is a need for a government business vision and an economic growth target. Programs should principally be generic, but resolution of impediments to growth in particular industries needs particular intelligence on the impediments to growth — using the 'Supermarkets to Asia' program as an exemplar. The government should vigorously promote Australia as a destination for foreign investment via a $1 billion fund. The report suggests that the telecommunications sector is a priority for industry review — but this mainly relates to carrier services.

Report of the Information Industries Taskforce (the Goldsworthy report)

World economies are in rapid transformation — because of revolutions in the information and communication (I&C) technologies. To prosper in the 21st century Australia must be a leading edge user and producer of I&C technologies. To achieve this, the sector should receive specific assistance. There must be national vision, led by government, for the development of the I&C sector. Production must be at global scale. Australia should seek to reduce its trade imbalance in IT substantially. Foreign investment should be attracted by matching other countries' concessions (including tax holidays in some cases). Investors should be given exemption from CGT while their investments are rolled over within the IT and other high technology industries. Trade liberalisation should proceed on the basis of reciprocal concessions.

Charles, Allen and Buckeridge

Australia is a world class user of information technology and telecommunications products, but not a world class producer. Australia has neither global scale indigenous or foreign companies operating in the sector. Government should establish a national priority for the information industries, provide education and R&D support, remove impediments and enable markets to work better. Government should ensure state cooperation when attracting foreign investment. Government competition policies for the carriers must ensure that they invest in the latest, low cost technologies for infrastructure. There should be an emphasis on export growth rather than domestic production, and on higher quality jobs. CGT of venture finance should be reformed. The Australian government should be a leader in the application of electronic commerce. Investment promotion and facilitation should be strengthened to attract global scale MNEs. PfD should be retained and extended to IT and telecommunications services. The government should look at the feasibility of attracting semiconductor and other key electronic component manufacturing in Australia.

cont'd

Box 4.1: Recent relevant reports (cont'd)

Report of the Information Policy Advisory Council (the Cutler report)

The information society is having a revolutionary impact on the world economy. Australia has some critical endowments which could underpin our success in the new economic order. However, government must set national priorities, avoid fragmentation of approaches across portfolios, talk up market opportunities, promote vigorous competition, avoid regulation except where it is necessary to instil consumer confidence (or where other market failure arguments have credibility), support infrastructure development, deploy innovative online services within government, make government information (and intellectual property) available as a catalyst for economic development, and capitalise on government buying. Governments should seek to generate and promote market based solutions wherever possible, and avoid 'endless' government subsidies. An international perspective should inform all policy decisions bearing on the information economy (for example in relation to taxation of Internet transactions). CGT imposts on venture capital financed enterprises should be removed. There should also be moves for preferential visa availability for skilled people and business people in the information industries, and skill and education upgrading of Australians in the information economy.

ACSI/McKinsey and Co

The emerging online economy is turning the service sector on its head. Governments must aid the development of a strong online economy by actively supporting a national vision. They must revise the capital gains tax regime to remove the penalty for high growth investments, revise other taxes (such as transaction taxes) which penalise growth; introduce appropriate online regulation, kick-start widespread demand for online services by becoming lead users, and create low cost high bandwidth international telecommunications connections with Asia-Pacific.

MTIA/EIU Australia

Australia's economic performance is poor — with high unemployment, a decline in the relative position of manufacturing including a loss of skills and little foreign investment. Industry policy should address global trends, make Australia an attractive location for foreign investment, foster industry clusters with strong growth potential and make effective use of tax breaks and grants to foster priority industry development. The government should establish strong central coordination of industry policy across portfolios including the establishment of a powerful investment agency, undertake major tax reform, strengthen investment incentives, negotiate better market access, and reform industrial relations.

However, the reports have substantial differences in their approaches. In particular, the extent to which they espouse intervention by government to support local production in the IT&T sector varies. The Mortimer report — not surprisingly, given its economy-wide focus — typically eschews

recommendations in favour of special treatment of particular sectors, but favours a general increase in funding for generic business assistance measures.

The Cutler and ACSI/McKinsey reports — with their emphasis on the services component of the IT revolution — tend to concentrate on prescriptions to increase *diffusion* of the information and communications technologies and practices amongst users, rather than *production* of the technologies. Accordingly they recommend appropriate regulation, the role of government as a lead user, operation of (relatively free) markets, and a global orientation.

In contrast, the Goldsworthy report (and to a lesser extent, Charles et al) places more emphasis on domestic production of the underlying technologies.[1] Thus the Goldsworthy report contends that countries wishing to be lead users must also be lead producers. This report is the strongest advocate for specific subsidies for the IT manufacturing sector (including telecommunications equipment), and for an active role by government in securing industry development objectives, particularly for SMEs, through purchasing arrangements. Moreover, the Goldsworthy report sees the reduction in the sectoral trade imbalance in IT goods as a major target of policy — through measures which stimulate export orientation.

4.4 Framework for industry policy

The Mortimer report (1997) urged that policy makers take a more hard-headed approach to policy formulation. They should use a clear, shared framework, articulate achievable objectives based on sensible economic rationales, require a net economic benefit and apply a set of consistent design principles (box 4.2). In effect, policy makers should adopt the same calculating and inquiring approach from a national perspective, that a CEO applies when considering a large scale investment proposal for a business.

There is a near infinite number of combinations of industry policy settings (as witnessed by variations in recommendations from the industry policy reviews issued this year — box 4.1). The challenge for quality public policy for the telecommunications and other industries is to separate the 'wheat from the chaff'. There is a sequential process for doing this:

- *Rationales* — discard any policy mechanisms which lack clear and explicit rationales and which are not coherent with other desirable policies;

[1] As does the MTIA report — though it advocates an emphasis on manufacturing as a whole.

- *Designing effective mechanisms* — work out what instruments should be used, their target groups, and their detailed design so that the probability of effectiveness in terms of their rationale is high;
- *Evaluation* — set up 'tests' of the effectiveness of any measure in achieving its fundamental objectives.

These are similar requirements to those of Regulation Impact Statements, which are now a mandatory feature of new federal legislation which affects business (IC 1997f).

Box 4.2: The Mortimer report's view of an appropriate framework

The most important finding was that business programs did not operate within a framework that could provide guidance as to how much should be spent or the role of business programs within an overall business strategy ... Many business programs have poorly specified objectives, and rarely have measurable performance indicators ... The current suite of programs is ad hoc, with many programs too small to achieve much at all. (p. 3)

The existing conglomeration of business programs has developed over many years on an ad hoc basis, often in response to short term imperatives. The result is an array of programs which lacks direction, is duplicative and confuses business. (p. 47)

... the net economic benefit of government intervention must outweigh the costs of the intervention. Further, the economic benefit must extend beyond the private beneficiaries to the broader community. (p. 70)

We believe that the second threshold test for business programs is that they meet a clear market imperfection ... (p. 71)

Program objectives in the past have frequently been broad and qualitative and hence outcomes are difficult to measure. Programs must have clear objectives and measurable performance indicators if they are to be an effective policy tool for achieving change. (p. 72)

Source: Mortimer 1997.

Rationales

Establishing sound rationales for intervention is the initial step in such a hard-headed policy formulation process. Unfortunately, the core programs supporting the telecommunications equipment industries do not establish underlying rationales for their existence. In many cases, the programs state their desired

outcomes (more exports, local production, networking or innovation) without spelling out the implicit assumptions that would make these activities nationally worthwhile (box 4.3). The Goldsworthy report's (1997) sweeping proposals for the information technology and communication equipment industries are a case in point. This means that evaluators have to act as sleuths trying to uncover what might be a reasonable rationale for the program.

Box 4.3: DIST's Telecommunications Equipment Industry Development Objectives

- Australia to have a world competitive, world-class, national and international telecommunications industry.
- We want strong export growth to continue — exceeding global growth of the industry.
- We want robust SMEs which seek and take on international opportunities.
- Sound strategic alliances should be maintained with the carriers and between the domestic and international telecommunications industries.
- We want to strengthen the investment that carriers and multinational firms have already made and attract new companies which have leading edge technology and actively pursue international development opportunities.
- We also want to see increased levels of R&D to develop new, competitive products for world markets.
- Also, it is important for the carriers and the government to encourage industry development through purchases of services and equipment.

Source: DIST 1997a.

If the underlying purpose of a program is obscured, it is hard to assess its appropriateness, or devise complementary or substitute programs which increase effectiveness or efficiency. Stating the rationales also forces policy makers to be more disciplined when thinking about whether programs are consistent with each other. For example, a policy of assisting exports (box 4.4), because it exposes firms to tough customers, might suggest that the government should be a tough and knowledgable customer at home.

DIST, in its response to the Draft Report noted the lack of transparency in the rationale for particular programs affecting the telecommunications industry, and said that this needed remedying:

> The report also highlights the lack of transparency in the rationale for particular programs. This point is valid and requires a response from DIST. (Sub. D9, p. 2)

Recommendation

The economic rationales for industry policies which affect the telecommunications equipment industries, such as the IDPs and the PfD/FTA programs, should be articulated clearly.

While a sound rationale is necessary, it is not all that is required. There may be reasons why an intervention may be impractical or still make Australians worse off — such as lack of vital information, risks of government failure, and insufficient budgets or specialist resources. In this sense, industry policy is somewhat like a drug treatment. We seek drug treatments which effectively treat (or prevent) a medical condition, but the existence of a medical condition does not guarantee that such a drug is available.

It should also be acknowledged that in industry policy, *potential* rationales for action are easy to construct — there *might*, under specified circumstances, be a rationale for almost any conceivable intervention. For example, it is easy to devise special exceptions to the value of free trade (Kreuger 1997), without knowing the extent of their applicability in practice, or the ability of an intervention to really eliminate any market inefficiency.

Designing and evaluating policy instruments

As emphasised by the Mortimer report (1997) and IC (1997e), policies should be carefully designed to maximise their benefits. The relevant considerations are depicted in figure 4.2.[2] Having determined that there really is a problem that can be fixed, policy makers should then formulate workable policies that are likely to efficiently target the problem. For example:

- The best instrument among a group of competing policies should be chosen.
- Information should be gathered about the impact of any proposed policy (pre-feasibility, and evaluation).
- An attempt should be made to assess the impacts of being wrong about any of this information (risk management).
- The duration, scope, governance, and magnitude of the intervention should be determined systematically.

[2] These detailed checklists are intended as useful guides for more effective policy making, rather than 'iron-clad' prescriptions.

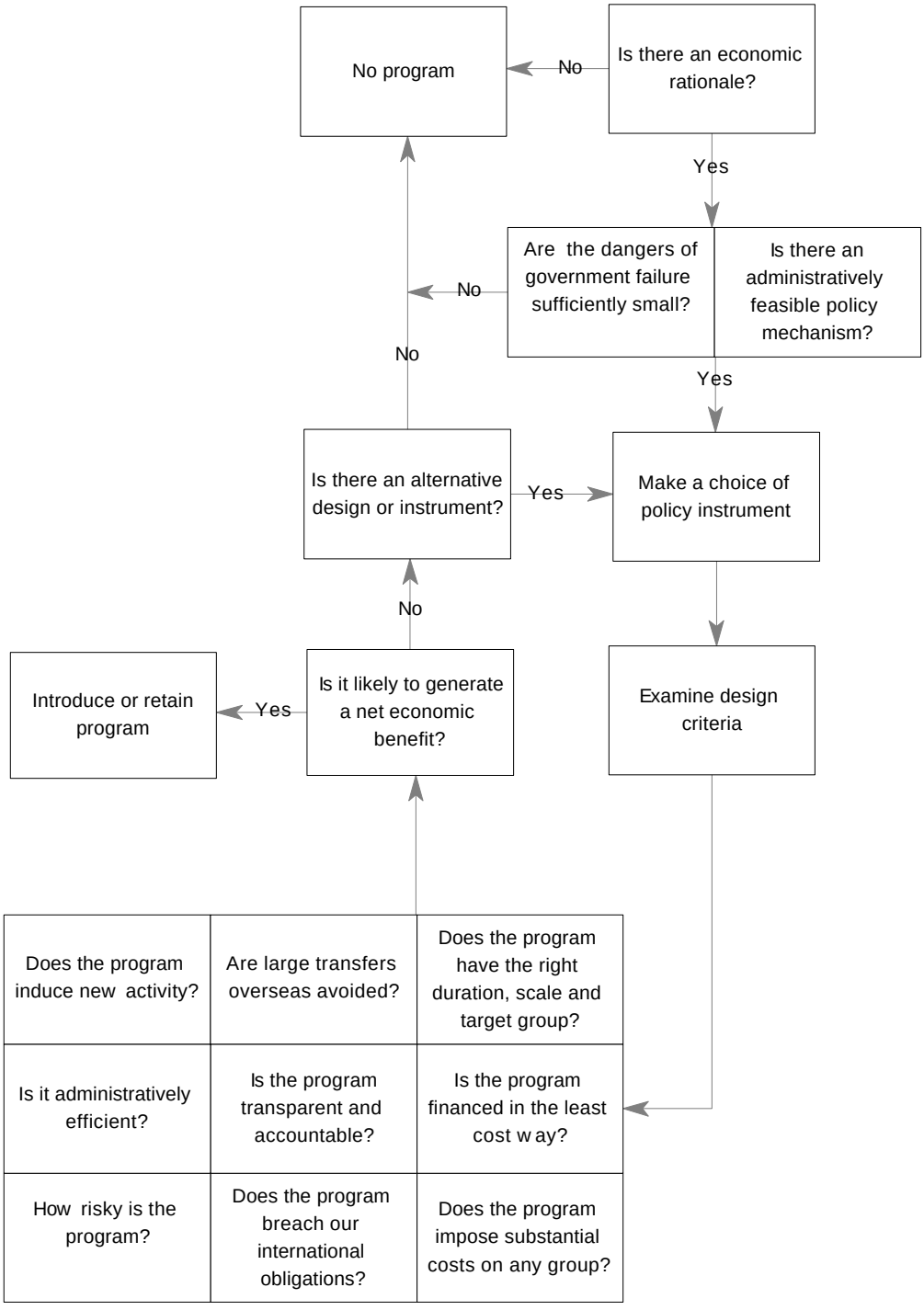
Box 4.4: Why articulating the rationale matters — the case of export assistance

It usually doesn't matter what has generated a dollar of value to a nation, whether it be exports, a government service, or local production. A program whose objective is expansion of exports, *for its own sake*, lacks a proper rationale. However, a case can be constructed which makes export promotion a vehicle for other, more economically valid, objectives (as noted by Stiglitz (1996) when analysing the success of the East Asian economies):

- A firm which exports a high quality product establishes a reputation from that product, which spills over to other exporters. Japan and Sweden with their reputation for high quality manufactures, are examples. A new Japanese exporter, for example, will find it easier to get a toe-hold in world markets when it can appeal to Japan's positive image. Note, however, that this, at best, implies interventions aimed at consolidating brand recognition and encouraging better quality exports (penalising shoddy goods), rather than across-the-board export subsidies.
- A small country has a limited number of leading edge customers. The number of leading edge customers is much greater in the global market. Firms that export have better access, through such customers, to best practice technology and management practices — which may enhance firm learning and generate spillovers for other domestic enterprises (World Bank 1993, AMC and McKinsey 1994, BIE 1995b and Stiglitz 1996). This may partly explain why more open economies get greater economic returns from R&D done by foreigners than less open economies (IC 1995a, p. QA49).
- Banks and other financial institutions may not always allocate credit perfectly — especially in the early stages of a country's development. Stiglitz (1996) has argued that preferential allocation of capital to exports overcame market failures. Notably, credit was typically allocated using 'strict performance criteria' (World Bank 1993, p. 20 and Stiglitz and Uy 1996).
- Gathering export market intelligence, or general export promotion may have public good elements which justify government intervention.

There may be other economic rationales for export targets or promotion. But stating the underlying reasons is important because it allows more precise design and evaluation of a program. For example, if the reason for encouraging exports is to enhance learning in firms by connecting them to leading edge customers, then such a program might include provision of information to Australian firms about such leading edge suppliers and customers abroad. In the evaluation of such a program, the evaluator could assess whether domestic firms had made such connections and find out how valuable these linkages had been. Potential rationales are considered in the next chapter.

Figure 4.2: Designing and evaluating effective business programs



Source: Mortimer 1997, IC 1997c and Lattimore 1997.

- Adverse side effects on the target industry, other industries and users should be avoided.
- Abuse of the program should be limited and adequate transparency and accountability systems put into place.

This complex decision process and an associated set of suggested design criteria for industry programs mean that in some cases a policy response to a clearly identified problem should *not* be pursued.

Of course, it may not always be possible to follow these imperatives for better policy to the letter, because of information deficiencies and resource constraints. But as noted by the OECD, just *thinking* about the framework helps improve policy making:

> ... the most important contribution to quality decisions is not the precision of the calculations, but the action of analysis — questioning, understanding real-world impacts, exploring assumptions. (OECD 1995, p. 1)

Ultimately, the basis for government industry policy intervention in any sector is that there are deficiencies in existing markets, firms or government which policy is likely to remedy successfully. The aspiration of any industry policy should be to make Australians as a whole better off. Its role is not to make investors or workers in particular industries better off if those benefits are outweighed, in aggregate, by costs to other user industries, consumers, taxpayers or government service recipients.

4.5 Summing up

This chapter has set out some principles and a general framework for the formulation of industry policies — and it is applied in subsequent chapters on the major policy instruments relevant to the telecommunications equipment industries.

While there appear to be no clearly articulated economic rationales for the policies applying to the telecommunications equipment industries, this does not necessarily mean that none exist. The next chapter starts to put flesh on the above framework by identifying the possible rationales for government intervention in the telecommunications equipment industries. Subsequent chapters then assess specific policies to see if the rationales apply, and whether there are other policy design lessons.

5 RATIONALES FOR INTERVENTION IN THE TELECOMMUNICATIONS EQUIPMENT INDUSTRIES

5.1 Introduction

The previous chapter set out a framework for assessing industry policy that can be applied to the telecommunications equipment industries. Broad statements of goals for policies for the industries exist, but not statements of the economic rationales. This is an important omission, as emphasised more generally in the Mortimer report. In this chapter, therefore, the Commission examines a range of possible economic rationales for government intervention in the telecommunications equipment industries, and also addresses some of the more popular perceptions about why governments need to intervene.

The rationales for programs operating in the telecommunications equipment industries (including systems and services) can be assessed in two stages:

1. Are there grounds for a sectoral compared to a broader approach?
2. What are the particular rationales for the sorts of programs and industry policy stances adopted in (or proposed for) the telecommunications equipment industries — regardless of whether these have wider generality?

We deal with these in turn.

5.2 A sectoral focus?

The first question is why industry policy should be organised along sectoral lines. Sectors are convenient statistical and conceptual pigeonholes for groups of firms which share certain characteristics — but that commonality need not imply that policies should be tailored for each individual sector. Indeed, industry policy has tended to shift from a sectoral focus in the last few decades.

The choice between generic and sectoral industry policies depends on the extent to which market, firm or government failures vary between sectors. Any gains from differentiating policies have to be set against the costs of increased complexity and unequal treatment of firms in different industries. Thus the Mortimer report (1997) recommended greater policy simplification, not less.

Sectoral policies may sometimes facilitate more effective administration of programs because policy makers can fine tune programs to the specific problems and impediments facing a particular sector.[1] On the other hand, if the success of a sectoral policy stems from the ability to juggle a set of interlinked and flexible policies, then this requires substantial expertise and resistance to 'capture' by industry interests.

Do the telecommunications equipment industries have unique problems which would justify consideration of sectoral measures?

The boundaries of the telecommunications equipment industries are vague (chapter 2 and Houghton et al 1996) because they encompass disparate technologies, customers, and product types. A computer without email is just a computer, but with the right software and a cable it performs telecommunications functions. IBM Australia pointed out the growing convergence between telecommunications equipment and other IT equipment:

> ... the internet (a telecommunicating network of interconnected computers) couldn't exist without the attached IT equipment (ITE). So is a personal computer which is used solely or primarily for internet applications a telecommunications equipment or an IT equipment? While it is generally regarded as ITE, the internet could not exist without ITE and telecommunications terminal equipment (TTE) and the telecommunications network. (Sub. D4, p. 6)

The Australian Information Industry Association also highlighted some of the difficulties of defining telecommunications equipment. For example, the categorisation of equipment for tariff purposes as either telecommunications or computer:

> ... perpetuate a division between telecommunications equipment and computer equipment which is just anachronistic. The field is converging ... (Transcript, p. 54)

The telecommunications equipment industries are popularly labelled as 'high technology'; yet they can include low technology products (such as telephone handsets, simple switches and transformers) as well as high technology products (such as satellites, complex software, and multiplexors). In Sweden, home of Ericsson, the low technology element of the industry has been acknowledged:

> The manufacturing process and in particular the production of the electronics was until recently not advanced. A large part of the process was comprised of manual assembly of the electronic components. Electronics manufacturing was often

[1] We note that even if the conditions for a sectoral policy do not exist, it does not mean that industry differences could not, to some extent, be accommodated as part of a generic assistance measure. For example, information provided by governments to minimise compliance costs of a particular regulation may well have to account for variations between firms in different industries.

> localised to countries with low wages due to the fact that the assembly work was easily learned. (Swedish National Board for Industrial and Technical Development 1994, p. 85)

Given the diversity of goods and services produced by the telecommunications equipment industries, any claim for selective industry policy has to make clear why any particular, inevitably ad hoc, classification is the appropriate one for policy:

> [The information industries sector] is a grouping of very different activities, ranging from electronic components, hardware, computer software, through to communications networks and content production. What binds these is their interdependence within a value chain of service delivery, and the convergence of underlying technologies through digitalisation and networking. However, this interdependence does not mean that it is always useful to talk about strategies for the 'sector' as a whole — what works for manufacturing assembly is not very relevant to content production — nor to talk about aggregate trade balances. (Cutler 1997, p. 8)

The manufacturer of an R&D-intensive telecommunications product (say a multiplexor) may have more in common with manufacturers of complex medical equipment, avionics, and certain defence equipment than with a handset manufacturer, despite the commonality of a shared ANZSIC code.

On the other hand, there *are* some common problems and attributes of firms in the telecommunications equipment industries, although these are not unique to the sector (table 5.1).

One area where a sectoral orientation appears to be warranted is in standards setting. Governments may have a role in ensuring that any domestic standards are appropriate, and in ameliorating the extent to which overseas telecommunications standards and associated testing arrangements create barriers to entry of Australian producers to foreign markets.

Table 5.1: Are the problems/features of the telecommunications equipment industries unique?

Common problems/features of the telecommunications equipment industries	*Are these unique features?*
The telecommunications equipment market involves only a few major ultimate buyers (the highly concentrated carrier market) surrounded by a fringe of competing new entrants.	Other industries — especially utilities — are marked by a few major enterprises (such as gas, electricity and water) and yet have no special industry development plans. For example, privatised utilities in the states do not have statutory obligations towards local suppliers as part of their licence agreements.
Government purchasing comprises an important (if declining) share of the market.	Government purchasing extends to many areas other than telecommunications equipment.
The 'information revolution' (the on-line economy) relies on efficient and leading edge telecommunications infrastructure.	The 'information revolution' poses some significant challenges for government industry policy.[2] However, it is questionable to what extent Australian production of telecommunications equipment is fundamental to the rapidly growing on-line economy and other aspects of the IT revolution (see below).
Domination of the global and domestic market by MNEs.	MNEs play a prime role in many other industries — such as automotive, chemical and petroleum products, and agri-food — without this foreign ownership status requiring a policy response.
A relatively prominent role played by R&D, the use of high technology and skills in securing industry competitiveness (ie a 'knowledge intensive' sector).	There are other knowledge intensive industries and there are a wide range of R&D programs without an industry focus (such as the tax concession and Start).
A growing role for software services, and hardware embedded software.	Software is critical in a range of other industries.
The products are typically used as part of a *system*, which requires compatibility. This in turn means that international and domestic standards (and testing) play an important role.	This applies to the broader information technology industry as well as telecommunications (Sub. D4, p. 4)
A change in the operating environment of the industry — brought about by the transformation of the whole regulatory regime for carriers, changes in standards, rapid technological change (with digitalisation and convergence), and intensifying international liberalisation.	Not unique (for example, there have been large changes in other utilities, such as water and electricity) but not a common feature either.

[2] Such as taxation of the Internet, skills, government role in providing information, electronic commerce, and an appropriate set of laws and regulations.

Another argument for a sectoral focus on the industry could be based on the coincidence of so many fundamental changes for firms in the industry (regulatory framework, international agreements, technology shifts). Once highly assisted — by tariffs, and local preferences (through Telecom) — the industry is facing a sudden wind change in its operating environment. A (temporary) policy might address missing skill requirements for this new environment, the adequacy of existing public research infrastructure[3] and remaining regulatory impediments to bandwidth growth.

Finally, even though there are other industries that are high technology, or dominated by a few sellers, or have strong representation by MNEs, there are few industries where these features coincide. This may establish a prima facie case for some forms of intervention aiming to increase spillovers through R&D or other knowledge diffusion and generation.

5.3 Possible economic rationales for telecommunications equipment policies

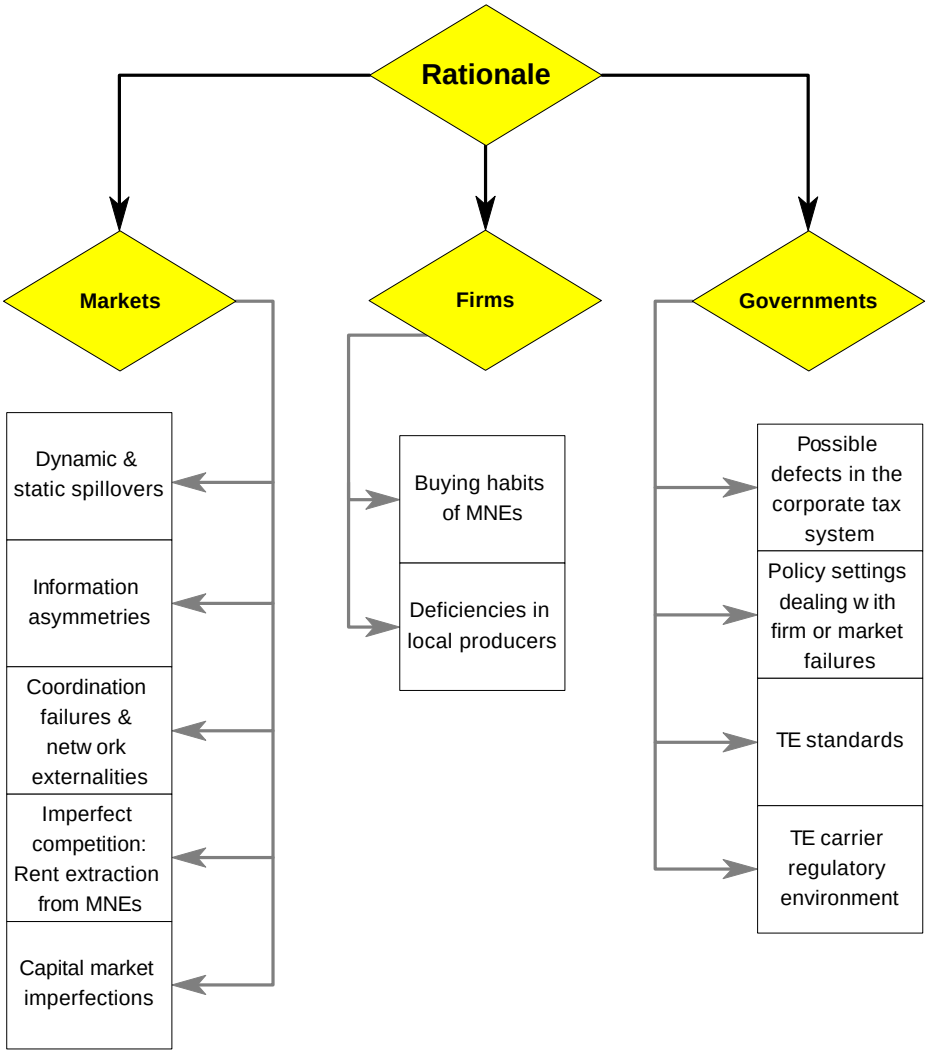
At the broadest level, there are three major reasons put forward for industry policies which may have relevance to the telecommunications equipment industries (figure 5.1). These cover imperfections in markets, firms and government.

The most important *possible* arguments for government intervention are that:

- Innovating firms often produce 'spillover' benefits for other firms and consumers. Sometimes the private returns from investments are not enough for a project to go ahead, even if there are spillover benefits big enough to make it socially worthwhile. Policy arrangements like IDPs or the PfD program may be used to encourage firms to undertake more activities with these spillover benefits.
- Local firms may be below world's best practice in some aspects of their business. Large sophisticated multinationals might have something to teach the locals.

[3] A specific example of this relates to the extent to which de-regulated, highly competing carriers may reduce expenditure on certain sorts of public good R&D. The degree to which public good research has been affected by shifts in ownership of utilities and changes to competition policy is currently under examination by both the House of Representatives Standing Committee on Industry, Science and Technology and the Australian Science and Technology Council (ASTEC).

Figure 5.1: Possible rationales for telecommunications equipment policies



- Foreign firms might not know much about the capabilities of Australian firms — and then make ill-informed buying decisions.
- Very large firms — like some carriers and big multinational telecommunications equipment suppliers — don't necessarily watch each dollar closely when making their decisions. They might be biased towards their home country or use 'seat-of-the pants' rules when buying their supplies, which may disadvantage Australian suppliers.
- The government is a big buyer. It may use its buying power to get a better deal on its purchases by extracting profits from MNE suppliers.

> Sometimes it may take that 'better deal' in the form of industry development in Australia.

Of these arguments, the first two provide the strongest 'in principle' justification for selective intervention. The rest, when looked at closely, appear less relevant.

The following three sections spell out these failures in detail. The issues are not straightforward. Readers who wish to skip the more technical and analytical material which follows could go directly to section 5.7.

5.4 Market failures

Markets don't function perfectly. Firms may not be able to access finance when their prospects or other characteristics suggest they should (failing capital markets). Firms undertaking R&D, training, developing new management systems or making other investments in knowledge, may find, at the margin, that they cannot appropriate all the benefits from these investments (spillovers). Important information flows between people can be weak or absent, so that poor decisions are made (informational deficiencies). And a dominant firm may charge premium prices for its goods or services (imperfect competition). These imperfections may justify some intervention by government, *subject to the tests in chapter 4*.

The issue of possible capital market deficiencies for innovative start-up companies — a common theme in recent reports and also raised in the Commission's visits to the telecommunications equipment firms — is explored in chapter 10.[4] Here we concentrate on three other potential sources of market failure in the telecommunications equipment industries.

Spillovers

Knowledge plays a fundamental role in economic growth. Yet it has two special qualities, unlike most other contributors to growth. First, a firm which generates new knowledge cannot, even at the margin, capture all its benefits — these benefits 'spill over' to other firms and consumers (IC 1995a, p. 163). This happens because other firms can acquire some of the knowledge about new

[4] Capital market deficiencies, where they exist, are often an amalgam of other problems — such as information asymmetries, institutional problems, regulatory and tax distortions. We include it as a separate item because of its possible significance.

products, processes or techniques through casual observation, reverse engineering, patent descriptions, or staff movements.

Second, the cost of disseminating any given bit of knowledge may be very low. So if one person knows something, it doesn't stop others from knowing it too. But the costs of producing the knowledge in the first place may be high, so that firms will typically sell information at prices well above the marginal cost of diffusing that information.

Much of the 'new' industry policy theory[5] emphasises such spillover effects by recognising that knowledge is cumulative and that therefore spillovers have enduring dynamic effects.

These features of knowledge may provide a rationale for government intervention in the general sense — for example, by stimulating public good R&D in CSIRO, encouraging industrial R&D through tax incentives and through knowledge diffusion programs.

However, such measures do not address the question of whether government should aim any additional specific measures at the telecommunications equipment industries. Special policies for the telecommunications equipment industries may be justified if:

- the industries share characteristics which allow more effective mechanisms for stimulating R&D — greater inducement; and
- the technological and non-technological spillovers are bigger.[6]

Moreover, while the main obvious sources of problems in information markets relate to R&D, knowledge diffusion and inter-firm relationships, there are other possible sources of knowledge spillovers. As noted by some participants, spillovers may have quite diverse transmission mechanisms, such as through R&D, training/skills formation, physical investment, production and associated learning by doing, and strategic alliances with local companies. The question, therefore, is what transmission mechanisms are likely to be most useful in pragmatic policies? For example, is stimulation of investment, production or exports likely to be a useful way of deriving spillovers?

We now turn to these questions, discussing the grounds for, and scope of, policies designed to elicit spillovers in the telecommunications equipment industries.

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5 For example, the role of path dependence and endogenous growth theory (see Romer 1986 and IC 1995a).

6 A third condition, which we do not consider in detail, is that investment in R&D should not go beyond the point at which the net gains are exhausted.

Inducement

It is very difficult to design policies which stimulate high quality R&D (and associated spillovers), without subsidising R&D that was going to take place anyway. This means that R&D policies often induce little new high quality R&D for the revenue forgone — or elicit only a small 'bang for a buck'. It is possible that the nature of the telecommunications equipment industries lend themselves to policies which might achieve higher than usual inducement rates.

Thus it is possible that the PfD program (and, to some extent, the IDPs) — by targeting footloose and technologically capable MNEs — *may* be a way of achieving both high inducement and good quality R&D in the telecommunications industry:

- Footloose MNEs typically can undertake R&D or other knowledge generating activities in more than one country. Arrangements such as the PfD program and IDPs could tip the balance in favour of Australia as the location for research. Moreover, such 'leverage' programs could avoid subsidising R&D that would otherwise have happened (in contrast to the tax concession). This suggests that the inducement rates of such programs could be relatively high (appendix D). On the other hand, Australia will only gain appreciably from such R&D if it does not significantly displace researchers from productive knowledge generation elsewhere in the economy[7], and if the resulting knowledge can effectively flow to Australians as well as foreigners.
- The firms themselves choose the type of R&D (or other knowledge generation) they will engage in as part of any industry development arrangement. This suggests that they will tend to avoid R&D activities in which Australia has little advantage. As well, these firms are probably less likely to choose very poor projects compared to bureaucrats unacquainted with the technologies.[8]

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[7] For example, indigenous (or third party) firms in the telecommunications industry reported that the PfD program had had a negative impact on the supply of experienced technical staff (through displacement effects) — see table A9.15 in BIE (1994a, p. 233). Jtec (Transcript, p. 6) noted that there is a shortage of engineering graduates, which means that subsidised investments tend to displace other investments. This implies that even when it appears as if a particular large scale investment might not otherwise have happened (additionality) it will divert resources from other investments, so that the overall change in investment may be small on an economy-wide basis.

[8] However, we note that firms receiving subsidies for new R&D still choose projects which maximise private rather than social returns. It is possible, therefore, that they will not choose the projects with the highest social rates of return.

IDPs and the PfD program may be used as leverage for local R&D, alliances, and other activities of MNEs which could generate these externalities. But ultimately the benefits that such externalities bestow have to be balanced against the costs of facilitation.

Potentially larger spillovers

Telecommunications equipment manufacturing and service provision are (on the whole) relatively knowledge intensive activities, where spillovers are more likely (figure 5.2). This is reflected in high R&D to sales ratios[9] and skill levels of workers (chapter 2). Spillovers are also likely to be greater if Australians are intensive and demanding users of the new telecommunications technologies — which appears to be so (section 5.3).

The fact that IDPs and PfD agreements form a complementary set of policies for encouraging links between MNEs, carriers and indigenous firms may enhance knowledge flows. However, the small scale of indigenous activity in the telecommunications equipment industries, and the possibility that MNEs could form an R&D enclave might reduce beneficial R&D spillovers between local and global firms. After all, if a MNE uses Australia as a low cost base for undertaking R&D, the results of which are primarily diffused abroad, the domestic gains may be quite modest. On the other hand, convergence between IT and telecommunications equipment technologies, and the possibility of spillovers to firms or consumers outside the IT&T sector, may negate some of the impacts of the small scale of the domestic telecommunications equipment industries.

The prominent role played by large sophisticated global companies in the Australian telecommunications equipment industries, also suggests that *non-technological* spillovers (figure 5.2) to indigenous firms may be more important than in many other industries. Such spillovers may include learning advantages to workers and spillovers of other forms of knowledge (like managerial excellence, administrative systems, marketing experience, and training systems).[10]

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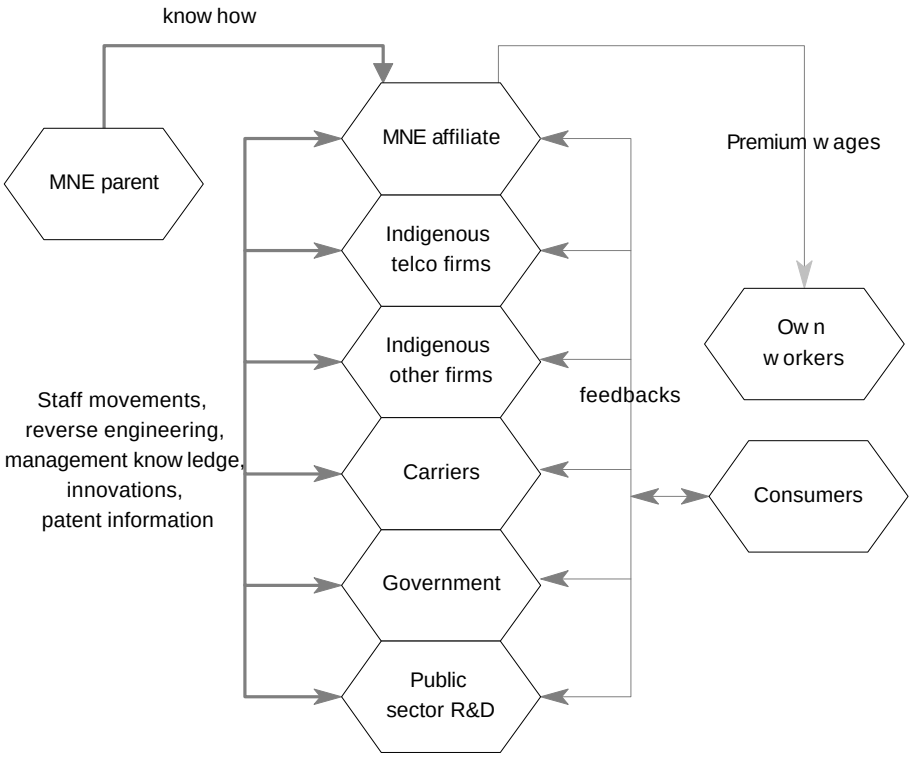
9 On the other hand, the R&D ratios observed in this industry are probably also influenced by government — through the IDPs and PfD programs. Moreover, the observed ratio of R&D to sales in a sector may not always be a very good guide to the *marginal* social returns of additional knowledge, which is what policy tries to target.

10 Attraction of MNEs may elicit another more subtle form of 'spillover' other than direct spillovers to firms or people outside these enterprises. It is usual to assume that the next best job for any worker in the economy pays the same wage. This may not hold in the case of jobs in telecommunications equipment MNEs. Instead, workers may receive a premium on their wages, compared to their next best job offer, because of efficiency wages (Layard,

Figure 5.2: How spillovers may be created in the telecommunications equipment industries



The scope for spillovers: implications for policy

Almost any economic activity can, in theory, generate some spillovers. For example, a firm which produces something new, learns from that experience. Investment in new (knowledge embodying) plant and equipment may therefore produce externalities by stimulating workers' learning by doing — knowledge which may be passed to other firms. Exports may produce spillovers too — as described in box 4.4 in chapter 4. The concept of spillovers also includes other apparent market failures such as network externalities, and coordination problems (appendix E). *If* the spillovers from all these activities were equally important, this would pose a problem for policy. This is because countries obtain the benefits of spillovers by stimulating activity where spillovers exist, and diverting resources from activities where spillovers are poor. But if

Nickell and Jackman 1991). This could occur if the MNE had certain characteristics which mean that the cost of poor worker morale and labour turnover would be greater than in alternative indigenous firms (for example, because of the need to preserve a reputation, or firm specific capital/knowledge that required training). By paying a wage premium the MNE discourages the worker from shirking or leaving.

spillovers were very widespread, then each diversion of resources to one area of the economy with spillovers, would deny resources to other areas where there are also spillovers — a zero sum game.

Accordingly, government efforts to stimulate spillovers are most effective if there are a few activities where spillovers are strongest. The empirical evidence is that spillovers are strongest for activities that bear directly on information creation or transmission — such as R&D — and less strong for exports or investment (for example, see Auerbach et al 1993). And while network externalities and coordination problems may have some significance for telecommunications equipment standards and competition policy, they are unlikely to establish a special case for industry policy for telecommunications equipment hardware in Australia (appendix E).

In summary, while there may be some spillovers associated with production, investment or exports in the telecommunications equipment industries, intervention aimed at generally stimulating these activities in this sector will be a blunt and partial tool for achieving them. For example, only some export activities can generate any spillovers (box 4.4) which, at best, would suggest policies designed to elicit those specialised activities. The more likely and robust sources of spillovers are R&D and strategic alliances.

Information imperfections

Newly arrived foreign MNEs (both new carriers and suppliers of MNE equipment or software) may have little understanding of the capabilities of Australian firms.[11] Is the technical performance and reliability of components or software supplied by indigenous firms as good as their usual suppliers overseas? Will the Australian supplier still be financially viable in three years time? Will their products continue to evolve at the right pace? Are their prices competitive now — and will they be so in the future?

Such information is important both to the large suppliers and the carriers, because the equipment they make or use is part of a system. The costs of failure of specifications or compatibility of equipment of the system are high. Of course, the indigenous firms know their own quality well. Why can't they simply tell the MNEs how good they are? There are two 'problems'.

[11] There can be information asymmetries on the other side too. Indigenous firms may have a poor understanding of the cultures, technologies and technical standards of such MNEs.

First, talk is not always cheap. The MNEs might want to examine the manufacturing plant of the local firm, look at the books, talk to the indigenous firm's accountants, financiers and existing customers, and consult their technical people. The transactions costs of extracting such information can be high, and it may tilt the balance of a MNE's buying preferences in favour of maintaining existing contracts with suppliers in other countries.

Second, talk is not always honest or complete — leading to enduring information asymmetries. Indigenous firms might provide information to MNEs about what they are like, but they may not be believed. The proof of the pudding is in the eating — and (rationally) a risk averse MNE might not want to dig in.

In fact, the first 'problem' is not a market failure[12], unless:

- government has some special cost advantage in collecting and disseminating the information. It may have such an advantage if, for example, it can reap economies of scope in the generation of knowledge. Thus it might be argued that government requires information about Australian firms for policy purposes, and therefore only needs to collect incremental information to act as an information broker; or
- the prices charged for such commercial information substantially exceed the marginal costs of disseminating it.

This argument may establish a role for government as a 'public good' collector and disseminator of *general* information about Australian industry capabilities in the telecommunications equipment industries (say for use in generating initial interests by MNEs in alliances and production contracts with Australian firms or for facilitating exports). This may be enough to overcome any initial barriers for alliances or other commercial arrangements between MNEs and indigenous firms. Overall though, the government is unlikely to have the aptitude or commercial incentives to be an efficient collector of the very specific commercial information which is ultimately required by a foreign MNE looking to sign contracts with Australian firms.

Governments may act in several ways to alleviate the second problem:

- Governments can certify the quality of suppliers, or facilitate the creation of institutions which do this. The government's Vendor Qualification

[12] The fact that information is costly (to gather, filter for useful insights, monitor for reliability, spread to the right decision makers, and interpret) does not distinguish it from other inputs to production. Such information costs are in many ways like other costs, such as transport, energy and labour costs, all of which can be sufficiently prohibitive that no, or fewer, trades take place in parts of an economy.

Scheme, now abandoned, attempted to promote quality certification of IT&T firms. To some extent, the current Endorsed Supplier Arrangements, with their quality standards and requirements for financial viability, continue to do this. Of course, markets often naturally develop measures for overcoming information asymmetries — such as warranties, self-regulation and voluntary certification — and any government measures have to demonstrate superiority to these market-based solutions.

- *If* government had superior information (for example, because it had been a customer of the indigenous firms) which was trusted by MNEs, then it may be a conduit of information to MNEs interested in local capabilities.

However, MNEs may not trust information provided by governments. Or MNEs may have negative and incorrectly-based perceptions about the quality of local firms. In this case, if the government forces or strongly encourages MNEs to develop commercial links with the indigenous firms, then the MNEs may uncover the true quality of the Australian suppliers. The Commission was told that the IDPs for carriers were partly aimed at ameliorating such informational imperfections by encouraging carriers to engage with local telecommunications equipment firms. This presumes that government perceptions about the quality of indigenous firms is correct, that the transactions costs they impose on the MNEs are slight, and that IDPs do indeed link carriers with local firms.

Extraction of oligopolistic profits

Sales of telecommunications equipment in Australia and other countries is dominated by large global enterprises (such as Fujitsu, Siemens and Ericsson). These firms supply high technology, complex goods and services, in which proprietary technologies and expertise are embedded. Arguably, their market environment tends to be oligopolistic. In these circumstances, the MNEs *may* earn some excess profits (or 'rents') through market power. Can government divert some of these profits back to Australia by requiring that such MNEs undertake industry development activities?

It is possible that when the government is the buyer it can try to appropriate a portion of such profits by inducing industry development in the telecommunications equipment industries — this is one of the rationales imputed to programs like the PfD (by BIE 1994a). On the other hand, an alternative strategy by government is to negotiate the lowest possible price — and in most (not necessarily all) cases this appears to extract the most rent (appendix F).

When the government is not the buyer, as in purchases by carriers, the government's bargaining strength is diminished. It can clearly use its licence

issuing authority to establish IDPs, but it is doubtful that such IDPs could be an effective vehicle for extracting profits from MNE telecommunications equipment suppliers — and may, in fact, generate perverse outcomes (appendix F).

In summary, the rent extraction rationale for leverage arrangements like the PfD program and IDPs is hard to sustain. Government leverage programs may, however, have positive impacts if they counter sub-optimal purchasing rules by MNEs (next section).

5.5 Imperfections in firms

Firms can sometimes be far from best-practice in some parts of their business. Markets may not force the closure of such firms, especially where product differentiation and entry barriers are significant. Such inefficiency may be manifested as poor management capabilities, low productivity, 'satisficing' behaviour (having an easier life) by managers, inefficient internal rules and regulations, and short-sighted investment behaviour. In the telecommunications equipment industries, such deviation from best practice, if it exists, may affect three distinct groups: the carriers as buyers of telecommunications equipment products and services, the telecommunications equipment MNEs as possible buyers from indigenous firms, and the indigenous firms themselves.

The buying habits of telecommunications equipment MNEs and carriers

It is sometimes suggested that large enterprises (such as the big carriers and MNEs) may not make optimal purchasing decisions. They can have cultures, norms or habits which allow a degree of inefficiency in the operations of the firm — and these can persist if their markets are insulated from competition either through dominance or regulation.

Consider for example, a purchasing officer who usually buys a foreign product. She knows the sales representative of the foreign firm. She knows that the board or any other superior is going to be happy with the sales arrangement as long as the costs are not too excessive because the supplier is a well-known multinational with a good reputation. It is expedient to roll over contracts with the traditional safe supplier. An Australian company which can provide the product at a lower overall cost may find it difficult to change the purchasing habit and culture of the buyer. Even savage loss leader discounts may not change habits if there is asymmetric information about the quality of the Australian producer, and prices are seen to signal quality, or profits to signal

reliability of supply (it may be preferable to trade with a company which will be here next year — and profits are one guide to this[13]).

For example, G R Technologies noted:

> We confirm the lack of ability of carriers as discerning customers in their inability to define a product or service in reasonable terms. (Sub. D6, p. 3)

DIST suggested that:

> ... informal feedback we have received is that the corporate headquarters of MNEs often have little understanding of Australian capabilities and/or have entrenched misconceptions. (Sub. D9, p. 10)

Jtec's CEO also pointed out what he perceived as a procurement bias against Australian companies:

> If Jtec actually manufactured a product in California and imported it here we'd have a much better chance of selling it to Telstra than if we made it here ... It's a perceptual thing ... (Transcript, pp. 7–8).

To the extent that they exist, inefficient purchasing practices may also reflect the influence of foreign head offices over small regional hubs. Because it centralises power, is encouraged by domestic government policies, or is just simpler, the head office may employ prescriptive operating rules (such as 'We will purchase our switches from the XY company in the US'). These rules may be close to the optimum, but leave scope for small gains in efficiency if local offices can exercise some discretion in purchasing. Industry development arrangements such as the PfD program can, in theory, shift the balance of power within the MNE from the foreign head office to the indigenous affiliate — with scope for further contracts with local firms. For example, one local affiliate said:

> Although decisions for investment need to be commercially sound, multinationals such as [company name deleted] are still competing for investment dollars between global locations. In our case it is US industry development vs Australian industry development, and PfD is a strong leverage point to win, given all things equal for commercial viability. Medium sized companies like [company name deleted] will lose this type of leverage if PfD is abolished. (Information provided to the Commission)

There is one major limitation with these, otherwise appealing, arguments. It is very hard to distinguish what appears to be sub-optimal behaviour from hidden, but valid, transactions costs. For example, as noted in the previous section, information costs can be appreciable. It may well be optimal in a world of uncertainty for a foreign owned subsidiary in Australia to source components from its traditional foreign supplier, even if a third party (say the government or

[13] Indeed, financial viability is one of the criteria for ESA status in government purchasing.

an industry observer) believes that the Australian producers are of equal, if not better, quality. This is because the foreign firm has to undertake considerable investments in information before it can make a relatively risk-free sourcing decision from the Australian company.

For example, IBM Australia argued that there was little evidence of a suboptimal bias against Australian suppliers, and that purchasing choices reflected the costs of complexity:

> Is there any evidence to support this assertion? The bottom line for most private firms is overall efficiency in value-for-money terms. It may be more effective for some companies to purchase some specific products, other than 'similar' products, because of the economies of scale in supporting a specific set of technologies. This is tied up very closely with the necessity of using products as part of a system. The more diverse the product range is within a system, the more complex, expensive and difficult becomes the management and operation of that system. Competitive pressures on costs and prices will tend to drive the grossly inefficient practices out of the system. (Sub. D4, p. 4)

Deficiencies in local producers

An important criticism of past protectionist policies has been that they reduced incentives for innovation, managerial excellence, cost control and outward orientation by Australian firms (eg BCA 1994, Keating 1994, Mitchell 1996). It is possible that at least some Australian telecommunications suppliers — reared in a sheltered environment of a beneficent local monopoly carrier, standards idiosyncratic to Australia, and protected by tariffs — have inherited internal norms and cultures which penalise their competitiveness in the new market conditions.

For these historical reasons, and because of other aspects of the Australian business environment, Australian business practices in the telecommunications equipment industries may be below world's best practice in some areas. One industry participant said:

> Amongst the many key variables which impact the current Australian way of thinking in this sector is that our home market, which is comparatively small, shortcuts the upside opportunity and fosters overly diverse product lines and stretched, unfocussed business models. This has at least two consequences: One, despite the creativeness of our managers (and products) which this environment generates, our managers and products become 'jacks of all trades' rather than masters or 'best of breed' in a tangible market segment. A result is that fewer products are exportable. Another result happens to be an acute unwillingness for key managers to listen to good advice — not surprising because there are few masters of their field here and a distinct lack of good advice. (Information provided to the Commission)

DIST suggested that deficiencies in the capability of the local industry was a major difficulty:

> The biggest problem for hardware SMEs who might sell to carriers is capacity to supply the products sought by carriers (ie being competent in the technologies, system and scale required) ... (Sub. D9, p. 8)

Environments in which learning between firms is harnessed may help to improve local capabilities (Marceau et al 1997, BIE 1995b). The AMC & McKinsey (1994) suggested that leading edge customers were a substantial source of innovation and efficiency in supplying firms. Nortel Australia suggested that there were substantial gains for SMEs from linking to MNEs:

> The low level of Australian manufacturer involvement in both international standards development and locally in the ACIF, indicates that local companies are less likely to be able to match leading-edge products to new standards. Effective partnering between MNEs and SMEs allows the SME input into international standards through the MNE's resources and representation at international standards meetings. (Sub. D7. p. 2)

But there may be a range of impediments to the development of relationships between leading edge global firms and indigenous suppliers. The global firms may not want to forge relationships with domestic suppliers unless the suppliers can demonstrate that they are already at world's best practice in their management and technology. But the supplier may not reach world's best practice without the association — a Catch 22.[14]

In these circumstances, policy measures which enhance learning and efficiency by indigenous firms could increase economic welfare. Alliances established by PfD and IDPs may be an example. Whether such arrangements enhance welfare overall will depend on the tradeoff between efficiency gains in indigenous firms and any cost increases in telecommunications equipment.

However, this sort of rationale has consequences for the type of policies pursued:

- If the argument is that the *transition* to a new market environment needs to be accommodated by government policies, then this suggests temporary arrangements.
- If the argument is that cultures of firms competing in today's deregulated markets can be adversely shaped by past sheltered markets, then this implies that any measures aimed at transforming those cultures should

[14] In theory, a local supplier could discount prices (effectively pay for the value of knowledge learned from the bigger enterprise) in the short run to encourage such a relationship. But that may not be possible if, for example, capital markets are not sufficiently prescient to finance the transaction, or the domestic supplier is insufficiently forward looking.

principally aim at established firms. New firms operating in the current environment are presumably less bound by the cultural inheritance of the past.

- The rationale implies that indigenous firms are not world's best performers, and that industry development arrangements which encourage sourcing from them implies (at least temporary) cost premiums for carriers (and ultimately consumers).
- There may be other more direct ways of facilitating alliances — for example, through programs such as the existing Business Network Program.
- Any policy should avoid assistance measures to firms which significantly shelter them from competition, as it is precisely such assistance measures which can embed inefficient practices and complacency.

5.6 Deficiencies in government arrangements

The government is a major actor in the Australian economy, as institution-maker, regulator, legislator, consumer, producer, tax collector and subsidiser. Problems or deficiencies in any of these areas can have adverse side effects for industry and others. For example, inefficient public utilities, ineffective aspects of the legal framework, a badly designed tax system, inappropriate assistance measures, and badly designed regulations can have adverse direct impacts on individuals' and firms' efficiency and incentives.

Such issues have much wider application than telecommunications — and have been explored more comprehensively in other reports (eg IC 1996e). But some issues appear to be significant for the telecommunications equipment industries:

- As noted in chapter 4, a recurrent theme in recent reports on the IT&T industries has been apparent problems in the tax treatment of capital gains, and their influence on the supply of venture finance. (We examine this issue in chapter 10.)
- There are a number of international agreements negotiated by government (for example, in relation to government purchasing) relevant to the telecommunications equipment industries (we examine these in chapter 8).
- Any problems in effective competition in the supply of carrier services. One telecommunications equipment supplier considered that lack of competition in the telecommunications services sector will constrain development in the technology/content sector, and will fail to provide consumers with effective choice, service differentiation and price competition. **However, the Commission has not assessed the access**

regime or other aspects of the newly deregulated carrier service market, as these are outside the terms of reference.

5.7 Some popular misconceptions

The Commission has just outlined a range of 'in-principle' arguments for government intervention in the telecommunications equipment industries. But much advocacy for strong industry policy in this sector (and the IT sector as a whole) is premised on a set of intuitively appealing, but far more questionable, propositions. For example:

- Australia cannot be a leading edge user of information and telecommunications technology without being a leading edge producer.
- Industry policies in strategic industries, like telecommunications equipment, are needed to create jobs for Australians and reduce national unemployment.
- The IT trade balance is bad, will get worse and requires a policy response.
- International trade is a 'war'. Countries lose out if they do not grasp strategic industry and investment opportunities.
- Governments should develop policies to encourage *high* growth industries.

We look briefly at each proposition in turn.

Use requires production

The Goldsworthy report (1997) contends that Australia needs a strong productive capacity in information and communication technologies in order to be a leading edge user:

> To prosper in the 21st century Australia must be a leading edge user *and* producer of information and communication technologies. Leading edge producers and leading edge users form mutually reinforcing relationships. Rarely does one exist in isolation from the other. (p. 3)

In contrast, Peter Upton (AIIA) argued:

> I think the argument [linking production and use] is unsound. I think we are a world class user of a lot of things we don't produce, and indeed I'd revert to the general comment about the theory of trade. It implies that we are world class users of some things, world class producers of others, and we'll swap the things we are world class producers of in order to buy the things that we are world class users of. (Transcript, p. 67)

Moreover, in the report commissioned by DIST for the Goldsworthy inquiry, Charles et al (1997) say:

> Australia is a world class consumer of information technology and telecommunications products and services accounting for over 2 per cent of the world market, making it the largest single market in Asia-Pacific other than Japan. However, Australia is punching far below its weight as a producer and exporter ... (p. v)[15]

The inherent assumption of the Goldsworthy report is that there are strong causal linkages between production and use, which shape the degree to which Australia can take up advanced telecommunication technologies. So what is the real importance of linkages — vertical and horizontal — for the take-up of telecommunications technologies? As noted by DIST (Sub. D9), there is a vast literature relating to the connections between production and use in many industries. For example, there is evidence that there are mutually valuable links between upstream and downstream segments of an industry, and between different market segments (BIE 1995b, and Marceau et al 1997). But before investing these links with policy relevance, we need to know:

- how important these links are to Australia's overall capability of being a leading edge telecommunications user — the critical question underlying the 'use needs production' paradigm;
- whether there are other gains from linkages;
- whether there are likely to be problems in the ways that markets shape linkages (suggesting the extent to which government may have a role in stimulating linkages); and
- the extent to which linkages cross national boundaries. If pronounced, this would undermine any imperative for local production in order to obtain value from linkages.

The links between leading edge use and production

The implications of the Goldsworthy report are that if Australia does not have a significant ability to produce telecommunications equipment, we forgo the opportunities of being a leading edge user of communications services (for example of internet services, including electronic commerce, internet software, and media). Such a premise seems to rely on strong linkages between such service providers and *domestic* producers of telecommunications equipment hardware. We can imagine possible routes for such connections, but the key question is whether they matter empirically enough to warrant policy interest. A test of the strength of such linkages is whether countries with relatively poor

[15] But in other parts of their report — for example, when assessing the importance of semiconductor manufacturing capability in Australia — they appear to endorse the view that there are strong links between use and production.

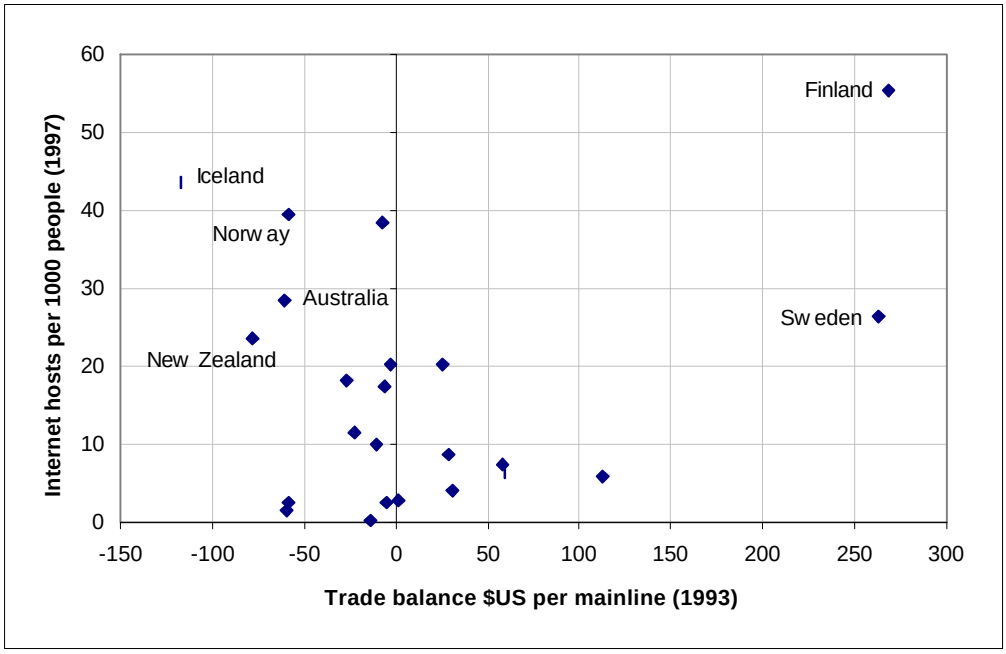
production capabilities have much lower or less sophisticated adoption of telecommunications equipment services than others.

However, the connection between ultimate consumer use (which should reflect the service industry potential of telecommunications) and comparative advantage in telecommunications equipment manufacture appears to be weak. A variety of indicators (covering computers, faxes and Internet use per capita — see BIE 1996d, IC 1997g) reveal that Australia has, by world standards, a highly advanced infrastructure for electronic diffusion of knowledge and transactions. For example, in January 1997 Australia had the fifth highest number of Internet connections per person in the world (OECD 1997). This is notwithstanding the small scale of our telecommunications equipment industries. Yet countries like France (with Alcatel), Germany (with Siemens) and Japan (with NEC and Fujitsu) have very low relative Internet use, despite their obvious communications equipment production capabilities. Only Finland seems to combine a very active manufacturing capacity in the telecommunications equipment area with very high use of the Internet.

The pattern of revealed comparative advantage in telecommunications[16] and Internet use per inhabitant suggests, if anything, a negative correlation between intensity of use and manufacturing capability (figure 5.3).

[16] Comparative advantage (and production capability) is measured as the trade balance in such equipment in $US per telephone mainline. The trade balance is divided by the number of mainlines to account for differences in the size of the telecommunications systems in different countries. A high negative value in this measure suggests few domestic capabilities.

Figure 5.3: Use versus production in OECD countries



Source: OECD 1997, vol. 1.

These data do not support the contention that there are significant dependencies between final use and production of telecommunications technology.[17] A country can have thriving and efficient telecommunications *services*, without the domestic capacity for manufacturing the constituent parts.

Thus, notwithstanding our telecommunications production base, the International Telecommunications Union ranks Australia as the fifth most likely nation in the world to emerge as the leader of the information superhighway. [18] The Cutler report (1997 p. 17) also observed that the most important aspect of telecommunications and IT had shifted to content and information management, and away from hardware production.

Jtec on the other hand, suggested that the hardware was still very important, and tied into the development of content:

> ... one very important point that everyone misses is that hardware and software are not really separable in a lot of cases ... Two thirds of our product and seven eighths of our value is software, but we need the hardware to deliver it on. The hardware is the vehicle for getting it to market. (Transcript, p. 5)

However, Jtec acknowledged that businesses often successfully contracted out manufacture of the hardware components overseas:

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[17] Other data on mobile phone use tell a very similar story.

[18] Cited in ACSI/McKinsey and Company (1997, p. 29).

> ... you can now get stuff made quite competitively in these contract shops. Even Cisco which is one of the world's largest companies gets its stuff made outside. It doesn't do it itself. So it's a world market for manufacture ... [But] you have to design it yourself. You have to make sure there's appropriate standards of quality which are now becoming standard, but you can get bits made. I mean Boeing gets a part of its fuselages made in Japan, and it gets part of its flaps made in Australia, and god knows where the wheels come from, but it's basically a final assembler rather than a manufacturer per se of aircraft ... and it's the biggest in the world ... So we have no problem with that. (Transcript, p. 11)

Other gains from linkages?

The above results do not mean that there is *no* connection between the quality of infrastructure and services, nor that there are *no* links between production and some aspects of use.[19]

First, there is a clear connection between the performance of the physical infrastructure, *whatever the nationality of its origin*, and its users. One of the major motivations for deregulation of carriers is to increase efficiency and product variety, while lowering prices. That is one reason why it is important to avoid any telecommunications equipment development arrangements which increase the costs of telecommunications infrastructure, or which lead to technological compromises.

Second, there *are* also some links between production and use:

- sophisticated customers may foster the development of more sophisticated production — though note that the direction of causality is from use to production, not the other way around (Porter 1990). If this is the only direction of causality then, at best, it suggests measures to increase our sophistication as users.
- evidence from BIE (1995b) and from More and McGrath (1996) also point to the importance of linkages between telecommunications equipment firms, both here and globally. For example, these are typified in Australia, by links between Optus and Nortel (a carrier/MNE subsidiary link), and Vodafone and Keycorp (an MNE /indigenous firm link); and globally, by complex and fluid relations between a nucleus of MNEs and a 'sea' of component suppliers and final assemblers.

Such linkages may improve efficiency and capabilities in domestic telecommunications production — which is beneficial for shareholder returns, wages and our economic prosperity. But the benefits of these linkages should

[19] DIST, for example, appeared to view that as the implication of the Commission's Draft Report (Sub. D9, p. 4).

not be confused with any linkages between production and *final* use of telecommunications services.

Crossing national boundaries

An examination of the actual pattern of linkages in telecommunications industries reveal a strong international dimension, with firms cooperating globally. Indeed BIE and AMC research (BIE 1995b and AMC and McKinsey 1993) implied that overseas links were more valuable than those with domestic partners — again undermining the notion that local production is required in order to capitalise on links between productive activities within the sector. In this sense, the use/production hypothesis seems to misunderstand the nature of globalisation.

It is probably not surprising, therefore, that there is little evidence that *internal* (vertical or horizontal) linkages are requirements for comparative advantage across the telecommunications equipment industries. In the OECD it appears that individual countries can gain advantages in one market segment of telecommunications, *without* advantages in others (OECD 1997, p. 165):

- Spain is a successful exporter of telecommunications switching equipment, but is relatively poor in telephone sets, receiver terminals, line equipment, transmission equipment and other equipment
- The Netherlands, and Belgium-Luxembourg are similarly successful in line equipment, but not elsewhere.
- Finland has an advantage in transmission equipment, but not largely in other market segments.
- In any case, in the Australian context, we cannot aspire to world scale production in *all* segments of the industry. Only the US and Japan appear to do that. If there are powerful horizontal *indigenous* linkages, it seems improbable that we will be able to make widespread use of them.

A role for government with linkages?

When firms forge mutually beneficial relations — based on information flows, shared R&D or other activities — they do so because there are large private benefits. Most cooperative behaviour does not require a helping hand from government. Even so, it is possible that firms may underutilise linkages, if for example, there are misperceptions about the capabilities of Australian producers, spillovers of information flows between linked firms, and the absence of a linkage 'culture' or other impediments to mutually beneficial corporate cooperation. One of the possible advantages of carriers' Industry Development Plans is that they may help to foster such linkages (chapter 6).

But we emphasise that while this might have implications for the capabilities of local telecommunications equipment suppliers, it does not, as preceding sections have explained, have any significant implications for users. If there are productive gains from alliances and other links we should exploit them, without inflating their importance to ultimate users of telecommunications technologies.

Implications

The notion that we will miss out significantly as consumers of telecommunication services if we do not have a bigger domestic telecommunications production capability is not supported by evidence, such as in figure 5.3. There may be links, but they don't matter a lot to final consumers. This implies that while it is sensible to consider any spillovers from producers to other downstream producers when appraising the costs and benefits of establishing major new productive activities in Australia, it is also important not to overdramatise their importance.

As well, a policy orientation which emphasises assistance measures for equipment manufacture may miss out on the larger opportunities that arise from services. During the industrial revolution it would be akin to a price support system for cotton — instead of creating appropriate infrastructure such as railways or ports. The concerns of equipment manufacturers should not, by and large, be seen as necessarily integral to policy initiatives aimed at maximising our productive use of the information technology revolution. Equipment is clearly an essential input, but the real opportunities from the revolution appear more likely to be manifest in information intensive service industries (the 'content') and in systems and software.

The 'use needs production' paradigm is a diversion from more pressing policy issues.

Where will the jobs come from without industry policy?

As noted at the start of this chapter, part of the revived interest in interventionist industry policies, such as those of the Goldsworthy report, stems from a concern about Australia's persistently high unemployment problem. We know at an individual business level, that a new factory (or a factory whose closure is prevented) appears to generate jobs for Australia. Accordingly, it may appear that by attracting foreign multinationals and by strengthening productive capacities in 'key' industries (such as telecommunications equipment), we can create new jobs and reduce unemployment. This is a common-sense, firm's eye view on job creation. For example, DIST (Sub. D9) suggested that externalities (as conventionally defined) were 'very secondary' to the actual benefits of the

carriers' Industry Development Plans. Instead they listed a range of other perceived benefits, in which job creation gets first billing.

Unfortunately, this view suffers from limitations when applied across a whole economy. When a firm employs a group of workers, it should not be supposed that all of them would be otherwise unemployed. The most common transition to a job is from another job. So new industries — whether created by market forces or through clever intervention — tend to displace workers from other industries.

This does not mean that structural change — changes in production capability among industries — cannot influence short-term unemployment, but that such change is unlikely to affect the long-run unemployment rate.

Workers are not all the same either — some are very highly skilled, others have little experience and no training. Unemployment and labour shortages can therefore co-exist. Many of the areas where industry policy might be applied — such as in the telecommunications equipment industries — are relatively intensive users of high-skill workers, where labour tends to be scarce rather than in excess supply. Nor would stimulating the lower-skill segments of the (highly tradeable) telecommunications equipment industries be a likely success, because this is where Australia is least competitive with lower-wage Asian economies.

Empirical studies of unemployment among different countries suggest that industry policy does not have a large role to play in ameliorating the problem (Layard, Nickell and Jackman 1991; Nickell 1997). Factors such as employment programs, industrial relations laws and institutions, and the social security and tax system are much more important long run determinants. The World Bank's (1993) analysis of the East Asian growth phenomenon suggests that flexible labour markets (and low unemployment) helped these countries achieve industry policy goals, not the other way round. As Krugman (1992) notes, industry policy neither creates nor destroys jobs.

Even if these views were wrong, and industry policy were successful in creating new jobs in the telecommunications equipment industries, any impact on unemployment would be slight. For example, suppose that:

- employment in the telecommunications equipment industries grew at a phenomenal 20 per cent per annum trend rate *every* year from 1995–96 until 2004–05, compared to a base rate of growth of 2.9 per cent per annum (which is the average trend growth rate of employment in the economy); and
- every second new job in the telecommunications equipment industries was created from the ranks of the unemployed (a bold assumption given the skilled nature of the jobs).

In this case the industry would employ roughly six times its current workforce by 2004–05, but unemployment rates for the economy would fall by only about one fifth of one percentage point. The impact of alternative industry policies should not be judged by (illusory) impacts on aggregate unemployment, but on the impacts they have on the economy's productivity.

The trade balance argument

As noted in Houghton and Flaherty (1997) and Charles et al (1997), Australia has a large trade deficit in information technology, although this does not appear to be so marked in telecommunications equipment. The concern expressed by some advocates for special policies for the telecommunications equipment (and the rest of the IT sector) runs as follows:

- Australia's terms of trade have fallen massively. According to the Goldsworthy report (1997) and Houghton and Flaherty (1997) they have fallen by 45 per cent from 1964 to 1992 (allegedly the largest fall among a group of 18 OECD countries).
- The decline in the terms of trade reflects the fact that prices of elaborately transformed manufactures have increased by more than resource-based commodities.
- As a result of falling terms of trade, Australia's (commodity) exports earn us less, while our (elaborately transformed) imports cost us more, leading to trade deficits, and exchange rate depreciation. This makes IT equipment and other ETMs more expensive to import, and leads to a vicious circle of deficits, further specialisation in commodities, and a weakened ability to buy high technology goods essential to our overall economic competitiveness.

The argument, while having some superficial appeal, has a number of logical and factual flaws:

- ABS national accounts data suggest that Australia's terms of trade have in fact declined by less than 21 per cent from 1964–65 to 1992–93.[20] In recent years (1980–81 to 1995–96) there has been virtually no decline (5 per cent). OECD data show that since the 1980s, the terms of trade of Switzerland, Norway and Singapore have all declined by more than Australia.

[20] The terms of trade data cited by the Goldsworthy report appear to ignore services, which have become increasingly important. Moreover, they appear to be using IMF data, which tell a very different story to official Australian data — a discrepancy which is under investigation.

- There is no statistically significant correlation between long-run changes in real GDP growth and long-run changes in the terms of trade.[21]
- While the prices of our imports have clearly been increasing more than the price of our exports[22], this does not appear to be true for the product class that the Goldsworthy report recommended should be the target of special export drives — IT and communications equipment. For example, in 1992, 100 tonnes of Australian wheat would have paid for four 486 computers. In 1997 it would have paid for 23 such computers, or 12 of the faster pentium computers. Prices of RAM, modems, mobile telephones and other IT equipment have fallen rapidly (even as quality has risen), reflecting increased competition, the rapid pace of technological change, and the impact of massive increases in the scale of production.
- In any case, the implication that we should shift exports to those goods which enjoy rising relative prices, ignores existing patterns of global productivity, the gains from international specialisation and the fact that people's needs span a vast range of goods and services across the technological spectrum.[23] People will still need to eat real food, while enjoying the virtual 'fruits' of the IT revolution.
- Partial trade deficits in one class of goods may provide a useful snapshot of a country's competitive advantage in that particular commodity — but they have no macroeconomic significance. Indeed trade deficits in at least some product groups are the inevitable consequence of international specialisation. There could be no gains from trade unless a country ran a trade deficit in some product groups. And the gains from trade — for small open economies like Australia — are profound. If the argument is that we should eliminate the trade deficit for the IT sector, while being content with trade deficits in other groups, then logically it is no longer the trade deficit *per se* which justifies our argument. As emphasised by Porter

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[21] Based on data for 95 countries from 1961 to 1993. The data were kindly provided by Chris Kent from the Reserve Bank of Australia.

[22] Even this measure is biased because these prices do not adequately take account of quality improvements, which have been more important for manufactures than for commodities.

[23] There *may* be other gains from an export orientation in government assistance programs for high technology goods, such as those described by Stiglitz (1996) and explored in the previous chapter. But these rationales should not be conflated with that based on the trade deficit argument. For example, government policy measures — changes in investment in infrastructure, skills and R&D — may produce dynamic spillovers which favourably shift our comparative advantage from resource-based commodities to other more knowledge intensive goods and services. But the reason for doing this is the dynamic spillovers, not a trade deficit in knowledge intensive goods and services.

(1990) the trade balance argument is essentially a red herring, which obscures more important issues pertinent to industry policy:

> Defining national economic goals in terms other than long-term productivity growth is a fundamental error that leads to inappropriate policies. No nation can achieve net exports in every industry. Efforts to preserve all industries will lower the national standard of living. Balancing trade is not in itself an appropriate goal, nor is attempting to boost 'competitiveness' through forcing down the value of the currency. If policies are always measured in terms of their effects on dynamism and sustained productivity growth, however, the chances of working at cross-purposes to true economic progress are much less. (Porter 1990, p. 618)

- The overall goods and service trade deficit, which can matter, has been falling steadily since 1985–86 and was negligible in 1995–96.

It's a war out there

There is a tendency to see trade in adversarial or combative terms. For example, Goldsworthy sees investment attraction as a 'brutal global competition' and notes that the 'spoils' of the information age will only go to those countries prepared to embrace an activist regime. Others see increases in the economic capabilities of our Asian neighbours as a threat:

> If [the] analysts ... are right, our problems are going to get a lot worse as the real competitiveness growing steadily in Asia hits home. ('The Twin That Must Be Tamed', *Canberra Times*, 12 Aug 1997)

For individual firms trying to succeed in tough national and global markets, these metaphors are probably appropriate. But for a whole country they tend to obscure the gains from trade, and the benefits that increases in productive efficiency in other countries confer on us. It is hard to think of any single product where efficiency improvements over time in overseas countries have not provided benefits to Australians.

The current problems posed by financial crises in East Asia emphasise the interdependence of economies and the value of trade. Australia does not stand to gain from the trade and domestic problems in the region — as the 'war' metaphors would imply.

These adversarial metaphors also lead to contentious arguments about the need for reciprocity in trade liberalisation (IC 1997e, pp. 17–23). For example, the Goldsworthy report (1997) enunciates the principle of:

> reciprocity — not giving away advantage without getting something in return. Reciprocity in the sense of negotiating and trading advantages in multi or bilateral fora, and having regard to the pace of change elsewhere. (p. iii)

What lies behind such reciprocity arguments?

- They imply that unilateral trade liberalisation is actually bad for the liberalising country, and gains can only be had if other countries also liberalise. That is we 'win' only where we have tit for tat. This ignores the efficiency benefits to Australia of specialising in the productive activities we are best at.
- Another basis for such arguments is that Australia should not squander 'negotiating coin'. Unilateral liberalisation means that Australians give up the capacity to bargain for trade liberalisation with our trading partners. But any gains from such (typically drawn out bargains) have to be compared with the losses from delaying unilateral reform.

While the overall story of trade is one of 'win win' there is a footnote provided by some of the literature on foreign investment attraction and strategic trade theory. These suggest that, in some circumstances, countries may gain advantages over others (through monopoly profits, learning benefits and technological externalities) by competing for foreign investment or providing subsidies to certain technologies with scale and learning economies (such as aircraft). These have been reviewed in detail by the BIE (1993b), but their pragmatic significance to overall industry policy is likely to be modest (see chapter 10).

Going for high growth industries

It is sometimes asserted that Australia's resources should be shifted to industries with high world growth rates. This is one of the rationales for the choice of the IT and communications sector for a sectoral industry policy by Houghton and Flaherty (1997):

> Other things being equal, a country that has a higher share of fast growing industries in its economy will gain a growth advantage over countries with a preponderance of slow growing industries.

Unless it can be demonstrated that there are externalities consistently present in high growth industries (most of which, however, are in the services sector) it is not clear why high growth industries should be the target of policy. If it involved shifting resources from a slow growing industry that we are good at, to a high world growth industry we are bad at, this would (at least in the absence of externalities) make us poorer not richer. Moreover, there are feedback mechanisms in the global economy. If many or all countries elected to shift resources in this way, prices of the output of such high growth industries would be pushed down, and the prices of the (now scarce) 'slow' growth industries would rise.

In the same vein, there is reason to be cautious in interpreting the spectacular growth of some telecommunications firms in other countries. For example, Canadian telecommunications companies, such as Nortel, Eicon, Gandalf, Mitel and Newbridge, have achieved rapid (but typically waning) growth rates. But the average return on capital in these firms is reported as 'weak' (Walsh 1996).

The notion that Australia should invest in high growth IT&T equipment technologies is exemplified by recommendations in the Goldsworthy report (1997) and Charles et al (1997) that the government should seek to attract a large scale chip fabrication plant to Australia. These reports emphasise the special significance of semiconductors as high growth, leading edge suppliers to IT&T industries:

> If Australia is to develop an internationally competitive semiconductor industry, which it must do in order to avoid technological and industrial marginalisation, it will need sooner or later to consider a similar approach [to other government's supporting policies] ...
>
> Each transition to a new chip paradigm has introduced computationally more demanding and more memory intensive software. This has created a dynamic by which PC hardware and software industries have enabled each others' generational shifts ...
>
> ... [Industry] participants need access to semiconductor design and fabrication to remain competitive and, in the long run, those that remain disconnected from these capabilities cannot succeed. (Charles et al, pp. 151–154)

The perception of the strategic character of semiconductors has led governments around the world to subsidise production of semiconductors or associated R&D. This is reflected in vigorous bidding by governments (such as Malaysia, Germany and UK) for foreign investment by Intel or other chip makers. For example, it has been reported that the Government of Saxony and the German Government have recently paid over DM800 million to a US company, AMD, to set up a chip plant near Dresden at a cost of DM3 billion — with loan guarantees up to DM1 billion. The rationale for the decision is apparently to use the investment as the core to build up a cluster of chip plants and related IT businesses.

It has also coloured Japanese-US trade relations with a series of semiconductor trade agreements aimed to limit Japanese price advantages, and facilitate US market access.

Australian interest in these technologies is hardly unique. For instance, the US National Advisory Committee on Semiconductors (1992 p.2–4) said:

> ... strong linkages help to create external economies — economies that flow between semiconductor firms and their customers and suppliers, and also between competing semiconductor firms ... The critical importance of semiconductors to

> US economic growth and international competitiveness demands a new and coordinated strategic response from the industry ... and the Federal Government.

The economic case for subsidising local manufacture of semiconductors rests on spillovers. Semiconductors are complex electronics. There is significant knowhow in their design and development. Their manufacture requires advanced technologies, and there are big gains from learning-by-doing. Such knowledge intensive goods and processes may well produce spillovers to other firms, and to employees.

Learning-by-doing is probably the most policy relevant feature of semiconductors. Such learning stems from the extremely exacting requirements for production — with small variations in production management leading to large variation in the number of rejects. Early in the production process, up to 90 per cent of the output has to be scrapped, but after learning, the reject rate can fall below 10 per cent (Irwin and Klenow 1994, p. 1203). These learning effects are so pronounced that a better ability to learn can lead to large competitive advantages for a firm. Key questions relevant to policy are:

- how big are learning effects? and
- how much of the learning-by-doing can flow on to other semiconductor firms (domestically and overseas) and to successive 'breeds' of semiconductors?

Learning rates — reflected in the extent to which unit production costs fall with each doubling of cumulative output — appear to be between 16 per cent and 36 per cent, with an average of around 20 per cent.[24] These learning benefits usually last over a roughly five year production life, before the chip is completely superseded. However, these benefits are mostly not in the form of spillovers. The evidence from Irwin and Klenow (1994) suggests that most learning benefits are retained within the firm. But there are spillover benefits equal to about one quarter of the total learning benefits between firms. Such learning spills over as much between firms in different countries as it does between firms in a given country. Importantly, Irwin and Klenow find that the gains from learning on one breed of semiconductor do not appear to translate to big learning advantages in successive breeds.

These results tend to weaken arguments for subsidies based on learning-by-doing spillovers. A nation with an early start need not acquire a permanent lead, obviating the imperative for policy action demanded by some. Moreover, the fact that foreign learning-by-doing spillovers appear to be as important as domestic ones, suggests that there are few agglomeration economies arising

[24] US Department of Commerce 1979, Dick 1991, Flamm 1993 and Irwin and Klenow 1994.

from learning-by-doing (though there may be such economies from other sources).

What about other possible gains from semiconductor manufacturing? Semiconductors are clearly an enabling technology, and are used in a wide range of applications. There are obvious gains to consumers and using industries from *access* to semiconductors. There are also possible spillovers from the design and assembly of the chips, and from the manufacture of the capital equipment used in such plants — but the former would probably be done in the US, and the latter in Japan. As Jtec put it, the sort of plant Australia is most able to attract would be chip assembly — effectively 'a big high precision printing plant' (Transcript, p. 16). But are there gains from such an assembly operation itself? Jtec underlined some of the complexities of this question:

> I was quite supportive of the fact that we should have a silicon plant in Australia; a lot of caveats on that; people have got to remember that a $1.5 billion plant is actually made up of a billion dollars worth of hardware, zero of which is made in Australia and has to be imported, and the other half billion is investment incentives you get from the government. So the value is really three or four hundred jobs. But you do in fact create some environment around the plant that does a lot of other things, so there's pull through advantages. (Transcript, p. 7)

There may be gains from information flows between local customers and a chip maker, development of skills in employees of any plant, and increased incentives for acquisition of engineering training driven by wage rises. But it is questionable whether these are all genuine externalities. Secondly, the telecommunications revolution itself means that some of the information flows between countries can now occur more easily.

As a number of industry representatives themselves recognised, the substantial government subsidies required to attract such a plant to Australia may not actually generate the suggested benefits, and entail significant risks. Charles et al (1997, p. 162), for example, acknowledged that the semiconductor industry 'operates in one of the fastest moving and least forgiving of all marketplaces, where only the technologically and financially strongest of all companies can succeed in the long run'. The US and Japan, for example, have both lost market share in the memory-chip market to Taiwan and South Korea.[25] The prices for any existing marque of chip tend to fall quickly (partly because of learning-by-doing and partly due to competition from new marques). This can expose any given chip plant to large risks (box 5.1). According to the financial press, even Intel is recording a substantial downturn in sales and expected profits in 1998. These risks means that the subsidies underwriting any such investments in Australia may not yield the expected benefits.

[25] *Economist*, 1 November, p. 70.

The assessment of the costs and benefits of attracting a chip plant to Australia is complex:

- The magnitude of any beneficial spillovers depend on a range of questions, such as the depth of complementary IT and microelectronics in Australia, the extent to which an attracted plant displaces high skill workers from other industries, the sort of chip that is assembled, the production life of the plant, and the existence of supporting design or R&D.
- Governments have to avoid a situation in which the gains from such spillovers have already been exhausted in bidding contests with other nations. Say, for example, that a $1.5 billion plant has a spillover value of $250 million. Countries around the world bid for the project. Australia finally wins by providing a transfer to foreigners of $250 million, but the gains have been dissipated through international competition.
- There are large risks associated with such plants. The subsidy required to attract a single plant is high — and would use funds that could be invested in a pool of diversified projects, with less overall risk.

As Charles et al (1997 p. 5 and p. 105) note, the assessment of any proposal with significant budgetary implications should be subject to careful cost-benefit analysis (a point we take up further in chapter 10).

Box 5.1: What's in a chip?

In the early 1990s, the South Korean companies, Samsung, Hindi and LG borrowed heavily to invest in memory chips — encouraged by growth rates in the personal computer market of 25 per cent a year. This 'invest in high growth' strategy appeared to pay off. In 1995, the semiconductor operations of these firms generated $5 billion in cash for these industrial conglomerates. But in 1997, with a world glut in memory, the spot price of 16 megabyte chips fell from $50 to less than $10 (in under a year) — and the companies posted massive losses in their semiconductor operations.

While Taiwanese chip makers did not appear as badly affected — because of lower debt levels, and greater diversification — continuing chip price falls also led to large losses for their semiconductor manufacturers. For example, Texas Instruments/Acer, one of Taiwan's largest chip makers, posted large losses in 1997, rather than the expected profits. In early 1998, Texas Instruments decided it would withdraw from the joint venture.

Even Intel — maker of the more sophisticated central processing units — significantly revised its sales and revenue forecasts in 1998 — projecting a 10 per cent decline in revenue.

Source: 'Chips on their Shoulders', *Economist*, 1 November 1997, p.70;

CNET NEWS.COM (6 March 1998); http://www2.techstocks.com/~wsapi/investor/s-4462/reply-24083 (28 November 1997); and http://www.infoworld.com/cgi-bin/displayStory.pl?98034.ectiacer.htm (March 4 1998).

5.8 Implications for telecommunications equipment policies

There are two quite different approaches that can be taken in designing new industry policies:

- policies can be pragmatic, but ad hoc, responses to the needs of a particular industry, with little consistency in the application of principles, administrative guidelines and other design criteria across different industries; or
- policies for any industry, while potentially recognising what is unique, apply a common set of design and administrative principles.

The danger of the first approach is that piecemeal industry policy development can have perverse impacts on economic welfare; and can frustrate business aspirations for a clear statement by government of the principles and objectives of its *overall* industry policy. It can also lead to uncertainty for business as governments 'chop and change' their mix of policies.

In this chapter, the Commission has tried to identify what is unique about the telecommunications equipment industries and to see what economic rationales could credibly be applied. These in turn impose some structure on any desirable form of industry policy and on methods for assessing whether they have, or are likely to have, been effective.

Overall, the Commission finds that rationales based on technological and non-technological spillovers and learning by indigenous firms provide the strongest 'in-principle' justifications for policies directed at telecommunications equipment industries.

The role of government in negotiating international agreements relating to the telecommunications equipment industries is potentially important too (chapter 8). Capital market imperfections — brought about by institutional problems, taxation distortions or market failures — may exist, and are assessed in chapter 10.

Arguments based on information difficulties, clawback of excess profits and bad buying practices appear to have less validity. This does not mean that there are *no* such problems affecting the telecommunications equipment industries, but that, by themselves, they do not present a sufficient basis for policy. We still

assess the policy significance of these problems, where potentially relevant, in the following two chapters.

Finally, a number of 'popular misconceptions' provide little, if any, justification for government intervention in the telecommunications equipment industries. Thus:

- Australia is a leading edge user of information, even though it is not a leading edge producer of equipment;
- industry policies cannot solve Australia's unemployment problems;
- the argument that a trade deficit in the IT sector requires a specific policy response has logical and factual flaws;
- the view that Australia must fight (use incentives) to secure investment in a 'brutal global competition' misunderstands the benefits from liberalised and competitive international trade; and
- the notion that a high average global growth rate in an industry, provides, by itself, a rationale for subsidies to such industries is flawed.

6 CARRIERS AND INDUSTRY DEVELOPMENT

6.1 Introduction

Telecommunications carriers have a key influence on local industry development through their role as buyers of telecommunications equipment, systems and services. One important feature of the environment facing the local telecommunications equipment industries is the gradual deregulation of the telecommunications services market since the late 1980s, and particularly the introduction of 'full and open' competition from 1 July 1997.

Section 6.2 provides background material on the process of deregulation since the late 1980s, and the carrier-related industry development initiatives that have been introduced. The role that Telstra has historically played in local industry development is reviewed briefly, and then the role of carriers' Industry Development Plans (IDPs), which were formalised in the *Telecommunications Act 1991* as a requirement for gaining a carrier licence.

In section 6.3, several aspects of the current environment are examined: the main features of the new regulatory regime; recent changes in the number of players; and the new framework for carriers' IDPs. The likely impact of deregulation on existing and new carriers and service providers is assessed in section 6.4, as well as the implications of these changes for telecommunications equipment manufacturers. In section 6.5, an assessment of the role of IDPs as an industry development instrument is undertaken, while conclusions are provided in section 6.6.

Details of the IDPs of the three carriers during the period 1992 to end-June 1997 are described in appendix G. While thirteen IDPs have been approved up to end-March 1998, the public versions of only four have been released — they too are summarised in appendix G.

Clearly, there are other factors at work that impinge on the strength of links between telecommunications carriers and the local equipment industry. Underlying demand and supply factors are discussed in chapter 2, the role of technological change and convergence in chapter 3, and international trade liberalisation in chapter 8. The other main government initiatives — the Partnerships for Development (PfD)/Fixed Term Arrangement (FTA) programs and Endorsed Supplier Arrangements (ESA) — are discussed in the following chapter.

6.2 Background to the new regulatory environment

A phased deregulation process

The process of introducing competition into the Australian telecommunications services market dates from the late 1980s. At the time, there were three government-owned players in the local market: Telecom (the domestic carrier); the Overseas Telecommunications Commission (OTC, the international carrier); and AUSSAT (domestic satellite services).

In May 1988, the government announced the first phase of a gradual opening up of different areas of the telecommunications services market to competition. Among the major reforms enacted in the *Telecommunications Act 1989* were:

- the exposure of value-added network services to full competition; and
- the progressive opening of supply, installation and maintenance of customer premises equipment to competition.

In November 1990, further reforms were announced that subsequently resulted in fundamental changes in the structure of the telecommunications services market, including:

- the selection by the government of Optus as the sole fixed network competitor to Telecom (November 1991);
- the merger in February 1992 of Telecom and OTC to form the Australian and Overseas Telecommunications Corporation (AOTC), renamed Telstra in 1993;
- the sale of AUSSAT to Optus;
- the selection by the government of Vodafone as the third mobile carrier (December 1992);
- the removal of all restrictions on resale of domestic and international network capacity; and
- open competition in public-access cordless telecommunications services.

The process of phased deregulation over the period from the late 1980s up to end-June 1997 had the following main effects on the structure of the telecommunications services market:

- the fixed network carrier market changed from a monopoly to a transitional duopoly (Telstra and Optus);
- three competitors were licensed in the mobile carrier market (Telstra, Optus and Vodafone); and

- many domestic and international service providers and resellers entered a broad range of telecommunications services markets.

Industry development initiatives

Accompanying the deregulation process in telecommunications services were government strategies to foster development of the local telecommunications equipment industries. (In the remainder of the chapter, for convenience and consistency we refer to Telecom or AOTC under its current name of Telstra.)

Telstra's role in industry development

The single most important influence on the development of the local telecommunications equipment industry has been Telstra — through its role as regulator of the telecommunications network, its purchasing behaviour, its dominance as a buyer of many products, and its product marketing functions. An indication of the quantitative importance of Telstra to the local equipment industry can be gauged by the fact that in the early 1980s around 90 per cent of its purchases of telecommunications equipment were produced locally, and these purchases accounted for around three-quarters of the local industry's output (IAC 1984).

As a publicly-owned monopolist, Telstra's charter called on it to conduct its business 'in a manner which would best meet the social, industrial and commercial needs of the Australian people for telecommunications services'. In practice this appeared to translate into objectives such as to foster 'a vigorous telecommunications manufacturing and development capability in Australia' (IAC 1984, p. 34).

Telstra's purchasing policies supported local supply, and encouraged multinational telecommunications companies to establish production in Australia, rather than to supply products from their plants overseas. At the time of an earlier IAC Inquiry, Telstra indicated that local manufacturing of telecommunications equipment provided commercial benefits such as added security of supply, delivery flexibility, improved maintenance and support capability, quality assurance, technical integration and installation efficiencies (IAC 1984, p. 37).

Doddrell (1995) has summarised the role of Telstra in local equipment industry development as follows:

> In the past Telstra's purchasing has driven industry growth. Telstra's past policies were a *de facto* industry policy which were only formalised as the IDPs in 1991 with the issue of the second carrier licence. (p. xii)

The changing role of Telstra in relation to industry development, arising both in response to deregulation during the period 1992 to end-June 1997, and likely pressures for change in the new deregulated environment, are discussed later in the chapter.

Industry development arrangements

By the late 1980s, customer premises equipment (mainly PABXs, small business/key systems, first telephones and cellular mobile phones) accounted for around one-third of local industry output, and was assisted by Telstra's local content and industry support policies (BTCE 1995a, p. 70). Following the deregulation of customer equipment markets in the 1989 Act, the government introduced Industry Development Arrangements (IDAs) to ease the transition of local producers into a more competitive environment, and to assist them to become internationally competitive and export oriented.

Under the IDAs, a company could obtain a permit to supply customer equipment (for connecting to the public switched telephone network) if it achieved a specified minimum number of points each year, based on activity in R&D, local manufacture and exports. By June 1994, 36 companies supplied customer equipment under the IDAs — of which half were suppliers endorsed under the Arrangements and the other half had gained exemptions by participating in the PfD/FTA programs (BTCE 1995a, pp. 70–71). Always intended as a transitionary scheme, the IDAs ended on 30 June 1996.

Carrier industry development plans

The requirement for carriers to have an industry development plan as a condition of licence was formalised in the *Telecommunications Act 1991*. Carriers were required to 'maintain and implement a plan for the development of the Australian telecommunications supply and information industries in conjunction with its business'.

The reasons given by the government for requiring industry development plans as a licence condition of carriers were explained in the second reading speech on the *Telecommunications Bill 1991* (in relation to bids for the sale of AUSSAT):

> ... it is essential that the carriers be able to turn to a dynamic local industry, with a research and development ethos that looks beyond Australia's boundaries, for necessary support. A local industry that is innovative, forward-looking and has a commitment to excellence will also be necessary if we are to take full advantage of the opportunities that telecommunications will present in the next century.
>
> Secondly, we recognise that Telstra's policies to date have contributed in no small measure to the development of a significant electronics industry in Australia and a

> research and development base. It is important that we build on this. (Beazley 1991, p. 3094)

Under the IDPs, carriers were required to:

- submit their plans to the Industry Minister for approval; and
- make summaries of their plans publicly available.

An advisory body, the Telecommunications Industry Development Authority (TIDA), was established in July 1992 to monitor and advise the Industry Minister on the extent to which carriers met their industry development commitments. The IDPs were monitored annually by TIDA.

The IDPs of the three carriers in the period 1992 to end-June 1997 are now reviewed. The IDP framework under the post-July 1997 legislation is described in section 6.3.

IDPs of carriers, 1992 to end-June 1997

A summary of the main commitments and achievements of Telstra, Optus and Vodafone for the period 1992 to 30 June 1997 is presented in table 6.1. Full details are provided in appendix G. The IDPs of Optus and Vodafone were based on their industry development proposals, submitted as part of the bidding process for the second fixed network carrier licence and the third mobile carrier licence.

Telstra's commitments to local industry development for the period 1992–1997 included the following undertakings (see AOTC, 1992):

- to enter into long-term agreements (in the form of product sourcing agreements) whenever there is a continuing predictable and significant demand for a product;
- cooperating with the government to assist Telstra's major suppliers to comply with the government's industry development policies;
- not to purchase from overseas firms without first considering Australian firms that it knows to be suitably qualified;
- to offer Australian equipment, products and services in tenders for foreign contracts, when they are competitive and suitable for the market; and
- to assist its suppliers to meet world's best quality standards.

Table 6.1: Carriers' IDPs, selected commitments and cumulative achievements, 1992–1997

Activity	*Commitment/undertaking*	*Achievement*
Telstra		
Expenditure	$10 billion	Around $20 billion
Local content	Strong preference to source from local industry	Around 65 per cent
R&D	More than 1.5 per cent of sales	Around $1 billion, representing over 1.5 per cent of sales
Strategic relationships	Enter product-sourcing agreements where continuing predictable and significant demand	Strategic alliances formed with Alcatel, Ericsson, Nortel and Siemens
Training	Expenditure greater than 3 per cent of annual national payroll	Around $900 million, or nearly 6 per cent of annual national payroll
Exports	Provide opportunities for Australian firms to promote their equipment, products and services for export	Involvement in activities such as the Telecommunications Export Taskforce & Telecommunications Export Development Group
Optus		
Local content (ratio)	70 per cent of capital expenditure 75 per cent of total expenditure	72.3 per cent of capital expenditure 75.6 per cent of total expenditure
Local content ($)	$870 million, capital expenditure $3 billion, total expenditure	$2.5 billion, capital expenditure $7.4 billion, total expenditure
R&D	$100 million	Around $360 million
Strategic relationships	Strategic supplier agreements with Digital, Fujitsu, Leighton, Nokia, and Nortel	Alliances in place at outset
Training	$100 million	$139 million
Exports	Facilitate exports from strategic suppliers and other suppliers	$137 million by strategic and other suppliers attributable to Optus' business
Vodafone		
Capital expenditure	$417 million	$939 million
Local content	At least 60 per cent	67 per cent
R&D	A minimum of $5 million	$4.9 million (actual) $5.7 million (committed)
Strategic relationships	To form a strategic supplier relationship with either Ericsson or Nokia	Strategic supplier relationship formed with Ericsson; and strategic alliance with Keycorp
Training	$7.2 million	$8.6 million
Exports	To facilitate exports by its strategic suppliers	Some exports by Ericsson attributable to Vodafone's business

Sources: AOTC 1992; Telstra 1994, 1998; Optus 1992, 1994, 1997a, 1997c; Vodafone 1995, 1997a, 1997b.

Telstra anticipated purchasing around $10 billion worth of equipment over the five-year period from 1992 to 1997. Telstra's actual spending was around $20 billion, or double that originally planned. This better than expected performance was driven largely by two influences — its strategy to be a key player in the converging telecommunications, computing, information and entertainment industries; and industry competition (Telstra 1996a, p. 2). The most significant elements of Telstra's expenditure were its network modernisation program (the FMO project); and the HFC (hybrid optical fibre/co-axial) cable network rollout.

Telstra expected the majority of its planned expenditure to be sourced from local industry. As noted in table 6.1, the local content of its actual expenditure was around 65 per cent — meeting its commitment, but somewhat lower than the 90 per cent local content achieved in its purchases during the 1980s. With Telstra facing increased competitive pressures as a result of the entry of two new carriers and other service providers, there was a likelihood that it would not be able to maintain the same degree of support for the local equipment industry as it had done before.

Optus exceeded all the commitments made in its IDP. The local content shares of capital and total expenditure were met, and all local content commitments in dollar terms were exceeded by substantial margins (some by as much as 180 per cent) because Optus achieved much higher levels of expenditure than estimated.

Optus also exceeded its R&D commitment by some 260 per cent, comfortably met its training commitment, and facilitated exports with the implementation of various programs including the Export Partners Program. In relation to strategic alliances, Optus had already formed a number of strategic supplier agreements during the preparations for its bid to become Australia's second carrier.

Vodafone achieved more than double the capital expenditure to which it originally committed; comfortably met its undertaking on local content and training; and largely met its commitments in terms of strategic alliances and R&D.

TIDA assessment of carrier performance, 1992 to 1997

A review of the performance of the three carriers during the period 1992 to 1997 was undertaken by TIDA (1997). That assessment highlighted the following points:

- actual expenditure on telecommunications equipment and services was around $24 billion by end-July 1997, compared to a planned expenditure of around $12 billion;

- local content of this expenditure was well above expectations in total dollar terms and met expectations in percentage terms;
- expenditure on R&D of more than $1 billion was undertaken, including both in-house R&D and that contracted out to universities, the CSIRO and CRCs;
- strategic relationships were formed with suppliers, most notably Telstra's Future Mode of Operation (FMO) strategic supplier initiatives; Optus' selection of strategic partners for their network rollout; and Vodafone's initiatives with Ericsson in cellular base station production; and
- deliberate steps were taken by carriers to involve Australian small and medium enterprises in their supply chain.

TIDA (1997) concluded that:

> We can say with confidence that the levels of commitment in the carriers' industry plans for the 1992–1997 period have been exceeded by considerable margins in nearly every respect. The plans have been generally recognised as a success, a major contribution to industry development and a major contribution to the commercial success of carriers. (p.1)

But the real issue in assessing the effectiveness of IDPs in encouraging local industry development is the extent to which requiring a carrier to have an IDP as a condition of licence influences their strategic behaviour in relation to supporting local suppliers. That issue is taken up in section 6.5.

Links between IDPs and PfD program

Of the nine companies with whom the three incumbent carriers formed strategic relationships as part of their IDPs, seven have participated in the PfD program — Alcatel, Digital, Ericsson, Nortel, Siemens, Fujitsu, and Nokia. The other two companies are Leighton Contractors (which provided construction work, civil services and cable laying for Optus), and Keycorp (which established SIM card manufacture in Australia as part of Vodafone's IDP).

As Nortel reported to the Commission, most of the industry development under the IDPs is performed by the equipment suppliers, and the carriers leverage off their investments with regard to local content, R&D and export commitments.

In Optus' case, for example, the approach used to ensure that its IDP undertakings would be met was to require each of its strategic suppliers to have a contractual commitment to achieve specified levels of Australian content, R&D and exports (Optus 1992). Vodafone made a 'reasonable endeavours' undertaking in its IDP to ensure that its strategic suppliers complied with its local content undertaking.

6.3 The post-July 1997 regulatory regime

Features of the new regulatory regime

The key features of the post-July 1997 regulatory regime include the following:

- the introduction of full and open competition at all levels of service;
- no restrictions on the installation of telecommunications infrastructure;
- no restrictions on the number of carrier licences which may be issued — but a licence can only be granted by the Australian Communications Authority (ACA) where the applicant has an approved IDP;
- no restrictions on entry to any telecommunications service market;
- community and consumer service obligations placed on carriers and service providers (such as universal service, and untimed local calls);
- reliance on self-regulation — provision for processes of commercial negotiation in relation to aspects such as access pricing, and if that fails, arbitration by the regulator (the Australian Competition and Consumer Commission, ACCC);
- the ACCC given strong authority to prevent anti-competitive conduct by a carrier or service provider.

Entry of new carriers

Up to end-March 1998, ten new carriers had been granted licences (see box 6.1), and there are currently several applicants in the approval process.

Box 6.1: Licensed carriers[a]

Telstra (2 licences — Telstra Corporation Ltd, Telstra Multimedia)

Optus (3 licences — Optus Networks Pty Ltd, Optus Mobile Pty Ltd, Optus Vision Pty Ltd)

Vodafone Pty Ltd

AAP Telecommunications Pty Ltd (1 July 1997)

Primus Telecommunications Pty Ltd (1 July 1997)

Horizon Telecommunications Pty Ltd (25 July 1997)

Omniconnect Pty Ltd (19 August 1997) cont'd

Box 6.1: Licensed carriers[a] (cont'd)

United Energy Telecommunications Pty Ltd (27 August 1997)

Windytide Pty Ltd (4 September 1997)

Northgate Communications Australia–Ballarat Pty Ltd (3 December 1997)

Macrocom Pty Ltd (22 December 1997)

Oz Telecom Pty Ltd (2 March 1998)

WorldCom Australia Pty Ltd (24 March 1998)

a A carrier is defined as an owner of network units used to supply carriage services to the public. Network units are line links exceeding 500 metres, or designated radiocommunications links, such as mobile service base stations, or satellite based facilities.

Source: ACA 1997a, 1997b.

Framework for carriers' IDPs

In the *Telecommunications Act 1997*, carrier industry development plans were retained as a condition of licence. Under the new legislation, a carrier licence can only be granted if a current IDP has been approved by the Industry Minister. This and other key features of IDPs are set out in box 6.2.

Box 6.2: Simplified outline of carrier IDPs

- A carrier must at all times have a current industry development plan. A plan is current at a particular time if, and only if, that time is included in the period to which the plan relates.
- An industry development plan is a plan for the development in Australia, in connection with the carrier's business as a carrier, of:
  - (a) industries involved in the manufacture, development or supply of facilities; and
  - (b) research and development activities relating to an industry referred to in (a).
- A carrier licence cannot be granted by the Australian Communications Authority unless an industry development plan has been approved by the Minister for Industry, Science and Tourism.
- A summary of an industry development plan must be made available to the public.
- A carrier must comply with its industry development plan, in so far as the plan relates to its research and development activities.

Source: *Telecommunications Act 1997*, Schedule 1, Part 2; *Telecommunications Legislation Amendment Act 1997*.

Content of IDPs

The industry development obligations of carriers as set out in the *Telecommunications Act 1997* relate to four areas (see box 6.3): strategic commercial relationships; R&D; export development; and employment opportunities and training.

Box 6.3: Content of carrier IDPs

- The plan must include any relevant particulars of the carrier's strategic commercial relationships, including (but not limited to):
  - (a) the carrier's relationships in connection with the production and supply of facilities; and
  - (b) the carrier's relationships in connection with investment in, and development of, Australian manufacturing and supply capabilities; and
  - (c) the carrier's strategic alliances with Australian companies; and
  - (d) the carrier's strategic alliances with multinational companies; and
  - (e) the carrier's relationships in connection with the production and supply of equipment for use by people with disabilities.
- The plan must include any relevant particulars of the carrier's activities in relation to research and development, including (but not limited to) matters in connection with:
  - (a) investment in research and development capabilities; and
  - (b) research into, and development of, new technologies; and
  - (c) arrangements for maintaining Australian ownership of intellectual property; and
  - (d) arrangements relating to technology transfers to Australian industry; and
  - (e) research and development to address the needs of people with disabilities.
- The plan must include any relevant particulars of the carrier's export development plans, including (but not limited to) export development plans relating to equipment for use by people with disabilities.
- The plan must include any relevant particulars of the carrier's arrangements aimed at encouraging employment in industries involved in the manufacture, development or supply of facilities, including (but not limited to) arrangements aimed at encouraging:
  - (a) employment opportunities relevant to those industries; and
  - (b) training relevant to those industries.

Source: *Telecommunications Act 1997*, Schedule 1, Part 2, Clause 6.

DIST has issued guidelines — the Carrier Industry Plan Template — to potential carriers for drawing up their IDPs. These guidelines expand on the obligations set out in the legislation (some details from the Template are reported in box 6.4). The implications of these IDP requirements for the compliance burden on carriers is discussed in section 6.5.

An IDP may be varied if the carrier has given a copy of the proposed variation to the Industry Minister and the Industry Minister has approved it — and the carrier must make a summary of the variation available to the public as soon as practicable after varying the IDP. Also, if a carrier becomes aware that a particular matter may affect the achievement of its IDP, the carrier must advise the Industry Minister and explain the effect of the matter on the achievement of the plan.

Approval of IDPs

Under the Act, the ACA must not grant a carrier licence unless the applicant has a current IDP that has been approved by the Minister for Industry, Science and Tourism.

Approval of IDPs take place as a result of a negotiation process between carriers and officers within DIST. In commenting on recent experience in relation to approval times, DIST noted that:

> ... most carrier plans were approved within eight weeks and some as quickly as three weeks. The major factor determining the speed of processing is the time taken by the companies to respond to our advice on requirements. (Sub. D9, p. 8)

Some aspects of the approval process are considered in section 6.5, where an assessment is made of the IDPs.

Monitoring of IDPs

The new Act contains two tiers of reporting on implementation of the IDPs:

- A carrier with a current IDP must provide a report to the Industry Minister within 90 days of the end of the financial year, setting out the progress made in implementing the plan during that year; and make a summary of that report available to the public.
- The Industry Minister must prepare reports on progress by the carriers in implementing their IDPs, and these reports must be tabled in both houses of parliament according to a strict timeframe.

Box 6.4: Selected IDP requirements from DIST Template

Carrier's strategic statement — this part of the plan should contain the following:

- the carrier's mission statement;
- a comprehensive statement of the carrier's strategy and objectives; and
- a broad description of its telecommunications and information technology capital and software expenditure program.

Telecommunications and information technology procurement — this part of the plan should:

- review annual implementation plans for telecommunications and information technology;
- provide sources of telecommunications and information technology products and related services by category, setting out proportions Australian designed/developed and manufactured/produced, etc;
- outline the technology involved in each category and Australia's strengths and inadequacies of Australian-based suppliers in being able to supply the required products; and
- provide a detailed review of where Australian-based suppliers could become competitive suppliers for products not designed/developed in Australia.

Industry development obligations — the provisions of the legislation that are expanded on in the Template include the following:

- *strategic commercial relationships* — the carrier is expected to outline the strategic arrangements it has with suppliers, identifying the objectives, the nature of the arrangements, and the impact of the alliance on the future growth of capability to meet the carrier's future requirements and position the supplier to achieve exports;
- *R&D* — the carrier should include particulars of investment in R&D comparable with relevant international benchmarks by technology, performer, product and innovation to be achieved;
- *export development* — details of how export development will be achieved should include, where appropriate, carrier contributions to attracting regional headquarters and leveraging exports through the activities of offshore joint ventures or strategic partners;
- *employment and training* — carrier plans must include particulars of arrangements aimed at: increasing the skill pool required by carriers; promoting training relevant to user and supplier industries; and encouraging employment in industries involved in the manufacture, development or supply of facilities.

Source: DIST 1997a.

Summary of key features of IDPs

The key features of the current IDP arrangements are:

- the requirement to have a current IDP is one of the licence conditions of carriers;
- the degree of commitment on the part of carriers to local industry development is, in a formal sense, 'voluntary';
- the only part of an IDP that a carrier must comply with under the Act is that relating to its R&D commitment; and
- at present, there are no explicit penalties (specified in the Act) for non-achievement of commitments.

6.4 Likely industry development under the new regulatory regime

Deregulation of telecommunications services is only one of several factors influencing the competitive environment in which carriers, service providers and local equipment suppliers operate. Other market drivers include the globalisation of markets, technological change, the convergence of telecommunications, computing, information, and entertainment industries, and the Internet. Here though, we attempt to focus on the implications of deregulation for carriers and local equipment suppliers.

Some of the regulations in relation to carriers' operations under the new Act might have an impact on industry development. For example, the retention of untimed local calls (with the price capped at 25 cents until 31 December 1998) can act as a disincentive for carriers to put in some new technologies, which in turn might have implications for local telecommunications equipment suppliers. However, to get a handle on such issues would have required a detailed review of the carrier side of the market, which was beyond the scope of the inquiry. We therefore concentrate on the effects of removing restrictions on entry.

Implications of deregulation for carriers

More players and greater competitive pressures

As noted in section 6.3, ten new carriers have been awarded licences since 1 July 1997, and there are several more applications currently being processed. There is no limit on the number of licences that can be granted under the new legislation, and a much larger number is expected to enter.

As TIDA (1997) noted:

> Overseas experience of liberalisation of the telecommunications regime would indicate that we can expect a significant growth in the number of carriers and that such growth will stimulate further investment. If the carriers can continue to align their commercial interests with a strong and expanding local supply and support industry, the basic motivation for ongoing industry growth will continue, provided Australian suppliers can deliver competitive value, in a global sense. (p. 3)

The increased competition as a result of the entry of new carriers and service providers will put pressure on the market share and profit margins of incumbents. For example, Telstra has surrendered around 15 per cent of the national telephony market since Optus entered five years ago, though the overall market has grown appreciably in that period. Telstra (1997b) has also indicated that it is likely to lose further market share in the post-July 1997 deregulated environment:

> The extent of Telstra's future market share loss cannot be predicted with accuracy but it may be markedly higher than losses of market share to date. (p. 30)

Key influences on the extent of competitive pressures in the deregulated environment are issues like local number portability (LNP), interconnection of networks, and unbundling of services.

For example, the absence of LNP can act as a barrier to entry. As the ACCC (1997b) has noted:

> Studies in Australia and overseas show [the] cost and inconvenience [of changing telephone numbers] is a significant deterrent to consumers changing suppliers and a major barrier to competition ... Number portability ... increases the pressure on telecommunications suppliers to compete more vigorously, encouraging lower prices, and a greater range and quality of services. (p. 1)

On 23 September 1997, the government imposed an interim licence condition on Telstra, requiring it to provide LNP to Optus from 1 May 1998 — the earliest date for which the two carriers consider LNP to be technically feasible (DCA 1997). This decision should encourage greater competition in the local call market. Ultimately, the LNP arrangements under the new Act will extend beyond Telstra and Optus to encompass all carriers and carriage service providers.

Telstra has recently lodged a draft undertaking with the ACCC on its proposed charges to other carriers for interconnection with its fixed-line and mobile phone networks. The ACCC has the responsibility for determining whether the terms and conditions in the undertaking are reasonable — though it has announced that its assessment is unlikely to be completed before mid-1998 (ACCC 1997c).

The view was put to the Commission that greater competition among carriers as a result of deregulation is resulting in a change in the attitude of incumbents to local industry development — because in very competitive areas like long-distance and international calls, carriers would not be able to pass on any higher costs in the form of higher prices to customers. This will result in increased competitive pressures on local equipment suppliers.

As Budde (1997b) commented in relation to Telstra:

> While in the past Telstra, by far the largest buyer of telecommunications equipment, was willing to favour local suppliers, increased competition has forced [it] to look for the best and most competitive suppliers in an increasingly global market.

The possible ramifications of Telstra's changing role in supporting local industry is examined further when we look at the implications of deregulation for the local equipment industry.

A more customer-focused approach?

In the changed commercial environment, it is likely that the incumbent carriers will be continually reviewing their competitive strategies, to defend areas under threat from entry or potential entry, and in anticipation of new opportunities.

As TIDA (1997) noted in relation to the changing role of carriers:

> There is a transformation taking place in the role and business of carriers. What products and services the carriers choose to invest in will continue to change, as their businesses change. It is likely that carriers' businesses will become more diverse and continue to evolve rapidly, which will be another challenge for industry development, just to keep pace and to anticipate the next move. (p. 5)

Budde (1997a) indicated that carriers will have to respond to the range of new customer markets that are emerging, by becoming more focused on smaller groups of customers.

Telstra has indicated that it will need to become more customer focused and differentiate itself from its competitors to meet these competitive challenges. It plans as an overriding goal to excel in 'customer intimacy' — that is, providing customers with a bundle of products/services/systems/solutions that meets their particular telecommunications needs. Given the pace of technological change in telecommunications, 'speed to market' will also be an important strategy for new products or services (Telstra 1997a).

Implications of deregulation for local equipment suppliers

A wide range of views were expressed on the likely effects of deregulation on local equipment suppliers, ranging from greater opportunities to little, if any, effect and even adverse effects.

Prospects of greater opportunities?

One of the new carriers, AAPT, thought that deregulation offered the prospect of greater opportunities for the local equipment industry through the entry of new carriers:

> With the advent of deregulation, a shift within the supply chain is expected as the new entrants provide a contestable market and therefore greater industry development opportunities. AAPT is confident that in such circumstances Australian industry should be well positioned to deliver significant proportions of AAPT requirements for hardware and software within the next 3 to 5 years. (AAPT 1997b)

Some equipment manufacturers thought that the first stage of deregulation (1992 to 1997) had been a boon to local industry, especially through the business generated by Telstra's FMO project. But they too thought that there would be additional business generated in the new deregulated environment by the entry of new carriers into the market.

Budde (1997a) saw the likelihood of significant opportunities for equipment manufacturers, if they are prepared to implement an attitudinal change. In his view, opportunities will arise if manufacturers unbundle and re-engineer their products to facilitate the new trend towards niche market development by service providers. The cultural change needed is that rather than manufacturers 'dictating to service providers' what can be purchased, they should be receptive to service providers telling them what equipment might be required.

Furthermore, as discussed in chapter 8, there are likely to be opportunities for local equipment suppliers arising from incumbent and new carriers entering export markets in response to trade liberalisation in telecommunications.

Changing opportunities

Telstra sees the post-July 1997 period as one in which supplier roles will be changing. For Telstra, deregulation coincides not only with a change in its competitive situation, but also a change in the evolution of its core network. The digitisation of the network (the FMO project) will be substantially completed by end-1998. As a consequence, Telstra has indicated that while there will be continued network growth, hardware purchases will fall significantly, and this will have a major impact on existing suppliers (Telstra 1997a).

In relation to hardware procurement, Telstra has indicated that it will be looking for 'global standard' products, where it can maximise its position by achieving economies of scope and scale. Telstra also sees software as growing in importance, because it will be critical to achieving differentiation through enhanced connectivity services, and network and service management superiority (Telstra 1997a).

At the recent Vendors' Forum, Telstra identified opportunities for local suppliers in areas such as (Telstra 1997a):

- Component technologies with global applications and support services in:
  — core network (hardware, software, data management);
  — network intelligence (peripheral hardware, component software); and
  — management systems (software components, peripherals).
- Telecommunications applications 'middleware' for data and voice networks, to deliver high value services to customers.

Little change in opportunities?

However, the view was also put to the Commission that deregulation would have little beneficial impact on local manufacturing activity because of the nature of most new carrier entrants. For example, one equipment manufacturer suggested that because new carriers will mainly be operating in niche markets, they will be making only limited investment expenditure.

Similarly, another equipment manufacturer thought that deregulation would not provide significant growth prospects for the local equipment industry because the new carriers would not be spending much on new infrastructure — rather, they would be tending to rely on interconnecting with the Telstra and Optus networks.

Increased competitive pressures

A major concern of some equipment manufacturers was that as a result of the incumbent carriers embracing the challenges of a more competitive environment, this would in turn place them under greater competitive pressures.

Most comment related to likely changes in the purchasing policies of Telstra. Announcements by Telstra, such as it looking for 'global standard' products, have led some local suppliers to perceive their future prospects as being under threat. In particular, some small indigenous Australian telecommunications companies considered these announcements as meaning that Telstra will most likely source its future hardware purchases from multinationals rather than indigenous companies.

A number of other reasons were put to the Commission why some local equipment suppliers will be under greater competitive pressures in the new deregulated environment:

- Some features of the Telecom fixed network in the 1980s (such as inconsistencies with world standards), which provided opportunities for indigenous companies, are unlikely to arise in the future.
- The implications of system failure for carriers are greater now in the more competitive environment. This makes carriers very risk averse, and may well lead them to favour the big established suppliers.
- In areas where technology is developing very rapidly (such as the Internet), there is an increased likelihood that carriers will favour companies at the leading edge because speed to market is a critical aspect of carriers' competitiveness.
- Insofar as Australian carriers forge global alliances, this may lead them to restructure their equipment sourcing arrangements, and this will put greater competitive pressure on local suppliers.

IDPs for the post-July 1997 period

In addition to these broad perceptions of the implications of deregulation for carriers and equipment manufacturers, the carriers' IDPs for the post-July 1997 period give some indications of likely prospects for future local industry development.

However, the picture is incomplete because, while thirteen carriers have been granted licences since 1 July 1997, the public versions of only four IDPs were available at end-March 1998 — Optus, AAPT, Primus and Omniconnect (the main features of those IDPs are presented in appendix G).

In its new IDP, Optus notes that predictions of future levels of investment expenditure are difficult because of factors like competitive pressures and changes in technology. However, it foresees capital expenditure over the five-year period to June 2002 at a similar level to that achieved during its first IDP (between $600 million and $800 million per year). Optus also plans to maintain the same degree of local content as before (70 per cent of capital expenditure).

AAPT intends to undertake investment expenditure of approximately $300 million over its five-year plan period. The prospects for local sourcing of some part of this expenditure varies by product category and type of activity (design, manufacture and support) — see appendix table G.5.

Primus intends to carry out capital expenditure of around $285 million over the five-year period. No voluntary local content ratios are specified in its IDP — the approach in procurement decisions will be 'local sourcing wherever practical and cost effective'.

Information on likely capital expenditure by the smaller new carriers is scant. For example, the public version of Omniconnect's IDP contains no details of likely procurement expenditure, though it does indicate that around 25 per cent will be sourced locally and 75 per cent from overseas.

6.5 Assessment of IDPs

An analytical framework for examining industry policies in the telecommunications equipment industries was outlined in chapters 4 and 5. Figure 6.1 presents a simplified set of questions which are useful in assessing the desirability and impact of IDPs. They are used as a basis for organising the discussion in this section.

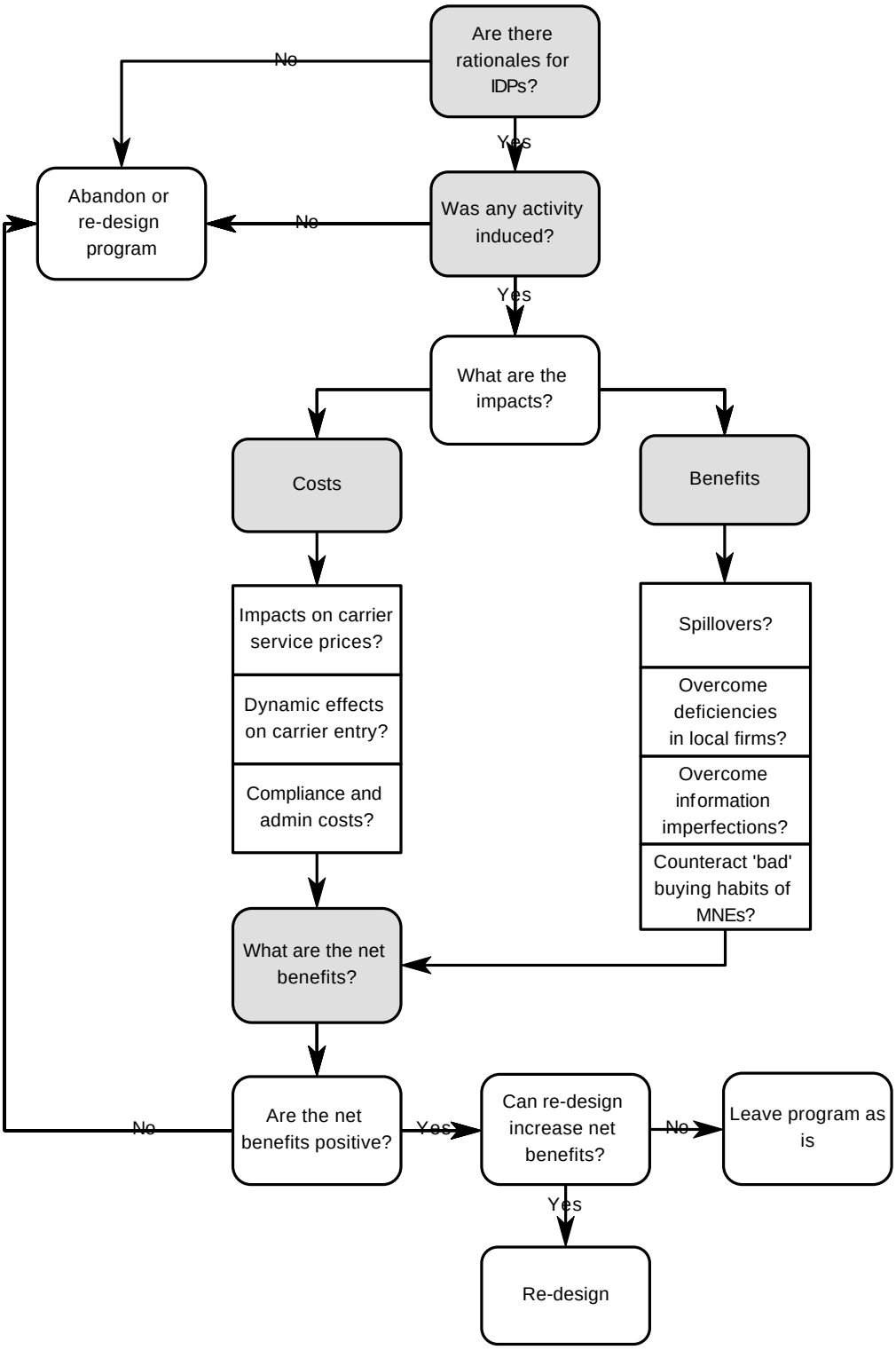
We begin by looking at the economic rationale for IDPs, and then examine whether the current approach is appropriate. A key consideration in any program assessment is the benefits and costs generated. Accordingly, we examine the extent to which IDPs may induce additional local activity among telecommunications equipment industries, potential benefits arising from such IDP activity, and the main costs associated with IDPs — administrative, transactional and dynamic. Finally, we assess a number of issues relating to the design of IDPs — including transparency, the approval process, and approaches to ensure that carriers' commitments are achieved.

The economic rationale for IDPs

The objective of the requirement for carriers to prepare and maintain an IDP as part of their licence condition has been explained by DIST (1997a) as follows:

> The principal intention of the government's industry plan regime is that carriers will undertake activities which are fundamentally commercial and strategic in character, but [which] at the same time contribute substantially to the development of the Australian telecommunications industry and the economy as a whole. (p. 1)

Figure 6.1: Assessing IDPs



TIDA (1997) argues that the IDP arrangements are beneficial because they increase demand for local content in the telecommunications equipment industries:

> Carrier industry development plans can deliver real growth in demand for the supply industry and encourage productive relationships between carriers and their suppliers ... The mere fact that the Partnerships for Development Program and carrier industry plans exist gives that essential signal to industry participants that Australia wants them to develop the industry, to generate exports, [and] to expand R&D. (p. 4)

TIDA's view is reiterated in the government's industry development objectives for telecommunications in the post-1997 period (chapter 4, box 4.3) which set out a series of objectives based on stimulating local production of telecommunications equipment products.

In the absence of the market or other failures identified in chapter 5, stimulating local content in the telecommunications equipment industries can actually reduce economic welfare for Australians by shifting scarce resources from other business activities — in effect, from *other* local content. Accordingly, it is critical to base decisions to support local content in the telecommunications equipment industries on more than the idea that extra output from this industry is intrinsically worthwhile.

The broad types of firm and market failures that might justify government intervention in the telecommunications equipment industries were discussed in chapter 5. In the absence of any stated rationale for the program, we briefly review the arguments that seem most appropriate in the case of the carriers' IDPs.

Spillovers

Most large telecommunications equipment suppliers in Australia are subsidiaries of MNEs — and are typically characterised by skilled workforces, relatively advanced technologies, sophisticated quality assurance systems and world class marketing and administrative systems. By encouraging them to carry out more activity in Australia, IDPs might confer benefits through:

- spillovers from tacit and explicit technology transfers, management practices, and marketing experience to indigenous telecommunications equipment firms; and
- increases in returns to workers employed in the MNEs over the best alternative wages.

Moreover, as noted in chapter 5 and in appendix D, if leverage-type schemes like IDPs were effective at stimulating truly additional R&D (with

accompanying technological spillovers), they would also do so at less cost than direct subsidy measures like the R&D tax concession.

Dealing with deficiencies in local firms?

The notion of using IDPs as a vehicle to overcome deficiencies in local firms invokes similar mechanisms — information flows — to the spillover argument above. In the former case, local firms may be extremely efficient, given their scale and resources, but may gain beneficial access to spillovers of technologies or knowledge that they have not invested in directly. In this case, the argument is that local firms fail to operate at world's best practice, given their resources and scale, because of problems with internal cultures and management practices. They can, therefore, *learn* from sophisticated carriers/MNEs which are already at world's best practice — via both information transfers and incentives to perform.

Encouraging carriers to form strategic relationships with local equipment suppliers as part of their IDPs might, therefore, be justified on the grounds that it orients local firms' capabilities to world's best practice levels. Local firms may gain access to global networks, and more particularly to superior management, marketing and administrative practices. The focus in IDPs on requiring carriers to encourage training relevant to user and supplier industries to enhance skills might also be justified on similar grounds. However, we note that as the new regulatory environment matures — and the rate of new entry falls — the scope for creating *additional* beneficial linkages will decrease.

Correcting an information gap?

The IDP approach of requiring carriers to consider opportunities for local industry involvement in their procurement decisions might be justified by carriers' ignorance of the competitive strengths and capabilities of local equipment suppliers. DIST (1997a) has noted:

> Australia's telecommunications industry base is highly capable and innovative and can meet many of the challenges of competitively supplying telecommunications products to carriers. Its opportunities depend on the carriers' appreciation of the capability to be found in Australia. (p. 2)

Similarly, Doddrell (1995) has reported that IDPs have been influential in building carriers' confidence in local suppliers:

> ... it is likely that the IDPs provided an important demonstration effect in forcing carriers' attention to Australian-based equipment suppliers, to an extent that might not otherwise have occurred. (p. 10)
>
> ... the IDPs may have helped overcome crucial information gaps in the form of a lack of market awareness of the capacities of local equipment producers. (p. 42)

There may also be an international dimension to any demonstration effect — it is easier for a local equipment supplier to export if it is seen to be selling to significant customers in the home market.

Misperceptions and information problems may also affect local Australian firms in their dealings with MNEs and carriers. For example, indigenous firms may underestimate the benefits from cooperative relationships with MNEs and carriers.[1] Arrangements like the IDPs may facilitate cooperative arrangements that might not otherwise have taken place — but again, benefits will decline over time as carriers become more aware of local capabilities.

Buying practices of carriers/MNEs?

Carriers and telecommunications equipment MNEs may treat indigenous suppliers adversely because of simple but discriminatory rules (or prejudice) determined by head offices. To the extent that such implicit 'rules' exist, and are genuinely sub-optimal, then IDPs may provide leverage for 'fair and considered' treatment of local suppliers.

Conclusion: is an IDP approach appropriate?

First, the strongest in-principle case for intervention relates to spillovers, and information exchanges which enhance learning by local firms. But it only provides a possible justification for targeting those business activities or actions which are likely to generate such knowledge flows. Such actions include *additional* R&D and alliances. It does not provide a strong basis for export or other local content aspirations per se, since these do not provide obvious mechanisms for effective generation of such spillovers.[2]

However, the lack of transparency of IDPs (discussed below) makes it difficult to assess the extent to which such leverage programs genuinely have an impact on R&D levels or alliance formation — though the Commission did undertake a survey of carriers to gauge their views (appendix H). In those circumstances where they have small or no impacts on a carrier's behaviour, then the transactions costs of negotiating IDPs, and any dynamic impacts on carrier entry, may generate net costs, rather than benefits.

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1 For example, a BIE study (1995b) into business linkages found that many of the benefits of business cooperation arose unexpectedly as spinoffs — rather than being part of the original objective of the cooperative arrangement. Also, the study found that firms' concerns about 'lack of control' — a major impediment to alliances — appeared rarely to materialise in actual relationships.

2 The exception to this being those activities which are likely to generate premium wages for workers in MNEs (see chapter 5).

Second, information deficiencies in relation to carriers and demonstration effects provide a less convincing rationale, by themselves, for possible specific action for telecommunications equipment industries. For example, private markets respond to opportunities to provide valuable information to participants. The Internet has increased capabilities for low cost information diffusion. DIST already has an IT&T directory listing on the Internet; many individual telecommunications equipment companies have web sites which provide information to possible clients, and there are private sector databases (such as Kompass) which are also accessible. AEEMA and DIST sponsor product exhibitions. Where information is not available (or suffers from lack of credibility or specificity), it needs to be demonstrated that this reflects a market failure, and not unavoidable transactions costs.

Any residual information deficiencies would suggest a need for voluntary arrangements in which government facilitates reliable sources of information on local capabilities (through databases, exhibitions, seminars and introductions), rather than suasive arrangements to buy locally. And finally, even if IDPs were selected as the mechanism for overcoming information deficiencies, that function would be served by temporary measures. Once a new carrier or MNE telecommunications equipment supplier is aware of the capabilities of local firms — whether as part of a mandated arrangement or the provision of information — then they could be exempted from future policy actions. This implies that it would be more appropriate to require a 'one-off' IDP of a carrier as a condition of licence, rather than requiring it to maintain a series of IDPs for as long as it wishes to retain its licence. This might also suggest the exemption of firms which have already been here for some time (such as Telstra).

Moreover, if informational deficiencies underlie the problem addressed by IDPs, then it suggests that the biggest gains from an IDP are the efforts that it elicits from carriers to discover the capabilities of local firms. This requires little role for monitoring of plans once they are in place, or for penalties for failure to comply.

Third, it is hard to assess the applicability of the argument that carriers and telecommunications equipment MNEs may engage in discriminatory buying practices when dealing with local producers. As noted in chapter 5, it is difficult to distinguish cases of discrimination from cases where genuine transactions costs warrant foreign, rather than domestic, sourcing. Also, the role of MNEs or centralised buyers is not unique to the telecommunications equipment industries. There does not appear to be concern by policy makers about the buying practices of large firms outside the telecommunications equipment industries. A policy based on correcting such apparent biases would need to show why carriers or MNEs in the telecommunications equipment industry are

more likely to behave in a discriminatory way relative to similar firms in other industries. Moreover, even supposing that *some* (unidentified) MNEs or carriers behaved in this way, it is questionable whether this would justify IDPs for all carriers.

A final issue is whether IDPs overcome any other residual impediments to good buying practices. These include any problems associated with:

- the strength of competition in carrier services, which provides incentives for carriers to buy from the best suppliers;
- the Australian certification system, which may provide a useful role in providing information about the technical capabilities of firms, so as to decrease the perceived risks of buying from them; and
- the extent to which local firms are able to produce goods to appropriate international standards.

DIST indicated that there were problems in some of these areas. For example:

> The Australian certification system for suppliers does not reduce risks sufficiently to encourage purchasing from SMEs. The hurdles they face in selling to carriers relate to issues of commercial size, opportunity to demonstrate ability to deliver the required solution for some product when there is only one or possibly two customers in the Australian market, the purchasing policies of carriers and their perceptions of risks, etc.
>
> Standards for telecommunications products have impediments associated with them which hinders the local firm's capacity to provide products. Access to testing facilities, costs of testing technology, and access to technology licences are some of the major issues faced. (Sub. D9, p. 9)

To the extent that these are genuine problems, IDPs do not, however, deal with them. For example, IDPs cannot serve to 'demonstrate' Australian capabilities unless they were to force a carrier to use an Australian supplier's product.

Features of IDP activity — potential benefits of IDPs?

An indication of the quantitative performance of the three carriers under their IDPs during the period 1992 to 1997 was presented in section 6.2. The cumulative achievements of each of the three carriers over the five year period generally exceeded, sometimes by a substantial margin, the undertakings that were made back in 1992 — including comfortably meeting their local content commitments.

As noted in section 6.2, the awarding of the second fixed network licence to Optus, and third mobile licence to Vodafone, were the outcomes of a bidding process. It might be expected that the commitments made by these two carriers

to local industry development as part of the bid strategy for a licence would be more ambitious than in the open entry situation that now applies in the deregulated environment. But even so, some of the undertakings that they made were well exceeded, suggesting that they were not 'biting'.

A number of 'success stories' arising from activity undertaken in the IDPs were reported to the Commission, including examples of technology transfer associated with strategic alliances (box 6.5).

More and McGrath (1996, pp. 67–71) have examined the types of benefits that partners derived from the cooperative relationships formed as part of (though not necessarily induced by) the IDPs. They found that alliances benefited partners by:

- assisting them to win new business — involvement in a strategic supply relationship improved their credibility with other firms as well;
- enhancing head office perceptions of the Australian experience — cooperative relationship formation and management were viewed as leading-edge practices from which many lessons could be learned; and
- encouraging learning in areas such as product design, and ways of doing business.

Optus (1994) has commented on some of the learning benefits that local telecommunications equipment suppliers have derived from the deployment of its infrastructure:

> Australian industry has become far more responsive to the needs of its customers both in terms of quality and timeliness. As such, Optus' suppliers are able to build on their success with Optus and tackle export markets with the confidence of knowing that they will be seen as highly responsive, customer oriented suppliers which are able to meet short lead times. (p. 5)

The new knowledge and new products, processes and services that result from telecommunications R&D can generate a variety of benefits which extend beyond the firms carrying it out (spillovers). Indeed, the R&D and innovation activity undertaken by carriers and telecommunications equipment suppliers ultimately influence the range, quality and price of telecommunications services available to the whole community. The spillover benefits from R&D in telecommunications potentially can be very wide-ranging.

Box 6.5: Technology transfer arising from strategic alliances

- The initial large expenditure by Vodafone to establish its mobile digital network justified manufacture in Australia by Ericsson of GSM base transceiver stations (BTS). As a consequence, transfer of technology has taken place from Ericsson

companies in Sweden to Ericsson Australia in a number of areas, such as product/project management, BTS production, and BTS installation and commissioning.

- Vodafone formed a strategic alliance with Keycorp (an indigenous company). Vodafone provided technology and expertise to Keycorp for the Australian development and manufacture of SIM cards.
- A central motive for the strategic alliance between Optus and Nokia was the 'second tier' alliance between Nokia and ERG (an indigenous company). ERG and Nokia negotiated a collaboration and technology transfer agreement for the development of Nokia's second generation GSM base station technology.
- Optus formed a strategic alliance with Leighton Contractors (an indigenous company). Leighton has benefited greatly from the alliance, developing the 'blow through' cable laying technique.

Source: Vodafone 1995; Optus 1992.

But while activities like R&D or alliance formation undoubtedly produce economic benefits, the critical question is the extent to which IDPs actually generate such activities. That question is taken up below.

Before doing so, however, it should be noted that DIST was critical of the Commission for the 'very narrow basis' for evaluating benefits from IDPs. According to DIST:

> The externalities focused on [by the Commission] are very secondary to the actual major potential benefits of the carrier industry plans. ... From the Department's view the major benefits are:
>
> - retained footloose capital with associated jobs, technology transfer and contribution to Australia's national know-how, and the business for supplier industries, export income and tax revenue.
> - new capital investment by MNCs also with the above related benefits (ie activity which contributes to national wealth). (Sub. D9, p. 5)

There are several comments to make about these points. First, the externalities (spillovers) on which the Commission focuses— technology transfer and know-how — and which DIST describes as 'very secondary', are also among the benefits which DIST lists as being 'major'.

Second, the supposed benefits that can arise from capital investment by MNEs (such as job creation, exports and tax revenue) are typically not *net* benefits because the resources used to generate them have value elsewhere in the

economy. For example, Jtec indicated that newly attracted investment tends to displace skilled workers from indigenous firms (Transcript, p. 9).

But more fundamentally, benefits can only arise if IDPs actually change the behaviour of carriers or telecommunications equipment suppliers and thereby induce additional local activity. For example, to what extent do IDPs result in more new capital investment by MNEs than they would otherwise undertake? It is to this and related questions that we now turn.

Do IDPs induce additional activity?

Any consideration of outcomes under IDPs hinges importantly on the following distinction:

- the activity undertaken by carriers that they would have done anyway; and
- the extra activity that might have been induced by the need to have an IDP approved as a condition of gaining a carrier licence (activity that carriers would *not* otherwise have undertaken).

In any assessment of benefits attributable to IDPs, it is only the benefits arising from the *extra activity induced* by IDPs that is relevant. It is therefore necessary to assess the extent to which IDPs actually change carriers' behaviour.

IBM was sceptical of whether IDPs influenced carriers' performance over the period 1992 to 1997:

> Capital expenditure was very high, but how much of this was due to the opening up of competition and the resultant heavy investment in capital equipment to build two completely new nation-wide networks and modernise the huge existing network to compete with those? How much have IDPs affected these results? (Sub. D4, p. 7)

To gain insights into the extent to which IDPs induce additional activity, the views of carriers were obtained by means of a survey sent to nine carriers (three incumbents and six post-July 1997 entrants) in mid-February 1998 (see appendix H for details).

Influence of IDPs on carriers' behaviour

Overall, carriers perceived the impact of IDPs on their behaviour to be small. They said that there was little or no difference between the undertakings made in their IDPs and what their intentions would be if no IDP were required.

- For seven of the nine carriers, IDP undertakings in relation to the local content ratio for capital expenditure, and R&D expenditure, were the same as they would have been doing anyway.

- For all nine carriers, IDP undertakings in relation to capital expenditure and training expenditure were reported to be the same as they would otherwise have been.

Understandably, in a competitive market, carriers' business strategies are influenced by commercial fundamentals. Some carriers indicated that their IDPs had been developed from their existing business plans, and the IDP process had not resulted in any significant change in behaviour relative to what they would otherwise be doing.

The strategic alliances formed by the three incumbent carriers as part of their IDPs over the period 1992–97 have been examined in detail by More and McGrath (1996). In the study, carriers were asked to identify the motives for entering into their alliances. The most commonly mentioned motives were 'access to labour and expertise', 'access to technology', 'risk sharing' and 'increased innovation', while 'abiding by government requirements' was less frequently mentioned. More and McGrath (1996) conclude that:

> In a sense, all three [carriers] have government obligations relating to their [strategic] relationships but ... there are also broader commercial strategic rationales at play. (p. 30)

In the Commission's survey, perceptions were sought on the importance of IDPs to strategic relationships and export development in terms of a four-point scale, ranging from 'no impact' to a 'major impact'.

- Four of the nine carriers perceived the requirement of an IDP as having at least a 'moderate' effect on their decision to form strategic relationships.
- IDPs were less important as an influence on their export development plans — three of the nine carriers perceived IDPs as having no impact, and five others reported the impact as being only 'slight'.

Ways in which IDPs influence carriers' behaviour

In the Commission's survey, carriers were also asked to indicate in what ways the requirement to have an IDP as a condition of licence influenced their behaviour in relation to local industry development.

Insofar as IDPs have any effect, they appear to influence local industry development only *at the margin* (see appendix table H.2):

- The requirement to have an IDP encourages some carriers to search out the capabilities of local industry to an extent they might not otherwise have done, and to favour local suppliers that are competitive with alternative sources of supply.

- The need to go through an approval process with DIST had no impact on the local industry development undertakings of five of the nine carriers surveyed.

Costs associated with IDPs

Administrative costs

The budgetary costs associated with IDPs are the administrative costs involved in assessing, negotiating, approving, and monitoring the IDPs. Under the previous regime, the role of monitoring and reporting on the IDPs of the three carriers was carried out by TIDA, which ceased operation at 30 June 1997. DIST informed the Commission that a TIDA-like organisation is to be created to monitor the carriers' IDPs, but with a broader remit (extending to information technology as well as telecommunications industry development).

DIST indicated to the Commission that its estimate of the potential number of carriers has been revised up from 18 to around 50 — as mentioned above, so far thirteen plans have been approved (and licences granted), and more plans are currently in the approval process. The government has provided funding of $600 000 for monitoring IDPs in 1997–98, rising annually to $870 000 in 2000–2001. According to DIST, the monitoring costs will be offset by an increase in the licence charge payable by the carriers (DIST 1997g).

Compliance costs

The direct costs to carriers from complying with the IDP requirements involve preparing the plan, going through the approval process, and reporting annually on progress in implementing the plan. In relation to the magnitude of these compliance costs, More and McGrath (1996) cite one carrier's reference to:

> ... the very minimal cost that [the IDP] had imposed on us in order to monitor it and make sure that it was going the right way. (p. 81)

While Doddrell (1995) reports that the costs of the IDP to Optus were 'approximately 0.4 per cent of its total budget', information obtained from the Commission's survey of carriers suggests that the costs are very much smaller.

The relative magnitude of compliance costs differs across carriers, reflecting mainly differences in size. As reported in appendix H, the costs associated with preparing an IDP averaged around $60 000 for incumbents and around $17 000 for new carriers; costs associated with making IDPs publicly available averaged around $30 000 and $2400 respectively; while the monitoring and reporting costs averaged around $70 000 and $9000 respectively per year.

While the compliance costs generally appear to be of minor importance, they are likely to be relatively more onerous for the smaller new carriers. This is because they require involvement by more senior management, and take up a larger proportion of total management capacity — to negotiate approval of the IDP, to report annually on progress in meeting the commitments, and to re-negotiate the IDP if, as has been the case for some small entrants, the licence is only granted for a short period of time (such as one year).

However, the views of the small carriers on compliance costs were mixed. One found the IDP process 'very time-consuming and burdensome'. In contrast, the IDP process was said to pose little burden for another small carrier because most of the information required was already available from its business plan; and another found the interaction with DIST to be useful in helping it prepare its IDP.

The industry development areas that carriers are required to address in their IDPs are defined in the *Telecommunications Act 1997* (set out in box 6.3 above). While the requirements of the Act appear benign, the impact on the compliance burden of carriers depends on how the IDP arrangements are administered. In this respect, one of the carriers expressed a concern that some of the more detailed IDP guidelines, set out in the DIST template, appear to go beyond the scope of the new legislation. For example, the guidelines suggest that carriers should (DIST 1997a, p. 2):

> outline the ... strengths and inadequacies of Australian based suppliers in being able to supply the required products;
>
> provide detailed review of where Australian based suppliers could become competitive suppliers for products not designed/developed in Australia;
>
> outline the strategic arrangements it has with suppliers ... [to] ... position the supplier to achieve exports.

The AIIA commented on the content of IDPs as follows:

> ... the Association would have a preference for seeing the industry development plans linked very firmly to those things which are specified in the Act ... the [DIST] template ... and the kind of questions that are asked around [it] considerably exceed the specification in the Act. (Transcript, p. 51)

But the implications for compliance burden depend on how seriously these guidelines are interpreted by carriers — on this point, the views of carriers varied.

Costs imposed through IDP approval delays?

Existing, typically large, incumbents have several advantages relative to small, new carriers:

- the 'fixed' costs of preparing and negotiating an IDP are spread over larger output;
- they can delegate preparation and negotiation of IDPs to specialist staff within the organisation (the negotiation process need not deflect top management from its key strategic roles);
- they already have a strong awareness of the capabilities of local producers — and can more easily prepare the documents.

On the other hand, potential new (typically small) carriers may find their entry impeded or delayed by the IDP approval process. In an industry where speed to market can be critical to success, such delays can clearly disadvantage new entrants and help incumbents. As IBM commented:

> ... for a new carrier that is applying for a new licence, the carrier is earning no income for the negotiation period until the licence is granted. The cost of that loss of potential revenue could possibly add significantly to the overall cost of IDPs to the Australian economy. (Sub. D4, p. 10)

But the approval times for the IDPs of new carriers were generally fairly short — averaging one to two months (appendix H). Only in one case were the negotiations somewhat protracted, lasting six months.[3]

Impacts on carriers' prices and costs?

IDPs will impose costs if they encourage carriers to give preference to local suppliers in their procurement policies, where local suppliers are not the least cost source. The likelihood that carriers would be prepared to give a margin of preference to local suppliers, despite higher costs, depends on the scope they have to absorb or pass on the higher costs to customers. It is likely that the smaller new carriers find the competitive pressures in the deregulated market more intense than any large existing incumbents — and thus would not have much scope for preferential treatment of local suppliers.

In the Commission's survey, views were sought on the extent to which IDPs encourage carriers to pay a premium for local sourcing:

- Seven of the nine carriers indicated that IDPs do *not* lead them to pay a price premium for locally sourced equipment in order to encourage local industry development.

One small carrier indicated that it would source locally where it could (and even be willing to incur a slight cost disadvantage) in order to get access to

[3] According to DIST, this reflected a slow response by the carrier to the IDP guidelines, rather than delays with the Department or the IDP process (Sub. D9, p. 8).

engineering support from the local supplier. This example illustrates that the choice between sourcing locally or via imports should be based on *net* cost. And in this respect, local sourcing can confer a variety of benefits — such as proximity of supply, shorter delivery time, better service capability, etc. A common theme expressed by carriers was that in the more competitive deregulated environment, they would not compromise the commercial basis of their procurement policies for the sake of local industry development.

Simulating possible R&D-related and other impacts of IDPs

The question of whether the IDPs are worth having — in the sense that they provide a net benefit for Australia — depends on assessing:

- the extent to which they induce more activity in the local telecommunications equipment industry than would otherwise take place; and
- the relative magnitude of the associated costs and benefits.

The costs and benefits will vary depending on the nature of the induced activity. As discussed previously, the strongest rationale for IDPs relates to their potential to induce spillovers through R&D and strategic alliances. To the extent that IDPs, in conjunction with the PfD program, have an impact on exports or local content — which do not serve this end — they are likely to generate net costs which would need to be set against any R&D and learning-related benefits.

A methodology for quantifying the key benefits and costs is reported in appendix I. Results from the Commission's survey of carriers were used to provide estimates of the additional activity that IDPs might have induced, and the compliance costs incurred by carriers. The benefit-cost simulations are illustrative because some of the parameter values are uncertain (such as the spillover benefits arising from the induced activity). For that reason, sensitivity analysis was conducted.

In the illustrative simulations, the net benefits of IDPs range from slightly negative to modest positive. At best, the net benefits in the simulations equate to a very small share of total sales of telecommunications services.

The simulations also suggest a greater likelihood that IDPs result in net costs for small carriers — to the extent that compliance and administrative costs are more important relative to any benefits in their case.

Issues relating to the design of IDPs

Transparency

A carrier must make a summary version of its IDP available to the public. While this improves transparency somewhat, a problem with leverage-type approaches such as IDPs is that they do not generate observable information from which to gauge their net impact.

Approval process

Gaining approval of an IDP to obtain a carrier licence is the outcome of negotiations with officials. DIST indicated that in negotiating IDPs, it avoids a prescriptive approach — the size and circumstances of the different applicants are taken into account. While some anecdotal support for this view was provided by carriers, the Commission's survey also yielded comments such as IDPs 'should not be prescriptive', or they should be 'less prescriptive'. Further, there is scope for administrators to press carriers harder in terms of industry development commitments and to be discriminatory in approach — it depends on the attitudes of the administrators during the negotiation process. In this respect, one carrier noted that:

> [IDPs] should not be subject to negotiation. The Act is clear on what is required and empowering DIST officials will only serve as a barrier. (IC Survey of carriers)

There is a degree of flexibility in the approval process, as indicated by the different time periods for which the carriers have 'signed up'. For example, one of the smaller new carriers, Omniconnect, has committed to only a one year plan, because of the rapid developments that are taking place in its market area; and Vodafone's new IDP is only for two years because it wanted to get issues of principle sorted out before committing to a longer plan.

In its Draft Report, the Commission suggested that one way of achieving a more balanced outcome in the IDP approval process, would be to take account of the impact of IDPs on users of telecommunications services as well as local equipment manufacturers. The Commission suggested the possibility of having a user perspective in the IDP negotiation process by, for example, including representation from the Department of Communications and the Arts (DOCA) as well as DIST.

This suggestion received a mixed reaction. For example, the AIIA provided qualified support:

> ... the fear that we have is that you might end up with a more cumbersome bureaucratic process. And given the concerns we have already expressed about time to market and the delay, we'd be apprehensive about that. But if some process

> could be found of setting some pretty strict time limits [on the approval process] we would see the addition of a [DOCA] voice to be relevant and potentially effective. (Transcript, p. 52)

Nortel commented that:

> [We] see value in having a user perspective but consider for this to be effective it would need to encompass the diverse views of small business, corporation, residential and government users. We would then be concerned, however, about the potential for this to delay the approval of plans and for the IDP approval process to seek commitments that are not commercially driven. (Sub. D7, p. 3)

DIST saw no reason to change the existing arrangements:

> The proposal for having a user perspective in the IDP process by including representation from DOCA as well as DIST has no substantive justification. Also, the Minister for Industry, Science and Tourism has a clear interest in the possible cost impacts on the wider commercial community, and matters relating to consumers through the portfolio's responsibilities for consumer affairs. (Sub. D9, p. 5)

Nor was DOCA itself in favour of the suggestion:

> We do not support the recommendation that this Department participate in the IDP process currently undertaken by DIST, to provide a 'user perspective'. DOCA does not have a user perspective but rather brings a wider industry perspective. (Sub. D8, p. 1)

Given the risk of adding complexity to the process, we see no effective mechanism within government to promote user interests.

Legality of enforcement

Carriers told the Commission that they treat the commitments made in their IDPs seriously — even though there are no explicit penalties specified in the Act for non-achievement. Compliance with commitments has been achieved via a cooperative approach between carriers and the government rather than enforcement through legislative measures. The annual monitoring process by TIDA involved a review of the carriers' achievements and then consultations with carriers and key suppliers (see Doddrell 1995, p. 10).

As noted above, all the key undertakings made by the three carriers in their plans during the period 1992–1997 were either met or exceeded. Furthermore, Ministerial approval to vary commitments made in IDPs appears to have been sought only very much as a 'last resort'. For example, Vodafone sought relief from its 'best endeavours' undertaking to facilitate the manufacture of GSM handsets in Australia, after three years of negotiations failed to achieve that outcome.

If penalties were to be introduced for non-achievement of commitments, it is likely that this would prompt more strategic behaviour by carriers. To reduce the risk of incurring penalties, carriers would be far more cautious in what they would commit to undertake. Any bargaining associated with getting the IDP approved would therefore probably take place from a lower base level of local activity. Hence, introduction of penalties could perversely reduce the potential benefits of the IDP arrangements.

Voluntary or compulsory IDPs for small carriers?

Another suggestion made in the Draft Report was to make participation in the IDP process voluntary for small carriers. The basis for this suggestion was that for small carriers, the costs associated with IDPs are likely to loom large relative to any social benefits, and this has the potential to impede entry and reduce some of the dynamic gains from liberalisation.

DOCA noted that exemption is already possible under the current legislation — the Industry Minister may exempt a specified kind of carrier from industry development plan requirements (*Telecommunications Act 1997*, Schedule 1, Part 2, Clause 5). To date though, the exemption provision hasn't been applied.

The Commission's survey of carriers conducted in mid-February sought their views on the suggestion of allowing IDPs to be voluntary for small carriers. Of the nine respondents, five preferred the current arrangements of mandatory IDPs, three were in favour of the voluntary option, and one was indifferent.

Perhaps surprisingly, the smallest four carriers among the new entrants surveyed were equally divided between favouring the voluntary option and the status quo. The general view of those in favour of the current mandatory status of IDPs was that involvement in the IDP approval process with DIST had helped them to close some of the information gaps that potential new entrants face (such as local equipment manufacturers' capabilities).

On the other hand, those agreeing with the voluntary IDP suggestion considered that it was very difficult for a small new carrier to make commitments at an early stage of market entry, particularly when the industry is changing so rapidly. One (large) carrier considered that because the IDPs of small carriers may have very little or no impact on the local telecommunications equipment industry overall, they were essentially a waste of resources for the carriers concerned.

DIST was critical of the suggestion to make IDPs voluntary for small carriers:

> New carriers are often small when they lodge their IDPs and many have expectations of creating substantial businesses. ... Giving an exemption would place the carrier outside of the arrangements and should it become a major

> business this would be inconsistent with the purpose of the legislation. There is also the issue of equitable treatment around the cut-off point. (Sub. D9, p. 5)

However, the voluntary IDP option for small carriers need not imply that such carriers will always be outside the IDP arrangements, even if they subsequently grow to become 'large' — the option relates only to those carriers that are small at some stage of their life-cycle. Further, problems associated with defining 'smallness' would not seem to be insurmountable — it could be based on one or more of a range of indicators, such as capital expenditure, sales revenue, and/or market share. Currently, it would be possible to set a clear size threshold to exempt some small carriers. While this situation might change in the future, it is unlikely to present a problem for more than a few carriers and would be unlikely to have a significant impact on their competitiveness compared to exempt carriers.

IDPs as permanent or temporary arrangements?

The rationales for IDPs provide one guide as to whether they should be permanent or temporary. There is a case for permanent IDP arrangements if, for example, IDPs were intended primarily to generate technological or knowledge spillovers by encouraging additional innovation by carriers. So long as IDPs were a cost effective instrument for generating such spillovers, it would be appropriate for the arrangements to be ongoing.

However, transitory arrangements are appropriate if IDPs were primarily intended to:

- establish alliances between the wave of new carrier entrants and Australian suppliers; and/or
- overcome misperceptions or information deficiencies by carriers about local suppliers' capabilities.

In fact, IDPs have a multiplicity of rationales, and the issue of the ideal life of such arrangements will depend on their efficacy in achieving those rationales.

The Commission's survey evidence on carriers' behaviour— combined with the analysis in appendix I — suggests that IDPs are not particularly effective mechanisms for eliciting additional R&D and any associated spillovers. Were these the only impacts of IDPs, they would not justify the compliance and administrative costs. Such spillovers cannot, therefore, justify permanent IDP arrangements.

However, in the short term, IDPs may produce sufficient other benefits from information about local suppliers' capabilities and alliance formation to be worthwhile. Over the next few years though, these benefits are likely to taper off because there is likely to be:

- less new entry of carriers (who might be unfamiliar with local suppliers' capabilities);
- less scope for more strategic alliances to be formed between new or existing carriers and local suppliers; and
- less ignorance among existing carriers about the capabilities of local suppliers.

Therefore, it is likely that IDPs will generate net costs — simply through administrative and compliance burdens — suggesting that the arrangements should be temporary. While there will still be some sporadic entry by new carriers which might not be fully aware of Australian suppliers' capabilities, maintaining an IDP administrative infrastructure for such a few carriers would almost certainly impose costs in excess of any plausible benefits.

6.6 Conclusions

The main economic rationales for IDPs relate to the spillover benefits that can arise from telecommunications equipment suppliers carrying out more activity in Australia; and the learning benefits that indigenous telecommunications equipment firms derive through forming relationships with carriers and MNEs. It should also be noted that if better mechanisms can be found for inducing additional R&D across the economy than those currently in place (see chapter 9), this rationale for IDPs would be weakened.

An assessment of whether IDPs are worthwhile depends on comparing the costs associated with them and the likely benefits arising from additional local industry activity. A significant drawback with such programs is their lack of transparency and the difficulty of quantifying these key elements.

Carriers negotiate their IDPs with DIST from a statutory basis of voluntary commitments. The Commission has concluded on the basis of information obtained from a survey of carriers, and discussions with a range of carriers, that the IDPs are unlikely to have significantly changed carriers' behaviour in relation to local industry development commitments. IDPs are essentially based on carriers' strategic plans prepared as part of normal good business practice, and appear to be modified by the IDP approval process, if at all, only 'at the margin'.

In particular, IDPs do not appear to alter carriers' intentions in relation to capital investment, export development, and expenditure on training. On the other hand, overall R&D expenditure under IDPs appears to be slightly higher than carriers would otherwise undertake. However, the amount involved is only a tiny fraction of carriers' total R&D expenditure.

IDPs may provide some benefits by encouraging carriers to search out the capabilities of local telecommunications equipment suppliers, and by encouraging some strategic alliances that might not otherwise take place. But it is likely that over time, any benefits from encouraging better information and alliances with local suppliers will be of lesser importance as the rate of new carrier entry declines.

A key issue is the potential for the IDP negotiation process to impede and delay entry in a sector where speed to market can be critical. To date, there is little evidence of such an effect. However, with the prospect of an estimated 30–40 additional entrants in the future, this could change, depending on the 'flexibility' of administrators and the resources available to them.

Administrative costs associated with the IDP arrangements are expected to escalate with the entry of more carriers. The government has provided funding of $600 000 for monitoring IDPs in 1997–98, rising annually to $870 000 in 2000–2001. These monitoring costs will be offset by an increase in the licence charge payable by the carriers.

It appears that IDPs impose average annual compliance, administrative and other burdens of around $1 million. The Commission developed a methodology for quantifying the economic effects of IDPs in relation to any induced R&D and other activity from which benefits might arise. Depending on the parameters used, the (illustrative) simulations yielded either small net costs or modest benefits.

The simulations also suggest a greater likelihood that IDPs result in net costs for small carriers — to the extent that compliance and administrative costs are more important relative to any benefits in their case.

Recommendation

IDPs should be voluntary for small new carriers. The criterion of 'smallness' could be based on indicators such as capital expenditure, sales revenue, and/or market share.

Overall, there is little evidence that IDPs generate substantial net benefits, but there is similarly no strong evidence that they currently impose net costs on the economy. However, in a few years time, when most incumbent carriers will be familiar with the capabilities of Australian telecommunications equipment suppliers, the Commission's assessment is that the costs of the IDP arrangements will exceed the benefits.

Recommendation

Mandatory IDPs should not be a permanent feature of the carriers' regulatory regime, and should ultimately be made voluntary for all carriers. One option is to do this by 30 June 2002, when all current plans will have lapsed.

7 GOVERNMENT PURCHASING PROGRAMS

7.1 Introduction

Purchasing of telecommunications equipment is subject to extensive Commonwealth policies and guidelines. In broad terms, the objective of these policies is to obtain the best 'value for money', where this is interpreted broadly to encompass a number of factors including price, whole of life cost, quality, service and support. Other procurement principles include compliance with Commonwealth policies, open and effective competition, ethics and fair dealing, accountability and reporting, and promotion of national competitiveness through local industry development.

The Commission has been asked to evaluate government programs aimed at improving the telecommunications equipment industries' performance and report on ways in which assistance could be better used to promote the long term development of the industry and the economy.

This chapter briefly describes government purchasing arrangements for telecommunications equipment, and considers some issues about their rationales and effectiveness. It covers: Common Use Arrangements; Endorsed Supplier Arrangements (ESA); the Partnerships for Development Scheme (PfD); and the Fixed Term Arrangements (FTA). However, all these purchasing arrangements (unlike the telecommunications carrier industry development plans (IDPs), discussed in chapter 6) apply more generally than to telecommunications equipment, and would require more substantive review than the Commission could undertake in this report. Nevertheless, this inquiry has provided some insights into the operation and effects of these arrangements.

Recently announced changes to government purchasing arrangements are expected to have little effect on the ESA, PfD and FTA programs, at least as far as the telecommunications equipment industries are concerned, but could have some effect on common use arrangements (see section 7.4).

7.2 Common use and endorsed supplier arrangements

Common use arrangements

Government policy has required that 'common use arrangements'[1] be used for purchase of information technology (IT) and other goods and services when available (Commonwealth of Australia 1997a). Box 7.1 sets out these arrangements.

Box 7.1: Common use arrangements

Common use arrangements are standing offers from companies to supply goods and services to governments for a period of time based on specified terms and conditions and agreed prices. These arrangements allow government to pool demand for commonly used goods and services. Buyers place orders directly with nominated suppliers, eliminating the need for calling quotations or tenders for individual purchases.

Information technology hardware and software goods and services are covered by a PE series of common use arrangements. PE contracts cover the hardware, software, telecommunications equipment and services needed for the electronic collection, processing, storage and dissemination of information. IT common use arrangements, covering a full range of product and service categories, are grouped into five panels, of which the one most relevant to telecommunications equipment industries is PE65:

- PE60 – Small Systems Hardware and Maintenance;
- PE64 – Software;
- **PE65 – Voice, Data and Video Communications Equipment and Services;**
- PE67 – Medium and Large Computing Systems and Maintenance; and
- PE68 – Information Technology Services.

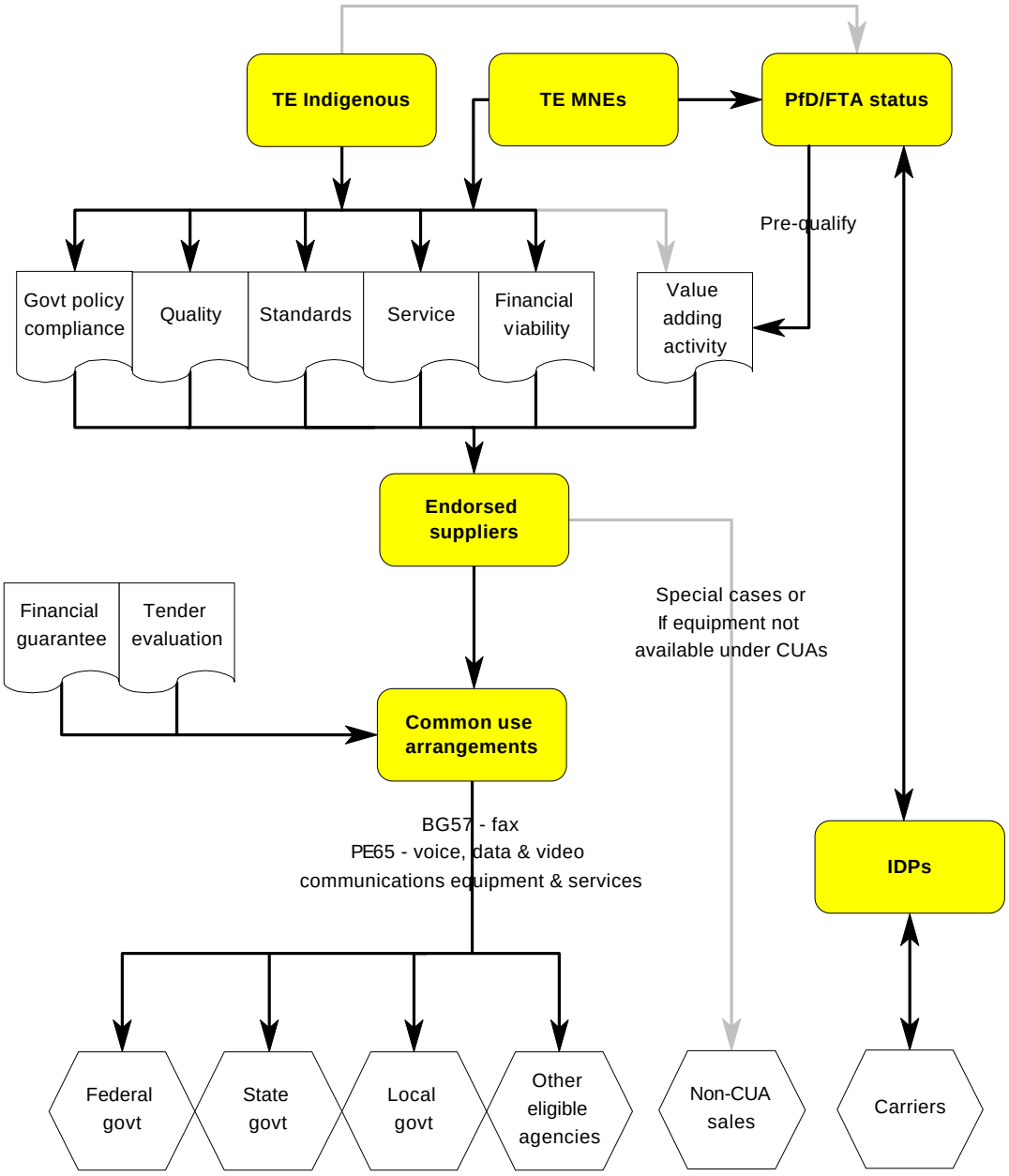
Similarly, major office machine goods are covered by BG (Buyer's Guide) series. For example, communications equipment such as facsimile machines are purchased through BG57 common use arrangements.

Source: DAS 1997c, 1997d, 1995.

[1] Where a particular IT or major office machine product or service is *not* covered by a common use arrangement, agencies must give endorsed suppliers first opportunity to tender, subject to the principle of open and effective competition. Buyers are not, however, required to limit themselves only to endorsed suppliers (DAS 1996).

While becoming an endorsed supplier (see below) is a prerequisite to being considered for IT and major office machine common use arrangements, it does not guarantee a place in a common use arrangement panel. Suppliers also need to submit tenders, which are evaluated by the Competitive Tendering Contracts Group of the Department of Finance and Administration (figure 7.1).

Figure 7.1: Telecommunications supplier–buyer links



As shown in box 7.1, government agencies purchase telecommunications equipment from what is known as common use arrangement panel PE65. Some communications equipment is also purchased through office machine common use arrangements such as BG57 (for example, facsimile machines).

As at 30 June 1996, there were 32 endorsed suppliers in the PE65 and 10 endorsed suppliers in the BG57 panels. The types of telecommunications equipment purchased under the PE65 series are outlined in table 7.1.

Table 7.1: List of PE65 common use arrangements products

Broad description	*What does it include?*
Automatic call distribution	Stand-alone or PBX-based system for processing and distributing incoming calls
Cordless Telephones	Portable handsets linked to a fixed base station
Enterprise Networking Equipment	Wide Area Networking products including Routers, Bridges, Switches, and PADs
Facility Management Services	Includes reviewing current equipment, advice on current and emerging technologies, system performance monitoring, provision of personnel and management of third-party contracts
Key Telephone Systems	Small office telephone systems
Microwave & Earth Station Link Equipment	Line-of-sight microwave and laser transmission equipment, satellite earth station link equipment.
Mobile Telephones	Analogue and digital cellular and satellite telephones
Modems	Includes cellular, fax and cable modems
Multiplexors	Includes digital access and inverse multiplexers
Paging Equipment & Services	Mobile telephones are listed separately
PBXs	Also known as Private Branch Exchanges, and PABXs
Radio Communication Equipment	Includes mobile data terminal equipment
Telephone Handsets	Includes analogue and digital telephones
Tele sets	Includes cordless headsets
Conferencing Systems	Includes PC-based, roll-about and studio systems
Voice/Data Cables	Boxes of copper or fibre cable (box of 1000 feet/305 metres or box of 500 metres).
Voice Processing/Response Systems (VPS)	Includes stand-alone or PBX-based voice mail systems and interactive voice response systems

Source: DAS 1997a.

Endorsed supplier arrangements (ESA)

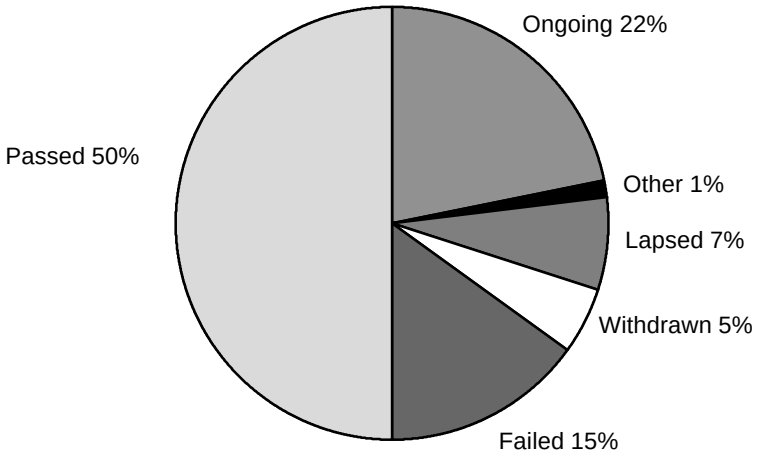
In 1994, the Commonwealth Government announced certain changes to its purchasing practices, with a view to using the government's purchasing power to maximise opportunities for Australian industry. Keating (1994) said:

> The government is restructuring its purchasing framework to use its capacity as a major purchaser of goods and services to promote the development of Australian industry strategically, *without compromising on quality or price*. (p. 76)

A key initiative was the introduction of endorsed supplier arrangements (ESA) for day-to-day purchases of information technology and major office machine products. The program's objective, administration and requirements are outlined in box 7.2. Under the program, firms must commit to long-term value adding activity in Australia and 'world best practice' before being considered for the government market.

By 30 June 1996, 274 companies, or one-half of those who had applied, had received endorsement (see figure 7.2). The Commission understands that the number of endorsed suppliers has since increased to over 400. This includes IT and major office machine product sellers (not just telecommunications).

Figure 7.2: Status of ESA applications, 30 June 1996



Source: DAS 1996.

7.3 The PfD/FTA programs

The Partnerships for Development (PfD)/Fixed Term Arrangement (FTA) programs are Commonwealth programs undertaken in cooperation with state and territory governments. These purchasing-linked programs are designed to encourage industry development activities in the areas of information

technology and telecommunications. Governments essentially use purchasing as a lever to encourage MNEs to undertake business activities in Australia.

Box 7.2: ESA objective, administration and requirements

The objective of the program is 'to recognise IT and major office machine suppliers who can demonstrate a commitment to "world best practice" in terms of quality, standards and service and long term value-adding activities in Australia and New Zealand'. It is Commonwealth Government policy in IT and major office machine procurement that Commonwealth agencies must use suppliers who prequalify through the ESA.

Assessment of the endorsement is based upon specific requirements in each of the following areas: 1. Financial viability; 2. Quality; 3. Standards; 4. Service. 5. Government policies; and 6. Long term value adding activity in Australia. The Competitive Tendering Contracts Group of the Department of Finance and Administration undertakes the assessments relating to the first five areas, while DIST assesses the last.

To comply with the domestic value added criterion, applicants are expected to undertake three mandatory activities — product development, investment and local sourcing. In addition, companies are expected to demonstrate commitment to at least one of the non-mandatory activities, which include R&D, exports, networking between local or overseas organisations and technology transfer.

Each endorsed supplier receives a certificate of endorsement which it can use as a marketing tool.

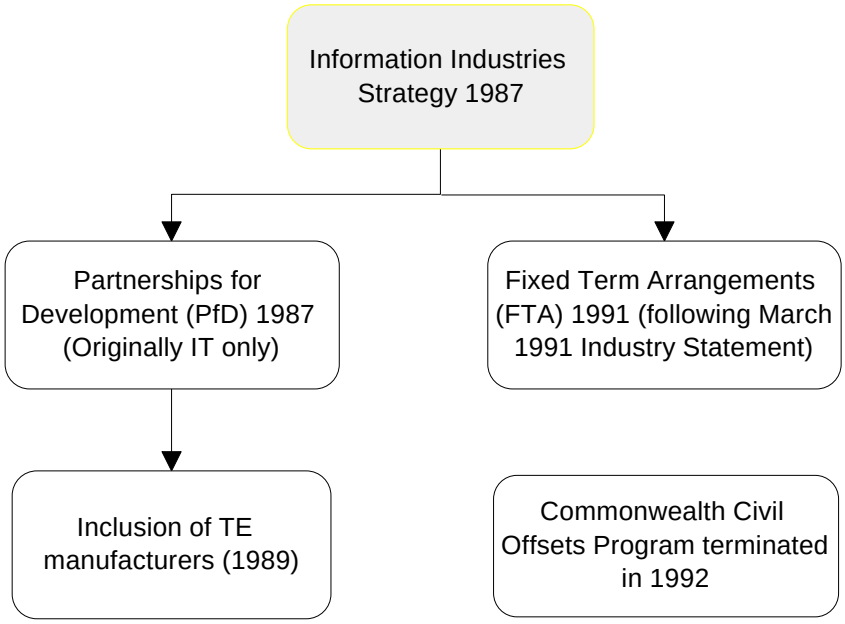
Both the Department of Finance and Administration and DIST conduct 'status reviews' of a selection of endorsed suppliers during the two year endorsement period. The status review seeks to verify claims made in the applications, to identify changes in circumstances and to monitor progress towards achievement of nominated timetables. Each supplier's endorsement status is renewed every three years.

Source: Commonwealth of Australia 1997a, DAS 1997b, 1996, 1995.

Background to the PfD/FTA programs

The PfD program, which applies to multinationals with at least $40 million of annual sales to governments, was introduced in 1987 following the Commonwealth Government's announcement of the Information Industries Strategy in the same year (see figure 7.3).

Figure 7.3: Development of the programs



The Strategy was intended to address a number of perceived problems, including a lack of internationalisation of the Australian IT&T industries, a growing trade deficit, a product development gap and skill shortages (DITAC 1987).

According to DITAC, the objective of the Strategy was to ensure that IT&T industries achieved their full potential through building a set of dynamic, outward looking industries which were effectively integrated into the world production and marketing networks for their goods and services. Other objectives were to encourage indigenous producers' pursuit of niche markets and to capitalise more fully on the MNEs' presence in Australia through, in particular, the integration of Australian activities into the MNEs' global plans and the formation of strategic relationships between Australian companies and MNEs (see Doddrell 1995).

The Strategy combined initiatives which were aimed at developing the potential of the IT&T industries in three key areas:

- product research and development;
- enhanced international integration and increased exports; and
- a supportive industry infrastructure, including education and skills formation and a deregulated business environment (DIST 1997f, p. 4).

According to DIST, the centrepiece of this strategy was the Partnerships for Development (PfD) program. This program was effectively widened in 1991 with the introduction of Fixed Term Arrangements (FTA) for firms with annual sales of between $10 and $40 million. The $10 million threshold for FTAs was dropped in 1994.

Inclusion of telecommunications firms

The PfD program originally covered only IT, since it was essentially a strategy aimed at the development of the IT industry. In 1989, the program was expanded to include multinationals selling telecommunications equipment. Table 7.2 shows selected PfD telecommunications equipment companies, their agreement dates and total commitments.

Table 7.2: Some PfD partners in the telecommunications equipment industries[a]

Company	*Agreement dates*	*Export commitment ($m)*	*R&D commitment ($m)*	*Total other commitments[b] ($m)*
NEC	7-6-89	535	157	
Nortel	7-9-89	264	58	
Ericsson	15-11-89	477	317	
Fujitsu-ICL	25-7-90	352	160	
Nokia	24-11-92	116	27	
Alcatel	5-2-93	1173	161	
Panasonic	27-10-93	73	11	
Siemens	23-11-93	300	95	
Motorola	19-4-94	181	147	74
BT Australasia	1-12-94	307	15	122

a As at June 1995. Partners commitments are usually for seven years from the agreement dates.

b Other commitments include strategic capital investments in Regional Headquarters, Regional Support Centres and Centres of Excellence; education and training; and technology transfer.

Source: DIST 1995.

NEC Australia was the first telecommunications equipment and service MNE to enter into a PfD program in 1989. At that time, DIST considered that the nature of the telecommunications equipment industry was also suited to partnerships-type arrangements, particularly because of the increasing technological convergence between IT and telecommunications equipment (see BIE 1994a, p. 62).

Relationship to civil offsets

The PfD/FTA programs were developed partly in response to problems recognised in the civil offsets program. The offsets program required transnationals to offset 30 per cent of the imported value of large government contracts with activities such as local investments, R&D, export facilitation and technology transfer (IC 1995d).

Prior to the termination of the offsets arrangements in 1992, a major reason for joining the PfD/FTA programs was to get exemptions from the more rigid offset requirements. However, the underlying motivation was to have access to the government market (see section 7.5).

A 1985 review[2] of the civil offsets program found that foreign suppliers were having considerable difficulty meeting their obligations. In 1994, the former DITARD considered that:

> The main disadvantage of the program was that it led to short term contract by contract and fragmented industry development activities to satisfy offsets requirements, in contrast to the long term strategic focus in the PfD and FTA programs. (in BIE 1994a, p. 61)

Concerns over the offsets program led to the establishment of the PfD program in 1987 as an alternative to offset commitments for firms selling IT to governments.

Basic features of the PfD/FTA programs

IT&T multinationals — with annual sales (including sales to carriers) of equipment, software or services to the governments (federal, state and territory) amounting to $40 million or more — are 'invited' to join the PfD program.[3] The PfD program involves the development by partner companies of a seven year business plan which contains a number of commitments to undertake industry development activities. This plan forms the basis of agreement between partner companies and the Commonwealth, acting on behalf of state and territory

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[2] Committee of Review on Offsets (Sir Brian Inglis, Chairman), Report, 1985. See also IAC 1987.

[3] In its submission responding to the Draft Report, DIST stated that: 'Companies are not approached to formally invite them to join the program. Company participation in the scheme is a result of an inability to meet Section J requirements of the Endorsed Supplier Arrangements' (Sub. D9, p. 10). However, according to the guidelines for the PfD program published by DIST, 'Large international companies which have IT&T business with government and telecommunications carriers are invited to sign a Partnership Agreement' (DIST 1997f, para. 2.1.1). Further, 'Companies may alternatively be invited to sign a four year Fixed Term Arrangement' (para. 2.1.2).

governments. Partner companies develop their own programs of strategic, commercially advantageous activities:

> Through the program, the government aims to encourage international companies to develop, on sound commercial grounds, Australian based activities ... (DIST 1997f, p. 4)

Companies with a lower level of annual sales may alternatively be 'invited' to sign FTA agreements. The FTA partners commit to a four-year program of activities. According to DIST, the philosophy of the two programs are essentially the same (DIST 1997e). Details of their operations are outlined in box 7.3.

Currently, there are 26 PfD companies, many of which produce telecommunications equipment and related services. They include Ericsson, Alcatel, Nokia, Fujitsu, NEC, MM Cables and Siemens. Another 86 companies have signed up for the FTA program.

It is important to note that 'sales to licensed carriers are treated in the same manner as sales to government for the purposes of the PfD/FTA programs' (DIST 1997e). For valuation purposes, a PfD/FTA company carrying out industry development activities as part of a carrier's commitment under the *Telecommunications Act* 1997 can seek to have those activities recognised as part of its PfD/FTA commitments.

7.4 Recently announced changes

In mid December 1997, the government announced some changes to government purchasing arrangements (see box 7.4). These changes will have no implications for the ESA, PfD and FTA. Continuation of the latter two arrangements was affirmed in the December 1997 *Investing for Growth* policy statement, but with some examination to be undertaken by the government of the PfD to ensure that it 'is focussed consistent with the initiatives' outlined in that statement (Howard 1997, p. 77).

The common use arrangements are being restructured so that they 'concentrate on a few strategic markets fundamental to Commonwealth operations and where major savings can be made for the taxpayer' (DFA 1997, p. 5). Advice from the Department of Finance and Administration indicates that the existing IT&T common use arrangements (see box 7.1) expire later in 1998 (30 June for Information Technology Services and 30 September for the others). However, they may be extended as an interim arrangement pending implementation of the government's policy on outsourcing. Alternative options, including modifications to the ESA, are also being explored.

Box 7.3: PfD and FTA — a snapshot

Objectives: DIST has defined the objectives of the PfD program as:

- to attract international investment capital and technology to expand and internationalise Australia's IT&T industries;
- to link Australia's IT&T industries into international R&D and marketing networks through using Australia as a base for selected corporate activities where Australia has competitive strength;
- to expand exports and export oriented import replacement activity through strategic long-term, commercially viable industry development activities, thereby reducing Australia's trade imbalance; and
- to facilitate development of mutually beneficial business relationships between international IT&T corporations and local IT&T firms and research institutions.

Eligible activities: export of Australian developed products and services including Regional Headquarter services; facilitation of new export market opportunities for local companies; research and development; training; technology transfer; strategic capital investment; and venture capital investment.

Commitments: Essentially, companies 'volunteer' industry development commitments under the programs in areas of eligible activity. According to the DIST guidelines (DIST 1997f, paras. 2.1.4 and 2.1.5): 'PfD/FTA agreements should encompass both R&D and export activities. Other types of activities are recognised where they are an integral part of a long term commitment to industry development in Australia. These must be consistent with the company's strategic plan ... The general criteria applying to all business proposals put forward for inclusion in a PfD/FTA Agreement is that they must be commercially viable and integrated into the company's global strategies for product development and marketing. It is expected that proposed strategic business activities would not lead to any price increase of goods and services sold to government'.

While the PfD program had set percentage targets for industry development activities in its early years, this is no longer the case. Neither are there local content requirements, except in the PfD where DIST stated that there is 'a suggested requirement for local content with respect to exports and even here ... substitution [is allowed] where local components are not competitively available' (Sub. D9, p. 10).

The Commonwealth undertakes to publicise and promote the PfD/FTA partners' as 'good corporate citizens'; assist in developing a supportive industry infrastructure, including the availability of skilled IT&T professional; and assist in the development of a vendor base of local companies capable of supplying world class components, products, software and services.

cont'd

Box 7.3: PfD and FTA — a snapshot (cont'd)

Graduation: a partner graduates from the PfD program upon fulfilment of its final year PfD commitment and is accorded 'senior partner status'. Upon graduation, a senior partner is expected to maintain and build upon its industry development activities on the basis of its seventh year. A FTA partner, upon completion of its agreement may enter into a new FTA agreement (or a partnerships agreement if its level of Australian revenues has reached the threshold). Failure to perform adequately during post PfD/FTA period may still result in termination of senior partner or FTA status.

Audit and monitoring: Under the PfD/FTA programs, company performance is monitored via annual reports, review, and audit.

PfD/FTA agreements require partners to provide an annual report on their progress in implementing strategic business activities. These reports are then assessed to ensure that activities are carried out in accordance with partners' undertakings in the agreements. Reviews are conducted one month after receipt of the Annual report. Annual PfD/FTA reports are treated as 'commercial in confidence'.

PfD/FTA activities are also audited normally once every two years to assess the accuracy of the information contained in the annual report. A final audit report is forwarded to DIST.

The cost of auditing is met by the Commonwealth. The 1995–96 audit of the reported performances of six PfD and 10 FTA partners by Ernst & Young and Price Waterhouse validated the claimed performance of partners against Australian turnover, R&D, exports and imports.

Partners can in certain circumstances modify the agreements to take account of changing market conditions and/or business strategies, following consultation with DIST.

If after formal notice from the Department a partner fails adequately to carry out its industry development commitments, the Department may take action to suspend that company's PfD/FTA status (DIST 1997e, p. 11). For example, a review and audit of Acer Computer Australia in August 1994 revealed inadequate performance against its FTA. As a result, Acer was suspended from the government market for a period of five months, during which time Acer worked closely with the Department and state governments to develop a mutually acceptable revised business plan detailing its commitment to industry development. It was re-admitted to the FTA program in April 1995.

Source: Based on DIST 1997d, 1997e, 1997f, 1995, BIE 1994a, IC 1995d, Sub. D9.

Box 7.4: Changes announced in December 1997 to government purchasing arrangements

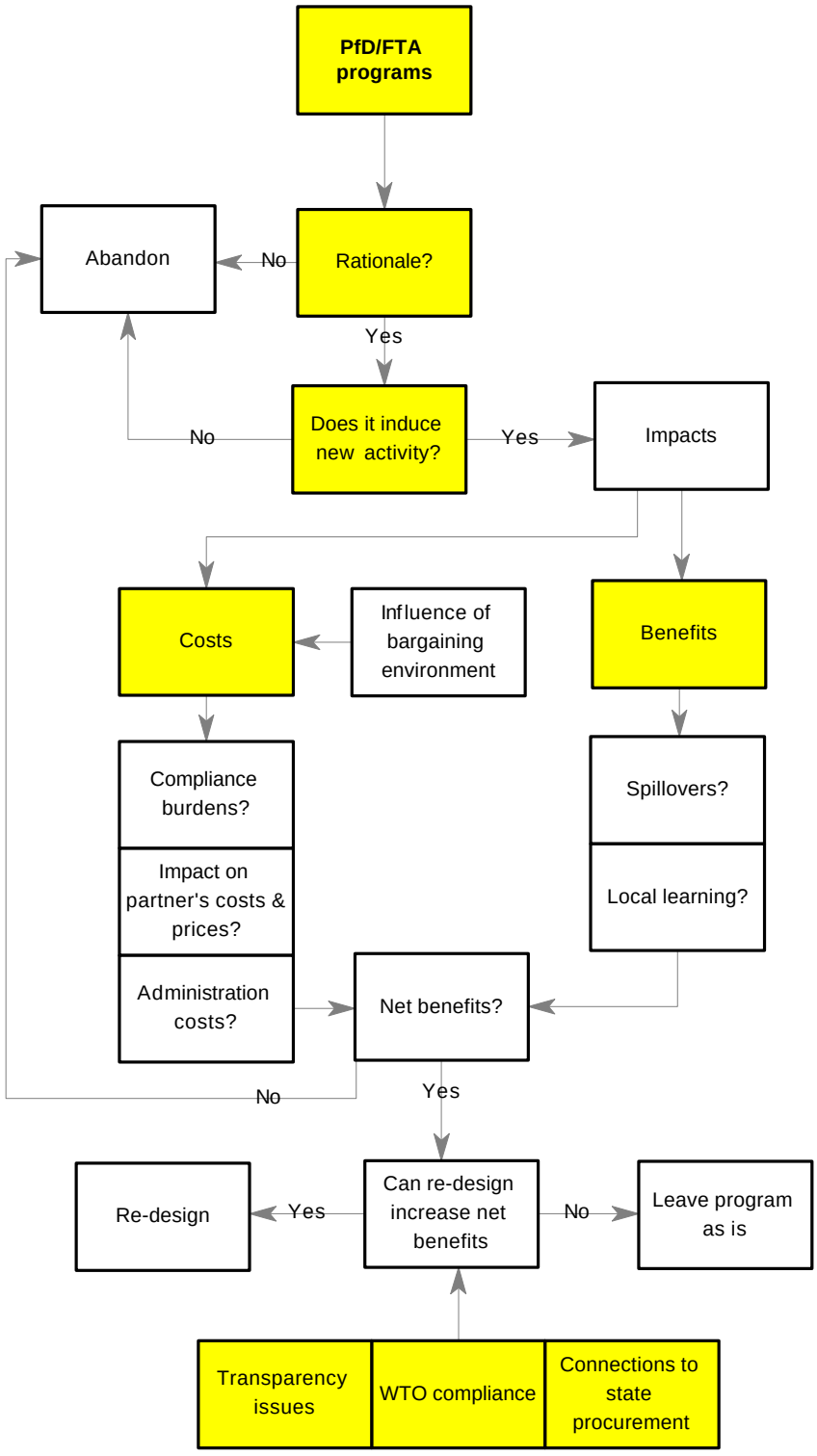
- The government will maintain its election commitment to Commonwealth departments and agencies sourcing at least 10 per cent of their purchases from small and medium enterprises (SMEs).
- Industry development requirements, related evaluation methodology and opportunities for SMEs will be required to be included in tender documents for major projects over $10 million. Model guidelines will be developed by the government, in consultation with industry, for use by agencies in formulating their tender documents.
- The 'complex and time consuming' two envelope tendering requirement and industry impact statements will be abolished.
- The commission imposed on suppliers by the Common Use Arrangements (CUA) will be abolished.
- Common Use Arrangements will be restructured so that they apply to a smaller number of strategic markets. The use of these arrangements will be mandatory for agencies for the term of the arrangement.
- A pre-qualification scheme will be established for businesses supplying in specific markets where the government is a major purchaser but CUAs are not cost effective or there is a risk of market failure.
- A Purchasing Advisory and Complaints Service will be set up within the Department of Finance and Administration to assist suppliers with problems they may experience with purchasing processes.
- The National Procurement Board will cease in March 1998, with some functions continuing within the Department of Finance and Administration.

Source: Fahey and Moore 1997, and DFA 1997.

7.5 Economic issues

The Commission has not undertaken a detailed evaluation of the PfD/FTA programs, as they predominantly apply to other industries than telecommunications equipment. Moreover, data problems in this area currently preclude a detailed assessment (as depicted in figure 7.4). Nevertheless, we examine some of the key issues identified in the policy framework of chapters 4 and 5 — and which have also been raised by participants in the inquiry and by other recent studies.

Figure 7.4: Assessing the PfD/FTA programs



The Commission makes some observations about:

- the economic rationale for the PfD/FTA programs;
- the extent to which the programs induce new activity in local firms and MNEs (for example, R&D, exports and local content);
- the potential to incur costs under the PfD/FTA programs;
- the scope for offsetting benefits;
- administrative and transparency issues;
- relationship to the WTO Agreement on Government Procurement;
- relationship to state/territory procurement;
- relationship to other Commonwealth programs; and
- the ESA program.

The economic rationale for the PfD/FTA programs

As noted, the PfD/FTA programs evolved from the old offsets program, which was essentially protective in nature, encouraging local content and employment generation in the targeted industries. According to the AIIA, the PfD program has advantages over state and federal government offsets which it replaced (at least for program members):

> [the PfD program] recognised that you were a success in the marketplace. It allowed you to consider the whole of Australia as your investment target. It got the offsets mechanisms that the states had previously operated off your back ... (Transcript, p. 44)

However, to some extent the current program (see box 7.3) continues to emphasise the goals previously sought through offsets — and in this sense the program could be viewed as a 'fuzzy' local content plan.

Indeed, the objectives of the PfD are hard to distinguish from those of the former offsets arrangements. Market or institutional failures that may provide an economic rationale for pursuing these objectives through PfD are not articulated.

This poses a problem for evaluators, who need to assess not only whether an industry policy objective has been met, but whether the objective is justified in the first place (see Mortimer 1997). For example, it is necessary to ask why export orientation should be an objective of an industry program. In chapters 4 and 5 we described a range of rationales for such an objective. Some of them were economically justifiable; others (such as the trade balance argument) manifestly less so. The value of knowing the rationale underlying a program is

that *specific* questions can be framed about its effectiveness in overcoming the market and other failures that are its targets.

In chapter 6, the Commission outlined a range of possible rationales for industry development plans for the carriers. The same questions of rationales arise in both IDPs and the PfD/FTA programs. Both are government leverage programs — one operating through the buyers of the equipment, the other through the prime contractors. Given this symmetry, we do not discuss in any detail the rationales or appropriateness of the PfD/FTA programs, to avoid duplication of content in chapter 6. As identified in relation to IDPs, the strongest rationales for intervention are:

- *Dynamic and static spillovers.* There can be grounds for supporting intervention where there are externalities from the location of MNEs in Australia. These could include, for example, spillovers from technology transfer, management practices and marketing experience to indigenous companies. Such externalities can help local firms to improve their own product and process technologies and augment their sales, quality and employment. MNEs do not take account of such externalities when making their locational choices, nor are the indigenous beneficiaries sufficiently coordinated to internalise the gains by explicitly buying them from the MNEs.[4] This leaves a potential role for government. Moreover, as noted in chapter 5 (and further explored in chapter 9), the fundamental problem in the design of policies intended to increase R&D is trying to subsidise only additional R&D activity. It may be that the PfD/FTA programs — by targeting R&D of footloose, technologically able MNEs — may increase national telecommunications equipment R&D more effectively than direct subsidies.
- *Enhancing local learning.* Australian firms may, for a variety of reasons, be below world standards in aspects of their businesses. MNEs, by virtue of their exposure to fierce global markets, tend to define that standard. Exposure to such MNEs — through alliances, contracts, staff movements and casual observation — can potentially enhance the learning of local firms.

It should be emphasised that these are possible rationales — and that they represent a starting point for evaluation, not the end point.

[4] Each individual indigenous company, for example, would face an incentive to free ride.

Do the arrangements induce new activity?

Telecommunications equipment MNEs undertake hundreds of millions of dollars of activity in Australia — from R&D, to exporting, to manufacture for domestic sales. The plans of the partners specify commitments which seemingly span all these activities. It is tempting, then, to see the PfD/FTA programs as a trigger for this activity.

In DIST's view, the PfD/FTA programs have been instrumental in securing a range of longer term, strategic and commercial activities in Australia (see box 7.5). According to DIST, significant industry development activities are carried out by telecommunications firms:

> the majority of activity is presently generated by less than 10 companies (IBM, Alcatel, NEC, Ericsson, Digital, Fujitsu, Nortel and Unisys). With the exception of IBM, Digital and Unisys, the major activities [R&D, exports etc] are being undertaken in the telecommunications sector. (DIST 1997e, p. 5)

Box 7.5: Examples of activities apparently induced by the PfD/FTA programs according to DIST

- Fujitsu's agreement encompasses its Dandenong manufacturing facility plant which is its fourth centre of excellence for R&D and manufacturing of telecommunications transmission equipment for supply to Optus and export.
- Alcatel Australia's $45 million Liverpool facility which manufactures System 12 digital switches for Telstra's national network. S12 also forms a significant part of Alcatel's exports to the Asia Pacific including China. Alcatel's $100 million optical fibre cable facility at Port Botany manufactures and supplies cable for the South Pacific Rim network and the Jakarta-Djibouti section of the Singapore-Europe cable.
- Ericsson's 650 person R&D facility at Broadmeadows in Melbourne is the largest privately funded centre in Australia and provides the basis for manufacturing and export of products such as the company's automatic call queuing system.

Source: DIST 1997e.

However, it is very difficult to isolate which activities are due to the existence of the PfD/FTA programs and which would have proceeded anyway. A plan can specify commitments without having much role in achieving them. For example, a firm might have been about to undertake R&D equal to 4.75 per cent of turnover. Under a partnerships agreement it decides to undertake an additional 0.25 per cent of R&D. The amount of induced R&D is then only 0.25/5, or 5 per cent. Another major problem in deciding whether the PfD/FTA programs

have genuinely induced additional activity, is that several programs can simultaneously affect the incentive to undertake additional local activity (box 7.6).

Box 7.6: The story of an R&D dollar

A carrier signs an IDP with DIST and agrees to undertake an additional $3 million of R&D, contracted out to a telecommunications equipment MNE. DIST perceives the IDP as inducing $3 million of R&D. The telecommunications equipment MNE undertaking the R&D is a partner in the PfD program, and includes the $3 million as part of its committed rate of R&D — the PfD scheme is credited with expanding R&D by $3 million. As well, the telecommunications equipment MNE uses the 125 per cent R&D tax concession, and says it would not have undertaken the R&D in the absence of the concession. Evaluators of the tax concession record that it has induced $3 million of R&D. Three separate programs claim success in inducing $3 million of R&D. Someone who added up induced R&D from each of the three programs would conclude that R&D had expanded by $9 million! This illustrates the dilemmas in evaluating, in isolation, programs which exert leverage on the same activities of firms.

A number of industry participants visited by the Commission considered that their R&D activities would have been undertaken without obligations to do so. Some saw them as part of their global strategies. In a recent discussion paper, IBM stated that the program does not provide effective outcomes, a view also echoed by the Australian Information Industry Association (AIIA):

> there is increasing industry conviction that industry development programs have failed to deliver expected outcomes ... (AIIA 1997a)

Jtec considered that the PfD program 'is not a bad idea' (Transcript, p. 22). But although there is some additional activity, 'in terms of cooperation, real spillover, for the amounts they are claiming, there is very, very little evident' (Transcript, p. 21).

However, others said they would have done less if the PfD/FTA programs had not existed. For example, a number of telecommunications partner companies claimed that PfD played a 'crucial role' in establishing their R&D facilities in Australia. Some considered that the PfD program has contributed to successful industry results for both exports and R&D, and provided leverage when competing for global investment dollars. Charles et al (1997. p. 57), for example, found that the program helped give local management some leverage in their search for product design and manufacturing mandates from the corporate centre overseas.

BIE survey results

In the BIE's survey of PfD and FTA program participants undertaken in 1994, the responses suggested that the industry development activities of the telecommunication partners would have been lower if the programs were discontinued (see tables J.1 and J.2 in appendix J). The BIE survey data suggested that partners' sales of telecommunications equipment would have been nearly 8 per cent less in the absence of the program, exports some 21 per cent less, and R&D about 17 per cent less.

Some qualifications must be given to the sales loss estimate:

- sales to government lost by partners might be picked up by indigenous firms or non-partners;
- in their survey responses, partner firms might not have allowed for the possibility of picking up sales that other partners might lose; and
- sales losses do not equate with local content because of the potential for assembly/packaging operations with minimal real value added.

However, the telecommunications equipment firms' estimates of export and R&D reductions, and the possible employment impacts of cessation of the arrangements suggest that, to the extent that the survey results are reliable, the arrangements could have sizeable impacts on local value added by the telecommunications equipment MNEs.

Interestingly, while the multinational telecommunications equipment firms appeared to have increased employment by more than IT firms in response to the arrangements, the opposite was true for R&D. The reduction in telecommunications equipment partners' R&D expenditure if the arrangements had ceased would have been about half that of IT firms. Even so, the survey data suggest that the program appears to induce significant new R&D *directly* conducted by the telecommunications equipment MNEs — R&D is projected to be about 17 per cent less in the absence of the arrangements.

Data presented in table J.2 (appendix J) suggest, however, that flow-on effects of the arrangements to indigenous firms depend on the nature of the activity. There are reported to be negligible impacts on R&D conducted in indigenous telecommunications equipment firms (compared to indigenous IT firms). There appeared to be larger impacts on demand for components from suppliers. The partners estimated that there were sizeable knowledge flow-ons to Australian subsidiaries from the parent companies (see table J.3, appendix J), but the local

firms recorded insignificant impacts of the program on such flows (tables J.5 and J.6 in appendix J).[5]

Overall, the BIE survey data — combined with recent estimates of the scale of activities undertaken by telecommunications equipment MNEs (chapter 2) — would suggest that the arrangements stimulate up to about $250 million in sales (including $110 million exports) and $45 million of R&D annually.[6] The results also suggest that employment in the telecommunications equipment industries is about 500 more than it otherwise would be. However, for the reasons outlined above, it is likely that this sales effect is overestimated. And, to the extent that the employment effect depends on changes in total sales, the effect on employment is also likely to be less than this estimate.

There are other reasons why the impacts estimated from the survey should not necessarily be taken at face value. First, there are problems of strategic responses, survey reliability and consistency — which may be particularly severe when trying to discern the impacts of programs like PfD (appendix J). Second, even if the survey data are accurate, they ignore the way the economy acts as a system. The PfD/FTA programs may have stimulated additional sales and jobs when results are aggregated across all the individual firms, but that does not mean that these are net gains to the economy, or even to the sector as a whole. For example, the jobs are mainly highly skilled, so that the workers involved are unlikely to have been unemployed in the absence of the program. Table 7.3 describes the problem. Firms join the arrangement, and expand activity, paying a higher wage to attract skilled labour from their existing jobs. These firms, when questioned, answer that the program has stimulated 25 new jobs. But the non-partners have lost the equivalent number of workers — and they may not even realise that the underlying mechanism has been the government program.

Flow-on effects were emphasised by some participants visited by the Commission. One local firm suggested that the broadening of activities by the multinationals in Australia had the effect of taking some business opportunities away from local equipment manufacturers. It considered that while the PfD/FTA programs have encouraged multinationals to place more manufacture locally, this resulted in fragmentation of production in Australia and could have pushed out some local companies.

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5 See also BIE 1994a (tables A.9.14 and A.9.15 on p. 233).

6 The calculation is based on BIE inducement data reproduced in appendix J and data from table 2.3.

Table 7.3: How partial stories can mislead: a hypothetical

	Before PfD/FTA	*After PfD/FTA*
Partners		
Firm 1	120 people	125 people
Firm 2	230 people	250 people
Employment sub-total	350 people	375 people
Non-partners		
Firm 3	70 people	65 people
Firm 4	150 people	130 people
Employment sub-total	220 people	195 people
Overall employment	570 people	570 people
Average wages	$50 000	$55 000

Similar problems of interpretation exist for the inducement data relating to R&D, not least because the most important inputs to R&D are specialist skilled people, who presumably are drawn (at least in the short run) from other activities, including R&D in other firms. As noted in chapter 2, there are indications of a growing shortage of skilled engineers, for example. Moreover, stimulation of additional R&D in one set of firms can generate duplication of R&D efforts or act as either a deterrent or inducement for other firms to undertake R&D, depending on the nature of firm rivalry and technological opportunities in the industry.[7]

These difficulties of interpretation suggest that the real economy-wide impact of the arrangements are likely to be weaker than the survey data suggest.

Costs

In leverage programs like the PfD/FTA (and IDPs), any costs are inevitably hard to detect because they arise out of a complex bargaining process between MNEs and government. But that does not mean, as is sometimes suggested, that they have no costs. The programs have impacts on local industry development, and clearly impose compliance and administrative burdens for firms and governments. In this section, the Commission examines:

[7] It is likely that the arrangements *can* permanently affect the overall level of R&D in the economy in the long run — because the people and other resources that are used in R&D can be drawn from non-R&D activities. It is less likely that there are long-run impacts on total employment or local content.

- the bargaining environment in which arrangements are struck;
- where costs might arise;
- what firms say about the pressures of the arrangements on prices and costs;
- what changes in R&D imply about the magnitude of costs; and
- administrative and transactions costs imposed by the program.

The bargaining environment facing partners

There may be potentially significant costs associated with any price increases for products sold by telecommunications equipment MNEs if they engage in local activities which could not otherwise be commercially justified. The extent to which this is likely depends on the nature of the bargaining environment facing partners and government, and on any reciprocal advantages which government offers partners (figure 7.5). Four alternatives representing the possible bounds of the arrangements are outlined in box 7.7.

The Commission observed mixed signals about where the bargaining environment was positioned amongst these four possibilities. Some companies saw value in being able to portray the company as a partner of the Australian government when selling overseas (consistent with the first scenario).

A majority of the local subsidiaries of MNEs also noted that they were able to increase leverage with the parent company in negotiations about the scale of activities in Australia (consistent with the second scenario).[8]

Some indigenous firms felt that there may be a degree of preferential treatment for partners (the third scenario).[9] Similarly, the BIE (1994a, p. 79) revealed that there is a real perception by some partners and non-partners that the PfD/FTA programs are an implicit contract involving preferential treatment in awarding government business in exchange for industry development activities, although no undertaking is given by the government to provide purchasing preference to partners. The BIE report also indicated that some of the objections expressed by indigenous firms toward the PfD/FTA programs relate to the perception that partners are guaranteed sales at the expense of local firms. The Bureau judged this perception to be misguided. The Commission does not have any concrete evidence to suggest that governments favour partner firms (over other local

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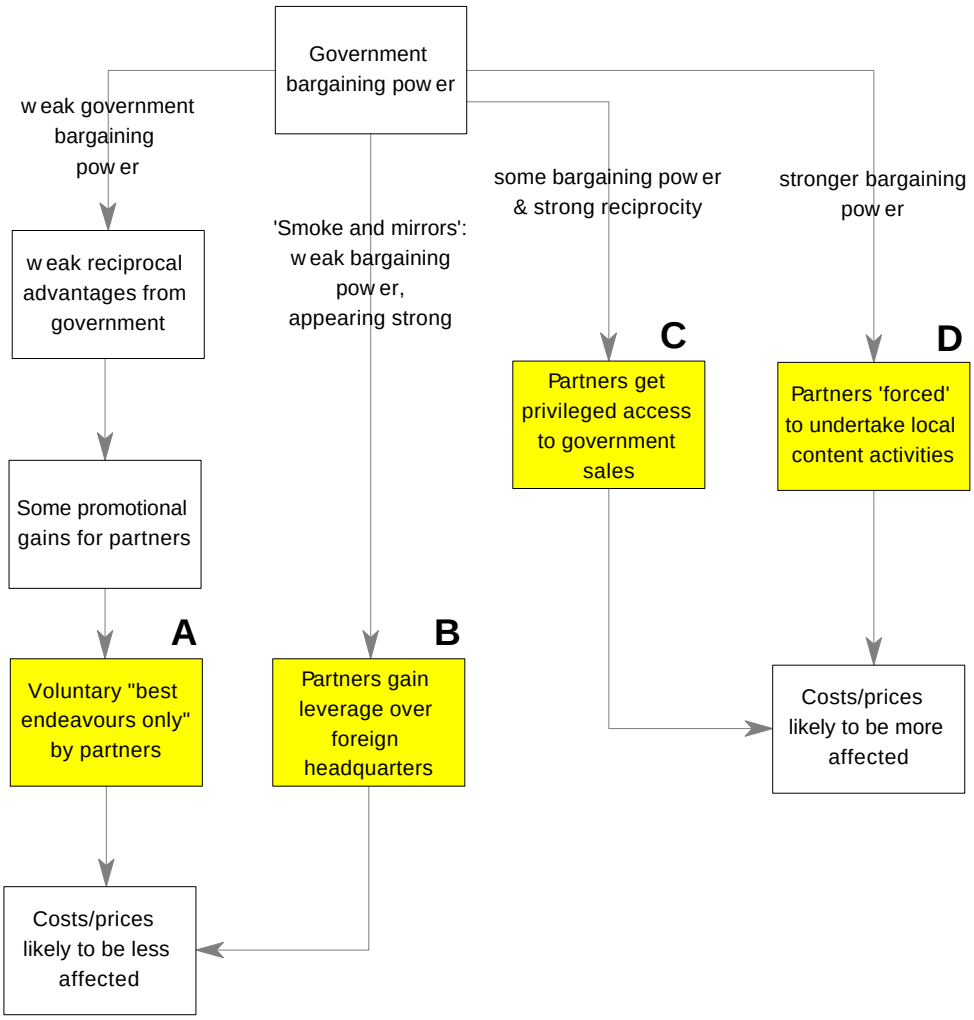
8 There may be a difference in perspectives between a foreign headquarters and the local subsidiary. It is notable that the US State Department (1997) lists the PfD/FTA scheme as a 'significant barrier to US exports' and regards membership of the programs as mandatory if sales to government exceed the relevant thresholds.

9 See for example, Doddrell 1995.

Australian firms) because of their commitments to industry development activities.

Figure 7.5: The government's bargaining power



However, there appeared to be evidence from a variety of sources that the government had at least some suasive power over MNEs (the last scenario). As noted, where sales to governments are substantial, companies are 'invited' to join the PfD/FTA programs. It is an 'offer' that those wishing to maintain government sales are unlikely to refuse. DIST has observed:

> Access to the government IT&T market through endorsed supplier arrangements is the main reason companies seek to enter PfD/FTA agreements. (DIST 1997d, p. 1)

Box 7.7: Bargaining scenarios — carrots, sticks, smoke and mirrors

Small carrots (weak government bargaining power) — the government has very weak or non-existent bargaining power, and offers little reciprocal advantages in exchange for industry development activities by MNEs. Under this scenario, the program is a purely voluntary arrangement, which partners can leave without concern over the impact on government sales. The fact that the large telecommunications equipment MNEs have signed up at all would suggest that they get sufficient promotional advantages (the value of being seen to be a good 'corporate citizen', or the endorsement of the Australian government when trying to export) to offset any small costs. Under this scenario, the partners would not engage in any local activity which was not cost effective.

Smoke and mirrors (weak government bargaining power made to appear strong) — it may be in the interests of MNE affiliates to exaggerate the degree to which the PfD/FTA programs actually binds them in order to secure a larger share of the global activity of the MNE. They can only do this to the extent that they are fundamentally competitive, so that again there would not be significant cost implications.

Sticks and carrots (some government bargaining power and preferential treatment) — the government may also offer partners preferential advantages over firms which do not qualify for partnership status (by virtue of the scale of their sales to government). In this bargaining environment, partners may engage in costly domestic activities, and/or displace activity from non-qualifying competitors.

Sticks (stronger government bargaining power) — the program is coercive, with the government exercising bargaining power to obtain concessions for industry development from MNEs with large government contracts. To the extent that there are competitive disadvantages locally, then this could imply more significant cost and price increases for products sourced from the telecommunications equipment MNEs.

The BIE PfD/FTA survey results, reported above, suggest that other local firms could lose sales to the MNE partners. Given a relatively fixed level of purchasing by government, the increase in sales reported by PfD partners would have to come at the expense of non-partners.

In its report on the WTO Agreement on Government Procurement, the BIE conducted a survey of endorsed suppliers. The survey found that 42 per cent of the 50 PfD/FTA respondents indicated that they would withdraw from the program if the link between government purchasing and ESA were removed (BIE 1996b).

The BIE also reported that although the PfD/FTA programs are nominally voluntary, the Commonwealth Government has always used its procurement policies to persuade companies to join it, noting that following the abolition of offsets in 1992, the Commonwealth Government penalised companies which dropped out of the PfD/FTA programs (BIE 1996b, p. 12).

Similarly, some partners, interviewed as part of the BIE's evaluation of the programs, also perceived that their share of government business could be placed at risk if they did not participate in the programs (BIE 1994a, p. 79).

These perspectives suggest that the PfD may indeed occasion some costs arising from shifts to activities where Australia may be a higher cost supplier than alternative sources. But the difficulty in isolating exactly what type of bargaining environment applies is symptomatic of the Delphic character of the program.

Where costs may arise

The PfD/FTA programs are intended to encourage local production (for exports), R&D, and investment. While the program does not explicitly require local content for domestic sales, its suggested requirement for local content in exports can still represent a barrier to imports. For example, a MNE which exports may have to agree to use domestic rather than imported inputs in those exports. This feature of the program was likened to a 'hidden tariff' by the BIE review (1994a, p. 80) — since the program has the effect of discouraging imports versus domestic production. IBM, for example, noted that the program acted as a barrier to imports of information technology and telecommunications equipment:

> The major non-tariff barrier to IT in Australia is the market access regime created by the PfD and FTA programs and the carrier plans. (Sub. 2, p. 11)

To the extent that such domestic production of the relevant telecommunications equipment is less competitive than overseas sources, this implies that induced activity under the program generates higher production costs. The MNEs then pass on some or all of these costs as higher prices for Australian buyers of telecommunications equipment — the carriers and government — and it is this price premium which is the major cost of the program.[10]

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[10] There may be second round costs too from such price rises, stemming from small reductions in the demand for telecommunications services and inefficiencies generated by any additional tax revenue the government must collect to meet the higher prices of its purchases. Note that to the extent that the partners do not fully pass on the costs to users via price increases, these additional production costs are really losses to foreign shareholders, not Australians. There may be some other residual production inefficiencies, but these are likely to be small.

Such programs may also have impacts on dynamic efficiency by altering the behaviour of firms. For example, while IBM acknowledges the contribution of the PfD/FTA programs towards industry development activities, including increased IT&T exports and improved access to new skills and business opportunities by local firms, it considers that the programs should be terminated, or phased out as companies fulfil their obligations and graduate:

> The programs encourage business arrangements to ensure compliance, rather than the primary goal of creating wealth ... the uptake of the PfD/FTA schemes ... is so pervasive that it could be said that the Australian industry is strategically positioned to supply the government and carrier markets ... The effect may be that a disproportionate part of the company strategy is directed to winning business in the domestic market. (Sub. 2, p. 14)

*What firms **say** about costs and prices*

The local affiliates of the telecommunications equipment MNEs visited by the Commission expressed few concerns over the impact of the PfD/FTA programs on prices or costs of their products. In part, this may be because the program currently has modest impacts on *overall* activity, so that any costs are also slight. Charles et al (1997) found that 'with a couple of exceptions, MNCs (with PfD obligations) interviewed are supportive of the scheme and want it retained'.

The BIE (1994a) assessed the burdens of the program by asking MNEs to enumerate them as a percentage impact on prices and costs. This is difficult when the orders of magnitude must inevitably be small when expressed this way. As well, management of local affiliates of MNEs may understandably wish to increase the scope of their domestic activities vis-a-vis other global operations — a common theme in discussions with such companies. Their answers to questions posed on costs or benefits of the PfD/FTA programs may partly be strategically motivated.

The BIE survey suggested that the average impact on costs was of the order of half a per cent for telecommunications equipment participants in the PfD/FTA programs — considerably less than that of IT participants (table J.4, in appendix J). The BIE study found an even lower impact on prices, implying that the MNEs had absorbed about 65 per cent of the cost impact. But such absorption may have been a short-run phenomenon only. These results imply direct economic costs of the order of about $4.4 million (with absorption) to $13.3 million (with no absorption) in 1996.

Small overall cost burdens need not imply that Australian production of telecommunications equipment products under the PfD/FTA programs is world competitive at the margin. Significant cost margins on a small amount of induced activity may be masked by the overall scale of an MNE's activities.

Costs implied by changes in R&D

The PfD/FTA programs do appear to stimulate significant new R&D, in the sense that the local affiliates of the telecommunications equipment MNEs report that levels of R&D have expanded by about 20 per cent because of the program. But what is this new R&D?

- It can be additional R&D from a global perspective. In this case, the MNEs are undertaking projects that they would not have conducted before, anywhere in the world. That implies that they expect such projects to earn rates of return, at the margin, somewhat less than the rate they normally expect as a global operation. On the other hand, even if the expansion in such R&D may be relatively large from the viewpoint of the Australian affiliate of any telecommunications equipment MNE, it would typically be very small relative to the global R&D performance of the firm. This implies that the distortions will be small, because for a large global company there are many technological and innovation possibilities which are very close to being economically feasible. This implies that the distortions from leveraging a large MNE to undertake R&D are rather less than those applying to a smaller enterprise.
- It may be R&D which is displaced from other possible global sites. In this case, any cost penalty is simply the difference between costs of conducting R&D in Australia relative to alternative sites. Evidence from the Commission's visits and from SIRF (1995) suggests that Australia is a relatively competitive location for R&D, so that the cost penalty for location of a global R&D facility in Australia is likely to be small.

This implies that the inefficiencies generated by leverage programs aimed at stimulating R&D in large MNEs are probably small, relative to programs which aim at smaller domestically centred firms.

Administration and compliance costs

In a recent paper, the AIIA expressed concern about the transactions costs imposed by the programs:

> There is certainly widespread concern about the administrative, compliance and transaction costs the programs impose on participants. (AIIA 1997a)

The guidelines for the programs specify highly detailed annual reporting requirements (amounting to seven pages of data). Compliance by telecommunications equipment MNEs is believed to have cost around $90 000 per year per partner for telecommunications equipment firms in 1994 (BIE 1994a, p. 223).

Administration costs (excepting audit) incurred by DIST were around $11 000 per firm per year in the FTA/PfD programs in 1993–94 (BIE 1994a, pp. 64–65). Total administrative costs — covering telecommunications equipment and information technology firms — were approximately $583 000 in 1993–94.

Total audit costs for the PfD/FTA programs (IT&T) were approximately $125 000 for 1993–94; they were expected to have risen to $238 000 for 1994–95 because many new partners were undergoing their first audit (BIE 1994a).

Against the background of other costs, such burdens appear relatively modest.

Benefits

As noted, an apparent impact on local value added or employment in the telecommunications equipment industry need not constitute an economy-wide benefit. It is primarily an indication of the ability of the program to encourage resource flows from elsewhere in the economy — whether this is a good thing depends on whether the new activities have a higher value than the activities displaced in other firms.

The mechanisms through which economic benefits are possible are described in a previous section, chapter 5 and table 7.4. Of the six possible set of benefits, spillovers and learning effects have the greatest application.

Table 7.4: Possible benefits and their implications for the PfD/FTA programs

Possible economic benefit	*Likely relevance to the arrangements*	*Any implications*
Spillovers	R&D, training and potentially some other investments may generate spillovers	Concentrate leverage on activities which generate spillovers.
Enhancing local learning	In the telecommunications equipment industry there is a mixed story about the magnitude of information flows between MNEs and local firms.	Strategic alliances, best practice demonstration, or other mechanisms for learning may be useful features of agreements — but should probably be on a 'best endeavours basis' only.
Effective inducement mechanism	Appendix D suggests that the scheme may well be an effective inducement method compared to alternatives	The relative ability of the program to achieve this goal depends on the design of other, more general, mechanisms for stimulating R&D. If the design of these other mechanisms changes then this may alter the desirability of the program in this area.
Rent extraction	The Commission did not encounter this argument in its visits. There was some BIE evidence that MNEs met the costs of industry development out of global MNE overheads, and did not pass the costs onto Australian buyers.	No.
MNE buying practices	The Commission did not encounter any evidence suggesting this was a systematic problem.	Not a relevant benefit.
Information asymmetries	No partner indicated to the Commission that this was a problem	To the extent that it is relevant, this would only justify a short-lived program (see chapter 6)

Spillovers?

The BIE (1993a) and the IC (1995a) have cited significant spillovers from induced R&D in their assessments of the R&D tax concession (see chapter 9). However, the PfD/FTA program can stimulate R&D in a special class of firms — foreign owned MNEs — and the spillovers associated with their R&D may be different from those associated with indigenous companies (Bernstein 1989). The magnitude of spillovers will tend to be higher the greater:

- the extent of horizontal linkages between telecommunications equipment MNEs and other firms. There appear to be substantial linkages in the industry (chapter 2 and BIE 1995b) compared to other industries;
- the extent to which there are technological/informational linkages to upstream suppliers;
- the labour mobility between firms and between industries;
- the extent to which there is 'depth' in an industry — so that there is a large range of potential firms with the technological capability to learn from each other's innovations (BIE 1994a). For example, if a MNE undertook research into an area of technology where no Australian firm had any technological capability, the Australian firms' ability to absorb any gains through imitation, reverse engineering or by other means would be more limited;
- the extent to which the R&D is applied in products sold in the Australian market.

A recent study (Lattimore 1997) found some weak evidence of higher than average spillover rates from R&D for firms in the PfD program (which would include some telecommunications firms), in software and in the Photographic and Scientific Equipment industry. But there was no evidence of higher than average rates in the electrical appliances and equipment industry (which includes telecommunications equipment).

The Commission does not have the information needed to gauge the magnitude of spillovers generated by telecommunications equipment MNEs. But one way of appraising these benefits is to look more closely at how indigenous firms viewed the arrangements.

Local learning?

There are mixed views about the extent to which the PfD/FTA programs benefited local firms. Charles et al (1997) found that the PfD scheme is supported by some locally owned companies 'who see it as bringing benefits in terms of facilitating closer relationships with the MNCs both in the domestic and in global markets' (p. 57).

In the present inquiry, a number of local telecommunications equipment manufacturers saw benefits in the PfD/FTA programs. For instance, ERG argued that Australian companies cannot develop in the telecommunications area without such support, noting that its own commercial relationship with Nokia Telecommunications was formed because of the PfD program. Under this relationship, ERG makes base station transmission equipment for Nokia to supply to Optus as well as to export. This partnership was described by a

telecommunications carrier as an 'outstanding and unqualified success'. Technology was transferred from Nokia to ERG.

Evidence from BIE (1994a, p. 145) indicated that, overall, most local companies were largely unaffected by the program and much of the collaboration between partners and local companies would have occurred anyway. The BIE survey (see table J.6 in appendix J) also found that the estimated value of technology transfer in terms of average yearly increases in sales over 1990 to 1993 was only 2 per cent for local telecommunications equipment firms (only marketing technology was transferred) compared with about 9 per cent for IT firms (technology included product, marketing and quality).

The opinions of the local IT&T firms about the PfD/FTA programs are shown in table J.5 in appendix J and suggest that the PfD/FTA programs were valued less by indigenous telecommunications equipment firms than by IT firms.[11]

Administrative and transparency issues

Discretion and transparency

There is extensive administrative discretion in the PfD/FTA programs. For example, DIST is responsible for approving agreements and subsequent changes to those agreements based on broad guidelines. Furthermore, while agreements are independently audited, there is considerable discretion in determining whether penalties for non-compliance will be imposed and the level and nature of such penalties.

While the PfD/FTA programs had set targets for industry development in the early years, DIST has now moved away from quantitative targets, focusing instead more on the overall business strategy of firms.

This 'flexibility' can have costs and benefits. Less prescription by DIST may reduce the burden of the program on MNEs. For example, a particular firm may not be able to achieve the export commitment without large costs, because of domestic cost disadvantages in the technology concerned — but would be better placed to increase domestic R&D activity. On the other hand, the greater the degree of flexibility or discretion, the lower the transparency and accountability, and the greater the uncertainty for (prospective) partners about what exactly their obligations will be. The AIIA commented on this aspect of transparency of the PfD program:

[11] Though it should be noted that the BIE coverage of non-partner firms was relatively low.

> it is not always possible to compare deal with deal, they are essentially done in private. The kinds of arrangements are known in general terms, but there must always lurk in the back of the firm's mind that [a] competitor might have got a better deal ... (Transcript, p. 45)

According to DIST's guidelines (DIST 1997f, para. 2.2.1), PfD and FTA agreements are treated as commercial-in-confidence between the partner and DIST. Indeed, little information about the commitments of partners, or their achievements, is available publicly. This contrasts with the IDP arrangements (discussed in chapter 6) where a public version of each plan must be prepared and made available.

Auditing

The PfD/FTA partners are usually audited once every two years with the aim of validating their reported performances. Apart from normal administration costs, the Commonwealth also meets the auditing costs incurred by the program.

The BIE (1994a) saw a need to improve the audit arrangements of the program. For example, evidence from the program auditors suggested that, in many cases, they were unable to monitor the progress of each company because partners failed to provide sufficient information on the Australian value added components of exports. The BIE report concluded that:

> reviewing the minimum reporting requirements in this area would facilitate a more effective assessment of this aspect of the program's performance. (p. 155)

Some telecommunications firms in this inquiry have raised concerns about audit costs and procedures of the program. For instance, one partner company found the audit process (on one occasion) to be very costly and of little value either to it or the government. Similarly, others argued that auditing is not carried out in a proper way. Jtec considered that:

> there is no sanction for non-compliance ... [non-compliance] is aided and abetted by hopelessly optimistic accounting. (Transcript, p. 21)

Relationship to WTO Agreement on Government Procurement

The PfD/FTA programs are seen by some as contradicting the rules of the WTO Agreement on Government Procurement which Australia is yet to join (see chapter 8). IBM specifically raised concerns about this, recommending that the PfD/FTA and IDP arrangements be terminated, or phased out. It also recommended that the industry development requirement of the endorsed supplier program be removed.

Mortimer (1997, p. 165) concluded that the PfD program may need to be altered to suit the WTO Agreement on Government Procurement. The Australian

Information Industry Association (AIIA) put the view that phasing out the PfD/FTA programs 'would go some way towards resolving the issue of offensive offsets-type policies under the AGP' (AIIA 1997a). In the context of ESA, it said that:

> So far as the endorsed supplier arrangement is concerned, excising the offsets-type industry development requirements in section J of the Agreement would possibly relieve Australia of any potential breach of the AGP if we were to seek accession. (AIIA 1997a)

Further details about the WTO Agreement on Government Procurement and its implications are discussed in chapter 8.

Program's relationship to state/territory procurement

Some states and territories have their own programs of government procurement and ask suppliers to commit to industry development. States also offer incentives to attract investment to their jurisdictions. Such behaviour emanates in part from concern that most partners are located in NSW and Victoria, and other states and territories only attract a small share of investment through the PfD program.

However, some partners find that they have to undertake state/territory activities in order to compete for their IT&T contracts over and above what may be required under the PfD/FTA programs. This has the effect of putting a national approach at risk. The BIE (1994a) said that:

> Some view the programs [PfD/FTA] as essentially a Federal Government initiative rather than a joint Commonwealth/State and Territory program. The view is particularly apparent in those States and Territories with their own IT&T industry development initiatives. While endorsing the PfD and FTA programs, their primary concern appears to be the pursuit of State/Territory based strategies, which may conflict with the PfD and FTA programs ... Such a policy mix has the effect of creating confusion and frustration for some partner companies because of the competing objectives of different levels of government. (p. 209)

More details about state/territory procurement policies and their effect on the PfD/FTA programs can be found in BIE (1994a) and IC (1995b). An IC Report (1996c) also discusses the issues of overlap between levels of governments.

Relationship to other Commonwealth programs

As noted in the introduction, a variety of government purchasing policies and programs affect the telecommunications equipment industries, with a number of recent changes in the process of development and implementation (see box 7.4).

This multiplicity of government programs directed at achieving a number of objectives, including industry development, raise the possibility of inconsistencies and overlaps. In commenting of the Commission's Draft Report proposal for a review of the PfD program in 1999, the AIIA considered that:

> the major problem seems to be the relative inconsistencies ... between different ... purchasing leverage linked schemes. (Transcript, p. 48)

Further, the PfD program had been intended to replace the need for the government to require industry development commitments in particular contracts/tenders. However, according to the AIIA, the Commonwealth was requiring additional industry development commitments in IT outsourcing deals:

> it is clearly on the record that the IT outsourcing deals are seeking additionality ... It seems in breach of the Commonwealth's undertakings with the states and ... it is a very dangerous precedent from the viewpoint of the life of the partnership. (Transcript, p. 45)

It is also not clear, at this stage, how the new requirement for industry development requirements to be included in tender documents for major projects over $10 million will interact with the PfD program.

The ESA program

The impact of the ESA program on industry development is likely to be smaller in absolute terms than that of the PfD/FTA programs.

Apart from committing to quality, standards and service, endorsed suppliers are expected to demonstrate long-term commercially sound activities and a commitment to value adding in Australia.

As noted, the government's objective is to use its purchasing framework as an important element of industry development policy, while also ensuring value for money for the Australian taxpayer. However, requiring firms to commit to value adding activities as part of the ESA may conflict with the broader objective of obtaining value for money.

For example, ESAs go beyond prequalification for the purchasing needs of governments. There is a risk that the upfront costs imposed by the industry development requirement may deter some firms (particularly SMEs) from entering the market, although they may be quite capable of meeting the purchasing needs of the relevant procurement agencies.

The New Zealand Ministry of Commerce said that:

> the Australian procurement-linked industry development measures, exemplified by the Endorsed Supplier Arrangement (ESA) ... seem ... to entail added costs in the purchasing and supply process for buyers and suppliers. Comments from New

> Zealand business indicate that the extra 'red tape' involved is a deterrent to suppliers applying for ESA status ... (Sub. 3, p. 2)

The Information Industries Taskforce report (Goldsworthy 1997) indicated that a number of smaller companies raised concerns about the 'costs and risks' associated with gaining endorsement. To improve access for SMEs to the government market, it recommended that:

> There should be a graded process for prequalification with progressively more demanding requirements for larger companies wanting to be endorsed to carry out high value or complex projects. At the lowest level, even the smallest businesses could be eligible for endorsement through a simpler prequalification process which would qualify the company for more modestly sized contracts. (p. 26)

The industry development requirement of the ESA may also have implications for governments as buyers of IT&T products and services. For instance, such a requirement may prevent some prospective SMEs from participating in the competitive tendering process altogether, and therefore conflict with the Commonwealth Government's objective of 'open and effective competition' in purchasing arrangements. This may also reduce the range of products available to government buying agencies.

However, (the former) DAS (1996) said that DIST takes into consideration a company's size when assessing industry development activities. The assessment also recognises that some SME service providers perform intellectual activity rather than provide a product or perform a process and, therefore, it is not appropriate to require them to meet the third mandatory requirement — local sourcing. Overall, in the view of DAS, SMEs are not disadvantaged and such a perception stems from 'a lack of information being supplied regarding the requirements of the assessment criteria and in particular how these relate to SMEs' (p. 32).

Nevertheless, any decision to remove the industry develop requirement of the ESA should be considered in the context of other programs such as PfD/FTA. For instance, withdrawing such a requirement from the ESA only may result in some firms being forced into FTA agreements.

7.6 Summing up

The Commission has used the submissions and transcript, its visits to participants, and data gathered in past reviews to explore the effect of the Commonwealth Government's purchasing arrangements on the telecommunications equipment industries. By its very nature, the PfD/FTA programs are hard to assess, because:

- their impacts depend on the bargaining environment, the nature of which is difficult to surmise;
- information collected about the programs record the outcomes of the plans, rather than what is genuinely induced;
- the programs themselves are more flexible in real life, than they are on paper;
- participants in the programs can sometimes have incentives to provide strategic answers to questions about costs and benefits;
- even where they are not strategically motivated, participants' viewpoints can miss the system-wide implications of the programs; and
- any costs, other than minor administrative and compliance burdens, are hidden.

Despite these problems, some patterns emerge. There are potential rationales for the programs — based on technological spillovers and learning by Australian firms.

Our re-appraisal of the BIE (1994a) survey evidence for telecommunications equipment firms, taking into account information obtained during the course of this inquiry, suggests that the arrangements increase R&D and technology transfer — with potential for spillovers and beneficial learning.

The biggest potential strength of the programs is that they may be able to induce additional R&D, without the costs of substantial transfers for R&D that was going to occur anyway.

The biggest potential costs of the programs relate to local content activities— such as for exports where a local content requirement is 'suggested' — where there is not a strong rationale for intervention. Facilitation of local content — though now less explicit and prescriptive — appears to be the vestigial remnants of the old days of offsets and border protection. The Commission considers that the program should be oriented to activities, such as R&D or alliance formation, where spillovers are most likely.

Recommendation

The PfD/FTA programs should be reoriented towards activities such as R&D and alliance formation, where spillovers are most likely, and away from local content for its own sake.

The Commission also considers that the government should clarify the rationale for the programs. Their present objectives do not constitute an economic rationale. Having a clear and explicit rationale will help focus the programs, assist in the appropriate collection of data for ongoing monitoring of their performance, and aid their final evaluation.

The Mortimer report (1997, p. v) recommended that business programs be subject to full evaluation every five years. The government's recent industry policy announcement, *Investing for Growth*, also endorsed 'regular independent evaluations' (Howard 1997, p.82). Both the BIE (1994a) and the IC (1995d) recommended that another full evaluation of the programs should be undertaken soon. This inquiry has only been able to assess some of the issues relating to these programs, the coverage of which extends well beyond the industries under reference. The underlying benefits and costs of the whole programs (encompassing both telecommunications equipment *and* IT firms) merits a further evaluation.

Independent review and evaluation of the PfD and FTA programs would be facilitated if greater public details of partners' commitments and achievements were to be made available. One way of facilitating transparency would be to adopt similar arrangements to the IDPs — that is partners could be required to prepare and publish public versions of their agreements, and report publicly on their achievements from time to time.

Recommendation

Greater transparency of individual partner's commitments and achievements should be introduced into the PfD/FTA programs, by requiring partners to publish public versions of their agreements and reports of their achievements.

As noted above, the PfD program is being examined to ensure it is consistent with the initiatives announced in *Investing for Growth*. However, this examination cannot take the place of a full independent review of the PfD/FTA

programs. The Commission considers that there should be such an independent review during 2000. Nevertheless, the Commission recognises that an inherent problem of such schemes is that they are hard to evaluate. Box 7.8 outlines some guidelines for conducting the review.

Recommendation

There should be a full independent review of the PfD/FTA programs in the year 2000, taking account of the Commission's suggested guidelines for conducting such a review.

Box 7.8: What should a future review of PfD/FTA do?

Such a review should use a variety of methods to evaluate program-related benefits and costs — both by partners and governments. Any survey should be designed to minimise strategic responses, and where possible information should be corroborated. For example, do the views of the partners on technology transfers match those of the indigenous firms?

Apart from administration and compliance costs, the review should measure costs imposed on partners as a result of their industry development activities. Any price increases to users should be seen as costs to the Australian community and should form part of the assessment of total costs.

The review should measure the induced R&D, exports and employment (excluding activities which partners would have undertaken regardless of the programs). Increases in R&D and exports are not benefits by themselves. Benefits to Australia, for example, would require estimating spillovers from R&D and productivity improvements from the transfer of technology and skills from parent companies.

The programs' impact on indigenous companies should also be assessed in detail. This could include: contract R&D, export facilitation, development of innovative products and services, quality control techniques, access to global marketing networks and employment generation. The review should assess any mechanisms for spillovers. For example, how frequent and valuable are movements of staff from MNEs to indigenous firms? Have local firms learned from partners (eg copied administrative systems, management procedures or marketing approaches)? Other impacts, for example, could include spin-off activities by indigenous companies. In terms of strategic relationships, the review could ask:

- How many commercial relationships were induced by the programs? Would such relationships be different (eg duration, nature of the contract), or continued if the programs were to cease?
- Are price and quality of local manufacturers higher than from alternative sources such as overseas? where costs are higher, do they justify the proximity advantage of dealing with local companies?

Inconsistencies and overlaps with other Commonwealth, state and territory government procurement and industry development policies and programs should be considered in the review.

Changes to existing arrangements can have financial implications for partner and non-partner firms. The review should consider the likely effects of any possible changes, and whether any transitional measures are necessary.

8 INTERNATIONAL AGREEMENTS

8.1 Introduction

The Commission has been asked to assess the effect of existing and proposed international trade agreements on the industries under reference, both in Australia and internationally.

This chapter accordingly covers the most significant World Trade Organisation (WTO) Agreements and other international arrangements, including standards setting, of importance to Australia's telecommunications industries. Appendix K provides specific details of the content of these agreements.

International agreements can affect the industries under reference in a number of ways. For example, agreements such as the WTO Agreement on Basic Telecommunications have only an indirect effect — they liberalise the markets for communications carriers and service providers, not the telecommunications equipment industries. But carriers and service providers are significant purchasers of telecommunications equipment, so that any resultant changes in activity levels in the former flow through to the latter. Other agreements such as the WTO Information Technology Agreement relate directly to the telecommunications equipment industries under reference by, for example, reducing their tariff levels. International agreements and arrangements on standards can have both direct and indirect effects.

Trade liberalisation — involving the elimination of both tariff and non-tariff barriers — has contributed to rapid globalisation of world markets for telecommunications services and equipment. These trends are increasingly significant for the Australian telecommunications equipment and services sector. According to the OECD (1997), the sudden globalisation of telecommunications has forced a restructuring of the industry worldwide, including the closing of plants in many countries, and new investment opportunities in others, especially in Asia.

Although overseas barriers to Australia's exports of telecommunications equipment may take some time to phase down or be removed, industry players have expectations of improved access to growing markets, especially in the Asia-Pacific region, where massive infrastructure developments are underway. According to Vodafone:

> Telecommunications is one of the major growth industries in the Asia Pacific region and Australia stands on the threshold of significant trade and export opportunities. (Vodafone 1997b, p. 13)

By supporting commitments to freer trade in telecommunications services and equipment, Australian carriers and suppliers have an opportunity to make competitive gains overseas. But trade liberalisation is a two way street, in which enhanced overseas market opportunities for Australian firms are coinciding with greater competitive pressures domestically, as barriers to foreign firms in the Australian market decline.

8.2 The WTO and telecommunications

Following the conclusion of the Uruguay Round in April 1994, there is now a suite of agreements under the umbrella of the World Trade Organisation. They extend beyond the rules of the revised GATT (ie GATT 1994), which continue to focus on merchandise trade, to include agreements on services, investment and intellectual property. Like GATT 1994, these generally provide both a framework of agreed rules and the scope for further liberalisation through reciprocal negotiations among member countries.

The WTO Agreement on Trade In Services

The most significant agreement for the telecommunications sector is the General Agreement on Trade in Services (the GATS). The GATS establishes multilateral rules to liberalise services trade (enforceable through WTO dispute settlement procedures) but also has provisions to improve competition and regulation in domestic economies in order to remove impediments to trade and investment (see IC 1996b, p. 161).

The structure of the GATS comes in two parts:

- First, a framework agreement contains a set of general obligations, across the board, concerning measures affecting trade in services. These include most-favoured-nation (MFN) treatment, which requires that the rules of the GATS and commitments made under it must be applied to all members.
- Second, members make specific sectoral commitments covering 'market access' and 'national treatment' which are subject to qualifications or conditions.

In practice, many members did not schedule key service industries at all, or scheduled them subject to 'unbound commitments', meaning that members are

free to maintain existing restrictions and/or introduce new ones (IC 1996b, p. 160). The restricted nature of these commitments reduces the liberalising significance of the GATS at this stage.

Discussions under the auspices of the WTO and regional bodies are continuing on a broad agenda of trade related issues. These include the further development of an international investment regime and the mutual recognition of standards and conformance testing. These negotiations, if they result in new binding international agreements, will also affect global trade in telecommunications services and equipment.

Agreements of particular relevance to telecommunications

In addition to the suite of agreements negotiated at the conclusion of the Uruguay Round, two further agreements of particular relevance to the telecommunications sector have been finalised. These are the Agreement on Basic Telecommunications, which is incorporated in the GATS, and the Agreement on Information Technology (the ITA).

- Box 8.1 lists these and other agreements of relevance for the telecommunications sector, such as agreements in the area of intellectual property, the agreement on Trade Related Investment Measures (TRIMS), and the Agreement on Government Procurement (the AGP).

Product coverage under the ITA is very broad (see box 8.2), including computers, telecommunications equipment and software.

Discussions are proceeding within Australia on the desirability of acceding to the AGP, to which Australia is not a signatory. The chief objective of the AGP is to expand world trade in government procurement through the elimination of discrimination against and between foreign products, services and suppliers. However, members are permitted to negotiate reciprocally the extent of the AGP's coverage to certain agencies (such as defence agencies) in relation to contracts above certain thresholds. For instance, several AGP members have negotiated exemptions for programs to set aside a share of government procurement for SMEs (DFAT 1997a, p. 13).

Although a number of these agreements are recent, they are seen by some commentators as having:

> significant implications for the development of global markets, trade flows, technology transfer and capital investment ... forcing a global restructuring of telecommunications assets, as well as placing new demands on suppliers. (Telecommunications Policy 1997)

8.3 Asia Pacific Economic Cooperation (APEC)

The APEC forum is based on principles of 'open regionalism', and 'concerted unilateralism', which involves the reduction of barriers to trade on a non-discriminatory basis.

Box 8.1: Relevant international agreements

The WTO Agreement on Basic Telecommunications

The Agreement on Basic Telecommunications — which came into effect on 5 February 1998 — extends the disciplines of the GATS (including the core commitments, such as market access and national treatment) to basic telecommunications. The Agreement covers the provision of telecommunications services involving simple transmission such as voice, facsimile and data transmission (but not value added services) including supply of international and domestic services on a facilities basis and through resale. In addition, to ensure that market access is fair in practice, most countries agreed to a set of telecommunications specific regulatory principles called the 'Reference Paper' which is to be used as a guideline for future commitments.

The Reference Paper deals with competition safeguards, interconnection guarantees, licensing and the independence of regulators. It provides information on universal service rules to ensure that universal service obligations do not reduce competition; public availability of licensing criteria; and rules for the allocation and use of scarce resources such as limits on foreign equity participation in the radiofrequency spectrum.

The WTO Agreement on Information Technology (the ITA)

The key element of the ITA is the commitment by signatories to phase out all tariffs and other charges on information technology products and related products (see box 8.2), over the period from 1 July 1997 to 1 January 2000. This phase out is to be implemented on a most favoured nation basis (meaning that tariff reductions must apply equally to all WTO members). Australia is one of the original 28 countries which signed the Agreement. Most countries within our region have joined the ITA, including Japan, Singapore and Taiwan.

cont'd

Box 8.1: Relevant international agreements (cont'd)

The WTO Agreement on Trade Related Aspects of Intellectual Property Rights (the TRIPS Agreement)

The major international agreement on intellectual property, the TRIPS Agreement, was signed, along with the WTO Treaty, as part of the Final Act of the Uruguay Round of trade negotiations. The treaty aims to provide greater protection for the owners of intellectual property and indirectly assist states and multinational corporations wanting to invest in new technology. It sets uniform standards and enforcement procedures for all WTO members, and, in effect, globalises a set of intellectual property standards. The TRIPS Agreement protects the intellectual property rights of producers of innovative technologies and products in the telecommunications area.

A related development presently under negotiation is a five year Economic Cooperation Program in intellectual property rights, based on mutual interests between the European Union and ASEAN.

The WTO Agreement on Trade Related Investment Measures (the TRIMS Agreement)

The TRIMS Agreement recognises that certain investment measures restrict and distort trade. It provides that no contracting party shall apply any TRIM inconsistent with the Article 3 of the GATS 'national treatment' and Article 11 'prohibition of quantitative restrictions'. TRIMS may include measures which impose local content requirements, and 'trade-balancing requirements' (measures which restrict the volume or value of imports an enterprise can purchase or use to an amount related to the level of products it exports). They are often used to compel or induce MNEs to meet certain performance measures.

The WTO Agreement on Government Procurement (the AGP)

The AGP is a plurilateral agreement — members are permitted to negotiate reciprocally the extent of coverage. The object of the AGP is to subject government procurement to greater international competition by extending to it the obligations of national treatment and 'most favoured nation' treatment. Parties to the Agreement are required to provide legal mechanisms that allow private firms to take action against violations of the AGP rules and disciplines in domestic courts.

Source: IC 1996b, IC 1997b, DFAT 1997a.

The Osaka Action Agenda: Implementation of the Bogor Declaration was adopted by the APEC leaders in November 1994 (see APEC 1994). It outlines the general principles to be applied to APEC's liberalisation process, including the principles of 'comprehensiveness and non-discrimination'. In the Declaration, the leaders of the 18 Asia-Pacific nations made a commitment to

eliminate tariffs among the APEC economies over the next twenty five years and committed APEC members to the long-term goal of free and open trade and investment in the Asia Pacific by 2010 for developed nations and 2020 for developing nations, with an important exception that those nations that are not ready to participate may join at a later date. This goal was to be pursued by reducing barriers to trade and investment and by promoting the free flow of goods, services and capital amongst APEC economies (APEC Economic Leaders 1994).

Box 8.2: Main products covered by the ITA

Computers including complete computer systems and laptops as well as the components such as CPUs, keyboards, printers, display units (monitors), scanners, hard disk drives, power supplies.

Telecommunications equipment including telephone sets, cordless phones, video phones; cellular phones, pagers; telephone answering machines, facsimile machines, certain photocopiers, modems and parts thereof; radio broadcasting and television transmission and reception apparatus; optical fibre cable.

All **semiconductors,** including memory chips, microprocessors, ASICs, and semi-conductor equipment.

Software such as application-type software, multimedia software products, 'unrecorded' floppy disks and other software media.

Scientific instruments and other products including measuring and checking devices, chromatographs, spectrometers, optical radiation devices and passive and active components.

The Australian schedule to the Agreement includes 190 tariff lines, including telecommunications equipment, electronic components and office machines.

Source: Gibbons 1997.

APEC Ministers have stated more recently that progress should be made quickly on reducing impediments to trade in information technology and telecommunications, because of the benefits to the region that will flow from the development and liberalisation of the telecommunications and information infrastructure. Such benefits can include wider access to telecommunications services, expanded and fairer competition in the supply of telecommunications goods and services, price reductions and more rapid infrastructure development (APEC 1996).

To assist the liberalising process in these industries, APEC's Working Group on Telecommunications provides a continuing mechanism for the exchange of information, and for consultation on policy and regulatory developments.

Trans-Tasman trade

The New Zealand Government's submission to this inquiry discussed trade implications arising from the two key bilateral agreements between Australia and New Zealand, the Australia-New Zealand Closer Economic Relations Trade Agreement (CER) and the Australia New Zealand Government Procurement Agreement (ANZGPA) (see Sub. 3, p. 2).

Under these agreements, New Zealand suppliers are entitled to equality with Australian suppliers in competing for Commonwealth and state government contracts for goods and services. A recently agreed and revised ANZGPA clarifies the mutual commitment to avoid any form of discrimination, and to provide equal and transparent opportunity to compete for government contracts on the basis of value for money.

8.4 OECD Multilateral Agreement on Investment (MAI)

The government is holding discussions and consultations with relevant organisations on issues associated with Australia's proposed entry to the MAI. The objective of the MAI is to provide a comprehensive set of rules to increase certainty for foreign investment. Box 8.3 provides further details on the MAI.

Although the MAI will be based on equal legal treatment between foreign and domestic investors, nations are able to lodge 'exceptions' where they wish to impose more stringent requirements on foreign investment than on domestic investment. Thus Australia could lodge exceptions to ensure that current policy arrangements on foreign investment are not subsumed or overridden in particular areas, such as in telecommunications. For instance, an exception could be lodged to allow the government to continue foreign investment limitations on the ownership of Telstra Corporation.

Box 8.3: The scope of the MAI

Members of the OECD, including Australia, are currently negotiating an international treaty covering cross-border investments. The treaty, to be known as the MAI, provides for a broad multilateral framework for international investment. It will be based on three key principles of investment rule making: investment protection; investment liberalisation; and dispute settlement.

OECD members account for a high proportion of world investment flows. The MAI is designed to complement the work of other major international trade and finance bodies, including the WTO.

The MAI's key objective is to provide a 'level playing field' for international investors, with uniform rules on both market access and legal security. Its aim is to eliminate barriers and distortions to investment flows by adopting the principle of 'non-discrimination', in that Parties commit themselves to treatment of foreign investors and their investments no less favourably than they treat their own investors. They will also agree not to discriminate among the investors or investments of different MAI Parties. The MAI is intended to apply to a wide range of investments, including foreign direct investments, portfolio investments and rights under contract. The Agreement will apply MAI disciplines to all sectors and at all levels of government.

Source: http://www.oecd.org/daf/cmis/mai/negtext.htm.

8.5 National implications of some international agreements

The Agreement on Basic Telecommunications

As noted, this agreement can indirectly affect the telecommunications equipment industries by liberalising international trade in basic telecommunications services provided by carriers and service providers.

Domestic market

Domestically, the government has now largely deregulated the market for telecommunications carriers. As chapter 6 notes, there have already been several new carrier licences issued. The government has also partially sold Telstra, the former monopoly carrier.

Deregulation has led to increased competition, lower prices and increased demand for services. In turn, this has increased demand for telecommunications equipment. As well, the entry of the new carriers directly increases equipment demand as they need to install relevant facilities.

Export markets

The core trade liberalisation commitments contained under the GATS, including commitments to liberalise foreign direct investment, have the potential to ameliorate the existing barriers faced by domestic carriers wishing to trade and

invest overseas. Some commentators are positive about the prospects. For instance, the Goldsworthy report commented:

> there are substantial opportunities for growth and export for carriers and service providers from the opening up of telecommunications to competition around the world. (Goldsworthy report 1997, p. 52)

Growing overseas markets for communications services also increase the opportunities for telecommunications equipment suppliers. For Australian suppliers, the opportunities can arise indirectly in two ways:

- firstly, in response to increased demand from overseas carriers for original or upgraded equipment; and
- secondly, by 'piggy backing' on the overseas activities of local carriers, such as Telstra. Already, Telstra has significant overseas activity: for instance, it has built and managed networks in Vietnam, Cambodia, Laos and a number of other countries.

However, as the Commission has indicated elsewhere (IC 1997b, p. xi), non-tariff barriers to services trade, including to foreign direct investment, remain high, including in the communications sector.

Also, many of the schedules to the Agreement submitted by other countries contain few commitments to future action, and tend to bind existing discriminatory policies. The result is that many of Australia's fastest growing markets in the region will continue to restrict access to their telecommunications markets (Warren 1997, p. 1).

The Information Technology Agreement

The ITA was negotiated under the WTO framework and is primarily concerned with the elimination of tariffs on information technology products, directly affecting the telecommunications equipment industries in both their local and overseas markets.

Domestic market

Although Australia's tariffs on these products will be reduced to zero by 2000 at the latest, they are already low — averaging 2.7 per cent, with no applied tariff being greater than 5 per cent and almost half at zero (Gibbons 1997, p. 6).[1] This

[1] In *Investing for Growth*, the government announced that it would remove tariffs on inputs to the manufacture of information industries equipment to reduce input costs and avoid a situation of 'negative assistance'. This would follow a short consultation process with local component suppliers to assess the likely impact on them.

relatively open nature of the existing domestic telecommunications equipment market means that increased competitive pressure on Australia's telecommunications equipment industries arising from tariff reductions is not likely to be strong.

Export markets

Although Australia remains a net importer of both IT and telecommunications products, exports have grown significantly through most of the 1990s (see chapter 2). Australia stands to gain substantially from the ITA because participation in the Agreement by other countries should provide Australian industry with increased export opportunities. There could be opportunities in Asia, the EU, Canada and the United States, for instance. The Australian telecommunications industry has estimated that the ITA will add up to $400 million a year in new exports (Gibbons 1997, p. 6). Countries other than Australia will obviously also be competing for these opportunities.

The Goldsworthy report recognised the export and other opportunities for local industry arising from trade liberalisation, and recommended that Australia reaffirm support for the ITA:

> There is significant advantage to be gained from free trade in information and communication technology products and services for both users and suppliers. Most leading participants in world information and communication technology trade are participating in the ITA, although a number of developing countries have sought derogations for certain sensitive categories. (Goldsworthy report 1997, p. 51)

According to that report, Australia should actively seek the extension of the ITA to cover non-tariff barriers, and a broader coverage of countries and products. It also recommended action to address government procurement practices, different national standards, and regulatory and compliance arrangements, in order to provide an international environment more open to competition.

AEEMA has commented that it supports an examination of additional product coverage under the ITA, particularly in related technologies and input products as well as wider country coverage, and targeting of non-tariff barriers. AEEMA also considers that Australia should argue for the winding back of the derogations which a number of our trading partners have made for specific products in relation to the year 2000 deadline (AEEMA 1997).

Some work is proceeding on extending the ITA to new products, and non-tariff barriers. For instance, the WTO Secretariat is conducting a survey of international standards in common use in the industry. The Commission endorses moves towards extending the scope of the ITA.

Agreement on Government Procurement (AGP)

Benefits and costs

It is not obligatory for WTO members to join the AGP, and Australia is not a signatory. However, since 1994, the Department of Foreign Affairs and Trade (DFAT) in consultation with the former Department of Administrative Services and other Commonwealth agencies including the former BIE, have been consulting industry and other interested parties on the costs and benefits for Australia of joining the Agreement. A review of AGP membership implications was released by DFAT in early 1997 for public comment and as a basis for consultation with industry and state and territory governments (DFAT 1997a).

DFAT noted that whether or not Australia seeks accession to the AGP, the liberalisation of procurement regimes will be an ongoing issue in international trade:

> Australian procurement policies and practices at the federal and state/territory level are also likely to remain an issue in the bilateral trading relationship with some of our major trading partners, particularly the US, Japan and the EU. Australia needs to take a forward-looking strategic approach to the issue of trade-related government procurement in order to safeguard its commercial and economic interests. (DFAT 1997a, p. 6)

In a submission, IBM considered that the ability of Australian firms to access the European market could be reduced if Australia does not join the AGP:

> It is possible however, that the Europeans will grant full market access only if the regulatory regime in the exporting economy is as open as the regime in Europe. As in Australia, the government sector is a major buyer of IT&T products in Europe. It should therefore be anticipated that the EU may expect exporting countries to be members of the WTO Agreement on Government Procurement. (Sub. 2, p. 8)

In principle, accession by Australia to this agreement would open up procurements by overseas governments to competition from Australia's telecommunications equipment suppliers, and open up Australia's government procurement to overseas suppliers. A recent report by the BIE concluded that Australia's accession to the AGP is likely to provide Australian exporters with greater access to signatory countries' markets and, overall, the removal of discriminatory procurement policies is likely to provide a small but positive net impact on output, exports and consumption (BIE 1996b, p. 38). However, whatever the effect on Australia overall, the AGP would bring both benefits and costs to particular industries, such as the telecommunications equipment industries.

Industry development

An important issue for Australia in considering the implications of the AGP is the status of industry development arrangements such as the PfD/FTA and the telecommunications IDPs.[2]

Accession to the AGP would potentially affect purchasing-linked industry development programs because it prohibits 'offsets'— that is, measures to encourage local development, local content, licensing of technology, investments or countertrade requirements.

A number of studies have commented on this issue:

- In 1994, a study by International Trade Strategies Pty Ltd concluded that general industry programs providing subsidies and support for innovation and high technology processes are consistent with Australia's international obligations, as long as such subsidies are not paid according to export performance or according to the use of domestic products rather than imports. But if the operation of the PfD/FDA programs could be shown to result in domestic products being favoured over imports, they may be open to challenge under WTO rules (International Trade Strategies 1994, p. 10).
- A 1996 BIE report indicated that where local industry development programs are closely linked to the qualification and selection of suppliers, products or services for government procurement requirements, they are likely to be inconsistent with the rules of the AGP (see BIE 1996b, p. 38).
- The Mortimer Review made reference to such findings and concluded that the PfD may need to be altered to suit the obligations that could be imposed by a decision to enter the agreement (Mortimer 1997, p. 165).

As noted in chapter 7, IBM considered that the PfD/FTA and IDP arrangements should be terminated or phased out, and the ESAs modified, stating:

> Termination of these programs will facilitate Australia's accession to the WTO Agreement on Government Procurement. If Australia joins the Agreement, Australian exporters of IT will benefit from gaining best possible access to the important US and European government markets, and other markets where reciprocity is demanded. (Sub. 2, p. 14)

The AIIA supported signing the AGP even if there were implications for the ESA and PfD arrangements, as:

> the net benefit of access to other markets is at least likely to outweigh any net detriment to opening up the Australian government market. (Transcript, p. 56)

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[2] Concern about industry development arrangements has also been raised in relation to Australia's general obligations under the WTO, including the GATS and the WTO Agreement on Subsidies (see Oxley 1997).

However, it was concerned about the possibly 'bureaucratic and cumbersome' appeal procedure (Transcript, p. 56).

Another issue is whether state government purchasing arrangements would be consistent with the AGP. According to the BIE, state government procurement policies, to the extent that they discriminate against foreign suppliers or consider spin-off benefits to the local economy in the awarding of contracts, are likely to be in contravention of the AGP (BIE 1996b, p. 29).

8.6 International standards agreements

International organisations involved in standards setting

The major international bodies responsible for setting telecommunications standards are the International Standards Organisation (ISO), the International Telecommunications Union (ITU), and the Electrotechnical Commission (IEC).

These bodies facilitate meetings of technical committees which formulate specific standards. Telecommunications companies, research bodies and government agencies contribute appropriately qualified people to these committees. Higher level committees are responsible for progressing the more political processes involved in obtaining approval of the standards which have been recommended by the technical working groups.

Standards setting arrangements in Australia

Until recently, Australia was served by a single domestic telecommunications utility, Telstra (previously Telecom Australia), for the provision of telecommunications facilities relating to the development, establishment and maintenance of a telecommunications network, and the development of technical standards for the connection of customer premises equipment to the network.

According to the Australian Communications Authority (ACA), Telecom/Telstra actively participated in global standards setting activities for both customer equipment and network standards. It had also been involved in technical authorisation procedures using its own engineering and research facilities. Moreover, it had assumed the role of assessing equipment products by using its own testing facilities and, if compliant with requirements, allowing such items to be connected to the network with an authorisation mark affixed (ACA Sub. 1, p. 1.).

Legislation in 1989 created the Australian Telecommunications Authority (AUSTEL) which assumed responsibility for the development and maintenance of technical standards and the assessment of conformity of customer equipment and customer cabling against those standards. AUSTEL was able to determine a technical standard where it considered it to be necessary to protect the integrity of the network, to ensure interoperability, or to ensure compliance with necessary international standards concerned with interfacing with customer equipment or customer cabling.

AUSTEL also assumed, in January 1991, prime responsibility for managing Australia's input to the setting of international technical standards for telecommunications.

IBM considered that the AUSTEL regime, although a considerable improvement on past practice, was hampered in its adoption of international standards because it had competing policy objectives. According to IBM, AUSTEL could not write a standard about a network matter unless directed to do so by the Minister, a power that was used sparingly:

> Therefore the telecommunications equipment industry had to build products to interface with the carrier's networks, per se, and if those interfaces of the carriers were designed to comply with international standards, then, well and good, but it wasn't always the case. (Sub. D4, p.11)

The *Telecommunications Act 1997* continued a limited domestic standards regime for network integrity, interoperability and safety, but abolished the arrangements relating to international standards:

> The 1997 Act, with the aims and objectives of encouraging industry self-regulation, removed, among other things, the requirement for technical standards made under the previous Acts to comply with recognised international standards. This was done in the expectation that industry would, of its own accord, recognise and apply such standards in its work. Former standards requirements of the regulator were reduced to a minimal set of mandatory conditions which are covered in section 376 of the 1997 Act. (Sub. 1, p. 4)

The Australian Communications Industry Forum (ACIF), an industry funded body established in 1997, accepted the delegation from the government for the development and maintenance of technical standards. ACIF provides the coordination for industry to participate in telecommunications standards/code of conduct setting in domestic and international meetings. ACIF does not sponsor representation, but facilitates the provision of industry financial assistance for attendance at those meetings. In relation to international standardisation, ACIF will be developing a role in:

- providing the national secretariat;
- managing the activities of the National Study Groups;

- liaising with other international and national standards bodies; and
- providing the coordination and development of upstream and downstream standardisation activities.

Issues

As the ACA commented in its submission:

> The use of standards, both national and international, affects the economy of a nation by either facilitating or hindering trade transactions and service development. Standards provide for information relating to the product and its usage and allow for interoperability which is a paramount issue in telecommunications provision of connectivity. Standards also directly affect efficiency of production and economies of scale, together with access to international markets. (Sub. 1, p. 5)

The Commission considers that effective and efficient standards setting arrangements, with open standards and an absence of discrimination, can enhance the continuous development and efficiency of the telecommunications equipment industries worldwide.

But establishing, maintaining, and enforcing standards can be costly. There is also a danger that standards can be used to restrict competition, for example through proprietary standards or standards unique to a country. Discriminatory certification and testing requirements can also present serious obstacles to competition and trade.

Australia's move away from compulsory standards, towards self-regulation, appears sensible in industries such as the telecommunications equipment industries where technological change is so rapid and unpredictable (see chapter 3). Further, in telecommunications there are good reasons for Australia to comply with international standards as far as possible. For example, this can reduce compliance costs for Australian telecommunications carriers, service providers and equipment manufacturers (many of which are the Australian operations of MNEs), and open up export opportunities. Telstra has indicated that it is likely to rely more in future on off-the-shelf products meeting recognised international standards. The AIIA considered that 'Australia should be very wary of any departures from international standards' (Transcript, p. 63), and IBM commented that 'the ACIF, Standards Australia and industry generally remain committed to international standards' (Sub. D4, p. 11).

A particular issue raised by the ACA is the extent to which Australian firms should be active in international standards setting fora:

- It considered that the incorporation of intellectual property derived from local R&D into an international standard can provide the originator of the

R&D with a market lead of up to 2-3 years over other participants, or an opportunity to capitalise on the R&D through licensing arrangements.

- Even if the R&D does not eventuate in the international standard, participation in standards negotiations ensures access to information one or more years in advance of publication of the successful standard.

The ACA expressed concern that Australian firms, including Telstra, had reduced their participation in international working groups and fora as a result of the changed regulatory environment and stressed that:

> Participating in international standards making should be part of Australian industries' strategic marketing planning. It could be fostered and encouraged by considering standards participation as an integral component of any R&D towards product or service development, and eventual delivery to the global market of competitive Australian products which are in advance of other nation's equivalents. (Sub. 1, p. 6)

To encourage industry participation in standard setting, the ACA made a number of recommendations, summarised in box 8.4 below.

The AIIA considered that Australia should be wary of any departures from international standards. However, Telstra could no longer be expected to be Australia's representative in negotiations. Further, many MNEs have rationalised their involvement in standard setting worldwide, so the involvement of their Australian subsidiaries in representational efforts to international bodies has declined markedly (Transcript, pp. 63–4).

Box 8.4: The ACA's recommendations on standards

- The ACIF be encouraged to play a lead role, in educating and encouraging industry to participate in international standards setting activities at the earliest possible stage of their development.
- The ACIF also be encouraged, in close cooperation with Standards Australia, to develop further a working framework for industry participation and resource contribution.
- The carriers be encouraged to set an example by providing incentives and leading industry delegations to international standards development and discussion fora, and that this incentive might be treated as funds directed towards research and development activities under the Industry Development Plans of Carriers scheme administered by the Department of Industry, Science and Tourism.
- The industry could be provided with an incentive in the form of tax relief for investment made in attending and participating in international standards development and setting activities, as part of the R&D cycle of relevant activities.

Source: ACA submission.

In substantially supporting the thrust of the ACA's recommendations, including its call for the government to subsidise international standards activities, IBM considered that the benefits ultimately flowed to the Australian community:

> the development of ... standards and dissemination of the advance information about the standards directions are shared [within the industry and industry groups] ... the benefits ... [also] flow on to the Australian community by way of rapid access to advanced products. (Sub. D4, pp. 12–13)

The Commission's views on the ACA's recommendations

The Commission notes that the ACIF is developing a role in coordinating industry participation in international standards setting activities, including the facilitation of financial assistance for attendance at meetings. Thus, the ACA's recommendations relating to the ACIF are already in the process of being put into effect.

The other two ACA recommendations seek to treat expenditure incurred in participating in meetings on international standards setting activities as R&D expenditure for the purposes of the telecommunications IDPs and the business R&D tax concession. In considering them, a number of points need to be made:

- Obviously, much R&D work is undertaken in developing goods and services to which international standards apply. Such R&D would already be eligible for consideration under the IDPs and for the tax concession.
- The main issues in considering whether expenditure on activities such as attendance at international meetings should be treated similarly to R&D expenditure are:
  - the nature and extent of any spillovers associated with that expenditure; and
  - whether adopting the ACA's recommendations would induce additional participation.
- If an individual firm, for its own commercial reasons, participates in such activities, there are unlikely to be significant spillovers outside that firm. If a group of firms, an industry association or delegation participates, then, as IBM commented, the benefits of that are likely to be shared among the participants and indeed spread to the industry more generally. Although IBM suggested that the benefits ultimately flowed on to the Australian community through rapid access to advanced products, these benefits are not spillovers — the community pays for those benefits through the prices paid for the goods and services in question.

- Further, there is doubt about whether significant additional participation would be induced. A small subsidy might not induce much greater involvement from Telstra or the other carriers. The AIIA noted that the MNEs (which account for nearly 90 per cent of the employment in the Australian telecommunications equipment industries) have rationalised their participation in standards activities. And the smaller indigenous firms may have less to gain.

In conclusion, the Commission considers that there is little justification for treating expenditure incurred in participating in meetings on international standards setting activities as R&D expenditure.

This is not to say that better coordination of Australian participation in such meetings might not be beneficial. The Commission notes that the ACIF is currently developing a role in this regard. It also notes that bodies such as Standards Australia and the National Association of Testing Authorities (NATA) receive some government funding for industry participation in international standards work. There seems no in principle reason why the ACIF should not also receive some such funding.

8.7 Conclusions

The key international agreements on telecommunications were negotiated against a background of considerable change in the international trading environment, including the speed of innovation in the industry; the dramatic reduction in the costs of telecommunications and information technology; the convergence of computing, communications and broadcasting; and the effect of international and domestic developments in competition policy.

Overall, the Australian community benefits from international agreements which liberalise trade and enhance competition. But with respect to the telecommunications equipment industries, the combined effect of the three international agreements discussed above is somewhat uncertain, although probably beneficial:

- The Basic Telecommunications Agreement will encourage liberalisation of markets for communications services. In turn, demand for telecommunications equipment potentially will expand, bringing greater opportunities for telecommunications equipment firms in domestic and export markets.
- As Australia's tariffs on telecommunications equipment are already low, the Information Technology Agreement should bring little additional competition in the domestic market. However, overseas tariffs are higher,

and Australian firms could benefit significantly from enhanced export opportunities in some markets.

- Accession to the AGP could bring overall net benefits to Australia. However, the effects on the telecommunications equipment industries under reference are unclear. Accession should bring greater opportunity for Australian telecommunications equipment firms to compete overseas for government procurement. In one sense, domestic government procurement is already open to foreign firms — all the main telecommunications equipment multinationals operate in Australia now. However, to the extent that industry development policies such as the PfD/FTA programs, the IDPs, and state government purchasing policies have any protective effect and need modification to meet requirements of the AGP, accession could bring greater overseas competition to the Australian market for government procurement.

9 RESEARCH AND DEVELOPMENT POLICIES

Two major R&D programs are particularly relevant to the research-intensive telecommunications equipment industries: the 125 per cent R&D tax concession and the Cooperative Research Centres (CRCs) program.

The Mortimer (1997) and Goldsworthy (1997) reports recommended substantial changes to the tax concession to enhance its effectiveness. Telecommunications equipment firms visited by the Commission also expressed concern at the lower rate of assistance now available under the tax concession and its impact on their decisions to conduct R&D. In *Investing for Growth*, the government made no further changes to the tax concession, other than a review of the definition of eligible R&D, but announced a substantial increase in direct financial assistance for R&D through the Start program.

These issues clearly extend beyond the industries under reference and the Commission has already conducted a detailed review of R&D policy (IC 1995a). However, given continuing discussion about the nature and rate of assistance through the tax concession, the Commission has re-examined a number of possibilities for changing the design of the concession to improve its cost effectiveness and impact.

The Mortimer report also recommended a downgrading of the CRC program. Such a recommendation, if acted upon, may have substantial long-run impacts on the extent of collaborative R&D conducted in the telecommunications equipment industries — the two older telecommunications CRCs conducted about $24 million of R&D in 1995–96. Accordingly, while we could not undertake a formal evaluation, the Commission has examined some CRCs of particular relevance to the telecommunications equipment industries.

9.1 The R&D tax concession

Notwithstanding the substantial injection of funds into direct grant schemes like the R&D Start program, the 125 per cent R&D tax concession remains the most important across-the-board mechanism for stimulating business R&D in Australia.

While the IC (1995a) and BIE (1993a) considered that the concession was likely to be welfare enhancing, they (and other studies such as Lattimore 1997 and Mortimer 1997) have pinpointed a range of limitations in the program:

- *Low additionality or inducement.* The concession provides tax relief for all eligible R&D expenditure conducted by an innovative firm. But it has been estimated that around 90 per cent of the R&D conducted under the R&D tax concession would have gone ahead anyway (BIE 1993a, Lattimore 1997). This means that the program predominantly provides transfers to company shareholders. Such transfers are, in themselves, not economic costs. However, distortions arise when labour or capital income is taxed to finance these transfers — the so-called 'marginal excess burden' of taxation. It is estimated that for every dollar of government revenue used to finance the R&D tax concession, there is a cost equal to around 20 to 25 cents for labour income (Campbell and Bond 1997) and around 45 cents for capital income (Diewert and Lawrence 1997). Low inducement thus reduces the net benefit of the program because of these tax financing distortions.
- *Transfers to foreigners.* Most R&D in the telecommunications equipment industries is conducted by foreign MNEs (chapter 2). Some of this is ineligible for the concession. But subsidies to eligible R&D undertaken by foreign MNEs will generate transfers to foreigners, which are economic costs to Australia.[1] The implication of this is that any dollar of government revenue spent on R&D conducted by foreign MNEs has two cost elements: finance distortions *and* leakages of transfers. The result is that the concession almost certainly generates a net cost when it is applied to foreign MNEs. In the telecommunications equipment industries, the dominance by foreign MNEs means that net benefits from the use of the concession by indigenous firms would be outweighed by the net costs stemming from its use by foreign MNEs.
- *Discrimination against start-up high technology firms.* The attractiveness of the concession is lower for firms with tax losses (which have to defer the benefits of the concession) and those which issue at least partly unfranked dividends (because the dividend imputation system 'claws' back some of the concession). Firms with these characteristics tend to be the smaller high tech start-ups.
- *Uncapped government expenditure.* Unlike grant programs where a fixed budget limits government liabilities, the concession is an uncapped tax measure. This means that if demand for R&D rises suddenly in the economy, or a loophole is discovered which widens the scope for claims (as occurred in the case of core technology, feedstock and interest

[1] Some of these transfers are clawed back or may be appropriated by Australian workers. (See BIE 1993a, p. 237.)

deductions in the 1990s), then the government may face unexpectedly high claims on its budget.

- *Uncertainty over duration and subsidy rate.* The subsidy rate provided by the R&D tax concession has varied many times since its inception because of changes in the company tax rate, eligibility conditions and, most recently, the rate of concession. Firms also perceive it as vulnerable to abolition, despite its apparently 'permanent' status. This means that firms with longer planning horizons for their R&D will tend to discount the value of the subsidy — and inducement will be less[2].
- *Compliance costs.* BIE (1993a) found relatively high compliance costs for the then 150 per cent R&D tax concession of between 1.6 and 3 per cent of eligible R&D, based on a survey of registrants.[3] Price Waterhouse-Australian Industrial Research Group (1996) suggested an average increase in compliance costs of 114 per cent as the program graduated to its current form. Mortimer (1997) described current administrative arrangements as 'burdensome'. Compliance costs matter most when the inducement rate is low. For example if inducement is 10 per cent of R&D, and there are spillover benefits worth 50 cents in the dollar on this additional R&D, then the program generates gross benefits of 5 per cent of eligible R&D. But if compliance costs were as high as 3 per cent of eligible R&D, then the benefits have been cut by more than half, before taking account of other costs.

Existing schemes such as the R&D Start program may present partial solutions for some of the above problems. But they have other drawbacks that suggest that it would not be appropriate to divert resources from the tax concession (see IC 1995a), but to instead maintain a degree of diversity in arrangements. As noted by DIST (Sub. D9) 'there is a recognised need for a diversity of R&D policy instruments'.

In particular, the tax concession is unique in that it represents a general, non-selective, mechanism for stimulating R&D in thousands of firms (whereas, for example, the Start program provides large grants on a competitive basis to a relatively few firms). A non-selective approach is appropriate where

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[2] The evidence on planning horizons for telecommunications equipment firms suggests that this is not likely to be as large concern as in some other industries (such as pharmaceuticals and biotechnology). In industry visits telecommunications equipment firms emphasised the rapid rate of technological change, and the crucial importance of even six month technological leads. The Office of Technology Assessment (1995) in the US also characterises R&D in the communications industry as having short planning horizons.

[3] Though Lattimore (1997) considers these figures are biased upwards.

externalities from R&D are widely spread and relatively uniform among innovating enterprises. As well, companies using the tax concession ultimately decide which projects will go ahead, while in all other support mechanisms there is an additional layer of filtering by external agencies — with the administrative overheads and the dangers of discretion and subjectivity that this can entail. As we note in chapter 3, the pace of change in telecommunications equipment is particularly rapid — and complicates technological assessments by external agencies even further.

The question arises as to whether the R&D tax concession can be re-designed to overcome some or all of its shortcomings. A number of possible changes could be considered:

- a non-taxable grant instead of a tax concession;
- capping the tax concession budget; and
- a subsidy on incremental R&D.

Each possible change is considered separately, though one or more could be combined in any new arrangement.

A non-taxable grant

As noted in IC (1995a) the current tax concession provides lower rates of assistance to some firms — those in tax loss or who pay partly unfranked dividends. This is particularly problematic since small high technology start-ups are often in tax loss (because they make large upfront investments), and yet are the most responsive to any changes in cash at hand. Thus the current system penalises a group of responsive high technology companies — arguably a major source of new technologies and their associated spillovers. In view of this limitation, the IC (1995a) recommended a non-competitive[4] non-taxable grant for tax loss companies equivalent to the value of the tax concession for taxable companies. A similar recommendation was made by Mortimer (1997, p. 107).

There are a number of choices about where such non-competitive, non-taxable grants could be applied. They could apply:

- to just those companies which cannot effectively use the existing tax concession, so that they receive identical after-tax treatment as profitable firms using the tax concession. This would make rates of assistance for

[4] Such non-competitive non-taxable grants are different to grants made under competitive programs like the R&D Start program, since they are not provided after an assessment of merit, but are available to all firms which meet the eligibility criteria.

marginal investments in R&D equal across all firms, regardless of their franking accounts or tax loss position.

- to all companies, since a profitable entity should be indifferent to a non-taxable grant or a tax concession, so long as the underlying subsidy rates are equal. Such a change would permanently uncouple the subsidy rate of the R&D program from the corporate tax rate.
- to all R&D, if a 'levels' R&D scheme is retained; or
- to only incremental R&D, if an incremental scheme is introduced.

The full or partial adoption of a non-taxable grant overcomes the uneven accessibility of the existing R&D tax concession, but it would not help alleviate one of the limitations of the tax concession — low inducement. That could be addressed by an incremental scheme, as discussed below.

Capping

Uncapped tax or grant measures can have unpredictable revenue implications, which is problematic for government, and prompts business concerns about the vulnerability of the program to abolition. The government could elect to cap expenditures for each year over the standard budget cycle. This might increase business certainty about the program to a degree[5] — which in turn may increase firms' responsiveness to the incentive. Capping, however, could introduce a major problem — that of rationing demand. If the cap binds, then more firms will apply for the R&D grants than can get them.[6]

One of the attractive features of the tax concession is that bureaucrats and agents external to the firm do not shape firms' investment decisions. This suggests that rationing should not be by discretion of officials. One possible rationing device is to set the cap at a level which somewhat exceeds the likely demand by Australian-owned firms. The grants could then be allocated on a first-come first-served basis, with majority Australian-owned firms having precedence over foreign-owned firms. This would have the advantage of reducing the leakage of transfers to foreign firms, while still allowing them at least some access to the concession.

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5 Though of course, there may still be business concern that the cap might be changed because of budget exigencies.

6 An alternative possibility would be to provide the capped funds to all applying businesses. This would have the implication that the subsidy rate would vary depending on the demand. This eliminates rationing, but creates uncertainty about the rate of subsidy, which in turn, will presumably affect inducement.

Of the three possible amendments to the R&D tax concession, capping is perhaps the most problematic.

An incremental scheme

Australia is one of the few industrialised countries which has a tax concession that applies to the *level* of R&D expenditure, rather than being targeted at *incremental* or additional R&D. For example, the US, Canada, France, Japan, Sweden, and Taiwan all have incremental schemes (Hall 1995). Such schemes work by only allowing concessional tax treatment for R&D which is above some base level — usually expressed as the ratio of R&D to sales. Both the Commission (IC 1995a) and the BIE (1993a) considered that some form of incremental scheme would significantly enhance the cost effectiveness of the current R&D tax concession, but had concerns about possible implementation problems. The most important of these was the absence of a legal requirement for consolidated company accounting in Australia:

> ... the absence of a requirement for consolidated company accounting would make an incremental scheme vulnerable to abuse, because R&D could be channelled through special-purpose affiliated companies that had never been involved in R&D before. (IC 1995a, p. 654)

A mechanism for implementing an incremental scheme?

One possible way around this problem is to adopt an administrative solution to the risk of abuse, similar to that which has now been developed for the EMDG scheme (box 9.1). A non-subsidiary firm wishing to gain access to the tax concession would be obliged to confirm its non-subsidiary status via a legally binding statement. A parent company would indicate that it was claiming for all of its subsidiaries. This administrative device, with appropriate auditing, may be a reasonably low cost method for deterring abuse, without having to introduce sweeping legislative changes to company accounting arrangements in Australia.

DIST, in its response to the Draft Report, supported the idea of 'exploring options to the present flat-rate R&D tax concession', but also indicated that further analysis of the administrative solution to abuse would be needed prior to implementation:

> AusIndustry is aware of some concerns that incremental concessions may give rise to abuse and artificial structuring of company operations to maximise benefits. While the EMDG model appears simple and attractive, Austrade has clearly experienced problems in relation to the legal status of the declaration. Expert advice may need to be sought on the appropriateness of applying this model in the context of corporate taxation. (Sub. D9, p. 11)

DIST also noted that the administrative and compliance burdens of an incremental scheme would be higher:

> Incremental R&D incentives will have administrative demands over and above those of the present R&D tax concession, both for administrators and clients. (Sub. D9, p. 11)

This suggests careful design of the administrative aspects of any incremental program to lower such costs, as well as consultation with US authorities about the lessons learned in the application of their incremental tax credit.

Box 9.1: How the EMDG limits abuse

The EMDG scheme limits eligibility to certain sized firms. Policy makers faced the risk that some large companies might establish small 'ghost' companies through which export grants could be channelled. To preclude this, applicants for the EMDG scheme sign a form which, amongst other matters, includes a statement that they are not related to an entity with turnover above the allowed EMDG upper limit. In past variants of this arrangement, they signed a statutory declaration, but this was changed on legal advice to the present form which apparently has a legal standing above that of a statutory declaration. If they provide false information on the form, they are liable to prosecution (for example for fraud) and other legal proceedings.

Source: Advice from Austrade.

Defining the base for an incremental scheme?

The complex problems of defining the base for an incremental scheme still remain. There are many dimensions to determining the base:

- whether it is fixed or moving. A fixed base means that a particular year (or years) is defined as the base for calculating any increment. Of course, a moving base shifts over time;
- the 'window' length of any base. For example, the US uses a four year fixed window over which the average R&D to sales ratio is determined;[7]
- the particular measure of the R&D to sales ratio used (such as the average, median, maximum or minimum);

[7] A short window length, say one year, increases the probability that any individual firm will either have too low or too high a base. Averages or medians over longer window lengths — by reducing the variance of the R&D to sales ratio — decreases that probability.

- whether the experience of the individual firm is taken as the benchmark, or the aggregate experience of groups of firms. For example, some have advocated industry-wide R&D to sales ratios as the base; and
- whether the base is adjusted for any differences between firms (such as size, industry and age) or for events in the macroeconomy (for example, cyclical effects, interest rate changes, credit availability or other macroeconomic variables which may be correlated with the R&D to sales ratio).

Fortunately, it is not necessary to start from scratch when investigating which combination of the above factors is likely to be best. We can learn from other countries with incremental schemes, and particularly from the United States where evaluation and policy experimentation is well documented (OTA 1995, Hall 1995).

The US Research and Experimentation Tax Credit is calculated by taking eligible R&D expenditure that exceeds a particular base, multiplying it by a tax credit rate and deducting this from corporate tax obligations. Until 1989, a rolling three-year base was used, but this had the disadvantage that the more a firm spent in any given year, the less it could access the credit in future years.[8] It could also have encouraged some firms to deliberately increase the variability of their R&D expenditure (such as on–off R&D behaviour). In 1989 the US moved to a fixed base (initially calculated as the average R&D to sales ratio for any claimant firm from 1984 to 1988) with an exception for start-up firms.[9]

There can be tradeoffs between inducement and coverage of firms under these arrangements.[10] For example, if a base is set at the highest ratio of R&D to sales over the last ten years, then only firms which increase their R&D above that high base will be eligible for the concession. Many firms will be disqualified from applying for the concession, simply because their current ratio of R&D to

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8 According to the OTA (1995) which reviews arrangements in a host of countries, some other countries are still using rolling bases (a two year moving average) which will presumably be subject to the problems that afflicted the earlier US system. One other country uses the maximum R&D to sales ratio since 1986 — this will tend to increase inducement rates but also disqualifies many firms from using the credit, even if it might have had an impact.

9 The program allows a maximum base of 16 per cent, and imposes a start-up base of 3 per cent.

10 In some (probably extreme) cases, there may not even be a tradeoff. For example, suppose that the concession was only available for firms whose R&D to sales ratio exceeded 15 per cent. Further, assume that the firms for which this is true are in a particular sector where R&D to sales growth rates are *naturally* high and growing. In this case, we have excluded most firms in the economy, and are left with a sub-sample where inducement could be quite modest.

sales is below that maximum. In this case coverage is very low, the opportunities for stimulating R&D in most firms are lost — and the net economic benefits of the program may be more modest than less restrictive schemes.

The US experience suggests that a fixed three or four year base (for example the R&D to sales ratio applying from 1993 to 1997), with sporadic updating, would be a preferred route for Australia because it is easy to use, has good coverage of firms, and overcomes some of the peculiar incentives imposed by a rolling base. Inevitably, such an arrangement favours firms which would have substantially increased their R&D intensities anyway[11], and adversely affects those whose R&D intensities would have naturally declined with time. But the overwhelming majority of R&D is conducted by medium and large established firms, with relatively stable R&D to sales ratios. Such an incremental scheme would reduce the magnitude of transfers significantly, even if it did not entirely eliminate them.

Other implementation issues in relation to an incremental scheme

Subsidy rate on incremental R&D?

The existing tax concession implies a subsidy of roughly 9 cents in the dollar — calculated as 0.36 (the tax rate) times 0.25 (the concessional tax treatment of immediately expensable R&D).[12] With an estimated inducement rate of (at best) 10 per cent under the current arrangements, this implies that for every $100 of R&D undertaken, the government spends around $9, and $8 of this is dissipated as transfers for R&D that would have been done anyway.

For a given level of assistance to marginal R&D, an incremental scheme will cost much less revenue, and will generate much higher rates of social return from the program. This suggests that under such a scheme an increase in the subsidy rate from its present 9 per cent level could be considered — which should increase R&D investment above current levels at lower costs to revenue than under the present tax concession arrangements.

DIST (Sub. D9, p.12) indicated that it would be useful to model the ‘level of revenue neutral incentive’; that is, how much bigger could the subsidy to R&D be such that the same revenue would be spent as the existing scheme? The Commission has not undertaken detailed calculations of this issue. We note, however, that the OTA (1995 p. 54) suggests that if the US were to adopt a

[11] This is where the problem of transfers still occurs in an incremental scheme.

[12] Lattimore (1997) shows that the effective subsidy rate is somewhat higher than that because it also includes accelerated depreciation for some capital expenditure associated with R&D.

scheme something akin to Australia, the tax credit rate would have to be around 2 per cent to be revenue neutral, instead of the current 20 per cent tax credit rate. The indications are, therefore, that appreciable increases in the subsidy rate could be achieved in an incremental scheme without costing more in terms of tax revenue forgone. Further analysis of the impact of introducing an incremental scheme could be undertaken using simulation techniques. This could be done by obtaining representative sample data on R&D-to-sales ratios for individual firms over a reasonable time period (for example using data from the Business Longitudinal Survey — IC/DIST 1997), and computing the likely impacts on R&D spending and tax revenue.

How might the base be defined for start-up firms?

Clearly, start-up firms have no base year defined by their past experiences. The US tax credit scheme defines an R&D to sales ratio base of 3 per cent for start-up firms. An Australian incremental scheme could adopt a similar approach, although not necessarily the same reference number. It would probably be sensible to err on the low side, even though this would increase the costs associated with transfers. Such a strategy:

- would ensure wide coverage of start-ups, an important source of innovation;
- may help partly to ameliorate some of the liquidity constraints that new high technology firms face; and
- would largely obviate the problem of leakages abroad of transfers, since most start-ups are Australian owned.

The aggregate value of any transfers associated with start-ups is likely to be small.

To what extent do current programs 'contaminate' the base?

If Australia currently had no policies supporting R&D, then determination of a suitable base would be less complicated. However, the existing 125 per cent R&D tax concession and the previous 150 per cent R&D tax concession mean that some proportion of R&D conducted in the last few years (which would comprise the obvious base) was induced by these measures. If the effects of these programs are not accounted for, then the base will tend to be set too high. One possible adjustment would be to set the base at a level which deducts the estimated induced R&D — which over the period from 1993 to 1997 would be roughly 10 to 15 per cent.[13]

[13] If the base is sporadically updated, a similar adjustment would be required.

Summing up

The R&D tax concession is Australia's major incentive scheme for business R&D, with relevance to all innovating firms, not just those in the telecommunications equipment industries. Its objective is to induce additional R&D, which generates external benefits big enough to offset the costs of the program. The current design has a number of limitations — particularly a low inducement rate — that reduce the potential benefits of the program. It also penalises high technology start-ups which often have limited franking credits or tax losses.

The Commission has explored a number of modifications to the current scheme which mitigates these deficiencies. These modifications would increase the beneficial impact of the incentive in the telecommunications equipment industries, as well as in other industries.

In particular, the Commission considered the scope for an incremental scheme. Previously discounted as a viable option because of a lack of consolidated company accounting, a mechanism is suggested here for minimising potential abuse. An incremental scheme could be combined with the provision of the subsidy in a non-taxable form, at least for those firms in tax loss or with insufficient franking credits to make use of a tax concession.

The greater efficiency of such an incremental scheme could allow the rate of concession to be increased above the present 125 per cent level — providing an added incentive for R&D.

Recommendation

The Commonwealth Government should consider:

- the merits of replacing the existing general tax concession for business R&D with an incremental scheme;
- providing the incentive in a non-taxable form instead of a tax concession, at least for firms with tax losses or insufficient franking credits; and
- the scope in an incremental scheme to increase the rate of assistance to R&D.

9.2 Cooperative Research Centres

Background

There are a number of major Cooperative Research Centres (CRCs) active in technologies relevant to the telecommunications equipment industries (appendix L). Because these CRCs are an important part of government arrangements aimed at stimulating R&D investment in telecommunications, they warrant some scrutiny.

CRCs aim to bring large teams of researchers from different institutions to work jointly on R&D projects (box 9.2). The centres were intended to establish long-term programs of collaborative strategic research along with a series of shorter term, more applied research projects. CRCs were intended to develop generic technologies of benefit to a range of users rather than individual firms (see IC 1995a, pp. 833–836).

Reviews

The Commission's review of Australia's innovation system (IC 1995a) encompassed CRCs. Though emphasising that it was still too early in their life to conduct a proper evaluation, the Commission observed:

> The CRC program has a number of commendable features in terms of program design. Grants are awarded after a competitive selection process. Extensive monitoring and evaluation processes are in place ... There is a real prospect that continued funding for an existing CRC would be able to be contested by other applicants after seven years. (p. 850)

Box 9.2: The nature of CRCs

The original concept of CRCs sought to rectify a perceived gap in the institutional organisation of the natural sciences and engineering in Australia — the absence of large integrated research teams — and the adverse consequences this lack of 'critical mass' had for keeping up with international developments and skill formation. The centres were to link researchers and also to link them to the public and private sector users of their research.

The CRC grants totalled $132.6 million in 1995–96. This was 3.5 per cent of the Commonwealth Government's expenditure on major science and technology projects. In 1995 it was estimated that around $2.7 billion had been committed by various parties to the then 61 CRCs over their lifetimes (ie around $386 million per year). CRC grants provided 30 per cent of these contributions, other Commonwealth contributions were 5 per cent, universities 22 per cent, CSIRO 15 per cent, the states 11 per cent, industry 14 per cent, and other parties 3 per cent.

In all, government contributions amounted to 82 per cent of the support for the program. In addition, the Commonwealth provides support for the industry contribution through tax concessions and grants. There is some indication that industry's commitment to the program is growing (the target contributions for CRCs with industrial applications is 25 per cent).

Source: Australian Parliament 1996 and IC 1995a.

The Myers report (1995) provided a detailed evaluation of the CRC program and endorsed its continuation, arguing that it was a 'major valuable and complementary addition to the range of Australian science and technology funding'. However, the report is largely qualitative in nature, and does not address in any depth some of the key economic issues concerning CRCs (such as additionality or spillovers). This reflects the fact that at the time of the evaluation the oldest centres had only been operating for three years, which is too short a period of time to examine costs and benefits rigorously.[14]

In contrast, the more recent Mortimer report (1997) was highly critical of the CRC program, and recommended a substantial cut in its long-term funding:

> ... we consider that it [the CRC program] exhibits a number of flaws against our principles. The program funds institutions ... rather than research activities. This is

[14] Another review of CRCs — the Mercer review — examined commercialisation within CRCs and the prospects for greater self-funding. The review was completed in February 1998, but has not been publicly released.

> inconsistent with the Review's program design principles, in that funds should be directed at the activity rather than institutions or providers.
>
> It is also questionable whether there is a continuing market failure given that the same organisations participate in many of the CRCs ... Furthermore, the Review considers that in the majority of cases government funding under this program confers a private benefit to participants ... Where there is a clear private benefit being extracted from a CRC Program, government should cease funding the institutional collaborative arrangement ... The Review has concluded that a Commonwealth contribution towards funding of CRCs of $20 million per annum would be sufficient to cover ongoing 'public good' activities and allow for some new collaborative efforts. (pp. 126–7)

To some degree, the Mortimer Report's negative assessment is based on (questionable) a priori reasoning, rather than evidence:

- R&D rarely generates purely private or public benefits. To say that there is a clear private benefit earned by firms' participation in CRCs is not a sufficient basis for reducing the scope of the program. After all, the R&D tax concession was not subjected to the same criticism, yet it clearly also provides public support for what will be predominantly projects earning private returns. The key questions are: (a) whether the expected private benefits are big enough so that private agents have incentives to undertake the investments without government subsidies; and (b) if they are not big enough, are there spillovers or other benefits from the induced R&D which are worth the public subsidy? The Mortimer report makes no assessment of these issues.
- The distinction between supporting an institution and an activity can be blurred. The funds available for CRCs are not initially earmarked for any particular institutions, and indeed one of the strengths of the program is the strong contestability for funds on a seven year rolling basis.

There are, accordingly, divergent views about the net economic benefits of CRCs, which reflect partly the varying frameworks of the commentators. To appreciate better the impact of the CRC program, it is important to identify the key economic issues.

Chapters 4 and 5 outlined a range of criteria for assessing programs. These, together with analysis in the Commission's earlier report (1995a), suggest that the critical economic issues which need to be assessed are:

- what is the rationale for the program?
- to what extent do CRCs encourage collaborative R&D that would not otherwise have taken place?

- what are the public benefits of CRCs (such as spillovers, changes in the collaborative culture of universities, or the effective management of R&D)?
- is there a risk that CRCs will deliver excessive assistance to participating firms?
- to what extent do private firms extract benefits from the research without adequately paying for them?
- are there likely to be big problems of locking-in existing CRCs to the detriment of new CRCs?

The Commission was not in a position in this inquiry to undertake a detailed evaluation of the CRC program — or even of the telecommunications equipment-related CRCs. However, we can shed some light on these issues by looking at the experiences of the CRCs relevant to the industries under reference.

Telecommunications CRCs

There are a number of CRCs working on areas relevant to telecommunications equipment producers. Indeed, with the convergence of telecommunications and computing, all of the IT&T CRCs can be viewed as being relevant to telecommunications. Those directly involved in research into improved telecommunications equipment and technologies are:

- the CRC for Broadband Telecommunications and Networking (BTN-CRC);
- the Photonics CRC; and
- the new CRC for Satellite Systems (SS-CRC), which incorporates part of the Institute for Telecommunications Research (ITR).

In 1995–96 the funding for the telecommunications CRCs (BTN-CRC and Photonics CRC) was $23.3 million. This amounts to around 6 per cent of the total resources devoted to CRCs in 1995. The BTN-CRC received 14 per cent of its resources from industry in 1995–96, and the industry contribution for the Photonics CRC has been around 15 per cent (BTN-CRC 1996 and Photonics CRC 1996).

Linkages

One of the major goals of the program has been to encourage linkages between researchers in different institutions. The program appears to involve substantial

collaboration between public sector, university and industry researchers in the telecommunications equipment-related CRCs (table 9.1).

Table 9.1: CRC linkages with industry

Photonics CRC		*BTN-CRC*	*ITR*
Australian Photonics[a]	Utilux Australia	Magellan Corporation	Vodafone
Telstra	Rofin Australia	NEC Australia	Ericsson
TransGrid	Pirelli Cables	QPSX Communications	Inmarsat[b]
ABB	Communications Design & Management	Telstra Research Labs	NEC Australia
IBM	PowerData	British Technology Group	EF data
Tyree	Alcatel	British Telecom	JNS Electronics
Prospect Electricity	ABB Switchgear	ERG Telecommunications	PT-INTI
Amskan	AOFR	IBM France	Step Electronics
BHP	Netcomm	Atmosphere	Telstra Research Labs
Vision Systems	Pacific Broadband Networks	Spectrum	Hammersley Iron
Dallas Delta Corp	Pirelli Cables	Sprint Corporation	Standards Australia
3DIS	Virtual Photonics		MITEC
Emtech Safety	CEOS		
AVK Systems	Indx		

a Commercialisation company.

b International organisation.

Source Photonics CRC 1996, BTN-CRC 1996 and ITR 1996.

But the key question is whether such linkages are truly additional. The public sector partners collaborated in a number of ways with each other *prior* to the formation of these CRCs. On the other hand, the resources committed to such prior arrangements were much less. Moreover, the nature of the research conducted in CRCs is qualitatively different — including rapid development of real world applications, as well as basic research.

The involvement of industry in the telecommunications equipment collaborative arrangements appears to have been largely stimulated by the program. The Commonwealth CRC grants represent a substantial injection of funds into CRCs, which enabled projects to be at a scale which could attract industry partners. The Commission was told that commercially important projects

involved the commitment of more funds than many university research groups had access to. On the other hand, some of these links would have existed anyway. For example the ITR (part of which is to be incorporated into the SS-CRC) had been involved in work with industry even though it was not receiving a CRC grant.[15]

In visits to the CRCs, the Commission was told that the program also tilts the behaviour of academic researchers in ways that are likely to increase exploitation of fundamental research. For example:

- CRC grants allowed enough researchers to be assigned to projects to produce results at speeds consistent with commercial requirements:

  > The CRC money allows our researchers and students to work on substantial projects and to solve problems with real world applications (Dr Fynn, Deputy Director, BTN-CRC).

- The telecommunications CRCs also emphasised the importance of being able to produce commercial prototypes, which will involve additional expenses. This contrasts with the kind of research often done within universities, where a paper outlining a new approach may be presented without the backing of a physical demonstration of its effectiveness. These kinds of research outcomes may often be wasted because industry will not adopt them prior to prototype stage. Industry often has few means to judge the effectiveness of pre-prototype research ideas and may fear that there are further remaining insuperable technical problems. Even though the CRCs took projects to the prototype stage — to 'prove' concepts — this did not involve designing final production ready versions of their technology.
- By encouraging university researchers to seek commercial links, the grants also bring forward the commercial application of their basic research. They can be encouraged to concentrate on shorter term, more achievable, less esoteric research projects.
- Linking with industry also disciplines the centres' research efforts. Commercial partners insist on the achievement of milestones and quality targets as well as the achievement of market objectives.
- The program also encourages post-graduate training in an environment where industry is involved. The Photonics CRC and BTN-CRC have 99 postgraduate students. This allows graduates to gain experience in the kinds of skills many of them will need when entering the workforce, or to

[15] However, it still received assistance from government to undertake such cooperative activities.

create an awareness of commercial opportunities even if they elect to undertake research in public sector agencies.

- The telecommunications research bodies have also spun off a number of companies. For example, Photonics CRC has spun off Australian Photonics (its commercialisation company), CEOS, Indx and Virtual Photonics. BTN-CRC has spun off the company Atmosphere. Linkages with spinoff companies were seen as a way of ensuring that the technology developed in CRCs was commercialised. In some cases establishing these spinoffs required investment from the CRCs:

> At the establishment of the Australian Photonics CRC, Australia did not have a photonics industry. The mission of the CRC was to give birth to that industry. Initially, the CRC's industry participants generally had little expertise in photonics even though they were aware that it would impact on their companies' businesses. Because of this lack of expertise in photonics in the existing companies, the CRC adopted the strategy of forming companies and joint ventures to nucleate the industry. The technology manufactured by these start-up companies is being incorporated into systems and products manufactured, through appropriate licences and agreements, by the CRC's industry participants, thus greatly enhancing their commercial competitiveness. Australian Photonics Pty Ltd, the CRC's technology transfer company, assists in the establishment of, and holds equity in start-up companies to commercialise CRC innovation. (Sub. D5, p. 7)

Characteristics of the R&D performed by the telecommunications CRCs

The telecommunications centres have maintained strong core programs of strategic basic research.[16] This research requires highly skilled researchers, often working at the frontier of their fields:

- The BTN-CRC has achieved a number of new telecommunications techniques, standards, algorithms and network management techniques. The need for these has emerged in response to developments in higher

[16] Research can be divided into basic and applied, although there are often interactions between the two. Basic research is experimental and theoretical work undertaken primarily to acquire new knowledge without a specific application in view. It comes in two forms — pure basic and strategic basic. Pure basic research is research carried out without looking for long term benefits other than the advancement of knowledge. Strategic basic research is research undertaken without specific applications in mind — but which is undertaken in broad areas which are expected to provide useful discoveries. It provides the broad base of knowledge necessary for the solution of recognised practical problems. Applied research is original work undertaken in order to acquire new knowledge with a specific application in view (ABS 1994).

capacity telecommunications systems, developments in protocols and the emergence of new user demands.

- Photonics CRC undertakes research into photonic and electro-optical components, systems and fabrication techniques. This involves the development and use of theories in the physical and materials sciences.
- ITR is also involved in the development of new mobile telecommunications protocols and novel DSP compression and error correction algorithms, and in the design of efficient mobile network architectures.

The CRCs also work on a number of contract and collaborative applied R&D projects with private companies — with diffusion benefits for partners. These applied projects build upon the basic research undertaken at the centres. Many of these projects are dependent upon the knowledge and skills brought to them by centre researchers who have participated in the underlying basic research programs.

The centres also encourage diffusion by seeking industry involvement and venture capital, through commercialisation companies set up by the CRCs and through firms that market the outcomes of CRC research.

Are these CRCs likely to produce social returns?

The CRC program is intended to be more than an industry assistance program. One of its major goals is to increase the returns to the community produced by public sector research. The program aims to do this by encouraging better links between researchers and users. Encouraging such links is designed to improve the diffusion of public sector research, and to provide feedback to the public sector researchers from industry, which allow them to better target socially beneficial areas (for examples of returns from successful CRC projects, see boxes 9.3 and 9.4).

Judging whether a publicly supported R&D scheme like the CRC program produces net benefits for Australia requires an understanding of the benefits and costs of the program, and what would happen in the absence of the program. Benefits include direct benefits for the CRCs and indirect spillover returns. Costs include the costs of successful and unsuccessful projects as well as the costs associated with raising taxes. The CRCs' activities will also be of little use if they merely displace or duplicate other research efforts.

There are two kinds of social returns that are generated by the public sector research of the CRCs:

- The first are spillover and diffusion benefits. For example, the Commission was told that networking among researchers was an important mechanism for knowledge flows in the Photonics CRC. Industry partners were prepared to open their headquarters' research facilities to researchers from other parts of the CRC and this had provided important benefits.
- The second are direct returns to the CRCs themselves. The CRCs can profit from the performance of contract research or from taking equity in collaborative projects. One of the centres commented that it formed a joint venture with an overseas firm in order to receive a part of what were likely to be substantial returns.

Box 9.3 An example of returns to the BTN-CRC

The BTN-CRC has developed a microprocessor chip designed to implement efficient broadband access networks. The chip incorporates a number of innovative designs and telecommunications protocols which were developed at the centre. One innovative element was the inclusion of the centre's generic flow control protocol. This had been developed by researchers at the centre for a different project a number of years earlier.

There have been a number of outcomes of the project. One is the establishment of a company (Atmosphere) to commercialise the technology. The others include a Distributed Queued Dual Bus (DQDB) monitor being commercialised through Coda Systems. The project also produced results which assisted the development of a product by QPSX Communication. The project cost was $1.5 million over three years.

Atmosphere has been part-funded by a US venture capitalist, who provided $5.5 million for a 40 per cent share of the company. This values Atmosphere at $13.75 million — a substantial return on the $1.5 million investment. The value for Australia will be achieved through returns on equity, royalty payments and benefits for Australian telecommunications consumers. The latter will benefit if more efficient broadband telecommunications services are brought forward as a result of the CRC's work.

These results also have to be placed in the context of the CRC's total expenditures (which were $4.9 million in 1995–96) and the returns that the centre will earn on other successful projects.

Source: Commission visit to BTN-CRC and BTN-CRC 1996.

The value of spillover returns generated by the CRCs will be less if overseas researchers are undertaking similar projects, or if the centres' publicly funded research merely displaces private efforts. However there are reasons to believe that private firms would not usually undertake this kind of research and that the

centres undertake different activities and follow different approaches from those of other research groups around the world.

- The strategic basic research projects undertaken by the public partners are long-term activities which typically involve larger spillovers than short-term applied projects.
- Each of the centres has areas of specialisation and have been responsible for a number of 'world firsts'. These have resulted in the publication of scientific papers, patents and the commercialisation of innovative products.

Box 9.4 An example of returns to the Australian Photonics CRC

The CRC has launched two spin-off companies — Indx and Virtual Photonics. Indx manufactures and markets high performance gratings for a full-range of wavelength division multiplexed (WDM) applications primarily for the telecommunications market. These products have been recognised as being world class.

In order to establish Indx the CRC needed to invest around $800 000 in the firm. The CRC has gained on this investment, with the US company Uniphase Corporation moving to fully acquire Indx, which is now valued at around $10 million. Another source of returns for the CRC are the royalties it receives from Indx for the licences for its WDM technology. Of course the net gains to the CRC will depend upon the costs it incurred in developing the Wave Division Multiplexing (WDM) technology.

WDM equipment allows carriers to increase the capacity of their fibre networks without the need for laying expensive new cable. This should benefit Australian consumers of telecommunications products. However the CRC's research into WDM equipment would only be considered to have brought net benefits for consumers if: it brought forward the availability of WDM equipment; resulted in the availability of superior WDM equipment; or resulted in the availability of cheaper WDM equipment than would have been the case if the CRC had not been involved (and the WDM developments had been left to other researchers in the field).

Source: Sub. D5, and Photonics CRC 1996.

Potential problems

Risk of an excessive commercial focus?

How far should CRCs go down the road to commercialisation and delivery of outputs to industry? The danger of seeing CRCs as *purely* a device for delivering commercialisable technologies to industry — which appears to be the

assumption underlying the establishment of the Mercer review of CRCs — is that it undermines some of the other economic rationales for such institutions. In particular, the more commercial is the orientation of CRCs the greater are the private returns. The greater the private returns, the bigger are the incentives for business to conduct the research, without government assistance.

Moreover, if CRCs become vehicles for commercialising research for their industry partners, there is the possibility that rates of assistance to these private partners could be unduly high (a point we develop below). Finally, if the focus is on commercialisation, then this tends to intensify pressures for protection of intellectual property — and this, if taken too far, can weaken the spillovers which justify public funding.

High rates of assistance?

As noted by the IC (1995a), a private partner can obtain potentially high assistance from membership of a CRC. A private firm might obtain the 125 per cent R&D tax concession on its expenditure in a CRC. This means that for every $100 it puts in it obtains a $9 subsidy. But there can be more. On average, the Commonwealth government provides a grant of 30 per cent of the funds employed in a CRC, but it does not count as a participant in the CRC. Say that the private company's contribution represents 10 per cent of the total funds employed in the CRC — that means that the universities/CSIRO and other participants provide the remaining 60 per cent of funds. This implies that the private company may obtain access to one seventh of the funds put in by the Commonwealth (or an additional 1/7 x 300 = $43 for every $100 of private money). The private company receives effectively a $52 subsidy for every $100 of R&D conducted.[17]

The existence of such a premium rate of assistance to private R&D conducted in a CRC may not be inappropriate. Private firms are often concerned about collaborating because they can lose control of tacit intellectual property. A larger subsidy may be needed simply to attract their interest in such large-scale collaborative ventures. This implies that much of the collaborative R&D

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[17] This subsidy rate (s) does not vary with the private share of the total CRC's funding. To see why note that:

$$s = \frac{0.36 \times 0.25 \times r + \frac{r}{(u+r)} \times g}{r} = 0.36 \times 0.25 + \frac{g}{(u+r)}$$

where r is the dollars of R&D from the private participant, g is the dollars from the government and u is the dollars from other participants. But g/(u+r+g)=0.3 (ie a government share of 30 per cent) so that g/(u+r)=3/7. Therefore s = 0.36x0.25+3/7.

undertaken by private partners in such arrangements is not likely to have occurred in the absence of the CRC grants. Thus, even if the subsidy rate to private partners is higher than the tax concession, it is plausible that so too may be the amount of new R&D induced relative to revenue lost (the 'bang for a buck'). Moreover, the fact that such ventures involve so many interacting partners from different institutions (table 9.1), as well as many postgraduate students, suggests that knowledge spillovers may well be significantly higher than for R&D conducted within private firms. For example, in the BTN-CRC:

- 35 per cent of the active researchers are postgraduates, who will generally produce publicly available papers and theses. Where these are commercially sensitive, their public availability may be delayed by a few months;
- there are 17 participating institutions — with all their associated interactions;
- it noted that it had to give away some otherwise proprietary knowledge in order to obtain acceptance of standards. For example, it negotiated acceptance of the Generic Flow Control technology (which improves the functioning of ATM switches) as an ITU standard. The Generic Flow Control Protocol will now be incorporated into future ATM switches made by companies around the world.

A more substantial cause for concern can arise where the private company gains favourable license rights and/or tilts the CRC research to firm-specific technological problems. By doing this, a private partner may be able to co-opt benefits not only from the Commonwealth grant, but from university or other participants as well. In this case, the effective subsidy could exceed 100 per cent. In the telecommunications equipment-related CRCs, we obtained no evidence that the private partners have been able to secure such additional hidden subsidies.

Institutional 'lock-in'?

Many CRCs are now coming to the end of their seven year funding cycle. Is there a risk that the CRCs currently operating could successfully lobby to maintain their funding over more worthy new applicants? In a submission to the IC (1995a) inquiry, the CRC Committee said:

> It has been made clear to all CRCs that there can be no expectation of CRC program funding at the end of the agreed funding period ... All CRCs have therefore been urged to plan for the period when these funds are no longer available. (Sub. 240 to the IC's R&D Inquiry, IC 1995a pp. 19–20)

The Photonics CRC informed the Commission that the seven year funding itself is not even guaranteed, and that the annual review process is rigorous. It

indicated that of the 15 CRCs funded in 1991, only 10 have survived. While noting a need for longer term government support for CRCs (Sub. D5, p. 4), the Photonics CRC commented that CRCs are more responsive to market forces than major standing research institutes (Transcript, p. 29), represent 'probably an optimum way of accountability to government' (Transcript, p. 29), and 'must now be among the most reviewed operations in the country' (Sub. D5, p. 4). DIST (Sub. D9, p. 13) said:

> Each selection round allows existing CRCs to compete with new applications. These are assessed on merit of the application and not necessarily the performance of the Centre (in the case of the existing CRCs). In addition, to obtain new funding, existing CRCs must be able to demonstrate that they are undertaking a new research program.
>
> In refunding existing Centres in the last round (1996) the CRC Committee made it clear that these Centres would be expected to be in the main self sufficient at the end of their extended term and in most cases, these Centres were offered significantly ramped-down funding in their final years.

These features of the management of the program limits the likelihood that existing incumbents have privileged access to continued funding after seven years has elapsed.

Implications

The Commission has not undertaken a full evaluation of the telecommunications equipment CRCs. However, we looked at how the centres were functioning, and found that they shared some desirable design features with the program as a whole. Features such as longer term collaborative frontier research, strong networks and a substantial postgraduate training component, increase the likelihood of spillovers arising from their activities. And the initial contestability of funds and the regular review process are disciplines on their performance.

10 OTHER INVESTMENT ISSUES

10.1 Introduction

The global pattern of investment in the telecommunications equipment industries is marked by two special qualities:

- Large globally mobile MNEs play a critical role in production and research and development. We have already examined how leverage programs such as the IDPs and the PfD program aim to influence the behaviour of those MNEs already resident in Australia (chapters 6 and 7). But we have so far not examined policies aiming to attract such MNEs to Australia in the first place.
- The pace of technological change and growth is very rapid (chapter 3), which has special significance for start-up high technology firms. Such start-up firms are often an important source of innovation in new technology industries, and can grow very rapidly if the economic environment is conducive.

In this chapter we examine incentives-based investment attraction regimes such as those recommended by the Goldsworthy (1997) and Mortimer (1997) reports, as well as the government's initiatives in its recent policy statement *Investing for Growth.*

We also examine briefly issues related to the availability of venture capital. Particular aspects include the adequacy of available venture capital, possible effects of tax arrangements, and venture capital fund management expertise.

10.2 Investment attraction

The debate

The question of attracting greater investment into the telecommunications equipment industries in Australia was often raised in the Commission's informal discussions with firms. Some supported government action to encourage investment, but some smaller indigenous firms expressed concern that such measures could favour overseas multinationals at their expense. Jtec, however, considered that Australia needed to attract investment because of spillover benefits to other industries, even though 'there's pain associated with it for indigenous companies' (Transcript, p. 10).

The issue has such prominence because a number of recent reports (MTIA/EIU 1997, Goldsworthy 1997 and Mortimer 1997) have endorsed vigorous incentives-based investment attraction programs to encourage multinationals to invest in Australia:

> To be a winner, Australia must attract more regionally or globally scaled investments in the information industries. The future requires information industries investments in the billions of dollars, one or two orders of magnitude greater than those seen to date ... Australia must compete proactively to attract global investment ... we must offer competitive incentives ... This will require an investment pool of several hundred million dollars. (Goldsworthy report 1997, pp. 29–31)

> The Review believes Government can play a more pragmatic role in encouraging domestic and foreign investment. Creating a more attractive investment environment through macroeconomic and microeconomic reform is the most important step. But more is required. Australia needs to stimulate domestic investment in new industries and improve its armoury to match the investment attractiveness of other countries. The Review therefore proposes a radical new investment incentives package ... [to] be funded with an allocation of $1 billion over five years. (Mortimer report, 1997, p. 83)

Such an investment attraction program is also seen by some as a long run *substitute* for the PfD/FTA arrangements (examined in chapter 7). For instance, the Goldsworthy report (1997) proposed that:

> With the successful introduction of an incentives-based investment attraction regime dependence on leverage-based, purchasing-linked industry measures [such as the PfD, the FTA and the IDPs] will cease. (pp. 33–4)

However, there are substantial differences between leverage programs like the PfD program and investment attraction programs. In particular, the leverage programs are much less oriented towards local content requirements, deal mainly with a group of MNE affiliates already resident in Australia, appear to involve relatively moderate costs, and are unlikely to involve costly transfers to foreign shareholders.

This is not to say that there are no arguments for investment attraction, but as noted in the Commission's 1996–97 Annual Report (IC 1997e) 'the issues are complex'.

Misconceptions

At the firm level, investment incentives appear to work well. A large new MNE will employ people, may well generate significant exports and pay tax into the Treasury's coffers. But, as reviewed in chapter 5 (see also IC 1997e and Oxley 1997), the more populist arguments advanced for large scale incentives-based

investment attraction fail to take an economy wide perspective, or suffer from other flaws. Where the MNEs receiving an incentive would have come anyway, there is 'all pain, no gain' from the use of the incentive. And even where an investment incentive is successful in attracting genuinely new foreign investment, this ignores the system-wide characteristics of the economy.

Economies have strong interrelationships among industries and often resource constraints too, which may offset the benefits from such new investment. For example:

- many of the apparently new jobs created — being relatively highly skilled — may simply shift Australians from one job to another, rather than out of unemployment;
- the highly visible tax revenue gain from the new investment (from the profits and the wages of workers) may be offset by unobserved tax revenue losses on workers displaced from other industries, or investment which is crowded out. As well, foreign MNEs have avenues for tax avoidance which are generally unavailable to Australian firms — such as transfer pricing and 'thin' capitalisation (BIE 1996c, pp. 88–89). For these reasons the Goldsworthy report's intuitively appealing statement that 'a tax holiday for an investment that would not otherwise have gone ahead is not tax revenue forgone' is simply incorrect.

The BIE (1996c, pp. 80–85) in its evaluation of the Investment Promotion and Facilitation Program, examined simulation results from a number of models of the Australian economy. These suggested that at the economy-wide level, investment attraction is unlikely to be a panacea for unemployment, to have large impacts on trade flows, or to garner much more tax revenue — although it may have some small impacts on all of these.

Advocates for such special incentives have also tended to exaggerate the possible consequences of inaction. For example, the Goldsworthy Report (1997) says that:

> a hands off attitude to industry policy that does not recognise the incentives being offered by other nations to attract these industries ... will truly consign us to the second eleven. (p. VI)

Simple back-of-the-envelope calculations (box 10.1) suggest that if Australia were to commit to big spending investment incentives, then the national benefits would have to be very large before any national gain could be realised.

Box 10.1: Can foreign investment incentives make a big difference?

Consider a $1 billion incentive package to attract foreign investment over 5 years — which is the largest amount that has been suggested for any incentive program in Australia. Say that it takes the form of direct assistance as suggested by the Mortimer Report (1997). The biggest initial cost of such finance is simply a transfer of $1 billion of Australian income to foreign shareholders. As well, Australia has to finance this transfer. If it is raised by labour taxes then it generates distortions costing around $200 to $250 million (because of the marginal excess burden of taxation — see chapter 9). It could also distort local production efficiencies if it shifts resources from other higher value uses — but we will ignore that for the moment. To be worthwhile, the investment has to yield at least $1.2 billion in benefits.

The benefits could include some gains from technological and knowledge spillovers. If an investment project uses some otherwise unemployed resources, then there could also be additional benefits from reducing the unemployment rate and some tax revenue.

How much benefit is obtained depends on the extent to which genuinely new foreign investment is stimulated. Say that overall the billion dollar incentive is used to finance $20 billion of foreign investment, of which $4 billion is genuinely new foreign investment (a *very* large bang for the buck), and that there are (large) spillover and other benefits to Australians of 40 cents for every a dollar of such investment. In this case the net gain is $400 million ($1.6 billion minus $1.2 billion) over 5 years, $80 million a year or about $4 for every Australian.

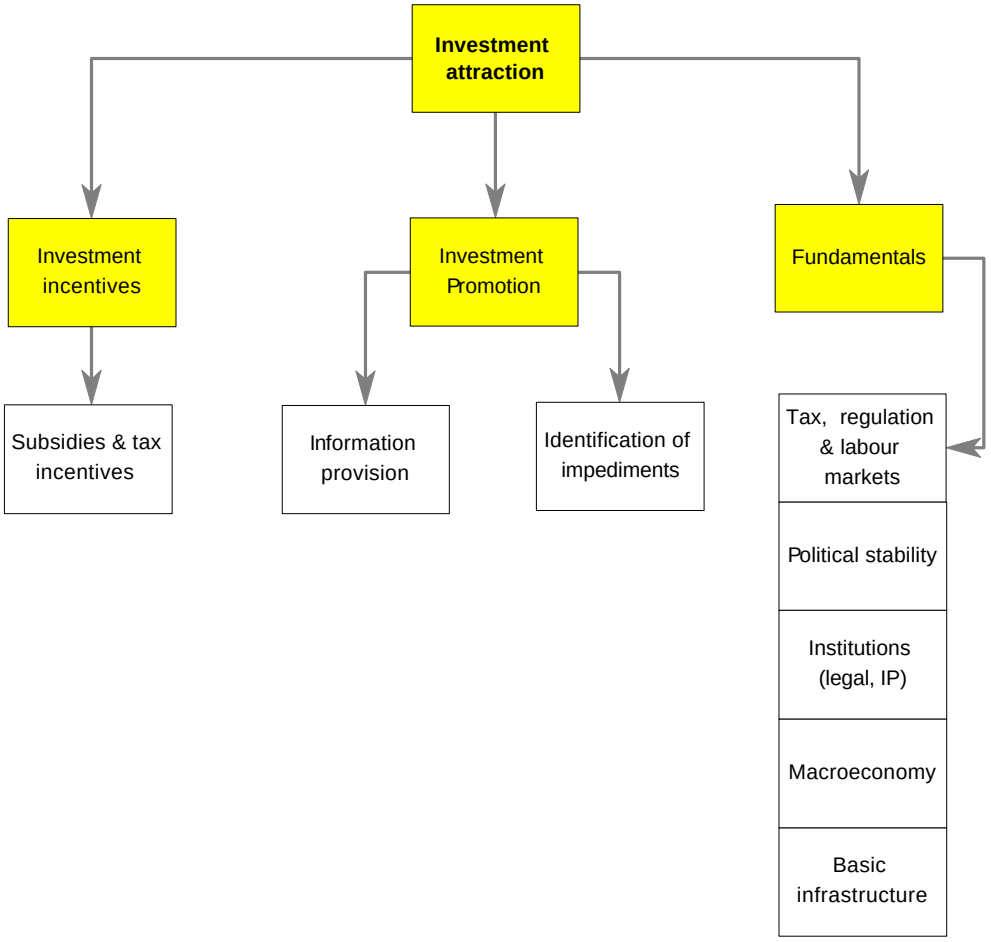
The real issues

Investment attraction can be achieved using three broad measures (figure 10.1). One broad mechanism is to improve the 'fundamentals' — through better tax, legal and educational and other systems in the economy. Such a strategy has several advantages over alternatives. Such changes are beneficial in their own right, even if no foreign investment is attracted. Moreover, as studies such as Preston (1994) and BIE (1996c) reveal, fundamental factors such as skilled labour, well developed local infrastructure, and an efficient public sector are important determinants of the locational choices of foreign MNEs.

A second broad mechanism is investment promotion — which is largely aimed at increasing awareness of foreign MNEs about the nature of the Australian market. BIE research (1996c) suggested that foreign investment has been inhibited by negative and inaccurate perceptions about Australia as a good site for investment. This, with the 'public good' aspects of general promotional

activities, suggests a possible role for government as an investment promoter. For example, it may be important for government to inform foreign would-be investors about improvements in Australia's fundamentals. The BIE evaluation was largely positive about the promotional aspects of the Investment Promotion and Facilitation Program. On the other hand, other studies (for example, Head et al 1994) found that some aspects of investment promotion, such as US investment promotion offices in Japan, were ineffective.

Figure 10.1: Mechanisms for investment attraction



The third leg in the tripod of possible measures — and the most unstable — is an incentives-based investment attraction strategy. By incentives we mean *selective* measures which involve rewarding companies for investing here using measures, such as tax holidays, exemptions, and pecuniary or non-pecuniary subsidies, which are not offered to all companies.

It is important to distinguish between such incentives, and other possible actions of governments (such as providing information through investment promotion or improving fundamentals such as the tax or IR system) which can produce an incentive effect. The former work in a discriminatory way; the latter are available to all firms — foreign and domestic, new and established. In the rest of this chapter we refer to incentives in the former sense only, while not denying the potentially large benefits that can emerge from the latter.

Figure 10.2 outlines some of the key questions that have to be asked when assessing such incentives-based mechanisms.

Inducement

As indicated in the previous section, an investment attraction strategy must induce genuinely new investment for there to be even the potential for a net benefit. That raises the question of the responsiveness of foreign investment to government incentives. Some reports (MTIA/EIU 1997, pp. 78–81) have asserted that investment attraction measures have been effective in countries such as Ireland, Singapore, and Malaysia. EIU Australia (1996) cites survey results of foreign investor perceptions, which suggest that 70 per cent of investors believe that lack of investment incentives make investment in Australia difficult or impossible.

These results are not in line with the bulk of the literature. Most empirical evidence emphasises factors other than financial incentives as the major determinants of the locational choices of firms (UNCTAD 1996, BIE 1993b, 1995a, 1996c and IC 1996a, 1996c). Market factors, such as the size and growth rates of the market appear to matter most. This does not mean that investment incentives (or tax rates) do not have *some* bearing on investment location, but rather that their role is dependent on the nature of the competing locations. A country with a major problem in any fundamental part of its market will have to pay a large incentive to attract foreign MNEs.

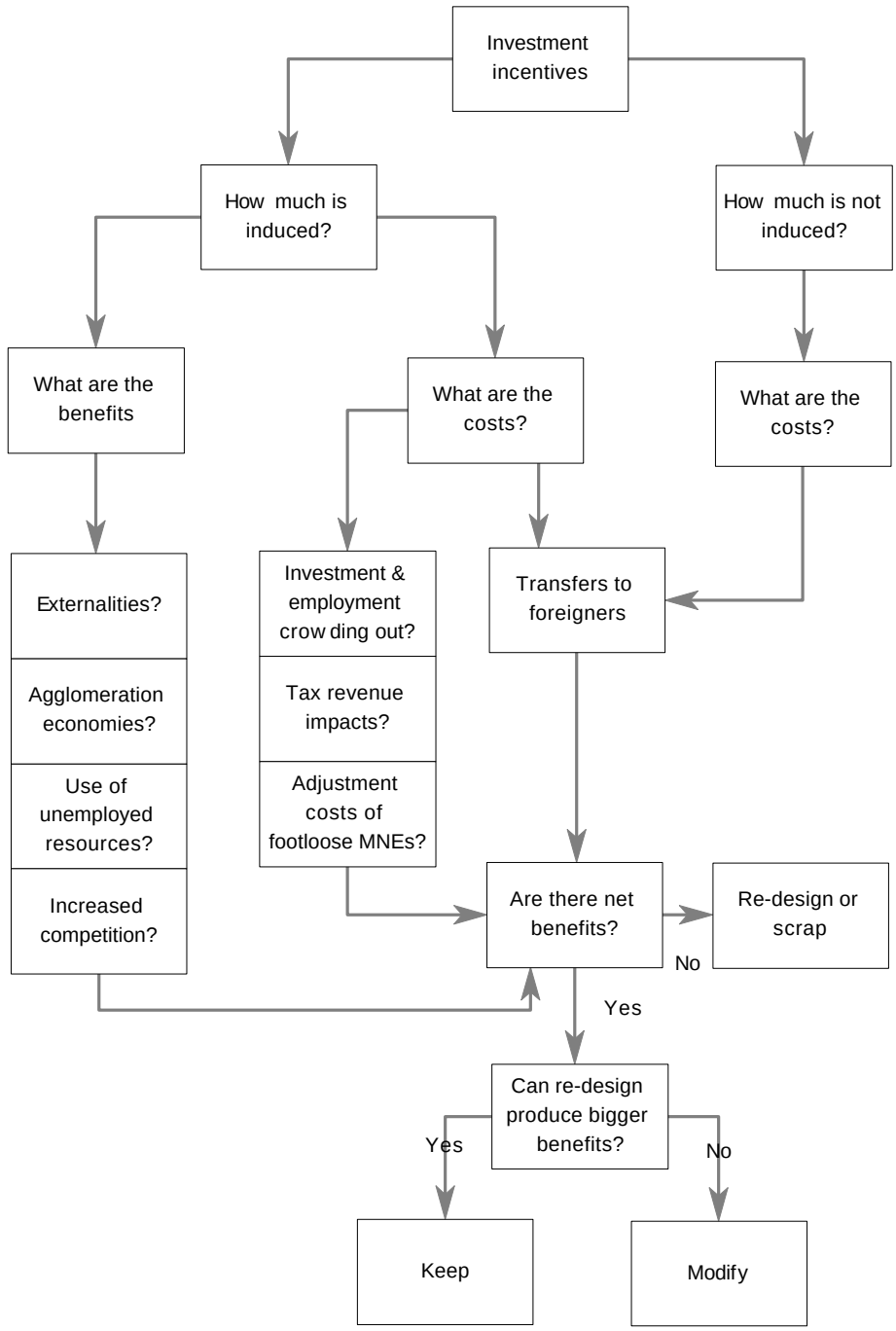
The overall implications of this complex literature is that tax and other incentives can matter at the margin, but that they risk substantial transfers of income to foreign shareholders.

Benefits

Investment by foreign MNEs can produce benefits. As the IC (1997e) notes:

> The more substantive economic case offered for subsidising certain projects is that, in principle, foreign investment may bring with it externalities for local industry — such as new technology and skills transfer. (p. 28)

Figure 10.2: Broad criteria for judging investment incentives



But such benefits, of course, do not merely equate with the magnitude of investment apparently induced — they are likely to be much less. For example, suppose an incentive of $250 million can attract additional investment in a chip plant of $2.5 billion. Much of that investment would take the form of

acquisition of land, construction of buildings and other infrastructure, and purchase of imported capital equipment. Although there may be some spillover benefits through employment in the construction activity, it is unlikely that spillovers will accrue from the land or capital components. Any spillovers are likely to be associated with the operation of the chip plant, rather than with its establishment.

Further, suppose another $250 million induces the establishment of a second $2.5 billion chip plant in Australia. Because of their nature (see below) any spillovers associated with the second plant are likely to be much less than with the first.

The theoretical mechanisms for such spillovers have been discussed in chapters 5 and 6 — and there is some international evidence suggesting that they can be important. For example, Mansfield and Romeo (1980) estimated that investment abroad by US firms increased the pace at which technologies leaked abroad to competitors.

It seems likely that the spillovers will vary by the technological intensity of the firm attracted, its relations with indigenous firms and the degree of labour turnover. They are probably greatest where the MNE sets up a design or R&D centre. However, effective tax rates appear to affect the location abroad of such design centres less than for production plants (Ruding Committee 1992). Thus spillovers may be greatest where investment incentives have the least bite.

Some spillovers from foreign investment may take the form of ‘agglomeration’ economies. These arise when the additional investment reduces the costs of ‘doing business’ for other firms in a particular, regional, location (Krugman 1991, Head et al 1994). For example, the additional infrastructure — such as R&D centres, new manufacturing capabilities in suppliers, training institutions and courses — required to support the new investment can also benefit related firms.

Investment by MNEs can also increase competition in local markets and stimulate better performance (and emulation of strategies) by indigenous firms (Graham and Krugman 1993).

Finally, as noted, the probability of net benefits from any induced foreign investment is greater if the firms use unemployed labour. But foreign firms which are intensive employers of the (typically unskilled) unemployed, are less likely to generate technological spillovers. This is because one major mechanism for the transfer of spillovers are movements of highly skilled labour. Moreover, the probability of gains from using unemployed resources is greatest in depressed regions, but agglomeration economies are likely to be weakest in these areas, because they lack other infrastructure.

Costs

The biggest risk from any large scale investment incentive strategy is that Australians will end up transferring substantial income to foreign shareholders for investment decisions they were going to make anyway. These transfers, in turn, have to be financed by either tax increases or by cutting government expenditure (longer hospital waiting lists, worse roads, poorer schools). Indeed, one of the potentially perverse impacts of incentives-based investment attraction strategies is that by diverting resources, they can weaken the fundamentals of an economy (like public infrastructure) — and discourage other foreign investors from coming.

And there can be large costs from apparently 'successful' investment attraction too:

- They can disadvantage (often smaller) indigenous firms which cannot access the incentives, and can draw skilled workers (and with them local technological expertise) to foreign owned firms. In principle, such measures could also create incentives for Australian companies to engage in strategic games, such as threatening to go offshore in order to get incentives to stay here. Opaque arrangements, backed by the discretion of administrators, inevitably incite lobbying for 'me too' treatment.
- They contribute to 'bidding contests' between countries, in which governments attempt to out do each other to attract big ticket, 'high profile' investments, such as microchip plants. The government's recent industry policy statement, *Investing For Growth* (Howard 1997) identified the strategic response of MNEs:

  > Competition for investment is strong and it is common for large companies to 'shop around' the countries of the region, seeking the most lucrative package of investment attraction measures. (p. 43)

  At the end of this contest, the spillovers or other gains from attracting a foreign company may have been bid away. The UN (1996) has indicated how costly such investment attraction strategies can be (table 10.1). The bidding contests that have emerged among Australian states provide a local example (IC 1996c).

- They can create other costly problems, such as protected markets. For example, the MTIA/EIU (1997) quote the experience of Daewoo:

  > Before Daewoo selects an investment site we refer to the incentives offered by the government, and look at its willingness to support the industry ... In Vietnam, where Daewoo is the largest foreign investor, we asked for and received a 30% tariff and a 10 year monopoly on making picture tubes. We are offered similar incentives in Uzbekistan and Poland. (p. 76)

- They can produce costs from sudden structural change, when footloose plants move away. For example, Digital was initially attracted to Ireland, but closed its plant and moved to Scotland in 1993 (Shirlow 1995).

Table 10.1: The cost of attracting investments: examples of incentives given to investors around the world

Country/ state	*Year*	*Plant*	*Other locations consid'rd*	*State investment on behalf of company*	*Company's investment in state*	*Number of employees per plant at start*	*State financial incentive per employee*
				$m	$m	no.	$
UK	1995	Siemens	Austria, Germany, Ireland, Portugal, Singapore	76.9	1 428.6	1 500	51 280
Portugal	1991	Auto Europa Ford, Volks-wagon	UK, Spain	483.5	2 603	1 900	254 451
Alabama US	1993	Mercedes Benz	5 other US states	250	300	1 500	166 667
UK	1995	Jaguar	US	128.7	767	1 000	128 720

Source: United Nations 1996, Incentives and Foreign Direct Investment, New York.

Net benefits?

In *theory*, the very prudent application of investment incentives to projects with high probabilities of spillovers could generate a gain for Australia. But even in theory the expected gains would probably be small. In practice, there are enormous difficulties in achieving even these modest aspirations, as has been noted in recent international reports on trade issues:

> ... where information is costless, there are no special interest groups and policy decisions are guided only by a desire to use resources more efficiently, a case could be made for using investment incentives ... However ... in the real world ... the case for using investment incentives must be heavily qualified, if not totally rejected. (WTO 1996)
>
> Countries have now had several decades of experience in granting competitive incentives. This often frustrating experience is beginning to lead them to a better understanding that their long-term interests do not lie in short-term advantages

> gained through incentives ... In the absence of any international action to limit incentives, some governments are searching for ways to curtail their own excessive granting of incentives. (UNCTAD 1996)

Although there may be exceptional specific cases where net benefits — properly evaluated — might arise from investment incentives, the Commission is sceptical about the benefits of large scale incentives-based investment attraction programs. They have more serious design limitations than either PfD or IDPs.

Policy responses to the Goldsworthy and Mortimer reports

The Commonwealth Government has not implemented the recommendations of either the Mortimer or Goldsworthy reports for a large scale incentives-based investment attraction program. However, in late 1997, the government announced the *limited* provision of incentives for strategic projects on a case-by-case basis (box 10.2).

The operating criteria have yet to be announced, though *Investing for Growth* lists some general principles (p. 44). The question arises of what criteria would minimise the risks of the planned incentives-based programs.

How can inducement be maximised?

The chief problem of such programs — one recognised by the government — is inducement (Howard 1997, p. 44). The dilemma for a government is to discriminate between the marginal investor and one who would have come anyway. MNEs have strong incentives to be coy, so as to secure any concessions, even when they have already decided Australia is an attractive investment site. With these challenges in mind, the Commission considers that there may be a number of ways of increasing additionality.

First, establish a transparent cap on the maximum amount of financial resources government will provide, through subsidies or tax incentives, under the program, to foreign investors over a given period.

This signals the fact that the program 'kitty' is limited. This has a number of advantages. First, a cap makes it clear to MNEs that Australia is establishing a contest between MNEs for limited benefits. If combined with hard-headed and rigorous assessment of applications for the incentives, then firms which were coming here anyway may drop out of the contest beforehand. In contrast, an open ended scheme with made-to-measure incentives will encourage all MNEs to apply, regardless of whether they were coming anyway.

Secondly, a cap limits Australia's revenue exposure. It is important, in this context, to note that statements such as '10 per cent of something is worth more than 100 per cent of nothing' and 'if we don't get the investment, it's a tax holiday forever' are misleading simplifications of the impact of tax holidays on tax revenue (see *Misconceptions* section above). Tax holidays will usually have revenue impacts and should be appropriately costed.

Finally, a cap increases the effective bargaining power of government, and means that Australians may be able to obtain bigger external benefits from any investment. This is because MNEs which know there are external benefits from their investments will try to capture these as tax breaks or other incentives. At the margin, if they are hard bargainers there might not be many net benefits left for Australians. The cap signals that there are limits to what the government is willing to give away to attract such investment.

Box 10.2: The government's investment attraction policy

'The recent financial turbulence in our region highlights the importance of the economic fundamentals to foreign investors, and the fragility of investor confidence. It also reaffirms the reality that highly interventionist strategies do not guarantee economic advantage in their own right, and that, in particular circumstances, they can accentuate economic problems which may have other causes.

In a global environment where investment capital is increasingly mobile, the key to our attractiveness as an investment location will continue to be the strength of the country's economic foundations ... The Government will, however, consider the provision of incentives, in limited and special circumstances, for major strategic projects that would not otherwise be likely to occur in Australia and where a significant net economic and employment benefit is expected to result ... The Government will also expand its program to promote investment opportunities in Australia.'

The government created a position of Strategic Investment Coordinator to coordinate the case-by-case assessment of the possible need for investment incentives. No specific funding has been allocated to such incentives. An amount of $11 million per year over four years has been allocated to the investment promotion program.

Source: Howard 1997, pp. ix–x.

Second, choose projects on the 'knife's edge' of coming here

It is very difficult for governments to pick investment projects which clearly generate net economic benefits for the nation — such judgements suffer inevitably from subjectivity, lack of performance incentives for the selectors and other pitfalls of 'picking the winners'. Nevertheless, if governments are seeking the best possible outcomes, they have to avoid two classes of investment.

First, they must try to avoid projects where Australia does not appear to have a long run comparative advantage. Such projects are more likely to leave when any incentives stop, will divert resources from other areas of the economy where Australia does have a long term advantage, and will tend to lack agglomeration economies. The magnitude of any subsidy or tax concession provides a pointer to such projects. If very big subsidies or tax concessions are required then it suggests that Australia is unlikely to have a long run comparative advantage in that industry. Certainly, unless exceptional circumstances suggest that spillovers in Australia are likely to be greater here, Australia should not be prepared to pay any more than any other country as an investment subsidy. Indeed, projects where Australia will have a long run advantage should only require marginal subsidies.

Second, the Office of the Strategic Investment Coordinator (OSIC) should also reject projects where Australia already has an obvious competitive advantage over other countries — activities where we are already producing and trading successfully. These are projects (for example, certain food processing or mining ventures) which are likely to go ahead anyway. Saying no, and providing clear criteria for the decisions, will discourage opportunistic bids for incentives by those who are coming anyway. An awareness by OSIC that they should reject such projects also mitigates, to some extent, the temptation to select 'tried and true' investment projects (which would come here anyway), and spuriously claim them as program successes — a common fault in business programs.

The OSIC will have to make knife's edge assessments of which projects lie between these two sorts of projects. Such assessments require expertise from highly trained and commercially experienced investment analysts — which does not come cheaply.

How can the benefits of any induced investment be maximised?

Technological and other knowledge spillovers are likely to be the major enduring source of benefit from MNEs, rather than employment gains. It is important, therefore, to have a systematic means of assessing the likely magnitude of such spillovers. The spillovers are probably bigger:

- for R&D and design centres in technologies where Australia has some potential advantages;
- for design intensive, software intensive activities — 'headware' rather than hardware;
- where existing firms have complementary capabilities, and so can learn from the new firm (BIE 1994b), and in technologies where Australians are regarded as demanding, discerning buyers;

- where the firm has unique management, quality assurance, and marketing solutions to problems/opportunities that also confront many other Australian firms;
- where the MNE affiliate is likely to develop substantial formal strategic linkages forwards and backwards to Australian firms; and
- where a sequence of MNEs with complementary capabilities can be attracted.

Any incentives should be seen as a way of 'buying' such benefits for Australians as a whole. In other words, Australians should be seen as the customers of the program, not the MNEs.

The process of discerning beneficial investment opportunities will likely only emerge after trial and error. This suggests that OSIC should ensure that it documents and evaluates the outcomes of its attraction strategies (using a common framework). It should also learn as much as possible about the lessons from failures and successes of other countries' attraction policies. For example, Walsh (1996) notes that the Irish Industrial Development Authority has learned to identify better investment strategies over time:

> In response to such criticisms, fixed asset grants have been scaled back and some tax breaks eliminated ... Effort is now concentrated in a few sectors ... which have already shown a propensity to thrive in Ireland; attempts are no longer made to attract firms in sectors such as heavy engineering, where past failures were costly. Less attention is paid to regional objectives. (p. 84)

How can costs of any induced investment be minimised?

As emphasised in *Investing for Growth* and in the Mortimer Report, getting the fundamentals right is a win-win strategy which should be exploited in tandem with any incentive-based system. One way of facilitating this is to consult with prospective investors to gain detailed, systematic and pragmatic intelligence about inappropriate microeconomic impediments to investment in Australia. Even if an investor fails to come, OSIC will still have collected useful information that can be used to press for specific reforms of general advantage to Australia.

Subsidies and tax incentives provided directly to a foreign venture represent pure transfers to foreigners. It may be preferable to use subsidies to fund specific improvements of Australian endowments critical to marginal investments. For example, this may be better physical infrastructure (port development, roads), supporting public sector R&D, or improved skill acquisition through funding of specific skills in short supply. Such endowment-building activities still generate benefits for other Australians and firms, as well as for the foreign MNE.

Some of the intangible costs of incentive packages emerge from rent seeking and strategic behaviour by potential recipients of incentives. Transparent processes and clear criteria for decisions may help to overcome some of these problems, as well as being a vehicle for evaluation and learning.

Recommendation

In implementing its plans for an investment attraction program, the Commonwealth Government should minimise the economic risks by following a number of principles:

- the program should be designed to maximise the extent to which investments are truly new to Australia by, for example, establishing a transparent cap on the maximum amount of financial resources the Government will provide under the program;
- any proposal should be subject to rigorous cost–benefit assessment, including examination of the sources of spillovers;
- as the process of discerning beneficial investment opportunities will emerge only after trial and error, the effects of the program should be monitored regularly so that changes in its design can be made to increase its effectiveness early in its life;
- the Office of the Strategic Investment Coordinator (OSIC) should consult with prospective investors to gain detailed intelligence about inappropriate microeconomic impediments to investment in Australia;
- it is better to provide subsidies to fund specific improvements of Australian endowments (eg roads, skills, R&D) critical to foreign investments, than to provide subsidies direct to foreign shareholders; and
- OSIC should use transparent processes and criteria for decision making.

10.3 Availability of venture capital

The availability of adequate capital is crucial to the development of firms and industries. As the Goldsworthy report commented in the context of the IT&T sector:

> Access to capital is fundamental to the development of the information industries. There must be fully functioning venture and development capital markets in

> Australia. Venture capital backed companies can make a very substantial contribution to employment and growth. (Goldsworthy report 1997, p. 35)

The report discussed whether, in fact, there were sufficient venture capital funds available, and whether there were sufficient 'good ventures' in which to invest:

> During our consultations we received mixed messages. Many of those seeking finance for start-up ventures complain that there is not enough capital available. Many of those running venture capital funds claim that they have sufficient funds for the good ventures, but not enough good ventures come forward. Probably, the truth lies somewhere between the two extremes.
>
> It is clear that many ventures are not investor ready. Many lack sufficient management skills and a convincing business or marketing plan. (Goldsworthy report 1997, p. 35)

A number of recommendations were made in the Goldsworthy report, directed both at increasing the demand for venture capital (through increasing investor readiness and the skills of fund managers) and its supply (through government funding and changes to tax arrangements, for example) — see box 10.3.

Charles et al (1997), in their report to the Taskforce on the competitiveness of Australia's information industries, commented that there are difficulties in raising venture capital funds from both domestic institutions and international sources for Australian ventures. They indicated that:

- domestic and international investors are deterred by Australia's tax structures; and
- because venture capital investments have not had a record of success, the needed management talent to develop small companies and compete internationally has not come forward. This, in turn, has also adversely affected the supply of domestic venture capital.

These reports mainly provide a perspective from the IT&T sector. A number of earlier reports have addressed issues of capital availability more generally.

For example, Marsden Jacob Associates in a 1995 report for the National Investment Council *(Financing Growth)* placed venture capital issues in perspective by noting that only around 10 per cent of small and medium sized enterprises (SMEs) aspire to significant growth and only about 30 per cent of these are willing to accept external equity and the potential loss of control this implies. They observed (pp. 1–2):

- 'Most growth firms seeking equity are not "investment ready". That is, they fail to meet fundamental requirements to be attractive to external investors ...'

Box 10.3: Goldsworthy report recommendations to develop Australian venture and development capital markets and encourage finance

'Major initiatives must include:

- the national implementation of an investor ready program modelled on Queensland's FIG [Financing IT&T Growth] program;
- continued and, as demand increases, greater support for the Small Business Innovation Fund [now known as the Innovation Investment Fund], Pooled Development Funds etc in order to increase the supply of early stage venture capital funds;
- ensuring Limited Partnerships provide a vehicle for venture capitalists in Australia which is equivalent to that offered in the United States;
- capital gains tax changes [see below];
- adequate exit mechanisms for venture capitalists, and the development of an Australian-based, high technology capital market of sufficient volume and liquidity to ensure that our high technology ventures obtain fair valuation; and
- incentives for bankers and financiers — for example, the interest earned from loans to high technology ventures could be taxed at a lower rate, or where interest is capitalised no tax would be payable until the repayment of the interest, again at a lower rate.'

The Goldsworthy report considered that government must 'ensure that the rate of business taxation is internationally competitive'. This should be in terms of tax levels (real effective rates) of corporate tax, capital gains tax etc and 'pro-growth, and then match or better the best'.

According to the report, 'dividend imputation creates a bias towards high dividend stocks, while high growth investments are subject to a relatively high CGT'. Suggested options to address this include:

- providing an offsetting imputation credit for capital gains related to the amount of R&D or technology acquisition investments; and/or
- providing rollover exemptions — exempting high technology industries investors from CGT while their investments are rolled over within the information industries and/or other defined high technology industries.

Source: Goldsworthy report 1997, pp. 39–40, 42–3.

- 'Despite the difficulties SMEs have in obtaining investment capital, there is no shortage of capital in Australia ... However, major difficulties lie in the efficiency of the market's allocation processes and the ability to deal with the risk, uncertainty, high cost and regulatory impediments incurred in SMEs.'
- '... high search, information and transaction costs and risks and uncertainty, are inherent characteristics of the SME capital market which

> constrain the flow of capital to SMEs. Essentially the same factors constrain SME capital availability in other developed overseas markets including North America and Europe.'

In an earlier report, the Commission examined the availability of equity capital for smaller enterprises as part of an inquiry into the overall availability of capital in Australia. The report recorded a difference of views between SMEs and financial intermediaries:

> Representatives of [SMEs] claimed that there was a lack of equity finance ... Representatives of financial intermediaries, particularly those specialising in investing in [SMEs], were equally adamant that plenty of funds were available but good business opportunities have been lacking. (IC 1991, p. xix)

The Commission noted that the venture capital industry had expanded rapidly through the 1980s but that, since the late 1980s, performance of venture capitalists had generally been 'poor', and this had affected their ability to attract capital (IC 1991, p. xx). The Commission did not consider that direct government intervention to expand the institutional funds to smaller companies, such as by requiring superannuation funds to allocate a specified proportion of their capital to them, would improve the efficiency of the capital market or the economy generally (p. xxi).

In its 1995 report into *Research and Development*, the Commission concluded that:

> consultations and discussions conducted in the course of this inquiry have not provided grounds for the Commission to change its view that the difficulties high technology SMEs face in attracting capital are explicable in terms of the inherent features of financing such risky ventures rather than a systematic bias by those with funds to lend or invest. (IC 1995, p. 625)

As well as finance from formal capital markets, SMEs receive funding from individuals. A recent report by the Industry Commission under the Small Business Research Program examined such informal equity investment. It found that such investment in Australia is presently modest compared with the UK and, more particularly, the US. It commented:

> the rapid expansion in the activity of business introduction services in Australia, and the comments of some of the services' operators, suggest that the flow of informal investment may be increasing quite strongly. (IC 1997, p. x)

In the past, some government financial assistance was given to business introduction services to facilitate informal investment. However, the report suggested there was no reason to consider further assistance.

The Commission notes that, from late March 1998, the Australian Stock Exchange has been operating a capital market for non-listed businesses under

the name 'Enterprise Market'. This Internet-based market facilitates venture capital investment in SMEs, and also provides an exit mechanism for investors.

In the context of the current inquiry, the AIIA stated that:

> the latest information from the market seems to be that the venture capital situation has eased considerably ... The issue is as much about the quality of applications as the availability of capital ... (Transcript, p. 60)

Significant doubts remain about the nature and extent of any shortfalls in the availability of venture capital for SMEs in Australia, the causes of any such shortfalls, and what government action is required, if any. Nevertheless, governments have put in place a number of programs to increase both demand for venture capital and its supply — see box 10.4.

The Commission considers that these programs now need to be monitored and evaluated before considering any additional programs in this area.

Recommendation

Existing venture capital programs should be monitored for some time and then evaluated to determine their effectiveness, before any additional or alternative programs in this area are considered.

Management expertise

A vital ingredient in successful venture capital funds is the expertise that fund managers can bring to guide the development of new firms. As Charles et al commented:

> Providing capital in the form of patient equity is a vital and necessary ingredient. However, by far the most important value that venture capitalists bring to early stage companies is their often hard-won expertise, their experience in similar companies, addressing all the problems that young growing companies have in the dynamic environment of the information industries. These are the factors that can make the difference between success and failure. (Charles et al 1997, p. 76)

Box 10.4: Some government venture capital programs

Some programs aim to increase effective demand by providing relevant information or developing management expertise. For example, the 1997 *Investment Readiness Study*, part of the Small Business Research Program, aims to provide small businesses with the information they need to become 'investment ready'. The study first seeks to: understand the complexities facing a high growth SME; and gain an insight into the complexities of the decision making process of equity investor groups. It then seeks to link these 'two

complexities' through matching SME stages of development with appropriate investor type. The study comments that: 'investment readiness' is a very complex issue which involves a subjective evaluation on the part of an equity investor and requires a 'mind set' change process for the SME. (DIST 1997c, p. x)

Other programs work on increasing the supply of venture capital to SMEs. *Pooled Development Funds* (PDFs), for example, introduced in 1992, enable investors to pool funds to invest in SMEs, receiving concessional tax treatment in return. PDFs must invest in:

- small or medium sized enterprises that have total assets of not more than $50 million;
- companies that will establish a new business, substantially expand production or supply capacity or expand and develop markets;
- newly issued ordinary shares; and
- activities other than retail operations or property development.

The *Innovation Investment Fund* (IIF), part of the R&D Start arrangements, was originally known as the Small Business Innovation Fund. It was announced by the Prime Minister in March 1997. Its role is to provide venture capital for firms with 'very high growth potential'. It aims to: 'create a self-sustaining Australian early stage, technology based venture capital market and to improve the commercialisation outcomes of Australia's strong R&D capabilities' (AusIndustry 1997a).

Initially the government announced that it would provide $130 million, to be augmented with $65 million in private sector capital. In *Investing for Growth* the government announced that it would make an additional $43 million available over the four years to 2001–02. A small number of early-stage investment funds in the range of $30 million to $50 million will be created, to be managed by private sector fund managers. Up to 90 per cent of any capital gains will accrue to the private investors and the fund manager. This provides investors and fund managers with a substantial potential subsidy.

Also under the R&D Start program, companies with up to 100 employees can be awarded concessional loans to 'undertake early commercialisation of technological innovation in goods, systems or services' (AusIndustry 1997b).

The AIIA commented that there is a 'developing layer of venture capitalists [in Australia] who are skilled in the assessment of IT&T related projects' (Transcript, p. 61). However, in discussions with the Commission, some telecommunications equipment firms commented that Australian venture capital fund managers were inexperienced, and lacked expertise in successfully investing in and developing new high technology firms. It was claimed by these firms, and also suggested in the Goldsworthy and Charles et al reports, that US venture fund managers had much better expertise. This reflected the depth of

venture capital markets in that country, and the scope for specialisation in particular areas such as IT&T.

At least in principle, Australian fund managers could employ experienced managers from the US to manage their Australian funds if they found it profitable to do so. Indeed, one of the firms visited by the Commission suggested that this was already happening to some extent. Expertise of this kind is highly valued around the world and will tend to locate where the best opportunities lie. This is an area in which markets, not governments, will exert the dominant influence.

Tax arrangements

As noted, Charles et al (1997) considered that domestic and international investors are deterred by Australia's tax structure. Jtec commented that 'the tax issue ... is fundamental to most problems in Australia' (Transcript, p. 2). And the AIIA considered that Australia needed a 'competitive' tax regime, with reform of the capital gains tax treatment of venture capital (Transcript, p. 59). This issue was also raised by telecommunications equipment firms in informal discussions with the Commission.

In elaborating on the perceived problem with tax, the point was emphasised that, in international venture capital investing, 'the investment objective is capital growth rather than being concerned with dividends':

> Most managed venture capital funds in the US are structured through limited partnerships so there is not double taxation on capital gains and the investors get the offsetting benefits of being able to write off the inevitable losses from some investments against their individual tax obligations. In Australia, given the risk profile of venture capital and the many other forms of less risky investments on offer to investors (such as infrastructure funding where there are incentives on dividends), venture capital cannot compete with other classes of investment in the face of a high capital gains tax rate. (Charles et al 1997, pp. 143–4)

According to the report, Australia treats (US) limited partnerships as corporations, thus attracting Australian rates of income tax and capital gains tax at the intermediate level of the fund structure, and then further taxation at the investors' location when funds are repatriated at the termination of the closed-end fund.

A number of the Goldsworthy report's recommendations aim to address these perceived problems (see box 10.3). However, some complexities arise when considering possible changes to tax arrangements:

- For one thing, it is not clear that, taken as a whole, Australia's tax structures and rates *do* discourage overseas investment. Although

comparisons between countries are not easy, and the study was not specifically considering venture capital, a 1995 study for EPAC into business taxation in Australia and Asia concluded that Australia is generally tax 'competitive' for overseas investment (leaving aside specific inducements).

- Although any foreign capital induced into Australia in response to a tax change would add to the pool of venture capital available here, some of it would displace venture capital previously provided by Australian firms. This effect could be quite marked if, for instance, Australian firms were to prefer US venture capital believing it could bring with it, as has been stated (see above), better skills in helping to manage new high technology firms.
- There could be severe practical problems in delineating and applying the relevant boundaries if tax arrangements were altered specifically to attract investment in new high technology firms.
- Although not necessarily the case, there could also be a loss of government tax revenue, which presumably would need to be made up in other ways.
- Consideration would need to be given to whether there might be better ways to more effectively target assistance to new high tech Australian firms.

Further, as noted previously, a range of factors (other than taxes) are relevant to investment decisions. The study for EPAC commented that:

> the significance of tax factors in savings and investment decisions should not be overstated. Though tax is a pervasive factor it is rarely of first order importance. Indeed recent international studies have indicated that tax is less important to a firm's investment location decision than a range of non-tax factors. (Pender and Ross 1995, p. x)

The Goldsworthy report indicates that there is merit in ensuring that business taxation is 'internationally competitive', especially for highly mobile capital funds. However, tax systems are not just about competition between countries for capital. As the Commission said in its 1996 report into Firms Locating Offshore:

> It is clearly advantageous for Australia to have the lowest corporate tax rate consistent with meeting the overall objectives of government. But this does not imply that the *sole objective* of taxation policy in Australia should be to achieve tax rates lower than those of our trading partners. Australia's taxation of corporate income should be determined with a view to achieving the most efficient and equitable structure for the taxation system as a whole, while raising the revenue required to meet Australia's economic and social objectives. (IC 1996a, p. 130)

This objective is very difficult to achieve given the complexities of Australia's tax arrangements. A change in one area of tax — albeit directed at some worthy objective — can have unintended and adverse consequences elsewhere. Because of the complexity of the Australian tax system, and because the identified tax issues have wider relevance than the telecommunications equipment industries under reference, the Commission endorses the views of the Mortimer report and others that any modifications would be best considered in the context of the wider review of the tax system.

Recommendation

Any modifications to the taxation system to improve the availability in Australia of venture capital should be considered in the context of wider review of the tax system.

A TERMS OF REFERENCE

I, PETER COSTELLO, Treasurer, under Part 2 of the Industry Commission Act 1989 hereby:

1. refer the Australian telecommunications equipment, systems and services industries for inquiry and report within nine months of receiving this reference;*

2. specify that in making its recommendations the Commission aim to improve the overall economic performance of the Australia economy;

3. in particular, request that the Commission examine and report on:

   (a) the current structure and competitiveness of the industries, drawing international comparisons where appropriate;

   (b) local and global trends, and the likely effect on the Australian industry of:

      (i) technological change and the convergence of technology and corporate structures; and

      (ii) transfer of technology and capital between different business sectors and nations;

   (c) the effect of existing and proposed international trade agreements on the industries, both in Australia and internationally;

   (d) any measures which could be undertaken to remove impediments to the industries' efficiency and development, including to Australian exports, or otherwise contribute to the efficiency and development of the industries;

   (e) the factors which are assisting and hindering the emergence of new high technology firms compared to other developed countries and any measures which could be taken to improve Australia's performance; and

   (f) any structural imbalance within the industry contributing to the current account deficit and measures which could be taken to overcome the imbalance.

* Reference received 9 July 1997.

4. request that the Commission evaluate current Government programs aimed at improving the industries' performance and report on ways in which that assistance could be better used to promote the long term development of the industry and the economy; and

5. specify that the Commission:

   (a) report on implementation strategies for any measures recommended by the Commission;

   (b) have regard to the Government's decisions on the post-1997 regulatory arrangements and the Government's information industries policy initiatives;

   (c) take account of any recent studies undertaken; and

   (d) have regard to the established economic, social and environmental objectives of the Australian Government.

PETER COSTELLO

3 July 1997

B PARTICIPATION IN THE INQUIRY

Research team

The following staff assisted in the preparation of this report:

Ralph Lattimore	Assistant Commissioner
Jim Roberts	Inquiry Director
Norm Gingell	Director
William Kerley	Assistant Director
Robert Phillips	Assistant Director
James Mills	Senior Research Officer
Abdul Waris	Senior Research Officer
Geraldine Martisius	Administrative Support Officer

Informal discussions and visits

Before release of draft report:

AAPT

ADTEC Communications

Alcatel Australia Ltd

Australian Communications Authority

Australian Electronics Development Corporation

Australian Information Industry Association

Australian Photonics CRC, Sydney

Dr David Charles (Allen Consulting)

COM 10 Ltd

CRC for Broadband Telecommunications and Networking

Datacraft Ltd

Department of Administrative Services

Department of Communications and the Arts

Department of Industry, Science and Tourism

Digital Equipment Corporation

ERG Telecommunications

Ericsson Australia Pty Ltd

Horizon Telecommunications Pty Ltd

Institute for Telecommunications Research (South Australia University)

Jtec Pty Ltd

Lucent Technologies (Bell Labs Innovations)

Motorola Australia Software Centre

NEC Ltd

NetComm Ltd

Nokia Telecommunications Pty Ltd

Nortel Australia Pty Ltd

Northgate Communications

Omniconnect Pty Ltd

Optus Communications

Pacific Dunlop Cables Group

Primus Telecommunications

SCITEC Ltd

Siemens Ltd

Mr Ron Spithill (Alcatel and AEEMA)

Telstra Corporation Ltd

Vodafone Pty Ltd

After release of draft report:

Australian Communications Industry Forum

Department of Communications and the Arts

Department of Industry, Science and Tourism

Public hearing participation

The following participated in the public hearings held in Sydney on 11 February 1998 and in Canberra on 12 February 1998:

Jtec Pty Ltd

Australian Photonics CRC

Australian Information Industry Association

Submissions

Submissions were received from the following participants. Those designated 'D' were received subsequent to the release of the draft report.

Participant	Submission No.
Australian Communications Authority	1
IBM Australia Limited and IBM Global Services Australia	2
New Zealand Government (Ministry of Commerce)	3
IBM Australia Ltd	D4
Australian Photonics CRC	D5
G R Technologies Pty Ltd	D6
Nortel Australia Pty Ltd	D7
Department of Communications and the Arts	D8
Department of Industry, Science and Tourism	D9

Other

Commissioners and/or staff also attended:

- the Technology Vendors' Forum held by Telstra in Melbourne on 8 October 1997; and
- a seminar on telecommunications industry development convened by the Australian Electrical and Electronic Manufacturers' Association (AEEMA) in Sydney on 19 November 1997.

C TRADE DATA

Tables 2.6 and 2.7 set out data about imports and exports, by broad commodity group, as published by the ABS in *1992–93 Information Technology in Australia* (cat. no. 8126.0) and *1995–96 Information Technology — Australia* (cat. no. 8126.0). The coverage of the trade data shown in those tables closely approximates the goods currently under reference.

To augment that information, the Commission has compiled trade data by broad commodity group for the 1988–89 to 1996–97 period, using basic data supplied by the ABS. Figures 2.3 to 2.6 and table 2.8 give some of the results. These compiled data differ to a minor extent to those published by the ABS in the publications referred to above, but are comparable over the time period.

This appendix sets out the basis for compilation of the data, as well as the more detailed results.

Table C.1: Concordance between descriptions and classifications[a]

Description	*Imports classification*	*Exports classification*
Telephonic or telegraphic switching equipment	8517.30.00 (all statistical codes)	8517.30.00
Coaxial communication cables and other coaxial electric conductors	8544.20.00.12 8544.20.00.14	8544.20.10 8544.20.90
Optical fibre cables	8544.70.00 (all statistical codes)	8544.70.00
Other communication cables	8544.41.90.20 8544.49.90.26	8544.41.00 8544.49.00
Communication equipment nes/Other communication equipment	Total for 8517 minus total for 8517.30.00 plus 8525.10.00 (all statistical codes) plus 8525.20.00 (all statistical codes)	Total for 8517 minus total for 8517.30.00 plus 8525.10.00 plus 8525.20.00

a Based on the Customs Tariff.

Source: Based on information supplied by the ABS.

Table C.4: Imports of mobile phones etc

$m vfd

Year	*Mobile phones etc*[a]	*Other than mobile phones etc*	*Total imports*
1988–89	149	413	562
1989–90	188	450	638
1990–91	166	351	517
1991–92	190	438	628
1992–93	289	578	867
1993–94	425	617	1 042
1994–95	814	737	1 551
1995–96	1 012	897	1 909
1996–97	854	906	1 760

a Includes 8525.10.00 (all statistical codes) and 8525.20.00 (all statistical codes).

Source: Compiled by the Commission based on information supplied by the ABS.

Table C.5: Exports ranked by value, 1996–97

Brief description	*Classification*	*Value*	*Proportion of total*
		$000 fob	%
Parts	8517.90.00	226 904	41.8
Mobile phones etc	8525.20.00	130 427	24.0
Optical fibre cables	8544.70.00	54 448	10.0
Modems, multiplexors, etc	8517.50.00	43 350	8.0
Other (excluding telephone sets, videophones, facsimile machines, teleprinters, and switching apparatus, modems, multiplexors, etc)	8517.80.00	26 143	4.8
Co-axial cable	8544.20.90	15 948	2.9
Telephonic or telegraphic switching apparatus	8517.30.00	9 966	1.8
Co-axial cable	8544.20.10	9 807	1.8
Telephone sets	8517.19.00	6 730	1.2
Cordless telephones	8517.11.00	5 745	1.1
Cables	8544.49.00	4 113	0.8
Facsimile machines	8517.21.00	3 281	0.6
Transmission apparatus	8525.10.10	3 243	0.6
Transmission apparatus	8525.10.20	1 892	0.3
Cables	8544.41.00	1 280	0.2
Teleprinters	8517.22.00	10	0.0
TOTAL		543 287	100.0

Source: Compiled by the Commission based on information supplied by the ABS.

Table C.6: Imports by country 1996–97

Country	*Value*	*Proportion of total*
	$000 vfd	%
USA	361 206	20.5
UK	249 790	14.2
Sweden	230 896	13.1
Korea, Republic of	138 888	7.9
Japan	137 939	7.8
Germany	122 870	7.0
Finland	64 348	3.6
Singapore	59 828	3.4
Canada	55 888	3.2
China	52 984	3.0
France	49 259	2.8
Malaysia	36 616	2.1
Taiwan	36 095	2.0
Thailand	27 493	1.6
Belgium	24 765	1.4
New Zealand	21 308	1.2
Israel	19 323	1.1
Hong Kong	18 845	1.1
Italy	9 010	0.5
Ireland	8 840	0.5
Philippines	6 207	0.4
Mexico	5 531	0.3
Austria	4 576	0.3
Denmark	4 194	0.2
Netherlands	3 664	0.2
Spain	3 623	0.2
Norway	2 097	0.1
Switzerland	1 093	0.1
Other (including re-imports)	7 866	0.4
TOTAL[a]	1 765 042	100.0

a Differs slightly from total shown in above tables.

Source: Compiled by the Commission based on information supplied by the ABS.

Table C.7: Exports by country 1996–97

Country	*Value*	*Proportion of total*
	$000 fob	%
NCD (no country details available)	130 427	24.0
New Zealand	58 001	10.7
Sweden	47 154	8.7
Malaysia	40 817	7.5
Singapore	35 864	6.6
Hong Kong	35 275	6.5
Thailand	31 962	5.9
Indonesia	30 283	5.6
USA	20 915	3.8
Philippines	20 891	3.8
UK	13 305	2.4
Sri Lanka	10 434	1.9
Canada	9 543	1.8
Western Samoa	7 904	1.5
China	7 506	1.4
South Africa	4 211	0.8
United Arab Emirates	4 094	0.8
Papua New Guinea	3 205	0.6
Germany	2 815	0.5
Korea, Republic of	2 654	0.5
Finland	2 551	0.5
Fiji	2 529	0.5
Japan	2 112	0.4
Taiwan	1 551	0.3
Italy	1 476	0.3
Vietnam	1 259	0.2
India	1 063	0.2
Netherlands	1 045	0.2
Brazil	1 029	0.2
Other	11 409	2.1
TOTAL[a]	543 282	100.0

a Differs slightly from total shown in above tables.

Source: Compiled by the Commission based on information supplied by the ABS.

Table C.2: Imports of telecommunications equipment (including cables)
$000 vfd

Item	*1988–89*	*1989–90*	*1990–91*	*1991–92*	*1992–93*	*1993–94*	*1994–95*	*1995–96*	*1996–97*
Telephonic or telegraphic switching equipment	33 466	53 068	26 805	61 294	88 126	62 361	92 971	41 028	44 307
Coaxial communication cables and other coaxial electric conductors	12 241	10 635	11 249	12 219	12 105	17 624	19 556	54 928	43 398
Optical fibre cables	353	2 030	4 475	3 885	6 879	4 616	9 106	28 708	12 802
Other communication cables	6 289	12 001	8 683	8 098	11 421	15 045	20 427	15 820	14 164
Communication equipment nes/Other communication equipment	509 492	560 487	466 186	542 543	748 654	942 227	1 408 975	1 768 701	1 645 511
TOTAL	561 841	638 221	517 397	628 040	867 185	1 041 873	1 551 034	1 909 185	1 760 183

Source: Compiled by the Commission based on information supplied by the ABS.

Table C.3: Exports of telecommunications equipment (including cables)
$000 fob

Item	*1988–89*	*1989–90*	*1990–91*	*1991–92*	*1992–93*	*1993–94*	*1994–95*	*1995–96*	*1996–97*
Telephonic or telegraphic switching equipment	1 405	4 585	15 567	15 317	21 390	31 874	54 254	71 438	9 966
Coaxial communication cables and other coaxial electric conductors	7 732	6 758	18 186	16 742	42 140	35 443	34 483	14 827	25 754
Optical fibre cables	393	1 340	5 393	23 191	29 993	19 107	14 830	36 095	54 448
Other communication cables	3 494	2 057	3 201	3 929	4 489	6 926	4 169	5 002	5 393
Communication equipment nes/Other communication equipment	91 146	151 597	202 757	212 934	379 518	513 418	356 978	474 984	447 726
TOTAL	104 170	166 337	245 104	272 113	477 529	606 768	464 714	602 347	543 287

Source: Compiled by the Commission based on information supplied by the ABS.

D PURCHASING POLICIES AND R&D

R&D commitments are a major feature of the PfD program and (to a lesser extent) the IDPs. This appendix assesses how, in theory, such programs may affect the level and type of R&D compared to other policy mechanisms. Chapters 5 and 6 provides some assessment of evidence.

Under 'leverage' programs like PfD, there is, at the margin, a trade off between an increase in R&D and the price for the services and goods sold by the carriers or partners. For example, suppose that an MNE is willing to conduct $20 million of R&D in the absence of any leverage program. Say that in a $50 million contract with the government, the government is able to stimulate an additional $5 million of R&D performed in Australia, at a cost premium (on the contract price) of 2 per cent (or $1 million).[1] In this hypothetical case, the government is able to obtain $5 million of additional R&D for a revenue cost of $1 million, or a bang for a buck of 5. The implicit subsidy paid to incremental R&D is 20 per cent (and the subsidy to total R&D is 4 per cent).[2]

Compare that with the use of a tax concession for R&D. A concessionary rate of deduction for R&D of 55.6 per cent is roughly equivalent to the 20 per cent subsidy rate implicit in the leverage program.[3] Let us assume that a 20 per cent subsidy stimulates the same amount of additional R&D, regardless of the form of the subsidy.[4] In this case, the final amount of R&D conducted by the MNE is $25 million as before, but the revenue costs of using the tax concession are $5 million. The bang for a buck is now only one (table D.1).

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1 Such a cost premium would reflect, for example, additional transactions costs for the MNE in locating R&D here rather than overseas.

2 These contrived results imply that a 20 per cent subsidy increases domestic R&D by 25 per cent (an elasticity of 1.25).

3 That is, the subsidy (s) in an R&D tax concession is (abstracting from the impacts of timing and dividend imputation) equal to $\tau \times \delta$ where τ is the corporate tax rate and δ is the concessional rate of deduction for R&D. Thus the value of δ corresponding to s=0.20 is $0.20/\tau = 0.20/0.36 = 0.5555$ or 55.6 per cent.

4 This will not necessarily be true, if the apparently identical subsidy rates conceal different levels of compliance burden associated with the measure. Some firms argue that the compliance burdens associated with the tax concession are high.

Table D.1: Cost–benefit analysis of hypothetical R&D impacts of the PfD program compared to an R&D tax concession

Formula	*Category*	*Tax concession*	*Leverage program*
	Social benefits		
ER = RD/(1-i)	Eligible R&D ($m)	25	25
100 x i	Inducement rate (%)	20%	20%
INDUCE = i x ER	Induced R&D ($m)	5	5
100 x SPILL	Spillover return (%) [a]	70%	70%
SPILLOVER = θ x i x ER	Spillover benefits ($m)	3.5	3.5
	Social costs		
R	Revenue forgone ($m)	5	1
s = R/ER	Subsidy rate on R&D (%)	20%	20%
m x 100	meb rate (%) [b]	27.5%	≈27.5%
MEB = m x R	MEB costs ($m)	1.375	≈0.275
forsh	Foreign ownership share (%)	100%	100%
RD	Uninduced R&D receiving subsidy ($m)	20	0
AFT = forsh x RD x s	Apparent foreign transfer ($m)	4	0
LEAK = 0.6 x AFT	Actual foreign transfer ($m)	2.4	0
TSC = MEB+ LEAK	Total social cost ($m)	3.775	0.275
NSB = SPILLOVER–TSC	Net benefit ($m)	–0.275	3.225
INDUCE/R	Bang for a buck (%)	1	5
NSB/R x 100	Net benefit to revenue (%)	–5.5	322.5

a In this table, we assume a spillover rate of 70 per cent — which lies centrally within a range of international estimates of spillovers. In its evaluations of the 150 per cent R&D Tax Concession and the Syndication program (BIE 1993a and 1994b) the BIE used a somewhat higher spillover rate of return of 90 per cent. The results change little for even quite significant variations in the spillover rate.

b This is the marginal excess burden of taxation (or the cost of distortions when raising a dollar of finance). The BIE used a mid-point estimate of the marginal excess burden of 32.5 cents in its examination of the tax concession. However, given the lower estimates recently produced by Campbell and Bond (1997) for Australia, we use a range from 15 cents to 40 cents with a midpoint of 27.5 cents in this analysis. We note that the distortion has a different basis in the case of a leverage scheme. This is because it reflects deadweight costs associated with price increases for telecommunications goods and services. We have assumed that the rate of distortion is equal here.

The net welfare implications of the two types of assistance measure are more pronounced. Abstracting from some of the complexities of calculating the net welfare benefit of R&D programs[5] we find that (given the estimated parameters, including the assumed inducement rate) the net social rate of return on the leverage program is substantial and positive even if they apply to foreign-owned enterprises (table D.1). On the other hand, the rate is positive, but much more

5 Such as firm compliance costs, program administration, time lags and imputation.

modest, for fully owned Australian firms accessing the tax concession[6] (ie for most carrier activity) and is *negative* for foreign firms using the tax concession (ie for partners).

There are two reasons for these findings:

- the aggregate value of distortions generated by subsidies under a tax concession are likely to be higher than under a leverage program. This is because the subsidy under a tax concession has to be paid on all (inframarginal) units of R&D carried out, whereas it is only paid on additional (extramarginal) units under the leverage program;[7]
- transfers to foreign companies for subsidised inframarginal R&D represent a net loss to Australia (even though we allow some leakages of such transfers to Australians in table D.1).

On the other hand, there are some possible disadvantages from fuzzy 'local content' plans like IDPs and the PfD program, especially if there is no (or very little) genuine bargaining power exercised by the government. In particular, for smaller players (ie the smaller carriers) the administrative costs of complying with the IDPs, while comparatively small, may outweigh any small gains from additional R&D. For example, suppose that a small carrier plans to conduct $995 000 of R&D in Australia, and hopes to have sales of $50 million of carrier services. The carrier puts in an IDP for pre-approval by DIST, and as an initial bargaining position says that it plans to conduct $750 000 of R&D per annum over the next two years. DIST argues that it should really aim for an R&D commitment of 2 per cent of sales — and under pressure the company agrees. While DIST may think it has induced $250 000, in fact it has only induced $5 000 of additional R&D per annum, but the combined administrative and compliance costs of achieving that may well represent multiples of this amount.

The very fact that calculations of the kind above are conjectural, underlines the lack of information about the impact of leverage schemes as mechanisms for encouraging R&D (or other activity). The degree to which firms respond to leverage programs depends on:

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6 This calculation is not shown in table D.1 — but can be derived by setting forsh=0.0 which implies that LEAK=0.0 and the NSB = SPILLOVER – MEB = 3.5 – 1.375.

7 The nature of the distortions are different too. The distortions under a tax concession arise because revenue has to be collected through taxation (the marginal excess burden of taxation) whereas the distortions under a leverage program arise from customer responses to (slightly) higher domestic prices for telecommunications goods and services. We have not been able to assess whether the rate of distortion per dollar of subsidy is higher or lower in the latter or former circumstance.

- the bargaining power of the two parties. This partly depends on the sanctions the government can, or is perceived able to, impose (eg withholding a licence, discretion to impose compliance burdens such as long drawn out negotiations, change in access to government contracts). The important role played by perceptions suggests that a firm which is less familiar with Australian government administrative arrangements, and the legislation or guidelines that empower the government, may be in a weaker bargaining position. It is likely that other factors will also shape what the government can hope to extract from any carrier or MNE. A firm which operates in a particularly competitive market segment, or which has to discount to gain market share, may have little scope to undertake any genuine additional activity under IDPs;
- the extent of information asymmetry between bureaucrats and the carriers/MNEs. The firms know how much a particular bargain affects what they would have done otherwise — but they have strong incentives to maintain a 'poker face' during negotiations. A bureaucrat may think that they have induced additional Australian activity, but how are they to know? If the bureaucrats have rich sources of information about the commercial environment of the carriers/MNEs, and have the analytical and other skills required to interpret it, they are more likely to induce new activity.

The implications of uncertainty over the real extent of information availability and bargaining strength implies that government cannot really know the precise extent to which firms are being assisted — and the penalties that consumers may be paying for final products (as in the old offsets arrangements — see BIE 1986). This lack of transparency means that accountability is diminished, and that it is difficult to enumerate the likely net benefits/costs of such arrangements.

E COORDINATION FAILURES

E.1 Introduction

Chapter 5 outlined a range of market failures that may provide in-principle justification for government intervention in the telecommunications equipment industries. Some commentators on IT&T industries (for example, Houghton and Flaherty 1997) consider that coordination failures may provide an important justification too. We consider the case here.

E.2 Nature of coordination failures

Coordination problems may, in theory, affect skilled labour, R&D and other factors of production. For example, say that the optimum size of an R&D facility is large — so that smaller facilities are more costly or less effective. Such a facility brings together a particular configuration of resources, which might not necessarily be created through market forces. For example, no one wants to train in specialist software skills unless they see a likely future job in it, and no firm will set up the facility unless it can obtain the required skilled labour. Because a minimum sized plant is required for viability, it may not be possible to converge to the right solution by slowly expanding smaller sized R&D units. In this case, there may be grounds for coordination — at least notionally between universities and firms — and possibly with government involvement.

More typically the problem is enunciated not in terms of coordinating skill acquisition and physical capital investments, but of investments in upstream and downstream industries.[1] For example, the World Bank (1993) argues that:

> Increasing returns from scale and capital market imperfections may mean that investments that could be internationally competitive at optimal scales will not be undertaken. This is especially true with large, interdependent projects for which optimum scale depends on simultaneous investment in upstream and downstream industries. The larger the indivisibilities and returns from scale, the more likely that private initiatives will be absent. (p. 293)

In fact, markets also develop mechanisms for coordination (such as signalling, contracting, and alliances). And governments, while apparently well placed for

[1] Also see Rodrik (1996).

coordinating resource allocations in these cases, are also prone to costly mistakes (as in Indonesia's aerospace industry, and heavy industries investments in Malaysia and Korea — World Bank, 1993).

Rodrik (1996), favourably cited by Houghton and Flaherty (1997) for his *theoretical* case for government as a coordinator of the shift in an economy from a low wage, low tech equilibrium to a high wage, high tech equilibrium, nevertheless ends his paper by saying:

> ... the empirical relevance of these ideas remains to be demonstrated. In the absence of such a demonstration, government intervention to promote industrial diversification must be judged a risky strategy. (p. 20)

A special form of coordination problem, increasingly cited in telecommunications product and service technologies (for example by Besen and Farrell 1994 and Katz and Shapiro 1994), are network externalities. Such 'externalities' arise when the benefit a user obtains from a good increases with the number of other users consuming the good. The telephone is the quintessential example — a telephone by itself is scarcely much use.

There are a number of ways in which such network commodities and services may serve as a justification for government intervention. In theory, governments may have a role in:

- subsidising or forming a network to kick-start its use. In some cases, such intervention may be a form of strategic trade policy. For example, a government can (theoretically) subsidise a particular network in which its domestic firms have proprietary technologies, to displace competing networks from other countries;
- selecting via regulation or subsidy a superior new network technology which cannot gain a market hold because of the existence of another 'locked-in' inferior network technology. The QWERTY keyboard is the classically quoted, though now contentious, example (David 1985);
- taxing congested networks (when the externalities are negative, not positive);
- imposing standards so that users can buy products compatible with others; and
- regulating the behaviour of dominant firms who use their advantages in an existing network standard as a way of deterring competition. For example, the US Federal Communications Commission requires that common carriers provide information about changes to network design and technical standards to rival suppliers of customer-premises equipment and enhanced telecommunications services before they introduce changes to their networks (Besen and Farrell 1994).

However, as Liebowitz and Margolis (1994) show, the term 'network externalities' is not only imprecisely applied[2], but empirical evidence in favour of their frequency is scanty. For example, the story of the QWERTY keyboard — so often used to support the real world relevance of such externalities — proves to be misleading (box E.1). Telephone systems, railways, television networks, video shops and video machines — all potential candidates for network externalities — appear to have developed rapidly without the need for coordination.

Box E.1: The quirky story of QWERTY

'The beguiling and often-told story is that the strike mechanism of the earliest mechanical typewriters was prone to jamming, so the typewriter's inventors designed the (now standard) QWERTY keyboard in order to slow down typing speed. This arrangement became the market leader, largely by accident, because it became associated with the world's only touch typist. Typists remain burdened by this speed-reducing design today, even though there exists a competing Dvorak keyboard — scientifically designed to be easier to learn and to allow greater speed. Nevertheless, we all learn touch typing on the QWERTY design because there are so few Dvorak typewriters, and there are so few Dvorak keyboard typewriters because almost no one knows how to type on them. The vicious circle keeps us stuck on the wrong standard. The empirical support for the story is a US Navy study conducted during World War II. Purportedly, that study conclusively demonstrates the superiority of the Dvorak design, determining that the costs of retraining QWERTY typists on the Dvorak design will be recouped within ten days from the start of training.

Alas, almost every element of this tale is false. ... The QWERTY keyboard was not designed to slow down typing speed. Early on, there were other publicised touch typists using other keyboards. The Navy study was very poorly documented and designed, and appears to have been conducted by Navy Lieutenant Commander August Dvorak, creator and patent holder on the keyboard bearing his name. A later carefully constructed and controlled study ... demonstrated quite the opposite results. More recent studies indicate there is practically no difference in typing speed between the two keyboard designs. The Dvorak typewriter, it turns out, is a rather poor empirical base upon which to support a theory.'

Source: Liebowitz and Margolis (1994, p. 147).

And as acknowledged even by theorists who see more scope in the problem, 'we are far from having a general theory of when government intervention is preferable to the unregulated market outcome' (Katz and Shapiro 1994). For example, many private institutions and practices develop to internalise the externalities, government may not have the incentives to improve matters (but may favour a current generation of users and producers), and any intervention

[2] With most examples of purported externalities really exhausted at the margin.

presumes that government has access to the information needed to make the right network choices.

E.3 Implications

Coordination problems — of which network externalities are a subset — are an interesting set of theoretical conditions for government intervention. They may have relevance to regulatory standard setting, anti-trust actions and network congestion taxes, but the theory is, so far, too little developed to provide unequivocal directions for industry policy.

F GOVERNMENT NEGOTIATING POWER: SOME ISSUES

As noted in chapter 4, a relatively few large global firms dominate telecommunications equipment manufacturing. Under such market structures, the bargaining that occurs between buyers and sellers, or between rival sellers, can influence the prices, quantities and other commercial behaviours of firms. The question is what sort of bargaining stance should government adopt in order to maximise returns to Australians?

Governments are very big, relatively well informed, and have 'deep pockets'—enabling them to act as a countervailing influence in dealings with MNE oligopolies. They can also increase their market power by concentrating purchasing into large 'take-it or leave-it' package deals with suppliers. As noted by the BIE (1994a, p. 81), the 'PfD/FTA are in a sense a package deal, imposing industry development obligations on suppliers in exchange for access to the government market'. The deals brokered between such powerful, rivalrous buyers and sellers will theoretically tend to be at lower prices than deals brokered between small fragmented buyers and large oligopolistic suppliers. For example, Australia is a monopsonistic purchaser of prescribed drugs from global pharmaceutical companies, and obtains discounts of around 40 per cent (IC 1996d).

As the BIE (1994a) noted in its review of the PfD scheme, this raises the prospect that:

> ... the government can use its purchasing power to obtain a potentially better deal for the community. It can use its monopsony position either to reduce prices (through bulk purchasing, common use contracts etc) or by inducing through conditional procurements, market access or other means, industrial development activities. (p. 81)

But the countervailing power of government invites three questions:

First, are there really any rents to be gained*?* Participants argued that supply of many products to the carriers, while mediated through large conglomerates, was still intensely competitive, and that any 'excess' profits available for extraction might be negligible in many product lines. The information needed to assess this question rigorously is not available, but the plausibility of significant competitive pressure is heightened by the increased competitive pressure now applying to the carriers themselves.

Second, why can't government countervailing power be used simply to screw down prices of government purchased goods and services, rather than be diverted to domestic producers? For example, say that the government and an MNE are bargaining over the price of some equipment. The usual price (when buyers are fragmented) is $50 per unit, while the cost[1] per unit is $45 leaving a profit of $5 per unit to the MNE. The government, however, strikes a hard bargain, and is able to buy at $48 per unit and at the same time obtain a commitment for local content by the MNE which is reflected in a one dollar premium in the MNE's costs (ie costs rise to $46 per unit). The local content stipulation may well produce benefits to Australians because it raises wages or shareholder returns — but it will typically do so by less than $1 a unit — let's say 50 cents.[2] The MNE gets $2 of profit after this hard bargain.

Now consider an alternative bargain. If the government has the market power to force the monopoly profit of the MNE down to $2 in the first scenario, presumably, they can do so in another bargain where there is no local content stipulation.[3] If they do this, they extract a rent of $3 for Australians, compared to $2.50 under the local content bargain (table F.1).[4]

The policy implication is that where government is a *direct* buyer of goods or services from MNEs, it should seek to use its bargaining power to obtain the lowest prices (unless there are other market or firm failures at work).

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1 Here we assume that the cost includes the required rate of return to capital, so that any profit is a super profit.

2 Reflecting the fact that there are likely to be deadweight production inefficiencies, as resources transfer from other uses in the economy.

3 This seems a common sense assumption, but there may be circumstances in which it does not hold. For example, in some MNEs the costs associated with the industry development provisions of a particular government contract may, as a matter of accounting and charging practice, be absorbed into *global* overheads, rather than reflected in the price of the contract. This was claimed to be true for some aerospace manufacturers when the offsets program was in existence (BIE 1986, p. 318) and for participants in the PfD program (BIE 1994a). If there are such administrative and accounting conventions within MNEs then it may not be possible to improve on the 'industry development' bargain, except through government to government multilateral agreements prohibiting any 'industry development' clauses in government contracts.

4 The BIE considered that if Australia stopped applying government leverage, then the price of imported products would not fall by the amount that companies saved by virtue of not having to carry out industry development activities. This argument seems to imply that the government has greater bargaining power when it extracts rents indirectly through industry development means, than directly through price cuts.

Table F.1: Gains from bargaining with and without local content endeavours

	Local content	*No local content*
Government	2	3
Workers and shareholders	0.5	0
MNE	2	2

Thirdly, what implications does the countervailing power of government have in third party deals? It is possible that governments (or a mandated monopoly, such as Telecom prior to the competition reforms) may be able to extract rents from oligopolistic firms when they are dealing *directly* with them. Monopoly buyers obtain bargaining power because they can veto all aspects of a package deal with a supplier — if they say no to a particular offer, no other competing buyer can say yes. But it is less clear why governments could extract rents when they are not directly involved in mandating any particular sale.

Consider, for example, a carrier buying some equipment from (a number of competing) telecommunications suppliers. In the new competitive market, no carrier (with the possible exception of Telstra) has much capacity for extracting rents from such suppliers, because at best they can withhold their own orders only. And government has little power either. This is because while it can set down the conditions for any industry development plans (through the PfD program or IDPs) it cannot veto or re-negotiate any individual deal between a carrier and a supplier.

Moreover, if there is some degree of imperfect competition, then the impact of any cost increase (arising from industry development arrangements) may be magnified. This is because under conditions of imperfect competition, prices may be set as a markup over costs. The more inelastic is the demand for a supplier's product/services, the greater that markup will tend to be. For example, this could mean that a 2 per cent increase in costs could raise prices by 4 per cent.

G CARRIERS' INDUSTRY DEVELOPMENT PLANS

G.1 Introduction

In this appendix, some of the main features of the Industry Development Plans (IDPs) of Telstra, Optus and Vodafone during the period 1992 to 30 June 1997 are summarised (section G.2). An indication is also provided of the extent to which these three carriers achieved their industry development undertakings.

In the period from 1 July 1997 to end-March 1998, thirteen carriers have been granted licences. However, only four IDPs have been made publicly available during that period. A summary of those IDPs is provided in section G.3.

G.2 IDPs of carriers, 1992 to end-June 1997

Telstra

Telstra (then operating as the Australian and Overseas Telecommunications Corporation, AOTC) released the public version of its IDP in April 1992 (AOTC 1992). It made thirty-two undertakings across a broad range of areas. The undertakings made in relation to capital expenditure, local content, strategic relationships, R&D, training and exports are outlined as follows (see table G.1).

The IDP undertakings

Capital expenditure — Telstra anticipated purchasing around $10 billion worth of equipment over the five-year plan period to 30 June 1997.

Local content — Telstra expected the major part of its capital expenditure to be sourced from local industry. The commitments made in relation to procurement and local value added included:

- not to purchase from overseas firms without first considering Australian firms that it knows to be suitably qualified;
- to continue participating in industry forums and to meet regularly with the industry as a means of informing industry participants in a timely fashion of Telstra's technical and commercial directions;
- to encourage the location in Australia of the advanced technical activities for the product development and production process; and

- to develop and use advanced networking technologies that comply with suitable international standards.

Table G.1: Telstra's IDP 1992–97, selected undertakings and achievements

Activity	*Undertaking*	*Achievement*
Expenditure	$10 billion	Around $20 billion
Local content	Strong preference to source from local industry	Around 65 per cent
R&D	More than 1.5 per cent of sales	Around $1 billion, representing over 1.5 per cent of sales
Strategic relationships	Enter product-sourcing agreements where continuing predictable and significant demand	Strategic alliances formed with Alcatel, Ericsson, Nortel and Siemens
Training	Expenditure greater than 3 per cent of annual national payroll	Around $900 million, or nearly 6 per cent of annual national payroll
Exports	Provide opportunities for Australian firms to promote their equipment, products and services for export	Involvement in activities such as the Telecommunications Export Taskforce & Telecommunications Export Development Group

Sources: Telstra 1994, 1996, 1998.

Strategic relationships — Telstra undertook to enter into long-term agreements (in the form of product sourcing agreements) whenever there was a continuing predictable and significant demand for a product.

Research and development — Telstra planned to spend more than 1.5 per cent of its sales on R&D. It also undertook to continue funding for the development of new and innovative products by small and medium sized Australian-owned companies (the Product Development Fund).

Training — Telstra planned to maintain training expenditure at a level of more than 3 per cent of annual national payroll.

Export enhancement — Telstra made the following qualitative commitments:

- to seek suitable Australian equipment, products and services early in the planning and development process for foreign projects;
- to offer Australian equipment, products and services when they are competitive and suitable for the market, when tendering for foreign contracts;

- to tender for foreign contracts with suitable Australian suppliers when that is mutually beneficial;
- to provide Australian firms with early advice of potential opportunities to supply the major requirements for its overseas projects; and
- to sponsor and finance international forums that provide opportunities for Australian firms to promote their equipment, products and services to the international market.

Extent to which undertakings were achieved

Capital expenditure — Telstra's actual spending on equipment and services over the five-year period was around $20 billion, or double that originally planned. The most significant elements of Telstra's expenditure were its network modernisation program to digitise existing infrastructure (the Future Mode of Operation project, FMO); and the HFC (hybrid optical fibre/co-axial) cable network rollout (to provide pay TV, high speed Internet access and other interactive broadband services).

In carrying out its industry development undertakings, Telstra used a very wide range of suppliers, both in terms of numbers and size. Telstra generally traded with more than 10 000 suppliers; and around one-third of its expenditure was placed directly with small-to-medium enterprises.

Local content — Telstra's purchasing plans had a very significant impact on local industry. Over the life of the plan, Telstra sourced around 65 per cent of its purchases from local suppliers. Indeed, Telstra spent more than $3 billion on locally produced equipment and services in each of the last two years of the plan.

Strategic relationships — Telstra's FMO project involves strategic alliances with several switching suppliers (Alcatel, Ericsson and Nortel) and a supplier of transmission facilities (Siemens).

Research & development — over the plan period Telstra spent around $1 billion on R&D, representing more than 1.5 per cent of sales revenue. Telstra achieved its R&D undertaking by carrying out the overwhelming majority of its R&D activity internally, but also by funding external projects with CRCs, and other university and government R&D organisations.

By 1995–96, Telstra's Product Development Fund had committed around $11 million to support new product development in 63 Australian companies.

Training — over the period, Telstra spent around $900 million on training, representing nearly 6 per cent of annual national payroll (almost double the undertaking).

Export development — Australian-based suppliers received orders arising from Telstra's off-shore activities (for example, amounting to $224 million in 1994–95 and $121 million in 1995–96). Telstra is also involved in joint, co-operative taskforces (the Telecommunications Export Development Group and the Telecommunications Export Taskforce) comprising industry and government representatives, to facilitate and maximise the export opportunities of the Australian telecommunications sector.

Optus

Optus was awarded its carrier licence in November 1991, and began operations on 31 January 1992. Details of the commitments Optus made in its Industry Deed with the Commonwealth Government, and the achievements to end-June 1997, are set out in table G.2.

Table G.2: Optus' IDP 1992–97, commitments and achievements

Activity	*Commitment/undertaking/forecast*	*Achievement*
Local content (ratio)	70 per cent of capital expenditure 75 per cent of total expenditure	72.3 per cent of capital expenditure 75.6 per cent of total expenditure
Local content ($)	$870 million, capital expenditure $3 billion, total expenditure	$2.46 billion, capital expenditure $7.4 billion, total expenditure
R&D	$100 million	Around $360 million
Strategic relationships	Strategic supplier agreements with Digital, Fujitsu, Leighton, Nokia, and Nortel	Alliances in place at outset
Training	$100 million	$139 million (representing 18 per cent of cumulative payroll)
Exports	Facilitate exports from strategic suppliers and other suppliers	$137 million by strategic and other suppliers attributable to Optus' business

Sources: Optus 1992, 1994, 1997a, 1997c.

The IDP commitments

Optus made undertakings to the government in respect of Australian content, R&D, training and exports.

Australian content — Optus undertook to achieve 70 per cent local content in its capital expenditure, and 75 per cent local content in its total expenditure. Optus' strategic suppliers had contractual commitments to enable it to achieve these target levels of Australian content.

The forecast cumulative expenditure on local content over the plan period was around $870 million for capital expenditure and $3 billion for total expenditure (Optus 1997c) — applying the local content ratios, these imply overall expenditure forecasts of around $1.2 billion for capital expenditure and $4 billion for total expenditure.

Research and development — Optus undertook to spend at least $100 million on R&D in the five years to 1997, and at least $400 million in the ten years to 2002, with at least 85 per cent of this R&D being undertaken in Australia.

Training — Optus made a commitment to establish an education and training program involving a minimum expenditure of $100 million in the five years to 1997. Of this, $15 million was to be spent in establishing the 'Optus Training Institute'.

Exports — Optus made a commitment to facilitate exports from its strategic suppliers and other suppliers. It estimated that overseas earnings of over $350 million would be generated by Optus and its strategic suppliers in the five years to 1997 and $1 billion in the ten years to 2002.

Strategic relationships — The Optus industry plan was based on stimulating local technology development and communications equipment manufacturing through strategic alliances and joint ventures. Optus formed a number of strategic supplier agreements — with Digital, Fujitsu, Leighton, Nokia, and Nortel — during the preparations for its bid to become Australia's second carrier. Some of the strategic suppliers in turn had alliances with indigenous Australian companies — for example, relationships were formed between Nortel and Exicom, and between Nokia and ERG Australia.

Extent to which commitments were achieved

Australian content

Over the plan period, Optus achieved a level of Australian content of 72.3 per cent in its capital expenditure, and 75.6 per cent in its total expenditure.

The degree of local content achieved in the equipment/services supplied to Optus varied across strategic suppliers. For example, the local content achieved in 1996–97 was as follows: Digital (84 per cent); Leighton (more than 90 per cent), Fujitsu (64 per cent), Nokia (64 per cent) and Nortel (74 per cent).

Capital and total expenditure

Much higher than forecast levels of expenditure were achieved:

- cumulative capital expenditure of $3.4 billion was undertaken, of which $2.46 billion was Australian content. This result exceeded forecast expenditure on local content by around 180 per cent.
- Cumulative total expenditure of $9.8 billion was undertaken, of which $7.4 billion was Australian content. This result exceeded forecast expenditure on local content by around 150 per cent.

Most of Optus' expenditure was generated through its strategic suppliers, but it also purchased equipment and/or services from over 4 500 vendors in 1996–97.

Research & development

Cumulative expenditure on R&D by Optus and its suppliers amounted to around $360 million, of which nearly 97 per cent was undertaken in Australia. Optus therefore exceeded its original R&D target by around 260 per cent. Optus achieved its R&D undertaking by outsourcing its R&D requirements — collaborative R&D projects were undertaken by its strategic and other suppliers.

Training

The cumulative expenditure by Optus on training amounted to around $139 million. Of this, more than $20 million was spent on the Optus Strategic Education Alliance (at the time of the Deed described as the 'Optus Training Institute').

Exports

The cumulative total of exports that Optus' strategic and other suppliers attributed to Optus' business amounted to around $137 million. Optus itself described the level of exports achieved as 'modest', and introduced the Export Partners Program in 1996 to encourage exports amongst its suppliers and any other interested companies (Optus 1996, p. 19).

Vodafone

Vodafone was granted a mobile carrier licence in December 1992, and launched commercial services on its digital network in October 1993. By March 1994, Vodafone's network provided coverage to every Australian capital city, and by August 1997 to 90 per cent of the Australian population (Vodafone 1997a). Details of the commitments made by Vodafone in its 'Industry Deed with government', and the achievements to end-June 1997 are set out in table G.3.

Table G.3: Vodafone's IDP 1992–97, commitments and achievements

Activity	*Commitment/undertaking*	*Achievement*
Capital expenditure	$417 million	$939 million
Local content	At least 60 per cent	67 per cent
R&D	A minimum of $5 million	$4.9 million (actual) $5.7 million (committed)
Strategic relationships	To form a strategic supplier relationship with either Ericsson or Nokia	Strategic supplier relationship formed with Ericsson; and strategic alliance with Keycorp
Training	$7.2 million	$8.6 million
Exports	To facilitate exports by its strategic suppliers	Some exports by Ericsson attributable to Vodafone's business

Sources: Vodafone 1995, 1997a, 1997b.

The IDP commitments

Capital expenditure — Vodafone undertook to spend $417 million by 30 June 1997 to establish its mobile digital network in Australia, and around $1 billion by the year 2000. This expenditure is expected to create, directly and indirectly, more than 5000 jobs in Australia's telecommunications and related industries (Vodafone 1997a; 1997b).

Local manufacturing content — Vodafone undertook to use Australian content wherever 'reasonably possible', and to achieve at least 60 per cent Australian content in its cumulative capital expenditure. An integral part of this commitment was an undertaking to make 'reasonable endeavours' to ensure that its strategic suppliers complied with its commitment to achieve at least 60 per cent local content for its capital expenditure.

Strategic relationships — Vodafone undertook to establish and support local manufacturing and technology transfer by forming a number of strategic alliances with leading technology partners in Australia. This was to involve three main areas (Vodafone 1995):

- mobile phone base transceiver stations (BTS);
- mobile phone handsets; and
- mobile digital SmartCards (which provide the intelligence for mobile digital phones).

Research and development — Vodafone undertook to establish a collaborative R&D program and to provide a minimum of $5 million itself in R&D funding at a rate of $1 million per year from 1993 to 1997. Also, it undertook to ensure that its strategic suppliers would spend no less than 6 per cent of Vodafone annual contracts on R&D in Australia. Of this, 1 per cent was as agreed with Vodafone, and 5 per cent as the PfD agreement with government (Vodafone 1997a).

Training — Vodafone undertook to spend $1.2 million on training in the first year of operation, and up to $6 million over the period 1 January 1993 to 30 June 1997.

Exports — Vodafone undertook to facilitate the export of Australian telecommunications products and services from its strategic suppliers to the Asian-Pacific areas, in particular to countries where there is a related company in the Vodafone group.

Extent to which commitments were achieved

Capital expenditure — Vodafone's cumulative capital expenditure to 30 June 1997 was around $939 million, or more than double the licence undertaking of $417 million.

Australian content — The local content of Vodafone's cumulative capital expenditure to 30 June 1997 was around 67 per cent, meeting the licence commitment of at least 60 per cent.

Strategic alliances —Vodafone complied with its commitments in the following respects:

- formed a strategic supplier relationship with Ericsson (for the design and manufacture of GSM base transceiver stations and related communications equipment). The parties signed a strategic partnership agreement in October 1996;
- formed a strategic alliance with Keycorp to launch the first manufacturing of GSM SmartCards in Australia (from September 1994).

However, Vodafone's 'best endeavours' commitment to facilitate the local manufacture of GSM handsets was subsequently removed from its IDP with the Industry Minister's approval, when circumstances made clear that this was not feasible (Vodafone 1997b).

Research & development — Vodafone's cumulative expenditure to 30 June 1997 on its collaborative R&D program was $4.9 million (compared to its original commitment of $5 million). Its total committed expenditure of $5.7

million will ensure that the original undertaking will be met, though some expenditure will carry over into 1997–98.

Vodafone sought to achieve its R&D undertaking by ensuring that its strategic partners spent a specified proportion of their contract on R&D. A Collaborative R&D Program was also established, which provided funding for projects carried out by the CSIRO and universities.

Because of the accelerated network rollout in 1996–97, Ericsson could only meet the '1 per cent of annual contract value' R&D requirement in terms of funds contracted rather than expended (this variation to the IDP was approved by the Industry Minister).

Training — Vodafone's cumulative investment in training to 30 June 1997 amounted to $8.6 million.

Exports — The strategy that led to the manufacture by Ericsson of GSM base transceiver stations in Australia also facilitated export opportunities for Ericsson to Fiji, and supply of RBS 200 transceivers worldwide.

G.3 IDPs for the post-July 1997 period

In the period since 1 July 1997, the IDPs of four carriers have been made publicly available by end-March 1998 — Optus, AAP Telecommunications (AAPT), Primus Telecommunications and Omniconnect.

Optus

Optus' IDP for the five-year period 1 July 1997 to 30 June 2002 was released on 12 December 1997 (1997b). Details of its undertakings are set out in table G.4.

Capital expenditure — Optus' capital expenditure during its first IDP averaged around $600 million per year. In its new IDP, Optus notes that influences such as changes in technology and business requirements, and competition, make prediction of future levels of investment expenditure difficult. However, on the basis of current planning, Optus foresees likely capital expenditure of between $600 million and $800 million per year.

Table G.4: Optus' IDP undertakings, 1 July 1997 – 30 June 2002

Activity	*Undertaking*
Capital expenditure	$600–$800 million per year
Local content	70 per cent in capital expenditure and 75 per cent in total expenditure
R&D	No overall targets specified; collaborative R&D funding at a level of 1–2 per cent of sales revenue (derived from sales to Optus).
Training	Undertake expenditure of around 5–8 per cent of payroll
Exports	Facilitate exports mainly through Export Partners Program

Sources: Optus 1997b.

Procurement policy — Optus' approach to procurement relies on the formation of alliances and strategic partnerships with Australian and global companies. Optus voluntarily commits to use Australian content 'wherever commercially and economically feasible'. Supplier evaluation is based on a number of factors, not simply price.

Optus plans to maintain the same levels of local content in the five years to 2002 as it achieved in its first IDP — 70 per cent for capital expenditure and 75 per cent for total expenditure. Optus has a general requirement in supply agreements that Australian content be not less than 70 per cent, though this is dependent on the scope of supply, as well as the nature of the goods and services to be procured, and whether local manufacturing capability is available.

Strategic relationships — Under its new IDP, Optus estimates that around 60 per cent of capital expenditure each year will be spent with strategic suppliers. The normal term of a strategic supplier agreement with Optus is three years. Further, there is no commitment to renew any part of an agreement after expiry — that decision is based on the commercial and technology requirements at the time.

Research and development — Optus' first IDP contained a ten-year commitment to spend $400 million on R&D by 30 June 2002. This undertaking was nearly met after only five years — cumulative R&D expenditure at 30 June 1997 was over $360 million.

The specific objectives of Optus' R&D activities in its new IDP are: to develop innovative and cost efficient ways of extending network access; to enhance network efficiency; and to develop new products and services to gain competitive advantage. The main categories of R&D comprise:

- Internal R&D projects (excluding information technology, IT) — some projects will be performed in-house, but many will be contracted to external organisations.
- Information technology R&D — Optus relies on suppliers or other vendors for a large portion of its IT-related R&D.
- Collaborative R&D — Optus and its strategic partners will develop collaborative R&D programs, with funding at a level of 1–2 per cent of sales revenue (derived from sales to Optus). Based on current estimates of capital expenditure and sales to Optus by individual suppliers, this funding is expected be in the range of $4–6 million per annum over the life of the plan.

Training — In its first IDP, Optus' expenditure on training averaged 18 per cent of payroll (a level that was among the highest in corporate Australia). In its new IDP, Optus intends to at least match the international benchmark for training expenditure in similar companies (currently around 5–8 per cent of payroll).

Exports — Central to Optus' export strategy is the Export Partners Program. Under the program, any suitable Optus-owned IT product is made available for export by an Optus supplier or any other company which believes there is a potential export opportunity. Optus also encourages its suppliers to export products made for Optus' network rollout.

AAPT

AAPT had its five-year IDP approved in June 1997, and was awarded a carrier licence operative from 1 July 1997. AAPT is Australia's third largest long-distance carrier. AAPT's major undertakings are summarised as follows.

Capital expenditure

AAPT plans to undertake expenditure of around $305 million in the five-year period to 2002 (1997b). By far the largest part of its capital expenditure consists of major network elements needed to implement a nationwide voice and data network. It intends to expand its network from the present 6 major switching exchanges located in capital cities, and 19 smaller exchanges in regional locations, to approximately 40 centres throughout Australia by 1998. It also expects its current employment of around 500 to increase to around 1200 during the implementation phase of the plan (AAPT 1997b).

Prospects for local sourcing

AAPT's approach in relation to information technology and telecommunications equipment procurement will be to use those suppliers which can meet its commercial, technological and strategic requirements. AAPT has assessed the potential for local industry involvement in its IT&T equipment requirements over the period of their plan, based on a three-way rating of prospects (low, medium and high) for three types of activity (design, manufacturing and ongoing support) — see table G.5.

Table G.5: AAPT Industry Plan — likelihood of local opportunities by product category

Product category	*Projected expenditure ($m)*	*Local design opportunity*	*Local manufacturing opportunity*	*Local support opportunity*
Information technology				
Hardware	19	Low/medium	Medium	High
Software	14	High	High	High
Services	12	High	High	High
Total	45			
Telecommunications				
Submarine cable	35	Low	High	Low
Toll switches	19	Low	Medium	High
Transmission equipment	90	Medium	Medium	High
Intelligent network	12	Medium	Medium	High
Regional cable	33	High	Medium	High
Mobile services	22	Medium	High	High
CBD fibre	20	High	High	High
Total	231			

Source: AAPT 1997c.

- *IT requirements* — the most favourable prospects for local involvement are in software and services — the local opportunities are assessed as high for design, manufacturing and support activities.
- *Telecommunications equipment* — the opportunities for local involvement are uniformly high in relation to local support (apart from submarine cable). In relation to design, the local opportunities appear best for regional cable and CBD fibre; while for manufacturing activity, local suppliers appear best placed for submarine cable, mobile services and CBD fibre.

In table G.6, the prospects for local involvement are seen from another perspective, with the expenditure aggregated for those product categories given the same assessment of possible local involvement.

Table G.6: AAPT Industry Plan — likelihood of local opportunities, as a share of expenditure

Product category	*Rating of local industry involvement*	*Local design opportunity %*	*Local manufacturing opportunity %*	*Local support opportunity %*
Information technology	High	58	58	100
	Medium	0	42	0
	Low	42	0	0
Telecommunications	High	23	33	85
	Medium	54	67	0
	Low	23	0	15

Source: Based on AAPT 1997c.

In terms of planned IT expenditure (amounting to around $45 million), there is a high chance of local involvement in around 60 per cent of design and manufacturing opportunities, and 100 per cent of the support requirements.

In terms of planned telecommunications expenditure (amounting to around $231 million), there is a high chance of local manufacturing involvement in product categories representing 33 per cent of this expenditure, and a medium chance of involvement in the remaining two-thirds. In terms of design, there is a high likelihood of involvement in activities accounting for 23 per cent of proposed expenditure, and for local support, there is a high likelihood of involvement in activities accounting for 85 per cent.

Research and development

AAPT expects its software development budget to grow in line with the growth in overall revenues. The areas of software applications development in which opportunities for local industry are most likely to exist include: network management; new billing/invoice facilities; and operational support systems (AAPT 1997d). AAPT will also be exploring opportunities for collaborative development projects with specialised research bodies, as well as with local and overseas companies.

Export development

AAPT has taken a number of strategic steps to facilitate access to key export markets by local firms and MNEs, including a significant investment in several submarine cable consortia (AAPT 1997e).

Growth of AAPT's international revenues will be assisted by ongoing strategic relationships with Singapore Telecom International, and through participation in correspondent agreements in ten overseas countries.

AAPT will also be pursuing opportunities to licence to overseas telecommunications companies software products/systems developed for AAPT's own use.

Training

AAPT maintains an ongoing training/skills development program at a cost of around $900 000 per year.

Primus Telecommunications

Primus entered the Australian telecommunications market in 1996 following its acquisition of Axicorp Telecommunications. It aims to become a leading provider of international and domestic long distance voice, data and value-added services to its customers. It currently has international gateway switches in Sydney and Melbourne; and domestic switching centres in Sydney, Melbourne, Brisbane, Perth, Adelaide, Gold Coast and Canberra. The period of its IDP is 1996–97 to 2001–02.

Capital expenditure — Primus is planning investment expenditure of over $285 million over the next five years. It plans to extend its switch intelligent network to Newcastle, Wollongong, Hobart and other centres; establish additional call centres (to those in Sydney and Melbourne); invest in an ATM network; invest in satellite earth stations for both the east and west coasts; and invest in software and systems development. The overall estimated value of the plan is around $359 million.

Sourcing of hardware, software and services — Primus' policy is to purchase from those competitive leading edge manufacturers/suppliers capable of meeting their technical needs and schedule requirements ('local sourcing wherever practical and cost effective').

Strategic alliances — Primus has formed a number of strategic relationships with Australian and overseas based telecommunications and IT equipment providers; and also has partnerships with local and international

telecommunications carriers. Primus also anticipates that there will be opportunities for potential long-term strategic relationships with local suppliers of the following services: personal communication services; voice conferencing; voice mail; and guaranteed fax.

Research and development — Primus is committed to undertaking an ongoing software development program in Australia consistent with its overall business strategy and in response to demonstrated market needs. Its focus is on developing new or enhanced software at both the operating system level and specific application packages.

Export development — Primus intends to actively pursue opportunities in the Asia Pacific region to market its network design and engineering skills and services. Australia is the Primus regional telecommunications hub and export revenues will be generated from international services.

Employment and skills development — In 1996, Primus employed a staff of 67 in Australia. This has increased to over 200, and is expected to grow to at least 300 by end-1997 and possibly up to 800 by 2001. Primus has put in place a comprehensive program focusing on the development and upgrading of the skills/capabilities of its employees.

Omniconnect

Omniconnect was granted a carrier licence on 19 August 1997. It will provide metropolitan area networks (MANs), based on the latest Spread Spectrum radio technology, to allow access to the Internet via various ISPs, and inter-office communications. Details of its one-year IDP presented here are drawn from Omniconnect (1997).

Commercial relationships and procurement — Omniconnect has an agreement with Paclink Communications (an Australian company) for the supply of spread spectrum radio technology from Breeze Wireless Communications (an Israeli company). The following buyer seller arrangements are in place: Racon Inc. USA (for microwave equipment); Pacific Satellite (for antennas); and RF Industries (for cable and components). Omniconnect will subcontract installation services to Australian companies.

Overall, Omniconnect plans to spend around 25 per cent of its procurement expenditure on Australian products and services; and 75 per cent on specialised equipment from overseas.

Overseas business — Omniconnect's primary focus during the term of this plan is the domestic market.

Research & development — Omniconnect plan a trial for ‘voice over IP and videoconferencing’ within nine months of commencement as a carrier.

H VIEWS OF CARRIERS ON INDUSTRY DEVELOPMENT PLANS

H.1 Introduction

In this appendix, we examine some elements of benefits and costs associated with carriers' industry development plans (IDPs). The information was obtained by means of a survey, sent to carriers in mid-February 1998. A copy of the survey questionnaire is attached to this appendix. Some of the data obtained are used in appendix I.

In section H.2, the extent to which IDPs induce additional local activity among telecommunications equipment industries is examined. The main ways in which IDPs influence carriers' behaviour are canvassed in section H.3.

In section H.4, quantitative estimates of compliance costs are reported, together with information on the time taken to get IDPs approved.

Finally, in section H.5 a range of carriers' views are reported on the current IDP arrangements.

H.2 To what extent do IDPs induce additional local activity?

Framework

Some undertakings made in IDPs are frequently specified as quantitative targets, such as planned levels of expenditure on equipment, R&D and training; and the degree of local content in capital expenditure. For these areas of activity, information was sought from carriers on:

- the undertakings made in their current IDP; and
- what their intentions would be if no IDP were required.

In this framework, if there is no difference between carriers' undertakings in their IDPs and what they would have done anyway, it can be inferred that IDPs do not change carriers' behaviour and hence there is no inducement of additional activity. On the other hand, if carriers' undertakings exceed what they would otherwise have done, then we can conclude that extra activity has been induced by the requirement of carriers to have an IDP. Note that a carrier's intentions in the absence of an IDP might even exceed what it agrees to under

its IDP. Such would be the case if a carrier were intentionally conservative in making undertakings in its IDP, so as to be certain of achieving them.

Where undertakings are of a more qualitative nature — such as strategic relationships and export development — perceptions were sought from carriers on the importance of IDPs in terms of a four-point scale, ranging from 'no impact' to a 'major impact'.

The following carriers were surveyed:

- *the incumbents* — Telstra, Optus, and Vodafone; and
- *new entrants* — AAPT, Primus, Horizon, Omniconnect, United Energy, and Northgate.

Responses were received from all of the carriers surveyed.

Survey findings

Expenditure on equipment, R&D and training; local content

Overall, carriers perceived the impact of IDPs on their behaviour to be small. In the areas of activity where quantitative undertakings are frequently specified, it was found that:

- For all nine carriers, their IDP undertakings in relation to capital expenditure and training expenditure were the same as they would have been doing anyway.
- For seven of the nine carriers, their IDP undertakings in relation to the local content ratio for capital expenditure, and their R&D expenditure, were the same as otherwise.

The small number of cases reported where carriers' behaviour under IDPs was different from otherwise included:

- In one case, the local content of a carrier's capital expenditure was up to 5 percentage points higher in its IDP than otherwise, while another carrier reported that no local content target percentage would have been set in its normal course of business.
- One carrier reported that R&D expenditure in its IDP was around 60 per cent higher than otherwise, and for another carrier around 10 per cent higher.

Strategic alliances; export development

The IDP process appears to have some influence on carriers' decisions to form strategic commercial relationships — four of the nine carriers perceived the impact as being at least 'moderate' (table H.1).

However, the role of IDPs was less influential for export development — three of the nine carriers perceived them as having no impact on their undertakings in this area of activity, and a further five carriers reported the impact as only 'slight' (table H.1).

Table H.1: Influence of requirement to have an IDP

	No impact (No.)	*Slight impact (No.)*	*Moderate impact (No.)*	*Major impact (No.)*
Forming strategic commercial relationships	1	4	2	2
Export development	3	5	–	1

Source: IC Survey of carriers, 1998.

H.3 How do IDPs change carriers' behaviour?

As noted above, the impact of IDPs on carriers' behaviour and decision-making appears to be small. However, insofar as there is any impact, carriers were asked to indicate *in what ways* the requirement to have an IDP as a condition of licence influenced their behaviour in relation to local industry development (table H.2).

It appears that IDPs influence local industry development mainly by encouraging carriers to search out the capabilities of local industry, and to favour local suppliers where they have a competitive edge over alternative sources of supply — six of the nine carriers surveyed perceived IDPs to have either a 'slight' or 'moderate' impact in these areas.

Also, most carriers do not perceive that the need to go through an approval process with DIST encourages a greater commitment to local industry development — five of the nine carriers consider the approval process to have made no impact and one other carrier thought the impact to be 'slight'.

Finally, carriers generally indicated that IDPs do *not* lead them to pay a price premium for locally sourced equipment in order to encourage local industry

development — seven of the nine carriers reported this influence as having no impact.

Table H.2: Ways in which requirement to have an IDP influences carriers' behaviour

	Influence of formal IDP requirement			
	No impact (No.)	*Slight impact (No.)*	*Moderate impact (No.)*	*Major impact (No.)*
It encourages you to consult with local industry more, to find out about its capabilities	3	3	3	–
It encourages you to favour local sourcing in procurement decisions	3	2	4	–
It encourages you to be more willing to pay a premium for locally sourced equipment	7	1	1	–
It encourages a greater commitment to local industry because of the need to get the IDP approved by DIST	5	1	3	–

Source: IC Survey of carriers, 1998.

H.4 Costs associated with IDPs

Compliance costs

The IDP arrangements require a carrier to prepare an IDP and have it approved by DIST; make the IDP publicly available; and monitor achievements against IDP undertakings and report annually. The compliance costs estimated by carriers for their current (post-July 1997) IDPs are provided in table H.3, averaged separately across incumbents and new entrants.

It is clear that the compliance costs associated with IDPs are small, even for the larger incumbent carriers. While the IDPs of incumbents tend to be more substantial documents than those of most new entrants — and to that extent require greater input to prepare, make publicly available, and monitor — the associated compliance cost would represent only a very small proportion of carriers' overall operating expenses. The small magnitude of the compliance costs is likely to reflect the fact that IDPs are typically developed from carriers'

strategic business plans that they prepare anyway, and therefore represent only a relatively minor additional cost.[1]

Table H.3: Average compliance costs associated with IDPs

Element of IDP compliance cost	*Incumbents ($'000)*	*New carriers ($'000)*
Preparing IDP and gaining approval	58	17
Making IDP publicly available	30	2
Annual monitoring and reporting on progress	72	9

Source: IC Survey of carriers, 1998.

Across all nine carriers, the length of the period over which their IDPs are current ranges from one to five years. The plan period can also affect the size of compliance costs. For example, two of the small new carriers have one-year IDPs. Hence they will incur the costs associated with preparation and approval on more occasions than those carriers whose IDPs are current for longer periods.

Costs associated with approval delays?

If the process of getting an IDP approved were unduly long, this has the potential to impose costs on prospective new carriers by delaying their entry to the market and diverting key management from more critical issues.

Generally, the time taken for new carriers to have their IDP approved was fairly short — averaging one to two months (except in one case where the approval time was six months). But one new carrier whose IDP had taken two months to be approved reported that even this delay had imposed financial costs, while another reported that key staff had been diverted at a most inopportune time.

For the incumbent carriers, the average approval time was less than two months. For the incumbent that experienced the greatest delay, the main reason was the need to resolve issues of principle with DIST.

[1] However, one new carrier's estimate of the preparation costs of its IDP included the cost of its initial business plan, because that was the basis for its IDP. Insofar as the business plan would have been prepared anyway, the reported average cost of preparing IDPs for new carriers is biased upwards somewhat.

H.5 Carriers' views on IDP arrangements

Voluntary or compulsory IDPs for small carriers?

In the Draft Report, the Commission put forward the suggestion that IDPs be voluntary for smaller carriers. The survey of carriers conducted in mid-February sought views on this suggestion.

Of the nine respondents, five preferred the current arrangements of mandatory IDPs, three were in favour of the voluntary option for small carriers, and one was indifferent. Those who argued in favour of the status quo included views such as:

- IDPs should be either 'for all or none'.

Some carriers in favour of IDPs being mandatory for all qualified their view in the following ways:

- the size, scope and development commitments associated with IDPs should be related to characteristics of carriers, such as market share; and
- the contents of IDPs should be restricted to only those aspects required by the legislation.

Perhaps surprisingly, the smallest four carriers among the new entrants surveyed were equally divided between favouring the voluntary option and the status quo. The general view of carriers in favour of the current mandatory IDPs was that they had benefited from the IDP approval process with DIST, mainly in relation to helping them close some of the information gaps that potential new entrants face (such as local equipment manufacturers' capabilities).

On the other hand, those agreeing that IDPs should be voluntary for small carriers considered that it was very difficult for a small new carrier to make commitments at an early stage of market entry, particularly when the industry is changing so rapidly.

Another (large) carrier that favoured the voluntary option for small carriers considered that because IDPs of small carriers are likely to have very little impact on the local telecommunications equipment industry overall, they were essentially a waste of resources for the carriers concerned.

One carrier that was indifferent considered that a plan along the lines of an IDP would be part of the strategic business plan that a carrier would prepare anyway — so there would be little practical difference one way or the other.

Other views on IDPs

Carriers were asked whether they were in favour of IDPs continuing and, if so, whether they would recommend any changes to the current arrangements.

- seven of the nine carriers considered that IDPs should continue.[2]

Some of the carriers indicated they would like to see changes made along the following lines:

- IDPs should be less prescriptive, and confined to what is specifically required under the Telecommunications Act.
- IDPs should be more qualitative — because in an industry where technological change is occurring so rapidly, it is difficult to predict outcomes with reasonable accuracy.
- IDPs should not be subject to negotiation — the Telecommunications Act is clear on what is required.
- The length of the plan period should be voluntary within set ranges — for example, up to two years for new entrants, and five years for established players.

[2] It may be noted that this formal written survey response exceeded that which emerged from informal face-to-face meetings with the carriers.

INDUSTRY
COMMISSION

SURVEY OF CARRIERS' INDUSTRY DEVELOPMENT PLANS

Please read this first!

Question 1 asks how the undertakings made in your current IDP compare with what you would have done anyway (that is, your intentions if no IDP were required as a condition of gaining a carrier licence).

Where your IDP stipulates quantitative undertakings, please fill out columns 2 and 3 (column 4 can be left blank).

If your IDP does *not* stipulate quantitative undertakings for some of the activities listed, then please either:

(a) provide rough estimates, if possible, in columns 2 and 3 (column 4 can be left blank); or

(b) if you cannot provide these, indicate only in column 4 the approximate percentage difference (plus or minus) between what you have agreed to do under your current IDP and what you think you would do if no IDP were required.

1 How have IDPs influenced your activities in the following areas? Please compare what you have agreed to do over the life of your *current* IDP with what you would have done anyway (your intentions if no IDP were required).

1	**2** *What you have agreed to do over life of current IDP*	**3** *Your intentions if no IDP were required*	**4** *Difference*
Local content in capital expenditure	%	%	%
Capital expenditure	$million	$million	%
R&D expenditure	$'000	$'000	%
Training expenditure	$'000	$'000	%

2 How important an influence on your decisions in the following areas was the requirement to have an IDP approved?

	Influence of requirement to have an IDP			
	No impact	*Slight impact*	*Moderate impact*	*Major impact*
Forming strategic commercial relationships				
Export development				

If what you have agreed to do over the life of your current IDP differs from what you would have done anyway, go to question 3.

If you reported no difference between what you have agreed to do over the life of your current IDP and what you would have done anyway for all parts of question 1, and *No impact* to both parts of question 2, then go to question 4.

3 In what ways does the requirement to have an IDP as a licence condition *change* your behaviour in relation to local industry development?

	Influence of formal IDP requirement			
	No impact	*Slight impact*	*Moderate impact*	*Major impact*
It encourages you to consult with local industry more, to find out about its capabilities				
It encourages you to favour local sourcing in procurement decisions				
It encourages you to be more willing to pay a premium for locally sourced equipment				
It encourages a greater commitment to local industry because of the need to get the IDP approved by DIST				
Other (please specify) _____ _____				

4 Can you give estimates of the following costs associated with complying with the IDP requirements?

Element	*Cost ($)*
Initial preparation of IDP, and any subsequent modifications needed to obtain approval by DIST (mainly the time costs of staff)	
Making IDP publicly available (such as printing and distribution costs if applicable)	
Monitoring of IDP, and reporting on progress against commitments (report costs for 12 month monitoring period)	

5 How long did it take to get your current IDP approved? _____ months

Did this application/approval period impose any costs on you *other than* the time cost of staff (eg. delayed market entry, diverted key management from more critical issues)? If so, please explain the nature of them.

6 For what length of period is your IDP current? _____ year(s)

What length of period do you think is most appropriate? _____ year(s)

7 What is your view of the suggestion made in the Draft Report of allowing IDPs for smaller carriers to be voluntary?

8 Do you think that IDPs should continue? (tick relevant box)

☐ YES ☐ NO

9 Are there any changes you would like to see made to the nature of IDPs? eg. voluntary for all, negotiation process, type of plan (qualitative vs. quantitative), etc.

I ILLUSTRATING THE ECONOMIC IMPACT OF INDUSTRY DEVELOPMENT PLANS

In order to explore the possible economic impact of IDPs, the Commission undertook some conjectural calculations of the benefits and costs that might arise each year. Information from field visits, a survey of carriers (appendix I) and guesstimates were used to look at the possible magnitudes of the costs and benefits of IDPs for nine carriers. The advantages of such an approach are that it elucidates where benefits and costs can arise, suggests where critical data are required in any future evaluations, and could provide some clues about the bounds of net benefits.

Benefits?

IDPs may, in theory, have impacts on a number of different activities undertaken by carriers. We look at each in turn.

Alliances

Alliances are a mechanism for cooperation, risk spreading, and information exchange — and largely produce private gains to partners. Firms presumably decide only to enter relationships with others where they suppose there are net benefits to each party, and they reject relationships which do not produce such benefits. To that extent, a government intervention, such as IDPs, which encourages an alliance that would not otherwise have occurred, would produce net costs, not benefits. But there are two important caveats to this accounting.

First, alliance formation depends critically on information about prospective partners. As richer information becomes available, the number of genuinely beneficial alliances may grow. IDPs, by increasing intelligence about the capacities of telecommunications equipment suppliers in Australia, may therefore increase alliances. The benefits are private ones, but they need to be counted in cost–benefit analysis because they would not otherwise have been realised.

Second, alliances create many information connections between partners (about marketing, production technologies, R&D and management systems) which can be a conduit for broader spillovers. An increase in firm learning as a result of alliances, can pass beyond the boundaries of the cooperating firms as staff move to other firms.

Quite apart from determining the magnitude of benefits generated by alliances, there are difficulties in working out what causes alliances to be formed. There are multiple pressures for alliance formation. Each pressure, by itself, might not be sufficient to encourage the alliance. For example, IDPs and the PfD program are 'daisy-chained' programs, so that IDPs can sometimes relay their impacts through the PfD program. For this reason, we have to be careful not to double count any such relayed effects, just as we caution double counting of R&D dollars in the main report. Even so, IDPs have probably slightly increased the extent and nature of alliances in the telecommunications industry.

Tangible and intangible Investment

The survey of carriers (appendix H) suggests that no additional investment in physical capital or training took place as a result of IDPs. However, two carriers indicated impacts on their R&D expenditure. These may produce external benefits which should be counted as part of a cost-benefit analysis.

Output

Telecommunications services are still mainly sold domestically, and new carriers have primarily entered to service the Australian market. No carrier suggested that IDPs had had any impact on their *own* export orientation — so we ignore such possible impacts here.[1] We note that if IDPs did have an impact on exports, then, in the absence of any externalities from exports, this may actually represent a net cost not a benefit (see chapter 4).

The IDPs of the three carriers during the period 1992 to 1997 contained commitments in relation to local content. The new legislation does not explicitly contain local content obligations, perhaps because of concerns about compliance under the WTO (see chapter 8). The survey revealed that for only two carriers did IDPs probably lead to somewhat higher local content. As in the case of exports, such an induced expansion in local activity may involve a negative contribution to the economy, if it involves costly diversion of resources. We have not included any such costs in this assessment.

Information

IDPs may increase levels of intelligence about the capacities of local firms, and the operating environment.

[1] IDPs may have affected the export orientation of some of the carriers' suppliers (see table 6.1).

The Commission's survey results suggests that IDPs encourage carriers to look at the capacities of Australian suppliers, which they might otherwise overlook. This may increase the information base on which carriers make decisions. It may even enhance their competitiveness if they locally source components or software with technical or other advantages over alternative global suppliers. There may, therefore, be benefits if IDPs overcome biased perceptions about the nature of Australian telecommunications equipment suppliers. No carrier suggested that such benefits were substantial.

Signalling

Finally, IDPs may increase certainty about the investment environment by signalling the limits and nature of government intervention into the purchasing activities of carriers. IDPs require largely voluntary indications of what a carrier will do over a specified time and they impose no penalties for non-compliance once a plan is in place. Such arrangements may be perceived to be more 'hands off' than other possible regimes in place around the world (Northfield and Barr 1995) — and perhaps as a shield against worse possible policy actions.

Overall, strategic alliances, R&D, information, and signalling appear to be the mechanisms by which IDPs can generate benefits.

The costs

Compliance costs

There are indications that the costs associated with negotiating, preparing and disseminating the IDPs — and in reporting on progress in implementing the IDP — are relatively modest.

The absolute value of the fixed compliance costs associated with the smaller carriers is likely to be lower. Some of their plans have amounted to only a few pages[2] — and are the sort of documents customarily prepared as part of business strategic plans. On the other hand, the smaller carriers have signed plans for shorter durations[3], and so will have to re-negotiate and re-prepare plans sooner than most larger carriers. As well, the CEO or senior management is typically involved in IDPs for smaller carriers, whereas tasks can be delegated to middle management in the larger carriers. Using the data from the survey of carriers, we found that the total annual compliance burden was around $333 000

[2] For example, the publicly available versions of Omniconnect's IDP is only two pages long, and that of Primus is 8 pages long.

[3] For example, Omniconnect has a plan lasting only one year.

for the four biggest carriers and $70 000 for the five smallest ones. These calculations spread the fixed costs of preparing a plan and disseminating it over the life of the IDP.

Government administration costs

The Commission understands that DIST employs around five people in administration of IDPs (Senate Economics Legislation Committee 1997, p. E552). They undertake negotiation, information collection, advice to their minister, and monitoring. The overall funding provided by government for administering the plans is around $600 000 in 1997–98, rising to $870 000 by 2000–2001 DIST (1997g). These costs, while borne initially by government, will be recovered from license charges to carriers.

Distortions

There are two possible static sources of distortions from IDPs:

- they may lower private returns from R&D; and
- may lead to some marginal distortions from increased telecommunications prices. Such price increases may arise in order to finance the program compliance and administration burdens borne by the carriers, and to meet any cost disadvantages from induced output increases.

All effects are likely to be negligible, with the possible exception of R&D supply distortions. We examine them in order of their possible impact.

In a couple of instances, IDPs appear to induce some additional R&D (INDUCERD). Carriers (presumably) undertake R&D up to the point at which the marginal project just earns them a sufficient private rate of return. Extramarginal projects earn returns which are less than inframarginal projects. To find out how big these effects are, we first ask how big a proportional reduction in the required rate of return on R&D capital is needed in order to stimulate R&D by the amount we observe. This is:

$$\Delta P_i / P_i = \frac{\text{INDUCERD}_i}{(\varepsilon_R \times R_i)}$$

where R_i is the value of total R&D done by the ith carrier, and ε_R is the extent to which R&D responds to a change in its cost. If $\Delta P/P$ was, say 10 per cent, then this would mean that the last (marginal) project induced by IDPs earned a rate of return of 10 per cent less than the usual private return. However, the average reduction in the rate of return on extramarginal R&D is only half that. Accordingly the welfare loss is approximately:

$$DW_i = \frac{1}{2} \times \frac{\Delta P}{P} \times INDUCERD_i = \frac{1}{2} \times \frac{INDUCERD_i^2}{(\varepsilon_R \times R_i)}$$

The magnitude of the distortions for any given carrier, therefore, depends on the ratio of induced R&D to actual R&D (R) of the carrier. But the relevant value of R depends on the circumstances of the carrier. If there is little substitutability between R&D conducted by a given carrier in one country with that of the same carrier in another country, then it is appropriate to use the value of R&D conducted by the carrier in Australia as an estimate of R. If, on the other hand, there is high substitutability, then the relevant value of R is the global sum of R&D undertaken by the carrier. In this case, the overall distortions caused by encouraging a carrier to undertake extramarginal projects in one country are likely to be very small, even if the extra R&D represents a significant increase in R&D for that country. We have assumed high substitutability in the analysis which follows.

Second, if IDPs increase carriers' costs then this will presumably be reflected in their prices. This will, at the margin, produce the usual deadweight losses for consumers associated with what amounts to an implicit (but tiny) tax. However, given the massive scale of the operations of the carriers relative to any plausible costs of the IDP program, these deadweight losses must be negligible — and are ignored.

Net benefits

Using the information above, the Commission generated some estimates for the costs and benefits of IDPs in relation to possible impacts on R&D activity. Given the high degree of uncertainty over benefits, we examined the sensitivity of the results to different assumptions.

Table I.1: Conjectural R&D impacts of IDPs (spillover rate of 70 per cent) $'000

	Large carriers	*Small carriers*	*All firms*
	$'000	$'000	$'000
Compliance costs	333	70	403
Administration by DIST[a]	267	333	600
Distortions[b]	22	0	22
Total costs	622	404	1025
Benefits			
R&D	490	0	490
Other benefits (eg alliances, information)			
scenario 1[c]	1991	500	2491
scenario 2[d]	362	172	534
scenario 3[e]	0	0	0
Net benefits			
scenario 1	1860	96	1956
scenario 2	231	-231	-1
scenario 3	-132	-404	-535

a We presumed that costs could be roughly distributed equally between carriers, regardless of size.

b This is the sum of the distortions arising on the supply side due to R&D and the excess burden associated with raising the small amounts of finance necessary for government administrative expenses. The critical parameter used here is $\varepsilon_R = 0.5$.

c This is based on other benefits being equal to one dollar in every $10 000 of large carrier services, and one dollar in every $1 000 of small carrier services. We have assigned much higher values for other benefits per dollar of services for smaller carriers because they are more likely to value new information or alliances than larger carriers which have typically been operation in the market for some time.

d This is based on other benefits being equal to one dollar in every $55 000 of large carrier services, and one dollar in every $2 900 of small carrier services.

e This is based on other benefits being equal to zero.

In interpreting table I.1 we note that:

- If the only benefits were spillovers from R&D, then IDPs appear to generate net costs.
- There is a lot of imprecision in the results. The key factor determining the outcome is the assumption about the value of 'other' benefits. We assumed that IDPs produced some quantum of intangible benefits per dollar of telecommunications services — such as through information or

alliances. For scenario 1 we chose a quantum which seemed the highest feasible value. In doing this, we used the survey responses, weighted by the size of the carrier, to look at some of the intangible benefits of IDPs. For scenario 2, we asked the following question: what would that quantum have to be in order to give approximately zero net benefits? Finally, for scenario 3, we chose the most pessimistic outcome — zero 'other' benefits.

- The worst outcome is not very bad — a loss of about $535 000 per year.
- Given our scenarios, the best outcome is about $1.95 million per year, which is not very good either. This represents only a tiny fraction of aggregate sales of telecommunications services. Even quite small changes in the productivity of telecommunications services would yield much bigger gains for Australians.
- It should not be thought that the most likely outcome is the average of scenario 1 and 3. We simply do not know.
- The larger carriers appear to drive the results — they account for the lion's share of the market for telecommunications services, and the effects on R&D are zero for the smallest carriers.
- The illustrative tables reveal that, other than scenario 1, the net benefits would have been greater had small firms been exempted from the IDP requirement. This reflects the greater significance of costs for smaller firms relative to benefits.
- We have used a relatively high spillover rate of 70 per cent. If the spillover rate were 30 per cent, then our calculations show that only scenario 1 produces net benefits.

In looking at the costs of the IDPs, possible dynamic distortions (as discussed in chapter 6) associated with entry deterrence have been ignored. These costs relate mainly to small, new carriers. Some account of these possible dynamic effects would tend to make the net losses associated with IDPs for smaller firms somewhat greater in absolute magnitude.

The calculations have been undertaken for only nine carriers. It is expected that more (smaller) carriers will enter in the next few years. This will tend to push up the overall compliance burdens and administrative costs associated with IDPs.

As well, the possibility of a net benefit from the program hinges on the benefits derived from induced changes in information and alliances. However, as the carrier market structure matures in the wake of the 1997 de-regulation of telecommunications carrier services, these gains will be reduced. This is because, in the longer run, there is likely to be:

- less new entry of carriers;
- an array of strategic alliances with indigenous suppliers in place amongst existing carriers or their multinational suppliers, with less capacity for more to be negotiated; and
- little ignorance amongst carriers about the capabilities of Australian producers.

In the longer run, therefore, it is likely that the program will generate net costs — simply through its compliance burdens — suggesting that it should be temporary.

J SUMMARY RESULTS OF THE BIE SURVEY ON PFD/FTA PROGRAMS

In chapter 7, the main features of the Partnerships for Development (PfD) and Fixed Term Arrangement (FTA) programs were described, and some insights provided into their operation and effectiveness. A detailed evaluation was carried out by the Bureau of Industry Economics in 1994 (BIE 1994a). In this appendix, we report some of the key findings from that study, with particular focus on the telecommunications equipment industries.

The BIE conducted a number of face-to-face and mail-out surveys of information technology and telecommunications (IT&T) firms as part of its evaluation of the PfD/FTA programs. The following summary is based on survey returns from 32 PfD and FTA companies which were in the programs at the time of the evaluation. It also includes information obtained through survey returns from local IT&T firms (non-partners).

Tables J.1 and J.2 show the expected impact on partners' activities in 1997–98, if the program were to cease in 1992–93. Table J.3 demonstrates the value (and the inducement rate) of technical knowledge and knowhow transferred from parent companies, while table J.4 identifies the cost and price increases due to the program. Finally, tables J.5 and J.6 depict some impacts of the PfD/FTA programs on indigenous firms.

The survey findings suggest that the amount of induced activity under the programs appear to be relatively great compared to the costs. For example, the BIE inducement and cost data imply that in 1996 the PfD/FTA programs generated an increase in local activity (exports, production for domestic sales and R&D) of 9.8 per cent (or $292 million) at a cost of $13.3 million. The implied subsidy rate is 13.3/292 = 4.6 per cent.[1] This implies that for every 10 per cent of subsidy, activity increased by around 22 per cent.

The BIE survey is a useful tool for assessing the impact of the arrangements. However, as in all such surveys it suffers from a number of limitations, which should be borne in mind when interpreting the results:

- Partners who value the PfD/FTA programs because they increase the influence of the local affiliate, may have incentives to underestimate the costs and exaggerate the induced activity. It is difficult to remedy such

[1] The subsidy rate is the costs relating to induced activity over the value of induced activity.

strategic responses unless there is substantial probing, corroboration and careful framing of questions.

- The BIE requested information on the costs imposed by the programs as percentages of total costs. This can be a highly problematic measure. For example, suppose that a firm sells $300 million worth of products to carriers and government. Say that the partnership agreement induces another $10 million of local production, but that domestic production and other costs are 50 per cent more than imports (ie local cost is $10 million, imported cost is $6.66 million). The cost to the partner is $3.3 million or only 1.1 per cent of total sales. In such percentage terms this appears next to nothing — and it may be reported as such. It is better in designing such surveys to discern what the induced activity is, and then to discover if there is any cost disadvantage associated with that activity.
- It is difficult to design surveys where the information sought is complex, subjective or may elicit strategic answers from respondents — characteristics which describe the information sought by the BIE survey. For example, different people in an organisation (the accountant, the government PR spokesperson, the CEO or the purchasing manager) have different perspectives which are difficult to control for.
- The survey results for indigenous firms (non-partners) are based on a small sample (covering an estimated 26 per cent of sales of these firms).
- Finally, such surveys can only obtain information about the possible effects firm-by-firm. Aggregate industry-wide effects may differ from the sum of these individual effects. And the economy-wide effects depend on the extent to which resources are displaced from other activities yielding spillovers.

Table J.1: Impact of PfD/FTA program discontinuation on partners' annual sales, exports, R&D and employment, 1997–98 (percentage)

	Annual sales	*Annual exports*	*Expenditure on R&D*	*Number employed*	*Ratio of employment effect to sales effect*[a]
	%	%	%	%	ratio
IT firms	-5.2	-23.2	-32.4	-3.0	0.58
TE firms	-7.6	-21.3	-16.5	-5.9	0.78

a This provides an indication of the extent to which the expansion in sales represents increases in local content.
Source: BIE 1994a, Appendix 8, p. 221.

Table J.2: Impact of PfD/FTA program discontinuation on partners' purchases from local component suppliers and sub-contracted R&D on hardware and software 1997–98 (percentage)

	Local electronic components	*Local non electronic components*	*Locally sub-contracted R&D on hardware*	*Locally sub-contracted R&D on software*
	%	%	%	%
IT firms	-32	-10	-48	-49
TE firms	-21	-12	0	-4

Source: BIE 1994a, Appendix 8, p. 222.

Table J.3: Impact on flows of knowhow from parent companies to Australian subsidiaries

	IT	*TE*
Median value of technical knowledge and know-how transferred ($m)	25.0	34.5
Induced by program ($m)	5.0	15.7
Inducement rate (%) [b]	20.0	45.5

a These data were based on assessments by the partners — not the indigenous firms.

b Defined as the value of R&D induced by the program over the total value of knowhow transferred.

Source: BIE 1994a, Appendix 8, p. 225.

Table J.4: Impact on costs and prices of products of the PfD/FTA programs

	TE			*IT*		
Impact on prices/costs	*Lower estimate*	*Higher estimate*	*Average*	*Lower estimate*	*Higher estimate*	*Average*
Impacts on costs (%)	0.3	0.6	0.45	0.6	1.6	1.1
Impact on prices of government agencies (%)	0.0	0.3	0.15	0.2	0.6	0.4
Impact on prices of other domestic customers (%)	0.1	0.2	0.15	0.0	0.1	0.05

Source: BIE 1994a, Appendix 8, pp. 223–224.

Table J.5: Views of the indigenous IT&T firms about PfD/FTA programs[a] (percentage)

	TE hardware		*IT Hardware*		Software/services	
	Agree	Disagree, ambivalent or don't know	Agree	Disagree, ambivalent or don't know	Agree	Disagree, ambivalent or don't know
	% of firms	% of firms	% of firms	% of firms	% of firms	% of firms
Discontinuation could seriously affect the business	17	83	44	56	18	82
Program should be continued	33	67	89	11	60	40
Other government R&D/export programs had a larger effect	50	50	36	64	57	43

a The number of respondents was 18 for IT firms and 6 for TE firms.

Source: BIE 1994a, Appendix 9, pp. 234–35.

Table J.6: Estimated value of technology transfer to indigenous firms in terms of increased sales (over 1990 to 1993)

Types of knowledge	*IT hardware*		*TE hardware*	
	Value $m	*% of sales*	*Value $m*	*% of sales*
Product	17.2	5.1	0.0	0.0
Market	3.0	0.9	3.9	2.0
Quality control	9.2	2.7	0.0	0.0
Total	29.4	8.7	3.9	2.0
Reduction in costs due to process knowledge transferred		0.4		0.0

Source: BIE 1994a, Appendix 9, p. 233.

K INTERNATIONAL AGREEMENTS

K.1 Introduction

This appendix provides details of five WTO international agreements that have possible implications for Australia's trade in telecommunications equipment, systems and services:

- Agreement on Trade in Services (the GATS);
- Agreement on Basic Telecommunications;
- Agreement on Information Technology (the ITA);
- Agreement on Government Procurement (the AGP); and
- Agreement on Trade Related Investment Measures (TRIMS)

It also provides information about APEC telecommunications initiatives and working groups.

K.2 The WTO General Agreement on Trade in Services (the GATS Agreement)

The importance of the GATS for telecommunications lies in both the general obligations imposed by the Agreement, and its telecommunications specific components. The key elements of the GATS are set out in box K.1.

Restrictions on foreign direct investment (termed commercial presence) are covered by the Agreement, and make the GATS more extensive than the GATT in this area.

The obligations of market access (see box K.2) and national treatment set out in the Agreement are not general. They apply only to the service industry segments which the member nation has included in its individual schedule of commitments.

Each nation lists the industries and sub-industries that will be subject to market access and national treatment provisions. It also lists the measures that will be kept in place for those industries which violate those provisions. Details under each industry listing are given specifically for each of four modes of supply:

- *cross-border supply* in which neither the producer nor the consumer moves physically, interacting instead through a postal or a telecommunications network;
- *consumption abroad*, where a consumer moves temporarily to a supplier's country of residence;
- *commercial presence*, where a commercial organisation moves to the consumer's country of residence; or
- *presence of natural persons* where an individual service supplier moves temporarily to the consumer's country of residence.

Box K.1: The GATS and the WTO

As a formal legal instrument the GATS consists of two parts: (1) the articles and annexes which contain obligations, disciplines, exceptions and definitions and (2) members' schedules which contain market access and national treatment commitments on specific services.

The obligation not to discriminate among Members, which is called most favoured nation (mfn) treatment, is, as in the GATT, the linchpin of the Agreement, giving it a truly multilateral character rather than that of a repository for bilateral arrangements. The commitments in the services schedules, like those in schedules of tariff concessions on goods, are legally bound contractual obligations of Members to guarantee specified levels of liberalisation to their trading partners.

The working structure of the WTO, which was created by the final Agreement of the Uruguay Round (April, 1994) to be custodian of the multilateral trade system, consists of a General Council with three subsidiary councils on goods, services and intellectual property rights, together with a single Dispute Settlement Body to deal with all matters under the aegis of the WTO.

Source: Lee Tuthill, *Users' Rights? The Multilateral Rules on Access to Telecommunications*, *Telecommunications Policy*, vol. 20, no. 2, pp. 89–99, 1996.

As well as specific industry commitments, countries also make *horizontal* commitments. These usually consist of a listing of laws and regulations that impede a particular mode of international service supply irrespective of the industry involved. Common examples include immigration restrictions and general foreign investment limitations.

Telecommunications under the GATS

Under the GATS, industries are defined with reference to a modified United Nations Central Product Classification (CPC). In telecommunications, the

standard list of 14 telecommunications services was split into two groups (see table K.1). The first group is generally referred to as basic telecommunications, the latter as value added telecommunications.[1] In practice the distinction between basic and value added telecommunications is not always that clear and tends to vary across regulatory environments (Warren 1997).

Table K.1: Basic and value added telecommunications services as defined under the GATS

Basic telecommunications	*Value added telecommunications*
Voice telephony	Electronic mail
Packet switched data transmission	Voice mail
Circuit-switched data transmission	On-line information and data base retrieval
Telex	Electronic data interchange
Telegraph	Enhanced/value added facsimile services, including store and forward, store and retrieve
Facsimile	Code and protocol conversion
Private leased circuit services	On-line information and/or data processing (including transaction processing)

During the final stages of the Uruguay Round negotiations it became clear that most members would limit their offers to include telecommunications in the GATS to *value added* telecommunications services. Of the 125 countries that eventually signed onto the GATS at the conclusion of the Uruguay Round (April, 1994) some 60 made commitments on telecommunications services. However, of that 60 only 8 made commitments on basic telecommunications (IC 1997d, p. 68). Consequently it was not possible to include basic telecommunications in the GATS as signed at the end of the Uruguay Round. However, an Annex on negotiations on basic telecommunications was agreed, and a process developed to move towards an agreement.

[1] For example, the Telecommunications Annex of the GATS adopts a functional definition of basic telecommunications using examples from the CPC list.

Box K.2: GATS Article XVI, Market Access

1. With respect to market access through the modes of supply identified in Article I, each Member shall accord services and service suppliers of any other Member treatment no less favourable than that provided for under the terms, limitations and conditions agreed and specified in its Schedule.[2]

2. In sectors where market-access commitments are undertaken, the measures which a Member shall not maintain or adopt either on the basis of a regional subdivision or on the basis of its entire territory, unless otherwise specified in its Schedule, are defined as:

   (a) limitations on the number of service suppliers whether in the form of numerical quotas, monopolies, exclusive service suppliers or the requirements of an economic needs test;

   (b) limitations on the total value of service transactions or assets in the form of numerical quotas or the requirement of an economic needs test;

   (c) limitations on the total number of service operations or on the total quantity of service output expressed in terms of designated numerical units in the form of quotas or the requirement of an economic needs test;[3]

   (d) limitations on the total number of natural persons that may be employed in a particular service sector or that a service supplier may employ and who are necessary for, and directly related to, the supply of a specific service in the form of numerical quotas or the requirement of an economic needs test;

   (e) measures which restrict or require specific types of legal entity or joint venture through which a service supplier may supply a service; and

   (f) limitations on the participation of foreign capital in terms of maximum percentage limit on foreign shareholding or the total value of individual or aggregate foreign investment.

Source: General Agreement on Trade in Services, GATT Secretariat 1993.

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[2] If a Member undertakes a market-access commitment in relation to the supply of a service through the mode of supply referred to in subparagraph 2(a) of Article I and if the cross-border movement of capital is an essential part of the service itself, that Member is thereby committed to allow such movement of capital. If a Member undertakes a market-access commitment in relation to the supply of a service through the mode of supply referred to in subparagraph 2(c) of Article I, it is thereby committed to allow related transfers of capital into its territory.

[3] Subparagraph 2(c) does not cover measures of a Member which limit inputs for the supply of services.

K.3 The WTO Agreement on Basic Telecommunications

On 1 February 1997, the WTO concluded nearly three years of negotiations on GATS schedules of commitments on liberalisation for basic telecommunications. The various commitments came into force on 5 February 1998.

The agreement comprises commitments by 69 countries (contained in 55 schedules) which are annexed to the Fourth protocol of the GATS. Offers made under the agreement are binding and disputes between countries can be taken to the WTO dispute resolution panel.

The WTO agreement covers the provision of telecommunications services involving simple transmission such as voice, facsimile and data transmission (but not value added services which were covered at the 1994 Uruguay Round Agreement) including supply of international and domestic services on a facilities basis and through resale.

As a result of the agreement, basic telecommunications services are covered by the provisions of the General Agreement on Trade in Services (GATS). This ensures that market access is transparent and available on terms and conditions that are reasonable and non-discriminatory.

Because GATS provisions aim at progressive liberalisation, governments can maintain certain restrictions on their commitments, as long as these are listed on their schedules. One such restriction involves limits on foreign equity participation.

In addition, to ensure that market access is fair in practice, most countries agreed to a set of telecommunications specific regulatory principles called the ‘Reference Paper’ which is to be used as a guideline for future commitments.

The Reference Paper deals with competition safeguards, interconnection guarantees, licensing and the independence of regulators. It provides information on universal service rules to ensure that universal service obligations do not reduce competition; public availability of licensing criteria; and rules for the allocation and use of scarce resources such as limits on foreign equity participation in the radiofrequency spectrum.

The Regulatory Principles provide transparency that market access and non-discrimination commitments which governments are willing to make can be fulfilled in practice so that telecommunications services suppliers can confidently enter markets.

Australia's WTO commitments on basic telecommunications

The commitments made by Australia during the negotiations on the WTO Agreement on Basic Telecommunications were the introduction of the 1997 telecommunications regime, the sale of one-third of the government's equity in Telstra, no limits on total foreign equity in Optus and finally the removal (after 30 June 1997) of restrictions on the primary supply of satellite services to two service providers, and on the primary supply of public mobile cellular telecommunications to three service providers (table K.2).

K.4 The WTO Agreement on Information Technology (ITA)

Attempts to negotiate an agreement on information technology products was a major focus of the WTO's first Ministerial meeting in Singapore on 9–13 December 1996. Agreement was finally reached after intensive bilateral discussions between the US and the EU. It was unveiled at the conclusion of the Singapore meeting as the 'Ministerial Declaration on trade in Information Technology Products'. Twenty eight countries, including Australia, signed on.

But the Singapore Accord required more countries to join on a broad product basis in order to reach the 90 per cent of world trade threshold considered necessary before an agreement could be finalised. After a number of South-East Asian nations agreed to join, the ITA was formally launched on 26 March 1997.

The ITA is designed to provide fair and competitive duty-free access to each WTO member's markets in information technology products. It will substantially reduce tariffs imposed on equipment essential to the growth of the telecommunications industry and has the potential to facilitate opportunities for Australian firms to access new markets or compete more effectively in overseas markets where they already have a presence, as well as reinforce the pro-competitive gains flowing from the ongoing deregulation in national telecommunications markets.

The key element of the ITA is that signatories have agreed to phase out all tariffs and other charges on information technology products over the period from 1 July 1997, concluding on 1 January 2000.

The phase-out is to be implemented on a most favoured nation basis (applied to all WTO members). Most countries within Australia's region have joined the Agreement, including Japan, Singapore and Taiwan. The ITA covers a wide range of products including telecommunications products, though not consumer electronics (see box 8.2 in chapter 8).

Table K.2 Australia's GATS schedule of specific commitments for basic telecommunications

Sector or sub-sector	*Limitations on market access*	*Limitations on national treatment*	*Additional commitments*
Telecommunications services (a) Voice telephone services (b) Packet-switched data transmission services (c) Circuit-switched data transmission services (d) Telex services (e) Telegraph services (f) Facsimile services (g) Private leased circuit services (o) Other Digital Cellular services Paging services Personal Communications Services	(1) None (2) None (3) Primary supply of satellite services limited to two service providers (licensed general carriers) until 30 June 1997. Primary supply of public mobile cellular telecom services limited to three service providers (licensed mobile carriers) until 30 June 1997. The Government has introduced legislation aimed at implementing an unlimited number of basic telecom carrier licences from 1 July 1997 and no sector specific foreign equity limits for new carriers. Australia binds itself to the outcome of this Parliamentary process in terms of numbers of carrier licences and foreign equity applying to new carrier licences. An entity holding a new carrier licence must be a public body or a constitutional corporation under Australian law (4) Unbound except as indicated in horizontal section	(1) None (2) None (3) None (4) Unbound except as indicated in horizontal section	A reference paper on regulatory principles is incorporated as additional commitments by Australia

Modes of supply: 1) Cross-border supply; 2) Consumption abroad; 3) Commercial presence; and 4) Presence of natural persons.

Source: GATS 1997.

K.5 The WTO Agreement on Government Procurement (AGP)

A revised WTO Agreement on Government Procurement came into force on 1 January 1996. The AGP is a plurilateral agreement — its disciplines apply only to those WTO members that choose to sign it.

A Code on government procurement was negotiated by some GATT members during the Tokyo Round of the GATT in 1979. The successor to the Code, the AGP, entered into force on 1 January 1996. Twenty three nations are members of the AGP including all the countries in the EEC, Japan, the US, Canada, Korea and Israel. Singapore, Hong Kong and Taiwan have applied for membership. Australia is not a signatory.

The AGP's objective is to contribute to trade liberalisation by eliminating discrimination against and between foreign products, services and suppliers. To pursue this objective the AGP sets rules to ensure the transparency of laws and practices and prescribes certain purchasing procedures.

The AGP covers purchases of goods, services and construction services by nominated entities at the central and sub-central (state) level and by utilities or government business enterprises, in each case above specified monetary thresholds. Thresholds vary depending on the level of government, nature of the requirement and nature of the purchasing entity, but are in the following approximate range:

- Central government, $A260 000.
- Sub-central government, $A400 000 – $A710 000.
- Utilities/GBEs, $A710 000 – $A900 000.
- Construction, $A10 million – $A30 million.

The Agreement is based on the principles of national treatment, non-discrimination and transparency in the tendering process. It does allow, however, for discrimination against suppliers from countries which have not signed ('Conditional Most Favoured Nation').

An important obligation under the AGP is to provide legal mechanisms that allow private firms to take action in domestic courts where there is violation of the AGP.

The scope of the AGP is very wide, applying to any law, regulation, procedure or practice regarding any procurement by entities covered by the Agreement. But the entities so covered are then subject to the rules and disciplines of the AGP with respect to their procurement of goods and services only if:

- the value of the procurement exceeds certain specified thresholds; and

- the goods or services are either specifically included or not exempted from the coverage of the Agreement.

Large variations exist in the thresholds across different types of entities. The only common threshold is for goods and services (excluding construction services) procured by central government entities. Generally, the thresholds are higher at the sub-central government entity level than the central government entity level, and higher again for other entities which procure in accordance with the Agreement.

Also, the Annexes of particular individual signatories may specify higher thresholds for particular members of the AGP in an attempt to ensure reciprocity and many parties to the Agreement have made explicit derogations of the commitments that are contained in their annexes to ensure reciprocity of access to other signatory country goods, services, and/or entities.

In the case of goods, the AGP's coverage is complete unless specified otherwise in an Annex. So a negative list approach is used to determine the coverage of the AGP for procurement of non-defence related goods by scheduled entities.

K.6 The Agreement on Trade Related Investment Measures (TRIMS)

TRIMS are measures employed to compel or induce MNEs to meet certain targets in relation to their domestic investment. TRIMS includes measures which impose local content requirements, and 'trade-balancing requirements' (measures which restrict the volume or value of imports an enterprise can purchase or use to an amount related to the level of products it exports).

The Agreement was signed at the conclusion of the Uruguay Round in April 1994 and provides that no contracting party shall apply any TRIM inconsistent with the Article 3 of the GATT 'national treatment' and Article 11 'prohibition of quantitative restrictions'.

The 'National Treatment' obligation of non-discrimination between like domestic and imported products is wide ranging in scope. It covers all forms of taxation other than tariffs and any other measure affecting the internal sale, purchase and distribution of competing domestic and imported product on the domestic market.

Article 3 of the GATT specifically provides that any of the above measures should not be applied in a way so as to afford protection to like product of domestic origin and that like imported product should be afforded 'treatment no less favourable' than that applied to the product of domestic origin in relation to

all laws, regulations and requirements affecting sale, purchase, transportation, distribution or use.

Specifically, TRIMS disciplines prohibit the following:

- measures which are mandatory or enforceable under domestic law or under administrative rulings, or compliance with which is necessary to obtain an advantage, and which require:
  - the purchase or use by an enterprise of products of domestic origin or from any domestic source, whether specified in terms of particular products, in terms of volume or value of products, or in terms of a proportion of volume or value of its local production; or
  - that an enterprise's purchases or use of imported products be limited to an amount related to the volume or value of local production that it exports.

According to DFAT, TRIMS obligations do not preclude measures such as enforceable undertakings in respect of the establishment of production or R&D facilities, or other targets which do not restrict the purchase or use of imported products, or specific commitments on R&D activity (DFAT 1997b, p. 3). Countries must notify the WTO of any TRIMS and a timetable for their phasing out. Australia did not make any notifications (DFAT 1997b, p. 4).

K.7 Developments in APEC

Although APEC is essentially a system of mutual cooperation, not a rules based system such as the GATT/WTO, it has proven an important forum for cooperation to achieve trade liberalisation in the region and has been used by Australia as a complement to multilateral negotiations (Commonwealth of Australia 1997b, p. 35)

Trade reform in telecommunications has been an important part of APEC's activities since the first Ministerial Meeting on the Telecommunications and Information industry in Seoul in May 1995.

The second Ministerial meeting held in Australia in 1996 resulted in the Gold Coast Declaration in which APEC Ministers responsible for the telecommunications and information industry re-affirmed the importance of telecommunications and information infrastructure in the Asia-Pacific region and the importance of cooperative efforts among APEC economies to develop an Asia-Pacific Information Infrastructure.

The Meeting also emphasised the contribution of the APEC Telecommunications Working Group (TEL WG), which provides a continuing

mechanism for the development of concrete policy proposals to support telecommunications cooperation. One important project is the work of a task force in developing a model mutual recognition agreement on Conformity Assessment of telecommunications equipment. APEC Ministers have set a target date of 1998 for the completion of the mutual recognition agreement, with implementation completed by mid 1999.

L COOPERATIVE RESEARCH CENTRES

Telecommunications CRCs

There are a number of CRCs working on areas relevant to telecommunications equipment producers. Indeed with the convergence of telecommunications and computing, all of the IT&T CRCs can be viewed as being relevant to telecommunications. Those directly involved in research into improved telecommunications equipment and technologies are:

- the CRC for Broadband Telecommunications and Networking (BTN-CRC);
- the new CRC for Satellite Systems (SS-CRC), which incorporates part of the Institute for Telecommunications Research (ITR); and
- the Photonics CRC.

CRC for Broadband Telecommunications and Networking

The BTN-CRC was established in July 1993 as an unincorporated collaborative venture involving four core partners. The core partners which together make up the CRC are: Curtin University's Australian Telecommunications Research Institute (ATRI), Edith Cowan University's Department of Computer and Communications Engineering (ECU), ERG Telecommunication Pty Ltd (ERGT), and the University of Western Australia. The CRC partners also work with QPSX, NEC, CSIRO and DSTO and Magellan Group Limited. The centre was incorporated as BroadCom Pty Ltd in December 1996. In 1996 the centre was composed of 52 research staff and 28 postgraduate students. Its annual expenditure in 1995–96 was $4.9 million, of which $0.7 million (14 per cent) was from industry (BTN-CRC 1996).

The BTN-CRC conducts research into: broadband integrated services digital networks (B-ISDN) for customer premises; digital signal processing (DSP) for wireless systems; and video DSP techniques (BTN-CRC 1996).

CRC for Satellite Systems

The establishment of SS-CRC was announced in late 1997. Its core partners will be the CSIRO Office of Space Science (COSSA), the ITR (the major communications partner), Queensland University of Technology, University of Newcastle, Auspace Ltd and Vipac Ltd.

The goals of the CRC are to undertake R&D into space science, communications, remote sensing and satellite systems, with the aim of enabling Australian industry to take advantage of commercial opportunities in providing services arising from satellite systems. Within five years the CRC intends to undertake a million dollars of research into small satellite subsystem design and in the delivery of new communications, position location and emergency services for users in remote locations. Within seven years they intend to become involved in multi-national experimentation with constellations of small satellites and to develop new commercial and scientific services for the Asia-Pacific region.

The ITR, which was established in 1984, is a research institute attached to the University of South Australia. It conducts research into satellite, terrestrial and defence mobile communications systems. In 1996 its total research funding was $3.4 million, of which $1.8 million was contributed by industry (52 per cent). In 1996 its activities were undertaken by 44 researchers and 38 postgraduate students (ITR 1996). It consists of four centres:

- Satellite Communications Research centre: a Space Industry Development Centre for commercially targeted research and product development of satellite communications and space-related signal processing. The centre is supported by the Australian Space Office on a dollar-for-dollar basis to match funding from Australian industry.
- Mobile Communications Research Centre: a centre for research into personal mobile communication systems and digital cellular networks. The principle sponsor is the Telstra Research Laboratories, Melbourne.
- Defence Information Systems Centre: a centre for research into telecommunications and information systems, with particular emphasis on defence applications. The principal sponsor is the Communications Division, Defence Science and Technology Organisation, Salisbury, South Australia.
- Telecommunications Systems Engineering Centre: a centre for research into methods, techniques and computer aided tools for the specification and analysis of distributed systems and concurrent processes (ITR 1996).

Photonics CRC

The Photonics CRC, which is the largest CRC, is an unincorporated collaborative venture established in 1992. The CRC's core partners are the Australian National University, CSIRO (Division of Applied Physics), Electricity Transmission Authority (TransGrid) FibreNet Pty Ltd, Siemens Ltd, Telstra Corporation Ltd as well as the Universities of New South Wales, Melbourne and Sydney. In 1996 the CRC consisted of 142 researchers (who

contributed 78.45 person years of effort to the centre) and 71 postgraduate students. In 1995-96 its expenditure (cash and in-kind) was $18.4 million. The industry contribution to the Photonics CRC has been around 15 per cent (Photonics CRC 1996).

The Photonics CRC conducts research into development of materials, components and fabrication techniques for photonic and electro-optic telecommunications systems. It also conducts research into the fabrication of optical fibres designed for different applications. One area of particular interest is the development of optical devices designed to be used to construct Wavelength Division Multiplexing (WDM) systems. WDM is the transmission of information in an analogue optical form — that is using different frequencies of light (ie different colours) to carry information. The installation of WDM equipment would allow the transmission capacity of current fibre links to be dramatically increased (Photonics CRC 1996).

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