International Benchmarking of Australian Telecommunications Services

PRODUCTIVITY COMMISSION

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The Productivity Commission

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FOREWORD

Benchmarking of key infrastructure industries such as telecommunications services, where government has played an important role, provides essential information by which to judge whether services central to the well-being of Australians are being supplied at internationally competitive prices.

This benchmarking study is part of a continuing program of research into the performance of economic infrastructure industries, which was commenced by the Bureau of Industry Economics. It is the third Telecommunications Services report in the cycle.

The study builds on the two previous studies, by benchmarking residential as well as business telecommunications prices and expanding on the number of services considered. To do this, the Commission further developed the price comparison methodology. Regulatory arrangements were also examined for the first time, to help in the interpretation of price differences between Australia and other countries.

The study was undertaken within the Economic Infrastructure Branch of the Commission. An officer of the Communications Research Unit (formerly part of the Bureau of Transport and Communications Economics) was seconded to assist with the price comparisons.

The study could not have been completed without the active co-operation of many participants in the sector, who either assisted the Commission directly or provided information to its consultant, Eurodata. We are grateful to all those who took part.

The Commission welcomes further feedback on this report, consistent with its objective to improve the information base on key issues affecting Australia’s economic performance and community living standards.

Gary Banks

Chairman

March 1999

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APPENDICES

ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACA	Australian Communications Authority
ACCC	Australian Competition and Consumer Commission
ACD	Agreed Commitment Date
ACIF	Australian Communications Industry Forum
ADSL	Asynchronous Digital Subscriber Line
AMPS	Advanced Mobile Phone System
ANSI	American National Standards Institute
ANZSIC	Australian and New Zealand Standard Industry Classification
AOTC	Australian and Overseas Telecommunications Corporation Ltd
APLDS	Alternate Providers of Long Distance Service
APO	Australian Post Office
ART	Autorite de Regulation des Telecommunications (France)
ASR	Answer Seizure Ratio
ASX	Australian Stock Exchange
AT&T	American Telephone and Telegraph
ATM	Asynchronous Transfer Mode
AUSTEL	Australian Telecommunications Authority
BIE	Bureau of Industry Economics
BISDN	Broadband Integrated Services Digital Network
BNS	Business Network Services
bps	Bits Per Second
BT	British Telecom
BTCE	Bureau of Transport and Communications Economics
CAN	Customer access network

CATV	Community Antenna Television
CBR	Constant Bit Rate
CDMA	Code Division Multiple Access
CIR	Committed Information Rate
CPE	Customer Premises Equipment
CPI	Consumer Price Index
CRS	Computer Reservation Systems
CRTC	Canadian Radio-Television and Telecommunications Commission
CSG	Customer Service Guarantee
CSO	Community Service Obligation
DDS	Digital Data Service
DG	Director-General
DoCA	Department of Communications and the Arts
DoCITA	Department of Communications, Information Technology and the Arts
EC	European Commission
ECPR	Efficient Components Pricing Rule
EDI	Electronic Data Interchange
EFT	Electronic Funds Transfer
EFTPOS	Electronic Funds Transfer at Point of Sale
ETNS	European Telephony Numbering Space
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission (US)
FMO	Future Mode of Operation
FTC	Fair Trading Commission
GDP	Gross Domestic Product
GDP PI	Gross Domestic Product Price Index
GEO	Geostationary Orbit

GFCF	Gross Fixed Capital Formation
GII	Global Information Infrastructure
GSM	Group Speciale Mobile
HFC	Hybrid Fibre Coaxial
Hz	Hertz
IC	Industry Commission
IDD	International Direct Dialling
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ITU	International Telecommunications Union
IVR	Interactive Voice Response
IXC	Inter-Exchange Carrier
KDD	Kokusai Densin Denwa Co
KSO	Kiwi Share Obligation
LAN	Local Area Network
LATA	Local Access Transport Area
LEC	Local Exchange Carrier
LEO	Low-Earth Orbiting Satellite
LRIC	Long-Run Incremental Cost
MFJ	Modified Final Judgement
MMC	Monopolies and Mergers Commission (UK)
MOC	Ministry of Commerce (NZ)
MPT	Ministry of Posts and Telecommunications (Japan)
MPTS	Ministry of Posts, Telecommunications and Space (France)
NAS	Network Access Services
NASA	National Aeronautics and Space Administration
NRA	National Regulatory Authority
NTT	Nippon Telegraph and Telephone Corporation

NZ	New Zealand
NZCC	New Zealand Commerce Commission
OECD	Organisation for Economic Cooperation and Development
OFTEL	Office of Telecommunications (UK)
OSI	Open Systems Interconnection
OTC	Overseas Telecommunications Commission Limited
P&T	Posts and Telecommunications (Finland)
PABX	Private Automatic Branch Exchange
PBX	Private Branch Exchange
PCI	Price Cap Index
PCS	Personal Communications System
PPP	Purchasing Power Parity
PRS	Premium Rate Services
PSTN	Public Switched Telephone Network
PTS	National Post and Telecom Agency (Sweden)
QoS	Quality of Service
RBA	Reserve Bank of Australia
RBOCs	Regional Bell Operating Companies
RPI	Retail Price Index
SAO	Standard Access Obligations
SDH	Synchronous Digital Hierarchy
SONET	Synchronous Optical Network
SMP	Significant Market Power
STD	Subscriber Trunk Dialling
TA 1991	*Telecommunications Act 1991*
TA 1997	*Telecommunications Act 1997*
TAF	Telecommunications Access Forum
TCNZ	Telecom Corporation of New Zealand Ltd

TCRC	Total Call Record Charging
TELRIC	Total Element Long-Run Incremental Cost
TFP	Total Factor Productivity
TIAS	Travel Industries Automated Systems Pty Ltd
TIO	Telecommunications Industry Ombudsman
TNAG	Telecommunications Numbering Advisory Group
TPA	*Trade Practices Act 1974*
TSLRIC	Total Service Long-Run Incremental Cost
UK	United Kingdom
US	United States (of America)
USO	Universal Service Obligation
VAN	Value-Added Network
VAS	Value-Added Services
VPN	Virtual Private Network
WAN	Wide Area Network

GLOSSARY

Access line	Connection from the customer to the local telephone exchange for access to the telephone network. Also the connection between the serving toll center and the serving office of the inter-exchange carrier used to access public switched network services.
Asynchronous Digital Subscriber Line	A technology for supporting high bandwidth (6 Mbps) over conventional telephone lines allowing subscribers to access multimedia-based applications such as video on demand.
Advanced Mobile Phone System	The analogue cellular mobile phone system in Australia and more than 35 other countries. AMPS cellular systems operate in the 800 to 900 MHz band, compared to 1.8 to 1.9 GHz for the digital GMS systems.
Analogue	A signal for which the amplitude (strength) and frequency (tone) varies continuously. In contrast to digital.
Any-to-any connectivity	A network has this feature when subscribers to one network are able to call and receive calls from subscribers to an alternative network.
Asynchronous Transfer Mode	An international packet switching standard using a cell based approach, in which each packet of information features a uniform size of 53 bytes.
Backbone	A central network that connects several other, usually lower bandwidth networks. The backbone network is usually composed of a high capacity communications medium, such as fibre optic or coaxial cable.
Bandwidth	The range of frequencies, expressed in Hertz (Hz), that can pass over a given transmission channel. The bandwidth determines the rate at which information can be transmitted through a circuit. The greater the bandwidth, the more information that can be sent

	through the circuit in a given amount of time.
Basic services	Services that provide the minimum carriage switching and routing functions necessary to establish and terminate a communications link.
Broadband Integrated Services Digital Network	An emerging telecommunications technology that will provide integrated voice, data, and video services at speeds of 155 Mbps and above.
Bits per second	Basic unit of measurement for serial data transmission capacity.
Broadband	A band width greater than a voice grade telecommunications channel.
Customer Access Network	The access network connecting customers to the local switch. In Australia, the CAN essentially comprises a fixed network of copper wire pairs.
Carriage service provider	A business that uses network facilities to provide basic or value-added communication services.
Carrier	A business that is the owner of network facilities and operates under licence.
Code Division Multiple Access	A digital cellular phone technology that operates in the 1.9 GHz (digital GSM) and 800 MHz (analogue AMPS) bands. CDMA uses a spread spectrum technique that codes each digital packet and allows multiple calls to be placed on one channel, boosting caller capacity 20 to 35 times that of the analogue network. CDMA phones are noted for their call quality and long battery life.
Cellular	A communication service in which voice or data is transmitted by radio frequencies. The service area is divided into cells each served by a transmitter. The cells are connected to a mobile switching exchange which is connected to the worldwide telephone network.
Centrex services	PBX services provided by a switched service provider. Switching is done in the local exchange. Some services switch at the customer’s site, others control it in the local exchange.

Channel	In data communications, a path along which signals can be sent between two or more points.
Committed Information Rate	The amount of bandwidth that a user can expect from a frame relay carrier on a particular virtual circuit.
Circuit switching	Temporary direct connection of two or more channels between two or more points in order to provide the user with exclusive use of an open channel with which to exchange information. A discrete circuit path is set up between the incoming and outgoing lines, in contrast to message switching and packet switching, in which no such physical path is established.
Customer premises equipment	Terminal equipment on the customers premises (such as telephone handsets) that is connected to a network.
Customer access charge	Charge to retail customers for access to the PSTN.
DATEL	Analogue data transmission services offered over the PSTN.
Digital Data Service	A digital transmission service supporting speeds up to 56 Kbps.
Digital	Communications procedures, techniques and equipment that encode information as either binary ‘1’ or ‘0’; the representation of information in discrete binary form, discontinuous in time. In contrast to analogue.
Electronic Data Interchange	The asynchronous exchange from computer to computer of inter-company business documents (such as purchase orders, bills of lading, and invoices) and information. EDI can be accomplished through OSI standards or through proprietary products.
Enterprise network	A network that connects every computer in every location of a company and runs the company's mission critical applications.

Frame relay	A high-speed (up to 45 Mbps) packet switching protocol used in wide area data networks.
Frequency	An expression of how frequently a periodic (repetitious) wave form or signal regenerates itself at a given amplitude.
Gateway	A device or program that connects two networks that use different protocols and translates between these protocols, allowing devices on the two networks to communicate with each other.
Global Information Infrastructure	A term used to describe a vision of individual national information infrastructures joined together to form an international network.
Group Speciale Mobile	A digital cellular phone technology based on TDMA that operate in the 1.8 to 1.9 GHz band, compared to 800 to 900 MHz for the analogue AMPS systems.
International Direct Dialling	Cooperative service enabling subscribers to place international calls without operator assistance.
Intelsat	International Telecommunications Satellite Consortium, formed in 1964 for the purpose of creating a worldwide communications satellite system.
Interconnection	The inter-working of two separate networks. Interconnection is used in reference to both the technical interface and to the commercial arrangements between the two network operators providing service.
Internet	Physically, a collection of packet switching networks interconnected by routers along with protocols that allow them to function logically as a single, large, virtual network.
Integrated Services Digital Network	A communication standard enabling a variety of mixed digital transmission services to interconnect. ISDN is part of the physical layer of the OSI reference model. A 144 Kbps basic rate is defined in ITU-T 1.430, and a primary rate (1.544 Mbps) interface is defined in ITU-T L431.

International Telecommunications Union	Telecommunications agency of the United Nations, established to provide standardised communications procedures and practices including frequency allocation and radio regulations on a worldwide basis. Parent of the ITU-T (telecommunications), ITU-R (radio), and ITU-D (developing nations) committees.
Local Area Network	A system for linking terminals, programs, storage and graphic devices at multiple workstations over relatively small geographic areas.
Leased line	A communication channel contracted for exclusive use from a common carrier, frequently referred to as a private line.
Local loop unbundling	Interconnection is provided for downstream of the tandem switch or local exchange.
Local switch	Switching center in which subscribers' lines terminate.
Multiplexing	The process of interleaving or simultaneously transmitting two or more messages on a single channel using a device called a multiplexor or MUX.
Non-switched line	In data communication, a permanent connection between computers or devices that does not have to be established by dialling. Contrast with switched line.
Overlay network	A high performance digital network which interconnects with the main public network but which has its own lines, exchanges and often a separate international gateway.
Private Automatic Branch Exchange	Private automatic telephone exchange that provides for the transmission of calls internally, and to and from the public telephone network.
Packet switched network	A network consisting of a series of interconnected switches that route individual packets of data over one of several redundant routes. Most commonly, packet switched networks refer to X25.

Packet switching	A method of transmitting messages through a communication network, in which long messages are subdivided into short packets. Each packet contains the data and a destination address and is passed from source to destination through intermediate nodes. At each node, the packet is received, stored briefly, and then passed on to the next node. The packets are then reassembled into the original message at the receiving end.
Personal Communications System	Refers to a variety of personal wireless communications services including cellular mobile and paging services.
Permanent virtual circuit	A defined path that provides essentially a dedicated private line between users in a packet switching network.
Private network	A network based on leased lines or other facilities which are used to provide telecommunications services, within an organisation or within a closed user group, as a complement or a substitute to the public network.
Public Switched Telephone Network	The PSTN provides the basic infrastructure for telecommunications services (including telephones, switches, local and trunk lines, and exchanges).
PSTN network hierarchy	The network hierarchy describes the linkages between switches in the PSTN that determine the strategy for routing individual calls.
Resale service provider	A business that redistributes the services of a common carrier and retails the services to the public.
Reseller	A business that purchases carriage services from another operator and sells them to retail customers.
Synchronous Digital Hierarchy	An ITU-T standard for digital broadband communications.
Smart card	An insertable credit card sized device with imbedded processors that can be programmed to decrypt messages, verify messages and digital signatures and create digital signatures for outgoing messages.

Switched line	A temporary connection between computers or devices.
Switching	The process of interconnecting circuits.
Telephony	Generic term describing voice telecommunications.
Traffic	Messages sent and received over a communications channel. Also, a quantitative measurement of the total messages and their length, expressed in hundred call seconds or other units.
Transmission	Sending information in the form of electrical signals over electric wires, waveguides, or radio.
Value-Added Services	Services provided over a public or private network which, in some way, add value to the basic carriage services, usually through the applications of computerised intelligence. This includes services which provide enhanced network features such as store and forward message switching, terminal interfacing and host interfacing.
Virtual Private Network	A software defined network offered by telephone carriers for voice and data communications among multiple sites. The network provides the appearance of a private network, except that it makes use of the public switched network rather than physically dedicated leased lines.
Wide Area Network	A group of computer networks connected over long distances, often by telephone lines and satellite transmission.
X25	An ITU-T standard that defines the interface between equipment operating in the packet mode on public data networks. It defines the interface for the packet mode.
X75	The ITU-T gateway standard which defines the interconnection of two or more X25 packet switched data networks.

OVERVIEW

This study compares the performance of the Australian telecommunications services industry with those in other countries. It is the latest in a series of international benchmarking studies conducted by the Commission. As with previous studies, it contains a variety of findings about Australia's relative performance (see Box 1), but has no policy recommendations.

Box 1 Key messages

- Australia's residential and business telecommunications prices rank about average among the countries benchmarked.
- However, prices in the best performing countries are 20 to 40 per cent below Australian prices on a purchasing power parity basis in most major market segments.
- The results are not sensitive to changes in assumptions about usage.
- Further, the price performance gap is too great to be explained by factors outside the control of industry participants, such as technological change, input prices, taxes and geography.
- An overall assessment of the evidence points to government involvement and intervention having a major influence on prices across the countries benchmarked.
- There are few quality of service indicators to make international comparisons.
- There is some evidence of scope for further productivity improvement and consequential lower prices in Australia.
- The potential benefits to consumers of even modest price reductions would be large.

Approach

- Australia is benchmarked against Canada, Finland, France, Japan, New Zealand, Sweden, the United Kingdom and the United States
  - these countries have a reputation for best practice in the industry and have economic environments broadly comparable to Australia
  - ownership in these countries varies from fully public to private
  - and they cover a wide range of regulatory and institutional environments.

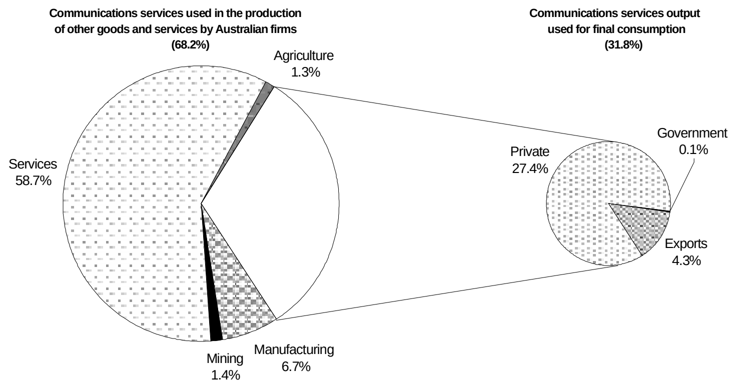
- For the first time, an extensive range of *voice and data communications services* sold by the major incumbent carrier(s) in each country were examined over a wide range of products and business sizes
  - including PSTN (Public Switched Telephone Network) customer access and telephone calls, fax and calls to mobile phones and Internet Service Providers
  - as well as ISDN (Integrated Services Digital Network), leased lines, frame relay and ATM (Asynchronous Transfer Mode) services
  - however, the provision of customer premises equipment (telephones, computer hardware and software) was not benchmarked.
- Industry performance was measured in terms of outcomes for consumers of telecommunications services
  - in particular the price and quality of services.
- The Commission did not benchmark charges for service provider access to essential infrastructure services because of the focus on the final consumer
  - however, consideration was given to their impact on consumer prices.
- The productivity of the industry within each country was not investigated in depth
  - because of the difficulty in making comparisons among a small number of multi-product, vertically-integrated businesses with a degree of market power
  - in any case, prices are most relevant to consumers, and they can reflect both productivity and the effectiveness of government regulation, as well as other factors.
- The reasons for international differences in prices have been considered
  - with the objective of assessing the impact of exogenous cost differences, internal factors and the institutional and regulatory environment on prices, as well as measurement error.
- The Eurodata Foundation was engaged to collect and analyse information on telecommunications prices
  - Eurodata has worked with the OECD to develop standard ‘baskets’ of residential and small business services to weight telecommunications prices into a single index.

- A workshop was held in December 1998 to provide a range of interested groups and individuals with the opportunity to comment on the preliminary benchmarking results and their interpretation.
- Telstra and Telecom Corporation of New Zealand accepted a general invitation issued at the workshop to make submissions and to examine the pricing model developed by Eurodata on behalf of the Commission
  - these submissions are posted on the Commission's Internet site
  - and the matters arising out of the model review are discussed in Chapter 5.
- Telstra furnished details of Australian demand patterns, so that the sensitivity of benchmarked prices to demand assumptions could be assessed by replacing the neutral 'standard' basket used to compare prices for the study with one that represented Australian consumption.

Telecommunications in Australia

- Telecommunications services, currently valued at about $20 billion are playing an increasingly important role in product and service industries for accessing, processing and disseminating information
  - about 70 per cent of the Australian communication industry's output, of which telecommunications services is a large part, was used as an intermediate input in 1993–94 (the latest year for which data are available)
  - the majority of this input to other industries (59 per cent) was consumed by the services sector, which is currently the fastest growing sector in the economy (see Figure 1).
- Overall, communications services accounted for about 3.5 per cent of total intermediate expenditure by Australian industry, and 5.3 per cent of expenditure by the services sector (see Figure 2).
- Telecommunications services also make a growing and significant contribution to economic activity in their own right
  - between 1994 and 1996, global telecommunications services revenue expanded from $374 billion to more than $489 billion
  - and is estimated to have reached $1105 billion by 1998.

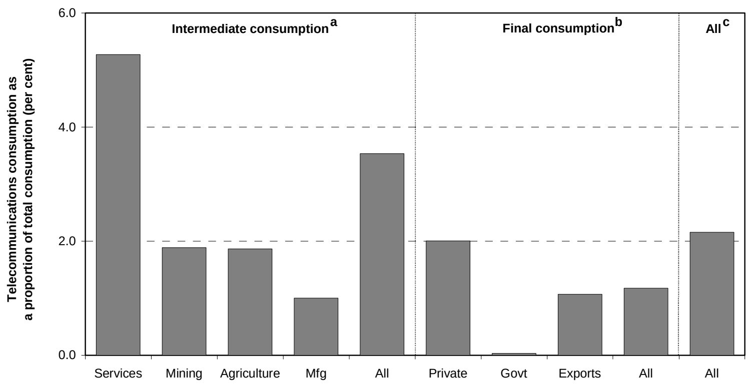
Figure 1 Users of communications services, 1993–94



Note: Communications services includes ANZSIC classification 711 Postal and Courier Services, and ANZSIC 712 Telecommunications Services.
1993–94 is latest available data.

Source: Productivity Commission estimates based on ABS (1997a).

Figure 2 Communications services expenditure as a proportion of total expenditure by sector, 1993–94



Note: Communications services includes ANZSIC classification 711 Postal and Courier Services, and ANZSIC 712 Telecommunications Services.

a Communications services expenditure as a proportion of total expenditure on goods and services used in the production of final goods and services produced by Australian firms.

b Communications services expenditure as a proportion of total final goods and services expenditure.

c Total communications services expenditure as a proportion of total intermediate and final goods and services expenditure.

Source: Productivity Commission estimates based on ABS (1997a).

- Telecommunications is a dynamic service industry with many new products being developed, particularly for data transfer
  - Box 2 gives details of value added services and the main data products available in the Australian market.
- In this environment, competition is important for stimulating innovation and productive investment, the keys to maintaining efficiency over time.
- Telstra still dominates the Australian market
  - in 1998, it accounted for nearly 75 per cent of overall market revenue.
- Local calls remain the most significant traffic in volume
  - but are on a par with long-distance calls in revenue terms.

Social and price regulation

- Government intervention in telecommunications markets has significant implications for benchmarking comparisons
  - retail prices are often regulated as well as being affected indirectly by regulations that are intended to promote competition
  - consequently, some understanding of regulatory and institutional arrangements is important to interpreting observed price differences.
- Six of the countries studied, including Australia, retained some form of Universal Service Obligation (USO) following the introduction of competition
  - the USO usually involves the provision of basic services in rural areas at prices comparable to those in urban areas (see Table 3.1 of the report).
- There is no direct funding of the USO in any of the benchmarked countries (including Australia)
  - instead all costs are borne by the telecommunications industry and, ultimately, (some) consumers.
- The cost of USOs in the United States had been estimated at less than 1 per cent of the industry’s total revenue (Lewin and Kee, 1997).
- The overall cost of the Australian USO recognised under carrier cost-sharing arrangements, was equivalent to about 1.3 per cent of total industry revenue in 1996–97

Box 2 Details of Australian value added services and data products, 1998

In 1998, value added services (VAS) revenue amounted to $5.1 billion, about a quarter of total telecommunications services revenue. Between 1992 and 1997, average annual growth in VAS revenue was 15.6 per cent, more than double the growth in basic services revenue over the same period.

Data network services accounted for about $2.5 billion in 1997, or about one half of all value added services revenue in that year. Between 1991 and 1997, revenue expanded about 10 per cent per year on average, with the rate increasing after 1994. The most important of these services are:

Leased lines

- Leased line services (Datel, DDS (64Kbps) and 2Mbps services) account for more than half ($930 million) of data network services revenue in 1997.

ISDN

- Between 1991 and 1997, revenue from ISDN services expanded by an average of nearly 40 per cent a year and accounted for $450 million of total data network services revenue in 1997. There were around 50 000 customers in 1997 (including 37 000 basic access rate and 8500 primary rate users).

Packet switching and international data network services

- In 1997, revenue from domestic packet switched data network services was $115 million.
- Packet switching is the dominant technology for international data communications which accounted for $220 million in 1997 and continues to expand at an increasing rate due, in part, to the globalisation of business.

ATM

- ATM (Asynchronous Transfer Mode) broadband data services have been launched by both Optus and Telstra as wide-area network solutions, mainly in the 2Mbps market.

Frame relay

- Revenue from frame relay network services in 1997 was around $45 million.
- Telstra introduced its service (Fastpac) in 1996. By 1997 there were 14 service providers offering frame relay services in Australia.

  - though this ignores the costs to Telstra of other elements of its service obligations, such as the provision of payphones, or of related price regulation, such as untimed local calls.
- Telstra has claimed that the annual USO cost in Australia is in the order of $1.8 billion, or about 9 per cent of the industry's annual revenue
  - however, this estimate is significantly higher than those prepared for the Government's review of USO costs, which is still to be finalised.
- The Commission is not in a position to assess this estimate
  - although consideration is given to how it might affect price relativities.

Price regulation

- Governments regulate telecommunications prices with the aim of protecting consumers and achieving social objectives
  - customer access charges and local call prices are frequently regulated to ensure affordability and to promote universal access
  - in some countries, notably the United States, price regulation has also been introduced to prevent predatory pricing.
- In Australia and many other countries, price capping is the preferred regulatory approach for protecting consumers
  - rather than the alternative of rate-of-return regulation.
- Differences in the stringency of price caps directly affect price relativities.

Competition policy

- In most of the countries benchmarked, the incumbent telecommunications provider has been left with ownership of the established network.
- The incumbents generally have residual market power because they control access to the network and the price of that access
  - and are advantaged by economies of scope in marketing and billing services.
- Generally, governments have not vertically separated the monopoly segments of the industry, such as customer access network services, from those that are more competitive.

- Instead, most governments regulate the industry by establishing rights of interconnection and access to certain network services for the incumbent's competitors
  - to promote competition and efficient outcomes and mitigate the market power that control of the network gives the incumbent.
- As such, the regulatory environment in each country is dynamic
  - changing as regulators respond to market conditions.
- In most of the selected countries, decisions about how far the network should be unbundled were pre-determined at the outset of market liberalisation by the regulator.
- Australia is unique among these countries in that it has a formal regulatory process (based on Part XIC of the *Trade Practices Act 1974*) through which industry participants can have network services 'declared' open to access
  - this approach was adopted primarily because the Government believed the industry was best-placed to determine where regulation of access is required.
- The advantages of allowing industry participants to identify access requirements over time must be weighed against the potential cost of delaying competition and investment
  - in situations where 'first-mover' advantage can provide incumbents with time to cement and maintain a competitive advantage.
- In effect, the Australian approach involves a tradeoff between potential costs of delay, and possibly additional transactions costs for industry participants, against the benefits of ultimately getting better competitive outcomes.

Price comparisons

- Price comparisons for voice and data services were undertaken for both residential and business users, with an index based on annual expenditure on fixed baskets of telecommunications services.
- The Commission, in conjunction with Eurodata, developed a new price comparison methodology for residential and business users (see Box 3 for details)
  - utilising generally available discounted *actual* prices rather than *scheduled* prices

- involving a more extensive range of services to small, medium and large businesses than in previous studies, and
- covering a wider range of services.

Box 3 Price comparison methodology

Price information for many individual services was aggregated into ‘indices’ to provide a practical means of comparing price performance. Each price index was based on the expenditure over one year on a defined ‘basket’ of telecommunications services purchased by a representative user, at February 1998 prices.

OECD demand assumptions were used as a starting point for the baskets. However, they were developed further following consultations with Telstra and Eurodata.

The key elements of this approach are described below.

Demand assumptions

- Each basket or sub-basket specifies a distribution of calls made at different times of the day or week and over different distances.
- Although generally representative of usage patterns, they do not reflect actual usage in any particular country to ensure that comparisons are as neutral as possible.

Discounting plans

- Prices used in the comparisons are intended to reflect the actual cost to the user. The specified baskets of services are priced in each country using the lowest-priced discount plan that is widely available in the relevant market and consistently offered by the incumbent(s) in that country.
- Plans involving limited destinations, periods or targeting narrowly defined groups were not used, because there is no information on their market shares or the extent of their usage.

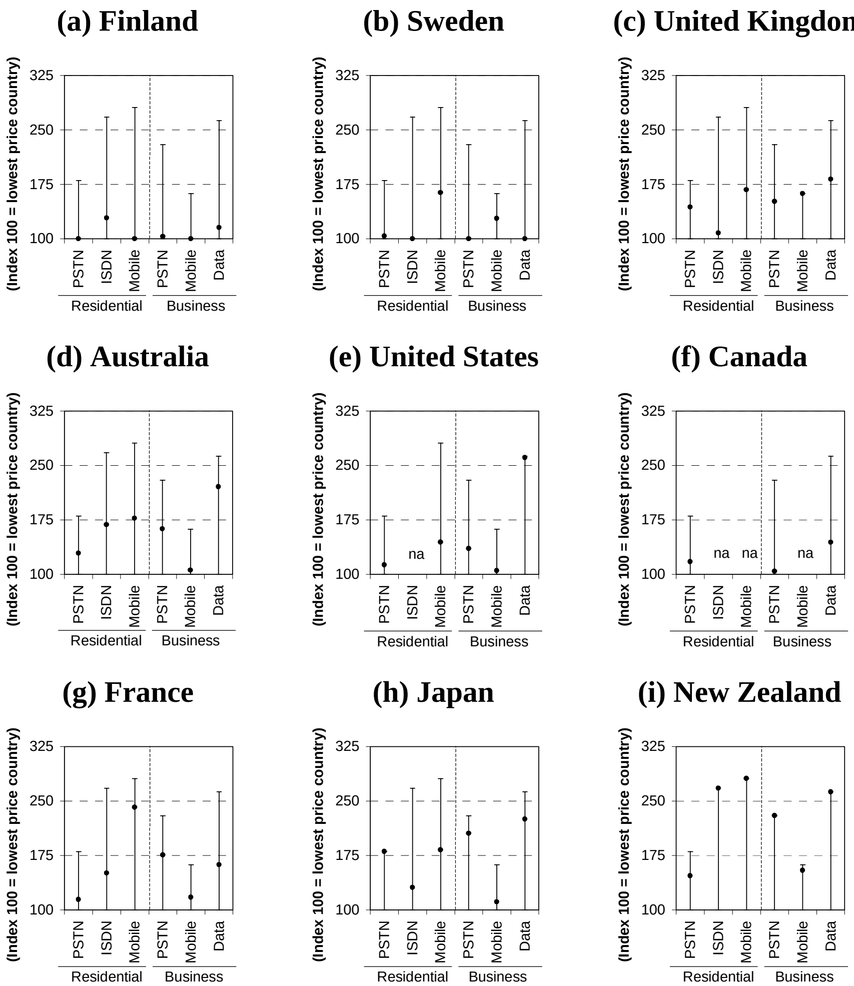
Taxes

- Indirect taxes imposed by governments differ among countries and so influence the relative prices of services in those countries. The indirect taxes associated with the production of telecommunications services, such as value added taxes, have been included because the aim is to compare the telecommunication cost for the consumer.

Currency conversion

- OECD measures of Purchasing Power Parity (PPP) exchange rates current at February 1998 were used for the conversion of prices to reflect the cost of telecommunications relative to the general cost of goods and services in each country.

Figure 3 Summary of price comparisons, February 1998



Note: The data underlying the above charts expresses the service price for each country as an index relative to the least expensive country. The price in the least expensive country corresponds to an index of 100. The bars represent the range of prices among all the selected countries for the particular service and is the same for each country as depicted. For each country, each dot indicates how much more expensive the price of the service is compared with the lowest-priced country. For example, Australia's PSTN price falls approximately in the middle of the range of prices represented by the bar. Where necessary, price differences have been averaged to provide a basis for aggregate comparisons.

na Data not available for this service

Source: Productivity Commission estimates.

- The results of the price comparisons are summarised in Figure 3
  - and Australia's relative performance is presented in Table 1.
- A broad indication of relative prices can be obtained from the results over all markets
  - price relativities in some individual markets are less reliable.

Table 1 Relative Australian telecommunications services prices, February 1998

Service	*Country with lowest prices*	*Ranking of Australian price performance*	*Per cent by which best prices are below Australian prices*	*Per cent by which Finnish prices are below Australian prices*[a]
Residential services				
PSTN	Finland	6 of 9	23	23
ISDN	Sweden	6 of 7	41	24
Mobile	Finland	5 of 8	44	44
Small and medium business services				
PSTN for small business	Finland	7 of 9	40	40
PSTN for medium business	Finland	6 of 9	39	39
ISDN for small business	Sweden	6 of 7	43	32
ISDN for medium business	Sweden	4 of 7	46	35
Mobile for small business	Finland	3 of 8	14	14
Mobile for medium business	Finland	3 of 8	5	5
Data services for business				
Leased lines	Sweden	6 of 9	63	63
X25 (packet-switched)	New Zealand	6 of 8	52	48
Frame relay	Sweden	6 of 7	46	22
Large business services	Sweden	4 of 6	47	43

a Finland is used as the benchmark because its prices, overall, are the lowest.

Note: A ranking of 6 of 9 for Australia's price performance for residential PSTN services (for example) means Australia has the sixth lowest prices out of 9 countries included in the particular comparison (given all the specified assumptions).

The business comparisons above are simple averages of relative prices obtained from the various business baskets.

Source: Productivity Commission estimates.

- It is also important to avoid ascribing unwarranted precision to performance rankings
  - adjustment for differences in external factors, such as economies of scale, could alter the ranking among countries with similar prices.

Residential prices

- Price comparisons for residential customers were undertaken using separate baskets of PSTN, ISDN and mobile services
  - within the PSTN 'total service' baskets, there are sub-baskets for particular types of calls, such as domestic voice, Internet, and international.

There is a wide dispersion in the price performance of the countries studied (see Figure 3).

- Australian PSTN prices for the total service were nearly 30 per cent above the lowest prices (Finland) and about 30 per cent below the highest (Japan)
  - Australian residential mobile prices were over 70 per cent above the lowest prices (Finland again) and around 35 per cent below the highest (New Zealand).
- The ranking and dispersion of price indices were not greatly affected by changes in assumptions about the number and duration of calls (see Chapter 5).
- Utilising the Australian residential demand patterns provided by Telstra for all the countries benchmarked improved Australia's price relativity against most other countries
  - using an Australian demand pattern naturally favours Australia because services with lower prices have higher demand relative to other countries and receive a greater weighting
  - for this reason, the OECD uses a neutral basket to weight prices.
- The Commission's results are consistent with previous studies undertaken by the OECD and others
  - with Australia in the middle rank of those advanced countries with low telecommunications prices.
- Periodic comparisons of standard prices by the OECD and Eurodata do not indicate a significant trend in Australia's relative price performance for residential PSTN services over recent years.

Business prices

- International price comparisons were undertaken for small, medium and large business users and for services using PSTN, ISDN, mobile, leased line, X25, frame relay and ATM technology
  - price comparisons were made for different volumes and patterns of demand for communications services and combinations of the technologies available for supplying the services.
- There is a reasonable degree of consistency in the price comparisons for different business customer groups and product groups
  - Finland and Sweden generally have the lowest prices
  - Australia generally ranks in the middle of the countries benchmarked for most services and is one of the best performers for mobile services.

Price structures

- There are some important differences in the price structures of the various countries.
- Using the OECD price basket assumptions of an average day-time call duration of about 3 minutes for local voice calls and 20 to 30 minutes for Internet calls, Australia has relatively high prices for local voice calls and relatively low prices for Internet calls in the residential market.
- Using an average day-time call duration of 5 minutes, which may be more typical of the current situation, Australia's relative local voice call price performance would be improved
  - but the price of the total PSTN service for residential customers would still be 20 to 30 per cent more than those of the best performing countries.
- The current level of Australian residential fixed charges, and the ratio of fixed to usage charges, are relatively low compared with most of the countries benchmarked.

Quality of service

- Both prices and service levels should be benchmarked to make a judgment about overall performance
  - quality of service (QoS) is linked with price outcomes for consumers because of tradeoffs between the standard of services and their cost.

- The main service aspects of concern to consumers are their 'administrative' dealings with carriers and the availability of services in geographically-remote areas
  - complaint records indicate that, for most consumers, the quality of the signal is not a major concern.
- There are few objective and consistent QoS indicators with which to make reliable international comparisons
  - and those available are clouded by definitional and methodological differences.
- More could be done to address the dearth of information to measure service quality in Australia
  - this would involve ensuring that performance indicators are relevant, consistent with measures used internationally, and published regularly without breaks due to changes in definition and collection methodology.
- With these qualifications in mind, the available comparable indicators of QoS show mixed results for Australia (see Table 2)
  - on some indicators, such as call failure rates and the penetration of card operated payphones, Australia performs quite well, though below the best of the countries for which data are available
  - on others, such as fault restoration, Australia performs relatively poorly.

Table 2 Australia's ranking compared with other OECD countries supplying data on QoS indicators, 1992 to 1996

Indicator	*1992*	*1993*	*1994*	*1995*	*1996*
Fault clearance	na	7 of 19	11 of 14	21 of 22	na
Call failure rates:					
Local	na	na	3 of 12	2 of 13	na
Long-distance	na	na	3 of 11	3 of 13	na
Answer seizure ratio for international calls[a]	15 of 27	16 of 27	17 of 27	19 of 27	na
Payphones per 1000 inhabitants[b]	18 of 27	16 of 26	17 of 26	9 of 26	8 of 25
Payphones in working order	na	3 of 9	3 of 11	5 of 13	na
Payphones that are card phones	na	na	na	3 of 20	na

a Measure of the proportion of international calls that successfully 'seize' an international circuit and are answered in the terminating country

b Australian data prior to 1995 excluded non-public payphones.

Note: Rankings indicate rank position ordering countries from best to worst

Source: Productivity Commission.

Interpretation

- The size of the average variation in prices among countries is such that Australia's relative position cannot be simply explained by *measurement error* or differences in *external factors* outside the control of the industry
  - in fact, Australia has a significant indirect taxation advantage relative to the countries with the lowest prices
- If the effects of factors outside the control of the industry are small, it follows that differences in g*overnment involvement and intervention* are likely to be the major influence
  - the nature and degree of government intervention in telecommunication markets varies considerably among the benchmarked countries.
- Differences in business *internal factors*, such as governance structures, corporate culture and managerial performance, are another possible source of variation
  - however, the extent of this variation in practice can be expected to be influenced by the effectiveness of government supervision in preventing any abuse of market power.

Role of price controls

- In some countries, including Australia, price capping is claimed to be distorting efficient price structures
  - resulting in a so-called 'access service deficit' where customer access charges do not reflect costs.
- Differences in the stringency of price caps and the USO cost affect relative prices
  - particularly local service prices.
- Caps on local services that prevent a normal rate-of-return from this segment of the market can be expected to affect prices in the long-distance market also
  - because of the nature of the industry, the need to maintain prices at a level that provides for an adequate overall rate of return means that the incumbent's ability to compete in the long-distance market is constrained.

- With this in mind, it is interesting to note that the countries with the lowest relative prices have pursued a policy of 'rebalancing' incumbent prices so that they reflect costs across all market segments
  - and have few controls on local services to ensure that normal rates of return are achievable in all market segments.
- The cost of the USO in Australia is suggested as one reason for the access service deficit and relatively high prices.
- However, no more than a third of the difference between Australian prices and those in the best performing countries can be explained even if the highest current USO cost estimate (9 per cent of revenues) were used
  - and the unfunded costs in other countries are taken into account.

Role of competition policy

- Overall, the countries that have the best price performance moved earliest to facilitate competition
  - from a previous emphasis on retail price supervision.
- The regulatory regimes in these countries generally provide for interconnection at any technically feasible point in the incumbent's network at cost-based prices
  - with competitors given maximum flexibility to decide how much of the incumbent's network they need to access
  - and cost-based pricing ensuring that incumbents are constrained in monopoly pricing access to facilities that entrants find inefficient to duplicate.

Benefits of improving Australia's performance

- Residential and business prices in the best performing countries are 20 to 40 per cent below Australian prices on a purchasing power parity basis.
- Furthermore, indirect taxes do not affect Australian telecommunications prices as much as European prices (which include 18 to 25 per cent value added tax)
  - which makes the performance of countries such as Finland and Sweden all the more impressive.

Improvement seems possible

- There is also some evidence that across the countries benchmarked higher prices may also have been associated with higher profitability
  - with financial performance positively correlated to prices.
- A rudimentary indicative assessment of relative productivity shows that there could be a significant performance gap between Telstra and the incumbents in countries with the lowest prices
  - there may accordingly be further scope to reduce prices through productivity improvement.

Savings to consumers could be significant

- The lower prices and profitability in the best performing countries provides evidence that the benefits of productivity improvement are usually passed on to consumers
  - through competition or effective regulatory supervision.
- Significant savings could flow to Australian consumers if prices were reduced
  - given that industry revenue for fixed and mobile telecommunications services, including data network services, equals some $20 billion
  - and telecommunications is an essential input to other industries in Australia.

1 INTRODUCTION

This study is part of a series of international benchmarking studies conducted by the Productivity Commission. The chief aim of this study is to compare the price and quality-of-service of the Australian telecommunications industry with those in other countries. Comparisons of the regulatory arrangements in Australia and overseas have also been undertaken to assist with the interpretation of these measures.

The industry was last benchmarked by the Bureau of Industry Economics (BIE), using mainly 1994 data. Since then, the industry, both in Australia and overseas has undergone significant change. The timing of this study was opportune because the benchmarking results provide a baseline for future measurement of the success of the Australian regulatory regime introduced in July 1997.

1.1 Rationale for benchmarking telecommunications services

A telecommunications industry that performs well against other countries is vital to Australia because of its economic significance.

Telecommunications makes a notable direct and indirect contribution to the economy. End users consume about $20 billion of telecommunications services annually, with about two-thirds of these services being used in the production of other goods and services and the remaining one third being final consumption.

For the most part, telecommunications services comprise a small but nevertheless vital component of production. In the service industries, for example, telecommunications constitutes 5.3 per cent of costs. Apart from the telecommunications sector itself, the most significant service industry users are property and business services (where telecommunications services represent 6.5 per cent of costs), retail (6.7 per cent), and personal and other services (7 per cent).

In manufacturing, mining, and agriculture, forestry and fishing, the industry's role as an intermediate input is less significant. In these industries telecommunications constitutes between 1 and 2 per cent of costs.

The industry's importance is increasing. From 1992 to 1998, output of telecommunications services increased by between 9 and 13 per cent per year.[1]

1 Estimate based on ABS *Consumer Price Index* data, Table 2.1.

Growth has been fastest in the mobile services sector where numbers of subscribers have increased a thousand-fold since 1986 and in data services where revenues have increased by 70 per cent between 1992 and 1998.

1.2 Approach

For this study, the aim was to benchmark how well the Australian telecommunications industry compared in relation to its counterparts in other countries (benchmarking is described in Box 1.1).

Box 1.1 Benchmarking

The chief purpose of benchmarking is to identify performance gaps and areas of potential improvement. This may be done by measuring the performance achieved by a better performing business engaged in the same or similar activity, or by a business regarded as being ‘best practice’. Alternatively, the current performance can be measured against past performance to gauge whether improvement is occurring over time.

The term ‘benchmarking’ is also used to encompass the identification of ‘best practice’ *processes*, that is, finding ways of doing better. This involves assessing a business’s practice against those of other high performing businesses engaged in the same activity (‘in-industry’ benchmarking) or against businesses in other industries engaged in similar activities (‘out-of-industry’ benchmarking). It is also possible to determine which practices make a significant contribution to performance.

Industry performance is measured in terms of outcomes for the consumers of telecommunications services, in particular the price and quality of the services. The reasons for differences in performance among countries are also considered, focussing in particular on the impact that different regulatory approaches have on prices.

The Commission was unable to collect the comparative data necessary to construct direct measures of total factor productivity. These measures require estimates of the quantities of inputs used and outputs produced by telecommunications carriers. The inputs include fixed capital, various types of labour, and material inputs purchased by the carriers.

More often, partial productivity measures are used in international comparisons. However, these measures are defective because they ignore differences in the proportions of factor inputs used by carriers in different countries. For example, data on lines per employee are readily available for many countries and therefore reported as indicators of labour productivity and sometimes interpreted as measures of relative efficiency. Such an interpretation overlooks the fact that some carriers employ their own staff to provide services which other carriers purchase from subcontractors.

Price comparisons

This benchmarking study follows, for the most part, the methodology initially developed by the Organisation for Economic Cooperation and Development (OECD) — also used by the BIE for their telecommunications services price comparisons.

The main indicator used is prices of telecommunications services purchased by residential and business customers measured by their annual expenditure on fixed baskets of services valued at February 1998 prices.

Previous studies by the OECD and BIE based their comparisons on prices obtained from incumbent operator’s standard plans. However, this approach has been compromised by the emergence of discount plans which provide savings on standard plans (for example, up to 25 per cent for residential PSTN customers).

To ensure that comparisons would continue to reflect the actual cost to the telecommunication user, a refinement introduced in this study is to compare prices on the basis of the lowest-priced discount plans. That is, the prices used in this study are those taken from the lowest-priced discount plan that is widely available in the relevant market and consistently offered by the incumbent operator(s).

To facilitate cross-country comparisons, the cost, in local currency, of each basket was converted into $US using OECD purchasing power parities (PPPs). PPPs reflect the real purchasing power of a national currency — that is, the ability of currency in a particular country to purchase a representative basket of consumer goods and services. Consequently, prices of telecommunications services are compared in relation to the general level of prices in each country.

The Commission attempted to benchmark quality of service. However, there are few comparable indicators in the public domain. They are usually constructed to satisfy disparate regulatory requirements in each country. As such, they were not sufficiently consistent for robust comparison.

That said, the benchmarks of quality of service provide some useful insights into Australia’s relative performance and the change over time.

Comparison of regulatory approaches

Government involvement in the telecommunications industry has significant implications for benchmarking comparisons. Differences in price controls will result in price variations. Furthermore, the regulatory arrangements affect the degree of competition and incentives for efficient outcomes.

In this study, Australia's regulatory arrangements are compared with the approaches used in the benchmarked countries. These arrangements include universal service obligations, retail price controls, interconnection or access arrangements to the existing network, number portability and carrier pre-selection and accounting separation.

The comparisons highlight key differences in the regulatory approach. The comparisons are also examined to determine if these are possible factors influencing differences in relative price performance.

Limitations of benchmarking

There are a range of factors which affect the usefulness of benchmarking. These include:

- the accuracy and integrity of the assumptions and data used in the analysis;
- difficulties ensuring that comparisons are being made in like-with-like circumstances; and
- problems with interpreting benchmarking results, in particular, identifying the cause of performance differences.

The impact of any deficiencies in the accuracy and integrity of the assumptions has been tested through sensitivity analysis.

The benchmarking approach has been designed to mitigate, but not eliminate, the impact of external factors that are beyond the control of the industry and regulatory authorities. It was beyond the scope of the study to 'standardise' price and quality of service comparisons by adjusting for these factors.

Instead, information is provided to qualify the results and give the reader insights into their interpretation by providing possible explanations for differences in prices.

1.3 Study scope

The Australian telecommunications industry is benchmarked against those in Canada, Finland, France, Japan, New Zealand, Sweden, United Kingdom and the United States. These countries were chosen from among the members of the

OECD which have been used in previous benchmarking studies (including those conducted by the BIE and the OECD Secretariat).

The number of countries studied was dictated by project resource considerations. They were selected to represent a range of regulatory or institutional environments and include countries regarded to be at 'best practice'.

Just the incumbent carriers — in most cases the original monopoly supplier — were benchmarked because they provide similar ranges of products. Although it is acknowledged competitors often have lower prices, they were assumed to be offering a similar price-quality of service mix to the incumbent (which usually still dominates the telecommunications market).

The services considered were chosen from among the extensive range of *voice and data communications services* on the market. The provision of customer premises equipment (telephones, computer hardware and software) were not included. Telecommunications equipment, systems and services were the subject of a recent Industry Commission inquiry (IC 1998). Broadcasting services also do not fall within the scope of the study, which is concerned with inter-active point-to-point communications services.

1.4 Data Collection

The Eurodata Foundation was engaged by the Productivity Commission to collect information and develop spreadsheets for the purpose of international comparisons of telecommunications prices.

Eurodata has worked with the OECD to develop the 'baskets' of services reflecting the telephone access and call patterns of residential and small-business customers on which both Eurodata and the OECD base their current price comparisons. These baskets were costed at standard or 'list' prices charged in each OECD country.

The Commission asked Eurodata to obtain information on the published discounts available from the major telecommunications carriers in the selected countries. This approach was adopted to use the best price generally available and overcome differences in the margins between discounted and standard 'list' charges.

Eurodata was required to collect and analyse prices relevant to a wide range of medium and large businesses in addition to small businesses. The product range includes PSTN, ISDN, mobile services, leased lines, X25, frame relay and (where possible) ATM services.

1.5 Consultation

The Commission consulted widely with Government, industry, consultants and others during development of the study approach. Advice was obtained on methodology, specification of customer groups and products, and regulatory issues.

Throughout the study, comment on the accuracy of the description and interpretation of regulatory arrangements was obtained from the Australian Competition and Consumer Commission, the Department of Communications, Information Technology and the Arts, Ovum, Telstra and overseas regulatory authorities. Feedback was also obtained on the accuracy and interpretation of other data used.

A list of the organisations and individuals contacted by the Commission, in the course of the study is provided in Appendix A.

Interested parties were also provided with opportunities to examine the price comparison models used and their input data. This process of rigorous scrutiny served to refine the price benchmarks and increase confidence in the results.

A workshop was held on 17 December 1998 — to provide a forum for discussion of the study methodology, the presentation of results and their interpretation. A list of organisations and academics who were invited to attend the workshop is provided in Appendix A.

Following the workshop, Telstra commissioned consultants, NECG Ltd, to prepare papers on a number of topics related to the study. The topics included the USO, the impact of geography on costs, rebalancing, performance measurement and the Finnish and Swedish telecommunications markets.

Telecom New Zealand also provided several papers on the price comparisons.

The NECG and TCNZ papers are available on the Productivity Commission web site.

1.6 Refereeing

Drafts of the report chapters were refereed by Professor Peter Forsyth, Monash University. A draft of Appendix B was refereed by Dr John Small, Director of the Centre for Research in Network Economics and Communications, University of Auckland.

1.7 Structure of the report

Major technological issues, the recent emergence of new telecommunications products and demand trends being experienced by the industry are outlined in Chapter 2. There is also a brief discussion of the industry's place within the general economy. This chapter is intended to provide the context in which the regulatory arrangements and industry performance are assessed.

The current regulatory arrangements in Australia and the other countries selected for this study are described in Chapters 3 and 4. In Chapter 3, the arrangements for the provision of universal service obligations and retail price controls are compared. Arrangements governing competition policy — covering interconnection and access arrangements; number portability and carrier pre-selection; accounting separation; and the regulation of anti-competitive conduct — are reviewed in Chapter 4.

Price comparisons for residential and various types of business customers are reported in Chapters 5 and 6. The 'baskets' of services typically purchased by the customer groups are specified, and the price structures employed by the carriers described. The impact of tax structures and exchange rates on the price comparisons is considered. Having outlined the approach and assumptions, the price comparisons for the customer groups and types of services are presented.

Quality of service measures are reported in Chapter 7. Also included is a discussion of measurement issues, and approaches to monitoring quality in Australia and overseas.

The factors affecting the level of Australia's telecommunications prices relative to those in other countries are discussed in Chapter 8, with particular attention paid to the impact of regulatory arrangements on prices. The total impact on consumers of improvements in telecommunications prices is also raised.

2 TELECOMMUNICATIONS SERVICES IN AUSTRALIA

Communications in Australia, along with many other developed and developing countries, is undergoing a fundamental transformation with the approach of the new millennium — the so-called ‘post-industrial information age’.

Central to this transformation has been an increasing globalisation of markets and organisations, and a relative decline in importance of the traditional agricultural and manufacturing sectors. Trade in the global economy has an increasing dependence on the use, transfer, and management of information. As a result, access to information and communications services are increasingly important in determining competitiveness and living standards.

Information is provided in this chapter about the economic significance of the telecommunications industry in Australia, trends in technology and demand for services, and the structure of the Australian industry in terms of the roles of the main carriers and service providers. This serves as background to the subsequent discussions of regulatory arrangements and presentation of material on performance benchmarking.

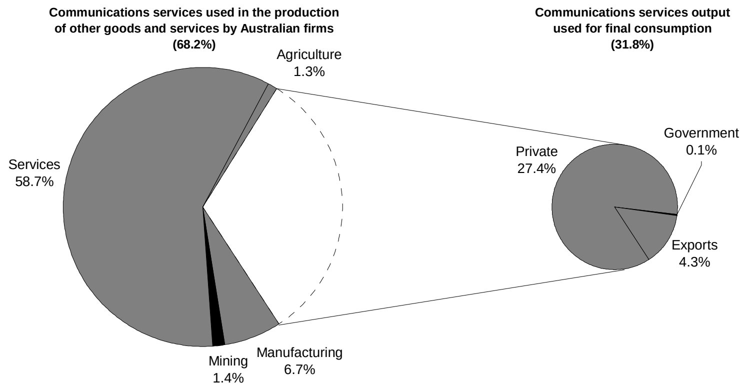
The new regulatory arrangements are opening the telecommunications market to new carriers and service providers which are competing with incumbent carriers. Despite this diversification, the incumbent carriers — Telstra in Australia — still dominate the overall market and are the focus of the price comparisons.

2.1 The significance of telecommunications services to economic activity

The telecommunications services industry has a major influence on the competitiveness of other industries and makes an important contribution to economic activity in its own right. The overall contribution of telecommunications services to economic activity can be examined from the proportion of total telecommunications services consumed by other industries and by the economy as a whole. The importance of telecommunications services relative to other inputs can be determined by examining the expenditure of each sector on telecommunications services relative to the sector’s total expenditure.

ABS data for 1993–94 show that about 68 per cent (or $12 billion) of communications industry output — of which telecommunications services is a large part — was used as an intermediate input by other industries.[1] The majority of this output (59 per cent) was consumed by the services sector which is currently the fastest growing sector in the economy (see Figure 2.1).

Figure 2.1 Users of communications services output, 1993–94



Note: Communications services includes ANZSIC classification 711 Postal and Courier Services, and ANZSIC 712 Telecommunications Services.

Source: Productivity Commission estimates based on ABS (1997a).

Overall, communications services accounted for about 3.5 per cent of total intermediate expenditure by Australian industry and 5.3 per cent in the service sector (see Figure 2.2).

Growth in telecommunications services

Telecommunications services have also made a significant and growing contribution to economic activity in their own right. For example, between 1994 and 1996, global telecommunications services revenue expanded from $374 billion to more than $489 billion (ITU 1995, 1998a), and was estimated to have reached $1105 billion by 1998 (Budde 1999g).[2]

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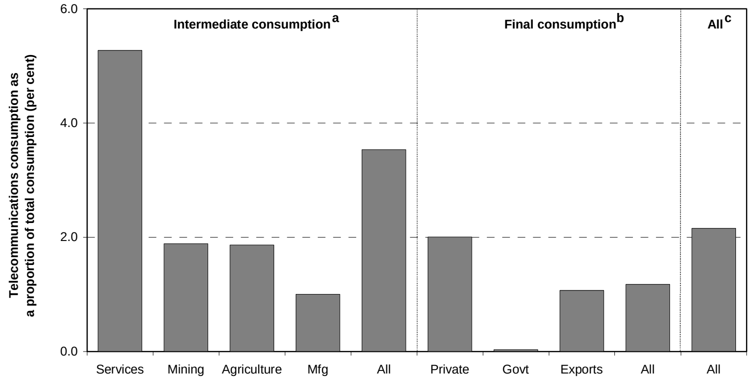
1 Communications services includes ANZSIC classification 711 Postal and Courier Services, and ANZSIC 712 Telecommunications Services. 1993–94 was the latest available data from the ABS at time of publication.

2 Throughout this chapter, currency conversions to Australian dollars are based on RBA published exchange rates for 30 June for the relevant year.

Figure 2.2 Communications services expenditure as a proportion of total expenditure by sector, 1993–94



Note: Communications services includes ANZSIC classification 711 Postal and Courier Services, and ANZSIC 712 Telecommunications Services.
a Communications services expenditure as a proportion of total expenditure on goods and services used in the production of final goods and services produced by Australian firms.
b Communications services expenditure as a proportion of total final goods and services expenditure.
c Total communications services expenditure as a proportion of total intermediate and final goods and services expenditure.
Source: Productivity Commission estimates based on ABS (1997a).

Over the same period, telecommunications services revenue in Australia grew from $14.1 billion to $22.0 billion and is expected to approach $24.7 billion by 1999 (see Table 2.1; Budde 1999b, pp. 1-2). This represents an average annual growth rate of about 11 per cent, with the greatest growth being in mobile communications. Despite rapid demand expansion there was a slowdown in revenue growth in 1997. This is likely to reflect the impact of increasing competition on prices. For example, fixed voice, mobile, and data services usage was estimated to have expanded at 10 to 20 per cent, 30 to 40 per cent and 40 to

Table 2.1 Australian telecommunications services revenue, 1992 to 1998

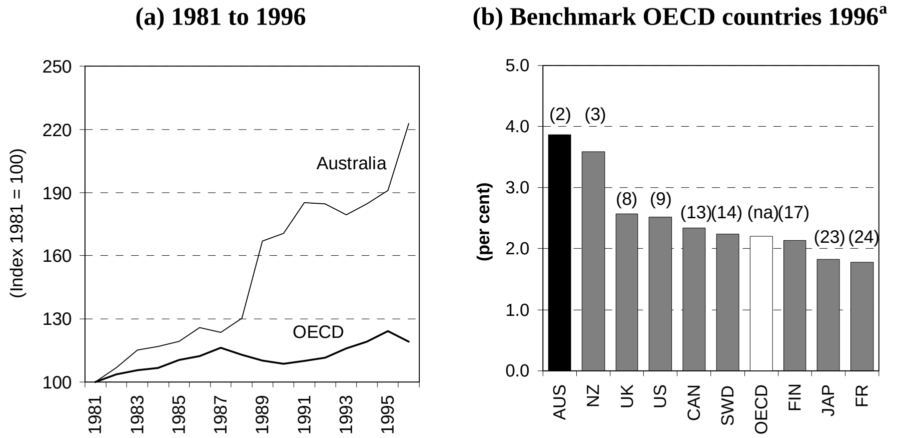
Type	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*
	($b)	*($b)*	*($b)*	*($b)*	*($b)*	*($b)*	*($b)*
Fixed services	10.4	10.1	10.2	11.0	11.7	11.8	13.3
Mobile services	0.6	1.0	1.3	2.3	3.0	3.2	3.7
Value-added services	1.8	2.2	2.6	2.8	3.3	4.0	5.1
Total revenue	**12.8**	**13.2**	**14.1**	**16.1**	**17.9**	**19.0**	**22.0**

Source: Productivity Commission estimates based on Budde (1998f, 1998g, 1998l, 1999b, 1999d, 1999f).

100 per cent respectively during 1997 (see Section 2.3).

Telecommunications services revenue is also a significant and growing share of Gross Domestic Product (GDP), accounting for about 2.1 per cent of world GDP in 1996 (ITU 1998a). The Australian share has grown rapidly compared with the OECD (see Figure 2.3(a)), and was nearly 4 per cent in 1996 (see Figure 2.3(b)).

Figure 2.3 Telecommunications revenue relative to GDP



Legend AUS: Australia, CAN: Canada, FIN: Finland, FR: France, GDP: Gross Domestic Product, JAP: Japan, NZ: New Zealand, SWD: Sweden, UK: United Kingdom and US: United States.

a The chart presents data for the OECD countries selected as the benchmark group (see Chapter 1). Bracketed figures denote ranking out of the 27 OECD countries for which data were available.

Source: ITU (1998a); OECD (1997c).

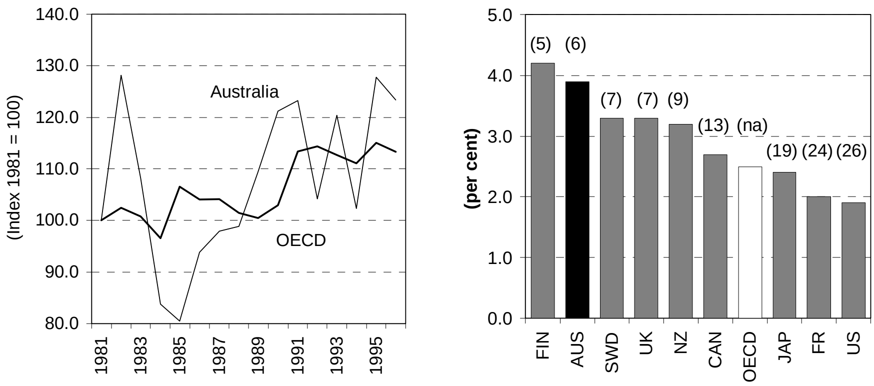
Growth in investment

Between 1981 and 1996, telecommunications investment in the OECD expanded at an average of 2.3 per cent a year, with total growth over the period approaching 42 per cent. Over the same period, telecommunications investment in Australia grew at an average of 6.8 per cent a year and more than 150 per cent over the entire period (OECD 1997c; ITU 1998a).

Although Australian telecommunications investment as a proportion of Gross Fixed Capital Formation (GFCF) fluctuated significantly between 1981 and 1996, it generally followed the OECD average (see Figure 2.4(a)). In 1996, Australian telecommunications investment as a proportion of GFCF was in the top quartile of OECD countries (see Figure 2.4(b)).

Figure 2.4 Telecommunications investment relative to Gross Fixed Capital Formation (GFCF)

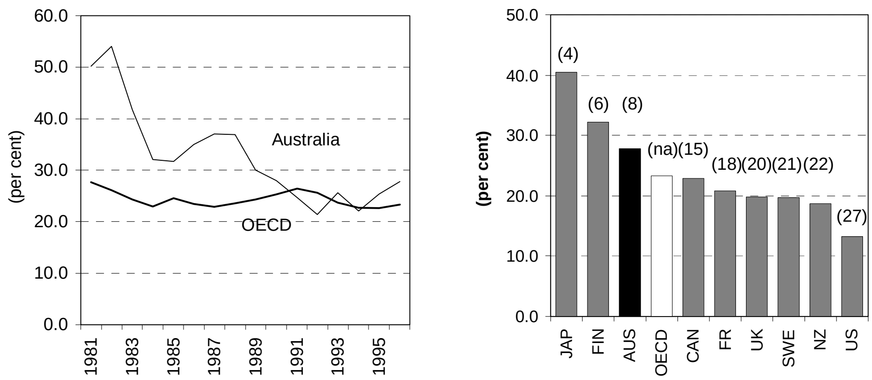
(a) 1981 to 1996 **(b) Selected OECD countries 1996**



Note: Bracketed figures denote ranking out of the 27 OECD countries for which data were available.
Legend AUS: Australia, CAN: Canada, FIN: Finland, FR: France, JAP: Japan, NZ: New Zealand, SWD: Sweden, UK: United Kingdom and US: United States.
Source: ITU (1998a); OECD (1997c).

Figure 2.5 Telecommunications investment relative to revenue

(a) 1981 to 1996 **(b) Selected OECD countries 1996**



Note: Bracketed figures denote ranking out of the 27 OECD countries for which data were available.
Legend AUS: Australia, CAN: Canada, FIN: Finland, FR: France, JAP: Japan, NZ: New Zealand, SWD: Sweden, UK: United Kingdom and US: United States.
Source: ITU (1998a); OECD (1997c).

In contrast, telecommunications investment relative to revenue in Australia has fallen steadily since the early 1980s and is now close to the OECD average (see Figure 2.5).

2.2 Network structure and technological trends

The principal building block of telecommunications infrastructure is the public switched telephone network (PSTN). Originally designed for the carriage of analogue voice traffic, the PSTN can be divided into a number of sub-networks:

- *Customer access network* (CAN): The local loop (the twisted pair copper wires in the street) that connects homes and offices to the local switch;
- *Transit networks*: Short distance carriage and basic switching; and
- *Long-distance networks*: Country trunks, interstate fibre cables and microwave bearers, international submarine cables and satellites.

Gateway switches allow interconnection between fixed, wireless voice and data networks, and between the domestic and international networks.

Global trends in communications technology

The traditional public telecommunications networks have evolved to become the fundamental element of the 'global information infrastructure' (GII). This is leading to changing philosophies behind network expansion and technological development, with the focus shifting to the services and applications running over the network rather than the network itself.

The likely direction for future development in telecommunications networks has been generally assessed as:

- *The network will be digital*: In a digital network, information should be able to flow from any source to any destination.
- *Capacity will be abundant*: Data compression technologies, the development of broadband fibre-based networks, and the use of digital transmission are expanding existing capacity.
- *Services will be personal*: The basic user will be the individual rather than the residential or work location (ITU 1995, pp. 17-20). This trend is already being realised in the growth of the 'wireless' or mobile communications market.

The key technological developments that are influencing the ability to deliver these services in a high quality and cost effective format include:

- *Computer power and accessibility*: Increasing processing power, at lower unit cost, is a key factor influencing the current development of the PSTN. Greater processing power will allow more efficient use of existing and future network capacity and the ability to deliver network-based services through ‘intelligent network’.
- *Digital processing techniques*: Advances in data compression techniques and switching technology are increasing the quality and speed of transmission and making it possible to make more efficient use of existing network infrastructure and bandwidth.
- *Photonic technologies*: Developments in photonic technology promise to substantially reduce bandwidth constraints. Optical fibre networks transmit messages by means of light pulses (generated by light emitting diodes), rather than electricity. With new wavelength multiplexing techniques, bandwidths of up to 75THz can be achieved, compared with about 1MHz on twisted copper pair and up to 750MHz on coaxial cable (see Table 2.2). Photonic switches are forecast to enter commercial usage around the turn of the century and will increase current network capacity by around 200 000 times (Lido 1998a).

Table 2.2 Transmission system characteristics

Media	*Capacity*	*Performance (Error rate)*	*Distance between repeaters*
Twisted-copper pair	1MHz	Poor to fair (10^{-5})	short
Coaxial	370 to 750MHz	Good (10^{-7} to 10^{-9})	short
Microwave	up to 45MHz per channel	Good (10^{-9})	medium
Satellite	36MHz, 75MHz (up to 48 on board)	Good (10^{-9})	long
Fibre	Over 75THz	High (10^{-11} to 10^{-13})	long

Source: Lido (1998a).

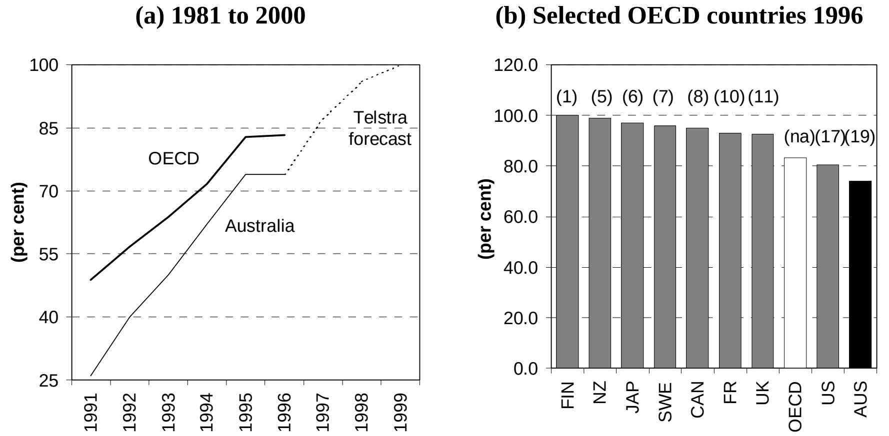
Digitalisation of the PSTN is one of the most important stages in modernising the existing infrastructure. Digital transmission is cheaper, faster and of higher quality than traditional analogue transmission and is an essential precursor to further technological development.

Australia had one of the lowest penetration rates of digital telephone exchanges within the OECD countries (see Figure 2.6(b)) in 1996 with 74 per cent of main lines digitised, compared with 83.3 per cent for the OECD on average (see Figure 2.6(a)).

Among OECD countries, the Netherlands was the first to reach full digitalisation followed closely by Finland, Luxembourg and Iceland. New Zealand, Japan and Sweden had all achieved greater than 95 per cent digitalisation by 1996 (see Figure 2.6(b)).

Telstra's $3.3 billion modernisation program — Future Mode of Operation (FMO) — is expected to deliver full digitalisation by 1999 (Telstra 1997). By June 1998, 95 per cent of all metropolitan and 94 per cent of country PSTN services were digital (Telstra 1998a, p. 11).

Figure 2.6 Progress in network digitisation



Note: Bracketed figures denote ranking out of the 27 OECD countries for which data were available.
Legend AUS: Australia, CAN: Canada, FIN: Finland, FR: France, JAP: Japan, NZ: New Zealand, SWD: Sweden, UK: United Kingdom and US: United States.
Source: ITU (1998a); OECD (1997c).

2.3 Telecommunications services demand

Telecommunications services demand can be examined from either the perspective of subscriber access or service characteristics.

Subscriber access

Subscriber access characteristics include:

- *Transmission media*: Principally the traditional fixed telephone services and emerging 'wireless' or mobile networks.

- *Sectoral segments*: Private residences and businesses; and
- *Geographical segments*: Metropolitan and regional areas.

Between 1986 and 1998, the fixed network expanded at around 3 per cent a year, reaching about 9.6 million access lines by June 1998 and is expected to exceed 10.5 million by the end of the century (see Table 2.3).

Table 2.3 Fixed and mobile penetration in Australia, 1986–87 to 2000

	Fixed network		*Mobile network*	
	Total access lines	*Access lines per 100 inhabitants*	*Mobile subscribers*	*Subscribers per 100 inhabitants*
	(million)	*(No.)*	*('000)*	*(No.)*
1986-87	6.8	41.9	4	0.0
1987-88	7.1	42.9	32	0.2
1988-89	7.4	44.1	95	0.6
1989-90	7.8	45.6	185	1.1
1990-91	8.1	46.6	292	1.7
1991-92	8.3	47.2	497	2.8
1992-93	8.5	48.3	690	3.9
1993-94	8.9	49.6	1 220	6.8
1994-95	8.9	49.3	2 305	12.8
1995-96	9.2	50.1	3 815	20.8
1996-97	9.4	50.4	4 893	26.4
1997-98	9.6	51.0	5 382	28.6
2000 (estimate)[a]	*10.5*	*55.7*	*7 500*	*39.5*

a ITU estimates based on average growth rates over the last four years of data.
Source: Productivity Commission estimates based on Telstra (1998a); ITU (1998a); ABS (1997b).

The expansion of the mobile network over the same period has been far greater (averaging 32 per cent a year between 1994 and 1998 but slowing after 1997). As a result, the share of total connections accounted for by the fixed network has fallen from close to 100 per cent in 1985–86 to around 64 per cent in 1997–98. If current trends continue, it is expected to fall below 60 per cent by the end of the century (see Table 2.3).

Payphone penetration in Australia is slightly less than the OECD average. In 1997, there were less than 82 000 payphones, or about one payphone for every 220 persons in Australia (see Table 2.4). The decline in the number and penetration of payphones in recent years is partly explained by the increasing penetration of other telecommunications technologies (mobile communications in particular), and the consequent cutbacks to Telstra's payphone services.

Payphones nonetheless represent a significant source of revenue (Telstra $225 million, others $130 million (Budde 1998g).

Future developments for payphone services in Australia are likely to be focussed on ‘smart technology’ and enhanced service rather than penetration. For example, Telstra initiated a major program in May 1997 to upgrade its payphones to ‘smart card technology’ and expected to have had 30 000 of the new phones installed by mid-1998. Telstra also intends to have 5000 ‘multimedia payphones’ installed by the year 2000.

Table 2.4 Payphones services in Australia, 1995 to 1998

	1995	*1996*	*1997*	*1998*
Payphones in Australia				
Public payphones operated by Telstra	np	30 740	30 170	36 892
Non-public payphones operated by Telstra	np	6 309	7 192	np
Non-public payphones operated by other parties	np	45 153	44 335	43 278
Total	**84 000**	**82 202**	**81 697**	**80 170**
Payphone per 1000 inhabitants				
Australia	4.65	4.49	4.41	np
OECD	4.66	4.53	np	np

np not published.
Source: Budde (1998g), ITU (1995, 1997, 1998a), Telstra (1998); Productivity Commission estimates.

Population and economic activity in Australia are concentrated in metropolitan regions. In 1997–98, more than 64 per cent of the estimated 9.6 million fixed telephone connections were in metropolitan areas (Budde 1998g). Residential subscribers are the most numerous in both metropolitan and regional areas accounting for 72 per cent of connections overall (see Table 2.5). However, while households spend around $800 per annum on telecommunications services, business users average around $10 000 per annum and account for about 72 per cent of total revenue (Budde 1998g).

Service characteristics

Services characteristics include:

- *Basic services*: Traditional traffic over the PSTN, including voice, data, image (fax) and video transmission;

- *Value-added services*: Services provided over public or private networks which, in some way, add value to the basic carriage, usually through the application of computerised intelligence.

Table 2.5 Access lines by market segment, 1997–98

Market segment	*Number of access lines*	*Share of access lines*
	(million)	*(%)*
Residential		
Metropolitan	4.4	45.5
Regional	2.5	26.3
All Residential	**6.9**	**71.8**
Business		
Metropolitan	1.8	18.6
Regional	0.9	9.6
All Business	**2.7**	**28.2**
All Australia	**9.6**	**100.0**

Source: Productivity Commission estimates based on Budde (1998g); Telstra (1998).

Basic services

Basic services include local, long-distance and international calls. In 1998, Telstra processed 10.8 billion local calls, accounting for about 84 per cent of all fixed network calls. In comparison, long-distance calls accounted for around 15 per cent and international calls for just 1 per cent (see Table 2.6).

Call durations vary according to the type of call and the subscriber. Voice calls in Australia average between 3.5 to 4 minutes in duration compared with 20 minutes for data or Internet calls (Budde 1998g).

Value-added services

In 1998, value-added services (VAS) revenue accounted for about 23 per cent ($5.1 billion) of total telecommunications services revenue. Between 1994 and 1998, average annual growth in VAS revenue was 18.5 per cent — more than double the growth in basic services revenue over the same period (see Table 2.1).

VAS are foreshadowed by most commentators as the area that offers the greatest growth potential. For example, Budde suggested that:

> Developments in information services, multimedia, pay TV and broadband networks all indicate the importance of value-added telecommunications

services. It will be this segment of the market that will add real value to the infrastructure provided by the carriers (Budde 1998k, p.1).

Table 2.6 Telephone call patterns, 1993 to 1998

	Fixed network calls				***Mobile***	***Total***
	Local calls	*STD calls*	*IDD calls*	*Total*	***calls***	***calls***
	(billion)	*(million)*	*(million)*	*(billion)*	***(billion)***	***(billion)***
1993	9.7	2 000	124	11.8	0.8	12.6
1994	10.0	2130	144	12.3	1.1	13.4
1995	10.3	2270	167	12.7	1.2	13.9
1996	10.5	2400	194	13.1	1.5	14.6
1997	10.8	2550	233	13.6	1.9	15.5
1998	11.1	2700	275	14.1	2.1	16.2

Source: Budde (1999c, p.1).

Although the VAS industry is highly dynamic, three main segments are widely recognised:

- *Voice-based VAS*: Principally delivered over the PSTN, voice-based VASs include premium rate services, enhanced call services, interactive voice response services, call centres and computer integrated telephony;
- *Video-based VAS*: Dominated at present by video conferencing, but also includes video entertainment services such as video-on-demand; and
- *Data-based VAS*: Data network services are the most significant data-based VAS. Other data-based VAS include data transaction services (EFT/EFTPOS), electronic data interchange (EDI), enhanced facsimile services, on-line information services, Internet access provision, electronic messaging, facilities management and outsourcing (telemetry and alarm) and electronic bureau services.

Data network services — which are a major focus of the performance comparisons presented in this report — are discussed in detail in the following section. The remainder of the VAS industry is discussed in more detail in Appendix B.

Data network services

Data network services accounted for about $2.5 billion, or about half of all value-added services revenue in 1998. Between 1992 and 1998, revenue expanded at an average of around 10 per cent a year, with the rate increasing since 1994 (see Table 2.7).

Table 2.7 Data network services revenue, 1992 to 1997

Data network services	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*
	($m)	*($m)*	*($m)*	*($m)*	*($m)*	*($m)*	*($m)*
Leased line services							
Analogue Datel	84	74	59	47	37	30	25
64 Kbps Digital Data Service (DDS)	567	629	635	650	660	680	700
2Mbits services	145	157	170	183	198	220	240
Total leased line service	**796**	**860**	**864**	**880**	**895**	**930**	**965**
Other data network services							
ISDN	81	107	150	210	320	450	800
International data services	100	110	126	150	180	220	280
Packet switching (X25)	88	95	100	105	110	115	125
ATM	na	1	2	3	4	5	6
Frame Relay	na	na	na	10	25	100	200
Others	54	56	58	60	65	75	90
Total other data network services	**323**	**369**	**436**	**538**	**704**	**965**	**1501**
Total revenue	**1 119**	**1 229**	**1 300**	**1 418**	**1 599**	**1 895**	**2 466**

Source: Budde (1999e, p.1).

While there are a number of service providers active in data network services, they generally use Telstra’s infrastructure. In 1998, Telstra’s data services revenue was estimated to be in excess of $2.2 billion (Budde 1999e, p.1).

Budde estimated that data traffic volumes accounted for 58 per cent of total communications traffic in 1997 (Budde 1998j, p.2). If current trends continue, data traffic is expected to account for around 80 per cent of traffic by the year 2000 (Lido 1998b, p. DCB-2). Corporate demand for Local Area Network (LAN) and Wide Area Network (WAN) traffic on enterprise networks, coupled with current Internet developments and falling prices (which are expected to increase residential uptake), are increasing the overall demand for data network services. On average, data network services revenue expanded by 14 per cent a year between 1993 and 1998 (some newer services are expanding much faster).

Leased line services (Datel, DDS (64Kbps) and 2Mbits services) account for about 39 per cent ($965 million) of data network services revenue in 1998. The Datel analogue network is declining as users switch over to the 64Kbps (DDS) and 2Mbits digital services (see Table 2.7). Corporate customers with fluctuating needs generally opt for more cost effective services such as frame relay.

ISDN services were introduced by Telstra as a separate network in 1989. Although Australia became one of the first countries with a nationwide ISDN service, links to this proprietary system have been expensive by world standards (Budde 1998j). Telstra's On-Ramp ISDN service (based on the ETSI Euro-ISDN standard) was launched in two stages (the Basic Access service in March 1997 and the Primary Rate Access service six months later). The proprietary services will be phased out after 2000.

Between 1993 and 1998 revenue from ISDN services expanded by an average of about 47 per cent a year and accounted for $800 million of total data network services revenue in 1998 (see Table 2.7). However, revenue growth understates the growth in usage of the service. ISDN faces competition from other technologies such as frame relay and cable modems which provide data and voice services at less cost. As a result, ISDN tariffs were reduced by 13 to 17 per cent in July 1996 and by a further 30 per cent in early 1997. There were around 88 000 customers in 1997 (including 74 000 basic access and 14 000 primary rate access users). This is expected to grow to 180 000 by 2000 (Budde 1999e, p.3).

Packet Switching and international data network services generated $405 million in 1998 (see Table 2.7). Revenue growth in domestic packet switching network services was principally based on growth in EFTPOS, but has slowed due to saturation in the EFTPOS retail market and because the Internet offers cheaper alternatives (Budde 1998j).

Packet switching is still the dominant technology for international data communications which accounted for $280 million of data network services revenue in 1998 and continues to expand at an increasing rate due, in part, to globalisation (see Table 2.7).

ATM (Asynchronous Transfer Mode) broadband data services have been launched by both Optus and Telstra as WAN solutions, mainly in the 2Mbps market. Although growth in revenue has been significant since 1993 (see Table 2.7), this is from a low base and ATM is not expected to have a major impact before the end of the decade (Budde 1998j).

Frame relay services generated revenue of around $200 million in 1998, a 100 per cent growth over the previous year (see Table 2.7). One reason for the rapid growth in frame relay is that it offers operational cost savings of up to 20 to 30 per cent over ISDN (Budde 1998j). Another is the ability of service providers to increase the effective capacity of traditional leased lines by using frame relay. Several Internet service providers have adopted frame relay as their backbone network to allow more efficient use of traditional leased lines (Budde 1998j).

Telstra introduced its frame relay service (Fastpac) in 1996. By 1998, there were 15 main service providers offering frame relay services in Australia (see Box 2.1).

Box 2.1 Frame relay service providers in Australia, 1998

AAPT	Equant	Saturn Global Network
AT&T	Global One	Telecom NZ
BT Australasia	Interlink	Telstra
CITEC	MUAnet	TMI
Eclipse	Optus	TPG

Source: Budde (1999e, p.4).

2.4 Telecommunications carriers and service providers

The *Telecommunications Act 1997* (TA 1997) liberalised entry into the telecommunications services industry in Australia. Specifically, it removed the distinction between mobile and general carriers and allowed for an unlimited number of carrier licenses. The Act made a distinction between carriers and service providers. Carriers are organisations that own or have control of network infrastructure (fixed network over 500 meters, satellite, mobile and so on). A carrier must be licensed and has defined obligations and rights. The Act distinguishes between two types of service provider:

- *Carriage service providers*: Organisations that supply carriage services to the public; and
- *Content service providers*: Organisations that supply content services to the public.

Service providers do not require a special licence.

The benchmarking study focuses on the incumbent — Telstra — which is dominant in the Australian telecommunications market (see Table 2.8). Telstra is a very important provider in all the main telecommunications markets, and has about 75 per cent of overall market revenue.

There are, however, a range of other carriers and service providers now existing in Australia. The role of these players will become increasingly important for the performance of the industry.

Table 2.8 Share of the Australian telecommunications market, Telstra and others, 1997 and 1998

	Telstra	*Others*
	(%)	*(%)*
Mobile, 1998 (subscribers)	57	43
Payphones, 1997 (number of payphones)	46	54
Local calls, 1997 (number of calls)	91	9
Long-distance and international, 1998 (call minutes)	55	45
Business voice, 1997 (sole provider)[a]	54	46
Business data, 1997 (sole provider)[a]	86	14
Total telecommunications services revenue, 1997	78	22
1998	75	25

a Responses to Amos Aked Swift *Telecommunications Business Users Survey*. Based on the proportion of respondents that used Telstra as their sole service provider for each specified service.

Source: Productivity estimates based on Amos Aked Swift www.aas.com.au (accessed October 1998); Budde (1999b, 1999c, 1999d).

Major facilities-based carriers

At February 1998, there were 14 licensed carriers (see Table 2.9). Telstra, Optus Communications and Vodafone are the major facilities-based carriers in the Australian market.[3] AAPT is Australia's third largest long-distance service provider.

Telstra

Telstra is Australia's largest telecommunications carrier and accounted for more than 2.4 per cent of GDP in 1996 (Budde 1998m). The Australian and Overseas Telecommunications Corporation Ltd (AOTC) was formed by the merger of Overseas Telecommunications Commission Limited (OTC) and the Australian Telecommunications Commission (trading as Telecom Australia) in 1992. In April 1993, Telstra Corporation Ltd became the legal corporate name of the AOTC, trading as a fully Government-owned enterprise until the one third public float in November 1997. The public ownership of Telstra is split between

3 Facilities-based carriers provide voice or data communications services over telecommunications infrastructure which it owns or has control of. The infrastructure of a telecommunications network includes lines, towers, masts and switches necessary to complete a communications circuit and to interconnect with another telecommunications network.

small investors (40.7 per cent), Australian institutions (21 per cent), foreign institutions (19 per cent), stockbrokers and financial planners' clients (15 per cent) and staff (4 per cent) (Budde 1998m).

Table 2.9 List of licensed carriers, January 1999

Carrier licence granted to:	*Date licence granted*
Telstra Corporation Ltd	1 July 1997
Optus Networks Pty Ltd	1 July 1997
Optus Mobile Pty Ltd	1 July 1997
Vodafone Pty Ltd	1 July 1997
AAP Telecommunications Pty Ltd	1 July 1997
Primus Telecommunications Pty Ltd	1 July 1997
Optus Vision Pty Ltd	1 July 1997
Telstra Multimedia	1 July 1997
Horizon Telecommunications Pty Ltd	25 July 1997
OMNIconnect Pty Ltd	19 August 1997
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	18 December 1997
Oz Telecom Pty Ltd	2 March 1998
WorldCom Australia Pty Ltd	24 March 1998
Iridium South Pacific Pty Ltd	2 April 1998
PanAmSat Asia Carrier Services Inc	1 May 1998
Spectrum Network Systems Ltd	6 May 1998
Agile Pty Ltd	15 May 1998
Xinhua News Telecommunications Pty Ltd c/- Hunt & Hunt Lawyers	1 June 1998
Amcom Pty Ltd Unit	28 July 1998
Davnet Pty Ltd	1 September 1998
SCCL Australia Ltd	22 September 1998
Hutchison Telecommunications (Australia) Ltd	30 September 1998

Source: www.aca.gov.au, accessed January 1999.

As at June 1998, Telstra had 57 234 full-time employees, generated $17 billion in revenue in 1997–98 and reported an operating profit before income tax of $4.5 billion (Telstra 1998a).

Telstra provides local call services and basic access to virtually all homes and most businesses in Australia. It is also the major provider of international and national long-distance services.

Fixed local and national long-distance telecommunications (including basic access) accounted for 40 per cent of Telstra's revenue in 1997–98. International telephone services revenue contributed a further 8 per cent (see Table 2.10).

Telstra's network is large and diverse (see Box 2.2). Virtually every residence in Australia is connected to the PSTN via Telstra's local loop. It operates fixed and mobile networks for voice telephony, and a number of switched and dedicated digital networks. Broadband services via fibre optic and hybrid fibre coaxial (HFC) cable are also provided.

Telstra currently operates both analogue and digital mobile networks.[4] The analogue (AMPS) network is among the world's largest, consisting of about 41 switching centres and 1361 base stations and providing coverage of more than 346 000 sq km (about 4.5 per cent of the continent) to 91 per cent of the population. Telstra's digital mobile (GSM) network was launched in 1993. By June 1997, Telstra had invested more than $1 billion in expanding the network to provide coverage for 90 per cent of the population. At June 1997, its digital mobile network consisted of 11 mobile switching centres, 8 home location registers and 1763 base stations.

Until recently, Telstra provided ISDN services via an overlay network (consisting of 28 nodes situated in capital cities and provincial cities) which was integrated with the PSTN. Under its FMO capital program, ISDN is now available on nearly all local exchanges. Using these delivery options, 93.4 per cent of Telstra customers could gain access to ISDN services (within 90 days where the deployment of a modular unit is required). Telstra's plan is for ISDN access to Australian customers to grow from 30 000 in 1997 to 1.1 million by 2000 (Budde 1998n, p.3).

Telstra began a $400 million upgrade to ISDN services in 1996 and launched a new suite of ISDN services under the tradename On-Ramp. This upgrade should be finalised by the end of 1998. On-Ramp is based on the Euro-ISDN (ETSI) standard which provides increased performance and a greater range of features.

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4 The analogue network is scheduled to be closed down in metropolitan areas on 1 January 2000. The Government is considering extending operation of the AMPS network in some regional areas to ensure residents in these areas continue to 'enjoy reasonably equivalent coverage' by mobile networks post 1 January 2000.

Table 2.10 Telstra revenue by major product and service category for years ended 30 June, 1996 to 1998

	1995–96		*1996–97*		*1997–98*	
Revenue category	*($m)*	*(%)*	*($m)*	*(%)*	*($m)*	*(%)*
Sales revenue						
Basic access[a]	1 727	11	1 740	11	1 770	10
Local calls[b]	2 669	18	2 664	17	2 664	15
National long-distance calls[c]	2 505	16	2 455	15	2 594	15
International telephone services[d]	1 338	9	1 342	8	1 380	8
Mobile telecommunications services[e]	1 705	11	1 981	12	2 154	12
Data and text services[f]	1 574	10	1 883	12	2 097	12
Directory services[g]	709	5	723	5	1 013	6
Customer premises equipment[h]	611	4	576	4	538	3
Intercarrier services[i]	485	3	558	3	582	3
Public payphones[j]	259	2	248	2	225	1
Other sales and services[k]	1 134	8	1 266	8	1 803	10
Total sales revenue	*14 716*	*97*	*15 436*	*97*	*16 819*	97
Other revenue[l]	523	3	547	3	483	3
Operating revenue	**$15 239**	**100**	**$15 983**	**100**	**17 302**	**100**

a Revenue from installation and connection charges and monthly rental fees associated with providing basic connection between customer premises and Telstra’s PSTN.

b Revenue associated with local calling and certain billable value-added services.

c Revenue from fixed-to-fixed national long-distance calls, including calls made from independently operated payphones to Australian fixed and mobile telephones and calls from Telstra’s non-PSTN network to Australian mobile telephones. Excludes calls from non-PSTN networks, such as ISDN, VPNs and FaxStream® services.

d Revenue from international outgoing calls, fees charged by Telstra to overseas telecommunications carriers for carriage and termination services, operator assisted international calls and the transit of international traffic.

e Revenue from initial connection charges, monthly access fees and usage charges, sales of mobile handsets and charges for a number of value-added and paging services. Excludes provision of analogue services to Optus.

f Principally revenue from data transmission services, dedicated leased lines, ISDN access and call revenue, and facsimile products such as FaxStream® services.

g Revenue from advertising fees for special listings, value-added directory products and services such as electronic and online services.

h Revenue from the rental of customer premises equipment including the sale of small business systems, maintenance of PBX systems, rental and sale of telephones and telecommunications equipment.

i Revenue from the provision of services to other carriers and service providers.

j Revenue from coin-paid calls from public payphones and pre-paid phone cards

k Revenue from other sales and services including intelligent network products and services, various controlled entities, Internet access and intranet products and services, domestic operator-assisted calls, Pay-TV connections, ship-to-shore services, recorded message and other enhanced call products.

l Includes interest received/receivable, proceeds from sale of assets/investments, dividends received/receivable and miscellaneous revenue.

Source: Telstra (1997; 1998).

Box 2.2 Major features of the Telstra network, June 1997

Fixed network:

- local access network to 9.4 million lines;
- 5000 local exchanges of which 84 per cent were digital;
- 200 digital switches;
- 2700 digital radio systems;
- over 2.4 million kilometres of fibre optic trunk network;
- 5000km of SDH (synchronous digital hierarchy) lines running from Perth to Brisbane;
- digital undersea cable to Tasmania;
- broadband cable network passed 2.1 million homes;
- international Internet bandwidth 32Mbps, national 64Mbps;
- international gateways;
- partner in several fibre optic submarine cable networks;
- sixth largest investor in IntelSat;
- fibre optic loops in major business centres; and
- a wide variety of data connection networks.

Mobile network:

- analogue AMPS: 41 switches and 1361 base stations; and
- digital GSM: 11 switches and 1763 base stations.

Source: Budde (1998n).

Following trials in the early 1990s, Telstra developed a five-year plan to roll-out synchronous digital hierarchy (SDH) links between major capital cities, and fibre optic loops within capital cities, that would provide a ‘future proof’ fibre optic network for businesses. Roll-out began in 1994 and is expected to cost more than $500 million over the life of the plan. Telstra’s SDH network has the capacity to carry 30 000 simultaneous long-distance calls, 64 broadcast quality TV channels, 240 Pay TV channels or 250 000 data channels (Budde 1998n, p.5). At Port Headland the network is linked to the international submarine cable JASURAUS, connecting Australia with Indonesia and other Asian countries.

Cable & Wireless Optus Limited (C&W Optus)

C&W Optus (then Optus Communications) was awarded its licence to become Australia’s second facilities-based carrier in November 1991.

Initially owned by a private consortium, C&W Optus listed on the Australian Stock Exchange in November 1998. As at February 1999, the UK-based Cable & Wireless held 52.8 per cent of the shares. The remainder is owned by major Australian and international institutional investors as well as a large number of private investors.

As at June 30 1998, C&W Optus employed 5745 full-time and full-time equivalent employees and generated $2.9 billion in revenue (Optus 1998a, pp. 6 and 60).

C&W Optus is the second largest provider of telecommunications services in Australia and provides a broad range of telecommunications services including: Mobile Communications Services; National and International Long Distance; Local Telephony Services; Business Network Services (BNS); Internet Services and Premium TV. In 1997–98 C&W Optus's largest business line, Mobile Services and Equipment, accounted for 46 per cent of operating revenue. Long Distance services and Business Network Services accounted for 36 per cent and 13 per cent of operating revenue respectively (Optus 1998a, p. 38).

C&W Optus launched its AMPS analogue mobile telephone service in June 1992 (leasing capacity on Telstra's network) followed by its GSM digital mobile telephone service (using its own network) in May 1993. As at June 1998, Optus had 1.62 million mobile subscribers (with 74 per cent of those customers connected to the digital network), representing about 30 per cent of the mobile market (24 and 33 per cent of the analogue and digital mobile markets, respectively) (Optus 1998a, pp. 38–9).

C&W Optus launched its national and international long-distance call service in November 1992. By December 1996, C&W Optus was offering this service to more than 99 per cent of the Australian population. As at June 1998, C&W Optus had obtained a 17 per cent share of long-distance traffic (in market minutes) (Optus 1998a, p. 40).

C&W Optus launched its BNS in December 1992 and initial services included Interlink™, Datalink™ and BusinessNet Premier™. BNS services have subsequently been augmented and currently generate more than $375 million a year in revenue (Optus 1998a, p. 70).

Optus operates four principle networks. The fixed long-distance and mobile networks were rolled out by Optus itself, the satellite network acquired with Aussat in 1991 and since expanded, and the broadband local network acquired through the acquisition of Optus Vision.

The Optus fixed network comprises more than 8500 kilometres of fibre optic cable linking Brisbane to Perth via Sydney, Canberra, Melbourne and Adelaide. Switching centres for national long-distance traffic are located in six Australian cities, with international switches located in Sydney and Melbourne. Optus's network is one of the first in the world to be built around the SDH standard and is complemented by ATM technology to enhance the provision of high speed communications services.

Fibre optic loops in the CBDs of Sydney, Melbourne, Brisbane, Perth, Adelaide and Canberra provide business and government customers with direct access to C&W Optus's fixed backbone network.

The wireless component of the C&W Optus's network is largely comprised of a digital mobile phone network based on the international GSM standard. It consists of over 1150 base stations connected to mobile switching centres by microwave, fibre optic cable or leased lines from Telstra. Mobile switching centres are connected to C&W Optus's fixed backbone network. This network currently provides coverage to 92 per cent of the Australian population.

C&W Optus also has a satellite mobile phone service called MobileSat, which provides coverage to 100 per cent of the continent and up to 200 kilometres out to sea. MobileSat uses C&W Optus's own communications satellites.

Optus gained three satellites when it acquired Aussat in 1991 and two more have been launched since (C&W Optus currently has 4 satellites in operation). C&W Optus also has a number of international satellite earth stations which provide up and down links to INTELSAT satellites for the transmission of international traffic.

At present, most television broadcasts in Australia pass through an Optus satellite at least once. These satellites also provide a backup to C&W Optus's terrestrial network.

In February 1996, Optus launched Project Aurora, a plan to migrate the current 13 analogue satellite transponders to 5 digital ones which will free up capacity for a large number of new services including data broadcasting, video-conferencing and high-speed Internet services.

The broadband local network acquired through Optus Vision has passed 2 million homes in Sydney, Melbourne and Brisbane. The network is a hybrid fibre coaxial network with an initial capacity of 750Mhz to the customer and 42 Mhz from the customer which is sufficient to carry pay TV, telephony, full two-way high-speed access to data transmission and other digital and interactive services.[5]

Vodafone

Vodafone became Australia's third mobile carrier in December 1992. Vodafone Australia is owned jointly by Vodafone UK (90.5 per cent), AAP (5 per cent) and Philip Cornish (4.5 per cent).[6] However, Vodafone has foreshadowed a public float around the year 2000.

As at November 1997, Vodafone controlled 6.7 per cent of the total mobile market and 20 to 25 per cent of the GSM market. Vodafone's revenue has increased from $135 million in 1995–96 to about $500 million in 1997. Over the same period, the number of subscribers has grown from 200 000 to about 450 000 and is expected to increase to 1.5 million by the year 2000 (Budde 1998o).

Vodafone is operating as a wholesaler, relying on 15 service providers with 650 outlets for the delivery of services to the end customer.

Vodafone commenced operation of Australia's first fully digital network on 1 October 1993 for Sydney, Melbourne and Canberra — with coverage extended to all capital cities in March 1994. Vodafone estimated that, as at February 1998, it had coverage of 92 per cent of the Australian population (hand-held and car-kit) (www.vodafone.com.au, April 1998).[7]

Through a number of international alliances and partnerships, the Vodafone network also allows 'automatic' and 'plastic' global roaming in 78 countries.[8] The terrestrial network will also be supplemented by interconnection with the Globalstar satellite consortium in late 1998 (see Box 2.3).

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5 Internet access via cable modem is expected to be available in the near future. It is anticipated that this technology will deliver speeds up to 100 times faster than standard dial up modem products.

6 Vodafone UK controls more than 50 per cent of the mobile phone market in the UK and operates networks and services in ten other countries. Globally, Vodafone UK services more than 4 million subscribers.

7 Mobile phones mounted in car-kits generally have greater range.

8 With 'automatic' global roaming, subscribers use their own handset and Vodafone mobile phone number while travelling in countries which have the GSM system and with whom Vodafone Australia has a roaming agreement. Alternatively, subscribers can obtain access to 'plastic' global roaming by using a different SmartCard (and therefore a different phone number), while travelling in countries which have a roaming agreement with Vodafone UK (www.vodafone.com.au, June 1998).

Box 2.3 Globalstar

There are several global satellite systems in the advanced stages of planning and implementation. One such system is *Globalstar*, which is currently being developed by Vodafone and a number of other multinational companies. Globalstar is a network of 48 low-earth orbiting satellites (LEOs) scheduled to be launched in January 1999. Globalstar will enable customers with dual-mode handsets to use their mobile phones almost anywhere in the world. It is estimated that by 2002 Globalstar will be providing service to 2.7 million customers, and to 16 million by 2012.

Globalstar will cover 100 per cent of Australia and its coastal waters. Consequently it will provide coverage to the 10 to 15 per cent of the population living in rural and remote areas that will not be serviced by the terrestrial networks. Vodafone has developed a site at Dubbo (NSW) to be used for the new satellite service. A second gateway will be built in Darwin.

Source: www.vodafone.com.au, April 1998.

AAP Telecommunications (AAPT)

Established in 1991, AAP Telecommunications (AAPT) operated under a Service Provider’s Class Licence to compete with Telstra in the switched long-distance and international telecommunications markets. In July 1997, AAPT was granted a carrier licence, becoming the largest of several organisations to migrate from service provider to carrier under the new liberalised arrangements.

AAPT listed on the Australian Stock Exchange (ASX) in November 1997 (the first Australian carrier to do so), placing about 16 per cent of ownership in public hands. The balance of ownership is distributed between AAP Information Services Pty Ltd (AAPIS) (Australia), Todd Communications (Australia) Ltd and Singapore Telecom International (Australia) PTE Ltd which hold about 40, 21 and 21 per cent of all shares respectively (Budde 1998a, p.1).

AAPT is the third largest long-distance telecommunications service provider in Australia. In 1997, it provided voice, data, frame relay, Internet, mobile and facsimile services to 300 000 (100 000 residential and 200 000 business) customers and is estimated to have generated $392 million in revenue. AAPT’s major revenue source is the rebilling of other carriers’ services (including mobile services), which accounted for 46 per cent ($87 million) of revenue for the six months to June 1997. For the same period, data services accounted for 7 per cent ($13 million), international services accounted for 18 per cent ($34 million), and long-distance services accounted for 29 per cent ($54 million) of revenue, respectively (Budde 1998a, p.1).

AAPT delivers telecommunications services via its virtual private network (VPN) which consists of:

- AAPT’s fully-owned Vantage network — an intelligent network that includes major switching exchanges in all capitals (except Darwin and Hobart), and 13 smaller exchanges or intelligent nodes in regional locations;
- High-capacity trunk links leased from Telstra and Optus;
- Dedicated access lines from customer premises; and
- Interconnection with a number of submarine cables.

AAPT has invested more than $90 million in its own fully-digital network and expects to continue investing $20 million a year. At present about 80 per cent of AAPT’s services are carried on its own network (Budde 1998a, p.4).

The terrestrial network is backed up by Sat-Tel, AAPT's fully-owned satellite network, with additional satellite-based services provided through PanAmSat. Mobile services are provided through Cellular One (Vodafone’s largest independent network reseller), in which AAPT has had a 40 per cent interest since 1996.

Service providers

Service providers are a significant and innovative segment of the telecommunications services industry. There is also evidence that a strong service provider segment can promote greater growth and innovation than markets where carriers predominate (or have a monopoly). However, one prerequisite for this is a regulatory environment that encourages competition via open and reasonably priced interconnection.

In an attempt to improve the image of the service provider market, a number of service providers negotiated voluntary membership of the Telecommunications Industry Ombudsman (TIO) scheme in 1995–96. Under the TA 1997, all carriage service providers have to belong to the scheme from July 1998, which also includes some 500 Internet service providers.

Service providers can be segmented into four categories:

- Switched service providers;
- Switchless service providers;
- Mobile service providers (which are also switchless); and
- International service providers (which can be either switched or switchless).

Switched service providers: Businesses that combine their own switching and network facilities with those of facilities-based carriers. Switched service providers have high entry costs but can retain between 35 per cent to 40 per cent of their resale revenue. This is higher than the 10 per cent to 20 per cent retained by switchless carriage service providers because of lower interconnect costs (Budde 1999a, p.2). The principle difference between switched service providers and facility-based carriers is their scale of operation and regulatory requirements.

Switchless service providers: These service providers do not own their own infrastructure and typically onsell basic carriage services, generating profit from the margin between the retail price to their customers and the volume discounts they can negotiate with the facilities-based carriers. Switchless service provider categories include aggregators, rebillers and dealer networks:

- *Aggregators:* Customers receive a share of the volume discount, although billing is still managed by the carrier. The value-added by the service provider is low and profits rely on discount margins. This form of resale is declining under new tariff arrangements by the carriers.
- *Rebillers:* Rebillers process raw data from the carrier with ‘smart’ software. This allows for a greater range of management services including bill analysis (with an estimated error detection rate of 10 per cent (Budde 1998b, p.3)), and represents a value-added component by the service provider that is much higher than under simple aggregation. This is currently one of the stronger markets for switchless service providers.
- *Dealer networks:* Approved dealers are able to resell to residential and small business markets at discounts of approximately 15, 12 and 3 per cent for long-distance, international and local calls respectively. Although dealers do not ‘own’ their customer lists, they benefit from Telstra’s large dealership development budget. One example of a dealer network is Telstra’s ‘Solution Plus Dealership’ plan.

Overall, switchless resale is the largest (in numbers) service provider segment and is expected to account for more than 10 per cent of long-distance revenue by the year 2000 (Budde 1999a, p.3).

Mobile services providers: Mainly engaged in resale, mobile service providers are one of the strongest growth areas of the service provider segment. Each of the top three carriers has developed networks of (non-exclusive) service providers to resell their mobile services:

- *Telstra MobileNet:* CXA Communications, Corptel, Axicorp, United Telecommunications;

- *Optus Communications:* First Direct, Link Communications, Hutchison, One.Tel, First Netcom; and
- *Vodafone:* AAPT, Advanced Communications, Cellular One Communications, Digicall-Vodata, GSM Renta Fone, Martin Dawes Communications Pty Ltd, MobileCom, Mobile Innovations, Myline, Nomad Telecommunications, Talkland, Total Tel, Vodac, Votel, Winterton Communications.

There are also numerous mobile phone retailers who sell handsets and act as agents for the carriers. However, billing and customer support is supplied by the carrier.

International service providers: More commonly referred to as callback operators, they derive profits from the differences in international tariffs that exist between countries. In the past, these differences have allowed callback operators to offer customers discounts of between 25 and 30 per cent. However, falling outbound international tariffs and the emergence of new telecommunications alliances that offer globally managed services foreshadow limited growth in this segment. In Australia, the callback market is estimated to account for less than $8 million of the $1.5 billion international call market. Although there are several operators active in the callback market, Telegroup Australia with 15 000 customers claims to control 95 per cent of the market (Budde 1998b, pp. 6-8).

2.5 In summary

The services provided by the telecommunications services industry are a major input to many industries, particularly those in the service sector (currently the fastest growing sector in the Australian economy). The industry itself also makes a significant and growing contribution to economic activity.

Growth prospects and the level of competition vary among market segments. Those experiencing the greatest growth relative to the traditional voice services are mobile, data and value-added services. These are also areas where entry and, potentially, competition have been the greatest.

Technological developments and convergence have significant implications for the network infrastructure and the cost, quality and range of telecommunications services that carriers deliver. These developments centre on digitalisation that allows for a range of services (voice, data, video) to be transmitted across common infrastructure. Data and multimedia communications are the areas likely to have the greatest benefit from these developments.

That said, new technologies are not expected to significantly affect comparisons in the price of traditional voice services in the benchmarked countries, particularly as all have access to the latest technology. However, the changing usage patterns necessitate some consideration of broadband data services such as ATM, frame relay and ISDN in price comparisons.

Another practical consideration of technological development is that price comparisons must be based on carriers providing a comprehensive range of services. For Australia, the incumbent, Telstra, dominates all segments of the market (see Table 2.10).

The telecommunications industry has become increasingly important to the competitiveness of other industries and, therefore, it is crucial that it is efficient. The rapidly changing nature of the industry highlights the importance of innovation and investment (dynamic efficiency). An efficient industry that exploits new technology and is responsive to changing demands benefits business and private consumers.

3 SOCIAL POLICY AND RETAIL PRICE REGULATION

Government involvement in the telecommunications industry has significant implications for benchmarking comparisons. An understanding of regulatory and institutional arrangements is important because they affect performance measures, including prices.

Social policies (including the Universal Service Obligation (USO) and retail price regulation) form one part of the regulatory arrangements surrounding the Australian telecommunications industry. Another significant part is competition policy which is discussed in Chapter 4.

In Australia, there is currently a range of social obligations placed on telecommunications providers:

- the USO;
- emergency call services;
- operator services and directory assistance;
- a customer service guarantee; and
- itemised billing of timed calls, with the option of itemised billing of untimed local calls.

There are also a range of retail price controls in place, including price caps and a requirement for untimed local calls.

The most significant of the social policy obligations are the USO, retail price regulation and the regulation of service quality. The aim of this Chapter is to describe the arrangements for the provision of the USO (Section 3.1) and retail price regulations (Section 3.2) in Australia. The arrangements in other countries are also discussed briefly and important differences identified.

Arrangements regulating quality of service are outlined in Chapter 7.

The arrangements described in this Chapter were those in place as at February 1998 when the price comparisons presented in Chapters 5 and 6 were conducted. Unless otherwise indicated, documentation published by the regulatory authorities and relevant Ministries in each country was used.

The application of USOs and other controls affect prices. An understanding of these effects is required to interpret differences in the prices reported for each country in Chapters 5 and 6.

3.1 The Universal Service Obligation

In Australia and in other countries covered by this study, the USO was traditionally a condition for the incumbent's retention of its monopoly. The costs of providing the USO were borne by the incumbent.

All of the countries studied, including Australia, retained some form of USO requirement following the introduction of competition (see Table 3.1). However, not all provide a mechanism for funding this obligation.

Purpose of the USO

The purpose of the current Australian USO is:

> ... to safeguard access to a minimum standard of essential communications services for all persons in Australia. This recognises the fundamental importance of telecommunications in supporting effective participation in Australian society (Explanatory Memorandum to the TA 1997, vol. 1).

The role of the USO in achieving access to basic voice telephony services in Australia is difficult to assess. The high percentage of households with a telephone in Australia and the other countries covered by the study may not be solely attributable to the USO (see Table 3.2). All these countries have well-developed systems of telecommunications and high per capita incomes.

Defining the USO — Australia

Telstra remains the nominated universal service provider. Although the legislation allowed for the possibility that the USO (or sections of it) could be fulfilled by other carriers, this provision has not been invoked.

Table 3.1 USO requirements in the selected countries, 1996

	USO requirements
Australia	Requires that standard telephone services, including services for the disabled, public payphones and prescribed carriage services are reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business.
Canada	Requires that telephone services be provided to all who can pay for it, but customer access and usage charges are not required to be maintained at a uniform level across the country.
Finland	Dominant operators must serve all customers in their territory.
France	Obligation to provide a quality telephone service at an affordable price
Japan	The USO requires uniform and regulated charges for local calls and customer access. In high-cost areas these charges are cross-subsidised by customer access charges in more populated and therefore less costly areas, and by long-distance charges.
NZ	The Kiwi Share Obligation on TCNZ: • mandates maintenance of the option of free local calls for residential customers, but tariff packages incorporating charges for local calls may be offered as an optional alternative; • prohibits real increases in residential customer access charges, subject to no ‘unreasonable impairment’ of the overall profitability of the TCNZ’s subsidiary regional operating companies; • requires the ordinary residential telephone service to be made as widely available as it was at 11 September 1990; and • obliges TCNZ to maintain rural customer access charges at rates no higher than the standard residential rental. The Obligation does not extend to public payphones.
Sweden	Telia is obliged to provide telephony services between fixed points to all regardless of where they live at an affordable price.
UK	• a connection to the fixed network able to support voice telephony and low speed data and fax transmission; • the option of a more restricted service package at low cost; and • reasonable geographic access to public call boxes across the UK at affordable prices.
US	Local Exchange Carriers (LECs) must average call prices for a given distance across their entire service areas, regardless of differences in costs. They must give customers in remote areas access to telecommunications services that are ‘reasonably’ comparable to services provided in urban areas at charges which are ‘reasonably’ comparable. Services must be provided at concessional rates to libraries, educational and health facilities and low-income customers. There is no legal requirement for LECs to install and maintain public payphones.

Source: EC (1997); Harris and Kraft (1997, p. 109); MoC (1997); TA 1997; Appendix E.

Table 3.2 Household penetration rates in Australia and the selected countries, 1996

	Households with a telephone	*Residential main lines per 100 household*
	(per cent)	*(number)*
Australia	96.4	96.4
Canada	98.7	>100
Finland	95.0	88.3
France	97.0	>100
Japan	not reported	96.2
New Zealand	96.0	>100
Sweden	not reported	>100
UK	91.1	96.1
US	93.9	>100

Note: Since households may have more than one residential main line or, alternatively, may share a main line with other households, column 2 is not necessarily identical to column 3.

Source: ITU (1998a, p. A23).

In Australia, the USO is defined in the *Telecommunications Act 1997* (TA 1997) as the obligation to ensure that:

- standard telephone services, including services for the disabled;
- public payphones; and
- prescribed carriage services

are reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business.

Carriers are required to offer the option of untimed local calls. However, this obligation is not part of the USO requirement. Rather, the provision of untimed local calls forms part of retail price regulation (see Section 3.2).

This is commensurate with the main feature of the Australian USO, which requires the provision of a standardised service to all areas at ‘equitable’ prices. The Explanatory Memorandum to the TA 1997 makes it clear that the USO does not encompass affordability. Rather, affordability is a matter which should be dealt with through such mechanisms as price controls:

> In relation to the concepts of ‘reasonable access’ and ‘equitable basis’, it should be noted that these concepts are intended to relate principally to access in geographical terms and equity in terms of equality of opportunity, rather than concept of affordability. While affordability is clearly important to access in general terms, it is a matter which the Government considers should not be embedded in the USO itself, but should be tackled through other (transparent) mechanisms such as competition, price control and targeted assistance (Explanatory Memorandum to the TA 1997, vol. 1).

The standard telephone service is voice telephony. The standard telephone service and prescribed carriage services must be supplied *on request*. According to the Explanatory Memorandum to the TA 1997, the intention is:

> ... that people will always have reasonable access to a minimum service that is of general appeal and that can change over time, while providing a mechanism to ensure that more advanced services, which may not be of general appeal, can be required to be made accessible under the USO, without affecting overall access to the basic service (Explanatory Memorandum, TA 1997, vol. 1).

The USO provider must also supply a service of equivalent functionality to the standard telephone to those whose disability prevents the use of the equipment normally supplied to customers.

All reasonable requests for the provision of a payphone must be met by the provider. The Minister may also determine that a payphone should be provided at a particular location. Customer equipment must be supplied under the USO. At a minimum, this is a telephone which allows calls to be made and received, but does not necessarily have other functionality.

In addition, there are a number of statutory obligations for consumer protection which are *not* included in the legislation. For example, all carriage service providers supplying the standard telephone service must offer access to emergency and directory services, operator assistance, untimed local calls and itemised billing for calls priced on a timed basis. A number of these requirements apply in most other countries covered by this study, and are sometimes, but not always, included in legislation.

The TA 1997 provides two means of adjusting and upgrading the services covered by the USO over time. Changes can be effected by prescribing additional purposes or performance characteristics for the standard telephone service or by expanding the definition of the USO to include new carriage services.

Prescribing additional purposes or performance characteristics for the standard telephone service requires the USO provider to deliver the upgraded service universally. Expanding the definition of the USO requires that the upgraded service be delivered only to those who request the new carriage service.

Costing and funding USOs

The TA 1997 specifies three permissible alternatives for estimating the ‘total’ costs of the USO in Australia:

- the ‘avoidable cost less revenue foregone’ method;
- the amount established in any tendering or other selection process; or

- the amount agreed between the carriers.[1]

Under the 'avoidable cost less revenue foregone' method, the provider may claim costs for 'net cost areas' only. 'Net cost areas' are areas in which the provider is likely to make a 'substantial loss' in the course of delivering the USO. They are declared by the Australian Communications Authority (ACA) after making suitable inquiries. The ACA must be satisfied that the loss is beyond the provider's power to avoid or mitigate.

The cost of the Australian USO was originally estimated by the Bureau of Transport and Communications Economics (BTCE) in 1989. Using an avoidable cost-based model, the BTCE estimated the net USO cost at around $250 million (see Box 3.1). This estimate subsequently became the basis for the USO costing under the cost sharing arrangements established by the *Telecommunications Act 1991*.

However, the model prescribed in the legislation proved 'essentially very difficult and … unworkable' (Lomdahl 1997 quoted in Langtry 1998, p. 30). Consequently, in 1993–94, Telstra, Vodafone and Optus commercially agreed to a USO cost of $230 million, indexed at CPI in subsequent years.

Recently, the ACA engaged Bellcore to assess the original model and develop a more accurate costing of the USO. Using the Bellcore model, Telstra subsequently claimed that the net cost of the USO is $1.8 million. As part of the assessment of this claim a further study was commissioned by the ACA which implies a much lower than $1.8 million net cost (Gibson Quai and Associates and Ovum (1998)).

A policy principle of the TA 1997 is that the USO should be fulfilled as efficiently and economically as practicable. This is not to be at the expense of achieving the USO, but is directed at ensuring that the provider delivers it cost-effectively (Explanatory Memorandum of the TA 1997, vol. 1). The legislation provides that the Minister may reduce the net cost claimed by Telstra.

USO providers are required to submit plans outlining how they intend to meet their USO for Ministerial approval. Prior to obtaining Ministerial approval, a preliminary draft must be made available for public comment. The plans must include the performance standards to which the provider will be subject under the Consumer Service Guarantee. For example, Telstra's Universal Service Plan includes an undertaking to reduce connection times to the basic phone service in very remote areas lacking existing infrastructure (Australian Financial Review 19 May 1998).

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1 The Minister may also make a determination specifying a method of determining the cost. However, its adoption requires the written consent of the USO provider.

Box 3.1 The current agreed cost of the Australian USO, 1998

In 1989, the Bureau of Transport and Communications Economics (BTCE) estimated the cost of the USO to Telecom using the 'avoidable cost (net of revenue foregone)' method (now incorporated in the legislation) as approximately A$250 million. This approach estimated the cost of the USO by summing only those costs that could have been avoided if the USO had not been provided. Revenue foregone includes the sum of incoming and outgoing call revenue.

This was in contrast to the 'distributed cost' method then advocated by Telecom, which resulted in an estimation of A$800 million. Under this method, all costs are allocated to the USO and non-USO services regardless of whether they would have been incurred if the USO had not been provided. The rationale was that the system would have had a different configuration if it had not been for the USO. Revenue included outgoing call revenue only.

Maddock (1996) identifies the difference between the distributed cost and avoidable costs methodologies as the treatment of joint costs incurred in providing both the USO and non-USO services. He also nominates a third method — the 'stand-alone cost' approach — as the method that a new entrant would use to price the activity concerned. If there are economies of scale and scope, the stand-alone cost will be higher than avoidable cost. The use of the stand-alone cost method involves leaving all the benefits of such economies with the owner of the enterprise. The use of the avoidable cost methodology gives the benefits of economies to the USO recipients — leaving the fixed costs to be recovered from other customers.

a The stand-alone cost approach involves estimating the costs that would have been incurred if the USO alone was delivered.

The TA 1997 also requires that the costs of the USO be shared among carriers so that no one carrier is disadvantaged (see Table 3.3). To this end, the costs of the USO must be shared in proportion to carriers' shares of 'eligible revenue' (as defined in regulations). After obtaining the consent of participating carriers, the Minister may specify another cost-sharing mechanism.

Loading all the costs onto a single carrier would be incompatible with competition policy:

> It is generally recognised that a universal service provider that must subsidise USO losses by itself in a competitive regime is at a disadvantage (Explanatory Memorandum to the TA 1997, vol. 1).

Moreover, distributing the burden is intended to ensure the sustainability of the USO.

However, USO arrangements must not under- or over- compensate the provider for the cost of the USO.[2] Under- or over-compensation may impede the establishment of a fully competitive market, impairing the long-term interests of end-users.

In the United Kingdom, the Office of Telecommunications (OFTEL) argued that funding through the Government budget is the 'fairest and least distorting' mechanism of funding a USO (OFTEL 1995, p. 62). Moreover, since it avoids cross-subsidisation, it is potentially the most transparent mechanism, provided all social obligations are costed and included in the estimates. Few, if any, of the selected countries practice direct funding of the USO.

In the United Kingdom, OFTEL estimated the annual cost of the USO as being between £50 million ($131 million)[3] and £100 million ($262 million) (OFTEL 1997d, p. 17).

In the United States, Inter-Exchange Carriers (IXCs) and all other suppliers of interstate services are now required to contribute to a universal service fund for high-cost areas served by incumbent Local Exchange Carriers (LECs), in proportion to their revenues from interstate services. In effect, this involves a continuation of partial subsidisation through the pricing structure.[4]

Lewin and Kee (1997) estimates the cost of the USO in the United States as $US1.65 billion in mid 1997, of which $US1.5 billion is attributable to the high cost area subsidy.

USOs in the United States were previously financed through averaging across geographic areas and a surcharge on charges for access to the services of LECs paid for by the IXCs. Concern about the efficiency of such arrangements led to new approaches.[5]

2 Violations of competitive neutrality are likely to deter efficient entry, investment and innovation.

3 Using a conversion rate of £1 to $2.7.

4 Consideration is also being given to competitive tendering for supply of the basic telephone service in small rural areas of the US (Ovum 1997).

5 These inefficiencies were mainly as a result of immunity from competition for LECs by new entrants in subsidised areas and inefficient entry in areas providing the subsidy. The contributions through access charges led to inefficient by-pass (Vogelsang and Mitchell 1997). Inefficient by-pass is duplication of the network which is not cost effective.

Table 3.3 Funding USOs, January 1998

	Funding mechanism
Australia	The costs of the USO must be shared among carriers so that no one carrier is disadvantaged. To this end, the costs of the USO are shared in proportion to carriers' shares of 'eligible revenue'. After obtaining the consent of participating carriers, the Minister may specify another cost-sharing mechanism.
Canada	Carriers are required to contribute to the USO requirement through a Portable Contribution Subsidy. The Subsidy is an explicit toll levied on all long-distance traffic carried on the local telephone network. The funds are distributed to all local carriers based on subsidy requirements per residential Network Access Services or equivalent by rate band.
Finland	There is no specific universal scheme and as such universal service costs are not borne by other market participants. Incumbent must meet all universal service costs.
France	A national universal service fund was established in 1997. Net costs of overall geographic supply will be compensated by interconnection surcharges until 31 December 2000 at the latest.
Japan	Designated carriers must bare the cost of the USO's provision. Funding of the USO is to be reviewed in 2000.
New Zealand	Kiwi Share Obligation is met by TCNZ through surcharges on its interconnection rates.
Sweden	There is no specific universal scheme and as such universal service costs are not borne by other market players. Incumbent must meet all universal service costs.
United Kingdom	BT is responsible for the provision of the universal service obligation but the cost of the obligation is not re-imbursed.
United States	Each telecommunications carrier that provides interstate or intrastate telecommunications services must contribute, on an equitable and non-discriminatory basis, to the provision of universal service.

Source: Appendix E.

The European Commission permits, but does not require, the establishment of cost-sharing arrangements to finance USOs. It reports that nine member States (from a total of 15) have decided either that the costs of the USO do not constitute an unfair burden on the provider or that the costs of establishing a fund are not justified.[6]

6 The rebalancing taking place in Europe, to the extent that it has reduced constraints on cost recovery, may have reduced the burden on incumbents.

In Canada, carriers are required to contribute to the USO requirement through a Portable Contribution Subsidy. The Subsidy is an explicit toll levied on all long-distance traffic carried on the local telephone network.

Nippon Telegraph and Telephone Corporation (NTT), the Japanese provider of domestic services, has traditionally been regarded as having funded the USO through a cross-subsidy from its long-distance charges (Lewin and Kee 1997). Competition has reduced these charges. Although the regulator has permitted NTT limited tariff rebalancing — that is, increases in prices and charges for its local services — the poor financial performance of NTT indicates that it is unlikely that the current price structure can be sustained. The regulator, the Ministry of Posts and Telecommunications, has indicated that it will review the current arrangements.

3.2 Retail price regulation

Governments regulate telecommunications prices and charges to protect consumers from monopolistic pricing or from sudden increases in prices. Price regulation in telecommunications is often justified on the grounds that the market is not fully competitive. It is argued that dominance confers market power on incumbents. As a result, their prices are higher and their output lower than if the market were more competitive (see Appendix B for a discussion of market power in the industry).

In some countries (notably the United States) price regulation has also been prompted by the possibility that incumbents might engage in predatory pricing to the detriment of emerging competition in the more contestable segments of the market (Braeutigam and Panzar 1993, p. 374).[7] In Australia, predatory pricing is addressed under s.46 or Part XIB of the *Trade Practices Act 1974*.[8]

Price regulation also has political and social objectives. Customer access charges and local call prices are frequently regulated to ensure affordability and promote universal access.

7 It is argued that the incumbent could price below short-run incremental cost in the more contestable sectors of the market (such as the long-distance market), thus deterring entry. Price regulation may prevent this — for example, by placing constraints on price increases in the less competitive areas of the market (such as the local call market).

8 Einhorn (1991, p. 218) considers that price regulation is an inappropriate means of preventing predatory pricing, which is best dealt with under competition law.

Differences in price controls across countries will impact on customer price outcomes. Price controls ultimately impact on the extent of competition in each of the market sectors and, hence, on price performance.

Instruments

Retail *price regulation* is designed to ensure that prices and charges to *end-users* of telecommunications are appropriate. Price regulation may take the form of direct *price controls* on charges for individual services or products. For example, regulation requires that the price of locals calls in Australia not exceed 25 cents from residential phones or 40 cents from a public payphone.

Another form of retail price regulation is *rate of return regulation*. Rate of return regulation involves the imposition of a maximum target rate on the capital invested by a telecommunications company.[9] Provided this is not exceeded, the company is free to make any changes to prices it sees fit.

Retail price regulation may also include *price caps*. Price caps typically cover a number of services and are set for a pre-determined period of time. Prices can be adjusted within the cap during that period, subject to any additional constraints which may be imposed, such as caps on individual services (sub-caps) within the overall basket.

Under price caps, the amount that price can be adjusted over time is frequently set by reference to the rate of inflation (CPI) less an amount X. X is usually determined by reference to expected productivity growth over the price cap period.[10] The value of X should be equal to the difference between the productivity growth of the incumbent carrier and the economy as a whole.

The result of a positive X is a reduction in the real price of the services covered over the period of the price cap. Expected productivity growth may arise from technical progress, but might also come from eliminating inefficiencies. However, allowance may be made for factors which increase costs but are outside the control of the enterprise.

The usual arrangement is to set the price cap for a basket of services and products, with the weighting system of the basket based on each service's contribution to revenue. At the end of the period, both X and the composition of the basket are reviewed and adjusted and a new period specified.

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9 A minimum, or target, rate of return may also be set for publicly owned enterprises to ensure that they at least achieve the required return on their capital.

10 Consistency with the achievement of a minimum rate of return may also be a factor in the determination of X.

Within the overall basket, there are often sub-caps on individual services. Individual services may also be subject to direct price controls. Sub-caps and individual controls can ensure that particular classes of customer, such as residential customers, share in the benefits of price control.[11]

A common practice, when the basket is reviewed, is to exclude services considered to be supplied competitively. If the omitted services are those whose prices are expected to fall relatively rapidly (for example, long-distance services), the X applied to the more narrowly defined basket may be smaller than before. Furthermore, the decrease may be less than the expected rate of productivity increase for the enterprise as a whole.

Price caps and rate-of-return regulation allow flexibility to adjust the ‘relative’ prices of goods and services. This permits prices to reflect costs and to achieve an efficient price structure. Where there are price distortions, it allows for rebalancing to a more efficient structure (see Box 3.2).

Australian arrangements

Retail prices in telecommunications in Australia are controlled in a variety of ways. All suppliers of local calls are obliged to offer untimed local calls on fixed telephones and public payphones. Telstra’s untimed local call charges are subject to direct price control. In addition, Telstra’s retail prices and charges are subject to an overall price cap, applied to a weighted average or ‘basket’ of services, with sub-caps applying to some individual services within the basket.

The TA 1997 gives the Minister power to establish price control arrangements for the standard telephone service and for services supplied under the USO. Should a carrier other than Telstra assume the USO within a particular service area, it could become subject to a Ministerial determination for the prices of USO-related services, but within the specified service area only. As of January 1999, no determinations had been made.

Price caps

Under the Notification and Disallowance provisions of the *Telstra Corporation Act 1991*, Telstra is required to notify the Minister of any proposed changes in charges for particular services. The Minister can disallow changes. These provisions currently only apply to charges for directory assistance services.

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11 OFTEL (1996) pointed out that in six years of price control covering the whole of the market, BT’s low to medium spending residential customers on average received real price reductions of 2.7 per cent a year, compared to average real reductions of around 9.3 per cent per year for business customers.

Box 3.2 Rebalancing

What is rebalancing?

Rebalancing in telecommunications services means adjusting the structure of prices — between different services, classes of customer or between customer access charges and usage charges — to achieve a more efficient structure. See IC 1997b for a discussion of rebalancing access and usage charges.

There are two reasons for advocating rebalancing. One is the argument that rebalancing is necessary to achieve *economic efficiency*. The other is the argument that rebalancing is needed to facilitate effective *competition*.

Political and social objectives also frequently impose constraints on the extent to which price adjustments are possible.

Pricing efficiency

The case for rebalancing is mainly argued on the grounds that there is cross-subsidisation in the existing price structure and that this is inefficient and inequitable. For example, it has been frequently argued that long-distance call prices should be reduced, and that customer access charges should be increased. It has also been argued that the relative charges faced by businesses and householders should be adjusted.

There are various methods of adjusting prices towards a more economically efficient structure to recover financial costs fully (see IC 1997b, pp. 43-47 for a discussion). However, the general aim is to minimise reductions in the levels of demand selectively from those which would apply when prices are set at marginal costs.

Competition

It is sometimes asserted that rebalancing is required for the introduction of competition, which in turn produces a more efficient telecommunications industry.

Generally across countries, the inherited price structure (existing before rebalancing) has tended to yield higher returns for the incumbent from long-distance calls than from customer access and possibly also from local calls. The market for long-distance calls is expected to be more attractive to new entrants than the market for customer access and local calls.

Under open competition at existing prices, the incumbent could lose revenue to new entrants in the long-distance market without compensating revenue improvements in the local markets. Therefore rebalancing may be required to allow the incumbent to compete in the long-distance markets while earning a reasonable return in the local markets.

The Australian Competition and Consumer Commission (ACCC) is responsible for the administration of price regulation. The prior consent of the ACCC is required if Telstra proposes to increase a charge that is subject to the price control arrangements by more than the change in the CPI during a year. Under Part XIB of the *Trade Practices Act 1974*, the ACCC is also responsible for monitoring and reporting to the Government annually on the prices of specified goods or services.

Price caps were chosen, in preference to rate-of-return regulation, as the means of price regulation because of concern that imposing a maximum rate-of-return, while avoiding excessive profits, would not create any incentive to improve efficiency.

It was argued that price capping would encourage efficiency improvements by allowing Telstra to increase its profits to the extent that it could achieve annual increases in productivity in excess of X per cent over the specified period of the cap (Brunker and Shaw 1989).

Price caps were first applied to Telstra (then Telecom) in 1989 (see Table 3.4). This regime was part of a change in the Government's policy towards telecommunications which left Telecom's monopoly powers almost intact, while giving it a degree of independence through corporatisation.[12] Prior to that Telecom and OTC prices for basic or standard services were subject to Ministerial approval following consideration by the Prices Surveillance Authority.

Between 1989 and 1992, Telstra operated under a price cap (CPI-4 per cent) applied to a revenue-weighted basket of line rentals, local calls, STD and IDD calls. Subcaps (CPI) were also applied to local calls and residential rentals. Increases in connection fees, payphone calls, calls to directory assistance were notifiable and disallowable. Leased line charges, 008 services and mobile services were added to the list of notifiable services in 1991.

In 1992, the price cap on the revenue-weighted basket of services was changed to CPI-5.5 per cent and the basket extended to include connections, domestic leased lines, international leased lines and mobile services. Subcaps applied to certain services, including connections, rentals and local calls (CPI-2 per cent) and STD and IDD calls (CPI-5.5 per cent). In addition, prices for connections, rentals, local calls and STD calls could not increase by more than CPI each year. Increases in payphone calls, calls to directory assistance and connections for resellers were notifiable and disallowable.

The current Australian arrangements impacting on the price comparisons in Chapters 5 and 6 came into effect on 1 January 1996 and were originally to

12 Competition was confined to value-added services and customer equipment at this time.

apply until 30 December 1998. The Minister has extended the application of the price caps until June 1999:

- The price cap on the overall basket of Telstra's main services tightened to CPI-7.5 per cent for each calendar year.
- Within this basket are individual price caps of CPI-1 per cent for each year applying to *residential* connections, line rentals, long-distance and international calls.
- Before increasing any charge subject to these price control arrangements by more than the CPI during a calendar year, Telstra is required to obtain the prior consent of the ACCC.
- There is a direct price control of 25 cents on local calls from fixed phones and 40 cents on local calls from payphones.
- Telstra's charges for directory assistance are subject to notification and disallowance. The Minister may, after receiving a report from the ACCC, disallow a charge on public interest grounds.

The intention of retail price regulation in Australia is to protect end-users from the effects of Telstra's market power and satisfy social objectives. The sub-caps and the controls on individual services, such as the cap on line rentals and direct price control on untimed local calls, are consistent with this motivation. However, there may be a tension between price regulation and competition policy.

Both in Australia and many countries overseas, price caps have been chosen as an alternative to rate-of-return regulation. Price caps may be important for protecting and benefiting consumers, at the same time permitting the incumbent to earn a normal rate of return and encouraging productive efficiency. However, price cap settings, together with other forms of price regulation, such as direct price controls on individual services, must be established within a holistic framework.

Price regulation involves making a trade-off between social objectives and the desirability or otherwise of encouraging entry into particular markets. For example, if price regulation leads to the incumbent's charges for local services being below levels at which a new entrant can attain 'full cost recovery', entry into that market will be deterred, with possible adverse consequences for efficiency.

The current price controls are being reviewed by the Government, with a view to determining appropriate arrangements to apply until the end of the year 2000 (DoCA 1998). This review includes assessments of constraints on the prices of particular telephony services and the price cap on a broader basket of services.

The principles or criteria for making the assessments include effects on incentives to improve efficiency and the protection of particular groups of consumers.

There are likely to be tensions among these criteria. The rebalancing of prices towards a structure which is more efficient and more conducive to a competitive environment may impinge on other social and economic objectives (see Appendix B). For example, there is some concern that increasing customer access charges may deter customers from connecting to the network, reducing the value of the network as a whole.

Untimed local calls

All carriage service providers must give the option of untimed local calls — for voice, facsimile, data transmission and the Internet — to all residential and charitable customers who had access to untimed local calls before 20 September 1996.[13] Although business customers have a statutory right to untimed *voice* calls only, service providers voluntarily offer an untimed local call option for facsimile, data transmission and the Internet to their business customers.

The right to untimed local calls applies in local call zones, but not to mobile or satellite-delivered services. The geographically isolated, outside local call zones, do not have access to untimed local calls, but pay a special ‘pastoral rate’ of 25 cents for each 4.5 minutes. Commencing on 1 January 1998, those in remote areas receive an annual rebate of $160 per year against their pastoral call spending. This is the amount Telstra estimates as the benefit to the average consumer in country towns of being able to make untimed local calls rather than ‘pastoral rate’ calls (Alston 1998).

13 In some of the countries included in the study — New Zealand and some parts of the US — there is a requirement that local calls be free.

Table 3.4 Retail price regulation in selected countries

	Start date	*Price control*	*Services covered*
Australia	1989	CPI-4%	Line rentals, local calls, STD and IDD calls.
		Sub caps CPI	Local calls and residential rentals.
		Notifiable and disallowable	Connection fees, payphone calls, calls to directory assistance.
	1991	Notifiable and disallowable	008 services, leased line charges, mobile services.
	1992	CPI-5.5%	Connections, line rentals, locals calls, STD calls, IDD calls, domestic leased lines, international leased lines, mobile services.
		Subcap CPI-2%	Connections, rentals and local calls.
		Sub caps CPI-5.5%	STD calls; IDD calls.
		Capped at CPI	Increases in prices for connections, rentals, local calls and STD calls
		Notifiable and disallowable	Payphone calls, calls to directory assistance, connections for resellers.
	1996 to 1998	CPI-7.5%	Connections; line rentals; local, long-distance and international calls; leased lines; mobile telephone services.
		Sub caps CPI-1%	Residential connections, line rentals, long-distance calls and international calls.
			Before increasing any charge subject to these price control arrangements by more than the CPI during a calendar year, Telstra is required to obtain the prior consent of the ACCC.
			There is a direct price control of 25 cents on local calls from fixed phones and 40 cents on local calls from payphones.
		Notifiable and disallowable	Directory assistance.
Canada	1994	Direct price control	Three regulated increases proposed for 1996, 1997 and 1998 to bring residential services rates in line with costs.
	1995	Rate of return	Utility segment (the non-competitive part of the industry).
	1998 to 2002	CPI-4.5%	Utility segment.
		CPI	Basket of basic local residential services. No individual local residential or business charge will increase by more than 10 per cent any year.

Table 3.4 Retail price regulation in selected countries (cont.)

	Start date	*Price control*	*Services covered*
Finland			No retail price controls.
France	1995	CPI-4.5%	Basic voice telephony services.
	1996	CPI-5.5%	Basic voice telephony services.
	1997	CPI-6%	Basic voice telephony services.
	1998	CPI-9%	Basic voice telephony services.
Japan			Rate of return price regulation.
New Zealand	1989	CPI	Line rentals; customer access charges for residential customers in rural areas not to be higher than in the cities.
		Direct price control	Local free calling to remain a tariff option available to all residential customers.
Sweden	1993	CPI-1%	Basket of telephony services supplied to households and smaller companies.
		Light user scheme	Users with low consumption offered reduced subscription fees.
	1997	CPI	Customer access charges.
UK	1984	CPI-3%	Line rentals; local and long-distance calls.
		Indiv. cap CPI+2%	Line rentals. This sub-cap remained with the same X until 1997.
	1989	CPI-4.5%	Line rentals, local and long-distance calls.
	1991	CPI-6.25%	Basket extended to include international calls.
	1992	CPI-7.5%	Line rentals; local and long-distance calls; international calls. In addition to the cap on this basket, some individual price caps were place on certain services.
	1997 to 2001	CPI-4.5%	Line rentals; local, long-distance and international calls for small to medium usage households (light user scheme).
		CPI	Line rentals; local, long-distance and international calls for small business.
USA			Price caps in some States. Price cap on AT&T’s interstate charges for a period after 1989.
			Allowed rate of return for LECs interstate connection.

A Ministerial Determination under the *Telstra Corporation Act 1991* came into effect on 31 December 1997. Under the determination, the weighted average untimed local call price for residential and charity customers in rural Australia in 1998 is not to exceed the weighted average local call price for residential and charity customers in metropolitan Australia in 1997. A similar rule applies to untimed local call prices for business customers.

The Minister has also indicated that he will prevent any attempt by Telstra to impose timed charges on Internet Service Providers for calls made to them by their customers. This is intended to promote use of the Internet (DoCA 1998b).

Overseas arrangements

A similar array of instruments are apparent in overseas price regulation (see Table 3.4).

United Kingdom

Price caps were introduced following the privatisation of British Telecom (BT) in 1984. It was deemed superior to ‘rate-of-return’ regulation then being applied in the US (Scott 1996). Reviews were to take place every 4 years. Scott (1996) comments that it was intended to be ‘light-handed’ in both procedural and substantive terms. Changes could occur only in conjunction with alterations to BT’s licence conditions, a procedure requiring the agreement of BT.

Between 1984 and 1988, BT kept its prices below the levels allowed under the regime (Einhorn 1991). Despite this, its profitability increased. ‘X’ was increased in 1989, in 1991 and again in 1992, when individual price caps were placed on certain services. According to Spiller and Vogelsang (1993, p. 25), BT agreed to the 1992 increase in X under threat of a reference to the Monopolies and Mergers Commission, with the possibility of eventual restructuring.

These adjustments to X were required by OFTEL because of the slowness with which effective competition — which might have been expected to lead to price reductions — had developed.

Although price caps had originally been adopted in the UK as an alternative to rate-of-return price regulation, OFTEL used BT’s rate-of-return both in the process of determining the value for ‘X’ and as an indicator of the effectiveness of price capping. BT’s rate-of-return was unexpectedly high, despite increases in ‘X’. Calculating the rate-of-return required detailed investigations of BT’s financial structure and costs (Scott 1996) and therefore imposed similar transactions costs to rate-of-return regulation. Liston (1993) concluded that a well-functioning price cap regime requires as much knowledge about costs as rate-of-return regulation.

In 1997, OFTEL replaced an emphasis on price control with more general powers to regulate anti-competitive conduct based on the European Commission model. The scope of the price cap in terms of revenue covered was reduced. Price capping now applies to services for residential and small business customers only. OFTEL intends to abolish price controls completely at the end of 2001.

United States

Rate-of-return regulation was the traditional method of regulating the prices of utilities in the US. However, many States introduced 'incentive regulation' or price caps as an alternative to rate-of-return regulation.

The motive was the level of administrative effort and regulatory transactions costs in annual rate of return hearings, and the time and costs associated with ratepayer refunds if the operator exceeded the authorised ceiling rate-of-return. Incentive regulation was intended to operate for more than one year, and to establish bands for efficiency improvement which might be shared between the ratepayers and the operator's shareholders.

Price caps first replaced rate-of-return regulation in Michigan in 1980 (Einhorn 1991), resulting in considerable savings in administrative costs (estimated at $US 40 million in 1982) for the company concerned.

A number of State public service commissions have imposed price caps on Regional Bell Operating Companies (RBOCs), but many persist with rate-of-return regulation.[14] Price caps are frequently combined with some form of rate-of-return regulation (Brauetigam and Panzar 1993). When earnings exceed a certain level, prices may be reduced (Majumdar 1997).[15] Many States exempt competitive services from price caps.

A comparison of the pricing behaviour of RBOCs regulated by rate-of-return regulation and incentive regulation in 1991 indicates that, by itself, price-

14 The Federal Communications Commission (FCC) currently prescribes rates of return on interstate connections for local exchange carriers. The FCC announced in October that it intends to represcribe the rate of return in 1999 – carriers have been invited to comment on appropriate methodologies by February 1999.

15 Majumdar found that these 'revenue sharing' arrangements were less conducive to efficiency improvements than 'pure' price capping. In particular, the incentive to reduce 'X-inefficiency' and invest in cost-saving technology was lower.

capping may have no significant effect on long-distance prices, and may even increase them (Blank, Kasserman and Mayo 1998).

At the Federal level, American Telephone and Telegraph (AT&T) was subjected to *de facto* rate-of-return regulation from the 1930's. Price capping AT&T's interstate charges commenced in 1989. As services became competitive, they were removed from the basket, and eventually, price regulation of AT&T ceased.

Canada

All federally-regulated carriers were placed under the jurisdiction of the Canadian Radio-television and Telecommunications Commission (CRTC), which approved carriers' tariffs and their rate-of-return, in 1993. In 1994, companies were required to separate their accounts for the 'utility' parts of their businesses (those not considered to be supplied competitively) and 'competitive' parts. Rate of return regulation applied to the utility segment only.

Between 1995 and 1 January 1998, telephone companies were required to rebalance by increasing local residential line rentals, offset by reductions in call prices.

Price caps replaced rate-of-return regulation in 1998. The current regime will be effective for 4 years from 1 January 1998 and applies to regional incumbents.[16] The price caps are only applied to services which are not supplied competitively, mainly local residential services.

New Zealand

The Kiwi Share Obligation places certain pricing obligations on Telecom New Zealand (TCNZ):

- to provide the option of free local calls to residential customers;
- to restrict the rate of price increases for residential access rentals to the annual rate of inflation, subject to no 'unreasonable impairment' of TCNZ's profits at the regional subsidiary level; and
- to maintain rural residential customer access charges at rates no higher than standard urban residential customer access charges.

This pricing regime does not require scrutiny of TCNZ's costs. However, TCNZ's rival, Clear Communications, has claimed that TCNZ bundles competitive services (long-distance) with monopoly services (for example,

16 The companies affected are BC Tel, Bell Canada, Island Tel, MT&T, MTS, NBTel, NewTel, and TCI.

customer access charges) to the detriment of competition (Lewin and Kee 1997). Lewin and Kee (1997) considers that long-distance rates are comparatively high, allowing scope for considerable rebalancing.

France

Basic voice telephony services provided by France Telecom are subject to price capping arrangements. From 1 January 1998, joint control was to be exercised by the Ministry of the Economy and the industry’s regulator, Autorite de regulation des telecommunications (ART).

Japan

Prior to opening the market to competition, the Diet was responsible for price regulation. Any telecommunications company wishing to alter prices must now apply to the regulator, the Ministry of Posts and Telecommunications (MPT), which uses rate-of-return as a guide to appropriate prices. However, to reduce delay in the introduction of a new or changed service, a system of notification is to be introduced. After introduction, the charges can be disallowed by MPT if found to disadvantage end-users (MPT 1998).

MPT currently uses price regulation to regulate competition. For example, the incumbent, NTT, may be refused permission to lower prices if this appears likely to harm new entrants (Vogel 1996, p. 163).

Consideration is currently being given to introducing price capping for telecommunications services (MPT 1998).

MPT has permitted some rebalancing — increases to local call prices and customer access charges and reductions to long-distance call rates. According to Lewin and Kee (1997), the ratio between charges for long-distance and local calls services now reflects the ratio of the underlying costs of provision.

Sweden

Until 1997, the incumbent, Telia, was subject to price caps on baskets of calls. According to Lewin and Kee (1997), the National Posts and Telecommunications Authority, the regulator for telecommunication, removed the price capping because:

- rebalancing was considered to have been completed; and
- competition was considered to be emerging and to be reducing the need for price controls.

Finland

Competition in network services has been extended to local services through the *Telecommunications Market Act* which came into effect in July 1997. There are no price caps in Finland, and operators can set prices without prior government approval.

Commentary

The arrangements chosen for price regulation may affect the incumbent's incentives to invest efficiently, to adopt an efficient price structure and to pursue cost savings and efficient production techniques. Consequently, differences in price control arrangements across countries can result in price differences that affect comparisons and interpretation of overall price performance. In particular, differences in the composition of price cap baskets, the value of X, the timing of reviews and the application of sub-caps can make interpretation of price differences difficult.

Price regulation can impact upon the degree of competition in a market. Price regulations can interfere with competitive processes by reducing the competitive returns available in a market and thus making entry unattractive.

Pricing efficiency

In Australia, there is no mandatory requirement for rebalancing.[17] Indeed, there are separate controls on 'big ticket items' within the basket — that is, individual services making major contributions to revenue — such as line rentals and local calls.

There is evidence that the price caps on line rentals have inhibited Telstra from removing the 'access service deficit' by adjusting the balance between customers so that prices reflect costs (see Box 3.3) (IC 1997b; NECG 1999a). It has been required to maintain its residential line rental in real terms *each year* since 1989–90. This has left little scope to rebalance, especially after having regard for the administrative costs and loss of goodwill of making frequent price adjustments.

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17 The European Union and the Canadian regulatory authorities require incumbents to rebalance. However, because rebalancing may require increases in customer access charges, there is a contradiction between this and 'affordability'. For this reason, the European Union permits member countries to proceed with rebalancing at a pace consistent with the maintenance of affordability in the local call market.

Box 3.3 The access service deficit

The access service deficit is the alleged difference between non-call related costs and non-call related revenues. Non-call related costs are incurred independently of the use of the network and comprise such things as capital, installation and maintenance costs of the links between the network and the customer’s premises. Non-call related revenues are customer access charges such as line rentals and connection charges.

A customer-by-customer access service deficit is created when the cost of providing and maintaining a connection to the network for a particular customer exceeds connection and annual customer access charges. For example, if the annualised cost of maintaining a connection to a customer is $300 but the annual customer access charge is $140, then the access deficit for the customer is $160.

A geographic access service deficit is created when the costs of maintaining a connection to the network for customers in one particular area exceed the revenues raised through line rentals from that area. For example, if the average cost of connecting customers in an area is $400 and the average customer access is $140, then the access deficit is $260.

An average access service deficit can also be calculated across all customers on the network.

If an access service deficit exists, then the network operator must recover the shortfall from other charges, such as call charges.

Source: ACCC (1998a, p. 5).

Telstra (1998, per. comm) has also identified political considerations as another factor possibly discouraging increases in customer access charges, pointing out that there is a high level of political interest, and willingness to intervene in Telstra’s pricing. It regards a number of recent decisions as evidence of this, namely the:

- requirement for average pricing of local calls in metropolitan and non-metropolitan areas;
- requirement that directory assistance be ‘free’ to the inquirer; and
- prohibition on B-party charging of Internet service providers for long held data calls.

The extent to which prices can be rebalanced toward a more efficient pricing structure can affect the level of competition. Hence countries that have rebalanced and increased competition should display better overall price performance than those where progress has been slow.

Sidak (1998, p. 14) has drawn attention to the interaction of price caps and changes to the duration of calls in Australia. The duration of local calls has been rising in recent years largely as a result of increasing Internet usage. Given that local call prices are capped at an untimed 25 cents, this has resulted in the implicit price per minute of a local call falling:

> Because a carrier incurs incremental costs on a per minute basis to provide a local call, and because the price of a local call must contribute also to the recovery of the carrier's non-incremental costs, Telstra's falling implicit price per minute for local calling discourages entry and investment by competitors in the local call market (Sidak 1998, p. 14).

One possible implication of a falling implicit price in the local call market is that the incumbent may not be able to fully rebalance prices between the local call and long-distance markets. Hence, the cap on local call prices could potentially detract from Australia's performance in international comparisons of long-distance prices (see Chapters 5 and 6).

Timing of reviews

Changes in X have occurred at roughly three year intervals in Australia. The review currently under way will establish price controls to apply only in calendar years 1999 and 2000, with a further review during the year 2000 to establish the need for controls beyond that date.

The timetable, principles and expected outcomes associated with the current review have been sufficiently well articulated to remove the possibility of unanticipated changes in X such as those experienced in the United Kingdom in 1989, 1991 and 1992. However, the setting of the new price regulation regime involves a number of difficult trade-offs. The most significant of these is the trade-off between social objectives and the benefits attainable through efficient competition.

The level of X

X has been increased with each review of the price capping arrangements in Australia. With the exception of the most recent reviews, this has also occurred in the United Kingdom.

Price cap basket

The current Australian and French baskets are the most comprehensive of those covered by Table 3.4, and include, for example, long-distance calls, regarded as being supplied more competitively than local services in most countries. However the terms of reference for the review of price capping arrangements currently under-way in Australia includes the following statement:

> A reduction in, or removal of, price caps for specific product areas, or generally, would normally be expected where there is effective competition in the relevant market.

In the United Kingdom and Canada, services considered to be supplied competitively have been removed from the basket of services, with a view to the eventual abolition of price capping. Since there would be less scope for price reductions for the remaining services in the basket, a lower value of X would generally be expected for a less comprehensive basket.[18]

3.3 In summary

All of the countries studied, including Australia, have retained some form of USO requirement. However, three countries — Sweden, Finland and the United Kingdom — do not have a mechanism for funding this obligation.

Recasting the USO to fit a more competitive environment has proved difficult. However, few, if any, of the countries studied directly fund the USO. Rather the costs are borne by the industry and ultimately some consumers.

Until recently, the estimated cost of the USO in Australia was small by comparison with total revenue. However Telstra has recently claimed that the net cost of the USO in Australia was $1.8 billion. However, Gibson Quai & Associates and Ovum (1999) who were engaged by the ACA to look into the matter have estimated a range of possible costs that are much lower.

Studies conducted in the United States and United Kingdom estimate their respective USO costs at $US1.65 billion and between £50 million and £100 million.

It was beyond the scope of this study for the Commission to estimate the cost of the USO. However, if recent cost estimates conducted are accurate, then the requirement on Telstra to provide a universal service could be a factor in explaining price differences between Australia and the overseas countries included in this study.

The effect of retail price regulations may prove more significant in the pricing comparisons. Telstra is currently subject to a range of retail price controls which limit the annual price increases of various telecommunications services to residential and business customers. Principal among these are the price cap applying to line rentals and the direct price control on local call charges plus the requirement to offer untimed local calls.

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18 This assumes that price reductions in the ‘competitive’ sectors of the market will continue.

It is suggested that both of these price controls greatly restrict Telstra’s ability to rebalance prices so that they more accurately reflect costs (NECG 1999a). Price caps on line rentals have prevented Telstra from rebalancing its charging structure from usage to customer access, creating an access service deficit.

The price control upon local calls may also restrict Telstra’s ability to rebalance prices between local and long-distance, possibly causing long-distance prices to be above costs. It may also discourage entry into the local call market. This situation may be aggravated by increased usage of the local network as Internet usage grows.

While Telstra has been unable to rebalance its prices, incumbents in most of the benchmarked countries have faced a similar situation. Like Telstra, at the time of the pricing comparisons in Chapters 5 and 6, these incumbents have also been subjected to retail price regulation.

Only Finland and Sweden are considered to have fully rebalanced their retail prices. Full rebalancing may mean that these countries have relatively low USO costs and thus relatively lower retail prices.

4 REGULATION OF COMPETITION

The institutional and regulatory arrangements in a country affect the performance of the telecommunications industry, including the prices of services. By influencing the extent of competition and degree of concentration in the market they also affect efficiency incentives for operators.

Governments in all the countries studied have sought to introduce competition into their telecommunications industries. Previously, these industries were characterised by a publicly-owned and regulated monopoly.

In doing so, governments have established regulatory regimes to maximise the extent of competition in an industry where incumbents retain significant market power and have a presence in all of the telecommunications markets. Primarily, the regimes provide for access to network facilities and services at reasonable prices and also provide for supervision of market conduct and sanctions against anti-competitive behaviour.

Regulatory intervention was considered necessary because of perceived barriers to entry, particularly where the incumbent remains vertically integrated. An incumbent with market power has little incentive to open any segment of the market to competition and is often in a position to reduce its effectiveness:

> ... a firm can leverage its monopoly power in one market into other markets where it faces competition. That can happen through price squeezes, vertical restrictions and attempts at foreclosure by which the monopoly firm can prevent entry or induce exit in those markets. Thus monopoly leveraging can lead to reductions in the amount of effective competition and to distortions in the monopolist's behaviour (Vogelsang and Mitchell 1997, p. 57).

The purpose of the analysis contained in this Chapter is to compare the Australian arrangements — the processes and instruments — against those in place in the selected countries. Regulatory design affects price and quality performance and hence is important in the interpretation of results in later chapters. The justification for the regulatory intervention is not examined, nor its effectiveness. The possible impact of the regulatory arrangements on performance is discussed in Chapter 8.

The regulatory arrangements dealt with in this Chapter concentrate on those necessary for competition. In Section 4.1, a brief history of the evolution of competition policy in the selected countries is provided. This is followed in Section 4.2 with a discussion of the arrangements in place which allow competitors to access the network. The availability of number portability and carrier pre-selection is highlighted in Section 4.3, while, in Section 4.4, the arrangements for access pricing are discussed. In Section 4.5, an outline of the industry-specific anti-competitive conduct provisions in place is provided.

The comparison of the regulatory frameworks relate to those existing at February 1998 and relies on documentation published by the regulatory authorities and relevant Ministries in each country. This date was chosen to coincide with the price comparisons in Chapters 5 and 6.

4.1 Evolution of regulatory arrangements

Prior to deregulation, telecommunications services in most countries were provided by a telecommunications carrier that was government-owned and protected from competition by legislation. The main exceptions to this were Finland, Canada and the United States where there were privately-owned telecommunications carriers.

Over the last two decades, governments in each of the selected countries have sought to introduce competition into the industry. Market liberalisation has occurred at different speeds and times and in different ways (see Table 4.1) but is similar in that it has sought to remove legislated barriers to entry and establish arrangements to facilitate access to existing network services.

In Australia, the regulatory arrangements introduced in 1991 established a general carrier duopoly and a three mobile carrier market. The legislation was intended to nurture facilities-based competition so that the post-1997 regime could be light handed. Entry into the industry was restricted to allow Optus to undertake the large capital investments involved in establishing its own network. The arrangements set in place in 1997 removed all legislative barriers to entry and established an industry specific access regime and anti-competitive conduct framework.

All statutory barriers to entry into the New Zealand telecommunications market were removed in 1989. However, unlike the other countries studied, New Zealand has not attempted any direct regulation of the industry.[1] Rather, it has placed sole reliance on general competition policy.

The Japanese telecommunications market was opened to competition in 1985. Japan originally followed a framework similar to New Zealand’s in that direct regulation of the industry was minimised. However, a report by Japan’s

1 With the exception of information disclosure requirements (see Section 4.4) and the Kiwi Share Obligation (see Chapter 3).

Telecommunications Council found that competition was not effective because of the difficulty confronting new carriers in negotiating access to the incumbent's facilities. Consequently, new regulatory arrangements were introduced in 1998 to strengthen interconnection rights for new carriers.

In the United States, competition originally developed in the long-distance market after the finalisation of the Modified Final Judgement (MFJ). The MFJ restructured the telecommunications industry into its competitive and non-competitive elements. It required American Telephone and Telegraph (AT&T) to divest itself of its local exchange carriers.

The local exchange carriers remained protected by a legislated monopoly until the enactment of the *Telecommunications Act 1996*. This Act sought to introduce competition into local exchange services by imposing an obligation to interconnect on the local exchanges and requiring them to resell retail services at wholesale prices.

In Canada, where the market structure resembles that of the United States, competition in the long-distance market began in the early 1990s. In 1997, the Canadian Radio-television and Telecommunications Commission (CRTC) set out the terms and conditions of local competition in the territories of certain of the local exchange companies. The new regime obligated incumbent operators to interconnect and foreshadowed the regulation of interconnection charges.

In Finland and Sweden, all sectors of the telecommunications industry were opened to competition in the early 1990s. Originally, there was little direct regulation of the industry. However, in 1997, both countries introduced changes which aimed to stimulate competition in the local call market and bring regulations in line with the directives of the European Union.

France did not begin deregulating its telecommunications industry until required by the European Union Directives. The *Telecommunications Act 1996* set out the principles for the liberalisation of the telecommunications market on 1 January 1998.

The United Kingdom began liberalising its telecommunications industry in 1984 when British Telecom (BT) was privatised and a general carrier duopoly was established. Two mobile network operators (Cellnet and Vodafone) were also licensed. In 1991, all legislative barriers to entering the industry, either as a fixed or mobile carrier, were removed. In 1997, a third wave of deregulation removed regulatory controls from what the Office of Telecommunications (OFTEL) considered were competitively provided services. Despite this, certain network charges remained under direct regulation.

Table 4.1 Major regulatory reform initiatives in Australia and the selected countries

	Date	*Major reform initiatives*
Australia	1989	*Telecommunications Act 1989* begins liberalising the industry. Competition restricted to the provision of value-added services, private networks, customer equipment and cable installation. AUSTEL created and charged with the economic and technical regulation of the industry and the introduction of a new system of price regulation based on a CPI–X price cap.
	1991	*Telecommunications Act 1991* establishes a general, fixed network carrier duopoly and a three mobile carrier market. AUSTEL given the power to behave as an arbitrator in access disputes.
	1997	*Telecommunications Act 1997* introduces open competition and revises the definition of universal service obligations and the mechanism for funding it. The *Trade Practices Amendment (Telecommunications) Act 1997* establishes an industry-specific access regime and anti-competitive conduct framework.
Canada	1979-1981	CNCP permitted to compete in the provision of certain interconnected private line voice services and interconnected data services in Bell Canada's territory. Decision extended to allow CNCP to operate in B.C. Tel's territory.
	1982	CRTC sets out the terms and conditions governing the attachment of subscriber-provided terminal equipment to the networks of all federally regulated telecommunications carriers.
	1984	CRTC sets out terms and conditions for interconnection by cellular mobile radio systems with federally regulated telephone companies following a decision by the Department of Communications to establish two cellular radio systems in each of the major markets in Canada.
	1986	CRTC allows Telesat Canada to offer interconnected private line services like those permitted in 1979.
	1987	Resale and sharing of the private line services of the federally regulated companies permitted.
	1992	CRTC sets out the terms and conditions for competition in the provision of public long-distance voice services.
	1994	CRTC establishes a new regulatory framework for the federally regulated Stentor-member companies. New framework establishes a transitional period for a move toward the implementation of price cap regulation for these companies' utility segments.

Table 4.1 Major regulatory reform initiatives in Australia and the selected countries (cont.)

	Date	*Major reform initiatives*
Canada (cont.)	1997	CRTC sets out the terms and conditions of local competition in the territories of certain of the Stentor-member companies as well as establishing the parameters of the price cap regime. The new regime obligated incumbent operators to interconnect. Other key features required incumbent telephone companies to: • unbundle ‘essential facilities’ and allow for co-location on the same terms as are used by the incumbents themselves; • provide access to their local networks at prices consistent with established access pricing rules; and • provide for the resale of local residential services (at retail rates).
Finland	1987	*Telecommunications Act 1987* introduces first steps towards liberalisation by defining the responsibilities and duties of telecommunications operators and the rights of users of the telecommunications services.
	1988	Competition in corporate networks and data transmission partially liberalised.
	1990	Free competition in data networks and GSM networks.
	1991	Corporate networks become subject to free competition.
	1994	Local, long-distance and international telecommunications markets become subject to free competition
	1996	Amendments to the *Telecommunications Act 1987* made: • Telecommunications operators obliged to lease telecommunications connections to each other. • Whole field of telecommunications no longer subject to licences granted on the basis of discretion. • Customer fees become free of regulation.
	1997	*Telecommunications Market Act 1997* aims at further stimulating competition, particularly in the local call market. Fixed network operators are obliged to interconnect. Those with significant market power must accept all reasonable requests for interconnection. Charges must be non-discriminatory and reasonable. Those with significant market power must publish standard reference offers and separate their accounts.
France	1996	*Telecommunications Act 1996* set out principles for the liberalisation of the telecommunications market in 1 January 1998.
	1998	Telecommunications industry liberalised. Fixed network operators are obliged to interconnect. Those with significant market power must accept all reasonable request for interconnection. Charges must be non-discriminatory and reasonable. Those with significant market power must publish standard reference offers and separate their accounts.

Table 4.1 Major regulatory reform initiatives in Australia and the selected countries (cont.)

	Date	*Major reform initiatives*
Japan	1985	New entrants permitted to operate in the national or international markets but the incumbents in each of these markets (NTT and KDD) are not permitted to compete with each other. Interconnection terms and conditions are negotiated between parties and agreements must be authorised by the MPT.
	1998	Proposed restructure of NTT into a long-distance supplier and two local call suppliers. The two regional companies not permitted to compete in long-distance market. New interconnection requirements introduced: • Type I network operators obliged to interconnect. Access must be provided at wholesale rates and authorised interconnect agreement must be made public. • Designated carriers (NTT) required to provide interconnect at any technically feasible point. Tariffs must be cost-based and annually submitted to Minister for approval. Essential facilities must be provided to other carriers on conditions equal to those the designated carrier provides itself. Designated carriers become subject to accounting separation requirements.
NZ	1987	*Telecommunications Act 1987* removes competitive restrictions on the supply of customer premises equipment.
	1988	*Telecommunications Amendment Act 1988* removes restrictions on the supply of telecommunications services of all kinds.
	1989	*Radiocommunications Act 1989* reforms the management of the radio spectrum to facilitate competitive entry into the industry.
	1990	*Telecommunications Amendment Act 1990* establishes information disclosure requirements on TCNZ. TCNZ required to publish prices, terms and conditions for the supply of certain prescribed telecommunications goods and services.
Sweden	1992	Telia negotiates Sweden's first interconnect agreement with Tele2.
	1993	*Telecommunications Act 1993* establishes an independent regulator (PTS) and opens the industry to competition.
	1997	Amendments made to the *Telecommunications Act 1993* leading to the attainment of the Government's objectives through legislation rather than through State ownership of Telia and the imposition of special obligations regarding interconnection on operators with significant market power (such as Telia).

Table 4.1 Major regulatory reform initiatives in Australia and the selected countries (cont.)

	Date	*Major reform initiatives*
UK	1984	BT privatised and a duopoly policy initiated, regulated by the newly-formed OFTEL, which limited entry into the sector until 1991. BT's retail prices controlled by a price cap covering quarterly rentals and connection charges and national and local call charges. BT required to interconnect with Mercury. Two mobile network operators (Cellnet and Vodafone) licensed. Network operators not permitted to sell directly to customers. Mobile services must be marketed through service providers.
	1991	Entry into the telecommunications market liberalised. BT's prices remain under price caps except that the controls extended to international calls. Accounting separation requirements imposed upon BT. The mobile duopoly ended and two further operators licensed.
	1997	Third wave of deregulation removes regulatory controls from what OFTEL considers to be competitively provided services. Certain network charges also become subject to a price cap regime and a Fair Trading Condition inserted into carrier licences.
USA	1982	Modified Final Judgement results in AT&T divesting its local exchange carriers and all areas of the industry opened to competition with the exception of intraLATA services.
	1996	*Telecommunications Act 1996* introduces competition into intraLATA services. Obligation to interconnect placed on LECs. Unbundling of local loop and local call resale at wholesale prices required.

4.2 Approaches to regulating access

Regulatory design has a bearing upon the way in which competition develops. Who gains access, to what types of services access is mandated and at what price, can determine the form that competition takes and the effectiveness of that competition.

The most crucial issues are regulations relating to interconnection (including unbundling of the local loop[2]) and access to the incumbent's carriage services. For example, allowing carriers to interconnect and gain access to each other's carriage services at wholesale prices, but not extending this right to resellers, creates an incentive for new competitors to enter the industry as carriers rather

2 Unbundling of the local loop allows competitors to interconnect with the existing network between the local exchange and the customer access lines.

than resellers. Ensuring carriers and resellers have equal rights in interconnecting and obtaining access to carriage services neutralises the impact that regulations have on entry decisions. Similarly, how the local loop is unbundled affects the configuration of the network and the types of investments undertaken by competitors.

Australian approach to interconnection, reselling and unbundling

The new regulatory regime introduced with the enactment of the *Telecommunications Act 1997* (TA 1997) and the *Trade Practices Amendment Act 1997* takes a neutral approach to the development of competition. The regime removed legislative barriers to entering the industry and aimed to provide equal rights of access to all types of operators. It does this by making commercial negotiation the primary means of determining access rights and, thus an operator's right of access depends on what is negotiated with existing operators.

However, underpinning commercial negotiation is a regulatory regime that provides mechanisms for mandating access rights. The Commonwealth Government intended that industry self-regulation be the primary means of mandating access rights (Second Reading Speech, *Trade Practices Amendment (Telecommunications) Bill*, 5 December 1996). To this end, an industry forum — the Telecommunications Access Forum (TAF) — was formed and charged with, among other things, developing a list of carriage services that carriers should make available to all competitors.

Part XIC of the *Trade Practices Act 1974* (TPA) allows the ACCC to approve TAF recommendations on declaring a carriage service, provided the ACCC is satisfied that the TAF has given interested parties adequate opportunity to comment on the proposed declaration (s.152AL). Access rights established through this process apply equally to all types of operators.

Alternatively, access rights may be determined by the ACCC following a public inquiry (see Box 4.1 or, for more detail, Appendix D of the report).[3] Declaration of a carriage service involves neutral treatment because it grants equal rights of access to that service to carriers, carriage service providers and resellers. The provider of that carriage service is obliged to provide the declared service on reasonable terms and conditions.

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3 Schedule 1 of the TA1997 regulates physical access to network facilities.

Box 4.1 Declaration under Part XIC

Under Part XIC of the *Trade Practices Act 1974*, the ACCC may declare a service where such a declaration would promote the long-term interests of end-users. The ACCC is required to engage in a public inquiry process prior to making its decision.

In determining whether a declaration will promote the long-term interests of end-users, the ACCC must have regard to the extent to which declaration would achieve the following objectives:

- promoting competition in markets for listed services;
- achieving any-to-any connectivity in relation to carriage services that involve communication between end-users; and
- encouraging the economically efficient use of, and economic efficient investment in, the infrastructure.

Upon declaration, all carriers and carriage service providers supplying the declared service become subject to standard access obligations (exemptions are available). These obligations require the access provider to supply a declared service to whoever requests it. They also require the access provider to ensure that the technical and operational quality and the level and quality of fault detection, handling and rectification are equivalent to those which the access provider provides to itself.

Source: *Trade Practices Act 1974.*

Declaration, either through TAF recommendation or ACCC determination, does not fundamentally change the rights of access already in existence under Section 46 of Part IV of the TPA. Under this provision, a supplier of carriage services cannot refuse to deal with a competitor. Refusals to deal could also breach the competition rules contained in Part XIB of the TPA.

Declaration shifts the resolution of access pricing disputes from the Courts to the ACCC, although it does not preclude parties from seeking redress under general competition legislation. In particular, it has implications for pricing of carriage services subject to a declaration because, in the event of a pricing dispute, the ACCC may be called to arbitrate.

Declaration can also have the effect of determining the degree to which carriage services are unbundled. In this way, it can set minimum interconnection requirements.

When the regulatory regime changed on 1 July 1997 certain carriage services were immediately declared. These were:

- domestic PSTN originating and terminating access;

- domestic GSM originating and terminating access;
- domestic AMPS originating and terminating access;
- transmission;
- digital data access service;
- conditional local loop service;
- AMPS to GSM diversion service; and
- broadcasting access service.

Since that time, the following services have also been declared by the ACCC:

- ISDN origination and termination services (draft decision);
- inter-city high bandwidth transmission capacity; and
- local loop unbundling and local call resale (draft decision).

As of January 1999, the ACCC was conducting inquiries into the possible declaration of fixed-to-mobile services.

Declaration does not mean that carriers must offer these services at a particular price. Rather, the price of access must be negotiated between the carrier and access seeker. Alternatively, the price as specified in an approved undertaking may be used (see Section 4.5).

Overseas approaches

Internationally, a variety of approaches to regulating access have been used (see Table 4.2). The countries selected for coverage are those included in the benchmarking comparisons made in Chapter 5, 6 and 7. The level of detail varies across countries due to difficulties in obtaining information in some instances. However, the information included here has been corrected by the relevant regulatory authority in each country.

Interconnection

Many of the countries examined for this study have a legislative requirement on carriers to allow competitors to interconnect with their network.

This requirement is implemented across most countries, although generally it only applies to fixed-wire services as the mobile phone sectors in these countries are considered sufficiently competitive. Different countries also apply different demands upon carriers with significant market power or those considered dominant (usually the incumbent).

Table 4.2 Access arrangements, February 1998

	Access arrangements
Australia	Access or interconnection must be negotiated with existing operators. Provision for mandatory access requirements through declaration following self-regulatory processes or an ACCC inquiry. A declaration may apply to any market sector (ie fixed or mobile) and applies to all carriers and carriage service providers. Certain services were declared under transitional arrangements on 1 July 1997. Resale of retail services at wholesale rates requires negotiation with existing operators although declaration may force cost-based pricing.
Canada	All local exchange carriers in a local call area must be interconnected. Each carrier is required to designate a point of interconnect as a gateway for the interchange of traffic. Only those local loops considered 'essential' by the regulator must be unbundled. Other local loops must also be unbundled, with prices based on the rating principles for essential facilities, for a period of five years from 1 January 1998. Resale of retail services only permitted at retail rates.
Finland	Requirements apply to fixed network services only as there is no operator with significant market power in the mobile sector. All operators must provide for interconnection. Operators with significant market power must accept all reasonable interconnection requests. This may require the network operator to lease connections even where it does not normally provide them, including the unbundling of the local loop. There is no requirement for the resale of retail services at wholesale rates.
France	Requirements apply to fixed network services only as there is no operator with significant market power in the mobile sector. All operators must provide for interconnection. Operators with significant market power must accept all reasonable interconnection requests. There is no requirement for the resale of retail services at wholesale rates.
Japan	Requirements apply to fixed network services. All carriers are required to interconnect. Designated carriers (own >50 per cent of subscriber lines in a market) are obliged to provide a minimum number of interconnection points. There are seven minimum points of interconnectionand, subject to technical feasibility, designated carriers are required to unbundle other facilities on request. Resale of retail services required at wholesale rates (based on cost).
NZ	No formal access arrangements. To interconnect with the networks of existing carriers or gain access to retail services, competitors must negotiate with the carrier and take recourse for unfair dealings through general competition legislation.

Table 4.2 Access arrangements, February 1998 (cont.)

	Access arrangements
Sweden	Requirements apply to fixed network services only as there is no operator with significant market power in the mobile sector. All operators must comply with requests for interconnection. Those with significant market power must comply with special interconnection requirements. In particular, this requires that the incumbent comply with all reasonable interconnection requests. There is a legislated requirement for the incumbent to unbundle its local loop, however it is unclear whether this has in fact occurred. There is no requirement for the resale of retail services at wholesale rates.
UK	Requirements apply to fixed network services only. Mobile market is considered competitive. Carriers with significant market power are required to connect their networks with other network operators. Regulations do not extend interconnection rights to unbundling of the local loop. There is no requirement for the resale of retail services at wholesale rates.
USA	Requirements apply to fixed network services where incumbents have significant market power. All operators have a right to interconnect. Incumbent local exchange carriers required to provide interconnection at any technically feasible point. The regulator prescribes seven minimum points of interconnect, including unbundling of the local loop. Resale of retail services required at wholesale rates (based on avoided cost).

Source: Australian *Trade Practices Act 1974* (Part XIC); Brock and Katz (1997); CRTC (1997a); Finish Telecommunications *Market Act 1997;* MPT (1997); MPTS (1997); MTCS (1997); Keewin and Lee (1997).

In line with European Commission Directives, the United Kingdom, France, Sweden and Finland require carriers with significant market power (that is, the incumbent) to allow competitors to interconnect with their networks. The United Kingdom, which has tended to favour facilities-based competition, allows BT to determine the point of that interconnection. In France, Sweden and Finland, the incumbent must accept all ‘reasonable requests’ for interconnection (MPTS 1997; MTCS 1997; Finish *Telecommunications Market Act 1997*). Disputes over what is reasonable are resolved by the regulator.[4]

Regulations in the United States and Japan also require the incumbent to provide for interconnection (Brock and Katz 1997; MPT 1997). In both cases, the regulators defined a list of minimum interconnection points that the incumbent must make available to competitors.

4 What is reasonable is usually determined in terms of what is technically feasible.

The only country studied that does not mandate interconnection is New Zealand. New Zealand has any telecommunications specific regulations.[5] There is no mandated requirement for the incumbent to interconnect its network with the networks of its competitors nor is there any regulation mandating the resale of retail services. To interconnect with the incumbent's network or gain access to its retail services, competitors must negotiate with the incumbent and take recourse for unfair dealings through general competition legislation.

Unbundling the local loop

There are disparate policies on whether interconnection rights should extend to unbundling the local loop. Some countries provide for unbundling, others do not.

Unbundling requirements are most extensive in the United States and Canada where incumbent local exchange carriers are required to unbundle their local loops (CRTC 1997b). In Finland, interconnection rules require the network operator to allow connection even where it has not provided them before, including at the local loop (MTCFb 1997).

In the United Kingdom, BT provides for interconnection at its tandem switches and on the network side of its local switches (Ovum 1997). OFTEL specifically excluded unbundling of the local loop from interconnection requirements. It believed that unbundling would be counter to its policy of facilities-based competition by dissuading competitors from investing in their own networks (OFTEL 1997c).

Reselling

There are also differing approaches to reselling. Regulations in the United Kingdom, Canada, France, Sweden and Finland do not provide for the resale of retail services at wholesale rates. In some of these countries (notably Canada), resellers may purchase the retail services of the incumbent but may only do so at retail rates.

In the United States and Japan, network operators are required to sell retail services at wholesale rates (Brock and Katz 1997; MPT 1997). In the United States, wholesale rates are based on avoided cost (Brock and Katz 1997) while, in Japan, wholesale rates are based on long-run incremental cost.

5 Except in terms of TCNZ's Kiwi Share Obligation and information disclosure requirements.

Commentary

Differences in the approach to access arrangements will affect the extent of effective competition. This is likely to lead to differences in the incentives to improve performance and ultimately the prices paid by consumers of telecommunications services.

The most significant difference between Australia's approach and those in the selected countries is that Australia has a formal co-regulatory process by which industry participants can initiate declarations.

The intention of the legislation was to have services declared primarily through industry self-regulatory processes as embodied in the TAF:

> It is a clear policy intention that, as much as possible, both the determination of access rights and terms and conditions of access be the result of commercial processes and industry self-regulation (*Trade Practices (Telecommunications) Amendment Bill*, Second Reading Speech, 5 December 1996).

The 'self-regulatory' element of the framework allows the industry, which is closest to the issues, to drive declaration decisions. It also reduces some of the costs on government as they are borne by the industry itself. While the burden is shared, there is only a saving to the government or its regulator if industry participants reach substantive agreement.

Ovum has argued that:

> Many observers believe that commercial conflict between the TAF members is unlikely to lead to the addition of many new services through [the TAF process] (Ovum 1997).

Transaction costs, which must ultimately be borne by the community and consumers, may be higher overall under a co-regulatory approach if all declaration decisions end up with the ACCC.[6] Industry participants must also invest resources in being a member of the TAF rather than responding to arguments put forward by the regulator.

Allowing the industry to progressively identify areas where declaration is needed has the benefit of avoiding unnecessary declarations. Where participants

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6 The cost associated with regulating an industry can be significant. There are the direct costs of running the regulatory agency, the cost of input to policy formulation and compliance by the parties and the waste of resources when firms engage in lobbying activities to try to influence regulators.

There may also be an efficiency cost associated with delays to the regulator making a decision. This cost is dependent on the complexity of the issue and the capabilities of the regulator.

are prepared to duplicate facilities as a viable commercial proposition there is no need for declaration.

However, there may be a cost in terms of the lost opportunities for competition and there are the transactions costs associated with dealing with the TAF and ACCC. In addition, the possibility of having additional services declared has the potential to encourage regulatory 'gaming'. The incumbent could use the declaration process to delay competition and competitors could use it as a means of cheap and easy entry.

The effectiveness of the declaration regime in promoting efficient competition will be crucial to how well Australia performs in any price and quality of service comparison (see Chapters 5, 6 and 7). If the process of obtaining a declaration obstructs competitive entry to telephony markets, then Australia may not perform well in price and service quality comparisons.

Of course, the limited period of time over which the declaration regime had been in operation at February 1998 (when the price and service quality comparisons are made) needs to be taken into account when examining the likely impact of the Australian access regime upon price performance.

The service-by-service approach to access that results from using a declaration process has been criticised. King and Gans have argued that:

> If you are planning to invest in infrastructure in the future, do not expect to have full control of your investment. ... access regulation in [the telecommunications] industry is likely to have the perverse effect of reducing future investment and innovation (King and Gans, AFR, January 1998).

Similarly, KPMG stated that:

> ... investment can be discouraged if there is uncertainty as to whether the ACCC may declare a facility service under the access provisions. A decision to declare could affect future net returns for the access provider (KPMG 1998, p. 8).

Declaration may also have the effect of shifting future investment between services:

> It is possible that declaration may have the potential to diminish investment incentives in relation to networks used to supply the eligible service, while encouraging investment in infrastructure used to supply other services (ACCC 1998a, p. 27).

The service-by-service approach to access employed under declaration may introduce uncertainty into investment decisions. New and existing carriers cannot be certain that current investments will not become subject to future declarations, resulting in the investor carrying the full risk of the investment but sharing the benefits with competitors.

The ACCC has undertaken to reduce this uncertainty to some extent by introducing certainty of process. It has published a series of guidelines, such as *Declaration of Telecommunications Services*, which outline the approach the ACCC will take in declaration proceedings.

The ACCC also takes the opportunity provided in each declaration hearing to indicate how similar matters will be approached in the future. This provides for a more detailed and certain policy framework than is actually provided for under the legislation.

The legislation outlining the processes that the ACCC must take in its declaration proceeding provides for a high degree of transparency. Under the TPA and TA 1997, the ACCC is required to hold public hearings into proposed declarations, inform the public of the existence of that inquiry, provide reasonable opportunity for the public to make written submissions and prepare a report setting out its findings. Recently, the ACCC has taken this further and has released draft declarations and provided scope for public comment on those drafts prior to making a final determination.

However, certainty in process does not necessarily mean that there will be commensurate certainty in the outcomes of that process. The interpretation of access issues and the resolution of those issues may change over time.

4.3 Number portability and carrier pre-selection

Number portability and *carrier pre-selection* promote competition by facilitating consumer choice and reducing transaction costs for subscribers. With number portability and pre-selection, subscribers can change carriers without having to change telephone numbers or dialling extra digits each time they make a call.

Most of the countries studied have or are in the process of introducing number portability and carrier pre-selection (see Table 4.3). The two exceptions are New Zealand and the United Kingdom.[7] New Zealand does not have a legislated requirement to provide number portability or pre-selection. Instead, it requires operators to negotiate this amongst themselves should it be desired. The United Kingdom does not require carrier pre-selection because OFTEL believes this would detract from its policy of encouraging network competition.

[7] At January 1999, OFTEL was in the process of introducing number portability, in line with European Union Directives.

Table 4.3 Requirement for number portability and carrier pre-selection, February 1998

Country	*Number portability*	*Carrier pre-selection*
Aust.	Number portability required for fixed services. Moving to extend to 1800, 13, 1300 and mobile services.	A basket of national long-distance, international direct dial, operator assistance, and international ringback calls.
Canada	Yes	Information unavailable.
Finland	Yes	Moving to carrier pre-selection by 30 September 1998.
France	Number portability due by 1 Jan. 2001.	Moving to carrier pre-selection
Japan	Moving towards its introduction.	Introducing carrier pre-selection.
NZ	Number portability based on call forwarding has been introduced. Cellular number portability is under negotiation.	No. Currently only indirect access.
Sweden	Regulator desires the deployment of number portability by 1 Jan. 1999. However, regulator has also allowed 1 January 2003 in the event of technical or costing difficulties.	Introducing carrier pre-selection by September 1999.
UK	Number portability being introduced into fixed and mobile services	No. Currently only indirect access is available. Users directly connected to a particular carrier have no right of access to other operators' long-distance services.
USA	Deployment of number portability due by 31 December 1998. Only applies to fixed telephony.	Yes.

Source: Appendix E.

Australia is well placed in terms of the availability of number portability and carrier pre-selection in comparison with the other countries examined. Under Australia's Numbering Plan, all carriers and carriage service providers, unless exempted, must provide full number portability (including local calls) by 1 January 2000. The terms and conditions for providing number portability must be negotiated, although the ACCC may arbitrate in a dispute.

In line with its power under Part 17 of the TA 1997, the Australian Communications Authority (ACA) mandated that pre-selection be available for a basket of national long-distance, international direct dial, operator assistance, and international ringback calls.

Number portability and carrier pre-selection reduce transaction costs for consumers but they can also impose a cost upon providers. For example, there is the cost of establishing the technology required to provide these services. These costs must be weighed up against the gains from competition and direct consumer gains from greater choice.

4.4 Access terms and conditions

Once access rights are in place, the terms and conditions must be determined. Terms and conditions relate to the price and other non-price aspects (such as quality) of providing a carriage service.

The price of access is critical to the achievement of efficient outcomes. Where charges are too high, efficient operators may be dissuaded from entering the market or inefficient bypass of network services may occur. Conversely, if charges are too low, the access provider may not be able to recover the full cost of supplying the network and curtail efficient investment. In addition, inefficient operators may be encouraged to enter the market or new entrants may be discouraged from establishing their own infrastructure.

The price of access will also have flow on effects to the final price of telecommunications services and will thus affect the price comparisons made in Chapter 5 and 6. The significance of the price of access is illustrated in Optus's claim that access charges are at least 30–50 per cent of input costs for new entrants (Optus Communications 1998b).

The non-price aspects of a carriage service also influences an access seeker's ability to compete in downstream markets. For example, if a lower level of quality is provided to those seeking access, they will be unable to compete effectively with the provider.

Australian approach

In Australia, access conditions are determined through commercial negotiation. In the case of declared services, failure of negotiations may trigger either the application of terms and conditions specified in an undertaking or ACCC arbitration.

Voluntary undertakings specify a set of standard terms and conditions that apply to the provision of particular declared carriage services. These undertakings must be approved by the ACCC following a period of public review.[8]

Arbitration occurs when either negotiating party requests it of the ACCC. There is no guidance under Part XIC as to what is a reasonable timeframe for negotiations to occur before the parties resort to arbitration. This allows discretion, both on the part of the negotiators and the regulator, over when to intercede.

Where a carriage service meets certain criteria,[9] the ACCC has foreshadowed the use of forward-looking total service long-run incremental cost (TSLRIC)[10] when arbitrating or assessing the appropriateness of the terms specified in an undertaking (see Appendix B for definition). However, application of TSLRIC is not mandatory and the ACCC reserves the right to consider a range of criteria before doing so.

Part XIC of the TPA also requires that carriers and carriage service providers supplying a declared carriage service to take all reasonable steps to ensure that:

- the technical and operational quality of the declared service being supplied is equivalent to what the access provider provides itself; and
- the access seeker receives a level of fault detection, handling and rectification that the access provider provides to itself.

Where access terms and conditions are negotiated without recourse to an undertaking or arbitration, there is no legal requirement on the parties to publish the access agreement.[11] Division 9 of Part XIC provides for parties to have their agreements registered with the ACCC, however, this is at the discretion of the parties involved.

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8 The ACCC must approve an undertaking that adopts the set of model terms and conditions contained in an approved access code.

9 Where the ACCC considers a particular declared service is necessary for competition in dependent markets, where the forces of competition, or the threat of competition, work poorly to constrain the price of access to efficient levels and the service is well developed in the market (ACCC 1997a).

10 The forward-looking nature of these costs refers to those that apply to the best in-use technology. Where a carrier’s technology has been superseded, it is costed as though it is the latest (usually lower cost) technology.

11 There is a possibility that carriers or carriage service providers may be required under Divisions 4 & 5 of Part XIB to forward access agreements to the ACCC (Department of Communications, Information Technology and the Arts, per. comm.).

Overseas approaches

Commercial negotiation is a common approach to determining access terms and conditions in the other countries studied (see Table 4.4).

In some countries, Japan, France, Sweden and Finland, the regulator is empowered to require certain carriers (those with significant market power) to develop and publish standard reference offers. Typically, standard reference offers specify the technical conditions and tariffs applicable for interconnection.

In most cases, the technical and financial terms specified must be the same as what the access provider provides to itself. Standard reference offers are generally negotiable, although in Japan they are binding and any variation away from terms specified in a standard reference offer must be approved by the regulator.

Standard reference offers generally specify all the terms and conditions relevant for interconnection. For example, the MPTS in France decreed that:

> The services listed in the standard interconnection offer ... shall contain the various conditions to meet, on the one hand, the interconnection requirements of public network operators and, on the other hand, the network access requirements of public telephone service providers ... These conditions shall be broken down to a sufficient level of detail so that the various individual components required by applicants may be identified. The information necessary to the establishment of interconnection shall be provided to other operators under the same conditions and to the same degree of quality as that furnished by these operators to their own departments and their subsidiaries and partners (MPTS 1997).

Other countries (the United Kingdom, United States and Canada) have seen the need for continued direct regulation of some network prices. The United Kingdom applies price caps to certain of BT’s network services considered non-competitive and, like the United States and Canada, requires reciprocity of call termination charges.

Table 4.4 Determination of terms and conditions, February 1998

	Method of determining access terms and conditions
Aust.	Negotiation with provision for the application of approved undertakings and ACCC arbitration. Arbitration decisions may be appealed in the Australian Competition Tribunal and, ultimately, in the Federal Court.
Canada	Negotiation, although call termination charges must be based on the principle of reciprocity or mutual compensation. CRTC may act as an arbitrator in disputes. It is unclear whether arbitration decisions may be appealed.
Finland	Operators with significant market power must publish standard interconnection offers specifying the technical conditions and tariffs applicable for interconnection. Offers must be approved by the regulator against cost-based pricing principles. The technical and financial terms offered to other operators must be the same as what the operator provides itself. Operators must not refuse to negotiate where certain interconnection conditions are not provided for in the standard offer. Standard offers do not preclude negotiated agreement between interconnecting parties so long as they are objectively justified and transparent. The Ministry may arbitrate in a dispute. It is unclear whether arbitration decisions are binding.
France	Access terms and conditions determined as per Finland. Regulator may arbitrate in a dispute. It is unclear whether arbitration decisions are binding.
Japan	Negotiation with non-designated carriers is required. Ministry regulates the tariffs set by designated carriers. Designated carriers must submit tariffs and any proposed changes to the Ministry for authorisation. Tariffs must be at least equal to those for comparable services provided to itself. Tariffs set by designated carriers are reviewed annually by the regulator on the basis of interconnect accounting data. Designated carriers may only provide interconnection by individual agreement after obtaining Ministerial authorisation. The Ministry may arbitrate in a dispute. It is unclear whether arbitration decisions are binding.
NZ	Negotiation. Private arbitration available with ultimate resort to the Courts.
Sweden	Access terms and conditions determined as per Finland. At the request of either party to a negotiation, the regulator may set a time limit for negotiations and the regulator may mediate if the time limit is not met. The regulator may arbitrate in the event of a dispute. Its decisions may be appealed in a general administrative court.

Table 4.4 Determination of terms and conditions, February 1998 (cont.)

	Method of determining access terms and conditions
UK	Negotiation with BT subject to price caps on certain of its network services. BT is required to give notice of changes to a charge covered by the price caps. Call termination charges must be based on the principle of reciprocity. OFTEL may act as an arbitrator in disputes and its decisions are binding.
USA	Preference for incumbent local exchange carriers and new entrants to come to privately negotiated interconnection agreements. However, call termination and transport charges must be based on the principle of reciprocity. RBOCs may (but are not required to) file general offers of interconnect services and prices with the relevant State Commission. Commercially negotiated agreements must also be approved by the relevant State Commission. State Commissions may act as a mediator or as an arbitrator where negotiations fail. Mediation is not binding while arbitration is.

Source: Australian *Trade Practices Act 1974* (Part XIC); Brock and Katz (1997); MPT (1997); MPTS (1997); MTCF (1997); MTCS (1997); OFTEL (1997b).

Disclosure of final interconnection agreements is common in the selected countries (see Table 4.5). Disclosure has the advantage of ensuring certainty for entrants and neutrality of treatment. It is also possible that disclosure may produce outcomes similar to mandated standard reference offers.

Commentary

Disclosure of agreed access prices may play a role in discouraging anti-competitive pricing arrangements. In particular, it may allow others in the industry to view final interconnection agreements and bring the regulator's attention to possible undesirable pricing practices.

KPMG has argued that a higher degree of transparency would remove the need for the ACCC to apply its access pricing principles:

> ... it would seem desirable for the ACCC to try to deal with the monopoly problem more by promoting market transparency, monitoring prices and removing artificial barriers to entry than by attempting to regulate prices directly. The difficulties associated with direct price regulation are well known and will no doubt be again manifested if the ACCC attempts to pursue the total service long-run incremental cost approach (KPMG 1998, p. 13).

Disclosure may also have the added benefit of increasing the level of information available to potential entrants. Having access to access prices prior to entry allows entrants to more adequately assess the true cost of entering the industry.

Table 4.5 Disclosure requirements, February 1998

	Disclosure requirements
Aust.	Approved undertakings are publicly available. Negotiated access agreements need not be published.
Canada	It is unclear what form of disclosure, if any, is required.
Finland	Approved set of standard terms and conditions must be publicly available. Interconnection contracts must be submitted to the Ministry where they shall be made available to the public with the exception of sections handling the business strategy of the parties.
France	Those with significant market power must publish standard interconnection offers incorporating services and components specified in regulations. Standard offers must be approved by the regulator. Interconnection agreements must be forwarded to the regulator. The regulator may make agreements available to interested parties without prejudice to information covered by commercial confidentiality.
Japan	Authorised interconnection agreements entered into by non-designated carriers must be made available for public perusal. Designated carriers must publish their set of interconnection tariffs approved by the Ministry. Tariffs set by designated carriers are reviewed annually by the Ministry on the basis of interconnect accounting data.
NZ	TCNZ is obliged to disclose all interconnection agreements with other parties, including its own subsidiaries. It is understood that publication may be delayed six months so that publication does not deprive the competitor of the commercial benefit of its agreement.
Sweden	Those with significant market power must publish their set of approved standard interconnection charges.
UK	Operators with significant market power must publish a standard contract and a list of standard services with standard charges. Additionally, all interconnect agreements with the incumbent must be published.
USA	The set of approved standard terms and conditions for interconnection are publicly available. Privately negotiated agreements must be approved by the relevant State Commission against specified pricing requirements. Incumbent local exchange carriers are required to offer the terms specified in an existing agreement to any party who requests it.

Source: Australian *Trade Practices Act 1974* (Part XIC); Harris and Kraft (1997, p. 104); MPT (1997); MPTS (1997); MTCS (1997); MTCF (1997); New Zealand Telecommunications (Disclosure) Regulations 1990 (as amended in 1993); OFTEL (1997b).

However, against this must be weighed the disadvantages of disclosure. Disclosure may militate against welfare-enhancing price discrimination where there are common costs to be recovered and final demands are different. Disclosure is likely to result in prices set closer to incremental average costs because arbitrage is made possible.

Disclosure may also be disadvantageous to some access seekers who do not wish competitors to know the price they negotiated. Access seekers do not want competitors to know critical cost input data.

However, non-disclosure creates a substantial information asymmetry in favour of the incumbent. Undertakings may not completely correct this because not all the material terms and conditions are required to be disclosed under legislation.

4.5 Accounting separation

AUSTEL introduced accounting separation requirements in the early 1990s and specified how carriers were to meet these requirements in its Chart of Accounts and Cost Allocation Manual. These requirements applied to Telstra, Optus and Vodafone and aimed to assist AUSTEL in arbitrating over disputes involving interconnection. There is no requirement on these carriers to make these statements publicly available.

Accounting separation is a common practice internationally and, in most cases, there are no requirements on operators to publish these accounts (see Table 4.6). Most countries require that the operator publish a statement of compliance accompanied by an independent auditor’s statement.

Publication of accounts can go some way to reducing the information asymmetry present in the negotiation of access prices. Without cost information, access seekers cannot be sure that the price offered by the access provider is a true reflection of cost and thus reasonable.

However, disclosure of accounting costs may be detrimental to efficient outcomes. First, it requires the access provider to divulge commercially sensitive information and thus weaken its competitive position against access seekers (ie its competitors). Second, disclosing information of this nature may provide a basis for collusive behaviour.

Table 4.6 Accounting separation requirements, February 1998

	Accounting separation requirements
Aust.	Certain carriers required to meet accounting separation requirements specified by AUSTEL in its Chart of Accounts and Cost Allocation Manual. The Manual specifies 26 broad product categories for monitoring within each carrier's business. Publication is not required. The ACCC has the authority under Part XIB to issue other account keeping rules which specify the manner and form in which records must be kept.
Can.	No longer required as of January 1998.
Fin.	Operators with significant market power are required to separate out their accounts for interconnection. Interconnection accounts must show the main categories into which costs are divided (ie direct costs and common costs) as well as the rules used for the allocation. Cost accounting descriptions must be forwarded to the Ministry. The accounting method must be approved by the Ministry.
Fr.	Operators with significant market power must keep a separate accounting system for their interconnection activities, the specifications of which are set out under a decree of the Ministry. In particular, the system must allow for the identification of the following costs: general network costs; costs specific to interconnection services; costs specific to the operator's services other than interconnection; and common costs. The cost accounting systems are independently audited. Publication is not required although the operator is required to publish a statement of compliance.
Jap.	Designated carriers' accounting reports must be separated between the management and operation of essential facilities and the provision of services to users utilising essential services. A report on their interconnection accounting must be forwarded each year to the Ministry and published. A certification of the results authorised by a certified public accountant must be attached. Accounting standards are defined by the government.
NZ	TCNZ required to publish separate financial statements for its principal operating subsidiary, Telecom New Zealand.
Swe.	Operators with significant market power are obliged to keep the accounting of revenue and expenses for interconnection separate from other accounts. Further details of the accounting separation system are unavailable.
UK	BT is required to separate its accounts for its retail services, core network services and access network services. BT is also required to publish statements of incremental costs for the network business. These will show the attribution of costs to each network component and part and provide incremental cost floors and stand-alone cost ceiling for all services. There is also a requirement for BT to publish its current cost accounting statements annually. All accounts are independently audited to tight audit standards and reconciled to statutory annual accounts.
USA	The regional Bell operating companies must provide long-distance services through a separate affiliate for a period of three years. The affiliate is required to publish its own set of accounts.

Source: AUSTEL (1993); Australian *Trade Practices Act 1974* (Part XIB); New Zealand Telecommunications (Disclosure) Regulations 1990; CRTC (1997b); MPT (1997); MPTS (1997) MTCF (1997); MTCS (1997); OFTEL (1997b, 1997c).

4.6 Regulating anti-competitive conduct

Part XIB complements Part XIC of the TPA in that it provides for the ACCC to act upon evidence of anti-competitive conduct in those telecommunications carriage services not under a Part XIC declaration. This does not preclude the ACCC from using Part XIB to take action against a carrier attempting to behave anti-competitively in relation to a declared service.

Part XIB complements rather than replaces the anti-competitive conduct provisions contained in Part IV of the TPA.

> It was felt by the government that total reliance on Part IV may be ineffective to constrain anti-competitive conduct in the telecommunications industry, given the still developing state of competition (ACCC 1997b, p. 7).

Part XIB was intended to allow:

> ... the ACCC to respond swiftly where anti-competitive conduct is evident (Second Reading Speech, *Trade Practices (Amendment) Bill*, 5 December 1996).

Some form of anti-competitive conduct regulation applies to the telecommunications industries in each of the benchmarked countries. However, as far as the Commission is aware, the United Kingdom is the only other country studied that uses special anti-competitive conduct provisions for the telecommunications industry. OFTEL has introduced a Fair Trading Condition into the licences of all operators which prohibits a licensee from engaging, whether by act or omission, in certain anti-competitive practices (OFTEL 1997a).

4.7 In summary

In all the countries benchmarked, whilst competition has been introduced into the market, the incumbent has been left vertically-integrated with ownership of the established network.[12] Some possible reasons for this are:

- separating the monopoly segments of the industry from those that are competitive and ensuring that they remain independent would result in customers having to deal with two entities;

[12] Vertically-integrated here means that the incumbent operates in both the wholesale and retail sectors. Hence, the local exchange carriers in the United States are considered vertically-integrated because they own the local exchange network and provide retail services to final consumers.

- there are potential dynamic efficiency advantages where facilities service providers having a presence in retail markets that make them more responsive to demand; and
- there are significant economies of scope in marketing and billing services.

Governments recognise that some form of regulatory oversight of telecommunications, at least in regard to fixed networks, is required to ensure competition and efficient outcomes. They have regulated to mitigate the market power that control of the network gives the incumbent.

The regulations establish rights of interconnection and access to certain network services for the incumbent’s competitors. How these regulations are designed can have a significant impact upon the way in which competition develops.

A variety of approaches to regulating access have been tried. These are summarised in Table 4.7. However, with the possible exception of New Zealand, all of the overseas countries studied are similar in that the critical decision over how far the incumbent is required to unbundle its network was pre-determined by the regulator. In each country, the regulator was given wide scope to determine what demands would be placed on the incumbent in regard to interconnection and access to network services prior to deregulation.

In Australia, Part XIC of the TPA established a formal process for industry participants to have additional network services declared.

There are costs in empowering a regulator to pre-determine access rights. These include the potential for political interference and the possibility of information deficiencies leading the regulator to establish inappropriate access requirements.

However, there are costs in delaying fully effective competition because competitors do not have access to the necessary network services. There are also transactions costs involved in dealing with both the TAF and ACCC. Australia’s service-by-service approach to access may also cause investment uncertainty and create a potential for regulatory ‘gaming’ — the incumbent could use the declaration process to delay competition and competitors could use it as a means of cheap and easy entry.

These costs need to be weighed against the perceived benefits of taking an industry-based approach. Establishing mechanisms that allow industry participants to initiate declaration proceedings means that the need for declaration in a particular case would emanate from competition. In other words, service-by-service declaration is economically-sound, resulting in sustainable long-term investment decisions.

Table 4.7 Overarching characteristics of competition policy in selected countries, February 1998

	Access rights	*Scope of access rights*	*Standard offers*[a]	*Terms and conditions*
Aust.	Deemed services mandated, others subject to public interest test	Subject to a public interest test. Potentially all 'eligible services'.	Voluntary, approved by ACCC	Arbitration by ACCC available.
Can.	Interconnection mandated	Incumbent determines point of interconnect. Unbundling of local loops required.	No	Arbitration by government available.
Fin.	Interconnection mandated	Carrier with SMP must accept all reasonable interconnection requests.	Carrier with SMP must lodge standard reference offer.	Standard reference offers approved by government. Arbitration available.
Fr.	Interconnection mandated	Carrier with SMP must accept all reasonable interconnection requests.	Carrier with SMP must lodge standard reference offer.	Standard reference offers approved by government. Arbitration available.
Jap.	Interconnection mandated	Designated carriers required to provide interconnection wherever technically feasible.	Designated carriers must lodge standard reference offer.	Regulated for designated carriers. Arbitration available.
NZ	Negotiated	Negotiated.	None.	Arbitration available through Courts.
Swed.	Interconnection mandated	Carrier with SMP must accept all reasonable interconnection requests.	Carrier with SMP must lodge standard reference offer.	Standard reference offers approved by government. Arbitration available.
UK	Interconnection mandated	Operator determines point of interconnect. Unbundling the local loop specifically excluded	Carrier with SMP must lodge standard reference offer.	Price caps in place. Arbitration by government available.
USA	Interconnection mandated	Incumbent local exchange carriers required to interconnect wherever technically feasible. Includes unbundling the local loop.	Defacto	Approved by government and arbitration by government available.

a Defacto when terms and conditions are filed.
SMP Significant market power.

Disclosure of agreed access prices may play a role in discouraging anti-competitive pricing arrangements. Disclosure may also have the added benefit of increasing the level of information available to potential entrants. Having knowledge of access prices prior to entry allows entrants to more adequately assess the true cost of entering the industry.

However, against this must be weighed the disadvantages of disclosure. Disclosure may militate against welfare-enhancing price discrimination and may be disadvantageous to some access seekers who do not wish competitors to know the price they negotiated.

Overall, Australia’s regulatory framework is flexible enough for regulators to arrive at an effective regime that suits local market circumstances. However, arriving at this regime is likely to take some time.

In effect, the Australian approach involves a tradeoff, the costs of delay against the benefits of ultimately making a better decision. It may also delay competition in new services as incumbents have time to cement and maintain a competitive advantage.

The regulatory environment has implications for the assessment of the outcomes or benchmarks of performance discussed in Chapter 5, 6 and 7. The possible impact of regulatory arrangements on price comparisons are discussed in Chapter 8.

5 RESIDENTIAL PRICE COMPARISONS

Australian prices of residential telecommunications services are compared with the prices in eight other OECD countries in this Chapter. The services examined include the Public Switched Telephone Network (PSTN), the digital mobile network and the Integrated Services Digital Network (ISDN) network. These comparisons are an extension of previous OECD studies, which did not include ISDN comparisons. Also, calls from fixed lines to mobile phones, calls to Internet Service Providers and normal voice calls within the networks are included in the comparisons.

The telecommunications industry is diverse and changing rapidly. As discussed in Chapter 2, new technologies and services are emerging and competing with established services. There are different regulatory frameworks applying across countries as increasing competition occurs (Chapters 3 and 4). Also the process of regulatory change in telecommunications markets is encouraging new pricing strategies involving innovative discount plans.

At best, a broad picture of relative prices in different countries is presented in this study. The comparisons are based on many assumptions related to the specifications and pricing of the services provided to customers. The effect on the price comparisons of changing the most important assumptions is investigated in order to test the robustness of the approach.

The countries selected for analysis are generally among the better performing countries with relatively low prices according to previous OECD comparisons. Therefore, Australia’s relative position among all OECD countries (and possibly among a list of other non-OECD countries) can be expected to be better than among the countries studied.

The Commission appointed the Eurodata Foundation to assemble the price indexes utilised in this study. Eurodata maintains and updates the OECD telecommunications database. Eurodata, in conjunction with the Commission, further developed the methodology currently utilised by the OECD.

Telstra and Telecom New Zealand examined the model and consulted on some of the price and demand assumptions.

5.1 Methodology

Price information for many individual services is aggregated into ‘indices’ to provide a practical means of comparing overall prices. Each index is based on the expenditure over one year on a defined ‘basket’ of services purchased by a typical residential user, at prices as at February 1998. For example, price comparisons for the total service provided by the PSTN are based on an index which includes the price of access to a line and the prices for a representative basket of domestic and international calls.

Inter-country comparisons are obtained by pricing the same basket of services in each of the countries selected for this study (see Chapter 1).

Telecommunications carriers

The prices used for the international comparisons were normally obtained by the consultant from the incumbent carriers in each country. In four of the countries, a single dominant carrier was used (see Table 5.1 and Table F.1 in Appendix F). In other countries it was necessary to combine an incumbent local service provider with the major long-distance or international carrier. Prices for both the competing Finnish incumbent carriers were included in the analysis.

Table 5.1 Carriers used for the price comparisons

Country	*Carrier*
Australia	Telstra
Canada	BC Tel, Stentor
Finland	Telecom Finland (now Sonera), Finnet
France	France Telecom
Japan	NTT, KDD
New Zealand	TCNZ (Telecom Corporation of New Zealand)
Sweden	Telia, Tele2
United Kingdom	British Telecom
United States	AT&T, Nynex, PacBell

Residential price baskets

Separate baskets are used for PSTN, ISDN and mobile services supplied to residential customers. Furthermore, within the PSTN ‘total service’ basket there are sub-baskets for particular types of calls, such as domestic voice, Internet or international calls.

Each basket or sub-basket of national (domestic) calls specifies the distribution of calls made at six different times of the day or week and over 14 different distances. This is necessary because prices vary with distance and time-of-day and day-of-week. The usage weights are based on those developed by the OECD, which are widely considered to be industry standards for telecommunications price comparisons.[1] The price of international calls from each country is the weighted average of the prices of calls to the various destinations, the weights being the relative call volumes to the destinations.

The demand assumptions for this study were developed further in consultation with Eurodata and Telstra. In doing so, the aim was to ensure that there was a reasonable representation of usage patterns which were, as far as possible, neutral in their impact on the measurement of prices.

The actual distributions in any particular country depend on the structure of prices in the country, as well as geographic factors such as population distribution. The impact of changes in the assumptions on the price comparisons was assessed.

Discounting plans

Comparisons such as those published by the OECD were normally based on the standard prices. The accuracy of these comparisons has been affected by the widespread emergence of discount plans. Price savings resulting from these discount schemes can represent up to one quarter of the ‘standard’, or ‘list’, price structure.

Discount plans generally take the following forms:

- proportionally lower usage charges, once customer expenditures have achieved a specified level;
- higher customer access charges and lower usage charges, which are attractive to very high volume users; or

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1 Sets of assumptions for both residential and small business customers were originally developed in the late 1980s by the OECD Secretariat and a working group consisting of representatives from a number of OECD member countries.

The OECD recognised that a basket that reflected the demand patterns of any one country would tend to influence the price comparisons in favour of that country. The OECD therefore agreed to attempt to develop assumptions which were broadly representative of member countries.

- lower usage charges to a limited number of specified destinations (such as family and friends packages) or for a limited period.

For this study, the prices used in the comparisons are intended to reflect the actual cost to the user. The specified baskets of services are priced in each country using the lowest-priced discount plan that is widely available in the relevant market and consistently offered by the incumbent operator(s) in that country.

Plans involving limited destinations or periods (the last of the above three categories) were not used because there is no information on their market shares or the extent of their usage. Also there are plans which target narrowly defined groups of customers (for example, students) which are excluded for the same reasons. New Zealand has many such plans.

Regional price variations

In countries such as Finland and the US, there are significant regional variations in prices within the country. Variation occurs within the operational area of the same incumbent (for example, rural and urban areas), and between incumbent carriers operating in different parts of the country.

In Finland, the Finnet group is a federation of many companies providing local services in different regions and other companies providing mobile, long-distance or international services. In the context of historically separate local service companies, prices were not required to be uniform across the country.

Although some averaging of different regional prices has been undertaken, it has not been possible to take into account all the complexities of the regional pricing structures in these countries. The Commission is unaware of any studies that have fully addressed this issue.

Taxes

Indirect taxes imposed by governments differ between countries and so influence the relative prices of services in those countries. The indirect taxes associated with the production of telecommunications services, including value added taxes, have been included in the price comparisons because the aim is to compare the cost to the consumer.

Currency conversion

Purchasing power parity (PPP) exchange rates were used for the conversion of prices into a common currency (US dollars).[2] The particular rates used for this study are given in Table 5.2 and are the same as those used by the OECD for residential telecommunications price comparisons. They were constructed by the OECD using a broad basket of goods and services weighted to be representative of the average expenditure patterns of households throughout OECD member countries.

Table 5.2 Purchasing power parity exchange rates used for the price comparisons, 1998

Country	*Unit of local currency*	*US dollar equivalent of one unit of local currency*
Australia	Australian dollar	0.7463
Canada	Canadian dollar	0.8264
Finland	Markka	0.1698
France	French franc	0.1541
Japan	Yen	0.0059
New Zealand	New Zealand dollar	0.6667
Sweden	Swedish krona	0.1017
UK	Pound (sterling)	1.4771
USA	US dollar	1.0000

PPPs are designed to reflect the real purchasing power of a national currency. Through the use of PPP exchange rates, the prices of telecommunications services are compared in relation to the general level of prices in each country (see Box 5.1).

2 The choice of exchange rate used reflects the objective of the study. PPP exchange rates have been used in this study because the focus is on determining the extent to which Australian telecommunications services prices are higher or lower, relative to the general consumer price level, when compared with other countries.

Box 5.1 Purchasing power parity

Purchasing power parities (PPPs) are rates of conversion that are designed to equalise the internal purchasing power of different currencies by eliminating differences in general price levels between countries. A given sum of money, converted into other currencies at PPP rates, should buy the same broad and representative basket of final goods and services in each country.

This would not necessarily be the case if market exchange rates were used. Market exchange rates are determined by trade in a smaller (traded) basket of goods, by capital inflows and outflows, by government policies on quotas, tariffs and taxes, and by expectations. Consequently, comparisons based on market exchange rates are often volatile, particularly when capital flows are volatile. The rates may shift abruptly with changed expectations, government trade and tax policies, trade patterns and monetary conditions — thus they can quickly become dated.

The PPP adjusted prices are aimed at providing information on the price of telecommunications services relative to the general price level facing residential consumers in each of the countries studied.

For business comparisons, PPPs constructed to compare general business input price levels may be preferable. However, this type of index is not available and constructing such an index would, in itself, be a major undertaking.

The adequacy of the available PPP rates as a proxy for an ideal ‘business’ index depends on the magnitude of variation in the general level of prices faced by businesses, relative to the general level of prices for final goods and services, across the countries compared. The countries compared are all mature, developed economies. Hence this variation is likely to be significantly smaller than it would have been if underdeveloped countries had also been included.

As an alternative to the PPP rates, market exchange rates were also considered for business price comparisons. They might be useful for comparisons in situations where businesses can easily switch their demand for telecommunications between countries. However, most businesses are unable to do so without also relocating to the other country. Telecommunications services typically comprise only a small component of most businesses’ overall costs. Consequently, in most industries, they generally have little bearing on location decisions.

5.2 Public Switched Telephone Network

The residential PSTN customer access service supplied to an average household consists of a single connection to the fixed telephone network. The annual expenditure by the household covers customer charges for access to this network and usage charges for the calls made over the year.

Customer access charges include line rental and installation and registration charges associated with setting up a telecommunications service amortised over five years. They are independent of the amount of usage by the customer.

Usage charges accrue on a per call or per call minute basis. Call charges include charges for national (local and long-distance) voice calls, international voice calls, calls to mobile telephones and calls to Internet Service Providers (ISPs), but exclude fees charged by the ISPs.

Assumptions for the benchmarks

The assumptions about the numbers and average duration of calls for the single line residential PSTN user are summarised in Table 5.3. More details are given in Appendix F.

Table 5.3 Key assumptions of the residential PSTN basket

		Call durations	
Type of call	*Quantity of annual calls*	*Peak*[a]	*Off-peak*[b]
	(No.)	*(Minutes)*	*(Minutes)*
Local voice calls[c]	970	2.5 to 3.5	3.5 to 6.0
Long-distance calls	158	3.5 to 6.0	6.0 to 7.0
Calls to mobiles	60	3.0	3.0
Fax calls	0	na	na
Calls to ISPs	150	20.0	30.0
International calls	12	3.0	5.0

a The peak period includes calls in the basket made at 11:00am and 3:00pm on weekdays in all countries.
b The off-peak period includes calls made at 8:00pm and 3:00am on weekdays, and 11:00am and 3:00pm on weekends.
c Local calls are those made to destinations up to and including 27 kilometres distance from the caller.
na Not applicable.
Source: OECD, Eurodata; Productivity Commission.

Internet service providers were assumed to be located within the local call area as defined in each country. This is a reasonable assumption for Australia which has relatively large local call areas. However, for countries with small local call areas, a reasonable proportion of calls to ISPs may in fact be charged as long-distance calls.

Sensitivity tests show that the comparisons were quite robust. Large changes in weighting assumptions have a relatively small impact on Australia's comparative prices for the total residential PSTN service.

Residential price comparisons

The price indices for the nine selected countries are presented below. Comparisons for the total residential service are considered first, followed by discussion of the major components of the total service.

Total service

For the residential PSTN basket of services, Australia was ranked sixth out of the nine countries included in the analysis (see Figure 5.1, chart (a)). That is, the price of these services in Australia was the sixth lowest among the nine selected countries.

Each price index in Figure 5.1 is the expenditure in each country (in US dollars using PPP exchange rates) on the defined service or fixed basket of services, at February 1998 prices. For example, a residential customer in Australia would pay $US502 for the total basket of services defined in Table 5.3, including $US160 on access rental, $US241 on domestic (local and long-distance) voice calls, and so on. However, price relativities are of more relevance than the actual numbers.

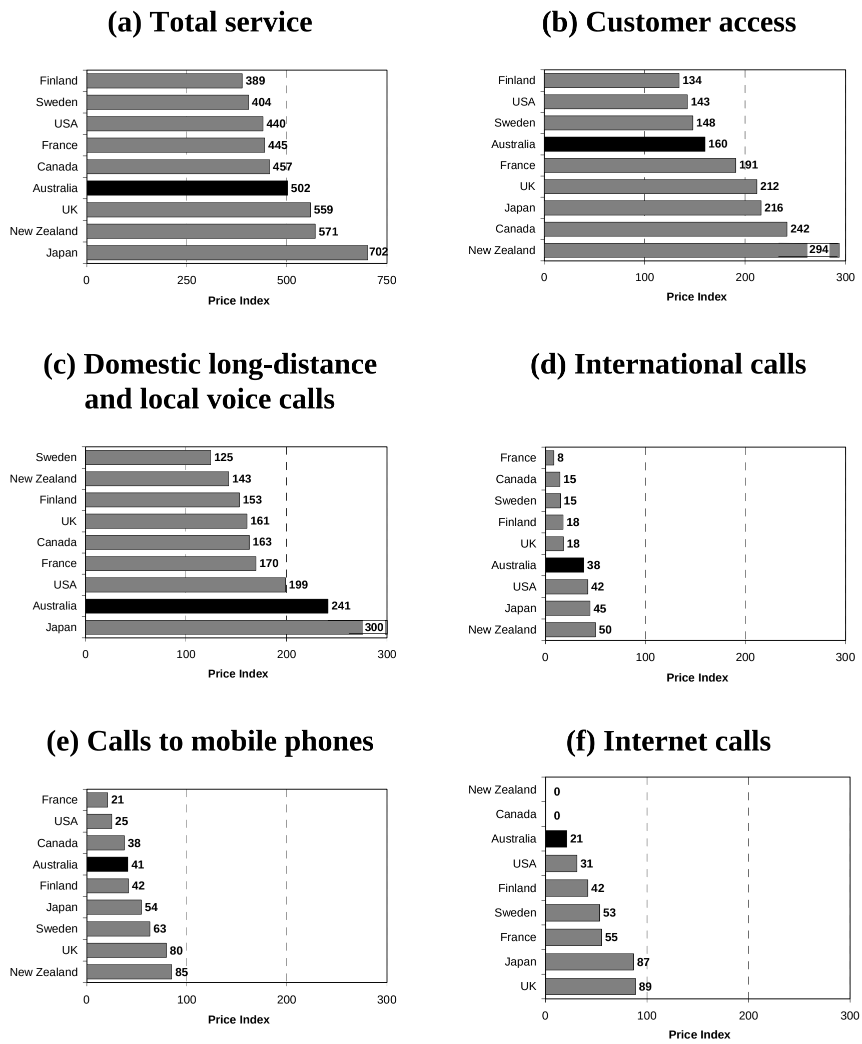
Customer access and usage charges

Comparisons of customer access charges and various components of usage (call) charges are given in Figure 5.1, charts (b) to (f).

Customer access charges in Japan, Australia and the United States were a relatively small component of total PSTN charges (see Figure 5.2(b)). New Zealand and Canada had relatively high access charges, but zero prices for short distance calls.

The structure of customer access and usage charges has pricing efficiency implications (see Chapter 3). In some countries, including Australia, discount plans reducing usage charges result in customer access charges contributing proportionally more to the overall cost of PSTN services to residential consumers.

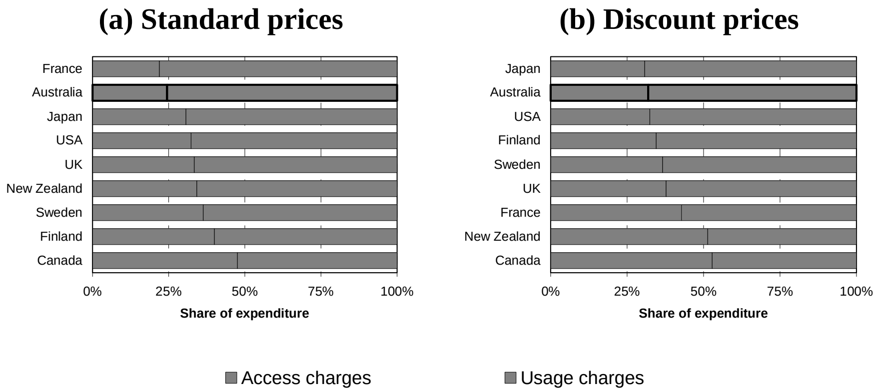
Figure 5.1 Relative prices for residential PSTN services, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of Public Switched Telephone Network (PSTN) services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Figure 5.2 Customer access and usage shares of total PSTN prices, February 1998



Note: Customer access charges are shown as the lighter portion of the bar, usage charges by the dark portion.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Domestic voice calls on the PSTN

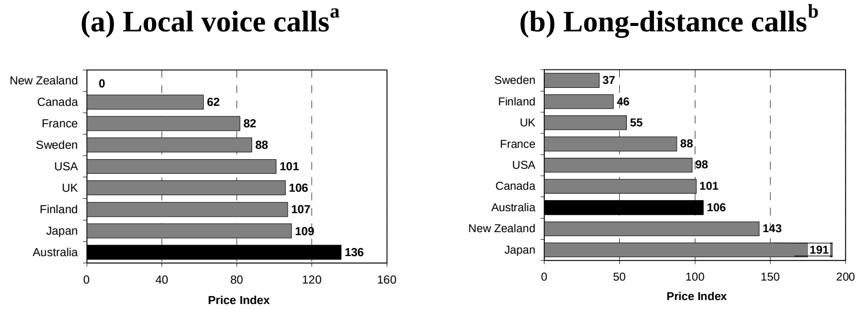
Australia's relative prices for domestic voice calls are indicated in Figure 5.1(c).

Each country has a different definition of local calls. In particular, local call areas differ in size, so that, for example, a 10 kilometre call is normally a long-distance call in Canada but a 25 kilometre call is normally a local call in Australia.

A common definition of local calls has been established in order to generate separate international price comparisons for local and long-distance calls (see Figure 5.3). According to this definition, which is related to the estimated maximum distance of Australian local calls, calls up to and including 27 kilometres in distance are regarded as local calls. Under this assumption for instance, annual expenditure on local calls in Canada is $US62 — despite a zero price for calls defined in Canada as local. This expenditure of $US62 includes an amount for some calls which are priced in Canada as long-distance calls but are within the definition used here for local calls.

Australia's local call prices were relatively high. However, a more favourable result for Australia would be obtained by increasing the assumed call duration (see Table 5.3). Local calls of longer duration might be expected in Australia, where the price remains constant as the duration increases, than in countries where the price increases with the duration of the call.

Figure 5.3 Relative domestic local and long-distance PSTN voice service prices, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of Public Switched Telephone Network (PSTN) services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

a Calls to destinations up to and including 27 kilometres distance from the caller.

b Domestic (national) calls to destinations 40 kilometres or greater form the caller.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Local call price comparisons are particularly sensitive to the call duration assumptions. For example, with an average day-time duration of 3 minutes, the local call price in the United Kingdom is 32 per cent below the Australian price. With an average duration of 5 minutes, the United Kingdom local call price is 7 per cent above the Australian price.

International voice calls

Australia, United States, Japan and New Zealand had higher prices for international calls than the European countries and Canada (see Figure 5.1(d)). However, removing international calls from the basket did not change the country rankings (see Figure 5.4).

The contribution of international calls to the overall cost of the basket was about 8 per cent for Australia and 5 per cent for all other countries. International calls from Australia are likely to be more expensive because:

- Call destinations are generally further away than for the other countries studied; and
- Traffic volumes are smaller compared with European and North American countries. Smaller traffic volumes are an impediment to negotiating favourable agreements under the international accounting rate system.

Technological development has resulted in reductions in the cost of providing international telecommunications. However, the international system for determining the prices paid by consumers has resulted in premiums above the underlying costs of calls (IC 1997a). On the other hand, competition is progressively eroding these premiums (Sidak 1998).

Calls to mobile phones

The proportion of expenditure on calls to mobile phones (see Figure 5.1(e)) was greater than would be expected given the relatively small number of such calls made. For the basket of services used in the comparisons, only 5 per cent of all national voice calls from fixed phones were to mobiles, but these latter calls account for about over 20 per cent of expenditure on all national voice calls. Calls to mobiles were generally expensive relative to other voice calls.

Calls to Internet service providers

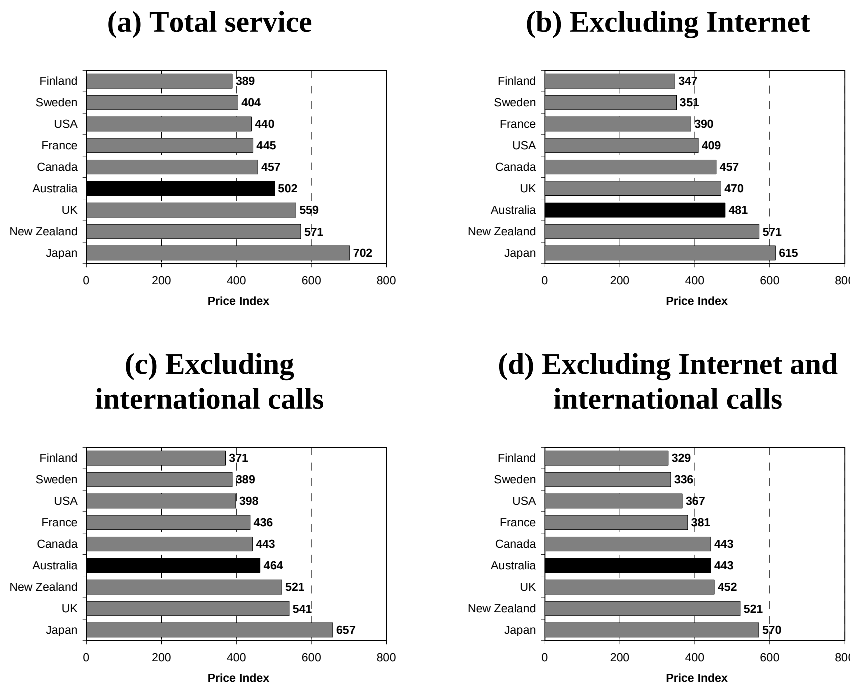
Australia had relatively low prices for calls to Internet Service Providers (see Figure 5.1(f)). These calls were assumed to be local calls with an average duration of nearly half an hour. Removing Internet calls from the PSTN basket would only marginally change total service ranking for residential prices (see Figure 5.4).

Australia's untimed local calls resulted in relatively cheap Internet calls, with Internet calls contributing 4 per cent of the residential PSTN total service cost, below the average of 11 per cent for all other countries. In countries with timed local calls, the cost of Internet calls can be substantial compared to voice calls, which are assumed to be only a few minutes long. In the United Kingdom, for example, Internet calls represented about half of the cost of all domestic voice calls. However, in Canada, where unlimited local calls are included in the customer access fee, calls to Internet service providers are free.[3]

These results are dependent on an assumption that calls to Internet service providers are made within a local call zone. This is a realistic assumption for Australia because of its large local call areas. However, for countries like Canada with relatively small local call areas, the price of calls to Internet Service Providers may be understated.

[3] Free local calls are also available in New Zealand but only to households.

Figure 5.4 Impact of exclusion of Internet and international calls on PSTN price relativities, February 1998



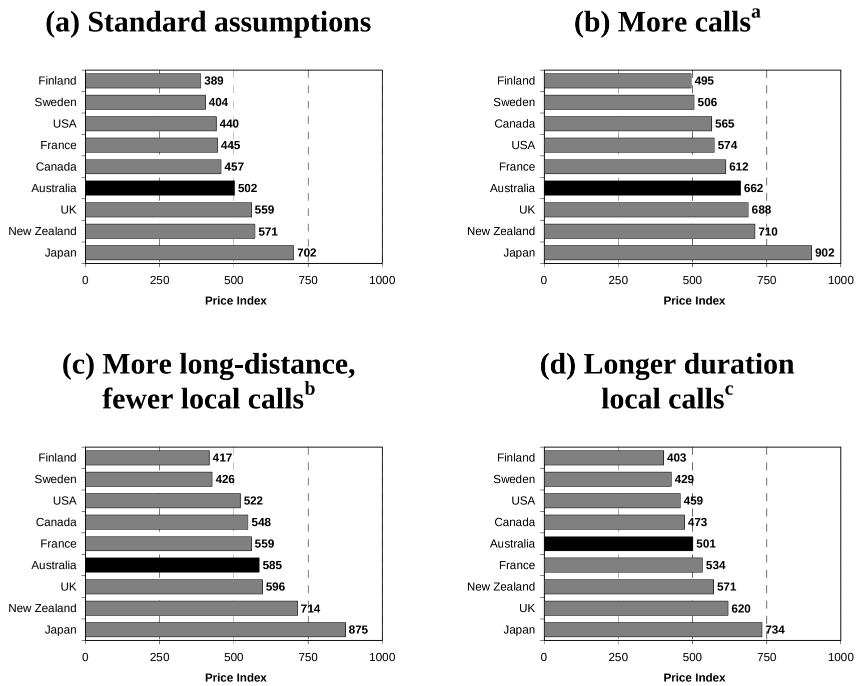
Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of Public Switched Telephone Network (PSTN) services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Impact of call and price assumptions

Some of the assumptions behind the residential PSTN basket were varied to test the robustness of the price comparisons for the total residential PSTN service. Comparisons can be regarded as being robust where variations in the usage assumptions do not lead to significant changes in the countries' relative price performance.

Figure 5.5 Impact of different usage assumptions on the total PSTN service price, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of Public Switched Telephone Network (PSTN) services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

a 50 per cent more voice calls, that is from 1200 to 1800 calls per annum.

b Double the proportion of long-distance calls, from 14 per cent to 28 per cent of domestic voice calls.

c Duration of day-time local calls increased from about 3 minutes to 5 minutes.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Impact of changes to call patterns

Three different sensitivity tests were performed to assess the impact of different call patterns (see Figure 5.5).

More calls: When the total number of voice calls made by a household was increased by 50 per cent from 1200 calls to 1800 calls per annum, Australia's rank among the countries benchmarked did not change, despite differences in the fixed and variable cost shares (see Figure 5.5(b)).

More long-distance calls, fewer local calls: The proportion of long-distance calls (call distance 40 kilometres and greater) was doubled and the number of local calls reduced to keep the total number of domestic voice calls constant. Increasing the proportion of long-distance calls in this way did not change Australia's price ranking (see Figure 5.5(c)).

Longer local calls: When the assumed average duration of day-time local calls was increased from about 3 minutes to 5 minutes, Australia's overall total service performance improved slightly (see Figure 5.5(d)). As discussed earlier, such a change would have a larger impact on Australia's relative price performance for local calls than for the total service.

Sensitivity tests show that the comparisons are quite robust. Changing weighting assumptions for call patterns by as much as 50 per cent had a small impact on Australia's relative price for the total residential PSTN service.

Impact of discount plans

Plans tailored for residential consumers can generate significant savings over standard packages (see Figure 5.6(a) and 5.6(b)). For example, France Telecom's discounts reduced the total cost of the basket by over 25 per cent. The effect of this level of discounting was to improve France's ranking from seventh to fourth position, above Australia. Telstra's discounts represented savings of 6 per cent.

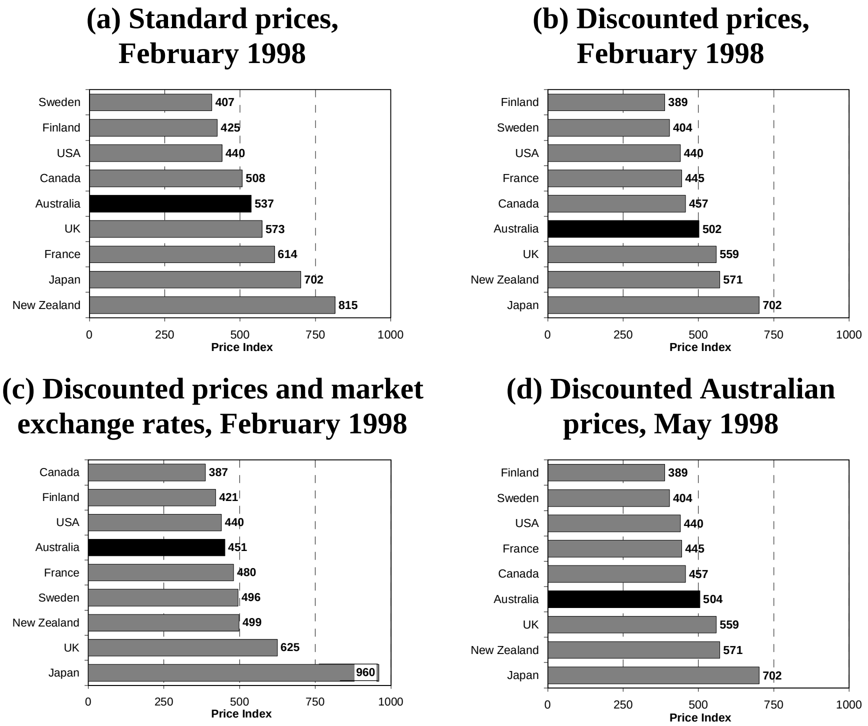
The decisions about which plans to utilise in the study involved an element of judgement by the consultant using the criteria of the lowest-priced plan which was widely available to customers with the assumed usage call patterns.

Impact of exchange rate assumptions

The effect of using market exchange rates instead of PPPs was to improve Australia's ranking because of the relatively low value of the Australian dollar in February 1998 (see Figure 5.6(c)). As discussed previously, use of market exchange rates for currency conversion would render the price comparisons subject to factors external to the telecommunications industry.

The PPP exchange rate used for Australia was 74.6 US cents. The market rate for the Australian dollar declined from about 73 US cents in September 1997 to 67 US cents in February 1998 because of the impact of the Asian crisis and falling commodity prices. This reduced by nearly 9 per cent Australian telecommunications prices measured in terms of US dollars using market exchange rates.

Figure 5.6 Impact of discounting, exchange rate assumptions, and recent Australian price adjustments on total PSTN service price, February 1998



Note: The price index is the expenditure in each country on a fixed basket of Public Switched Telephone Network (PSTN) services. Expenditures are expressed in $US purchasing power parity (PPP) terms, except in chart (c) where average market exchange rates in February 1998 are used.
All other assumptions are as summarised in Table 5.1 for the total PSTN service.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Impact of Telstra's May 1998 price adjustment

Telstra changed its price structure in May 1998. However, there was very little impact on the overall expenditure on the residential basket (see Figure 5.6(b) and (d)).

Treatment of discounts on long-distance calls

Australia and New Zealand have adopted, as a pricing strategy, a cap on long-distance calls in off-peak periods. Once the price of such calls reaches the cap

($3 in Australia), it does not increase as the call duration increases further. The price comparisons model does not include the effective discounts on these calls.

The $3 cap in Australia starts to bring benefits to customers when long-distance evening calls last longer than about 15 minutes. The assumed average duration of long-distance off-peak calls was 7 minutes — based on OECD assumptions — which suggests that a relatively small proportion of calls would have durations longer than 15 minutes and receive the benefits. However, some customers would tend to increase the duration of their calls when the $3 cap applies.

Impact of Australian call patterns

Telstra furnished commercial-in-confidence information, on the numbers, distributions and durations of domestic calls for a typical Australian residential customer. Internet calls were not separately identified from voice calls. The data was provided in an aggregated form which satisfied the input requirements of the Eurodata model. The Commission did not have access to raw data.

Price comparisons using the Australian call pattern were then contrasted with the comparisons based on the basket developed by the Commission as described earlier (see Figure 5.7). This latter basket was more broadly representative of OECD call patterns.

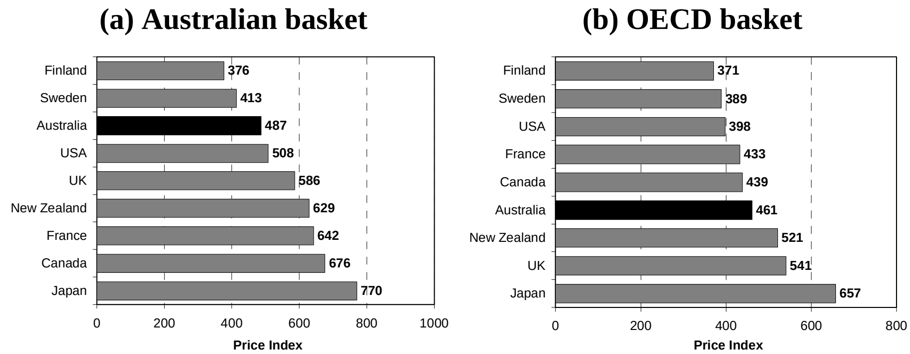
The ‘Australian’ basket had a much smaller proportion of very short-distance calls (less than 3 kilometres) and a correspondingly larger proportion of medium-distance calls (7 to 40 kilometres). This may reflect the relatively lower population densities of Australian urban regions.

The price structure in Australia can be expected to have an impact on calling patterns. Those services with relatively low prices in Australia compared with other countries can be expected to be relatively more in demand in Australia. Costing a basket in which these services are given a greater weight would generally be expected to lead to a lower relative price for the total service.

The effect of using the Australian basket for all countries benchmarked was to improve Australia’s relative prices from sixth lowest to the third lowest for residential domestic service. Canadian, French and US prices became higher than Australia’s. In the case of Canada, the Australian distribution adversely affected the overall price because 3 kilometres calls are free and middle-distance calls relatively expensive in Canada.

However, Finnish and Swedish prices remain substantially below Australia’s prices, using the Australian basket.

Figure 5.7 Australian and OECD basket price comparisons for total residential PSTN service, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of Public Switched Telephone Network (PSTN) services. Expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.
International calls were excluded from both comparisons.
The $3 charge cap for off-peak calls in Australia leads to some very long-duration calls which are not properly accounted for in the price comparisons model. Telstra has provided information which suggests that the estimated price index for Australia using the Australian basket is over-estimated by between 4 and 5 per cent. Any other countries with discounts on long-duration calls could be similarly over-estimated.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

New Zealand prices

As stated previously, the Commission's methodology was based on a common neutral basket of calls which is priced in each country. TCNZ's Friends and Family Home pricing plan was used to calculate New Zealand's price index. This plan is widely available to customers and embodies a substantial discount from basic rates. As with other countries, price plans with more limited applicability were not used.

In a submission, TCNZ provided a price measure for New Zealand based on revenue per call minute (yield) for national and international calls. This measure embodied all of the discount plans offered by TCNZ including the NZ$5 cap in off-peak periods (similar in concept to Telstra's $3 cap). Also, the overall yield measure reflected the numbers and durations of calls made in different time periods and over different distances by New Zealanders.

The price measure provided by TCNZ was 16 per cent lower than that recorded in Figure 5.1(a). However, a measure for one particular country based on yield, and hence on the call pattern in that country, would be expected to produce a more favourable result for that country.[4]

Comparison with other price benchmarking

In its most recently published price comparisons, the OECD reported that, based on 1996 tariffs, Australia's standard residential prices for customer access and local and long-distance national voice calls (excluding calls to mobiles) were slightly higher than the average of 23 OECD countries (OECD 1997b). However, in the OECD's comparison, Australia was ranked last (having the highest prices) among the nine benchmarked countries considered in the Commission's study (see Table 5.4). Eurodata updated the comparisons in February and May 1998, using the OECD methodology.

Table 5.4 Results of cross-country comparisons of residential prices

Source	*Date*	*Australia's ranking in nine selected countries*[a]	*Coverage*[b]
OECD[c]	January 1996	Nine	Standard prices; national voice calls
Eurodata[d]	February 1998	Seven	Standard prices; national voice calls
Productivity Commission[e]	February 1998	Six	Discount prices; calls to mobiles and ISPs as well as national voice calls
Eurodata[d]	May 1998	Eight	Standard prices; national voice calls

a Australia's price ranking relative to the nine benchmark countries. For example, a rank of seven means seventh lowest price out of the nine countries.
b All studies use PPPs for currency conversions and include indirect taxes.
c The most recent published OECD comparisons.
d These comparisons are part of a regular service offered to Eurodata customers based on OECD/Eurodata methodology.
e The current study based on Productivity Commission/Eurodata methodology
Source: OECD, Eurodata and Productivity Commission.

4 It was not possible to obtain a yield measure for the other benchmarked countries. Furthermore, use of the yield approach across all countries can produce confounding results (see Quiggin 1997). For example, it is possible for a country to have higher prices than another country, for each service, yet still have a lower overall yield due to a higher proportion of sales in the lower yield parts of the market.

The Communications Research Unit (CRU) has recently undertaken international comparisons of standard prices in 6 of the 9 countries considered by the Commission (Finland, Japan and the US being excluded) (ACCC 1998b).[5] The CRU did not use price baskets but examined the individual charges for connection, rent and calls. Australia was found to rank in the middle of the sample of countries for most basic telephone services.

Telstra has also recently undertaken international comparisons of local service telecommunications prices, employing Analysys Limited as consultants (Telstra 1998b). This study examined charges for customer access, local voice and internet calls and call waiting and forwarding. The comparisons were based on an average call duration of 6 minutes and a call distribution pattern typical for Australia. Under these favourable assumptions, the study concluded that Australia had the lowest local service prices among the incumbent operators of 8 of the 9 countries included in the Commission's study (Finland was not included).

5.3 Integrated Services Digital Network

The ISDN basic service for residential households is delivered over a single twisted copper pair connection but can provide more capacity and a higher quality of service (see Box 5.2). The annual expenditure on the service by a household covers customer access charges for installation and access to the ISDN network and usage charges for national and international voice calls, calls to mobile phones and calls to Internet Service Providers.

The ISDN basket for the residential user had the same assumptions for call numbers, distributions over time and distance and durations as the residential PSTN basket (see Table 5.3).

Penetration of ISDN

The ISDN service is a potential alternative to the PSTN service for households. From a network perspective, ISDN is available to well over 90 per cent of the Australian population (see Chapter 2). However, the marketing of ISDN to residential customers in Australia is in its early stages and, as yet, only a very small number of residential customers have acquired the service. The promotion of ISDN to residential customers has been more vigorous in Europe.

[5] The Communications Research Unit was commissioned to carry out the international price comparisons for the Australian Competition and Consumer Commission.

Box 5.2 ISDN services

Integrated Services Digital Network (ISDN) is a technology which is bringing both voice and data digital communications into the home and office. It can increase the capacity of the copper pair by providing for simultaneous operation of a telephone and a 64 kilobit per second Internet service.

ISDN is beginning to challenge the PSTN in Europe, although less so in North America. The Scandinavian countries have the lowest ISDN call prices.

ISDN has had very little impact yet on the residential market in Australia, but is used quite extensively by business both as a dial-up service (incurring both rental and usage charges) and in the form of a semi-permanent circuit (incurring a rental charge). Telstra currently has a monopoly on ISDN local services. The Australian Competition and Consumer Commission has issued a declaration aimed at assisting access by service providers to ISDN terminating and originating services so that they can compete in long-distance markets.

ISDN may itself be challenged in the future by the implementation of Asynchronous Digital Subscriber Line technology which could support much higher bandwidth over conventional subscriber lines.

A basic ISDN service provides more capacity than a single PSTN service but has much higher customer access costs (including installation and rental). The call volumes and Internet usage of most households are currently insufficient for ISDN to be more cost-effective than the PSTN.

ISDN discounting plans

In most countries, discounting plans for ISDN are similar to those available for PSTN services. Discounts generally apply to variable (call) charges. Since ISDN fixed charges are relatively large, the savings generated by discount plans are relatively small (especially for low volume users). For example, applying Telstra's Residential Smart Saver discount plan to *OnRamp* ISDN yields a 3 per cent saving to the residential customer's total ISDN costs. In France, discount packages yield a saving of 5 per cent for residential ISDN customers.

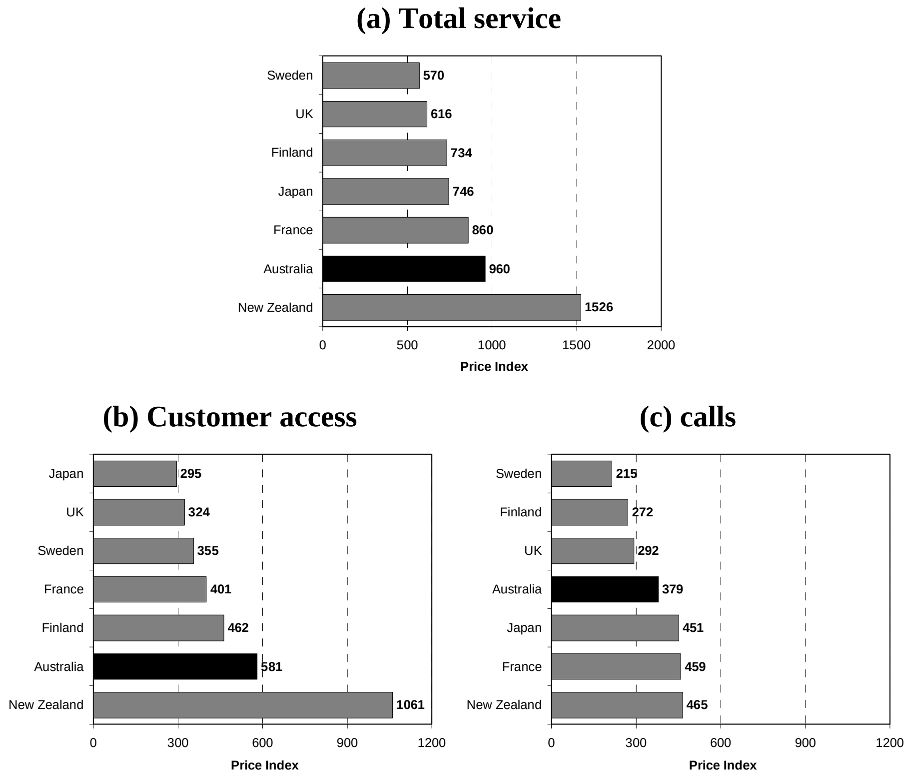
International price comparisons

ISDN price comparisons are presented for seven of the benchmarked countries. Price information was not available for Canada and the United States — ISDN services are offered only in pockets of the North American continent.

Australian ISDN prices were relatively high (see Figure 5.8). Although usage charges for ISDN services were similar to PSTN services, access charges to residential customers were significantly higher for ISDN which was not subject to a price cap.

For the group of countries benchmarked, customer access charges averaged 60 per cent of the total ISDN price, compared with an average of 40 per cent for PSTN. For Australia, the customer access charge represents 60 per cent of the total service price for ISDN and 32 per cent for PSTN.

Figure 5.8 Relative prices for residential ISDN services, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of Integrated Services Digital Network (ISDN) services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

5.4 Mobile

The residential mobile basket includes access to a single digital mobile service, and 366 annual local and long-distance calls from the mobile phone to fixed phones and to other mobile phones. International, fax and Internet calls from mobile phones are excluded.

Annual fixed expenditure includes rental and amortised connection charges and annual usage expenditure includes the charges for the 366 calls with destinations and durations indicated in Table 5.5.

Canada was excluded from the comparisons because tariff packages comparable to those in other countries could not be located.

Table 5.5 Key assumptions of the residential mobile basket

		Call durations	
Type of call	*Quantity of annual calls*	*Peak*[a]	*Off-peak*[b]
	(No.)	*(Minutes)*	*(Minutes)*
Local calls[c]	285	2.5 to 3.5	3.5 to 6.0
Long-distance calls	44	3.5	6.0 to 7.0
Calls to mobiles	37	2.5	3.5

a Peak calls are priced at 11.00am and 3.00pm on weekdays.
b Off-peak calls are priced at 8.00pm and 3.00am on weekdays, and 11.00am and 3.00pm on weekends.
c Local calls are made to destinations up to and including 27 kilometre distance from the caller.
Source: OECD, Eurodata; Productivity Commission.

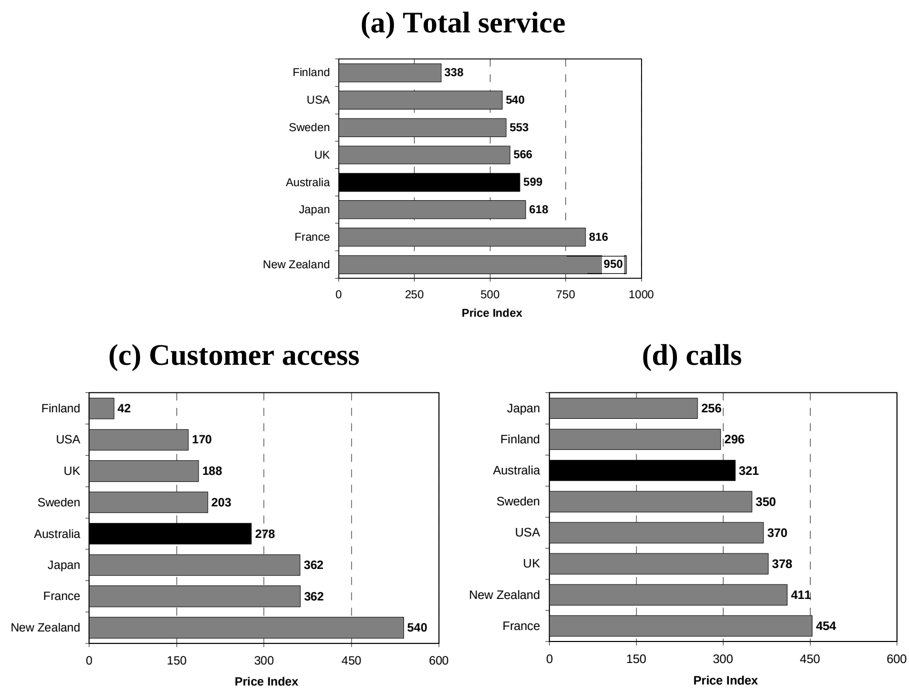
Overall, Australia's prices were in the middle of the eight countries included in the comparisons (see Figure 5.9). Australia's customer access charges were close to the average of all the countries, while its usage charges were relatively low.

There was a much greater variation in the customer access charge than in the usage charges among the countries. The countries with the lowest customer access charges were also the countries with the lowest prices overall.

For residential mobile users in New Zealand and Japan, about 60 per cent of the expenditure on the total mobile service related to customer access charges, about 35 per cent to local and long-distance calls to fixed lines and about 5 per cent to calls to other mobiles. This contrasts with the United Kingdom, Sweden and the United States where about 35 per cent of total mobile expenditure related to customer access charges, about 60 per cent to local and long-distance calls and about 5 per cent to calls to other mobiles.

For Finnish residential mobile users only 13 per cent of total mobile charges are fixed. Australian residential mobile expenditures were more evenly distributed between customer access and usage charges.

Figure 5.9 Relative prices for residential mobile telephone services, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of cellular mobile services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

5.5 In summary

International price comparisons of the kind reported in this Chapter are inevitably based on many assumptions. Although these introduce an element of statistical variability into the price comparisons, there is nevertheless a reasonable probability that the following broad conclusions hold:

- *PSTN*: Scandinavian countries had the lowest prices, Japan has the highest prices, with Australia in a group of countries in the middle;
- *ISDN:* The United Kingdom and Scandinavia had the lowest prices, New Zealand the highest prices, with Australian prices also relatively high;
- *Mobile services:* Finland had the lowest prices, New Zealand the highest prices, with Australia in the middle group of countries studied.

There was a wide dispersion in the relative prices of the countries studied. In the case of the PSTN, based on the assumptions adopted by the study, Australian prices for the total annual service were above the Finnish prices by nearly 30 per cent and below Japanese prices by about 30 per cent. In the case of mobiles, Australian prices were above Finnish prices by over 70 per cent and below New Zealand prices by around 35 per cent.

These conclusions are not greatly affected by changes in assumptions about the number and duration of calls, at least for the PSTN for which a considerable amount of sensitivity testing has been done. The PSTN results were slightly more favourable to Australia than indicated by the comparisons based on the OECD methodology, primarily because of the inclusion of untimed calls to the Internet.

When the price comparisons were based on Australian call patterns, Australia’s prices improved relative to some of the other countries studied, although Finnish and Swedish prices remained substantially lower than Australia’s. If the call pattern of another country were to be used for the comparisons, the measure of Australia’s prices in relation to the prices of that country might be expected to be higher.

It is not possible to report on how Australia’s relative price performance has changed over time. This is because there is no information on discounted prices from previous periods. However, the OECD’s comparisons of standard prices do not indicate a pronounced direction or trend in Australia’s relative price for residential PSTN service over recent years.

The significance of Australia’s overall relative price for ISDN services (sixth out of seven countries) would have been affected by Telstra’s recent major upgrade of the ISDN service to international standards (see Chapter 2) and the, as yet, very limited penetration of ISDN in the residential market in Australia. Comparisons of the cost of ISDN services to businesses is more meaningful because of the greater penetration of ISDN in business markets in Australia.

Price structures

There are some important differences in the price structures of the various countries. Australia has relatively low prices for calls to Internet Service Providers and relatively high prices for local voice PSTN calls. This is a consequence of untimed local call prices in Australia and the assumptions of call durations of about 3 to 6 minutes for local voice calls and 20 to 30 minutes for Internet calls.

Comparisons of local call prices are sensitive to call duration assumptions. There would be an improvement in Australia’s ranking for local call prices if the assumption about the duration for local voice calls was increased. However, relative prices for the total service would not be affected greatly by the local call duration assumption because local voice calls represent only around 20 per cent of the residential customers total bill (on average).

The incumbent operators in most of the countries studied have progressively rebalanced their price structures by maintaining or increasing customer access charges and reducing usage charges so that prices more closely reflect costs (see Chapter 3). Some of this rebalancing in residential prices has occurred because of competitive pressures and the widespread implementation of discount plans.

For Australian residential markets, the level of customer access charges and the ratio of customer access charges to usage charges were found to be lower than for most of the other countries benchmarked. An in-depth assessment of the price structures of the various countries would require extensive analysis of cost structures and demand characteristics.

6 BUSINESS PRICE COMPARISONS

The telecommunications needs of a business vary with its size, the geographical scope of its operations and the industry in which it operates. The telecommunications prices of the services available to business also vary with the combination of services chosen, traffic volumes and patterns and types of calls. For example, small businesses face relatively large fixed costs in gaining access to telecommunications services, whereas large corporations can reduce their telecommunications costs by negotiating discounts.

Past price studies of the Australian telecommunications industry have focussed on small businesses, and have not included services such as Integrated Services Digital Network (ISDN) and frame relay. This was the case for the 1995 telecommunications benchmarking study by the Bureau of Industry Economics (BIE) as well as OECD studies. Also, previous studies mostly used standard rather than discount prices for the price comparisons.

For this study, the telecommunications prices for ten different types and sizes of business were examined. Price discounts have been taken into account. The service needs of the various businesses were defined to reflect the diversity of requirements for telecommunications services. The effect on the price comparisons of the differences in the telecommunications demands of these businesses provides an indication of the robustness of the comparisons.

The Commission appointed Eurodata to collect the data and work with it in the development of the methodology.

6.1 Methodology

As for the residential price comparisons reported in Chapter 5, the price index for each of the business comparisons was the annual expenditure in each country on a specified basket of services.

Business price baskets

Separate price comparisons were developed for each of ten representative businesses and for the Public Switched Telephone Network (PSTN), ISDN, mobile services, leased lines and various other data products. Appropriate baskets of services were defined for each business.

The businesses were primarily defined in terms of the numbers of users of fixed voice telephony, the traffic distribution by distance (local, long-distance and international) and numbers of company sites (see Table 6.1). For many businesses, the number of telephone users is less than the total number of employees. Also, the number of external PSTN lines from the business to the local exchange is usually less than the number of users for medium and large businesses.

Table 6.1 Representative businesses included in the study

Class	*Code*	*Description*
Small business	S1	One user, mainly local traffic
	S2	Three users, mainly local traffic
Medium business	M1	30 users and one site, mainly local traffic
	M2	100 users and one site, mainly local traffic
	M3	30 users and one site, mainly long-distance traffic
	M4	100 users and one site, mainly long-distance traffic
Large business	L1	National financial company, 300 users and 30 sites
	L2	National manufacturing company, 300 users and 5 sites
	L3	International manufacturing company, 600 users and 10 domestic sites in home country
	L4	Multinational company, 1000 users and 5 sites in home country

Source: Eurodata (1998).

The small and medium-sized businesses were assumed to use the PSTN or ISDN for fixed network voice communications, as well as fax and access to Internet Service Providers (except for S1). Six representative businesses were defined. Each of the six was compared for both PSTN and ISDN prices, giving 12 different inter-country price comparisons.

Two baskets of mobile voice communications services were priced for business. They relate to usage patterns for small businesses and medium to large businesses.

Separate price comparisons are presented for leased lines, X25, frame relay and Asynchronous Transfer Mode (ATM). Brief descriptions of these services are given in the glossary and Chapter 2 has some additional information about them. Two baskets for each of these services were specified for medium-sized businesses. These data services are not commonly used by small businesses.

For large business, aggregate price comparisons over selected voice and data services were made. Four different comparisons are presented for the four types of large business.

The assumptions underlying the price comparisons for each of the various types of businesses and services are summarised later in the chapter. More details of the assumptions are given in Appendix F.

Prices

As with the residential comparisons, the business price comparisons were based on prices as at February 1998. The price (discount plan) for a service was the one that minimises the cost to the customer of the specified service in February 1998.

Discounts are often much more significant for business customers than for residential because the volumes of voice traffic are larger. The discounts tend to increase with the volume of traffic.

Generally, the prices included in this study were limited to published discount plans. Information on negotiated rates and individual contracts available to large businesses could not be obtained because they are normally confidential.

Taxes

As for the residential price comparisons, indirect taxes associated with the production of telecommunications services were included in the business price comparisons. In a number of overseas countries, value-added taxes are paid by businesses when they purchase telecommunications services. Australian providers pay various indirect taxes (for example, payroll taxes) which are imbedded in the prices for telecommunications services paid by businesses. Including all indirect taxes therefore provided a reasonably fair method of comparing the relative prices of telecommunications services of different countries.

The BIE (1995) excluded these taxes from their international price comparisons. It was argued that business users in overseas countries may reclaim value-added taxes included in the prices they pay for telecommunications services. However, taxes on the value added by all businesses are ultimately included in final consumer prices of goods and services (although not export prices).

Currency conversion

As for the residential price comparisons, purchasing power parities (PPPs) were used to compare business telecommunications prices in a common currency.

This has the benefit that the international comparisons focus on the relationship of telecommunications prices to the general price level in each country.

The BIE used market exchange rates in its 1995 study and argued that large business customers of telecommunications services tend to make business decisions on the basis of comparing costs using market exchange rates, rather than on considerations of consumer purchasing power.

This argument is most valid for those businesses producing tradeable goods or services and for which telecommunications represents a significant input cost. For many other businesses it may be argued that PPP rates are more appropriate. In particular, PPP rates may be more appropriate where differences in telecommunications services prices could be expected to have little influence over a business' decision to relocate (see Box 5.1).

6.2 Small businesses

Relative prices are estimated for the two representative businesses, S1 and S2, indicated in Table 6.1.

The annual expenditure used as the price index included the fixed charges for access to the services and usage charges for the calls made. The fixed charges were those associated with the installation, amortised over five years, and rental of each telecommunications service.

In consultation with the industry and the Commission's consultant (Eurodata), the assumptions originally developed by the OECD for its business price comparisons were modified for this study.

Business S1 has only one telephone user who makes 3260 voice calls a year and S2 was assumed to have three users, each of whom is assumed to make 4000 voice calls per year, 80 per cent of which are made in the peak-period (that is, during the day on week-days). Assumptions for the number of each type of call and average call duration are summarised in Table 6.2.

The majority of calls were local area calls. International calls and calls to mobile phones are included in the baskets for both types of business. Fax calls and calls to Internet Service Providers were included only in the S2 basket.

Voice calls and calls to Internet Service Providers can be made using either PSTN or ISDN services offered by carriers. The price comparisons for each of these services were based on the same assumptions about the numbers of users and calls. However, the PSTN and ISDN are different technologies and represent different price–quality combinations.

Table 6.2 Specifications of small business PSTN and ISDN services

	Annual calls per user[a]		
Type of call	*S1*	*S2*	*Call durations*
	(No.)	*(No.)*	*(Minutes)*
Local[b]	2 335	2 801	2.5 to 3.5
Long-distance	565	679	3.5 to 4.5
International	35	120	5.0
To mobiles	325	400	30.0
To Internet Service Providers	na	230	40.0 or 60.0
Fax	na	575	3.0

a The S1 basket includes one user, the S2 basket, three users.
b Local calls are made to destinations up to and including a 27 kilometre radius from the caller.
na Not applicable.
Source: Eurodata (1998).

Public switched telephone network

The PSTN customer access service for representative small business S1 was specified as having a single telephone line, and S2 having three telephone lines (one for each user), a fax line and a modem line.

Discount plans for PSTN services are available in most sample countries. In Australia, for example, two plans offered to business are Telstra's *Business Saver Plus* and *Long Distance Saver 4* plans. Both plans provide proportional discounts on the cost of long-distance and international calls, depending on the amount of expenditure by customers. Business Saver Plus is the discount package that yielded the largest savings for Telstra's small-business customers.

Generally, Australia's PSTN prices for small businesses were higher than those of European and North American countries and below those of New Zealand and Japan. Australia's relative prices were slightly better for the S2 basket than for S1 (see Figure 6.1). This difference arose partly because calls to Internet Service Providers were excluded from the S1 basket and included in the S2 basket. Internet calls are relatively cheap in Australia. Unlike a number of other countries, Australia has untimed charges for Internet calls, which are assumed to be local calls of long duration.

Price comparisons for each component of PSTN traffic for S1 and S2 customers are shown in Table 6.3. The contrast in Australia's relative prices for calls to

Internet Service Providers and voice calls is clearly evident, with Internet call prices ranking second lowest.

Table 6.3 Australia's relative price ranking for PSTN services to small business, February 1998

	Small business basket[a]	
Service	*S1*	*S2*
	Australian rank compared to other countries	*Australian rank compared to other countries*
Customer access	5 of 9	5 of 9
Voice calls	7 of 9	7 of 9
Fax calls	na	6 of 9
International calls	6 of 9	6 of 9
Internet calls	na	2 of 9
Calls to mobiles	5 of 9	5 of 9
Overall	7 of 9	6 of 9

Note: Australia's price ranking is out of nine countries, based on annual expenditures in each country on a fixed basket of Public Switched Telephone Network (PSTN) services. For example, a rank 5 of 9 means fifth lowest price out of the nine countries.
a **S1**: A small business with one user; **S2**: A small business with three users.
na Not applicable.
Source: Productivity Commission estimates based on Eurodata (consultant) data.

Australia's relative prices for PSTN services supplied to small businesses as measured in the BIE (1995) and OECD (1997b) studies and the 1998 Eurodata comparisons using the OECD methodology is presented in Table 6.4 along with the results of this study. These results indicate a degree of consistency across all studies with regard to Australia's price performance.

Telecom New Zealand claimed that the Commission over-estimated new Zealand's prices used in the comparisons of telecommunications prices for business customers. The issues were similar to those raised for the residential price comparisons which are discussed in Chapter 5. Utilising TCNZ's proposed methodology did not greatly change New Zealand's relative position for small businesses.

Table 6.4 Results of cross-country price comparisons for PSTN services to small business

Source	*Date*	*Australia's ranking in nine selected countries*[a]	*Methodology*[b]
BIE	1994	seven	Single line; value-added taxes excluded; market exchange rates
OECD[c]	January 1996	nine	Single line; value-added taxes excluded; PPPs
Eurodata[d]	February 1998	seven	Single line; indirect taxes included; PPPs
Productivity Commission[e]	February 1998	seven	Single line; indirect taxes included; PPPs
Productivity Commission[e]	February 1998	six	Five lines; indirect taxes included; PPPs[f]
Eurodata[d]	May 1998	eight	Single line; indirect taxes included; PPPs

a Australia's price ranking relative to the nine benchmark countries. For example, a rank of seven means seventh lowest price out of the nine countries.
b Only the Productivity Commission/Eurodata comparisons use discount prices.
c The most recent published OECD comparisons.
d Based on OECD/Eurodata methodology.
e The current study based on Productivity Commission/Eurodata methodology.
f Unlike the other comparisons, this includes fax calls and calls to mobiles and ISPs.
Source: OECD, Eurodata and Productivity Commission

Integrated services digital network

ISDN services are increasing in importance for small businesses. A basic ISDN service over one twisted copper pair can achieve the functionality of at least two PSTN lines.

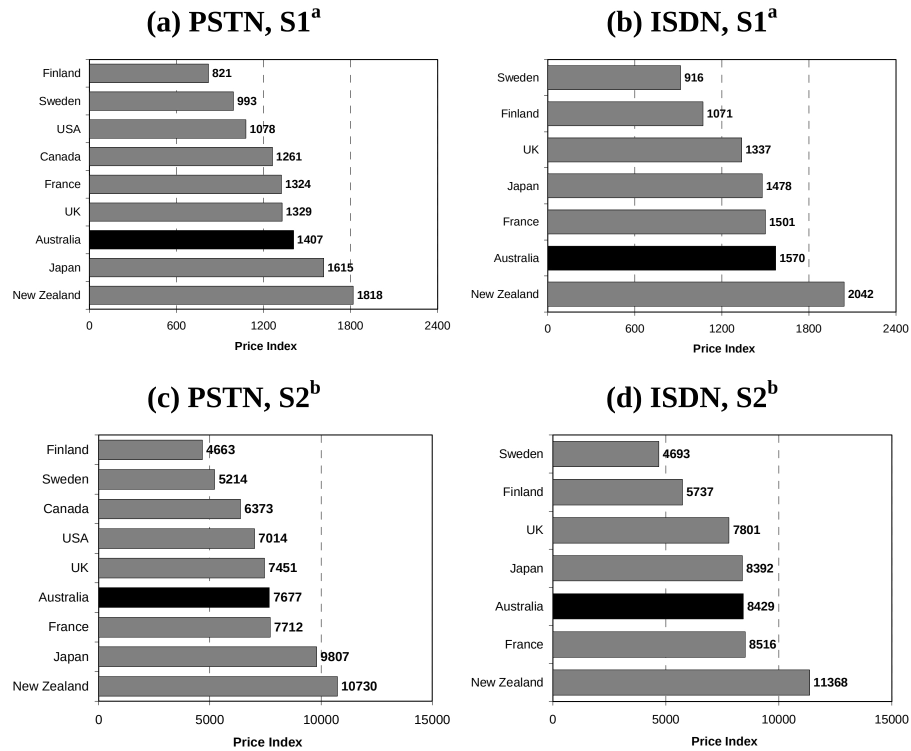
The ISDN services for small business are specified as follows:

S1 Basic access connection, which is equivalent to two 64 kbps (kilobits per second) channels available for use for voice calls; and

S2 Three basic access connections, equivalent to at least six 64 kbps channels, of which one is used for fax, another for an Internet connection and the other four are available for voice calls.

The relative prices for ISDN services for small business for the seven countries studied are presented in Figure 6.1.

Figure 6.1 Relative PSTN and ISDN prices for small businesses, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) by S1 and S2 customers on a fixed basket of Public Switched Telephone Network (PSTN) or Integrated Services Digital Network (ISDN) services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.

a S1: A small business with one user.

b S2: A small business with three users, and one fax line and one modem line.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Australia has a low penetration of ISDN services among small business users. Fixed costs are relatively high in Australia, which discourages low-volume users. Australia's ISDN fixed charges (that is, access charges) were found to be relatively high compared with its PSTN fixed charges, as indicated by a comparison of Tables 6.3 and 6.5.

For the small business baskets defined above, ISDN was more expensive than PSTN for five of the seven countries for which both PSTN and ISDN prices are available. Only in Japan and Sweden was ISDN cheaper.

In Australia, ISDN prices were about 10 per cent higher than PSTN prices for both of the small businesses. In other countries, ISDN prices were about 13 per cent higher. It should be noted, however, that there is more capacity and functionality available from the specified ISDN services than the specified PSTN services.

Table 6.5 Australia's relative price ranking for ISDN services to small business, February 1998

	Small business basket[a]	
Service	*S1*	*S2*
	(Rank)	*(Rank)*
Customer access	6 of 7	6 of 7
Voice calls	5 of 7	5 of 7
Fax calls	na	4 of 7
International calls	5 of 7	5 of 7
Internet calls	na	3 of 7
Calls to mobiles	3 of 7	3 of 7
Overall	6 of 7	5 of 7

Note: Australia's price ranking is out of seven countries, based on expenditures on a fixed basket of Integrated Service Digital Network (ISDN) services. For example, 3 of 7 means third lowest price out of the seven countries.

a **S1**: A small business with one user; **S2**: A small business with three users.

na Not applicable.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Mobile

Small business users were assumed to make 920 calls per year (four per working day), 86 per cent of these being made in the peak period (that is, during the day on weekdays). International calls were excluded. The numbers of different types of calls and average call durations assumed are summarised in Table 6.6.

The range of tariff plans available for mobile services is very large. Plans with pre-paid tariffs and subsidised handsets were excluded from the basket in order to simplify the comparisons.

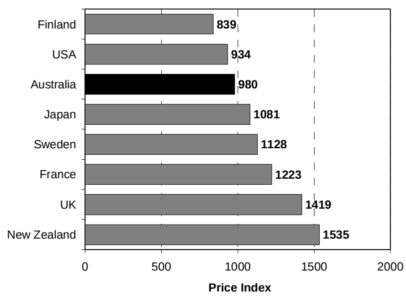
Table 6.6 Specification of mobile service use by small businesses

Type of call	*Quantity of annual calls*	*Call durations*
	(No.)	*(Minutes)*
Local[a]	645	2.5
Long-distance	110	3.5 to 4.5
To mobiles	165	3.5

a Local calls are made to a destination within a 40 kilometre radius of the caller.
Source: Eurodata (1998).

Australian mobile prices (when compared to prices in other countries) were significantly better for small business than for residential users, as can be seen by comparing Figures 5.8 and 6.2. Furthermore, Australia's mobile prices were lower, relative to mobile prices in other countries, than its PSTN and ISDN prices for small business customers.

Figure 6.2 Relative mobile prices for small businesses, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of cellular mobile services. The expenditures are valued at February 1998 prices, based on the widely available discounting plan that minimises cost to the customer.
Source: Productivity Commission estimates based on Eurodata (consultant) data.

6.3 Medium-sized businesses — dial-up services

The prices of dial-up PSTN and ISDN services were estimated for four medium-sized businesses (M1 to M4). Their assumed telecommunications needs are defined in Table 6.1.

As with small business, the price comparisons were made by calculating the expenditure on annual fixed and usage charges in each country for the basket of services defined for each of the four business types and each of the telecommunications services they were assumed to use.

The four medium-sized businesses differed in the volume of calls and in the proportions of local and long-distance calls. In each business, the average user was assumed to make 4000 voice calls, 230 Internet calls and 460 fax calls per year, using either the PSTN or ISDN. The distribution of these calls by time of day and the call duration assumptions were the same as for the small business baskets.

For M1 and M2, 80 per cent of the national voice calls were assumed to be less than 40 kilometres. For M3 and M4, 33 per cent of calls were assumed to be less than 40 kilometres. The proportion of international voice calls increased from M1 to M4. For all the medium-sized businesses, 42 per cent of fax calls were assumed to be less than 40 kilometres and all Internet calls 3 kilometres or less.

Public switched telephone network

The number of PSTN lines assumed to be required to carry voice calls, fax and Internet services, and the numbers of users of these services, are given in Table 6.7 for each of the four types of medium businesses. Users share the available telephone lines connecting the company site to the public network.

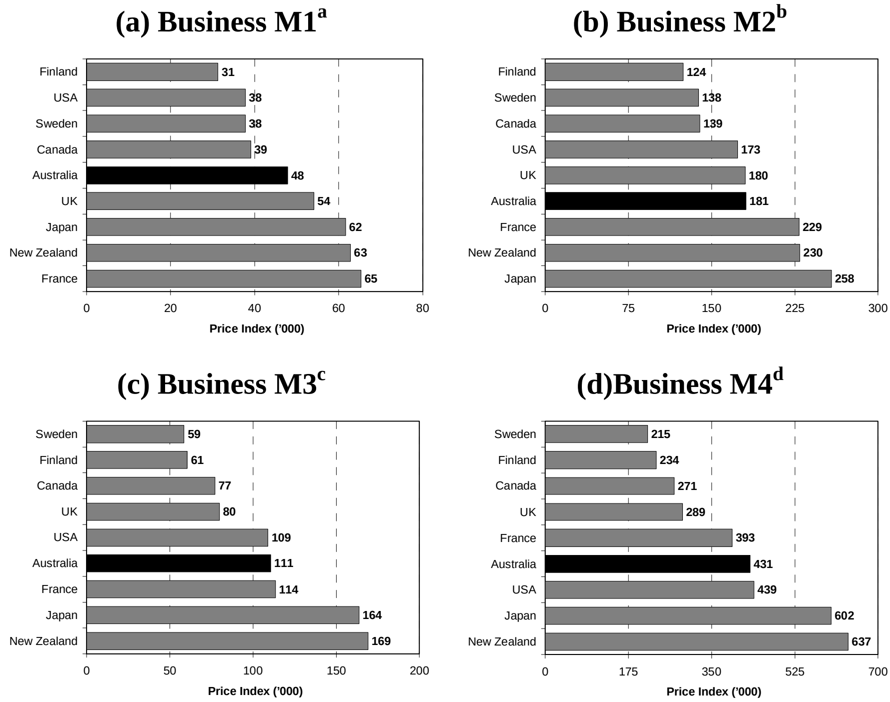
Table 6.7 Specification of PSTN services for medium-sized businesses

	Medium-sized business baskets			
	M1	*M2*	*M3*	*M4*
National calling profile	Local	Local	Long-distance	Long-distance
International calling profile	None	Minimal	Moderate	Heavy
Users (No.)	30	100	30	100
Voice lines (No.)	10	30	10	30
Fax lines (No.)	2	4	2	4
Internet lines (No.)	3	9	3	9

Source: Eurodata (1998).

For the PSTN services specified for the four medium-sized businesses, Australian prices are around the middle of the prices in the nine countries studied (see Figure 6.3). The Scandinavian countries consistently had the lowest prices and Japan and New Zealand the highest.

Figure 6.3 Relative PSTN prices for medium-sized businesses, February 1998



Note: The price index is the expenditure in each country (in $US'000 using PPP exchange rates) on a fixed basket of Public Switched Telephone Network (PSTN) services. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.

a M1: Business with 30 users and mainly local traffic.

b M2: Business with 100 users and mainly local traffic.

c M3: Business with 30 users and national traffic.

d M4: Business with 100 users and national traffic.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Australia's relative price ranking for each of the various elements of PSTN traffic, for each type of business, is presented in Table 6.8. Australia's relative performance was best for Internet calls and worst for voice calls.

Australian fixed charges were in the middle of the group of nine countries. However, the fixed charges were much less important for medium-sized businesses, representing between 3 and 7 per cent of total service price compared with 15 per cent for small business S1 and 34 per cent for residential customers.

Table 6.8 Australia's relative price ranking for PSTN services to medium-sized businesses, February 1998

	Medium-sized business basket[a]			
Service	*M1*	*M2*	*M3*	*M4*
	(Rank)	*(Rank)*	*(Rank)*	*(Rank)*
Customer access	5 of 9	5 of 9	5 of 9	5 of 9
Voice calls	7 of 9	7 of 9	6 of 9	6 of 9
Fax calls	5 of 9	5 of 9	6 of 9	6 of 9
International calls	na	6 of 9	6 of 9	6 of 9
Internet calls	2 of 9	2 of 9	2 of 9	2 of 9
Calls to mobiles	5 of 9	5 of 9	5 of 9	5 of 9
Overall	5 of 9	6 of 9	6 of 9	6 of 9

Note: Australia's price ranking is out of nine sample countries, based on expenditures on a fixed basket of Public Switched Telephone Network (PSTN) services. For example 2 of 9 means second lowest price out of nine countries.

a **M1**: Business with 30 users and mainly local traffic; **M2**: Business with 100 users and mainly local traffic; **M3**: Business with 30 users and national traffic; **M4**: Business with 100 users and national traffic.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

The high proportion of local calls assumed for representative businesses M1 and M2 adversely affected Australia's relative price. Australia's untimed local voice calls ranked poorly compared with its performance for long-distance voice calls (see Chapter 5).

Australian relative fax call prices for M1 and M2 were lower than voice call prices. This was because fax calls were assumed to be evenly distributed across call distances, rather than concentrated in local calls as in the case of voice calls for M1 and M2.

Australia's prices for international calls were higher than the four European countries and Canada. However, Australia's relative performance may have been better than its ranking implies. The majority of international calls from European countries are to other European countries and the majority of international calls from Canada are to its neighbour, the US. The short distances of these markets and, more significantly, the high traffic volumes are likely to reduce unit costs. Most international calls from Australia are not to nearby countries and not on routes that are heavily trafficked. Therefore unit costs are higher than those for European and Canadian international calls.

The absence of international calls helped Australia's overall price performance for business M1. If international calls were omitted from M2, Australia's price would become lower than the UK's.

Australia has relatively low prices for calls to Internet Service Providers. To some extent, this is attributable to untimed local call charges and the long duration of Internet calls. Australia's fixed-cost local calls bring the cost of an average Internet call to less than one cent per minute, well below the other countries studied, except Canada where local calls are free.

The Australian price for calls to mobiles from a PSTN service was the sample median, fifth out of the nine countries studied. The contribution of these charges can have a significant effect on overall expenditure on PSTN services by businesses. Although calls to mobile phones were assumed to represent ten per cent of traffic generated by medium-sized businesses, they can contribute as much as all other national voice calls to the total cost of the basket.

Telecom Corporation of New Zealand has concerns about the comparisons in Figure 6.3 which relate primarily to the omission of commercially negotiated discounts available to large businesses in New Zealand, in particular M4 business types. Most of these prices are subject to disclosure requirements in New Zealand.

TCNZ has calculated a much lower price index for New Zealand for the M4 basket. The index is based on revenue per call minute (discussed in Chapter 5) and takes into account negotiated discounts in New Zealand. However, if it was possible to adopt the same approach for the other countries', their prices would have also improved.

Integrated services digital network

Assumptions about the numbers of ISDN channels required to satisfy the specified profiles of voice calls, fax and Internet services for the four medium businesses, and the numbers of users generating the voice traffic, are given in Table 6.9. It is assumed that each channel carries 64 kbps with channels shared by users. It was assumed that the businesses use primary rate service and therefore the number of channels for each type of business is a multiple of 30.

Although the number of users in each type of business was assumed to be the same as those used in the PSTN comparisons, the capacity provided by the ISDN service exceeds that of the specified PSTN service (especially for M1 and M3). Therefore, it may be misleading to make direct comparisons between the prices of ISDN and PSTN services.

Table 6.9 Specification of ISDN services for medium-sized businesses

	Medium-sized business baskets			
Service	*M1*	*M2*	*M3*	*M4*
National calling profile	Local	Local	Long-distance	Long-distance
International calling profile	None	Minimal	Moderate	Heavy
Users (No.)	30	100	30	100
ISDN channels (No.)	26	55	26	55
Fax channels (No.)	2	3	2	3
Internet channels (No.)	2	2	2	2

Source: Eurodata (1998).

Australia's overall price for ISDN services was better for the medium businesses with local, rather than national, call profiles (Figure 6.4).

Australia's relative price ranking for each traffic element of the ISDN service is summarised in Table 6.10.

Table 6.10 Australia's relative price ranking for ISDN services to medium-sized businesses, February 1998

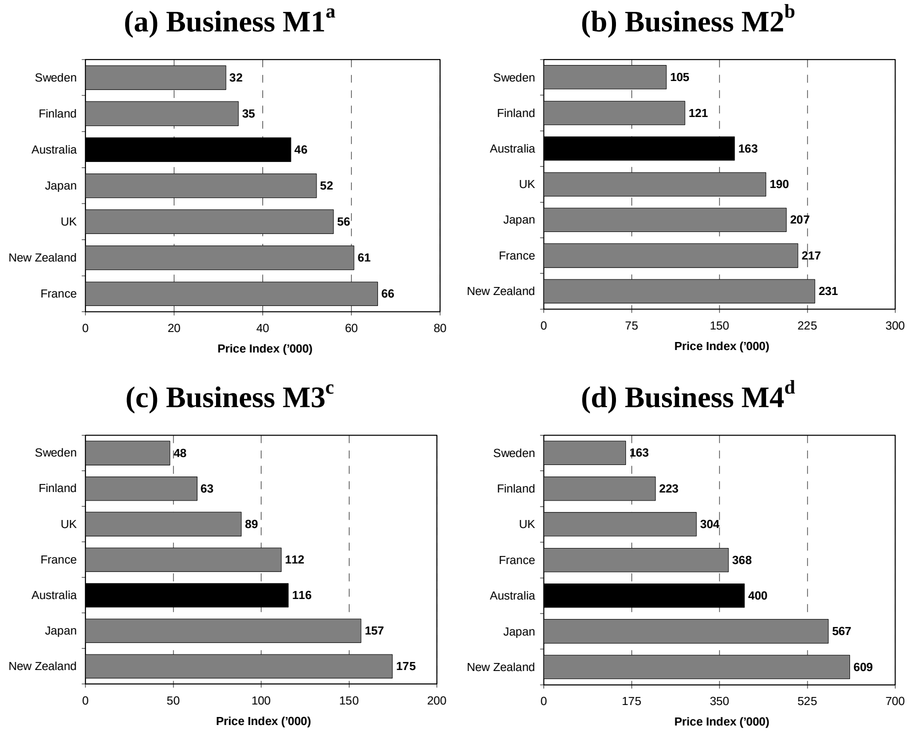
	Medium-sized business basket[a]			
Service	*M1*	*M2*	*M3*	*M4*
	(Rank)	*(Rank)*	*(Rank)*	*(Rank)*
Customer access	4 of 7	4 of 7	4 of 7	4 of 7
Voice calls	5 of 7	4 of 7	4 of 7	4 of 7
Fax calls	4 of 7	4 of 7	4 of 7	4 of 7
International calls	na	5 of 7	5 of 7	5 of 7
Internet calls	1 of 7	1 of 7	1 of 7	1 of 7
Calls to mobiles	3 of 7	3 of 7	3 of 7	3 of 7
Overall	3 of 7	3 of 7	5 of 7	5 of 7

Note: Australia's price ranking is out of seven sample countries, based on expenditures on fixed baskets of Integrated (ISDN) services. For example 3 of 7 means third lowest price out of the seven countries.

a **M1**: Business with 30 users and mainly local traffic; **M2**: Business with 100 users and mainly local traffic; **M3**: Business with 30 users and national traffic; **M4**: Business with 100 users and national traffic.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Figure 6.4 Relative ISDN prices for medium-sized businesses, February 1998



Note: The price indices are the expenditure in each country (in $US'000 using PPP exchange rates) on fixed baskets of Public Switched Telephone Network (PSTN) and Integrated Services Digital Network (ISDN) services. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.
a M1: Business with 30 users and mainly local traffic.
b M2: Business with 100 users and mainly local traffic.
c M3: Business with 30 users and national traffic.
d M4: Business with 100 users and national traffic.
Source: Productivity Commission estimates based on Eurodata (consultant) data.

For medium businesses with voice call profiles oriented towards local usage (M1 and M2), Australian ISDN prices, relative to those in the other countries studied, were lower than Australian PSTN prices. ISDN services are not as heavily regulated, and carriers need not supply fixed-price local calls. Thus, the relatively large cost associated with a demand profile of large numbers of short-duration local calls charged on an untimed basis can be avoided.

The price of Internet calls using ISDN were relatively low for Australian medium-sized businesses. Australian businesses tend to rent ISDN semi-permanent circuits for purposes of Internet access instead of paying timed local call rates for dial-up ISDN services. Businesses pay a higher monthly or annual rent for a channel with continuous Internet access at no extra usage cost. The option of timed local calls for Internet access using dial-up ISDN would be much more expensive in Australia given the assumptions about the numbers and duration of calls.

For international calls, Australia was more expensive than the four European countries, but less expensive than Japan and New Zealand. As discussed above, Australia's international call profile is characterised by greater distances and smaller traffic volumes than the European carriers, which has an adverse affect on costs and prices. The impact of this on Australia's relative price for ISDN services overall was greatest for M3 and M4 because of their greater demand for international calls.

Mobile

Only one basket was used to represent the call patterns of mobile users in both medium-sized and large businesses.

As with the other mobile price comparisons, only the digital service was considered, and plans with pre-paid tariffs and subsidised hand-sets were excluded from the basket to simplify the tariff comparison.

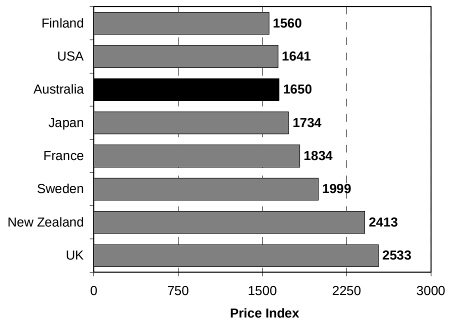
As for small businesses, Australia's relative prices for mobiles used in medium to large businesses were better than those for most other telecommunications services because of the low call charges (see Figure 6.5). Of the eight countries studied, Australia had the lowest usage charges for calls to the PSTN and second lowest charges for calls to mobile telephones.

6.4 Medium-sized businesses — data services

Price comparisons for data services were undertaken for leased lines and various switched data services including X25, frame relay, and ATM. Price data were more readily available for leased lines and X25 than for frame relay and ATM, the market for the latter being in the early stages of development.

Demand assumptions were specified for various hypothetical businesses, with characteristics not necessarily the same as those of the businesses described in the preceding section.

Figure 6.5 Relative mobile prices for medium to large businesses, February 1998



Note: The price index is the expenditure in each country (in $US using PPP exchange rates) on a fixed basket of cellular mobile services by a representative medium to large business users. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Leased lines

The leased lines included in the price comparisons were assumed to provide digital data services for businesses. Businesses leasing a dedicated telecommunications line of defined capacity from a carrier were assumed to have exclusive use of the line.

Carriers charge installation and rental fees but there is no price for usage. The fixed charges for a leased line vary with bandwidth (transmission capacity) and distance. Therefore price indices based on the expenditure (at February 1998) on specified baskets of lines representative of the requirements of the two businesses were constructed.

Leased lines for the smaller of the two businesses (LL1) were assumed to have 64 kbps capacity. Larger businesses (LL2) were assumed to have 64 kbps and 2 Mbps circuits for national services, and 64 kbps circuits for international services (see Table 6.11).

National circuits of 2 kilometres, 50 kilometres and 200 kilometres in length were included in the baskets. Some of the international circuits were to nearby countries and some to more distant countries.

Australia’s relative price performance was better for the smaller of the medium-sized businesses which use lower bandwidth lines (see Figure 6.6).

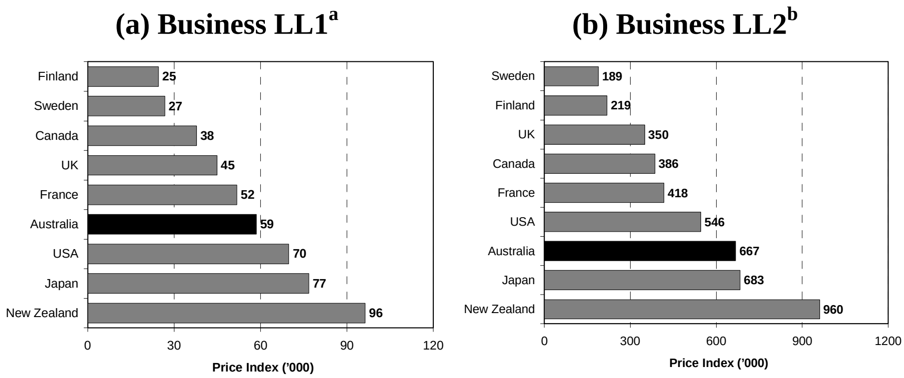
Table 6.11 Specification of leased lines for medium-sized businesses

Facilities	*Medium-sized business: leased line baskets*	
	LL1	*LL2*
	(No. of lines)	*(No of lines)*
64 kbps national lines	10	18
2 Mbps national lines	-	6
64 kbps international lines	-	6

Source: Eurodata (1998).

The Scandinavian countries once again had the lowest prices, and New Zealand and Japan the highest prices. Results for the US should be treated with some caution. The charges for the US vary depending on where in the US the circuits are located.

Figure 6.6 Relative leased line prices for medium-sized businesses, February 1998



Note: The price indices are the expenditures in each country (in $US'000 using PPP exchange rates) on fixed baskets of leased line services. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.

a LL1: Business with 10 lines.

b LL2: Business with 30.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Switched data services

Switched data services provided by carriers allow businesses to exchange data across a range of locations without leasing data lines. Businesses in the financial services, transport, wholesaling, retailing, government and manufacturing sectors may find their data communications needs met more cost-effectively using switched services.

There are various existing and emerging public networks providing data transmission services using packet-switching techniques, in contrast to the ISDN networks discussed earlier which provide circuit-switched voice and data services. Packet switching technology is more suitable for data transmission than for voice, making more efficient utilisation of network facilities (see the glossary for brief descriptions of services and technologies).

Packet-switching data networks using the X25 protocol have been in use for many years. Frame relay services are a more recent development and are likely to progressively replace X25 services and also the leasing of dedicated data lines. ATM is a new high-speed service as yet only in limited use.

International price comparisons for switched data services were based on a number of price baskets developed for X25, frame relay and ATM services. Separate price baskets were specified for X25, frame relay and ATM because they offer widely different capabilities based on different generations of technology, and are available at different prices.

As tariffs were not publicly available for each service in all the countries studied, there are some gaps in the price comparisons. This implies that prices for the service in that country was not disclosed by carriers, not that the service is not offered in that country.

X25

The X25 service usually has fixed charges for installation and rental of the connection, and usage charges for traffic carried. In most countries usage is paid per unit volume of traffic measured in data segments or kilobits — sometimes there is a further charge per minute of access for each call. Customer premises equipment costs and the costs of leasing a line from the customer premises to the X25 network are excluded from the analysis.

Prices were compared for the baskets of X25 services for two businesses, PS1 and PS2. Both businesses were assumed to have a national profile but PS2 has a much larger demand for data transmission than PS1 (see Table 6.12). It was assumed that 60 per cent of data calls are long-distance, and 75 per cent of calls are made during the working day. Further, each call has between 5000 and 9000 segments of data.

Table 6.12 Specification of X25 services for medium-sized businesses

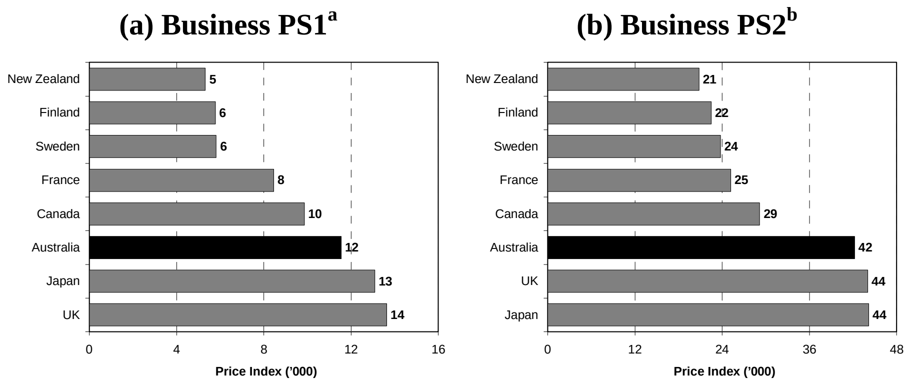
	Medium-sized business: X25 service baskets	
	PS1	*PS2*
Calls per year (No.)	1150	4600
Port bandwidth (kbps)	9.6	64

Source: Eurodata (1998).

Business type PS1 was assumed to have access to a 9.6 kbps X25 service and PS2 access to a 64 kbps service. Only one port (interface) was assumed for each business.

X25 services were found to be relatively expensive in Australia, as illustrated in Figure 6.7.

Figure 6.7 Relative X25 prices for medium-sized businesses, February 1998



Note: The price index is the expenditure in each country (in $US'000 using PPP exchange rates) on a fixed basket of X25 services. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.

a PS1: Business with 1150 data calls per year.

b PS2: Business with 4600 data calls per year.

Source: Productivity Commission estimates based on Eurodata (consultant) data.

Frame relay

Currently, frame relay services are normally permanent virtual circuits, and customers pay installation charges and an annual rental but no usage charges. There are two rental components — the port rental, which varies with the port speed or bandwidth (capacity) and a rental for the committed information rate (CIR), which is a guaranteed bandwidth of the circuit. A CIR of half the port speed was assumed.

A feature of frame relay is that short unpredictable bursts of traffic at speeds greater than the CIR can be transmitted. Consequently, a CIR can be specified at lower bandwidth than that necessary for a leased line to handle occasional bursts of high volume traffic. Businesses with sharply fluctuating demands for data transmission should find frame relay more cost-effective than the leasing of dedicated lines.

The assumed number of ports and bandwidth per port is given in Table 6.13 for the business types FR1 and FR2. It was assumed that each service is supplied for use over a distance of 200 kilometres.

Table 6.13 Specification of frame relay services for medium-sized businesses

	Medium-sized business: frame relay service baskets	
	FR1	*FR2*
Frame relay ports (No.)	2	2
Bandwidth per port (kbps)	64	128
Committed Information Rate (CIR) per port (kbps)	32	64

Source: Eurodata (1998).

Frame relay services were assumed to be used only for national traffic, within the coverage area of the national service. The line connecting the customers premises to the frame relay network was not included in the baskets.

Frame relay services were priced in seven countries. Tariffs were not disclosed in France and the US. Sweden's prices were based on a theoretical service between Stockholm and Karlskoga (about 200 kilometres).

Australian frame relay prices are relatively high (see Figure 6.8). Relative prices for Finland and Japan were found to be sensitive to the bandwidth. For example, Finland's frame relay service became more competitive at higher usage volumes, moving up four ranking positions from FR1 to FR2.

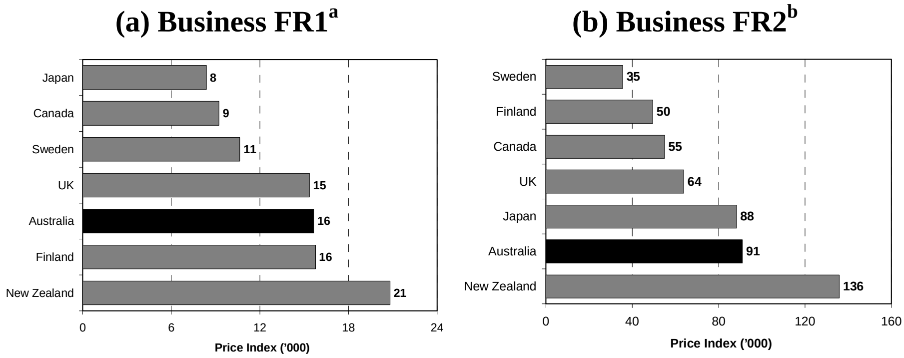
ATM

ATM is a relatively new service and is currently used only by businesses transmitting very large amounts of data with high bandwidth requirements.

ATM services are normally provided by permanent virtual circuits. As with frame relay, customers pay installation charges and an annual rental but no usage charge. There are two rental components — rental for each port, and rental for each virtual circuit. The rental charges both vary with bandwidth. The costs of access circuits between company sites and the ATM network were not included in the price comparisons.

Price comparisons were made for two businesses, ATM1 and ATM2, both with relatively large demands for data transmission. Business ATM2, however, was assumed to have a much greater demand for total bandwidth than ATM1.

Figure 6.8 Relative frame relay prices for medium businesses, February 1998



Note: The price index is the expenditure in each country (in $US'000 using PPP exchange rates) on a fixed basket of frame relay services. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.

a FR1: Business with two ports and 64kbps per port.

b FR2: Business with two ports and 128kbps per port

Source: Productivity Commission estimates based on Eurodata (consultant) data.

The businesses were also assumed to differ in the relationships between ports and virtual circuits. The numbers and bandwidths of ports and virtual circuits assumed for the two ATM baskets are given in Table 6.14. The virtual circuits were assumed to be national and vary in length from 2 kilometres to 50 kilometres to 200 kilometres. A Constant Bit Rate (CBR) service was assumed. The large number of ports for ATM2 implies a number of separate sites linked by virtual circuits (with a port at each end). ATM1 on the other hand has more circuits than ports indicating data transfer to external locations.

ATM services could only be priced in three countries. Carriers usually considered ATM prices either to be commercial-in-confidence, or negotiated on a case-by-case basis.

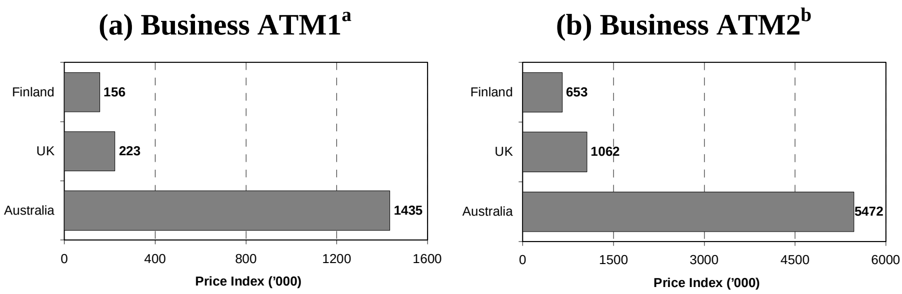
Of the three priced countries, Australian ATM services were by far the most expensive — more than five times the cost in the other two countries (see Figure 6.9).

Table 6.14 Specification of ATM services

	Medium-sized business: ATM baskets	
	ATM1	*ATM2*
ATM ports (No.)	2	15
Bandwidth per port (Mbps)	34	34
Virtual circuits (No.)	4	11
Bandwidth per virtual circuit (Mbps)	10	10

Source: Eurodata (1998).

Figure 6.9 Relative ATM prices, February 1998



Note: The price index is the expenditure in each country (in $US'000 using PPP exchange rates) on a fixed basket of ATM services by a representative customer The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.

a ATM1: Business with two ports (34Mbps per port) and 4 virtual circuits (10Mbps per circuit).

b ATM2: Business with 15 ports (34Mbps per port) and 11 virtual circuits (10Mbps per circuit).

Source: Productivity Commission estimates based on Eurodata (consultant) data.

6.5 Large businesses

Prices of services supplied to large business were estimated for the four different types of business (L1 to L4) defined in Table 6.1.

Ideally, price comparisons across countries would be on the basis of the aggregate purchase of telecommunications services by the representative business. This approach would be consistent with the normal practice of large businesses of negotiating with the telecommunications provider for the supply of a total service rather than separate purchases of individual services. However, quoted prices for individual products were used because negotiated prices for total service were generally unobtainable.

Patterns of demand were defined for the voice services and data access circuits of a national finance company, a national manufacturing company, a larger manufacturing company with subsidiaries in neighbouring countries and a major multinational company. The types of services and technologies assumed to be used by the four representative businesses are described in Table 6.15.

Table 6.15 Types of services included in price comparisons for large business

	Large business baskets			
	L1	*L2*	*L3*	*L4*
ISDN basic rate, voice, fax, Internet	✓			
ISDN primary rate for voice, fax		✓	✓	✓
Mobile	✓	✓	✓	✓
Leased lines for Internet		✓	✓	✓
Leased lines for other data	✓	✓	✓	✓
Frame relay for other data		✓		✓

Source: Eurodata (1998).

It was assumed that large companies would use ISDN rather than PSTN services, with basic rate services used by L1 and primary rate services by L2, L3 and L4. Each of the businesses were assumed to use leased lines for all or some of their data transmission needs. L2 and L4 were assumed to have made progress in adopting the new frame relay services for data transmission.

Frame relay can be expected to provide more cost-effective data communications than leased lines or ISDN, especially for large businesses. It was not possible to include ATM in any of the these baskets because of lack of price data for most of the countries.

Unlike the medium-sized businesses in most of the analyses reported above, the four representative large businesses were assumed to have multiple company sites (see Table 6.16). They were also assumed to have much larger numbers of telephone users and call volumes than the medium businesses. It was assumed that usage patterns for national calls (by time of day, day of week and distance) for large businesses are similar to those of small and medium-sized businesses. Half of the users of fixed telephony in each type of large business were assumed to also use a mobile phone.

Table 6.16 Assumptions for large businesses

	Large business baskets			
	L1	*L2*	*L3*	*L4*
Sites (No.)	30	5	10	5
Fixed telephony users per site (No.)	10	60	60	200
International calls (per cent of total)	2	5	8	15
ISDN channels required per site (No.)	7	25	25	70
Mobile users (No.)	150	150	300	500
Leased lines (No.)	29	25	120	35
Frame relay ports (No.)	0	20	0	20
Bandwidth per port (kbps)	na	128	na	256

na Not applicable.
Source: Eurodata (1998).

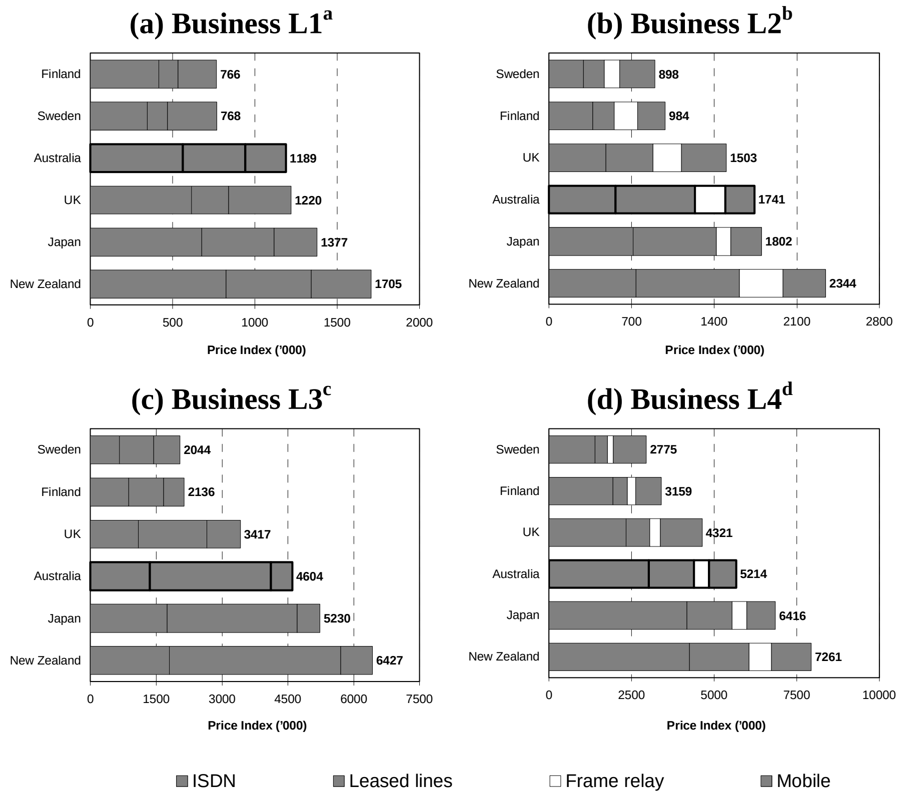
The price comparisons, based on the annual expenditure on all of the specified services, are reported in Figure 6.10 for the four representative businesses. In addition to the total expenditures, the separate expenditures on ISDN, leased line, frame relay and mobile services are identified.

Overall, Australia's prices were in the middle of the countries included in these comparisons, having either third or fourth lowest prices out of the six countries. The Scandinavian countries had the lowest prices and Japan and New Zealand the highest prices.

Australia's relative prices were lowest when ISDN and mobiles predominate, which is the case for business L1. The performance of Australia, Japan and New Zealand suffered in comparison with European countries for the largest businesses which have heavy demands for data communications and international calls.

Looking at the results for the individual services (see Table 6.17), Australia's relative prices were lowest for mobiles and highest for frame relay.

Figure 6.10 Relative prices for large businesses, February 1998



Note:	The price index is the expenditure in each country (in $US'000 using PPP exchange rates) on a fixed basket of services. The expenditures are valued at February 1998 prices, based on the discounting plan that minimises cost to the customer.
a	L1: National financial company with 30 sites, 10 users per site and leased lines used for data.
b	L2: National manufacturing company with five sites, 60 users per site and leased lines and frame relay used for Internet and other data.
c	L3: International manufacturing company with ten sites in home country, 60 telephony users per site and leased lines used for Internet and other data.
d	L4: Multinational company with five sites in home country, 200 telephony users per site and leased lines and frame relay used for data.
Source:	Productivity Commission estimates based on Eurodata (consultant) data.

Table 6.17 Australia’s relative price rankings for services to large businesses, February 1998

	Large business baskets[a]			
	L1	*L2*	*L3*	*L4*
ISDN	3 of 6	4 of 6	4 of 6	4 of 6
Leased lines	4 of 6	4 of 6	4 of 6	5 of 6
Frame relay	na	5 of 6	na	5 of 6
Mobile	2 of 6	2 of 6	2 of 6	2 of 6
Overall	3 of 6	4 of 6	4 of 6	4 of 6

Note: Australia’s price rankings are out of the six countries studied, based on annual expenditures. For example, a rank of 2 of 6 means second lowest price out of the six countries.

a **L1**: National financial company with 30 sites, 10 users per site and leased lines used for data; **L2**: National manufacturing company with five sites, 60 users per site and leased lines and frame relay used for Internet and other data; **L3**: International manufacturing company with ten sites in home country, 60 telephony users per site and leased lines used for Internet and other data; **L4**: Multinational company with five sites in home country, 200 telephony users per site and leased lines and frame relay used for data.

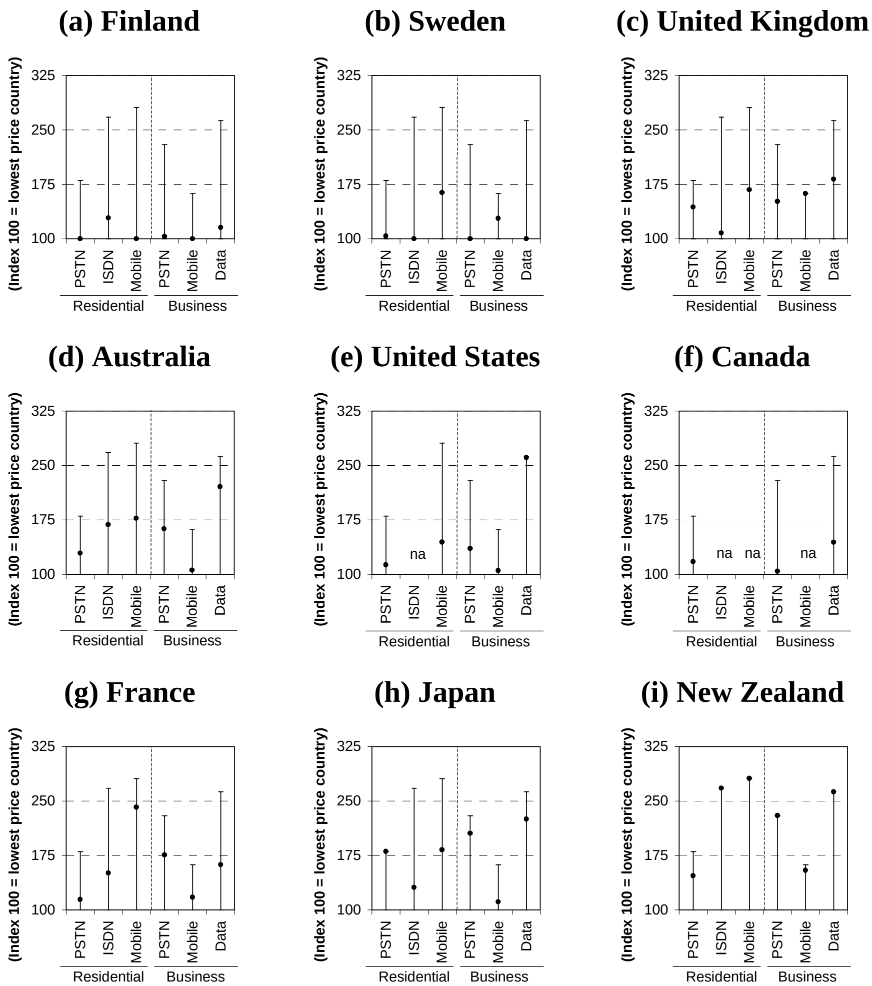
Source: Productivity Commission estimates based on Eurodata (consultant) data.

6.6 In summary

International price comparisons have been undertaken for small, medium and large business users and for voice and data communications using PSTN, ISDN, mobile, leased line, X25, frame relay and ATM technology. Different volumes and patterns of demand for telecommunications services and combinations of the technologies available for supplying the services were assumed.

The price comparisons presented in this chapter for services supplied to business, and in Chapter 5 for services to residential customers, are summarised in Figure 6.11.

Figure 6.11 Summary of price comparisons, February 1998



Note: The data underlying the above charts expresses the service price for each country as an index relative to the least expensive country. The price in the least expensive country corresponds to an index of 100. The bars represent the range of prices among all the selected countries for the particular service and is the same for each country as depicted. For each country, each dot indicates how much more expensive the price of the service is compared with the lowest-priced country. For example, Australia's PSTN price falls approximately in the middle of the range of prices represented by the bar. Where necessary, price differences have been averaged to provide a basis for aggregate comparisons.

na Data not available for this service

Source: Productivity Commission estimates.

The countries are ordered in the table according to a broad and subjective judgement about overall price performance. The results are conditional on the many assumptions discussed previously.

There is a reasonable degree of consistency among the price comparisons for different customer groups and product groups. Finland and Sweden generally had the lowest prices. New Zealand had relatively high prices. Australia was more or less in the middle of the group of countries benchmarked for most services and one of the better performers for mobile services.

It is difficult to distinguish overall price performance within the middle group of countries (UK, Australia, US, Canada and France). This is because of the variability in relative prices between the products, and the absence of information for some North American products.

7 QUALITY OF SERVICE

Service performance must be judged by both price and quality of service (QoS). Price in isolation can be a misleading performance indicator. Consumers of telecommunications services may be willing to accept higher prices in return for a more reliable, or higher quality, of service. Alternatively, service providers may deliver lower prices by sacrificing service quality.

QoS refers to the 'non-price' attributes that consumers associate with telecommunications services:

> ...business customers require continuous and reliable service to help them engage in their business activities, residential customers need the service to meet domestic requirements (Bantleon *et al* 1996, p. 12).

Quality has many dimensions. For example, quality can reasonably be expected to be related to a range of product characteristics including performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality (BTCE 1992).

A holistic definition of QoS is the totality of attributes embodied in (or associated with) a product or service that directly interact with the enjoyment (or utility) that consumers derive from that good or service.

In practice, data considerations and the perceived importance of selected key aspects of service quality generally result in QoS being identified with a limited number of attributes.

Australia's QoS performance was compared to that of eight other OECD countries. Where data was available, the same OECD countries used for the price comparisons in Chapters 5 and 6 were used. In other cases, similarly developed OECD countries were selected. The indicators examined include fault clearance, network access, call failure, operator services, payphone serviceability, mobile congestion and mobile drop-out. Changes in Australian QoS over time supplement the international comparisons.

7.1 Methodological issues

QoS comparisons between countries are hampered by a dearth of information and the underlying difficulties of constructing QoS indicators.

Sources of information

Data used in the international and time series comparisons of QoS in this chapter are drawn from a range of sources. The purpose for which these various data collections were compiled influences the range of, and methodology underlying the indicators available and thus has implications for their comparability. The nature of the various data sources also has implications for the timeliness of the available data.

The majority of publicly available data is collected under the QoS monitoring regimes in the relevant jurisdictions. Market liberalisation generally increases the commercial value of market information (include QoS performance information) and reduces the amount of publicly available data. Where markets are dominated by few players, there may be less incentive for industry to voluntarily provide information:

> Clearly, most of the information is in the possession of industry, and industry understands that it can use what it knows to influence what issues are discussed and in what detail. Consequently, industry will use information as a way to bargain with [the regulator]. Should the relationship between the [regulator] and industry become adversarial, it becomes even more difficult to obtain information (Witkind-Davis *et al* 1996, p. 120).

Consequently, there are few unambiguously consistent comparisons that can be made between countries and over time within the same country based on publicly available data. Further, there is often insufficient information available to determine the extent to which methodology differences in available data collections influence the reliability of comparisons. This is particularly a problem with subjective indicators such as customer satisfaction.

Thus, care should be exercised when interpreting international QoS performance differences:

> [T]he available data may cover only a small number of aspects of service quality in the countries that are being considered. Any comparisons may therefore be based on a narrow and selective group of indicators which does not accurately reflect the relative levels of overall service quality (BTCE 1992, p. 99).

The two major sources of consolidated internationally comparable QoS indicators are the biannual *Communications Outlook* published by the OECD and the annual *World Development Report* published by the International Telecommunications Union (ITU). Although both of these publications are supported by electronic databases of indicators, only the ITU database is updated on an ongoing basis. However, the consolidation process generally means data from these sources are at least two years out of date. More current data is available for some countries and carriers from their Internet homepages.

In Australia, QoS data are provided by both the Telecommunications Industry Ombudsman (TIO) in its *Annual Report* and the Australian Communications Authority (ACA) in its quarterly *Telecommunications Performance Monitoring Bulletin* (previously the *Quality of Service Bulletin*).

QoS regulation and indicator specification

Different approaches to QoS regulation and monitoring influence the comparability of QoS indicators between countries. Publicly available QoS indicators are typically constructed to meet the objectives of QoS regulation and monitoring regimes established in the respective country.

Approaches to QoS regulation

QoS regulation and monitoring in telecommunications has been enforced by many governments. The potential for undesirable consequences of liberalisation described above, has been the principal reason for some regulatory intervention (Bantleon *et al* 1996).

Two approaches to QoS regulation have been considered by regulatory agencies overseas. The first — applicable under price cap regimes — is to include a quality parameter in the price cap formula (price reductions are thereby tied to QoS performance). The second is to set specified enforceable performance targets or standards. This approach has generally been combined with a requirement that carriers publish regular QoS indicators. Each approach has inherent merits and limitations (see Table 7.1).

Indicators specification

QoS can be measured by means of subjective and objective indicators. Although the relative merits of these two approaches is debated, neither type of indicator is demonstrably superior in all circumstances (see Table 7.2).

Subjective indicators measure consumers’ perceptions of service quality. Typical indicators in this class are based on customer satisfaction surveys and analysis of customer complaints.

Objective indicators measure the quantum of key characteristics considered relevant to individual aspects of service quality. However, it is important to note that the choice of characteristic, and the measure chosen for objective indicators, has an inherently subjective basis. Typical objective indicators of telecommunications QoS include ‘faults per 100 mainlines per period’ and ‘the proportion of connections achieved within 24 hours’.

Another important specification issue is to measure the attributes that consumers consider important. For example, a key area of customer complaints in Australia has been billing issues. However, since coverage of itemised billing reached 100 per cent in June 1997, no objective indicators of billing performance are now reported on a regular basis (ACA 1997a).[1]

Table 7.1 Approaches to regulating QoS

	Advantages	*Disadvantages*
Including quality as a parameter in the price cap formula	• A quality index in the price cap can replicate the efficiencies of a competitive market.	• The benefits and costs of marginal quality improvement are not precisely known. • Large data requirements. • The subjective nature of quality. • No scope for compensation of customers that experience poor service.
Setting quality targets	• Provide a yardstick against which to measure QoS. • It is possible, in theory, to calculate the efficient level of the penalty (for failing to meet targets) that would encourage the appropriate level of quality.	• The regulator must make a judgement regarding the appropriate level at which targets should be set. • Setting specified targets for QoS may reduce the incentive to provide quality improvements over and above the target (that is regulated minimums become industry maximums). • Effort to improve QoS may concentrate only on those QoS aspects for which targets are set. • Difficult to strike the appropriate balance: – Standards set unrealistically high may be difficult or impossible to achieve. – If set too low inadequate QoS could result.

Source: Adapted from Bantleon *et al* (1996, pp. 27–28).

1 In recognition of the importance of billing as a consumer issue, the ACA (then Austel) developed Technical Standard 029, which sets performance targets for the overall accuracy of network licensees’ charging and billing systems (Austel 1996a; ACA 1997b). Compliance levels were first reported in the December 1997 edition of the *Telecommunications Performance Monitoring Bulletin*. However, because of implementation problems associated with test equipment, an assessment of the level of compliance was inconclusive (ACA 1997b).

Table 7.2 Characteristics of subjective and objective indicators

	Objective indicators	*Subjective indicators*
Application	Directly measures characteristics relevant to individual service quality aspects.	Directly measures consumers' overall perceptions of service quality.
Advantages	• Directly affected by factors such as changes in consumers' expectations or aspirations. • Can be used to identify quality problems because they are more easily disaggregated than subjective indicators.	• Consistent with views of consumers sovereignty. • Sometimes the only means for measuring some aspects of service quality (eg staff courtesy).
Disadvantages	• They measure service characteristics rather than consumer satisfaction levels. • It is technically difficult to define and construct objective indicators for some aspects of service quality. For example, billing or staff courtesy. • The choice of objective indicator is based on subjective factors. For example, stated or revealed preferences of consumers. • Also susceptible to deliberate or inadvertent data recording errors.	• Susceptible to bias if consumers make judgements based on imperfect information, have preconceived perceptions of the firms performance, or raise or lower their expectations and aspirations. • Susceptible to data collection bias.

Source: Based on BTCE (1992, pp. 29–32).

7.2 QoS regulation and monitoring in Australia

The emphasis on QoS monitoring has arisen from concerns about the transition to competitive markets, the desire to enhance both price and service competition following liberalisation and the desire to promote social objectives. In its inaugural issue of the *Quality of Service Bulletin*, the ACA (then Austel) cited the Government's primary concern with regard to QoS monitoring as:

> ... to ensure that a high level of service is provided to telecommunications users and quality of service monitoring and reporting provides an important source of feedback to the Government on the performance of the carriers in providing that service (Austel 1994c, p. 1).

In the transition to competitive markets, regulated monopolies have an incentive to cut costs which could, without adequate safeguards, lead to lower service quality. For example, there is evidence that price regulation encourages cost cutting and this may lead to lower QoS:

> In the United Kingdom, price cap regulation of British Telecom was followed by a decline in service quality. AT&T's service quality suffered following the adoption of price caps by the Federal Communications Commission (Witkind-Davis *et al* 1996 pp. 5–6).

Telecommunications retail prices in Australia are regulated in a variety of ways. These include an obligation on all carriers to provide untimed local calls from fixed telephones and public payphones, and price cap regulation which has applied to the majority of Telstra retail prices since 1989 (see Chapter 3).

In liberalised markets there may still be a role for QoS monitoring to promote market efficiency:

> Telecommunications customers often have less information about service quality than do the producers. Such information asymmetry leads to particular market inefficiencies or failures (Witkind-Davis *et al*, 1996 p. 131).

QoS monitoring and reporting can assist consumers of telecommunications services make informed choices by providing them with information which would otherwise be costly to collect on an individual basis.

QoS monitoring also supports consumer protection and equity objectives. For example, the ACA is required to develop performance standards in relation to the customer service guarantee (Part 9, TA 1997). In addition, the ACA is required to report on, among other things, the QoS performance of carriers and carriage service providers (s.105, TA 1997).

The Department of Communications and the Arts (DoCA) argued that QoS regulation must also consider the commercial impact of regulation:

> Quality of service regulation, like any regulation, imposes costs on suppliers. Because quality of services regulation and any required higher quality of service levels are likely to involve higher costs (unless it is all achieved through improved efficiency), there is likely to be a trade-off against the level of prices and/or returns to shareholders (Correspondence, DoCA 2 September 1998, p. 3).

In Australia, the approach to QoS regulation and monitoring has been to conduct periodic QoS monitoring and reporting and to establish a range of minimum QoS standards. There is also provision for incorporating changes in QoS into the price control arrangements for Telstra (see Box 7.1). However, these arrangements appear to focus on permanent, case-by-case changes in product mix rather than an ongoing adjustment of price caps in response to changes in QoS.

QoS monitoring and reporting in Australia

QoS service monitoring and reporting is conducted by both the TIO and ACA.

The TIO is an independent body, established as an '... office of last resort, to provide free, independent, just, informal and speedy resolution of complaints and disputes regarding telecommunications services' (TIO 1995, preamble). The TIO's annual reports provide characteristics of cases and key issues of consumer concern (as revealed by complaints) for each reporting period.

Box 7.1 Incorporation of alterations in the value of service into price control arrangements for Telstra

The *Telstra Carrier Charges — Price Control Arrangements, Notification and Disallowance Determination 1997* allows the Australian Competition and Consumer Commission (ACCC) to take changes in quality of service into consideration when assessing price movements of services subject to price caps (s.5, PD 1997). This requirement is more explicitly stated in the *Methodology for the Administration of the Telstra Carrier Charges Price Control Arrangements: January – December 1998,*[a] which states that:

> 4.1 Reductions in the Value of a Service
>
> The price charged for a service may be taken by the ACCC to have increased by an amount calculated by the ACCC if, in the reasonable opinion of the ACCC, the value of the service decreases due to an alteration made by Telstra to the quality of the service or the provision of the service, and the ACCC considers that the reduction in the quality of the service is a circumvention of the operation of the Telstra Act [the *Telstra Corporation Act 1991*] to control price increases.
>
> For example, this requirement may apply in cases where the area covered by one or more charging zones is decreased to produce an effective price increase for customers located in those charging zones or any adjacent charging zones.
>
> 4.2 Increases in the Value of a Service
>
> An increase in the value of a service due to an alteration made by Telstra to the quality of the service or the provision of the service may be treated as constituting a decrease in the price of the service. For this to occur:
>
> - Telstra must present the details of the increase in the value of the service and the associated claimed price reduction to the ACCC in writing; and
> - the ACCC must agree with the price reduction claimed by Telstra and notify this to Telstra in writing.
>
> An example of such a situation where Telstra might claim a price reduction would be in relation to the provision (without additional charge) of Intelligent Network features with the basic fixed telephone service, for example Telstra EasyCall features.

a The ACCC established this 'methodology' in consultation with Telstra under s.9(3) of PD 1997.

Source: *Telstra Carrier Charges — Price Control Arrangements, Notification and Disallowance Determination 1997*; *Methodology for the Administration of the Telstra Carrier Charges Price Control Arrangements: January – December 1998.*

The Austel commenced QoS monitoring for Telstra (then Telecom) and Optus in November 1992, with the first published indicators appearing in the March quarter 1994 edition of its *Quality of Service Bulletin*.[2]

Telstra (then Telecom) was identified as the main preferred source of QoS data for basic Public Switched Telephone Network (PSTN) services because:

> With a small number of exceptions, it is largely Telecom that supplies the standard telephone service which provides a customer's connection to the local exchange and access to local calls (Austel 1994c, p. 1).

Comparable indicators (for GSM mobile services only) were first published for the March quarter 1996. At the same time, monitoring was also extended to Vodafone.[3]

QoS standards in Australia

Under the TA 1997, standards-setting,[4] compliance testing, labelling and licensing fall under the jurisdiction of the ACA which can delegate some of these responsibilities to industry bodies such as the Australian Communications Industry Forum (ACIF).[5] Although it is legal for industry codes to be drafted and not registered, registration of codes allows the ACA to direct industry participants to comply.

Technical codes under Part 21 of the TA 1997 are the responsibility of the ACA. However the ACIF often drafts them for ratification by the ACA.

Standards are made under Part 6 of the TA 1997 where industry codes do not exist or they fail to achieve the desired outcomes. The ACA — in accordance with the Minister's direction[6] — also has responsibility for establishing minimum service standards under the Customer Service Guarantee (CSG) scheme (see Box 7.2). In addition, the ACA has responsibility for identifying exemptions, making the scale of damages and generally filling in the details so

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2 The TA 1997 divides the performance monitoring functions of Austel between the Australian Competition and Consumer Commission (ACCC) and the newly formed Australian Communications Authority (ACA). Responsibility for quality of service monitoring was retained (and slightly expanded) by the ACA under s.105 of the TA 1997.

3 Australia's third licensed mobile carrier.

4 Standard-setting includes technical standards, quality of service standards and other industry standards, each of which are covered as distinct areas in the Act.

5 The ACIF is an industry forum for developing consumer codes and operational codes.

6 Under Part 9 of the TA 1997, the Minister may direct the ACA about the use of its powers and the services to be covered, the amount of compensation, and to some extent the performance standard expected.

that the CSG is operational. The ACA can also make a ‘CSG waiver’ that allows customers to forego their CSG rights in exchange for some other customer benefit.

7.3 QoS performance indicators

The first two indicators examined are consumer satisfaction levels and customer complaints. These provide a measure of what consumers perceive as ‘acceptable’ levels of quality and which aspects of quality are important to them. This provides a context for assessing QoS performance as measured by the other indicators. These indicators include fault clearance, network access, call failure, operator services, payphone serviceability and mobile congestion and drop-out.

As discussed above, the need to rely on data in the public domain has resulted in comparisons based on data drawn from a wide range of sources. In some cases the comparability of this data is uncertain due to variations in methodology and environmental factors. As such, care must be exercised in drawing strong conclusions based on the available data.

Where possible, international comparisons of QoS have been made between the eight OECD countries used for the price comparisons in Chapters 5 and 6. When data for one or more of these countries was unavailable, a similarly developed OECD country was substituted. For some indicators — such as consumer satisfaction levels and customer complaints — comparisons were restricted to Australia because no directly comparable overseas data were available.

Customer satisfaction

The ACA publishes customer satisfaction levels for Telstra in its regular performance monitoring bulletins. Customer satisfaction is usually ascertained by surveying a sample of the carrier’s customers. Such surveys measure:

> ... the gap between the expectations of customers and their perception of the carrier’s performance. It is usually calculated as the percentage of users satisfied with the particular aspect of service under consideration (BTCE 1992, p. 69).

Telstra customer surveys reveal that fault restoration is the aspect of service where there is least satisfaction (see Table 7.3). However, the accuracy of customer surveys is influenced by the survey methodology (sample selection, sample size, questionnaire design) and any psychological bias of the

Box 7.2 Customer Service Guarantee

Part 9 of the *Telecommunications Act 1997* provides the framework for the Customer Service Guarantee Scheme. Where directed by the Minister, the ACA is responsible for formalising minimum customer service standards and a scale of punitive damages to be paid by carriage service providers to customers when the standard is contravened.[a]

The *Telecommunications (Customer Service Guarantee) Standard 1997* (CSG) came into effect from 1 January 1998. The CSG applies to standard local, long-distance and international voice services and some enhanced features (such as call waiting, call barring, call forwarding and calling number display) that can be supplied as part of the standard telephone service.[b] Standards have been specified for service connection, fault and service difficulties, and the making and keeping of appointments.

Service connection: Reconnection of in-place services must be within three working days. Connection times for new services range from one week to 12 months depending on the availability of cabling and other infrastructure, and the size of population centers.[c]

Fault or service difficulty: Repair times are measured from the first full day after the fault or difficulty was reported or detected. With the exception of disconnections due to an administrative error of the carrier (which must be rectified within one working day), repair times are linked to locality. The maximum repair time is one, two and three working days, for customers in metropolitan, rural and remote areas, respectively.

Appointments: Telephone companies must offer customers appointments within set times of the day (for example, am or pm) and must meet appointments at customer premises within 15 minutes of the appointment time agreed with the customer unless the phone company changes an appointment by giving reasonable notice to the customer.

Customers have the option to waive, in whole or in part, their protection under the CSG or to negotiate higher standards where it is beneficial to the customer. Where carriage service providers agree to provide better service than the standards, these must be guaranteed.

Where the carriage service provider fails to meet the specified standard (or agreed standard) the customer is entitled to punitive damages. The amount is based on the monthly rental fee for the standard telephone service and is calculated at a rate of one month's rental for each day the standard is exceeded (half for enhanced services). Compensation after the first five working days of delay for connecting or repairing the service increases to $40 per additional working day (half for enhanced services).

a The dollar amount of punitive damages cannot exceed $25 000 (s.236(3), TA 1997).

b Does not apply to mobile services or to customer equipment and cabling.

c The ACA is required to set connection periods in line with those for the Universal Service Obligation contained in the Universal Service Regime.

Source: ACA (1998a); *Telecommunications Act 1997*; *Telecommunications (Customer Service Guarantee) Standard 1997*; *Telecommunications (Customer Service Guarantee) Scale of Damages 1997*; *Telecommunications (Waiver of Customer Service Guarantee) Instrument 1997*; *Telecommunications (Customer Service Guarantee) Direction No. 1 of 1997 (Amendment No. 1 of 1998)*.

interviewees (that is, the interviewee's image of the carrier as a whole). Customer satisfaction levels can be influenced by changes in perception or taste, or by recent experiences. Similarly, gradual changes in quality are not often revealed in customer satisfaction surveys.

Table 7.3 Telstra's customer satisfaction levels, March 1998

Customer satisfaction with:	*March 1998*
	(%)
Call quality (local, long-distance and international)	95
Operator assisted services	94
Provision of new and in-place service	89
Service restoration	82

Source: ACA (1998b, pp. 5, 9, 15, 17).

Customer complaints

The ACA publishes data on customer complaints for Telstra in its regular performance monitoring bulletins. Telstra defines customer complaints as:

> Any expression of dissatisfaction with a Telstra service, product or policy, or with any aspect of an oral or written communication with Telstra, that requires some action by Telstra beyond the initial contact (Austel 1994d, p. 3).

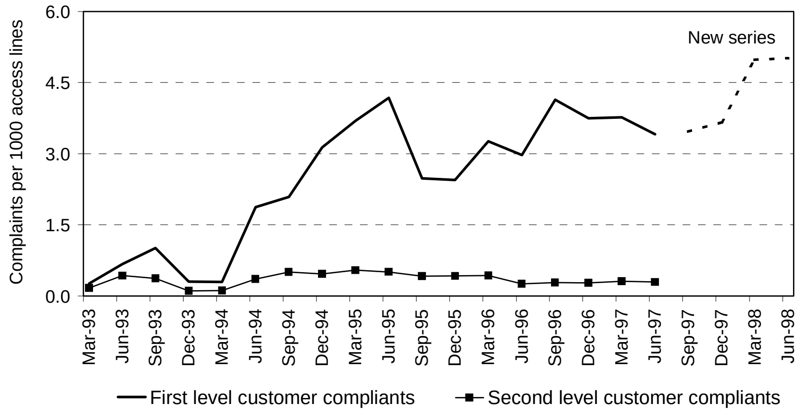
Customer complaints arise when QoS problems are sufficient to cause customers to seek corrective action. Complaints have increased steadily between March 1993 to June 1998 (see Figure 7.1). However, changes in complaint incidence over time can be influenced by a range of factors including consumer expectations, awareness of consumer rights, changes in complaint procedures and changes in operating environment — making the interpretation of such changes ambiguous.

Billing and service restoration are the most common areas of concern, accounting for more than 60 per cent of all Telstra complaints (see Table 7.4).

Billing was the aspect of service raised most often in complaints to the TIO (see Figure 7.2):

> It is simply the core issue for the investigations team and has consistently represented approximately one third of cases for the office (TIO 1995, p. 19).

Figure 7.1 Telstra's customers complaints per 1000 customer access lines, March 1993 to June 1998



Note: Telstra revised its complaint procedures from July 1997.
Source: ACA (various); Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin*.

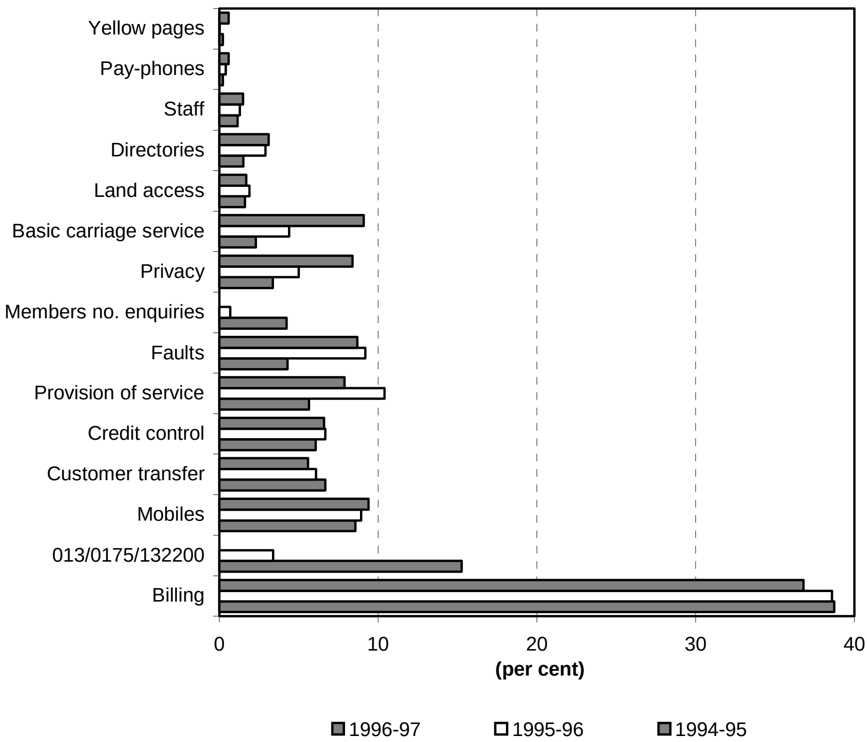
This may highlight a deficiency in existing QoS indicators in the area of greatest concern to consumers. Apart from the number of customer complaints, the ACA do not report more detailed performance indicators for billing. Examples of billing QoS indicators used overseas include the percentage of bill complaints that lead to amendments (indicating a billing error).

Table 7.4 Telstra's complaint categories, March 1998

Complaint category	*Complaint breakdown*	
	(No.)	*(%)*
Billing	17 736	36.8
Restoration of services	13 690	28.4
Provision of service	7 552	15.7
Product/services	4 635	9.6
Staff	1 971	4.1
Access to Telstra	904	1.9
Policy	904	1.9
Pricing	770	1.6
Total	**48 162**	**100.0**

Note: Data for previous periods are not directly comparable.
Source: ACA (1998b, p. 22).

Figure 7.2 Customers complaints issues: TIO members, 1994–95 to 1996–97



Source: TIO (1995, 1996, 1997).

Billing

Customer complaints regarding billing generally fall into four broad categories — metering issues, payment issues, billing delays, and party line and information calls.

Metering complaints about the accuracy of metered calls accounted for about one fifth of billing complaints processed by the TIO in 1997 (TIO 1997).

In addition to faulty metering equipment, billing errors may be caused by operational faults (including faulty call disconnection necessitating recalling, faulty customer premises equipment, crossed lines or transposition of lines). These problems can often be difficult to isolate. Metering complaints can also arise when customers misunderstand the nature of a metered call, that is, where a chargeable call can be made even though a connection is not established. For example, a fax call may be connected, but because the fax machines fail to 'handshake' the customer perceives that a call has not taken place.[7]

In its 1995 annual report, the TIO drew attention to the contribution of itemised billing to reducing the number of customer complaints:

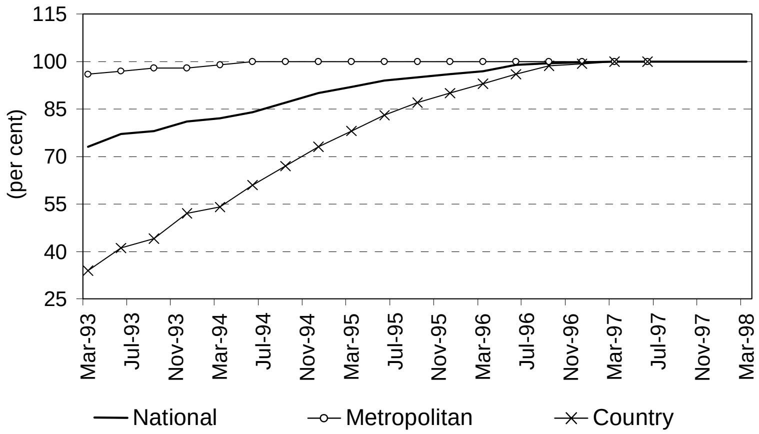
> It is significant that the TIO receives fewer calls about itemised long distance calls than non itemised local calls (TIO 1995, p. 20).

And concluded from its experience that:

> ... itemisation of bills encourages greater vigilance for both the consumer and the carrier and has the overall effect of reducing the number of disputes when applied to services (TIO 1995, p. 20).

Telstra successfully met its general carrier licensing obligations under the *Telecommunications Act 1991* (TA 1991) to provide itemised billing to all customers for time-charged calls before 30 June 1997 (see Figure 7.3). In 1997, Telstra also introduced its Total Call Record Charging (TCRC) system which provides itemised local calls.

Figure 7.3 Telstra's customers provided with itemised billing, March 1993 to March 1998



Source: ACA (various); Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin.*

7 The likelihood of this type of misunderstanding is increasing with the proliferation of telecommunications technologies and services such as fax machines, modems, PABX call answering, voice mail and call forwarding.

TCRC is available to customers at an additional charge provided their local exchange supports this facility, but is free of charge if it involves a billing dispute (TIO 1997). However, the BTCE cautions against viewing itemised billing as a panacea for billing inaccuracy:

> According to a survey reported in OFTEL (1990), customers who opted for itemised billing as a solution to their billing problems were no more satisfied that their bills were accurate than customers who did not receive itemised bills (BTCE 1992, p. 68).

In September 1996, Austel introduced Technical Standard 29 (TS29), which was intended to promote the technical aspects of call charging and bill accuracy QoS. Under the TA 1997, this standard continues to apply until replaced by an industry code of conduct currently being developed by the ACIF.

Payment related complaints are the second most common area of dissatisfaction with billing. They generally relate to instances where:

> ... the carrier has been unnecessarily harsh in not accepting a proposed payment arrangement or extreme in its decision to disconnect a service (TIO 1997, p. 39).

Although this may represent poor customer relations, carriers ultimately have a legal right to recover owed monies and determine their own credit control procedures.

Billing delay complaints are principally of two types — those where the carrier fails to bring call charges into account during the normal account period ('back billing') and those where the carrier fails to promptly issue an account when a customer transfers to (or pre-selects) another carrier.

Regardless of whether these delays result from interconnection issues between carriers or from technical problems within a single carrier, they affect QoS. However, the incidence of such delays has the potential to increase in a multi-carrier environment.

Party line and information call complaints are difficult to classify due to the nature of the calls. 'Party line calls' refer mainly to 0011 and 0055 sex line calls, while information calls relate to a host of 1900 and 0055 enhance voice services (see Appendix C).[8] With party line call complaints, customers typically deny having made the call even when the call has been substantiated by the

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8 Before cable pairs became plentiful and 'pair-gain' systems were common, the expression 'party line' applied to a shared telephone service where two handsets were connected in parallel on the same number and the same connection back to the exchange.

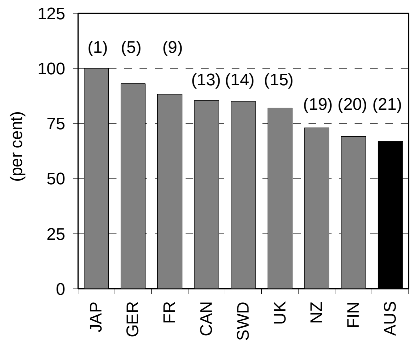
carrier. Similar complaints sometimes occur with information calls that are billed by a third party service provider.[9]

Fault clearance

Fault clearance indicators provide a measure of service responsiveness, that is, the likely time before a fault in the service is restored. Fault restoration times are influenced by a range of factors. For example, the overall workload and skill of the service staff will determine, in part, how quickly a fault can be identified and repaired.

Environmental factors, such as weather and geographical network density, will influence the time taken to locate and access the fault before repair can begin. Similarly, the level of network intelligence and redundancy determines the ability to restore customer service before physical repairs are effected.

Figure 7.4 Faults repaired within 24 hours for selected OECD countries, 1995



Note: Bracketed figures denote ranking out of the 22 OECD countries that provided data.
1995 and 1996 data for Australia include non-public payphones.

Legend AUS: Australia, CAN: Canada, FIN: Finland; FR: France, GER: Germany, JAP: Japan, NLD: Netherlands, NZ: New Zealand, SWD: Switzerland, and UK: United Kingdom.

Source: OECD (1997a, 1997c).

Service restoration performance is typically measured as the proportion of faults repaired within a given time — 24 and 48 hours in Australia. Australia's performance for fault clearance within 24 hours compared poorly relative to

9 Information calls (to 1900 and 0055 numbers) are billed by the telecommunications carrier from whose network the service is provided, regardless of which carrier the customer has pre-selected.

other OECD countries in 1995 (see Figure 7.4). Australia's performance of 67 per cent of faults repaired within 24 hours ranked 21st out of the 22 OECD countries that supplied data.

Such international comparisons must be treated with caution because some countries only report on residential customers and others report fault restoration over different intervals. For example, data for the UK are for repairs within 5 and 9 working hours (for business and residential customers, respectively).

Also, variations in performance between different customer groups make international comparisons based on 'average measures' difficult (see Table 7.5).

Table 7.5 Restoration of service, March 1996 to March 1998

	Mar 96	*Sep 96*	*Mar 97*	*Sep 97*	*Mar 98*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*
Australia (Telstra only)[a]					
National faults cleared within one working day of notification	66.0	74.0	69.0	67.0	63.0
Metropolitan business faults cleared within one working day of notification	79.0	82.0	82.0	83.0	79.0
Metropolitan residential faults cleared within one working day of notification	51.0	64.0	58.0	54.0	54.0
Country faults cleared within one working day of notification	67.0	75.0	69.0	68.0	59.0
Canada (BC TEL only)[a]					
Residential out of service conditions cleared within 24 hours of customer report	na	84.0	77.0	87.0	na
Business out of service conditions cleared within 24 hours of customer report	na	84.0	82.0	88.0	na
Urban out of service conditions cleared within 24 hours of customer report	na	85.0	79.0	89.0	na
Rural out of service conditions cleared within 24 hours of customer report	na	74.0	71.0	74.0	na
New Zealand (Telecom NZ only)[b]					
Faults cleared within 24 hours	60.0	54.0	60.0	na	na
United Kingdom (British Telecom only)[b]					
Business faults cleared in five working hours or by successful appointment	87.7	89.8	88.8	88.8	89.2
Residential faults cleared in nine working hours or by successful appointment	82.7	85.7	79.8	81.9	79.7

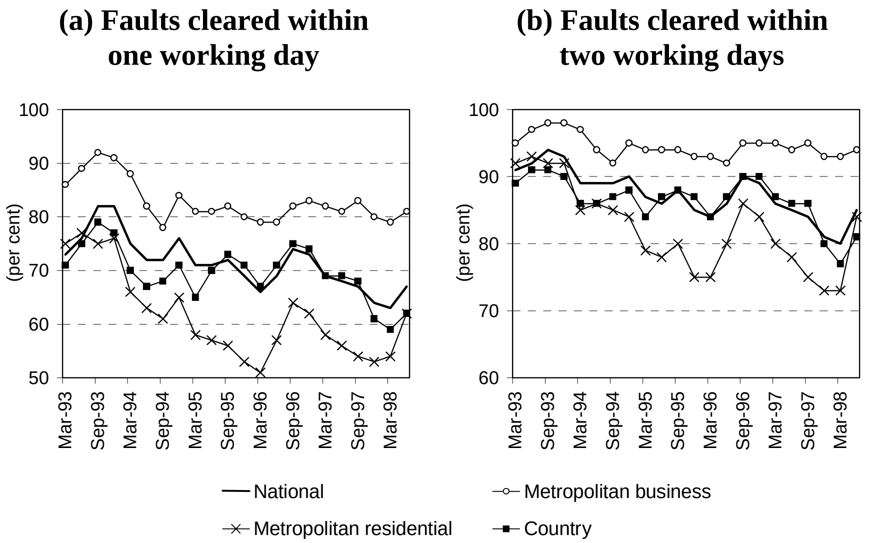
a Figures are averages for the quarter preceding the recorded date.
b Figures are averages for the six month period preceding the recorded date.
Source: ACA (1997b, 1998b); Austel (1996b, 1996c, 1997); MoC (1997); www.bt.com. (accessed July 1998).

For Australia (Telstra only), Canada (BC Tel only) and the United Kingdom (British Telecom only), business customers receive a consistently higher QoS than residential customers. The extent to which customers are willing to accept longer repair times in exchange for lower prices is not clear from the available data.

Consumer groups in Australia have experienced an absolute decline in fault clearance QoS since March 1993 (see Figure 7.5). Metropolitan residential customers experienced the greatest deterioration in service between March 1993 and June 1998 for both faults cleared within one day and faults cleared within two days.

Declining fault clearance QoS has been explained by the combined effects of changes in methodology, adverse weather conditions and manpower difficulties (Austel 1996b).

Figure 7.5 Telstra's restoration of service, March 1993 to June 1998



Source: ACA (various), Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin*.

Since March 1993, Telstra has introduced two changes to business systems that have consequences for the reporting of fault clearance indicators. The first, in December 1994, resulted in an increase in the overall number of faults recorded (Austel 1994a). The second led to the introduction of a 'customer participation' system in June 1996. This enabled customers to exchange faulty customer equipment at nominated Australia Post and Telstra outlets (Austel 1996b). Although this system allowed customers a quicker alternative to waiting for a repair visit, the time taken to clear the fault depended on the customer.

Adverse weather conditions were cited by Telstra as a major contributing factor to falling fault clearance QoS between March 1993 and June 1998.

> The effect of storms restricts the workforce from immediate activity repair until conditions improve sufficiently to affect the repair. Depending on the location and severity of the storm this increases the number of faults reported creating peaks in load during particular periods (Austel 1996c, p. 9).

Increasing demand for new service connections are also cited as a source of fault clearance QoS decline because of the need to reallocate staff from fault repair tasks to service connection tasks.

Minimum QoS standards for fault clearance are specified in the CSG scheme which came into effect from 1 January 1998 (see Box 7.2). From June 1998, the ACA began reporting Telstra's fault restoration performance against the CSG specified minimum service levels (see Table 7.6). Although the data indicates that performance against the CSG minimums declined over the quarter ending March 1998, the time series is too short to be conclusive.

Table 7.6 Telstra's fault restoration performance against the customer service guarantee, December 1997 and March 1998

	December 1997[a]	*March 1998*
	(%)	*(%)*
Urban areas[b] (within 1 full working day)	72	71
Rural areas[c] (within 2 full working day)	84	81
Remote areas[d] (within 3 full working day)	70	64

a Retro-fitted data for comparison purposes only.
b Areas in Australia with a population greater than 10 000 people.
c Areas in Australia other than urban areas and remote areas.
d Areas in Australia with a population less than 200 people.
Source: ACA (1998b, pp. 8–9).

Network access

A key attribute of telecommunications services is provision of service or 'network access'. Indicators of service in this area typically measure delivery precision and network accessibility or penetration.

For markets or regions reaching telephone penetration saturation levels, delivery precision — measured as the ability of the carrier to meet deadlines agreed with customers — is considered a better measure of provision of service quality than waiting times.[10] Delivery precision indicators for Telstra measure the proportion of customers connected before the Agreed Commitment Date (ACD).[11] Performance is monitored for new and in-place services,[12] and is

Table 7.7 Network access performance, March 1996 to March 1998

	Mar 96	*Sep 96*	*Mar 97*	*Sep 97*	*Mar 98*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*
Australia (Telstra only)[a]					
Customers connected to new services on or before the customer agreed date	83.0	83.0	82.0	79.0	74.0
Customer connected to in-place services on or before the customer agreed date	86.0	85.0	88.0	89.0	92.0
Canada (BC TEL only)[a]					
Residential appointments service connection met on customer arranged date	na	91.4	91.2	90.6	na
Business appointments service connection met on customer arranged date	na	92.3	93.4	93.0	na
New Zealand (Telecom NZ only)[b]					
Residential connections that meet the customer's requested installation time	94.0	93.2	90.8	na	na
United Kingdom (British Telecom only)[b]					
Circuits installed in standard lead time or 'customer later' date	98.9	99.4	99.3	99.1	98.5
Orders completed by latest 'customer required by' date	92.6	95.6	96.1	95.6	94.9

a Figures are averages for the quarter preceding the recorded date.
b Figures are averages for the six month period preceding the recorded date.
Source: ACA (1997b, 1998b), Austel (1996b, 1996c, 1997); MoC (1997); www.bt.com (accessed July 1998).

10 In 1996, 96 per cent of Australian households had a telephone (ITU 1998b).

11 ACD replaced 'customer required date' in September 1995. 'The concept of ACD focuses on providing customers with firm appointment dates which are acceptable to the customer and realistic in terms of Telstra's network workforce resources' (Austel 1995b, p. 3).

12 A new service is defined as '... the initial connection of service to the customer's premises involving the provision of a new network access line from the local telephone exchange to the network boundary' (Austel 1995c, p. 4). An 'in-place service' means the path from the exchange to the service delivery point still exists (Austel 1995c, p. 14).

reported for national, metropolitan business, metropolitan residential and country customers. Overseas carriers provide similar data (see Table 7.7).

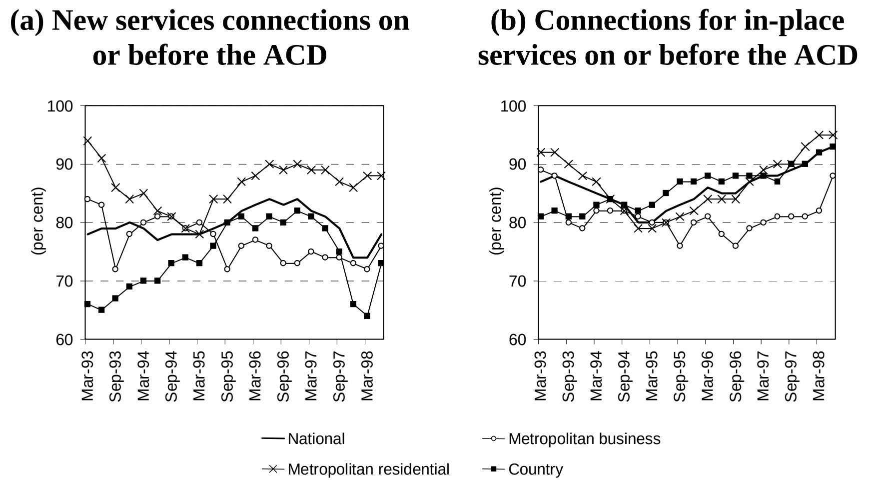
Delivery precision levels and trends between different customer groups or carriers or even for the same consumer group or carrier over time not directly comparable because ACDs time intervals can vary:

> The actual time intervals (between the date the request is made and the date promised to the customer) may vary even between customers of the same carrier. As a result this indicator may be easily manipulated. For example, if the carrier convinces the potential customer to put back the agreed date to one that better suits the carrier, the proportion of requests met on the agreed date will probably increase. Consequently, this indicator can be improving while quality is actually falling (BTCE 1992, p. 5).

Australian data for new connections suggests two distinct phases in the trends for national, metropolitan residential and country customers between March 1993 and June 1998 (see Figure 7.6(a)). Until December 1996, performance improved steadily, when a decline in service occurred. This decline has been attributed to:

> ... the introduction of new systems and by the corresponding organisational changes needed to provide a more flexible and responsive service ... [which] resulted in greater operational difficulties than anticipated (ACA 1998b, p. 8).

Figure 7.6 Telstra's network access and service restoration performance, March 1993 to June 1998



ACD Agreed commitment data.
Source: ACA (various), Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin.*

Connections for in-place services exhibited a steady increase for national, metropolitan residential and country customers since March 1995, and for metropolitan business customers since June 1996 (see Figure 7.6(b)).

Call failure

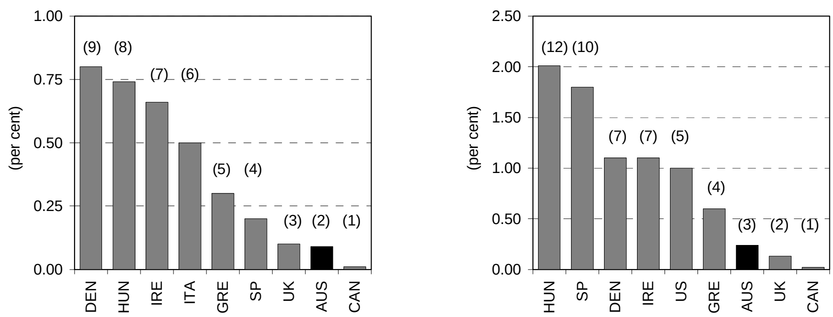
Call connection failure rates are an indication of the ‘technical’ quality of the network. A call can fail for a number of reasons including network congestion, failure of network equipment or customer premises equipment.

Congestion is usually greatest during peak periods and may vary for different services. Innovative marketing strategies are also having an influence on network congestion. For example, ‘special’ rates for long-distance or international destinations can produce unexpected congestion on the network.

In 1995, Australia performed well compared with other OECD countries for which data are available (see Figure 7.7).

Figure 7.7 Call failure rates for selected OECD countries, 1995

(a) Local call failure rates **(b) Long-distance call failure rates**



Note: Bracketed figures denote ranking out of the 13 OECD countries that provided data.
Legend: AUS: Australia (Telstra only); CAN: Canada; DEN: Denmark; GRE: Greece; HUN: Hungary; IRE: Ireland; ITA: Italy; SP: Spain; UK: United Kingdom (BT only) and US: United States.
Source: OECD (1997a, 1997c).

There was a steady improvement in local and long-distance call connections for Telstra’s fixed network between March 1993 and September 1995 for all users (see Figure 7.8(a) to (c)).[13] Country users and users of night time long-distance

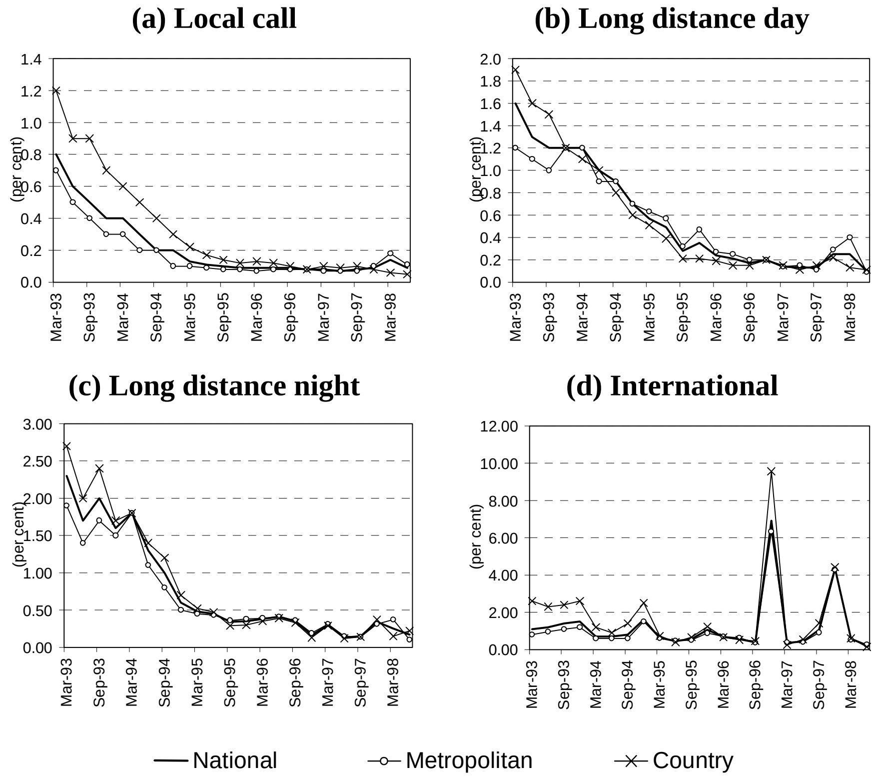
[13] Measurement is based on sampling of live traffic using automatic service assessment techniques. These measures exclude customer premises equipment (which may or may not be supplied by the carrier) and are segmented by local, long-distance and international

services experienced the greatest improvement in performance. The improvements prior to 1996 have been attributed to Telstra’s network modernisation program which included:

> ... new switching technologies, increases to the trunk cable network and the digitalisation of country exchanges have all contributed to the general improved trend in performance over the past few quarters (Austel 1994b, p. 4).

Since 1995, improvement has slowed and there have been some isolated instances of regression towards the end of the period (see Figure 7.8(a) and (b)).

Figure 7.8 Telstra’s call failure rates, March 1993 to June 1998



Source: ACA (various), Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin*.

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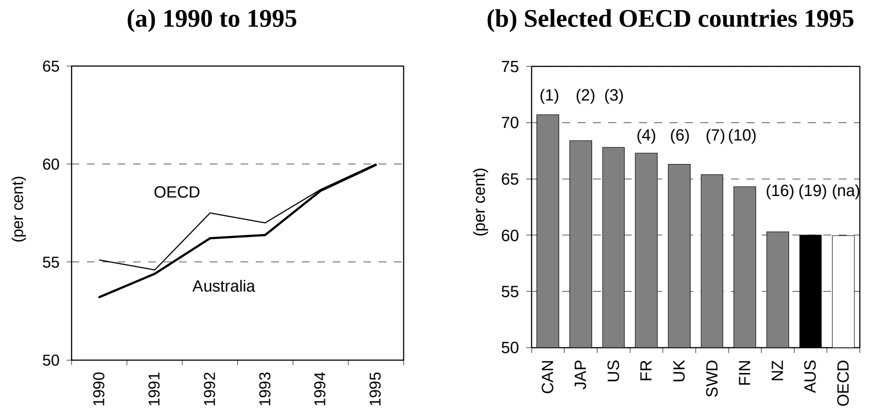
calls. Long-distance calls are segmented by day and night calls to isolate peak periods. All measures are reported for metropolitan, country and total (national) users.

International call connection performance is somewhat more difficult to interpret. The two available indicators provide conflicting impressions of Australia's performance with regard to international call connections, answer seizure ratios, and international call connection rates.

Answer seizure ratios (ASR) are published by the OECD. This is a measure of the proportion of international calls that successfully 'seize' an international circuit and are answered in the terminating country.

Australian carriers' ASR performance compares poorly relative to other OECD countries (see Figure 7.9(b)). In 1995, Australia's ASR was 60 per cent, or put another way, four out of ten international calls originating in Australia failed to be connected.

Figure 7.9 Answer seizure ratios for selected OECD countries



Note: Bracketed figures denote ranking out of the 27 OECD countries in the sample.
Legend AUS: Australia, CAN: Canada, FIN: Finland, FR: France, JAP: Japan, NZ: New Zealand, SWD: Sweden, UK: United Kingdom and US: United States.
Source: OECD (1997a, 1997c).

Some improvement was achieved between 1990 and 1995. However, Australia's ranking — relative to the 27 other OECD countries that provided data — slipped from 14th in 1990 to 19th in 1995 (OECD 1997c).

ASR measures can be misleading because failure to connect can be outside the control of the domestic carrier. International call failures occur for a number of reasons including line congestion, unanswered calls, incorrect number dialling, technical failure in either the originating or terminating network, busy lines and national disasters (OECD 1997c). ASR is influenced by a range of factors such as the availability and take-up of such equipment as answering and facsimile machines, and services such as call diversion, call waiting and voice mail.

In 1995, *international call connection* loss varied between 0.46 and 1.06 per cent (Austel 1995a and Austel 1995b). International call connection rates are published by the ACA for Telstra in the periodic *Quality of Service Bulletin*.

Between March 1993 and June 1998, international call connection improved slightly for all users. However, the gains were far less pronounced than for local and long-distance services, and by the end of the period the network was experiencing significant regression in QoS (see December 1996 and December 1997 in Figure 7.8(d)). Telstra attributes these occurrences to isolated instances of network congestion on Christmas day traffic and isolated failures of international and transit switch centres.

Although ASR and international call connection rates are not directly comparable, the difference in the two measures of performance suggests that a considerable proportion of the international call failures recorded in the ASR measure may be beyond the control of domestic carriers.

Operator services

The need for operator assistance declines with the degree of automation and as network reliability increases.[14] However, in those cases where users access operator services, the helpfulness of operators and the speed with which calls are answered, are important aspects of operator assistance QoS.

Australian performance relative to overseas countries for which data are available is difficult to ascertain because of variation in methodology and presentation format (see Table 7.8).

In Australia, Telstra provides the majority of operator services which comprise calls relating to service difficulties, directory assistance and operator assisted national calls. Telstra’s customer surveys reveal a high degree of satisfaction with these services (see Table 7.4). However, this reflects an aggregated response that may conceal dissatisfaction of users who rely heavily on such services.

Indicators published by the ACA allow for a more consistent comparison of operator services over time (see Figure 7.10). For each classification there is a

[14] Operator services are likely to be more important to people who have difficulty using the telephone system unaided.

measure for the proportion of calls answered within a given time and the proportion of calls that were not answered.[15]

Table 7.8 Operator and directory assistance performance, March 1996 to March 1998

	Mar 96	*Sep 96*	*Mar 97*	*Sep 97*	*Mar 98*
Australia (Telstra only)[a]					
Directory assistance calls answered within 10 seconds (%)	33.0	59.0	54.0	73.0	60.0
Operator assisted national calls answered within 10 seconds (%)	79.0	84.0	82.0	76.0	87.0
Operator assisted international calls answered within 10 seconds (%)	83.0	90.0	na	na	na
Canada (BC TEL only)[a]					
Operator assistance — average time to answer (seconds)	na	4.0	4.2	3.9	na
Directory Assistance — average time to answer (seconds)	na	6.0	5.8	6.1	na
New Zealand (Telecom NZ only)[b]					
Directory assistance calls — average to answer (seconds)	10.6	10.5	20.0	na	na
United Kingdom (British Telecom only)[b]					
Directory assistance service calls answered within 15 seconds (%)	92.0	87.8	91.1	91.3	91.4
Operator assistance service calls answered within 15 seconds (%)	91.9	88.0	92.1	85.1	89.9

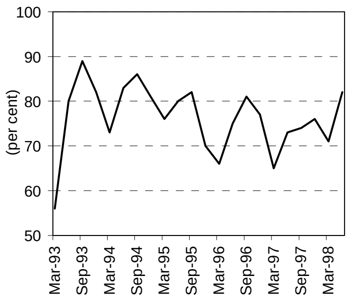
a Figures are averages for the quarter preceding the recorded date.
b Figures are averages for the six month period preceding the recorded date.
Source: ACA (1997b, 1998b), Austel (1996b, 1996c, 1997); MoC (1997); www.bt.com (accessed July 1998).

Although some improvement has occurred over the sample period for each of the available indicators, there is no clear trend (see Figure 7.10). The number of service difficulty calls are claimed to be influenced by the same factors that were discussed above under fault restoration.

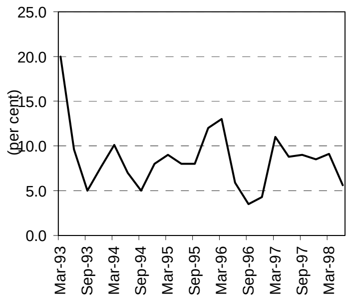
15 Response benchmarks are 15, 10 and 20 seconds for service difficulty, directory assistance and operator assisted national calls operator services, respectively.

Figure 7.10 Telstra's operator assisted services and service difficulty calls, March 1993 to June 1998

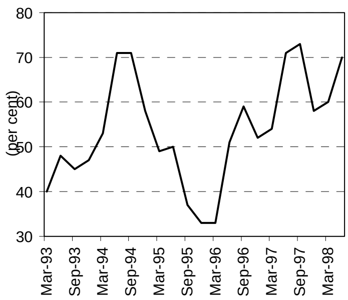
(a) Service difficulty calls answered within 15 seconds



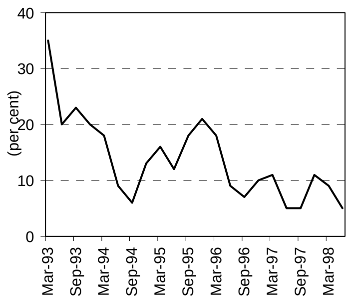
(b) Unanswered service difficulty calls



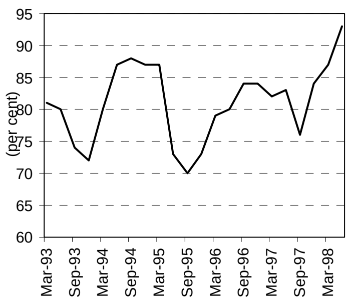
(c) Directory assistance answered within 10 seconds



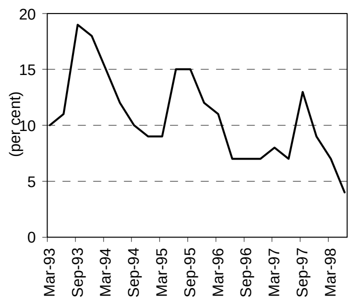
(d) Unanswered directory assistance calls



(e) Operator assisted national calls answered within 20 seconds



(f) Unanswered Operator assisted national calls



Source: ACA (various), Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin*.

Payphones

Payphones are vital for households in countries and regions without private telephones. Although, in aggregate, Australian households have nearly ubiquitous access to the fixed PSTN, individuals in groups and geographic areas still rely heavily on payphone services.[16]

Even for subscribers to the fixed PSTN, payphone services can be important when travelling or in emergencies outside the home (the emergence of ‘personal communications’ technologies such as mobile telephony offers an alternative to payphones in some circumstances). The two key aspects of payphone services are accessibility (or availability) and serviceability.

In 1996, Australia ranked 8th among OECD countries reporting data for payphone accessibility (measured as payphones per 1000 persons) (see Figure 7.11(a)). Although changes in reporting format make it difficult to compare trends in Australia with trends in the OECD, there has been a decline in payphone accessibility since 1995 (see Figure 7.11(b)). Increasing penetration of mobile and other communications technology offsets this decline to some extent. However, the consumers that rely most on public payphones (those with lower-income located in remote regions) may not have equal access to these alternative technologies.

One measure of payphone serviceability is the proportion of payphones working at any given time. The main weakness of payphone serviceability indicators is that measured performance can be increased by removing the payphones prone to damage. For example, there may be an incentive:

> ... to locate more payphones in affluent suburbs and less in poorer suburbs, the very suburbs where there is the most need. It is likely that vandalism may be more frequent in certain poorer suburbs and that, by under supplying such suburbs, carriers could reduce their maintenance cost (BTCE 1992, p. 65).

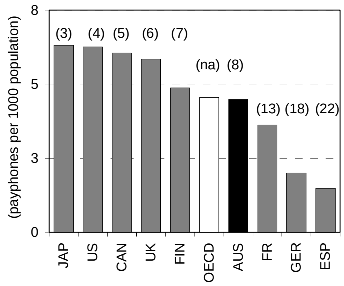
The universal service obligation (USO) provisions of the TA 1997 require Telstra to provide all people in Australia with reasonable access to public payphones. In addition, the Minister has the discretion to determine the location of payphones (see Chapter 3, Section 3.1).

Compared with other OECD countries, Australia performs relatively well in terms of percentage of payphones in working order, ranking 5th amongst the 13 countries that provided data for 1995 (see Figure 7.12(a)). Other available data

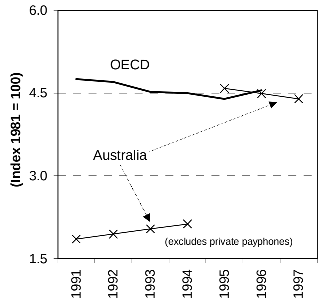
[16] Such as remote communities, caravan parks or in suburbs or socio-economic groups with lower phone penetration.

Figure 7.11 Payphones per 1000 inhabitants for selected OECD countries

(a) Selected OECD countries 1996



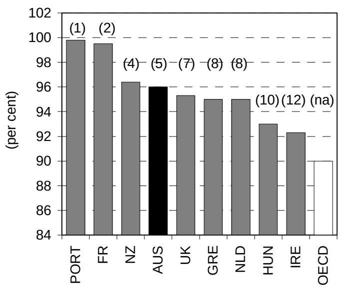
(b) 1990 to 1997[a]



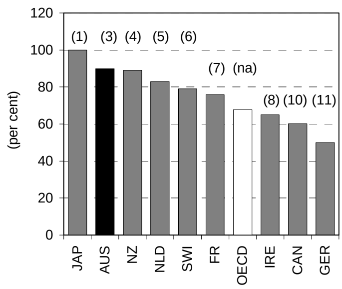
a Australian data from 1995 include non-public payphones.
Note: Bracketed figures denote ranking out of the 25 OECD countries in the sample.
Legend AUS: Australia, CAN: Canada, ESP: Spain, FIN: Finland, FR: France, GER: Germany, JAP: Japan, UK: United Kingdom and US: United States.
Source: ITU (1998b).

Figure 7.12 Payphone performance for selected OECD countries, 1995

(a) Average per cent of payphones in working order



(b) Percentage of payphones that are card phones



Note: Bracketed figures denote ranking out of the 13 OECD countries for Figure (a) and 20 OECD countries for Figure (b).
Legend: AUS: Australia, CAN: Canada, FR: France, GER: Germany, GRE: Greece; HUN: Hungary; IRE: Ireland, JAP: Japan, NLD: Netherlands, NZ: New Zealand; PORT: Portugal; SWI: Switzerland; and UK: United Kingdom.
Source: OECD (1997a, 1997c).

suggest that although Australia's performance compared favourably with overseas counterparts, there was a decline in the proportion of public payphones in working order towards the end of 1997 (see Table 7.9).

The decline in payphone serviceability towards the end of 1997 is more obvious in indicators published by the ACA (see Figures 7.13(a) to 7.13(d)). All payphone serviceability indicators exhibited steady improvement between March 1993 and September 1997. However, since September 1997 there has been a marked decline in all indicators (although the decline in QoS for country users began as early as September 1996 (see Figure 7.13(c) and 7.13(d)). Telstra has identified the source of this decline as:

> ... temporary resourcing difficulties associated with the roll-out of new payphones, and workforce restructuring including problems with the new work scheduling system. Increased vandalism of the new payphones and technical problems with coin jam have exacerbated the problem (ACA 1997b, p. 14).

Table 7.9 Payphones in working order, March 1996 to March 1998

	Mar 96	*Sep 96*	*Mar 97*	*Sep 97*	*Mar 98*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*
Australia (Telstra only)[a]	96.0	96.0	96.0	97.0	91.0
New Zealand (Telecom NZ only)[b]	98.0	97.7	97.9	na	na
United Kingdom (British Telecom only)[b]	95.1	95.3	94.3	95.8	95.3

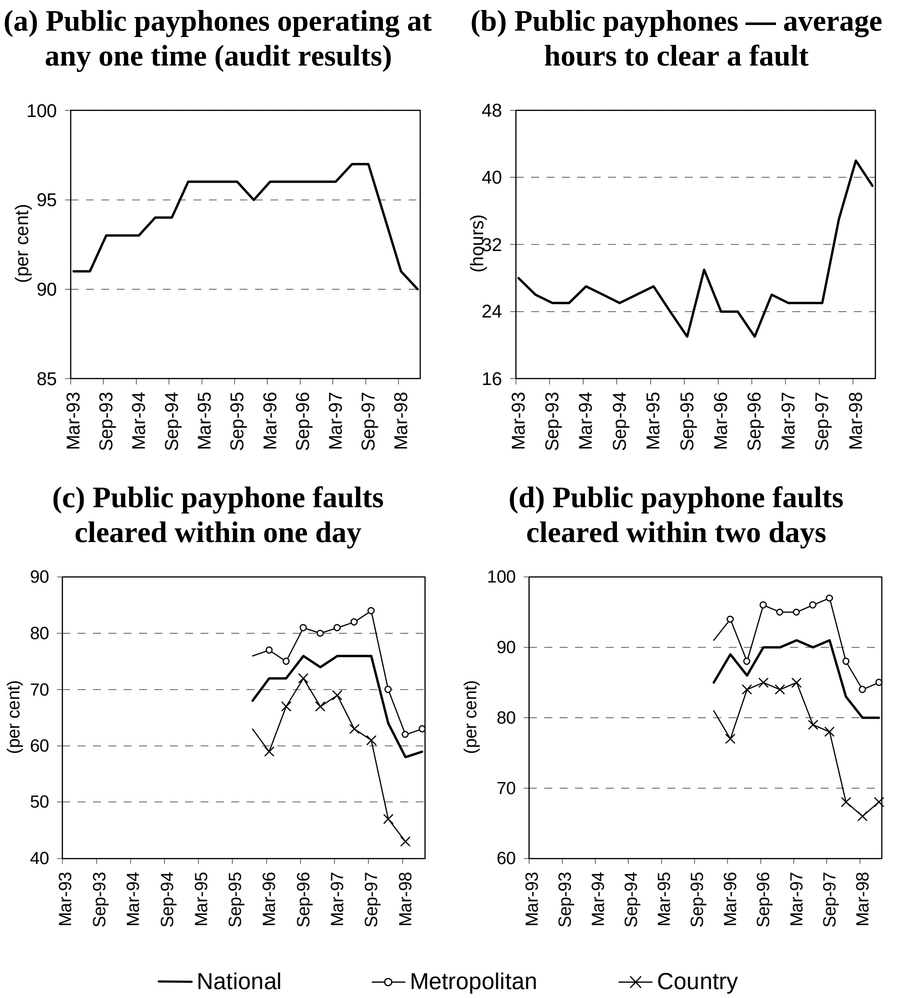
a Figures are averages for the quarter preceding the recorded date.
b Figures are averages for the six month period preceding the recorded date.
Source: ACA (1997b, 1998b), Austel (1996b, 1996c, 1997); MoC (1997); www.bt.com (accessed July 1998).

Cellular mobiles

The penetration of cellular mobile telephony has increased significantly over the past few years. However, there are no international data available for international QoS comparisons. For Australia, only 'call congestion' and 'call drop-out' are measured.

Mobile phone call congestion occurs when calls cannot be established because all channels serving the area are in use. Call drop-out is defined as the percentage of calls where there is an unintended disconnection of a call by the network during conversation. This can happen for a number of reasons including network congestion, the impact of signal fading or radio interference.

Figure 7.13 Telstra's public payphones, March 1993 to June 1998



Source: ACA (various), Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin*.

Call drop-out and congestion performance are influenced by variations in networks and operating environment, making comparisons between countries or regions and between carriers difficult.

Analogue, digital and hybrid standards have quite different performance characteristics. The impending closure of the AMPS network makes QoS an important issue in the short-term.[17]

Performance is also influenced by variations in city-scape and geographical characteristics of the service region. Variations in usage patterns will also influence performance (for example, timing influences congestion, proportion of calls made from inside buildings may influence drop-out rate due to structural barriers).

Data published by the ACA shows a steady improvement in call drop-out performance of the AMPS network since March 1993 (see Figure 7.14(a)). However, Sydney has had consistently poorer QoS performance than other major cities. This has been attributed to physical features and the size of the customer base (Austel 1994a).

Call congestion data for the AMPS network have been published since September 1996. Although there was no appreciable improvement in call congestion QoS between September 1996 and June 1998, there has equally been no appreciable deterioration (see Figure 7.14(b)).

QoS data for GSM services are published on a State-by-State basis for Telstra, Optus and Vodafone. The best and the worst performing States provide upper and lower bounds on the level of service, respectively. The difference between service levels for the best and worst results provide an indication of performance consistency.

Between September 1996 and June 1998, the maximum GSM call drop-out for all three carriers improved by 6, 8 and 16 per cent for Optus, Telstra and Vodafone respectively (see Figure 7.14(c)).[18] Over the same period, minimum call drop-out deteriorated for Telstra and Optus, but improved for Vodafone.

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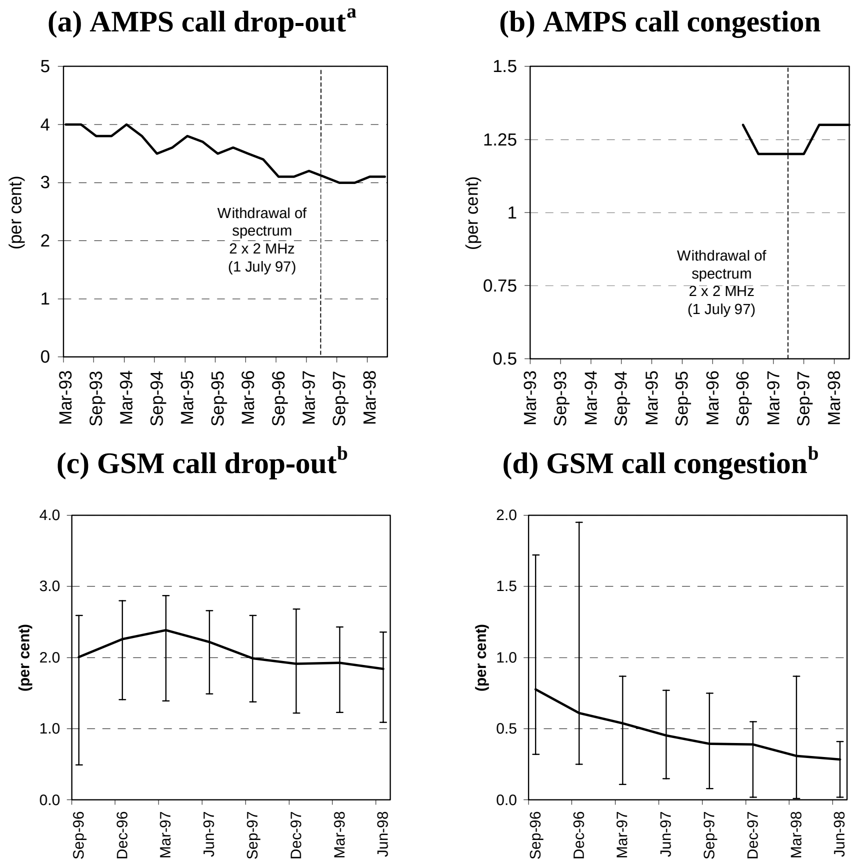
[17] On 9 July 1998 Telstra announced plans to invest more than $400 million in a new digital mobile network using the 800 MHz spectrum. This network is expected to be based on CDMA (Code Division Multiple Access) technology. CDMA technology offers better spectrum management (reducing capacity constraints) and significant quality improvements. Although this network will operate in parallel to the GSM network in both city and rural areas, it is expected to provide the greatest benefit to rural users who currently rely on the AMPS system due to be phased out by 1 January 2000. Trials for the CDMA network are expected to commence in early 1999.

[18] Call drop-out indicators for the analogue AMPS network are not directly comparable with those for the digital GSM network. The AMPS network records some events — such as flat batteries or customer moving out of coverage area — as call drop-outs, which the GSM network does not (ACA 1998b, p. 32).

Figure 7.14 Cellular mobile call drop-out and congestion performance: Australia, March 1993 to June 1998



a AMPS call drop-out indicators are not directly comparable with those for the digital GSM network as the AMPS network registers some events as drop-outs (such as customer unit flat batteries) which the GSM network does not.

b Chart present a range of performance around an a simple average of individual carriers performance for Optus, Telstra and Vodafone. National performance for each carrier was derived as a population weighted average of the carriers performance in each state Error bars indicate the maximum positive and negative deviation from this mean performance.

Source: ACA (various), Austel (various), *Quality of Services Bulletins*; *Telecommunications Performance Monitoring Bulletin*.

The performance consistency for all three carriers has improved over the period. While a decline in the ‘upper bound’ or best call drop-out QoS for Telstra and Optus has occurred, it has been accompanied by a reduction in the range of performance between the best and worst results amongst states, or an increase in reliability.

GSM call congestion QoS also improved between September 1996 and June 1998. Both maximum and minimum call congestion levels fell for all three carriers representing an improvement over the period (see Figure 7.14(d)). Furthermore, the range between the maximum and minimum call congestion levels for each carrier closed by 25, 55 and 93 per cent for Telstra, Optus and Vodafone respectively.

7.4 In summary

Comparisons of QoS performance complement the price comparisons of previous chapters. Both are required to arrive at an overall assessment of customer satisfaction performance.

QoS has many dimensions. If Australia’s performance, relative to other countries, were better or worse across all these dimensions it would be possible to draw conclusions about Australia’s relative performance with a degree of confidence. However, this is not the case. Furthermore, there are few indicators suitable for international comparisons of quality of telecommunications services and those available are clouded by definitional and methodological differences.

Table 7.10 Summary of selected QoS indicators: international comparisons

Indicator	*Year*	*Best observed*	*Worst observed*	*Australia ranked*
Fault clearance	1995	Japan	Greece	21 of 22
Call failure rates:				
Local	1995	Canada	Mexico	2 of 13
Long-distance	1995	Canada	Czech Republic	3 of 13
Answer seizure ratio	1995	Canada	Czech Republic	19 of 27
Payphones per 1000 inhabitants	1996	Switzerland	Turkey	8 of 25
Payphones in working order	1995	Portugal	Turkey	5 of 13
Payphones that are card phones	1995	Japan/Portugal	Iceland	3 of 20

Source: Productivity Commission.

The QoS indicators examined suggest Australia’s performance is mixed (see Table 7.10). On some indicators, such as call failure rates and the penetration of card operated payphones, Australia performs quite well, though below the best of the countries for which data are available. On other indicators, such as fault restoration, Australia's performance compares poorly relative to other countries reporting data.

Comparisons over time suggest that Australia's performance relative to other OECD countries for which data are available may have deteriorated on some indicators (see Table 7.11).

General indicators of satisfaction and records of complaints show that billing and fault restoration are of particular concern to customers. However, it is not possible to compare Australia's billing performance because suitable indicators are not currently collected.

Future assessment of the relative QoS performance of the Australian telecommunications industry would be enhanced by collecting QoS data for all carriers. Wherever possible, the indicators collected should be comparable to those published in other countries. Such indicators should focus on aspects of quality that are of most concern to Australian consumers.

Table 7.11 Australia's ranking compared to other OECD countries that supplied data on selected QoS indicators, 1992 to 1996

Indicator	*1992*	*1993*	*1994*	*1995*	*1996*
Fault clearance	na	7 of 19	11 of 14	21 of 22	na
Call failure rates:					
Local	na	na	3 of 12	2 of 13	na
Long-distance	na	na	3 of 11	3 of 13	na
Answer seizure ratio	15 of 27	16 of 27	17 of 27	19 of 27	na
Payphones per 1000 inhabitantsa	18 of 27	16 of 26	17 of 26	9 of 26	8 of 25
Payphones in working order	na	3 of 9	3 of 11	5 of 13	na
Payphones that are card phones	na	na	na	3 of 20	na

a Australian data prior to 1995 excluded non-public payphones.
Source: Productivity Commission.

8 INTERPRETATION

The purpose of this chapter is to assist with the comparison of measured prices by drawing together the information in the previous chapters. The focus is principally on prices. Quality of service has been excluded from the analysis because of a lack of reliable indicators.

Telecommunications prices vary significantly among the benchmarked countries (see Chapters 5 and 6). For example, the highest residential price index is almost 100 per cent higher than the lowest. Despite this variability, cross-country price relativities are generally consistent across markets.

The following groups of factors provide possible explanations for some of the observed differences in prices:

- *Measurement errors*;
- *External factors outside the control of industry* — technological change, input prices, taxes, geography and other factors affecting the physical operating environment and the characteristics of the network; and
- *Government involvement and interventions* — including ownership, structural separation, social policies, retail price controls and competition policy — that affect the market environment and incentives for efficient outcomes.

The impacts of these factors on prices are expected to vary among telecommunications markets.

In addition, there are *internal factors* — such as governance structures, corporate culture and managerial performance — that contribute to variation in productivity, profitability and prices.

In competitive markets, internal factors affect financial performance. However, market disciplines squeeze out poor performers, thus reducing performance variation. In markets that are not fully competitive greater performance variation is possible.

The influence of government involvement and interventions on internal factors and price outcomes is discussed in this report. Typically, telecommunications markets are not fully competitive and internal factors can account for greater variation in performance within a market. One source of this variation, for example, is differences in the nature of public and private ownership.

The extent of this variation will depend on the effectiveness of government supervision in preventing abuse of market power. Although market power often leads to productive inefficiency and higher prices, these outcomes are not solely attributable to internal factors such as mismanagement. For example, over-investment may be a response to deter entry, to conceal profits from a regulator or to hedge against more stringent supervision in the future.

Most attention is given to the Public Switched Telephone Network (PSTN) voice market, which remains the largest sector of the industry and the most heavily regulated. Only brief mention is made of the mobile and data markets. However, these markets are generally subject to greater growth and competition with their attendant performance disciplines.

8.1 Measurement errors

The comparisons of final telecommunications prices are dependent on the assumptions about call patterns and duration that define the basket of services costed as a price index for each country. These assumptions are necessary because the price structures and demand patterns differ across the countries studied.

Although the baskets were designed to minimise measurement error, it must be recognised that there is some residual error. Sensitivity testing on basket assumptions is reported in Chapters 5 and 6.

The demand pattern for services in each country is influenced by geographical and cultural characteristics as well as price structures and service quality. The sensitivity of the benchmarking results to these demand factors was tested by costing a basket reflecting Australian usage patterns in each country and comparing the price indices with those obtained using the composite basket developed for this study.

The usage profiles of business customers vary considerably within and between countries. Consequently, rather than attempting to devise a single basket, comparisons were conducted for a range of market segments, products and usage patterns (see Chapter 6). This provided a direct indication of the sensitivity of the assumptions.

This sensitivity testing suggested that, overall, the residential and business price relativities are robust.

Only the prices of the incumbent carriers were included in the comparisons. However, these carriers dominate the markets in each country. Although recent entrants usually offer lower prices, they generally do so to compensate for perceived differences in service or the inconvenience to customers of switching suppliers.

Overlooked or misapplied price discounts are another possible source of error. Eurodata undertook an extensive investigation to determine the price discounts offered in the benchmarked countries. Further checking was provided by Telstra and Telecom Corporation of New Zealand (TCNZ).

That said, any price discounts not included in the analysis are unlikely to have had widespread application, nor have had a significant effect on price indices that are an aggregation of a large number of prices. New Zealand is a possible exception. The use of targeted discounts and business contracts in New Zealand is more extensive than in other countries.

Telstra and TCNZ claimed that the price comparisons are biased against countries that have caps on charges for long-distance residential calls in off-peak periods. They argued that the prices used in the analysis based on a fixed per minute charge would overstate the amount paid by consumers. This arises because an average charge per minute declines when call durations exceed the time that the cap takes affect.

Although this is a short-coming of the methodology used, it is not a significant factor, particularly when comparing total service charges (see Chapter 5). Moreover, other countries with similar pricing schemes, would be affected also.

8.2 External factors outside the control of industry

Production costs and the prices of telecommunications services in each country are affected by the technology used and the operating environment. For example, the prices of inputs required by telecommunications suppliers affects their costs, as does market size, population density and even weather conditions. To a large extent, these factors are outside the control of the carriers.

Technology

Telecommunications companies world-wide are investing in new transmission and switching technology. This investment is greatly expanding the capacity and capabilities of the communications infrastructure, improving productivity and reducing costs (see Chapter 2). Examples of developments include digital exchanges, cellular mobile systems, fibre-optic cable for long-distance transmission and coaxial cable for the customer access network.

Price relativities between countries may be affected by differing economies of scope arising from uneven uptake of new technologies. Increasingly, the telecommunications network is being accessed through computers, for data transmission, broadcasting and broadband inter-active services. The growth of these activities can alter industry cost structures where these services share common facilities and provide economies of scope.

It is assumed that all the countries studied employ recent switching and cable technology. However, there are likely to be differences in the success with which new technology has been absorbed into the telecommunications networks.[1] This may have some effect on costs per unit of traffic and hence on prices.

Input prices

The prices of telecommunications services are influenced by the prices of inputs (including labour, specialised equipment and other materials and services) purchased by carriers. In an efficient and competitive industry, there will be a direct link between input prices and telecommunication service prices.

Differences in input prices among the countries studied were to some extent taken into account by the use of Purchasing Power Parity (PPP) in converting the prices of telecommunications services into a common unit of account (see Chapter 5). Nevertheless, cross-country price relativities of inputs to the telecommunications industry may differ from price relativities of inputs to the economy as a whole.

Most of the countries included in this benchmarking study have sophisticated and globally competitive manufacturing and software industries supplying these inputs. However, equipment costs in Australia and New Zealand may be higher than in European and North American countries and Japan. In the past, local manufacturing was protected, which may have increased the cost of specialised inputs in Australia relative to other countries.

All the countries are advanced and mature economies with telecommunications industry labour costs correlated to the cost of labour inputs in general. Across countries, these labour costs vary, affecting relative prices.

However, the use of PPP adjusted prices for cross-country comparisons ameliorates these influences. PPP adjusted prices are likely to be most affected

1 Innovation and the adoption of new technologies and services involves risks as well as opportunities for the industry when implementation costs and market demands are difficult to forecast.

by variation in the proportional difference between telecommunications labour cost and the average of all other industries within each country.

Finally, a concern was raised about the validity of using PPP exchange rates to adjust prices where telecommunications is used as a business input (NECG 1999b). It was suggested that an exchange rate based on the purchase of intermediate rather than final goods and services would be more appropriate.

Exchange rates based on intermediate goods and services are not generally available. However, the use of PPP exchange rates is not expected to introduce significant error. PPP exchange rates are designed to reflect the real purchasing power of a national currency and input prices would be related to the relative cost of final goods in the countries chosen for benchmarking.

Geography and economies of scale

Costs are influenced by geography and differences in point-to-point traffic volumes. In some parts of a network there may be substantial economies of scale and scope as well as related economies of density and massed reserves.[2] If this is the case, these economies would have an impact on the overall price comparisons and the cost of Universal Service Obligations (USOs).

The extent to which economies remain in large networks is disputed (see Appendix B). However, there is a general consensus that there are economies of density in the provision of local services in particular.

In its 1995 benchmarking study, the Bureau of Industry Economics (BIE) stated that it was difficult to substantiate evidence that comparisons were being significantly influenced by average density differences (BIE 1995).

The Commission invited Telstra to provide disaggregated information on the distribution of line densities in Australia and the other benchmarked countries so that the actual impact could be assessed. Telstra commissioned NECG Ltd to prepare a paper on the issue. Some information was provided on the distribution of line densities in Australia, along with results from two cost models which provided a cost–line density relationship (NECG 1999c). However, the lack of similar information for other countries precluded a comparative assessment.

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2 *Economies of density* are the savings that accrue when the number of services increases for a fixed area.

Economies of massed reserves arise when there is uneven or stochastic demand and the level of 'idle capacity' necessary to compensate for a given level of variability in demand falls (as a proportion of total capacity) as scale of the plant increases — raising overall asset productivity (Mulligan 1983).

Ovum (1998) examined the impact of *geographical and scale factors* in Australia relative to other countries. Ovum concluded that, although these factors may be influencing the relative prices to some degree, the overall impact was unlikely to be very large. It was argued that this was the case because Australia is highly urbanised with densities greater than broad aggregates (population divided by land mass) indicate. For example, Ovum noted that over 55 per cent of the population lives in the 5 largest cities. This compares with 20 per cent for Sweden and approximately 8 per cent for the USA and UK.

Ergas, Ralph and Sivakumar (1990) also noted that in parts of Australia where there is at least one inhabitant per 8 sq km, population densities are not significantly lower than in the inhabited parts of Canada and the USA. Also, the distribution of subscriber loop lengths in Australia is not very different to that in the US network.

Any scale disadvantage could impact on the cost of the USO. The USO cost currently recognised under legislation is $250 million — approximately 1.3 per cent of industry revenue. Telstra has recently claimed that the net cost of providing a universal service to rural and remote areas is $1.8 billion. However, Gibson Quai & Associates and Ovum (1999) who were engaged by the ACA to look into the matter, have estimated a range of possible costs that are much lower.

Most of the other countries have decided either that the cost of the USO does not constitute an unfair burden on the provider, or that the cost of establishing a fund to reimburse carriers for the USO cost outweighs the competitive neutrality benefit. In the USA, one of the countries with a USO fund, the net cost is estimated to be less than 1 per cent of industry revenue.

To the extent that there is disparity between the USO cost in Australia and the other countries studied, it would affect the interpretation of price relativities. In particular, the cost differences could partly explain price differences between Australia and the countries with the lowest prices.

Unit costs for mobiles and data transmission markets are also likely to vary with the density and distribution of population. However, it could not be ascertained whether Australia's geography causes higher costs in these markets.

Indirect taxation

Variations in the levels of indirect taxation on telecommunications may account for some of the observed PPP adjusted price differences. The price comparisons reported in Chapter 5 for residential services include value-added and sales tax. The prices also reflect taxes on inputs.

In the case of Australia, the level of indirect taxation is low compared with most other countries benchmarked. The level of taxation on telecommunications services imputed from input–output tables is approximately 4 per cent. Elsewhere, the level varies between 25 per cent (Sweden) and 3 per cent (Japan).

In particular, all of the countries with lower PPP adjusted prices than Australia have higher indirect taxes. The countries with the lowest PSTN prices — Finland and Sweden — have indirect taxes 18 and 21 percentage points higher.

Again, as mentioned earlier, indirect taxes are most likely to result in differences in relative prices where there is variation between countries in the extent to which indirect taxes specific to the telecommunications industry differ from an all industry average.

In countries like Finland and Sweden which have uniform indirect tax systems (for example, a Goods and Services Tax or Value Added Tax) there is little, if any, variation from an all industry average. In Australia, however, the difference is significant — in 1995–96, the average indirect tax rate for the telecommunications industry was about 4 per cent, while the average for all industries was 12 per cent.[3]

An adjustment for this indirect tax effect would increase the price gap between Australia and the lower price countries.

Summing up

The size of the average variation in prices among countries is such that Australia's relative position is not easily attributed to differences among the factors outside the control of the industry and governments. Although, it is possible that Australia is disadvantaged to some extent by the requirement to provide a universal service in very remote areas, it has a significant indirect taxation advantage relative to the countries with the lowest prices.

If on balance the effects of factors outside the control of the industry are small, other factors must explain the large variations in prices.

The telecommunications industry does not operate in fully competitive markets and is subject to government regulation in most countries. Differences in the effectiveness of price supervision and competitive disciplines can affect prices and are likely to be a major source of this price variation. Factors internal to the businesses are another possible source.

3 Indirect tax rates estimated using ABS (1997c).

8.3 Government involvement and interventions

Care has to be taken when assessing the role of government intervention because of the complex interactions of policy initiatives and market conditions at the time of their introduction. Any assessment of the effectiveness of government intervention would require detailed analysis of the actual extent of competition, and the link between competition and prices. Critically, it would depend on recognising that regulatory measures take time to have an effect.

Readers are advised not to infer causation between specific regulatory measures and prices, because the extent of the analysis undertaken for this study falls well short of that just described. The discussion is primarily aimed at cataloguing possible influences of broad differences in regulatory approach on relative prices.

Government ownership

Governments have a long history of involvement in the industry. Most incumbent carriers were originally government departments under the direct responsibility of a minister of State. Some incumbents remain government-owned corporations, while others have been partially or fully privatised.

Where governments are involved, their objectives and governance potentially affect incentives and, ultimately, competition and prices. For example, failure to require tax-equivalent payments and commercial rates-of-return on equity and government finance provides a price advantage and affects competitive neutrality. The absence of factor market disciplines may allow inefficient operations to be maintained, which would adversely affect prices. Prices may also be set at levels that do not fully reflect the cost of capital.

The countries with the lowest PSTN prices include carriers which are both fully government-owned — for example Telia of Sweden and Sonera (formerly Telecom Finland) — and not government-owned — for example, Finnet (of Finland). However, like-with-like price comparison between private and publicly-owned incumbents was not possible with the small sample of countries studied.

Structural intervention

Prior to the 1980s, a single carrier provided all domestic telecommunications services in most countries. These incumbent carriers had, and still have, market power in most of the countries benchmarked (see Appendix B for a discussion of market power in the telecommunications industry).

Governments have intervened to change the structure of the industry in order to limit market power. In the past, some have chosen to establish duopolies through legislation. In the US, the government vertically and horizontally separated the dominant carrier.

Sources of market power

The main source of market power is the control that the incumbent has over the existing network. In particular, the incumbent's ownership of the network gives it control of essential, or 'bottleneck', facilities. This represents an obstacle to competition unless the entrant can gain access to these facilities.

Some facilities are essential because they are needed to provide the 'any-to-any' subscriber connectivity necessary for the entrant to have an equivalent service. They cannot be bypassed easily because only one point of connection is usually required for each subscriber to make many calls — that is, subscriber facilities and the customer access network (local loop) are indivisible.

Market power is most evident in the local service markets, which encompass the connection of subscribers to the network and local switching services. However, some have argued that market power in the local service market can be levered to the long-distance market because all services are ultimately routed through the local loop (Vogelsang and Mitchell 1997). For example, any reluctance on the part of subscribers to engage multiple service providers or to switch service providers, advantages integrated local service incumbents in the long-distance market.

Dominant incumbent

In most of the countries studied, including Australia, governments have not intervened to limit the market power of incumbents by vertical or horizontal separation. The incumbent carriers have been left vertically-integrated and continue to offer customers both local and long-distance services.[4]

Other carriers wishing to compete have limited or no local service facilities with direct access to customers and are obliged to negotiate PSTN originating and terminating access agreements with the incumbent. The possible influence of the terms of these agreements on competition and prices is discussed later.

Duopoly

Most countries initially had one dominant incumbent carrier. Finland is an exception. It had a large number of operators, which amalgamated in 1995 to

[4] In Canada and Finland the providers were originally horizontally separated.

form two main carriers — the Finnet Group and Telecom Finland. Finnet provided mainly local services and Telecom Finland mainly long-distance services.

By 1994, both markets had been fully opened to competition. Finnet and Telecom Finland began to expand their operations into each other’s markets, becoming integrated carriers. The Finnish incumbents were able to negotiate interconnection agreements from a position of strength because each represented a credible competitive threat to the other.

This situation may have influenced the progress of competition and explain why Finland is among the countries with the lowest overall prices.

UK and Australian governments both sought to stimulate facilities-based competition by assisting a single new entrant to compete with the integrated incumbent when they first liberalised telecommunications. The duopoly was protected from additional competition. Interconnection between the new entrant and the incumbent was regulated.

Vertically and horizontally separated carriers

The US Federal Government sought to limit market power by structurally separating the local service market from the potentially competitive long-distance market. Monopoly suppliers continued to provide local services and vertically-separated carriers competed in the long-distance market.

The incumbent local service carriers (the regional Bell operating companies) have been protected monopolies and have not, until very recently, been permitted to provide long-distance services. All the long-distance carriers have negotiated agreements with the local-service carriers without having to compete with them in long-distance markets.

Competition in the US long-distance markets was facilitated with the divestiture by AT&T of its local operating companies, which contributed to the growth of MCI and Sprint. However, the effectiveness of this competition has been questioned (see Box 8.1).

Recent mergers and merger proposals between local service, long-distance carriers, cable and mobile operators may indicate that economies of scope may also have been lost with vertical separation.

Leaving other issues aside, the price comparisons do not provide evidence favouring any one of these approaches. US PSTN prices are reasonably low, but so too are prices in countries, such as Sweden, where integrated incumbents continue to dominate.

Box 8.1 The impact of competition in the US long-distance market

MacAvoy (1996) examined the impacts, from 1984 to 1994, of an antitrust judgement and deregulation of the US long-distance market. He concluded that the changes aimed at introducing effective competition into the US long-distance market during this period failed.

From the 1930s to 1982, three factors had provided the American Telephone and Telegraph Company (AT&T) with a near monopoly in the US long-distance market. These factors were AT&T's control of local exchange networks, its refusal to interconnect with rivals and other regulation restricting entry.

The 1982 settlement of an antitrust suit against AT&T facilitated substantial entry into the US long-distance services market. The Modified Final Judgement (MFJ) required AT&T to divest itself of local exchange operations by setting up regional Bell operating companies (RBOCs). These companies were then required to offer all long-distance carriers interconnection on equal terms. The RBOCs were also restricted from entering the long-distance market.

After divestiture, AT&T quickly shared the long-distance market with two other large nation-wide providers — MCI and Sprint — as well as a large number of resellers and other smaller, facility-based providers.

In the ten years following divestiture, the price of long-distance services fell, in real terms by more than 60 per cent. Yet, MacAvoy (1996) found that the fall in prices did not match the even more dramatic fall in operating costs.

Thus, although there was an increased number of competitors (that is, concentration in various long-distance markets fell) the relative margins of price above costs rose.

This result is surprising, because a reduction in industry concentration could have been expected to have resulted in reduced margins. MacAvoy concluded that the increased margins were evidence that competition had, effectively, been reduced.

Alternatively, dynamic factors may have played a role. Because costs in the industry fell rapidly, prices may not have fully adjusted during the period examined.

Source: MacAvoy (1996).

Retail price controls

Variations in the stringency of retail price controls are likely to affect relative prices. Retail price controls are most stringent for the local service PSTN market and minimal in the mobiles and most data markets among the countries studied (see Chapter 3). There are limited controls over long-distance PSTN prices in some countries.

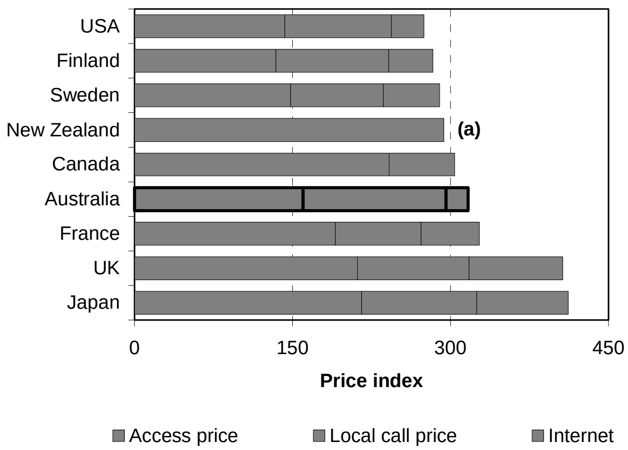
Local services typically include charges for:

- customer access — connection fees and line rental, which may vary between business and residential customers and between regions (for example, urban and rural);
- call set-up — a fee per call; and
- call time — a fee per unit of time (varying with the time of day, day of week) or call distance.

Retail price controls and incumbent pricing strategies have resulted in a variety of local service price structures. For example, local calls in Canada and New Zealand are free, though access charges are relatively high. Australia has a fixed charge per call. Other countries have timed local calls and different sized local call areas.

The contributions of the call charge and access charge components to the annual expenditure of the representative customer used in the price comparisons for residential local service are shown in Figure 8.1. For this comparison, a common definition of local calls was used (see Chapter 5).

Figure 8.1 Local service price comparisons for residential customers, February 1998



a Local calls are free of charge in New Zealand.

Source: Productivity Commission estimates.

Most price controls are in effect maximum charges or maximum rates of increase to charges, referred to as price caps. Their purpose is to encourage productivity improvements over the period of the price cap. Also, they are to ensure at least some cost savings are passed on to customers.

The price caps may be applied to baskets of services and allow incumbents flexibility in their price structure. However, this flexibility can be diminished by multiple caps, thereby impeding efficient pricing.

It was not appropriate to evaluate the economic efficiency of the current price structure in the context of this international benchmarking study.[5] However, an analysis of the Australian price structure is contained in a staff paper issued by Industry Commission entitled *Telecommunications Economics and Policy Issues* (March 1997).

The price controls on PSTN services in the countries studied are summarised in Table 8.1. Their impact on prices depends on the severity of the cap and the period over which the constraint has been applied.

Finland does not have price controls but nevertheless has relatively low local PSTN service prices among the countries studied. By implication, price caps may not be essential to low prices if other disciplines are in place, such as cost-based service provider access charges, which are stimulating competition. Also, mobile services have reached a higher level of penetration in Finland than in other countries, and may be providing effective competition with fixed-line services.

Australia is the only country among those studied still to have a cap on a basket of both local and long-distance services, as well as controls on line rental and local calls. It is also interesting to note that the difference between local service prices in Australia and countries such as Finland and Sweden is less than that for total service prices (see Figures 5.1 and 8.1).

Comparisons of capped PSTN local service prices are questionable because of these differences. It is more meaningful to compare total service prices because they capture the effects of any interactions of price caps across the PSTN markets.

In Australia, the UK and France, the regulatory authorities impose price caps on a *basket* of telephony services including long-distance calls (see Table 8.1). The

5 In resolving what is appropriate from an overall economic efficiency perspective, there are a number of critical sub-ordinate issues that must be addressed. Governments must decide whether customer access network costs should be recovered solely through customer access charges and, if not, whether there should be contributions to these costs in access charges paid for by competitors inter-connecting with the incumbent.

UK has the longest history of price capping a basket of services, dating back to 1984. Australia has employed price caps on a broadly-defined basket of services since 1989.

Table 8.1 Retail price controls on PSTN services, February 1998

Country	*Year current price cap began*	*Cap on local services*	*Cap on line rental*	*Local calls*	*Cap on local and long-distance basket*
		(per cent per annum)	*(per cent per annum)*		*(per cent per annum)*
Finland	-	-	-	-	-
Sweden	-	-	CPI	-	-
Canada	1998	CPI-4.5	10	-	-
US	-	a	a	a	-
UK	1997	-	-	-	CPI-4.5[d] CPI[e]
Australia	1996	-	CPI-1	25c	CPI-7.5
France	1997	-	-	-	CPI-9.0
NZ	1989	-	CPI	b	-
Japan (c)	-	na	na	na	na

na not available.
\- not applicable.
a Local service is regulated principally by State authorities with some Federal involvement. Regimes vary State by State.
b Telecom New Zealand must provide the option of free local calls for residential customers.
c Japan has direct government regulation of retail prices.
d Applied to residential services.
e Applied to a small- business basket.
Note: Countries are listed in order of increasing PSTN total service price.
Source: Appendix E.

Impact of price controls on competition

Price controls have the potential to impede competition, and hence market disciplines on prices. If set below the cost of providing the local services, price controls could inhibit entry in the local service market. Carriers will be compelled to offset the low returns from local service by charging high prices in other markets, traditionally the long-distance voice market, if they cannot readily improve productivity. Under these conditions, entrants in the long-distance market can follow the incumbent's price and earn a higher rate of return than would be achievable through vigorous competition.

Recently, governments and incumbent carriers have been pursuing a process of 'rebalancing' retail PSTN prices so that they better reflect costs by reducing long-distance call prices much more rapidly than prices of local services, which in some cases were increased (see Appendix E).[6] For example, the European Commission requires this of its member countries. The Canadian and French incumbent carriers are rebalancing their price structures with government encouragement (see Chapter 3).

Comparison of the ratios of local service (access and call) to long-distance (call) prices provides some information about the 'balance' of prices in each country and its likely impact on competition and prices. The price ratios can be expected to be similar in all countries if both the ratio of the costs attributable to the local and long-distance services are similar across the benchmarked countries and also the returns in each market are similar.

The large disparities in the ratios of local service to long-distance prices for residential services suggest that this may not be the case (see Table 8.2). For example, the ratio of local service to long-distance prices for Sweden is 2.64 times that for Australia. In the case of New Zealand, however, the same ratio is 0.69 of Australia's, principally because of the requirement to offer free local calls.

Relative price levels in the benchmarked countries are shown separately for local and long-distance residential voice traffic in Figure 8.2. The countries are ordered by prices in the long-distance market. The pattern of relative prices is markedly different in the two markets.

Lower prices appears to be associated with rebalancing. The countries with the lowest telecommunications prices — Finland and Sweden — claim to have rebalanced prices to reflect costs across the major market segments. Generally, they also have the highest ratio of local service to long-distance prices.

In the US, the ratio of local to long-distance prices appears low. However, the local service costs are met in part by a component of the 'gross' access charge paid by all the long-distance carriers for access to the local networks of the regional Bell operating companies.

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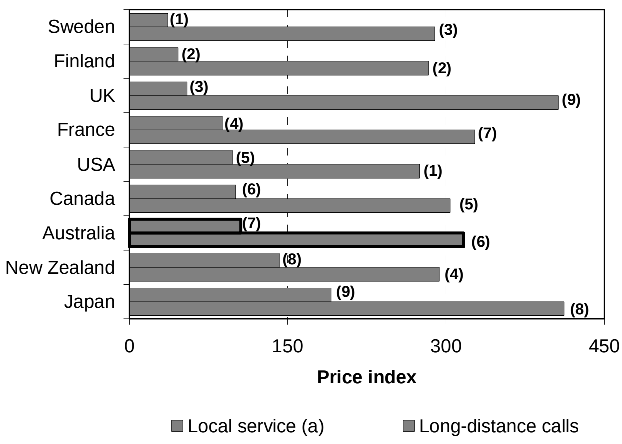
6 'Rebalancing' is sometimes seen as increasing the fixed cost element (the customer access charge) and reducing the variable cost element (usage charges). However, rebalancing local service prices and long-distance call prices is more important because it has a greater impact on competition.

Table 8.2 Price ratios for PSTN, 1998

Country	*Index of the ratio of local service to long-distance residential prices (Australia = 100)*
Sweden	264
UK	248
Finland	205
France	124
Canada	100
Australia	**100**
USA	93
Japan	72
New Zealand	69

Note: Countries are listed in the order of the ratio of local service (access and call) to long-distance (call) residential price.
Source: Productivity Commission estimates.

Figure 8.2 Relative local service and long-distance PSTN prices for residential customers, February 1998



Note: Figures in brackets “()” represent the ranking of each country relative to the other nine countries in the sample for each service.
a Local call service include access charges, local call charges and Internet call charges.
Source: Productivity Commission estimates based on Eurodata (consultant) data.

The ratio of Australian local to long-distance service prices is in the middle of the range. However, it is significantly below countries such as Sweden and Finland.

The concept of rebalancing applies not only to local and long-distance charges, but also between fixed and variable charges and between urban, rural and remote areas. For example, there are significant regional variations in Finnish local service prices, reflecting different costs in urban and rural areas.

The Australian USO may be a barrier to rebalancing if it accounts for a significant proportion of any gap between local-service costs and revenues. In New Zealand, the incumbent's capacity to rebalance is hampered by the government's requirement that residential users be offered the option of free local calls in the presence of constraints on line rental charges.

The ratios of local-service to long-distance prices are higher for residential customers than for business customers, which generally have higher call volumes in the long-distance market. Also, there is greater variation in the local to long-distance price ratio for residential customers among the countries. This is likely to be a manifestation of the absence of caps on non-residential services and the greater pricing freedom this provides.

Competition policy

Since the early 1980s, governments have sought to introduce competition into the industry. They have removed legislative restrictions on entry and established regulations governing access to essential facilities. However, the approaches differ across countries (see Table 8.3 and Chapter 4).

The time taken for competition to develop depends on the effectiveness of the policy design and its implementation. Consequently, it is difficult to assess at any point of time the outcomes of heterogeneous policies that have been in effect for varying periods of time.

Competition has been much slower to develop in the local service market than in the long-distance voice market. Consequently, local service prices are more likely to reflect government price controls than competitive forces.

The wide dispersion of national long-distance prices among the benchmarked countries — a five to one ratio of most expensive to cheapest — suggests differences in the effectiveness of policies that facilitate competition in this market. This is consistent with a wide variety of approaches to and timing of the introduction of competition. However, it may also reflect a stronger tradition of low prices in some countries. For example, Telia, the government-owned

Swedish carrier, has long been recognised as having among the lowest prices of the OECD countries (as indicated, for example, by the OECD comparisons since 1989).

Table 8.3 Major developments in the regulatory environment affecting competition in PSTN markets

Country	*Dates*	*Initiatives affecting the development of competition*
Finland	1994	Open competition
	1997	Current regulatory arrangements for interconnection
Sweden	1992	Telia's first voluntary interconnect agreement with a competitor
	1997	Current regulatory arrangements for interconnection
Canada	1992	Introduction of competition in long-distance market
		Regulations to facilitate local competition
	1997	Current regulatory arrangements for interconnection
United States	1983	Divestiture of AT&T
		Introduction of competition in long-distance market
	1996	Legislation to encourage competition in local services
		Current regulatory arrangements for interconnection
United Kingdom	1984	Protected duopoly and regulated interconnection
	1991	Open competition
	1997	Current regulatory arrangements for interconnection
		Access prices subject to price cap
Australia	1991	Protected duopoly and regulated interconnection
	1997	Open competition
		Current regulatory arrangements for interconnection
France	1998	Open competition
		Current regulatory arrangements for interconnection
New Zealand	1989	Open competition
Japan	1985	Restricted competition
	1998	Current regulatory arrangements for interconnection
		Restructure of NTT

Note: Countries listed in order of increasing PSTN total service price.

In other markets, such as mobile telephony, competition has been more readily achieved through liberalisation. Most countries have two or three competing operators. Finland, with two competitors, has the lowest prices in both residential and business markets. Australia, with three major competitors, also has relatively low prices, especially in the business market.

Technological innovation and rapid growth in demand in the mobile market are possibly the main drivers of competition and falling prices. However, regulatory arrangements for interconnection among the carriers and allocation of bandwidth to existing and new carriers may also be significant factors.

In the data markets, competition is being influenced by the implementation of new services such as frame relay and ATM and by the rapid growth in business demand. However, the terms and conditions of access by other service providers to the originating and terminating digital data services of incumbents affect the extent of competition in smaller business markets.

Access to local service facilities

Most countries have put in place legislative provisions to facilitate the access of new competitors to the incumbent's 'bottleneck' facilities (see Tables 8.4 and 8.5). These regimes include processes for establishing the terms and conditions on which new entrants obtain access to incumbent services.

The main exceptions are New Zealand and Japan, where liberalisation was initially confined to the removal of legislative barriers to competition. Others have put their access regimes in place only recently and their potential impact is unlikely to have been fully realised by the time that prices were benchmarked for this study.

Appropriate terms and conditions are required for the entrants to be able to compete with the incumbent, and with each other, for residential and business customers. Particularly significant are the location of the point of interconnection and the agreed price of access.

The ability of new entrants to compete is likely to be greater in countries where the regulator imposes cost-based interconnection prices on the incumbent. This may be achieved either by requirements for reference offers or by approval of negotiated agreements.

Requirements for disclosure of the terms and conditions of agreements may also be a factor. Disclosure has the advantage of hastening convergence on cost-based prices.

Access prices

Competition from specialist carriers in the long-distance market critically depends on access to services for originating and terminating PSTN calls. The access price affects their ability to compete because it feeds into their service cost.

Agreements between entrants and incumbents are in place in all the countries studied. However, the price of access to incumbent services may not have been based on costs (see Table 8.4).

According to an Ovum study (Lewin D. and Kee R.,1997) British Telecom's call termination interconnect price was the lowest. Telstra's price in its 'undertaking' to the ACCC was the highest in a sample of 11 countries, which includes five of the nine countries benchmarked for this study.[7] However, Telstra's interconnect price, like those of a number of the US local exchange carriers, included a component to help meet subscriber access costs at the time prices were measured.

Table 8.4 Regulation of the terms of interconnection, February 1998

Country	*Arrangements for establishing terms of interconnection*			*Carrier pre-selection*
	Requirement for cost-based standard reference offers	*Regulator approves negotiated agreements against costs*	*Publication of negotiated agreements*	
Sweden	yes	yes	no	no[b]
Finland	yes	yes	yes	no[b]
UK	yes	(a)	yes	nr
US	yes	yes	yes	yes
Canada	nr	nr	na	na
Australia	nr	nr[c]	nr	yes
France	yes	yes	yes	no[b]
New Zealand	nr	nr	yes	nr
Japan	yes	yes	yes	no[b]

a As an interim approach, access prices were assessed against fully distributed costs. Now access prices are subject to a CPI -X cap.
b Being introduced.
c 'Yes' if the agreement is arbitrated.
nr not required.
na Information is not available.
Note: Countries are listed in order of increasing PSTN long-distance service prices.
Source: Appendix E.

7 'Undertakings' are filed and approved agreements on the terms and conditions of access.

The low interconnect prices in the UK are consistent with low customer prices in the long-distance market and possibly the degree of competition.

Australia was one of the first countries to require the incumbent to provide carrier pre-selection, which makes it easier for long-distance customers to use a service provider other than the incumbent. However, this policy may not be a major factor in explaining price differences, since Sweden and the UK, which have low long-distance prices, did not have carrier pre-selection at the time prices were measured (Table 8.4).

Local loop unbundling

Local loop unbundling is the term used for accessing the local loop upstream of the local switch. Unbundling increases the contestability of the local service market because it gives service providers the opportunity to interconnect as close to the customer as commercially viable.[8] That said, there are few examples of facilities-based competition in local services.

The US, Canada, Sweden, Finland and Japan have recently provided regulatory encouragement for local loop unbundling (see Table 8.5). Except for Japan, they are also countries with relatively low local service prices.

Local loop unbundling may also increase the contestability of long-distance services and, thereby, influence prices through actual or potential competition. Notionally, the service provider has greater discretion over the technology they use. Furthermore, a greater portion of the overall service cost is under the control of the provider requiring access.

Overall, the countries with the lowest prices in the Commission's sample are generally characterised by established access regimes providing for interconnection at any technically feasible point in the incumbent's network at cost-based access prices (see Tables 8.4 and 8.5).

As noted earlier, the association of a particular regulatory approach with lower prices does not imply *causation*, particularly for specific initiatives. The sample is too small and there has been insufficient analysis to justify such an inference.

Nevertheless, given that the regulatory environment is likely to be a major explanator of observed price differences, the benchmarking results lend weight to exploring an increased emphasis on competition to achieve lower prices.

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8 Even if few businesses exercise their right to connect into the copper wires below the local exchange.

Table 8.5 Regulation affecting competition in the local service market, February 1998.

Country	*Unbundling of local loop required*	*Local call resale at wholesale prices*	*Number portability*
US	1996	1996	no[a]
Canada	1997	nr	yes
Sweden	1997	nr[b]	no[a]
Finland	1997	nr	yes
New Zealand	nr	nr	yes
Australia	nr	nr	yes
France	1998	nr	no[a]
UK	nr	nr	no[a]
Japan	1998	1998	no[a]

a Being introduced.
b Provided by Telia voluntarily.
nr not required
Note: Countries listed in order of increasing PSTN local-service prices.
Source: Appendix E.

8.4 Prices, financial performance and productivity

Financial performance and productivity are linked with prices (comparisons of PSTN prices from Chapters 5 and 6 are summarised in Table 8.6). As noted by Ergas, Ralph and Sivakumar (1990) comparative rankings of carriers in terms of prices they charge and the rates of return they earn are broadly indicative of comparative technical efficiency.

High levels of financial performance require high productivity or high prices in its absence. In an industry that is not fully competitive, incumbents have some leeway to be less than fully efficient and set prices to compensate or earn above-normal profits.

Financial performance and prices

There is a significant positive correlation between financial performance, as measured by sales margin before interest and tax, and prices overall (see Table 8.7). The simple correlation between the prices and financial performance is 0.41 (0.84 excluding Japan) with the financial performance tending to be lower in countries with the lowest prices.

This correlation suggests a link between prices and financial performance. However, this finding should not be used to infer from the relative prices of an individual incumbent that their financial performance is inappropriately high. Care has to be exercised when analysing financial performance. For example, the range of services provided and level of capital investment taking place at a particular point in time may differ. Furthermore, differences in the cost of capital or managerial performance may also affect financial performance.

Table 8.6 Comparisons of PSTN prices, February 1998

Country	*Residential*	*Small business*	*Medium-sized business*	*Overall average*[a]
	(index)	*(index)*	*(index)*	*(index)*
Finland	77	60	61	66
Sweden	80	69	65	71
Canada	91	86	73	83
USA	88	84	94	88
UK	111	96	88	98
Australia	100	100	100	100
France	89	97	114	100
New Zealand	114	134	140	129
Japan	140	121	140	134

a Simple average of the residential, small business and medium sized business prices.
na Not available.
Note: Countries listed in order of increasing PSTN prices.
Source: Productivity Commission estimates.

That said, the result is consistent with the view that high prices resulting from the exercise of market power allow businesses to earn above-normal profits. Furthermore, large variations in financial performance often reflect differences in the intensity of competition or regulatory supervision.

However, the market power and ineffective regulatory supervision that tolerates high prices is often associated with poor productivity. This off-setting factor detracts from financial performance. For example, it may be noted that Japan, which has the highest prices, also has the second worst financial performance among the countries studied.

Productivity

Productivity — broadly defined as the quantity of outputs per unit quantity of inputs — is driven by technological innovation, responsiveness to demand and efficiency in the use of resources. These factors, although substantially under the control of industry participants, are affected indirectly by market disciplines from competition or regulatory incentives aimed at encouraging efficient production.

Table 8.7 Prices and financial performance, 1997–1998

Country	*Price differences*	*Index of financial performance differences*[a]
	(%)	*(%)*
Finland	-34	-14
Sweden	-29	-21
Canada	-17	-4
USA	-12	-14
UK	-2	-8
Australia	Base	Base
France	0	-13
New Zealand	+29	+18
Japan	+34	-20

a Financial performance measured by sales revenue divided by expenses, where expenses exclude interest and company tax.
Note: Countries listed in order of increasing PSTN prices.
Source: Productivity Commission estimates.

As alluded to above, there is a link between prices, financial performance and productivity. Carriers with a high level of productivity are in a position to provide services to customers at relatively low prices and earn a satisfactory financial return. The extent to which consumers and shareholders share in the benefits of high productivity is affected by the incumbent carrier’s market power, among other things.

It can be demonstrated that relative differences in productivity between countries is equal to the relative difference in financial performance divided by the relative difference in the ratio of output and input prices (see Waters and Street 1998).

In the absence of appropriate input prices indexes, indicative estimates of differences in productivity may be obtained by assuming that telecommunications input prices, when converted at PPP rates, are the same across all the countries studied (see Box 8.2).[9]

Indicative estimates of differences in productivity, based on this assumption, are presented in Table 8.8. Although rudimentary, the estimates suggest that there is a significant variation in relative productivity among the countries studied.

The indicative estimates of relative productivity are consistent with Telstra's Chief Executive's assessment in June 1996 that 'It [Telstra] was not yet at world's best practice in terms of operating expenses per access line. "We make no secret that we are 35 per cent from where we ought to be" he said' (Meredith, 1996).

There is also a significant correlation between the indicative estimates of productivity and the differences in prices shown in Table 8.8. The simple correlation between relative prices and the indicative measure of relative productivity is -0.78 (-0.63 excluding Japan) with the relative productivity tending to be greater in countries with the lowest prices.

This correlation provides some evidence that the relative price differences for the countries studied may reflect productivity differences as well as profitability. This implies that customers of telecommunications services generally benefit from the higher levels of productivity and regulation aimed at maximising competition and encouraging efficiency.

Telecom Corporation of New Zealand's financial performance was better than those of the other incumbents studied. This suggests that TCNZ's relative productivity was better than its relatively high customer prices, by themselves, indicate.

On the other hand, for Japan's NTT, the combination of below-average financial performance and relatively high prices indicates that its productivity may be lower than that of incumbents in the other countries studied. However, accounting conventions may be important in explaining some of the difference in NTT's financial performance from that of other carriers. Also, labour costs are believed to be relatively high in Japan and may be part of the explanation of its high prices.

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9 To the extent that this assumption does not hold exactly, the estimates would be subject to some error and potential bias. Consequently, some of the differences in estimated TFP may be attributable to variations in the ratio of telecommunications input prices to the PPP rates. (The PPP rates being equal to the cost, in local currency, of a standardised general basket of goods and services.) Bias in the indicative estimates may arise if the variation in the relative prices of some inputs are correlated with productivity. That is, where productivity is low, input prices are high, and *vice versa*.

Box 8.2 Calculation of indicative productivity estimates

Total factor productivity (TFP), for an enterprise may be estimated as the quantity of its output (Q) per unit of quantity of input (I), with quantities as measured by appropriate indices.

The quantity index for outputs may be estimated by the revenue (R) earned from the output divided by a price index for output (P_O).

Similarly, the quantity index for input is equal to expenses (E) incurred in producing the outputs divided by a price index for inputs (P_I).

Therefore:

$$TFP = Q/I = (R/P_O)/(E/P_I) = (R/E)/(P_O/P_I).$$

See Waters II and Street (1998) for a recent discussion of the links between price indices, financial performance and productivity.

Estimates for revenue (R), expenditure (E) and output prices (P_O) are available for each country. Input prices (P_I) may be approximated by assuming that they are proportional to the PPP exchange rate for that country. With this assumption:

$$(P_{Ii}/PPP_i) = k \text{ for each country (i)}$$

$$(P_{Oi}/P_{Ii}) = (P_{Oi}/PPP_i)\,/(P_{Ii}/PPP_i) = (P_{Oi}/PPP_i)\,/k$$

In per cent difference (%Δ) form this implies:

$$\%\Delta\,(P_{oi}/P_{Ii}) = \%\Delta\,[(P_{Oi}/PPP_i)\,/k] = \%\Delta\,(P_{Oi}/PPP_i)$$

In which case, %Δ TFP for country (i) (compared with a ‘base’ country) is given by:

$$\%\Delta\,TFP_i \cong \%\Delta\,[(R/E)_i/(P_{Oi}/PPP_i)]$$

If P_{Ii} is proportional to PPP_i for all countries, then the substitution of (P_{Oi}/PPP_i) for (P_{Oi}/P_{Ii}) does not affect the estimates of %Δ TFP. However, exact proportionality is unlikely to hold. Consequently, the estimates should be treated as indicative only.

Summing up

The above indicative estimates suggest that high prices in the countries studied tends to be associated with both high financial performance and poor productivity in relative terms. If measurement error and differences in external factors are relatively small, the analysis also suggests that weaker competitive disciplines or less effective regulatory supervision prevail in countries with higher prices.

Table 8.8 Indicative estimates of productivity differences, 1997–1998

Country	*Financial performance*[a]	*PPP adjusted price differences*	*Indicative productivity differences*
	(%)	*(%)*	*(%)*
Finland	-14	-34	+31
Sweden	-21	-29	+11
Canada	-4	-17	+16
USA	-14	-12	-3
UK	-8	-2	-6
Australia	Base	Base	Base
France	-13	0	-13
New Zealand	+18	+29	-8
Japan	-20	+34	-41

a Financial performance is measured by sales revenue divided by expenses, where expenses exclude interest and company tax.

Note: These estimates are indicative only because the Commission could not obtain a robust index of input prices.

Countries listed in order of increasing PSTN prices.

Source: Productivity Commission estimates.

8.5 Benefits of lower Australian prices

With the exception of business mobiles, residential and business prices in the best performing countries are between 20 to 40 per cent lower than in Australia (see Table 8.9). This finding is consistent with previous studies.

This provides only an indication of the gap between Australia and the benchmarked countries with the lowest prices. The actual gap will be different because it was not possible to compare like-with-like. For example, the price gap would be less if Telstra and the other Australian carriers were disadvantaged by factors outside their control to a greater extent than their peers in the countries with the lowest prices.

Significant savings could flow to Australian consumers if prices were reduced, given that industry revenue for fixed and mobile telecommunications services equals some $20 billion and are an essential input to other industries in Australia.

Table 8.9 Relative prices of Australian telecommunications services, February 1998

Service	*Country with lowest prices*	*Ranking of Australian prices*	*Per cent by which best prices are below Australian prices*	*Per cent by which Finnish prices are below Australian prices*[a]
Residential services				
PSTN	Finland	6 of 9	23	23
ISDN	Sweden	6 of 7	41	24
Mobile	Finland	5 of 8	44	44
Small and medium business services				
PSTN for small business	Finland	7 of 9	40	40
PSTN for medium business	Finland	6 of 9	39	39
ISDN for small business	Sweden	6 of 7	43	32
ISDN for medium business	Sweden	4 of 7	46	35
Mobile for small business	Finland	3 of 8	14	14
Mobile for medium business	Finland	3 of 8	5	5
Data services for business				
Leased lines	Sweden	6 of 9	63	63
X25 (packet-switched)	New Zealand	6 of 8	52	48
Frame relay	Sweden	6 of 7	46	22
Large business services	Sweden	4 of 6	47	43

a Finland is used as the benchmark because its prices, overall, are the lowest.

Note: A ranking of 6 of 9 for Australia's prices for residential PSTN services (for example) means Australia has the sixth lowest prices out of 9 countries included in the particular comparison (given all the specified assumptions).

The business comparisons above are simple averages of comparisons for businesses of various sizes with a variety of patterns of demand for telecommunications services.

Source: Productivity Commission estimates.

A PARTICIPANTS

Organisations and individuals contacted by the Commission and its consultant, Eurodata, in the course of the study are listed below.

AB Stelacon (Sweden)

Amos Aked Swift

Australian Bureau of Statistics

Australian Competition and Consumer Commission

Australian Communications Authority

Australian Communications Industry Forum

Australian Internet Industry Association

Ausasean Telecommunications Solutions

Australian Telecommunications Users Group

Autorité de régulation des télécommunications (France)

Bureau of Transport and Communications Economics

Canadian Radio-Television and Telecommunications Commission (Canada)

Centre for International Research on Communications and Information Technologies

Centre for Telecommunications Information Networking

Consultel Australia

Department of Communications, Information Technology and the Arts

Department of Industry, Science and Resources

Federal Communications Commission (United States)

Global One

Horizon Telecommunications Pty Ltd

Ministry of Commerce (New Zealand)

Ministry of Transport and Communications (Finland)

Ministry of Posts and Telecommunications (Japan)

National Post and Telecommunications Agency (Sweden)

Network Strategies

Network Economies Consulting Group Pty Ltd

Office of Telecommunications (United Kingdom)

Omniconnect Pty Ltd

Optus Communications

Ovum Pty Ltd

Paul Budde Communications Pty Ltd

STM Consulting Pty Ltd

Telecommunications, Trans-European Networks and Services, and Postal Service Directorate (European Commission)

Telstra Corporation

Vodaphone

WWW.consult

Xavier, Patrick

A workshop was held on 17 December 1998 to provide a forum for the discussion of the study methodology, the presentation of results and their interpretations. Drafts of report chapters were circulated prior to the workshop on a ‘confidential work in progress’ basis.

The organisations and academics who were invited to attend the workshop are listed below.[1]

AAPT

ABN Amro

Albon, Dr Robert (Australian National University)

Australia Post

Australian Communications Authority

Australian Communications Industry Forum

Australian Competition and Consumer Commission

Australian Consumer Association

Australian Telecommunications User Group

Communications, Electrical and Plumbing Union

Department of Communications, Information Technology and the Arts

Department of the Treasury

Forsyth, Prof Peter (Monash University)

King, Prof Stephen (University of Melbourne)

Optus Communications

Ovum Pty Ltd

Paul Budde Communications Pty Ltd

Service Providers Access Network

Telecommunications Industry Ombudsman

Telstra Corporation

Vodafone

New Zealand Telecom requested and were granted an opportunity to comment on the draft report circulated to workshop participants.

1 Representatives from ABN Amro; Australian Communications Industry Forum; Paul Budde Communications Pty Ltd; and Ovum did not attend the workshop.

B TELECOMMUNICATIONS ECONOMICS

For over 100 years, policy makers have attempted to resolve a number of important issues in the economics of telecommunications. These issues arise out of the need to address the following:

- What policy framework best promotes the long-term interests of end-users in an evolving telecommunications industry?
- Is there a need for regulation? If there is, which of the regulatory arrangements available is best?
- Is there a need for subsidies? If there is, how should they be funded and targeted? and
- Given the existing industry arrangements, what is required to facilitate a transition toward better arrangements?

These issues are discussed in this appendix, drawing on a selective survey of the economics of telecommunications. The economic topics considered as part of this survey include:

- supply and demand in the industry;
- market power and barriers to entry;
- the economic need and rationale for regulation;
- the role for competition; and
- inter-connection regimes.

Understanding the economics of telecommunications also provides an appreciation of the many factors affecting price outcomes considered throughout this report — especially in Chapter 8. An understanding of the drivers of telecommunication costs and pricing structures is also necessary to appreciate the importance of the caveats placed on the price comparisons made in Chapters 5 and 6.

B.1 The complex nature of telecommunications

Telecommunications has been described as radically heterogeneous (Mueller 1997). The range of products on offer and production technologies used is immense and growing.

Products offered include voice telephony, video- and tele-conferencing, and various processing, informational and transaction services.[1]

Technologies used range from those used for the provision of the basic infrastructure — for example, microelectronics used in switches, exchanges and interexchange, cables, optical fibres, microwave relays and satellites — to those used for value-adding and information services — automatic teller machines, computers, remote sensing devices and various data storage media.

Further, telecommunications is a network industry. With a range of diverse and inter-connected products supplied over a network, the economics of the industry has a higher degree of complexity than most other industries (see Box B.1).

On the demand side, there is a high degree of inter-relation. For example, different subscriber's demands are often highly inter-related because many telecommunication services have value (or their value is enhanced) only when they are jointly used with others.

As the American Telephone and Telegraph Company 1908 Annual Report states:

> A telephone without a connection at the other end ... [is] one of the most useless things in the world. Its value depends on the connection with other telephones — and increases with the number of connections.

On the consumer side, there can also be economies of scope in consumption. This is because one product often builds on, and has greater value, when used with another — for example, auxiliary services like message banks, paging and call waiting.

On the production side, there are significant economies of scale and scope over some output ranges and product lines — in particular, on high traffic volume point-to-point carrier services. But in other cases, there may also be significant diseconomies — for example, historically, for local exchange networks serving large numbers of customers (Jones and Bigham 1931, Kahn 1971).

The nature of these economies is important because the industry is multi-layered. The outputs from some layers of the industry provide essential inputs for other layers of the industry (see Box B.2).

1 Nevertheless, there is some convergence between data and voice with digitalisation. As a consequence this multitude of services is increasingly provided by an integrated network.

Box B.1 The economics of telecommunications networks

The economics of telecommunications networks differs from the economics of most goods and services. Most economic analysis begins by treating outputs as identical and interchangeable — assuming a customer's demand is independent of others. With many network products these assumptions break down.

Communication is inherently a two-party or multiparty activity. Therefore, an individual's demand for access and use is highly dependent on others. Also, service is location and consumer specific — neither completely identical nor interchangeable.

Subscribers want wide ranging communication. They have some parties they communicate with frequently and regularly; a few they communicate with occasionally; and another group they contact as needed — emergency services and businesses (Mueller 1997).

These groups of potential subscribers have been referred to as 'communities of interest' (Vogelsang and Mitchell 1997). Unless other members of a subscriber's community of interest are also connected, the basic telephone service is valueless. In some cases, the members of a 'community of interest' form an exclusive group, separate from the wider community — for example, the members of a company, or the defence force. In these cases, there may be no loss in value where their network is disjoint from others. Indeed, there may be security reasons for separation. In most other cases, communities overlap hence one large interconnected network yields maximum benefits.

Interdependency means that each subscriber's access and use produces positive consumption externalities (unrequited benefits for others). Externalities mean that the 'penetration' and coverage of a network is important, providing part of the rationale for universal service and *any-to-any connectivity*. Principally, there are network externalities — people value others being subscribers because there are more people to contact; and call externalities — people value, but do not pay for, the calls they receive.

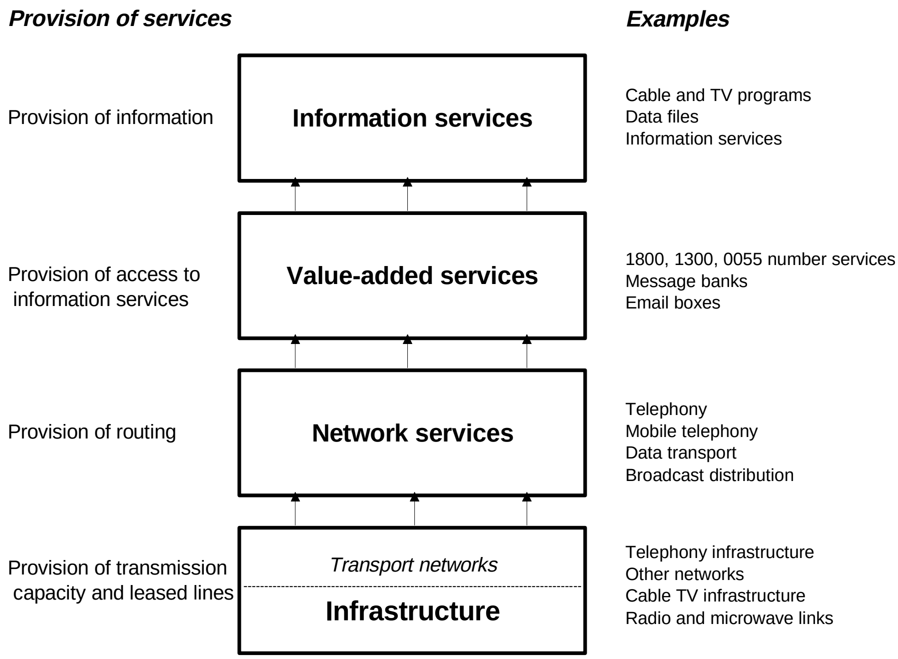
Network externalities are likely to be significant when a network has low penetration. For mature networks, the additional benefit to each existing subscriber, from one more subscriber, may be small (Taylor 1994). Call externalities may also be small because parties can always 'share' the cost of incoming calls by reciprocating and returning calls.

As discussed in later sections, telecommunications carriage may be a declining cost industry — as network capacity increases costs of usage may fall. However, one of the most significant economies in telecommunication arises from having an integrated network and the any-to-any connectivity this provides. In comparison, a large number of small, detached networks would be relatively ineffective and duplication can increase costs. Moreover, most users find a single network is more convenient because it means they are able to communicate with everyone else through a single access point.

Box B.2 The layers of service provision

Telecommunications has been characterised as having four layers (Vogelsang and Mitchell 1997). Each providing essential services to the layers above (see Figure B.1).

Figure B.1 The four layers of telecommunications and information services provision



The bottom layer provides the network infrastructure owned by the carrier — the transport facilities (cables, radio, microwave and satellite links) for telephone carriers, cable television distribution companies and television broadcasters. Parts of this layer are 'bottleneck' facilities. They are not easily by-passed by operators in the other layers.

The second layer provides routing services for the messages and signals. It consists of switches and control facilities, and the basic services provided are voice telephony, switched and packet data services, and television distribution.

The third layer comprises value-added services — 0055, 1800 and 1900 numbers, credit-card calling, message banks and email boxes.

The top layer is the information transported over the network — data files, television programs and the content on 0055, 1800 and 1900 services.

Source: Vogelsang & Mitchell (1997).

The layered structure is important when considering issues involving market power, because companies occupying niches in the higher layers depend on the services of companies in lower layers. Companies in higher layers risk having the rewards of their innovation and investment appropriated by carriers who own the ‘bottleneck’ facilities they rely on.

Finally, telecommunication is one of the most dynamic industries. Moreover, the rate of change in the industry has accelerated over the last two decades with the rapid reduction in the costs of microelectronics and the increased variety of information technology, multi-media content and other uses this has fostered.

B.2 Demand

Over time, the growth of telecommunications demand is becoming increasingly influenced by new services (for example, cable and the Internet), the availability of high quality content (voice, music, video or multimedia) for transmission across the network, and the exponentially decreasing costs of lines and routing (see Box B.3).

At any point in time, like most other products, the demand for telecommunication services is also influenced by subscribers’ demographic characteristics, their incomes, the prices of the services and the availability and price of other communication options.

As described in Box B.1, the demand for basic telephony and other party-to-party services is influenced by the number of subscribers connected to the network — that is, by the size of network and call externalities.

Most studies of telecommunications demand have concentrated on voice telephony services. They are subdivided into studies of residential and business demand for local, long-distance and international calls. Studies of the long-distance markets are further divided into studies of short-, medium- and long-haul demand.

Access and local calls

Local demand has two inter-related components — access (number of subscriber connections) and local calls (number of call-minutes).

Local calls depend on having access, and access is of value only if using the network has value. Whereas most economic goods are substitutes, access and local calls are complements. That is, if the price of access increases, the demand for access and local calls both decrease. If the price of local calls increases, demand for local calls and the numbers demanding access decrease.[2]

Box B.3 The demand for capacity

Historically, demand for telecommunications capacity depended mainly on the demand for voice telephony. Later this was augmented by increasing demand for telegraph, facsimile and data services. More recently demand for capacity has grown dramatically, stimulated by increasing computer processing speeds, use of the Internet and greater availability of capacity intensive uses and content — for example, video-conferencing and multi-media applications incorporating graphics, animation and video.

Growth has also been stimulated by rapidly falling costs of transmission. MacKie-Mason and Varian (1996) estimate that since the late 1960s telecommunications line and router costs have been falling at a compound rate of 30 per cent each year.

Some indication of the growth in demand for capacity is given by the growth in numbers of users and traffic on the Internet. In Australia, in 1995, there were 1.2 million users of the Internet. By mid-1997 this number had grown to 2.8 million (Appendix C, Table C.2). By the year 2000 this number is anticipated to more than double again.

Growth in Internet traffic volumes has been even more dramatic. For example, MacKie-Mason and Varian (1996) estimate that traffic on the United States NSFNET (part of the Internet backbone) has been growing at 6 per cent per month (more than doubling each year) since 1991.

Rapid growth in demand has also led to congestion. MacKie-Mason and Varian observe:

> The Internet has experienced severe congestion problems in 1987. Even now [1996] congestion problems are relatively common in parts of the Internet... (p.167)

A further indication of the potential increase in the demand for capacity that growth in the use of multi-media may stimulate is that although, with current infrastructure, 1400 pages of text (a 20 volume encyclopedia) may be sent across the Internet in half a minute, some upgrading would be required before high quality Internet video transmissions become widely available in real time.

Source: Lucky (1989), MacKie-Mason and Varian (1996).

The estimation of telecommunications demand has been made more difficult because of this factor and also due to the proliferation of different ‘call plans’

2 Estimates of cross price elasticities — the per cent change in the demand for access given a per cent change in the price of usage (and vice versa) — have not generally been estimated. However, Taylor (1994) provides a formula for inferring their value indirectly from access and usage price elasticities and their revenue shares.

that are provided to subscribers. More recently, with increasing competition and the rapid development of new services, obtaining comprehensive price and usage data has been difficult. Nevertheless, the results of different studies have been broadly consistent.

The effects of the many demand factors are typically measured by elasticities, for example by:

- *Income elasticities* which measure the per cent by which the demand for a telecommunication service increases in response to a one per cent increase in income; and
- *Price elasticities* which measure the per cent by which the demand for a telecommunication service decreases in response to a one per cent increase in price.

Surveys of local demand studies, reported in, for example, Taylor (1994), Bureau of Transport and Communications Economics (BTCE 1994) and Albon, Hardin and Dee (AHD 1997), indicate that the demand for access is relatively unresponsive to price (it is very price inelastic). The elasticity estimates reported range from 0.10 to 0.003 (see Table B.1).

Table B.1 Price elasticities of residential demand for access

Study	*Price elasticities*
Perl 1984 (United States)	around 0.04 at a penetration rate[a] of 0.93
Taylor and Kridel 1990 (United States)	around 0.04 at a penetration rate of 0.93
Cain and MacDonald 1991 (United States)	varying from 0.05 to 0.10 at a penetration rate of 0.95
Bodnar, Dilworth and Iacono 1988 (Canada)	about 0.01 at a penetration rate of 0.98
Madden, Bloch and Hensher 1993 (Australia)	about 0.003 at a penetration rate of 0.99

a The penetration rate is the proportion of households initially connected.
Source: AHD (1997); BTCE (1994), Taylor (1994).

Two important influences on access elasticities have been noted (Perl 1984). First, (holding other factors constant) access demand has become significantly less responsive to price changes since the 1970s.[3] This may be due, in part, to a relative increase in the cost of other forms of communication. Second, demand for access is found to be less price sensitive at higher rates of penetration (per cent of residences having telephones). This may be linked to the increased benefit to subscribers when penetration is high.

3 This study also found that the benefits from access, or subscribers' willingness-to-pay for access, has increased.

On the basis of their survey of previous studies, AHD (1997) concluded that price elasticities of 0.04 and zero for residential and business access respectively, are representative for Australia.

Table B.2 Price elasticities of demand for local telephone calls

Study	*Price elasticities*
Park, Wetzel and Mitchell 1983 (United States)	about 0.09 for per call about 0.11 for per call minute
Bidwell, Wang and Zona 1995 (United States)	about 0.04 for per call
Trotter 1996 (United Kingdom)	about 0.04 for per call minute
New York Telephone Company 1976 cited in Taylor 1980 (United States)	about 0.10 for basic residential service about 0.18 for basic business service
Waverman 1974 cited in Taylor 1980 (United States)	about 0.21 for basic residential and business service in the short run about 0.27 for basic residential and business service in the long run
Davis, Caccappolo and Chaudry 1973 cited in Taylor 1980 (United States)	about 0.09 for per call about 0.11 for per minute

Source: AHD (1997); BTCE (1994); Taylor (1994).

Various studies have also reported price elasticities for local calls which ranged from 0.04 to 0.27 (see Table B.2). AHD (1997) concluded that a residential and business price elasticity for local calls of 0.06 is representative for Australia.

Both, access and local call demand seem to be more responsive to income with their income elasticities ranging from 0.07 to some estimates of long-run values in excess of 1.5. Most estimates for both, though, are less than 0.5 (see Taylor 1994).

Income also influences sensitivity to price. Those on lower incomes have higher local call and access price elasticities. Again, differences appear to decrease as penetration increases (Taylor 1994).

Network externalities

Estimates have also been made of network externalities — that is, the increase in service value that existing subscribers receive when a new subscriber connects. One reason for interest in these externalities is that they form an important justification for mandating interconnection, since without this, expectations about which network would become largest would drive the choice of service provider (Katz and Shapiro 1985).

The existence of the externalities has also been argued as justifying an access subsidy for some subscribers. This is because others gain when an additional subscriber connects so there may be a net benefit to all subscribers if some subscribers, who wouldn't otherwise connect, are charged a lower access charge.

Using data on the United States, Perl (1984) found that, overall, the gains to all subscribers from network size are quite significant (see Table B.3).[4]

Table B.3 The effect of local network size on the value, to an average household, of telephone services

Local network size (subscribers)[a]	*Phones per square mile*	*Value*[b] *of telephone service in 1983*
(No.)	*(No.)*	*(US$)*
25 000	100	$56.02
50 000	200	$60.38
100 000	400	$61.55
500 000	2000	$68.40

a The number of subscribers sharing the local network.
b The estimated value, per year, is the average net benefit a subscriber gains from having a telephone and being able to contact others in their local area.
Source: Perl (1984) (United States), Figure 16.

Perl also estimated the benefits of an optimal access subsidy scheme designed to maximise subscribers net benefit. High penetration rates meant that access elasticities were close to zero. Consequently, Perl found that, for the average American household, the additional gains from an optimal subsidy were negligible — benefits almost eliminated by the administrative costs involved.

Long-distance and international calls

The demand for long-distance and international calls is relatively price elastic compared with local calls. Elasticities reported in the Taylor (1994), BTCE (1994) and AHD (1997) surveys range from 0.21 to 1.55 and 0.07 to 1.54 for long-distance and international calls, respectively (see Table B.4 and B.5).

The international price elasticities tend to be larger than the long-distance elasticities. Based on their survey, AHD selected elasticities of 0.60 for long-

4 Although the average or total network externality was large, high penetration rates meant that the additional externality created by an extra subscriber is low.

distance calls and 1.20 for international calls as being representative for Australia.

Table B.4 Price elasticities of demand for (domestic) long-distance telephone calls

Study	*Price elasticities*
Duncan and Perry 1994 (United States)	about 0.38 for call minutes
Gatto, Langin-Hooper, Robinson and Tyan 1988 (United States)	about 0.72 for call minutes
Madden, Bloch and Hensher 1993 (Australia)	varying from 0.53 to 1.01 for call minutes according to distance
Train 1993 (United States)	about 0.42 for call minutes
BTCE 1991 (Australia)	about 0.93 for number of calls
Martines-Filho and Mayo 1993 (United States)	varying from 1.05 to 1.55 for number of calls
Appelbe, Snihur, Dineen, Farnes and Giordano 1988 (Canada)	varying from 0.21 to 0.39 for short-haul call minutes about 0.48 for long-haul call minutes

Source: AHD (1997); BTCE (1994); Taylor (1994).

Table B.5 Price elasticities of demand for international telephone calls

Study	*Price elasticities*
Hackl and Westlund 1996 (Sweden)	varying from 0.07 to 1.38, according to distance, for call minutes
Acton and Vogelsang 1992 (United States)	about 0.36 for number of inbound calls about 0.49 for number of outbound calls
Bewley and Fiebig 1988 (Australia)	about 1.54 for minutes of use on long-haul calls
Appebe, Snihur, Dineen, Farnes and Giordano 1988 (Canada)	varying from 0.43 to 0.53 for call minutes
BTCE 1991 (Australia)	about 1.01 for number of calls

Source: AHD (1997); BTCE (1994); Taylor (1994).

B.3 Supply

The costs of supplying telecommunication services are highly dependent on economies and diseconomies related to the:

- nature of the technologies used;

- location and distribution of subscribers — which determines the configuration of the network; and
- numbers of companies that make up the network.

Technical economies and diseconomies

Telecommunication outputs are typically measured in terms of the:

- network's capacity to transmit information;
- numbers of subscribers served; and
- flow of services provided — for example, number of call minutes.

Using these measures, technical economies in telecommunications are generally associated with capacity, the flow of services and the location and distribution of subscribers (see Boxes B.4 and B.5).

Diseconomies are associated with numbers of subscribers — particularly, in local call areas (see Box B.4). The reason for this is the technology used to provide telecommunications services.

The typical telecommunications network comprises lines and switches. In the generic network, there are lines from customer premises to a set of switches, and then lines or other media to another set of switches, with lines to the called party completing the circuit (see Chapter 2).

Lines supply the capacity of the network. Point-to-point telecommunication lines (or other media, for example, microwaves) have significant economies of scale relating to capacity. That is, per unit of capacity, a line with greater capacity is cheaper to provide. These economies mean, as a rule, that the cost of a service can be more heavily dependent on the volume of traffic point-to-point than on the distance involved.

Nevertheless, it is important to note that many of the economies of scale related to capacity can only be realised by decisions made before it is provided.[5] As a result, it is usual for telecommunications companies to install a much larger capacity to save on the long-term costs of accommodating increases in demand.

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5 However, doubling existing capacity by laying an identical line exhibits economies of scale. There are economies because the cables can be layed in existing conduits and right-of-ways. Also, increased capacity allows higher average occupancy of circuits with a lower probability of lost calls (Saunder, Warford and Wellenius 1994). Also, separate lines can improve the integrity of the network. With separate lines there need be no interruption of service when a single line fails.

Box B.4 Empirical studies of economies in telecommunication networks

A number of empirical studies have examined the extent to which there are economies of scale[a], scope[b] or sub-additivity[c] in telecommunications networks. The results of these studies have been equivocal. Also, rapid technological change means that further caution is required when interpreting these results as applying to the current and future cost characteristics of the industry.

The earliest system-wide econometric studies of the telecommunications industry, using highly aggregated input and output measures, revealed, in some cases substantial, economies of scale and scope (see Sharkey 1982).

Reviewing these and later studies, Saunders, Warford and Wellenius (1994) state that a 1 per cent increase in inputs has been associated with a 1.05 to 1.15 per cent increase in outputs. Other studies have re-examined some of the earlier data and used new data with new methods and higher levels of disaggregation. The results in these studies have varied considerably with different results having been obtained with the same data sets.

Evans and Heckman (1984), for example, concluded the US ‘Bell system’ does not have natural monopoly characteristics. Shin and Ying (1992) came to similar conclusions. However, others, with the same (or similar) data sets have reached different conclusions (Charnes, Cooper and Sueyoshi 1988, and Roller 1990).

A problem with all the above studies has been the difficulty in unravelling underlying costs structures in the presence of rapid technological change and given the poor quality of data available (Gabel and Kennet 1994).

Reviewing some of this work, Saunders, Warford and Wellenius (1994) report that studies of long-distance transmission show that a 1 per cent increase in scale is associated with a 0.6 per cent reduction in average unit cost. They also report that there can be large economies associated with switching and routing. For example, mutli-plexing and other factors mean that as a network’s size increases, average circuit occupation can be increased because more customers share the circuits.

a Economies of scale exist where output can be increased proportionately with a less than proportionate increase in inputs.

b Economies of scope exist where costs can be reduced by producing a group of outputs together.

c The concept of sub-additivity is used to evaluate ‘size’ economies in multiproduct companies. Sub-additivity exists where use of the best available production technology means that a single multiproduct company is able to produce the same total outputs at a lower cost than any combination of two or more companies (Sharkey 1982).

Source: Charnes, Cooper and Sueyoshi (1988); Evans and Heckman (1984, 1988); Sharkey (1982).

Box B.5 Economies of scale, scope and density

The importance of economies of density is confirmed by Guldmann (1991). This study examined density and economies of scale in local telephone networks. It found that once a certain level of density and market size was achieved (about 50 000 telephone stations), economies of scale had been exhausted. Guldmann inferred that, above this level, markets could support more than one company competing side-by-side.

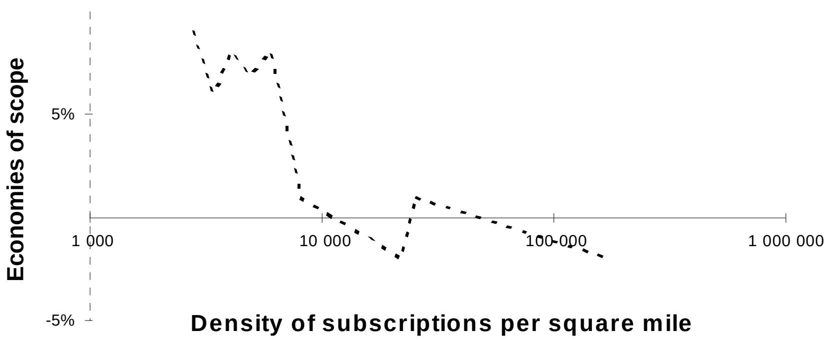
Gabel and Kennet (1994) used an engineering approach to examine economies and diseconomies of scope and their relationship to density in the local areas. Economies of scope exist where costs can be reduced by producing or providing two or more products together. In this case, the economy of scope was measured by the per cent additional cost if different services were provided separately on two or more networks rather than providing all the services together on a single network.

The four services examined were exchange switched service, toll switched service, local private line service and toll private line service.

Using an optimisation model they concluded economies of scope tend to decrease as the density of numbers of subscriptions in a local area increases. Nevertheless, they found that their results vary according to the detail of local topography and patterns of demand.

Their comparison of a single network providing all services with the services divided amongst two or more networks is presented below. In two of the three most densely populated markets they modelled, they found that there were some diseconomies of scope if all services were provide on one network. In these cases, it was better to have a separate private line network (providing local and toll private services) and a switched network (providing exchange and toll switched services).

Estimated economies and diseconomies of scope in providing services in local areas



Source: Gabel and Kennet (1994); Guldmann (1991); Sharkey (1982).

Consequently, capacity is described as being ‘lumpy’ because of the large increments installed, due to these economies.[6] This lumpy nature of investment means that there are short-run ‘economies of fill’ while capacity is underutilised (Sharkey 1982).

Switches are required to route calls from one subscriber to another. The need for switching capacity is dependent on the subscriber numbers, their location and distribution, and the distance between parties completing a call.

Switching equipment also has economies of scale. Some economies (referred to as economies of massed reserves) relate to the cost reductions and improved quality of service as the number of switches increases. Because of the random nature of telecommunication demand, as the base level of demand for switch use increases, proportionately fewer switches are required to handle the variations in demand. Other economies relate to some of the fixed costs associated with switching facilities which do not vary with facility size (Saunder, Warford and Wellenius 1994).

That said, the need for switching equipment capacity increases more than proportionately with the number of subscribers, resulting in off-setting diseconomies (Mueller 1997).[7] This is because the system of switches needs to be capable of connecting each new subscriber with all the existing subscribers. The significance of these diseconomies has been largely eliminated by technological developments. Nevertheless, the diseconomy may have influenced the results of some econometric studies which have used historical data.

Although numbers of subscribers can produce a diseconomy, the diseconomy can be misleading. It does not, for example, infer that two or more separate networks are necessarily better than a larger network (see Box B.4).

A network is only of value if it connects a subscriber to a desired party. In disjoint networks the value from being able to contact the widest number of other parties (the network externality) is reduced, because subscribers are split into separate groups. Consequently, the existence of network externalities implies that assessment of any technical diseconomy related to the number of

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6 However, on occasion, new technology has allowed the capacity of existing lines to be increased forestalling a need for new lines.

7 Historically, the growth in the size of an exchange, always increased the average costs associated with switching and maintenance, and these diseconomies were not offset by other economies. During the 1930s, public utility textbooks typically contained explicit discussion of this feature of telephone systems (Jones and Bigham 1931). Also, American utility commissions usually granted rate increases as exchanges grew (Mueller 1997, p. 15).

subscribers needs to be balanced against the increased utility provided by an integrated network.

Effects of demography

Demographic factors can impact on telecommunication costs. In particular, countries which have their populations concentrated in small areas may have cost advantages resulting from economies of density.[8]

In telecommunications, economies of density exist because a shorter average length of line (per subscriber) is required in areas where subscribers are more densely located. Also, as population density in an area increases main lines can benefit from economies of scale and massed reserves from the higher average traffic volume.

An indication of the magnitude of these economies of density is provided by the relationship between subscriber line density and average line cost (see Table B.6). As Table B.6 indicates, there is an inverse relationship between density and the average cost per line.

Average population densities (total population divided by land mass) vary substantially between countries and this might suggest that costs vary in a similar manner. However, this need not be the case. Although broad aggregates would provide a guide to cost impacts if the population in each country was uniformly distributed, they are misleading where a large proportion of a population is urbanised or living in a relatively small part of a large country.[9]

Detailed information on the distribution of line densities within each country is required to accurately assess the impact of variations in line density across countries. This would allow the impact of density on average cost per line in a country to be more accurately estimated. For example, the average cost per line for a country could be estimated as a weighted sum of the costs per line for each density category where the weights are the proportion of lines falling in the different density categories in that country.

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8 Economies of density exist where the per unit cost of providing a product (or range of products) is reduced as the density of customers being served in an area increases. There are also economies of fill and economies of traffic density. These are related to the lumpy nature of investment, and economies of scale related to increased point-to-point traffic.

9 For example, despite Australia having an overall average line density of 3.3 lines per square mile, Telstra provides 74 per cent of its lines in areas with an average line density of 300 or more, and a further 16 per cent in provincial districts where the average line density is over 20 per square mile (NECG 1999c).

The Commission invited Telstra to provide disaggregated information on the distribution of line densities in Australia and the other benchmarked countries so that the actual impact could be assessed. Telstra commissioned NECG Ltd to prepare a paper on the issue. Some information was provided on the distribution of line densities in Australia, along with results from two cost models which provided a cost–line density relationship (NECG 1999c). However, the lack of similar information for other countries precluded an assessment.

Table B.6 Average line cost by line density

Line density	*Average line cost*[a]	
	Hatfield Model	*Benchmark Cost Proxy Model*
(lines per square mile)	*(US$ per month)*	*(US$ per month)*
0 to 5	131	162
5 to 10	41	63
100 to 200	22	39
200 to 650	17	33
650 to 850	14	32
850 to 2550	12	29
2250 to 5000	10	27
5000 to 10 000	9	24
Greater than 10 000	6	21

a These average line costs were provided by Telstra. The estimates are derived from two US models, the Hatfield Model and the Benchmark Cost Proxy Model developed by Bell South, Indetec International, Sprint and US West. The estimation was undertaken by Charles River Associates using standard model inputs for the US states of Florida, Georgia, Maryland, Missouri and Montana. Although indicative of the magnitudes of the economies of density in telecommunications, Telstra stated that these results are not directly applicable to Australia.

Source: NECG (1999c).

Others have examined the impact of population density and its distribution on cost in Australia. In its 1995 benchmarking study, the Bureau of Industry Economics (BIE) stated that it was difficult to substantiate evidence that comparisons were being significantly influenced by countrywide average densities (BIE 1995).

Ergas, Ralph and Sivakumar (1990) also noted that the population density in the inhabited parts of Australia (where there is at least one inhabitant per 8 sq km) was not significantly lower than that in the inhabited parts of Canada and the US, and that the distribution of subscriber loop lengths in the Australian network is not very different to that in the US.

Ovum (1998) concurred by suggesting that, although the distribution of line densities may influence the relative prices of some countries to some degree, the overall impact on Australian costs is not very large. Ovum supported the conclusion by noting that in Australia, for example, over 55 per cent of the population lives in the 5 largest cities compared with 20 per cent for Sweden and approximately 8 per cent for the US and the UK.

Organisational economies and diseconomies

Telecommunications companies may also experience organisational economies and diseconomies related to their size that are typical of any business.

For example, there are economies because some management functions and operations are not heavily dependent on size. Larger organisations can have scale economies in marketing, advertising and billing. Relative numbers of maintenance staff and inventories can be reduced. Finally, a larger organisation has greater bargaining power and thus may have better and lower cost access to finance and other resources (Saunder, Warford and Wellenius 1994).

However, as with any organisation, a telecommunications company may become so large that diseconomies set in. As its size expands and the distance between the top and bottom of its organisational hierarchy increases, the company may become increasingly ineffective and unresponsive to the particular needs and circumstances of their subscribers. For example, staff at lower levels may have inadequate authority and incentives to efficiently respond to local concerns (Saunder, Warford and Wellenius 1994).

The reduced flexibility engendered by a large organisation may cause further diseconomies (Saunder, Warford and Wellenius 1994). Flexibility and responsiveness may be reduced by a standardisation of the services provided, of job classifications, work and pay conditions. A reduction in flexibility may also result in dynamic inefficiencies. For example, organisational inertias, including failure to delegate authority and requirements to consider organisation-wide implications of decisions, may reduce the speed with which under-utilised resources are shed or redeployed (Saunder, Warford and Wellenius 1994).

There may also be diseconomies of scope associated with the industry's multilayered structure (see Box B.2). That is, the different types of activities undertaken in different layers may be better suited to different types of organisation. For example, the bottom two layers of the industry involve the provision of network infrastructure and other carriage services. The nature of these services is radically different from the services provided by the top two layers — value-adding services and the provision of content. Whereas the former tend to be capital intensive and use specialised technical labour, the latter services are more reliant on a sales and marketing orientation.

Effects of innovation on economies and diseconomies

A number of researchers suggest that technological innovation may be reducing any existing economies of scale and scope in mature telecommunications networks (for example, King and Maddock 1996).[10] They note, for example, that recent technological advances have dramatically lowered costs, reducing the significance of these barriers to entry and allowing entrants to compete more effectively with incumbents.

In addition, technological innovations mean that many countries now have separate and competing mobile networks, as well as local networks for both voice telephony and cable TV. Each of these networks can also be used for other telecommunications services.

Effects of different economies on prices

Regardless of the extent to which there are economies in telecommunications, these effects do not appear to be reflected, significantly, in price differences between countries. Research has found only a weak effect on observed price differences (OECD 1990).

For example, OECD (1990) using a cross-country sample examined whether low aggregate line densities were correlated with higher prices. They found that they were, but not significantly so — the R-squared between the two was only 0.010. When an index of urbanisation was also included as an explanatory variable, the overall R-squared increased to 0.238.

B.4 Market power and barriers to entry

From the time the telecommunication industry began, central policy concerns have been the extent to which:

- parts of the industry are a monopoly or have barriers to entry; and
- there is scope for the exercise and abuse of market power.

For many years, the industry was commonly described as a natural monopoly (Sharkey 1982). Although more recently this characterisation has been re-assessed, concern about market power and barriers to entry persists.

[10] That said, the effects of future technological advances are unknown.

Sources of market power

The scope for market power, in most industries, relies on barriers to entry. Potential entrants either are unable to enter the industry or face significant disadvantages, when compared with incumbents, after they enter.

Factors that create barriers to entry include:[11]

- *Incumbent cost advantages* — a single or small number of companies may be able to satisfy demand at a lower cost than potential entrants;
- *Legislation* — entry into the industry may be unlawful or the legislative framework may permit the incumbent to engage in entry deterring practices;
- *First mover advantage* — the original entrant into a market may gain advantages, at little or no cost, that are costly for 'latecomers' to overcome to compete on an equal footing. These include: favourable location, brand loyalty, control of standards, network externalities, one-to-one connectivity and other 'lock in' effects (Arthur 1989); and
- *Irreversible investment* — because a sunk (or irreversible) investment has no alternative use, and the money on it has already been spent, the expenditure need not be factored into the incumbent pricing decisions. Entry may be deterred because this makes the threat of a price war more credible.

All these barriers to entry may play a role in telecommunications carriage. Consequently, many components of the network infrastructure are referred to as 'bottleneck' facilities. However, with changing technology the magnitude of these barriers and their significance need to be reconsidered.

Historically, the barriers to entry most often emphasised were cost advantages due to economies of scale or scope. A common belief was that multiple outputs provided by carriers could only be produced, at least cost, by a single company.

In many countries, belief in the existence of cost advantages (as well as the benefits from keeping a network unified) also provided support for the creation of legislative barriers to entry. Moreover, a concern was that regulatory protection was required because the industry might be an 'unsustainable' monopoly and inefficient entry (cream-skimming and by-pass) could occur.[12]

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[11] To some extent, barriers to entry categories overlap. Nevertheless, the categorisation is useful because it provides different perspectives for examining the related impediments and may suggest different policy prescriptions.

[12] Cream-skimming occurs when an entrant chooses to service only the most lucrative parts of a market the incumbent being left to provide a complete service. This may be inefficient

Nevertheless, the view that market power in telecommunications simply resided in cost was never universal. Others argued that the most significant barriers to entry can be sourced to the network externality (Kahn 1971, Mueller 1997). As outlined earlier, this beneficial externality is maximised by any-to-any connectivity — subscribers linked to a single integrated network.

Kahn (1971) noted that for local exchange network providers to compete head-to-head, without interconnection, subscribers would have to be connected directly to both companies. In this case, a duplicate local exchange network may contribute nothing and a single network is cheaper than two (Sharkey 1982).[13]

Mueller (1997) argues that the significant efficiencies reside on the demand, not the supply side. One network with complete coverage makes a telecommunication service cheaper to consume by eliminating a need for duplicate subscriptions (see Box B.6).

This barrier is enhanced because subscribers may not be easy to entice away from an existing network unless a competing network:

- offers the same or a better ‘universe’ of subscribers; and
- more than covers the inconvenience of the change.

The above suggests that the network externality provides an incumbent carrier with a significant first mover advantage where it is able to refuse to interconnect an entrant with its existing subscriber base at ‘reasonable’ prices.

Even where there is interconnection at reasonable prices, the lumpy and irreversible nature of investment can constitute another significant barrier to entry (Dixit and Pindyck 1994). If an incumbent carrier has more capacity than necessary to meet current demand it has strong incentives to engage in predatory

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where there are externalities because the lucrative parts of a market may rely on the whole market being serviced. And, if the revenue from more lucrative parts of the market is not available to cover common costs, providing service to the rest of the market may become uneconomic. An incumbent’s monopoly may also become ‘unsustainable’ due to social policies. For example, problem can arise if entry is permitted if Universal Service Obligations (USOs) require prices that are not differentiated by costs (that have to be funded by cross-subsidies between geographical regions or customer types). Entrants will cream-skim the parts of the market that bear the cost of the cross-subsidies seriously eroding the incumbents revenue base.

13 An exception to this is where duplicate networks, serving some other purpose, already exist — for example, to supply electricity or cable television (Vogelsang and Mitchell 1997).

Box B.6 Monopoly or simply market power?

A long standing yet largely unresolved issue in telecommunications has been whether any components of the basic carrier infrastructure have significant monopoly characteristics. Monopoly characteristics are of interest because they can provide a company with substantial market power.

Debate amongst policy makers and researchers has centred mainly around whether telecommunications is a natural monopoly. A natural monopoly occurs where a single provider is able to produce the industry output at a lower cost than two or more providers. In this case, from the viewpoint of productive efficiency, the socially optimal market structure is a single provider. Consequently, economists also call this type of monopoly a ‘normative’ monopoly.

However, even where there are the conditions for natural monopoly, monopoly need not occur. First, a monopoly may be unsustainable. To cover its costs, a company may need to charge above its ‘marginal costs’. (The marginal cost of an output is the additional cost of providing the last unit of output.) Unsustainability may allow other companies to enter and co-exist. Unsustainable natural monopoly is believed to be quite exceptional. Nevertheless, the possibility has been used to provide a rationale for creating legislative barriers to entry in monopoly markets (Vogelsang and Mitchell 1997). Second, a potential monopoly business may find it profitable to co-exist with competitors. That is, even where monopoly is sustainable, a potential monopolist may find its profits maximised by prices high enough to allow some others to enter.

Whether there are significant cost advantages for a single carrier in any of the carriage services markets is a hotly disputed issue. See, for example, Evans and Heckman (1984) and Röller (1990). More importantly, there do not appear to be cost advantages for a single provider in the value-adding and content services markets.

Nevertheless, for many carriage services an incumbent network has substantial market power — sourced in the network externality, rather than cost advantage (Mueller 1997). These advantages mean that, regardless of its cost characteristics, many components of a network are ‘bottleneck’ or essential facilities. The facilities are essential because they provide access to the subscriber base on which the network externality depends.

The bottleneck that carriers control (mainly in the local loop — the final connection from an exchange to a subscriber) can give them the power to dominate otherwise competitive markets that rely on carrier services. This is referred to as monopoly leverage (Vogelsang and Mitchell 1997 p. 57).

Source: Knieps and Vogelsang (1982), Mueller (1997), Vogelsang and Mitchell (1997).

pricing in any entered market.[14] This suggests that entry is most attractive where demand is unmet or markets are expanding. This has been the case historically.

Risks from market power and barriers to entry

The exercise of market power is an issue because it can result in inequitable and inefficient outcomes. Market power can be inequitable because subscribers may have to pay significantly higher prices than can be justified on the basis of cost.

Market power and barriers to entry can also create inefficiencies because they can create situations where, at least in principle, resources could have been used in a way that would have made everyone better off (see Box B.7).

Market power can create allocative, productive and dynamic inefficiency. Allocative inefficiency results where some demands remain unsatisfied because of high profit maximising prices even though the additional cost of supply is less than customers would be willing to pay.

Productive inefficiency may exist where barriers prevent more efficient entrants from taking business away from an incumbent. Productive efficiency may also be due to X-inefficiency resulting from the absence of competition. That is, without the threat of losing business to competitors, an incumbent is under less pressure to minimise costs and achieve productive efficiency.

Barriers to entry also create dynamic inefficiencies, again by protecting an incumbent from cost reducing competitive pressures, limiting the diffusion of new ideas and technologies, and, sometimes, creating perverse incentives to over- or under-invest.

Market power is a particularly important issue in telecommunications because, as described in Section B.1, the industry comprises several interdependent layers. The services provided by a carrier or carriage service operator form essential inputs into the higher layers in the industry (value-adding and content services).

The exercise of market power in vertical production relationships presents two risks. First, market power at more than one layer involves a risk of ‘double marginalisation’. This happens when two or more companies in a vertical production chain each add a ‘margin’ reflected in the final price. The resulting price can be higher than if the companies had merged and also exercised market power as a single entity (King and Maddock 1996).

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[14] Nevertheless, it is extremely difficult for an outside observer to distinguish between predatory pricing and the efficient response of an incumbent to an increase in competition.

Box B.7 Efficiency

The term 'economic efficiency' (or efficiency) is often used with reference to a benchmark of Pareto efficiency (or the allied concept of a potential Pareto improvement).

A Pareto efficient outcome (or a Pareto optimum) is a situation in which it is not possible to make someone better off without making at least one person worse off. Making one or more better off, without any one losing, is referred to as a Pareto improvement. If a change leads to circumstances where those gaining, could in principle, compensate those who lose (with everyone made better off), the change is referred to as a potential Pareto improvement.

Use of the criterion of efficiency — that is, whether an option is more efficient than alternatives (and represents a potential Pareto improvement) — is important when assessing the merits of policy options. Where an option is not efficient, it may be possible to achieve the same policy objective with fewer resources.

The concept of economic efficiency has been subdivided into *allocative efficiency*, *productive efficiency* and *dynamic efficiency*. These concepts are also based on the idea of Pareto efficiency.

Allocative efficiency is achieved when the prices of products (goods and services) reflect their relative scarcity. When prices are allocatively efficient, products tend to go to those who value them most (as expressed by their willingness-to-pay for them).

Productive efficiency is achieved when goods are produced in a technically efficient way — that is, in the way that minimises on inputs used (capital, labour and so on). Productive efficiency also requires that the mix of inputs used is allocatively efficient. That is, when the choice of inputs minimises cost, so that output is maximised per dollar spent on inputs.

Dynamic efficiency is achieved when incentives exist for resources to move over time to their highest value uses, in particular by encouraging efficient investment, research and development, and the diffusion of new ideas and technologies.

Second, carriers could use market power to appropriate rents in 'down stream' markets. If value-adding and content services are unable to recoup adequate returns from innovation, intellectual property and other sunk investments, future investment could be stifled.

Evidence of the exercise of market power and the significance of barriers to entry in telecommunications has been muddied by a long history of either comprehensive regulation or government ownership in all developed countries.

Nevertheless, the US provides some evidence of unfettered market behaviour from a period of relatively light regulation starting in 1894, when the last Bell patent protecting the telephone expired, and ending in the mid-1920s, when a final unification of telephone services had been achieved (Mueller 1997).

In 1894 the national network was relatively immature. The telephone was not a dominant mode of communication. In total, the US had about 280 000 telephones, so penetration and coverage was low.

The main carrier was the American Telephone and Telegraph Company (AT&T) which had owned the Bell patents. AT&T had a number of ‘franchises’ and a long-distance network which constituted the ‘Bell system’. Many markets were untapped and demand was growing rapidly.

Competition was vigorous and so was AT&T’s response to it (see Table B.7). Mueller (1997) states that AT&T embraced five tactics as a response to entry by independents:

- ‘fighting rates’ — temporarily lower prices to drive an independent out of a market;
- buying out the competitor;
- improving and extending AT&T’s service;
- interfering with (local governments) franchising of independents;
- spreading unfavourable publicity about independents to deter subscribers and financiers (Mueller 1997, p. 70).

In 1906, the independents began to combine, threatening to form a viable long-distance rival to AT&T. AT&T met this challenge by acquiring independents and otherwise improving the terms on which it would interconnect with independents. The potential long-distance rival lost critical mass.

Despite these tactics, some competition occurred (see Table B.7). Where there was overlap, subscribers were typically offered services on two or more separate networks. This was referred to as dual service.

Dual service meant that, initially, the vast majority of large business had dual subscriptions. (For example, by 1910, 75 to 100 per cent of banks, railroads, hotels, and wholesale farm suppliers had dual subscriptions where two or more services were available.) Dual service resulted in additional cost and inconvenience. Many had to pay two subscriptions and consult two sets of telephone directories before making calls.

Table B.7 Telephony competition in the US — 1894 to 1914

Period	*What happened*
Phase 1: 1894 to 1898	Over one thousand commercial independent telephone companies started operation — often as the 'first mover' in their local area. Many failed — depending on community size between 15 to 40 per cent. Some independents attempted to compete head-to-head with the Bell system in large cities. Mueller (1997) reports initial efforts almost always failed for three reasons. Political manoeuvring was complicated and expensive. The heavy capital equipment investment required to match Bell. And, the Bell service was reasonably good — complaints only about its high price and Bell undermined entrants with rate concessions. Both the independent exchanges established in 1894 in cities with populations greater than 50 000 failed within five years.
Phase 2: 1898 to 1907	A period of system overlap (dual service). In 1897, the Bell system (Bell and independents connected to Bell) comprised 415 000 telephones and independents (not connected to the Bell system) a further 100 000. By 1907, the Bell system comprised almost 4 million telephones and unconnected independents a further 2.3 million. Helped by growing dissatisfaction with Bell's prices, independents succeeded in a new wave of competition for the cities by concentrating on city peripheries. Between 1897 and 1904, the proportion of communities with populations greater than 5000 served by competing exchanges increased from 23 to 60 per cent. 'Dual service' competition quickly yielded price and service improvements that often doubled numbers of subscribers in affected cities within a year. However, dual service produced problems. And, at that time telephone companies were not required to physically interconnect with rivals. Moreover, AT&T made it a policy not to interconnect where it or one of its franchises had a presence.
Phase 3: 1908 to 1914	This was the 'shake-out' period for competing 'dual service'. After 1906, independents began to develop competitive long-distance lines. Large independent regional operating companies were formed through mergers and the independents started to threaten the Bell system's long-distance market. Mueller states this threat gave AT&T a clearly defined goal as 'the elimination of dual service and the creation of a nationally interconnected monopoly administered by Bell but supervised by regulators (p.107)'. From the beginning of 1907, the number of independent telephones interconnected to Bell rose, in two years, from less than 300 000 to 1.2 million. By 1913, the per cent of cities with population over 5000 with dual service fell from 59 percent to 37 per cent. During the period, AT&T also acquired a number of competitors. The rapidity of the acquisitions fuelled an already high level of anti-monopoly sentiment. In 1913, to forestall litigation and potential antitrust action or government acquisition AT&T made the 'Kingsbury Commitment' to the US Department of Justice (to cease acquiring and to interconnect). The combined effects of these factors meant that by 1914 two thirds of all independent telephones were connected to the Bell system — although, more than 1800 cities still had unconnected, competing exchanges. However, by the mid-1920s the remnants of dual service had been eliminated through further interconnection and consolidation.

Source: Mueller (1997).

However, dual service did not endure. Mueller (1997) reports that as the duplication continued, eventually, one carrier or the other tended to dominate a local area:

> Once rapid growth in the overall number of subscribers stopped, large disparities tended to reinforce themselves over time. More and more subscribers gravitated to the dominant system ... (p. 86)

Toward the later phase of this competitive era, AT&T’s tactics had caused wide-spread concern. In 1913, to forestall litigation and potential antitrust action or government acquisition, AT&T entered into the ‘Kingsbury Commitment’ with US Department of Justice, agreeing to:

- divest its controlling interest in Western Union Telegraph;
- cease acquiring competing independents; and
- open up its long-distance lines to independent exchanges under certain conditions.

Over a period of thirty years, AT&T’s tactics had proved successful. By the mid-1920s, the remaining independents no longer posed a credible threat to AT&T’s domination.

Limiting market power

The market power of carriers, and its consequences, have been addressed by most governments. Many approaches have been proposed and used. The rationales underlying these approaches are considered in the remaining sections of the appendix.

The approach taken depends on the policy objectives each government chooses to pursue. Their evaluation of likely outcomes is also a determinant. For example, the use of price regulations and mandated access regimes, in contrast to the use of general competition policy, is often predicated on an assessment of the relative costs of market failures in telecommunications compared with the direct and indirect costs of regulation.

B.5 Regulating incumbent carriers

Incumbent carriers are regulated primarily to limit abuse of market power. However, the industry has also been regulated, historically, to prevent possible inefficiency from entrants cream-skimming (choosing to service only the most lucrative markets thereby threatening the viability of the incumbent) or undertaking inefficient by-pass. Governments also regulate access (this is discussed in Section B.7)

Regulatory approaches used include the following:

- general trade practices regulation and competition policy; and
- industry specific regulation:

  cost-based regulation (primarily rate of return regulation);
  price-based regulation (for example, price caps); and
  incentive-based regulation.

General trade practices regulation and competition policy

One approach to the regulation of telecommunications carriage is to remove all industry-specific regulations and rely exclusively on general trade practices legislation and competition law.[15]

This is the path that was essentially followed in New Zealand.[16]

New Zealand originally had a protected government-owned monopoly carrier (Telecom New Zealand Ltd. — TCNZ).[17] With removal of restrictions on entry in 1988, New Zealand adopted a regime:

- generic to all industries that had previously been monopolies; and
- relying on relatively 'light-handed' regulatory restraints on a monopolist enforced by private legal actions together with actions undertaken by a generic competition law enforcement body (MoC 1995).

In addition, the New Zealand Government explicitly left open the possibility of more extensive, industry-specific, regulation should the need arise (MoC 1995).

The rationale for the regime was provided in a December 1991 policy statement:

> The [New Zealand] Government sees competition as the best regulator of telecommunications markets. Accordingly, there will continue to be no statutory or

15 Most countries, although not relying on general trade practices regulation and competition policy exclusively, have used it as part of their telecommunications regulatory regime.

16 Nevertheless, New Zealand continues to have some telecommunications-specific regulation — the *Telecommunications Act (NZ)* 1987, the *Telecommunications (Disclosure) Regulations (NZ)* 1990 and the *Telecommunications (International Services) Regulations (NZ)* 1994.

17 This situation was initially changed by the *Telecommunications Amendment Act (NZ)* 1988 which provided for the removal of restrictions on the supply of telecommunications services by 1 April 1989. The New Zealand Government then sold TCNZ in September 1990.

> regulatory barriers to competitive entry into the telecommunications market in New Zealand. (MoC 1997, p. 8)

Under the New Zealand regime, interconnection agreements are secured by private negotiations — mainly between the incumbent carrier (TCNZ) and entrants (for example, Clear). The course of negotiations is influenced by:

- overarching competition policy laws, intended to prevent anti-competitive behaviour (in particular, s.36 of the *Commerce Act (NZ)* 1986 prohibiting businesses in a dominant position from using dominance to restrict entry or deter competition);
- information disclosure regulations (to make the performance of businesses with market power transparent and to facilitate negotiations and recourse to the *Commerce Act (NZ)* 1986); and
- threat of further regulation if market dominance is abused (for example, price control which may be introduced under part IV of the *Commerce Act (NZ)*1986).

Nevertheless, negotiations with the incumbent have been long and protracted.

Moreover, after enactment of the regime there were many complaints about the TCNZ's practices and substantial litigation. In June 1992, the New Zealand Commerce Commission (NZCC) commented that:

> ... [TCNZ] has become the *de facto* industry regulator; it owns or controls most of the critical inputs, it competes with all the firms to which it supplies those inputs, and, by and large, it makes the rules under which competition is permitted to take place (p. 7).
>
> ... The number of substantive complaints about the telecommunication industry has exceeded the number in any other industry. ... Several major court cases, both of private action and Commission action, have arisen out of the telecommunication industry. In no other instance has entry into an industry produced such a need for litigation (NZCC 1992, p. 8).

Rate-of-return regulation

Rate-of-return regulation is a traditionally used form of cost-based regulation. Under the approach, the regulated company's schedule of prices need to be approved by the regulator. To be approved, the company must be able to justify its prices, overall, on the basis of cost.

Cost, in particular, includes provision for a market rate-of-return on the capital employed (an appropriate weighted average cost-of-capital). The idea is to prevent the company from earning excess profits. Nevertheless, just as important is ensuring that an adequate level of profit can be achieved because without an adequate rate-of-return the company will not continue to attract funds required for investment.

There are four steps in the regulatory process. They involve the regulator establishing:

- the allowable asset base;
- a system for calculating allowable costs;
- the rate-of-return to be allowed on the asset base (determining an appropriate weighted average cost-of-capital); and
- a set of prices that permits the rate-of-return to be achieved (Taylor and Weisman 1996).

Rate-of-return regulation has been subject to a number of criticisms. The main criticism is that because it is centred around justifying rather than reducing costs, incentives are created to ‘cost-pad’ and, in particular, use more capital than is efficiently required (referred to as ‘gold plating’).

This incentive toward over-investment is sometimes referred to as the Aversch-Johnson effect (Aversch and Johnson 1962). If the rate-of return allowed exceeds the appropriate risk adjusted market rate-of-return, and the regulator is unable to detect unnecessary capital expenditure (and hence adjust the allowable asset base), the company has a strong incentive to use more capital than is optimal. Conversely, if the allowed rate-of-return is consistently below the market cost of capital, there is a strong incentive to cease investing and let assets run down.

Another criticism of rate-of-return is its high regulatory burden. It is expensive to administer, imposes significant costs on the company and is extremely time consuming (although, these are failings shared with many forms of regulation).

The basis of the regulation is cost. Consequently, the regulator and company must be able to identify and allocate costs. This may require companies to adopt complex and expensive accounting and recording systems simply for the benefit of the regulatory process. In telecommunications, assessing costs on a service-by-service basis is difficult because there are several services all using common facilities. Regulators also incur significant expense in scrutinising and evaluating these records, and in conducting their own cost studies.

The regulatory process may also encourage resource wastage through ‘gaming’. That is, a company may engage in costly strategic behaviour, not because it is good business, but in anticipation of a more advantageous regulatory outcome.

Problems also arise, because in telecommunications there are many common and shared costs that are not unequivocally linked to particular services or groups of subscribers. As a result, there is considerable argument about how these costs ought to be allocated. The potential for dispute over the allocation of common costs encourages additional ‘gaming’. It can also lead to misallocation, because where the cost allowable is inflated, the company has an incentive to expand these services while cutting back on others.

The emphasis on costs and profits, rather than prices gives rise to other problems. The company obtains no reward from pricing more efficiently because prices are approved primarily on the basis of whether the overall revenue generated will allow the agreed rate-of-return to be achieved.

Nevertheless, rate-of-return regulation has been used to limit the exercise of market power in many industries including telecommunications. The success of rate-of-return regulation, in practice, may rely on the sophistication with which regulatory discretion is exercised as well as the skill with which regulators are able to address the above risks.

Price caps

Price caps are a more recently adopted approach to regulating incumbent carriers. Pioneered in the UK in the early 1980s, they have since been used a number of countries (King and Maddock 1996).

The two main advantages claimed for price capping are the promotion of :

- allocative efficiency by providing the incumbent with greater flexibility in pricing; and
- dynamic efficiency because the incumbent retains all the gains from unanticipated improvements in productivity.[18]

Essentially price capping involves:

- establishing the telecommunication prices that will be subject to the cap;
- developing a telecommunication price index to aggregate these prices into a single number;[19]
- establishing a general reference index against which performance is judged — for example, the consumer price index (CPI) as is used in Australia, or a retail price index (RPI) as used in the United Kingdom; and

[18] That is, the productivity gains where the incumbent does better than the regulator anticipated.

[19] In some cases, Australia for example, sub-caps are also used. Sub-caps are price-caps which apply to a more limited basket of products than the overall price-cap.

- establishing a reasonable rate (X) at which the relative telecommunication prices should fall through productivity improvements, and a time period over which this rate will take effect.

Price caps require the regulated basket of telecommunications products (the index) to change in price, on an annual basis, by no more than the rate of change of the representative index less some per cent (X). That is, prices should change by no more than RPI-X or CPI-X per year. Consequently price caps are also referred to as RPI-X regulation or CPI-X regulation, depending on the reference index used.

Before a price cap can be implemented effectively, a number of technical issues need to be solved.[20] Chief amongst these is the determination of X (the relative rate of price reductions) and the period over which an X should apply.

As King and Maddock (1996) note, reviewing the value of X can lead to a blurring of the distinction between rate of return regulation and price capping. This is because the X that is set depends on the regulator's perception of the scope for performance improvement and this, inevitably, is influenced by how well the incumbent has done in the recent past as indicated by its rate of profit.

Another problem with price capping may arise from the pricing flexibility that it is partly designed to promote. Price flexibility has advantages because it may allow the incumbent to recover its cost in an efficient manner (see Box B.8). However, the scope that a multi-product incumbent has to change price and service levels over a range of products in a number of markets also provides it with scope to use its market power against an entrant.

In the UK, British Telecom (the incumbent), operating under a price cap, aggressively countered entry into its long-distance market by lowering its prices while raising prices in its uncontested markets (King and Maddock 1996, Vickers and Yarrow 1988, and Armstrong, Cowan and Vickers 1994).

One approach that has been taken to overcome this problem is the use of sub-caps — that is, additional price caps covering subsets of telecommunication products. Sub-caps have also been used to pursue other objectives — for example, universal service obligations.

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[20] For example, details related to baskets of products, the measurement of quality and the construction of indexes needs to be resolved.

Box B.8 Efficient pricing and pricing rules

Prices have an important economic role. In production, they can contribute to efficiency by directing resources to highest value uses. In consumption, they contribute to allocative efficiency by rationing goods and services to those who value them most.

The ‘first best’ rule for efficient pricing is that prices should equal marginal short-run costs (that is, the additional short-run cost of producing an additional unit of output). This rule promotes efficiency because extra output is sold where its value to the buyer is greater than the additional cost in resources. However, simply ensuring that prices equal short-run costs is not always practicable. For example, it may require considerable regulatory oversight and in declining cost industries would result in a revenue short fall. Also, in exceptional cases it could lead to inefficiency (see Coase 1946). For these reasons, other rules, ensuring recovery of total costs, have been developed.

Two-part tariffs involve all customers paying a fixed sum and a per unit charge. The revenue raised through the fixed sum covers fixed costs. This allows per unit charges to be set equal to marginal cost. However, where individual valuations differ, a fixed charge may be too high for some and potential customers may be inefficiently excluded.

Ramsey prices involve charging premiums above marginal costs to recover fixed or joint costs. The pricing rule is designed to recover costs in a manner that minimises inefficiency by least distorting the ‘first-best’ pattern of demand. A higher premium is charged where demand is relatively unresponsive to price with the lowest premium charged where demand is most responsive.

Non-linear pricing involves offering each customer a schedule of prices which varies for different quantities of the product. Unfortunately, to implement non-linear pricing effectively, considerable information about customers’ demands is required.

Subsidy-free pricing involves ensuring prices do not exceed stand alone costs (and are no less than incremental costs) for individual or combinations of products. The rationale is to avoid inefficient entry. An advantage of the rule is that no information on the pattern of demand is required.

Pricing flexibility (subject to an effective price cap) provides companies with an opportunity to recover revenue efficiently. The profit motive provides the incentive. Consequently, telecommunications companies can be expected to use one or more of the above pricing approaches, or their variants, as specific conditions make them appropriate.

Source: BTCE (1995); Faulhaber (1975); Phlips (1983); Sharkey (1982).

Incentive regulation

As King and Maddock (1996) note, both rate-of-return regulation and price capping (as they are normally applied) may provide an incumbent carrier with opportunities for ‘gaming’. Under both regimes, the incumbent may have incentives to engage in various inefficient activities (cost padding, construction of unneeded capacity, lobbying and so on) with the intention of favourably influencing the regulator’s decisions.

Incentive regulation is intended to counter this unproductive activity by creating an environment in which an incumbent’s profits are more directly linked to efficient performance. One example of incentive regulation is yardstick competition applied in the context of price capping. Using yardstick competition, X — the relative rate at which the basket of telecommunication services should fall — may be set in a transparent manner based on the performance of other telecommunications companies (usually in other countries). This enhances the incentive an incumbent has to reduce costs because they gain all the benefits of the cost reduction without the risk that a regulator will appropriate the gains in the future by unilateral adjustment of the X rate.

B.6 Scope for competition

Historically, telecommunications networks have been treated as monopolies in many countries. Currently, the industry is being opened to competition in most countries (see Chapter 4).

Rationales for introducing competition

Many researchers suggest that, because telecommunications carriers have market power, competition may be less than fully effective (see Section B.4).

However, direct regulation of market power also has problems. Therefore, more recently, the promotion of effective competition has been part of the telecommunications policy framework of most countries for the following reasons (Director 1996):

- monopoly characteristics need not justify limits on competition;
- monopoly advantages are being eroded by technological change and other factors;
- legislators and regulators suffer from a number of limitations — for example, uncertainty about the technological evolution of the industry,

poor information about those they regulate, as well as, inflexibilities inherent in available regulatory instruments;

- dynamic efficiency may be enhanced under competition; and
- entrenched and powerful interests can be created by anti-competitive legislation and regulation, and may be difficult to control.

Monopoly characteristics need not justify limits on competition

Any monopoly characteristics of the industry need to be evaluated, and any advantages a single provider would have, need to be weighed against the potential advantages of competitive alternatives.

In general, there can be arguments for protecting a monopoly from competition, where competition would increase the costs of production. This is the unsustainable monopoly argument (see Box B.6). These arguments depend on the existence of economies of scale and scope.[21]

However, many monopoly advantages in telecommunications are based on ‘bottlenecks’, not on cost advantages.[22] These barriers to entry may be reduced or eliminated through appropriate interconnection policies.

The dynamic benefits of fostering competition also have to be considered. In addition to the limits competition places on the exercise of market power, there are benefits through more rapid innovation and the provision of a wider range of choice.

Monopoly advantages may be disappearing

A number of researchers suggest that technological innovation may be reducing any existing economies of scale and scope in the telecommunications network. For example, King and Maddock note that:

> Telstra’s local call network, particularly in the central business districts of Australia’s major cities, is unlikely to involve natural monopoly technology. Call volumes suggest that a number of local telephone companies, each with their own cables, could operate as efficiently as one company. ... The growth of other wire-based services and the use of mobile phones also suggests that competition is both feasible and desirable in local telephone services (King and Maddock 1996, p. 32).

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21 More exactly they depend on the existence of cost sub-additivity (see Section B.3). That is whether a single provider can provide the overall services cheaper than any combination of two or more providers. However, although cost sub-additivity is necessary for there to be an unsustainable monopoly, it is not sufficient.

22 The existence of significant cost advantages, for a single network provider, is less clear.

Similarly, Rosston and Teece note that:

> There are a variety of technological advances that have lowered local exchange costs, changed the nature of local exchange costs to threaten the natural monopoly, and reduced the difference between long-distance and local telephone calls (Rosston and Teece 1995, p. 792).

Also, as indicated in Section B.3, economies of scale may already have disappeared in some high density areas (Guldmann 1991).[23]

Legislators and regulators suffer from many limitations

Legislators and regulators have to make decisions in the face of uncertainty and, are further disadvantaged because they do not have all the information at the disposal of a regulated party.[24]

Accordingly, they are not well placed to make the decisions that comprehensive regulatory oversight requires. For example, legislators and regulators are less able than market participants to accurately predict market demand and technological developments. They don't have access to the best available information and even if they did, rapid technological change often precludes development of a comprehensive regulatory framework.

Dynamic efficiency may be enhanced under competition

Decentralisation and pressure on performance from other competitors in an essentially unregulated market may be a more effective way of achieving dynamic efficiency. It may provide strong incentives for companies to quickly find and take advantage of new value-adding opportunities.

In such an environment, technological change may drastically reduce the costs, or change the nature of bottleneck services. This may make relatively efficient bypass and duplication possible. For example, the increased use and utility of radio frequency services has altered the economics of competition in smaller and less populous markets. If there are legislative or regulatory limits on entry, potential competitors have no incentive to find ways of by-passing the bottlenecks.

Also, network expansion might happen more rapidly under competition. An incumbent monopolist, particularly if wholly or partly owned by government, may be unwilling or unable to finance network expansion and development.

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[23] Nevertheless, as mentioned earlier, the effects of future technological advances are unknown.

[24] That is, they suffer from asymmetric information.

Permitting multiple entry is likely to increase the incentives in the industry to rapidly access and deploy new capital.

Entrenched and powerful interests can be created by protection

Legal and regulatory protection of an incumbent network can create significant property rights which an incumbent will defend vigorously. This is true even if the incumbent is government owned, when the governments use ownership of monopolies as a means of raising revenue. A program of deregulation may be the most effective process for achieving better regulatory outcomes, because companies in an unregulated market may be easier targets for legal and regulatory action (Director 1996).

Choosing an objective for competition

Competition is a loosely defined concept and there are many types and degrees of competition. Consequently, policy makers must address what they want competition to achieve.

For example, the goal of competition could include creating a situation to ensure that:

- each company's market power is sufficiently reduced; or
- there are minimal barriers to entry into and exit from the telecommunications markets.

Alternatively, the goal of competition might be focused on promoting choice or retaining a company's flexibility to price. For example, the plan might be to:

- stimulate the development of at least one alternative to the incumbent carrier;[25] or
- avoid promoting any particular market structure (Director 1996).

The goals chosen, and the tools used to achieve them, appear to have differed between countries (see Chapter 4).

[25] This would increase choice, place some limit on market power and prices while still preserving operators ability to recover common and joint costs in a reasonably efficient manner through price discrimination.

B.7 Interconnecting others

In most cases, the opportunity for entrants to interconnect with an incumbent network, under reasonable terms and conditions, is essential to ensure effective competition in mature telecommunications markets.

Retaining the advantages of any-to-any connectivity means that to provide a competing and equal service with an entrenched network, it is necessary for an entrant to either:

- interconnect with the existing network; or
- bypass some, or many, elements of the network and interconnect with others; or
- duplicate the network in its entirety without interconnection.

For a number of services where an incumbent already has a mature network with high penetration, the last choice may not be viable. Not only would an entrant have to bear the costs of duplication, but, at least initially, it may find it necessary to subsidise access, to obtain a critical mass of subscribers. These subsidies may be required to attract sufficient subscribers away from an incumbent.

Even if some duplication is intended, as in mobile services, interconnection may still be necessary if only for the sake of providing an initial critical mass of other parties for the entrants subscribers' to call.

The importance of interconnection and the essential elements of a successful access regime are noted by Laffont, Rey and Tirole (1998a):

> ... Open network architecture requirements, motivated by the existence of network externalities, imply that networks are and will remain interconnected. Interconnection however, requires cooperation among competitors, who must agree on its mode and especially on its price (p. 2).

Access regimes

Most countries have some legislative requirement on carriers to allow entrants to interconnect (see Chapter 4). The only country studied that does not currently mandate such a requirement is New Zealand (see Section B.5).[26]

Regulatory arrangements buttressing the negotiation of access terms and conditions vary from dispute resolution and the approval of tariffs to mandating

[26] However, in New Zealand a refusal to interconnect is likely to be regarded as a violation of their competition law, thus, even there, interconnection is implicitly mandated.

that operators with significant market power publish standard interconnection offers.

The scope of access rights also vary. For example, some countries do not mandate number portability and do not provide for resale of retail services at wholesale rates. Unbundling requirements also differ.[27] For example, the most extensive unbundling requirements are in the US where local exchanges are required to unbundle the local loop.

Access — non-price issues

The ways in which an entrant may interconnect with an incumbent network has an important bearing on the success of any access regime because poor quality interconnection could limit an entrant's ability to compete.

As noted above, interconnection requires a high degree of co-ordination and co-operation. It also involves risk.

The policy challenge is to obtain neutral competition, between incumbent and entrants, without loss of efficiency. This may be difficult to achieve. On the one hand, delays in the granting of access, overly restrictive technical requirements and limits on the points of interconnection may increase the costs of an entrant. On the other hand, an incumbent may bear significant costs if it is required to interconnect at any of a number of points or to install new equipment to meet the requirements of the entrant.

There may also be risks to both parties (and users) if either installs equipment that compromises the quality or safety of the network (OECD 1995). In a dynamic industry, consideration also needs to be given to the long-term interests of users, the need to allow for the possibility of later entry and the potential for technical standards to change or be upgraded.

To ensure promotion of static and dynamic productive efficiency, access regimes usually provide for, as a minimum, consideration of the following:

- user safety;
- carrier safety;
- network protection;

[27] Unbundling refers to a requirement for a carrier to offer services or network elements separately at reasonable prices. Unbundling allows an entrant to purchase only those services or elements it requires — thus avoiding any need for the entrant to be 'tied-in' to services or elements it may be better able to provide itself.

- inter-operability;[28] and
- quality of service (OECD 1995).

Bearing these considerations in mind, the more important non-price issues subject to regulation or negotiation include issues related to:

- equal access for pre-selection (eliminating any need to dial extra numbers if the subscriber chooses the entrant as their main carrier);
- number portability (ensuring that the same number may be used when a subscriber changes carriers);
- unbundling of the local loop;
- unbundling of services — for example, whether local calls resale will be provided for; and
- disclosure of interconnection agreements.

Of these, the most important issues relate to unbundling.

The importance of unbundling is that it can allow a competitor to pick and choose the elements or services they require. The competitor has the choice of by-passing each and every network element or service of the incumbent. This promotes transparency, competition and efficient pricing because when selling elements and services to a competitor, the incumbent is faced with a credible threat of by-pass. Nevertheless, although by-pass is likely to occur where a competitor is more efficient than the incumbent, inefficient by-pass may occur where opportunities exist for cream-skimming or the market is distorted by regulation.

Access pricing rules

The achievement of efficient outcomes depends on the price of access.

If charges are too high, efficient entry may be discouraged and inefficient duplication or by-pass may occur. If charges are too low, the incumbent may not be able to fully recover costs and this may curtail further investment. Low charges may also encourage inefficient entry or forestall efficient by-pass because the incentives for entrants to establish their own infrastructure is reduced even where it would be efficient for them to do so.

Access pricing rules may also create a conflict between the objectives of achieving short-run and long-run allocative efficiency. For example, in the

[28] This involves ensuring that the components of the two networks (software and hardware) operate together as a seamless whole.

short-run, allocative efficiency often involves ensuring that existing facilities are used to the fullest. In the long-run, allocative efficiency also involves ensuring adequate investment. However, access prices that promote full use of facilities in the short-run may result in revenue short falls over the long-run — adversely affecting long-run patterns of investment.

Another factor that has further complicated access pricing is the existence of Universal Service Obligations (USOs) and cross-subsidies in telecommunications (see Box B.9). The USOs and cross-subsidies arise because incumbents, in many countries, have typically had to raise revenue to provide low rates for local calls or minimum services in uncommercial areas. Where an incumbent bears these costs, and access pricing does not make provision for raising this revenue, incentives may be created for entrants to inefficiently cream-skim an incumbent's business.

Because of their crucial importance, a substantial part of negotiation and regulation (where it exists) is devoted to determining appropriate interconnection or access prices.

To facilitate negotiation and to guide courts and regulators, a number of pricing rules have been proposed. They include:

- demand based rules — for example, the Ramsey pricing rule (see Box B.8);
- an efficient entry rule — the efficient components pricing rule (ECPR) proposed by Willig and promoted by Baumol (see Baumol, Ordover and Willig 1997); and
- cost based rules — for example, total service long-run incremental cost (TSLRIC) and total element long-run incremental cost (TELRIC);

Ramsey pricing

Ramsey pricing is designed to recover full costs while minimising the efficiency loses from setting prices above short-run marginal costs. In the simplest case, where all products are sold to the final consumer, the rule involves setting the mark-up of the price charged for each product above its marginal cost in an inverse proportion to that products elasticity of demand. In the case of access pricing, the rule is more complicated because access is not a final product (see Tirole and Laffont 1994).

The rule is difficult to apply because it requires estimation of a full set of price and cross-price elasticities for the products involved. In telecommunications, innovation is rapidly changing patterns of demand so estimation of these elasticities is made even more difficult.

Furthermore, Ramsey pricing could lead to high margins on some products resulting in cross-subsidisation in a multi-product industry (see Box B.9). Cross-subsidisation of products occurs where the price of a product or group of products is greater than those based on stand-alone costs.[29] With a cross-subsidy in place, an entrant could have an incentive to by-pass the incumbent in providing the product (or group of products) regardless of whether the by-pass is efficient.

Efficient components pricing rule

The efficient components pricing rule (ECPR) was proposed in the context of determining the price that a regulated monopoly should be allowed to charge a competitor for an essential input (Baumol, Ordover and Willig 1997).

The first step in implementing the rule is to establish the price the incumbent currently charges for the complete product in the final market. The second step is to establish the cost that the incumbent avoids by selling the incomplete product (the incumbent's incremental cost of producing the final product component). The final step is to subtract this avoided cost from final price to arrive at the ECPR access price.

Baumol and Sidak (1995) argue that the attractive feature of the rule is that entry (and consequent by-pass of the component the incumbent no longer supplies) would only occur where the entrant is a more efficient provider of the final component. That this necessarily follows, in the context of a regulated telecommunication carrier, has been disputed (see, for example, Laffont, Rey and Tirole 1998). Baumol and Sidak (1995) also note, the rule does not promote any dissipation of an incumbent's monopoly rents. That is, under the rule the incumbent still retains its full profit on any units it formerly sold in the final market (that are now sold by the entrant).

TSLRIC and TELRIC

Total service long-run incremental cost (TSLRIC) and total element long-run incremental cost (TELRIC) are two cost-based approaches that have been proposed to overcome the informational requirements of demand-based approaches and to avoid the possibility of product cross-subsidisation.

[29] Stand-alone costs are the costs of producing a product or groups of products without producing any other products. If there is sub-additivity, stand-alone costs may be higher than incremental costs.

Box B.10 Cross-subsidisation in telecommunications

Cross-subsidisation is thought to be possible in telecommunications because there are typically economies of scale and scope. There is some dispute over the extent of these economies. However for the purpose of this discussion, they are assumed to exist. The types of cross-subsidisation often referred to are long-distance to local calls, low usage to high usage, urban to rural and business to residence.

Reference to cross-subsidisation occurs in two broad contexts — between *products* (commodities and services) and between *consumers*. Subsidisation of products has consequences for competition and access prices that promote efficiency through competition. Consumer subsidies determine, more directly, whether market outcomes are efficient and equitable.

Cross-subsidies between products are defined to be absent when prices do not yield revenues greater than the stand-alone cost of any quantity or subset of products. A cross-subsidy means some consumers are paying a higher price than necessary. It also means that entrants could provide the subsidised products at a lower cost. This test assumes zero economic profit, and cost minimising production techniques and use of inputs.

Cross-subsidies between consumers are absent if the prices faced by consumers cover incremental costs for each of the products. This does not preclude including a margin to fully recover common and joint costs.[a]

Demand patterns across products critically affect the relationship between product and consumer subsidy-free prices. However, individual consumer demands are essentially unobservable. Consequently, the concept of *anonymous equity* is used. Prices are defined to be anonymously equitable if they are consumer subsidy free for any set of demands. Further, anonymous equity implies that prices are no lower than short-run marginal costs. Prices that are subsidy free for a particular set of demands are not necessarily anonymously equitable, that is, not subsidy free for all possible sets of demands.

There are practical difficulties to determining the existence of cross-subsidies. In both the stand alone and anonymous equity test the stand alone and the short-run marginal cost must be determined. In the case of the stand alone test, there is also the practical issue of testing all quantity and product combinations.

a Some regard that an absence of cross-subsidies implies that all consumers meet their incremental cost plus a ‘fair’ allocation of common and joint cost.

Source: Faulhaber (1975).

TSLRIC involves estimating the incumbent’s total long-run additional per unit cost of providing a particular service. In principle, this is done by establishing what the efficient cost should be to provide all the incumbent’s services and then subtracting from this the efficient cost of providing all services except the service of interest.

TELRIC involves a similar approach, except with TELRIC it is the incremental cost of the provision of elements of the infrastructure, rather than services, that is evaluated.

TSLRIC (and TELRIC) have adopted a forward-looking approach to the estimation of costs. A forward-looking approach involves estimating costs on the basis of the best in-use technology currently available (not on the current costs of the incumbent).

Forward looking costs provide for an expectation of cost recovery where an incumbent has made efficient decisions in the past because part of the cost allowed include an economic rate of depreciation. An economic rate of depreciation is usually faster than the physical rate of depreciation because it incorporates an allowance for the likelihood of technological obsolescence.

This forward looking aspect of TSLRIC increases the information requirements of the approach. And the results of an over- or under-generous assessment of costs are the same as those already detailed — inefficient entry or by-pass being encouraged or excluded.

As the Industry Commission (1997c) noted, evaluating the merits of the approach involves:

> ... efficiency trade-offs — in this case between static and dynamic efficiency. The issue is whether building technological obsolescence into the access price for the sake of dynamic efficiency may adversely impact on making best use of existing assets. It also raises issues of risk bearing and incentives to invest appropriately in the first instance.
>
> These issues are difficult to resolve because of uncertainty, lags associated with employing the latest available capital equipment and practical considerations such as ensuring additional investment is technologically compatible with other capital equipment and operating protocols (p. 2).

C THE VALUE-ADDED SERVICES INDUSTRY

Value-added services (VASs) accounted for $5.1 billion (23 per cent) of telecommunications services revenue in 1998 and have been widely identified as the telecommunications services segment that offers the greatest potential for growth (see Table C.1).

Recent studies characterise the Australian VAS industry as diverse with strong competition in many segments. However, it is also regarded as immature by world standards with some segments exhibiting lower growth and profitability than would have been expected given developments in overseas markets (see Box C.1).

C.1 Industry overview

The highly dynamic and evolutionary nature of their services makes it difficult to define the industry. Three main segments are widely recognised:

- *Voice-based VASs*: Principally delivered over the PSTN, voice-based VASs include premium rate services, enhanced call services, interactive voice response services, call centres and computer integrated telephony;
- *Video-based VASs*: Although the dominant service at present is video conferencing, video-based VASs also include video entertainment services such as video-on-demand; and
- *Data-based VASs*: Data network services are the most significant Data-based VAS. Other Data-based VASs include data transaction services (EFT/EFTPOS), electronic data interchange (EDI), enhanced facsimile services, on-line information services, internet access provision, electronic messaging, facilities management and outsourcing (telemetry and alarm) and electronic bureau services.

Data network services — which are a major focus of the price comparisons presented in this report — are discussed in detail in Chapter 2. The remainder of the VAS industry is examined in more detail in this appendix.

C.2 Voice-based services

Voice-based VASs are principally delivered via the PSTN. Telstra Multimedia and Optus (post-1995) are the major providers. Their services, include:

- premium rate services;
- enhanced call services;
- interactive voice response services; and
- call centres and computer integrated telephony.

Premium rate services

Also referred to as premium call services or audio text services, premium rate services are telephony-based information and entertainment services accessed using particular number prefixes. Examples include telephone competitions, 'psychic services' (tarot cards and horoscopes), freecall 1800 numbers and credit card services.

In 1995–96, there were between 40 and 50 PRS providers (Austel 1996b, p. 17). The top 10–15 PRS providers account for about 70 per cent of the market revenue which was about $80 million in 1996 (Budde 1998n, p. 4).

Table C.1 Telecommunications value-added services revenue, 1992 to 1998

Category	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*
	($m)	*($m)*	*($m)*	*($m)*	*($m)*	*($m)*	*($m)*
Voice-based							
IVR (incl. audiotex)	30	50	65	74	120	120	125
Centrex / VPN	30	120	290	325	350	400	460
Data-based							
EFT/EFTPOS	25	42	50	60	65	75	120
Electronic Data Interchange (EDI)	14	18	23	30	36	30	28
Enhanced Fax services	17	50	60	75	100	115	120
Facilities mngmnt/outsourcing	77	140	185	240	290	350	420
Online services (incl. Internet)	140	190	195	205	265	360	700
Computer Reservation Systems	40	60	80	90	100	110	140
Processing bureau services	90	100	110	115	115	110	110
Data network services revenue	1 140	1 180	1 250	1 300	1 550	1 895	2 500
Video-based							
Video/broadcasting[a]	175	210	230	250	275	300	310
Total revenue	**1 778**	**2 160**	**2 574**	**2 764**	**3 266**	**3 970**	**5 060**

a Video and broadcasting includes the revenue of Optus's satellite services, terrestrial broadcast transmission and tele-conferencing services revenues (no pay TV).

Source: Budde (1999f, p. 2).

Box C.1: Characteristics of the VAS industry, 1996

In December 1996, Austel (now the ACA) released its final report on the Value Added Services (VAS) industry in Australia. This report examined the current state of the industry and factors that may restrict its further development. Austel noted that:

- the VAS industry is diverse and dynamic, but also of a highly transitional and volatile nature;
- in general, VAS revenues were expanding more rapidly than those for basic carriage services (however, there was some variation between segments);
- overall, industry profits were reportedly low;
- successful applications or services were fewer than those involved in the industry had expected, given levels of innovation and development achieved in some overseas VAS segments;
- growth in some segments were slower than anticipated;
- with the exception of a small number of segments, the overall level of competition in the industry was strong and vigorous; and
- the benefits of competition were being passed on to consumers in terms of falling prices and increasing range and availability of services.

The study also identified a number of specific factors which were '... actual or likely impediments to vigorous and sustained VAS industry growth and competition and the levels of innovation in the industry.' These factors included:

- natural barriers to entry into the VAS segments of the industry arising out of rapid technological developments which result in high risk and volatility;
- barriers to entry and impediments to competition arising out of certain presently unregulated carrier vertical integration activities; and
- limited support available to VAS providers under the proposed (now current) regulatory regime.

Austel recommended a number of 'pro-competitive' measures to overcome impediments relating to unregulated carrier vertical integration activities.

Source: Austel (1996a pp. 22–23, 1996c pp. 6–7).

Enhanced call services

Enhanced call services are exchange-based calling facilities available to customers through tone signalling, * keys and # keys and times loop break. Services include call waiting, call diversion, third party inquiry and conference, call control, abbreviated dialling, delayed hotline and multiple number.

Call waiting and call forwarding are free services. Other services cost between 40 cents and $4 a month. Telstra's Easycall® is the most prominent of these services and had 2.5 million customers, using a total of 5.5 million services by 1998 (Budde 1998n, p. 6).

Interactive voice response services

Interactive voice response (IVR) services include automatic call distribution, voice response services and call answering (also referred to as voicemail services). There were an estimated 400 000 public voice mail boxes in Australia of which Telstra operates half, Optus and Vodafone operated 40 000 each and the remaining 120 000 were operated by independent operators.

The IVR market was estimated to be about $125 million in 1998 and has dominated by Telstra which had a 70 per cent market share (Budde 1998n, p. 6). Independent operators in the market included Connect International Australia, Voice Information Processing Services, Voice Mail Australia, Voice Mail Communications, Voice Messaging Australia and Voice-Tel.

Austel found evidence that the major carriers were cross-subsidising IVR services. For example, a voice mail box from Telstra retails at $6.90 per month compared with $30 per month for similar products from independent providers (Budde 1998n, p. 7). Participants to the Austel study argued that the actions of the major carriers in this respect stifled industry returns and resulted in lower investment. Austel argued that:

> ... while competition between carriers appears to be strong in call answering services only, conditions at present do not indicate that the segment overall is performing in a way which is likely to foster new entrants and the development of innovative services or sustained healthy competition. Additionally, there is a number of significant concerns held by non carrier associated voicemail service providers which require further investigation (Austel 1996b, p. 22).

Call Centres and Computer Integrated Telephony

An evolution of the telemarketing industry, call centers make use of new value-added services and technologies for integrating data processing and telecommunications to use in marketing, customer service and help desk activities. Austel defined Telemarketing activities as:

> ... all activities which relate directly or indirectly to the marketing of goods or services, product or consumer surveying, market research, fundraising or polling and which involve the use of a telephone, facsimile machine or any other relevant customer equipment connected to a telecommunications network and used to contact an individual (Austel 1996b, p. 22).

Research by Optus suggests that in 1997, 79 per cent of call centres used ‘1800’ numbers, 58 per cent used ‘13’ numbers and 47 per cent local calls. Revenue to the carriers for toll-free numbers was about $6.5 million (Budde 1998n, p. 9).

C.3 Video-based services

Video-based services in Australia have traditionally been related to the area of video conferencing and business TV services (Austel 1996c). Video-based services are also making some inroads into tele-education and tele-medicine. In the future, the convergence of voice, data and video services in the delivery of communications, information and entertainment is likely to result in an increasing range of applications.

Revenue from video-based services accounted for $310 million in 1998 (see Table C.1).[1] Revenue growth has been modest, around 10 per cent a year since 1992, and is not likely to increase significantly until current bandwidth constraints are overcome.

Carrier video-based network services for video-conferencing consist of:

- private line services;
- circuit switched data services;
- specialised carrier video conferencing services; and
- emerging data network services such as ATM.

In addition, Telstra and Optus offer public video conferencing centre access for companies without inhouse facilities.

C.4 Data-based services

The data-based VASs are the most dynamic and competitive of the VAS industries. The main services are:

- data network services;
- data transaction services (EFT/EFTPOS);
- electronic data interchange (EDI);
- enhanced facsimile;
- internet and online services; and

[1] Note that video and broadcasting includes the revenue of Optus’s satellite services, terrestrial broadcast transmission and tele-conferencing services revenues (no pay TV).

- computer reservation systems.

Data network services are a major focus of the performance comparisons presented in this report and are discussed in detail in Chapter 2.

Data transaction services (EFT/EFTPOS)

By 1997, there were about 150 000 EFTPOS (Electronic Funds Transfer at Point of Sale) terminals in Australia — covering around 40 per cent of all retail outlets. These services processed an estimated 440 million transactions a year (Budde 1998d, p. 2).

The current EFTPOS network represents the interconnection of several separate ‘rival’ networks under bilateral agreements. A further development that is likely to influence future developments in EFT/EFTPOS is ‘e-cash’ for Internet transactions.

Electronic Data Interchange

Based around formally structured electronic documents, EDI was originally intended to promote the concept of the ‘paperless office’ and provide fast and improved transactions between manufacturers, suppliers and retail outlets.[2]

However, most EDI systems are proprietary and mostly incompatible. Therefore, the systems are mainly used where suppliers and customers adopt the same system.[3] It has been estimated that less than 1 per cent of all businesses (about 6000) use some form of EDI and that only about 20 per cent of the transactions of these firms are processed using EDI (Budde 1998c, p. 2).

The major EDI providers in Australia in 1995 were Telstra Enhanced Services (40 per cent), GEIS (35 per cent) and AT&T Easylink–Tradegate (20 per cent). The EDI market is declining as proprietary EDI is overtaken by the e-commerce sites on the Internet (see Table B.1).

Investment in proprietary EDI is estimated to have peaked at around $80 million in 1995. EDI over the Internet is expected to cut EDI network costs by a factor of up to 100. By late 1997, more than 10 000 e-commerce Internet sites had been established generating an estimated $25 billion in revenue (Budde 1998e, p. 3).

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[2] The estimated 6000 organisations using EDI in Australia did so via value-added networks (VANs). Typical VAN charges were 20 to 30 cents per 1000 characters, in addition to substantial monthly mailbox charges. For a supplier to a major retailer, the savings could amount to thousands of dollars a year (Budde 1998d, p. 2).

[3] For example, after investing in EDI, the Victorian Public Transport Corporation (PTC) could persuade only 30 of its 12 000 trading partners to follow suit.

Enhanced Facsimile

Enhanced fax services revenue was worth about $120 million in 1998 (see Table C.1). These services include fax broadcasting, store and forward services, fax mail boxes for travellers and fax information services.

Telstra (FaxStream) has about an 80 per cent share of the enhanced fax services market. The other leading service providers are AAPT (MediaNet and the local services of NewsNet), Fax International (formerly SingCom) and Xpedite (Vitel and the Fax 2000 formerly operated by Pacific Star). Other service providers in this sector include Optus (Faxline 0019), AT&T Easylink, Tracom and about 150 resellers.

There were more than 1 million fax machines operating in 1996 and approximately another 1 million personal computers with modem/fax capability. Although it is not possible to differentiate fax traffic from normal calls, Budde has estimated that between 20 and 30 per cent of telephone calls are fax calls (Budde 1998i, p. 2).[4] It is expected that enhanced fax services will decline towards the end of this decade as e-mail and e-commerce related technologies gain prominence.

Internet and online services

The Internet and online services market generated $700 million in revenue in 1998, an increase of about 100 per cent over the previous year (see Table C.1). In 1997, there were an estimated 2.8 million Internet users in Australia (see Table C.2).

Falling prices (and subsequent increased penetration) of personal computers and the move away from proprietary interfaces have made a range of major online services available at a fraction of their previous cost. However, it is widely argued that the Internet represents a fundamental development in communications that will reach much wider than e-mail and online information services:

> The Internet has a potential to evolve into a multi-service network capable of delivery of all media forms involving text, data, voice (audio) and still or moving pictures (video), to meet a variety of differing customer needs. Many of the information types delivered will require substantially increased bandwidth to continue to be made available and advanced network stations such as Frame Relay (for data, essentially) and Asynchronous Transfer Mode (for multi-media) (Austel 1996c, p. 25).

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4 This includes local, long-distance and international calls.

Growth in Internet usage is often associated with the number of personal computers equipped with a modem connection (the principle form of Internet access). It is estimated that there were 6.9 million personal computers and 1.2 million modems in Australia in 1997. About 40 per cent of the personal computers and 50 per cent of the modems were installed in private households. By 2000, the installed base of personal computers is expected to increase to 9.7 million (with about 50 per cent in households) and from 1997 onwards, the majority of home personal computers will include a modem.

Table C.2 Internet demographics, 1995 and 1997

Data		*1995*	*1997 (mid)*
Users in Australia		1.2 million	2.8 million
Internet households		262 000	650 000
Age Groups[a]	18-25 yrs	30%	20%
	26-40 yrs	20%	40%
	41-55 yrs	15%	30%

a Proportion of age groups that uses the Internet.
Source: Paul Budde (1998e, p. 2).

Computer Reservation Systems

American Airlines launched the first proprietary CRS (Computer Reservation Systems) in 1976.[5] By the late 1980s, 95 per cent of US travel agents used a proprietary CRS with two major systems — Sabre (American Airlines) and Apollo (United Airlines) — accounting for 80 per cent of the market (Budde 1998h, p. 1).

Europe responded to developments in the US by establishing two reservation consortia:

- *Amadeus*: Launched in 1987, Amadeus is the world's largest travel distribution system and is jointly owned by Lufthansa, Air France, Iberia and Continental Airlines.
- *Galileo*: Launched in 1993 by the merger of UK-based Galileo company and the Apollo CRS, Galileo International is jointly owned by British Airways and United Airlines.

Abacus is an Asian based CRS consortia, whose owners include many of the major Asian airlines.

5 The genesis of CRS came out of work by American Airlines which found that travel agents tended to sell flights that where on the top of the list on their screens and showed a preference for reservation systems with which they were familiar (Budde 1998m).

Galileo and Sabre account for 90 per cent of the $100 million CRS market in Australia (see Table C.1).[6] Amadeus and Abacus each controled about 5 per cent of the Australian market.

Growth in the proprietary CRS market has slowed since the early 1990s (see Table C.1). Future developments are expected to be linked to open (non-proprietary) CRSs, driven mainly by the Internet:

> The open systems trend is fuelled by the Internet. New electronic services in general will cut out a large part of the 'middleman' market. Customers will directly tap into travel services and look at their travel destinations on their PC or TV set. When secure electronic transactions will be in place there is very little to stop airlines and other travel organisations to do direct business with their customers (Budde 1998h, p. 4).

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6 In Australia, Galileo and Sabre are represented by Southern Cross Distribution Systems Pty Ltd and Fantasia Information Network Pty Ltd, respectively. Southern Cross and Fantasia are owned by TIAS (Travel Industries Automated Systems Pty Ltd) which is jointly owned by Qantas, Ansett and Air New Zealand.

D AUSTRALIAN REGULATORY AND INSTITUTIONAL ARRANGEMENTS

Australia's regulatory and institutional arrangements are described in this appendix. The arrangements in the overseas countries studied are described in Appendix E.

The focus is on the arrangements in place in February 1998, the point in time at which the benchmarking applies. However, the evolution of the arrangements is also described briefly because of its influence on the market environment at any point in time.

D.1 Evolution

Until 1975, Australia's domestic telecommunications services were provided by a statutory monopoly — the Australian Post Office (APO), within the Commonwealth Government's Post-Master General's Department. International telecommunications services were provided by another statutory monopoly, the Overseas Telecommunications Commission (OTC).

The APO was required to fulfil certain universal and community service obligations. The Commonwealth Government required the APO to provide a standard of basic telephony services throughout Australia and provide local call services at a regulated uniform rate nationally (universal service obligation (USO)). The Government also required the APO to provide community service obligations (CSO) including the provision of basic telephony services at subsidised rates to disadvantaged groups in the community.

In the markets to which USOs and CSOs applied, the APO incurred losses. These losses were met through pricing long-distance services well above costs.

Australian Telecommunications Commission

In 1975, the provision of domestic telecommunications services was moved out of the Post-Master General's Department and given to the newly-created Australian Telecommunications Commission (Telecom). OTC remained the sole provider of international telecommunications services.

The creation of Telecom had little impact on the structure of the industry. Telecom retained domestic telecommunications services as a statutory monopoly and was required to continue the provision of the USOs and CSOs previously provided by the APO.

Long-distance revenues continued to cover the costs of providing USOs and CSOs. Telecom was given exemption from the *Trade Practices Act 1974* to allow it to continue this practice.

Telecom was subject to price regulations and other constraints on its operations. Telecom itself acted as the industry's technical regulator.

Telecommunications Act, 1989

The *Telecommunications Act 1989* marked the liberalisation of the telecommunications industry. Initially, competition was restricted to the provision of value-added services, private networks, customer equipment and cable installation.

Telecom was corporatised but retained its monopoly on the installation, maintenance and operation of the telecommunications network and the supply of basic telecommunications services within Australia. Telecom's monopoly on basic telephony services was retained to protect the provision of a universal service (Evans 1988, para. 3.24–3.42). OTC and AUSSAT[1] also retained their respective monopolies.

The Act restructured institutional arrangements governing the regulation of the industry through the creation of the Australian Telecommunications Authority (AUSTEL). AUSTEL assumed responsibility for the economic and technical regulation of the industry and introduced new CPI-X price cap regulation. AUSTEL's other functions included the protection of carrier rights, the protection of competitors from unfair practices, consumer protection and the promotion of carrier efficiency.

Telecommunications Act 1991

The *Telecommunications Act 1991* introduced major changes to the structure of the telecommunications industry. The Act established a general carrier duopoly and a three mobile carrier market. Restrictions on the number of operators were to end on 30 June 1997 after the second general carrier had been given a period of time to establish itself in the market place.

1 AUSSAT Pty Ltd was launched in 1985 to provide a national satellite telecommunications system. However, AUSSAT could not supply public switched telephone services within Australia, except on behalf of Telecom or OTC.

The general carrier duopoly comprised Telstra (created from a merger of Telecom and OTC) and Optus Communications. Optus entered the market through the purchase of AUSSAT, to which a full carrier licence was attached. The licence guaranteed Optus regulated access to Telstra's local network for the reticulation of its calls and permitted Optus to establish a second mobile telecommunications network.

Optus and Telstra could not initially agree on access terms and conditions. This led to AUSTEL regulating the price of access on the basis of directly attributable incremental cost.

The access price regulation was to cease after the existing carrier (Telstra) was no longer in a position of dominance in a particular market. Once the position of dominance was lost, interconnect charges would be determined by commercial negotiation, although still having regard to policy objectives which recognised the preferential interconnect rights of carriers.

Telstra retained responsibility for the provision of USOs and CSOs, but the funding arrangements for these obligations changed. Telstra and Optus were required to contribute to the funding of USOs and CSOs in proportion to their share of timed traffic. However, Telstra's dominance in the market meant that it remained the major contributor.

The third mobile telecommunications licence was issued to Vodafone to establish a digital mobile service. Telstra and Optus both offered digital and analogue services, although Optus purchased its analogue capacity from Telstra.

Licences were also issued for the provision of value-added services and the resale of basic carriage services purchased from Telstra.

AUSTEL's functions and powers were expanded to 'promote fair and efficient market conduct' in the industry. AUSTEL was given the power to arbitrate in access disputes and, to assist in this capacity, developed a chart of accounts and cost allocation manual to be used by carriers.

AUSTEL was also given consumer protection functions, including setting and monitoring carrier service quality indicators, monitoring and reporting on price controls, and enforcing licence conditions on carriers which included specific consumer safeguards and those relating to the USOs.

Current legislation

In 1997, the legal framework for the telecommunications industry was redefined with the enactment of two new pieces of legislation. These were the *Telecommunications Act 1997* and the *Trade Practices Amendment (Telecommunications) Act 1997*.

The primary objective of the *Telecommunications Act 1997* is:

> To provide a regulatory framework that promotes the long-term interests of end-users of carriage services or of services provided by means of carriage services and the efficiency and international competitiveness of the Australian telecommunications industry (*Telecommunications Act 1997*, section 3(a)).

This objective was to be achieved in a manner that promotes the greatest practicable use of industry self-regulation without imposing undue financial and administrative burdens on participants in the industry (*Telecommunications Act 1997*, section 4).

The revisions to the Act:

- provided for unrestricted issue of carrier licences;
- distinguished between carriers and service providers and assignation of their different obligations;
- redefined universal service obligations and the funding mechanisms;
- preserved the right for Australian consumers to untimed local calls; and
- established mechanisms for the determination of technical regulation.

The *Trade Practices Amendment (Telecommunications) Act 1997* inserted two new Parts into the *Trade Practices Act 1974* establishing a telecommunications-specific anti-competitive conduct regulatory framework (Part XIB) and an access regime (Part XIC).

D.2 Regulatory arrangements

The main areas of regulation examined in this study are:

- the provision of USOs and CSOs;
- retail price controls;
- anti-competitive conduct; and
- access terms and conditions.

Regulations also define the roles and powers of institutions, and govern the allocation of the spectrum.

Universal service obligations

Part 7 of the *Telecommunications Act 1997* broadened the concept of USO and laid the basis for future extensions. Telstra remains the USO provider, but the legislation allows flexibility to choose alternative arrangements. Contributions by other carriers are now in proportion to their shares of ‘eligible revenue’, rather than timed traffic.

Principles underlying the USO

Principles, set out in Part 7 of the *Telecommunications Act 1997*, include that the USO should be fulfilled as efficiently and economically as practicable and that the costs and funding of the USO should be arrived at by transparent processes.

The Minister is responsible for selecting universal service providers. They may be selected by tender — or by any method the Minister determines — to cover specific regions or elements of the service. Providers must draft universal service plans for the Minister’s approval. These are subject to public consultation and must be included in a register kept by the Australian Communications Authority (ACA).

Current scope

Under the *Telecommunications Act 1997*, the USO requires that:

- standard telephone services;
- payphones; and
- prescribed carriage services, as specified in regulations,

are reasonably accessible to all people in Australia on an equitable basis wherever they reside or carry on business (s.149).

The *standard telephone service* is defined as a carriage service for the purpose of voice telephony. It must pass the test of any-to-any-connectivity. Disabled persons unable to use voice telephony are to be given an equivalent form of communication corresponding to the USO, but satisfying the requirements of the *Disability Discrimination Act 1992.*

The location of payphones — which the universal service provider is obliged to supply, install and maintain — is prescribed in regulations.

The obligation may be upgraded over time, mainly through re-specification of the standard telephone service, but can occur in a number of ways.

The obligation to supply ‘prescribed carriage services’ is intended to enable the extension to services outside the standard telephone service (Department of Communications and the Arts 1997).

Costing and funding

The legislation permits alternative methods for calculating the cost of the universal service:

- the result of a method of selecting a provider approved by the Minister (for example, by tender);
- as agreed between carriers; or
- determination by the ACA.

ACA determinations must be on the basis of avoidable cost less foregone revenue for designated ‘net cost areas’. The Minister can formulate cost principles to prevent cost-padding or cross-subsidisation of the incumbent’s loss-making services.

In practice, Optus and Vodaphone reimburse Telstra, which remains the universal provider.

Other aspects of the standard telephone service

The standard telephone service has a number of other attributes. They are covered by a variety of legislative provisions — such as license conditions — not necessarily specific to the USO. They are:

- access to untimed local calls;
- the Telecommunications Industry Ombudsman scheme;
- free emergency call services;
- pre-selection of the customer’s preferred carriage service provider;
- calling line identification;
- standard terms and conditions of supply; and
- operator services, directory assistance and itemised billing.

Untimed local calls

Under the 1991 legislation, all providers of the standard telephone service were required to give their residential customers the option of untimed local voice calls within local zones. The legislative right to untimed local calls now applies to:

- businesses with respect to voice applications;
- residential customers for voice, data, facsimile and Internet applications.

The local zones are as at 1 July 1991. The obligation applies to all carriage service providers, with the exception of mobile or satellite-provided services, unless covered by the USO.

Emergency call services

Emergency call services are regulated by the ACA, which has the power to oblige any carrier to participate.

Itemised billing

All suppliers of the standard telephone service, including mobile and satellite-delivered services, must offer itemised billing for calls other than untimed local calls. If requested they must offer it for untimed local calls.

Retail price controls

Retail price controls exist in the form of price caps on certain telecommunications services. Telstra has been subject to price capping arrangements since 1989. On 1 January 1996, new price cap arrangements were introduced and applied to Telstra's tariffs.

The price cap was set at CPI–7.5 per cent and applies to Telstra's charges for a revenue weighted basket of main services. This basket includes:

- connections;
- line rentals;
- local, trunk (including both STD and calls to mobile phones) and international calls;
- cellular mobile telephone services; and
- leased lines.

Individual price caps were set at CPI–1 per cent on Telstra's individual stand-alone charges for the following residential services:

- connection;
- line rentals; and
- trunk (including both STD and calls to mobile phones) and international calls.

There is also a requirement on *all* operators that local calls be charged on an untimed basis. There is a direct price control of 25 cents on local calls from fixed phones and 40 cents on local calls from payphones. The pricing of untimed local calls is revised annually.

There are also provisions in the *Telecommunications Act 1997* for the regulation of universal service charges. These provisions, together with the Telstra price control arrangements, provide a means of ensuring the prices of USO services can be controlled. The Minister is able to make a declaration that a specified universal service charge be subject to a price control arrangement. This declaration sets out:

- price-cap arrangements and other price control arrangements that are to apply in relation to the charge; and/or
- principles or rules in accordance with which the universal service provider may impose or alter the charge.

The telecommunications industry is subject to the general price monitoring provisions contained in the *Prices Surveillance Act 1983*, however, as of January 1999, these provisions had not been invoked

Anti-competitive conduct

Part XIB of the *Trade Practices Act 1997* provides safeguards against anti-competitive conduct and is designed to complement the access regime set out in Part XIC and supplement Part IV of the Act.

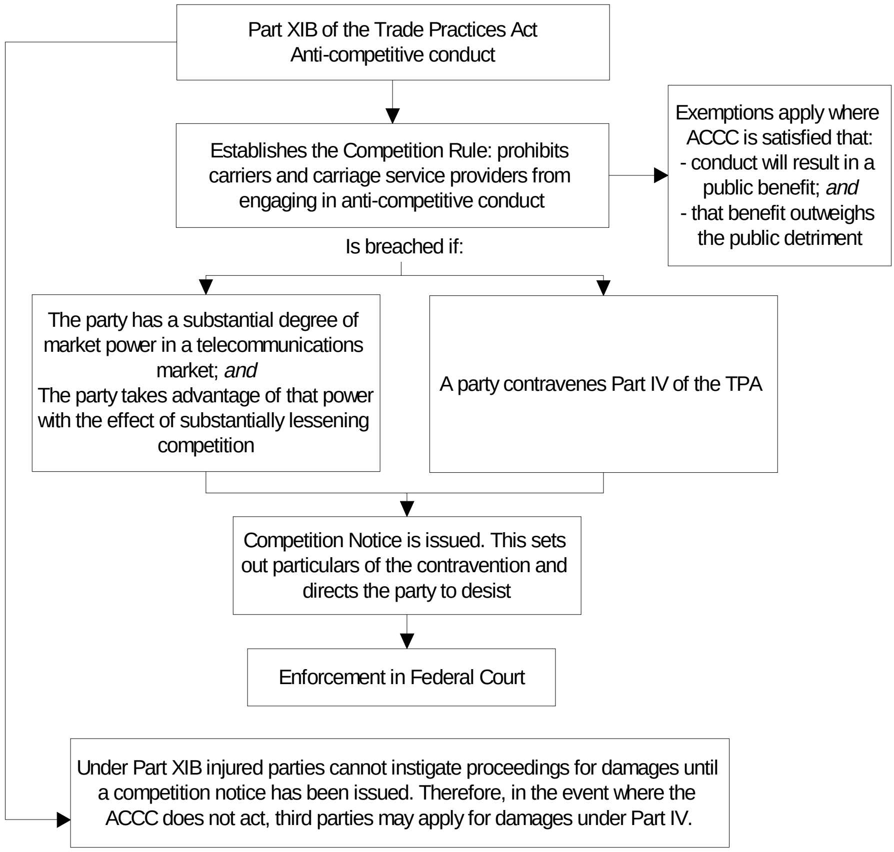
Part XIB sets out two circumstances in which a carrier or carriage service provider engages in anti-competitive conduct (see Figure D.1). The first is where a carrier or carriage service provider with a substantial degree of market power uses that power with the effect of substantially lessening competition in the market (s.151AJ(2)). Second, a carrier or carriage service provider engages in anti-competitive conduct if that conduct contravenes sections 45, 45B, 46, 47 or 48 under Part IV of the TPA and the conduct relates to a telecommunications market (s.151AJ(3)).[2]

When a carrier or carriage service provider contravenes either s.151AJ(2) or s151AJ(3), then that party has breached the Competition Rule — that carriers or carriage service providers must not engage in anti-competitive conduct.

When a party breaches the Competition Rule, the Australian Competition and Consumer Commission (ACCC) may issue that party with a Competition Notice. A Competition Notice sets out the particulars of how the Competition Rule is deemed to have been breached. Its effect is to give the offending party a 'grace' period to cease the conduct before the ACCC or other injured parties may seek injunctions or penalties through the Federal Court.

[2] A carrier or carriage service provider does not contravene sections 45, 45B, 46, 47 or 48 if the party concerned has been granted an authorisation or notification (s.151AJ(7)) or the conduct occurred before 1 July 1997 (s.151AJ(8)).

Figure D.1 Operation of Part XIB — Anti competitive conduct



Source: *Trade Practices Act 1974*

Access arrangements

Part XIC of the *Trade Practices Act 1974* sets out a telecommunications access regime (see Figure D.2). The access regime establishes processes for parties to have carriage services 'declared' to establish access rights to telecommunications services. It defines the obligations that access providers must meet when supplying a declared service.

Certain carriage services were deemed declared by the ACCC under transitional arrangements when the legislation was introduced on 1 July 1997. Deemed services included:

- domestic PSTN (fixed wire) originating and terminating access;
- domestic GSM (digital mobile) originating and terminating access;
- domestic AMPS (analogue mobile) originating and terminating access;
- transmission;
- digital data access service;
- conditional local loop service;
- AMPS to GSM diversion service; and
- broadcasting access service.

The transitional arrangements preserved existing access rights for carriers and extended those rights to service providers (Trade Practices Amendment (Telecommunications) Bill Second Reading Speech 5 December 1996). The deeming of certain services on 1 July 1997 provided for the continuation of the pre-existing arrangements.

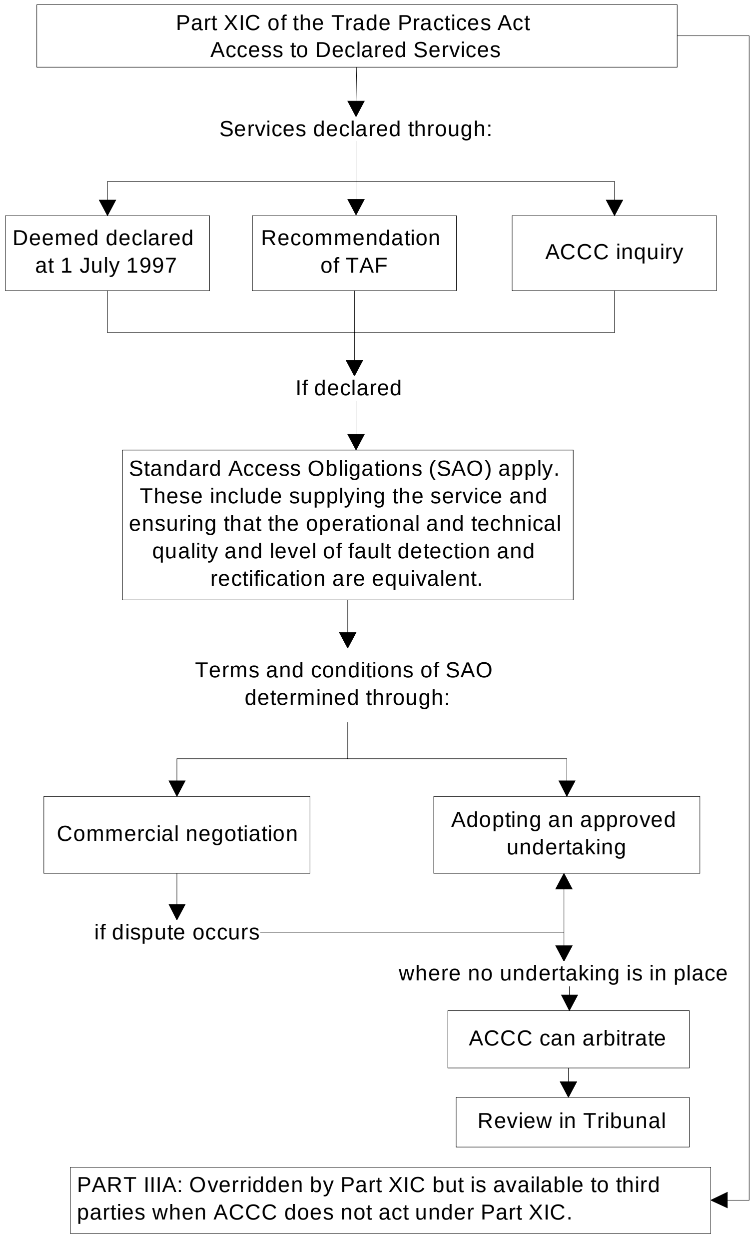
Alterations to the list of declared services may be made following the recommendation of the Telecommunications Access Forum (TAF). The ACCC must approve such a recommendation if the ACCC is satisfied that the TAF has given reasonable opportunity for interested parties to comment on the recommendation.

It was the Commonwealth Government's intention that TAF processes would be the primary means of declaring additional carriage services:

> It is a clear policy intention that, as much as possible, both the determination of access rights and terms and conditions of access be the result of commercial processes and industry self-regulation. ... The government expects the industry as a whole to work constructively to develop industry-driven solutions to access issues which reflect the legitimate interests of those seeking access and those under access obligations and which operate in the long-term interests of end users of telecommunications services (Trade Practices Amendment (Telecommunications) Bill Second Reading Speech 5 December 1996).

An alternative route for having a carriage service declared is through the ACCC. The ACCC may declare a carriage service on its own initiative or if requested to do so by another party if it considers such a declaration would promote the long-term interests of end-users. The ACCC is required to hold a public inquiry and report its findings within 180 days following declaration.

Figure D.2 Operation of Part XIC — Access



Source: *Trade Practices Act 1974*

In determining whether a declaration will promote the long-term interests of end-users, the ACCC must have regard to the extent to which declaration would achieve the following (and only these) objectives:

- promoting competition in markets for listed services;
- achieving any-to-any connectivity in relation to carriage services that involve communication between end-users; and
- encouraging the economically efficient use of, and economic efficient investment in, the infrastructure.

Declarations apply to all carriers and carriage service providers who supply the declared service at the time of declaration. There is no provision under the *Trade Practices Act 1974* to appeal ACCC decisions on declaration.[3]

Access terms and conditions

Under Part XIC of the *Trade Practices Act 1997*, declaring a carriage service means that an access provider becomes subject to standard access obligations. These require an access provider to:

- supply a declared service to the access seeker; and
- take all reasonable steps to ensure that the technical and operational quality of the declared service being supplied is equivalent to what the access provider provides to itself; and
- take all reasonable steps to ensure that the access seeker receives a level of fault detection, handling and rectification that the access provider provides to itself.

Standard access obligations do not apply where they would have the effect of preventing an existing user, including the access provider, from obtaining a sufficient amount of the service.

In supplying a declared service, the access provider must allow access seekers to interconnect their networks with the network of the access provider so as to be supplied with the declared service. The point of interconnection is at those points nominated by the access provider.

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[3] All decisions of the ACCC may be appealed under the *Administrative Decisions (Judicial Review) Act 1977* or Section 163A of the *Trade Practices Act 1974* on the basis that the ACCC either did not have jurisdiction or did not proceed in terms of the required statutory process.

The access provider must supply access seekers, if requested to do so, with billing information in connection with matters associated with the supply of a declared service. This billing information is defined in regulations.

Access providers may obtain exceptions from standard access obligations where it believes the access seeker would fail to comply with the terms and conditions of access or fail to protect the integrity of the network or the safety of individuals working on the network.

Access providers may also obtain class or individual exemptions from standard access obligations where the ACCC believes this will promote the long-term interests of end-users. If the ACCC believes that its determination will have a material effect on a party’s interests then, before making its final determination, the ACCC must publish a draft for public comment and consider any submissions forwarded to it.

Carriers and carriage service providers must comply with standard access obligations on terms and conditions agreed to between the access provider and access seeker. Where parties fail to reach agreement, they may apply the terms and conditions specified in an approved access undertaking or, if there is no such undertaking, seek arbitration by the ACCC.

An access undertaking specifies the terms and conditions under which a particular carrier or carriage service provider undertakes to comply with the standard access obligations in relation to a particular declared service.

Access undertakings must be approved by the ACCC. The ACCC may accept an undertaking provided it has published the undertaking for public comment and considered any submissions received. Further, the ACCC must be satisfied that the undertaking is consistent with the standard access obligations and the terms and conditions proposed are reasonable. The undertaking must also be consistent with any Ministerial pricing determinations.

If an undertaking adopts the terms and conditions set out in an approved TAF telecommunications access code, then the ACCC must accept that undertaking. The access code sets out the model terms and conditions relating to compliance with the standard access obligations. Compliance with this Code is voluntary and is intended to provide guidance to access providers in the development of access undertakings and to access seekers in assessing the terms of an undertaking or proposed agreement.

Number portability and carrier preselection

Under Australia’s Numbering Plan, all carriers and carriage service providers, unless exempted, must provide full number portability (including local calls) by

1 January 2000. The terms and conditions for providing number portability must be negotiated, although the ACCC may arbitrate in a dispute.

The ACA determines pre-selection requirements, having regard to benefits, costs and technical feasibility. The ACA has mandated that preselection be available for a range of services, namely national long-distance, international direct-dial services, operator assistance, and international ringback calls.

Allocation of spectrum

The allocation of spectrum by issuing spectrum licences is provided for by the *Radiocommunications Act 1992* and are carried out by the ACA.

Spectrum licences are a tradeable, technology neutral (that is, they are not bound to any specific technology) spectrum access right for a fixed non-renewable term (15 years in this case). Spectrum licences are flexible and can be used to provide virtually any type of service.

The ACA allocates spectrum licences by an electronic auction system. To support the spectrum licensing of these bands, the ACA has prepared a draft marketing plan and auction rules. The draft marketing plan sets out the procedures to be followed in issuing spectrum licences and also covers matters such as timing, the area and bandwidth of lots and spectrum licence conditions.

D.3 Institutional arrangements

A new institutional framework was established to administer the legislative arrangements under the *Telecommunications Act 1997*.

The Telecommunications Access Forum (TAF) was created as an industry self-regulatory body. Membership of TAF is open to all carriers and carriage service providers. The TAF was made responsible for recommending which services should be declared, developing a draft access code and revising that code when necessary.

The ACCC was made responsible for oversight of the TAF. The ACCC was given the authority to approve or override the TAF where parties are not given opportunity to comment on TAF proposals.

The ACCC also assumed control of competitive regulation of the industry from AUSTEL. The 1997 reforms repealed the industry’s exemption from the TPA and established industry-specific regimes, embodied in the TPA, governing access and anti-competitive behaviour in the industry.

The Australian Communications Industry Forum (ACIF), another self-regulatory body, was given responsibility for the development of consumer codes. Membership was made open to all participants in the industry.

The ACA was formed by a merger of AUSTEL and the Spectrum Management Agency. The ACA regulates consumer and technical issues under the 1997 Act and radiocommunications issues under the *Radiocommunications Act 1992*. It has responsibility for approving codes developed by the ACIF. In doing so, it must be satisfied that ACIF represents all sections of the industry and has consulted with all interested parties.

The ACA retained responsibility for the monitoring of the effectiveness of codes and standards. This included the allocation of licences, preparation of spectrum plans, marketing of spectrum and management of interference. It was also given responsibility for standards-setting, compliance testing, labelling and issuing of licences to industry bodies such as the ACIF.

The ACA was given the power to direct carriers or carriage service providers in regard to matters relating to its powers and functions. However, a requirement was placed on it to perform its functions consistent with government policy or at the direction of the Minister.

The Telecommunications Industry Ombudsmen (TIO) was established in 1993. Suppliers of the standard telephone service, mobile services and the Internet are required to become members of the scheme and to comply with determinations of the TIO.

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E INTERNATIONAL REGULATORY AND INSTITUTIONAL ENVIRONMENT

The regulatory and institutional arrangements of the European Commission and benchmarked overseas countries are described in this appendix. This is a companion to Appendix D which describes the Australian arrangements.

The focus is on the arrangements in place at February 1998, the point in time at which the benchmarking applies. However, the evolution of the arrangements is also described briefly because of its influence on the market environment at any point in time.

E.1 Canada

Prior to 1979, telecommunications services were provided by CNCP Telecommunications, Telecom Canada members (a consortium of federally regulated telecommunications carriers dominated by Bell Canada), Teleglobe Canada and Telesat Canada.

CNCP Telecommunications held a monopoly in the domestic telegraph market while Telecom Canada members held a monopoly on the long-distance voice market. Basic local telephone services were provided regionally across Canada on a monopoly basis by either Telecom Canada members or other telecommunications carriers. Data communications were provided nationally by two carrier systems, CNCP Telecommunications and Telecom Canada members.

Telesat Canada, incorporated in 1969, provided Canadian domestic satellite telecommunications services on a monopoly basis. Teleglobe Canada was established in 1974 as a federal corporation and was the monopoly supplier of Canadian overseas telecommunications.

Regulation

The first changes in the regulation of Canada's telecommunications industry occurred in 1979. In this year, the Canadian Radio-television and Telecommunications Commission (CRTC) allowed CNCP Telecommunications to interconnect its network with Bell Canada's. This allowed CNCP to compete in the provision of certain interconnected private line voice services and interconnected data services in Bell Canada’s markets. This decision was later extended in 1981 to B.C. Tel’s markets, another Telecom Canada member.

In 1982, the CRTC set out the terms and conditions governing the attachment of subscriber-provided terminal equipment to the networks of all federally regulated telecommunications carriers. In 1984, the CRTC set out the terms and conditions for interconnection by cellular mobile radio systems with federally regulated telephone companies. This followed a decision by the Department of Communications to establish two cellular radio systems in each of the major Canadian markets.

In 1986, the CRTC allowed Telesat Canada to offer interconnected private line services like those permitted in 1979. In 1987, the resale and sharing of private line services of the federally regulated companies was permitted.

In 1992, the CRTC set out the terms and conditions for competition in the provision of public long-distance voice services. This allowed Unitel Communications Inc. (previously CNCP) and other facilities-based service providers to compete in some markets of the federally regulated Telecom Canada (later known as Stentor Resource Centre Inc.) member telephone companies.

In 1994, the CRTC established a new regulatory framework for the federally regulated Stentor-member companies, that is traditional earnings regulation (rate base/rate-of-return regulation) would be replaced with price cap regulation, effective 1 January 1998. Toward that end, the CRTC established a transitional period during which it would move toward the implementation of price cap regulation for these companies’ Utility Segments.

In 1997, the CRTC set out the terms and conditions of local competition in the markets of some of the Stentor-member companies and established the parameters of the price cap regime. Also in that year, the CRTC decided not to exercise its power to regulate the toll and toll free services provided by Stentor-member companies, Quebec Telephone, Telebec Itee and Sogetel Inc. and the inter-exchange private lines services provided by Stentor-member companies. In 1998, the CRTC opened the local pay telephone market to competition.

The implementation of the General Agreement on Trade in Services covering basic telecommunications negotiated under the World Trade Organisation (WTO/GATS) took effect 1 January 1998. Under the WTO/GATS, Canada made a commitment to end Telesat Canada’s Fixed Satellite Services monopoly, effective 1 March 2000.

Consistent with this newly competitive environment, the federal government announced that it will end, on 1 October 1998, the monopoly of Teleglobe

Canada over the provision of facilities-based overseas telecommunications services. The CRTC has a proceeding underway to determine the regulatory regime that should apply to the provision of international telecommunications services, when Teleglobe's monopoly terminates.

Institutional arrangements

Prior to 1994, telecommunications was regulated by either the CRTC, or a provincial government public utility or a municipal board.

Prior to 1987, CRTC had jurisdiction over the federally regulated telecommunications carriers in Canada which were B.C. Tel, Bell Canada, NorthwesTel Inc., Terra Nova Telecommunications Inc., CNCP Telecommunications and Telesat Canada. In 1987, Teleglobe Canada, a former crown corporation, was privatised and became subject to CRTC's jurisdiction. In 1989, the Supreme Court of Canada confirmed that inter-provincial undertakings were subject to the CRTC's jurisdiction. Thus, the privately owned, provincially regulated telephone companies (NBTel, MT&T, Island Tel and NewTel) now were regulated by the CRTC.

Alberta Government Telephones Commission, Manitoba Telephone System (known today as MTS Communications Inc.) and Sask Tel, as provincial crown agents, were immune from federal regulation by the CRTC. However, in 1990, the Alberta Government Telephones Commission was privatised and telephone operations were transferred to AGT Limited (known today as TELUS Communications Inc.) and came within the CRTC's jurisdiction.

In 1994, as a result of the Supreme Court of Canada decision, the remaining telephone companies (49 at that time) that provided services regionally across Canada on a monopoly basis, referred to as independent telephone companies, came under the CRTC's jurisdiction. With the exception of SaskTel, a Province of Saskatchewan crown agent, all telephone companies are currently under the CRTC's jurisdiction.

Revision of regulatory framework

In 1992, the CRTC announced that it would undertake a general review of telecommunications regulation. In 1993, the Canadian Parliament passed the *Telecommunications Act 1993* which repealed the telecommunications-related provisions of the *Railway Act*.

The *Telecommunications Act 1993* provides the CRTC with the power to:

- approve the rates to be charged by a Canadian carrier for a telecommunications service;

- ensure that the rates charged are just and reasonable and that the carriers do not unjustly discriminate or give an undue or unreasonable preference toward any person;
- to approve the working agreements between a Canadian carrier and another telecommunications common carrier;
- forbear, in whole or in part, from regulating classes of services; and
- to order a Canadian carrier to connect any of the carrier’s telecommunications facilities to any other telecommunications facilities.

In 1998, the *Telecommunications Act 1993* was amended to ensure that its telecommunications policy objectives were consistent with Canada’s commitments under WTO/GATS. The amendments, among other things, provide the CRTC with the statutory authority to require all members of any class of service providers to obtain a licence to provide international telecommunications services and to impose terms and conditions in such licences.

In 1994, having completed a general review of telecommunications regulation, the CRTC issued a Decision detailing a new regulatory framework. For certain of the Stentor-member telephone companies, the CRTC:

- required that the rate bases be split into Competitive and Utility Segments, effective 1 January 1995;
- determined that traditional earnings regulation would be replaced with price cap regulation, effective 1 January 1998;
- established a transitional period during which it would move towards the implementation of price cap regulation for the Utility Segment; and
- determined that restrictions on entry into the local market should be removed.

In 1997, the Commission set the parameters of a four year price cap plan and the terms for local competition.

Universal accessibility of service in a local market

Continued universal accessibility is achieved through public policy limits on residential service rates to the extent that, in higher cost areas, these are held below cost. This public policy approach is facilitated by price cap limits on increases in basic local residential rates (applied to incumbents only), provision of a portable ‘contribution’ subsidy available to all local service providers that provide residential services and the continued application of the telephone companies’ obligation with respect to the provision of service where effective facilities-based competition is absent. The CRTC will also continue to monitor the quality of service provided by incumbents.

The portable ‘contribution’ subsidy is based on the contribution mechanism established at the beginning of long-distance competition as a way of maintaining affordable local rates which had traditionally been subsidised by long-distance toll revenues. A contribution rate was established for each incumbent telephone company territory as an explicit charge levied on all long-distance toll traffic carried on the networks of all toll providers.

At least for the price cap period, toll contribution remains as the only explicit source of subsidy for basic residential local services. The contribution rates of the telephone companies subject to price cap regulation are frozen at the going rates for the price cap period. Freezing contributions rates aimed to maintain a subsidy that allows residential rates to remain affordable while not hindering the development of effective local competition.

In general terms, the contribution requirement is calculated as the difference between costs and revenues for all residential services in an incumbent’s market, whether provided by the incumbent or by competitors. This amount, divided by total long-distance market minutes (telephone company and alternate providers of long-distance), yields the average per-minute contribution rate.

The funds are distributed to all local carriers based on subsidy requirements per residential Network Access Services or equivalent by rate band. On an interim basis, the incumbent local exchange carriers are acting as central fund administrators.

Currently, the CRTC has a proceeding underway to consider the issues associated with service to high cost serving areas, including whether changes are required to current obligations.

Retail price controls during price cap regulation

In the 1994 Decision detailing a new regulatory framework, the CRTC aimed to bring the residential services rates for some of the Stentor-member telephone companies more closely in line with costs during the transitional period prior to price regulation. Local telephone rates were increased by $Can2 in 1996 and in 1997, with a final round of rate rebalancing increasing rates in 1998 up to $Can3.20 on average depending on the company.

For the transitional period 1995 to 1997 leading to price cap regulation which began on 1 January 1998, the CRTC implemented a split rate base regime. Commencing 1 January 1995, some Stentor-member telephone companies were required to split their rate bases into ‘competitive’ and ‘Utility’ Segments. This required the telephone companies to separate the revenues, expenses and investments associated with competitive services (long-distance, network and terminal) from the revenues, expenses and investments associated with the utility services (local and access). During the transitional period, the Utility Segment was regulated on the traditional rate base/rate-of-return basis.

Price caps only apply to BCTEL, Bell Canada, The Island Telephone Company Limited, Maritime Tel & Tel, MTS Communications Inc., The New Brunswick Telephone Company Limited, NewTel Communications Inc. and TELUS Communications Inc.

The features of the price cap plan are as follows:

- Certain Utility Segment services are grouped into a single basket.
- The single basket is capped by the Price Cap Index (PCI). The PCI includes the Gross Domestic Product Price Index (GDP PI) as the inflation measure, a productivity offset (X factor) of 4.5 percent and limited exogenous factors arising from events which are beyond the telephone companies’ control.
- The single basket of capped services is divided into three sub-baskets subject to additional pricing constraints:

  Basic residential local services: The weighted-average annual rate increase will not exceed the level of inflation (GDP PI) during the price cap period. In addition, no rate element in this sub-basket will increase by more than 10 per cent in any year. The exception to this is primary exchange services within bands for which local loops are considered nonessential.

  Single and multi-line local business services: These are not subject to an overall sub-basket pricing constraint. However, a 10 per cent constraint in any year was applied to individual rate elements for single-line business services, other than the rates for primary exchange service within the bands for which local loops are considered nonessential.

  Other services: The remaining Utility Segment services, which do not qualify as services excluded from price caps nor included in the other subbaskets. Prices will be constrained by the level of inflation (GDP PI).
- Contribution charges and the rates for emergency services, message relay services and several other services will be frozen for the price cap period.

- Services that were priced to maximise contribution prior to the implementation of price caps, such as optional local services, and those services under which a cap on prices would be redundant, such as Special Facilities Tariffs and competitor services required by local and toll competitors are not included with capped services.
- Streamlined regulatory process. Revenue requirement and annual contributor proceedings are eliminated and no longer a requirement to file capital plan submissions, depreciation studies or financial forecasts.
- A four year price cap plan, with no earnings sharing overlay, to be reviewed prior to the end of 2001 to ascertain that the parameters have been set correctly.

Access Arrangements

In 1997, the CRTC established a framework, to begin in 1998, for the entry by new local exchange carriers in the territories of some of the incumbent local telephone companies. Incumbent telephone companies are required to provide:

- for the unbundling of ‘essential facilities’ and co-location on the same terms as are used by the incumbent telephone companies themselves;
- access to their local networks at prices consistent with established access pricing rules; and
- for the resale of local residential services (not necessarily at wholesale rates).

The framework also:

- indicated the CRTC’s intention to implement a number portability scheme;
- provided for equitable access to toll contribution as a subsidy for basic residential local services in high cost areas;
- created the Canadian Interconnection Steering Committee to deal with technical implementation issues;
- required competitors to meet certain public interest requirements; and
- allowed for competition and convergence between the telecommunications and broadcasting industries.

Essential Facilities and Mandatory Unbundling

The CRTC determined that mandatory unbundling would be required where a facility was ‘essential’. The CRTC determined that, for a particular facility to be essential, it must be monopoly controlled, a competitor requires it as an input to provide services and a competitor cannot technically or economically duplicate it. Unbundling requirements were only to apply to the incumbent telephone companies as the CRTC was satisfied that the new competitors' local exchange service facilities would rarely meet the test of essential facilities.

Facilities classified by the CRTC as being essential are central office codes (NXXs), subscriber listings and local loops in small urban and rural areas. Local loops in other areas did not meet the criteria for essential facilities as there was some competitive supply. However, the CRTC believed that this supply was limited and therefore required that these local loops be unbundled and priced based on the rating principles for essential facilities for a period of five years from the date of the Decision (1 January 1998).

Resale of local retail services

Although entrants are permitted to resell the local retail services of the incumbents, incumbents are not required to provide these services at wholesale rates. The CRTC considered that ultimately facilities-based competition would be more effective.

Competitive safeguards

The CRTC has introduced some industry competitive safeguards. The telecommunications industry is to some extent subject to general competition law as administered by the Competition Bureau of Industry Canada.

The CRTC prohibits exclusivity arrangements between newly entered local exchange carriers and inter-exchange service providers as it considered such arrangements reduce consumer choice. New competitive local exchange carriers must provide equal access to all inter-exchange service providers at terms and conditions that are equivalent to the terms and conditions contained in the incumbents' tariffs.

The CRTC requires competitive local exchange carriers to file proposed tariffs for inter-exchange carrier equal access, and to justify any departure from the terms and conditions contained in incumbents' tariffs. The equal access requirement applies equally to wireless services providers supplying public switched voice services.

E.2 European Commission

The European Commission derives its power to regulate telecommunications from competition and harmonisation provisions in the Treaty of Rome, which established the European Economic Union (formerly the European

Community). The objective of these provisions in the Treaty is to ensure free trade and open competition within the Common Market.

The European Commission has used the following Articles in the treaty to achieve progressive liberalisation of telecommunications:

- Article 85 permits the Commission to prohibit and declare illegal all anti-competitive behaviour between businesses within the European Union;
- Article 86 prohibits abuse of dominant position by a dominant company in a market that affects trade between member states;
- Article 90 permits the Commission to issue directives to member states; and
- Article 100a permits the Council of Ministers and the European Parliament, on the recommendation of the Commission, to enact legislation which member states must in turn incorporate into their own laws (Lewin and Kee 1997).

In 1987, the Commission issued a Green Paper on the development of a common market for telecommunications services and equipment. This proposed the introduction of a more competitive environment within European telecommunications combined with a greater degree of harmonisation.

In 1990, the Commission adopted the principles of Open Network Provision. These principles were objectivity and transparency in setting criteria for access conditions and price setting, and non-discrimination. The intention was to achieve harmonisation of network interfaces, usage conditions and tariff principles within the European Community as part of the process of achieving economic integration.

The Commission usually seeks to prevent anti-competitive agreements and the abuse of market power through legal action on a case-by-case basis. However, in 1992, it published general guidelines for telecommunications which stated that it will actively apply the competition rules to:

- interconnection agreements;
- conditions of access for competing infrastructure and service providers;
- schemes for funding the universal service;
- access to rights of way;
- cross-ownership of networks and joint provision of networks and services; and
- the emergence of global and regional partnerships and alliances.

In May 1995, members were required to liberalise the mobile market by abolishing any ‘special and exclusive’ rights enjoyed by providers.

Licensing conditions for telecommunications operators had to be liberalised and made consistent across the European Union by April 1997. Only technical limitations on new licences, such as restrictions on the availability of suitable radio frequencies or telephone numbers (on a temporary basis) are now permitted within the European Union.

On 1 January 1998, all telecommunications services and infrastructure were required to be liberalised, although extensions of time were granted to countries with smaller or less developed networks. Within the framework established by the European Commission, each country must enact its own legislation, but the details vary from country to country. Waverman and Sirel (1997) discuss national responses to the Commission's requirements, which depend on the progress already made with liberalisation of the telecommunications market, and on local attitudes to such issues as privatisation.

Although there is no requirement for privatisation, when organisations providing telecommunications services continue in public ownership, regulation must be conducted by an independent national regulatory authority. By European Law, these must be independent (EC 1996).

The stated objectives of the European Commission's policy on telecommunications are to ensure economic efficiency and a guaranteed universal service (EC 1998, p. 57). The most important elements in the new regulatory system are the arrangements for interconnection and universal service.

Universal service obligations

The new arrangements for funding and the methodology for costing the universal service obligation within the European Union are intended to be competitively neutral. In the absence of compensation, the universal service obligation may impose an unfair burden on the incumbent. On the other hand, a requirement that new entrants contribute heavily to reimbursing the incumbent may have an anti-competitive effect and may deter entry.

The universal service is defined by the European Commission as *access for all users, at an affordable price, to the public fixed telephone network at a fixed location for voice, fax and data transmission, and to a basic range of facilities such as itemised billing and tone dialling*. Each country may designate the providers of its universal service.

The providers may be compensated through a cost sharing arrangement or through a national fund. If a fund is established, only the providers of public communications networks can be required to contribute. 'Access deficit' schemes — schemes to compensate incumbents for customer access prices that (allegedly) do not cover costs — must be phased out by 1 January 2000.

The cost of the universal service obligation must be estimated transparently, and must only cover the cost of voice telephony services and the public telephone network. In other words, the contribution required from new entrants must be limited. Member states have the option of determining that the cost is minimal, making compensation of providers unnecessary. To date, the majority have not instituted cost sharing arrangements

Tariff rebalancing, to ensure that charges for calls and customer access reflect costs, is required by the Commission. Countries which had not already implemented this by 1 January 1998, were required to submit a timetable on their progress. However, because rebalancing may entail increases in customer access charges there is a contradiction between this and the affordability criteria of the universal service. Countries are therefore permitted to proceed at a pace consistent with the maintenance of affordability in the local call market.

The European Commission expects that, in the long run, downward pressure on charges exerted by competition will guarantee affordability. It also believes that affordability is not just a matter of prices, but concerns the ability to match desired usage and expenditure patterns. Therefore household ‘penetration rates’ are treated as a useful indicator of affordability. Targeted subsidies — for example, reduced charges for low usage households — are prefered to uniformly low tariffs.

National regulatory authorities for the telecommunications sector are required to monitor and report to the Commission on service quality.

Interconnection

The objectives of the European Commission’s policy with respect to interconnection are to ensure *any-to-any communication* and to guarantee the rights of market participants to obtain interconnection with the networks of others when this is ‘reasonably justified’. A longer-term objective is to achieve harmonisation of access conditions across Europe.

Interconnection to public switched telecommunications networks must be granted on non-discriminatory and transparent terms based on objective criteria. New entrants have interconnection rights for call termination within the existing public telecommunications network. The terms of interconnection must be negotiated but are subject to the European competition laws. Agreements must be publicly available. Cheap and timely arbitration must be provided.

More stringent rules for interconnection apply where the network operator has significant market power. *Significant market power* is defined as more than 25 per cent market share but this definition may be modified by national regulatory agencies.

Operators with significant market power must provide interconnection on a non-discriminatory basis. To prevent delay, they were required to publish standard interconnection terms and conditions, called *reference offers*, by 1 January 1998. Interconnection charges in reference offers must be cost-based and supported by transparent cost-accounting systems. Accounting separation of interconnection must prevent cross-subsidisation of interconnection from other activities.

If access seekers wish to interconnect at network points other than those specified in the reference offers, access providers with significant market power must not refuse to negotiate, unless the request is unreasonable.

The European Commission recommends the adoption of long-run incremental cost principles for interconnection prices but recognises that this will take time to achieve.

These interconnection arrangements are supported by regulations pertaining to telephone number portability and pre-selection of carriers:

- all carriers with significant market power must offer call-by-call carrier pre-selection; and
- by 1 January 2000, all fixed local access providers with significant market power must offer carrier pre-selection and number portability.

By 1 January 1999, a European Telephony Numbering Space (ETNS) is to be established on a trial basis.

To ensure that competition is equitable, new entrants are prohibited from cross-subsidising their telephony services from unrelated parts of their business and are required to practice accounting separation to demonstrate that cross-subsidisation is not occurring.

E.3 Finland

Private ownership has always been a notable feature of the Finnish telecommunications system. In the 1930s, there were over 800 private telephone companies providing local telephone services. By 1996, these had been reduced by merger to 46 companies operating as the Finnet Group.

The publicly owned Posts and Telecommunications (P&T), later named Telecom Finland Ltd and now Sonera, provided long-distance services and built lines in sparsely populated areas. P&T also acted as the industry regulator until the *Telecommunications Act 1987* shifted this responsibility to the Ministry of Transport and Communications.

Between 1987 and 1997, amendments to the *Telecommunications Act 1987* progressively opened local, long-distance and mobile markets to competition. Until 1994, the telecommunications industry comprised a duopoly, with P&T providing long distance and international services and the Finnet Group providing local calls. In 1994, the local, long-distance and international markets were opened to competition and Telecom Finland was formed as a separate company from the postal section of P&T.

In 1996, further amendments abolished licensing for service providers and established their right to be connected to the networks of other companies. Price regulation of retail services was abolished but retained for interconnection charges. However, these were to be established in the first instance through negotiation. Number portability was also introduced.

Telecommunications is currently regulated under the *Telecommunications Markets Act 1997*. The new Act was introduced to bring regulation of the telecommunications industry in line with the Directives of the European Commission.

Access arrangements

Generally, requirements in regard to providing access only apply to operators of fixed networks as the mobile sector is considered sufficiently competitive not to require special arrangements.

Section 10 of the *Telecommunications Market Act 1997* requires fixed network carriers to allow interconnection with their networks. Operators with significant market power must accept all reasonable interconnection requests unless otherwise provided for by regulations. Interconnection must be effected at the point indicated by the telecommunications operators requesting interconnection unless otherwise provided for by the Minister.

The fees for using another operator’s network must be determined through negotiation. Such fees must be non-discriminatory and reasonable with regard to the costs incurred through the provision of a service.

Operators with significant market power must publish standard reference offers which specify the technical conditions and tariffs applicable for interconnection

(MTCF 1997). Offers must be approved by the regulator against cost-based pricing principles. The technical and financial conditions offered to competitors must be the same as what the operator provides itself. Operators must not refuse any requests to negotiate where certain interconnection conditions are not covered by the offer. Standard offers do not preclude negotiated agreement so long as they are objectively justified and transparent.

Interconnection contracts must be submitted to the Ministry and made available to the public with the exception of sections handling the business strategy of the parties.

Number portability and carrier selection

Number portability has been required in Finland since 1996.

Every long-distance carrier has a Carrier Identification Code, enabling customers to choose their preferred carrier for both long-distance and international calls. A customer failing to use a code is charged a price determined in accordance with the network selected at random.

Accounting separation

Operators with significant market power must also use cost-accounting systems that show the main categories into which costs are divided as well as the rules used for the allocations. The two primary cost categories are direct costs and common costs.

Cost-accounting descriptions must be submitted to the Ministry.

E.4 France

Until the late 1990s, France Telecom had a monopoly on telecommunications services and was completely state-owned. Waverman and Sirel report:

> In the late 1980s, France Telecom was among the best operators in Europe in terms of digital conversion of the network, quality of service and minimal waiting list (Waverman and Sirel 1997, p. 121).

However, they also report that France Telecom’s customer access charges were among the lowest in Europe while their call charges were among the highest.

In late 1995, the French Government issued a public consultation document. This set out proposed changes to the French regulatory framework necessary to ensure compliance with the directives of the European Commission for liberalising the sector on 1 January 1998. The document set out three objectives, namely to:

- to guarantee a high-quality communications service for all at an affordable price;
- to provide consumers with a choice of supplier, while guaranteeing easy access to telecommunications services through interconnection between public networks; and
- to create an environment which fosters competition.

These principles were incorporated into the *Telecommunications Act 1996*. The main objective of this legislation was to liberalise the telecommunications market prior to 1 January 1998, in conformity with the directives of the European Commission. The main effects of the French legislation were the abolition of licensing for network operators — except on technical grounds or on the grounds of national security — the establishment of an interconnection regime, and the establishment of a new telecommunications regulatory authority, the Autorite de Regulation des Telecommunications (ART).

ART acts as a technical regulator to the industry, but is also charged with implementation of economic regulation. It has responsibility for:

- arbitrating disputes relating to interconnection and infrastructure sharing;
- approving interconnection reference offers by public network operators with significant market power;
- the efficient allocation of radio frequencies and telephone numbers;
- processing licences for existing public network operators, service providers and new entrants (the Minister grants the licences);
- proposing the contributions to fund universal service obligations;
- advising on universal service tariffs, and tariffs by monopoly suppliers; and
- regulating competition in consultation with the competition authority.

There is a general competition authority, Conseil de la Concurrence, with which ART confers on matters relating to telecommunications. The Public Service Commission for Posts and Telecommunications provides policy advice to the Minister, including licence conditions and competition matters. ART participates in drafting legislation and regulations and in international negotiations pertaining to telecommunications.

In consultation with the competition authority, ART publishes a list of operators considered to have significant market power in a particular market. These will be those with more than 25 per cent of a particular market, but the authority must also take into account:

- turnover relative to the size of the market;
- control of access to end-users;
- access to financial resources; and
- experience in providing products and services in the market.

A party to commercial negotiations over access may call upon the authority to arbitrate the terms and conditions of access. ART also arbitrates disputes about access to the cable TV network.

Licensing

Consistent with the directives of the European Commission, licences to operate public telecommunications networks or provide public telecommunications services within France may be refused on technical grounds only. A restriction of 20 per cent foreign ownership applies.

Operators with annual turnovers exceeding a threshold (specified by the Ministers for Telecommunications and the Economy) or enjoying a monopoly or dominant position (as assessed by ART) must separate the accounts for authorised activities or for activities in which they dominate or have a monopoly. The intention is to prevent telecommunications operators from competing unfairly through cross-subsidisation from other activities.

Universal Service Obligation

Under the 1996 legislation, the uniform service means *the provision of a quality telephone service at an affordable price*. France Telecom, as the universal service provider, is obliged to provide:

- an information service and directory;
- public payphones;
- free emergency calls (compulsory for all public providers);
- services adapted for low income and disabled users; and
- continued access to limited service for heavily indebted users.

The French Government has expressed the desire to widen the scope of the universal service by including access to the Internet within schools, but is constrained by the definition adopted in the relevant directive of the European Commission.

The Public Service Commission for Posts and Communications is responsible for specifying a tariff which is affordable and uniform across all geographic locations.

Two components of the cost of the universal service are funded through contributions raised from carriers requesting interconnection in proportion to their traffic volumes. These components are the cost of a uniform tariff across all geographic areas — that is, the cost of servicing non-profitable areas — and the cost of non-profitable subscribers in profitable areas. However, to encourage competition in the mobile sector, mobile service providers will be exempt from the portion of the charge relating to non-profitable subscribers. By 1 January 2000, each provider will be required to provide at least one service in every remote area.

The cost of the other components of the service — special tariffs for the disadvantaged, public payphones and the directory and information service — are met through a fund, to which all operators subscribe in proportion to their shares of traffic volume.

Retail price regulation

The *Telecommunications Act 1996* required a gradual re-balancing of the tariff structure. Full rebalancing is required by 31 December 2000. In 1996-97, France Telecom announced an increase of almost 50 per cent in mainline phone rental rates, with corresponding decreases in call rates in both the long-distance and international markets (Waverman and Sirel 1997).

Interconnection

Interconnection is mandated for operators with fixed networks only, as the mobile sector is believed to be sufficiently competitive.

All operators must provide for interconnection. Operators with significant market power must accept all reasonable requests for interconnection. The technical quality of the interconnection services offered, the degree of unbundling and the quality of the information provided to external access seekers must be equivalent to that provided to access providers' own departments, subsidiaries and partners.

Interconnection terms must be agreed through negotiation. Operators with significant market power must publish standard reference offers which specify the technical conditions and tariffs applicable for interconnection. Offers must be approved by the regulator against cost-based pricing principles. The technical and financial conditions offered to competitors must be the same as what the operator provides itself. Operators must not refuse any requests to negotiate where certain interconnection conditions are not covered by the offer. Standard offers do not preclude negotiated agreement so long as they are objectively justified and transparent.

Interconnection contracts must be forwarded to the regulator. The regulator may make agreements public without prejudice to commercially confidential information.

The regulatory authority may arbitrate interconnection disputes. After having heard the parties, the authority may make a determination within a period specified by State Council. It must give reasons for its decision and — subject to certain requirements for confidentiality — must publish its decisions. Its determinations are subject to appeal or judicial review within one month of the decision. However, unless there are exceptional circumstances, notification of an appeal will not delay the putting into effect of the regulator’s determination.

Numbering system and carrier pre-selection

Carrier pre-selection is being introduced. At present, the system of long-distance carrier pre-selection is based on digit codes. Callers wishing to use a carrier other than France Telecom must replace 0, the first digit of the French telephone numbering system, with a digit applying to the preferred carrier.

ART is required to establish a national numbering system and subscribers changing their suppliers will be able to retain their numbers. It is intended to have complete number portability — even for subscribers changing their location — by 1 January 2001.

Anti-competitive conduct

The regulator and the competition authority must confer on abuses of a dominant position or on any anti-competitive practice by network operators or service providers. Behaviour constituting a criminal offence must be referred to the public prosecutor.

The regulator can itself impose penalties — fines or licence suspensions — for breaches of telecommunications regulations. These decisions are subject to appeal to the State Council. The imposition of penalties is suspended pending the hearing of appeals.

E.5 Japan

The Japanese telecommunications system was first liberalised in 1985. The Ministry of Posts and Telecommunications (MPT) was established as both regulator and policy maker. The telecommunications market was separated into a national component (local and long-distance) and an international component.

Nippon Telegraph and Telephone Corporation (NTT) and Kokusai Densin Denwa Co (KDD), the incumbents in the national and international markets, respectively, were each exposed to competition in their own markets. New entrants were permitted to operate in either market, but the incumbents — NTT and KDD — were not permitted to compete with each other. New entrants were classified as Type 1 carriers (owning their own facilities) or Type 2 carriers (renting network facilities from Type 1 carriers). Legislation preventing ‘excess’ investment in any market deterred facilities-based competition by Type 1 carriers.

NTT, previously Government-owned and operated, was partially privatised. Interconnection was not mandated. Interconnection terms and conditions were negotiated between the parties, and agreements, if reached, were required to be authorised by the MPT. When negotiations failed, the MPT arbitrated. Before approving agreements, the MPT scrutinised NTT’s costs.

In the opinion of Japan’s Telecommunications Council, this system did not function effectively. NTT continued to enjoy a monopoly in the local call market, accounting for approximately 99 per cent of inter-prefectural calls in 1996.

Both the subscriber’s connection charges and the cost of local calls increased between 1985 and 1996. For example, calls from public telephones increased three-fold. Although the cost of calls declined in the cellular, long-distance, and international call markets, it remained higher than in the US, UK, Germany or France. The range of services offered was lower than in the US and NTT attracted criticism for its customer relations policies. It was also criticised for bundling local and long-distance calls together, thus thwarting competition.

NTT’s superior bargaining position enabled it to prolong negotiations and to charge access fees above those charged internally and above international standards. NTT’s accounting system made it difficult to assess the reasonableness of NTT’s charges.

Despite its monopoly status, most of NTT’s local call services areas reported a loss in 1995. According to the Telecommunications Council, this poor financial performance was due to poor operating efficiency on the part of NTT. NTT’s incentive to improve its efficiency was adversely affected by a virtual lack of competition in the local call market.

However, according to Lewin and Kee (1997), price regulation was an important factor in NTT's poor financial results. Under Japan's universal service obligation, all increases in NTT's and KDD's customer charges required approval by the Diet, which required lower charges in less populated areas. According to Lewin and Kee (1997), constraints on local call and customer access charges resulted in cross-subsidisation by NTT's long-distance services. In recent years cost recovery from local services has increased. Nevertheless, Lewin and Kee (1997) regards continued cross-subsidisation of the universal service as 'unsustainable', because increased competition will erode NTT's long-distance call revenue.

In January 1996, the Japanese Government announced reforms to the regulatory regime for telecommunications. These reforms focused on restructuring NTT and specifying new interconnection requirements.

Restructuring NTT

The Japanese Government announced its intention to restructure NTT into a long-distance carrier and two companies supplying local call services in the East and West sections of NTT's current sphere of operations. It is unclear whether the restructure has occurred.

NTT is to be completely privatised, and will be allowed to compete in all areas of communications — including mobile, international and local phone services. Discontinuation of the current system for authorising long-distance rates will be considered. Consideration will also be given to changing the current system for authorising mobile and international call service charges to a system of prior notification.

The two regional companies are to be prevented from competing in the long-distance or international segments of the market within their own areas. They will, however, be permitted to compete with each other in all market segments outside their own regions. It is anticipated that they will also face competition from the 'long distance' NTT and from other companies, including KDD, which will also be permitted to compete in the local and long-distance markets.

As the two regional companies are considered to have monopoly power, the current system of authorising rates will continue for the time being. However, legal restrictions on 'excess' facilities investment have been removed.

Universal Service Obligations

The USO requires uniform and regulated charges for local calls and customer access. In high-cost areas, these charges are cross-subsidised by customer access charges in more populated, and therefore less costly, areas and by long-distance charges.

Funding of the universal service will be reviewed in two years. In the meantime, designated carriers must not seek contributions from other service providers, but must attempt to recoup the cost through efficiency improvements.

Access arrangements

Access arrangements group operators into Type I carriers, Type II carriers and designated carriers. Type I carriers own their own network facilities while Type II carriers do not. Designated carriers are a special class of Type I carriers who control over 50 per cent of subscriber lines. NTT is the only designated carrier.

Access requirement applying to Type I carriers

Type I carriers are obliged to provide for interconnection with other carriers unless there is an appropriate reason for not doing so. Authorised interconnect agreements must be made available for public perusal and arbitration is available in the event of interconnection disputes.

Type I carriers are obliged to provide access on wholesale rates.

The current competition law permits Ministerial intervention if a Type 1 carrier unreasonably discriminates against an access seeker. Consideration is being given to facilitating Ministerial intervention when interconnection is unreasonably delayed.

Access requirement applying to designated carriers

Designated carriers (NTT) must provide for interconnection at any technically feasible point. The Ministry of Posts and Communications specified seven minimum points of interconnection — local loop; local switching equipment; tandem switching equipment; local transmission facilities; interoffice transmission facilities; and signalling network — and, subject to technical feasibility, required designated carriers to unbundle other facilities on request.

Tariffs for interconnection with essential facilities must be cost-based and submitted to the Minister for authorisation. The Minister reviews these tariffs annually and carriers must seek authorisation for any proposed amendments. Essential facilities must be provided to other carriers on conditions equal to those that designated carriers provide to themselves.

The Ministry proposed the establishment of guidelines for calculating interconnection charges which designated carriers must follow. This proposal indicated the use of long-run incremental cost. It is unclear whether these guidelines have been developed.

When carriers apply for a point of interconnection not covered by the approved tariff schedule, interconnection must be based on individual agreement.

Number portability

The Ministry aims to have number portability operating by 2000 once it has completed a study on implementation and costing.

The Ministry proposes that designated carriers provide number portability for subscriber telephone numbers, ISDN numbers and freephone service numbers. Number portability for subscriber telephone numbers and ISDN numbers will only be guaranteed when switching between carriers at the same location.

Accounting separation

Designated carriers must separate their accounts according to accounting standards defined by the Government. These standards require accounts be separated into two parts — the management and operation of essential facilities and the use of essential facilities.

Carriers are obliged to submit a report on their interconnection accounting to the Minister and disclose it. A certification of calculation results authorised by a certified public accountant must be attached.

Anti-competitive conduct

Article 36 of the *Telecommunications Business Law* provides for the Minister to issue an order to improve business activities.

However, this framework is being reviewed as the Ministry believes Article 36 does not provide for a proper response to acts (such as deliberately delaying interconnection) that hinder smooth interconnection (MPT 1997).

E.6 New Zealand

Prior to 1987, telecommunications services in New Zealand were provided by the New Zealand Post Office. The Post Office was a government department which, among other things, was responsible for the provision of all telecommunications services in New Zealand.

In 1986, the New Zealand Government announced plans to corporatise the Post Office. The Post Office was split into three state-owned enterprises, one of which was Telecom Corporation of New Zealand Ltd (TCNZ). TCNZ was required to operate on a fully commercial basis, capable of earning profits and of paying dividends and tax to the government.

Policy and regulatory functions, previously handled by the Post Office, were transferred to the Department of Trade and Industry (now the Ministry of Commerce).

Restrictions on the provision of telecommunications goods and services were abolished with the passage of the *Telecommunications Act 1987* and the *Telecommunications Amendment Act 1988*. The former removed restrictions on the supply of customer premises equipment. The later removed restrictions on the supply of telecommunications services of all kinds.

Section 2A of the *Telecommunications Act 1987* provides for designation of telecommunications suppliers as ‘network operators’. Designation as a network operator provides suppliers with special rights of access to land and, in particular, the road reserve, to lay or construct lines where required to carry on a telecommunications business.

The *Radiocommunications Act 1989* introduced fundamental reforms to the management of the radio spectrum in order to facilitate competitive entry in telecommunications and broadcasting, as well as to promote efficiency in spectrum management.

The *Telecommunications Amendment Act 1990* placed information disclosure requirements on TCNZ with the purpose of facilitating effective competition. TCNZ must publish the prices, terms and conditions for the supply of certain prescribed telecommunications goods and services including:

- access to the public switched network;
- interconnection to a network owned and operated by Telecom for the purposes of operating any other network, whether or not owned or operated by Telecom;
- leased circuits; and
- local, national and international calls.

The *Telecommunications (International Services) Regulations 1994* allows registered providers to operate public switched telecommunications services, or leased circuits, between New Zealand and any overseas operator in a territory outside New Zealand. It also allows registered operators to negotiate freely with overseas operators.

The Ministry of Commerce has the power to require the registered operator to pay the same rates of settlements, in accordance with the same accounting method, that an overseas operator charges other registered operators.

Universal service obligations and retail price controls

Universal service obligations are implicitly included in the Kiwi Share Obligation (KSO) built into TCNZ's charter. The KSO requires TCNZ:

- to provide a local free calling option for residential customers;
- to ensure residential customer access charges rise no faster than movements in the CPI unless the profits of TCNZ Regional Operating Companies are unreasonably impaired;
- to ensure ordinary residential telephone services remain as widely available as at 11 September 1990; and
- to ensure customer access charges for residential customers in rural areas are no higher than those in the cities.

Access arrangements

Access or interconnection to either fixed or mobile networks is not mandated under legislation. Service providers and carriers are required to negotiate access to networks. There is no formal means of arbitration.

Where negotiations fail, negotiating parties may seek redress through the Courts under the *Commerce Act 1986*. In the early 1990s, Clear Communications brought action against TCNZ under Section 36 of this Act (dealing with misuse of market power) when negotiations over the terms and conditions of access to the network failed.

The protracted nature of these legal proceedings precipitated the Ministry of Commerce and the Treasury to jointly issue a discussion paper setting out options for enforcing the regulatory environment, including arbitration and introducing a statutory regulatory agency. The paper included options for broad legislative principles, access pricing and universal service obligations.[1]

In 1993, amendments to the *Telecommunications (Disclosure) Regulations 1990* required TCNZ to publish in full its interconnection agreements with other parties.

1 Debate on the discussion paper lead to maintenance of the status quo. However, further regulation was proposed if telecommunications carriers did not negotiate in good faith.

Following the election of the Coalition Government in 1996, a discussion paper on *Commerce Act* penalties and remedies was issued. No decisions have yet been made.

Allocation of spectrum

The *Radiocommunications Act 1989* provides for the allocation of spectrum through tendering processes. Rights to cellular telephone frequencies were first tendered in 1990. The successful bidders were required to obtain Commerce Commission clearance before uplifting the rights. TCNZ had incumbency rights to one of the bands while three further bands were offered for tender. BellSouth New Zealand Ltd successfully secured the rights to one band while TCNZ acquired the rights to another. The third right was retendered in 1993 and secured by Telstra (New Zealand) Limited. In 1997, Telstra subsequently sold its right to BellSouth.

TCNZ operates an analogue AMPS cellular service and has introduced a digital AMPS cellular service, while BellSouth is offering a digital GSM service.

The *Radiocommunications Act 1989* is currently under review.

Number portability

In 1993, the Telecommunications Numbering Advisory Group (TNAG) was established to facilitate the resolution of numbering issues.

In 1997, TNAG reached agreement on the technical means of providing initial telephone and mobile number portability between service providers. Telephone number portability based on call forwarding has been introduced. Mobile number portability is under negotiation. Portability has yet to be introduced for 0800 numbers.

In 1998, the New Zealand Government issued an ultimatum to the industry to agree on satisfactory voluntary arrangements to resolve number administration and number portability issues or face regulation.

Anti-competitive behaviour

Competitive conduct is regulated under the *Commerce Act 1986*. The legislation is designed to prevent anti-competitive behaviour and unlawful use of a dominant market position in industries generally. Proof of anti-competitive conduct requires proof of ‘dominance’ and proof of ‘purpose’.

E.7 Sweden

Competition in Swedish telecommunications commenced in 1992, when the incumbent, Telia, negotiated Sweden's first interconnect agreement with Tele2. In 1993, the Swedish Government enacted the *Telecommunications Act 1993*. It also entered into a three year agreement with Telia. Telia, which is wholly government-owned, was corporatised at that time.

The 1993 legislation established an independent regulator for telecommunications, National Post and Telecom Agency (PTS). PTS was given responsibility for the licensing system, and for mediating access disputes, if requested by one of the parties. It had no power to arbitrate, but could issue statements about the reasonableness of Telia's proposed interconnection charges. It could also prohibit pricing proposals which were not, in its opinion, cost-based. PTS has the power to collect data on which to base such assessments. PTS succeeded in achieving reductions in Telia's interconnect charges for fixed telephony between 1993 and 1997 (Lewin and Kee 1997).

Sweden also enacted the *Competition Act 1993*. This prohibits agreements detrimental to competition or abuses of a dominant position. It is administered by the Swedish Competition Authority. Since 1993, the Competition Authority dealt with a large number of complaints against Telia, many of which alleged unreasonable delays over negotiating access agreements. In 1996, it used its powers to break a deadlock in access negotiations between Telia and Tele2.

AB Stelacon (1997) reports that, despite the fall in interconnection charges, by 1996, competition in Swedish telecommunications was virtually limited to international and long-distance calls. Telia had 94 per cent of the fixed phone market, with 13 companies sharing the remainder. Wider margins in the international market allowed more scope for competition than in local and long-distance. By 1996, Telia's share of the international market had fallen to between 70 and 75 per cent with its nearest rival, Tele2, claiming 22 per cent.

Telia continues to dominate the mobile market, but its market share had fallen to 71 per cent by the end of 1996, as compared with 84 per cent at the beginning of the year (Stelacon 1997). Competition has taken the form of subsidised phones rather than reduced call charges, which remain higher than local call charges. Telia is the only operator with an analogue network.

Stelacon attributes the failure of Telia's competitors to make inroads into the fixed telephony market to the level of customer access charges imposed by Telia for access to the local loop. Customer access charges are combined with reasonably low local call charges which generally do not cover local interconnect fees.

Another factor limiting competition is that customers using operators other than the incumbent must use a prefix for all calls. Users tend to omit this. Tele2 has a relative advantage over other entrants, since its prefix is 007 — more likely to remembered and used by customers than alternative prefixes.

Stelacon reported that alternatives to the use of the local loop, such as radio-based telephony and cable TV, with which Telia's competitors are experimenting, may lead to enhanced competition. Tele2, Telia's strongest competitor, is engaged in renting and buying its own network infrastructure. In Stelacon's view, this strategy may in the long-run offer lower costs than relying on access. In 1996, however, Telia's interconnection charges, although high enough to discourage competition in the retail market, were sufficiently low to deter the construction of alternative infrastructure.

Between 1994 and 1996, Telia's local charges increased by 45 per cent, while long-distance call charges fell by 40 per cent. However, to some extent this reflects a 're-balancing' of prices to bring them more in line with costs. In 1997, Telia announced that 'rebalancing' had been completed.

In 1997, Sweden enacted amendments to the *Telecommunications Act 1993*. This was partly a response to a number of reports indicating that the regulatory framework had room for improvement, but was also prompted by the need to conform to the directives of the European Commission. A preliminary assessment by the European Commission (1997a) was that the Swedish legislation appeared to be in broad conformity with the Commission's framework for liberalisation by 1 January 1998.

The main features of the 1997 legislation are:

- the adoption of the provision of telephone services *at an affordable price* as the main objective of Government policy;[2]
- the attainment of the Government's objectives through legislation rather than through State ownership of — and formal agreement with — Telia; and
- the imposition of special obligations regarding interconnection on operators with significant market power — in practice, on Telia.

The incumbent, Telia, remains in government hands, but Lewin and Kee (1997) reports that consideration is to be given to the question of its future ownership.

2 The phrase affordable price is the most significant addition to the 1993 legislation's statement of objectives.

The 1997 legislation attempted to clarify the respective roles of the PTS and the Competition Authority by giving PTS greater powers with respect to interconnection disputes.

Under the 1997 legislation, PTS's main responsibilities are:

- the supervision of compliance with the telecommunications legislation and regulations, including the notification (registration) and licensing systems;
- determinations of interconnection prices;
- assessment of *significant market power* and notifications of undertakings with significant market power to the European Commission;[3] and
- monitoring the industry.

Decisions by PTS are subject to appeal in the Courts. Unless the decision involves the revocation of a licence or imposition of a charge, its decisions will normally stand until the appeal has been heard.

Registration and Licensing

The object of the Swedish system of registration and licensing is to facilitate entry (PTS 1997). Operators wishing to provide fixed and mobile telecommunications services or network capacity or to access the numbering system must register with the PTS. Although there are no pre-requisites for registration — only the provision of basic information — registration entails rights and obligations, particularly with regard to interconnection.

Operators are also required to hold licences if their activities are deemed by PTS to be *significant* with respect to factors such as the size of their area of operations or the number of users. The exceptions to this are where the operator provides premium rate services or have only registered in order to access the numbering system.

More extensive obligations are attached to licences depending on whether or not the licencee is considered to have significant market power. Currently only Telia has significant market power since it has greater than 25 per cent of market share.

For fixed network services, licence applicants must be capable of reaching 'adequate' capacity and quality. Mobile operators seeking access to the

3 Under European law, the benchmark for significant market power in telecommunications is a 25 per cent market share, but significant market power can also be determined by national regulatory authorities by reference to numbers of customers, area covered or other circumstances.

frequency spectrum must be granted access through a selection process utilising objective criteria.

Both licence holders and those registered with PTS have reciprocal rights to interconnection on commercial terms. They must:

- comply with requests for interconnection, subject to network capacity;
- have regard to the requirements of the disabled;
- adhere to international agreements;
- contribute to public emergency services;
- provide subscribers' details for directory service; and
- provide information as required by the authorities, including separate accounts for telecommunications activities.

In addition, licence holders must:

- comply with universal service obligations (only Telia);
- maintain a required standard of capacity and quality;
- provide information about their owners;
- publish their own telephone directories; and
- without compensation, provide a public telephone network to required specifications.

Universal Service Obligation

The Swedish Universal Service is now defined as *access to telephony services between fixed points to all regardless of where they live at an affordable price.* The reference to *affordable price* was added in the 1997 legislation. However, the definition of *telephony service between fixed points* does not include services suitable for people with disabilities, because this would contravene the legislation of the European Commission. Instead, PTS arranges for the provision of these services and receives Government funding for this purpose. This is consistent with the European Commission's view that services to the disabled should be a social, rather than an industry, obligation.

Telia is currently responsible for the Universal Service Obligation and receives no compensation for this or for the provision of public telephones.

Retail price regulation

Until 1997, PTS administered a price cap on baskets of Telia's retail charges. Within this price cap, considerable re-alignment of charges took place. Local call charges increased, while long-distance and international call charges fell.

The 1997 legislation applies to all licence holders for fixed telephony and leased lines and stipulates that their retail tariffs must be cost-based. Notwithstanding this, the Government has the power to determine them. However, call price regulation has been discontinued in Sweden, and replaced by monitoring of 'affordability' by PTS, particularly in market segments not exposed to competition. Price capping of customer access fees for both business and household subscribers continues.

The grounds for discontinuing the call price cap were mainly that it was originally intended to protect consumers from rapid increases in prices while 're-balancing' occurred. As 're-balancing' is considered to have been completed, price-capping is considered unnecessary. Furthermore, it is believed that restraints on interconnection charges should benefit consumers by encouraging greater competition at the retail level. There is some concern that price capping may concentrate entry into the higher call price segments of the market.

Prior to 1997, Telia's licence conditions required it to charge uniform prices to end-users no matter what their geographical location. However, geographical variations are now permitted on the grounds that uniformity may inhibit product development and price falls in response to increases in competition, to the detriment of consumers.

Interconnection

All operators of public network services are required to provide for competitors to interconnect with their network. In the case of those considered to have significant market power, the party requesting interconnection may request the point of interconnection and the access provider must not refuse any reasonable requests.

The terms and conditions of interconnection must be determined through commercial negotiation. The PTS is empowered to mediate or arbitrate if requested by one of the parties and may set a time limit for negotiations. Lewin and Kee (1997) stated that arbitration becomes available six months after negotiations commence. The PTS retains the right to alter interconnection charges if these are not fair and reasonable.

Operators with significant market power must publish standard reference offers which specify the technical conditions and tariffs applicable for interconnection. Offers are reviewed by the regulator against cost-based pricing principles. The technical and financial conditions offered to competitors must be the same as what the operator provides itself. Operators must not refuse any requests to negotiate where certain interconnection conditions are not covered by the offer. Standard offers do not preclude negotiated agreement so long as they are objectively justified and transparent.

In assessing interconnection terms, the PTS had previously used fully allocated cost principles. However, the PTS believed this was unsatisfactory as it involved an arbitrary allocation of fixed costs. The burden of proof that interconnection charges are cost-based lies with Telia (MTCS 1997).

The Swedish 1997 legislation originally only required that interconnection charges be cost-based with respect to fixed telephony providers with significant market power and not to mobile operators. To conform to the directives of the European Commission, during 1997 this requirement was extended to mobile operators with significant market power in the national market for interconnection.

Number portability and carrier pre-selection

PTS is responsible for the numbering system. The European Commission has directed that number portability should be available by 1 January 2003 at the latest and Sweden intends to introduce it as soon as possible (Swedish Ministry of Transport and Communications 1996).

A decision to implement equal access with pre-selection by September 1999 has been taken. *Equal access pre-selection* means that the subscriber is required to use an equal number of digits in the prefix to the number called, regardless of the carrier. This would give other providers parity with Telia. Under the current system, Tele2 has already built up a subscriber base with its 007 prefix.

E.8 United Kingdom

Competition was first introduced into the telecommunications sector in 1984. Prior to this, all telecommunications services were provided by British Telecom (BT) which was a government-owned monopoly.

In 1984, BT was privatised and a duopoly policy initiated, regulated by the newly-formed OFTEL, which limited entry into the sector until 1991. Mercury became the second carrier and commenced operations as a competing fixed-link operator. The duopoly policy aimed to provide Mercury with a degree of protection against future competition to allow Mercury time to install and consolidate its national network.

BT’s retail prices were controlled by a price cap covering quarterly rentals and connection charges and national and local call charges. The price cap limited price rises to: RPI-3 per cent from 1984 to 1989; RPI-4.5 per cent from 1989 to 1991; RPI-6.25 per cent from 1991 to 1993; RPI-7.5 per cent from 1993 to 1997. Until 1996, BT also undertook to limit quarterly rental increases to RPI+2 per cent and wholesale customer access charges to RPI+5 per cent.

Licence conditions required BT to interconnect with Mercury. It was intended that BT and Mercury negotiate interconnection arrangements. However, when the parties failed to reach agreement, OFTEL determined the arrangements.

In the mobile services market, two network operators — Cellnet and Vodafone — were licenced. Network operators were not permitted to sell directly to customers. Mobile services had to be marketed through service providers. Cellnet and Vodafone were allowed to own or control service providers, however, there were conditions in their licences which prevented them from favouring their tied service provider.

In 1991, entry into the telecommunications market was liberalised for domestic traffic. In particular, cable companies were able to enter the telephony market, although BT and Mercury were prevented from entering the cable business. This aimed to provide cable companies with an opportunity to construct their networks before having to face competition from BT (Cave and Williamson 1996, p. 103).

BT’s prices remained under price caps except that the controls were extended to international calls. BT was able to offer quantity discounts subject to restrictions relating to the availability of such packages, a floor on prices and limitations on the speed at which prices could be reduced.

An access deficit contribution scheme was introduced to compensate BT for the losses it claimed it was making because of the price cap on customer access charge increases. Operators interconnecting with BT were to make a contribution to BT access deficit proportional to profitability of the service which the entrant was providing.

OFTEL imposed accounting separation requirements on BT, requiring it to account separately for its retail and network businesses and to charge its retail affiliate transfer prices equal to those its levied on its competitors.

Competitors were entitled to purchase network services at wholesale prices. However, this advantage was only extended to facilities-based entrants as

OFTEL sought to maximise network competition. Service providers had to purchase network services at retail prices.

OFTEL assumed control of the telephone numbering system and required BT to make technical arrangements for the introduction of number portability.

The same year, the mobile duopoly ended and two further operators — Mercury One-to-One and Orange — were licensed. No further GSM licences are to be issued until at least 2005, though licensing of third-generation mobile ("UMTS") is expected in summer 1999. All four GSM operators are now permitted to retail directly to the public.

In 1997, OFTEL initiated a third wave of deregulation. Firstly, this completely liberalised the international facilities market, allowing all appropriate applicants to receive International Facilities Licences. This was followed by action in the domestic field aimed to minimise the level of regulation in the industry by removing regulatory controls from what it considered to be competitively provided services.

Universal service obligations

OFTEL established the level of universal telecommunications service for the four year period from 30 September 1997 to 29 September 2001[4] as consisting of the following services:

- a connection to the fixed network able to support voice telephony and low speed data and fax transmission;
- the option of a more restricted service package at low cost; and
- reasonable geographic access to public call boxes across the UK at affordable prices.

All consumers should be able to access emergency phone services free, receive itemised bills, be able to choose selective call barring, and have access to operator assistance and directory information. Consumers should also be given the option of an outgoing calls barred service, together with a repayment plan, as an alternative to disconnection for non-payment.

The provision of universal services should be at geographically averaged prices.

In its calculations, OFTEL did not find that BT faced an undue burden as a result of its obligations as the universal service provider. Therefore, OFTEL did not propose to establish a universal service funding mechanism.

4 Subject to a review in 1999 which will take into account the views of the Secretary of State for Trade and Industry, who shares statutory responsibilities with the DG in this area.

However, OFTEL recognised that the decision not to adopt a funding mechanism immediately did not remove the need to consider how such a fund might work in the future. OFTEL has consulted on the various ways of organising such a funding mechanism and the basis for making payments. Although, no clear consensus on the way forward emerged from the consultation, OFTEL will continue to work on the practicalities of a funding mechanism with the assistance of a Working Group and will undertake a review of the situation in the summer of 1999.

Retail price controls

New retail price controls came into effect in 1997. The residential price cap was refocussed to reflect the pattern of usage of the first 80 per cent by spending of residential customers. OFTEL estimated that the last 20 per cent were the highest users of residential services and had access to volume discounts unavailable to the rest of BT's customers. By excluding the highest volume users, the new price cap gives less weight to international and national calls than would otherwise have been the case.

The new residential price cap was set at RPI-4.5 per cent and is intended to end in July 2001. At this stage, OFTEL would like not to have to renew the price cap after its expiry as it hopes competition will be providing adequate protection for consumers.

The arrangements also include a degree of protection for the top 20 per cent of users. The residential price cap acts as a ceiling for the prices they pay.

The price cap extends to residential services only and therefore specific protection has been provided for small business. BT is required to offer a package which has call charges at least as low as those required to meet the price cap for the residential market and annual retail increases are limited to RPI.

Access arrangements and pricing

The provision of access remains a condition of BT's licence. However, interconnection or network charges, as OFTEL terms them, are now subject to a price-cap regime. The network charge controls apply to the charges BT makes to other operators when they use BT's network. BT is free to determine its network charges itself as long as those charges remain within the price cap and above the Long-Run Incremental Cost (LRIC) floor. However, BT is also subject to an overarching revenue cap. (Access charges of non-dominant operators are determined by commercial negotiation with recourse to OFTEL if agreement cannot be reached.)

OFTEL developed three different network baskets, each of which is subject to its own price cap. The first basket comprised those services which were not competitive and were unlikely to become so during the charge control period. OFTEL defined these services to include call origination, local-tandem conveyance and single transit. This basket is indexed at RPI-8 per cent.

The second basket related to services that were expected to become competitive during the charge control period. These services included inter-tandem conveyance, inter-tandem transit, international direct dial conveyance, value-added elements of access to Directory Enquiries services and are indexed at RPI.

The third basket included only call termination where OFTEL believed BT's market power would remain for the duration of the charge control period. The charge cap for call termination is RPI-8 per cent. OFTEL also required that the actual charges for call termination be reciprocal and required the industry to develop suitable implementation procedures.

In addition to the price caps, BT is subject to a revenue cap. BT must ensure that the charges it sets for interconnection services in any basket, multiplied by the prior financial year volumes of those services, is less than or equal to the allowable revenue for that basket as set by OFTEL. Allowable revenue is calculated using an incremental cost model.

OFTEL also requires the:

- publication of separate, audited accounts for BT's regulatory businesses and disaggregated activities, including a detailed explanation of the methodology used to attribute costs;
- publication of BT's interconnection agreements and of the amounts attributed to Network Components and Parts, and charges for Standard Services;
- non-discrimination requirements to oblige BT Network to set transfer charges to BT Retail Systems on the same basis as the interconnection charges to other operators; and
- a requirement upon BT not to discriminate between itself and other operators in respect of the quality of service offered.

Interconnection arrangements and charges in the mobile sector have never been controlled, but the charges are currently the subject of an inquiry by the

Monopolies and Mergers Commission (MMC) following a referral from OFTEL.

Anti-competitive conduct

OFTEL inserted a Fair Trading Condition (FTC) into BT's licence as the new regulatory arrangements gave BT greater pricing freedom at the retail and network level, and therefore greater scope for anti-competitive behaviour.

The FTC prohibits abuses of a dominant position, anti-competitive agreements and concerted practices between businesses. The FTC requires the Director-General to have regard to the principles of European competition law and also the decisions of the European Commission, the Director-General of Fair Trading and the MMC in deciding whether any behaviour is caught by the condition.

OFTEL sought the introduction of a FTC as it considered the processes under the *Fair Trading Act* or the *Competition Act* too slow:

> ... the competitor might be put out of business before the offending behaviour could be stopped ... OFTEL needs to get away from detailed, specific conditions and to have instead powers which are more broadly drawn and which allow it to act quickly as soon as particular behaviour is recognised as anti-competitive. (OFTEL 1996, para. 3.5-3.6)

The FTC is enforced, as all licence conditions, by the Director-General of Telecommunications (DGT) issuing Orders under procedures laid down in the *Telecommunications Act 1984*. A Provisional Order (this lasts three months) can be made with immediate effect, where it appears to the DGT that a breach is occurring. To issue a Final Order, the DGT must be satisfied that there is, has been or is likely to be again a licence breach. The DGT must give a minimum period of 28 days notice and hear representations from the licencee before a Final Order can come into effect. A Final Order is permanent until revoked and permits third parties to seek damages from a licencee breaching the Order.

The decisions made by the DGT may be challenged by judicial review. Under the *Telecommunications Act 1984*, there is no other mechanism for appeal. However, OFTEL argued that:

> The onus is on OFTEL to show that a particular action has had, or is likely to have, an appreciable effect on competition in a market (OFTEL 1996, 3.28).

In addition, the operator is only liable to penalties if the operator persists in anti-competitive behaviour after an Order (Provisional or Final) is made.

OFTEL indicated that Article 85 (prohibiting anti-competitive agreements) and Article 86 (dealing with abuse of a dominant position) of the European

Commission Treaty would override the FTC. The United Kingdom Government has proposed the introduction of the European Commission Articles in a new competition act with stringent enforcement measures of fines imposed by the competition authorities and the right of third parties to seek damages through the courts. An appeals mechanism will also be introduced.

E.9 United States

National regulation of the United States telecommunications industry was first implemented with the *Communications Act 1934*. Until this time, the industry comprised an unregulated interstate monopoly (American Bell, later AT&T) and monopolies in each local area were subject to State-based regulation. AT&T owned the local operators in the major cities while independent companies served the small towns and rural areas.

The 1934 Act established the Federal Communications Commission (FCC) and gave it broad discretionary authority to regulate the telecommunications industry:

> The Commission may perform any and all acts, make such rules and regulations, and issue such orders, not inconsistent with this Act, as may be necessary in the execution of its functions (United States Code quoted in Brock 1994, p. 50).

In particular, the Act allowed the FCC to:

- suspend new tariffs for up to five months to determine lawfulness;
- prescribe tariffs after an appropriate hearing;
- investigate complaints against carriers and award damages;
- require extensions to facilities;
- prescribe accounting systems and depreciation charges for carriers; and
- compel information from the carriers.

The FCC's authority over these matters only extended to interstate and international telecommunication services. The 1934 Act reserved the regulation of intrastate services to the State Commissions. The division of powers frequently resulted in conflict between Federal and State regulatory authorities over policy issues, as each believed it had the right to act independently of the other (Brock 1994, p. 56). The division of Federal and State jurisdictional responsibilities affected the operation of AT&T which acted across those political jurisdictions. AT&T encountered different levels of restraint on its prices.

The 1934 Act also provided stronger regulatory authority to compel interconnection and to suspend tariffs. The Act specified:

- common carrier obligations to serve all who request service;
- the right of the FCC to require interconnection with other carriers;
- that rates of interconnection be just and reasonable;
- that unreasonable discrimination was prohibited; and
- tariffs for all communications charges be filed, publicly available and followed in a non-discriminatory manner.

Regulation at the State level aimed to ensure universal service. To this end, State regulators argued that long-distance services should subsidise the cost of local services:

> The State regulators had an incentive to argue that the long-distance service is only possible because of the local connections and that part of the long-distance toll revenue should be used to cover the cost of local service ... (Brock 1994, p. 66).

The desire to use long-distance revenues to subsidise local services culminated in the 'separations and settlements' policy. Separations referred to a cost allocation process that divided the costs of commonly-used plant into State and interstate jurisdictions. Each jurisdiction then set its own policies for the recovery of these costs. State regulators sort to keep local rates as low as possible by increasing the costs allocated to the interstate jurisdiction.

Settlements allowed for local exchange companies to recover a portion of their costs allocated to the interstate jurisdiction from interstate toll revenues. In effect, the separations and settlements policy transferred revenue from long-distance services to local-call services. It also resulted in interstate PSTN long-distance prices being far above the cost of the services (Brock 1994, p. 70).

Between 1959 and 1979, competition was gradually introduced into the long-distance network and the provision of telecommunications equipment through the interaction of FCC decisions and Federal Appeals Court decisions.

The trend toward competition culminated in the Modified Final Judgement (MFJ) of 1982. The MFJ restructured the telecommunications industry, separating the industry's competitive services from its natural monopoly services. The MFJ resulted in:

- AT&T divesting its local operating companies. The local operating companies were re-organised into seven regional holding companies, known as regional Bell operating companies (RBOCs) or "Baby Bells";

- Each RBOC provided telephony services within a designated local access transport area (LATA). LATAs were constructed so that few LATAs crossed state boundaries (that is, each state consisted of one or more LATAs). In more profitable high-density areas, LATAs were small geographically so that a high proportion of originating traffic was carried by the inter-LATA operators. In low-density areas, the LATAs were large so that a high proportion of originating traffic was carried by the RBOC (Lewin and Kee 1997);
- AT&T restricting its operations to the long-distance market. It also retained control of its equipment manufacturer Western Electric and the Bell Laboratories;
- All licensing and supply agreements between Western Electric and the RBOCs were cancelled and the RBOCs were not to show preference for Western Electric equipment;
- AT&T was prohibited from purchasing stock in the RBOCs;
- RBOCs were required to provide interconnection to any long-distance provider; and
- RBOCs were prohibited from producing customer premises and other telecommunications equipment. Neither could they offer inter-exchange long-distance and information services.

The effect of the MFJ was to open all areas of the telecommunications industry competition, with the exception of intra-LATA services. Regulatory control of the RBOCs remained with the respective State Commission while inter-LATA and international services were regulated by the FCC.

Universal service obligations

Each telecommunications carrier that provides interstate or intrastate telecommunications services must contribute, on an equitable and non-discriminatory basis, to the provision of the universal service.

Universal service obligations require local exchange carriers to give consumers in remote areas access to telecommunications services that are ‘reasonably’ comparable to services provided in urban areas at charges which are also ‘reasonably’ comparable (Harris and Kraft 1997, p. 109). Local exchange carriers must average call rates across their entire service areas for calls of a given distance, independent of any cost differences that may exist.

The 1996 Act extends the universal service obligation to:

- eligible primary and secondary schools, libraries, and rural and non-profit hospitals at preferential rates; and
- the provision of telecommunications equipment and services to individuals with disabilities to the extent readily achievable.

Eligible schools and libraries will also receive full support for Internet access.

The FCC has a general universal service responsibility to ensure telecommunications are available to all people of the United States 'without discrimination on the basis of race, colour, religion, national origin or sex'.

Retail price controls

Retail price controls on inter-LATA services are applied only where the FCC determines a carrier is dominant. Currently, there are no retail price controls, the last being abandoned in 1995 when the FCC declared AT&T was no longer dominant in inter-LATA services. All inter-LATA carriers, whether dominant or not, are required to file their tariffs with the FCC.

Access arrangements

The *Telecommunications Act 1996* introduced new regulatory and institutional arrangements for the telecommunications industry in the United States. The Act primarily aimed to introduce competition into those areas of the industry still characterised by monopoly, that is, the local telephone exchange services.

Section 251 of the Act requires all carriers to provide for interconnection and to abide by any interconnection standards set by national bodies. However, because local exchange carriers remained within the jurisdiction of the State Commissions, the FCC had no direct authority to enforce Section 251 at the local level. Consequently, the FCC could not compel the local exchanges to open their markets to competition.

The FCC structured the implementation of the 1996 Act in such a way as to provide the local exchange carriers with an incentive to liberalise their markets. The FCC would not authorise the entry of incumbent local exchange carriers into the long-distance market within its own region unless the incumbent carrier had opened its own market for intra-LATA services to competition. However, they were permitted to provide long-distance services outside their local service areas.

To determine whether a local exchange carrier had opened its market to competition, the FCC developed a competitive checklist that the incumbent needed to satisfy to obtain FCC authorisation. This checklist requires the incumbent to interconnect new entrants at any technically feasible point on reasonable and non-discriminatory rates, terms and conditions.

The FCC has prescribed certain minimum points of interconnection necessary to permit competing carriers to choose the most efficient points at which to interconnect with the local network. The FCC also developed a list of unbundled network elements that the local exchange carrier must make available to new entrants upon request.

Incumbent local exchange carriers must also resell local call services to competing carriers at wholesale rates. The FCC requires that wholesale rates are based on avoided costs.

Compliance with the competitive checklist must be certified by the relevant State Commission. The FCC must then consult with the Justice Department regarding the likely competitive implication. Based on this input and its own evaluation, the FCC determines whether entry of the local exchange carrier in the long-distance market is in the public interest.

Where competitors show little interest in entering a local market, the FCC provides a so-called ‘track B’ method of entry into the long-distance market for incumbent local exchange carriers. Track B requires local exchange carriers to have proposed wholesale tariff schedules approved by the relevant State Commission. Where this approval is received, local exchange carriers are permitted entry into the long-distance market.

Access terms and conditions

Section 252 of the 1996 Act requires commercial negotiation of the terms and conditions of interconnection, although final agreements must be approved by the relevant State Commission. In the event that a State Commission fails to ratify an agreement within the deadlines specified in the 1996 Act, the negotiating parties may seek approval from the FCC. State or local governments cannot prevent carriers from interconnecting with the local network. Interconnection agreements must be published.

Where negotiations fail, the interconnecting party may file for arbitration by the State Commission according to the broad guidelines laid out by the FCC. Where the FCC is required to arbitrate, the FCC has indicated its intention to use ‘final offer’ arbitration. Under this approach, each party proposes its best and final offer and the FCC chooses between them on an issue-by-issue basis.

In arbitrating disputes, FCC guidelines require the State Commissions to use forward-looking Total Element Long-Run Incremental Cost (TELRIC) plus some mark-up for joint and common costs. Where States were unable to conduct the appropriate cost studies and apply TELRIC, the FCC established default ceilings and ranges for the States to apply on an interim basis — 0.2-0.4 cents per minute plus access charges for local switching and 0.15 cents per minute for tandem switching.

Co-location, number portability and dialling parity

Other provisions under the 1996 Act require local exchange carriers — incumbents and entrants — to provide:

- Either physical or virtual co-location of equipment required for interconnection including access to the local exchange carrier's offices on reasonable and non-discriminatory conditions. Rural local exchange carriers and local exchange carriers with fewer than two per cent of the nation's subscriber lines are exempted.
- Number portability to the extent technically feasible.
- Dialling parity which allows a rival's customers to dial the same number of digits as its own customers to reach other parties.
- Reasonable access to rights-of-way, poles and conduits.

Implementation

The implementation of the 1996 Act remains 'gridlocked' in the Courts as local exchange carriers and State Commissions test the validity of the FCC's requirements.

In July 1997, the Eighth Circuit Court found that the FCC did not have the authority to interpret the pricing provisions of Section 252 of the Act (Brock and Katz 1997). This implies that the FCC cannot require the State Commissions to apply its pricing rules in arbitration.

In December 1997, Judge Kendall of the United States District Court struck down several key provisions of the 1996 Act as unconstitutional, noting that they restrict the rights of local exchange carriers to compete in long-distance by unfairly delaying their entry. Kendall, however, preserved all provisions of the Act requiring that local exchange carriers continue to open their local markets to competitors (Pointcast Network, 8 January 1998).

Commentators claim that the confused jurisdictional situation evolved from the way the 1996 Act was established. The 1996 Act was structured as an amendment to the 1934 Act rather than a complete replacement for it. It established federal control over the development of local exchange competition, however, it did not repeal provisions from the 1934 Act reserving oversight of intrastate communications to the States.

Mobile communications and the allocation of spectrum

Cellular mobile communications were introduced on a regional basis. Licences were issued to provide services within given metropolitan areas. In each of these areas, two operators were licenced — the local exchange carrier took one licence and an independent company the other.

Operating outside its licenced area required the mobile operator to enter into roaming agreements with other carriers. Consequently, cellular mobile services remain mainly a local rather than national service.

With the 1996 Act, mobile operators have been consolidating their networks to create larger contiguous areas.

The FCC, which manages spectrum, designates particular parts of the spectrum for particular uses. It then assigns licences to individual applicants for the designated uses.

The FCC initially used administrative hearings to assign licences. However, hearings resulted in lengthy delays in the introduction of new technologies such as cellular telephones (Scharwtz 1997, p. 223).

In 1981, lotteries replaced administrative hearings. Lotteries reduced delays but also created windfall gains to those who resold their licences through secondary markets.

In 1993, Congress gave the FCC the authority to auction spectrum licences. The FCC uses electronic simultaneous multiple-round auctions. A simultaneous multiple-round auction is similar to a traditional auction, except that, rather than selling licences one at a time, a large set of related licences are auctioned simultaneously and bidders can bid on any licence offered. The auction closes when all bidding activity has stopped on all licences.

> The principal advantage of a multiple round auction for assigning spectrum is the information that it provides bidders about the value other bidders place on licences. This information increases the likelihood that licences will be assigned to the bidders that value them the most and will generally yield more revenue than auctions where there is much uncertainty about common factors that affect the value of a licence to all (FCC 1998, p. 2).

F PRICE BASKET ASSUMPTIONS USED FOR PRICE COMPARISONS

Comparisons of Australian telecommunications prices with those of eight other OECD countries are presented in Chapters 5 and 6. These comparisons are derived by costing a number of defined baskets of telecommunications services in each country. The price baskets were developed by Eurodata Foundation in consultation with the Productivity Commission.

The baskets represent the usage patterns of different residential and business users. The assumptions underlying these baskets are described in broad terms in Chapters 5 and 6 and are presented in more detail in this Appendix.

F.1 Coverage

Prices are compared for the services and countries listed in Table F.1, which also indicates the availability of price information for the various services.

Table F.1 Services and carriers covered in this study

Country	*Carrier*	*PSTN*	*ISDN*	*Mobile*	*Leased lines*	*X25*	*Frame Relay*	*ATM*
Australia	Telstra	✓	✓	✓	✓	✓	✓	✓
Canada	BC Tel/ Stentor	✓			✓	✓	✓	
Finland	Tele	✓	✓	✓	✓	✓		
	HTC	✓					✓	✓
France	FT	✓	✓	✓	✓	✓		
Japan	NTT/KD D	✓	✓	✓	✓	✓	✓	
New Zealand	NZ Telecom	✓	✓		✓	✓	✓	
Sweden	Telia	✓	✓	✓	✓	✓	✓	
	Tele2	✓						
UK	BT	✓	✓	✓	✓	✓	✓	✓
USA	Nynex/ PacBell	✓			✓	✓		

Source: Eurodata (1998).

There are a number of gaps in the coverage because only some carriers provide the full range of telecommunications services. For example, Canada and the US were excluded from the ISDN comparisons where services are available only for small areas of these countries.

Frame Relay and ATM tariffs were also not available for some countries. Tariff information was considered to be commercially sensitive or only available on a customer-by-customer basis.

Table F.2 Telecommunications price baskets' characteristics

Basket	*Characteristics*
Residential	One line, very little (1 per cent) international traffic, some traffic to Internet and mobile phones, no fax calls.
Small business (S1)	One line, one user, some international traffic, some traffic to mobile phones, no fax and Internet calls.
Small business (S2)	Three users with individual lines, a fax line and a modem line. Some international traffic (3 per cent), fax and Internet traffic and calls to mobile phones.
Medium-sized business (M1)	A company with 30 users, only national traffic, with a majority of local traffic.
Medium-sized business (M2)	A company with 100 users. Some international traffic (2 per cent), but with an emphasis on local traffic.
Medium-sized business (M3)	A company with 30 users, with 7 per cent of the traffic is international and there is a clear emphasis on regional and long-distance traffic.
Medium-sized business (M4)	A company with 100 users, high (10 per cent) international traffic and an emphasis on regional and long-distance traffic.
Large business (L1)	A large, national company with 30 sites and ten users per site. Low (2 per cent) international traffic and an emphasis on local calls.
Large business (L2)	A large, national company with five sites and 60 users per site. Medium (5 per cent) international traffic and an emphasis on local calls.
Large business (L3)	A large, international company with 8 per cent international traffic, and ten sites with 60 users per site on a national basis.
Large business (L4)	A large, multinational company with high (15 per cent) international traffic and five sites with 200 users per site nationally.

Source: Eurodata (1998).

F.2 Baskets used in this study

The baskets used in this study are based on OECD telecommunications price baskets. The OECD baskets are structured to reflect the cost of typical telecommunications consumption within member countries.

The OECD produces a series of baskets for different services and residential and business user groups. Currently they are defined for PSTN services, national leased lines, X25 and mobile services.

The baskets were originally developed in the late 1980s. The Commission modified the OECD baskets to include calls to mobile phones and Internet service providers. Additional baskets including multiple telecommunications lines were developed to represent larger business users. Baskets for ISDN services, Frame Relay and ATM services were also developed.

The baskets are based on users with the characteristics outlined in Table F.2.

Baskets were constructed for a range of users for PSTN, ISDN, mobile, leased line and data services. The basket sizing parameters vary with the size of business. However, these baskets are kept as consistent as possible, to allow for direct comparability.

Large business baskets were not developed for all substitute services. For example, large businesses were assumed to use ISDN services, but not PSTN services, and ATM or Frame Relay services, but not X25 services.

See Table F.3 for the different service types specified for the large business baskets.

Table F.3 Large business baskets

Services	*L1*	*L2*	*L3*	*L4*
ISDN basic rate for voice, fax, Internet	✓			
ISDN primary rate for voice, fax		✓	✓	✓
Mobile	✓	✓	✓	✓
Leased lines for Internet		✓	✓	✓
Leased lines for other data	✓	✓	✓	✓
Frame Relay for other data		✓		✓
ATM				✓

Source: Eurodata (1998).

PSTN baskets

PSTN baskets were constructed for residential, small and medium-sized business users. The assumptions used to construct the PSTN baskets are presented in Table F.4. Large business users were assumed to use ISDN services, so no large business PSTN basket was constructed.

Table F.4 Underlying assumptions, PSTN baskets

Charge	*Assumption*
Installation charges	Basket includes installation charges depreciated over five years.
Rental	Rental per year.
Recurring option charges	Option charges per year.
Call setup	Multiplied with total number of calls for each calling zone. Call setup charge may vary with calling zone.
Minimum charge per call	Compared with actual call charge, and applied if call charge is less than the minimum.
Duration charge	Used with call duration for each call. If fixed charge units are used, only full units are calculated.
Volume discount	Total usage charges of the basket are compared with discount thresholds (where applicable), and discounts are applied.
Call charge discounts	Where a specific discount has been applied to specific call charges, this discount is included in input data.
Selective discounts	'Friends and Family' type discount packages have not normally been taken into account in this study.
Internet	All calls to Internet service providers are local calls.
Fax	Fax is only included in the business baskets. As specific information is unavailable on fax usage patterns, an even distribution over national distance is assumed.

Source: Eurodata (1998.).

Residential PSTN baskets

The residential PSTN basket reflects a residential user with a single telephone line. The fixed costs of the line and connection are included. The majority of calls are local calls, with some long-distance and international calls. The discount package that is widely available and which minimises the cost to the customer is used.

The residential user was assumed to make a total of 1200 calls per year. The assumed distributions of calls are given in Tables F.5, F.6 and F.7. The number of calls to Internet service providers was assumed to be about one call every other day, that is, 150 calls per year.

The number of international calls has been set at 1 per cent of the total number of calls, or 12 calls per year. International calls were weighted using an average of the international traffic statistics reported by the ITU between 1990 and 1995.

Table F.5 Call distance distributions, residential PSTN basket

Distance	*Proportion of calls*	*Distance)*	*Proportion of calls*
(km)	*(%)*	*(km)*	*(%)*
3	56.4	110	1.4
7	13.2	135	1.2
12	4.7	175	0.9
17	2.8	250	0.9
22	1.4	350	0.7
27	2.4	490	3.3
40	2.4	Mobile	5.0
75	2.4	International	1.0

Source: Eurodata (1998).

Table F.6 Time of day and day of week call distribution, residential PSTN basket

		Proportion of calls		
Day: time		*National voice calls*	*International calls*	*Internet calls*
		(%)	*(%)*	*(%)*
Weekdays:	1100	26.3	12.5	5.0
Weekdays:	1500	22.1	12.5	5.0
Weekdays:	2000	26.6	18.9	40.0
Weekdays	0300	3.0	18.9	10.0
Saturdays:	1100	10.0	18.9	20.0
Saturdays:	1500	13.0	18.9	20.0

Source: Eurodata (1998).

Small business PSTN baskets

Two small business PSTN baskets were constructed:

S1 A small business with one telephone line.

S2 A small business with three telephone lines, one fax line, one modem line for Internet, and three users.

See Tables F.8, F.9, F.10 and F.11 for the assumed distribution of calls for the small business PSTN baskets.

Table F.7 Call duration, residential PSTN basket

	Call duration	
Distance	*Weekdays 11.00 and 15.00*	*All other times*
(km)	*(minutes)*	*(minutes)*
3 – 12	2.5	3.5
17 – 40	3.5	6.0
75 – 490	3.5	7.0
Internet	20.0	30.0
International	3.0	5.0

Source: Eurodata (1998).

Table F.8 Distribution of call types, small business PSTN baskets

	Number of calls (per annum)	
Call type	*S1 basket*	*S2 basket*
	(No.)	*(No.)*
National voice	2899	3480
International voice	33	120
To mobiles	326	400
National fax	–	460
International fax	–	115
Internet	–	230

Source: Eurodata (1998).

Table F.9 National voice and fax call distance distributions, small business PSTN baskets

	S1 basket	S2 basket	
Distance	*Proportion of national voice calls*	*Proportion of national voice calls*	*Proportion of fax calls*
(km)	*(%)*	*(%)*	*(%)*
3	53.0	53.0	7.1
7	11.0	11.0	7.1
12	7.0	7.0	7.1
17	4.0	4.0	7.1
22	2.5	2.5	7.1
27	3.0	3.0	7.1
40	3.5	3.5	7.1
75	3.5	3.5	7.1
110	2.5	2.5	7.1
135	2.0	2.0	7.1
175	1.5	1.5	7.1
250	1.5	1.5	7.1
350	1.0	1.0	7.1
490	4.0	4.0	7.1

Source: Eurodata (1998).

Table F.10 Time of day and day of week call distributions, small business PSTN baskets

		Proportion of calls			
Day : time		*National voice calls*	*Fax calls*	*International calls*	*Internet calls*
		(%)	*(%)*	*(%)*	*(%)*
Weekdays:	1100	45.4	40.0	12.5	40.0
Weekdays:	1500	40.6	40.0	12.5	40.0
Weekdays:	2000	7.0	5.0	18.9	5.0
Weekdays:	0300	0.8	0.0	18.9	0.0
Saturdays:	1100	5.7	10.0	18.9	10.0
Saturdays:	1500	0.5	5.0	18.9	5.0

Source: Eurodata (1998).

Table F.11 Call duration, small business PSTN basket

Distance	*Call duration*	
	Weekdays 1100 and 1500	*All other times*
(km)	*(minutes)*	*(minutes)*
3 – 12	2.5	2.5
17 – 40	3.5	3.5
75 – 490	4.5	4.5
Internet	40.0	60.0
Fax	3.0	3.0
International	5.0	5.0

Source: Eurodata (1998).

Medium-sized business PSTN baskets

The medium-sized business PSTN baskets reflect users of four different sizes of business. See Tables F.12, F.13 and F.14 for the assumptions underlying the four medium-sized business PSTN baskets. The distribution of fax call destinations was assumed to be the same as that for the small business baskets — a uniform distribution over all call distances.

The assumed time of day and day of week distribution of calls and the call durations for the medium-sized business baskets are the same as those assumed for the small business baskets (see Tables F.10 and F.11).

Table F.12 Medium-sized business PSTN baskets

Assumption	*Medium-sized business basket*			
	M1	*M2*	*M3*	*M4*
National calling profile	Local	Local	National	National
International calling profile	None	Minimal	Light	Heavy
Number of sites	1	1	1	1
Number of telephone lines per site	10	30	10	30
Number of users per site	30	100	30	100
Number of fax lines per site	2	4	2	4
Number of Internet lines per site	3	9	3	9

Source: Eurodata (1998).

Table F.13 Distribution of call types, medium-sized business PSTN baskets

Calls	*Number of calls (per user per annum)* M1	M2	M3	M4
	(No.)	*(No.)*	*(No.)*	*(No.)*
National voice	3600	3520	3320	3200
International voice	–	80	280	400
To mobiles	400	400	400	400
National fax	460	460	460	460
International fax	–	60	115	230
Internet	230	230	230	230

Source: Eurodata (1998).

Table F.14 National voice and fax call distance distributions, medium-sized business PSTN baskets

Distance	*Proportion of calls* Local call profile, M1 and M2	National call profile, M3 and M4
(km)	*(%)*	*(%)*
3	53.0	12.0
7	11.0	6.0
12	7.0	5.0
17	4.0	3.0
22	2.5	3.0
27	3.0	4.0
40	3.5	4.0
75	3.5	4.0
110	2.5	5.0
135	2.0	7.0
175	1.5	10.0
250	1.5	12.0
350	1.0	10.0
490	4.0	15.0

Source: Eurodata (1998).

ISDN baskets

ISDN baskets were constructed for residential, small, medium-sized and large business users.

Residential ISDN basket

The residential ISDN basket applies to a residential user with a basic access connection.[1] The type, number and distribution of calls, and call durations assumed for the residential ISDN basket are the same as those assumed for the residential PSTN basket (see Tables F.5, F.6 and F.7).

Small business ISDN baskets

Two small business ISDN baskets were constructed:

S1 A small business with one basic access connection.

S2 A small business with three users, and three basic access connections, where one channel is designated to fax, and another to Internet.

The number and distribution of calls, and call durations assumed for the small business ISDN baskets are the same as those assumed for the small business PSTN baskets (see Tables F.8, F.9, F.10 and F.11).

Medium-sized business ISDN baskets

Medium-sized businesses were assumed to be using primary rate ISDN with fully utilised systems in multiples of 30 channels. The reduction in fax and Internet channels, compared with PSTN, reflects the increased capacity per channel. The medium-sized business ISDN baskets are more fully defined in Table F.15.

The number, distribution and duration of calls assumed for the medium-sized business ISDN baskets are the same as those assumed for the medium-sized business PSTN baskets.

Large business ISDN baskets

The large business ISDN baskets were constructed so that they could be combined across services to obtain a total large business telecommunications expenditure figure for each benchmarked country.

For ISDN services, it was assumed that all companies except L1 use primary

[1] A basic access ISDN connection is defined as two 64 kbps channels.

Table F.15 Medium-sized business ISDN baskets

	Medium-sized business basket			
Assumption	*M1*	*M2*	*M3*	*M4*
National calling profile	Local	Local	National	National
International calling profile	None	Minimal	Light	Heavy
Number of sites	1	1	1	1
Number of users per site	30	100	30	100
Number of channels per site	26	55	26	55
Number of fax channels per site	2	3	2	3
Number of Internet channels per site	2	2	2	2

Source: Eurodata (1998).

rate services, with fully utilised systems. All non-voice calls in the ISDN baskets were charged as data calls. The assumptions for the ISDN baskets for large businesses are described in Table F.16.

The call distance and time of day and day of week profiles for the large business baskets are based on the call profiles defined for the medium-sized business PSTN baskets. The distributions of different call types for the large business baskets are given in Table F.17.

Table F.16 Large business ISDN baskets

	Large business basket			
Assumption	*L1*	*L2*	*L3*	*L4*
National calling profile	Local	Local	Local	Local
International calling profile	Little	Some	Medium	Heavy
Number of sites	30	5	10	5
Number of users per site	10	60	60	200
Number of voice channels per site	6	20	20	60
Number of fax/Internet channels per site	1	5	5	10
ISDN system used (per site)	Basic rate 7x	Premium rate 1x	Premium rate 1x	Premium rate 3x

Source: Eurodata (1998).

Table F.17 Distribution of ISDN call types, large business baskets

	Number of calls (per user per annum)			
Calls	*L1*	*L2*	*L3*	*L4*
	(No.)	*(No.)*	*(No.)*	*(No.)*
National voice	3920	3800	3680	3400
To mobiles	400	400	400	400
National fax	437	414	391	345
International voice	80	200	320	600
International fax	23	46	69	115
Internet	230	0	0	0

Source: Eurodata (1998).

Mobile baskets

Mobile baskets were constructed for residential, small and medium-sized and large business users.

Residential mobile basket

The residential mobile basket represents a residential user's consumption of digital cellular mobile (GSM) services. The structure of the mobile basket was based on the PSTN basket and adjusted to reflect the impact of mobile tariff structures. The basket includes only national calls.

The residential mobile user is assumed to make 365 calls per annum (one per day) with the distance distributions shown in Table F.18. The time of day and day of the week distributions and call durations for the residential mobile basket are the same as those assumed for the residential PSTN basket (see Tables F.6 and F.7).

Small business mobile basket

The small business mobile basket represents the use of digital cellular mobile (GSM) services by a user from a small business. As with the residential mobile basket, the basket structure was based on the small businesses PSTN baskets, and adjusted to reflect the impact of mobile tariff structures.

The small business mobile user is assumed to make 920 calls per annum, that is four calls per working day. The assumed distribution of calls over distance is given in Table F.19. The distribution of calls over time and call durations are the same as those assumed for national voice calls in the small business PSTN baskets (see Tables F.10 and F.11).

Table F.18 Call distance distributions, residential mobile basket

Distance	*Proportion of calls*
(km)	*(%)*
3	72.0
7	6.0
40	4.0
110	3.0
250	2.0
490	3.0
Calls to mobiles	10.0

Source: Eurodata (1998).

Table F.19 Call distance distributions, small business mobile basket

Distance	*Proportion of calls*
(km)	*(%)*
3	64.0
7	6.0
40	4.0
110	3.0
250	2.0
490	3.0
Calls to mobiles	18.0

Source: Eurodata (1998).

Medium-sized and large business mobile basket

The medium-sized and large business mobile basket reflects the use of digital cellular mobile (GSM) services by a user from a medium-sized or a large business. Although this basket was intended to include international calls, it was not possible to price international calls for all countries in the study. Consequently international calls were not taken into account in the benchmarking study.

The medium-sized and large business mobile user is assumed to make 1840 calls per annum, that is eight calls per working day. The assumed distribution of

Table F.20 Call distance distributions, medium-sized and large business mobile basket

Distance	*Proportion of calls*
(km)	*(%)*
3	60.0
7	6.0
40	4.0
110	3.0
250	2.0
490	3.0
Calls to mobiles	17.0
International calls	5.0

Source: Eurodata (1998).

Table F.21 Medium-sized business leased line baskets

	Medium-sized business basket	
Assumption	*LL1*	*LL2*
Number of circuits	10	30
	(Per cent)	
2 km circuit, 64k	50	30
50 km circuit, 64k	30	18
200 km circuit, 64k	20	12
2 km circuit, 2M	–	10
50 km circuit, 2M	–	6
200 km circuit, 2M	–	4
International: 64k, neighbouring country[a]	–	10
International: 64k, distant country[b]	–	6
International: 64k, overseas country[c]	–	4

a A neighbouring country is the closest (cheapest) country, not including border zone tariffs.
b A distant country is a country on the same continent, with the highest circuit charge.
c The overseas country is the US for all countries except the US, and the UK for the US.
Source: Eurodata (1998).

calls over distance is given in Table F.20. The distribution of calls over time and the distribution of call duration are the same as those assumed for national voice calls in the small business PSTN baskets (see Tables F.10 and F.11).

Leased line baskets

The leased line baskets reflect the use of leased line services by each business type. The leased line circuits assumptions for two types of medium businesses are presented in Table F.21. The assumptions for the four large businesses are given in Table F.22.

Table F.22 Large business leased line baskets

	Large business basket			
Assumption	*L1*	*L2*	*L3*	*L4*
Number of circuits	29	25	120	35
		(Per cent)		
2 km circuit, 64k	40	40	45	–
50 km circuit, 64k	24	10	10	10
200 km circuit, 64k	16	10	5	10
2 km circuit, 2M	10	5	10	30
50 km circuit, 2M	6	15	10	15
200 km circuit, 2M	4	15	10	15
International: 64k, neighbouring country[a]	–	5	5	5
International: 64k, distant country[b]	–	–	5	5
International: 64k, overseas country[c]	–	–	–	10

a A neighbouring country is the closest (cheapest) country, not including border zone tariffs.
b A distant country is a country on the same continent, with the highest circuit charge.
c The overseas country is the US for all countries except the US, and the UK for the US.
Source: Eurodata (1998).

The prices for each leased line basket are calculated by first determining the price for each circuit type, then applying the percentage weights to those prices for each company type and multiplying by the number of circuits used by the company. Connection charges are excluded in the leased line baskets.

X25 baskets

The X25 baskets describe the usage of packet switched services for each business type under the following assumptions:

- The data traffic is defined by data volume, based on a standard transaction.
- A new call is made for each transaction.
- The definition of a transaction, 512 kilobytes per transaction, is taken from the OECD Packet Switched basket.
- Each company has only one interface.
- Connection charges are not included.
- Calls are assumed to be distributed over time.

The assumed X25 service usage for medium-sized businesses are described in Chapter 6. Large business was assumed to use ATM or Frame Relay services, rather than X25 services.

Frame Relay baskets

The Frame Relay baskets were structured to best suite available services and their tariff structures and were based on the following assumptions:

- The CIR speed is half that of the port speed.
- No overflow is included.
- The cost of connecting to the Frame Relay network is not included in the basket.
- Traffic (CIR) rates are priced over a 200 kilometre distance, where applicable.

The assumptions for medium-sized and large businesses are presented in Tables F.23 and F.24 respectively.

Table F.23 Medium-sized business Frame Relay baskets

	Medium-sized business basket	
Assumption	*FR1*	*FR2*
Company size[a]	Small	Large
Usage profile	National	International
Number of ports	2	4
Port speed (kbps)	64	128
CIR per port (kbps)	32	64

a Describes the company's telecommunications activities, within the medium-sized business range.
Source: Eurodata (1998).

Table F.24 Large business Frame Relay baskets

Assumptions	*Large business basket* L1	L2	L3	L4
Number of ports	0	20	0	20
Port speed	–	128 kbps	–	128 kbps
CIR per port	–	64 kbps	–	64 kbps

Source: Eurodata (1998).

ATM baskets

ATM services provide high speed and high capacity data transmission. Prices were obtained for only 3 countries. ATM was not included in the large business baskets because of the lack of price information.

The assumptions used for two representative businesses used in the study are presented in Table F.25.

Table F.25 Medium-sized business ATM baskets

Assumptions	*Medium-sized business basket* ATM1	ATM2
Number of ports	2	15
Port speed (Mbps)	34	34
Bandwidth per virtual circuit (Mbps)	10	10
2km virtual circuit	2	5
50km virtual circuit	1	3
200 virtual circuit	1	3

Source: Eurodata (1998).

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