Information and Communications Technologies

OECD Communications Outlook

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Foreword

This report, the eighth in a series of biennial Communications Outlooks, was prepared in the context of the OECD's work on the analysis of communication policy in member countries.

The report was drafted by the staff working in the OECD Directorate for Science, Technology and Industry, including Dimitri Ypsilanti, Sam Paltridge, Taylor Reynolds and Frédéric Bourassa as well as John Houghton from Victoria University and Jonathan Levy from the Federal Communications Commission. They are grateful for the contribution of information by telecommunication carriers and to national delegations that responded in 2004 to an OECD questionnaire relating to industry regulation and data.

The assistance of Netcraft and the International Telecommunication Union is gratefully acknowledged where they provided data. The pricing comparisons are undertaken in co-operation with Teligen Ltd., from which quarterly updates of some pricing indicators using the OECD methodology are directly available. Many of the other indicators in this report are available on in electronic format from the OECD Telecommunication Database 2005, covering the period 1980-2004.

The draft of this report was presented to the OECD Working Party on Telecommunication and Information Services Policies at its meeting of 29-30 November 2004. The Committee for Information, Computer and Communications Policy subsequently recommended that the report be made available to the general public.

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Executive Summary

Following the bursting of the "dot-com bubble", the telecommunications industry was in the midst of a crisis. This resulted in job losses, bankruptcies and large financial losses in the industry and had a negative impact on investment growth. The industry has, however, rebounded and, as this 2005 *OECD Communications Outlook* shows, revenues are strengthening and investment is focused on the diffusion of new technologies. Carriers that took on too much debt during the "dot com years" have undergone substantial restructuring, reducing both their levels of debt and operating costs. The total debt level in the industry was reduced by 14% between 2001 and 2003. Inefficient firms or those with unrealistic business models have exited the market. Telecommunication revenues continue to grow in total, although they are flat or declining in some market segments. While the level of investment in infrastructure has declined from the record highs of the boom years, new investment has focused on the expansion of broadband services for fixed and wireless networks. This has resulted in continuous growth in network access and, in particular, tremendous growth in broadband. Despite the crisis faced by the telecommunications industry, it has continued to play an important role in increasing GDP and in the underlying industrial and social fabric of OECD economies, and the technological innovation that has characterised the industry has continued its momentum.

Growth and convergence

The 2005 *OECD Communications Outlook* addresses the issues of policy, regulation, and the size and structure of the telecommunication and broadcast markets. In particular, it examines the return to growth in the telecommunications sector in 2003 and 2004, touching on recent trends such as convergence and the growth of voice over Internet protocol. It also examines trends in competition and regulatory safeguards given current market developments. In the last few years, the telecommunication industry has been moving towards more converged networks and services. Service operators are starting to "triple play", offering integrated video, voice and data products in one service offering. In addition, Voice over Internet Protocol (VoIP) services are leading to an even greater integration between fixed and mobile voice services. These changes in technology and strategy can be expected to have implications for policy and regulation in the future. Additional policy issues include foreign ownership restrictions, local loop unbundling, number portability, carrier pre-selection and fixed-to-mobile interconnection.

Further, this *Outlook* examines the size of the overall telecommunication market, including mobile communications, leased lines and research and development. Telecommunication revenues in the OECD are again experiencing fast growth, with total revenues reaching USD 946 billion, up 10% from 2002. While overall revenues continue to grow there are large shifts occurring between different segments of the industry. Revenue from traditional fixed line services is relatively flat or shrinking while revenue growth is strongest in mobile communications and broadband access.

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Development progress and falling prices

Total access to communication networks is increasing across the OECD, with rapid growth in mobile and broadband connections. At the end of 2003, the total number of fixed and mobile telecommunication paths had increased to more than 1.4 billion, a 6.7% increase over 2002 and more than a 12% annual increase since 1998. For the first time, however, growth is not occurring across all platforms. The number of mobile and broadband subscribers continues to climb at the same time that some segments of the fixed telephony connection market have begun to decrease. Internet connectivity overall continues to expand rapidly in the OECD. By the end of 2003, there were roughly 259 million subscribers to fixed Internet connections and 84 million broadband subscribers. By August 2004, the number of broadband subscribers had passed 100 million, equating to an average annual growth rate of 60% since 2000. Mobile Internet access is now also becoming increasingly common. The analysis looks at network development, expansion and digitalisation, and examines the growth of Internet infrastructure and its adoption throughout the OECD. This includes data on the number of subscribers, availability, Internet hosts, secure servers and domain names.

The television broadcasting sector in the OECD countries has been subject to structural changes over the last several years. Cable and direct broadcast satellite (DBS) platforms have increased their shares of total television households. At the same time, cable, DBS and terrestrial television broadcasting are also experiencing a transition from analogue to digital transmissions. The number of channels available to consumers is increasing as is the number of delivery paths for video. An examination of these structural changes – including convergence – and their effects on the broadcast market also covers the regulatory implications of the evolving market.

Most OECD countries have reached very high levels of quality of service as measured using the indicators collected by the OECD. The typical waiting time for new fixed-line telephone connection is under 48 hours and the number of faults on existing lines is steadily decreasing. The number of payphones in OECD countries is also declining as the number of mobile phone subscribers increases. This edition of the *OECD Communications Outlook* provides measures of quality of service, including connection time, availability of payphones, network maintenance, directory assistance charges and answer seizure ratios. In addition, it discusses the changing nature of quality of service measurements given the rapid increase of mobile and broadband connectivity. These development and the concurrent improvements in access and service quality have been accompanied by diminishing prices. The pricing of telecommunication services in the OECD has proven very responsive to competition. Prices for most telecommunication have continued to fall and users have benefited. Many operators have moved towards flat-rate or unlimited calling and data plans. In addition, competition from newer technologies such as Voice over Internet Protocol (VoIP) has contributed significantly to more competitive rates for businesses and consumers. The OECD's analysis of the data for a wide variety of residential and business price baskets cover fixed line, mobile, international, Skype, DSL, cable modem and leased lines.

Broader effects: Employment, trade and the digital divide

Employment in telecommunication services has fallen from the levels reached during the boom years of the late 1990s, and now stands at around 2.9 million. Mobile communications has been the main driver of recent employment growth, now accounting for 17% of total telecommunication services employment and half a million jobs in OECD countries. There have also been rapid increases in access paths and revenue per employee.

OECD trade in communication equipment grew again in 2003 after two years of decline. Communication equipment trade has been expanding faster than total merchandise trade, suggesting the increasing globalisation of equipment manufacturing activities. A growing share of communication equipment imports into OECD countries are from non-member countries.

Telecommunication markets and regulatory policies in OECD countries have been particularly successful at extending network access to rural and remote regions. While the digital divides in developing economies are often much more pronounced than those faced in the OECD, elements from OECD country experiences can be extracted and applied in developing economies as a first step towards improving access to ICTs.

A note on data

The tables presented in this report provide communication indicators in a harmonised format using the most recent data available. On the whole, data are presented on a country by country basis. This task is becoming increasingly difficult, based on traditional information sources, due to the rapid expansion in the number of firms supplying communication services to the public and the increasing participation by service suppliers in foreign markets. This is particularly true for telecommunication operators, once largely confined to national boundaries but increasingly entering each other's markets. Technological convergence and the ability of firms to supply the same services over different networks are increasingly blurring traditional distinctions between industry segments. To complement the national figures an extensive range of additional firm-level data are provided for leading service suppliers. In general, data from earlier years are displayed to enable analysis of developments over the past decade and to highlight future trends.

Most comparisons of the telecommunication sector are for 2003, but some indicators such as tariffs are provided for 2004. Data for Internet developments are also for 2004. Where countries use a reporting period for financial data which differs from and goes beyond the calendar year, these figures are taken to represent 2003. A chapter on broadcasting has also been included with data, where available, to 2003.

Continuing challenges

The main challenge for OECD governments is to continue to keep markets open such that all players can continue to compete and develop the telecommunications market. Liberalisation has brought tremendous benefits to users and overall growth in the sector over the recent past. The restructuring following the financial bubble, was the consequence of "irrational exuberance" rather than a slowdown of growth in demand for communications services. With that in mind, OECD governments need to continue to keep markets open if these benefits are to be sustained and if growth is to continue.

Policy makers will also need to keep under review the evolution of universal service in respect to telecommunications. The rapidly changing telecommunication environment will pose challenges to some of the traditional funding models for universal service as well as the expectations users have for the level of service they require. On the other hand, tremendous opportunities are presented by technological development for lowering the cost of the provision of such services and extending the ability of the market to meet user demands.

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Chapter 1

Policy Issues and Market Structure

This chapter addresses the issues of policy, regulation, and the size and structure of the telecommunication and broadcast markets. The chapter also examines the return to growth in the telecommunications sector in 2003 and 2004. Finally, it touches on recent trends in telecommunications such as convergence and the growth of Voice over Internet Protocol.

The telecommunications industry, over the past decade, has played an increasingly important role in economy-wide productivity growth and technological diffusion. The industry's infrastructure and services provide a fundamental underpinning for information economies. At the same time, in 2001 and 2002, the industry was an important factor in the poor performance of stock markets, job losses, and financial losses. One reason for these setbacks was exaggerated expectations arising from the "dot com bubble" that resulted in rapid investment growth and poor management decisions and led to a number of companies expanding their activities outside their traditional core business. The accumulated large debts of many companies could not be supported during a period of slower growth in the market.

The crisis that affected a number of firms in the industry did not provide any evidence that would have justified a reversal of government telecommunication policies or telecommunication regulatory frameworks which emphasise competition. The financial problems which afflicted the industry in the early part of the decade did not arise from attempts by regulators to enhance competition in the sector. The setbacks in investment and employment, while important, did not diminish the increasingly important role the sector is playing in increasing GDP and in the underlying industrial and social fabric of OECD economies. Moreover, as events subsequent to the financial bubble have shown, the industry continues to rebound at a time of increasing competition across all market segments.

More broadly, the convergence in service offerings between different platforms calls into question the logic of maintaining existing separate regulatory frameworks for telecommunications and broadcasting. The integration of these frameworks is not simple, requiring a review of the legal and policy frameworks covering the formerly distinct sectors and the possible creation of a single policy framework which is coherent across the electronic communications sector. New platforms, in particular broadband Internet, and the services provided on these platforms have already begun to compete with traditional services provided over broadcasting and telecommunications infrastructures. This also provides a challenge to regulation. New developments do not necessarily imply that existing regulations need to extend their coverage over other platforms or services. Rather, they offer an opportunity to review and lighten existing regulations.

The telecommunications market

In 2003 the size of the telecommunication services market in the OECD area was just under USD 950 billion. The two major drivers of growth continue to be wireless communications and the Internet. Revenues for cellular mobile services reached USD 336 billion in 2003. This was nearly four times the total for 1997 and reflected the tremendous expansion of wireless access over that time. The impact of the Internet on growing telecommunication revenues is harder to determine because it cuts across a range of platforms and services. It has undoubtedly created a new revenue stream from Internet subscriptions but has also increased the demand for fixed network access, backbone

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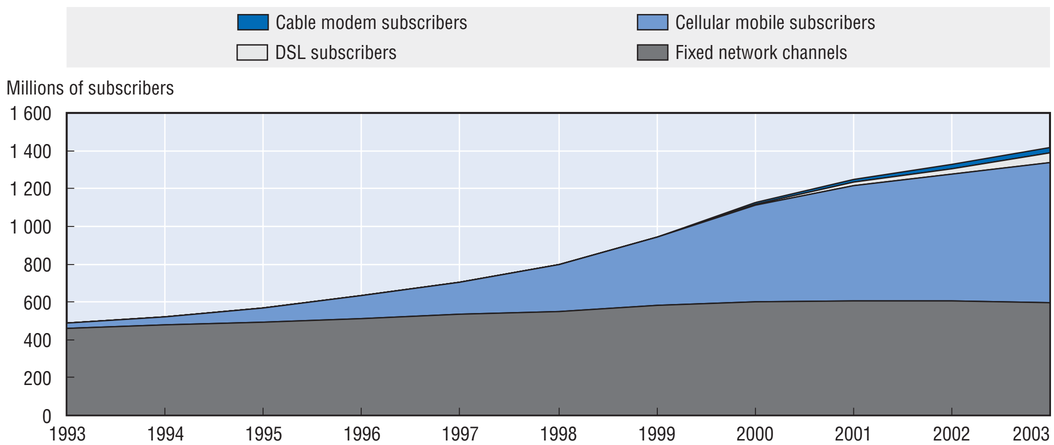
capacity and leased lines. More recently revenues for fixed network broadband access and wireless data services are beginning to become significant.

At the end of 1991 there were only 15 million cellular mobile subscribers in the OECD area. By the end of 2003 there were more than 741 million. The number of Internet users in the early 1990s was negligible. Commercialisation at that time was only at a very early stage and in a very limited number of countries. By the beginning of 2004, the number of Internet subscribers with access over a variety of platforms was nearly 260 million and there were more than half a billion users of these subscriptions.

In the third quarter of 2004 the number of broadband subscribers in OECD countries surpassed 100 million. Together with the development of the fixed network, particularly in countries with low penetration rates, the degree of access has expanded enormously in OECD countries (Figure 1.1). In 2003, OECD countries had 1.4 billion fixed PSTN, broadband and mobile subscriber lines, which is double the number in 1997. The first signs of significant substitution, however, are occurring between platforms. Tremendous growth continues in wireless access and broadband access, but the number of fixed lines has begun to decrease for the OECD as a whole.

Figure 1.1. **Access growth in the OECD**



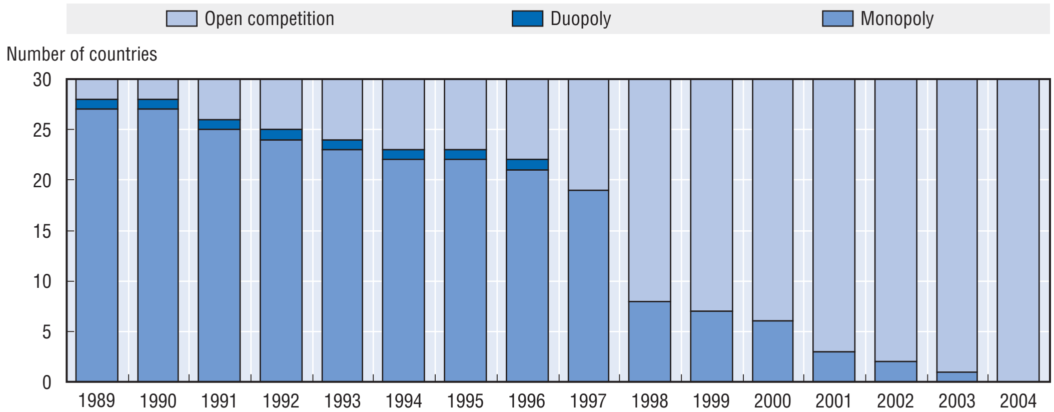
StatLink: http://dx.doi.org/10.1787/387415347263

Telecommunication market structure

By 2004 there were no countries with a monopoly for the provision of fixed network services remaining in the OECD area (Figure 1.2). The process of liberalisation has been faster in the wireless sector where the last monopoly was eliminated in 1998 (Figure 1.3). Figure 1.3 shows the number of mobile operators with their own facilities although in a number of countries there are virtual mobile operators reselling service.

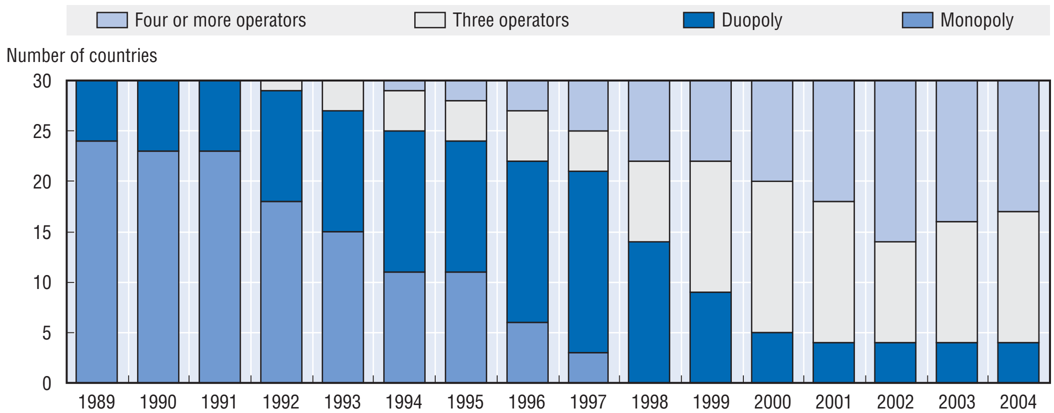
In general, the methodology used in the *Communications Outlook* shows data on a country by country basis. Data are also included for the leading telecommunication operators in the OECD area on a company by company basis (Table 1.1). These data provide an additional perspective on industry development to complement data presented on a national basis because the increasing international investment by telecommunications operators means

Figure 1.2. **Competition in fixed networks**



StatLink: http://dx.doi.org/10.1787/264812474633

Figure 1.3. **Competition in mobile infrastructure**



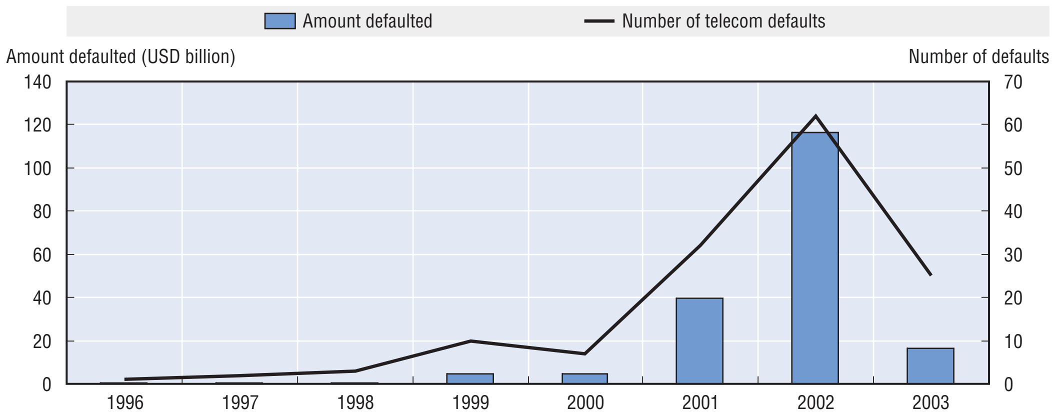
StatLink: http://dx.doi.org/10.1787/617174061637

that country by country analysis no longer wholly captures the dimensions of communication markets. These include records of market entry and market exit.

In 2003 there were 78 providers of telecommunication and Internet access services with revenues greater than USD 1 billion. This compares with 71 in 2000 and, on a comparable basis, 72 in 1999 and 78 in 2001. There have been fewer mergers and acquisitions in the period since the previous edition of the *Communications Outlook* and its predecessors. While some firms have exited the market they tended to be those with revenues of less than USD 1 billion. New companies on this list include broadband Internet access providers Tiscali and Hanaro. Firms with revenues lower than USD 1 billion in 2003, following restructuring, and which were on the list in 2001 include McLeodUSA, Wiltel (formerly Williams Communications) and Genuity (which was purchased by Level3).

A number of companies on the list have emerged from bankruptcy protection (referred to as Chapter 11 in the United States) after they restructured their financial position. Most significantly these include MCI (formerly Worldcom), NTL, Global Crossing, XO, McLeodUSA, Wiltel and United Pan-European Communications. Other companies to

Figure 1.4. **Telecommunication sector defaults**



Source: Standard and Poors.

StatLink: http://dx.doi.org/10.1787/230778861842

emerge from bankruptcy include Covad, 360Networks, Flag Telecom (with a new owner) and Energis (returned to private ownership).

The undoubted losers during the bursting of the financial bubble were investors. According to data collected by Standard and Poors, at the peak in 2002, companies in the telecommunications sector defaulted USD 116 billion (Figure 1.4). In 2003 this sum was reduced to USD 16 billion and in 2004 the amount defaulted was negligible. As greater stability returned to the sector following the bubble, so too have investors. In 2003 and 2004, telecommunication returned to the top five subsectors in respect to the issuance of high-yield bonds in both Europe and the United States after an absence in 2002 (Table 1.2). Notable in these data, given convergence, is the high ranking of the media and entertainment sector.

The previous *Communications Outlook* documented the sale of assets in the post-bubble environment as firms restructured or exited the industry. In many cases these sales were realised on a fraction of the original investment. Some of the examples given were the sale of assets by PSInet, 360Networks, KPN-Qwest, Exodus, Global Crossing, Asia Global Crossing. Others included the sale of assets of Flag Telecom and Dynegy's European network. Since that time further sales have occurred as firms such as MCI, AT&T and Bell South sold properties in Latin America and Level3 sold its Asia/Pacific network. Most recently Tyco sold its undersea cable network.

Significantly, many of these sales have brought new players with their own facilities into international markets for the first time. Some of the "new entrants", in that sense, include China Netcom, Singapore Telemedia, Tata and Reliance. In other cases companies such as Telmex and Telefonica purchased assets to complement their regional strategies. As a result the international market for telecommunications continues to be extremely competitive.

Broadcasting markets

Broadcasting markets have also undergone important changes over the last five years, in particular with a continuation of the growth in the number of OECD households utilising multi-channel television broadcasting distribution platforms – primarily cable and satellite. The number and share of households relying solely on free-to-air transmissions has declined noticeably. The total number of channels available over these platforms has also increased substantially. Public service broadcaster channels are a decreasing share of the total, and audience shares for those channels are either flat or slightly down in most OECD countries.

The transition to digital television has also continued, initially with services that were satellite-based, but in recent years digital terrestrial television service has expanded significantly in several OECD countries. In most OECD countries, cable television operators are providing Internet service along with video, and in a few cases they are offering telephony as well. The telephony offerings are likely to expand much more widely as VoIP technology proliferates. Satellite platforms offer Internet access in several OECD countries as well.

Looking to the future, countries face a variety of issues and challenges in the broadcasting services sector. They include completing the transition from analogue to digital television service and "switching off" analogue terrestrial services at an appropriate time; realising the objectives of public service broadcasting in a world where public service broadcasters face increasing competition from commercial broadcasters over a variety of distribution platforms; and, evolving the broadcasting business model in response to technological developments that may make advertising a less viable source of support for commercial broadcasters.

A return to growth

At the close of 2004 the telecommunications sector was emerging from a period of slower growth and most leading players had regained financial stability. Undoubtedly major challenges remain for carriers as they seek to adjust to increasing substitution between services. Notwithstanding this, the overall size of the sector continues to grow.

The previous *Communications Outlook* noted that those telecommunication carriers taking a proactive role in developing broadband appeared to be best placed to be competitive as markets continued to develop following liberalisation. This has been borne out as carriers, such as BT, Deutsche Telekom, France Telecom, NTT and Verizon continue to see some of their traditional lines of business shrink but enjoy tremendous growth in respect to broadband access. As a result, a growing number of carriers are committing themselves to a faster transition to what many call "next generation networks".

In the area of Internet telephony, the traditional carriers can expect increasing competition from firms such as Skype and Vonage, but also from the adoption of this technology by operators of other platforms such as cable networks and fixed wireless networks. As well as bringing greater competition, convergence also creates opportunities for carriers. One important development since the previous edition of the *Communications Outlook* has been the launch of television over DSL. After an initial trial of the service in 2003, France Telecom launched television over DSL in 2004. Other incumbents offering television over DSL include Sasktel, MTS and Telefonica. A larger group of carriers, and Internet service providers, already offer video on demand and are expected to launch television services over DSL.

The traditional fixed line carriers are also losing market share to cellular mobile operators that are offering increasing amounts of airtime in return for a fixed monthly fee. For their part the cellular operators also face challenges. In some countries fixed network

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operators have announced their intention to provide Wi-Fi enabled phones and most fixed operators are rapidly increasing the number of hotspots which provide Internet access. One of the assumptions behind 3G was that cellular mobile operators would have these markets to themselves. Further developments of fixed wireless technology, such as WiMAX, may provide increasingly competitive options for fixed network providers to offer video and telephony to mobile users. Indeed the providers of 4G may well come from either the wireless or the fixed sector. Fixed wireless also holds out tremendous possibilities for the provision of broadband access in areas that might otherwise be underserved by terrestrial platforms such as DSL and cable networks.

Table 1.1. **Major public telecommunication operators and Internet service providers in the OECD area with revenues greater than USD 1 billion, 2003**

USD millions

Name of PTO	Country	Revenue	Depreciation	Operating income	Net interest paid	Tax	Net income	Total assets	Fixed assets	Debt	Capital expenditure	Total access lines	Mobile subscribers	Employees (units)	Personnel costs	Mobile revenue
NTT	Japan	95 709	18 952	13 459	1 017	2 191	5 554	167 643	92 898	41 026	17 369	50 938 000	45 927 000	205 288	..	43 544
Verizon	United States	67 752	13 617	7 494	2 797	1 252	3 077	165 968	75 316	39 413	11 884	55 541 000	37 522 000	203 100	..	22 489
Deutsche Telekom	Germany	62 739	14 476	6 100	4 243	99	1 408	130 426	53 110	62 260	6 776	27 500 000	61 100 000	251 263	15 637	25 593
Vodafone (Group)	United Kingdom	55 015	7 457	- 6 934	1 170	5 170	- 14 779	328 280	29 644	21 270	7 166	..	133 421 000	60 109	..	55 015
France Telecom	France	51 821	8 470	10 735	4 201	365	3 602	112 172	34 421	53 731	5 715	33 900 000	56 200 000	221 657	10 626	18 419
SBC Communications	United States	40 843	7 870	6 469	1 241	2 930	8 505	100 166	52 128	16 060	5 219	54 683 000	24 027 000	168 950	..	15 483
Telecom Italia	Italy	35 051	7 617	7 628	2 544	1 139	1 339	90 451	20 589	34 665	5 499	20 569 000	44 514 000	93 187	4 835	12 991
AT&T	United States	34 529	4 870	3 657	1 158	816	1 863	47 988	24 376	13 066	3 400	4 500 000	..	61 600	..	..
Telefonica	Spain	31 910	7 050	7 110	1 682	589	2 476	69 747	50 566	19 881	4 164	19 084 100	19 661 000	148 288	5 215	10 006
BT	United Kingdom	30 359	4 789	4 654	1 543	1 569	2 310	29 623	26 046	13 811	4 382	29 998 000	..	99 900	7 233	..
MCI	United States	27 315	2 647	908	190	..	22 211	27 367	11 758	7 117	1 000	..	..	56 600	..	..
Sprint	United States	26 197	5 004	861	1 374	..	1 215	42 850	27 276	19 407	3 824	7 900 000	15 900 000	66 900	..	12 690
KDDI	Japan	24 550	3 101	2 520	249	143	1 009	22 769	13 109	8 481	2 185	..	16 650 300	13 128	..	19 715
Bell South	United States	22 635	4 179	5 906	1 048	2 011	3 904	49 702	23 807	11 489	3 200	23 729 000	9 611 000	75 743	..	6 193
AT&T Wireless	United States	16 695	3 181	1 213	789	112	429	47 802	16 374	10 459	2 774	..	21 980 000	31 000	..	16 695
KPN Telecom	Netherlands	14 502	2 848	3 492	1 097	289	- 969	27 107	22 494	10 371	1 597	6 100 000	16 026 368	31 267	1 913	6 044
Qwest	United States	14 288	2 739	- 254	1 757	..	1 512	26 216	18 149	17 508	2 088	16 200 000	..	47 000	..	594
Telstra	Australia	13 818	2 347	4 260	462	1 124	2 674	22 723	14 846	5 853	1 958	10 370 000	7 604 000	41 941	2 090	2 472
BCE Inc.	Canada	13 611	2 238	2 894	781	811	1 246	28 079	13 235	8 852	2 699	13 051 000	4 412 000	64 054	..	1 804
Swisscom	Switzerland	10 990	1 159	1 804	210	370	1 162	12 252	5 192	1 810	899	4 010 000	3 796 000	19 207	1 878	2 544
Telmex	Mexico	10 829	1 918	3 664	240	950	2 081	17 216	11 220	4 487	945	15 683 000	..	62 103	215	..
Nextel	United States	10 820	1 694	2 522	802	113	1 537	20 510	9 093	10 212	1 716	..	12 882 000	17 000	..	10 820
TeliaSonera	Sweden	10 108	2 171	1 624	98	458	948	23 493	18 917	2 251	1 159	..	11 957 000	26 694	..	3 812
Korea Telecom	Korea	9 714	2 062	1 043	363	386	697	16 426	9 437	6 471	1 748	21 841 000	10 442 000	38 167	1 505	3 494
MMo2 (Group)	United Kingdom	9 334	1 862	259	95	..	272	18 615	6 551	600	1 826	..	20 700 000	12 347	898	9 334
Cegetel / SFR	France	8 510	..	2 207	..	..	..	13 520	10 133	954	869	..	14 370 000	9 756	652	..
SK Telecom	Korea	7 989	1 249	2 585	..	647	1 630	11 225	3 820	1 145	1 423	..	33 592 000	4 164	292	7 127
AllTEL	United States	7 980	1 248	1 898	379	581	1 330	16 661	14 910	5 581	1 194	3 095 600	8 023 400	19 986	..	4 728
America Movil	Mexico	7 965	1 286	1 665	130	304	1 393	13 900	6 595	3 448	1 265	..	43 725 000	8 624	..	4 862
TDC	Denmark	7 945	1 415	..	4	..	273	14	9 746	5 209	2	4 504 000	8 257 000	25 432	1 759	..
Time Warner AOL (ISP Subscription Revenue)	United States	7 593	..	..	..	..	..	..	..	..	..	..	..	..	..	..

StatLink: http://dx.doi.org/10.1787/388087500441

Table 1.1. **Major public telecommunication operators and Internet service providers in the OECD area with revenues greater than USD 1 billion, 2003** (continued)
USD millions

Name of PTO	Country	Revenue	Depreciation	Operating income	Net interest paid	Tax	Net income	Total assets	Fixed assets	Debt	Capital expenditure	Total access lines	Mobile subscribers	Employees (units)	Personnel costs	Mobile revenue
Telenor	Norway	7 503	1 497	1 068	352	336	644	12 162	9 653	3 691	912	1 096 000	2 363 000	19 450	1 350	2 941
Portugal Telecom	Portugal	6 490	1 072	1 476	577	51	270	15 234	4 795	3 613	733	4 225 000	4 887 000	24 872	793	1 711
Belgacom	Belgium	6 128	884	636	30	234	193	6 752	3 207	417	564	3 565 000	4 201 000	17 541	1 175	2 451
Cable & Wireless	United Kingdom	6 018	1 292	- 952	21	..	- 389	8 143	1 990	2 531	561	10 000	..	17 430	..	..
OTE	Greece	5 522	1 022	1 145	161	425	461	11 713	7 723	3 544	1 093	6 297 000	..	17 169	1 218	1 381
Telus Corp.	Canada	5 104	909	831	449	126	237	12 484	..	5 370	895	4 870 000	3 424 000	23 817	1 345	..
Türk Telekom	Turkey	5 065	..	1 898	..	..	..	..	..	..	..	18 916 721	2 200 000	61 219	..	264
Wind (Infostrada)	Italy	4 925	..	..	..	..	- 661	..	..	7 861	949	..	10 000 000	8 769	..	2 560
TPSA	Poland	4 701	1 113	779	514	135	247	9 390	6 861	4	1 060	11 127 000	5 700 000	42 600	790	793
Tele2 AB	Sweden	4 563	473	233	66	13	296	5 930	4 407	590	234	..	6 422 000	3 274	145	..
Telekom Austria	Austria	4 460	1 273	416	260	93	151	8 872	5 009	2 632	674	3 010 800	4 737 700	13 890	786	2 180
Auna (Amena, Retevision)	Spain	4 334	878	159	..	55	- 62	..	..	4 922	803	..	8 161 000	4 578	..	3 128
Optus	Australia	4 292	646	1 210	131	144	301	..	..	..	542	549 000	5 553 000	8 868	547	2 237
Level3	United States	4 026	827	- 156	567	..	- 711	8 293	5 727	5 250	191	..	..	4 650	..	..
Bouygues Telecom	France	3 689	587	518	..	..	226	..	..	..	557	..	6 500 000	6 900	..	3 689
NTL	United Kingdom	3 645	1 233	- 278	746	..	- 954	11 173	7 881	5 728	574	2 525 000	..	13 650	..	..
Rogers	Canada	3 462	743	292	349	16	92	6 047	3 600	3 789	164	..	3 789 400	15 000	..	1 630
Telephone and Data Systems (TDS)	United States	3 445	596	268	143	50	60	10 193	3 351	1 995	777	1 087 000	4 409 000	10 900	..	2 583
Telecom, NZ	New Zealand	3 128	478	1 309	194	196	438	4 360	2 507	1 999	353	1 801 000	1 352 000	6 840	345	356
Global Crossing	United States (Bemuda)	2 932	153	- 141	27	..	24 730	2 171	1 109	200	152	..	..	5 000	..	..
Matav	Hungary	2 724	178	544	134	61	256	4 844	2 768	1 910	405	2 303 113	3 766 274	15 178	83	1 133
Citizens Communications	United States	2 445	595	558	417	67	188	7 689	3 526	4 196	278	2 386 500	..	6 708	..	..
CenturyTel	United States	2 381	451	750	227	187	345	7 896	3 455	3 109	317	2 376 118	..	6 720	..	..
Turkcell	Turkey	2 219	422	606	484	..	..	3 867	..	..	141	..	18 990 000	2 148	..	2 219
Telewest	United Kingdom	2 118	810	- 143	825	7	- 446	- 8 443	5 146	10 249	734	1 600 033	..	9 111	..	..
Mobilcom	Germany	2 065	91	285	103	..	..	995	102	2	49	..	4 200 000	2 693	118	2 065
Colt	United Kingdom	1 912	1 180	- 126	101	..	- 204	3 972	2 204	1 876	231	..	..	3 866	..	..
LG Telecom	Korea	1 869	291	177	63	28	66	2 818	1 462	1 019	309	..	4 836 857	1 896	47	1 869
IDT	United States	1 835	89	- 74	26	70	- 18	1 732	287	..	63	..	..	3 549	..	..
Eircom	Ireland	1 829	413	13	178	16	- 238	3 443	3 156	2 201	255	1 578 000	..	7 943	424	..
Czech Telecom	Czech Republic	1 825	689	..	26	172	- 63	5 484	3 911	499	175	3 586 000	4 215 000	13 343	276	1 032

Table 1.1. **Major public telecommunication operators and Internet service providers in the OECD area with revenues greater than USD 1 billion, 2003** (continued)

USD millions

Name of PTO	Country	Revenue	Depreciation	Operating income	Net interest paid	Tax	Net income	Total assets	Fixed assets	Debt	Capital expenditure	Total access lines	Mobile subscribers	Employees (units)	Personnel costs	Mobile revenue
Elisa	Finland	1 728	470	38	45	67	- 19	2 168	1 587	693	218	1 190 000	1 347 146	6 683	419	856
UGC Europe (UPC)	Netherlands	1 654	738	971	303	..	..	..	..	..	..	..	..	..	..	..
Cincinnati Bell	United States	1 558	169	684	234	..	1 332	2 074	899	2 275	126	986 000	474 000	3 300	..	260
Western Wireless	United States	1 501	200	154	159	35	..	2 522	543	2 173	174	..	1 290 400	2 357	..	971
Aliant Inc.	Canada	1 478	279	303	59	98	139	2 190	1 438	635	240	1 501 000	584 000	..	..	..
Poweredcom	Japan	1 461	0	- 68	40	0	- 124	2 502	1 850	1 487						
PTC (Era GSM)	Poland	1 440	242	299	110	21	147	1 875	1 530	1 108	75	..	6 200 000	3 635	..	1 440
Earthlink	United States	1 402	329	- 66	- 25	..	- 62	827	108	342	28	..	..	3 335	..	..
Polkomtel	Poland	1 331	194	321	26	12	194	1 855	800	289	191	..	5 490 000	3 001	14	1 331
Mobistar	Belgium	1 303	194	1 349	37	5	255	1 093	951	409	153	..	2 615 368	1 601	151	1 303
Primus Telecommunications	United States	1 288	86	70	61	6	55	751	341	542	25	..	..	2 219	..	..
Hanaro Telecom	Korea	1 161	360	59	105	..	- 135	2 842	2 141	971	283	..	..	1 489	78	..
LDCom	France	1 115	..	..	..	..	..	..	..	..	..	..	..	2 300	..	..
E.On Telecom	Germany	1 114	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Softbank	Japan	1 112	..	..	..	..	- 756	..	..	..	..	..	..	..	..	..
XO	United States	1 110	109	- 112	37	..	- 102	1 265	486	537	82	..	..	5 100	..	..
Finnet Networks Ltd (FINNET) (formerly Suomen 2G)	Finland	1 056	..	..	..	..	..	..	..	..	..	..	..	760	33 369	..
Tiscali	Italy	1 012	341	..	..	2	..	1 867	277	314	..	..	..	3 226	160	..
Other OECD PTOs		22 433	4 443	- 101	1 463	1 053	- 1 811	38 925	23 629	14 129	2 897	3 440 299	18 050 260	76 291	14 924	4 592
Other US PTOs		10 058	2 191	- 1 024	925	- 56	- 1 578	17 220	9 380	7 445	1 060	2 243 690	1 569 283	29 468	..	1 269
Other Canada PTOs		2 218	140	1 240	37	4	125	2 715	2 931	845	152	..	255 657	7 571	194	..
Other Europe PTOs		7 858	1 679	67	207	1 094	465	13 632	8 412	3 751	1 324	648 609	9 815 847	29 450	14 594	2 090
Top 25 Ptos by revenue		741 135	134 318	93 089	31 150	22 888	55 284	1 645 590	680 553	440 552	101 190	415 597 100	574 332 668	2 116 493	52 045	299 752
Top 50 Ptos by revenue		879 618	155 041	112 293	36 223	26 294	60 751	1 831 657	792 468	510 826	117 580	482 276 221	755 999 168	2 505 872	63 242	344 372
80 PTOs with revenue over USD 1 billion		929 594	164 115	118 745	40 021	27 148	86 291	1 891 955	832 544	547 863	122 286	499 782 985	810 008 213	2 623 033	98 380	358 850
All PTOs		952 027	168 558	118 644	41 484	28 201	84 480	1 930 880	856 173	561 992	125 183	503 223 284	828 058 473	2 699 324	113 305	363 442

Table 1.2. **Top five subsectors by issuance of high-yield bonds**

	1999	2000	2001	2002	2003	Year to September 2004
United States						
1	**Telecom (17369)**	High Tech (9173)	Media and Entertainment (18290)	Media and Entertainment (8311)	Media and Entertainment (18131)	Media and Entertainment (15012)
2	Media and Entertainment (12750)	**Telecom (9027)**	**Telecom (11230)**	High Tech (6648	**Telecom (13035)**	**Telecom (6292)**
3	High Tech (10395)	Media and Entertainment (6593)	Utility (Electric Gas and Water) (9432)	Forest Products and Building Materials (4222)	Utility (Electric Gas and Water) (12943)	International Oil and Gas (4492)
4	Utility (Electric Gas and Water) (5467)	Utility (Electric Gas and Water) (4494)	High Tech (7910)	Retail and Restaurant (4038)	International Oil and Gas (8445)	Household and Real Estate (4178)
5	International Oil and Gas (4674)	Healthcare (2858)	Healthcare (7871	International Oil and Gas (4002)	High Tech (8175)	High Tech (4132)
Europe						
1	**Telecom (7033)**	Media and Entertainment (4737)	Media and Entertainment (1300)	Brokerage (1636)	**Telecom (3672)**	Media and Entertainment (3844)
2	Media and Entertainment (4257)	**Telecom (2266)**	High Tech (1282)	Media and Entertainment (1136)	Media and Entertainment (3007)	Capital Goods (3333)
3	Forest Products and Building Materials (1058)	High Tech (917)	Chemicals Packaging and Environmental Services (708)	International Oil and Gas (769)	Capital Goods (2765)	Finance Company (2268)
4	Household and Real Estate (623)	Chemicals Packaging and Environmental Services (899)	**Telecom (634)**	High Tech (705)	Chemicals Packaging and Environmental Services (1420)	**Telecom (2024)**
5	Consumer Products (622)	Consumer Products (523)	Consumer Products (594)	Consumer Products (517)	Healthcare (1098)	Chemicals Packaging and Environmental Services (1905)

Source: Standard and Poors.

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Chapter 2

Recent Communication Policy Developments

In the last few years, the telecommunication industry has been moving towards tighter integration. Service operators are starting to offer integrated video, voice and data products in one service offering. In addition, Voice over Internet Protocol (VoIP) services have led to an even greater integration between fixed and mobile voice services. These changes in technology and strategy can be expected to have implications for policy and regulation in the future. This chapter examines trends in competition and regulatory safeguards given current market developments. Additional policy topics include foreign ownership restrictions, VoIP, local loop unbundling, number portability, carrier pre-selection and fixed-to-mobile interconnection. Finally, the chapter examines the increasing proportion of communications expenditures in OECD households.

The return to growth in the telecommunications industry, as noted in the previous chapter, has been closely linked to the deployment of new technologies and the diffusion of the services they provide. These technological developments are expected to change the underlying nature of public switched telecommunication networks, the technology used to provide voice services as Voice over Internet Protocol (VoIP) develops, and lead to greater integration between fixed and mobile voice services with the proliferation of Wi-Fi technology. Continuous technological change is expected to remain a driving force in the communications industry.

Already, with the provision of increasingly higher DSL speeds to the public, telecommunication operators have begun to offer television over DSL and are beginning to integrate their fixed services and Internet access with Wi-Fi access. The changes in technology, closer integration of fixed and mobile services, and the emergence of "triple play" services by operators, *i.e.* the offer to customers of voice, multimedia programming and Internet access in a single bundle, can be expected to have implications for policy and regulation in the future. Developments in the broadcasting sector (see Chapter 7) are increasingly becoming more relevant for telecommunications development and need to be of concern to telecommunication policy makers and regulators.

In turn, however, continued market growth and investment in new technologies will also require policies and regulations that create certainty in the market and allow for flexibility. A key regulatory issue in the next few years will be VoIP and its treatment. Commercial offers of VoIP at present on the market provide a preview of the potential significant benefits which new voice services can provide to subscribers in terms of lower prices, improved value-added features and, in the longer term, access to seamless fixed and mobile services.

Trends in competition

Frameworks to establish the conditions of competition are well established in most OECD countries. Turkey, the last OECD country to introduce full competition in the telecommunication market, did so at the beginning of 2004. The financial crisis, which had impacted the industry, had led to a number of mergers and bankruptcies among telecommunication operators. Some of these market adjustments are apparent in the decline in the number of fixed PSTN operators licensed in some countries (Table 2.1), but on the whole the number of telecommunication operators has increased across most countries since the last edition of the *Communications Outlook*. A handful of 3G (IMT-2000) operators began to provide services in 2004 and this number is expected to rapidly increase through 2005. However, over time as 3G develops decisions need to be taken on the remaining life span of 2G operations. One important development in OECD mobile markets is the increasing number of mobile virtual network operators (MVNOs) in the market.

Facilities-based competition is viewed by OECD countries as important to ensure durable and effective competition in the telecommunications market. In this context it is

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regrettable that a number of regulators do not provide, and in some cases do not have the mandate to obtain, adequate data on the development of competition in the market. Despite the number of operators in the fixed telecommunications market, competition in some of these markets has been relatively slow to develop. This is particularly the case for facilities-based competition as measured by the share of access lines by new entrants (Table 2.2). Both the United Kingdom and the United States were early starters in opening their market to competition, which is reflected in the share by new entrants of access lines in 2003 of 17% and 15% respectively in those countries. Facilities competition in Korea has occurred mainly as a result of rapid growth in Hanaro's network. An increasing number of cable companies are expected to begin providing voice services over cable modems in the next few years which will imply that measures of competition based solely on PSTN lines will need to change.

In both the national long distance market (Table 2.3) and international long distance market (Table 2.4) new entrants have made progress in increasing market share. Carrier selection and preselection have played an important part in stimulating competition in these markets. In some markets, such as France and Germany preselection has shown significant growth (Table 2.5). In contrast, in the United Kingdom and in Switzerland the number of subscribers opting for preselection has declined since 2002.

As shown in this edition of the *Communications Outlook*, cellular mobile markets continue to grow and have become an important source of revenue growth for the communications industry. It is still too early to predict how the commercialisation of 3G will impact on the mobile sector. However, given that the emphasis of 3G will be on access to data and content, the take-up of 3G services may add new revenue growth to the mobile sector, but it may be necessary to persuade pre-paid customers, who form a large part of the subscriber base in some countries, to migrate to post-paid subscriptions for this to happen to a significant extent. Some cellular markets have a relatively unbalanced distribution of market share (Table 2.6) where, usually, the incumbent fixed line operator also has a dominant market share in the mobile market. If fixed and mobile services integrate, as appears may occur using Wi-Fi hotspots and perhaps eventually WiMAX technologies, the integrated market power of fixed line incumbents with integrated or majority-owned mobile operations is likely to increase their dominance in the marketplace.

As discussed in Chapter 7, the television broadcasting sector in the OECD countries has also been undergoing structural changes over the last several years. An important development has been in the changing shares of multi-channel pay television platforms, primarily cable and direct broadcast satellite (DBS) which have increased their shares of total television households. At the same time, these platforms, along with terrestrial television broadcasting, are also experiencing a transition from analogue to digital transmissions. Most terrestrial transmissions remain analogue, although the transition to digital is well underway. Target dates for ending the transition to digital terrestrial television (DTT) and switching off analogue service range from 2006 to 2015.

Digital terrestrial television is supporting an increase in the number of terrestrial channels available and in some countries subscription bouquets of channels are offered. Overall, the number of channels available has continued to increase significantly. From the broadcasting perspective, convergence is manifesting itself primarily via joint offerings of video service and high-speed Internet service, mostly *via* cable platforms.

Regulatory safeguards

The improvement in financial performance of the communications sector, reflected as well in their performance in securities markets, has led to more governments accelerating the process of privatising their incumbents. Countries, such as Australia and France, that had laws requiring the state to maintain majority ownership of their incumbent operator, have now rescinded these laws and have made it clear that they are willing to reduce state ownership below 50% and in certain cases have made commitments to privatise completely. This process needs to be encouraged to avoid situations which have occurred in previous years where government ownership of incumbents conflicted at times with best practice regulation and policy. Despite increased steps toward privatisation the degree of state involvement in ownership in the telecommunications sector has tended to increase in recent years, as measured by the number of enterprises in the sector which are fully or partially owned by central governments. Many of these enterprises are new entrants from state-owned sectors usually from the public transportation and electricity sectors. Table 2.7 shows government ownership in the telecommunication sector. In only two OECD countries, Luxembourg and Turkey, is the incumbent telecommunication operator still wholly owned by the state. In the other countries where there is state ownership of the incumbent some progress has been made in reducing the government's share in operators, but this has been rather slow. As already noted, government ownership is expected to decline over 2005 to 2006.

Although state ownership is changing there is renewed interest by local authorities to enter into the telecommunications market, in particular to provide broadband access. In many cases these municipalities are in geographic areas where incumbents are slow to provide service. Although such networks benefit consumers it is important that municipalities do not abuse their power over rights of way and ensure that the market remains open for new entrants on the same terms and conditions as obtained by municipal owned or sponsored networks.

Broadcasting markets in Europe have been impacted by the Electronic Communications Directives adopted by the European Commission. Those directives envision a separation of content and conduit (transmission capacity), and place specific limits on the regulation of conduit. Most OECD countries also do not consider video on demand to be broadcasting and its regulatory treatment is generally independent of the transmission system used to deliver it. Virtually all OECD countries regulate broadcast content to achieve social objectives and many of them limit media ownership by regulation. In the United States, the most significant television regulatory developments relate to the digital television transition, in particular, digital rights management. Transmissions in digital format may be copied repeatedly and redistributed inexpensively via the Internet, which threatens the revenues of content creators and may limit incentives for high-value content creation and distribution. However, viewers have developed certain expectations regarding their ability to copy for various purposes, including time-shifting and portability. The Federal Communications Commission has attempted to strike a balance between these competing values. In 2003 the FCC adopted rules to ensure digital "plug and play" cable compatibility to ensure interoperability between cable television systems and consumer electronics and retail availability of set-top boxes. These rules also specify the level of digital rights management that may be imposed on different categories of programming.

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Foreign ownership

Since the last edition of the *Communications Outlook* there has been no progress in eliminating existing foreign ownership restrictions. There are 10 OECD countries that have foreign ownership restrictions in place (Table 2.8). In four of these countries restrictions only apply to the incumbent wireline telecommunications operator whereas new entrants in the fixed or mobile sector would not be subject to foreign ownership restrictions. Several countries also maintain a "golden" share in the incumbent or some type of control usually aimed at ensuring that the incumbent carrier does not come under the control of a single investor irrespective of whether the investor is a national or foreign. Canada, which has the most extensive foreign ownership restrictions among the OECD countries, undertook a review of these restrictions in 2003 and the government at the time was favourable to reducing the restrictions but no action has been taken to date.

Voice over Internet Protocol

There has been heightened interest in Voice over Internet Protocol (VoIP) services in recent years. A number of regulators are beginning to examine how new emerging voice services using the Internet should be treated, and whether there should be regulatory forbearance allowing these services to develop unhindered in the market without being subject to the obligations required by voice services provided over public switched networks. Table 2.9 provides an overview, albeit very initial in many cases, of the first steps policy makers and/or regulators are taking in this area. Whereas in the early days when VoIP was emerging regulators for the most part viewed this service as a data service, there now appear to be a number of regulators who, using technological neutrality arguments, are ready to subject VoIP providers to the same obligations as PSTN operators. Nevertheless, there is recognition that treatment of VoIP will very much depend on how such services are classified and on the way in which they are provided in the market. PSTN operators using IP networks to transmit their traffic are likely to still be considered as public telecommunication operators, whereas other service providers without ubiquitous networks and without using PSTN numbering resources may likely be treated differently.

Issues surrounding the classification and regulatory treatment of VoIP will likely become one of the key issues for regulators over the coming years. At the same time as VoIP services expand they are likely to have positive implications for increasing competition in the voice market thus lowering prices for consumers. The impact of such competition is already apparent in the international voice market and developments there have started spilling over into domestic long distance and local markets. Concerns are likely to be raised as to how certain social obligations, such as universal service, and emergency call features, can be met in a changed environment where voice services can be provided to subscribers by suppliers that do not have physical presence in a market.

Local loop unbundling

Although there were several early starters among OECD countries that had implemented local loop unbundling, the majority of OECD countries began to implement unbundling around 2000-2001. These countries were mainly those belonging to the European Union, which had agreed to a new directive on unbundling. Policy and regulatory support for full unbundling, as well as variants of unbundling such as line sharing and bitstream access, were largely driven in the beginning of this decade by the recognition that rapid diffusion of Internet access, in particular through broadband, has important social and economic benefits. Broadband has been viewed as providing the cornerstone of the digital economy and there was early recognition by many policy makers that without competitive provision of broadband access, price levels for access would remain high and the diffusion of broadband would remain low.

Although regulators in some countries took hesitant steps in the early days to fully implement local loop unbundling, now most countries have well established policies for unbundling (Table 2.10). Only Mexico, New Zealand and Switzerland have not yet implemented unbundling – in New Zealand bitstream access was introduced in September 2004, while in Switzerland the federal government has placed a proposal before Parliament to change the existing law on telecommunications to allow unbundling. In Turkey, regulations on local loop unbundling were issued in July 2004, and will be enforced by 1 July 2005. In the United States, recent regulatory and court decisions have reduced US reliance on unbundling in favour of giving incumbents a greater incentive to appropriate the benefits of their high-speed Internet investments.

In many countries delays in the full implementation of unbundling occurred because it was necessary to put in place effective policies for collocation and agree on cost-oriented wholesale prices for unbundled loops. Strong opposition to unbundling by incumbents also led to a number of court actions which further delayed the implementation of regulatory decisions. In addition, delays also occurred because of the technical work necessary to upgrade local exchanges to support unbundling. A large number of incumbents in the OECD have now finished the technical work to upgrade main distribution frames to support unbundling as shown in Table 2.10. Before unbundling had been adopted and implemented as policy, many incumbents were predicting that the upgrading of switches to support xDSL would take many years; unbundling played a significant role in reducing the projected timeframe to upgrade switches and ensured the wide geographic availability of xDSL technologies.

The rapid demand for unbundled local loops is shown for some countries in Table 2.11. As a result of unbundling, broadband has shown significant growth as evident in Chapter 5, which examines the broadband market. Unbundling has not only delivered on the promise of lower prices through competition in the retail market, but has resulted in new entrants providing increasingly higher speeds and bundled services including the provision of television programming on xDSL.

Number portability and carrier selection

Providing the consumer with choice to change telecommunications operators in the fixed and mobile markets has been an important part of facilitating the process of competition. Such choice has resulted from the regulatory requirement for number portability as well as carrier selection and preselection.

For number portability to be successful the implementation process for consumers must be simple and short. In certain countries it has often been complex and long. Delays in porting numbers have often occurred because some incumbents have often been given a large leeway in the time taken to process applications. There is scope in a number of countries to review or set a mandated time during which numbers should be ported. Already much has been done in many countries to simplify procedures. More serious, however, is the difficulty residential subscribers often have in terminating their contracts. In a number of countries, for example, contracts for cellular mobile services are renewed tacitly every year

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which may mean that a customer cannot change service provider until an existing contract has expired. Although this issue is often one which falls into the policy competence of consumer protection agencies, it nevertheless has implications in creating more market flexibility and thus increasing effective competition in the market. Policies for number portability, as shown in Table 2.12, are widespread across the OECD for fixed as well as mobile numbers. The United States implemented number portability in November 2003. Consumers in the United States are permitted to port numbers among either fixed or mobile carriers and between fixed and mobile carriers as well. Turkey, which opened its market to full competition in 2004, is planning to finalise its regulatory review of number portability by the end of 2005. Number portability for mobile services is still not available in several OECD countries although it is under consideration in most of these countries.

Carrier preselection is now well established in most OECD markets although, as shown in Table 2.12, there are still a number of countries that have not yet implemented carrier preselection for local calls. Where available, procedures to implement preselection are often fairly simple for consumers and are usually put in place quite quickly by operators. A number of regulators have also required incumbent to enter into service level agreements with new entrants to ensure that carrier preselection functions well.

Fixed to mobile interconnection

Business and consumers have long complained about the high retail charges for terminating mobile calls. In most countries regulators only began to examine these rates in the past few years, and have begun to take appropriate action to ensure that rates are cost oriented (Table 2.13), although in a number of countries mobile termination rates are not regulated. Nevertheless, as Figure 2.1 shows both within and across countries the mobile termination rates vary widely. Figure 2.1 shows a selection of rates – the lowest (which is often an off-peak rate) and the highest rate in a country. In some countries there are no peak or off-peak rates and in many countries rates may differ substantially between operators. The wide variation in rates would tend to indicate that, given fairly similar cost conditions for GSM operators, there is still scope for further adjustments in rates in a number of countries.

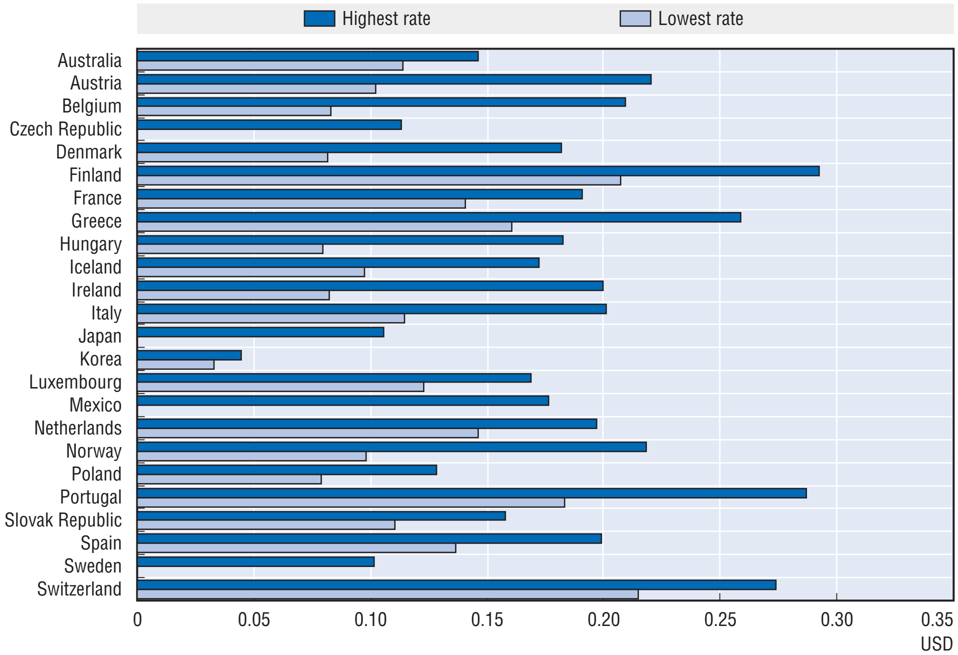
Household expenditures on communication

Chapter 4 shows the significant growth in communications access in OECD countries, driven primarily by mobile growth, and in recent years by broadband Internet. This growth in access reflects the rapid growth in demand for communication products and services which, in turn, is reflected in consumer demand. The fast pace of development in communication technologies, innovation in products and services, and the wide variety of offers and pricing structures has resulted in communications becoming an important and growing part of everyday life. These developments are reflected in household consumption expenditures patterns in OECD countries.

Compared to other areas of expenditures, households in the OECD area have been spending an increasing amount of their budget on communications since 1991 (Figure 2.2). Although this growth slowed during the financial crisis which affected the telecommunications industry, communications still remains the fastest growing consumption sector ahead of health, education, housing and recreation and culture.

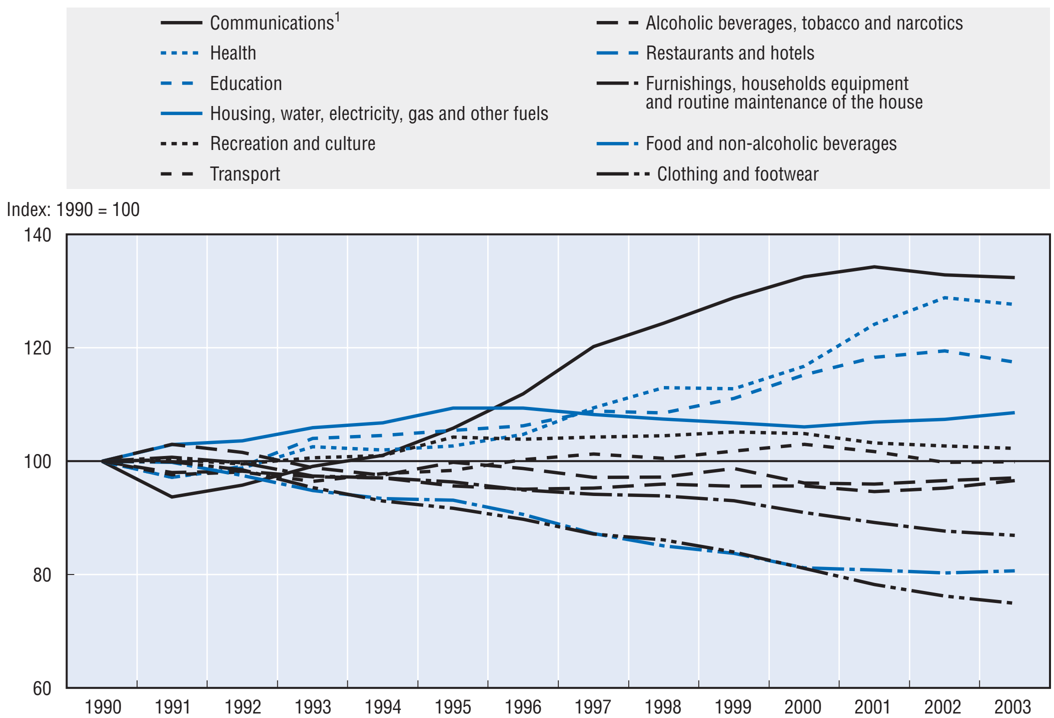
These data were obtained by creating an index from the variation of the proportion of every consumption sector compared to the disposable income of households. The index

Figure 2.1. **Mobile termination: range in rates, July 2004**



StatLink: http://dx.doi.org/10.1787/362004240716

Figure 2.2. **Changes in the proportion of communication in disposable household income**



Note: New Zealand and Turkey are not included in this index.

1. Communication includes telecommunication equipment and services and postal services.

Source: OECD, SNA database.

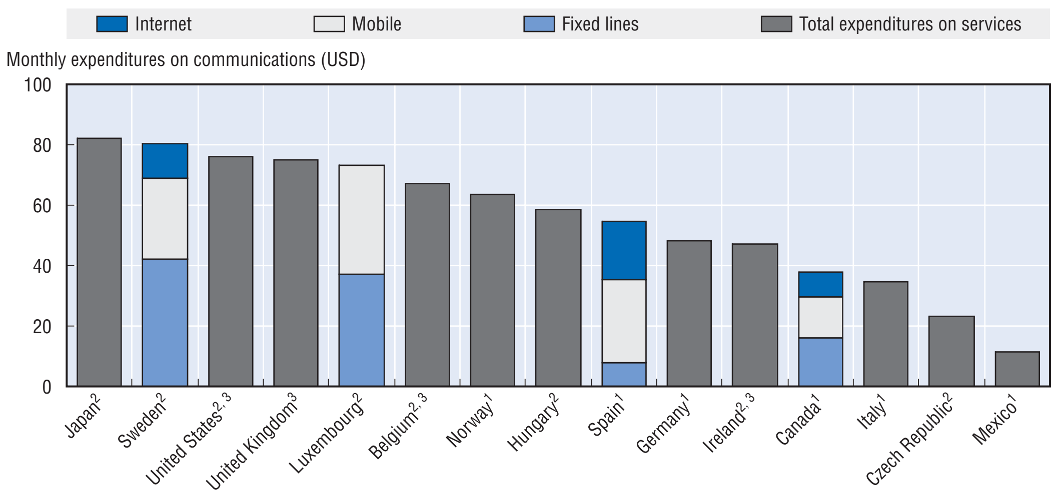
StatLink: http://dx.doi.org/10.1787/305638343714

provides broad trends of the spending patterns of households for the last decade. The OECD System of National Accounts (SNA) database was used. The time series *household expenditures on communication* from the SNA database is the best available source to evaluate the overall trend of expenditure on communication in comparison to the other consumption sectors within OECD member countries. However, two disadvantages must be noted. First, the *communication* indicator of the SNA database consists of telecommunication equipment and services as well as postal services. It is not possible to disaggregate these data. A second disadvantage is that, at the time of writing, some data for the year 2003 were not yet available. This was the case for New Zealand and Turkey. Data for 2002 were used instead of the one for 2003. A second source of data is the national surveys on household expenditure. National surveys cannot be totally harmonised because they often use a different methodology, have different time coverage, and are aggregated in different ways.

The percentage of final consumption expenditure that households allocate to communication increased from an average of 1.6% to 2.3% between 1991 and 2003 (Table 2.14). This represents a supplementary annual spending of USD 548 per household from 1991 to 2003. The annual expenditures on communication increased from USD 509 in 1991 to USD 1 057 in 2003. This constant increase of 108% between 1990 and 2003 was the most significant of all consumption sectors. Because the SNA data do not provide the opportunity to disaggregate between telecommunication equipment and services and postal services, further examination was undertaken of national surveys to indicate the proportion between these three elements. Within countries which provide surveys with enough detail in order to evaluate shares of household expenditures, it can be observed that on average, postal services make up 2% of household budgets for all communications. By way of contrast, telecommunications equipment made up 8% and telecommunications services made up 90% of the total for communications. These proportions tended to remain relatively stable during the short period of time for which data are available.

Figure 2.3 is based on data from different national surveys, and shows that monthly spending on communication, for most countries, ranged between USD 11 to USD 82, for an

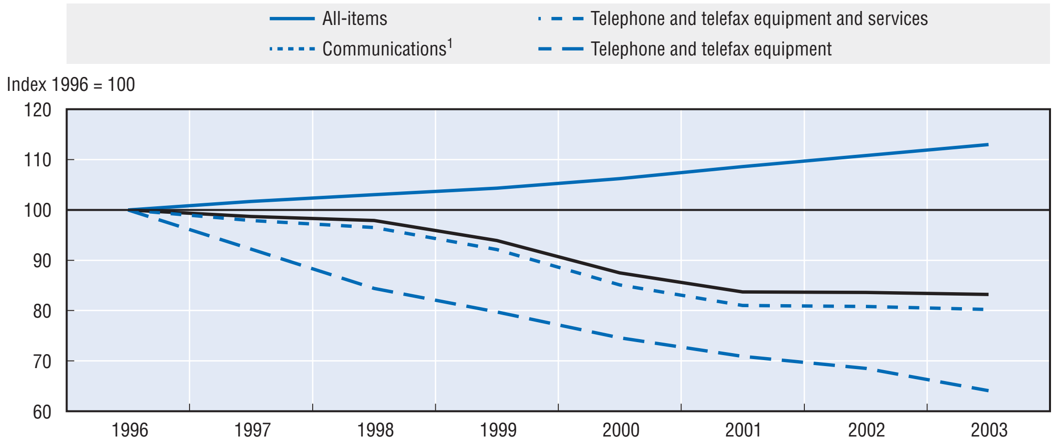
Figure 2.3. **Monthly household expenditure on communications in selected OECD member countries, 2003 or latest available year**



1. Data for 2002.
2. Data for 2003.
3. Expenditures including communications equipment.

StatLink: http://dx.doi.org/10.1787/445521857456

Figure 2.4. **Trend in harmonised indices of consumer prices (HICP) for communication for the EU15**



1. Communications includes: telephone and telefax equipment and services, telephone and telefax equipment and postal services.

Source: Eurostat.

StatLink: http://dx.doi.org/10.1787/461577726685

average value of USD 62. This amount represents approximately 2% of total household spending. As noted, this proportion has tended to grow in recent years. This figure shows the household expenditures for the two last years when available in national surveys and disaggregates, where available, expenditures on fixed lines, mobile services and Internet.

Figure 2.4 shows the annual harmonised index of consumer prices for the EU15. It can be observed in this figure that prices for telecommunication equipment followed by telecommunication services declined significantly over the last seven years. In comparison, the index for "all items" increased for the same period. This would indicate that telecommunication is tending to be more affordable for consumers and that the increase in consumption is due in part to decreasing prices for some services or the substitution of new services with lower prices for traditional services.

Table 2.1. **Number of operators in service, 2003**[1]

	Fixed PSTN (local, national and international)	Network infrastructure capacity (only includes companies not licensed to provide voice services)	Cellular mobile	Wireless local loop (fixed wireless)	IMT-2000 operators (*i.e.* UMTS, 3rd generation)[2]	MVNOs[3]
Australia	105		4		4[4]	Permitted
Austria	80	95	4	2	5; 1MVNO	Permited
Belgium	29	46	3	4	3	Not yet
Canada	78		16	69	2; 1 MVNO	Permitted
Czech Republic	26	51	3	5	2; 1 MVNO	Permitted
Denmark	35		4	4	4; 1MVNO	Permitted
Finland	48	31	4	18	4 + 1 regional	Permitted
France[5]	37	119	3	3	3	Permitted
Germany	182	428	4	10	5	Permitted
Greece	24	15	4	7	3	No
Hungary	26		3	5	-	Permitted
Iceland	4	1	3	5	0	Permitted
Ireland	28	9	3	9	3	Permitted
Italy	92	81	3	69	4	No
Japan	393	336	26	21	12	Permitted
Korea	5	17	3	1	3	No
Luxembourg	9	7	4	2	4	Permitted
Mexico	58	15	14	3	0	No
Netherlands	91	25	5	2	5	Permitted
New Zealand						Permitted
Norway	33		2		3	Permitted
Poland	90	-	3	-	3	19
Portugal	12		3	8	3	No
Slovak Republic	18	30	2	2	2	No
Spain	33		3		4	Permitted
Sweden	169	231	91		4	Permitted
Switzerland	40	138	5	6	4	Permitted
Turkey[6]	43		3			Not yet
United Kingdom	102	26	4		5	Permitted
United States[7]	2743		150			Permitted

1. Licensing, authorisation and registration practices differ across OECD countries so that it is difficult to compare the number of operators. For a number of countries licenses do not differentiate between local, national and international PSTN or the provision of infrastructure. Some licenses may be regional. Some countries license services rather than networks so that an individual firm offering a range of services has multiple licenses. Some countries have included companies providing PSTN via carrier selection in data on fixed PSTN. Resellers are not included where they can be identified. In a number of OECD countries analogue mobile, which is being phased out, is a monopoly.
2. The column indicates the number of UMTS licenses (some of which were not in operation in mid-2004).
3. Mobile virtual network operators.
4. Only one license is operational.
5. Only licenses for Metropolitan France are included.
6. Figures for Turkey reflect the number of operators licensed as of December 2004.
7. US mobile operators have the flexibility to upgrade their networks to 3G technologies on their existing 2G (PCS/cellular/SMR) spectrum.

StatLink: http://dx.doi.org/10.1787/638556708506

Table 2.2. **Access line market share of new entrants**

Percentage of access lines

	1997	1998	1999	2000	2001	2002	2003
Australia	0.41	1.04	3.97	6	7	10	11
Austria		0.2	1.8	4	4.9	5	5
Belgium		0	0	0.1	0.1	..	..
Canada	0.5	1.6	2.6	3.4	3.9	4.8	..
Czech Republic		0.3	0.34	0.46	0.49	0.39	0.25
Denmark	0	0.89	0.37	18	12	13	16
Finland	0.38	0.46	5.5	4.6	4.9	..	..
France		0	0	0.5	0.5	..	..
Germany	0	0.1	0.2	0.5	0.6	0.8	1.1
Greece		0	0	0	0	0	0
Hungary[1]		0	0	0	n.a	n.a	n.a.
Iceland		0	0	0	0	0	8
Ireland		0	2.4	0	0	..	..
Italy		0	0	0.4	0.98	0	0.1
Japan			1	1.3	0.3	..	..
Korea		0	0.3	9.8	11.9	13.1	13.9
Luxembourg		0	0	0.77	0.89	..	0.1
Mexico		0	0.4	2	3	..	..
Netherlands		0.1	0.1	..	..	..	3
New Zealand	0.06	2	3.5	3	3.7	..	..
Norway		0.1	0.97	0.27	0.82	1.34	4.94
Poland		3.7	5.3	8.21	8.51	9.38	9.7
Portugal		0	0		1.86	4.86	5.63
Slovak Republic				0	0	0	0.01
Spain		0	0	0	1.1	6.2	10.7
Sweden				0.1	0.1	..	..
Switzerland				0	0	0	0.1
Turkey			0	0	0	0	0
United Kingdom	11.9	15.1	16.5	16.4	16.6	16.8	16.9
United States	1.06	3.05	4.3	7.7	10.3	13.2	14.7

1. Hungary has local telephone operators with a market share of 20% of main lines which they obtained when they had a regional monopoly after the partial market opening of 1993.

StatLink: http://dx.doi.org/10.1787/340088185731

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Table 2.3. **National long distance market shares of new operators**

Share of switched minutes, percentage

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	0.0	0.5	2.0	7.6	11.7	13.9	17.3	15.0	16.4	16.0	29.0	30.0	35
Austria								..	15.0	49.0	54.2	46.8	46.2
Belgium								..	..	..	15.3	..	..
Canada	5.0	7.0	14.0	18.0	..	..	..	26.1	27.9	32.1	32.0	34.1	..
Czech Republic								0.0	0.9	2.75	25.0	..	..
Denmark						0.0	5.0	10.0	38.0	37.0	36.0	35.0	37
Finland			5.5	54.0	60.0	60.1	59.6	63.0	62.0	63.0	63.0	..	..
France								5.0	20.0	13.0	36.4	35.7	38.2
Germany								..	28.4	35.3	33.0	35.6	39.8
Greece								0.0	0.0	0.0	1.8	4.3	21.4
Hungary								0.0	0.0	0.0	0.0	…	…
Iceland								0.0	4.0	5.0	8.0	..	20
Ireland								0.0	..	..	..	..	..
Italy								0.0	15.0	16.4	24.7	..	..
Japan	22.4	26.8	29.1	31.3	31.9	35.7	40.6	..	..	42.8	45.8	48	48.0
Korea						0.0	9.0	8.9	10.0	16.6	19.1	19.6	23.0
Luxembourg[1]								..	..	..	..	..	12.0
Mexico						0.0	18.8	..	24.0	26.8	32.0	..	..
Netherlands								11.0	16.0	21.0	24.0	35.0	.0
New Zealand	12.0	18.0	19.0	21.0	22.0	..	25.0	25.0	..	..	..	..	..
Norway[2]								1.8	11.7	20.9	26.7	28.6	32.1
Poland								0.0	0.0	3.3	27.0	13.9	13.9
Portugal [3]								0.0	0.0	12.0	9.4	..	..
Slovak Republic										0.0	0.0	0.0	0.0
Spain								1.0	14.3	14.0	18.1	..	..
Sweden				0.0	5.0	10.0	17.0	..	14.0	23.0	31.0	..	..
Switzerland								5.6	18.6	29.4	..	45.2	..
Turkey									0.0	0.0	0.0	0.0	0.0
United Kingdom	9.0	10.7	14.0	16.5	18.6	21.0	24.1	29.3	35.9	42.6	45.9	46.4	46.4
United States	37.8	39.5	39.8	41.5	44.5	47.8	48.6	61.3	62.9	55.3	63.7	68.8	..

1. Local minutes. 2. On 1 July 1999 long distance charge zones were eliminated. Data represent share of local calls. 3. The percentage relates to all types of national calls.

StatLink: http://dx.doi.org/10.1787/117452400507

Table 2.4. **International market share of new market entrants**

Share of minutes of international traffic, percentage

	1984	1986	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia			0	4.4	13	21	27.8	36.07	42.9	43.8	42.9	54.0	..	..	48.0
Austria										..	..	52.0	55.0	52.3	..
Belgium										..	..	..	48.53	..	..
Canada				0	7	20	26	33	33	36	57	48.8	56.4	50.8	..
Czech Republic										0	0	0.73	24.98	..	..
Denmark							0	7.5	18.02	35.92	43.7	55.8	47.2	45.0	49.0
Finland					0	9	27.3	34.3	41.4	45.3	48.5	49	50	..	..
France										15.00	27.1	18	26	..	..
Germany										19.8	47.5	63.7	46.3	54.2	59.7
Greece										0	0	0	4.3	6	29.1
Hungary										0	0	0	0	...	..
Iceland										0	5	16	22	..	21
Ireland										0	..	25	..	..	..
Italy										..	32	37.46	50	..	..
Japan			26.7	30.4	33.1	33.7	33.8	35.1	40.6	..	..	47.2	57.4	61.6	..
Korea			0	20.1	25.5	31.3	27.4	26.5	32.0	32.9	38	50.5	53.0	53.7	60.3
Luxembourg										..	..	25.23	28.02	..	24
Mexico								0	7	24	25	29	38	..	..
Netherlands								0	5	10	33	35	38	40	55
New Zealand			11	15	17.4	21.0	21.0	21.8	36.0	..	..	..	..	..	..
Norway										17.8	26.8	30.7	39.8	33.9	38.9
Poland										0	0	0	0	10	10
Portugal										0	0	19	23.6	23	25.1
Slovakia												0	0	0	2
Spain										1	12.9	13.8	17.2	..	..
Sweden				0	7.4	15	21	25	32	..	45	51	57	..	..
Switzerland										18	38.2	48.6	52.8	57.4	..
Turkey											0	0	0	0	0
United Kingdom			14	22.3	26.3	30.5	30.3	40	47.3	49.1	57.8	62.1	63.7	63	64
United States[1]	20	..	27.3	31	37.5	40.9	44.4	50.6	54.6	56.90	61.8	67.5	64.0	64.5	67.9

1. Based on revenue.

StatLink: http://dx.doi.org/10.1787/668520706876

Table 2.5. **Number of preselected lines**[1]

	2002	2003
Australia		
Austria	870 000	950 000
Belgium		
Canada		
Czech Republic		
Denmark	905 161	918 018
Finland		
France[2]	6 420 482	7 589 630
Germany	4 141 000	4 900 000
Greece	..	276 500
Hungary	..	2 500
Iceland		27 061
Ireland		2 250
Italy	3 370 000	3 600 000
Japan	12 294 000	12 966 000
Korea	21 674 000	22 085 000
Luxembourg		43 900
Mexico		
Netherlands		
New Zealand		
Norway	457 535	512 638
Poland	1 825 068	2 193 000
Portugal		
Slovak Republic	0	0
Spain	1 806 999	2 311 009
Sweden		
Switzerland	1 369 252	1 305 162
Turkey	0	0
United Kingdom	638 000	2 598 000
United States		

1. In some countries carrier selection and preselection are included in data. Some countries do not have local call by call selection or preselection.
2. Preselection and call by call.

StatLink: http://dx.doi.org/10.1787/167281625804

Table 2.6. **Cellular mobile competition in the OECD area, 2003**

Mobile operator market share according to number of operators, percentage

Number of operators	1	2	3	4	5	Others
Australia	46.6	30.6	19.7	3.1		
Austria	43.9	28.7	19.4	7.8	0.2	
Belgium	49.9	35.8	14.3			
Canada	36.9	28.3	25.5	9.3		
Czech Republic	43.4	40.7	15.9			
Denmark	35.1	23.8	12.9	11.1	10.2	6.9
Finland	51.4	28.7	16.4			3.5
France	48.8	35.3	15.9			
Germany	40.6	38.1	12.7	8.6		
Greece	37.8	35.5	23.2	3.5		
Hungary	47.4	35.8	16.8			
Iceland	66.8	32.9	0.3			
Ireland	55	40	5			
Italy	46.1	36.4	16.9	0.6		
Japan	53.9	19.6	17.3	4.2	3.3	2.5
Korea	54.4	31.1	14.4			
Luxembourg	62.7	37.3				
Mexico	77.8	11.5	6.6	4.1		
Netherlands	39.1	25	15.6	10.9	9.4	
New Zealand	52.3	47.7				
Norway[1]	58.3	29.9	6.2	3.6	2	
Poland	35.7	32.8	31.5			
Portugal	52.3	30.2	17.5			
Slovakia	56.2	43.8				
Spain	52.4	25.8	21.8			
Sweden	43.6	38	15.1	3.3		
Switzerland	61.4	20.4	17.6	0.6		
Turkey	68.1	18.3	7.2	6.4		
United Kingdom	24.5	23.9	25.6	25.6	0.4	
United States[2]	23.6	13.9	13.8	10.0	8.1	30.6

1. Three operators in Norway are resellers.
2. There are 150 cellular mobile operators in the United States.

StatLink: http://dx.doi.org/10.1787/628348032173

Table 2.7. **Government ownership of public telecommunication network operators**

As of June 2004

	Operator	Status	Control of PSTN
Australia	Telstra	State ownership: 51.05%	
Austria	Telekom Austria AG	State ownership: 47.2%	
	UTA Telekom AG	Federal government ownership: 1.23%	
Belgium	Belgacom	State ownership: 50% + 1 share in accordance with the Law of 21 March 1991	
	Belgacom Mobile	75% owned by Belgacom (which in turn is owned 50% by the state)	
	B-Telecom	100%	
	MET	100%	
	IRISNET	100%	
	ALE	100%	
	IGEHO	2/3 government ownership	
	SEDITEL	2/3 government ownership	
	INATEL	2/3 government ownership	
	SIMOGEL	3/4 government ownership	
	TELELUX	2/3 government ownership	
Canada	SaskTel	100% Province of Saskatchewan	
Czech Republic	Czech Telecom	State ownership: 51.1%	The government has taken steps for further privatisation.
Denmark	Danske Telecom A/S	The backbone network of the Danish National Railways Agency became part of the Danske Telecom network when the Agency (Banedanmark) acquired shares in the company in the first six months of 2002 (nearly 33%).	
Finland	TeliaSonera Ltd.	State ownership: 19.1% by the Finnish government and 45.3% by the Swedish government.	The Finnish Parliament authorised the Government in June 2000 to lower the state's holding to zero.
	Elisa	Private ownership (State ownership 0.72%)	

StatLink: http://dx.doi.org/10.1787/387850450267

Table 2.7. **Government ownership of public telecommunication network operators** (continued)

As of June 2004

	Operator	Status	Control of PSTN
France	France Telecom	State ownership: 43.25%	Adoption of a new law (2003-1365 of 31 December 2003) authorised the transfer of the French state's stake in France Telecom from the public sector to the private sector and removed the requirement for the state to directly or indirectly hold over half of the company's capital.
Germany	Deutsche Telekom AG	State ownership: 38.02%	Neither German law nor the Memorandum and Articles of Association *(Satzung)* of Deutsche Telekom restricts the right of non-resident or foreign owners of shares to hold or vote the shares. The German government has indicated its intention to substantially reduce its shareholding of DT.
Greece	OTE S.A	State ownership: 33.76%	
	TELLAS	State owns 50% minus one share through PPC Telecommunications Services S.A., a subsidiary of the Public Power Corporation (PPC S.A)	
	FORTHnet S.A.	State owns 23.1% through the Public Foundation of Technological Research	
Hungary	Matav Co.	The state holds one golden share (nominal value of HUF 10 000)	
	Hungarian Broadcasting and Radiocommunications Corporation	State ownership: 74.06%	
Iceland	Iceland Telecom	State ownership: 99%	The state privatisation committee is planning to privatise the incumbent in 2005.
Ireland	Eircom	Private ownership	
Italy	Wind Telecomunicazioni S.p.A.	State ownership: 73.42%	
	Elsacom S.p.A.	State ownership: 64.6%	
	Eurnetcity S.p.A.	State ownership: 100%	
	Basictel S.p.A.	State ownership: 100%	

Table 2.7. **Government ownership of public telecommunication network operators** (continued)

As of June 2004

	Operator	Status	Control of PSTN
Japan	NTT East Corp. and NTT West Corp. (indirect government ownership)	The government currently holds 46.107% of the issued shares of NTT Corp.	The NTT Law stipulates that the government shall always hold one-third or more of the total number of the outstanding shares of NTT Corp. (holding company), and the law also stipulates that NTT Corp. shall always hold all the shares of NTT East Corp. and NTT West Corp. As such, the government does not have direct ownership shares in NTT East Corp. and NTT West Corp.
Korea	Korea Telecom	Private ownership	
Luxembourg	P&T Luxembourg	State ownership:100%	
Mexico	Telefonos de Mexico	Private ownership	The Foreign Investment Law and Regulations and the Concession require that Mexican shareholders retain the power to determine the administrative control and the management of Telmex. Non-Mexican investors are not permitted to own more than 49% of the capital stock of a public telecommunication operator. Mexican corporation engaged in the telephone business. Foreign investment in cellular telephony may be authorised up to 100%.
Netherlands	KPN N.V.	State ownership: 19.9%	
New Zealand	Telecom Corporation of New Zealand Limited ("Telecom")	A convertible preference share in Telecom ("the Kiwi Share") is held by the Kiwi Shareholder (the Minister of Finance). The New Zealand government purchased the Kiwi Share for $1 when Telecom was privatised in 1990.	
	Broadcast Communications Limited (BCL)	State ownership: 100%	
Norway	Telenor	State ownership: 53.1%	In 2001 the Norwegian Parliament authorised the Norwegian government to reduce its ownership level to 34%.
	Bane Tele AS	State ownership: 100%	
Poland	Telekomunikacja Polska Spolka Akcyjna (TPSA)	State ownership: 3.97%	

Table 2.7. **Government ownership of public telecommunication network operators** (continued)

As of June 2004

	Operator	Status	Control of PSTN
Portugal	Oni Telecom	State ownership: 21%	Direct and indirect state ownership.
	Oni Infocomunicações	State ownership: 5.04%	
	PT Comunicações	State ownership: 6.42%	
	PT Prime Portugal	State ownership: 6.42%	
	TMN – Telecomunicações Móveis	State ownership: 6.42%	
	Refer Telecom	State ownership: 100%	
Slovak Republic	Slovak Telecom a.s.	State ownership: 49%	34% of shares owned by the state and 15% by the Fund of National Property.
Spain	Telefónica	Private ownership	When Telefónica de España, S.A., was privatised a "golden share" regime was created. This regime requires prior administrative authorisation for the direct or indirect acquisition of shares in Telefónica de España's capital stock when this involves at least 10% of this capital). The same regime is applied for Telefonica's subsidiary that manages the mobile telephone service (Telefónica Móviles España, S.A.U.)
Sweden	TeliaSonera	State ownership: 45.3% by the Swedish government and 19.1% by the Finnish government.	Requirement for minimum state ownership of 51% abolished in June 2001.
Switzerland	Swisscom SA	State ownership: 62.7%	The state is required to retain its majority shareholding in Swisscom.
Turkey	Türk Telekomünikasyon A.Ş.	State ownership: 100%	There are no legal restrictions limiting foreign ownership of Turk Telekom. The state maintains a golden share.
United Kingdom	BT	Private ownership: 100%	
	Kingston Communications	Kingston-upon-Hull City Council: 44.9%	
United States	All major carriers	Private ownership: 100%	

Table 2.8. **Foreign ownership restrictions in telecommunications**

Australia	Under the *Telstra Corporation Act 1991*, Telstra is subject to ownership restrictions that limit foreign groups to 35% of Telstra's listed capital and a maximum holding of 5% for individual foreign entities.
Austria	No foreign ownership restrictions.
Belgium	No foreign ownership restrictions.
Canada	Canadian carriers (*i.e.* companies owning or operating telecommunications transmission facilities used to offer service to the public for compensation) must have at least 80% of their voting shares owned by Canadians and not less than 80% of the members of their board of directors must be Canadians. In addition, these Canadian carriers must be controlled in fact by Canadians at all times. Investor companies in such Canadian carriers will be treated as Canadian if at least 66 2/3% of their voting shares are held by Canadians. Radiocommunication carrier licensees are subject to the same Canadian ownership and control requirements. Resellers are not subject to Canadian ownership and control requirements, nor do they apply to satellite earth stations or international submarine cables.
Czech Republic	No foreign ownership restrictions except as regards land ownership.
Denmark	No foreign ownership restrictions.
Finland	No foreign ownership restrictions.
France	No foreign ownership restrictions.
Germany	No foreign ownership restrictions.
Greece	No foreign ownership restrictions.
Hungary	No foreign ownership restrictions.
Iceland	No foreign ownership restrictions.
Ireland	No foreign ownership restrictions. The incumbent must notify ComReg of any changes in shareholding/ownership.
Italy	No foreign ownership restrictions.
Japan	There are no restrictions on foreign individuals and corporations investing in telecommunication operators in Japan in principle. However foreign capital participation, direct and/or indirect, in NTT Corp. that holds all the shares of NTT East Corp. and NTT West Corp. is restricted to less than one-third.
Korea	Foreign governments, foreigners or domestic corporations with over 15% of their stock held by a foreign government or foreigners as the largest share holder cannot hold more than 49% of the shares issued by a facilities-based supplier in Korea.
Luxembourg	No foreign ownership restrictions.
Mexico	A PTO concessions may only be granted to Mexican citizens or enterprises. Foreign investors or their investments may only own, up to 49% of the ownership interest in an enterprise, established or to be established in the territory of Mexico, to own or operate a public telecommunications network. Foreign investment may participate in excess of 49% in concessionaire enterprises authorized to provide cellular telephony services, in which case the enterprises will require the favourable ruling of the National Foreign Investment Commission.
Netherlands	No foreign ownership restrictions.

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Table 2.8. **Foreign ownership restrictions in telecommunications** (continued)

New Zealand	According to the Constitution of Telecom Corporation of New Zealand Limited (Clause 6) no person shall have a relevant interest in 10 % or more of the total voting shares for the time being without, and except in accordance with the terms of, the prior written approvals of each of the Kiwi shareholders and the Board given and no person who is not a New Zealand national shall have a relevant interest in more than 49.9% of the total voting shares for the time being without, and except in accordance with the terms of, the prior written approval of the Kiwi shareholder. There are no restrictions on other operators.
Norway	No foreign ownership restrictions.
Poland	No foreign ownership restrictions. The President of the Office of Telecommunications and Post Regulation (URTiP) may impose on a PTO, within the provisions of the granted telecommunications authorisation, the obligation to inform the URTiP, within 14 days of the date of receiving such information, on each case when a shareholder took the right to over 10%, 30% and 50% votes on a general shareholders' meeting (Art. 13.1 of the Telecommunications Law).
Portugal	No foreign ownership restrictions.
Slovak Republic	No foreign ownership restrictions.
Spain	The right to operate networks and render electronic communications services to third parties is reserved to natural or legal persons who are residents in a Member State of the European Union, as well as the nationals of other countries when that is provided for by International Agreements wherein Spain is a Party. For any other natural or legal persons, the government may authorise either general or particular exceptions to the previous rule.
Sweden	No foreign ownership restrictions.
Switzerland	The federal government is required to retain majority shareholding in Swisscom SA.
Turkey	No foreign ownership restrictions.
United Kingdom	No foreign ownership restrictions.
United States	The Telecommunications Act allows the FCC to deny radio licenses to corporations with greater than 25% foreign investment only if the public interest is served by this refusal. Wireline common carriers are not subject to these restrictions. Foreign-controlled enterprises and all other foreigners may not hold in aggregate more than 20% ownership in the Communication Satellite Corporation.

Table 2.9. **Treatment of national and international voice telephony services provided over the Internet**

Australia	There are no regulatory requirements directed specifically at VoIP. It is the view of the regulator, the Australian Communications Authority (ACA), that VoIP services generally fall within the existing technology-neutral definition of the standard telephone service, and as such are subject to the regulatory requirements that generally apply to such services. In many instances, however, exemptions from such requirements can be sought. Reviewing the policy and regulatory environment applying to emerging voice services like VoIP is under consideration.
Austria	The New Regulatory Framework (NRF) generally is based on technological neutrality, *i.e.* allowing providers to offer services based on IP technology without the need for any specific regulation. Under the Telecommunications Act of 2003, Internet voice service with gateway functionality to the PSTN (calls from the Internet to the PSTN and vice versa); and Internet voice service with gateway functionality to the PSTN with provision of broadband access and control of routing path of the packets within the (own) IP-network have to give notice of the provision of communication services to the NRA and then get a general authorisation.
Belgium	The classification of VoIP as telephony services or not is not always obvious. Therefore, they are treated on a case-by-case basis since the technical possibilities are so different from case to case that a general solution is not possible at this stage.
Canada	The preliminary view of the Canadian Radio-television Commission (CRTC) is that its existing regulatory framework should apply to VoIP services where its definition of VoIP is voice using IP that provides access to and/or from the PSTN using existing numbering plans. Under the current regulatory scheme the extent of regulation is broadly determined by the degree of market power of the service provider as well as the corresponding social obligations. Incumbent local exchange carriers would be required to file tariffs for VoIP services, would be subject to restrictions on bundling and promotions, among other things. Competitive local exchange carriers would be subject to fewer regulatory constraints, such as no obligations to file retail tariffs, to adhere to bundling restrictions. Resellers would be subject to even fewer regulations. However, these service providers would be required to contribute to the universal service fund based on a percentage of revenues from VoIP services and provide access to emergency services (*e.g.* E9-1-1), although it is noticed that some service providers may not be able to do so at this time. Revenues from computer to computer (peer to peer) voice communications would be exempt from contribution requirements.
Czech Republic	VoIP is not considered as a public telephone service, but as a data transmission service – no regulatory initiative has been undertaken.
Denmark	VoIP services are fundamentally treated in the same way as traditional fixed and mobile telephony services. The legislation is technology neutral. This means that the decisive parameter regarding whether or not a technology is encompassed by the legislation is whether or not a technology is conceptually encompassed by the definitions in the legislation.
Finland	If VoIP services are connected to the fixed network and fixed network numbers are used, the service shall be subject to the same regulations as voice services.
France	VoIP is an emerging service on the market, thus *ex ante* regulation would not be appropriate. Since July 2003, the providers of VoIP together with other telephone service to the public have been subject to general authorization rules instead of individual licensing.
Germany	Providers of VoIP services are treated just like any other service provider. Their rights and obligations depend on how the respective service is classified according to its features under regulatory aspects especially telecommunications services, publicly available telephone service, operation of telecommunications networks or telecommunications systems. The use of geographic numbers is tolerated if the customer's residence is located in the corresponding local area. The German regulator also issued a new numbering space for non-geographic national subscriber numbers, which are seen to be especially adequate for VoIP services. As of 13 December 2004 no decision has been taken on the regulatory classification of any VoIP business model.
Greece	Provision of VoIP requires general licensing. No initiatives have been taken yet, although the issue is under consideration.
Hungary	VoIP service is not regulated. The regulator, taking into consideration the basic principle of technology neutrality, is investigating whether a call which is conveyed through a transmission route and has one or more parts using packet switched technology (VoIP) can be regarded as a traditional fixed telephone service.
Iceland	No formal decision has been made on VoIP services.

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Table 2.9. **Treatment of national and international voice telephony services provided over the Internet** (continued)

Ireland	VoIP services will be regulated subject to their classification as electronic communications services (ECS) or publicly available telephony services (PATS). If the service does not fall under these definitions, it will be unregulated. Obligations on the incumbent include network requirements such as provision of access to its own network via interconnection agreements with other operators and provision of service level agreements for provision of facilities/services to customers, as well as other service obligations such as performance related to consumer protection, publication of prices and itemised billing (for the call). If a VoIP service is classified as PATS, then a range of obligations would apply (access to emergency services) or might be applied (obligations for operator assistance, payphones, directory enquiry services and directories etc). If a VoIP service is classified as PATS a lesser range of obligations apply.
Italy	VoIP services (PC-to-PC and PC-to-phone) are unregulated. Traditional telephony service carried on an IP-based network would be subject to the same rules of telephony services on a PBX network in order to respect a technology-neutral approach to regulation.
Japan	VoIP services are not subject to the regulation of Telecommunications Business Law in principle. On the other hand, VoIP services are classified as "voice transmission services". Therefore, the minimum requirements, such as those on voice quality, are stipulated to safeguard the interest of users.
Korea	VoIP has been classified as a facilities-based telecommunication service under the Telecommunications Business Act since September 2004.
Luxembourg	The provision of VoIP services will require, according to the new regulatory framework, notification.
Mexico	National regulation establishes voice services as basic public service telephony and to provide such services requires a licence (concession). Basic telephony can only be provided by those with a concession regardless of the technology uses to carry such basic telephony services.
Netherlands	Given that VoIP is still marginal in the market the provision of the service is not creating any market tension as yet. Any decision on its treatment will depend on the development of VoIP.
New Zealand	VoIP is not a regulated service in New Zealand and authorisation (*e.g.* a licence) is not required to supply VoIP services.
Norway	Currently there is no regulation that deals specifically with VoIP services. As long as a VoIP service provides full connectivity and a quality similar to PSTN/ISDN, it will be regarded as public voice telephony and regulated as such in accordance with the principle of technology neutrality.
Poland	VoIP is not regulated. In the new telecommunications law in accordance with the principle of technological neutrality, VoIP will be an available service within the scope of publicly available telecommunications services.
Portugal	All providers are subject to the general regime of authorization. Undertakings that wish to provide electronic communications networks and services are bound to submit to the national regulatory authorty a short description of the network or service they wish to initiate and to notify an estimated date for starting the activity. Moreover, VoIP services have some specific conditions, when considered as a fixed telephone service.
Slovak Republic	Provision of VoIP services can be performed only on the basis of a general authorisation. Other specific conditions are not specified.
Spain	Voice service providers using IP are deemed to be similar to a common electronic communications operator and have to meet the same general requirements as other operators. Following EC Directives a system of general authorisation will replace the licensing system which will require pre-notification before the service is started.
Sweden	The same regulations apply to all undertakings that provide fixed telephony services.
Switzerland	Voice telephony over the Internet is regarded as a telecommunication services and consequently subject to telecommunication legislation. VoIP is considered as a service relevant to universal service if the service meets certain criteria with regard to quality of service. If this were the case it would also be subject to a number of legal obligations (emergency numbers, interconnection, interoperability, etc.) In any event service providers offering national and international voice telephony services on Internet, even if these services are not considered as universal services, would be subject to a number of legal obligations such as interconnection, secrecy of communications, etc.
Turkey	There is no special regulation applicable to voice over Internet Protocol (VoIP) services. National and international long distance voice telephony services are subject to a telecommunications license that is technology neutral.
United Kingdom	Regulation is technology neutral. However, OFCOM is currently considering how new types of services, for example, Voice over Broadband, would be treated under the regulatory framework.
United States	Basically, the approach is restraint from regulating Internet applications, including VOIP. However, the relevance of some social obligations is under review. In a Notice of Proposed Rulemaking on IP-enabled services, comments were asked on *1)* classification issues, whether VOIP and similar services should be considered a telecommunications or information service, and what principles could be used to differentiate services which should be regulated from those which should not be; *2)* jurisdiction issues, whether federal or state governments should have authority; and *3)* what type of regulation should apply, whether for social or economic objectives.

Table 2.10. **Local loop unbundling**

Country	Regulatory requirement for local loop unbundling	Cost methodology for unbundled loops	Number of main distribution frames and percentage that can offer unbundled lines
Australia	Unconditioned local loop service, mandated in July 1999, was made available in the second half of 2000 by the incumbent. A draft decision made by the ACCC in April 2002 that a line sharing service would be in the long-term interests of end users, but that if Telstra offered reasonable commercial terms to access seekers the ACCC would exercise regulatory forbearance.	Total service long run incremental cost plus contribution to indirect costs.	5 000 100% can offer unbundled lines
Austria	Implemented in July 1999. Sub-loop unbundling and penalties in case of incumbent's failure to meet lead times have been implemented. The incumbent, since September 2001, has to make available shared access for local loops.	Cost-oriented (FL-LRAIC) based on a bottom-up cost model calculation. The cost for shared access for a local loop is 50% of the monthly charge for the full unbundled line. Costs are 50% of the monthly charge for the full unbundled line.	1 400 100% can offer unbundled lines
Belgium	Full unbundling, shared access and sub-loop unbundling in place since 1 March 2001.	Recurring charges are based on a "retail minus" formula and non-recurring charges on a LRIC methodology.	950 100% can offer unbundled lines (*i.e.* incumbent can provide at that location)
Canada	Announced in May 1997. Facilities that were classified as essential are subject to mandatory unbundling. Rate reductions of 30%-40% have been implemented since 1997.	Incremental costs plus a mark-up to recover fixed and common costs. The mark-up was reduced from 25% to 15% in 2002.	2 819 local exchanges There have not been complaints that unbundled loops are unavailable in specific areas.
Czech Republic	In September 2003 Czech Telecom published a reference unbundling offer. By the end of 2003 two operators had signed agreements with Czech Telecom. Today, the Czech Telecommunication Office resolves price disputes on on-off prices of LLU.		140 local exchanges
Denmark	Implemented in July 1998. Line sharing mandated in January 2001. Bitstream access available since 2000.	The method of estimating costs changed as of 1 January 2003 from historic costs to long run average incremental cost.	1 200 100% can offer unbundled lines
Finland	Implemented in 1996. All local operators have significant market power implying that all have to offer LLU.		All exchanges can offer LLU.
France	Available from 1 January 2001. Includes raw copper unbundling and line sharing. A new Reference Unbundling Offer for LLU was published by the incumbent in December 2003.	Long run incremental costs.	1 600 local exchanges (7 900 MDFs). 100% of local exchanges can offer unbundled lines.
Germany	The incumbent has been obliged to offer access to the local loop since 1998. In 2001 the obligation to offer shared access was implemented.	Long run incremental costs.	

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Table 2.10. **Local loop unbundling** (continued)

Country	Regulatory requirement for local loop unbundling	Cost methodology for unbundled loops	Number of main distribution frames and percentage that can offer unbundled lines
Greece	Unbundling came into effect on 1 January 2001.	Prices for full unbundled loops as well as shared access are based on LRAIC methodology using current costs.	2 103 100% can offer unbundled lines
Hungary	Unbundling came into force on 1 July 2001 and the first Reference Unbundling Offer was accepted in 2002. From 2002 full unbundling and shared access has been available.	The applied costing methodology is FDC.	1 787 90% can offer unbundled lines
Iceland	Came into force on 1 October 2000.	Using a cost based tariff model using historic costs.	223 MDFs 100% can offer unbundled lines
Ireland	Full unbundling has been available since April 2001. Sub-loop unbundling is also available but has not been taken up.	Prices are reviewed by the regulator and are based on LRIC costs.	LLU is being used at 40 exchanges
Italy	During 2000 different decisions of the regulator led to full implementation of unbundling. This was supplemented in January 2001 with decisions to implement shared access and sub-loop unbundling. Decisions in December 2003 have introduced a set of specific criteria to be met by the incumbent in setting prices for unbundled local loops.	Historical cost methodology used.	10 350 MDFs Local loop unbundling services available on 1 003 MDFs at end 2003 (addressing about 50% of total lines).
Japan	Ministry issued an interpretative document in August 1999 by which clarified that the incumbent was required to provide interconnection to the main distribution frame and provide line sharing. Unbundling of optical fibre implemented in April 2000 and full unbundling and line sharing implemented in September 2000.	Costs for unbundled lines are calculated using the Interconnection Accounting Information.	100% can offer unbundled lines
Korea	Full unbundling and line sharing available.	LRIC methodology is used.	826 All the incumbent's exchanges offer unbundled lines.
Luxembourg	EC Directive applied.		
Mexico	Not available.		
Netherlands	Unbundled access to the local loop available since December 1997. OPTA laid down guidelines indicating the way in which it would settle any disputes over unbundled access in March 1999. Implementation of EC Directive came into effect in January 2001.	Prices are regulated and subject to cost orientation which means the cost of the service plus a reasonable profit margin.	1 353 97% of local exchanges can offer LLU.
New Zealand	In September 2004, bitstream access was implemented. The independent regulator recommended against full local loop unbundling in May 2004.		As of May 2002 there were 3 800 MDF and by the end of 2003, 744 were able to offer unbundled lines.

Table 2.10. **Local loop unbundling** (continued)

Country	Regulatory requirement for local loop unbundling	Cost methodology for unbundled loops	Number of main distribution frames and percentage that can offer unbundled lines
Norway	From 6 February 2001 the incumbent is obliged to offer full access, shared access and bitstream access.	Prices should be cost-oriented.	
Poland	Amendments to the Telecommunicating Law contain provisions for local loop unbundling entered into force in October 2003.		
Portugal	The EC regulation on unbundling came into force in January 2001.	Cost estimations and international benchmarking for reference purposes. Cost estimations used the incumbent's cost accounting system, based on historical costs. When assessing new services for which historical information was not available, certain present costs were used.	1 753 MDFs All MDF are able to offer unbundled lines.
Slovak Republic	As of the end of 2003, this obligation has not been implemented, but according to law an undertaking with SMP is required to give third party access to specified network elements, including unbundled access to the local loop.		
Spain	Since 2001 the dominant carrier has been required to provide full unbundled access, shared access and bitstream access. The incumbent's bitsream and LLU reference offer was revised in March 2004.	Based on costs justified by the operator to the regulator.	7 500 MDFs 170 MDFs available for LLU.
Sweden	Unbundling came into force with the EC regulation of January 2001. The incumbent offers full unbundling, shared access and sub-loop unbundling.	Costs are calculated with a top down fully distributed cost model based on current costs. Tariffs for LLU are set on a geographically averaged basis.	7 000 local exchanges 100% offer LLU
Switzerland	Full access, shared line access and bitstream were introduced in 2003 in the telecommunication service ordinance. However, due to legal procedures this has not yet been implemented.		No MDFs offer LLU.
Turkey	A communiqué on procedures and principles regarding unbundled access to the local loop was published in July 2004 and will be implemented in July 2005.		

Table 2.10. **Local loop unbundling** (continued)

Country	**Regulatory requirement for local loop unbundling**	**Cost methodology for unbundled loops**	Number of main distribution frames and percentage that can offer unbundled lines
United Kingdom	From January 2001 the incumbent has published a reference offer that includes fully unbundled loops, shared lines and sub-loop unbundling. Local access market review is currently carried out.	Charges are cost-oriented and geographically averaged.	5 600 local exchanges 4% of local exchanges unbundled.
United States	Incumbent carriers must offer unbundled access to copper analogue loops in all cases, and need not unbundle OCn or dark fibre loop in any case. Pursuant to an order adopted by the FCC on 15 December 2004 and expected to take effect in early 2005, incumbent carriers must unbundle DS1 and DS3 capacity loops, except in central business districts of major cities, as defined by specific criteria measuring business line density and the presence of competitively provisioned fibre optic facilities.	Based on forward-looking economic costs.	22 982 central offices 75% of central offices able to offer unbundled lines.

Table 2.11. **Number of unbundled lines**

	2001	2002	2003
Australia		5 000	
Austria[1]	4 800	9 075	19 856
Belgium	50		3 915
Canada	802 000	380 806	
Czech Republic		No unbundling	
Denmark[2]	57 052	61 245	12 000
Finland	42 500		72 304
France[2]	398	9027	273 255
Germany	618 486	944 941	1 349 848
Greece		93	655
Hungary	0	0	0
Iceland	NA		12 074
Ireland	13	26	280
Italy	6 900	124 400	538 800
Japan	1 411 126	4 465 495	7 107 973
Korea	NA		672
Luxembourg	0		1 579
Mexico		No unbundling	
Netherlands	5 650		978 044
New Zealand		No unbundling	
Norway	NA		
Poland	0		
Portugal	20	54	1 867
Slovak Republic	No unbundling	0	0
Spain	103		
Sweden	2 282		
Switzerland		No unbundling	
Turkey		No unbundling	
United Kingdom	600		300 000
United States	13 474	17 228	21 256

1. 2003 data are for September.
2. Includes bitstream access.

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Table 2.12. **Carrier number portability and carrier pre-selection**

	PSTN carrier number portability	Carrier pre-selection
Australia	Local number and non-geographic number portability available. Mobile number portability available.	Implemented, including fixed to mobile calls, but not available for local calls.
Austria	Geographic portability only available if consumer stays within a local area.	Implemented and covers all types of geographic calls.
Belgium	Implemented. Service level agreements introduced for number portability in fixed networks. Mobile number portability introduced in September 2002.	Implemented and covers all type of geographic calls including 0800 numbers. Service level agreements introduced for carrier select and pre-select.
Canada	Local number portability (LNP) implemented in major centres. Incumbent carriers required to implement LNP in smaller centres upon request by competitive local exchange carriers. Portability of toll free numbers implemented. The CRTC will initiate a proceeding to examine wireless number portability.	Implemented for long distance and international calls.
Czech Republic	Implemented at end of 2002.	Carrier selection implemented in June 2002 and pre-selection at end 2002.
Denmark	Implemented between fixed networks within the same geographic area and includes ISDN. By 1 January 2001 total portability, including between fixed and mobile, introduced. Mobile portability implemented on 1 July 2001.	Implemented for all geographic calls.
Finland	Mobile number portability was introduced in July 2003. Fixed network number portability shall be widened also to nationwide universal access numbers in March 2005.	Implemented for long distance and international calls.
France	Implemented for fixed geographic, non geographic areas and mobile number portability in 2003.	Implemented for long distance and international calls. Carrier selection and pre-selection introduced for fixed to mobile calls from 17 November 2001. From 1 January 2002 carrier selection and pre-selection introduced for local calls.
Germany	Implemented for fixed geographic areas and for non-geographic numbers. Mobile number portability came into effect in November 2002.	Implemented for long distance and international calls and for fixed-mobile calls. Carrier pre-selection has been available since July 2003 and carrier selection (call-by-call) was implemented in April 2003).
Greece	Introduced on 1 January 2003. Mobile number portability has been available since March 2004.	Carrier selection introduced on 1 January 2002. Introduction of carrier pre-selection was available on 1 December 2002 for international calls and from 1 February 2003 for long distance calls, calls to mobiles and local calls.
Hungary	Number portability of geographic numbers was implemented on 1 January 2004 and number portability of non-geographic numbers (including mobile numbers and subscriber numbers of freephone, shared cost and premium rate services) was implemented in mid-2004.	Carrier selection introduced 1 January 2002. Carrier selection for local calls introduced 1 January 2004.

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Table 2.12. **Carrier number portability and carrier pre-selection** (continued)

	PSTN carrier number portability	Carrier pre-selection
Iceland	Number portability introduced 1 September 2000, and geographic portability on 1 June 2001. Number portability for mobile calls will be available from 1 July 2003.	Implemented for all geographic calls.
Ireland	Non-geographic portability introduced on 1 January 2000. Geographic number portability was established by June 2001. Full mobile number portability was introduced in July 2003.	Implemented for all geographic calls.
Italy	Geographic number portability introduced within the local area only. Non-geographic portability restricted to toll free, shared cost, and premium services. Mobile number portability introduced including porting numbers from 2G to 3G services.	Implemented for all geographic calls.
Japan	Number portability for PSTN and ISDN numbers to be provided from 2001. Geographic portability within the same numbering area is not an obligation but is provided by telecommunication carriers. Mobile number portability has been under examination since November 2003 and it was concluded in April 2004 that it should be introduced as early as possible in FY 2006.	Implemented for all geographic calls in May 2001.
Korea	The decision to adopt number portability was taken in January 2001 for local calls and toll-free services. Since 2003 number portability has been introduced on a step-by-step basis. Seoul had number portability in August 2004. A decision to adopt mobile number portability was taken in February 2002. This is being implemented first for 2G during 2004 and will be completed by January 2005.	Implemented for national long distance.
Luxembourg	Implemented. Preparing mobile number portability.	Implemented.
Mexico	Not implemented.	Implemented for national and international long distance services.
Netherlands	Implemented. Mobile portability available.	Implemented for all geographic calls.
New Zealand	Number portability is a designated service which imposes an obligation on telecommunications carriers to provide the service.	Implemented for all geographic calls and for fixed to mobile calls.
Norway	Geographic and non-geographic portability implemented. Mobile number portability introduced on 1 November 2001.	Implemented for all geographic calls.
Poland	Number portability for geographic PSTN introduced in 2003. Mobile number portability will be introduced when the new law is adopted.	Carrier selection and pre-selection introduced for long distance services in 2001. There is no carrier selection for local calls.
Portugal	Number portability in the fixed network available since 30 June 2001 and for mobile networks since 1 January 2002. The Draft Portability Regulations were approved in March 2004, which established the principles and rules applicable to portability in the public telephone networks, being compulsory for all companies with portability obligations.	Implemented for all geographic calls.

Table 2.12. **Carrier number portability and carrier pre-selection** (continued)

	PSTN carrier number portability	Carrier pre-selection
Slovak Republic	Number portability has not been introduced yet.	Carrier selection introduced from 1 January 2003.
Spain	Geographic and non-geographic portability implemented.	Implemented for national and international long distance services.
Sweden	Geographic and non-geographic portability implemented. Available for digital mobile services from 1 September 2001.	Implemented for national and international long distance services, mobile calls and for local calls.
Switzerland	Geographic portability within the same numbering area and non-geographic portability implemented. From 29 March 2002 full national geographic portability. Mobile number portability implemented.	Implemented for all geographic calls, including fixed to mobile calls. Mobile operators required to allow users to choose on a call-by-call basis service providers for international calls.
Turkey	Not applicable since there is only one operator for fixed telephony in local lines	
United Kingdom	Geographic and non-geographic portability implemented including mobile number portability from 1999.	Interim carrier pre-selection using autodiallers was withdrawn at the end of 2001. Switched based pre-selection.
United States	Local number portability and non-geographic portability implemented. Wireless carriers in the largest Metropolitan Statistical Areas were required to implement local number portability from November 2003. This included mobile to mobile and fixed to mobile number portability. In May 2004 wireless carriers were required to implement number portability in smaller markets across the country.	Implemented for all geographic calls.

Table 2.13. **Fixed to mobile interconnection**

	Publication of termination rates	Determination of fixed to mobile termination rates	Regulation of termination rates
Australia	No	Commercially negotiated between operators. If negotiations fail, the Australian Competition and Consumer Commission (ACCC) may determine terms and conditions through arbitration.	GSM (and CDMA) termination is a declared service. The ACCC has indicated that the pricing methodology that it will use for determining access prices in arbitration will be based on benchmarking of retail mobile prices rather than a cost-based approach. The ACCC recommended that prices be reduced in the following 3 years by 3 cents per minute until it reaches 12 cents per minute.
Austria	Yes	Fixed to mobile rates are agreed through commercial negotiations between operators. The regulatory authority may settle disputes.	Mobile termination rates have to be cost-oriented following the concept of forward looking-long run average incremental cost if operators have significant market power. For non-SMP operators there is no requirement for interconnection charges other than that they are reasonable.
Belgium	No systematic publication of these tariffs	The termination rates of the two SMP-operators, Belgacom Mobile (Proximus) and Mobistar, are subject to cost orientation. The non-SMP operator Base is in principle free to define its termination rates.	The tariffs are not confidential as they are mentioned in decisions of the BIPT.
Canada	No	Termination rates not imposed.	Not applicable.
Czech Republic	Yes, same price for all operators	Commercial agreement. If there is no agreement the method of calculation and prices can be set by the regulator.	The price should be cost-oriented – average cost of all mobile operators (not only SMP).
Denmark	Yes	Commercial negotiation	No regulation. The regulator has not yet determined whether any operator has SMP in accordance with the EC's new regulatory framework.
Finland	Yes (for operators with significant market power - all GSM network operators)	Commercially negotiated but must be non-discriminatory and cost-oriented.	Fixed to mobile is not yet regulated only mobile-to-mobile. There is a draft proposal to regulate fixed-to-mobile termination rates.
France	Published for Orange and SFR	The fixed operator determines the retail tariffs and the mobile operators the call termination tariffs.	Termination fees for Orange and SFR, considered as having SMP, have to be cost-oriented. Since 2002 a price cap has also been imposed.
Germany	Not published	Commercial negotiation	Whether the rates will be subject to any regulation depends on the outcome of the market review, currently being carried out.

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Table 2.13. **Fixed to mobile interconnection** (continued)

	Publication of termination rates	Determination of fixed to mobile termination rates	Regulation of termination rates
Greece	Yes	Commercial negotiation	Those mobile operators, who have been designated as having SMP in the mobile networks, must have reasonable prices. Those operators who have been designated as having SMP in the interconnection market must be cost-oriented.
Hungary	Yes	Two operators have been designated as having SMP in the interconnection market and are required to apply cost-based prices. Commercial negotiation for the 3rd operator.	Prices must be cost-oriented (LRIC methodology used).
Iceland	Yes	Set by companies but controlled for the mobile operator of the incumbent which has SMP and was required to lower its wholesale termination charge by 15% in April 2003.	Cost orientation required for SMP operators.
Ireland	Yes	Commercial negotiation by mobile operators.	If the operator has been designated as having significant market power in the interconnection market then charges must be cost-justified and transparent ensuring non discrimination.
Italy	Yes for the two operators notified as having significant market power.	Termination rates on the two SMP operators are cost-oriented. The regulator set a maximum termination price ceiling on the two notified operators.	A price cap mechanism for termination services on mobile networks will be decided after the new market analysis. Non-discriminatory rules apply to operators with significant market power.
Japan	Telecommunications carriers with Category II designated telecommunications facilities are obliged to publicize their interconnection tariffs (including termination rates).	Commercial negotiation in principle. However, carriers with Category II designated telecommunications facilities must make contracts based on their interconnection tariffs. If the negotiation fails, the regulator may settle disputes.	The termination rates of carriers with Category II designated telecommunications facilities are required to be below the sum of reasonable costs under efficient management and reasonable profit. Otherwise, the regulator may order a change in the rates.
Korea	Yes	The government sets the conditions for rate determination and these are published. The termination rates for the fixed network and the mobile network are determined according to the criteria for interconnection.	The government makes public the criteria for calculating the interconnection fee and calculates mobile termination rates accordingly.
Luxembourg	No	Commercial negotiation	No
Mexico	No	Commercial negotiation (In case there is disagreement between operators, the regulator will set these rates.)	No (currently there is not an operator defined by the competition authority as holding significant market power, nor an operator with asymmetric regulation in its concession title as was the case for basic local service.)
Netherlands	Yes	Determined by mobile operators in an agreement with the competition authority and telecommunication regulator.	No

Table 2.13. **Fixed to mobile interconnection** (continued)

	Publication of termination rates	Determination of fixed to mobile termination rates	Regulation of termination rates
New Zealand	No	Commercial negotiation	No
Norway	Yes	Commercial negotiation	Cost-oriented rates for operators with SMP in the national market for interconnection. Currently two operators have SMP.
Poland	No	Commercial negotiation	As soon as decisions designating SMP of mobile operators in the interconnection market become final, interconnection rates applied to these operators will have to be cost-oriented.
Portugal	No	Commercial negotiation and regulatory intervention if negotiations fail.	There is a maximum termination rate defined by the regulator.
Slovak Republic	Yes	Commercial negotiation	No
Spain	Yes	Commercial negotiation, but in practice imposed by the regulator based on cost-oriented rates.	Termination rates must be cost-oriented.
Sweden	Termination rates by incumbents must be published.	Rates are commercially negotiated between operators.	Incumbent: cost-oriented tariffs; Other operators: market based tariffs concerning mobile interconnection (may hence be commercially negotiated)
Switzerland	Providers with a dominant position in the market must publish every year a basic offer.	Commercial negotiation between operators.	Dominant operators must use cost-oriented prices.
Turkey	No	Commercial negotiation and regulatory intervention if negotiations fail.	Operators designated by the national regulatory authority as having SMP must have cost based termination rates. The regulator sets the (maximum) termination charges for the operators.
United Kingdom	Not published by the regulator.	Ofcom sets charge controls on termination rates and in complying with these controls operators may vary their termination rates by time of day.	The regulator has imposed price controls on mobile termination rates to ensure that they are set at the 'efficient' level. In complying with these controls, mobile operators are able to vary their termination rates by time of day. Time of day termination rates (daytime, evening, weekend) are set by the mobile operators subject to the regulation.
United States	No. Most mobile networks operate under a mobile-party-pays regime.	Interconnection between dominant carriers, the incumbent local exchange carriers and other carriers, including mobile operators are regulated. Termination rates for fixed to mobile calls are initially commercially negotiated. If operators cannot reach agreement, they are generally arbitrated by state public utilities commissions.	"Reciprocal compensation " rules apply which require that the rate a mobile operator charges the fixed operator for termination equal the rate the fixed operator charges the mobile operator unless the mobile operator can prove that its costs are higher.

Table 2.14. **Final consumption household expenditure in the OECD area**[1]

Percentages

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Communications[2]	**1.8**	**1.6**	**1.7**	**1.7**	**1.8**	**1.9**	**2.0**	**2.1**	**2.2**	**2.3**	**2.3**	**2.4**	**2.3**	**2.3**
Food and non-alcoholic beverages	13.4	13.4	13.1	12.7	12.5	12.5	12.1	11.7	11.4	11.2	10.9	10.8	10.8	10.8
Alcoholic beverages, tobacco and narcotics	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	3.0
Clothing and footwear	6.8	6.8	6.7	6.5	6.3	6.3	6.1	5.9	5.9	5.7	5.5	5.3	5.2	5.1
Housing, water, electricity, gas and other fuels	18.7	19.3	19.4	19.8	20.0	20.5	20.5	20.3	20.1	20.0	19.9	20.0	20.1	20.3
Furnishings, households equipment and routine maintenance of the house	6.3	6.3	6.2	6.1	6.1	6.0	5.9	5.9	5.9	5.8	5.7	5.6	5.5	5.4
Health	8.0	7.8	7.9	8.2	8.2	8.2	8.4	8.8	9.0	9.0	9.3	9.9	10.3	10.2
Transport	12.2	12.0	12.0	11.8	12.0	12.0	12.3	12.4	12.3	12.5	12.6	12.5	12.2	12.2
Recreation and Culture	9.0	9.0	8.9	9.0	9.0	9.3	9.3	9.3	9.4	9.4	9.4	9.2	9.2	9.2
Education	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0
Restaurants and hotels	7.7	7.5	7.5	7.5	7.5	7.3	7.3	7.3	7.4	7.3	7.3	7.3	7.3	7.4

1. New Zealand and Turkey are not included in this average.

2. Communication includes Telecommunication equipment and services and Postal services.

Source: OECD, SNA Database.

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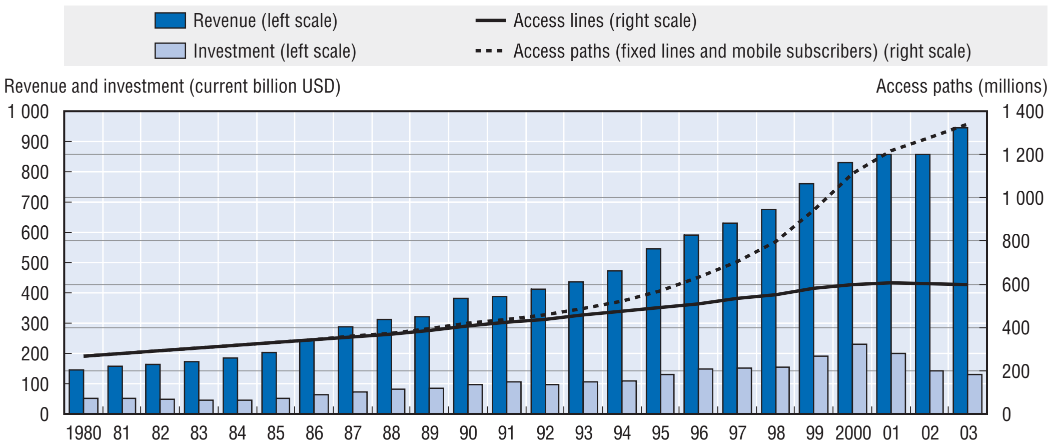
Chapter 3

Telecommunication Market Size

Telecommunication revenues in the OECD are again experiencing fast growth, with total revenues reaching USD 952 billion, up 10% from 2003-2004. While overall revenues continue to grow there are large shifts occurring between different segments of the industry. Revenue from traditional fixed line services is relatively flat or shrinking while revenue growth is strongest in mobile communications and broadband access. This chapter examines the size of the overall telecommunication market, including mobile communications, leased lines and research and development.

OECD telecommunication services revenues reached USD 946 billion in 2003 (Table 3.1). This represented a return to significant revenue growth after a relatively flat period from 2000 to 2002. Revenue in 2003 showed a 10% increase over the same figure for 2002 (Figure 3.1).

Figure 3.1. **Trends in telecommunication revenue, investment and access paths, 1980-2003**



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While overall revenues continue to grow there are large shifts occurring between different segments of the industry. Revenue from traditional fixed line services is relatively flat or shrinking reflecting mature penetration rates and in some cases the substitution of one service for another. Revenue growth is strongest in mobile communications and broadband access. In 2003 a weaker US dollar, against a number of other currencies, also contributed to the increase in total revenue for the OECD area when measured in that currency.

In the United States, the Federal Communications Commission (FCC) reported a modest increase in industry revenue for 2003. While the total revenues reported by the industry in that country continue to increase, they are growing at a much slower pace than at the end of the twentieth century. In the United States the total long distance revenue reported by fixed line carriers continues to decline as users substitute mobile communications or Internet telephony for that segment of the market. Lower revenues also reflect the impact of increasing competition as fixed network providers lower prices or bundle long distance with other services.

The FCC Trends in Telephone Service report shows long distance service revenue in the United States had decreased to USD 77.6 billion by 2003 from a peak of USD 109.6 billion in 2000. Over the same period wireless revenues increased from USD 62 billion to USD 89.8 billion. During 2003 local service continued to show modest growth in the United

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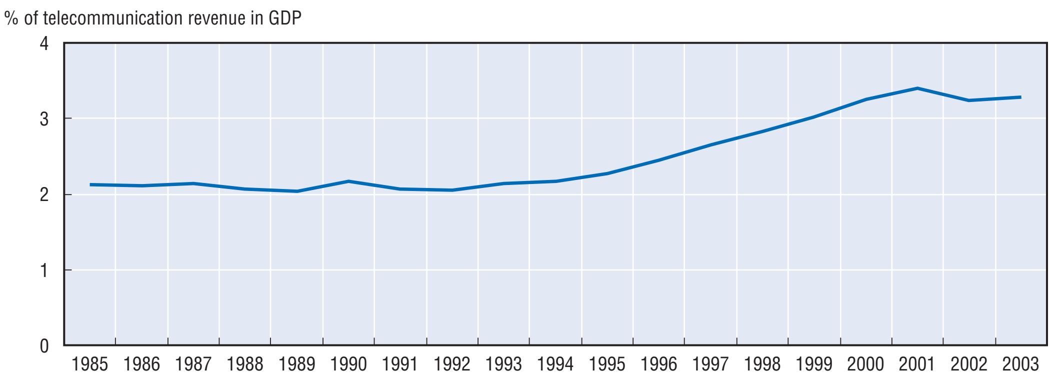
States following a decrease between 2001 and 2002. The potential for future growth, in local service, may be limited by substitution from wireless and Internet services. As such, fixed line carriers are looking towards broadband access and services not only as a revenue opportunity but to stem the loss of customers to other providers. Generally they would appear to be relatively successful as the difference between total telecommunication revenues and total revenues reported by the industry, which include enhanced services, continue to increase. One further segment is worth noting in the United States. The spread of wireless communications is the most likely reason for payphone revenue more than halving in that country from USD 2.5 billion in 1998 to USD 1.2 billion in 2002.

In Europe most countries recorded strong increases in revenue for 2003. This is attributable mainly to the growth of broadband access and new services such as mobile data. The strengthening of European currencies against the United States dollar contributed to a further increase when measured in that currency. It is also true to say that demand appears to have increased in 2003 following the industry's recovery from the bursting of the financial bubble which engulfed it during the several previous years. In Japan, both NTT and KDDI, the two largest carriers, reported revenue increases in 2003. In Korea growth continued, following a relatively flat period between 2000 and 2001, reflecting that country's leading development of broadband access.

After many years where telecommunication service revenues accounted for an increasing share of total GDP across the OECD area, this share appears to have stabilised at just over 3% (Table 3.2 and Figure 3.2). The impact of liberalisation, which led to a sharp increase in revenue from the mid-1990s onwards, is readily evident. In 1995 telecommunication service revenues represented 2.3% of GDP in the OECD. In 2003 this had increased to 3.2%.

Figure 3.2. **Telecommunication revenue as a percentage of GDP, OECD, 1985-2003**



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Liberalisation has been fundamental in the growth of the telecommunication sector. In previous editions of the *Communication Outlook*, it has been noted that the opening of markets promoted competition, and in turn, brought a tremendous expansion of access and increasing innovation in services. It also made it possible for telecommunication carriers to better serve their customers outside their "home country" and to seek new opportunities for growth in foreign markets. One reflection of this trend was the growing proportion of revenue that telecommunication carriers earn outside their "home markets".

Between 1999 and 2003 the proportion of revenues, from a selection of carriers, that was derived from foreign investments increased from 10.7% to 22%. Leading the way was Vodafone whose foreign revenues as a proportion of total revenues increased from 63.2% in 1999 to 83.6% in 2003. Among the traditional carriers France Telecom, Deutsche Telekom, Telefonica, Telenor and TDC have expanded well beyond their "home countries". The merger between Telia and Sonera is another manifestation of globalisation. That being said there has also been a counter trend as some carriers either restructured or sought greater focus on their traditional operating areas following the bursting of the financial bubble. In most cases local investors have been willing to increase their share of equity if foreign carriers put their share on the market (Table 3.3).

In terms of size Vodafone is the largest beneficiary of foreign revenues, earning some USD 46 billion outside the United Kingdom in 2003. Deutsche Telekom and France Telecom were the second and third ranked companies, by the scale of foreign earnings, with USD 23.8 billion and USD 21.4 billion respectively. Next largest in terms of total foreign revenue was Telefonica with USD 12.3 billion in 2003, much of which was located in Latin America. BT is one of the companies whose foreign revenues have decreased as that company sought to reduce debt by selling several foreign operations and by divesting its mobile operator MMo2.

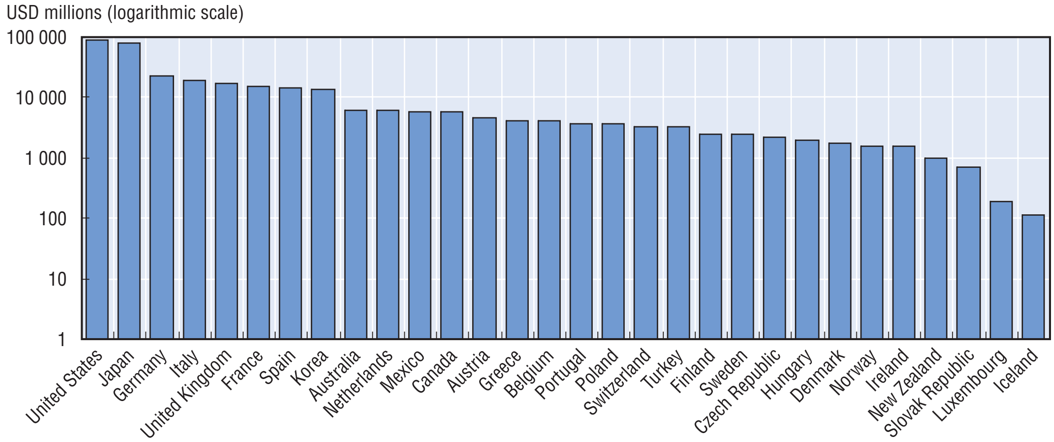
While a number of incumbent carriers continue to hold shares of incumbents in foreign markets, the number of new transactions of that nature has decreased. One area where such investments remain relatively popular is in the ownership (and sometimes cross-ownership) of carriers in adjacent countries. Examples of this are the investment by SBC in Telmex, Telefonica in Portugal Telecom and Portugal Telecom's holding in Telefonica. In terms of fixed networks Deutsche Telekom has also invested close to home with stakes in Matav and Slovak Telekom. By way of contrast KPN, Telecom Italia, SBC and Verizon are among the carriers which have sold stakes in incumbents in other countries.

There is one caveat which needs to be noted in relation to the data on foreign revenues shown by companies. This concerns the different accounting treatment given to foreign revenue. Some companies fully consolidate foreign operations. In such cases all revenue and costs are included in those company's accounts. By way of contrast, other companies use the equity method. Under this accounting treatment only the net income or net losses from their equity share in foreign operations are counted as revenue. Companies such as SBC in the United States and NTT in Japan use the equity method in treating foreign revenues. Accordingly, the foreign revenues shown for these companies are much lower than those consolidating foreign operations, even though these companies have significant offshore holdings. SBC, for example, has significant investments in North America and Europe. NTT has foreign holdings in Southeast Asia, Europe and North America although the returns on equity are not large enough to be separately reported.

Mobile communications

The size of the wireless communications market in the OECD area was USD 336 billion in 2003 (Table 3.4 and Figure 3.3). This represented just under a 19% increase from 2002. In seven countries more than 50% of all telecommunication service revenues was attributable

Figure 3.3. **Mobile telecommunication revenue in OECD countries, 2003**



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to mobile communications in 2003 (Figure 3.4). In a further eight countries more than 40% of all telecommunication services revenue is derived from wireless services.

Revenues per basic access path (*i.e.* fixed PSTN lines plus mobile subscribers) have been tending to fall over recent years (Table 3.5 and Figure 3.5). The main reason for this is the trend toward lower revenue per wireless user. Users of pre-paid cards generally generate much less revenue than post-paid wireless customers. By way of contrast, revenue per capita has increased due to the expansion of fixed and wireless access across the OECD (Figure 3.6). While revenue per capita continues to increase, it can be noted that revenue per access path was also higher in 2003 than in previous years. The main reason for this is the increase in revenues from broadband access and the decrease in the number of basic fixed lines. In addition, the long-term trend towards lower revenue per mobile user

Figure 3.4. **Share of mobile revenue in telecommunication revenue**

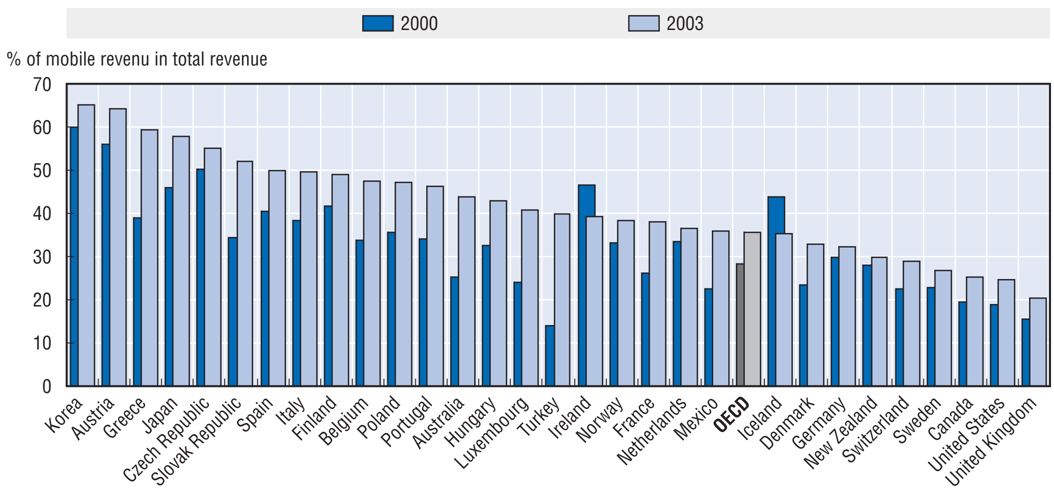

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Figure 3.5. **Telecommunication revenue per access path, 2001 and 2003**

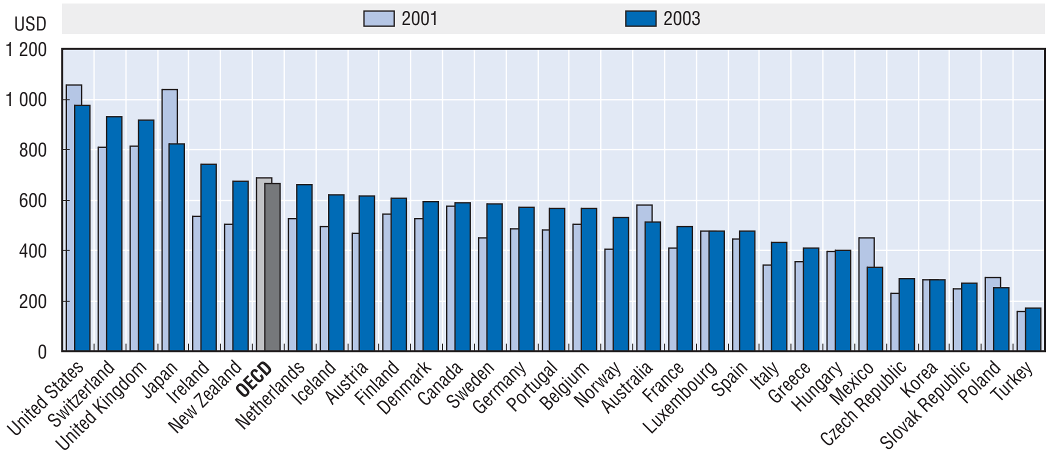

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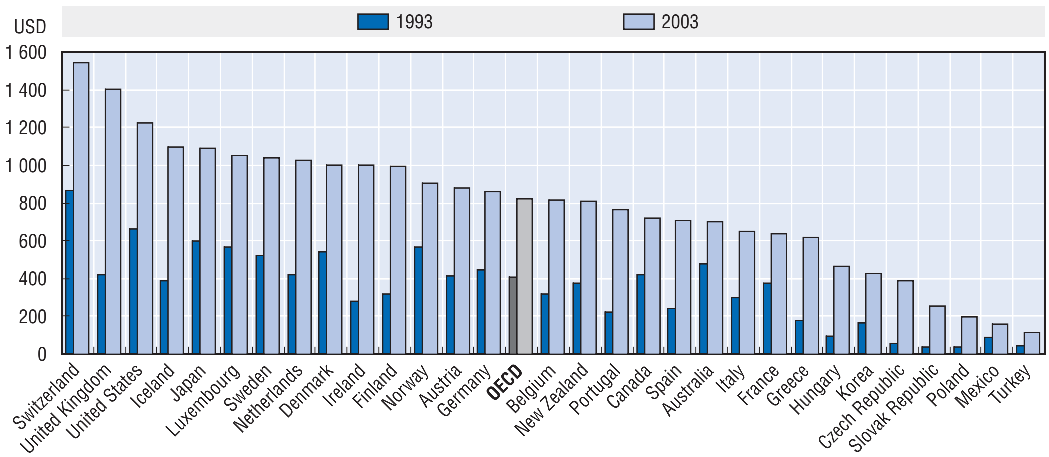
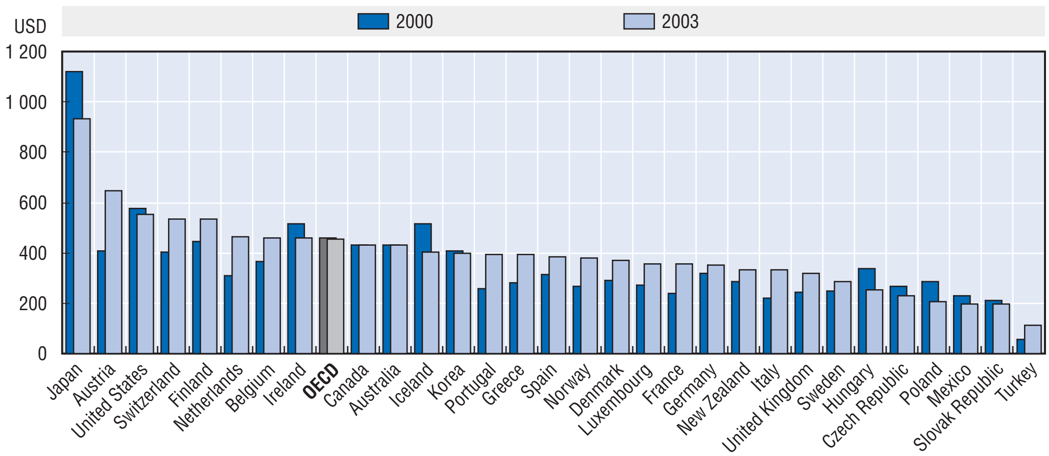
Figure 3.6. **Telecommunication revenue per capita, 1993 and 2003**



StatLink: http://dx.doi.org/10.1787/716158252331

was reversed in 2003 (Table 3.6 and Figure 3.7). This may be due to and increase in data revenue and the use of services such as text messaging. Furthermore, flat-rate plans are increasing in popularity as they enable greater use in return for a higher monthly fixed fee than a user might otherwise spend with metered use.

Figure 3.7. **Cellular mobile telecommunication revenue per subscriber, 2000 and 2003**



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International communications

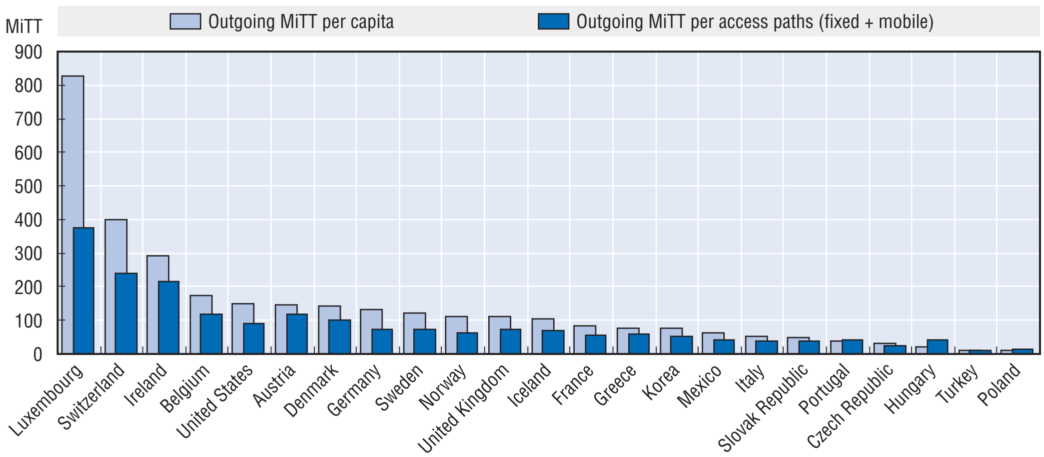
In the past the very high cost of international telephony made this segment a significant part of the overall revenue of telecommunication carriers. In 1992 more than a third of carriers in the OECD relied on international traffic for more than 20% of their revenue. A decade later, international telecommunication is responsible for a relatively small share of total telecommunication revenue.

In 2003 only Luxembourg derived more than 10% of revenue from the international segment (Table 3.7). This compares to 45% of that country's overall revenue in 1992. Mexico had the next highest proportion of international revenue with a total of 8% in 2003 but, as with other countries, this has been declining in recent years.

Several factors are at work in the declining proportion of international revenue in relation to the total. A significant factor, of course, has been the growth of mobile communications which have meant that total industry revenues have increased at a more rapid rate than international revenue. At the same time, liberalisation has pushed prices closer the cost of providing international services. This has caused a sharp increase in the volume of international traffic even at a time of increasing substitution of PSTN based international communication. Some of the services substituting for international PSTN telephony and fax traffic include Internet telephony and e-mail.

Price declines have stimulated a very large increase in traffic over recent decades. The number of international calls made from the United States increased from 200 million in 1980 to 5.9 billion in 2002. At the same time the average revenue per minute, for calls from that country to others, was reduced by 79% since 1980 and 54% since 1998. On a more general basis international traffic has tended to increase on a per capita basis across the OECD (Table 3.8 and Figure 3.8) but decline when weighted by basic access paths (*i.e.* fixed PSTN lines plus mobile subscribers). One reason for this is the price of international calls has fallen faster on fixed networks than mobile networks. Accordingly, while more

Figure 3.8. **Minutes of outgoing international telecommunication traffic (MiTT), 2003**



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international calls are being made there is an incentive to use the fixed network rather than a mobile network.

Internet telephony is also growing apace. For example, iBasis a company specialising in Voice over Internet Protocol increased the number of international minutes its network carried from 600 million to 1.4 billion in 2001. By the end of 2003 this had increased to 3.5 billion minutes. The various combinations of PC to PC, PC to Phone and Phone to Phone IP telephony radically alter the traditional definition of an international telephone call.

Internet telephony is changing the once relatively easily defined boundaries of international calls. Several services offer telephone numbers to users which are unrelated to their country of residence. In addition these services can be used wherever the user has access to the Internet. A user of Vonage, a VOIP provider in the United States, can make free calls within the United States and Canada or metered calls to any foreign destination while they are physically located at any foreign location with broadband Internet access. At the same time the pricing of VoIP in many cases does not differentiate between domestic and international calls. In the case of Vonage packages are available that treat Canada and United States as the same calling zone. In the case of Skype, a peer to peer VoIP provider, the tariffs to call the fixed networks of most OECD countries are the same as for a domestic call in those countries. Where prices are higher it is a sign of higher termination rates.

Leased lines

The advent of the Internet created significant new demand for leased lines from the mid 1990s onwards. In countries where competition had already pushed down the price of leased lines, such as in the United States, the demand for additional capacity pushed revenues from USD 18.8 billion in 1997 to USD 38 billion in 2002 (Table 3.9). The years 2001 and 2002 may, however, be a peak for the industry in the United States. While local leased line revenue continued to grow in 2002, competition further decreased margins for sales of capacity on backbone networks. As a result, the total revenue from long distance leased lines decreased in the United States for the first time after more than a decade of consistent growth leading to 2002.

In countries where there has been a decrease in revenue it is generally not because of any volume decrease. Rather it suggests increasing competition in market with lower prices. This being said, some forms of xDSL may be substituting for local access leased lines. These services are less expensive than the traditional pricing of local leased lines and may be contributing to a shift in revenue between segments.

Research and development

Although complete data are not available for all telecommunication carriers in 2003, expenditure by leading carriers was in the range of USD 7 billion to USD 8 billion (Table 3.10). The majority of this expenditure is impacted by government regulation. In a number of OECD countries regulation requires telecommunication carriers to allocate a certain amount of their turnover for research and development.

In Japan, the NTT Law requires NTT to conduct research relating to telecommunication technologies. The law stipulates that NTT (including NTT East and NTT West) are responsible for promoting research in telecommunications technologies and disseminating the results of such research. In Korea, under the Telecommunications Basic Law, the Ministry for Information and Communications (MIC) may recommend that network service providers contribute a percentage of their total annual revenues to telecommunication research. These recommendations may be made for the level of internal R&D made by carriers as well as external contributions. The external contributions are made to a fund administered by MIC, which then distributes funding to Korean research institutes. In France, government regulation requires France Telecom to spend 4% of its unconsolidated revenues on research and development. This amount has declined relative to the growth of consolidated revenues and represented 1% of France Telecom's turnover in 2003.

Apart from France, Japan and Korea, telecommunication carriers in most OECD countries are not required by regulation to engage in a specific amount of R&D. Company strategy appears in many cases to be a greater influence than regulation. Worthy of note is that BT, without a regulatory obligation and 100% privately owned, spent more on R&D than France Telecom in 2003.

In some cases telecommunication carriers spent much less in 2003 than they did in 1997 or 1999. Carriers such as AT&T and KPN are spending less on R&D. This does not mean that products and services have less of an R&D component. In liberalised markets, and free of regulatory requirements, telecommunication carriers tend to focus R&D expenditures on applying technology and services developed by others such as equipment companies. This contrasts with the era of monopolies when some telecommunication carriers did significant amounts of fundamental research. This does not mean that less R&D is being conducted in the sector. In fact the reverse is the case. In competitive markets telecommunication carriers have become increasingly demanding customers for the technologies and applications developed by others. The impact of this is readily evident in the trends in R&D expenditure among the leading equipment suppliers. In 2003, telecommunication equipment companies spent more than USD 37 billion on R&D (Table 3.11). This compares to around USD 27 billion in 1997 – the last year in which monopolies over telecommunication services existed in the majority of OECD countries.

After experiencing a sharp downturn in the market for equipment, a number of telecommunication equipment companies decreased their R&D in 2003. By way of contrast, Nokia increased its R&D. In 2003, Nokia had R&D expenditure of USD 4.6 billion, representing some 12.3% of that company's turnover. This was some USD 2 billion greater than in 2001.

As measured by the number patents filed with the United States Patents and Trademark Office (USPTO), the level of R&D undertaken by telecommunication equipment companies has also increased significantly following widespread liberalisation across the OECD. In 2003, the leading equipment manufacturers were awarded 10 420 patents by the USPTO. This was 63% greater than the number of patents awarded in 1997 but down from a peak in 2001. The number of patents awarded to telecommunication carriers has also increased. In 2003, 462 patents were awarded to leading telecommunication carriers in OECD countries by the USPTO (Table 3.12). This was a 180% increase on the number of patents awarded to the same carriers in 1997. However, the number of patents granted to telecommunication carriers in 2003 has decreased from the peak in 2001. Data on patent applications filed with the European Patent Office are also available (Table 3.13).

Table 3.1. **Telecommunication revenue in the OECD area**

	Revenue 1991 (USD m)	Revenue 1993 (USD m)	Revenue 1996 (USD m)	Revenue 1997 (USD m)	Revenue 1998 (USD m)	Revenue 1999 (USD m)	Revenue 2000 (USD m)	Revenue 2001 (USD m)	Revenue 2002 (USD m)	Revenue 2003 (USD m)	CAGR 2002-2003	CAGR 1998-2003	CAGR 1993-2003
Australia	9 554	8 458	13 109	13 463	12 850	14 098	14 656	13 382	11 305	14 036	24.2	1.8	5.2
Austria	2 934	3 332	4 012	3 736	4 120	4 997	4 440	5 043	5 813	7 119	22.5	11.6	7.9
Belgium	2 820	3 198	4 465	4 229	5 100	5 896	6 095	6 716	6 880	8 445	22.7	10.6	10.2
Canada	12 667	12 059	13 361	17 080	16 824	17 450	19 396	20 258	20 000	22 714	13.6	6.2	6.5
Czech Republic	485	602	1 130	1 452	1 833	2 110	2 316	2 558	3 270	3 999	22.3	16.9	20.8
Denmark	2 389	2 818	3 491	3 485	3 760	4 146	4 173	4 240	4 384	5 400	23.2	7.5	6.7
Finland	2 140	1 627	2 693	3 071	3 634	4 041	4 004	4 189	4 728	5 169	9.3	7.3	12.3
France	20 527	22 367	30 591	28 620	26 619	28 231	27 186	29 279	31 852	39 175	23.0	8.0	5.8
Germany	28 430	36 424	42 067	43 698	49 111	51 170	51 560	53 482	57 830	70 787	22.4	7.6	6.9
Greece	1 345	1 885	3 133	3 285	4 304	4 254	4 297	4 995	5 425	6 820	25.7	9.6	13.7
Hungary	466	1 014	1 841	2 138	2 513	3 071	3 210	3 440	3 869	4 686	21.1	13.3	16.5
Iceland	89	103	156	151	167	191	253	216	228	319	39.8	13.9	12.0
Ireland	997	1 012	1 557	1 674	1 504	1 927	2 249	2 478	3 197	3 983	24.6	21.5	14.7
Italy	18 155	17 028	24 189	23 880	26 468	26 696	24 486	27 061	30 148	37 763	25.3	7.4	8.3
Japan	52 115	74 593	118 336	116 505	113 184	143 183	163 253	156 796	129 352	139 407	7.8	4.3	6.5
Korea	6 112	7 365	14 919	9 097	12 784	13 557	18 168	18 131	18 730	20 427	9.1	9.8	10.7
Luxembourg	154	225	318	306	341	363	340	372	394	473	20.0	6.8	7.7
Mexico	5 390	7 885	6 755	8 770	9 579	11 205	14 284	16 013	16 941	16 536	-2.4	11.5	7.7
Netherlands	11 422	6 391	8 413	7 890	9 491	10 719	10 150	11 607	12 988	16 604	27.8	11.8	10.0
New Zealand	1 484	1 350	2 142	2 249	2 041	2 173	2 224	2 117	2 465	3 282	33.2	10.0	9.3
Norway	2 204	2 456	3 437	3 609	2 466	2 603	2 711	2 894	3 469	4 129	19.0	10.9	5.3
Poland	1 160	1 508	2 535	2 593	3 620	4 592	5 427	6 583	6 905	7 650	10.8	16.1	17.6
Portugal	1 671	2 220	3 822	3 959	4 215	4 730	5 049	5 995	6 469	7 974	23.3	13.6	13.6
Slovak Republic	..	205	417	451	480	444	804	942	1 024	1 381	35.0	23.5	21.0
Spain	10 066	9 587	11 630	14 254	15 961	18 202	18 652	21 745	22 444	28 763	28.2	12.5	11.6
Sweden	5 717	4 543	7 577	6 910	7 393	7 421	6 867	6 401	7 656	9 325	21.8	4.8	7.5
Switzerland	5 173	6 056	7 687	6 794	7 699	8 729	8 244	8 745	9 516	11 403	19.8	8.2	6.5
Turkey	2 744	2 542	3 066	3 983	5 017	5 462	6 215	5 888	6 726	7 988	18.8	9.7	12.1
United Kingdom	26 031	24 083	30 539	35 782	48 747	56 637	63 681	65 820	71 208	83 286	17.0	11.3	13.2
United States	153 942	172 860	222 256	256 801	272 801	301 648	335 023	349 835	352 747	357 000	1.2	5.5	7.5
OECD	388 383	435 800	589 644	629 916	674 625	759 946	829 412	857 221	857 963	946 043	10.3	7.0	8.1

StatLink: http://dx.doi.org/10.1787/603472805142

Table 3.2. **Telecommunication revenue as a percentage of GDP**

	1985	1990	1995	1997	1998	1999	2000	2001	2002	2003	GDP per capita 2003 (USD)
Australia	1.92	2.81	2.99	3.25	3.47	3.50	3.77	3.62	2.74	2.66	26 406
Austria	1.68	1.75	1.82	1.80	1.93	2.35	2.30	2.62	2.82	2.80	31 377
Belgium	1.27	1.37	1.56	1.73	2.04	2.35	2.68	2.96	2.79	2.79	29 194
Canada	2.21	2.12	2.09	2.71	2.77	2.69	2.72	2.88	2.75	2.65	27 101
Czech Republic	..	1.69	1.91	2.58	3.01	3.57	4.16	4.20	4.43	4.42	8 863
Denmark	1.49	1.77	2.07	2.06	2.18	2.40	2.64	2.66	2.54	2.55	39 319
Finland	1.50	1.62	1.95	2.50	2.81	3.17	3.35	3.46	3.57	3.21	30 894
France	1.65	1.55	1.94	2.04	1.83	1.96	2.09	2.22	2.21	2.24	28 432
Germany	1.60	2.91	1.87	2.08	2.29	2.43	2.77	2.89	2.91	2.96	28 978
Greece	1.33	1.55	2.38	2.70	3.54	3.40	3.78	4.26	4.06	3.97	15 661
Hungary	..	..	3.45	4.68	5.34	6.39	6.88	6.64	5.96	5.66	8 172
Iceland	1.29	1.35	1.92	2.08	2.08	2.27	3.00	2.82	2.69	3.02	36 541
Ireland	2.31	2.15	2.08	2.10	1.73	2.02	2.38	2.40	2.65	2.63	37 947
Italy	1.48	1.46	1.68	2.05	2.22	2.26	2.29	2.49	2.54	2.58	25 161
Japan	1.58	1.52	2.14	2.71	2.88	3.22	3.44	3.77	3.26	3.24	33 702
Korea	2.05	2.05	2.17	1.76	3.70	3.04	3.55	3.76	3.42	3.37	12 631
Luxembourg	1.03	1.33	1.66	1.76	1.80	1.82	1.74	1.89	1.83	1.76	59 815
Mexico	0.52	1.53	2.27	2.19	2.28	2.33	2.46	2.57	2.62	2.64	6 090
Netherlands	1.45	3.75	2.05	2.10	2.41	2.69	2.75	3.03	3.09	3.25	31 461
New Zealand	2.46	3.33	3.44	3.37	3.73	3.78	4.26	4.07	4.10	4.10	19 832
Norway	1.91	2.02	2.14	2.30	1.64	1.65	1.62	1.70	1.82	1.87	48 381
Poland	..	0.88	1.69	1.69	2.14	2.79	3.26	3.54	3.61	3.65	5 483
Portugal	2.66	1.93	2.83	3.70	3.76	4.12	4.76	5.48	5.29	5.44	14 041
Slovak Republic	..	..	1.72	2.13	2.17	2.18	3.96	4.51	4.22	4.23	6 073
Spain	1.44	1.69	1.89	2.54	2.72	3.03	3.33	3.72	3.42	3.44	20 505
Sweden	1.78	2.24	2.91	2.79	2.98	2.95	2.87	2.91	3.17	3.09	33 644
Switzerland	2.15	2.14	2.62	2.59	2.86	3.29	3.35	3.50	3.44	3.55	43 351
Turkey	1.03	1.37	1.08	2.10	2.50	2.95	3.12	4.04	3.65	3.33	3 385
United Kingdom	2.36	2.59	2.50	2.69	3.41	3.89	4.42	4.57	4.57	4.61	30 405
United States	2.67	2.54	2.71	3.11	3.14	3.27	3.43	3.47	3.38	3.26	37 622
OECD	2.13	2.16	2.28	2.65	2.82	3.02	3.25	3.39	3.24	3.19	25 674

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Table 3.3. **Globalisation of selected telecommunication carrier revenues**

Name of PTO	Country	Major foreign telco shareholders, 2001	Major foreign telco shareholders, 2003	1999			2000			2001			2002			2003		
				Revenue (USDm)	Group foreign revenue (USDm)	Foreign revenue as % of total	Revenue (USDm)	Group foreign revenue (USDm)	Foreign revenue as % of total	Revenue (USDm)	Group foreign revenue (USDm)	Foreign revenue as % of total	Revenue (USDm)	Group foreign revenue (USDm)	Foreign revenue as % of total	Revenue (USDm)	Group foreign revenue (USDm)	Foreign revenue as % of total
Telstra	Australia	None	None	12 800	370	2.9	13 362	618	4.6	10 778	793	7.4	11 748	799	6.8	13 818	845	6.1
Telekom Austria	Austria	Telecom Italia (29.78%)	None	3 966	..	..	3 575	136	3.8	3 521	251	7.1	2 942	294	10.0	4 460	491	11.0
Belgacom	Belgium	SBC (17%) TDC (16.5%), Singapore Telecom (12.5%)	SBC (16.9%), TDC (15.9%)	5 151	..	..	4 912	..	..	5 013	..	..	6 058	..	..	6 128	..	..
Bell Canada Enterprises	Canada	SBC (20%)	None	9 540	728	7.6	11 669	881	7.5	14 007	2 063	14.7	12220	632	5.2	13 611	..	..
Telus	Canada	Verizon (23.7%)	Verizon (20.9%)	3 941	..	..	4 098	..	..	4 647	..	..	4 463	..	..	5 104	..	..
Czech Telecom	Czech Republic	KPN (6.5%), KPN, Swisscom, AT&T (27%)	None	1 501	..	..	1 482	..	..	1 470	..	..	1 614	..	..	1 825	..	..
TDC (TeleDanmark)	Denmark	SBC (41.6%)	SBC (41.6%)	5 762	2 407	41. 8	5 787	2 690	46.5	6 500	3 522	54.2	6 778	3 598	53	7 945	4 217	53
Elisa	Finland	None	None	1 138	57	5.0	1 141	90	7.9	1 285	48	3.7	1 475	201	14	1 728	269	16
Sonera	Finland	None	Merged with Telia	1 841	92	5.0	1 887	139	7.4	1 953	133	6.8						
France Telecom	France	None	None	29 000	3 843	13. 3	30 894	7 982	25.8	38 416	13 750	35.8	43 991	18 139	41.2	51 821	21 417	41.3
Cegetel/SFR	France	BT (26%), Vodafone (15%), SBC (15%)	Vodafone (SFR: 43.9%), Vodafone (Cegetel: 28.5%)	4 087	23	0.6	4 835	150	3.1	6 821	1 132	16.6	6 667	..	..	8 510		
Deutsche Telekom	Germany	None	None	35 325	2 988	8.5	37 559	7 156	19.1	43 133	11 786	27.3	50 650	17 359	34.3	62 739	23 761	37.9
OTE	Greece	None	None	3 622	17	0.5	3 299	56	1.7	3 643	68	1.9	4 065	209	5.1	5 522	1 062	19.2
Siminn	Iceland	None	None	191	0.0	0.0	224	0.0	0.0	187	0.0	0.0	196	0.0	0.0	245	..	..
Telecom Italia	Italy	None	None	29 425	1 739	5.9	24 926	3290	13.2	27 516	3742	13.6	30 106	6493	21.6	35 051	7173	20.5
Matav	Hungary	Deutsche Telekom (59.5%)	Deutsche Telekom (59.5%)	1 623	..	..	1 580	..	..	1 912	210	11.0	2 297	262	11.4	2 724	312	11.5
Eircom	Ireland	KPN (21%) Telia (14%)	None	2 313	..	..	1 806	20	1.1	1 927	..		1 587	..	..	1 829	..	..
NTT	Japan	None	None	91 156	..	..	105 912	6	..	96 121	51	0.1	87 113	..	..	95 709	..	..
KT	Korea	None	None	9 914	..	..	11970	..	..	12 351	..	..	9 389	..	..	9 714	..	..
P&T	Luxembourg	None	None	327	..	..	283	..	..	285	..	..	317	..	..	393	..	..
Telmex	Mexico	SBC (8.1%)	SBC (8%, voting 20.8%)	10 075	..	..	11262	..	..	11 881	..	..	12 137	..	..	10 829	..	..
America Movil	Mexico			1 693	168	9.9	3181	723	22.7	4 429	974	22.0	6 185	1795	29.0	7 965	3102	39.0
KPN Telecom	Netherlands	None	None	9 722	921	9.5	12 395	1 859	15.0	11 481	2 526	22.0	12 060	2 173	18.0	14502.25	2 925	20.2
Telecom, NZ	New Zealand	Verizon (21.5%)	None	2 299	471	20. 5	2 562	813	31.7	2 326	757	32.5	2 403	677	28.2	3 128	876	28.0
Telenor	Norway	None	None	4 291	748	17. 4	4 270	379	8.9	5 121	731	14.3	6 119	2 228	36.4	7 503	3 095	41.3
TPSA	Poland	France Telecom (33.93%)	France Telecom (interest 33.93%, control 47.5%)	3 317	..	..	3 650	..	..	4 236	..	..	4 396	..	..	4 701	..	..
Portugal Telecom	Portugal	Telefonica (3.5%)	Telefonica (4.7%)	3 429	303	8.8	4 721	1 508	31.9	5 113	1 252	24.5	5 266	1149	22	6 490	1530	24
Slovak Telecom	Slovak Republic	Deutsche Telekom (51%)	Deutsche Telekom (51%)	445	..	..	399	..	..	416	..	..	416	..	..	483	..	..
Telefonica	Spain	Portugal Telecom (1%)	Portugal Telecom (1%)	24 459	14 214	58. 1	26 133	11 349	43.4	27 726	10 611	38.3	26 803	11 123	41.5	31 910	12 253	38.4
Tele2	Sweden	None	None	992	187	18. 8	1 358	485	35.7	2 428	1 551	63.9	3 213	2 108	65.6	4 563	3 297	72.3
TeliaSonera (Telia for 1999-2001)	Sweden	None	Merged with Sonera	6 310	649	10.3	5 902	829	14.0	5 537	1 050	19.0	8 314	4 011	48.2	10 108	4965	49.1
Swisscom	Switzerland	None	None	7 440	676	9.1	8 393	2 441	29.1	8 513	2 363	27.8	9 482	2 786	29.4	10 990	3 399	30.9
Cable & Wireless	United Kingdom	Verizon (5.4%)	None	14 840	10 366	69. 9	12 271	9 021	73.5	8 567	5 139	60.0	6 554	4 040	61.6	6 018	3 295	54.8
Vodafone	United Kingdom	None	None	12 698	8 019	63. 2	22 733	17 515	77.0	33 109	27 655	83.5	45 336	38 388	84.7	55015	45992	83.6
Colt	United Kingdom	None	None	648	353	54. 5	1 041	697	67.0	1 313	940	71.6	1 533	1 038	67.7	1 912	1 301	68.0
BT	United Kingdom	None	None	35 327	2 506	7.1	31 921	8 315	26.0	31 616	7 807	24.7	27 951	1778	6.4	30 359	2179	7.2
MMo2	United Kingdom	None	None	..	..	..	5 812	1 667	28.7	6 197	2 130	34.4	7 275	2760	37.9	9 334	3598	38.5
AT&T	United States	None	None	..	..	..	..	..	..	34 529	1 577	4.6	37 827	1625	4.3	42 197	1685	4.0
Bell South	United States	None	None	25 224	2 358	9.3	26 151	2 906	11.1	24 130	2 910	12.1	22 440	2233	10.0	22 635	2294	10.1
Level3	United States	None	None	515	22	4.3	1 184	125	10.6	1 533	174	11.4	3 111	642	20.6	4026	762	18.9
Verizon	United States	None	None	58 194	1 714	2.9	64 707	1 976	3.1	67 109	2 337	3.5	67 304	2219	3.3	67 752	1949	2.9
SBC	United States	None	None	49 531	255	0.5	51 374	328	0.6	45 908	185	0.4	43 138	1102	2.6	40 843	589	1.4
Total of above				524 073	56 194	10.7	572 624	86 151	15.0	624 703	110 218	17.6	642 936	131 862	20.5	722 141	158 632	22.0

Note: Bell Canada Enterprises purchased SBC share in June 2002. Telecom Italia sold stake in Telekom Austria in 2002. In January 2003, SBC sold to Vodafone Group PLC (Vodafone) their 15% equity interest in Cegetel S.A. (Cegetel). Verizon sold its stake in Telecom New Zealand in 2002. Singapore Telecom sold its share of Belgacom in 2003/4. In April 2004 Telefonica increased its share of Portugal Telecom to 8.17%.

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Table 3.4. **Mobile telecommunication revenue**

	1995 (USD m)	% of total revenue	1998 (USD m)	% of total revenue	1999 (USD m)	% of total revenue	2000 (USD m)	% of total revenue	2001 (USD m)	% of total revenue	2002 (USD m)	% of total revenue	2003 (USD m)	% of total revenue
Australia	1 776.71	15.96	3 564	27.74	3 861	27.38	3 686	25.15	3 488	26.06	4 671	41.3	6 156	43.9
Austria	..	..	937	22.75	2 215	44.34	2 487	56.01	2 701	53.55	3 085	53.1	4 580	64.3
Belgium	419.96	9.73	1 167	22.88	1 600	27.14	2 052	33.67	2 676	39.85	3 058	44.5	4 008	47.5
Canada	1 662.84	13.65	2 957	17.58	3 221	18.46	3 758	19.38	4 129	20.38	4 522	22.6	5 714	25.2
Czech Republic	112.11	11.26	597	32.58	850	40.28	1 162	50.16	1 414	55.29	1 651	50.5	2 208	55.2
Denmark	312.14	8.37	829	22.05	993	23.95	983	23.56	1 037	24.46	1 276	29.1	1 768	32.7
Finland	3 067.12	20.23	1 295	35.64	1 588	39.30	1 666	41.61	1 796	42.87	2 137	45.2	2 528	48.9
France	2 140.68	7.10	4 385	107.98	6 393	22.65	7 146	26.28	8 954	30.58	11 121	34.9	14 909	38.1
Germany	6 828.67	14.77	12 472	49.66	16 443	32.13	15 392	29.85	15 357	28.71	17 600	30.4	22 890	32.3
Greece	293.53	10.49	1 127	26.18	1 564	36.76	1 670	38.88	1 802	36.08	3 041	56.1	4 048	59.4
Hungary	286.38	18.58	712	28.33	764	24.89	1 043	32.49	1 312	38.15	1 574	40.7	2 016	43.0
Iceland	13.15	9.92	36	21.41	46	24.18	111	43.76	104	48.18	96	42.2	112	35.2
Ireland	..	..	385	25.60	777	40.33	1 045	46.48	1 252	50.52	1 110	34.7	1 567	39.3
Italy	2 847.88	15.41	7 706	29.12	8 785	32.91	9 404	38.40	12 411	45.86	14 386	47.7	18 743	49.6
Japan	25 292.37	22.38	45 697	40.37	60 028	41.92	74 948	45.91	75 383	48.08	74 706	57.8	80 802	58.0
Korea	2 216.80	20.87	3 798	29.71	7 284	53.73	10 905	60.02	10 800	59.57	11 943	63.8	13 311	65.2
Luxembourg	15.34	5.11	26	7.57	81	22.23	82	24.14	112	29.98	123	31.2	193	40.9
Mexico	449.53	6.92	815	8.50	1 542	13.76	3 214	22.50	4 564	28.50	5 690	33.6	5 936	35.9
Netherlands	859.70	10.15	2 164	22.81	2 580	24.07	3 412	33.62	4 129	35.58	4 434	34.1	6 067	36.5
New Zealand	206.12	9.83	315	15.42	481	22.16	625	28.10	612	28.91	660	26.8	984	30.0
Norway	478.86	15.29	622	25.21	760	29.20	898	33.12	997	34.45	1 319	38.0	1 585	38.4
Poland	..	..	668	18.46	1 416	30.83	1 931	35.59	2 621	39.81	2 941	42.6	3 617	47.3
Portugal	397.36	13.04	1 155	27.40	1 549	32.75	1 721	34.09	2 168	36.16	2 631	40.7	3 694	46.3
Slovak Republic	3.57	1.13	25	5.31	13	2.84	276	34.30	354	37.62	415	40.6	718	52.0
Spain	613.47	5.57	4 327	27.11	6 295	34.59	7 544	40.45	8 954	41.18	10 525	46.9	14 399	50.1
Sweden	848.11	12.13	1 351	18.28	1 532	20.65	1 571	22.88	1 572	24.55	2 154	28.1	2 511	26.9
Switzerland	539.83	6.69	1 237	16.07	1 670	19.13	1 868	22.66	2 298	26.27	2 703	28.4	3 312	29.0
Turkey	55.18	3.03	336	6.69	670	12.28	861	13.85	758	12.88	2 517	37.4	3 187	39.9
United Kingdom	2 501.59	8.76	6 065	12.44	7 863	13.88	9 798	15.39	11 478	17.44	13 706	19.2	16 918	20.3
United States	18 627.00	9.35	37 032	13.57	50 152	16.63	63 280	18.89	74 687	21.35	77 000	21.8	88 000	24.6
OECD	72 866.01	13.37	143 802	21.32	193 017	25.40	234 540	28.28	259 920	30.32	282 794	33.0	336 481	35.6

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Table 3.5. **Telecommunication revenue ratios**

	1998 (USD)		1999 (USD)		2000 (USD)		2001 (USD)		2002 (USD)		2003 (USD)	
	Per access path (fixed + mobile)	Per capita	Per access path (fixed + mobile)	Per capita	Per access path (fixed + mobile)	Per capita	Per access path (fixed + mobile)	Per capita	Per access path (fixed + mobile)	Per capita	Per access path (fixed + mobile)	Per capita
Australia	820.1	683.0	806.5	740.5	724.8	760.4	580.7	685.3	451.4	572.3	514.4	701.9
Austria	672.5	516.4	612.0	625.2	435.7	554.3	467.8	627.9	525.5	721.9	613.6	879.1
Belgium	737.5	499.9	698.0	576.8	546.1	594.8	505.5	653.3	487.1	666.0	564.2	814.0
Canada	642.3	557.9	639.5	573.9	618.4	632.0	576.7	653.0	540.6	637.7	586.5	718.1
Czech Republic	387.9	178.0	363.9	205.2	277.2	225.5	230.5	250.2	256.8	320.5	287.3	391.9
Denmark	695.8	709.1	666.1	779.2	577.8	781.7	528.0	791.5	507.2	815.4	594.5	1 001.8
Finland	601.1	705.1	613.1	782.4	551.2	773.6	542.3	807.4	574.0	909.1	605.9	991.5
France	589.1	443.3	517.9	468.2	425.3	448.7	408.4	480.7	428.1	520.1	494.4	636.6
Germany	813.8	598.7	714.8	623.4	523.2	627.3	484.6	649.5	498.5	701.1	572.6	857.8
Greece	565.5	397.2	443.0	390.9	360.9	393.6	353.3	456.7	347.6	495.4	409.8	621.1
Hungary	550.0	244.8	576.4	300.0	466.9	314.4	393.8	337.6	364.4	380.8	399.1	462.6
Iceland	591.1	608.9	530.4	688.9	615.8	899.5	493.3	756.1	479.4	793.9	622.1	1 099.3
Ireland	583.0	405.3	577.4	513.7	589.0	591.9	534.9	642.1	634.6	814.3	739.4	998.0
Italy	566.0	459.6	467.2	463.1	352.0	423.9	340.0	467.4	365.3	519.9	433.2	650.0
Japan	978.8	894.8	1 123.9	1 130.2	1 151.6	1 286.2	1 036.5	1 231.8	806.3	1 015.0	821.9	1 092.4
Korea	351.2	276.2	267.0	290.8	313.1	386.5	281.6	383.0	270.0	393.1	283.3	426.2
Luxembourg	931.1	799.5	760.3	839.2	543.2	775.5	477.0	843.1	472.9	883.8	478.4	1 051.2
Mexico	720.7	100.0	600.5	115.3	539.5	144.8	448.5	160.0	383.7	167.1	332.0	161.0
Netherlands	835.2	604.4	653.0	678.0	474.0	637.5	525.2	723.5	566.7	804.3	661.4	1 023.5
New Zealand	676.2	533.0	658.2	564.1	563.7	574.4	502.3	541.2	560.3	619.9	676.3	812.5
Norway	487.6	556.4	439.1	583.4	407.0	603.6	404.3	641.2	465.6	764.2	532.6	904.6
Poland	347.0	93.6	339.9	118.8	303.5	140.4	292.9	172.1	262.9	180.6	252.8	200.2
Portugal	584.1	416.1	531.2	465.0	458.8	493.7	481.2	582.4	491.9	623.9	564.8	763.6
Slovak Republic	239.3	89.1	190.5	82.4	265.4	148.9	248.7	174.3	229.7	189.9	270.0	256.8
Spain	669.1	404.5	557.8	459.4	436.1	467.1	443.1	540.0	413.6	553.5	477.5	704.8
Sweden	703.9	835.3	632.8	837.8	521.0	774.0	449.7	719.6	507.0	857.8	582.3	1 040.8
Switzerland	1 169.0	1 079.5	1 074.6	1 218.0	830.1	1 143.5	809.7	1 200.4	826.1	1 295.9	930.0	1 539.9
Turkey	245.1	77.4	211.2	83.0	185.6	92.1	157.5	85.8	158.3	96.5	169.5	112.8
United Kingdom	1 054.4	836.1	976.6	968.5	848.6	1 085.9	814.4	1 115.0	824.8	1 202.7	917.6	1 402.7
United States	1 077.2	987.9	1 088.8	1 079.9	1 087.7	1 186.2	1 056.3	1 226.0	1 019.2	1 223.8	975.2	1 226.4
OECD	839.0	605.3	805.9	677.2	737.9	733.4	687.7	752.6	644.7	748.1	665.9	819.5

Note: Fixed access paths here exclude broadband lines.

StatLink: http://dx.doi.org/10.1787/354854832734

Table 3.6. **Cellular mobile telecommunication revenue per cellular mobile subscriber**

USD

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	881	792	533	548	667	594	431	313	371	429
Austria	..	..	..	747	407	515	407	413	458	646
Belgium	1 932	1 787	..	676	664	502	365	348	376	460
Canada	703	642	610	499	553	466	431	388	381	432
Czech Republic	2 965	2 452	755	705	618	437	267	204	192	227
Denmark	462	380	507	528	429	378	292	262	285	371
Finland	2 995	2 952	2 765	2 533	455	485	447	430	473	533
France	875	1 487	1 329	818	391	310	241	242	288	358
Germany	1 129	1 829	1 571	1 234	896	701	319	274	298	353
Greece	215	1 075	915	839	548	402	282	226	326	392
Hungary	1 021	1 073	1 284	1 088	687	477	339	264	229	254
Iceland	428	426	434	413	337	267	515	441	369	402
Ireland	..	..	698	569	407	486	518	452	361	458
Italy	886	726	724	564	380	292	222	243	271	331
Japan	3 132	2 160	1 388	1 140	966	1 056	1 122	1 008	921	932
Korea	1 232	1 351	1 338	506	272	311	407	372	369	396
Luxembourg	960	571	465	335	199	387	271	258	260	359
Mexico	1 570	653	501	378	243	199	228	210	219	197
Netherlands	1 543	1 601	732	843	647	380	310	359	376	463
New Zealand	412	488	..	292	251	312	286	253	260	332
Norway	488	488	572	495	295	277	269	265	337	381
Poland	..	..	..	453	347	363	286	244	212	208
Portugal	1 176	1 166	1 023	653	376	332	258	272	308	395
Slovak Republic	..	290	..	..	55	19	213	165	142	195
Spain	842	660	767	735	614	423	315	304	314	384
Sweden	407	422	444	348	329	299	247	220	271	285
Switzerland	1 007	1 210	1 134	906	728	546	403	436	471	535
Turkey	353	126	339	353	96	86	57	41	108	114
United Kingdom	0	465	571	602	467	328	245	256	275	319
United States	630	593	588	597	535	583	578	581	547	554
OECD	917	978	882	771	586	537	459	426	421	454

Note: Figures for 1999 do not include data for the following operators: TAL (Iceland); Dutchtone, Telfort, Ben (Netherlands); P&T (Luxembourg); Telsim (Turkey).

StatLink: http://dx.doi.org/10.1787/716158252331

Table 3.7. **International telecommunication revenue**

	International revenue (USD million)							As percentage of total national revenue				Per total national access paths (fixed + mobile) (USD) (2003)
	1997	1998	1999	2000	2001	2002	2003	2000	2001	2002	2003	
Australia	1276	1 279	1 161	1 006	..	..	..	6.86	..	..	..	..
Austria	..	..	295	218	200	196	..	4.90	3.97	3.36	..	..
Belgium	552	..	369	273	226	210	242	4.48	3.37	3.06	2.87	16.18
Canada[1]	1441	..	..	..	..	844	1 011	..	..	4.22	..	..
Czech Republic[2]	241	228	182	100	58	..	..	4.33	2.27	..	..	..
Denmark (TDC)	370	302	191	233	115	211	238	5.59	2.71	4.80	4.40	26.18
Finland	213	226	203	154	..	236	192	22.8	..	5.00	3.72	22.52
France (France Telecom)	2164	1 772	1 312	1 105	1 005	802	924	4.06	3.43	2.52	2.36	11.65
Germany	2836	2 761	2 044	1 269	1 245	1 222	1 349	4.79	4.41	2.11	1.91	10.92
Greece (OTE)	548	589	576	373	336	167	190	0.03	6.73	3.08	2.78	11.41
Hungary (Matav)	124	181	185	147	123	..	..	4.57	3.56	..	..	..
Iceland (Telecom)	..	15	17	10	7	..	11	4.04	3.36	..	3.56	22.15
Ireland	358	..	..	..	..	..	..	..	..	..	..	..
Italy	1467	1 544	1 283	978	875	808	914	3.99	3.23	2.68	2.42	10.49
Japan (KDD)	2604	2 422	2 235	2 069	..	..	..	1.27	..	..	..	..
Korea (Korea Telecom)	690	522	483	536	486	525	524	2.95	2.68	2.80	2.56	7.27
Luxembourg	..	..	..	..	..	..	51	..	..		10.69	51.13
Mexico	1887	1 367	1 599	1 768	1 470	1 360	1 331	12.38	9.18	8.03	8.05	26.73
Netherlands (KPN)	1067	..	678	545	527	..	..	5.37	4.54	..	..	..
New Zealand (Telecom)	303	217	185	161	150	..	..	7.25	7.10	..	..	..
Norway	..	65	53	42	42	82	89	1.57	1.44	2.35	2.16	11.48
Poland (TPSA)	..	..	..	343	327	169	84	6.32	4.97	2.45	1.10	2.79
Portugal (Telecom)	478	..	..	241	340	140	..	4.76	5.67	2.16	..	..
Slovak Republic	74	59	45	39	34	50	59	4.90	3.60	4.84	4.26	11.51
Spain	922	760	751	1 037	930	..	..	5.56	4.28	..	0.00	..
Sweden	353	312	287	234	153	154	177	3.42	2.39	2.01	1.90	11.04
Switzerland (Swisscom)	948	968	799	468	393	414	461	5.68	4.49	4.35	4.05	37.62
Turkey	143	131	164	110	139	43	86	1.78	2.36	0.65	1.08	1.83
United Kingdom	2459	2 333	2 258	1 818	1 594	1 289	1 226	2.86	2.42	1.81	1.47	13.51
United States	20355	20 056	20 360	23 325	18 200	16 206	15 148	6.96	5.20	4.59	4.24	41.38
OECD	43872	38 108	37 713	38 603	28 976	25 126	24 308	4.65	3.38	2.93	2.57	17.11

1. Total revenue for Teleglobe.
2. Cesky Telecom only for 2001.

StatLink: http://dx.doi.org/10.1787/262566447178

Table 3.8. **International telecommunication traffic**

	Outgoing MiTT per capita						Outgoing MiTT per access path (fixed + mobile)					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
Australia	89.8	111.1	..	..	..	..	107.9	121.0	..	..	..	..
Austria	139.5	147.4	158.8	130.0	136.4	142.0	181.7	144.3	124.8	96.8	99.3	99.1
Belgium	143.1	122.3	150.6	171.9	174.8	172.2	211.1	147.9	138.3	133.0	127.8	119.4
Canada	159.3	191.8	171.3	185.6	202.2		183.4	213.6	167.6	163.9	171.4	..
Czech Republic	33.0	44.2	42.3	47.1	52.3	50.0	71.8	44.2	52.1	43.4	41.9	36.7
Denmark	109.8	123.2	164.0	162.2	147.2	149.5	107.7	105.4	121.2	108.2	91.5	88.7
Finland	79.8	83.5	90.4	104.2	90.3	..	68.0	65.4	64.4	70.0	57.0	..
France	66.6	72.7	73.5	75.7	78.5	77.5	88.5	80.5	73.5	64.3	64.6	60.2
Germany	71.6	96.3	112.2	101.8	114.9	110.1	97.3	110.4	93.6	76.0	81.7	73.5
Greece	63.2	67.1	..	65.7	74.6	82.0	89.9	76.0	..	50.8	52.4	54.1
Hungary	28.9	31.9	32.3	30.5	29.4	30.0	64.8	61.3	47.9	35.6	28.1	25.9
Iceland	166.1	181.7	151.4	147.6	..	110.1	161.2	139.9	103.6	96.3	..	62.3
Ireland	238.5	270.6	..	..	289.6	291.7	343.1	304.1	..	..	225.7	216.1
Italy	39.7	44.1	48.3	53.0	63.6	63.4	48.9	44.5	40.1	38.6	44.7	42.3
Japan	14.4	14.1	17.2	20.2	22.1	..	15.7	14.0	15.4	20.2	17.5	..
Korea	19.5	20.6	13.7	40.4	41.3	76.6	24.8	18.9	11.1	40.4	28.3	50.9
Luxembourg	688.9	737.8	867.8	893.7	..	826.7	802.3	668.4	607.9	505.6	..	376.2
Mexico	13.7	16.1	19.1	20.4	19.7	20.6	99.0	83.8	71.1	57.1	45.2	42.6
Netherlands	114.9	136.0	..	132.6	..	..	158.8	131.0	..	96.2	..	..
New Zealand	123.5	148.3	162.1	155.7	..	..	156.7	173.0	159.1	144.5	..	..
Norway	104.2	127.1	120.7	126.7	126.0	121.8	91.4	95.6	81.4	79.9	76.8	71.7
Poland	15.6	16.1	17.5	11.2	11.7	9.5	57.7	46.2	37.8	19.1	17.1	12.0
Portugal	46.4	40.3	50.0	53.5	52.2	51.0	65.1	46.0	46.4	44.2	41.1	37.7
Slovak Republic	28.6	30.1	30.0	31.9	31.0	39.9	76.9	69.6	53.5	45.6	37.5	41.9
Spain	34.6	41.7	53.7	66.7	..	..	57.3	50.7	50.2	54.7	..	..
Sweden	143.0	171.1	142.7	152.1	142.5	130.5	120.5	129.3	96.1	95.1	84.2	73.0
Switzerland	285.2	336.8	390.6	416.5	435.4	399.5	308.8	297.2	283.6	280.9	277.5	241.3
Turkey	9.9	11.4	10.8	9.8	9.3	9.0	31.5	29.1	21.9	18.1	15.3	13.6
United Kingdom	93.8	111.3	115.2	119.2	105.9	105.1	118.3	112.2	90.0	87.1	72.6	68.8
United States	87.8	102.1	106.6	116.6	121.6	146.6	95.8	102.9	97.7	100.5	101.3	116.5
OECD	61.2	70.9	67.5	64.7	75.2	74.2	84.8	84.3	67.5	64.7	64.8	60.3

Note: MiTTs is minutes of international telecommunications traffic. OECD is a weighted average.

Source: OECD, ITU.

StatLink: http://dx.doi.org/10.1787/453437418614

Table 3.9. **Leased line revenue, selected incumbents/countries**

USD millions

Country	PTO	1997	1998	1999	2000	2001	2002	2003	Leased line revenue as a percentage of total company revenue		CAGR 1997-2003	CAGR 2002-2003
									2001	2003		
Australia	Telstra	..	..	..	264.0	173.1	147.3	167.5	1.6	1.2	..	13.7
Austria	All operators	..	138.3	267.6	285.0	270.1	264.5	..	7.7	..	..	..
Belgium	All operators[1]	256.0	270.8	377.0	305.6	293.8	250.5	330.1	4.4	3.9	4.3	31.8
Czech Republic	All operators[2]	45.8	49.1	57.8	57.1	63.1	151.2	171.6	4.3	4.3	24.6	13.5
Denmark	Tele Danmark	175.0	178.5	184.1	182.4	187.3	198.6	185.4	2.9	2.33	1.0	-6.6
France	France Telecom	902.1	1 610.5	1 738.5	1 845.0	2 078.6	2 133.0	2 553.9	5.4	4.9	18.9	19.7
Germany	All operators[3]	1 236.0	1 222.2	1 276.6	1 100.9	1 071.4	943.4	1 011.2	2.6	1.4	-3.3	7.2
Greece	All operators	103.3	124.7	..	..	179.5	198.1	258.4	4.9	4.7	16.5	30.4
Hungary	All operators[4]	40.7	48.9	58.3	58.3	62.9	79.0	94.9	3.3	2.0	15.1	20.1
Italy	All operators	419.2	1 540.5	1 549.1	1 434.9	1 292.2	1 339.4	1 542.6	4.7	4.1	24.3	15.2
Japan	NTT	4 034.7	3 874.3	4 388.6	4 583.8	4 311.7	3 867.9	3 924.8	4.5	4.1	-0.5	1.5
Korea	All operators	880.3	622.9	887.8	1 428.3	1 404.3	1 703.6	1 806.0	11.4	8.8	12.7	6.0
Norway	All operators	115.9	122.1	123.0	129.3	148.3	185.2	198.3	2.9	4.8	9.4	7.1
Poland	All operators[5]	..	..	110.1	130.5	126.6	201.1	95.4	3.0	1.2	..	-52.6
Portugal	All operators	179.2	188.6	242.5	276.8	306.6	373.8	..	6.0	..	..	..
Slovak Republic	All operators	35	46	42	40	29	37	50	3.6	5.3	6.0	36.7
Spain	Telefonica	..	..	..	..	228.4	240.8	219.1	0.8	0.7	..	-9.0
Switzerland	Swisscom	340.0	355.2	405.0	340.1	520.1	535.9	503.7	6.1	4.6	6.8	-6.0
Turkey	Türk Telekom	6.9	8.0	8.4	100.0	132.3	109.3	116.2	2.6	2.3	59.9	6.3
United Kingdom	All operators	1 911.5	2 238.3	2 659.7	2 880.3	3 046.4	2 867.2	2 670.5	9.6	3.2	5.7	-6.9
United States	Local and long distance carriers	18 786.0	22 355.0	26 083.0	33 053.0	38 368.0	38 178.0	..	11.0	..	..	..
Total of above		29 467.9	34 994.0	40 458.7	48 495.2	54 293.4	54 004.3	15 899.7	4.9	3.6	-9.8	-70.6

1. Belgacom only for 1997-98.
2. Czech Telecom for 1997-2001.
3. Deutsche Telekom only for 1997-1998.
4. Matav for 1997-2001.
5. TPSA for 1999-2001.

StatLink: http://dx.doi.org/10.1787/065086610175

Table 3.10. **R&D expenditures for PTOs**

USD millions

PTO	R&D expenditure (1997)	R&D as a percentage of total revenue (1997)	R&D expenditure (1999)	R&D as a percentage of total revenue (1999)	R&D expenditure (2001)	R&D as a percentage of total revenue (2001)	R&D expenditure (2003)	R&D as a percentage of total revenue (2003)
NTT	2 388	3.1	3 140	3.4	3216.0	3.3	3061.0	3.2
Deutsche Telekom	692	1.8	697	2.0	804.0	1.9	1011.0	1.6
BT	502	2.0	556	1.6	525.0	1.7	548.0	1.8
France Telecom	918	3.5	632	2.2	506.0	1.3	507.0	1.0
AT&T	829	1.6	550	0.9	325.0	0.6	277.0	0.8
Korea Telecom	113	2.2	258	2.6	293.0	2.4	195.0	2.0
Telefonica[1]	153	0.8	96	0.4	153.0	0.6	494.0	1.6
Telia	202	3.3	190	3.0	126.0	2.3	..	..
Telecom Italia	..	..	352	1.2	123.0	0.4	166.0	0.5
SK Telecom	41	1.7	89	2.4	119.0	1.8	232.0	2.9
Vodafone	55	1.4	74	0.6	104.0	0.3	280.0	0.51
Telenor	113	3.1	68	1.6	102.0	2.0	65.0	0.9
Sonera[2]	52	3.5	64	3.5	73.0	3.7	..	..
KPN Telecom	60	0.8	59	0.6	41.0	0.4	26.0	0.2
Elisa	..	..	16	1.4	32.0	2.5	27.0	1.6
Telekom Austria	..	..	20	0.6	19	0.5	48	1.08
Hanaro Telecom	..	..	6	28.4	10.0	1.6	8.0	0.7
Dacom	3	0.6	6	1.0	4.0	0.5	..	..
Telecom New Zealand	4	0.2	5	0.1	3.4	0.1	5.8	0.2
Qwest	..	..	36	0.9	..	..	..	..
Telstra	43	0.3	19	0.1	..	..	17	0.12
OTE	..	..	11	0.3	..	..	3	0.1
Belgacom	18	0.4	7	0.1	..	..	..	..
KDDI							115	0.5
TPSA							15	0.3
Portugal Telecom							30	0.5
MMO2							16	0.2
Cable & Wireless	169	1.2	18	0.1	..	..	..	..
Total/average of above	6 355	1.7	6 970	2.5	6 578	1.5	7 147	1.0

1. Telefonica used a different methodology to calculate R&D prior to 2001.
2. Following Telia and Sonera's merger, the new entity does not report R&D as a separate line item.

StatLink: http://dx.doi.org/10.1787/114880223717

Table 3.11. **R&D expenditures for telecommunications equipment manufacturers**
USD millions

Manufacturer	1997			1999			2001			2003		
	R&D expenditure	R&D as a % of total revenue	USPTO patents granted	R&D expenditure	R&D as a % of total revenue	USPTO patents granted	R&D expenditure	R&D as a % of total revenue	USPTO patents granted	R&D expenditure	R&D as a % of total revenue	USPTO patents granted
Ericsson	3 175	14.5	181	4 201	16.0	657	4 511	20.1	775	3 593	24.0	652
Motorola	2 748	9.2	1 058	3 440	11.1	1 192	4 300	14.3	778	3 811	14.5	610
Cisco	1 050	12.4	..	1 663	13.7	45	3 922	17.6	163	3 135	16.6	336
Lucent	3 023	11.5	768	3 563	13.2	1 152	3 520	16.5	1 109	1 838	21.1	621
Nortel	2 147	13.9	64	2 724	13.9	240	3 292	18.8	461	2 024	21.1	434
Fujitsu	3 199	7.8	903	3 520	7.6	1 192	2 878	7.0	1 116	2 381	6.2	1 302
NEC	2 880	7.0	1 095	2 767	5.5	1 842	2 745	6.5	1 953	2 511	6.1	1 181
Nokia	879	8.7	47	1 793	8.9	268	2 665	9.6	291	4 617	12.3	212
Alcatel	2 844	8.9	68	2 181	9.5	115	2 589	11.3	315	2 532	13.5	269
Siemens[1]	2 312	..	454	2 446	18.8	722	2 461	10.1	793	943	11.8	660
Samsung Electronics[2]	1 213	8.3	582	1 697	6.5	1 455	1 690	6.2	1 450	2 500	5.0	1 313
Matsushita Communications[3]	..	..	746	994	12.1	1 124	1 128	12.9	1 440	4 968	7.7	1 774
GEC Marconi	407	6.5	7	611	7.1	13	910	14.0	3	462	15.2	12
LG Electronics	457	4.7	110	353	4.0	224	588	4.6	245	859	5.1	409
Corning	117	6.5	264	245	9.8	340	474	10.6	241	401	14.0	257
Qualcom	349	10.4	45	340	10.6	110	415	15.5	173	523	13.2	178
3Com	270	12.9	..	611	14.1	90	286	19.3	220	113	12.1	200
Juniper Networks	..	..	..	42	40.4	..	156	17.5	..	176	27.0	..
Total/average of above	27 071	9.5	6 392	33 190	12.4	10 781	38 529	12.9	11 526	37 387	13.7	10 420

1. Siemens R&D expenditure data are proportional for communications sales.
2. Samsung R&D expenditure for 2003 and 2001 are for 2002 and 2000.
3. Matsushita patent data for 2001 are for Matsushita Electrical and Industrial. Matsushita R&D is for the parent company in 2003.

StatLink: http://dx.doi.org/10.1787/411033427701

Table 3.12. **US Patent Office: number of patents granted to selected telecommunication operators**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total (1995-2003)
ATT[1]	..	..	46	150	278	294	289	284	208	1 549
BT	55	48	35	70	77	70	94	56	48	553
NTT (including mobile)	3	12	25	49	32	67	78	60	70	396
France Telecom	35	47	36	63	47	39	35	24	29	355
Deutsche Telekom	0	0	2	8	9	6	25	19	26	95
Telecom Italia (SIP and CSELT)	7	15	16	11	7	7	11	5	10	89
TeliaSonera	..	..	0	0	2	2	1	11	9	25
KPN	0	0	0	0	13	16	1	6	8	44
Qwest Communications International	..	..	..	..	..	..	40	37	39	116
SK Corportation	..	..	0	0	1	6	5	9	5	26
Korea Telecom	0	1	0	0	4	0	6	8	5	24
Telstra	1	3	3	5	5	0	3	0	0	20
Bell Canada	2	0	1	1	2	2	2	4	2	16
Telefonica	0	2	1	8	1	2	0	0	0	14
Swisscom						1	2	4	3	10
Total	103	128	165	365	478	512	592	527	462	3 332

1. Data for ATT prior to 1997 included Lucent.

Source: USPTO.

URL to reports: www.uspto.gov/web/offices/ac/ido/oeip/taf/topo_01.pdf

URL to telecom definition: www.uspto.gov/go/classification/uspc379/defs379.htm

www.uspto.gov/web/offices/ac/ido/oeip/taf/asgstc/regions.htm

StatLink: http://dx.doi.org/10.1787/320388448447

Table 3.13. **Telecommunications patent applications filed at the European Patent Office (EPO)**[1]

	1995	1996	1997	1998	1999	2000	2001[2]
Australia	6	6	11	17	21	18	24
Austria	9	11	9	10	20	9	24
Belgium	11	12	25	22	31	54	49
Canada	45	40	58	96	116	114	135
Czech Republic			2				1
Denmark	2	12	12	20	24	24	20
Finland	50	66	92	115	184	216	192
France	96	119	168	212	277	310	334
Germany	164	198	296	451	526	644	676
Greece			1	1	3	3	3
Hungary		1	0	3	7	11	5
Iceland		3	2	5	6	2	1
Ireland	1	2	7	8	10	9	19
Italy	19	17	20	26	29	46	54
Japan	164	242	306	353	449	634	560
Korea	5	2	17	28	45	80	121
Luxembourg		1				1	
Mexico				1		1	
Netherlands	41	68	68	77	90	147	183
New Zealand		1	1	0		4	4
Norway	2	7	10	11	9	7	9
Poland			0			1	0
Portugal				1			1
Slovak Republic						0	1
Spain	3	4	8	9	10	18	18
Sweden	57	76	102	106	167	141	103
Switzerland	10	19	14	28	40	45	43
Turkey					0	1	
United Kingdom	91	111	124	166	196	276	233
United States	495	624	792	912	1 210	1 203	1 070
Total OECD	1 269	1 641	2 147	2 675	3 470	4 017	3 883
Total EU15	543	696	932	1 222	1 567	1 897	1 909
World total	1 287	1 673	2 203	2 729	3 560	4 161	4 029
OECD as % of world	99	98	97	98	97	97	96

1. According to the residence of the inventors, by priority year. Telecommunications patents include: telephonic communication (H04M) and transmission of digital information (H04L) subclasses of electric communication technique class (H04) from the International Patent Classification.

2. Provisional.

Source: OECD, Patent database, March 2005.

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Chapter 4

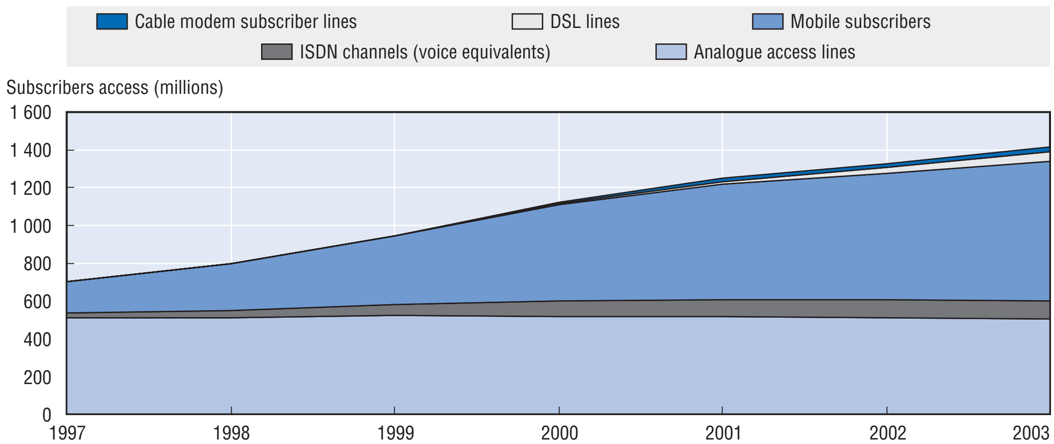
Network Dimensions and Development

Total access to communication networks is increasing across the OECD, with rapid growth in mobile and broadband connections. At the end of 2003, the total number of fixed and mobile telecommunication paths had increased to more than 1.4 billion, a 6.7% increase over 2002 and more than a 12% annual increase since 1998. For the first time, however, growth is not occurring across all platforms. The number of mobile and broadband subscribers continues to climb at the same time that some segments of the fixed connection market have begun to decrease. This chapter examines investment in network development, expansion and the digitalisation of networks.

This chapter deals with the public switched telecommunication network, mobile networks and broadband connections. The Internet infrastructure and broadcasting networks are examined in the chapters which follow.

Access to communication networks continues to expand in all OECD countries. At the end of 2003, the total number of fixed and mobile telecommunication paths had increased to more than 1.4 billion (Table 4.1). This represented a 6.7% increase over 2002 and more than a 12% annual increase since 1998 (see Figure 4.1). Fixed network connections include those made *via* public switched telecommunication networks as well as broadband connections (in this case DSL and cable modems).

Figure 4.1. **Total fixed and mobile telecommunication paths, millions, 1997-2003**



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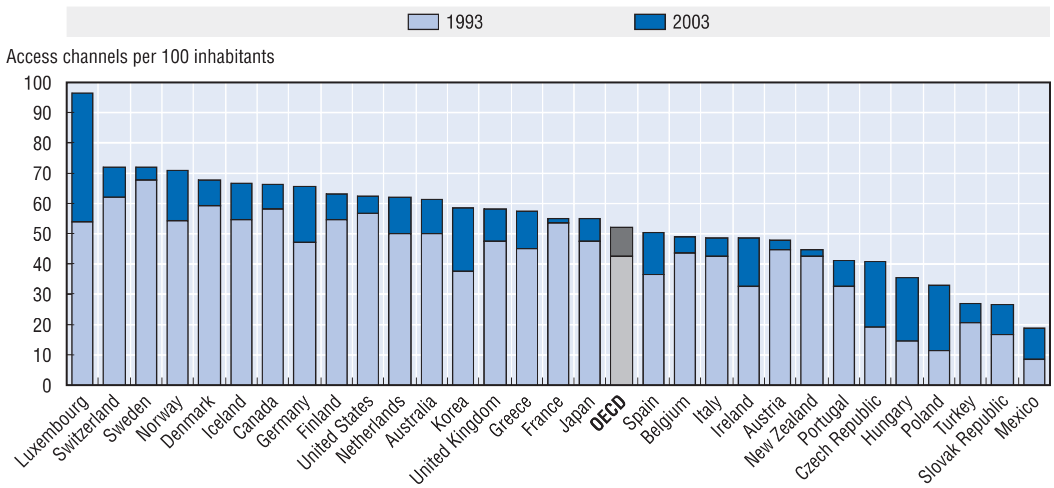
For the first time, however, growth is not occurring across all platforms. The number of cellular mobile communication subscribers continues to climb. An additional 69 million mobile subscribers were added in 2003. By way of contrast, some segments of the fixed connection market have begun to decrease. The number of fixed access lines decreased in both 2002 and 2003 and will, most likely, continue to do so over the coming years.

The most obvious explanation for the decrease in fixed access lines is the increasing take up of mobile communications. Discussion of mobile service substituting for fixed access has been ongoing for more than a decade. In all that time mobile has, to some extent, been increasingly substituted for fixed line service as well as created a new market. For a variety of reasons, however, the total number of fixed lines continued to expand for the OECD, as a whole, even as the ubiquity of mobile services increased. It is worth examining these factors in more detail before considering the impact of mobile communications.

One reason fixed networks continued to expand, at a time of very rapid growth in mobile services, was that some OECD countries had relatively undeveloped fixed networks. As the reforms introduced by member countries made the provision of fixed access increasingly more efficient, growth in countries with relatively low penetration rates tended to offset the relatively low growth in mature markets or declines in advanced markets. The overall impact was that the total number of fixed access line connections for the OECD as a whole continued to grow. This is, however, no longer the case.

Even those countries with relatively low fixed network penetration rates the growth of fixed connections has slowed and in some of these countries has begun to decline. The only exception is Mexico, where there were significant increases in both fixed and mobile access in 2003. In other countries, such as Turkey and the Slovak Republic, growth in fixed network access has either slowed to a virtual halt or begun to decrease at a rapid pace. On the other hand, both the Slovak Republic and Turkey recorded a large increase in mobile penetration. The most obvious explanation is the impact of mobile communications substituting for fixed lines.

Figure 4.2. **Access channels per 100 inhabitants in OECD countries, 1993 and 2003**



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A further phenomenon impacting on directions of growth, for the fixed network, has been the advent of the Internet. In the first years of its commercial development the Internet stimulated demand for greater access to ISDN and additional residential lines. This was because dial-up Internet, in single line households, did not allow simultaneous telephony. As a result, residential users started to purchase additional lines in North America or ISDN in a number of European countries. In addition, dial-up service reinforced the need for a primary connection without which a user could not access the Internet at all from that location.

The advent of broadband access has, of course, considerably altered patterns of demand for basic fixed network connections such as analogue lines and ISDN. If a user has a DSL connection that line can be used simultaneously for telephony and Internet access. This has caused many users to give up second lines and ISDN connections in favour of a single line which is DSL-enabled. There are some interesting exceptions in countries where ISDN is still marketed as a bundle with DSL, such as in Germany. A more common case, however, is that demand for ISDN and second lines has slowed or begun to decrease. In a number of countries, telecommunication carriers actively market the offset saving customers can make by opting for a DSL connection instead of ISDN or second lines.

A further factor in broadband substitution for additional residential lines and ISDN has been the advent of independent broadband platforms such as cable modems, which claim more subscribers than DSL in countries such as Austria, Canada, Czech Republic, the Netherlands, Poland, Portugal and the United States. Customers in areas with cable modem availability might opt to give up additional public switched access lines by substituting Internet access *via* cable modems. At the same time some customers may also be giving up their primary lines where they judge mobile service and cable modem service, when used together, adequately meet their requirements. One sign of this latter phenomenon has been the advent of so-called "naked DSL" offers. In the United States, rather than lose customers altogether to a combination of other service providers (*e.g.* mobile plus cable modem or Internet telephony plus cable modem), telecommunication carriers have begun to market stand alone DSL connections. In most other OECD countries users still need to take a primary telephone service from an operator to be able to obtain a DSL service from that operator or another.

The experience in the United States would appear to indicate that faced with losing customers altogether telecommunication carriers will develop commercial responses to retain at least part of their business. One factor at work here may also be that cable modems outnumber DSL connections in the United States. In other OECD countries where this is not the case operators may for now feel under less pressure to offer "naked DSL".

While a simple substitution of mobile service for fixed access is the most likely explanation for a shift in demand for basic fixed lines, it is worth noting that the total number of fixed paths is still increasing. If the total number of broadband connections (*i.e.* in this case DSL and cable modems) are added to the total number of fixed channels or fixed lines the overall total has increased in every year between 1998 and 2003 at an annual rate of 4%.

In summary the overall trend for the OECD is the following:

- The number of standard analogue lines is decreasing as substitution of secondary lines occurs from ISDN and DSL. Cellular mobile and cable modems are also being used in tandem to substitute for primary lines. Overall, the number of fixed channels decreased by just over 1% in 2003 (Table 4.2).
- The offset to the decline in standard analogue lines provided by ISDN has begun to slow or decrease as this platform is itself substituted for by a combination of DSL, Cable Modems and mobile service. This is causing a decrease in the total number of fixed line connections and ISDN channels (Tables 4.3 and 4.4). In the residential market all countries for which data are available witnessed a decrease in the number of fixed lines in 2003 except Austria and Mexico (Table 4.5).

In terms of fixed network penetration, as measured by channels, more than two-thirds of the total number of OECD countries experienced a decline in 2003 (Table 4.6). On the other hand, if mobile cellular subscribers are included, then access continues to expand across the OECD. In 2003 there were 123 basic telecommunication access paths (*i.e.* fixed plus wireless) per 100 inhabitants. All but four OECD countries had more than one basic telecommunication access path per inhabitant. At the other end of the scale, Luxembourg has more than two basic telecommunication access paths per inhabitant. Sweden has the next highest penetration with 179 basic telecommunication access paths per 100 inhabitants. Access to cellular mobile networks continues to transform telecommunication access in recent years and is worthy of greater examination.

Mobile network growth

The number of mobile subscribers continues to expand for the OECD as a whole. At the end of 2003 there were 741 million mobile subscribers (Table 4.7). In 2003 just over 69 million new subscribers were added to cellular networks. This was slightly up on the increase for 2002 but much lower than the record growth experienced between 1998 and 2001. The slower growth reflects a maturing in mobile penetration rates.

Just under two-thirds of people in OECD countries had a mobile phone by the close of 2003, up from around one-third in 1999 (Table 4.8). Luxembourg is the leader with more mobile telephones than inhabitants. The explanation for this is probably users who reside in surrounding countries and have a second mobile for use in Luxembourg. It is also the case in some countries that users have more than one pre-paid card or SIM cards on different networks to take advantage of lower prices for on-net calls.

Worthy of note is the OECD's declining share of the world total. At the close of 2003 the total number of mobiles in OECD countries represented 55% of the global total, down from 85% in 1993. While the OECD was still expanding at a relatively high rate a large and growing market has emerged in the rest of the world. In large part this is due to the spread of liberalisation and to the remarkable success of pre-paid cards in countries with relatively low GDP per capita.

Across the OECD two in every five mobile users utilise pre-paid cards (Table 4.9). The greatest use of pre-paid cards is made in European countries such as Italy and Portugal. Mexico and Turkey also have among the highest proportions of pre-paid users. By way of contrast, little use of pre-paid cards is made in Korea, Japan and the United States. Among European countries, Finland is exceptional in the low use of pre-paid cards.

Provision of access to mobile service is fairly ubiquitous across the OECD. All countries have at least 90% of their population covered with most in the high 90s or with complete

Figure 4.3. **Mobile subscribers in the OECD countries**

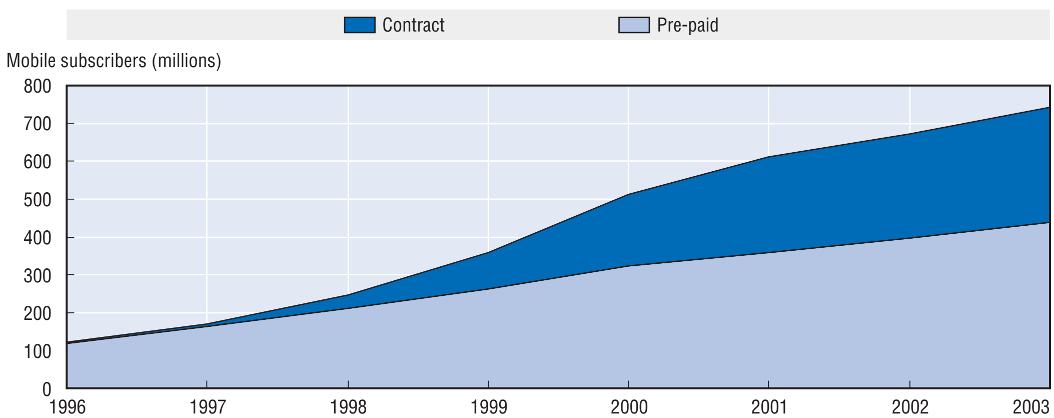

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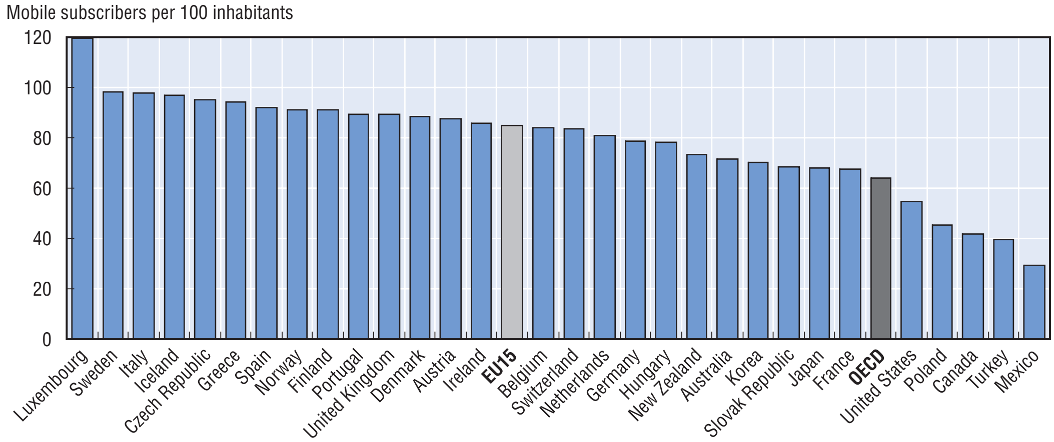
Figure 4.4. **Cellular mobile subscribers per 100 inhabitants, 2003**



StatLink: http://dx.doi.org/10.1787/875763084367

coverage (Table 4.10). In 2003 the average for the OECD was 98%. Even large countries such as Australia, Canada and the United States have almost universal coverage of their population.

Digitalisation

The process of digitalising all telecommunication networks is nearing completion across the OECD area. Nearly all wireless networks are now digital although there are still a small but rapidly decreasing share of analogue services in Mexico and the United States. In respect to the fixed network the proportion of lines connected to a digital exchange is now 99% (Table 4.11). OECD countries whose networks lag the OECD average, in terms of digitalisation, include the Slovak Republic (84%), Hungary (88%), Spain (90%) and Turkey (90%).

With most OECD countries being fully digital, attention has more recently turned to the number of lines that can be enabled to provide DSL. In 2004 Luxembourg reached 100% DSL availability (Table 4.12). While the same feat had earlier been accomplished by several relatively small networks in rural areas of the United States, Luxembourg was the first OECD country to have universal DSL coverage. Belgium and Switzerland had the next highest DSL availability with service available over 98% of all those countries lines.

The overall availability of DSL was around four in five lines at the end of 2004. In terms of the larger G7 countries, the United Kingdom has the highest projected coverage for 2005 of 99.6% of lines followed by France with 96% for the same year. Some of the larger networks in the United States are also expected to record availability in that vicinity by that date. In late 2004, for example, Verizon was offering service over 93% of their lines. Coverage is expected to be greater than 90% in all Nordic countries by the end of 2005. The United Kingdom's successful demand registration scheme has been emulated in a number of countries such as Australia and Ireland, which is also having a beneficial impact on coverage.

As fixed line operators been rolling out DSL, cable TV operators in many OECD countries have also been upgrading their networks to provide broadband Internet access. In seven of the 30 OECD countries there are more broadband subscribers using cable modems than DSL. Countries with high cable TV penetration have typically benefited as

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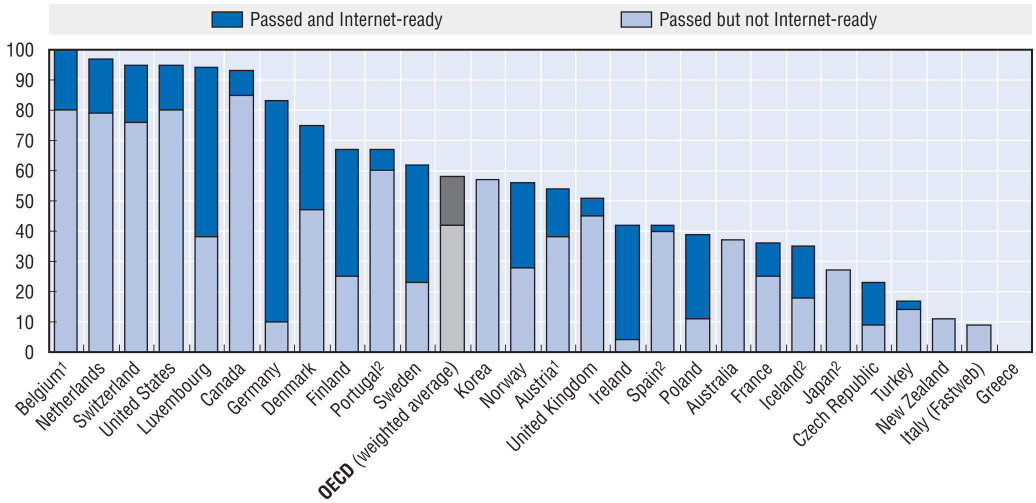
Figure 4.5. **Total households passed by cable TV networks**



1. Indicates based on earlier data on cable modem availability than 2003.
2. Indicates estimate based on company information. Fastweb does not use cable modems but provides the largest alternative network providing broadband access to the incumbent in Italy.

StatLink: http://dx.doi.org/10.1787/370504323128

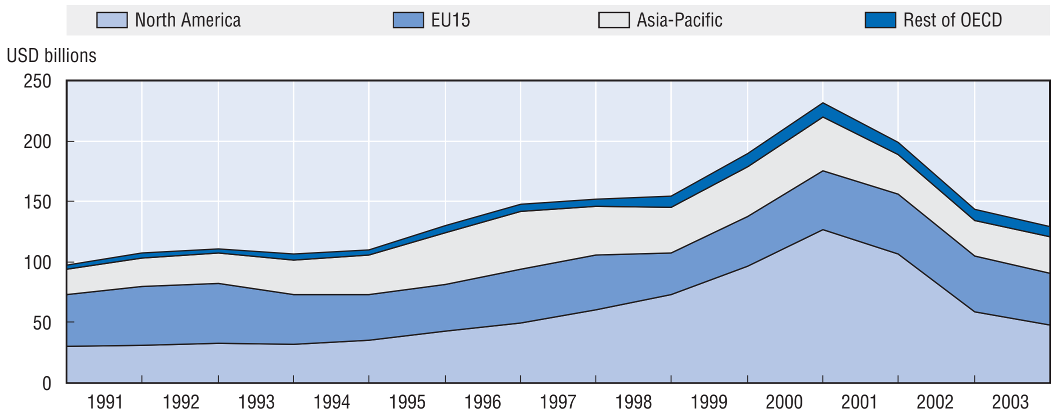
operators upgrade networks for Internet access. However, high cable TV penetration rates do not guaranteed widespread cable modem availability. For example, in Germany 83% of homes were passed by cable television networks in mid-2003 but cable broadband was available to only 10% of households (see Figure 4.5).

Investment

In the period leading to 2000, capital expenditure on telecommunication networks grew to record levels in OECD countries. The three main drivers for this increase in investment were the construction of second generation wireless networks, the first significant entry into local access markets for fixed networks, and very large commitments by new entrants and incumbents in national and international backbone infrastructure. Following a peak in 2000 of USD 231 billion, investment in telecommunication networks has decreased in every subsequent year. In 2003 capital expenditure by telecommunication carriers was down by just under USD 130 billion from the peak set in 2000 (Table 4.13). This was similar to the levels witnessed in the mid 1990s but in stark contrast to the expenditure highs reached during the financial bubble.

The peak in investment in telecommunication networks coincided with auctions for licences to spectrum allocated for 3G (UMTS, IMT-2000) services in a number of OECD countries (Table 4.14). At its peak the combined investment in tangible infrastructure and spectrum licenses reached a peak of USD 327 billion. This was more than three times the total investment in the sector a decade earlier. In 2000, the total amount outlayed on auctions and licencing soared to USD 82 billion before reducing to USD 4 billion in 2001. The largest part of this expenditure was outlayed in Europe. On a regional basis this is reflected in both the investment series for the EU15 countries and the broader measure of all European countries that are members of the OECD (Table 4.15). Since that time outlays for spectrum have been relatively minor across the OECD. At the same time investment in network infrastructure has also been reduced.

Figure 4.6. **Public telecommunications investment by region, 1990-2003 (excluding spectrum fees)**



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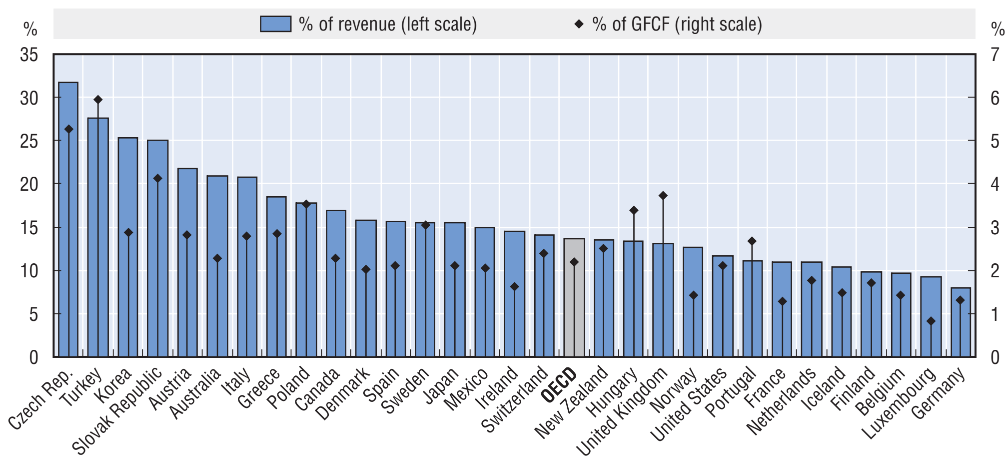
Investment in telecommunication networks across the OECD represented the equivalent of 13.6% of total revenue in 2003 (Table 4.16). That figure is much lower than in previous years. There are undoubtedly several factors at work. First is that the tremendous expansion in access to networks and new services over recent years has generated ever larger streams of revenue. Accordingly, even during the boom in expenditure on telecommunications networks, the equivalent proportion of revenue devoted to capital expenditure was lower than it had been in the early 1990s. Other factors include the impact of developments such as digitalisation and dramatic increases in the capabilities of technology (driven by Moore's Law) in lowering the cost of equipment, and greater competition between equipment suppliers than in the days where service providers with monopolies often favoured national suppliers. In addition there are undoubtedly growing economies of scale as access expands and new entrants complete the build out of their networks. Here, in particular, there has been much less expenditure by operators on

Figure 4.7. **Public telecommunication investment as a percentage of PTO revenue and gross fixed capital formation (GFCF), 2003**



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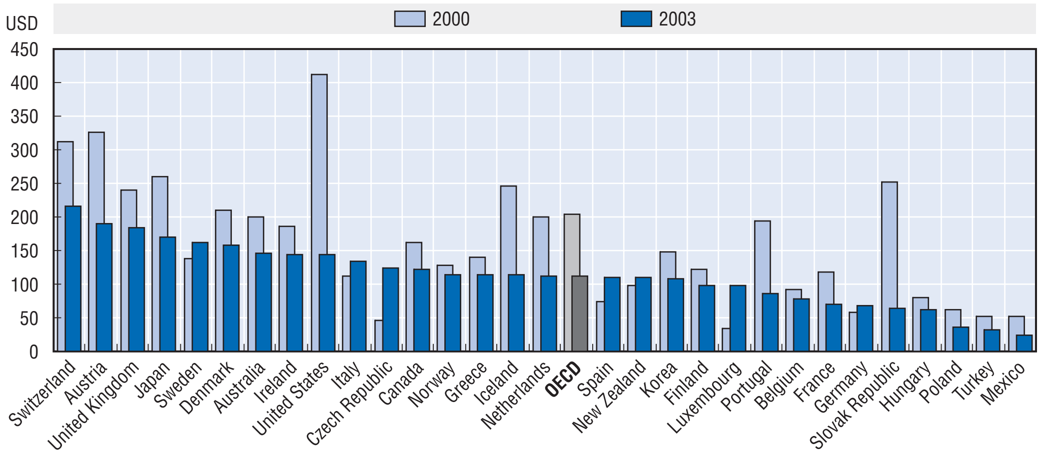
second generation mobile and Internet backbones than there was in the 1990s when there were many new entrants in these segments.

Figure 4.8. **Public telecommunication investment per capita**



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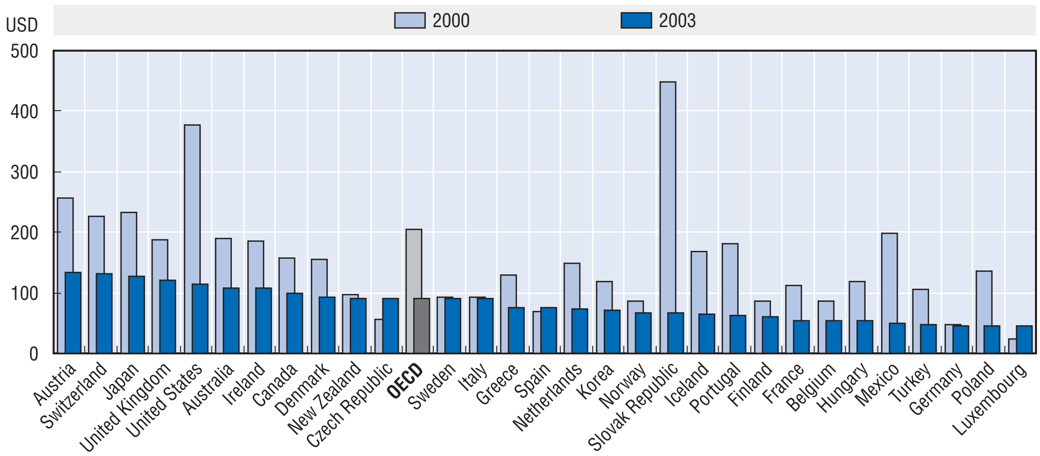
Perhaps most importantly, the end of the financial bubble in the telecommunication sector certainly affected the level of industry investment. Currently, operators and capital markets are much more focused on reaping a return from investment than they were during the bubble. That is not to say that new entry is still not occurring but it tends to have more of a local or regional focus (*e.g.* fixed wireless ISPs) rather than trying to enter the market as a national service provider. One of the common problems during the financial bubble was the funding of overly ambitious business plans in terms of coverage and demand.

In 2003, investment in telecommunication infrastructure decreased as a proportion of gross fixed capital formation (GFCF) (Table 4.17). As GFCF only applies to expenditure on structures, machinery and equipment, the levels of investment are not impacted by investment in spectrum licences. The same factors driving the decreased level of investment in telecommunication networks across the OECD are at work with this indicator and similar indicators on investment per access channel (Table 4.18), investment per basic access path (Table 4.19) and investment per capita (Table 4.20).

For the future the major driver of investment in telecommunication networks is likely to be the transition to "next generation networks". The major part of this is expected to be in the area of upgrading existing fixed access networks to provide broadband access, new fixed wireless networks and the development of 3G. It is unlikely that any of these developments will cause expenditure to increase to the levels witnessed at the peak of the bubble. For one reason the cost of upgrading networks to provide xDSL is decreasing and the cost of 3G networks is not expected to be as high as some original projections due to rapid technological development. In addition, in the area of fixed wireless broadband, access new entry is relatively inexpensive compared to traditional networks.

A number of companies (*e.g.* NTT, SBC and Verizon) have committed to build extensive next generation access networks using fibre optics to provide local access but here again the decision to build these networks has taken into account the falling cost of the equipment. In October 2004, SBC announced that it would significantly accelerate its deployment pace for fibre optic access to reach 18 million households by year-end 2007. Through "Project Lightspeed", the company said it would deploy 38 800 miles of fiber – double the amount used to build out the company's DSL network – at a cost of USD 4 billion to USD 6 billion. Even though SBC's plans build on its existing network and investments the high end of this projection is an average investment of USD 333 per household. This is significantly lower than the unit cost for fibre to the home made in the 1990s. For its part Verizon is investing USD 800 million in 2004 on increasing its fibre deployment. Verizon aims to reach 3 million homes and businesses by the end of 2005 – about 10% of the 30 million homes within its territory.

Figure 4.9. **Public telecommunications investment per access path**



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Japan is at the lead of the OECD in terms of number of fibre to the premises subscribers and its availability. In Japan there were more than 1.5 million subscribers with fibre to the premises at the end of 2004. This was up from 200 000 at the end of 2002. While this has undoubtedly required significant new investment by carriers such as NTT, it has not caused a spike in Japan's overall capital expenditure. Part of the reason for this is that fibre to the premises in a competitive environment is demand-driven. Whereas in a monopoly environment the development of fibre to the premises would have been supply-driven, telecommunication carriers such as NTT and Verizon only incur additional expense to connect a household when they receive an order. For the future the extent to which other carriers follow the strategic plan of companies such as NTT, SBC and Verizon will depend on customer demand. If services emerge for which customers express a preference for fibre to xDSL or cable, that will be reflected in the investment decisions of operators in the market.

Table 4.1. **Access trends in the OECD area**

	1997	1998	1999	2000	2001	2002	2003	CAGR (2002-2003)	CAGR (1998-2003)
Standard analogue access lines	507 968 892	511 731 049	521 778 679	519 039 092	515 795 994	509 635 163	503 435 035	-1.22	-0.33
Total access lines	517 449 971	525 074 461	542 459 073	547 227 519	547 432 039	544 060 634	538 109 741	-1.09	0.49
Total channels (64kbit/s voice equivalents, excluding DSL)	533 855 536	550 920 038	581 762 789	599 952 134	605 953 996	606 846 533	600 685 395	-1.02	1.74
DSL lines	0	27 131	583 707	5 880 198	15 882 288	28 996 960	47 167 932	62.67	140.71
Cable modem subscriber lines	0	684 921	2 520 356	7 616 675	15 046 632	22 946 187	31 408 113	36.88	114.92
Total fixed access paths (channels + DSL + cable modem)	533 855 536	551 632 090	584 866 852	613 449 007	636 882 916	658 789 680	679 261 440	3.11	4.25
Mobile subscribers	170 359 942	245 574 682	359 542 482	510 626 021	609 637 029	671 966 370	741 342 542	10.32	24.73
Total access paths (total channels + DSL + cable modem + mobile)	704 215 478	797 206 772	944 409 334	1 124 075 028	1 246 519 945	1 330 756 050	1 420 603 982	6.75	12.25
DSL lines as percentage of total access lines	0.0	0.01	0.1	1.1	2.9	5.3	8.8		

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Table 4.2. **Telecommunication channels in the OECD area**

	1993 (000)	1996 (000)	1997 (000)	1998 (000)	1999 (000)	2000 (000)	2001 (000)	2002 (000)	2003 (000)	CAGR (2002-2003)	CAGR (1998-2003)	CAGR (1993-2003)
Australia	8 866	9 709	10 071	10 262	10 979	11 585	11 753	12 118	12 253	1.1	3.6	2.9
Austria	3 580	3 779	3 726	3 726	3 865	3 938	3 946	3 875	3 890	0.4	0.9	1.0
Belgium	4 398	4 871	5 209	5 056	5 261	5 386	5 165	5 120	5 074	-0.9	0.1	1.6
Canada	16 736	18 051	19 029	19 907	20 348	21 285	21 921	21 596	20 991	-2.8	1.1	2.7
Czech Republic	1 961	2 817	3 274	3 749	3 853	3 998	4 137	4 108	4 159	1.2	2.1	7.7
Denmark	3 067	3 315	3 280	3 432	3 596	3 791	3 832	3 725	3 648	-2.1	1.2	2.3
Finland	2 767	2 932	3 080	3 184	3 317	3 506	3 480	3 437	3 292	-4.2	0.7	2.3
France	31 534	32 382	32 685	33 857	33 888	34 081	34 084	34 124	33 905	-0.6	0.0	0.8
Germany	38 342	44 205	45 142	46 430	48 137	50 147	52 339	53 644	54 255	1.1	3.2	3.2
Greece	4 744	5 333	5 436	5 555	5 710	5 972	6 176	6 294	6 297	0.1	2.5	2.7
Hungary	1 498	2 688	3 172	3 531	3 726	3 798	3 742	3 666	3 603	-1.7	0.4	9.6
Iceland	144	157	164	176	187	194	192	192	193	0.5	1.8	2.9
Ireland	1 167	1 390	1 500	1 634	1 737	1 798	1 862	1 954	1 936	-1.0	3.5	4.8
Italy	24 179	25 324	26 088	26 465	27 070	27 153	28 100	28 587	28 315	-0.9	1.4	1.5
Japan	59 360	64 192	65 954	67 701	70 550	74 344	73 627	71 703	70 205	-2.1	0.7	2.2
Korea	16 686	19 959	20 887	20 858	27 316	27 298	27 213	27 819	27 984	0.6	6.1	5.0
Luxembourg	215	252	265	236	269	323	347	355	435	22.3	13.0	4.9
Mexico	7 621	8 826	9 254	9 927	10 927	12 385	13 832	18 003	19 377	7.6	14.3	6.1
Netherlands	7 634	8 530	9 660	7 767	9 624	10 153	9 989	9 984	10 092	1.1	5.4	2.7
New Zealand	1 532	1 719	1 753	1 763	1 759	1 749	1 765	1 801	1 798	-0.2	0.4	1.4
Norway	2 335	2 589	2 735	2 935	3 176	3 302	3 314	3 357	3 244	-3.3	2.0	3.6
Poland	4 416	6 533	7 510	8 505	9 606	11 132	11 708	12 320	12 578	2.1	8.1	10.2
Portugal	3 271	3 806	3 993	4 117	4 230	4 314	4 383	4 361	4 279	-1.9	0.8	3.0
Slovak Republic	893	1 246	1 392	1 542	1 669	1 737	1 638	1 532	1 430	-6.7	-1.5	6.3
Spain	14 301	15 632	16 372	16 790	17 748	18 776	19 101	19 521	20 563	5.3	4.1	2.9
Sweden	5 910	6 132	6 210	6 338	6 535	6 705	6 718	6 576	6 439	-2.1	0.3	1.3
Switzerland	4 335	4 444	4 688	4 835	5 066	5 236	5 383	5 388	5 324	-1.2	1.9	2.2
Turkey	12 192	14 286	15 744	16 960	18 060	18 415	18 959	19 138	19 134	0.0	2.4	4.5
United Kingdom	27 340	30 550	31 690	33 210	34 050	34 940	35 550	35 040	34 590	-1.3	0.8	2.7
United States	147 096	165 421	173 891	180 471	189 502	192 513	191 697	187 509	181 403	-3.3	0.1	2.7
OECD	458 118	511 070	533 856	550 920	581 763	599 952	605 954	606 847	600 685	-1.0	1.7	2.8

StatLink: http://dx.doi.org/10.1787/212251156044

Table 4.3. **Standard analogue telecommunication access lines in the OECD area**

	1993 (000)	1996 (000)	1997 (000)	1998 (000)	1999 (000)	2000 (000)	2001 (000)	2002 (000)	2003 (000)	CAGR (2002-2003)	CAGR (1998-2003)	CAGR (1993-2003)
Australia	8 851	9 170	9 350	9 540	9 930	10 350	10 485	10 905	10 965	0.55	2.82	1.71
Austria	3 578	3 656	3 482	3 299	3 202	3 034	2 900	2 754	2 708	-1.67	-3.87	-2.08
Belgium	4 396	4 725	4 939	4 549	4 394	4 256	4 003	3 941	3 932	-0.24	-2.87	-0.93
Canada	16 716	18 051	18 660	19 294	19 624	20 347	20 805	20 456	19 951	-2.47	0.67	2.21
Czech Republic	1 961	2 817	3 273	3 732	3 795	3 872	3 861	3 675	3 626	-1.34	-0.57	7.01
Denmark	3 060	3 225	3 104	3 086	2 934	2 833	2 769	2 679	2 618	-2.28	-3.23	-0.99
Finland	2 763	2 842	2 861	2 855	2 850	2 849	2 806	2 726	2 500	-8.28	-2.62	0.15
France	30 992	31 600	31 572	31 050	30 253	29 597	29 248	28 980	28 627	-1.22	-1.61	-0.58
Germany	37 500	39 000	37 800	36 200	34 500	32 200	30 500	29 100	27 700	-4.81	-5.21	-2.04
Greece	4 744	5 329	5 431	5 536	5 611	5 659	5 608	5 413	5 200	-3.93	-1.24	1.69
Hungary	1 498	2 675	3 133	3 457	3 614	3 492	3 294	3 092	3 038	-1.75	-2.56	8.20
Iceland	144	154	152	151	148	144	140	140	135	-3.49	-2.18	-0.23
Ireland	1 167	1 390	1 500	1 536	1 585	1 590	1 590	1 600	1 600	0.00	0.82	3.14
Italy	24 167	24 918	24 801	24 251	23 453	22 569	22 244	21 943	21 372	-2.60	-2.50	-0.83
Japan	58 830	61 526	60 451	58 559	55 446	52 258	50 997	51 162	51 592	0.84	-2.50	-1.42
Korea	16 686	19 942	20 845	20 756	26 879	26 999	27 002	27 482	27 652	0.62	5.90	4.93
Luxembourg	215	248	255	219	189	206	191	191	245	28.01	2.27	-1.15
Mexico	7 621	8 826	9 254	9 927	10 927	12 332	13 774	14 975	16 311	8.92	10.44	6.10
Netherlands	7 630	8 110	8 850	7 767	7 330	7 075	6 569	6 316	6 306	-0.16	-4.08	-1.49
New Zealand	1 530	1 719	1 753	1 763	1 759	1 749	1 765	1 801	1 798	-0.17	0.39	1.44
Norway	2 335	2 440	2 325	2 166	1 914	1 683	1 548	1 484	1 417	-4.53	-8.13	-4.03
Poland	4 416	6 532	7 510	8 479	9 483	10 814	11 225	11 534	11 323	-1.83	5.96	9.78
Portugal	3 271	3 724	3 819	3 803	3 752	3 571	3 482	3 409	3 339	-2.05	-2.57	0.63
Slovak Republic	..	1 246	1 392	1 539	1 655	1 698	1 556	1 403	1 295	-7.70	-3.40	..
Spain	14 300	15 413	15 854	16 285	16 770	17 102	17 427	17 427	17 609	1.04	1.58	2.00
Sweden	5 910	6 032	6 010	5 965	5 892	5 760	5 668	5 562	5 441	-2.18	-1.82	-0.42
Switzerland	4 300	4 045	4 076	3 883	3 622	3 382	3 240	3 163	3 089	-2.34	-4.47	-2.79
Turkey	12 192	14 286	15 744	16 960	18 060	18 395	18 904	18 915	18 917	0.01	2.21	4.48
United Kingdom	27 072	29 668	29 569	31 051	31 045	30 940	31 060	30 316	29 936	-1.25	-0.73	1.38
United States	146 524	163 087	170 205	174 075	181 163	182 285	181 133	177 089	173 193	-2.20	-0.10	2.14
OECD	455 260	496 397	507 969	511 731	521 779	519 039	515 796	509 635	503 435	-1.22	-0.33	1.26

StatLink: http://dx.doi.org/10.1787/821460570046

Table 4.4. **ISDN subscribers in the OECD area**

		1993 (000)	1995 (000)	1996 (000)	1997 (000)	1998 (000)	1999 (000)	2000 (000)	2001 (000)	2002 (000)	2003 (000)	CAGR (2002-2003)	CAGR (1998-2003)
Australia	ISDN Channels (64Kbit/s Voice Equivalents)	15 000	..	539 050	720 700	722 300	1 049 000	1 235 000	1 268 000	1 213 000	1 288 000	6.2	12.3
	ISDN Basic	7 500	193 600	269 525	360 350	360 350	360 350	461 000	451 000	390 000	451 000	15.6	4.6
	ISDN Primary	..	..	..	..	..	..	..	..	..	..	..	..
Austria	ISDN Channels (64Kbit/s Voice Equivalents)	10 418	47 766	122 564	244 166	427 400	663 200	903 800	1 046 400	1 121 000	1 182 000	5.4	22.6
	ISDN Basic	3 859	16 308	40 642	83 083	152 200	247 600	331 900	398 700	424 000	441 000	4.0	23.7
	ISDN Primary	90	505	1 376	2 600	4 100	5 600	8 000	8 300	9 100	10 000	9.9	19.5
Belgium	ISDN Channels (64Kbit/s Voice Equivalents)	2 606	78 066	145 984	270 260	507 468	867 650	1 130 228	1 162 282	1 179 098	1 142 070	-3.1	17.6
	ISDN Basic	1 153	27 288	53 342	95 935	179 769	311 230	420 094	438 191	433 324	430 935	-0.6	19.1
	ISDN Primary	10	783	1 310	2 613	4 931	8 173	9 668	9 530	10 415	9 340	-10.3	13.6
Canada	ISDN Channels (64Kbit/s Voice Equivalents)	19 600			369 240	612 899	724 417	937 717	1 115 586	1 139 670	1 039 977	-8.7	11.2
	ISDN Basic	600			50 162	69 975	80 999	84 126	78 864	69 332	59 494	-14.2	-3.2
	ISDN Primary	800			11 692	20 563	24 453	33 455	41 646	43 522	40 043	-8.0	14.3
Czech Republic	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	..	1 260	17 210	58 040	126 084	276 010	432 398	532 206	23.1	98.6
	ISDN Basic	..	..	..	165	2 335	10 135	23 562	80 555	140 569	179 193	27.5	138.2
	ISDN Primary	..	..	..	31	418	1 259	2 632	3 830	5 042	5 794	14.9	69.2
Denmark	ISDN Channels (64Kbit/s Voice Equivalents)	..	41 688	89 574	176 000	346 000	661 912	958 084	1 063 052	1 045 548	1 029 850	-1.5	24.4
	ISDN Basic	..	13 599	28 797	58 000	113 000	240 731	368 762	397 846	385 239	367 250	-4.7	26.6
	ISDN Primary	..	483	1 066	2 000	4 000	6 015	7 352	8 912	9 169	9 845	7.4	19.7
Finland*	ISDN Channels (64Kbit/s Voice Equivalents)	..	25 544	90 184	218 946	329 028	467 346	656 930	674 286	711 436	792 396	11.4	19.2
	ISDN Basic	..	5 962	25 922	54 168	95 064	151 413	199 015	272 013	207 068	224 418	8.4	18.7
	ISDN Primary	..	454	1 278	3 687	4 630	5 484	8 630	4 342	9 910	11 452	15.6	19.9
France	ISDN Channels (64Kbit/s Voice Equivalents)	542 000	1 417 600	782 400	1 112 800	2 807 255	3 634 739	4 373 260	4 773 539	5 084 292	5 218 318	2.6	13.2
	ISDN Basic	91 000	258 800	391 200	556 400	..	..	..	..	..	..	..	..
	ISDN Primary	12 000	30 000	..	..	..	..	..	..	..	..	..	..
Germany	ISDN Channels (64Kbit/s Voice Equivalents)	842 400	2 778 800	5 204 600	7 342 400	10 229 600	13 637 000	17 947 000	21 839 000	24 544 000	26 555 000	8.2	21.0
	ISDN Basic	217 200	864 400	1 918 300	2 831 200	4 174 000	5 524 000	7 358 000	9 073 000	10 427 000	11 428 000	9.6	22.3
	ISDN Primary	13 600	35 000	45 600	56 000	62 720	86 300	107 700	123 100	123 000	123 300	0.2	14.5
Greece	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	4 566	5 604	19 956	99 424	312 324	567 940	880 964	1 097 020	24.5	122.9
	ISDN Basic	..	..	888	792	3 258	27 542	96 972	199 205	349 747	448 490	28.2	167.8
	ISDN Primary	..	..	93	134	448	1 478	3 946	5 651	6 049	6 668	10.2	71.6
Hungary	ISDN Channels (64Kbit/s Voice Equivalents)	..	5 000	12 900	38 600	74 100	111 766	305 882	448 396	574 872	565 370	-1.7	50.1
	ISDN Basic	..	2 500	6 450	19 300	37 050	22 343	95 641	155 468	203 676	212 275	4.2	41.8
	ISDN Primary	..	..	..	..	..	2 236	3 820	4 582	5 584	4 694	-15.9	..
Iceland	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	3 916	12 700	24 856	39 204	49 670	51 228	51 228	57 150	11.6	18.1
	ISDN Basic	..	..	698	3 425	7 388	12 192	16 300	17 379	17 379	15 900	-8.5	16.6
	ISDN Primary	..	..	84	195	336	494	569	549	549	845	53.9	20.3
Ireland	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	..	..	97 700	152 446	208 340	271 848	354 448	335 860	-5.2	28.0
	ISDN Basic	..	..	..	..	48 850	76 223	43 360	65 484	95 309	87 830	-7.8	12.4
	ISDN Primary	..	..	..	..	..	..	4 054	4 696	5 461	5 340	-2.2	..
Italy	ISDN Channels (64Kbit/s Voice Equivalents)	..	195 842	406 136	1 287 000	2 213 950	3 616 900	4 584 000	5 856 000	6 644 000	6 942 980	4.5	25.7
	ISDN Basic	..	45 571	97 543	448 500	867 500	1 524 500	1 899 000	2 479 000	2 822 500	2 953 746	4.7	27.8
	ISDN Primary	..	3 490	7 035	13 000	15 965	18 930	26 200	29 933	33 300	34 516	3.7	16.7
Japan	ISDN Channels (64Kbit/s Voice Equivalents)	529 707	1 274 453	2 666 150	5 502 553	9 142 402	15 104 054	22 085 986	22 629 812	20 540 421	18 613 191	-9.4	15.3
	ISDN Basic	211 436	519 846	1 084 928	2 364 520	4 019 707	6 600 080	9 571 522	10 233 239	9 547 424	8 562 120	-10.3	16.3
	ISDN Primary	4 645	10 207	21 578	33 631	47 956	82 778	127 954	94 058	62 851	64 737	3.0	6.2
Korea	ISDN Channels (64Kbit/s Voice Equivalents)	..	8 618	16 810	42 220	102 372	436 588	299 608	211 892	336 952	332 280	-1.4	26.6
	ISDN Basic	..	4 309	8 405	21 110	37 686	171 314	96 629	54 316	100 601	99 810	-0.8	21.5
	ISDN Primary	..	..	..	..	900	3 132	3 545	3 442	4 525	4 422	-2.3	37.5

*In 2000, a change was made in the way Finnish data are compiled.

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Table 4.4. ISDN subscribers in the OECD area (continued)

		1993 (000)	1995 (000)	1996 (000)	1997 (000)	1998 (000)	1999 (000)	2000 (000)	2001 (000)	2002 (000)	2003 (000)	CAGR (2002-2003)	CAGR (1998-2003)
Luxembourg	ISDN Channels (64Kbit/s Voice Equivalents)		1556	3688	9840	17220	80018	116 440	155356	163900.58	189500	15.6	61.6
	ISDN Basic	..	778	1 844	4 920	8 610	27 544	40 640	57 968	57 968	73 000	25.9	53.3
	ISDN Primary	..	..	..	..	..	831	1 172	1 314	1 314	1 450	10.4	..
Mexico	ISDN Channels (64Kbit/s Voice Equivalents)			..	..	..	..	53 698	58 168	3 028 000	3 066 000	1.3	..
	ISDN Basic			..	..	..	..	13 739	26 669	1 514 000	1 533 000	1.3	..
	ISDN Primary			..	..	..	..	1 140	210	0	0	..	..
Netherlands	ISDN Channels (64Kbit/s Voice Equivalents)	4 450	95 000	420 000	810 000	..	2 294 000	3 078 778	3 420 000	3 668 000	3 786 000	3.2	..
	ISDN Basic	1 100	22 000	30 000	270 000	..	862 000	1 239 389	1 395 000	1 514 000	1 533 000	1.3	..
	ISDN Primary	75	1 700	12 000	9 000	..	19 000	20 000	21 000	22 000	24 000	9.1	..
New Zealand	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	..	..	..	..	..	..	..	..	..	..
	ISDN Basic	..	..	..	..	..	..	..	..	..	..	..	..
	ISDN Primary	..	..	..	..	..	..	..	..	..	..	..	..
Norway	ISDN Channels (64Kbit/s Voice Equivalents)	..	45 180	148 708	410 480	768 992	1 262 338	1 619 198	1 765 876	1 872 202	1 827 372	-2.4	18.9
	ISDN Basic	..	11 580	41 819	146 005	304 636	524 999	696 289	760 463	801 971	775 686	-3.3	20.6
	ISDN Primary	..	734	2 169	3 949	5 324	7 078	7 554	8 165	8 942	9 200	2.9	11.6
Poland	ISDN Channels (64Kbit/s Voice Equivalents)	..	164	476	800	26 402	123 714	317 678	482 650	785 859	1 254 914	59.7	116.5
	ISDN Basic	..	82	238	400	5 956	49 500	130 260	170 000	321 605	485 877	51.1	141.2
	ISDN Primary	..	..	..	..	483	824	1 905	4 755	4 755	9 439	98.5	81.2
Portugal	ISDN Channels (64Kbit/s Voice Equivalents)	..	37 902	81 934	173 670	313 654	477 352	644 330	816 702	859 736	856 975	-0.3	22.3
	ISDN Basic	..	7 101	18 212	45 060	85 907	132 926	185 995	240 141	267 428	270 975	1.3	25.8
	ISDN Primary	..	790	1 517	2 785	4 728	7 050	9 078	11 214	10 632	9 974	-6.2	16.1
Slovak Republic	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	..	..	2 858	13 466	39 110	82 200	129 400	135 236	4.5	116.3
	ISDN Basic	..	..	..	..	724	4 183	11 365	30 360	52 220	59 773	14.5	141.7
	ISDN Primary	..	..	..	..	47	170	546	716	832	523	-37.1	61.9
Spain	ISDN Channels (64Kbit/s Voice Equivalents)	..	28 012	219 110	518 176	504 640	978 826	1 674 140	1 674 102	2 094 200	2 954 580	41.1	42.4
	ISDN Basic	..	10 601	96 040	228 458	177 215	355 493	632 470	..	..	..	..	..
	ISDN Primary	..	227	901	2 042	5 007	8 928	13 640	..	..	..	..	..
Sweden	ISDN Channels (64Kbit/s Voice Equivalents)	..	39 900	99 900	200 100	372 900	643 000	944 700	1 050 000	1 014 000	998 000	-1.6	21.8
	ISDN Basic	..	12 000	30 000	60 000	114 000	194 000	259 050	270 100	250 000	226 000	-9.6	14.7
	ISDN Primary	..	530	1 330	2 670	4 830	8 500	14 220	16 990	17 133	17 867	4.3	29.9
Switzerland	ISDN Channels (64Kbit/s Voice Equivalents)	34 960	236 946	399 180	612 000	952 202	1 443 810	1 854 130	2 143 180	2 224 112	2 234 174	0.5	18.6
	ISDN Basic	7 280	65 958	120 540	201 000	331 516	517 245	712 295	845 750	899 296	913 567	1.6	22.5
	ISDN Primary	680	3 501	5 270	7 000	9 639	13 644	14 318	15 056	14 184	13 568	-4.3	7.1
Turkey	ISDN Channels (64Kbit/s Voice Equivalents)	..	..	..	..	0	0	19 730	54 400	223 046	216 834	-2.8	..
	ISDN Basic	..	..	..	..	..	..	7 000	7 370	6 553	9 387	43.2	..
	ISDN Primary	..	..	..	..	..	..	191	1 322	6 998	6 602	-5.7	..
United Kingdom	ISDN Channels (64Kbit/s Voice Equivalents)	268 000	661 000	882 000	1 626 000	2 163 000	3 003 000	4 000 000	4 487 000	4 727 000	4 654 000	-1.5	16.6
	ISDN Basic	44 000	102 500	141 000	219 000	342 000	537 000	803 000	922 000	961 000	929 000	-3.3	22.1
	ISDN Primary	6 000	15 200	20 000	39 600	49 300	64 300	79 800	88 100	93 500	93 200	-0.3	13.6
United States	ISDN Channels (64Kbit/s Voice Equivalents)	571 823	1 246 825	2 333 545	3 686 129	6 396 625	8 338 900	10 228 241	10 564 189	10 419 563	8 210 344	-21.2	5.1
	ISDN Basic	268 857	502 375	836 895	1 102 062	1 402 208	1 509 385	1 550 558	1 694 474	1 320 424	1 086 537	-17.7	-5.0
	ISDN Primary	1 483	10 525	28 685	64 435	156 183	231 310	309 875	311 967	338 205	262 490	-22.4	10.9

Table 4.5. **Residential lines**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	CAGR (2002-2003)
Australia	..	..	..	..	..	6 420 000	6 560 000	6 640 000	6 770 000	6 930 000	6 510 000	6 290 000	6 350 000	6 200 000	-2.36
Austria	..	..	..	..	..	..	..	..	..	..	..	..	2 448 000	2 451 000	0.12
Belgium	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Canada	..	..	..	..	..	..	..	12 425 838	12 600 563	12 743 406	12 921 737	12 854 023	12 752 091	12 650 376	-0.80
Czech Republic	..	..	..	..	..	..	..	..	..	..	2 662 790	2 631 613	2 516 035	2 455 880	-2.39
Denmark	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Finland	2 034 540	1 995 012	2 056 500	2 119 221	2 111 954	2 017 580	2 040 556	2 031 310	2 007 065	1 960 800	1 922 946	1 877 214	..	..	
France	..	..	..	..	..	..	..	..	..	24 033 862	23 774 393	23 600 871	23 494 319	..	
Germany	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Greece	..	..	..	..	..	..	..	..	..	..	..	..	..	4 027 466	
Hungary	..	..	952 000	1 135 000	1 399 000	1 785 000	2 213 000	2 627 000	2 888 000	3 091 000	3 063 000	2 926 000	2 805 276	2 754 239	-1.82
Iceland	..	..	..	..	..	..	..	..	..	..	..	..	..	135 402	
Ireland	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Italy	..	..	..	..	..	..	..	..	18 890 000	18 700 000	18 460 000	18 220 000	18 030 000	17 575 892	-2.52
Japan	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Korea	..	..	..	..	..	..	..	..	..	..	..	15 781 657	19 522 334	19 362 715	-0.82
Luxembourg	..	..	..	..	..	..	..	..	..	191 732	187 693	199 096	..	168 000	
Mexico	..	..	4 818 466	5 524 348	6 206 715	6 481 023	6 588 510	6 901 882	7 427 811	8 078 581	9 034 054	10 063 040	11 069 019	12 220 291	10.40
Netherlands	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
New Zealand	..	..	..	..	..	..	..	..	1 339 000	1 349 000	1 357 000	1 385 000	..	..	
Norway	..	..	..	..	..	..	..	..	1 821 228	1 810 183	1 793 729	1 766 806	1 751 066	1 709 350	-2.38
Poland	..	..	..	..	..	..	..	..	..	..	..	..	10 409 502	10 338 670	-0.68
Portugal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Slovak Republic	..	..	611 250	661 548	748 209	830 413	920 000	1 002 628	1 125 950	1 228 760	1 255 000	1 157 258	1 029 687	987 489	-4.10
Spain	..	..	..	..	..	..	..	..	..	..	..	..	..	13 439 000	
Sweden	..	..	..	..	..	..	..	..	..	3 921 000	3 847 900	3 843 300	4 370 000	4 351 000	-0.43
Switzerland	..	..	..	..	..	..	..	..	..	3 235 000	3 040 000	2 942 000	..	..	
Turkey	..	..	5 714 000	6 754 000	8 004 000	9 821 000	10 631 000	11 658 000	12 612 000	13 511 000	13 967 000	14 200 000	14 428 873	14 366 761	-0.43
United Kingdom	..	..	..	..	..	20 490 000	20 510 000	20 170 000	20 090 000	20 080 000	19 930 000	20 040 000	20 090 000	19 920 000	-0.85
United States[1]										143 127 136	145 492 886	142 910 619	141 533 942	137 476 134	-2.87
OECD (Total of above)	2 034 540	1 995 012	14 152 216	16 194 117	18 469 878	47 845 016	49 463 066	63 456 658	87 571 617	263 991 460	269 220 128	282 688 497	292 600 144	282 589 665	

1. Data for the United States includes residential and small business lines.

StatLink: http://dx.doi.org/10.1787/831481611435

Table 4.6. **Telecommunication channels per 100 inhabitants in the OECD area**

	1990	1992	1995	1996	1997	1998	1999	2000	2001	2002	2003	Basic telecom. access paths (fixed and wireless) per 100 inhabitants[1] 2003
Australia	47.1	48.9	51.0	52.7	54.1	54.5	57.7	60.1	60.2	61.3	61.3	136.4
Austria	41.8	44.0	47.2	47.5	46.8	46.7	48.4	49.2	49.1	48.1	48.0	143.3
Belgium	39.3	42.5	46.5	48.0	51.2	49.6	51.5	52.6	50.2	49.6	48.9	144.3
Canada	55.2	57.3	60.0	61.0	63.6	66.0	66.9	69.4	70.7	68.9	66.4	122.4
Czech Republic	15.7	17.6	23.2	27.3	31.8	36.4	37.5	38.9	40.5	40.3	40.8	136.4
Denmark	56.6	58.1	62.0	63.0	62.1	64.7	67.6	71.0	71.5	69.3	67.7	168.5
Finland	53.5	54.4	55.5	57.2	59.9	61.8	64.2	67.7	67.1	66.1	63.2	163.6
France	49.6	53.2	57.3	54.3	54.6	56.4	56.2	56.2	56.0	55.7	55.1	128.8
Germany	50.7	44.7	51.4	54.0	55.0	56.6	58.6	61.0	63.6	65.0	65.7	149.8
Greece	39.1	43.6	48.5	49.8	50.4	51.3	52.5	54.7	56.5	57.5	57.3	151.6
Hungary	9.6	12.5	21.5	26.1	30.8	34.4	36.4	37.2	36.7	36.1	35.6	115.9
Iceland	51.4	53.6	55.6	58.6	60.7	64.3	67.6	68.9	67.2	66.6	66.6	177.4
Ireland	28.1	31.4	36.5	38.3	41.0	44.0	46.3	47.3	48.2	49.8	48.5	135.0
Italy	39.4	41.7	43.7	44.1	45.4	46.0	47.0	47.0	48.5	49.3	48.7	150.1
Japan	44.2	46.6	49.7	51.0	52.3	53.5	55.7	58.6	57.8	56.3	55.0	132.9
Korea	35.7	35.6	42.0	43.8	45.5	45.1	58.6	58.1	57.5	58.4	58.4	150.4
Luxembourg	47.8	52.2	56.4	60.5	63.0	55.4	62.2	73.6	78.5	79.6	96.6	219.7
Mexico	6.6	8.0	9.8	9.6	9.9	10.4	11.2	12.6	13.8	17.8	18.9	48.5
Netherlands	46.4	48.7	52.5	54.9	61.9	49.5	60.9	63.8	62.3	61.8	62.2	154.7
New Zealand	43.8	43.2	44.8	45.7	46.1	46.0	45.7	45.2	45.1	45.3	44.5	120.1
Norway	50.3	52.9	56.8	59.1	62.1	66.2	71.2	73.5	73.4	73.9	71.1	169.8
Poland	8.6	10.3	14.8	16.9	19.4	22.0	24.9	28.8	30.6	32.2	32.9	79.2
Portugal	24.1	30.7	36.1	37.8	39.6	40.6	41.6	42.2	42.6	42.1	41.0	135.2
Slovak Republic	..	15.5	20.9	23.2	25.9	28.6	30.9	32.2	30.3	28.4	26.6	95.1
Spain	32.4	35.4	38.6	39.8	41.6	42.6	44.8	47.0	47.4	48.1	50.4	147.6
Sweden	68.3	68.4	68.6	69.4	70.2	71.6	73.8	75.6	75.5	73.7	71.9	178.8
Switzerland	58.7	60.9	65.6	62.6	65.9	67.8	70.7	72.6	73.9	73.4	71.9	165.6
Turkey	12.3	16.2	23.0	22.8	24.7	26.2	27.4	27.3	27.6	27.5	27.0	66.6
United Kingdom	44.1	45.2	50.3	52.6	54.5	57.0	58.2	59.6	60.2	59.2	58.3	152.9
United States	53.9	55.8	59.3	61.3	63.7	65.4	67.8	68.2	67.2	65.1	62.3	125.8
OECD	39.7	41.4	45.4	46.5	48.3	49.4	51.8	53.1	53.2	52.9	52.0	123.1

1. Basic telecommunication access paths include the total of analogue and ISDN fixed access lines (*i.e.* excluding DSL and cable modem) and cellular mobile subscribers.

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Table 4.7. **Cellular mobile subscribers in the OECD area**

	1993	1996	1997	1998	1999	2000	2001	2002	2003	CAGR (2002-2003)	CAGR (1998-2003)	CAGR (1993-2003)
Australia	682 000	3 990 000	4 578 000	5 342 000	6 501 000	8 562 000	11 132 000	12 575 000	14 347 000	14.1	21.8	35.6
Austria	221 450	598 804	1 164 270	2 300 000	4 300 000	6 117 243	6 541 386	6 736 368	7 094 502	5.3	25.3	41.4
Belgium	67 771	478 172	974 494	1 756 287	3 186 602	5 629 000	7 690 000	8 135 512	8 712 269	7.1	37.8	62.5
Canada	1 332 982	3 420 318	4 194 761	5 346 026	6 911 038	8 726 636	10 648 824	11 872 050	13 221 819	11.4	19.9	25.8
Czech Republic	11 151	200 315	521 469	965 476	1 944 553	4 346 009	6 947 151	8 610 177	9 708 683	12.8	58.7	96.8
Denmark	357 589	1 316 592	1 444 000	1 931 000	2 628 585	3 363 552	3 960 165	4 477 845	4 767 277	6.5	19.8	29.6
Finland	459 074	1 476 976	2 091 791	2 845 985	3 273 433	3 728 625	4 175 587	4 516 772	4 747 000	5.1	10.8	26.3
France	467 000	2 440 139	5 754 539	11 210 100	20 619 000	29 644 771	36 997 300	38 585 200	41 683 100	8.0	30.0	56.7
Germany	1 768 000	5 782 200	8 175 500	13 913 000	23 446 000	48 202 000	56 126 000	59 128 000	64 800 000	9.6	36.0	43.4
Greece	28 000	531 488	938 038	2 056 084	3 894 312	5 932 403	7 963 742	9 314 000	10 337 000	11.0	38.1	80.6
Hungary	63 000	473 000	706 000	1 036 000	1 601 000	3 076 000	4 967 430	6 886 111	7 944 586	15.4	50.3	62.2
Iceland	17 409	46 302	65 746	106 000	172 600	215 000	235 400	260 900	279 670	7.2	21.4	32.0
Ireland	57 065	290 000	510 747	946 000	1 600 000	2 020 000	2 770 000	3 078 000	3 421 000	11.1	29.3	50.6
Italy	1 206 975	6 413 412	11 760 000	20 300 000	30 068 000	42 290 000	51 096 000	53 100 000	56 700 000	6.8	22.8	47.0
Japan	2 131 367	26 906 511	38 253 893	47 307 592	56 845 594	66 784 374	74 819 158	81 118 324	86 654 962	6.8	12.9	44.8
Korea	471 784	3 180 989	6 895 477	13 982 919	23 442 724	26 816 398	29 045 596	32 342 493	33 591 758	3.9	19.2	53.2
Luxembourg	5 082	45 000	67 208	130 000	208 364	303 274	432 400	473 000	539 000	14.0	32.9	59.4
Mexico	386 100	1 021 900	1 740 814	3 349 475	7 731 635	14 077 880	21 757 559	25 928 266	30 097 700	16.1	55.1	54.6
Netherlands	216 000	1 016 000	1 688 550	3 347 000	6 790 000	11 000 000	11 500 000	11 800 000	13 100 000	11.0	31.4	50.8
New Zealand[1]	186 000	476 200	710 000	1 254 900	1 542 000	2 187 000	2 422 000	2 539 000	2 959 000	16.5	18.7	31.9
Norway	369 271	1 261 445	1 676 763	2 106 414	2 744 793	3 339 936	3 766 431	3 911 136	4 163 381	6.4	14.6	27.4
Poland	15 699	216 900	812 000	1 928 000	3 904 000	6 747 000	10 750 000	13 898 471	17 401 222	25.2	55.3	101.6
Portugal	101 231	663 651	1 506 958	3 074 633	4 671 458	6 664 951	7 977 500	8 528 944	9 341 383	9.5	24.9	57.2
Slovak Republic	3 125	28 658	200 141	465 364	664 072	1 293 736	2 147 331	2 923 383	3 678 774	25.8	51.2	102.8
Spain	257 261	2 997 212	4 330 282	7 051 441	14 884 207	23 938 970	29 495 278	33 530 997	37 468 128	11.7	39.7	64.6
Sweden	850 000	2 492 000	3 169 000	4 108 000	5 125 000	6 369 000	7 158 000	7 949 000	8 801 000	10.7	16.5	26.3
Switzerland	259 200	662 700	1 044 400	1 698 565	3 057 509	4 638 519	5 275 791	5 736 303	6 188 793	7.9	29.5	37.3
Turkey	84 187	806 339	1 609 808	3 506 100	7 796 000	15 062 744	18 420 000	23 323 118	27 887 535	19.6	51.4	78.7
United Kingdom	2 216 000	6 817 000	8 463 000	13 001 000	23 942 000	40 049 000	44 919 000	49 921 000	52 984 000	6.1	32.4	37.4
United States	14 712 000	44 042 992	55 312 293	69 209 321	86 047 003	109 500 000	128 500 000	140 767 000	158 722 000	12.8	18.1	26.9
OECD	29 003 773	120 093 215	170 359 942	245 574 682	359 542 482	510 626 021	609 637 029	671 966 370	741 342 542	10.3	24.7	38.3
EU 15	8 278 498	33 358 646	52 038 377	87 970 530	148 636 961	235 252 789	278 802 358	299 274 638	324 495 659	8.4	29.8	44.3
World	34 161 906	144 965 802	214 483 373	318 316 658	489 998 313	740 189 267	962 505 900	1 162 805 400	1 383 908 393	19.0	34.2	44.8
OECD % share of world total	85	83	79	77	73	69	63	58	54	-7.3	-7.0	-4.5

1. New Zealand in 1996 and 1997 is for Telecom NZ only.

StatLink: http://dx.doi.org/10.1787/103071215747

Table 4.8. **Cellular mobile penetration, subscribers per 100 inhabitants**

	Subscribers per 100 inhabitants								CAGR	CAGR
	1996	1997	1998	1999	2000	2001	2002	2003	(2002-2003)	(1998-2003)
Australia	21.7	24.6	28.4	34.1	44.4	57.0	63.7	71.7	12.7	20.4
Austria	7.5	14.6	28.8	53.8	76.4	81.4	83.6	87.6	4.7	24.9
Belgium	4.7	9.6	17.2	31.2	54.9	74.8	78.8	84.0	6.6	37.3
Canada	11.6	14.0	17.7	22.7	28.4	34.3	37.9	41.8	10.4	18.7
Czech Republic	1.9	5.1	9.4	18.9	42.3	67.9	84.4	95.2	12.7	59.0
Denmark	25.0	27.3	36.4	49.4	63.0	73.9	83.3	88.4	6.2	19.4
Finland	28.8	40.7	55.2	63.4	72.0	80.5	86.8	91.1	4.9	10.5
France	4.1	9.6	18.7	34.2	48.9	60.7	63.0	67.7	7.5	29.4
Germany	7.1	10.0	17.0	28.6	58.6	68.2	71.7	78.5	9.5	35.9
Greece	5.0	8.7	19.0	35.8	54.3	72.8	85.1	94.1	10.7	37.8
Hungary	4.6	6.9	10.1	15.6	30.1	48.8	67.8	78.4	15.7	50.7
Iceland	17.2	24.3	38.7	62.3	76.5	82.6	90.7	96.7	6.6	20.1
Ireland	8.0	14.0	25.5	42.7	53.2	71.8	78.4	85.7	9.3	27.4
Italy	11.2	20.4	35.3	52.2	73.2	88.3	91.6	97.6	6.6	22.6
Japan	21.4	30.3	37.4	44.9	52.6	58.8	63.7	67.9	6.7	12.7
Korea	7.0	15.0	30.2	50.3	57.0	61.4	67.9	70.1	3.2	18.3
Luxembourg	10.8	16.0	30.5	48.2	69.2	97.9	106.0	119.8	13.0	31.5
Mexico	1.1	1.9	3.5	8.0	14.3	21.7	25.6	29.3	14.6	53.0
Netherlands	6.5	10.8	21.3	43.0	69.1	71.7	73.1	80.7	10.5	30.5
New Zealand	12.7	18.7	32.8	40.0	56.5	61.9	63.9	73.3	14.7	17.5
Norway	28.8	38.1	47.5	61.5	74.4	83.5	86.2	91.2	5.8	13.9
Poland	0.6	2.1	5.0	10.1	17.5	28.1	36.4	45.5	25.3	55.6
Portugal	6.6	14.9	30.4	45.9	65.2	77.5	82.3	89.4	8.7	24.1
Slovak Republic	0.5	3.7	8.6	12.3	24.0	39.7	54.2	68.4	26.1	51.3
Spain	7.6	11.0	17.9	37.6	60.0	73.3	82.7	91.8	11.0	38.7
Sweden	28.2	35.8	46.4	57.9	71.8	80.5	89.1	98.2	10.3	16.2
Switzerland	9.3	14.7	23.8	42.7	64.3	72.4	78.1	83.6	7.0	28.5
Turkey	1.3	2.5	5.4	11.8	22.3	26.8	33.5	39.4	17.7	48.7
United Kingdom	11.7	14.5	22.3	40.9	68.3	76.1	84.3	89.2	5.8	32.0
United States	16.3	20.3	25.1	30.8	38.8	45.0	48.8	54.5	11.7	16.8
OECD	10.9	15.4	22.0	32.0	45.2	53.5	58.6	64.2	9.6	23.9
EU15	8.9	13.9	23.4	39.5	62.2	73.4	78.5	84.8	8.1	29.4

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Table 4.9. **Mobile pre-paid subscriptions**

	1996	% of total	1997	% of total	1998	% of total	1999	% of total	2000	% of total	2001	% of total	2002	% of total	2003	% of total
Australia	..	..	..	..	..	..	757 800	11.7	1 798 020	21.0	3 339 600	30.0	3 339 600	26.6	5 606 000	39.1
Austria	..	..	..	..	..	..	2 044 168	47.5	3 184 653	52.1	3 330 559	50.9	3 259 436	48.4	3 338 473	47.1
Belgium	..	..	..	..	..	..	1 275 000	40.0	3 377 400	60.0	5 153 900	67.0	5 330 641	65.5	5 428 909	62.3
Canada	..	..	..	..	340 899	6.4	1 132 142	16.4	1 878 650	21.5	2 736 028	25.7	2 937 224	24.7	3 147 000	23.8
Czech Republic	..	..	..	..	..	..	..	..	..	..	3 016 209	43.4	6 731 573	78.2	7 268 478	74.9
Denmark	..	..	..	..	..	..	979 811	37.3	1 244 886	37.0	1 473 871	37.2	1 354 376	30.2	1 117 962	23.5
Finland	..	..	..	..	..	..	29 907	0.9	74 573	2.0	83 512	2.0	90 335	2.0	94 000	2.0
France	..	..	..	..	..	..	7 279 489	35.3	13 806 500	46.6	18 060 800	48.8	17 108 000	44.3	17 146 500	41.1
Germany	..	..	..	..	2 087 000	15.0	5 533 000	23.6	26 318 000	54.6	31 374 000	55.9	31 338 000	53.0	33 307 000	51.4
Greece	..	..	..	..	716 314	34.8	2 052 085	52.7	3 468 960	58.5	5 029 014	63.1	6 066 000	65.1	6 757 000	65.4
Hungary	..	..	..	..	..	..	473 630	29.6	1 748 981	56.9	3 584 581	72.2	5 378 171	78.1	6 157 554	77.5
Iceland	..	..	..	..	5 500	5.2	40 000	23.2	63 000	29.3	88 000	37.4	88 000	33.7	112 573	40.3
Ireland	..	..	..	..	..	..	640 000	40.0	1 266 338	62.7	1 966 700	71.0	2 210 000	71.8	2 510 000	73.4
Italy	577 207	9	5 527 200	47.0	15 022 000	74.0	25 257 120	84.0	37 290 000	88.2	45 792 000	89.6	47 732 000	89.9	51 705 540	91.2
Japan	..	..	..	..	..	..	1 907 000	3.4	1 414 000	2.1	1 847 000	2.5	2 084 000	2.6	2 609 000	3.0
Korea	..	..	..	..	..	..	..	..	..	..	..	..	607 002	1.9	591 215	1.8
Luxembourg	..	..	..	..	..	..	46 631	22.4	119 560	39.4	179 416	41.5	179 416	37.9	318 000	59.0
Mexico	423 365	41.4	981 872	56.4	2 282 110	68.1	6 327 238	81.8	12 449 806	88.4	19 973 638	91.8	23 921 813	92.3	28 069 335	93.3
Netherlands	..	..	..	..	1 573 090	47.0	3 938 200	58.0	7 370 000	67.0	7 500 000	65.2	7 400 000	62.7	8 100 000	61.8
New Zealand	..	..	..	..	577 254	46.0	878 940	57.0	1 487 160	68.0	1 661 492	68.6	1 737 420	68.4	2 061 530	69.7
Norway	..	..	..	..	474 152	22.5	1 194 034	43.5	1 480 570	44.3	1 648 679	43.8	1 774 550	45.4	1 768 975	42.5
Poland	..	..	..	..	462 720	24.0	942 285	24.1	2 605 691	38.6	5 120 000	47.6	7 374 699	53.1	9 466 935	54.4
Portugal	..	..	..	..	2 428 960	79.0	3 705 968	79.3	5 305 301	79.6	6 366 045	79.8	6 690 198	78.4	7 354 189	78.7
Slovak Republic	..	..	..	..	..	..	127 007	19.1	483 441	37.4	1 535 671	71.5	1 961 330	67.1	2 284 105	62.1
Spain	..	..	..	..	2 609 033	37.0	8 930 524	60.0	15 320 941	64.0	19 171 931	65.0	21 121 720	63.0	21 893 791	58.4
Sweden	..	..	235 000	7.4	1 016 000	24.7	1 983 000	38.7	2 773 000	43.5	3 536 000	49.4	4 333 000	54.5	5 003 000	56.8
Switzerland	36 000	5.4	209 000	20.0	590 000	34.7	1 053 425	34.5	1 707 078	36.8	2 154 579	40.8	2 314 844	40.4	2 601 322	42.0
Turkey	..	..	..	..	..	..	779 600	10.0	6 627 607	44.0	11 500 000	62.4	17 125 431	73.4	20 851 364	74.8
United Kingdom	..	..	..	..	2 910 000	22.4	12 059 000	50.4	27 400 000	68.4	31 037 000	69.1	33 758 000	67.6	36 000 000	67.9
United States	..	..	..	..	..	..	4 302 350	5.0	6 570 000	6.0	11 565 000	6.0	11 565 000	8.2	11 565 000	7.3
OECD	1 036 572	0.9	6 953 072	4.1	33 095 032	13.5	95 669 354	26.6	188 634 116	36.9	249 825 224	41.0	276 911 779	41.2	304 234 750	41.0

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Table 4.10. **Percentage of population coverage of mobile networks**

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	85	91	91	94	94	95	97	98	98
Austria	87	90	93	97	97	99	98	98	98
Belgium	..	..	95	96	98	99	99	99	99
Canada[1]	..	..	93	93	93	94	96	96	96
Czech Republic	88	92	95	96	97	98	98	99	99
Denmark	100	100	100	100	100	100	100	100	100
Finland	100	100	100	100	100	100	100	100	100
France	98	98	94	97	98	99	99	99	99
Germany	99	99	99	99	99	99	99	99	99
Greece	95	95	95	95	96	98	99	100	100
Hungary	89	97	97	98	98	98	98	98	99
Iceland	..	..	99	99	99	99	99	99	99
Ireland	95	95	96	96	96	98	99	99	99
Italy	95	95	97	98	100	100	100	100	100
Japan	..	..	98	98	98	98	99	99	99
Korea	95	95	97	98	99	99	99	99	99
Luxembourg	..	..	99	98	98	98	99	99	99
Mexico	..	..	80	81	82	86	90	91	92
Netherlands	97	80	98	98	98	100	100	100	100
New Zealand	95	95	95	95	95	95	97	97	97
Norway	98	98	98	98	98	98	98	98	98
Poland	..	..	75	91	93	95	98	99	99
Portugal	..	..	98	98	99	99	99	99	99
Slovak Republic	..	..	95	96	98	98	98	97	99
Spain	98	99	99	99	99	99	99	99	99
Sweden	..	..	96	96	96	96	96	96	96
Switzerland	95	98	98	98	98	98	99	99	100
Turkey	..	46	61	61	61	64	88	89	95
United Kingdom	..	..	98	98	98	98	98	98	98
United States[2]	95	95	95	95	95	95	97	99	99
OECD average	94.7	92.5	91.0	95.2	95.7	96.4	97.8	98.0	98.4

1. Data for Canada are Rogers Communications Canadian coverage for 1997-1999 and Bell Canada for 2000. This would tend slightly understate the combined coverage of all systems in these years. Canadian data for 2001-2003 are CWTA estimates for the entire industry.
2. Data for the United States show the proportion of population living in counties with mobile network coverage.

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Table 4.11. **Digitalisation in the OECD area**

	Fixed network (percent of digital access lines)								
	1993	1995	1997	1998	1999	2000	2001	2002	2003
Australia	40	62	84	95	100	100	100	100	100
Austria	54	72	82	92	100	100	100	100	100
Belgium	54	66	83	83	91	100	100	100	100
Canada	85	94	99	100	100	100	100	100	100
Czech Republic	10	17	55	64	74	86	95	100	100
Denmark	46	61	86	100	100	100	100	100	100
Finland	62	90	100	100	100	100	100	100	100
France	86	100	100	100	100	100	100	100	100
Germany	41	56	100	100	100	100	100	100	100
Greece	22	37	47	75	91	93	96	97	100
Hungary	27	53	73	79	81	86	88	88	88
Iceland	66	100	100	100	100	100	100	100	100
Ireland	71	79	92	100	100	100	100	100	100
Italy	57	76	94	98	100	100	100	100	100
Japan	72	90	100	100	100	100	100	100	100
Korea	59	63	67	69	74	80	88	97	100
Luxembourg	82	100	100	100	100	100	100	100	100
Mexico	65	88	90	98	100	100	100	100	100
Netherlands	93	100	100	100	100	100	100	100	100
New Zealand	95	97	100	100	100	100	100	100	100
Norway	60	82	100	100	100	100	100	100	100
Poland	10	48	58	62	68	77	90	90	97
Portugal	59	70	88	98	100	100	100	100	100
Slovak Republic	5	26	51	62	67	70	74	78	84
Spain	41	56	81	86	87	87	87	89	90
Sweden	67	91	99	100	100	100	100	100	100
Switzerland	48	66	99	99	99	100	100	100	100
Turkey	74	77	82	83	84	87	89	90	90
United Kingdom	75	88	100	100	100	100	100	100	100
United States	78	82	86	90	93	95	97	99	99
OECD (weighted average)	68	77	90	92	94	95	97	98	99

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Table 4.12. **Availability of digital subscriber lines (DSL) in the OECD area**

	Commercial service launch	Actual coverage by year end (%)				Actual or *projected* coverage	*Projected coverage*	Indicator used to express coverage
		2000	2001	2002	2003	2004	*2005*	
Australia	August 2000	50	72	75	75	*84*		Population
Austria	November 1999	72	77	80	80	*85*		Lines
Belgium	October 1999	75	93	98	98	*98*		Lines
Canada	1996	69	70	75	75.4	*75.4*	*75.4*	Population
Czech Republic	March 2003	0	0	0	44	84		Population (customers)
Denmark	July 1999	65	90	95	95	*96*	*98*	Lines
Finland	May 2000	50	60	75	81.5	94.1	*95-98*	Lines
France	November 1999	32	66	71	79	*90*	*96*	Population
Germany	August 1999	60	70	80	85	*90*		Households
Greece	June 2003	0	0	0				
Hungary	September 2000		20	38	57	65	75	Lines
Iceland	April 2000	33	51	78	90	92		Population
Ireland	May 2002	0	0	25	50	*74*	*80*	Lines
Italy	December 1999	45	67.5	70	80			Lines
Japan	September 2000		73.5	80	90	*90*		Households
Korea	April 1999		70	89	93			Lines
Luxembourg	2001	0	65	90	90	100	*100*	Population
Mexico	September 2001	0	0		58.9			Population
Netherlands	June 2000	40	67	85	85			Lines
New Zealand	June 1999	60	69	83	84.8	92		Population (customers)
Norway	December 2000	20	50	58	67	77	*90*	Lines
Poland (TPSA)	2001	0	3.5	56	69	*77*	*85*	Lines
Portugal	December 2000		50	60.7	84.7			Population
Slovak Republic	2003	0	0	0	14.5	*50*	*60*	
Spain	1999	62.2	81.3	89.33	92			Lines
Sweden	October 2000		70	75	78	*90*		Lines
Switzerland	October 2000	0	85	95	98			Lines
Turkey	February 2001	0	0.01	2.5	5	*10*		Lines
United Kingdom	July 2000	50	60	64	85	*95*	*99.6*	Lines
United States[1]	1997	36	50	68	75	*84*		Lines
OECD (weighted average)		42.0	55.8	66.9	75.9	*81.9*	*82.9*	
OECD (simple average)		27.3	51.0	61.9	72.0	*79.5*	*81.5*	

1. Data for the United States is an average for Verizon, SBC, Bell South, Qwest, Sprint, Alltel, Cincinnati Bell, Centurytel and ACS.

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Table 4.13. **Public telecommunication investment in the OECD area**

USD millions (excluding spectrum fees)

	Average 1988-1990	Average 1991-1993	Average 1994-1996	1997	1998	1999	2000	2001	2002	2003
Australia	2 285	2 130	3 050	4 009	3 463	4 145	3 842	3 333	2 649	2 939
Austria	965	1 308	1 283	1 000	1 662	2 002	2 619	1 620	905	1 546
Belgium	614	779	927	719	670	746	952	591	754	812
Canada	3 479	3 353	2 811	4 181	4 357	4 015	4 943	5 140	4 159	3 844
Czech Republic	..	226	818	1 421	1 164	854	471	599	455	1 267
Denmark	490	431	612	890	1 077	986	1 116	1 302	970	849
Finland	670	510	632	832	596	573	629	657	475	508
France	4 548	6 081	6 175	6 421	939	959	7 194	8 198	5 376	4 311
Germany	9 263	15 808	12 717	11 970	4 091	4 239	4 690	5 414	6 684	5 618
Greece	291	808	751	841	1 557	1 403	1 531	1 552	1 368	1 258
Hungary	216	456	754	764	662	812	820	750	713	625
Iceland	12	23	30	29	52	56	69	37	24	33
Ireland	174	202	260	462	515	460	704	442	575	575
Italy	7 365	8 657	5 065	5 558	5 981	5 500	6 448	7 071	8 936	7 824
Japan	15 389	20 339	33 120	32 815	29 023	32 924	32 883	24 658	19 872	21 698
Korea	2 587	3 167	4 615	3 049	4 495	3 317	6 920	4 327	6 579	5 169
Luxembourg	39	72	96	79	30	55	15	30	49	44
Mexico	1 409	2 214	1 862	1 971	3 164	4 028	5 226	5 751	3 104	2 482
Netherlands	1 144	1 572	1 511	1 494	2 682	4 731	3 174	2 671	1 564	1 821
New Zealand	362	367	340	389	298	352	379	289	412	442
Norway	500	483	361	541	477	541	578	597	707	524
Poland	140	489	896	1 006	1 365	1 862	2 434	1 965	2 326	1 363
Portugal	562	973	938	1 078	1 503	1 714	1 981	1 719	2 014	889
Slovak Republic	..	..	287	384	343	1 050	1 359	1 405	641	345
Spain	4 517	4 265	3 220	2 654	2 959	3 547	2 943	3 071	5 412	4 500
Sweden	1 079	1 164	1 197	967	929	1 267	1 226	1 047	1 423	1 452
Switzerland	1 597	1 786	1 761	1 637	1 275	2 034	2 245	1 643	1 653	1 604
Turkey	548	787	500	546	4 213	3 788	3 568	2 960	2 163	2 203
United Kingdom	4 830	3 738	4 887	9 971	8 987	12 800	14 122	14 159	10 185	10 933
United States	23 401	26 064	37 751	54 224	65 829	88 847	116 117	95 625	51 330	41 651
OECD	88 514	108 296	129 227	151 901	154 355	189 604	231 198	198 626	143 477	129 129

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Table 4.14. **Licencing revenues in the OECD area**

USD millions

	Revenue from sale of spectrum for cellular wireless communications (including UMTS)						Revenue from sale of spectrum for wireless local loop						Revenue from sale of spectrum for any other telecommunication service (e.g. LMDS)						Revenue from PSTN licences						Total revenue received by public authorities from licensing or spectrum fees					
	1999	2000	2001	2002	2003	2004	1999	2000	2001	2002	2003	2004	1999	2000	2001	2002	2003	2004	1999	2000	2001	2002	2003	2004	1999	2000	2001	2002	2003	2004
Australia[1]	0.03	771.51	601.04	..	..	..		65.39		..	..	..	42.73	21.86		..	..	..	9.62	10.81	11.61	30.11	35.97	37.99	60.71	54.65	61.87	661.96	77.79	..
Austria	104.49	770.38	64.39	13.96	..	..	..	..	1.21	..	..	..	..	..	..	..	..	..	0.29	0.19	0.14	0.04	0.02	..	104.78	770.57	65.74	14.00	0.02	..
Belgium	6.21	5.94	8.62	10.48	12.64	15.58	..	..	..	0.01	0.06	0.06	3.51	2.88	3.29	15.82	18.52	18.93	15.43	14.47	21.11	0.84	1.03	0.28	25.15	23.29	27.99	27.15	32.25	34.85
Canada	115.33	..	956.06	145.03	153.00	151.07	..	..	..	..	..	..	..	..	..	..	..	8.00	..	..	..	..	..	..	115.33	..	956.06	145.03	153.00	159.07
Czech Republic[2,2f]	4.92	8.29	11.83	16.48	..	172.15[2h]	..	11.66[2a]	0.53[2a]	1.22[2i]	..	..	3.24[2b]	3.95[2b]	7.99[2b]	..	..	..	..[2g]	..	..	0.07	0.07	0.02[2j]	45.18[2c]	12.24[2d]	67.14[2e]	47.73	34.51	204.32
Denmark	..	..	..	..	..	..	..	..	..	..	..	0.24	..	..	..	..	..	..	..	..	..	..	..	..	..	0.01	0.12	41.76	50.00	50.00
Finland	3.58	3.36	4.37	5.21	6.76	6.62	0.21	0.28	0.22	0.11	0.09	0.09	0.05	0.06	0.16	..	..	..	..	..	..	..	..	..	3.84	3.71	4.75	5.62	7.68	..
France	47.87	56.88	113.39	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16.86	26.24	12.50	..	..	..	64.70	83.03	125.89	..	..	..
Germany	226.11	46,871.79		0.02	0.18	0.06	6.84	11.56	7.79	4.87	0.89	4.78	6.24	14.88	5.09	2.78	2.11	1.24	26.91	106.62	-93.10	..[8a]	1.73[8b]	0.01[8c]	266.09	47,004.85	-80.23	7.65	4.73	6.04
Greece[3]	..	..	432.61	36.00	..	..	..	54.03	..	..	..	..	..	..	..	2.83	..	..	3.53	2.99		3.10	3.66	..	3.53	57.02	447.45	23.77	25.40	..
Hungary	131.28	119.17	11.97	0.03	0.06	0.03	..	..	9.77	..	..	..	12.95	10.48	10.69	12.93	13.40	12.71	6.71	5.44	4.82	3.66	0.36	0.27	150.94	135.10	37.26	49.37	70.55	42.54
Iceland	47.02	61.78	58.08	0.30	0.51	1.22	..	..	..	0.01	..	..	40.02	55.79	49.63	0.16	0.19	0.17	103.93	89.15	72.88	0.70	0.86	..	..	..	1.27	1.46	..	..
Ireland	..	24.90	1.42	..	114.04	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.06	0.04	..	..	..	..	42.69	22.63	0.00	125.78	17.48
Italy	..	11,155.96	..	..	..	..	..	..	32.43	34.27	..	..	..	..	..	..	..	..	4.73	9.98	15.54	25.48	42.28	..	..	..	..	26.66	44.25	..
Japan[4]	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	313.41	379.51	371.10	378.82	468.39	476.15
Korea	68.56	120.25	66.38	69.66	78.81	..	15.98	..	..	..	..	..	2.44	..	1,006.98	228.97	52.63	..	..	..	..	54.12	54.84	..	191.87	261.46	1,157.25	355.22	189.78	..
Luxembourg[5]	..	..	0.00	1.60	2.43	..	..	..	..	..	..	..	..	..	..	1.26	1.61	..	..	..	0.05	1.86	1.48	..	..	..	..	6.60	8.21	..
Mexico[6a]	277.65	..	..	237.76[6b]	273.69[6b]	89.59[6b]	56.36	..	..	..	..	..	24.11	12.41	..	36.84[6c]	32.26[6c]	3.41[6c]	..	..	..	0.51	0.67	0.21	358.12	12.41	..	285.17	316.17	94.05
Netherlands	..	25.80	..	..	..	..	..	..	..	..	5.62	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5.62	..
New Zealand	..	..	49.79	0.93	..	..	..	..	5.21	2.82	0.02	..	..	..	..	..	..	..	..	..	..	..	..	..	6.35	5.23	5.21	4.17	0.02	..
Norway	..	..	..	..	25.28	16.67	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.56	93.18	12.41	..	..	..
Poland	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.07	0.03	0.01	..	..	45.61	..	..	..
Portugal	32.60	38.41	49.33	55.83	65.22	67.30	..	3.63	3.54	..	..	..	..	..	..	9.35	12.57	13.40	0.72	1.31	1.41	1.02	1.02	1.24	14.58	10.08	6.41	66.20	78.81	81.94
Slovak Republic	1.70	1.57	1.98	1.84	2.58	1.44	..	..	..	0.04	0.07	0.03	..	..	..	4.81	4.82	..	..	..	2.61	67.98	1.52	1.46	3.03	2.97	4.34	74.66	8.98	0.00
Spain	29.47	38.26	735.27	..	..	..	..	2.02	38.21	..	..	..	1.28	43.12	21.25	..	..	..	..	..	..	..	..	..	..	..	..	235.85	303.37	314.61
Sweden	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8.74	10.59	13.34	..	..	..	..	..	..
Switzerland	3.20	2.84	124.26	6.47	8.15	..	..	343.20	0.04	0.01	0.01	..	..	..	..	..	..	..	..	..	..	7.69	1.78	..	..	..	..	..	..	..
Turkey	..	27.83	77.35	5,509.88	..	..	..	..	..	..	..	..	..	0.004	0.79	..	..	0.002	..	..	..	..	..	6.91	..	27.84	77.36	5,510	0.57	7.92
United Kingdom	..	33,333.33	..	94.57	104.31	104.31	..	..	..	1.83	13.41	2.01	..	..	..	..	..	..	..	..	..	..	..	..	..	33,333.33	..	191.61	167.71	104.61
United States[7]	412.84	..	538.78	..	..	..	..	410.65	..	..	..	..	45.06	..	..	..	..	..	85.00	90.71	97.59	..	..	..	172.52	185.76	201.21	..	..	..
OECD	1,512.84	93,438.28	3,906.92	5,968.30	573.97	364.30	79.39	890.76	98.43	43.97	20.16	7.21	178.38	161.50	1,097.87	278.91	105.86	54.45	273.72	357.98	147.20	205.99	156.19	61.71	1,857.51	82,486.68	3,551.70	8,160.35	2,173.59	1,593.57

1. Notes on Australia: *a)* Licence fee information in the total revenue row is by financial (not calendar) year and does not include revenue from the PSTN licences category. *b)* There are no PSTN licences as such, but Australia provides telecommunication carrier licenses which include access to the PSTN. This revenue includes a licence application charge, an annual charge and a percentage of eligible revenue.

2. Notes on Czech Republic:
a) Revenue from the tender process. Administrative charges for licence and use of frequencies and numbers are not included. *b)* The following services are included: fixed, broadcasting, maritime, aeronautical and satellite. *c)* Sum of fees for use of frequencies and licences sold to providers: CZK 281.8 million in fees for use of frequencies; CZK 1.28 billion in income from the tender of GSM operator (administrative charges for granting of licence and use of frequencies and numbers not included). *d)* Fees for use of frequencies. *e)* Sum of fees for usage of frequencies and licences sold to providers. The sum given represents the total of the following: CZK 1.8 billion (part of income from the tender for the UMTS licence paid in the year 2001; no administrative fees for granting of the license or fees for the frequencies and numbers are included. Payment of the sum of CZK 7.385 billion for the UMTS tender is spread out over a period of 10 years up to 2011) and paid for use of frequencies). *f)* For 2001 data: The revenue from the usage of frequencies is still being recalculated as it must be in accordance with the governmental edict which entered into force in July 2000 and it is applied retroactively. *g)* Any fees collected for these licences before the issue of the new Telecommunications Act. *h)* revenue from tender of two UMTS licences (instalments of Eurotel Praha and T-Mobile Czech Republic, also including instalments to be paid in August 2004). *i)* Revenue from tender of network P-MP, 3.5GHz FWA. *j)* To 30 April 2004.

3. Note on Greece: Revenues from PSTN licences received by EETT plus revenues from sale of spectrum received by government.

4. Note on Japan: The spectrum user fee is a special charge that is borne by all radio station license holders to cover the expenditure of the administrative work for all the radio stations.

5. Notes on Luxembourg: *a)* The Regulation of 14 December 2001 established the basic conditions for the establishment and operation of mobile telecommunication networks and services. The Luxembourg Regulatory Institute requires: i) payment of an annual licence fee amounting to 0.2% of sales realised by the operator within the scope of the license (minimums apply); and ii) operators must contribute to spectrum and frequency management costs. *b)* The Luxembourg Regulatory Institute only charges license fees in order to cover extraordinary costs related to the management and implementation of local radio loop authorisations. They do not constitute royalties.

6. Notes on Mexico: *a)* For 1999, includes MXN 344 168 774 corresponding to value-added taxes, MXN 689 613 827 for interest related to late bid payments and MXN 98 908 449 due to penalties arising from default on payments of winning bids. For 2000, includes MXN 15 131 447, corresponding to value-added taxes, MXN 689 613 827 for interest related to late bid payments and MXN 1 421 828 due to penalties arising from default on payments of winning bids. *b)* The revenue corresponds to a share percentage of the annual gross income of the mobile companies *(aprovechamientos). c)* The revenue comes from a duty caused for private use of spectrum, *e.g.* private radio connections of voice or data.

7. Note on the United States: Auction close date is the qualifier for spectrum revenue generated for the respective year, not the date money was actually collected.

8. Notes on Germany: *a)* RegTP was unable to charge such licence fees for nearly one year for legal reasons. *b)* In view of the direct impact of Article 3(2) of the AUD, from 25 July 2003 activities hitherto requiring a licence under the TKG 1996 no longer needed special authorisation by Reg TP. For this reason licences were no longer issued under the TKG 1996. *c)* These revenues result from licence fees for class 3 licences the invoices for which became legally valid before 25 July 2003.

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Table 4.15. **Telecommunication investment by region**

USD millions (including spectrum fees)

	Average 1988-90	Average 1991-93	Average 1994-96	1997	1998	1999	2000	2001	2002	2003	Average 2001-2003
Europe	39 603	50 662	45 678	51 264	43 727	50 614	156 010	59 944	55 373	50 905	55 407
(%)	45	47	35	34	28	27	48	30	39	39	35
North America	28 289	31 631	42 424	60 376	73 349	97 696	126 286	107 471	58 593	47 976	71 347
(%)	32	29	33	40	48	52	39	54	41	37	45
Asia/Pacific	20 622	26 003	41 125	40 261	37 279	40 807	44 917	33 274	29 511	30 248	31 011
(%)	23	24	32	27	24	22	14	17	21	23	20
EU 15	36 552	46 370	40 271	44 937	34 177	39 387	143 700	49 406	46 690	42 940	46 345
(%)	41	43	31	30	22	21	44	25	33	33	29
OECD	88 514	108 296	129 227	151 901	154 355	189 116	327 213	200 690	143 477	129 129	157 765

Note: Data for wireless spectrum included from 1999 onwards.

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Table 4.16. **Public telecommunication investment as a percentage of telecommunications revenue**

	Average 1988-90	Average 1991-93	Average 1994-96	Average 1997-99	1997	1998	1999	2000	2001	2002	2003
Australia	50.8	24.1	33.4	30.8	29.8	27.0	29.4	26.2	24.9	23.4	20.9
Austria	47.9	48.6	37.5	38.7	26.8	40.3	40.1	59.0	32.1	15.6	21.7
Belgium	32.9	30.5	28.1	16.4	17.0	13.1	12.6	15.6	8.8	11.0	9.6
Canada	38.0	27.6	23.3	29.5	24.5	25.9	23.0	25.5	25.4	20.8	16.9
Czech Republic	..	68.6	131.5	96.1	97.9	63.5	40.5	20.4	23.4	13.9	31.7
Denmark	29.9	19.3	21.6	27.6	25.5	28.7	23.8	26.7	30.7	22.1	15.7
Finland	47.8	25.1	35.1	24.1	27.1	16.4	14.2	15.7	15.7	10.0	9.8
France	30.6	32.7	26.9	9.3	22.4	3.5	3.4	26.5	28.0	16.9	11.0
Germany	47.8	48.5	34.6	15.4	27.4	8.3	8.3	9.1	10.1	11.6	7.9
Greece	32.7	66.8	38.0	41.2	25.6	36.2	33.0	35.6	31.1	25.2	18.5
Hungary	82.9	122.3	71.5	40.5	35.7	26.3	26.4	25.6	21.8	18.4	13.3
Iceland	17.6	27.8	28.8	31.0	18.9	31.1	29.2	27.5	17.3	10.6	10.4
Ireland	21.7	20.2	24.0	31.1	27.6	34.2	23.9	31.3	17.8	18.0	14.4
Italy	64.3	54.0	27.7	25.6	23.3	22.6	20.6	26.3	26.1	29.6	20.7
Japan	40.2	43.1	45.3	27.2	28.2	25.6	23.0	20.1	15.7	15.4	15.6
Korea	87.5	59.6	61.7	31.4	33.5	35.2	24.5	38.1	23.9	35.1	25.3
Luxembourg	49.6	53.5	39.8	17.8	25.8	8.9	15.1	4.5	8.1	12.4	9.3
Mexico	112.5	55.9	24.0	41.6	22.5	33.0	35.9	36.6	35.9	18.3	15.0
Netherlands	33.2	17.8	23.5	36.0	18.9	28.3	44.1	31.3	23.0	12.0	11.0
New Zealand	32.2	25.6	23.4	16.0	17.3	14.6	16.2	17.0	13.6	16.7	13.5
Norway	25.5	21.9	14.4	15.3	15.0	19.3	20.8	21.3	20.6	20.4	12.7
Poland	29.8	69.8	59.4	58.1	38.8	37.7	40.5	44.8	29.9	33.7	17.8
Portugal	62.1	70.2	43.5	39.7	27.2	35.7	36.2	39.2	28.7	31.1	11.1
Slovak Republic	..	..	197.3	149.9	85.1	71.3	236.3	169.0	149.3	62.7	25.0
Spain	109.0	51.5	31.3	24.8	18.6	18.5	19.5	15.8	14.1	24.1	15.6
Sweden	34.5	23.2	23.0	14.7	14.0	12.6	17.1	17.9	16.4	18.6	15.6
Switzerland	45.1	39.0	28.4	21.9	24.1	16.6	23.3	27.2	18.8	17.4	14.1
Turkey	52.6	37.3	20.8	96.3	13.7	84.0	69.4	57.4	50.3	32.2	27.6
United Kingdom	28.6	15.3	19.2	33.5	27.9	18.4	22.6	22.2	21.5	14.3	13.1
United States	17.6	17.6	21.9	30.8	21.1	24.1	29.5	34.7	27.3	14.6	11.7
OECD	31.6	29.7	29.4	28.1	24.1	22.9	24.9	27.9	23.2	16.7	13.6

StatLink: http://dx.doi.org/10.1787/254207313322

Table 4.17. **Public telecommunication investment as a percentage of gross fixed capital formation (GFCF)**

	Average 1988-90	Average 1991-93	Average 1994-96	Average 1997-99	1997	1998	1999	2000	2001	2002	2003	Average 2001-2003
Australia	3.06	3.18	3.60	4.17	4.18	3.96	4.27	4.55	3.97	2.64	2.27	2.96
Austria	2.95	3.05	2.47	3.18	2.16	3.48	4.26	5.96	3.83	2.09	2.83	2.92
Belgium	1.69	1.78	1.80	1.39	1.44	1.30	1.42	1.97	1.25	1.57	1.42	1.41
Canada	2.89	3.08	2.63	3.30	3.30	3.55	3.08	3.57	3.66	2.87	2.27	2.93
Czech Republic	1.57	2.74	5.23	7.25	8.43	6.78	5.36	3.06	3.57	2.32	5.27	3.72
Denmark	2.06	1.71	1.96	2.84	2.68	3.03	2.88	3.52	4.03	2.72	2.01	2.92
Finland	1.97	2.32	3.25	2.84	3.63	2.40	2.29	2.66	2.66	1.89	1.72	2.09
France	1.92	2.29	2.22	1.04	2.54	0.35	0.35	2.73	3.09	1.93	1.28	2.10
Germany	2.97	3.51	2.45	1.49	2.66	0.89	0.93	1.16	1.44	1.81	1.32	1.52
Greece	1.79	3.99	3.48	4.94	3.50	6.06	4.95	5.70	5.56	4.29	2.85	4.23
Hungary	..	5.94	8.22	6.83	7.51	5.95	7.07	7.47	6.16	4.69	3.38	4.74
Iceland	0.98	1.94	2.59	2.58	1.94	2.63	2.93	3.42	2.19	1.53	1.47	1.73
Ireland	2.45	2.43	2.27	2.49	2.77	2.63	2.00	3.03	1.83	2.11	1.61	1.85
Italy	9.35	3.82	2.48	2.59	2.61	2.71	2.45	3.04	3.29	3.80	2.80	3.30
Japan	1.65	1.72	2.39	2.75	2.72	2.75	2.81	2.63	2.30	2.07	2.11	2.16
Korea	3.54	2.66	2.68	2.90	1.66	4.29	2.51	4.35	3.04	4.13	2.88	3.35
Luxembourg	1.89	2.33	2.64	1.30	2.04	0.71	1.16	0.37	0.68	1.04	0.82	0.85
Mexico	3.54	3.24	2.99	3.42	2.52	3.60	3.95	4.21	4.62	2.48	2.05	3.05
Netherlands	1.97	2.30	1.88	3.50	1.86	3.17	5.28	3.89	3.22	1.79	1.77	2.26
New Zealand	4.12	5.05	2.67	2.94	2.85	2.83	3.05	3.73	2.74	3.34	2.52	2.86
Norway	1.92	1.98	1.21	1.43	1.56	1.26	1.55	1.86	1.92	2.10	1.42	1.81
Poland	3.39	3.43	3.77	3.74	2.98	3.41	4.72	6.21	5.11	6.40	3.54	5.02
Portugal	3.56	4.65	3.97	4.83	3.94	4.99	5.47	6.66	5.79	6.64	2.68	5.04
Slovak Republic	..	..	5.48	8.26	5.30	4.28	17.39	25.83	23.35	9.58	4.12	12.35
Spain	4.23	3.34	2.64	2.28	2.16	2.21	2.45	2.08	2.08	3.26	2.10	2.48
Sweden	2.27	2.76	3.28	2.73	2.49	2.28	2.92	2.89	2.73	3.53	3.05	3.11
Switzerland	2.98	3.23	2.89	3.19	2.88	2.12	3.43	4.00	2.96	2.78	2.38	2.71
Turkey	1.99	1.94	1.27	6.11	1.09	8.55	9.37	8.01	11.19	7.08	5.94	8.07
United Kingdom	2.59	2.19	2.67	4.39	4.55	3.58	5.13	5.78	5.90	3.97	3.72	4.53
United States	2.41	2.54	2.89	4.12	3.54	3.95	4.92	5.97	4.96	2.74	2.11	3.27
OECD	2.51	2.54	2.61	3.20	3.01	3.05	3.52	4.18	3.76	2.73	2.21	2.90

StatLink: http://dx.doi.org/10.1787/386518532288

Table 4.18. **Public telecommunication investment per access channel**

USD millions

	Average 1988-90	Average 1991-93	Average 1994-96	Average 1997-99	1997	1998	1999	2000	2001	2002	2003	Average 2001-2003
Australia	294.8	248.8	328.4	371.0	398.0	337.5	377.5	331.6	283.6	218.6	239.9	330.9
Austria	310.4	377.6	343.3	412.1	268.4	446.1	518.0	665.1	410.5	233.5	397.5	531.2
Belgium	164.3	183.1	196.8	137.5	138.1	132.5	141.7	176.8	114.5	147.2	160.1	144.3
Canada	238.6	206.1	159.4	211.7	219.7	218.9	197.3	232.2	234.5	192.6	183.1	221.3
Czech Republic	25.2	123.4	333.2	316.2	434.0	310.5	221.7	117.9	144.9	110.8	304.6	161.5
Denmark	171.9	143.4	189.4	286.4	271.2	313.9	274.1	294.3	339.8	260.4	232.8	302.7
Finland	260.2	186.1	221.1	208.9	270.2	187.3	172.7	179.3	188.9	138.1	154.3	180.3
France	168.6	199.9	187.3	82.8	196.5	27.7	28.3	211.1	240.5	157.6	127.2	160.0
Germany	312.2	438.3	298.6	145.3	265.2	88.1	88.1	93.5	103.4	124.6	103.5	95.0
Greece	76.8	180.4	145.7	227.6	154.8	280.2	245.7	256.3	251.4	217.3	199.8	251.1
Hungary	233.8	349.5	337.7	214.5	240.9	187.4	217.9	216.0	200.5	194.4	173.4	211.5
Iceland	96.6	166.5	198.5	258.0	173.6	294.6	297.6	358.5	194.5	126.7	171.7	283.6
Ireland	191.4	182.2	197.8	294.8	307.8	315.0	264.6	391.3	237.4	294.4	297.2	297.8
Italy	346.8	366.0	202.7	214.0	213.0	226.0	203.2	237.5	251.6	312.6	276.3	230.7
Japan	294.8	350.9	530.4	464.1	497.5	428.7	466.7	442.3	334.9	277.1	309.1	414.6
Korea	194.5	202.8	244.8	157.3	146.0	215.5	121.4	253.5	159.0	236.5	184.7	178.0
Luxembourg	222.5	353.6	409.7	213.4	298.2	128.7	204.1	47.0	87.3	138.1	100.9	112.8
Mexico	289.7	325.6	213.8	304.3	213.0	318.7	368.6	422.0	415.8	172.4	128.1	402.1
Netherlands	170.7	212.4	185.0	329.3	154.7	345.3	491.6	312.6	267.4	156.7	180.5	357.2
New Zealand	254.5	242.8	205.2	197.0	221.8	169.1	200.4	216.7	163.7	228.8	245.8	193.6
Norway	241.1	213.1	145.1	176.1	197.6	162.5	170.2	174.9	180.2	210.7	161.5	175.1
Poland	44.8	123.1	155.6	165.2	134.0	160.5	193.8	218.6	167.9	188.8	108.4	193.4
Portugal	267.6	325.2	257.7	348.0	269.9	365.0	405.2	459.3	392.3	461.8	207.7	418.9
Slovak Republic	..	71.8	256.0	386.0	275.9	222.1	629.3	782.5	857.8	418.6	241.5	756.5
Spain	383.1	309.4	212.5	179.9	162.1	176.2	199.8	156.7	160.8	277.3	218.8	172.4
Sweden	188.7	196.3	197.6	165.7	155.7	146.5	193.8	182.9	155.8	216.4	225.5	177.5
Switzerland	421.7	425.0	389.3	339.1	349.2	263.8	401.5	428.7	305.1	306.9	301.4	378.5
Turkey	92.9	79.1	35.8	168.4	34.7	248.4	209.7	193.7	156.1	113.0	115.1	186.5
United Kingdom	195.4	141.7	166.5	320.9	314.6	270.6	375.9	404.2	398.3	290.7	316.1	392.8
United States	178.8	182.2	238.3	384.1	311.8	364.8	468.8	603.2	498.8	273.7	229.6	523.6
OECD	227.8	246.2	261.7	297.5	284.5	280.2	325.9	385.4	327.8	236.4	215.0	346.4

StatLink: http://dx.doi.org/10.1787/576347748502

Table 4.19. **Public telecommunication investment per basic access path**

USD

	Average 1988-90	Average 1991-93	Average 1994-96	Average 1997-99	1997	1998	1999	2000	2001	2002	2003	Average 2001-2003
Australia	290.88	235.81	259.99	246.52	273.65	221.02	237.12	190.00	144.63	105.77	107.71	119.37
Austria	305.17	359.99	308.61	244.43	204.49	271.36	245.19	256.96	150.29	81.77	133.26	121.77
Belgium	162.93	180.58	185.72	99.54	116.33	96.87	88.25	85.31	44.51	53.37	54.27	50.71
Canada	232.51	193.65	138.74	165.56	179.48	166.32	147.13	157.59	146.32	112.44	99.25	119.33
Czech Republic	25.18	122.97	321.26	240.38	374.33	246.40	147.36	56.43	54.01	35.75	91.03	60.26
Denmark	164.73	132.44	148.81	181.01	188.34	199.35	158.33	154.50	162.19	112.21	93.51	122.63
Finland	244.70	163.57	161.53	112.49	160.91	98.65	86.94	86.55	85.12	57.61	59.54	67.42
France	167.49	197.18	178.80	60.28	167.04	20.77	17.60	112.55	114.34	72.26	54.40	80.33
Germany	310.29	425.40	273.02	109.59	224.50	67.79	59.22	47.59	49.05	57.61	45.45	50.70
Greece	76.85	180.07	137.16	161.12	131.99	204.49	146.09	128.59	109.79	87.64	75.61	91.02
Hungary	233.55	341.25	298.36	162.47	197.01	144.85	152.33	119.30	85.93	67.14	53.20	68.76
Iceland	90.58	150.18	163.02	156.12	123.98	183.86	154.94	169.06	85.28	50.97	64.42	66.89
Ireland	188.30	175.19	175.42	181.13	229.60	199.48	137.75	184.27	95.41	114.23	106.79	105.47
Italy	344.85	353.27	173.57	120.20	146.85	127.90	96.24	92.70	88.84	108.28	89.75	95.62
Japan	291.83	340.71	431.47	273.40	314.90	250.99	258.44	231.96	163.01	123.87	127.93	138.27
Korea	193.87	198.94	222.13	95.79	109.73	123.50	65.33	119.27	67.21	94.82	71.70	77.91
Luxembourg	221.84	349.37	365.81	139.78	237.91	82.99	115.04	24.25	38.79	58.83	44.31	47.31
Mexico	288.23	312.44	196.64	213.42	179.25	238.02	215.87	197.37	161.06	70.31	49.83	93.73
Netherlands	169.31	207.78	171.83	229.11	131.68	235.99	288.21	148.24	120.87	68.24	72.55	87.22
New Zealand	245.61	221.80	164.59	118.35	157.83	98.77	106.78	96.06	68.53	93.67	91.05	84.42
Norway	222.58	188.75	105.23	101.34	122.52	94.28	91.20	86.72	83.42	94.94	67.57	81.98
Poland	44.77	122.91	152.68	131.17	120.89	130.80	137.79	136.13	87.42	88.56	45.05	73.68
Portugal	267.18	319.78	232.58	198.87	195.93	208.23	192.49	180.05	138.02	153.14	62.93	118.03
Slovak Republic	..	..	252.51	299.48	241.20	170.62	450.14	448.51	371.20	143.92	67.49	194.21
Spain	382.07	305.38	193.98	118.69	128.21	124.02	108.69	68.81	62.57	99.74	74.71	79.01
Sweden	177.75	175.59	149.25	100.45	103.12	88.44	108.01	93.04	73.54	94.22	90.66	86.14
Switzerland	413.36	404.24	352.06	242.61	285.61	193.65	250.39	226.05	152.09	143.53	130.86	142.16
Turkey	92.60	78.57	34.60	134.23	31.47	205.80	146.50	106.55	79.17	50.90	46.74	58.94
United Kingdom	188.65	133.33	140.33	220.18	249.07	194.39	220.72	188.17	175.20	117.98	120.45	137.88
United States	174.00	169.06	197.57	276.90	236.58	259.93	320.68	376.98	288.73	148.30	113.78	183.60
OECD	223.66	234.58	225.03	203.11	215.72	191.96	201.08	205.68	159.34	107.82	90.90	119.35

Note: Access paths include fixed access channels and cellular mobile subscriptions. xDSL and cable modem connections are not included.

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Table 4.20. **Public telecommunication investment per capita**

USD

	Average 1988-90	Average 1991-93	Average 1994-96	Average 1997-99	1997	1998	1999	2000	2001	2002	2003	Average 2001-2003
Australia	135.97	121.83	168.73	206.40	215.41	184.07	217.72	199.35	170.67	134.09	146.96	150.57
Austria	126.24	165.56	159.44	192.40	125.50	208.38	250.48	326.91	201.72	112.34	190.92	168.33
Belgium	61.80	77.57	91.39	69.74	70.66	65.65	72.93	92.93	57.52	72.98	78.29	69.59
Canada	127.61	118.17	95.76	138.35	139.80	144.47	132.05	161.07	165.68	132.63	121.52	139.94
Czech Republic	3.79	21.86	79.21	111.37	137.90	113.08	83.08	45.89	58.62	44.63	124.16	75.81
Denmark	95.44	83.36	116.96	185.57	168.34	203.15	185.22	209.01	243.12	180.40	157.57	193.70
Finland	134.87	101.14	123.83	129.43	161.90	115.73	110.94	121.48	126.73	91.24	97.42	105.13
France	80.61	106.25	106.76	47.48	107.32	15.63	15.91	118.72	134.58	87.80	70.06	97.48
Germany	148.79	196.16	155.73	82.46	145.88	49.87	51.64	57.07	65.75	81.04	68.08	71.62
Greece	28.95	78.42	71.89	120.47	78.07	143.66	128.94	140.22	141.93	124.92	114.61	127.15
Hungary	20.75	44.21	73.70	73.76	74.24	64.47	79.29	80.34	73.66	70.16	61.66	68.49
Iceland	47.13	89.15	112.46	165.68	105.32	189.41	201.23	246.97	130.72	84.42	114.27	109.80
Ireland	49.47	57.01	72.16	129.24	126.12	138.68	122.55	185.18	114.53	146.57	144.14	135.08
Italy	128.67	152.72	89.28	99.61	96.64	103.86	95.40	111.63	122.13	154.08	134.67	136.96
Japan	125.07	163.49	263.89	249.81	260.09	229.46	259.89	259.07	193.72	155.94	170.02	173.22
Korea	60.93	72.40	102.35	78.21	66.34	97.11	71.15	147.22	91.39	138.09	107.86	112.45
Luxembourg	103.11	182.69	234.21	128.42	187.79	71.26	126.98	34.63	68.56	109.94	97.38	91.96
Mexico	17.00	26.07	20.63	31.90	20.98	33.03	41.44	52.97	57.48	30.61	24.16	37.42
Netherlands	77.01	103.58	97.75	189.00	95.75	170.78	299.25	199.37	166.51	96.87	112.26	125.21
New Zealand	108.63	104.52	92.99	91.46	102.23	77.86	91.52	97.88	73.83	103.63	109.39	95.62
Norway	118.26	112.68	82.87	117.16	122.72	107.59	121.17	128.59	132.31	155.82	114.76	134.30
Poland	3.68	12.75	23.21	36.50	26.03	35.29	48.16	62.98	51.38	60.84	35.69	49.31
Portugal	56.71	98.85	95.17	143.94	106.79	148.36	168.48	193.75	167.04	194.22	85.09	148.78
Slovak Republic	..	7.73	53.62	109.88	71.33	63.54	194.63	251.70	260.14	118.96	64.19	147.76
Spain	116.46	109.34	82.09	77.34	67.45	74.99	89.51	73.71	76.26	133.48	110.27	106.67
Sweden	127.06	134.34	135.72	119.09	109.33	104.94	142.99	138.21	117.67	159.43	162.06	146.39
Switzerland	239.14	259.96	249.97	231.77	230.18	178.82	283.80	311.39	225.49	225.18	216.67	222.44
Turkey	9.97	13.48	8.12	43.98	8.57	65.02	57.55	52.89	43.14	31.04	31.11	35.10
United Kingdom	84.21	64.45	83.38	178.66	171.42	154.14	218.87	240.81	239.86	172.02	184.13	198.67
United States	94.57	102.05	143.50	257.42	198.65	238.38	318.07	411.14	335.10	178.08	143.09	218.76
OECD	86.76	102.21	119.21	149.33	137.29	138.50	168.96	204.44	174.38	125.11	111.85	137.11

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Chapter 5

Internet and Broadband Infrastructure

Internet connectivity continues to expand rapidly in the OECD. By the end of 2003, there were roughly 259 million subscribers to fixed Internet connections and 84 million broadband subscribers. By August 2004, the number of broadband subscribers had passed 100 million, equating to an average annual growth rate of 77% since 2000. Mobile Internet access is now also becoming increasingly common. This chapter examines the growth of Internet infrastructure and its adoption throughout the OECD and includes data on the number of subscribers, availability, Internet hosts, secure servers and domain names.

The Internet continues to expand and the number of broadband connections is increasing rapidly. At the end of 2003, there were around 259 million subscribers to fixed Internet connections in OECD countries. At the end of 2003, almost 84 million subscribers connected to the Internet via broadband connections, and by the end of August 2004 broadband subscribers had passed 100 million. Korea remains the clear leader in terms of broadband penetration, but the number of individual subscribers (taking account of both dial-up and broadband connections) is higher in a number of other countries including Portugal, Denmark and the Netherlands. Mobile Internet access is now also becoming increasingly common. As an example, there were almost 44 million i-mode subscribers in OECD countries by mid-2004 and with the growth in 3G (IMTS-2000, UMTS) during 2003 and 2004 mobile Internet access is expected to increase.

After a year of slower growth in the number of Internet hosts in 2002, growth in host connections strongly increased during 2003 to reach 233 million in January 2004. The use of secure servers for e-commerce is also growing rapidly, increasing 59% per annum since 1998 reaching worldwide 325 000 by July 2004 (306 000 in the OECD area). Iceland, the United States and Canada are among the leading users of secure servers. After slowing, domain registration rates have also now returned to the higher levels experienced during the late 1990s, with more than 17 million new registrations during 2003. Data from Regional Internet Registries reveal a maturing of Internet address space allocations in North America and relatively rapid development of Internet networks in Europe and Asia. Peering statistics also show both the continued development and a maturing of peering and traffic exchange relationships. While a number of Internet and broadband indicators suggest a degree of catching up, significant access differences remain.

Internet subscribers

There is widespread interest in the take up and use of the Internet. The number of people accessing Internet is, therefore, a key indicator. There is no single universally accepted measure of adoption. Some national statistical agencies report the number of "users" based on business and household surveys of Internet access habits, and many private and public sector organisations report the number of "users", "people" or "households" online. An alternative approach is to compile information on Internet subscribers by country from major telecommunication carriers' reports of the number of subscribers to their Internet services and their market share. These carriers manage connectivity via public switched telecommunication networks, so they are often in the best position to know subscriber numbers on a nation-wide basis. Moreover, the term "subscribers" has a more specific meaning for most carriers. Namely, the number of active registered Internet accounts. The definition of "active" varies a little from country to country (*e.g.* from accessing an account every 45 days to every six months), but these data provide an internationally comparable source of information on the take up and use of Internet services.

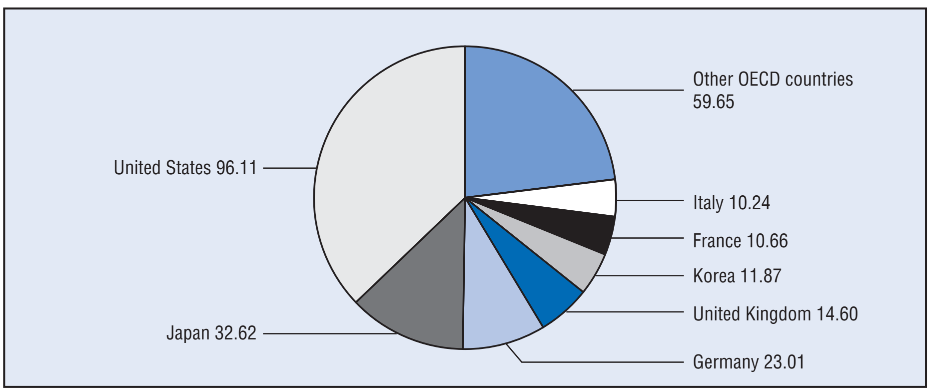
There are a number of factors affecting subscriber numbers, including the now declining business model that encouraged the registration of "free" Internet accounts and the recent rapid adoption of mobile Internet access. Mobile Internet access provides a different Internet experience, with major differences in pricing and capabilities. For that reason they are here treated separately, with data presented first on the number of active subscribers to fixed Internet services. This is followed by a discussion of mobile Internet subscribers and mobile data revenues.

Fixed Internet subscribers

At the end of 2003, there were around 259 million active Internet subscribers with fixed Internet connections in OECD countries, up from around 106 million in 1999 or by almost 26% per annum (Table 5.1). Among those with large fixed Internet subscriber populations at the end of 2003 were the United States with 96 million (36%); the EU15 countries with 92 million (35%) – of which Germany with 23 million and the United Kingdom with 15 million accounted for the largest percentage; Japan (33 million) and Korea (12 million) (see Figure 5.1). Recent growth in the number of fixed Internet subscribers varies considerably from country to country. Those countries experiencing rapid growth over the period 1999 to 2003 included Portugal, the Czech Republic, Korea, Luxembourg and Iceland. Slower growth was experienced in Sweden, the United States, the United Kingdom and New Zealand. Nevertheless, these countries still saw increases of 15% to 20% per annum.

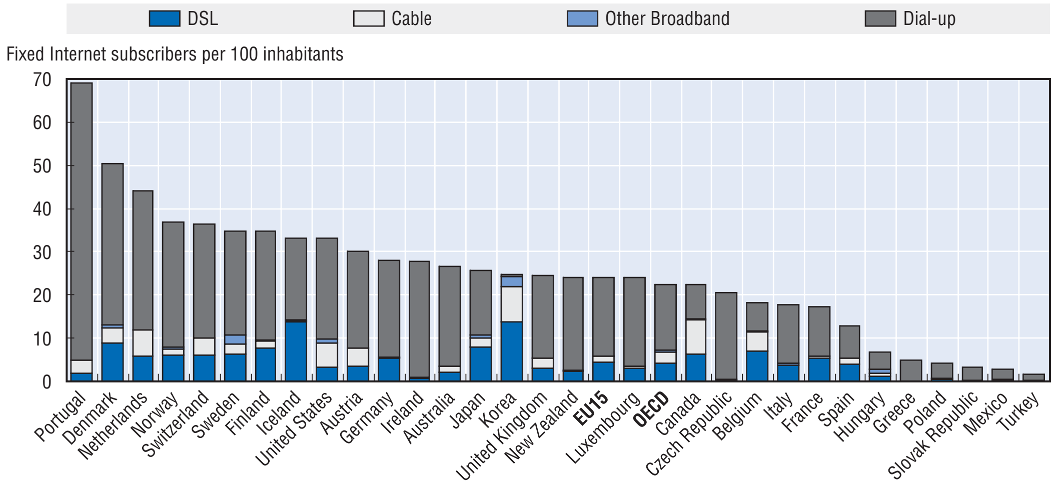
Growth in fixed Internet penetration is reflected in the overall increase in subscribers across OECD countries from 9.4 per 100 inhabitants in 1999 to 22.4 per 100 inhabitants in 2003. In 1999, there were 18 OECD countries with a fixed Internet penetration of less than 10 per 100 inhabitants. By 2003, there were just six countries. On a per capita basis, the highest penetration of fixed Internet connections at the end of 2003 was in Portugal (Figure 5.2). However, data for this country should be used with care in view of the warning of the regulator, ANACOM, which notes that there is an overstatement of the number of individual dial-up access customers, as some users have more than one ISP and more than one "free" dial-up account. In countries where Internet access is predominantly based on monthly subscriptions these accounts are generally shared by a number of users. In countries with "free" dial-up Internet access the fees for access are mostly billed *via* the telecommunication operator and then shared with the ISP. This encourages users to have multiple individual accounts rather than sharing a subscription. Other countries with

Figure 5.1. **Fixed Internet subscribers, millions, December 2003**



StatLink: http://dx.doi.org/10.1787/202345441061

Figure 5.2. **Fixed Internet access per 100 inhabitants, December 2003**



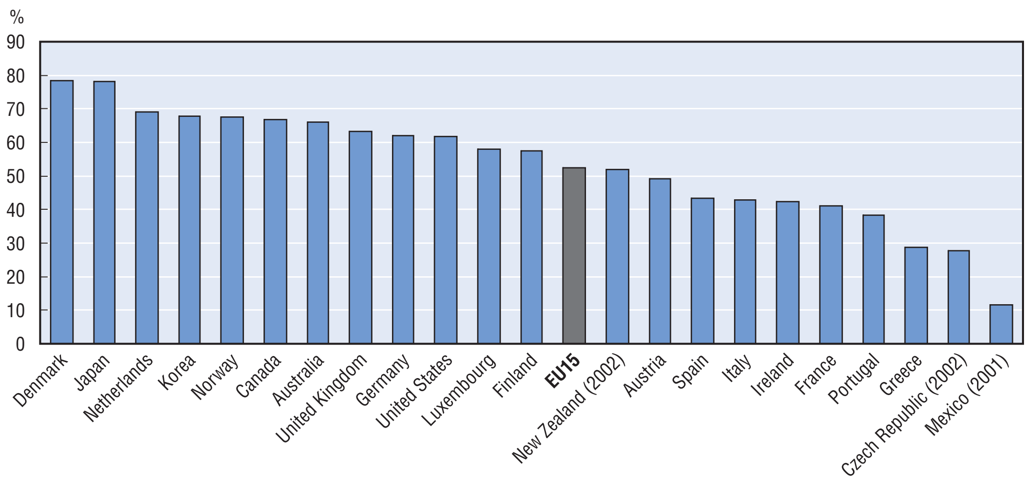
Note: Excludes mobile phone access to the Internet. Data for Portugal's dial-up service include multiple "free" ISP accounts. The data for Denmark include some inactive accounts.

StatLink: http://dx.doi.org/10.1787/813777638115

relatively high levels of fixed Internet penetration included: Denmark, Netherlands, Norway, Switzerland, Iceland, Sweden, Finland and the United States. Relatively lower penetration levels are evident in Mexico, Slovak Republic, Poland, Greece, Hungary and Turkey. PC penetration levels are just one factor that may affect Internet penetration rates (see Figure 5.3). Hence, despite some evidence of slowing growth in countries that were early adopters, there remain significant differences in Internet connectivity.

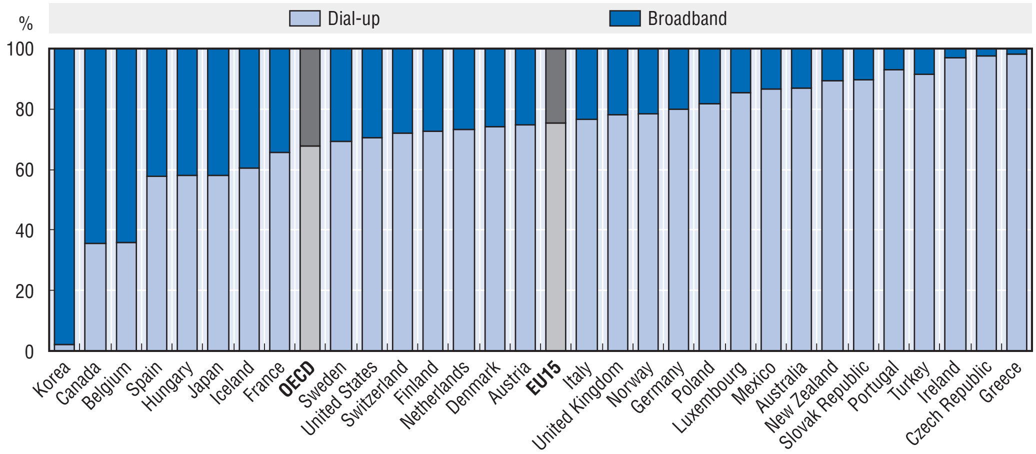
Dial-up subscribers accounted for 96% of all fixed line Internet subscribers in 1999 (102 million). By the end of 2003, dial-up subscribers accounted for just 68% but numbered 175 million. Dial-up subscribers accounted for just 2% of fixed Internet subscriptions in Korea at the end of 2003, compared with more than 95% in Greece and the Czech Republic. Other countries with a relatively high share of dial-up access included: Ireland, Portugal,

Figure 5.3. **PC penetration, percentage of households, 2003**



StatLink: http://dx.doi.org/10.1787/770360516488

Figure 5.4. **Dial-up and broadband shares of total fixed Internet subscribers, December 2003**



Note: Excludes mobile phone access to the Internet.

StatLink: http://dx.doi.org/10.1787/605160887873

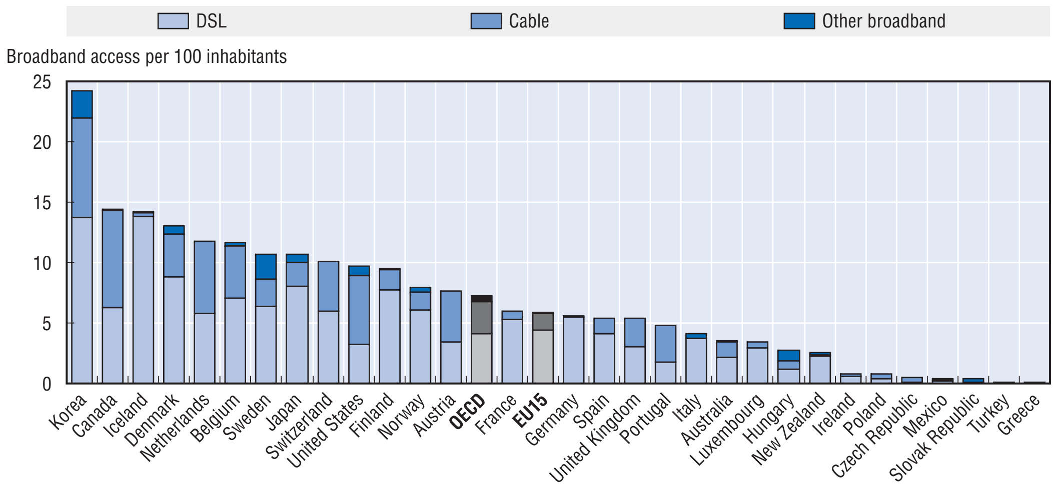
Slovak Republic, New Zealand, Australia and Mexico. In addition to Korea, dial-up access accounted for less than 50% of total fixed Internet subscribers in Belgium and Canada (Figure 5.4). Details of broadband access are discussed in more detail below.

Broadband access

The scope and quality of Internet experience and the full adoption and integration of e-commerce depend upon bandwidth and "always on" access. By the end of 2003, there were almost 84 million broadband Internet subscribers in OECD countries – up from 15 million at the end of 2000, or by 77% per annum. Over the period from 2000 to 2003, the number of broadband subscribers using DSL connection increased from less than 6 million to more than 47 million (100% per annum) and the number using cable connections increased from 7.6 million to more than 31 million (60% per annum). Hence, the share of DSL subscription increased from 39% of all broadband connections in 2000 to 57% by the end of 2003, with DSL subscriptions surpassing cable during 2001 (Table 5.6).

At the end of 2003, one-third of all broadband subscribers in the OECD were in the United States and more than 25% were in EU15 countries. Japan and Korea were among the other largest broadband markets, with almost 14 million and 12 million broadband subscribers, respectively. Over the three years to the end of 2003, Greece, Ireland and Hungary experienced the most rapid growth in broadband subscriptions (services commenced in these countries during that time), while Korea, Canada, United States, Austria and Czech Republic experienced growth below the OECD average of 77% per annum – reflecting catch up among countries with low bases. On a per capita basis, Korea continued to be a leader of broadband development with more than 24 broadband subscribers per 100 inhabitants. Canada, Iceland, Denmark, Netherlands, Belgium, Sweden, Japan and Switzerland also had more than 10 broadband Internet subscribers per 100 inhabitants at that time. At the same time, there was less than one broadband subscriber per 100 inhabitants in Greece, Turkey, Slovak Republic, Mexico, Czech Republic, Poland and Ireland (Figure 5.5). Clearly, significant access differences remain.

Figure 5.5. **Broadband access per 100 inhabitants, December 2003**



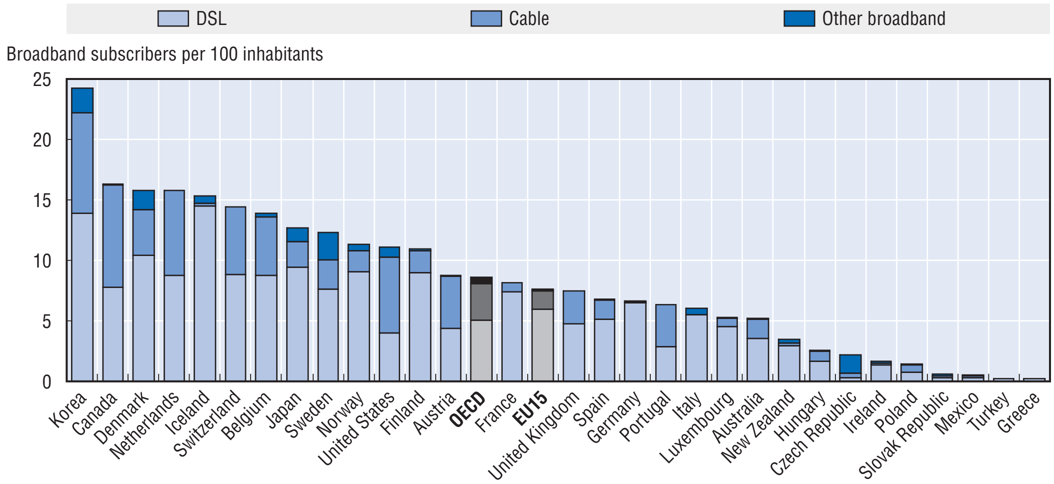
StatLink: http://dx.doi.org/10.1787/522202133400

Iceland and Korea led the development of DSL access, each with almost 14 DSL subscribers per 100 inhabitants at the end of 2003. Denmark, Japan, Finland, Belgium, Canada, Sweden, Norway and Switzerland also had more than six DSL subscribers per 100 inhabitants. Conversely, the Slovak Republic, Greece, Turkey, the Czech Republic, Mexico, Poland and Ireland had less than one DSL subscriber per 100 inhabitants at that time. Korea, Canada, the Netherlands, the United States, Belgium and Austria and Switzerland were the leaders in access over cable networks at the end of 2003, with between four and nine cable modem subscribers per 100 inhabitants. No fewer than 21 countries fell below the OECD average of 2.7 cable subscribers per 100 inhabitants.

Differences in broadband access opportunities and the continuing importance of dial-up Internet access in some countries are evident when fixed Internet subscribers per 100 inhabitants are presented by access technology (Figure 5.2). Some countries, with relatively high levels of Internet penetration lag others on the adoption of broadband (*e.g.* Ireland, Portugal and Australia), while other countries have high levels of broadband penetration but relatively lower overall fixed Internet penetration (*e.g.* Korea, Canada and Belgium). This may reflect consumer behaviour in response to price difference (*e.g.* the consolidation of multiple "free" dial-up subscriptions into single household broadband accounts) and technological changes (*e.g.* household adoption of wired and wireless networking, allowing shared access).

So rapid is the development of broadband that 15 million subscribers were added during the first half of 2004, more than 11 million of which were DSL connections (Table 5.7). By August 2004, there were more than 100 million broadband subscribers in the OECD. At the end of June 2004, 59% of broadband connections were *via* DSL and 35% *via* cable. On a per capita basis, Korea remains the clear leader in broadband access with almost 25 broadband connections per 100 inhabitants. Canada, Denmark, the Netherlands and Iceland were the other countries with more than 15 broadband subscribers per 100 inhabitants, and there were a total of twelve OECD countries with more than 10 per 100 inhabitants (Figure 5.6).

Figure 5.6. **Broadband access per 100 inhabitants, June 2004**



StatLink: http://dx.doi.org/10.1787/613067253121

Mobile Internet subscribers

Mobile Internet access refers to access primarily via mobile phone-based technologies. A related category is portable Internet access (*e.g. via* Wi-Fi) where users access the Internet with devices such as laptops or PDAs. The main difference between the two is the coverage of the service. A mobile Internet user can access the Internet wherever cellular mobile service is available. Portable Internet access has a more limited coverage and users need to be in a "hotspot" or local area covered by a fixed wireless provider to access the service. In some cases these areas can be extensive (*e.g.* city wide or rural area) but they do not have the near national coverage that many cellular networks provide. For the future the two are expected to converge with devices being enabled to access both services depending on the user's location and preference.

Data on the number of mobile Internet subscribers are difficult to compile, with reporting varying between countries and firms. The i-mode service is one subset of mobile Internet access that has been launched in a number of countries and has enjoyed rapid take-up. It is indicative of mobile Internet access developments.

NTT DoCoMo launched i-mode in Japan in 1999. In Europe, i-mode services were launched by E-Plus in Germany in March 2002. That was followed by the launch of services by KPN Mobile in the Netherlands, BASE in Belgium and Bouygues Telecom in France later that year. In Spain, Telefónica Móviles launched i-mode in June 2003, Wind of Italy did so in November 2003 and COSMOTE launched i-mode in Greece in June 2004 to coincide with the Olympic Games in Athens. A number of other carriers were scheduled to launch i-mode services during the second half of 2004 (*e.g.* Telstra was scheduled to launch a service in Australia in October 2004).

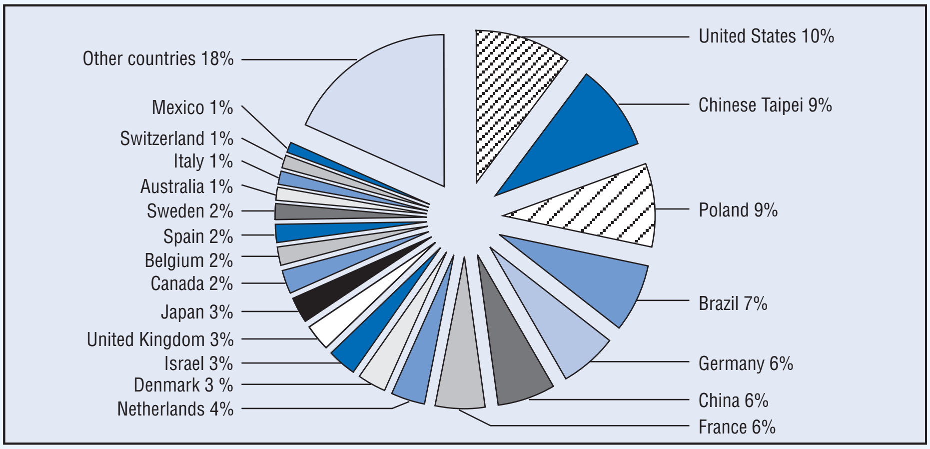
By June 2004, there were almost 45 million i-mode subscribers worldwide, of which almost 44 million were in OECD countries (Table 5.2). Growth of i-mode subscribers has been rapid, rising from just 3.1 million at the end of 1999 to 39.2 million at the end of 2003 – or by 88% per annum. In Japan, where i-mode services are most developed, other modes of mobile Internet access are also popular. From just 3 million in 1999 the number of

Box 5.1. **Voice over IP: Skype**

The development of broadband Internet access, as well as the use of innovative technologies such as advanced wireless systems (*e.g.* third generation mobile (3G) and wireless LANs), have triggered a shift in voice traffic from the traditional public switched telephone network (PSTN) to alternative Internet Protocol (IP) networks. While there is a variety of IP-enabled services, voice over IP (VoIP) is likely to be one of the more important. At present, the consumer VoIP market is not large, but it is expected to grow rapidly. Some industry analysts believe that 50% of the world's telephone traffic may be based on VoIP by 2006.

Skype is one of the many providers of VoIP that is experiencing rapid growth. Founded in August 2003, Skype reported 9.5 million users within a year, that it consistently had more than 500 000 people connected *via* Skype at any given moment, and that users had generated more than 1.2 billion minutes of traffic. In late 2004, Skype reported that 10% of their users were based in the United States, with a number of other OECD countries also featuring in their top 20 countries by user base (Figure 5.7).

Figure 5.7. **Distribution of Skype users, 2004**



Source: OECD, based on *news@dslprime.com*.

StatLink: http://dx.doi.org/10.1787/266358424531

Internet subscriptions from mobile phones in Japan increased to more than 70 million by mid-2004 (Figure 5.9). Operators in Japan and Korea have begun selling cellular mobile phones with a built-in smart card enabling subscribers to use their phones as credit cards which communicate with electronic scanners installed in retail outlets. Anticipating the use of mobile phones for e-commerce, GeoTrust recently announced a new secure socket layer (SSL) certificate product targeting the mobile commerce market. Such developments enable new applications and are likely to drive further growth in mobile Internet access.

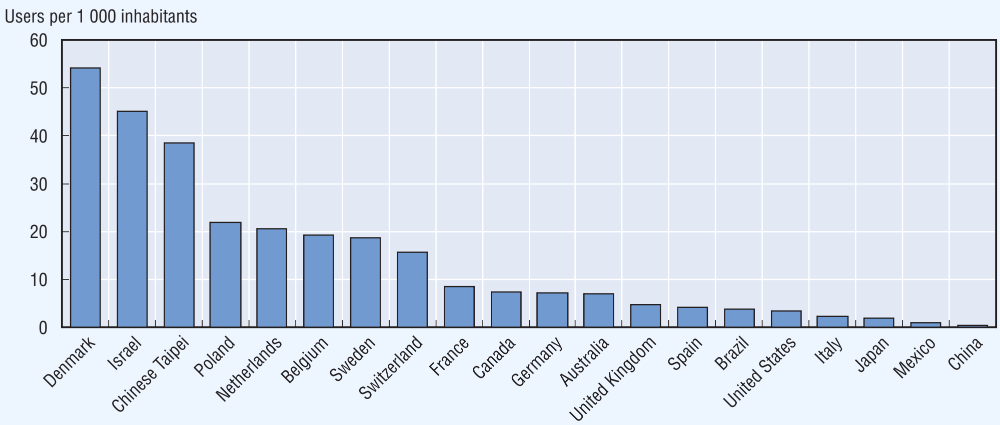
Mobile data revenue

Another indicator of the rapid adoption of mobile Internet services is the growth in data mobile revenues reported by carriers. Not all mobile carriers report data and voice revenue separately, and many of those that do include SMS and MMS messaging revenues with other mobile phone-based Internet revenues. In addition the revenue received by

Box 5.1. **Voice over IP: Skype** *(cont.)*

On a per capita basis, Denmark had the highest proportion of Skype users per 1 000 inhabitants among countries listed with the top 20 user base, with more than 50 Skype users per 1 000 population. Among other OECD countries: Poland, Netherlands, Belgium and Switzerland all had more than 15 users per 1 000 inhabitants (Figure 5.8). Other VoIP providers publishing subscriber numbers, as reported by ISP-Planet, in mid 2004 included: Callware with 997 000 subscribers worldwide, Vonage with 276 000, Optimum Voice (CableVision) with 115 000 and Charter with 31 000.

Figure 5.8. **Skype users per 1 000 inhabitants, 2004**

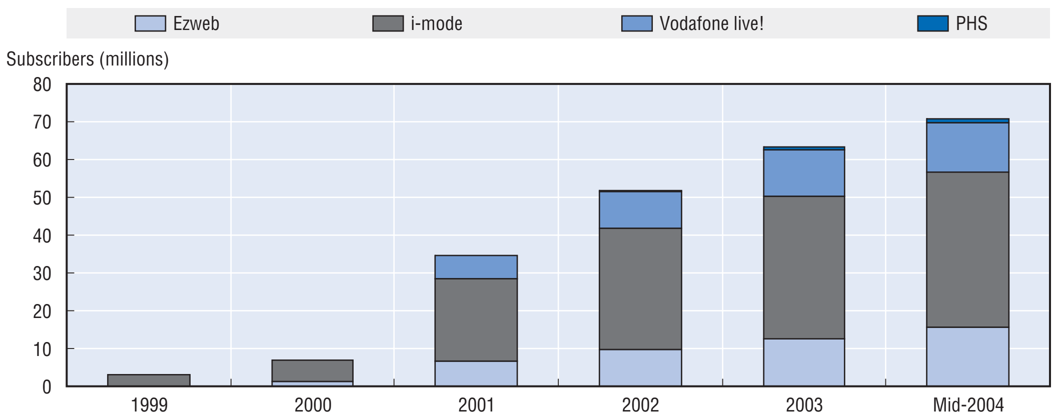


Source: OECD, based on *news@dslprime.com* and Skype (*www.skype.com*).

StatLink: http://dx.doi.org/10.1787/247887057428

Figure 5.9. **Mobile Internet services in Japan, 1999-2004**

Number of subscribers



Source: OECD. Compiled from company reports.

StatLink: http://dx.doi.org/10.1787/115656212180

operators from portable Internet access is reported together with that from mobile Internet access. Nevertheless, the limited mobile data available are indicative of market developments (Table 5.4).

T-Mobile reported a 37% increase in mobile data revenue between 2002 and 2003, with an increase of more than 330% in the United States, 46% in the Czech Republic, 35% in Austria and 27% in the United Kingdom. The increase in the United States is worthy of note. In that country T-Mobile has been among the most active in rolling out wireless hotspots. Towards the close of 2004, T-Mobile offered wireless (Wi-Fi) Internet access in around 5 000 locations across the United States in places like coffeehouses, book stores, hotels and airports. In addition, for the first time, handhelds became available that could act as both mobile telephones and PDAs in these locations.

Similarly, Vodafone reported a 24% increase in mobile data revenue during the year, with increases of 44% across Southern Europe and 23% across Northern Europe. A 21% increase in mobile data revenue during 2003 was reported by O2, with increases of 75% in Ireland, 44% in Germany and 27% in the United Kingdom. As a result of this growth, mobile data revenues now regularly account for more than 20% of all revenue from mobile services. Much of this is due to increasing SMS and MMS traffic (Table 5.5), but mobile Internet connections, and portable Internet access, also play an important part.

Leased line Internet connections

Few comparable data are available on the penetration and use of leased lines to access the Internet. Some telecommunications carriers and regulators report the number of leased lines by company or country, but generally do so without indicating the proportion used for providing permanent local access connections to the Internet. An alternative is to examine Netcraft's leased line survey, which uses the same methodology across countries. It should be noted, however, that some DSL connections may be reported as leased line connections in the Netcraft data. This can occur when a user has a statically allocated IP address, which Netcraft counts as a permanent connection because it has the same characteristics as a leased line connection. However, the vast majority of residential and many business DSL connections use dynamically assigned IP addresses, so potential double counting should be limited and the Netcraft survey results can be taken to be indicative of the development of leased line access networks. In addition, the use of symmetrical DSL as a substitute for leased lines is increasing.

Data are available for those countries that are the largest leased line users, meaning that not all OECD countries are included. Nevertheless, the seventeen OECD countries, for which data are available, increased their total number of leased line connections to the Internet from 266 791 at the end of 2000 to 333 283 by the end of 2001. Worldwide, leased line connections increased from 295 962 to 374 124 over the same period. By June 2004, leased line connections worldwide had increased to 398 327. However, as other broadband access alternatives have become more readily available (*e.g.* cable and DSL), the number of leased line connections in this selection of OECD countries has declined (Table 5.8). Some countries (*e.g.* Korea, Belgium, United Kingdom, Japan and Netherlands) have experienced substantial decreases in the number of leased line Internet connections since the end of 2001. A further factor, other than substitution by DSL, is that Netcraft has become more adept at excluding DSL connections in this survey.

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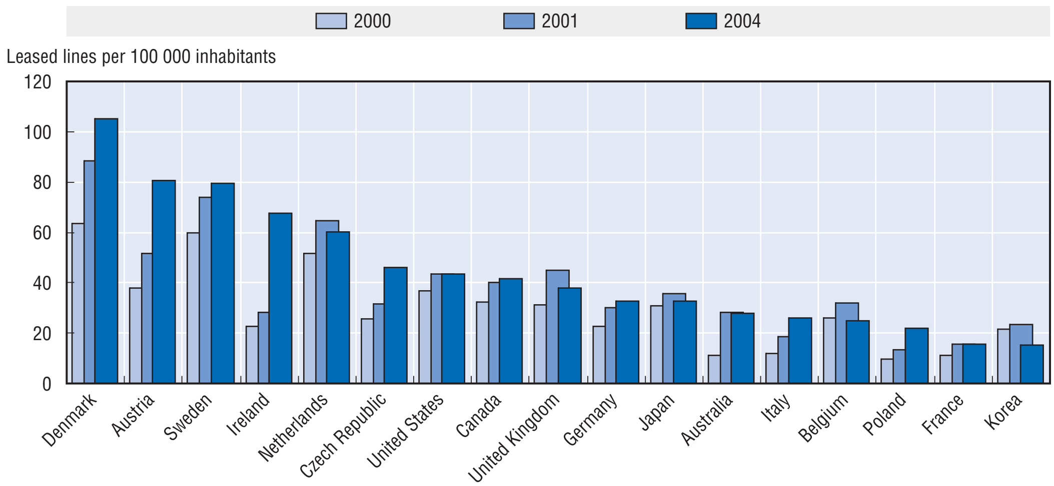
Figure 5.10. **Leased lines connect to Internet per 100 000 inhabitants, 2000-2004**



Source: OECD, based on Netcraft surveys (*www.netcraft.com*). *StatLink:* http://dx.doi.org/10.1787/411700416162

On a per capita basis, Denmark had the highest penetration of leased line Internet connections in June 2004, with more than 100 per 100 000 inhabitants (Figure 5.10). Other countries with relatively high levels of leased line Internet connection at that time included: Austria, Sweden, Ireland and the Netherlands.

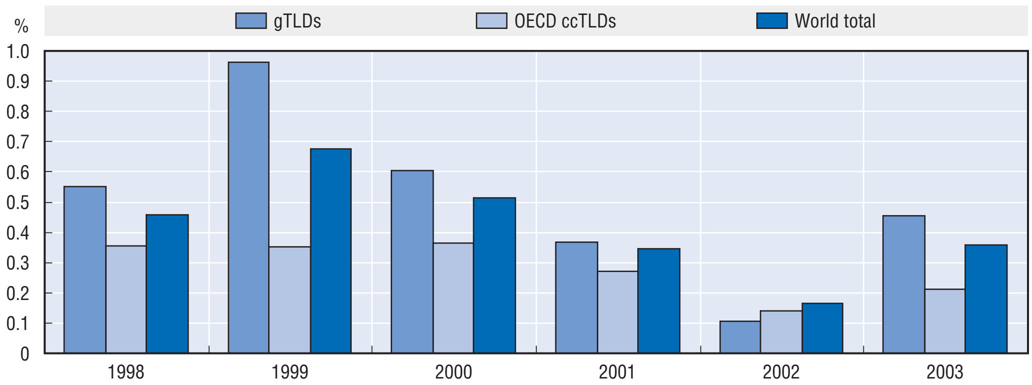
Internet hosts

The number of Internet hosts has been one of the more commonly used indicators of Internet development. A host is a domain name that has an IP address associated with it. This includes any computer or device connected to the Internet *via* full or part-time, direct or dial-up connection. In the past, a host used to be a single machine on the net, but with the development of virtual hosting, where a single machine acts like multiple systems and has multiple domain names and IP addresses, no longer are hosts necessarily individual devices. Nevertheless, the number of hosts is indicative of the extent of Internet growth. Sometimes host devices are not accessible to automated surveying techniques because of security firewalls. Consequently, host counts tend to on the low side and should be seen as an indicator of the minimum size of the Internet. Moreover, it should be noted that with recent increased concern over security it is likely that comparisons of historical and more recent data will somewhat understate growth in the number of hosts as more firewalls are installed. It should also be remembered that there is no necessary correlation between a host's domain name and its physical location. Indeed, remote and virtual hosting are increasingly breaking the link between country code domains, hosts and their physical location.

In January 2004, there were 233 million hosts connected to the Internet worldwide, up from less than 30 million in January 1998 (Table 5.9). More than 150 million of the hosts found in January 2004 were under generic domains (gTLDs), of which more than 100 million were under **.net** and 49 million under **.com**. There were 64 million hosts connected under OECD country-related country code domains (ccTLDs) in January 2004. The largest OECD country code domain (ccTLD) at that time was **.jp** (Japan) with almost

Figure 5.11. **Annual growth in Internet hosts, 1998-2003**

Percentage



Source: OECD, based on Internet Software Consortium Surveys (*www.isc.org/*).

StatLink: http://dx.doi.org/10.1787/124454568436

13 million hosts. There were just 1.76 million hosts under the **.us** domain, but there were 11.4 million under the various United States-related domains (**.us**, **.edu**., **.mil**, **.gov**) combined. Other large ccTLDs included: **.it** (Italy) with 5.5 million hosts, **.uk** (United Kingdom) 3.7 million, **.de** and **.nl** (Germany and Netherlands) 3.4 million, **.ca** (Canada) 3.2 million and **.au** (Australia) 2.8 million.

The total number of hosts worldwide increased 41% per annum between 1998 and 2004, with those under gTLDs increasing 49% per annum and those under OECD-related ccTLDs increasing 28% per annum. The connection of hosts appears to have been affected by the "dot com" phenomenon, with year-on-year growth in the number of hosts somewhat lower during 2001 and 2002 than was the case during 1999 and 2000 (Figure 5.11). The visibility of hosts to Internet Systems Consortium surveys may also have been affected by increased Internet security. Nevertheless, growth in the number of hosts was higher during 2003 than during the previous two years, suggesting a return to strong growth.

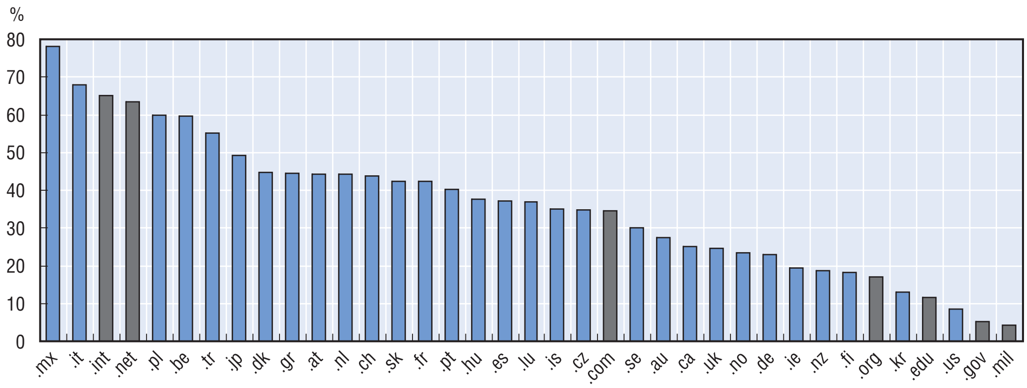
Among OECD-related ccTLDs, **.mx** (Mexico) experienced the fastest growth, with hosts increasing by 78% per annum over the period. Other OECD-related ccTLDs experiencing strong growth in the number of hosts included: **.it** (Italy), **.pl** (Poland), **.be** (Belgium), **.tr** (Turkey) and **.jp** (Japan). A wide range of growth is evident across domains (Figure 5.12).

Secure servers

Netscape developed the secure socket layer (SSL) protocol for encrypted transmission over TCI/IP networks. The most common use of SSL is to provide a secure end-to-end link for e-commerce transactions, with major e-commerce uses of secure server software including encrypted credit card transactions in payment applications and restricted access to privileged information both within and between organisations. Hence, Netcraft's SSL surveys provide one of the best indicators of the growth and diffusion of a major platform used for e-commerce. A change in survey methodology in October 2001 introduced a somewhat stricter definition for authenticated sites. Hence, comparing surveys over the period 1998 to 2004 may somewhat understate growth. Also, as e-commerce transactions are increasingly handled by other security technologies, Netscraft's SSL data may understate the growth of Internet commerce. As an example, a number of companies in

Figure 5.12. **Average annual growth in Internet hosts by domain, 1998-2004**

Percentage



Source: OECD, based on Internet Software Consortium Surveys (*www.isc.org*).

StatLink: http://dx.doi.org/10.1787/215220688168

Korea are using an SSL-equivalent technology developed in that country resulting in an underestimation of e-commerce activity.

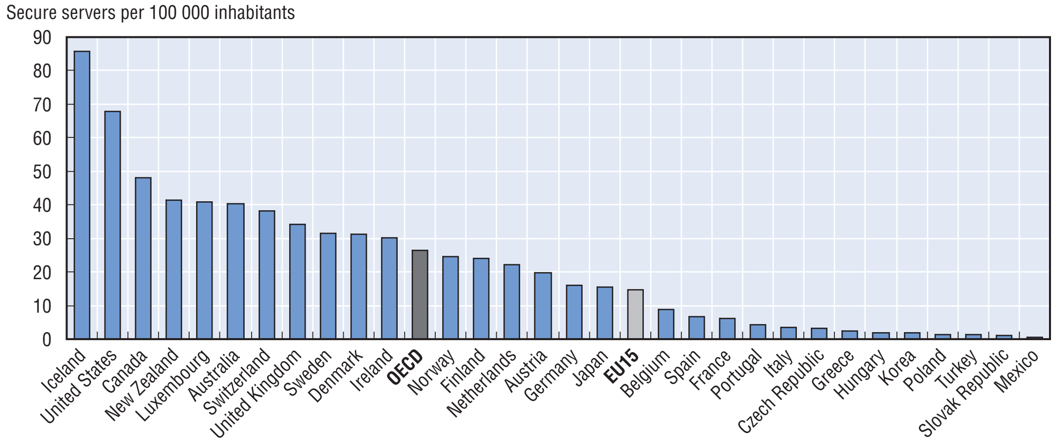
In July 2004, the Netcraft survey found 324 816 secure servers worldwide, of which 94% (305 939) were in OECD countries (Table 5.10). Almost 200 000 secure servers were located in the United States, compared with approximately 20 000 in the United Kingdom and Japan, 15 000 in Canada and 13 000 in Germany. The total number of secure servers worldwide increased by almost 59% per annum between July 1998 and July 2004, while the number of secure servers located in OECD countries increased by 58% per annum and those in EU15 countries by 68% per annum. Among OECD countries, those experiencing faster growth in secure servers included: Turkey, Japan, Denmark, Greece, the United Kingdom and the Netherlands. Below OECD average growth was experienced in the Slovak Republic, Hungary, Spain, Italy, Australia and the United States. Growth in the number of secure servers slowed somewhat during 2001 and 2002, but stronger growth returned during 2003.

There were almost 27 secure servers per 100 000 inhabitants across OECD countries in July 2004, up from 1.8 per 100 000 in July 1998. Countries with higher levels of penetration included: Iceland (86 per 100 000 inhabitants), United States (68), Canada (48), New Zealand (41), Luxembourg and Australia (40). A wide range of adoption levels is apparent, with six OECD countries having more than 40 secure servers per 100 000 inhabitants in July 2004, while thirteen countries had fewer than 10 per 100 000 inhabitants (Figure 5.13).

Links to secure servers

Another indicator of the level of development of e-commerce is the number of hypertext links that point from each domain to secure servers. It is not possible to produce a perfect count, but it is possible to use search engines, such as Google, to count the number of links under country code and generic top level domains that contain references to secure socket layer servers (*i.e.* https) in the URL. This is imperfect, because in addition to direct links to secure servers such counts will include some pages discussing the topic of secure socket layer servers that have "https" embedded within the URL. Nevertheless, such a count is indicative of the use of, and interest in secure servers, and the level of use of secure transactions for e-commerce.

Figure 5.13. **Secure servers per 100 000 inhabitants, July 2004**



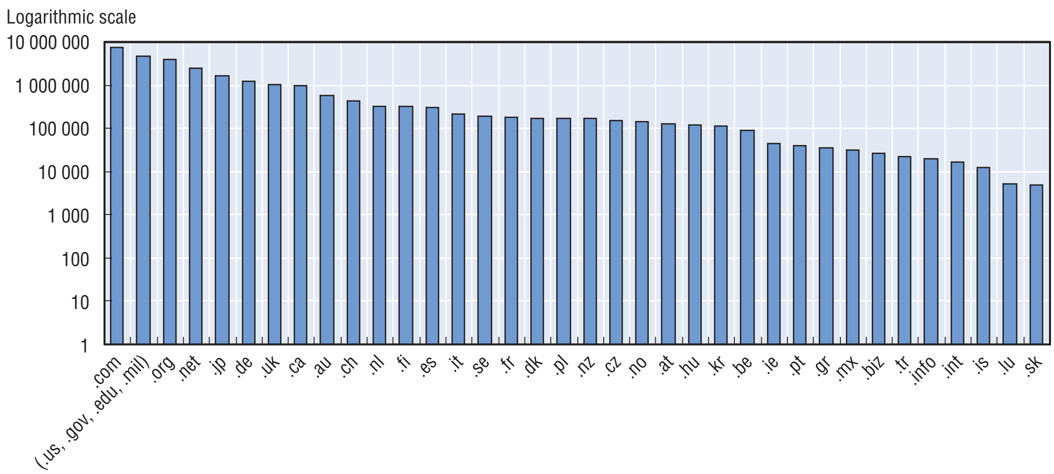
Source: OECD, based on Netcraft SSL surveys (*www.netcraft.com*).

StatLink: http://dx.doi.org/10.1787/825651076202

References to secure servers by domain

In September 2004, Google reported more than 21 million URL references to secure socket layer servers. This compares with around 2.8 million such links found in a similar sample taken in July 2000, and almost 7.4 million in August 2002. More than 13.5 million were under OECD country code top level domains (ccTLDs). As might be expected, the **.com** domain contained by far the largest number of reported references to secure socket layer servers of any domain, with almost 7.6 million references. The combined United States-related domains (**.us**, **.edu**, **.gov** and **.mil**) contained almost 4.7 million and the generic domains **.org** and **.net** contained 3.9 and 2.4 million, respectively. Other domains with a relatively large number of references to secure socket layer servers included: **.jp** (Japan), **.de** (Germany), **.uk** (United Kingdom) and **.ca** (Canada) (Table 5.11).

Figure 5.14. **References to secure servers by domain, September 2004**



Note: Sample taken using Google, September 2004.

StatLink: http://dx.doi.org/10.1787/784740337632

Those domains with the fastest growth in the number of references to secure socket layer servers between August 2002 and September 2004 included: **.ie** (Ireland), **.int** (international), **.be** (Belgium), **.dk** (Denmark), **.gov** (government), **.ca** (Canada) and **.gr** (Greece). Major gTLD domains experienced a 100% per annum increase in the number of references to secure servers, while OECD country-related ccTLDs experienced a 137% per annum growth.

References to secure servers by country

It is also possible to count references to secure socket layer servers by country, rather than domain, based on ISP allocations of IP address blocks. Again, the count is imperfect, both for the reasons noted above and because ISPs operating in multiple countries may use their allocated IP addresses outside their home country. Nevertheless, a count of references to secure socket layer servers can be taken as indicative of the use of and interest in the use of SSL for e-commerce on a national basis.

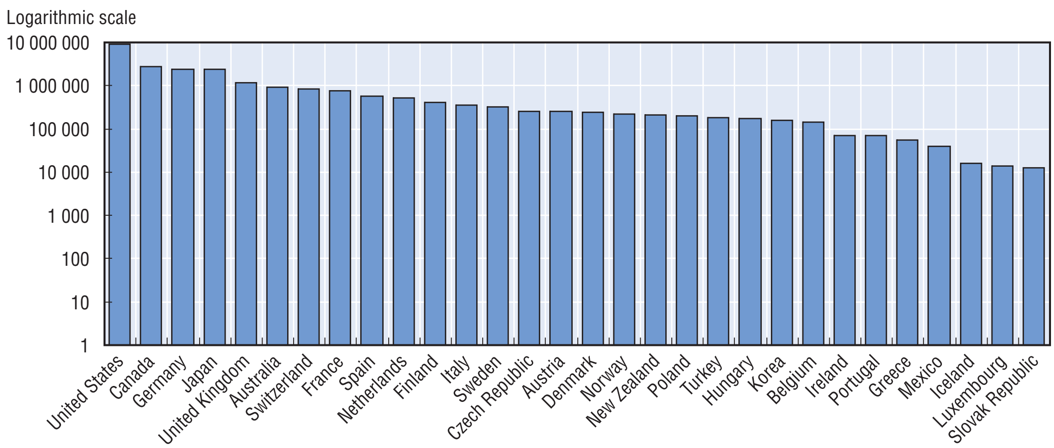
A sample taken in September 2004 reported almost 25 million references to SSL servers in OECD countries. This compares with 4.8 million reported from a similar sampling taken in August 2002, an increase of 127% per annum (Table 5.12). The largest number of references found related to the United States (9 million), with Canada (2.7 million), Germany and Japan (2.4 million) and the United Kingdom (1.2 million) among other countries showing a large number of references to secure servers (Figure 5.15).

On a per capita basis, Switzerland had the most references to secure servers, followed by Canada and Finland (Figure 5.16). By contrast, there was less than one reference found per 100 inhabitants in Mexico, the Slovak Republic, Turkey, Korea, Greece, Poland, Italy and Portugal.

E-commerce access and supply

Internet subscribers are one of the main indicators of connectivity to the Internet. Secure servers represent one infrastructure used to conduct secure electronic transactions, and imply the provision of content for sale and/or the conduct of commercial transactions. Together, they can be seen as indicators of e-commerce access and supply.

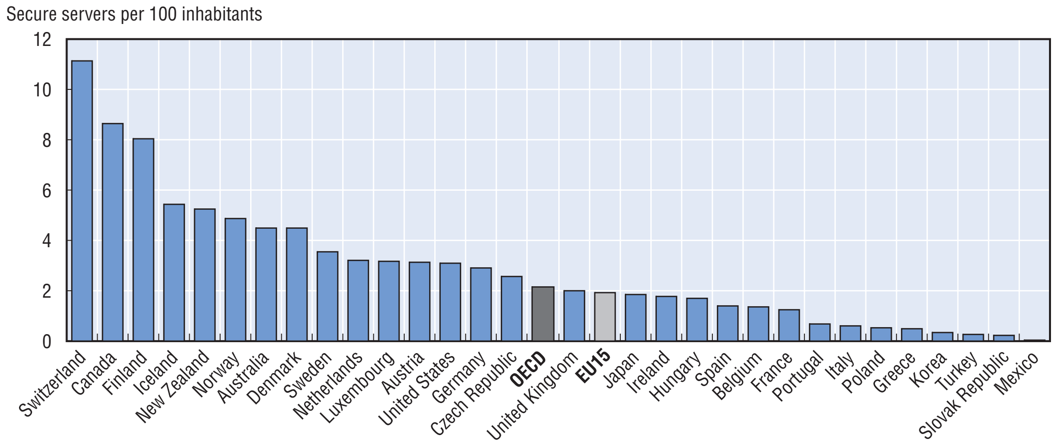
Figure 5.15. **References to secure servers by country, September 2004**



Note: Sample taken using Google, September 2004.

StatLink: http://dx.doi.org/10.1787/404272525775

Figure 5.16. **References to secure servers per 100 inhabitants, September 2004**



Note: Sample taken using Google, September 2004. Population refers to 2003.

StatLink: http://dx.doi.org/10.1787/808113854427

Hence a scatter plot of Internet subscribers and secure servers can show something of the distribution of e-commerce access and supply – the demand side and supply side of Internet-based commercial content and commerce.

Countries which rank high on both scales (subscribers and secure servers) are likely to be the most active in e-commerce. These include: Iceland, the United States, Canada, Denmark, the Netherlands and Switzerland (Figure 5.18). Countries that rank high in terms of subscribers, but lower on secure servers are likely to have active e-commerce access but lower levels of domestic supply using SSL. Those countries that rank highly in terms of secure servers, but lower on subscribers are likely to be more active online suppliers using SSL but have somewhat less developed access. Those countries below the OECD average on both scales are the slower e-commerce adopters, with lower levels of both connectedness and e-commerce infrastructure per inhabitant. As well as Turkey, Mexico, the Slovak Republic, Poland, Greece and Hungary, such countries as France, Belgium, Spain and Italy also fall into this category. The result for Portugal is influenced by the inclusion of "free" Internet access accounts and is less directly comparable.

Domain names

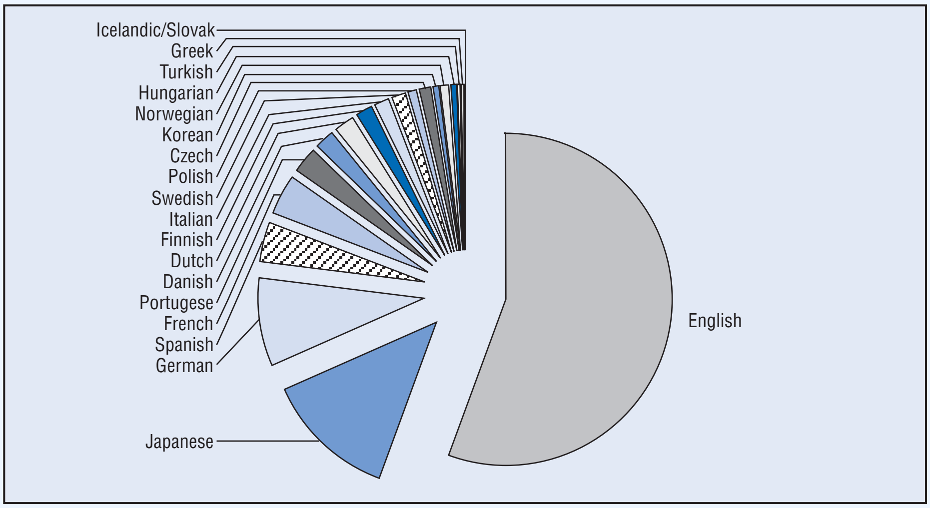
The domain name system (DNS) translates Internet addresses back and forth between domain names and IP addresses, which are numbers. Whereas an IP address is a number, similar to a telephone number, a domain name is a directory listing similar to the way a businesses' name is listed in the telephone book. Domain names enable users to find and refer to a person or organisation in a way that is easily recognisable, and allow businesses to use recognised business and brand names in the online world. The registration of domain names indicates interest in adopting a web presence, and is one indicator of the development of the Internet.

In mid-2004, there were more than 64 million domain names registered worldwide, of which 40 million were registered under major gTLDs and 21 million under OECD-related country code top level domains (ccTLDs). Since mid-2000, the number of registered domain names has increased by around 19% per annum, with faster growth in OECD-related ccTLD

Box 5.2. **The language of e-commerce**

English continues to be the most commonly used language on the Net. In September 2004, a sample taken using the Google search engine reported 21.3 million secure socket layer server link references (*i.e.* pages with "https" in the URL), of which 16.8 million were in the 20 most widely used languages in OECD countries – the remainder being pages in other languages or pages with no discernable language. Of those pages in the 20 most widely used languages, more than 9.3 million or 56% were in English. The other major languages represented in the sample included: Japanese (13%), German (8.7%), Spanish (3.9%) and French (3.8%). A similar sample taken in August 2002 showed similar overall language shares. However, growth in secure server page links over the last two years has been highest among those pages in Greek, Danish, Norwegian, Korean, Polish and Dutch, and relatively slower among those in Turkish, Czech and Spanish. Thus, while English is still the dominant language of e-commerce, there is increasing development of content and access in other languages.

Figure 5.17. **References to secure servers by language, September 2004**

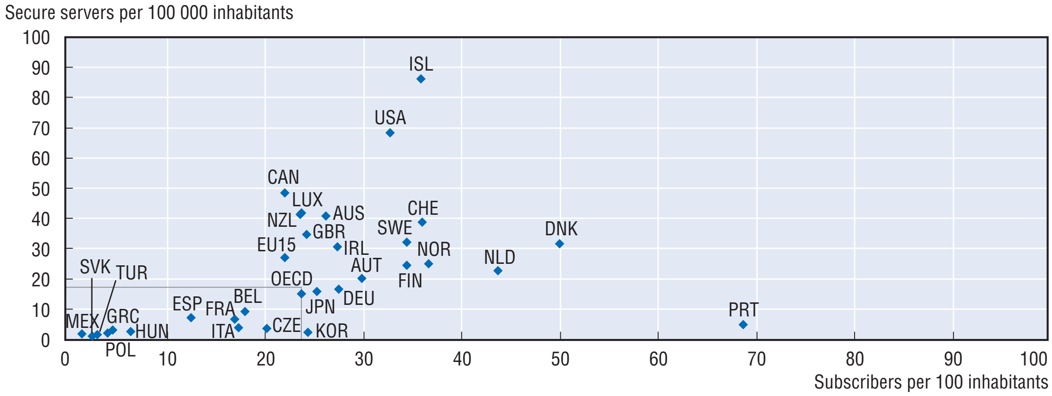


StatLink: http://dx.doi.org/10.1787/561317758551

registrations than gTLD registrations (Table 5.13). After slowing, domain name registration rates have now returned to the higher levels experienced in the late 1990s, with more than 17 million new registrations during 2003 compared with less than 14 million during 2001.

The differences in the magnitude of registrations under each gTLD and ccTLD are related to a number of factors. For ccTLDs the historical factors involved include the pace of Internet development in any given country. In addition, some ccTLDs are regarded as being more open in the conditions they apply to the registration of domain names. For example, **.de**, which is the ccTLD corresponding to Germany, has a relatively open policy for its registration. As a result, **.de** had 7.8 million registrations by mid-2004, which is the largest number of registrations among OECD ccTLDs. Other relatively large OECD-related ccTLDs included: **.uk** (United Kingdom) with 4.8 million registered names, and **.nl** (Netherlands) with more than 1 million. These compare with more than 30 million

Figure 5.18. **Internet subscribers and secure servers (access and supply)**



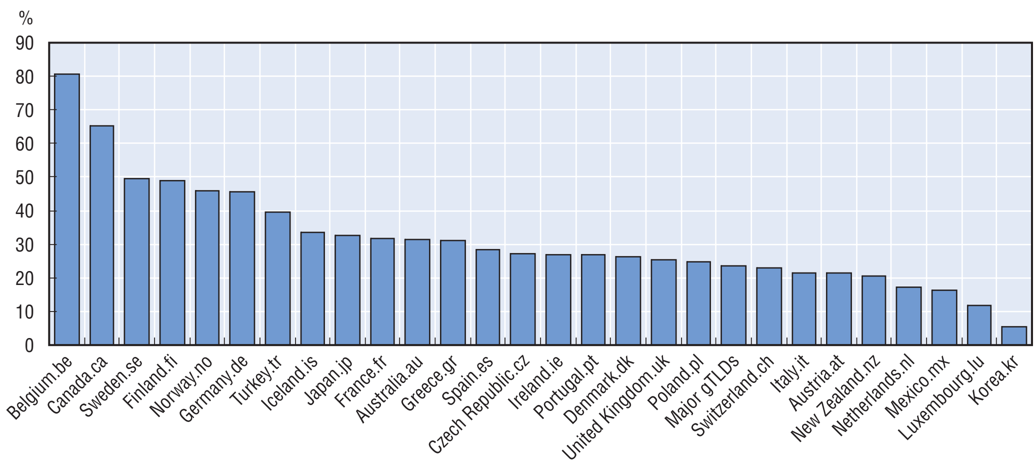
StatLink: http://dx.doi.org/10.1787/123412170156

registered names under the most widely used gTLD (**.com**). Among those domains for which data are available, those OECD-related ccTLDs experiencing above average growth in domain name registrations over the period from mid-2000 to mid-2004 included those related to Belgium, Canada, Sweden, Finland, Norway and Germany (Figure 5.19).

OECD country-related ccTLDs accounted for 33% of all worldwide domain name registrations in mid-2004, within which **.de** (Germany) accounted for 12% and **.uk** (United Kingdom) accounted for 7.4%. On a per capita basis, the highest number of registrations under ccTLDs was in **.dk** (Denmark), **.de** (Germany), **.ch** (Switzerland), **.uk** (United Kingdom) and **.nl** (Netherlands) (Figure 5.20). The position of countries is not an indicator of relative performance. Some ccTLDs limit registrations to users with a presence in that country and limit the number of registrations per entity. These practices are designed to limit speculation or cyber-squatting, or to give the ccTLD a distinctive national presence, rather than trying to maximise the number of registrations. Historically, some ccTLDs had

Figure 5.19. **Annual growth in domain name registrations by domain, 2000-2004**

Percentage



Note: As at mid-year or nearest available data point. No data are available for Hungary (**.hu**), Slovak Republic (**.sk**) and United States (**.us**).

StatLink: http://dx.doi.org/10.1787/361328416412

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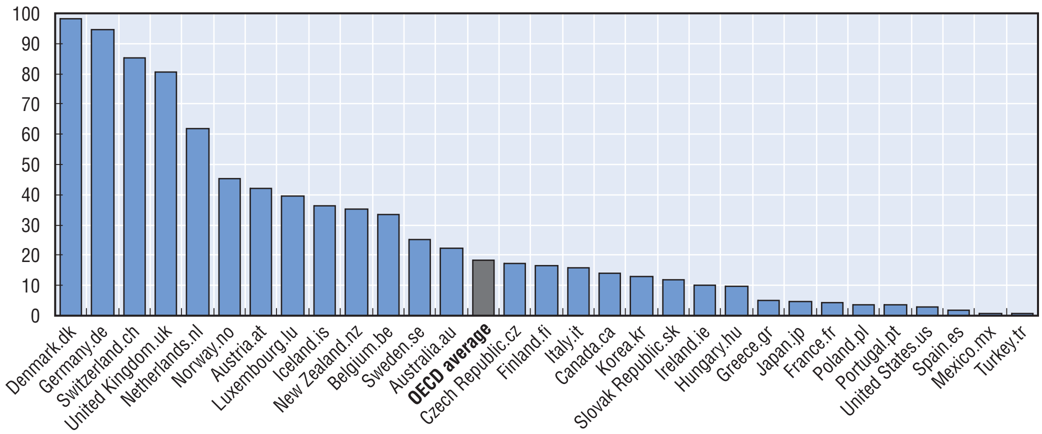
Figure 5.20. **OECD country-related ccTLD registrations per 1 000 inhabitants, September 2004**



Note: As at mid-year or nearest available data point. Data for the United States relate to **.us** only and do not include **.gov**, **.mil** or **.edu**.

StatLink: http://dx.doi.org/10.1787/765150745264

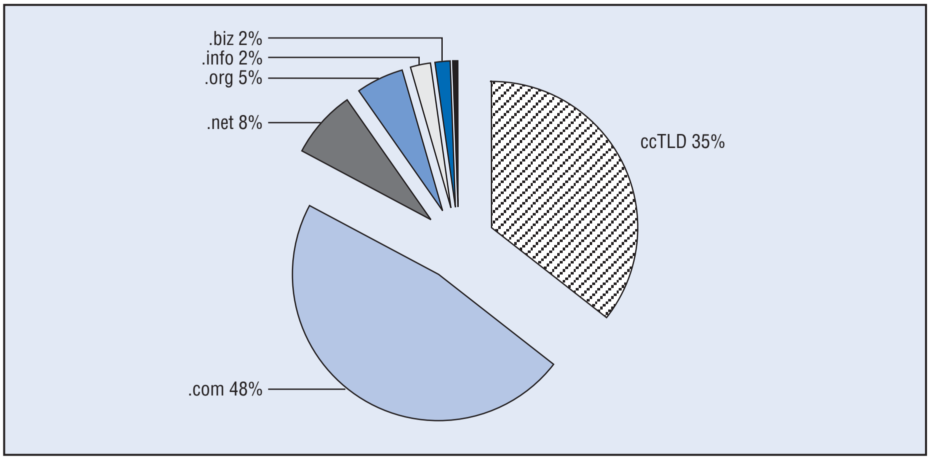
policies that meant users simply preferred gTLDs. Business users may also have preferred gTLDs because they project an international image.

Limited data are available on the geographic distribution of domain names. It can be assumed that users adopting ccTLDs are either based in the related country or seek to reflect a presence there. Users that adopt gTLDs can be anywhere, and the related Web site and content, if any, may or may not be co-located with the user. WebhostingInfo (*www.webhosting.info*) publishes geographic gTLD registrations according to the location of the hosting company. Table 5.14 shows the number of domain name registrations under related ccTLDs and major gTLDs by registry location for OECD countries. The country distribution of domains published by WebhostingInfo represents the country of purchase rather than the country of registrant. For example, a user in Australia may choose a hosting company in the United Kingdom, and the servers may actually be in the United States. There could be three countries involved: the country of the domain registrant, the country of the hosting company, and the country of the data centre. Herein, reference is to country of the hosting company.

Across the OECD, 35% of registrations were under country-related ccTLDs and 65% under gTLDs, of which 48% were under **.com**, 8% under **.net**, 5% under **.org** and 2% under **.info** and **.biz** in September 2004 (Figure 5.21). However, these shares varied considerably from country to country. For example, **.us** accounted for only 3% of US-related registrations. Other countries with relatively high proportions of gTLD registrations included Spain, France, Turkey, Canada and Australia, in all of which gTLD registrations accounted for more than 60% of all country-related registrations. Conversely, ccTLD registrations accounted for more than 70% of all country-related registrations in the Slovak Republic, Hungary, Switzerland, Belgium, New Zealand, the Czech Republic, Greece, Germany, Denmark, the Netherlands and Poland (Figure 5.22).

Combining ccTLDs and country-related registrations under major gTLDs reveals that, on a per capita basis, Denmark (136 per 1 000 inhabitants), Germany (127), the United Kingdom (116), Switzerland (103), the United States (92) and the Netherlands (87) had the

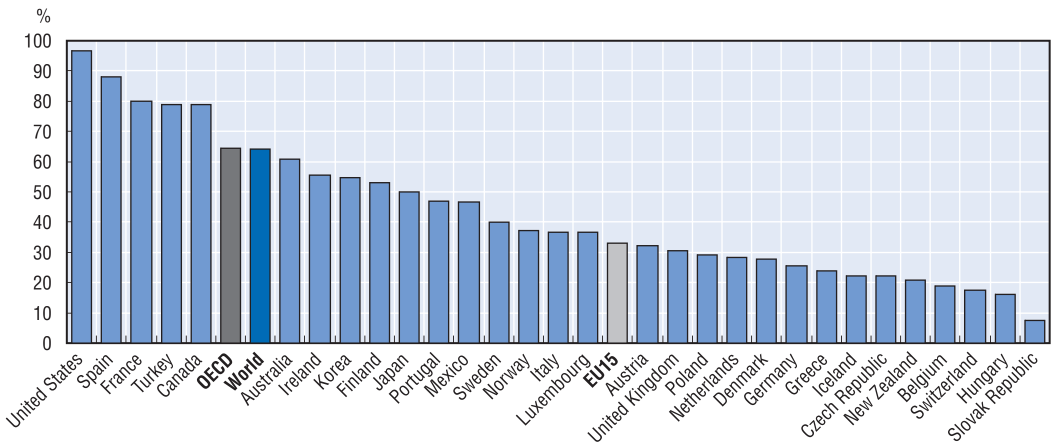
Figure 5.21. **Shares of OECD country-related domain name registrations under ccTLDs and major gTLDs, September 2004**



Source: OECD, compiled from country and generic NICs and WebhostingInfo (*www.webhosting.info*).

StatLink: http://dx.doi.org/10.1787/056120716708

Figure 5.22. **Shares of gTLDs in OECD country-related domain name registrations, September 2004**



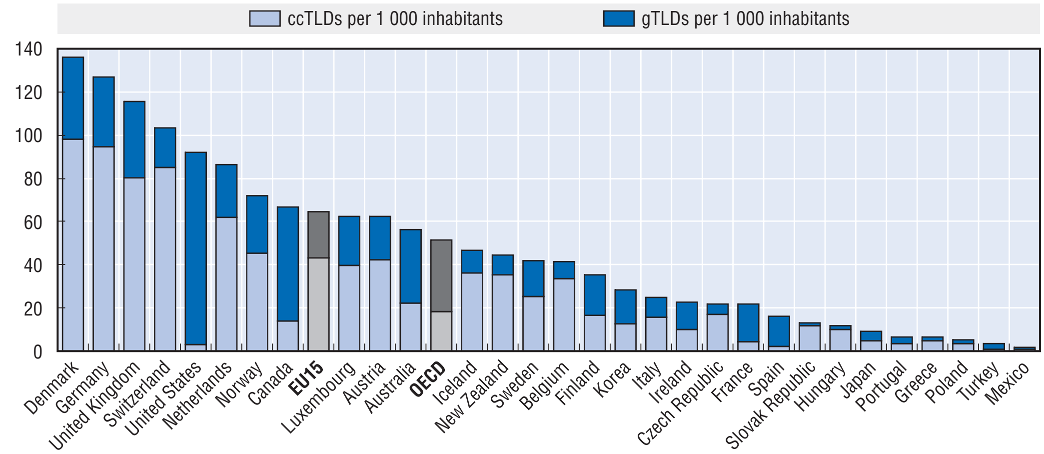
Source: OECD, compiled from country and generic NICs and WebhostingInfo (*www.webhosting.info*).

StatLink: http://dx.doi.org/10.1787/667542104033

highest number of domain names registered in September 2004. The average across OECD countries was 52 per 1 000 inhabitants (Figure 5.23). Domain name registrations were significantly lower in Mexico, Turkey, Poland, Greece, Portugal and Japan.

Data on the geographical distribution of registrations under the new unsponsored gTLDs (**.info**, **.biz** and **.name**) are made publicly available by ICANN. These data are reported by country of the registrant. At the end of 2003, some 91% of these registrations, under new unsponsored gTLDs, were made by users in OECD countries (Table 5.15). At that time, the largest number of registrations had been made by users from the United States, followed by Germany and the United Kingdom. On a per capita basis the new unsponsored

Figure 5.23. **Domain name registrations per 1 000 inhabitants, September 2004**



Source: OECD, compiled from country and generic NICs and WebhostingInfo (*www.webhosting.info*).

StatLink: http://dx.doi.org/10.1787/484380488655

gTLDs have proven most popular in Switzerland (Figure 5.25). Next, in order of the greatest number of registrations per 1 000 inhabitants, were Germany, the Netherlands and Austria, followed by the United States and Sweden. By contrast, relatively little use of new unsponsored gTLDs was being made by users in Greece, Japan, Portugal, the Slovak Republic, Poland, Hungary, Turkey or Mexico.

Regional Internet development

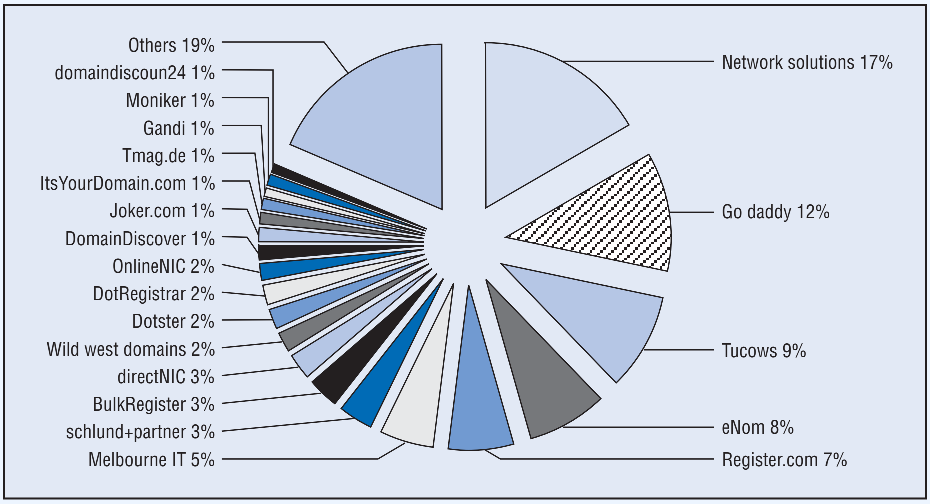
Tracking address space allocations reveals a good deal about the growth and regional development of the Internet. Internet address space allocation is handled by National Internet Registries operating under Regional Internet Registries, namely: ARIN (North America), RIPE NCC (Europe), APNIC (Asia-Pacific), LACNIC (Latin America and Caribbean) and AfriNIC (Africa). These registries coordinate Internet address allocation for their regions. APNIC collects data, which provide a picture of the growth and regional distribution of Internet activity. APNIC's statistics are drawn from the Internet Protocol version 4 (IPv4) routing table of the APNIC router located at WIDE in Japan (AS 4777). Because of the use of routing aggregation the Internet looks somewhat different from different routers. Nevertheless, these data give an overview of the regional development. To date, there has been limited allocation of IPv6 address space. As of August 2004, RIPE NCC had made 765 IPv6 allocations, APNIC 169, ARIN 120 and LACNIC just six. Hence, IPv4 allocations still provide a reasonable overview of the regional development of the Internet.

On 31 August 2004, there were 145 818 routes being announced (*i.e.* entries in the APNIC routing table). Globally, an average of 36% of the publicly available IPv4 Internet address space was being announced. Address space refers to public IPv4 address ranges. Allocated address space is address space that is distributed to Internet Registries (IRs) or other organisations for the purpose of subsequent distribution by them. Assigned address space is address space that is delegated to an Internet Service Provider (ISP) or end-user, for use within the Internet infrastructure they operate. Of the IPv4 Internet address space that has been allocated to Internet Registries, an average of 58% was being advertised (*i.e.* made available for public access). An average of 72% of the IP address space allocated to the Asia-Pacific through APNIC

Box 5.3. **Domain name registrars' market share, September 2004**

gTLD registries perform back-office functions and provide services to registrars. Registrars, in turn, provide services to users. Following reforms introduced by ICANN, new registrars have rapidly gained market shares. Nevertheless, the market is still relatively concentrated. In September 2004, the top 20 gTLD registrars accounted for around 80% of the market and the top four for 45%. The largest registrar, Network Solutions, accounted for 16.5% of the gTLD registration market, Go Daddy for 12% and Tucows for 9.5%. Go Daddy, Domainsite.com, domaindiscount24 and ItsYourDomain.com were among the fastest growing registrars at that time.

Figure 5.24. **Domain name registrars' market share, September 2004**



Source: OECD, compiled from country and generic NICs and WebhostingInfo (*www.webhosting.info*).

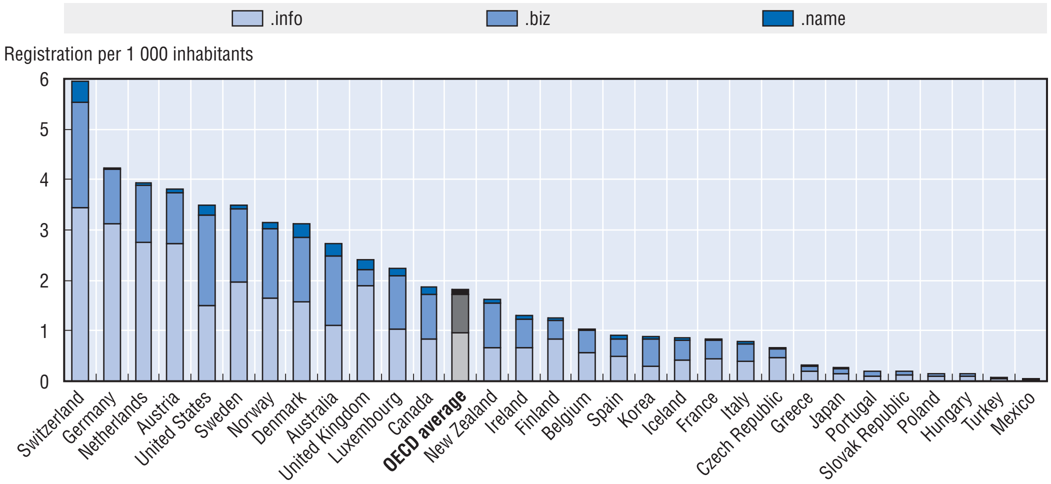
StatLink: http://dx.doi.org/10.1787/574860758373

was being advertised on Internet at the end of August 2004, as was 69% of the IP address space allocated to North America through ARIN, 60% of the IP address space allocated to Europe through RIPE NCC, 47% of the IP address space allocated to Latin America through LACNIC and 12% of the IP address space allocated to Africa through AfriNIC.

Autonomous Systems Numbers (ASNs) identify Autonomous Systems (ASes), which are groupings of IP connected networks that share a common routing policy. In practice, ASNs and ASes refer to major networks, such as large international Internet Service Providers (ISPs). Globally, there was 15 589 ASes originating routes and 2 370 advertising transit routes at the end of August 2004. Indicative of relative concentration, some 7 262 ASes (47%) were advertising just one route.

The share of total routes announced by regional ASes at any given time provides a snapshot of the regional development of the Internet (Figure 5.26). The largest regional share of routes announced on 31 August 2004 was North America (ARIN), with 83 427 routes announced – or 57% of all routes announced to Internet at that time. Asia-Pacific (APNIC) originating ASes advertised 27 967 routes (19% of all Internet routes being announced at that time), Europe (RIPE NCC) originating ASes advertised 26 797 routes

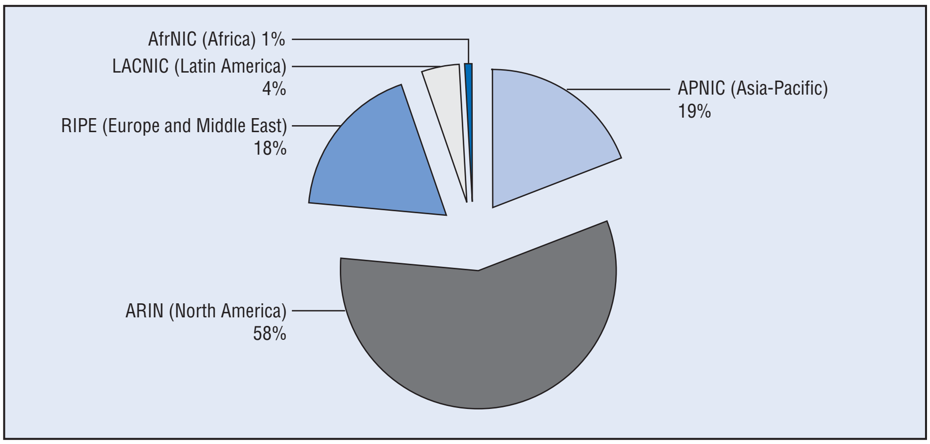
Figure 5.25. **Number of registrations per 1 000 inhabitants under new unsponsored gTLDs in OECD, December 2003**



Source: OECD, based on monthly registry reports.

StatLink: http://dx.doi.org/10.1787/510715627512

Figure 5.26. **Regional share of routes announced to the Internet, August 2004**



Source: OECD, compiled from APNIC statistics (*www.apnic.net/*).

StatLink: http://dx.doi.org/10.1787/063011038128

(18%), Latin America (LACNIC) originating ASes advertised 6 322 routes (4.3%) and Africa (AfriNIC) originating ASes advertised 1 229 routes (less than 1%).

Other regional characteristics that could be observed at the end of August 2004 included:

- *Connecting networks.* North America (ARIN) showed the largest share of networks originating routes (*i.e.* connecting networks to the Internet) at 9 510, or 61% of the total of networks originating routes at that time. Europe (RIPE NCC) showed 5 777 or 37% of total, Asia-Pacific (APNIC) 2 124 or 14% of the total, Latin America (LACNIC) showed 387 and Africa (AfriNIC) 91.

- *International transit.* Europe (RIPE NCC) showed a somewhat higher relative share of international transit providers, at 42% of the total global transit ASes at the end of August 2004 – reflecting the geography of the region. North America (ARIN) accounted for 39% of total, Asia-Pacific (APNIC) for 14%, Latin America (LACNIC) for 3.2% and Africa (AfriNIC) for less than 1%.
- *Local ISPs.* 47% of the ASes advertising just one route were doing so from North America (ARIN). Forty-three per cent of networks advertising just one route on 31 August 2004 were doing so from Europe through RIPE NCC, 8.6% through APNIC in the Asia-Pacific, 1.6% through LANIC in Latin America and just 0.3% were doing so through AfriNIC.

Growth in these activities reveals both the rapid development of the Internet and its increasing development outside North America. Globally, the number of routes announced increased by 11% per annum between August 2001 and August 2004. Growth in route announcements from regional ASes was stronger in the Asia-Pacific (18% per annum) and Europe (16% per annum) than in North America (4.5% per annum) – although the latter number is affected by the passage of responsibility for Latin American allocations to LACNIC, which experienced an 18% increase in its originating ASes' route announcements between August 2003 and August 2004 (Table 5.16). Growth in the number of originating ASes in the APNIC routing table was highest for those from Europe (RIPE NCC), as was growth in the number of transit ASes and in the number of ASes advertising one route. These data clearly reflect a maturing of Internet allocations in North America and relatively rapid development of Internet networks in Europe and the Asia Pacific.

Peering

As is commonly noted the Internet is a network of networks. Peering is the arrangement of traffic exchange between networks (Internet service providers – ISPs). Larger ISPs with their own backbone networks agree to carry traffic from other large ISPs in exchange for the carriage of their traffic on the other ISPs' backbones. They may also exchange traffic with smaller ISPs so that they can reach regional end points. All these arrangements can include paid peering (*i.e.* transit) or peering without monetary exchange (*i.e.* mostly between networks or equal size and characteristics). The value of a peer in peering arrangements depends upon the number of users for whom and to whom it provides access. FixedOrbit provides a snapshot of Internet peering, showing the centrality of various networks in terms of the number of peers with which they exchange traffic. These data provide a picture of the size and market shares of the larger ISPs.

In late September 2004, FixedOrbit reported a total 78 862 peerings, up from 67 354 in May 2003. However, the top 10 networks' share of peerings declined from 17.6% of all peerings to 14.2% (Figure 5.27). UUNET Technologies (MCI) was the largest network in terms of peering relationships, with around 2 400 peers or 3% to 4% of total Internet peerings (Table 5.17). While there were movements within the top 10 over the period, the leading group was relatively stable. Those dropping out of the top 10 included: Cable and Wireless USA (which had 1 049 peers in May 2003 falling to 528 in September 2004) and Genuity (which had 796 peers in 2003 falling to 36 in 2004). Conversely, Cogent Communications came into the top 10 in September 2004 (with 623 peers, up from 302 in May 2003), as did Globix Corporation (with 533 peers, compared with 460 in May 2003). The largest networks play a central role in Internet traffic exchange, but no one network accounted for more

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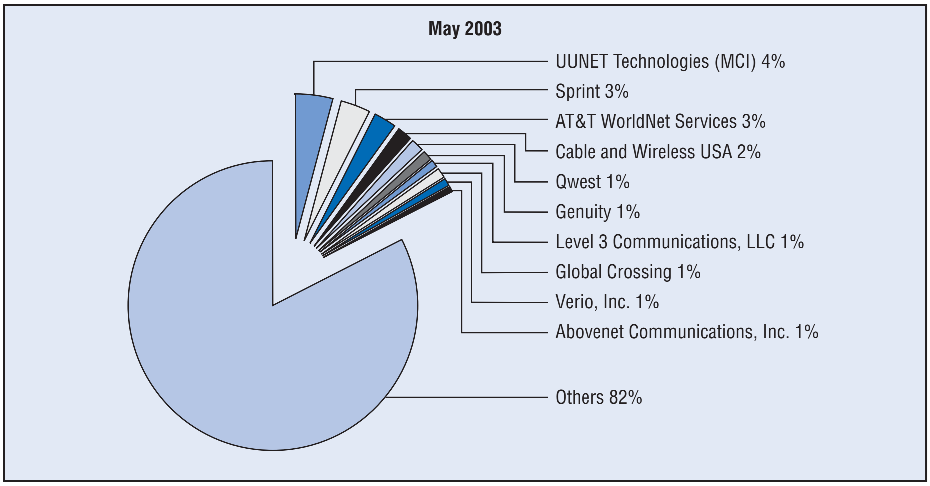
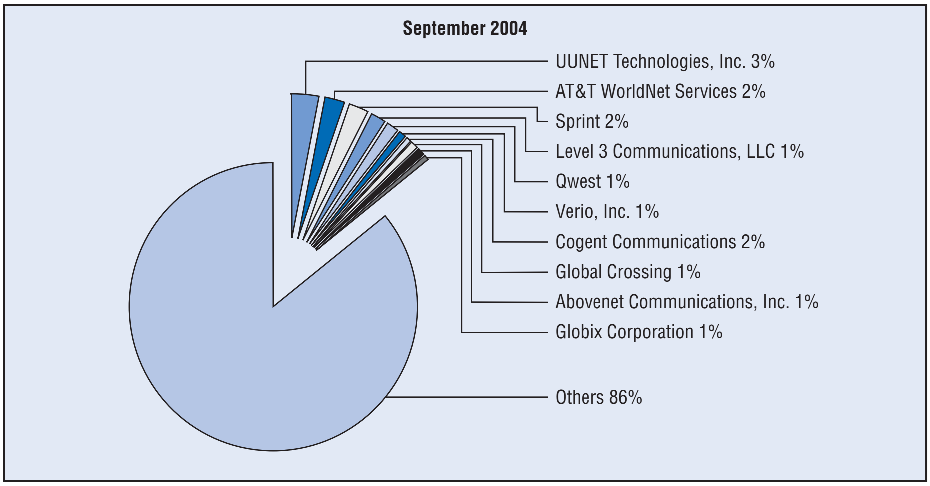
Figure 5.27. **Top 10 networks defined by number of peers, 2003-2004**

Share of total peering, percentage





Source: OECD, compiled from FixedOrbit statistics (*www.fixedorbit.com*).

StatLink: http://dx.doi.org/10.1787/047370151372

than 5% of peerings. These data suggest both the development and maturing of Internet peering and traffic exchange relationships.

Table 5.1. **Internet subscribers to fixed networks, 1999-2003**

	1999	2000	2001	2002	2003	Per 100 inhabitants					CAGR 1999-2003
						1999	2000	2001	2002	2003	
Australia	2 407 407	3 862 000	3 979 000	4 354 500	5 305 700	12.6	20.0	20.4	22.0	26.5	21.8
Austria	489 364	991 500	1 674 600	2 227 632	2 444 286	6.1	12.4	20.9	27.7	30.2	49.5
Belgium	558 995	1 015 447	1 424 516	1 694 384	1 892 000	5.5	9.9	13.9	16.4	18.2	35.6
Canada	3 367 000	4 353 307	5 747 531	6 578 923	7 055 545	11.1	14.2	18.5	21.0	22.3	20.3
Czech Republic	199 000	418 448	457 016	1 522 181	2 093 018	1.9	4.1	4.5	14.9	20.5	80.1
Denmark	1 135 393	1 684 167	2 023 461	2 580 773	2 715 868	21.3	31.6	37.8	48.0	50.4	24.4
Finland	564 000	810 000	950 000	1 495 640	1 812 410	10.9	15.6	18.3	28.8	34.8	33.9
France	3 030 000	5 452 443	7 005 322	9 160 992	10 656 654	5.0	9.0	11.5	15.0	17.3	36.9
Germany	8 005 000	11 105 000	14 934 000	19 308 900	23 011 086	9.8	13.5	18.1	23.4	27.9	30.2
Greece	199 960	271 278	350 072	393 953	530 476	1.8	2.5	3.2	3.6	4.8	27.6
Hungary	137 001	222 295	319 461	445 863	673 723	1.3	2.2	3.1	4.4	6.7	48.9
Iceland	9 000	15 035	57 478	74 285	96 406	3.2	5.3	20.2	25.8	33.2	80.9
Ireland	405 000	583 636	600 000	738 000	1 108 000	10.8	15.4	15.5	18.8	27.8	28.6
Italy	3 800 615	6 209 900	7 976 000	8 726 019	10 244 939	6.6	10.8	13.8	15.0	17.6	28.1
Japan	10 590 000	18 126 945	23 073 888	28 284 119	32 615 165	8.4	14.3	18.1	22.2	25.6	32.5
Korea	1 222 976	4 940 007	8 768 877	10 879 934	11 867 959	2.6	10.5	18.5	22.8	24.8	76.5
Luxembourg	11 411	24 500	80 000	91 861	107 821	2.6	5.6	18.1	20.6	24.0	75.3
Mexico	718 000	1 132 000	2 055 867	2 240 385	2 792 308	0.7	1.1	2.1	2.2	2.7	40.4
Netherlands	3 000 000	5 000 000	5 900 000	6 372 000	7 149 000	19.0	31.4	36.8	39.5	44.1	24.2
New Zealand	480 000	542 234	644 500	874 100	969 776	12.5	14.0	16.5	22.0	24.0	19.2
Norway	626 632	1 026 894	1 255 581	1 349 671	1 687 190	14.0	22.9	27.8	29.7	37.0	28.1
Poland	750 000	930 000	1 200 000	1 605 846	1 626 613	1.9	2.4	3.1	4.2	4.3	21.4
Portugal	645 146	2 110 828	3 459 640	5 165 083	7 211 208	6.3	20.6	33.6	49.8	69.0	82.8
Slovak Republic	43 856	65 798	97 980	130 385	178 359	0.8	1.2	1.8	2.4	3.3	42.0
Spain	2 241 092	3 222 400	3 673 959	3 924 541	5 217 453	5.7	8.1	9.1	9.7	12.8	23.5
Sweden	1 880 000	2 373 800	2 849 000	3 190 000	3 117 000	21.2	26.8	32.0	35.7	34.8	13.5
Switzerland	992 248	1 647 215	2 054 234	2 318 190	2 690 830	13.8	22.8	28.2	31.6	36.3	28.3
Turkey	1 500 000	4 459	10 715	25 531	1 164 669	2.3	0.0	0.0	0.0	1.6	-6.1
United Kingdom	7 400 000	12 600 000	13 600 000	14 419 319	14 600 000	12.7	21.5	23.0	24.4	24.6	18.5
United States	49 723 100	69 991 116	77 500 000	96 900 000	96 110 000	17.8	24.8	27.2	33.6	33.0	17.9
OECD	106 037 948	160 732 652	193 722 698	237 073 009	258 745 461	9.4	14.2	17.0	20.7	22.4	25.0
EU15	33 365 976	53 454 899	66 500 570	79 489 097	91 818 201	8.9	14.1	17.5	20.9	24.0	28.8

Notes: Dial-up subscribers in 2003 refer to 2002 data for Canada and Netherlands. Denmark includes inactive accounts, Iceland excludes free access subscribers to internet banking services, and for Portugal ANACOM note that there may be some overestimation of the number of dial-up access customers, as some users may use more than one ISP. The numbers will also be affected by "free" dial-up accounts.

StatLink: http://dx.doi.org/10.1787/518778100847

Table 5.2. **Mobile internet: i-mode subscribers, 1999-2004**

	1999	2000	2001	2002	2003	Mid-2004	Carrier and launch
Belgium	..	..	..	2 000	25 000	30 000	Base, launched October 2002
France	..	..	..	100 000	500 000	666 000	Bouygues, launched November 2002
Germany	..	..	..	123 000	440 000	855 000	Eplus, launched March 2002
Italy[1]	..	..	..	..	100 000	150 000	Wind, launched November 2003
Japan[2]	3 130 000	5 603 000	21 695 000	32 156 000	37 758 000	41 077 000	NTT DoCoMo, launched 1999
Netherlands	..	..	..	111 000	403 000	567 000	KPN, launched April 2002
Spain	..	..	..	..	..	450 000	Telefonica, launched June 2003
OECD (total of above)	3 130 000	5 603 000	21 695 000	32 492 000	39 226 000	43 795 000	

1. Data for mid-2004 are estimations.

2. i-mode subscribers for 31 March 2004 rather than mid-2004.

Source: Compiled from carrier reports.

StatLink: http://dx.doi.org/10.1787/717231445347

Table 5.3. **Mobile phone-based internet subscribers in Japan, 1999-2004**

	1999	2000	2001	2002	2003	Mid-2004
Ezweb	..	1 349 000	6 716 000	9 639 000	12 541 000	15 700 000
i-mode	3 130 000	5 603 000	21 695 000	32 156 000	37 758 000	41 077 000
Vodafone live!	..	..	6 156 000	9 747 000	12 162 000	12 956 000
PHS	..	..	..	334 000	765 000	990 000
Total	3 130 000	6 952 000	34 567 000	51 876 000	63 226 000	70 723 000

Source: KDDI Fact Book 2004, p. 39.

StatLink: http://dx.doi.org/10.1787/773581568401

Table 5.4. **Mobile data revenues**

USD millions

	2000	2001	2002	2003	CAGR 2002-2003
Australia (Telstra)	72	112	184	295	60.5
Austria (T-Mobile)	..	..	94	127	35.1
Belgium (Mobistar)	..	..	109	187	70.6
Canada	..	..	..	..	..
Czech Republic (T-Mobile)	..	..	170	242	42.6
Denmark	..	..	..	..	..
Finland	..	..	..	..	..
France	..	..	..	..	..
Germany (T-Mobile)	..	..	1 472	2 125	44.3
Greece	..	..	..	..	..
Hungary	..	..	..	..	..
Iceland	..	..	..	..	..
Ireland (MMo2)	..	55	101	176	75.0
Italy (Wind)	..	16	27	39	46.1
Japan (KDDI)	..	..	2 815	4 661	65.6
Korea (SK Telecom)	116	169	585	1 108	89.5
Luxembourg	..	..	..	..	..
Mexico	..	..	..	..	..
Netherlands (T-Mobile)	..	..	..	162	..
New Zealand (TCNZ)	..	..	13	30	120.9
Norway	..	..	..	..	..
Poland	..	..	..	..	..
Portugal	..	..	79	117	48.2
Slovak Republic	..	..	..	..	..
Spain	..	..	..	..	..
Sweden	..	..	..	..	..
Switzerland	..	254	312	336	7.9
Turkey	..	..	..	..	..
United Kingdom (MMo2)	..	438	835	1 064	27.4
United States (T-Mobile)	..	..	74	322	332.8

Source: Compiled from company reports and SEC filings.

StatLink: http://dx.doi.org/10.1787/706178074655

Table 5.5. **SMS traffic, 2003-2004**
Millions of messages

	Q1 2003	Q1 2004	CAGR 2003-2004	Includes			
Australia	725	1 069	47.4	Telstra	Optus		
Austria	318	380	19.6	Mobilkom	Connect (one)	T-Mobile	
Belgium	755	802	6.2	Mobistar	Belgacom		
Canada							
Czech Republic	1 493	1 447	-3.1	Eurotel	T-Mobile		
Denmark	463	748	61.4	Telia	Sonofon	TDC	Orange
Finland	309	363	17.4	TeliaSonera	Radiolinja		
France	1 904	2 486	30.5	Orange	SFR	Bouygues	
Germany	6 355	6 980	9.8	T-Mobile	E-Plus	Vodafone	O2
Greece	933	1 102	18.2	Cosmote	Vodafone	TIM	
Hungary	285	326	14.4	Pannon	Westel	Vodafone	
Iceland	28	29	2.5	Siminn			
Ireland	728	910	25.0	Vodafone	Meteor	O2	
Italy	3 138	3 984	27.0	TIM	Wind		
Japan	..	..	..				
Korea	..	..	..				
Luxembourg	..	..	..				
Mexico	..	..	..				
Netherlands	717	853	19.0	Vodafone	Telefort	KPN	T-Mobile
New Zealand	90	40	-55.6	TCNZ			
Norway	690	753	9.0	NetCom	Telenor		
Poland	710	811	14.2	Polkomtel			
Portugal	798	822	3.0	Era	Vodafone	Optimus	
Slovak Republic	85	121	41.5	Eurotel			
Spain	2 145	2 355	9.8	Telefonica			
Sweden	164	247	51.0	TeliaSonera			
Switzerland	656	806	22.9	Orange	Swisscom		
Turkey	1 639	1 695	3.4	Turkcell	Telsim	Aycell	Aria
United Kingdom	5 067	6 122	20.8	O2	T-Mobile	Orange	Vodafone
United States	..	..	..				
Total	30 196	35 250	16.7				

Source: Compiled from *3G Mobile* 6(13), 7 July 2004.

StatLink: http://dx.doi.org/10.1787/104641804672

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Table 5.6. **Broadband access, 2000-2003**

	December 2000				December 2001				December 2002				December 2003				CAGR 2000-2003	Per 100 inhabitants, 2003
	DSL	Cable	Other	Total	DSL	Cable	Other	Total	DSL	Cable	Other	Total	DSL	Cable	Other	Total		
Australia	10 000	64 000	..	74 000	50 000	110 000	5 000	165 000	177 900	173 200	12 400	363 500	433 900	251 200	13 600	698 700	111.4	3.5
Austria	38 500	99 000	..	137 500	100 600	192 000	..	292 600	179 500	272 071	..	451 571	279 500	338 000	1 000	618 500	65.1	7.6
Belgium	43 000	102 013	..	145 013	230 000	201 000	17 349	448 349	518 919	350 939	25 813	895 671	728 093	452 918	32 293	1 213 304	103.0	11.7
Canada	412 000	943 000	29 307	1 384 307	934 000	1 624 000	40 531	2 598 531	1 471 000	2 055 000	32 923	3 558 923	1 981 000	2 532 000	41 545	4 554 545	48.7	14.4
Czech Republic	..	10 000	..	10 000	100	12 000	..	12 100	100	16 800	..	16 900	13 818	34 680	..	48 498	69.3	0.5
Denmark	26 399	41 000	..	67 399	150 173	87 500	..	237 673	306 944	133 548	5 784	446 276	473 359	193 841	35 000	702 200	118.4	13.0
Finland	15 000	15 000	..	30 000	43 500	24 500	..	68 000	229 000	54 000	500	283 500	405 700	85 400	3 200	494 300	154.5	9.5
France	67 532	121 911	..	189 443	430 000	190 322	..	620 322	1 409 000	282 992	..	1 691 992	3 262 800	393 854	..	3 656 654	168.2	5.9
Germany	200 000	5 000	..	205 000	1 870 000	30 000	34 000	1 934 000	3 195 000	45 000	68 900	3 308 900	4 498 086	60 000	53 000	4 611 086	182.3	5.6
Greece	72	..	..	72	72	..	..	72	93	..	1 860	1 953	8 588	..	1 888	10 476	426.0	0.1
Hungary	400	1 904	1 900	4 204	6 200	17 419	2 460	26 079	32 054	31 190	20 590	83 834	114 813	77 189	90 332	282 334	306.5	2.8
Iceland	2 035	..	..	2 035	9 978	..	500	10 478	23 785	..	500	24 285	40 086	829	491	41 406	173.0	14.3
Ireland	300	..	..	300	300	100	..	400	3 300	2 300	5 000	10 600	25 300	4 900	2 850	33 050	379.4	0.8
Italy	114 900	..	5 000	119 900	390 000	..	25 000	415 000	835 525	..	140 494	976 019	2 158 458	..	243 481	2 401 939	171.6	4.1
Japan	9 732	625 000	..	634 732	1 524 348	1 303 000	12 000	2 839 348	5 645 728	1 954 000	206 189	7 805 917	10 272 052	2 475 000	894 259	13 641 311	178.0	10.7
Korea	2 353 314	1 556 072	12 466	3 921 852	5 178 323	2 936 280	31 398	8 146 001	5 664 915	3 553 830	1 181 352	10 400 097	6 574 593	3 943 012	1 091 296	11 608 901	43.6	24.2
Luxembourg	..	..	..	..	1 215	15	..	1 230	5 561	70	1 230	6 861	13 322	2 029	220	15 571	..	3.5
Mexico	..	15 000	..	15 000	4 938	111 000	..	115 938	66 566	150 000	44 854	261 420	179 293	150 000	44 854	374 147	192.2	0.4
Netherlands	10 000	250 000	100	260 100	145 000	467 000	200	612 200	340 000	796 000	200	1 136 200	944 000	969 000	200	1 913 200	94.5	11.8
New Zealand	9 676	658	..	10 334	25 579	2 500	..	28 079	54 000	4 900	5 200	64 100	90 000	5 734	8 042	103 776	115.7	2.6
Norway	1 485	16 344	7 416	25 245	31 803	45 339	7 050	84 192	130 034	52 066	8 444	190 544	275 997	69 587	18 520	364 104	143.4	8.0
Poland	..	..	..	..	1 796	19 900	..	21 696	14 000	33 900	..	47 900	135 495	150 000	11 796	297 291	..	0.8
Portugal	..	25 154	2 061	27 215	2 886	93 721	2 709	99 316	52 005	207 486	3 298	262 789	184 344	315 577	3 198	503 119	164.4	4.8
Slovak Republic	..	..	..	..	..	420	..	420	..	420	..	420	4 210	3 498	10 969	18 677	..	0.3
Spain	44 956	13 459	..	58 415	375 816	98 466	..	474 282	957 204	252 765	..	1 209 969	1 660 450	539 754	6 804	2 207 008	235.6	5.4
Sweden	49 000	56 300	67 000	172 300	242 100	115 500	126 600	484 200	421 000	156 000	143 000	720 000	570 000	205 000	184 000	959 000	77.2	10.7
Switzerland	4 416	52 000	..	56 416	42 935	98 753	..	141 688	199 144	196 740	..	395 884	446 309	302 289	..	748 598	136.7	10.1
Turkey	292	4 167	..	4 459	2 818	7 897	..	10 715	2 967	22 564	..	25 531	56 624	42 700	..	99 324	181.4	0.1
United Kingdom	38 000	19 693	..	57 693	140 000	208 000	2 000	350 000	590 000	779 319	350 000	1 719 319	1 828 300	1 363 800	8 500	3 200 600	281.4	5.4
United States	2 429 189	3 580 000	1 509 899	7 519 088	3 947 808	7 050 000	1 785 406	12 783 214	6 471 716	11 369 087	2 040 746	19 881 549	9 509 442	16 446 322	2 274 385	28 230 149	55.4	9.7
OECD	5 880 198	7 616 675	1 635 149	15 132 022	15 882 288	15 046 632	2 092 203	33 021 123	28 996 960	22 946 187	4 299 277	56 242 424	47 167 932	31 408 113	5 075 723	83 651 768	76.8	7.2
EU15	647 659	748 530	74 161	1 470 350	4 121 662	1 708 124	207 858	6 037 644	9 043 051	3 332 490	746 079	13 121 620	17 040 300	4 924 073	575 634	22 540 007	148.4	5.9

Note: "Other" broadband technologies include satellite broadband internet, fibre-to-the-home Internet access, ethernet LANs, and fixed wireless subscribers (at downstream speeds greater than 256 kbps).

StatLink: http://dx.doi.org/10.1787/713654566671

Table 5.7. **Broadband access to end June 2004**

	December 2003					June 2004					Total growth (Dec. 2003-June 2004)
	DSL	Cable	Other	Total	Per 100 inhabitants	DSL	Cable	Other	Total	Per 100 inhabitants	
Australia	433 900	251 200	13 600	698 700	3.5	710 200	324 400	13 200	1 047 800	5.2	50.0
Austria	279 500	338 000	1 000	618 500	7.6	355 718	350 000	1 000	706 718	8.7	14.3
Belgium	728 093	452 918	32 293	1 213 304	11.7	911 000	497 970	34 401	1 443 371	13.9	19.0
Canada	1 981 000	2 532 000	41 545	4 554 545	14.4	2 470 746	2 659 974	32 923	5 163 643	16.3	13.4
Czech Republic	13 818	34 680	..	48 498	0.5	30 000	40 680	150 000	220 680	2.2	355.0
Denmark	473 359	193 841	35 000	702 200	13.0	562 207	266 000	88 007	916 214	17.0	30.5
Finland	405 700	85 400	3 200	494 300	9.5	467 400	97 200	6 600	571 200	11.0	15.6
France	3 262 800	393 854	..	3 656 654	5.9	4 573 504	424 978	614	4 999 096	8.1	36.7
Germany	4 498 086	60 000	53 000	4 611 086	5.6	5 350 000	65 000	56 000	5 471 000	6.6	18.6
Greece	8 588	..	1 888	10 476	0.1	22 937	..	2 989	25 926	0.2	147.5
Hungary	114 813	77 189	90 332	282 334	2.8	166 003	85 000	10 000	261 003	2.6	-7.6
Iceland	40 086	829	491	41 406	14.3	42 003	584	1 870	44 457	15.3	7.4
Ireland	25 300	4 900	2 850	33 050	0.8	55 500	5 380	4 353	65 233	1.6	97.4
Italy	2 158 458	..	243 481	2 401 939	4.1	3 223 188	..	276 530	3 499 718	6.0	45.7
Japan	10 272 052	2 475 000	894 259	13 641 311	10.7	12 068 718	2 702 000	1 417 483	16 188 201	12.7	18.7
Korea	6 574 593	3 943 012	1 091 296	11 608 901	24.2	6 666 190	3 989 706	961 929	11 617 825	24.2	0.1
Luxembourg	13 322	2 029	220	15 571	3.5	20 500	2 996	220	23 716	5.3	52.3
Mexico	179 293	150 000	44 854	374 147	0.4	339 000	150 000	44 854	533 854	0.5	42.7
Netherlands	944 000	969 000	200	1 913 200	11.8	1 419 700	1 137 500	200	2 557 400	15.8	33.7
New Zealand	90 000	5 734	8 042	103 776	2.6	119 000	9 049	13 300	141 349	3.5	36.2
Norway	275 997	69 587	18 520	364 104	8.0	413 272	80 497	23 231	517 000	11.3	42.0
Poland	135 495	150 000	11 796	297 291	0.8	277 000	250 000	11 796	538 796	1.4	81.2
Portugal	184 344	315 577	3 198	503 119	4.8	297 154	366 139	3 110	666 403	6.4	32.5
Slovak Republic	4 210	3 498	10 969	18 677	0.3	17 000	5 440	10 969	33 409	0.6	78.9
Spain	1 660 450	539 754	6 804	2 207 008	5.4	2 086 172	660 881	12 615	2 759 668	6.8	25.0
Sweden	570 000	205 000	184 000	959 000	10.7	685 967	215 000	200 000	1 100 967	12.3	14.8
Switzerland	446 309	302 289	..	748 598	10.1	656 000	410 000	..	1 066 000	14.4	42.4
Turkey	56 624	42 700	..	99 324	0.1	136 598	44 667	..	181 265	0.3	82.5
United Kingdom	1 828 300	1 363 800	8 500	3 200 600	5.4	2 812 900	1 633 700	8 500	4 455 100	7.5	39.2
United States	9 509 442	16 446 322	2 274 385	28 230 149	9.7	11 621 036	18 200 000	2 450 000	32 271 036	11.1	14.3
OECD	47 167 932	31 408 113	5 075 723	83 651 768	7.2	58 576 613	34 674 741	5 836 694	99 088 048	8.6	18.5
EU15	17 040 300	4 924 073	575 634	22 540 007	5.9	22 843 847	5 722 744	695 139	29 261 730	7.7	29.8

Note: "Other" broadband technologies include satellite broadband internet, fibre-to-the-home Internet access, ethernet LANs, and fixed wireless subscribers (at downstream speeds greater than 256 kbps).

StatLink: http://dx.doi.org/10.1787/367367512422

Table 5.8. **Leased lines connected to Internet, 2000-2003**

	End 2000	Per 100 000 inhabitants, 2000	End 2001	Per 100 000 inhabitants, 2001	June 2004	Per 100 000 inhabitants, 2004	Total growth (End 2000-June 2004)
Australia	2 157	11	5 517	28	5 540	28	156.8
Austria	3 025	38	4 138	52	6 480	80	114.2
Belgium	2 677	26	3 268	32	2 558	25	-4.4
Canada	10 008	33	12 455	40	13 018	41	30.1
Czech Republic	2 645	26	3 219	31	4 693	46	77.4
Denmark	3 382	63	4 742	89	5 668	105	67.6
Finland	2 437	47	3 094	60	..	..	..
France	6 743	11	9 473	16	9 533	15	41.4
Germany	18 549	23	24 719	30	27 100	33	46.1
Greece	1 333	12	1 555	14	..	..	..
Hungary	2 810	28	3 219	32	..	..	..
Iceland	241	86	255	89	..	..	..
Ireland	855	23	1 089	28	2 645	66	209.4
Italy	6 833	12	10 681	18	15 080	26	120.7
Japan	39 210	31	45 187	35	41 754	33	6.5
Korea	10 046	21	11 000	23	7 323	15	-27.1
Luxembourg	232	53	299	68	..	..	..
Mexico	1 169	1	1 427	1	..	..	..
Netherlands	8 208	52	10 358	65	9 719	60	18.4
New Zealand	856	22	923	24	..	..	..
Norway	3 124	70	3 590	80	..	..	..
Poland	3 674	10	5 214	14	8 429	22	129.4
Portugal	2 677	26	2 719	26	..	..	..
Slovak Republic	437	8	465	9	..	..	..
Spain	2 333	6	3 075	8	..	..	..
Sweden	5 305	60	6 589	74	7 089	79	33.6
Switzerland	3 263	45	4 211	58	..	..	..
Turkey	623	1	890	1	..	..	..
United Kingdom	18 315	31	26 451	45	22 484	38	22.8
United States	103 624	37	123 461	43	125 326	43	20.9
OECD	266 791	24	333 283	29	314 439	27	17.9
EU15	82 904	22	112 250	30	108 356	28	30.7
World	295 962	..	374 124	..	398 327	6	34.6

Note: Data for Australia and Korea are adjusted for monthly fluctuation for December 2000 and include November 2000 leased lines.

Source: Netcraft (www.netcraft.com), OECD.

StatLink: http://dx.doi.org/10.1787/457710857823

Table 5.9. **Internet hosts by domain, 1998-2004**

	Domain	Hosts January 1998	Hosts January 1999	Hosts January 2000	Hosts January 2001	Hosts January 2002	Hosts January 2003	Hosts January 2004	CAGR 1998-2004
Australia	.au	665 403	792 351	1 090 468	1 615 939	2 288 584	2 564 339	2 847 763	27.4
Austria	.at	109 154	143 153	274 173	504 144	657 173	838 026	982 246	44.2
Belgium	.be	87 938	165 873	320 840	417 130	668 508	1 052 706	1 454 350	59.6
Canada	.ca	839 141	1 119 172	1 669 664	2 364 014	2 890 273	2 993 982	3 210 081	25.1
Czech Republic	.cz	52 498	73 770	112 748	153 902	213 803	239 885	315 974	34.9
Denmark	.dk	159 358	279 790	336 928	435 556	707 141	1 154 053	1 467 415	44.8
Finland	.fi	450 044	546 244	631 248	771 725	944 670	1 140 838	1 224 155	18.1
France	.fr	333 306	488 043	779 879	1 229 763	1 670 694	2 157 628	2 770 836	42.3
Germany	.de	994 926	1 316 893	1 702 486	2 163 326	2 681 325	2 891 407	3 421 455	22.9
Greece	.gr	26 917	51 541	77 954	148 552	182 812	202 525	245 650	44.6
Hungary	.hu	46 082	83 530	113 695	158 732	210 804	254 462	313 576	37.7
Iceland	.is	17 450	21 894	29 598	44 040	61 682	68 282	106 296	35.1
Ireland	.ie	38 406	54 872	59 681	88 406	95 381	97 544	111 467	19.4
Italy	.it	243 250	338 822	658 307	1 630 526	2 282 457	3 864 315	5 469 578	68.0
Japan	.jp	1 168 956	1 687 534	2 636 541	4 640 863	7 118 333	9 260 117	12 962 065	49.3
Korea[1]	.kr	121 932	186 414	283 459	397 809	439 859	407 318	253 242	13.0
Luxembourg	.lu	4 273	21 894	9 670	11 744	16 735	17 260	28 214	37.0
Mexico	.mx	41 659	112 620	404 873	663 553	918 288	1 107 795	1 333 406	78.2
Netherlands	.nl	381 172	564 129	820 944	1 309 911	1 983 102	2 415 286	3 419 182	44.1
New Zealand	.nz	169 264	137 247	271 003	345 107	408 290	432 957	474 395	18.7
Norway	.no	286 338	318 631	401 889	525 030	629 669	589 621	1 013 273	23.4
Poland	.pl	77 594	108 588	183 057	371 943	654 198	843 475	1 296 766	59.9
Portugal	.pt	39 533	49 731	90 757	177 828	263 821	291 355	299 923	40.2
Slovak Republic	.sk	11 836	17 953	25 906	36 680	68 972	80 660	98 788	42.4
Spain	.es	168 913	264 245	415 641	663 553	1 497 450	1 694 601	1 127 366	37.2
Sweden	.se	319 065	431 809	594 627	764 011	1 141 093	1 209 266	1 539 917	30.0
Switzerland	.ch	114 816	224 350	306 073	461 456	613 918	723 243	1 018 445	43.9
Turkey	.tr	24 786	32 496	90 929	113 603	139 805	199 823	344 859	55.1
United Kingdom	.uk	987 733	1 423 804	1 901 812	2 291 369	2 462 915	2 583 753	3 715 752	24.7
United States		6 618 382	8 746 846	10 490 416	12 052 491	12 579 595	11 683 370	11 422 195	9.5
	.us	1 076 583	1 562 391	1 875 663	2 267 089	2 125 624	1 735 734	1 757 664	8.5
	.edu	3 944 967	5 022 815	6 085 137	7 106 062	7 754 038	7 459 219	7 576 992	11.5
	.mil	1 099 186	1 510 440	1 751 866	1 844 369	1 906 902	1 880 903	1 410 944	4.2
	.gov	497 646	651 200	777 750	834 971	793 031	607 514	676 595	5.3
gTLDs		14 005 613	21 742 617	42 685 540	68 514 456	93 617 371	103 654 125	150 831 956	48.6
	.com	8 201 511	12 140 747	24 863 331	36 352 243	44 520 209	40 555 072	48 688 919	34.6
	.net	5 283 568	8 856 687	16 853 655	30 885 116	47 761 383	61 945 611	100 751 276	63.5
	.org	519 862	744 285	959 827	1 267 662	1 321 104	1 116 311	1 332 978	17.0
	.int	672	898	8 727	9 435	11 048	11 594	13 625	65.1
	.biz	0	0	0	0	1 477	16 680	28 586	..
	.info	0	0	0	0	2 128	8 349	15 502	..
	.name	0	0	0	0	7	217	318	..
	.pro	0	0	0	0	2	2	5	..
	.areo	0	0	0	0	0	132	315	..
	.coop	0	0	0	0	9	148	417	..
	.museum	0	0	0	0	4	9	15	..
World total	World	29 669 611	43 229 694	72 398 092	109 574 429	147 344 723	171 638 297	233 101 481	41.0

1. Korea's actual number of hosts may be underestimated as the ISC survey methodology relies on ARPA zone information which is often not reported by Korean network operators. KRNIC estimates there were 3 822 613 Korean hosts in January 2004.

Source: Internet Software Consortium (www.isc.org)

StatLink: http://dx.doi.org/10.1787/705536184278

OECD COMMUNICATIONS OUTLOOK 2005 – ISBN 92-64-00950-7 – © OECD 2005

Table 5.10. **Secure servers in OECD countries, 1998-2002**

	Secure servers							Secure servers per 100 000 inhabitants							CAGR
	July 1998	July 1999	July 2000	July 2001	July 2002	July 2003	July 2004	July 1998	July 1999	July 2000	July 2001	July 2002	July 2003	July 2004	1998-2004
Australia	632	1 305	2 828	3 704	4 693	4 830	8 079	3.4	6.9	14.7	19.0	23.8	24.2	40.4	52.9
Austria	98	241	447	881	949	1 073	1 590	1.2	3.0	5.6	11.0	11.8	13.3	19.6	59.1
Belgium	52	159	268	431	439	512	912	0.5	1.6	2.6	4.2	4.2	4.9	8.8	61.2
Canada	929	1 789	3 896	6 050	7 768	9 378	15 166	3.1	5.9	12.7	19.5	24.8	29.6	47.9	59.3
Czech Republic	19	88	194	383	185	213	315	0.2	0.9	1.9	3.7	1.8	2.1	3.1	59.7
Denmark	44	112	289	523	660	890	1 681	0.8	2.1	5.4	9.8	12.3	16.5	31.2	83.5
Finland	68	180	343	660	744	870	1 255	1.3	3.5	6.6	12.7	14.3	16.7	24.1	62.6
France	222	632	1 297	1 969	2 511	2 646	3 799	0.4	1.0	2.1	3.2	4.1	4.3	6.2	60.5
Germany	492	1 630	3 761	6 442	7 987	7 912	13 163	0.6	2.0	4.6	7.8	9.7	9.6	16.0	72.9
Greece	8	48	87	176	170	181	270	0.1	0.4	0.8	1.6	1.6	1.6	2.5	79.8
Hungary	18	26	90	165	86	122	199	0.2	0.3	0.9	1.6	0.8	1.2	2.0	49.3
Iceland	13	29	67	91	136	170	249	4.7	10.5	23.8	31.9	47.3	58.5	85.7	63.6
Ireland	56	97	245	467	579	701	1 201	1.5	2.6	6.4	12.1	14.7	17.6	30.1	66.7
Italy	167	432	795	1 264	1 167	1 327	1 977	0.3	0.7	1.4	2.2	2.0	2.3	3.4	51.0
Japan	429	1 170	2 900	7 952	7 179	10 513	19 610	0.3	0.9	2.3	6.2	5.6	8.2	15.4	89.1
Korea	38	106	243	397	562	623	878	0.1	0.2	0.5	0.8	1.2	1.3	1.8	68.8
Luxembourg	11	26	44	68	97	104	184	2.6	6.0	10.0	15.4	21.7	23.1	40.9	59.9
Mexico	26	58	176	310	324	379	605	0.0	0.1	0.2	0.3	0.3	0.4	0.6	69.0
Netherlands	127	306	541	1 064	1 332	1 723	3 595	0.8	1.9	3.4	6.6	8.2	10.6	22.2	74.6
New Zealand	90	227	482	778	983	1 124	1 668	2.4	5.9	12.4	19.9	24.7	27.8	41.3	62.7
Norway	55	130	273	491	528	666	1 122	1.2	2.9	6.1	10.9	11.6	14.6	24.6	65.3
Poland	23	61	188	467	373	382	557	0.1	0.2	0.5	1.2	1.0	1.0	1.5	70.1
Portugal	27	59	116	192	214	286	443	0.3	0.6	1.1	1.9	2.1	2.7	4.2	59.4
Slovak Republic	15	..	45	110	38	47	61	0.3	..	0.8	2.0	0.7	0.9	1.1	26.3
Spain	239	432	759	1 194	1 315	1 764	2 745	0.6	1.1	1.9	3.0	3.2	4.3	6.7	50.2
Sweden	145	406	811	1 261	1 246	1 437	2 826	1.6	4.6	9.1	14.2	14.0	16.0	31.5	64.0
Switzerland	152	401	854	1 370	1 555	1 769	2 826	2.1	5.6	11.8	18.8	21.2	23.9	38.2	62.8
Turkey	7	50	116	285	400	432	855	0.0	0.1	0.2	0.4	0.6	0.6	1.2	122.7
United Kingdom	714	1 735	4 404	7 916	10 288	11 714	20 339	1.2	3.0	7.5	13.4	17.4	19.7	34.3	74.8
United States	14 674	32 053	65 565	86 025	106 884	120 661	197 769	5.3	11.5	23.2	30.1	37.1	41.5	67.9	54.3
OECD	19 590	43 988	92 124	133 086	161 392	184 449	305 939	1.8	3.9	8.1	11.7	14.1	16.0	26.5	58.1
EU15	2 470	6 495	14 207	24 508	29 698	33 140	55 980	0.7	1.7	3.8	6.5	7.8	8.7	14.6	68.2

Source: Netcraft (www.netcraft.com)

StatLink: http://dx.doi.org/10.1787/670611446427

Table 5.11. **References to secure servers by domain, 2002-2004**

	Domain	Links to https August 2002	Links to https September 2004	CAGR (2002-2004)
Australia	.au	118 000	574 000	120.6
Austria	.at	11 700	125 000	226.9
Belgium	.be	2 540	89 300	492.9
Canada	.ca	55 900	996 000	322.1
Czech Republic	.cz	61 200	149 000	56.0
Denmark	.dk	6 890	167 000	392.3
Finland	.fi	25 500	317 000	252.6
France	.fr	38 000	181 000	118.2
Germany	.de	402 000	1 250 000	76.3
Greece	.gr	2 200	35 700	302.8
Hungary	.hu	29 400	118 000	100.3
Iceland	.is	2 950	12 200	103.4
Ireland	.ie	1 070	45 800	554.2
Italy	.it	19 600	214 000	230.4
Japan	.jp	258 000	1 610 000	149.8
Korea	.kr	10 400	115 000	232.5
Luxembourg	.lu	652	5 260	184.0
Mexico	.mx	22 600	32 100	19.2
Netherlands	.nl	23 500	325 000	271.9
New Zealand	.nz	69 200	166 000	54.9
Norway	.no	38 400	144 000	93.6
Poland	.pl	20 800	167 000	183.4
Portugal	.pt	3 250	40 400	252.6
Slovak Republic	.sk	2 190	4 780	47.7
Spain	.es	28 100	310 000	232.1
Sweden	.se	28 000	189 000	159.8
Switzerland	.ch	86 400	420 000	120.5
Turkey	.tr	2 980	21 900	171.1
United Kingdom	.uk	232 000	1 060 000	113.8
United States		*815 800*	*4 680 000*	139.5
.us	.us	25 400	305 000	246.5
.gov	.gov	29 400	654 000	371.6
.mil	.mil	263 000	621 000	53.7
.edu	.edu	498 000	3 100 000	149.5
Total major gTLDs		*3 456 039*	*13 962 600*	101.0
.com	.com	2 280 000	7 580 000	82.3
.net	.net	621 000	2 420 000	97.4
.org	.org	541 000	3 900 000	168.5
.int	.int	409	16 700	539.0
.biz	.biz	9 990	26 500	62.9
.info	.info	3 640	19 400	130.9
OECD ccTLD		2 419 222	13 564 440	136.8
EU15 ccTLD		825 002	4 354 460	129.7
World total		7 360 000	21 300 000	70.1

Note: Samples taken using Google, August 2002 and September 2004.

StatLink: http://dx.doi.org/10.1787/506733583033

Table 5.12. **References to secure servers by country, 2002-2004**

	Links to https August 2002	Links to https September 2004	CAGR (2002-2004)	Per 100 inhabitants
Australia	167 000	901 000	132.3	4.5
Austria	1 830	254 000	1078.1	3.1
Belgium	5 810	141 000	392.6	1.4
Canada	298 000	2 730 000	202.7	8.6
Czech Republic	68 000	260 000	95.5	2.5
Denmark	8 610	242 000	430.2	4.5
Finland	100 000	419 000	104.7	8.0
France	84 100	773 000	203.2	1.3
Germany	482 000	2 410 000	123.6	2.9
Greece	1 700	55 700	472.4	0.5
Hungary	31 900	171 000	131.5	1.7
Iceland	2 620	15 800	145.6	5.4
Ireland	1 600	71 500	568.5	1.8
Italy	64 600	356 000	134.8	0.6
Japan	403 000	2 370 000	142.5	1.9
Korea	17 800	161 000	200.7	0.3
Luxembourg	4 750	14 200	72.9	3.2
Mexico	65 100	40 300	-21.3	0.0
Netherlands	48 800	523 000	227.4	3.2
New Zealand	67 100	212 000	77.7	5.2
Norway	42 800	222 000	127.7	4.9
Poland	21 300	199 000	205.7	0.5
Portugal	2 030	71 000	491.4	0.7
Slovak Republic	1 440	12 600	195.8	0.2
Spain	156 000	572 000	91.5	1.4
Sweden	34 000	318 000	205.8	3.5
Switzerland	155 000	825 000	130.7	11.1
Turkey	39 300	178 000	112.8	0.3
United Kingdom	279 000	1 190 000	106.5	2.0
United States	2 150 000	8 960 000	104.1	3.1
OECD	4 805 190	24 668 100	126.6	2.1
EU 15	1 274 830	7 410 400	141.1	1.9

Note: Taken as a sample from Google, August 2002 and September 2004.

StatLink: http://dx.doi.org/10.1787/805305422051

Table 5.13. **Domain name registrations under top level domains, 2000-2004**

	Domain	Registrations July 2000	Registrations July 2002	Registrations July 2004	CAGR (July 2000-July 2004)	Share of world domains (%)
Australia	.au	148 539	250 000	443 128	31.4	0.7
Austria	.at	157 387	252 441	341 841	21.4	0.5
Belgium	.be	32 709	206 989	348 401	80.7	0.5
Canada	.ca	60 000	300 000	447 689	65.3	0.7
Czech Republic	.cz	66 555	119 145	174 914	27.3	0.3
Denmark	.dk	208 300	397 552	528 886	26.2	0.8
Finland	.fi	17 603	36 210	86 793	49.0	0.1
France	.fr	89 097	155 554	268 361	31.7	0.4
Germany	.de	1 732 994	5 666 269	7 799 823	45.7	12.1
Greece[1]	.gr	18 670	55 000	55 000	31.0	0.1
Hungary	.hu	..	81 804	100 000	..	0.2
Iceland	.is	3 300	8 200	10 500	33.6	0.0
Ireland	.ie	15 506	29 920	40 205	26.9	0.1
Italy	.it	417 609	735 156	909 241	21.5	1.4
Japan	.jp	190 709	482 644	587 412	32.5	0.9
Korea	.kr	494 074	479 643	612 840	5.5	1.0
Luxembourg	.lu	11 404	15 454	17 845	11.8	0.0
Mexico	.mx	49 947	71 590	91 559	16.4	0.1
Netherlands	.nl	532 596	748 510	1 005 292	17.2	1.6
New Zealand	.nz	67 777	111 000	142 468	20.4	0.2
Norway	.no	45,541	150 000	207 000	46.0	0.3
Poland	.pl	56 708	..	136 787	24.6	0.2
Portugal	.pt	14 394	26 158	37 250	26.8	0.1
Slovak Republic	.sk	..	57 091	64 100	..	0.1
Spain	.es	29 590	40 952	80 543	28.4	0.1
Sweden	.se	45 241	102 785	225 507	49.4	0.3
Switzerland	.ch	275 730	461 265	630 258	23.0	1.0
Turkey	.tr	14 447	32 639	54 705	39.5	0.1
United Kingdom	.uk	1 938 740	3 635 585	4 777 227	25.3	7.4
United States						
.gov		730	..	..	..	..
.mil		..	..	..	..	..
.us		..	269 233	875 016	..	1.4
.edu		6 154	7 409	7 397	4.7	0.0
OECD ccTLDs		*6 735 897*	*14 978 789*	*21 100 591*	33.0	32.7
Major gTLDs		*17 476 025*	*28 756 238*	*40 658 009*	*23.5*	63.0
.com		13 721 175	21 198 557	30 267 141	21.9	46.9
.net		2 305 075	3 586 124	4 910 121	20.8	7.6
.org		1 449 775	2 328 690	3 100 778	20.9	4.8
.int		..	..	..	..	..
.biz		..	700 962	1 028 314	..	1.6
.info		..	864 457	1 235 485	..	1.9
.name		..	77 448	116 170	..	0.2

Note: Registrations at mid-year, or nearest available count.

1. Domain name registrations for August 2002 rather than July 2004.

Source: Compiled from country and generic NICs, August 2004.

StatLink: http://dx.doi.org/10.1787/828873828214

Table 5.14. **Domain name registrations, 2004**

	ccTLD	.com	.net	.org	.info	.biz	Others	Total gTLDs	Total	gTLD share of total %
Australia	443 128	555 694	53 986	31 459	22 835	21 083	41	685 098	1 128 226	61
Austria	341 841	103 973	21 048	20 489	11 794	4 814	62	162 180	504 021	32
Belgium	348 401	58 192	9 883	7 486	3 572	2 686	17	81 836	430 237	19
Canada	447 689	1 311 155	162 055	120 429	33 456	30 570	6 185	1 663 850	2 111 539	79
Czech Republic	174 914	28 140	8 910	7 292	3 161	2 087	125	49 715	224 629	22
Denmark	528 886	119 722	33 584	19 038	17 535	14 423	353	204 655	733 541	28
Finland	86 793	67 694	21 303	4 955	2 871	1 062	167	98 052	184 845	53
France	268 361	770 593	141 129	100 873	32 304	22 687	8 369	1 075 955	1 344 316	80
Germany	7 799 823	1 474 080	467 222	377 660	244 894	115 233	3 378	2 682 467	10 482 290	26
Greece[1]	55 000	12 004	2 041	1 426	1 048	608	59	17 186	72 186	24
Hungary	100 000	12 225	2 781	1 598	1 279	1 263	157	19 303	119 303	16
Iceland	10 500	1 772	588	169	74	34	370	3 007	13 507	22
Ireland	40 205	38 421	5 032	3 084	2 602	814	436	50 389	90 594	56
Italy	909 241	365 637	75 827	47 722	19 522	16 019	2 924	527 651	1 436 892	37
Japan	587 412	437 526	100 647	23 850	15 918	9 490	1 925	589 356	1 176 768	50
Korea	612 840	533 219	148 601	27 099	16 530	12 072	3 129	740 650	1 353 490	55
Luxembourg	17 845	5 596	1 541	1 193	837	819	309	10 295	28 140	37
Mexico	91 559	68 213	5 999	4 137	817	757	250	80 173	171 732	47
Netherlands	1 005 292	257 445	49 505	43 218	31 699	12 588	4 493	398 948	1 404 240	28
New Zealand	142 468	29 646	3 316	1 984	1 423	1 097	216	37 682	180 150	21
Norway	207 000	77 223	21 094	10 784	7 673	4 457	900	122 131	329 131	37
Poland	136 787	33 254	8 156	7 715	4 142	2 245	668	56 180	192 967	29
Portugal	37 250	26 097	3 959	2 063	305	270	222	32 916	70 166	47
Slovak Republic	64 100	2 870	673	536	319	305	540	5 243	69 343	8
Spain	80 543	447 703	69 481	44 076	14 059	10 726	743	586 788	667 331	88
Sweden	225 507	99 570	18 867	12 300	7 696	5 211	6 520	150 164	375 671	40
Switzerland	630 258	81 986	18 824	14 349	11 503	7 483	260	134 405	764 663	18
Turkey	54 705	157 393	25 834	12 544	4 932	2 275	754	203 732	258 437	79
United Kingdom	4 777 227	1 481 136	265 618	150 269	93 351	78 034	25 700	2 094 108	6 871 335	30
United States	875 016	19 514 059	2 844 365	2 023 007	703 289	599 550	227 182	25 911 452	26 786 468	97
OECD	21 100 591	28 172 238	4 591 869	3 122 804	1 311 440	980 762	296 454	38 475 567	59 576 158	65
EU15	16 522 215	5 327 863	1 186 040	835 852	484 089	285 994	53 752	8 173 590	24 695 805	33
World	..	30 758 094	4 961 811	3 127 334	1 531 446	1 035 752	..	41 414 437	64 500 000	64

Note: ccTLD registrations at September 2004, or nearest available count. For gTLD registrations the country is that of the registry company, not necessarily that of the domain name holder or the related Web site or host.

1. Domain name registrations for August 2002 rather than July 2004

Source: Compiled from country and generic NICs and WebhostingInfo (www.webhosting.info), September 2004.

StatLink: http://dx.doi.org/10.1787/645815164730

Table 5.15. **Geographical distribution of registrations under new unsponsored gTLDs, December 2003**

		Total	% of total	.info	.biz	.name
Australia	.au	54 066	2.4	22 071	27 047	4 948
Austria	.at	30 727	1.3	21 920	8 257	550
Belgium	.be	10 715	0.5	5 831	4 570	314
Canada	.ca	58 671	2.6	26 338	27 664	4 669
Czech Republic	.cz	6 675	0.3	4 786	1 814	75
Denmark	.dk	16 767	0.7	8 439	6 887	1 441
Finland	.fi	6 492	0.3	4 346	1 896	250
France	.fr	50 677	2.2	26 733	22 768	1 176
Germany	.de	349 571	15.3	256 822	89 832	2 917
Greece	.gr	3 431	0.2	2 253	1 102	76
Hungary	.hu	1 454	0.1	1 112	322	20
Iceland	.is	249	0.01	119	117	13
Ireland	.ie	5 071	0.2	2 625	2 180	266
Italy	.it	45 298	2.0	23 534	19 505	2 259
Japan	.jp	33 196	1.5	18 452	11 322	3 422
Korea	.kr	42 464	1.9	13 846	25 995	2 623
Luxembourg	.lu	1 000	0.04	466	466	68
Mexico	.mx	3 997	0.2	1 820	1 914	263
Netherlands	.nl	63 358	2.8	44 464	18 223	671
New Zealand	.nz	6 412	0.3	2 602	3 580	230
Norway	.no	14 322	0.6	7 424	6 308	590
Poland	.pl	5 813	0.3	3 606	2 124	83
Portugal	.pt	2 028	0.1	966	981	81
Slovak Republic	.sk	1 035	0.05	642	386	7
Spain	.es	36 587	1.6	19 481	14 722	2 384
Sweden	.se	31 171	1.4	17 461	13 092	618
Switzerland	.ch	43 787	1.9	25 294	15 399	3 094
Turkey	.tr	5 834	0.3	2 862	2 840	132
United Kingdom	.uk	142 419	6.2	111 753	19 716	10 950
United States	.us	1 006 570	44.1	433 772	509 958	62 840
OECD total		2 079 857	91.0	1 111 840	860 987	107 030
Non-OECD countries		204 567	9.0	52 296	143 131	9 140
Total		2 284 424	100	1 164 136	1 004 118	116 170

StatLink: http://dx.doi.org/10.1787/142068378723

Table 5.16. **Regional development of the Internet, 2001-2004**

	APNIC (Asia-Pacific)	ARIN (Americas)	RIPE (Europe & Middle East)	LACNIC (Latin America)	AfriNIC (Africa)	Global
2001 (31 August)						
% of available address space being advertised						32.8%
% of allocated address space being advertised	76.5%	77.4%	70.4%	..	..	63.1%
Announcements from region ASes	16 909	73 197	17 238	..	..	106 542
Originating ASes in routing table	1 359	6 965	3 260	..	..	11 578
Transit ASes in routing table	224	700	583	..	..	1 505
Originating ASes advertising one route	453	2 075	1 729	..	..	4 257
2002 (31 August)						
% of available address space being advertised						32.1%
% of allocated address space being advertised	61.9%	68.7%	75.3%	..	..	58.8%
Announcements from region ASes	19 023	76 474	19 472	..	..	114 970
Originating ASes in routing table	1 594	8 004	3 967	..	..	11 792
Transit ASes in routing table	276	799	737	..	..	1 830
Originating ASes advertising one route	527	2 605	2 142	..	..	5 274
2003 (31 August)						
% of available address space being advertised						33.5%
% of allocated address space being advertised	65.3%	73.2%	73.3%	38.9%	..	59.8%
Announcements from region ASes	22 320	77 931	22 331	5 364	..	127 948
Originating ASes in routing table	1 884	8 613	4 814	346	..	13 638
Transit ASes in routing table	321	829	850	69	..	2 091
Originating ASes advertising one route	540	2 944	2 612	100	..	6 196
2004 (31 August)						
% of available address space being advertised						35.9%
% of allocated address space being advertised	72.3%	68.8%	59.6%	47.0%	11.9%	58.1%
Announcements from region ASes	27 967	83 472	26 797	6 322	1 229	145 818
Originating ASes in routing table	2 124	9 510	5 777	387	91	15 589
Transit ASes in routing table	335	917	995	77	13	2 370
Originating ASes advertising one route	627	3 393	3 105	116	21	7 262
Annual average growth 2001-2004 (%)						
Announcements from region ASes	18.3%	4.5%	15.8%	17.9%	..	11.0%
Originating ASes in routing table	16.0%	10.9%	21.0%	11.8%	..	10.4%
Transit ASes in routing table	14.4%	9.4%	19.5%	11.6%	..	16.3%
Originating ASes advertising one route	11.4%	17.8%	21.6%	16.0%	..	19.5%

Note : The annual average growth for LACNIC is calculated for one year, August 2003-August 2004.
Source: APNIC (www.apnic.net)

StatLink: http://dx.doi.org/10.1787/323020340357

Table 5.17. **Top 10 networks defined by number of peers, 2003-2004**

Rank	Top 10, May 2003		Top 10, September 2004	
	Network	Peers	Network	Peers
1	UUNET Technologies, (MCI)	2 774	UUNET Technologies, Inc.	2 347
2	Sprint	2 324	AT&T WorldNet Services	1 902
3	AT&T WorldNet Services	1 723	Sprint	1 732
4	Cable & Wireless USA	1 049	Level 3 Communications, LLC	1 171
5	Qwest	869	Qwest	1 092
6	Genuity	796	Verio, Inc.	636
7	Level 3 Communications, LLC	630	Cogent Communications	623
8	Global Crossing	609	Global Crossing	597
9	Verio, Inc.	564	Abovenet Communications, Inc	549
10	Abovenet Communications, Inc	501	Globix Corporation	533
	Top 10	11 839	Top 10	11 182
	Others	55 515	Others	67 680
	Total peerings	67 354	Total peering	78 862

Source: FixedOrbit (www.fixedorbit.com)

StatLink: http://dx.doi.org/10.1787/246517756512

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Chapter 6

Main Trends in Pricing

The pricing of telecommunication services in the OECD has proven very dynamic. Prices for most telecommunication have continued to fall and consumers have benefited. Many operators have moved towards flat-rate or unlimited calling and data plans. In addition, competition from newer technologies such as Voice over Internet Protocol (VoIP) has contributed significantly to more competitive rates for businesses and consumers. This chapter includes analysis and data for a wide variety of residential and business price baskets. Baskets include fixed line, mobile, international, Skype, DSL, cable modem and leased lines.

Several major trends have typified telecommunication pricing structures in the past several years. The trend toward tariffs that are not related to distance has been discussed in previous editions of the *Communications Outlook*. In response to the introduction of competition telecommunication carriers in a number of countries applied a single metered rate to all domestic calls. In those countries continuing to distinguish between local and long distance calling, particularly where local calls are unmetered, the size of local zones is often being expanded and long distance charges become more uniform.

All the signs are that this process will continue as competition from alternative platforms, such as cellular mobile or Internet telephony, evolve with tariffs that are not sensitive to distance. In the case of Internet telephony, for example, a number of providers charge the same price for domestic and international calls to some countries.

A second trend had been the shift toward unmetered PSTN access for dial-up Internet service (Table 6.1). In the most competitive market segments full or partially unmetered options were increasingly made available for customers that preferred such a pricing structure for dial-up Internet access. The number of countries with unmetered dial-up has, however, not greatly increased between 2002 and 2004. The main reason for this is that an increasing number of broadband access options, with pricing structures more appropriate to Internet access, than those inherited from telephony, have become available. That being said the pricing of telephony over the PSTN continues to evolve to meet competition.

In some countries where unmetered telephony has traditionally not been on offer and where unmetered Internet access did not take root prior to broadband alternatives becoming available, a significantly broader variety of tariff structures have become available. In Austria, which historically had one of the highest per minute rates for local telephony in the OECD, Telekom Austria cut the cost of local calls by 32.5% in May 2004. In addition, Telekom Austria began offering unmetered local telephony at evening and weekends. At the same time, France Telecom has introduced unmetered domestic telephony, over the PSTN, as an option for users. In addition France Telecom has launched an Internet telephony service, with unmetered domestic calls, for its broadband subscribers.

A number of other incumbent operators have begun to offer Internet telephony (Table 6.1). In the United Kingdom, for example, British Telecom was the first incumbent in Europe to launch an Internet telephony service over broadband networks. BT's tariffs for this service are the same those available to users for the PSTN but, as with other Internet telephony services, it can be used anywhere the user has access to the Internet. Internet telephony services from incumbents for their broadband subscribers are now also available in other countries such as Japan, Sweden and the United States.

In the United States companies such as Vonage were offering unlimited domestic calling in Canada and the United States for USD 24.95 per month in 2004. Alternatively, a user of Vonage could opt for 500 minutes per month for USD 14.95. Incumbents such as Verizon have responded to this by offering their own Internet telephony service to their broadband subscribers. In 2004, Verizon charged USD 29.95 for unlimited domestic Internet telephony.

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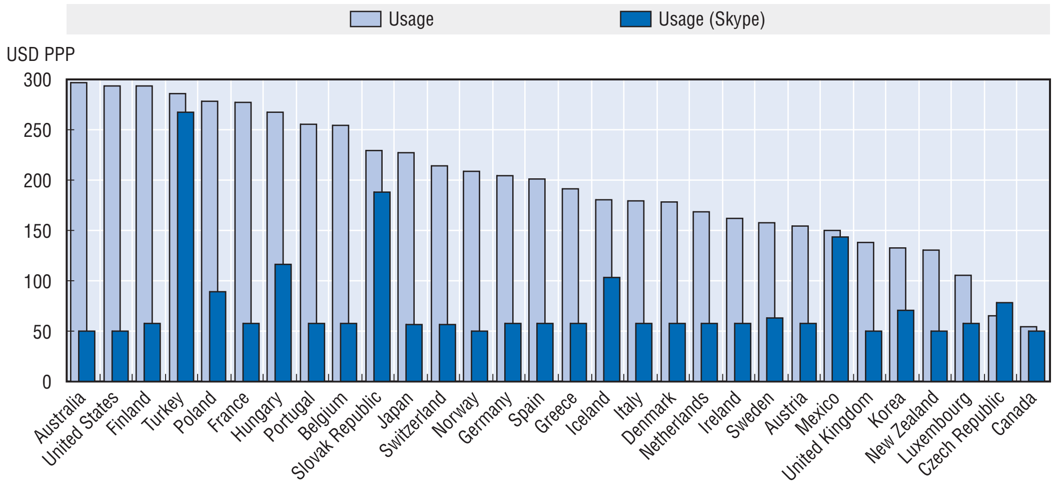
Figure 6.1. **OECD residential usage charges compared to Skype charges, September 2004**

Including VAT



StatLink: http://dx.doi.org/10.1787/442101481023

Source: OECD and Skype.

This raises the question of how these prices compare to those of the PSTN. The OECD residential basket contains around 200 minutes per month of calls to domestic fixed networks. Placing the cost of broadband access to one side, the Vonage offer of USD 14.95 per month for 500 minutes would represent a considerable saving over the PSTN price. The unlimited Vonage offer, while costing slightly more than the price of the OECD basket, is not directly comparable because of the ability of users to benefit from unmetered calls to all domestic locations.

It is likely that incumbent operators will increasingly offer Internet telephony to their broadband subscribers as companies like Vonage emerge in other countries. Gossiptel, in the United Kingdom, and Sipgate, in Germany, are examples of such companies. At the same time a global competitive threat in the form of peer to peer Internet telephony providers, such as Skype, have emerged to provide competition even in those countries where companies like Vonage do not offer service.

Skype's tariffs for Internet telephony are structured around the destination of the call rather than, as with PSTN and cellular mobile telephony, a combination of the destination and the origin. In other words it costs the same to call Japan, using Skype, irrespective of whether the calling party is in Australia, Mexico or Japan. (Table 6.2). This is also different from other Internet telephony services, which while being portable, also charge by a combination of origin and destination. A Vonage user travelling in the United Kingdom, for example, could make a call to France but they would still pay the international rate, set by Vonage, for calls made between the United States and France. By way of contrast, Skype's charges are wholly specific to the destination of the call.

The largest cost to Skype, in offering a service that completes calls on the PSTN or cellular networks, is the cost of local termination. In around two-thirds of OECD countries the price to call that destination is less than USD 0.02 per minute for calls completed on the fixed network. Calls to fixed networks were higher than USD 0.03 in seven countries while the highest prices charged were for areas in Mexico and Turkey outside the largest cities. Countries with above average prices usually have higher local termination fees usually indicating less developed competition in respect to access networks.

In the case of cellular networks there are major differences between those countries with calling party pays and those with receiving party pays. Skype's prices for calling cellular mobile networks in Canada, Mexico and the United States are the same as the fixed network. This is because the receiving party also makes a contribution to the cost of the call. In those countries with calling party pays the price to call a user ranges from USD 0.07 in Korea to USD 0.29 in the Netherlands and USD 0.34 in Switzerland.

It is possible for Skype, unlike Internet telephony services that are specific to one country, to provide a service to any user with a broadband Internet connection across the OECD. As such it raises the question of how the prices for a basket of calls on Skype compare to those for the OECD residential and international baskets.

Prior to examining such a comparison a significant difference needs to be noted between the PSTN prices and those of Skype. The difference is the treatment of taxation for both services. In the OECD's residential and international baskets the results include the value added tax or other applicable tax in that country. By way of contrast, Skype charges users residing within the European Union area a uniform 15% VAT. In 2004 this meant that a Danish user paid 15% VAT when using Skype compared to paying 25% VAT for using the PSTN. In 2004, users in other OECD countries did not pay tax when using Skype, Whereas the tax applicable to the PSTN in Australia is 10%, an Australian user paid no VAT on the Skype service.

The comparisons between the OECD baskets for residential (Table 6.3 and Figure 6.1) and international (Table 6.4) and those for Skype show that a user can make considerable reductions in price. The greatest potential savings are for international calls. Across the OECD, Skype's tariffs are on average 80% lower than the international tariffs for the PSTN. The response from telecommunication carriers is likely to be to offer competitive rates on their own Internet telephony service or additional discounts on their PSTN service to users with any significant volume of calls.

In the case of a basket of domestic residential telephony there are also considerable reductions to be had in most countries. That being said the savings are not great in the case of Canada and Mexico and Skype's service would be more expensive than the Czech Republic. In the cases of Canada and Mexico this is undoubtedly due to flat rate plans for local calls. Mexican users, for example receive 100 calls per month included in their local service. Canadian users have unmetered local service and some flat rate options for long distance calls.

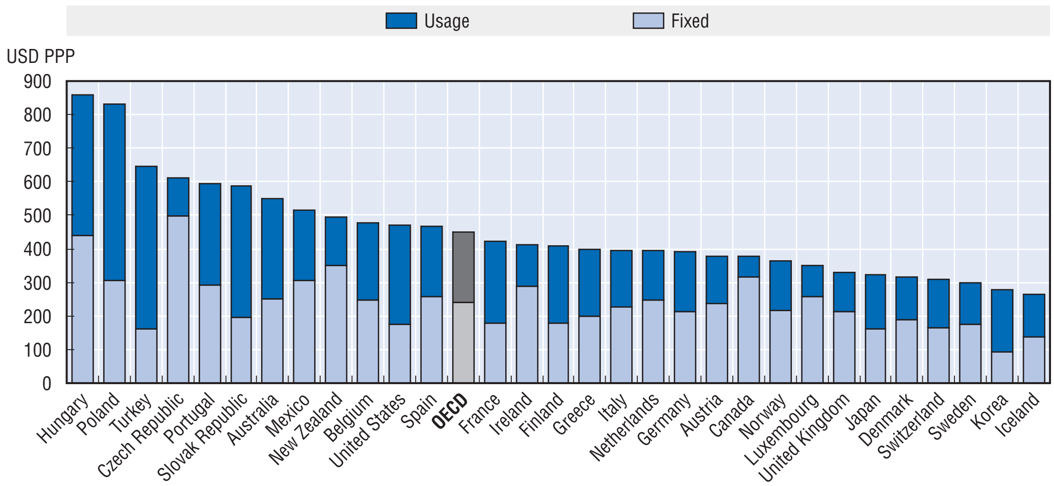
This may imply that other countries will witness a greater range of tariff options that include very low usage charges in return for higher fixed charges. Potentially mitigating against this development could be the development of "naked DSL" or alternative broadband whereby a user might bypass the traditional line rental (or any fixed charge for a discount plan) in favour of a pure Internet telephony service over their broadband access line (*e.g.* cable modem). Telecommunication carriers would also be mindful of putting up the line rental for the PSTN given the loss of customers to cellular mobile networks.

Residential and business telecommunication baskets

The OECD has two baskets to compare residential telecommunication prices. The first basket compares the price of domestic telephony (Table 6.5, Figure 6.2). The second basket, in addition to domestic services, includes international services and calls from the fixed network to mobile communication networks (Table 6.6, Figure 6.3). Iceland continues to have the least expensive domestic residential telecommunication services, when measured in USD using purchasing power parity, followed by Korea, Sweden, Switzerland,

Figure 6.2. **OECD residential tariff basket, USD PPP, August 2004**

Including VAT

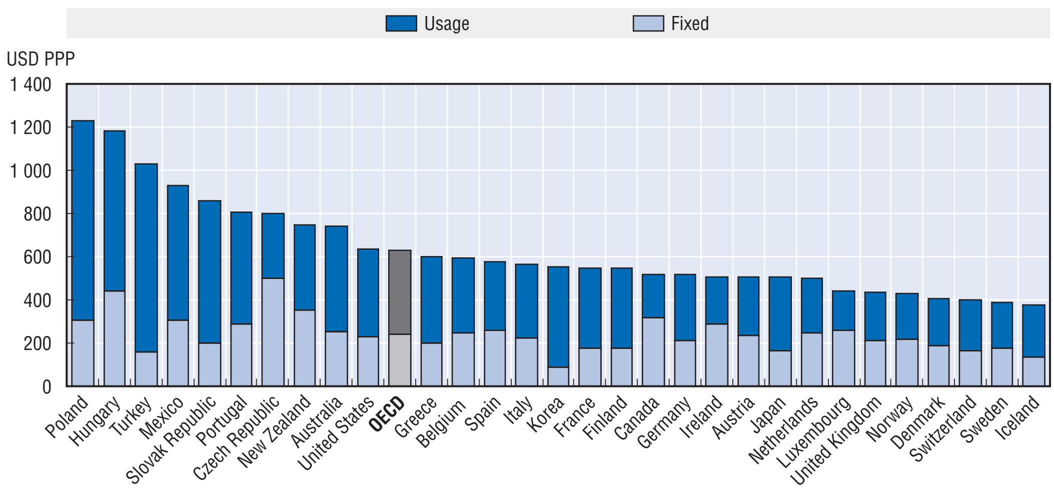


Note: Residential basket excludes international calls and calls to mobile networks.

StatLink: http://dx.doi.org/10.1787/426461503276

Figure 6.3. **OECD composite basket of residential telephone charges, August 2004**

Including VAT



Note: Composite basket includes international calls and calls to mobile networks.

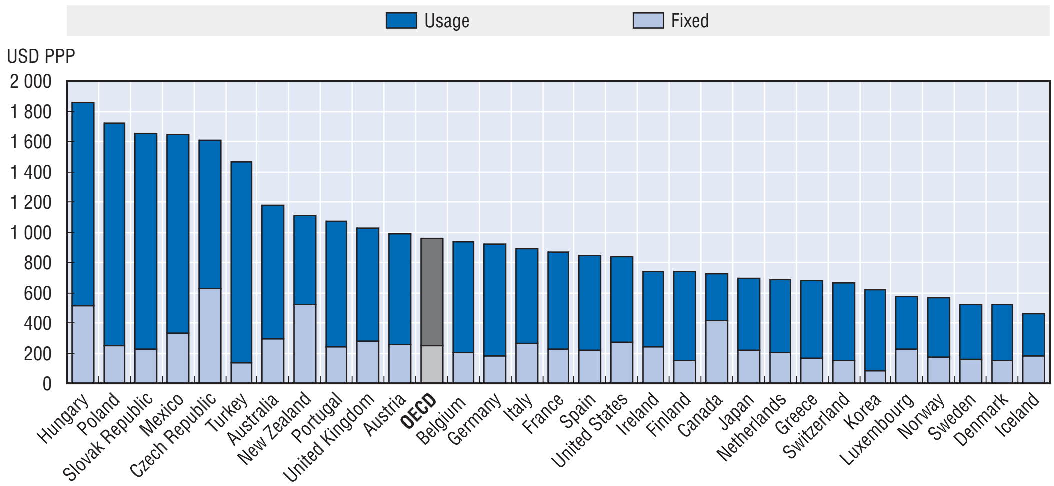
StatLink: http://dx.doi.org/10.1787/286266772265

Denmark, Japan and the United Kingdom. The inclusion of cellular mobile and international calls has a significant impact on the rankings. In this case the Scandinavian countries and Switzerland are the least expensive.

The OECD also has two baskets to compare business telecommunication prices. These baskets are for a small business user of telephony. The first basket compares the price of domestic telephony (Table 6.7, Figure 6.4). The second basket, in addition to domestic services, includes international services and calls from the fixed network to mobile communication networks (Table 6.8, Figure 6.5). The four Scandinavian countries are once again the least expensive for a basket of domestic telephony. For the composite basket the Scandinavian countries are also the least expensive joined by Luxembourg and Switzerland.

Figure 6.4. **OECD business tariff basket, USD PPP, August 2004**

Excluding VAT

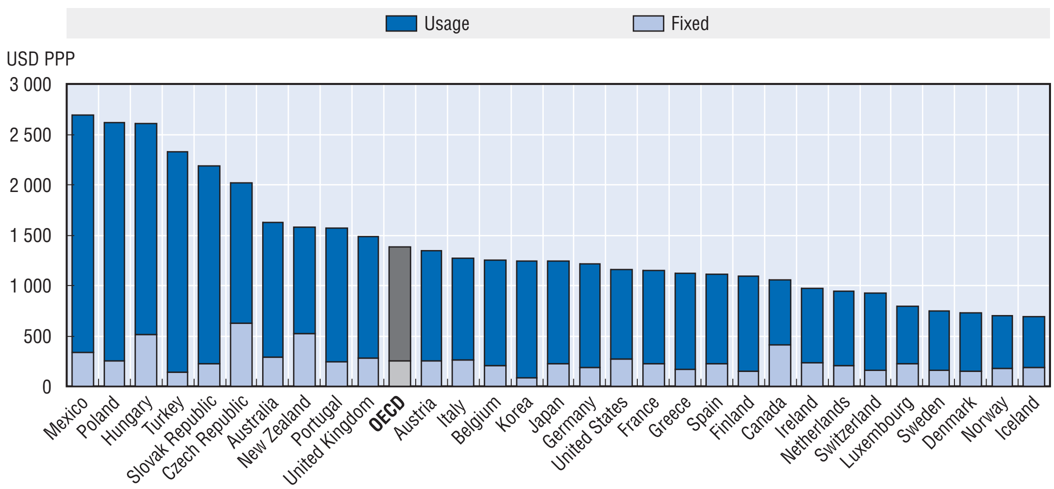


Note: Business basket excludes international calls and calls to mobile networks.

StatLink: http://dx.doi.org/10.1787/112167153550

Figure 6.5. **OECD composite basket of business telephone charges, August 2004**

Excluding VAT



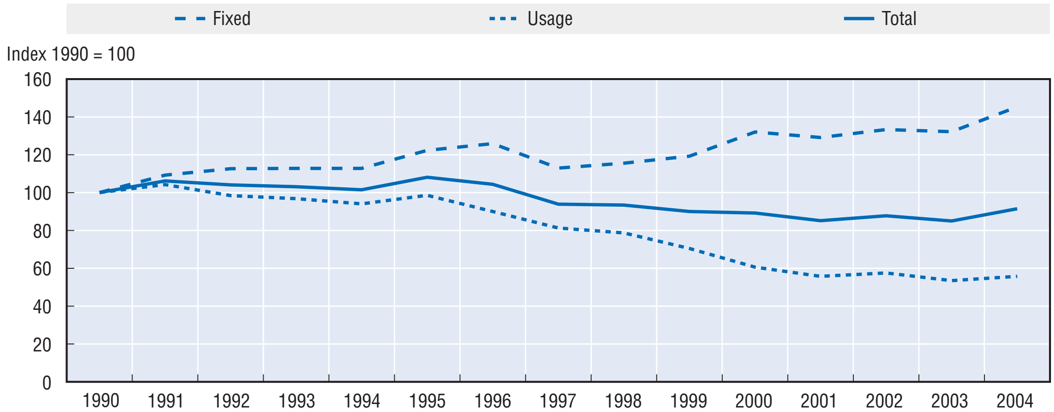
Note: Composite basket includes international calls and calls to mobile networks.

StatLink: http://dx.doi.org/10.1787/382715250054

Trends in residential and business rates

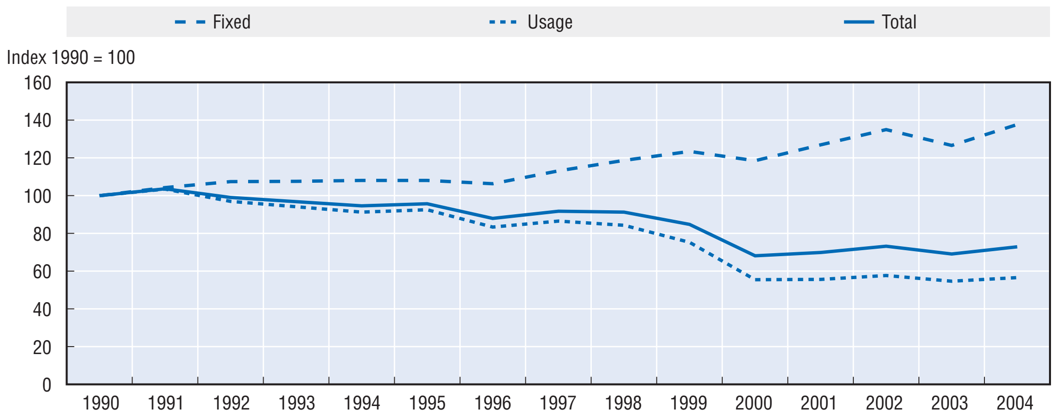
Telecommunication prices have declined significantly between 1994 and 2004. For residential users, prices have declined on average across the OECD by 10% for a basket of services during that period (Table 6.9, Figures 6.6a and 6.6b). Over the same time, albeit starting from a higher base, the prices for business users have declined by just under 22%. Taking into consideration that the data are based on current dollars, the actual gains for users are greater than shown.

Figure 6.6a. **Time series for residential telephone charges**



StatLink: http://dx.doi.org/10.1787/010824672866

Figure 6.6b. **Time series for business telephone charges**

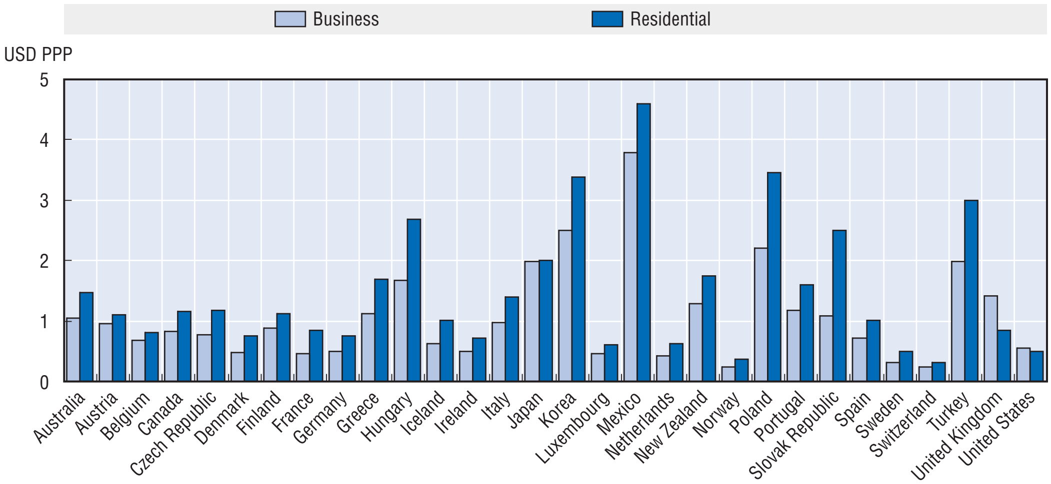


StatLink: http://dx.doi.org/10.1787/241240635356

For residential users it is worth noting that all these gains have been made since the middle of the decade when the decrease in usage charges began to outpace the rise in fixed charges. While the direct impact of rebalancing has been to shift the relative weight of charges, the decline in usage charges is directly attributable to increasing competition. For business users the gains have been particularly noticeable with increased liberalisation. Most of the gains have been made since 1998 coinciding with widespread liberalisation in that year. The rise in prices in 2004 may reflect less price competition as some firms exited the telecommunications market following the end of the financial bubble in the sector. On the other hand, some price changes reflect some degree of "optional rebalancing" as telecommunication carriers introduced a range of line rentals or fixed fees for discount plans. In these cases users elect to pay higher fixed charges in return for lower usage charges. Given that the OECD time series tracks the price for a fixed number of calls, the benefits users receive are not fully captured if they increase their levels of usage above this amount. Examples of such schemes include partially or fully unmetered long distance plans.

Figure 6.7. **OECD basket of international telephone charges for business and residential users, August 2004**

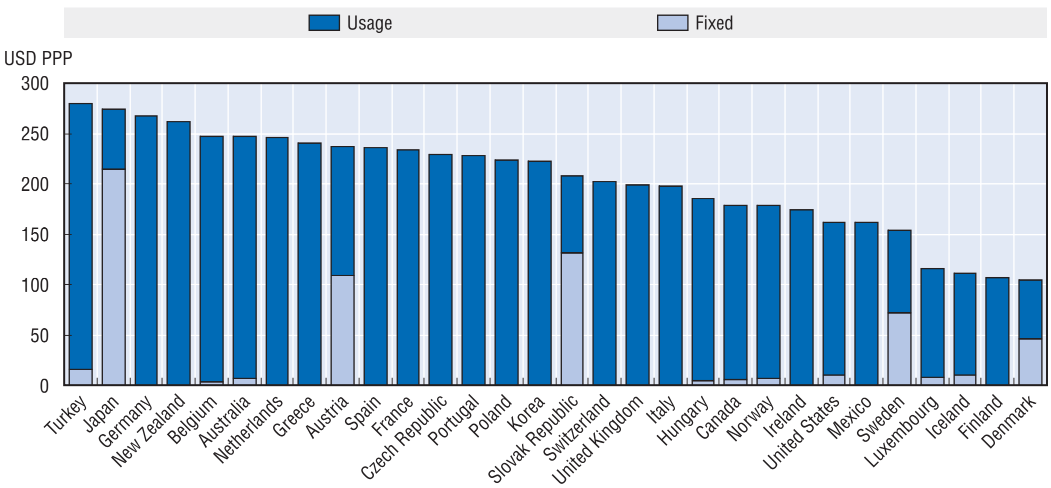
Including VAT



StatLink: http://dx.doi.org/10.1787/737167050861

Figure 6.8. **OECD basket of low user mobile telephone charges, August 2004**

Including VAT



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International rates

For business users the least expensive international rates, in August 2004, were to be found in Norway, Switzerland, Sweden the Czech Republic and the Netherlands (Table 6.10, Figure 6.7). At the same time, for residential users, the least expensive international rates were in Switzerland, the United States, Norway, and Sweden.

International rates have undergone the greatest reductions in any segment of telecommunication pricing over recent years. In some countries the standard published rates reflect these falls. In other countries it is necessary to subscribe to a discount plan to benefit from price reductions. In some cases these discount plans are automatically applied and in others the users need to pay an additional fixed monthly fee to receive the reduced rates.

In November 2004, for example, a user of Bell Canada would have paid USD 0.83 per minute to call the Netherlands at peak times, using standard rates. If the same user subscribed to Bell Canada's "First Rate Overseas Plan", for a fixed charge of USD 4.13 per month, the rate would have been USD 0.08 per minute. At the same time, the difference for a call from Canada to New Zealand using standard rate was USD 1.03 but only USD 0.08 under the discount plan. Canada's experience is mirrored in many other countries. Prices under various discount plans have fallen to very low levels compared to those available prior to liberalisation. On the other hand there is often little movement in the standard published rates that seem to be retained almost as benchmarks to show customers how much they are saving under various plans.

For the future, IP telephony will exert pressure on international rates. At one level the rates of Skype, Vonage and other independent internet telephony providers will exert an influence. At the same time the Internet telephony services of the incumbents are much lower than standard PSTN rates. In November 2004 Verizon's Internet telephony service, for example, charged less than USD 0.04 per minute for calls to Australia or France. This compares to Verizon's standard published PSTN rates of USD 2.83 per minute to Australia or USD 2.45 per minute to France.

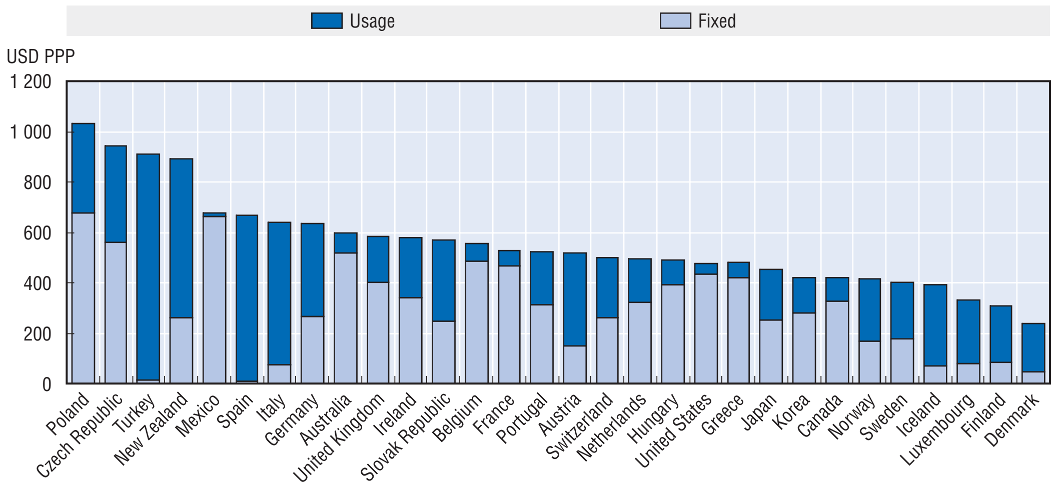
The other significant development in the pricing of international telephony is the differentiation between calls to fixed and mobile numbers. In recent years the price to terminate international calls on fixed networks has, in many cases, decreased below the price for terminating domestic calls to mobile networks. Accordingly, an increasing number of operators have negotiated international agreements to charge different rates for termination of incoming calls to fixed and mobile networks.

The result, for the users making the call, is a higher price to call a mobile number in a foreign country than a fixed line. In the case of Verizon's Internet telephony service it costs 10 times more to terminate on a mobile network than a fixed network in both Australia and France. In addition there is a large difference between the cost of terminating a call on a mobile network across the OECD with, in the case of Skype, the least expensive country being five times less expensive than the highest price in the OECD area.

Mobile communications

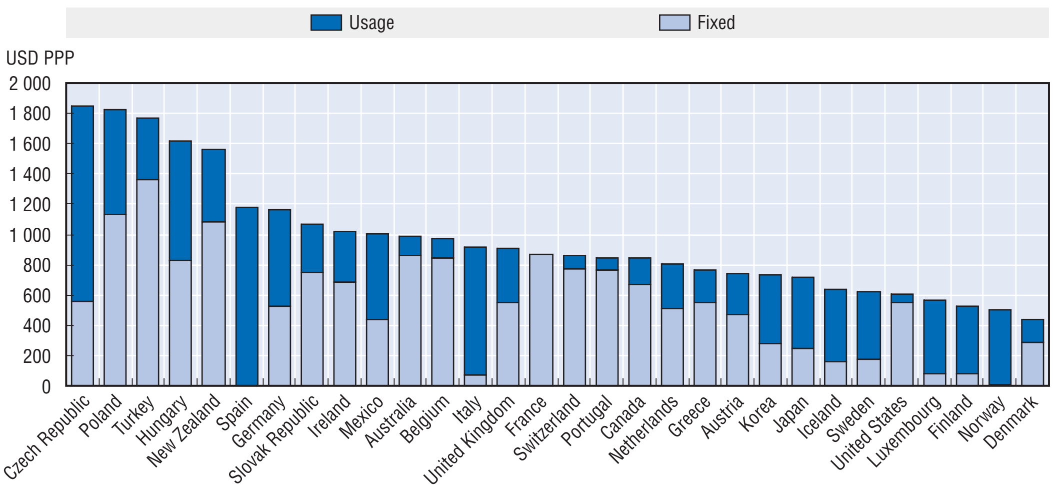
The OECD has three baskets for comparing cellular mobile communication prices. The low user makes 25 calls per month. The medium user makes 75 calls per month and the high user makes 150 calls per month. The baskets spread the calls over different times of day and days of the week. In addition the calls are spread over destination including calls to fixed networks, calls to other users on the same network and calls to other users on different mobile networks. A number of short message service (SMS) are also included for each user. In each country multiple mobile operators are surveyed and the least expensive option chosen for the applicable usage pattern. Some specific discount options are not taken into account, such as discounts on call charges between family members on the same network. For example, if a user in Japan has used NTT DoCoMo (Japan) for over five years and a family member is also using with NTT, the basic charge is discounted by as much as 40%.

Figure 6.9. **OECD basket of average user mobile telephone charges, August 2004**
Including VAT



StatLink: http://dx.doi.org/10.1787/167686511275

Figure 6.10. **OECD basket of high user mobile telephone charges, August 2004**
Including VAT

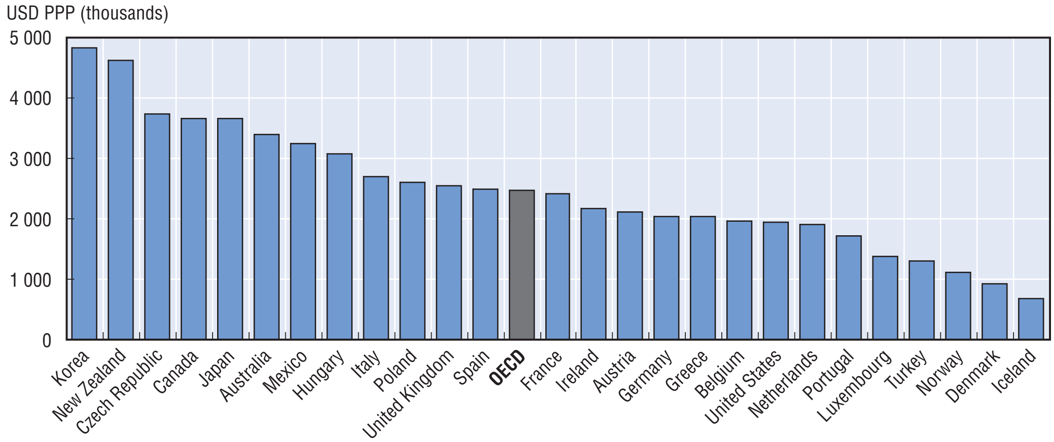


StatLink: http://dx.doi.org/10.1787/150548008384

For the low user basket the least expensive offers, measured in USD using purchasing power parity, were in Denmark, Finland, Iceland, Luxembourg, Sweden, Mexico and the United States (Table 6.11, Figure 6.8). The least expensive offers in this category tend to be pre-paid. One caveat applies to the pricing for wireless service in the United States. In that country some pricing options have local calling areas in terms of the location from which users make calls. If a user roams outside that local service area they pay additional roaming charges under such pricing options. For the OECD baskets, the pricing option selected must enable users to roam on a national basis. If this stipulation did not apply some pre-paid options, with local calling areas in the United States, would be comparable to the pricing found in countries with relatively small national calling areas such as Luxembourg.

Figure 6.11. **OECD basket of national leased line charges for 2M lines, August 2004**

Excluding tax



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The comparisons use the tariffs for operators with the largest market share in each country. In some countries, smaller operators provide lower tariffs in an effort to gain market share. In Japan for example, TU-KA has less expensive plans than the largest operators, NTT DoCoMo and KDDI. TU-KA's low-use plan "Simple 20 Course" has a monthly subscription fee of JPY 2 000 (USD 19.43) that is applied towards calls at between JPY 20-40 (USD 0.19-0.39) per minute.

For a medium user the least expensive baskets are Denmark, Finland, Luxembourg, Iceland Sweden, Norway and Canada (Table 6.12, Figure 6.9). For the high volume basket the least expensive offers were in the Denmark, Norway, Finland, Luxembourg and the United States (Table 6.13, Figure 6.10). Japan is also among the least expensive countries for higher volume users. The traditional approach to wireless pricing in North America, of including large amounts of minutes in the subscriber's package, comes strongly into its own as the usage level compared increases. Some of the early entrants in the 3G market are also bundling large volumes of minutes to attract telephony users.

Leased lines

Traditionally, leased lines have provided the main means by which telecommunication carriers have provided broadband services for business users. Leased lines, or private lines as they are called in North America, provide the building blocks for business to business electronic commerce. They allow users needing to transport high volumes of traffic to take advantage of lower prices than PSTN pricing and to have control over their own telecommunication facilities and traffic. Leased lines are also used by some companies to provide value-added services, often in competition with telecommunication carriers. ISPs use leased lines to build backbone networks for the Internet and large customers use them to access ISP facilities.

The Scandinavian countries have the least expensive leased lines in the OECD area. All the Scandinavian countries for which data are available have prices over 70% below the OECD average for 2 Mbit/s leased lines (Table 6.14, Figure 6.11). For the same amount of capacity the least expensive countries, outside the Nordic region, are Luxembourg, Ireland, the Netherlands, and Belgium.

The national leased line basket also includes, where possible, the following – analogue circuits equivalent to M1020, for up to 9.6 kbit/s data transmission and 64 kbit/s digital leased lines. Although these circuits are less important than they once were many businesses still rely on them for local connections. The results shown for each circuit type, are the annual prices for a basket of 100 circuits spread over different distances.

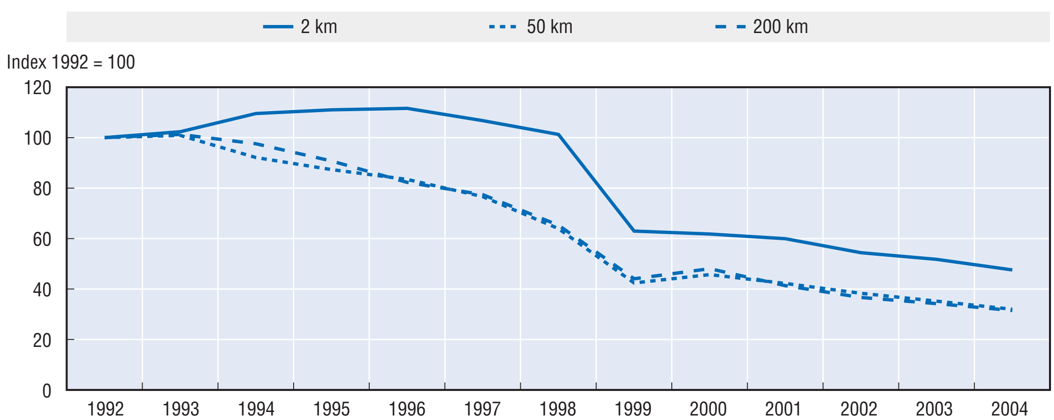
In the mid-1990s, prior to full liberalisation, a number of OECD countries, still with monopolies, began to allow the competitive provision of leased lines. This began to impose the first competitive discipline over leased line prices, but only over longer distances. The main reason for this is that it takes time to roll out alternative networks. Accordingly the average price for short distance leased lines – as represented by the prices at two kilometres – actually increased during this period (Table 6.15, Figure 6.12). Local leased line prices remain of concern where there is insufficient competition. For users in these areas this means that incumbents can continue to charge prices that are not disciplined by competition. For new entrants it means that incumbents may price local leased circuits in an anti-competitive manner.

A major turning point in the pricing of leased lines took place in 1998 when a significant number of European countries fully liberalised their telecommunication markets. The impact of increasing liberalisation is evident in the OECD's Index of leased line prices. At the distances of 50 and 200 kilometres the leased lines (2 Mbit/s) index fell from 77 in 1997 to 32 and 31 by 2004.

Far greater decreases in the pricing of capacity are evident over long distances. This is as a result of the greater amount of competition for the provision of long distance infrastructure than local infrastructure. However, it is propitious that the prices at two kilometres have also fallen since 1998 reflecting the competition provided by new entrants. For the future it is expected that symmetrical DSL services will provide an increasingly available substitute for local leased connections. This should provide less expensive options for business users to connect to backbone networks.

Figure 6.12. **Trends in leased line pricing over different distances, 1992-2004**

2 Mbit/s



StatLink: http://dx.doi.org/10.1787/646172562005

As noted in previous editions of the *Communication Outlook*, an important consideration in any examination of list prices of capacity and the prices available at bandwidth exchanges is the quality of service. Some telecommunication carriers argue that the prices available at exchanges may not have comparable levels of service as their listed offerings. On the other hand capacity which is listed at these exchanges is available under the conditions specified. A continuing issue with leased lines is that while prices are falling, incumbent operators may be less responsive to some customers who are also competitors. For example, a problem regulators often have to face is that incumbents delay the provision of a leased line to a competitor. While competition can no doubt take care of such problems on major routes there is much less competition available on thin routes and for local connections outside major cities. Previous *Communications Outlooks* have commented that regulators need to be vigilant in those areas where competition has not had time to mature and may need to consider quality of service indicators to monitor the provision of leased lines.

Broadband pricing

DSL

The structure of DSL pricing has a number of variables in OECD countries. Foremost among these is the advertised capacity for connections. In a small number of countries the lowest price for a DSL connection provides a downstream connection of 128 kbit/s. As this speed is akin to ISDN levels of service they are excluded from broadband comparisons. It is also noticeable, since the previous edition of the Communications Outlook, that a number of 128 kbit/s DSL offers have been discontinued in countries such as New Zealand and France. In these case users have been automatically shifted to higher speed offers.

In 2002 one of the more common baselines for DSL was 256 kbit/s downstream connectivity. Toward the close of 2004 only six incumbents across the OECD had this speed as their baseline offer (Table 6.16). A further three had baseline speeds between 384 kbit/s and 416 kbit/s. Some 12 incumbents had baseline speeds between 512 kbit/s and 1 Mbit/s. Incumbents in the remaining countries had baselines speeds at 1 Mbit/s or higher.

The highest DSL speeds from incumbents are available in Japan, Korea and Sweden where premium service is available to residential users at 10 Mbit/s or higher. NTT's ADSL service at 47 Mbit/s and Korea Telecom's service VDSL service at 50 Mbit/s are the highest DSL speeds offered by incumbent operators. Telia's service at 10 Mbit/s and Belgacom's service at 9 Mbit/s are the highest for incumbents in Europe. Bell Canada's service at 4 Mbit/s is the highest among the incumbents considered in North America followed by the SBC service at 3 Mbit/s. It is worth noting that these ADSL speeds may not be the fastest on offer in an economy.

It is the case, of course, that there are other suppliers in these markets with higher speeds using DSL or alternative platforms such as cable modems, fibre optics, fixed wireless and so forth. It is also the case that incumbents are often not the price leaders in these markets. That being said, the incumbents selected have the widest terrestrial coverage of broadband and are more likely to offer a comparable quality of service. It is also true that the prices of the incumbents, while not necessarily being the leaders, do reflect the level of competition in the surrounding market. If NTT, KT and Telia offer the fastest DSL service among the incumbents it is because they have been driven to do so by competition from companies such as YahooBB (Japan), Hanaro (Korea) and

Bredbandsbolaget (Sweden). Notwithstanding this the coverage of these new entrants is more limited than the incumbents in each case.

Toward the close of 2004 it was evident that a number of other countries were likely to join the leaders in terms of higher DSL speeds being made available. In France the incumbent's DSL offers ranged from 512 kbit/s to 2 Mbit/s. That being the case France Telecom had announced it would be raising the contracted speeds for users. This was undoubtedly in response to new entrants making DSL service available up to 15 Mbit/s in areas where unbundled local loops were available. In terms of alternative operators France also had some of the least expensive high speed DSL available. Neuf Telecom, for example, was offering an 8 Mbit/s service for under USD 20 in November 2004. For the same price as the incumbent's 2 Mbit/s offer, one new entrant ("Free") was offering a DSL service up to 15 Mbit/s as well as Internet telephony and 78 television channels. However, these offers had a more limited geographical reach than those of France Telecom, underlining the importance of comparing the services of incumbents against each other.

A second aspect of DSL pricing is whether the service has a metered element or is at a flat monthly rate. In two-thirds of OECD countries the incumbent offers a flat rate monthly price as the standard service or as an option. In some countries with caps on data transfer the service is virtually unmetered with the baseline threshold being set relatively high such as in Portugal and the United Kingdom. The two countries where the threshold for metered service is relatively low are Australia and Austria. In Australia some services, from the incumbent's own servers, are not counted towards these limits.

In comparing prices it is necessary to consider the capacity of the connection and, where applicable, the number of bytes users can download before additional charges are incurred. Some users will look for the best offer within a certain price range. This also presents one way to consider a comparison. For example if a user was willing to spend between USD 20 to USD 30 where could they receive the best offer from the incumbents across the OECD area? In this particular example the best offers are in Korea and the United States. In the United States a user could obtain a 1.5 Mbit/s connection, with unlimited usage, from Verizon for USD 29.95 or from SBC for USD 26.95. In Korea a 4 Mbit/s connection is available for USD 25.46 when expressed in USD, although this is higher than some other offers when measured in USD using purchasing power parity. Some less expensive offers do exist within that range, for other incumbents, but they are for significantly lower access speeds or have relatively limited usage allowances.

For a user prepared to spend between USD 30 and USD 40, as measured with purchasing power parity, the best offers are undoubtedly in Japan. For around USD 34 per month a Japanese user could choose between NTT's DSL services from 8 Mbit/s to 24 Mbit/s with unlimited usage. The lowest-priced offer when measured in USD using purchasing power parity, from an incumbent, for an unmetered DSL service, was Swisscom's 600 kbit/s service for USD 25.85 followed by SBC's baseline offer. In terms of exchange rates the lowest price for unlimited DSL was for Slovak Telecom's 384 kbit/s service for USD 22.56 per month followed by KT's offer for 4 Mbit/s at USD 25.40.

As some offers have been discontinued or upgraded it is not a simple matter to do a comparison with how prices and speeds have changed between September 2002 and November 2004. It is possible to compare the offers from 2002 with the closest comparable offers for 2004 (Table 6.17). In some cases the speed has been upgraded or the closest offer has been changed from limited to unlimited data transfer or both. The overall trend for baseline offers, however, is relatively clear. On average, a user in the OECD paid USD 9.42 (USD 17 in PPP) less in 2004 than 2002 for an increase in the downstream speed of their connection by 514 kbit/s.

Cable

Broadband access *via* cable modem accounts for 35% of all broadband subscriptions throughout the OECD and is the dominant access technology in Austria, Canada, the Czech Republic, the Netherlands, Poland, Portugal and the United States. Cable operators have typically been able to upgrade networks and launch Internet services quickly in areas with extensive cable TV coverage.

Cable Internet speeds are often higher than baseline DSL packages in the OECD but also higher in price. In the United States, for example, Verizon offers DSL connections at 768 kbit/s for USD 39.95 per month while Comcast offers 6 Mbit/s over cable for USD 59.99 (see Table 6.18). In order to attract customers, many cable providers offer bundled packages of video, voice and data (triple play) with significant discounts for users who subscribe to multiple services. For example, Comcast cable subscribers receive nearly a 30% reduction in cable Internet cost, from USD 59.99 to USD 42.95 if they subscribe to standard cable television service at USD 43.73 per month.

Cable Internet operators in some OECD countries have started offering telephony over their networks, highlighting their role as viable infrastructure-based competition to fixed-line operators in the OECD. Of the companies listed in Table 6.18, 68% offer voice services for an additional fee, with an additional 16% planning service in 2005. Cable Internet operators view telephony service as a vital part of their strategy to compete with DSL and satellite TV.

It is worth noting that cable modem speed estimations are relatively imprecise when compared to similar speeds published by DSL operators. DSL networks are characterised by a dedicated channel between the user's modem and the central office that will retain a stable bandwidth. In contrast, cable Internet subscribers share a given amount of bandwidth with a number of other users in their immediate area. Therefore, the bandwidth demands of neighbours will directly affect the speeds of other cable modem users in the neighbourhood. During off-peak hours, cable users may have very fast downloads while their connections will slow considerably during periods of peak usage.

Table 6.1. **Pricing structures for residential users in the OECD area, 2004**

	Local telephony	PSTN component of Internet access	Local telephony	Internet access	Unmetered dial-up for Internet access in 2004	DSL pricing structure[3]	Internet telephony offered by incumbent for residential broadband users by 2004 (for calls teminating in PSTN)
Australia	Unmetered (flat rate)		Per call	Per call	Yes	Metered and flat rate available	
Austria	Metered (options for unmetered weekends and evenings)	Metered	Seconds	Seconds		Metered and flat rate available	
Belgium	Metered	Metered	Seconds	Seconds		Metered data transfer followed by capacity reduction to 64 kbps	
Canada	Unmetered	Unmetered	None	None	Yes	Flat rate	
Czech Republic	Metered (Options for unmetered weekends and offpeak)	Unmetered/Metered	Seconds	Seconds	Yes (weekends and holidays)	Flat rate	
Denmark	Metered	Metered	Seconds	Seconds		Flat rate	
Finland	Metered	Unmetered/Metered	Seconds	Seconds	Yes (evening)	Flat rate	
France	Metered/Unmetered	Unmetered/Metered	Seconds	Seconds	Yes	Flat rate	Yes
Germany	Metered	Metered	Units	Seconds		Metered beyond 1.5 Gbytes; flat rate available	
Greece	Metered	Metered	Units	Seconds		Flat rate	
Hungary	Metered	Metered	Seconds	Seconds		Flat rate	
Iceland	Metered	Metered	Seconds	Seconds		Flat rate domestic	
Ireland	Metered	Unmetered/metered	Seconds	Seconds	Yes	Metered beyond 4 Gbytes; flat rate available as premium service	
Italy	Metered	Metered	Seconds	Seconds		Flat rate	
Japan[1]	Metered	Metered	Units	Units	Yes (late night and ISDN)	Flat rate	Yes
Korea	Metered	Unmetered/metered	Units	Units	Yes	Flat rate	
Luxembourg	Metered	Metered	Seconds	Seconds		Metered beyond 1 Gbyte; flat rate available	
Mexico	Unmetered (first 100 calls free, then flat rate)		Per call	Per call	Yes	Flat rate	
Netherlands	Metered	Metered	Seconds	Seconds		Flat rate	
New Zealand	Unmetered	Unmetered	None	None	Yes	Metered data transfer followed by capacity reduction to 64 kbps	
Norway	Metered	Metered	Seconds	Seconds		Flat rate	
Poland	Metered	Metered	Units	Units	Yes (not TPSA)	Metered and flat rate available	
Portugal	Metered	Unmetered/metered	Seconds	Seconds	Yes	Metered and flat rate available	
Slovak Republic	Metered	Metered	Seconds	Seconds		Metered and flat rate available	
Spain	Metered	Unmetered/metered	Seconds	Seconds	Yes (evening)	Flat rate	
Sweden	Metered	Metered	Seconds	Seconds		Flat rate	Yes
Switzerland	Metered	Metered	Units	Seconds		Flat rate	
Turkey	Metered[2]	Metered[2]	Units	Units		Metred and flat rate available	
United Kingdom	Metered	Unmetered/metered	Seconds	None/seconds	Yes	Metred and flat rate available	Yes
United States	Metered/flat rate/unmetered		Seconds/per call/none		Yes	Flat rate	Yes (Verizon)

1. NTT East and NTT West offer a flat rate for late evening for certain specified numbers for which subscribers pay a higher rental. The companies are also have an unmetered option using ISDN.
2. Türk Telekom's line rental includes 100 units.
3. Operators with metered pricing wil generally include a certain number of bytes followed by metered pricing.

StatLink: http://dx.doi.org/10.1787/544883725625

Table 6.2. **Skype pricing by call destination**

Destination of call	Rate per minute to fixed network (USD, excluding tax)	Destination of call	Rate per minute to mobile network (USD, excluding tax)
Australia	0.019	Canada (Mobile)	0.019
Austria	0.019	United States (Mobile)	0.019
Belgium	0.019	Mexico (Mexico City, Monterrey)	0.019
Canada	0.019	Korea (Mobile)	0.066
Denmark	0.019	Mexico	0.090
France	0.019	Japan (Mobile)	0.140
Germany	0.019	Belgium (Mobile - Proximus)	0.161
Ireland	0.019	France (Mobile)	0.184
Italy	0.019	Australia (Mobile)	0.185
Mexico (Mexico City, Monterrey)	0.019	Finland (Mobile)	0.185
Netherlands	0.019	Norway (Mobile)	0.193
New Zealand	0.019	Turkey (Mobile)	0.194
Norway	0.019	Czech Republic (Mobile)	0.200
Portugal	0.019	Greece (Mobile)	0.210
Spain	0.019	Ireland (Mobile)	0.213
Sweden	0.019	Slovakia (Mobile)	0.218
United States	0.019	Hungary (Mobile)	0.221
United Kingdom	0.019	Luxembourg (Mobile)	0.221
Switzerland	0.021	United Kingdom (Mobile)	0.230
Japan	0.022	Belgium (Mobile)	0.237
Czech Republic	0.026	Poland (Mobile)	0.237
Korea	0.027	Austria (Mobile)	0.246
Luxembourg	0.027	Denmark (Mobile)	0.253
Poland	0.029	Spain (Mobile)	0.263
Greece	0.030	Iceland (Mobile)	0.266
Finland	0.033	Sweden (Mobile)	0.266
Hungary	0.038	Italy (Mobile)	0.281
Iceland	0.039	Germany (Mobile)	0.282
Slovak Republic	0.062	New Zealand (Mobile)	0.283
Turkey (Istanbul)	0.085	Austria (Mobile - Telering)	0.292
Mexico	0.090	Netherlands (Mobile)	0.294
Turkey	0.125	Portugal (Mobile)	0.317
		Switzerland (Mobile)	0.335
OECD (average of above)	0.031	OECD (average for countries with receiving party pays)	0.037
		OECD (average for countries with calling party pays)	0.230

Source: Skype.

StatLink: http://dx.doi.org/10.1787/460684106010

Table 6.3. **OECD residential basket tariffs compared to Skype tariffs, August 2004**
USD

	Fixed	Usage	Total	Usage (Skype)	Total (Skype usage + fixed line rental)	Reduction of:
Australia	251.02	296.94	547.96	50.40	301.42	45.0%
Austria	261.94	154.31	416.25	57.96	319.89	23.1%
Belgium	273.84	254.58	528.42	57.96	331.80	37.2%
Canada	292.32	54.28	346.59	50.40	342.71	1.1%
Czech Republic	283.52	65.53	349.05	78.41	361.94	-3.7%
Denmark	268.72	177.98	446.70	57.96	326.68	26.9%
Finland	229.10	293.17	522.27	57.96	287.06	45.0%
France	204.09	277.48	481.57	57.96	262.05	45.6%
Germany	243.22	204.44	447.66	57.96	301.18	32.7%
Greece	192.03	191.45	383.48	57.96	249.98	34.8%
Hungary	281.63	267.20	548.82	115.91	397.54	27.6%
Iceland	191.58	180.52	372.11	103.76	295.34	20.6%
Ireland	377.48	162.10	539.59	57.96	435.44	19.3%
Italy	236.86	178.83	415.70	57.96	294.82	29.1%
Japan	233.28	226.71	459.99	56.92	290.20	36.9%
Korea	64.73	132.10	196.82	71.15	135.87	31.0%
Luxembourg	286.94	105.37	392.31	57.96	344.89	12.1%
Mexico	220.31	150.32	370.63	143.78	364.09	1.8%
Netherlands	280.67	168.91	449.58	57.96	338.63	24.7%
New Zealand	319.86	130.36	450.22	50.40	370.25	17.8%
Norway	314.04	208.61	522.65	50.40	364.44	30.3%
Poland	162.14	278.07	440.21	88.64	250.77	43.0%
Portugal	244.42	255.88	500.30	57.96	302.38	39.6%
Slovak Republic	116.33	229.65	345.98	187.50	303.83	12.2%
Spain	243.47	200.61	402.98	57.96	301.42	25.2%
Sweden	220.46	157.32	377.78	62.79	283.25	25.0%
Switzerland	251.23	213.82	465.05	56.32	307.55	33.9%
Turkey	95.06	286.13	381.20	267.00	362.06	5.0%
United Kingdom	245.88	137.86	383.74	57.96	303.84	20.8%
United States	176.44	293.94	470.38	50.40	226.84	51.8%

Note: OECD residential basket and Skype exclude tax. Skype basket for Mexico and Turkey include 50% of calls to Mexico City and Istanbul, respectively. For the OECD basket, taxes are included for all countries; for Skype, EU countries only.

Source: OECD and Skype.

StatLink: http://dx.doi.org/10.1787/543731444032

Table 6.4. **OECD international residential tariffs compared to Skype tariffs, August 2004**

	OECD basket (USD)	Skype basket (USD)	Reduction of:
Australia	1.48	0.09	93.6%
Austria	1.22	0.11	91.1%
Belgium	0.89	0.11	87.8%
Canada	1.07	0.09	91.1%
Czech Republic	0.67	0.15	78.0%
Denmark	1.06	0.11	89.7%
Finland	1.42	0.11	92.4%
France	0.97	0.11	88.8%
Germany	0.86	0.11	87.3%
Greece	1.63	0.11	93.3%
Hungary	1.72	0.22	87.3%
Iceland	1.40	0.19	86.1%
Ireland	0.94	0.11	88.5%
Italy	1.47	0.11	92.6%
Japan	2.85	0.11	96.3%
Korea	2.39	0.13	94.4%
Luxembourg	0.69	0.11	84.2%
Mexico	3.30	0.44	86.5%
Mexico (Mexico City, Monterrey)	3.30	0.09	97.2%
Netherlands	0.71	0.11	84.8%
New Zealand	1.60	0.09	94.1%
Norway	0.54	0.09	82.4%
Poland	1.83	0.17	90.9%
Portugal	1.35	0.11	91.9%
Slovak Republic	1.48	0.35	76.2%
Spain	0.97	0.11	88.8%
Sweden	0.64	0.12	81.5%
Switzerland	0.46	0.11	77.2%
Turkey	1.77	0.62	65.2%
Turkey (Istanbul)	1.77	0.38	78.4%
United Kingdom	0.98	0.11	88.9%
United States	0.49	0.09	80.7%
OECD average	1.37	0.16	88.5%

Note: Average call charge for one single call, weighted by traffic. For the OECD basket, taxes are included for all countries; for Skype, EU countries only.
Source: OECD and Skype.

StatLink: http://dx.doi.org/10.1787/783760545428

Table 6.5. **OECD basket of residential telephone charges, August 2004**
Including VAT

	Fixed		Usage		Total	
	USD	USD PPP	USD	USD PPP	USD	USD PPP
Australia	251.02	251.02	296.94	296.94	547.96	547.96
Austria	261.94	238.12	154.31	140.28	416.25	378.41
Belgium	273.84	246.70	254.58	229.35	528.42	476.06
Canada	292.32	317.74	54.28	59.00	346.59	376.73
Czech Republic	283.52	497.41	65.53	114.96	349.05	612.37
Denmark	268.72	189.24	177.98	125.34	446.70	314.58
Finland	229.10	178.99	293.17	229.04	522.27	408.03
France	204.09	179.03	277.48	243.40	481.57	422.43
Germany	243.22	213.35	204.44	179.33	447.66	392.68
Greece	192.03	200.03	191.45	199.43	383.48	399.45
Hungary	281.63	440.04	267.20	417.49	548.82	857.54
Iceland	191.58	136.85	180.52	128.94	372.11	265.79
Ireland	377.48	288.16	162.10	123.74	539.59	411.90
Italy	236.86	225.58	178.83	170.32	415.70	395.90
Japan	233.28	163.13	226.71	158.54	459.99	321.67
Korea	64.73	91.16	132.10	186.05	196.82	277.21
Luxembourg	286.94	256.19	105.37	94.08	392.31	350.28
Mexico	220.31	305.99	150.32	208.78	370.63	514.76
Netherlands	280.67	246.20	168.91	148.17	449.58	394.37
New Zealand	319.86	351.49	130.36	143.25	450.22	494.75
Norway	314.04	218.09	208.61	144.87	522.65	362.95
Poland	162.14	305.92	278.07	524.66	440.21	830.58
Portugal	244.42	290.98	255.88	304.62	500.30	595.60
Slovak Republic	116.33	197.16	229.65	389.24	345.98	586.40
Spain	243.47	256.28	200.61	211.17	444.08	467.45
Sweden	220.46	173.59	157.32	123.87	377.78	297.46
Switzerland	251.23	166.38	213.82	141.60	465.05	307.98
Turkey	95.06	161.12	286.13	484.97	381.20	646.09
United Kingdom	245.88	211.97	137.86	118.84	383.74	330.81
United States	176.44	176.44	293.94	293.94	470.38	470.38
OECD	235.42	239.14	197.82	211.14	433.24	450.29

Note: Residential basket excludes international calls and calls to mobile networks.
Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/038364017643

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Table 6.6. **OECD composite basket of residential telephone charges, August 2004**
Including VAT

	Fixed		Usage		Total	
	USD	USD PPP	USD	USD PPP	USD	USD PPP
Australia	251.02	251.02	490.12	490.12	741.14	741.14
Austria	261.94	238.12	294.68	267.89	556.62	506.02
Belgium	273.84	246.70	383.49	345.49	657.33	592.19
Canada	292.32	317.74	183.57	199.53	475.88	517.26
Czech Republic	283.52	497.41	172.45	302.55	455.98	799.96
Denmark	268.72	189.24	306.87	216.11	575.59	405.35
Finland	229.10	178.99	469.53	366.82	698.63	545.80
France	204.09	179.03	420.81	369.13	624.90	548.15
Germany	243.22	213.35	346.19	303.67	589.41	517.02
Greece	192.03	200.03	382.04	397.96	574.07	597.99
Hungary	281.63	440.04	475.74	743.35	757.37	1 183.39
Iceland	191.58	136.85	338.19	241.57	529.78	378.41
Ireland	377.48	288.16	288.03	219.87	665.51	508.02
Italy	236.86	225.58	353.60	336.76	590.46	562.34
Japan	233.28	163.13	488.81	341.83	722.09	504.96
Korea	64.73	91.16	326.61	460.01	391.33	551.17
Luxembourg	286.94	256.19	205.31	183.31	492.25	439.51
Mexico	220.31	305.99	450.89	626.24	671.20	932.23
Netherlands	280.67	246.20	291.29	255.51	571.96	501.72
New Zealand	319.86	351.49	358.60	394.06	678.46	745.56
Norway	314.04	218.09	300.13	208.42	614.17	426.51
Poland	162.14	305.92	488.42	921.56	650.56	1 227.47
Portugal	244.42	290.98	431.43	513.61	675.85	804.59
Slovak Republic	116.33	197.16	391.41	663.41	507.74	860.57
Spain	243.47	256.28	306.35	322.47	549.81	578.75
Sweden	220.46	173.59	270.33	212.86	490.79	386.45
Switzerland	251.23	166.38	350.90	232.38	602.13	398.76
Turkey	95.06	161.12	514.01	871.20	609.07	1 032.32
United Kingdom	245.88	211.97	256.57	221.18	502.46	433.15
United States	228.58	228.58	409.11	409.11	637.69	637.69
OECD	237.16	240.88	358.18	387.93	595.34	628.82

Note: Composite basket includes international calls and calls to mobile networks.
Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/387326833742

Table 6.7. **OECD basket of business telephone charges, August 2004**
Excluding tax

	Fixed		Usage		Total	
	USD	USD PPP	USD	USD PPP	USD	USD PPP
Australia	290.74	290.74	883.95	883.95	1 174.69	1 174.69
Austria	279.42	254.02	809.99	736.36	1 089.41	990.38
Belgium	226.32	203.89	813.12	732.54	1 039.44	936.43
Canada	380.14	413.20	287.25	312.23	667.39	725.42
Czech Republic	355.61	623.87	560.04	982.52	915.64	1 606.39
Denmark	214.98	151.39	520.74	366.72	735.72	518.11
Finland	192.24	150.19	750.33	586.19	942.57	736.39
France	258.54	226.79	730.95	641.19	989.49	867.98
Germany	209.67	183.92	843.07	739.54	1 052.74	923.46
Greece	162.73	169.51	491.11	511.57	653.85	681.09
Hungary	330.26	516.04	860.37	1 344.32	1 190.63	1 860.36
Iceland	257.43	183.88	383.75	274.11	641.18	457.98
Ireland	311.97	238.15	653.43	498.80	965.40	736.95
Italy	278.68	265.41	658.14	626.80	936.82	892.21
Japan	314.29	219.78	680.44	475.84	994.74	695.62
Korea	58.84	82.87	380.77	536.29	439.61	619.17
Luxembourg	249.51	222.78	389.24	347.54	638.75	570.31
Mexico	239.93	333.23	943.49	1 310.41	1 183.42	1 643.64
Netherlands	235.86	206.89	550.82	483.18	786.68	690.07
New Zealand	473.94	520.81	536.90	590.00	1 010.83	1 110.80
Norway	253.26	175.88	558.77	388.04	812.03	563.91
Poland	132.90	250.75	777.41	1 466.81	910.30	1 717.56
Portugal	205.40	244.52	695.94	828.50	901.33	1 073.01
Slovak Republic	134.55	228.05	840.95	1 425.33	975.50	1 653.38
Spain	209.89	220.93	594.41	625.69	804.29	846.63
Sweden	204.07	160.68	461.94	363.74	666.01	524.42
Switzerland	233.48	154.63	765.48	506.94	998.97	661.57
Turkey	80.56	136.54	783.82	1 328.51	864.38	1 465.06
United Kingdom	321.50	277.15	870.20	750.18	1 191.70	1 027.33
United States	274.29	274.29	562.30	562.30	836.59	836.59
OECD	245.70	252.69	654.64	707.54	900.34	960.23

Note: Business basket excludes international calls and calls to mobile networks.
Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/881157262484

Table 6.8. **OECD composite basket of business telephone charges, August 2004**
Excluding tax

	Fixed		Usage		Total	
	USD	USD PPP	USD	USD PPP	USD	USD PPP
Australia	290.74	290.74	1 331.40	1 331.40	1 622.13	1 622.13
Austria	279.42	254.02	1 195.90	1 087.18	1 475.32	1 341.20
Belgium	226.32	203.89	1 168.06	1 052.30	1 394.37	1 256.19
Canada	380.14	413.20	588.28	639.44	968.42	1 052.63
Czech Republic	355.61	623.87	794.42	1 393.72	1 150.03	2 017.59
Denmark	214.98	151.39	823.38	579.84	1 038.35	731.24
Finland	192.24	150.19	1 203.27	940.05	1 395.51	1 090.25
France	258.54	226.79	1 052.00	922.81	1 310.54	1 149.60
Germany	209.67	183.92	1 174.20	1 030.00	1 383.87	1 213.93
Greece	162.73	169.51	909.51	947.41	1 072.25	1 116.92
Hungary	330.26	516.04	1 335.88	2 087.31	1 666.14	2 603.34
Iceland	257.43	183.88	711.51	508.22	968.94	692.10
Ireland	311.97	238.15	959.64	732.55	1 271.61	970.70
Italy	278.68	265.41	1 054.69	1 004.46	1 333.37	1 269.88
Japan	314.29	219.78	1 458.09	1 019.64	1 772.38	1 239.43
Korea	58.84	82.87	825.69	1 162.95	884.54	1 245.83
Luxembourg	249.51	222.78	640.42	571.81	889.93	794.58
Mexico	239.93	333.23	1 695.79	2 355.27	1 935.72	2 688.50
Netherlands	235.86	206.89	839.56	736.46	1 075.42	943.35
New Zealand	473.94	520.81	960.78	1 055.80	1 434.71	1 576.61
Norway	253.26	175.88	762.77	529.70	1 016.03	705.58
Poland	132.90	250.75	1 252.06	2 362.37	1 384.95	2 613.12
Portugal	205.40	244.52	1 115.69	1 328.20	1 321.08	1 572.72
Slovak Republic	134.55	228.05	1 157.32	1 961.57	1 291.88	2 189.62
Spain	209.89	220.93	846.05	890.58	1 055.94	1 111.51
Sweden	204.07	160.68	749.23	589.95	953.30	750.63
Switzerland	233.48	154.63	1 157.13	766.31	1 390.62	920.94
Turkey	80.56	136.54	1 291.13	2 188.36	1 371.69	2 324.90
United Kingdom	321.50	277.15	1 402.00	1 208.62	1 723.50	1 485.77
United States	274.29	274.29	882.81	882.81	1 157.10	1 157.10
OECD	245.70	252.69	1 044.62	1 128.90	1 290.32	1 381.60

Note: Composite basket includes international calls and calls to mobile networks.
Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/650826436255

Table 6.9. **OECD time series for telephone charges**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Residential															
Fixed	100	109.18	112.66	112.76	112.82	122.39	125.91	112.97	115.50	119.27	132.02	129.13	133.33	132.21	145.23
Usage	100	104.17	98.45	96.77	94.05	98.55	90.09	81.29	78.69	70.54	60.61	55.83	57.46	53.50	55.75
Total	100	106.17	104.13	103.16	101.56	108.09	104.42	93.97	93.42	90.03	89.18	85.15	87.81	84.98	91.54
Business															
Fixed	100	104.30	107.45	107.59	107.99	108.07	106.37	113.07	118.68	123.37	118.55	126.90	134.97	126.52	137.73
Usage	100	103.50	96.88	94.18	91.29	92.52	83.26	86.46	84.31	75.18	55.50	55.54	57.73	54.65	56.56
Total	100	103.66	98.99	96.86	94.63	95.63	87.88	91.78	91.18	84.82	68.11	69.82	73.18	69.02	72.80

StatLink: http://dx.doi.org/10.1787/328427744340

Table 6.10. **OECD basket of international telephone charges, August 2004**

	Business (excluding VAT)		Residential (including VAT)	
	USD PPP	USD	USD PPP	USD
Australia	1.06	1.06	1.48	1.48
Austria	0.96	1.06	1.11	1.22
Belgium	0.68	0.75	0.80	0.89
Canada	0.83	0.76	1.16	1.07
Czech Republic	0.77	0.44	1.17	0.67
Denmark	0.47	0.67	0.75	1.06
Finland	0.88	1.12	1.11	1.42
France	0.46	0.53	0.85	0.97
Germany	0.50	0.57	0.75	0.86
Greece	1.12	1.07	1.69	1.63
Hungary	1.68	1.07	2.68	1.72
Iceland	0.63	0.89	1.00	1.40
Ireland	0.50	0.66	0.72	0.94
Italy	0.97	1.02	1.40	1.47
Japan	1.99	2.85	2.00	2.85
Korea	2.51	1.78	3.37	2.39
Luxembourg	0.45	0.51	0.61	0.69
Mexico	3.78	2.72	4.59	3.30
Netherlands	0.43	0.49	0.63	0.71
New Zealand	1.29	1.17	1.76	1.60
Norway	0.25	0.35	0.37	0.54
Poland	2.20	1.17	3.45	1.83
Portugal	1.17	0.98	1.61	1.35
Slovak Republic	1.08	0.64	2.51	1.48
Spain	0.72	0.68	1.02	0.97
Sweden	0.32	0.41	0.50	0.64
Switzerland	0.24	0.37	0.31	0.46
Turkey	1.98	1.17	3.00	1.77
United Kingdom	1.42	1.65	0.85	0.98
United States	0.55	0.55	0.49	0.49
OECD	1.06	0.97	1.46	1.29

Note: Average call charge for one single call, weighted by traffic.

Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/643236034261

Table 6.11. **OECD basket of low user mobile telephone charges, August 2004**
Including tax

		Fixed		Usage		Total		Contract type
		USD	USD PPP	USD	USD PPP	USD	USD PPP	
Australia, Optus	Optus Pre-paid Free Calls Anytime	7.16	7.16	239.50	239.50	246.66	246.66	Pre-paid
Austria, T-Mobile	Lucky 7	120.23	109.30	141.11	128.28	261.33	237.58	Post-paid
Belgium, Mobistar	Tempo Easy	4.12	3.71	270.17	243.39	274.28	247.10	Pre-paid
Canada, Telus Mobility	Pay & Talk $50	5.25	5.71	159.30	173.15	164.56	178.86	Pre-paid
Czech Republic, Eurotel	Special Go	0.00	0.00	130.84	229.55	130.84	229.55	Pre-paid
Denmark, TDC Mobil	MobilExtra400	65.27	45.97	82.86	58.35	148.13	104.32	Post-paid
Finland, Sonera IN	Easy	0.00	0.00	136.90	106.95	136.90	106.95	Pre-paid
France, SFR	La Carte Soir et Weekend	0.00	0.00	266.87	234.09	266.87	234.09	Pre-paid
Germany, T-Mobile	XtraGo	0.00	0.00	304.39	267.01	304.39	267.01	Pre-paid
Greece, Cosmote	Cosmokarta	0.00	0.00	230.38	239.98	230.38	239.98	Pre-paid
Hungary, Pannon GSM	Pannon Happy	3.15	4.92	115.80	180.94	118.95	185.86	Pre-paid
Iceland, Siminn	Frelsi	14.10	10.07	142.26	101.61	156.36	111.68	Pre-paid
Ireland, Vodafone	Ready to Go Social Life	0.00	0.00	227.44	173.62	227.44	173.62	Pre-paid
Italy, TIM	TIM Unica 10	0.00	0.00	207.47	197.59	207.47	197.59	Pre-paid
Japan, NTT DoCoMo	Cityphone O-Hanashi Plus S	306.49	214.33	85.46	59.76	391.95	274.09	Post-paid
Korea, KTF	Free Phone	0.00	0.00	157.85	222.32	157.85	222.32	Pre-paid
Luxembourg, Tango	Pronto	8.23	7.35	121.02	108.05	129.26	115.41	Pre-paid
Mexico, MoviStar	Prepago + 300	0.00	0.00	116.71	162.10	116.71	162.10	Pre-paid
Netherlands, Vodafone	iZi Pre-pay Dal-en-piek	0.00	0.00	280.79	246.30	280.79	246.30	Pre-paid
New Zealand, Telecom 027 CDMA	Go Prepaid Mates' Rates	0.00	0.00	238.41	261.99	238.41	261.99	Pre-paid
Norway, Telenor	RingKontant	9.94	6.90	246.57	171.23	256.51	178.13	Pre-paid
Poland, Centertel	POP	0.00	0.00	118.71	223.98	118.71	223.98	Pre-paid
Portugal, TMN	Forad'oras	0.00	0.00	191.59	228.08	191.59	228.08	Pre-paid
Slovak Republic, Eurotel	20More	77.31	131.03	45.21	76.62	122.51	207.65	Post-paid
Spain, Vodafone	Contrato Tarde	0.00	0.00	224.20	236.00	224.20	236.00	Post-paid
Sweden, Teliamobile	Telia Mobil 25	91.44	72.00	104.09	81.96	195.53	153.96	Post-paid
Switzerland, Sunrise	Sunrise Pronto	0.00	0.00	305.72	202.47	305.72	202.47	Pre-paid
Turkey, Turkcell	BizBizeCELL	9.52	16.14	155.54	263.64	165.07	279.77	Post-paid
United Kingdom, T-Mobile	Relax Pay As You Go £10 - £20 spend	0.00	0.00	230.37	198.60	230.37	198.60	Pre-paid
United States, Verizon	PREPAY	10.40	10.40	151.27	151.27	164.82	164.82	Pre-paid

Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/774342313144

Table 6.12. **OECD basket of medium user mobile telephone charges, August 2004**
Including tax

		Fixed		Usage		Grand total	
		USD	USD PPP	USD	USD PPP	USD	USD PPP
Australia, Telstra	Business Plan $60 Fixed & Mobile Saver	516.10	516.10	80.10	80.10	596.20	596.20
Austria, Mobilkom	A1 Xcite Remix	164.69	149.72	406.65	369.68	571.34	519.40
Belgium, Mobistar	Optimum For Me 4H	541.01	487.40	77.19	69.54	618.20	556.94
Canada, Telus Mobility	Talk 20	298.68	324.65	86.43	93.95	385.11	418.60
Czech Republic, Eurotel	Optimum	318.85	559.39	218.71	383.70	537.56	943.08
Denmark, TDC Mobil	MobilExtra400	65.27	45.97	275.88	194.28	341.15	240.25
Finland, Sonera IN	Max	106.99	83.58	287.83	224.87	394.82	308.46
France, Orange	Forfait Initial 2h Forfait SMS 30	533.60	468.07	67.94	59.60	601.55	527.67
Germany, T-Mobile	TellyActive More Talk	305.24	267.75	417.89	366.57	723.13	634.32
Greece, Cosmote	Cosmote 150	402.28	419.04	57.42	59.81	459.69	478.85
Hungary, Pannon GSM	Pannon 150	250.83	391.93	63.04	98.50	313.87	490.43
Iceland, Siminn	Almenáskrift	99.55	71.11	448.06	320.04	547.61	391.15
Ireland, Vodafone	Extra	444.67	339.44	316.53	241.62	761.20	581.07
Italy, Vodafone	Italy New	76.48	72.84	596.86	568.44	673.34	641.28
Japan, NTT DoCoMo	Cityphone Chotoku Plan	357.70	250.14	291.69	203.98	649.39	454.12
Korea, SK Telecom	Ting Buddy	197.46	278.11	101.89	143.51	299.35	421.62
Luxembourg, Tango	Twist	88.93	79.41	279.91	249.92	368.84	329.32
Mexico, Telcel	GSM 100 + Unlimited SMS	476.09	661.23	10.98	15.25	487.07	676.48
Netherlands, Vodafone	Vodafone 150	369.94	324.51	192.84	169.16	562.78	493.67
New Zealand, Vodafone	Get 200	239.62	263.31	573.63	630.36	813.24	893.67
Norway, Netcom	ActiveTalk	240.73	167.17	357.94	248.57	598.66	415.74
Poland, Centertel	Idea Firma 100	358.05	675.56	189.37	357.31	547.42	1032.87
Portugal, Vodafone	Privado 120	263.34	313.50	177.15	210.90	440.50	524.40
Slovak Republic, Eurotel	55Plus	146.83	248.87	188.65	319.75	335.49	568.62
Spain, MoviStar	Plus Planes 30	10.04	10.57	626.46	659.43	636.50	670.00
Sweden, Tele 2 Comviq	Comviq Kompis	225.70	177.72	286.30	225.43	512.00	403.15
Switzerland, Sunrise	Sunrise 75	397.75	263.41	357.09	236.48	754.84	499.89
Turkey, Turkcell	BizBizeCELL	9.52	16.14	527.04	893.29	536.56	909.43
United Kingdom, T-Mobile	Everyone 100	464.29	400.25	212.88	183.52	677.17	583.76
United States, AT&T	GSM Local 250	432.17	432.17	46.20	46.20	487.70	487.70

Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/711307272373

Table 6.13. **OECD basket of high user mobile telephone charges, August 2004**

Including tax

		Fixed		Usage		Grand total	
		USD	USD PPP	USD	USD PPP	USD	USD PPP
Australia, Telstra	Business Plan $100 Fixed & Mobile Saver	860.16	860.16	125.76	125.76	985.91	985.91
Austria, T-Mobile	Relax Plus	520.43	473.12	292.59	265.99	813.02	739.11
Belgium, Proximus	ProxiPro Anytime 300	934.92	842.27	145.56	131.14	1 080.48	973.40
Canada, Telus Mobility	Talk 50	613.94	667.33	165.51	179.90	779.45	847.23
Czech Republic, Eurotel	Optimum	318.85	559.39	734.71	1 288.96	1 053.56	1 848.35
Denmark, Sonofon	Kvantum	402.09	283.16	220.15	155.03	622.23	438.19
Finland, Sonera IN	Max	106.99	83.58	569.13	444.63	676.12	528.22
France, SFR	Formule Perso 6H +10 Texto par heure	993.10	871.14	0.00	0.00	993.10	871.14
Germany, Vodafone	Vodafone 200	603.19	529.11	718.59	630.34	1 321.77	1 159.45
Greece, Cosmote	Cosmote 240	524.71	546.57	207.70	216.36	732.41	762.93
Hungary, T-Mobile	Partner 400	530.86	829.47	502.27	784.79	1 033.13	1 614.26
Iceland, Siminn	Ásinnáskrift	225.57	161.12	670.75	479.11	896.32	640.23
Ireland, Vodafone	Business 200	896.75	684.54	436.74	333.39	1 333.49	1 017.93
Italy, Vodafone	Chiama Piu	76.48	72.84	889.34	846.99	965.82	919.83
Japan, NTT DoCoMo	Cityphone Chotoku Plan	357.70	250.14	668.10	467.20	1 025.80	717.34
Korea, SK Telecom	Ting Buddy	197.46	278.11	321.15	452.32	518.60	730.43
Luxembourg, Tango	Twist	88.93	79.41	541.07	483.10	630.01	562.51
Mexico, MoviStar	Emprendedor 220	314.04	436.17	411.47	571.49	725.51	1 007.66
Netherlands, Vodafone	Vodafone 300	577.45	506.54	335.73	294.50	913.18	801.03
New Zealand, Telecom 027 CDMA	Anytime Go 200	988.42	1 086.17	433.55	476.42	1 421.96	1 562.60
Norway, Netcom	Plenty 500	9.89	6.87	715.77	497.06	725.66	503.93
Poland, Centertel	Idea Top Firma 200	601.25	1 134.44	366.30	691.14	967.56	1 825.58
Portugal, Vodafone	Privado 480	642.22	764.55	70.38	83.78	712.60	848.33
Slovak Republic, Eurotel	200Plus	441.21	747.82	186.59	316.25	627.80	1 064.07
Spain, Vodafone	Contrato Universal 60	0.00	0.00	1 121.23	1 180.24	1 121.23	1 180.24
Sweden, Tele 2 Comviq	Comviq Kompis	225.70	177.72	565.96	445.63	791.66	623.35
Switzerland, Sunrise	Sunrise 300	1 171.76	776.00	124.63	82.53	1 296.39	858.53
Turkey, Turkcell	BizBizeCELL Package 240	804.59	1 363.72	237.90	403.22	1 042.49	1 766.94
UK, T-Mobile	Everyone 200	641.16	552.72	415.09	357.84	1 056.25	910.56
USA, Verizon	America's Choice 400	546.64	546.64	55.44	55.44	613.82	613.82

Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/000741527773

Table 6.14. **OECD basket of national leased line charges, August 2004**

Excluding tax

	M1020		64 kbit/s		2 Mbit/s		Index
	USD PPP	USD	USD PPP	USD	USD PPP	USD	2 Mbit/s
Australia	441 331	441 331	454 680	454 680	3 402 695	3 402 695	128
Austria	564 730	621 203	407 344	448 079	2 117 516	1 925 015	73
Belgium	620 753	689 036	465 922	517 173	1 963 764	1 769 156	67
Canada			450 282	414 259	3 655 102	3 972 937	150
Czech Republic	839 708	478 633	1 192 672	679 823	3 739 028	6 559 698	247
Denmark	145 667	206 847	222 189	315 508	924 914	651 348	25
Finland	..	..	..	..	..	..	
France	581 876	663 339	481 436	548 837	2 409 039	2 113 192	80
Germany	234 871	267 753	376 214	428 884	2 036 475	1 786 382	67
Greece	318 045	331 297	360 733	375 764	2 035 475	2 120 286	80
Hungary	482 946	309 085	829 514	530 889	3 067 549	4 793 045	181
Iceland			129 464	181 250	680 992	486 423	18
Ireland	214 162	280 553	275 939	361 480	2 171 271	1 657 459	63
Italy	399 096	419 051	486 655	510 988	2 694 656	2 566 339	97
Japan	648 365	927 162	301 143	430 634	3 652 292	2 554 050	96
Korea	398 033	282 603	821 466	583 241	4 835 021	3 432 865	129
Luxembourg	195 199	218 623	266 603	298 596	1 378 772	1 231 046	46
Mexico			423 441	304 877	3 241 031	4 501 432	170
Netherlands	347 024	395 608	424 191	483 578	1 907 262	1 673 037	63
New Zealand	504 687	459 265	1 035 486	942 292	4 621 672	5 078 760	192
Norway	187 653	270 220	237 930	342 619	1 105 698	767 846	29
Poland	491 972	260 745	745 983	395 371	2 601 473	4 908 440	185
Portugal	667 417	560 630	385 557	323 868	1 713 361	2 039 716	77
Slovak Republic	..	..	..	..	..	..	
Spain	495 647	470 865	516 495	490 671	2 484 938	2 615 724	99
Sweden	..	..	..	..	..	..	
Switzerland	..	..	..	..	..	..	
Turkey	212 151	125 169	323 466	190 845	1 293 348	2 192 115	83
United Kingdom	378 534	439 099	526 383	610 604	2 544 816	2 193 807	83
United States	..	..	671 386	671 386	1 942 800	1 942 800	73
OECD	425 903	414 460	492 791	455 238	2 470 037	2 651 370	100

Source: OECD and Teligen.

StatLink: http://dx.doi.org/10.1787/660546706762

Table 6.15. **Trends in leased line pricing over different distances, 1992-2004**

OECD average	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
56/64 kbit/s													
2 km	100	100	123	132	139	120	121	81	77	71	66	58	56
50 km	100	101	103	94	89	76	68	41	44	39	37	32	32
200 km	100	101	108	106	77	71	63	41	42	37	35	33	32
2 Mbit/s													
2 km	100	102	110	111	112	107	101	63	62	60	54	52	48
50 km	100	101	92	87	83	77	64	42	46	42	38	35	32
200 km	100	101	98	91	82	77	65	44	48	41	37	34	31

StatLink: http://dx.doi.org/10.1787/750312016403

Table 6.16. **Internet access by DSL in OECD member countries, September 2002-November 2004**

Including tax

		September 2002							November 2004						
	Company (1)	Monthly charge (USD)	Monthly charge (USD PPP)	Mbytes included	Additional cost per mbyte (USD)	Additional cost per mbyte (USD PPP)	Speed of connection downstream (kbit/s)	Speed of connection upstream (kbit/s)	Monthly charge (USD)	Monthly charge (USD PPP)	Mbytes included	Additional cost per mbyte (USD)	Additional cost per mbyte (US$ PPP)	Speed of connection downstream (kbit/s)	Spee conne upstr (kb
Australia	**Telstra - Big Pond**	**32.47**	**42.31**	**300**	**0.09**	**0.11**	**256**	**64**	**39.02**	**44.46**	**Unlimited**	**0.00**	**0.00**	**256**	
Australia	Telstra - Big Pond	41.67	54.30	1000	0.08	0.11	512	128	19.49	22.21	200	0.10	0.11	256	
Australia	Telstra - Big Pond								39.02	44.46	500	0.10	0.11	512	
Australia	Telstra - Big Pond								58.54	66.72	Unlimited	0.00	0.00	512	
Australia	Telstra - Big Pond								78.07	88.97	Unlimited	0.00	0.00	1500	
Austria	**Telekom Austria**	**39.73**	**43.21**	**1000**	**0.07**	**0.08**	**512**	**64**	**33.84**	**32.83**	**500**	**0.08**	**0.08**	**768**	
Austria	Telekom Austria								45.16	43.81	1000	0.08	0.08	768	
Austria	Telekom Austria								67.80	65.77	Unlimited (2)	0.08	0.08	768	
Belgium	**Belgacom**	**38.67**	**41.79**	**10000**	**0.12**	**0.13**	**750**	**128**	**44.8**	**42.4**	**10000(3)**	**0.001**	**0.001**	**3300**	
Belgium	Belgacom								33.9	32.1	400(3)	0.001	0.001	512	
Belgium	Belgacom								67.9	64.3	15000	0.001	0.001	9000	
Canada	**Bell Canada Sympatico**	**22.28**	**27.56**	**5000**	**0.005**	**0.01**	**960**	**120**	**34.48**	**40.56**	**Unlimited**	**0**	**0**	**3000**	
Canada	Bell Canada Sympatico								45.98	54.09	Unlimited	0	0	4000	
Czech Republic	Czech Telecom	0.00	0.00	0	0.00	0.00	0	0	29.63	57.37	Unlimited	0	0	256	
Czech Republic	Czech Telecom								35.80	69.32	Unlimited	0	0	512	
Czech Republic	Czech Telecom								49.10	95.08	Unlimited	0	0	1024	
Denmark	**TDC**	**46.09**	**41.48**	**Unlimited**	**0.00**	**0.00**	**256**	**128**	**53.84**	**42.88**	**Unlimited**	**0**	**0**	**512**	
Denmark	TDC	57.28	51.55	Unlimited	0.00	0.00	512	128	61.34	48.86	Unlimited	0	0	512	
Denmark	TDC								59.84	40.49	Unlimited	0	0	1024	
Denmark	TDC								89.84	71.55	Unlimited	0	0	2048	
Finland	**Elisa**	**48.90**	**44.95**	**Unlimited**	**0.00**	**0.00**	**256**	**128**	**35.09**	**31.36**	**Unlimited**	**0**	**0**	**256**	
Finland	Elisa	60.64	55.73	Unlimited	0.00	0.00	512	256	44.14	39.45	Unlimited	0	0	1024	
Finland	Elisa								66.78	59.68	Unlimited	0	0	2048	
France	**France Telecom Wanadoo**	**44.42**	**47.28**	**Unlimited**	**0.00**	**0.00**	**512**	**128**	**29.32**	**27.48**	**Unlimited**	**0**	**0**	**512**	
France	France Telecom Wanadoo								33.84	31.72	Unlimited	0	0	1024	
France	France Telecom Wanadoo								39.50	37.03	Unlimited	0	0	2048	
Germany	**Deutsche Telecom**	**44.00**	**47.07**	**Unlimited**	**0.00**	**0.00**	**768**	**128**	**30.49**	**28.48**	**1500**	**0.02**	**0.02**	**1024**	
Germany	Deutsche Telecom								33.89	31.65	1500	0.02	0.02	2048	
Germany	Deutsche Telecom								39.55	36.94	1500	0.02	0.02	3072	
Germany	Deutsche Telecom								53.13	49.63	Unlimited	0	0	1024	
Greece	**OTE**	**0.00**	**0.00**	**0**	**0.00**	**0.00**	**0**	**0**	**35.05**	**43.09**	**Unlimited**	**0**	**0**	**384**	
Greece	OTE								65.78	80.86	Unlimited	0	0	512	
Greece	OTE								113.87	139.96	Unlimited	0	0	1024	

StatLink: http://dx.doi.org/10.1787/733163414512

Table 6.16. **Internet access by DSL in OECD member countries, September 2002-November 2004 (continued)**

Including tax

		September 2002							November 2004						
	Company (1)	Monthly charge (USD)	Monthly charge (USD PPP)	Mbytes included	Additional cost per mbyte (USD)	Additional cost per mbyte (USD PPP)	Speed of connection downstream (kbit/s)	Speed of connection upstream (kbit/s)	Monthly charge (USD)	Monthly charge (USD PPP)	Mbytes included	Additional cost per mbyte (USD)	Additional cost per mbyte (US$ PPP)	Speed of connection downstream (kbit/s)	Speed of connection upstream (kbit/s)
Hungary	**Matav**	**59.39**	**117.76**	**Unlimited**	**0.00**	**0.00**	**384**	**64**	**42.58**	**84.69**	**Unlimited**	**0**	**0**	**512**	**128**
Hungary	Matav	248.64	492.97	Unlimited	0.00	0.00	768	128	51.18	101.80	Unlimited	0	0	1024	256
Iceland	**Iceland Telecom**	**29.03**	**26.06**	**0**	**0.14**	**0.13**	**256**	**128**	**47.91**	**40.45**	**Unlimited Domestic (100 International)**	**0.03**	**0.03**	**1024**	**128**
Iceland	Iceland Telecom	58.06	52.13	0	0.14	0.13	512	256	60.45	51.04	Unlimited Domestic (100 International)	0.03	0.03	2048	256
Ireland	**Eircom**	**105.32**	**103.50**	**3000**	**0.04**	**0.03**	**512**	**128**	**45.26**	**39.45**	**4000**	**0.04**	**0.04**	**512**	**128**
Italy	**Telecom Italia**	**48.85**	**61.66**	**Unlimited**	**0.00**	**0.00**	**640**	**128**	**41.82**	**46.27**	**Unlimited**	**0**	**0**	**640**	**256**
Italy	Telecom Italia	36.14	45.61	Unlimited	0.00	0.00	256	128	73.51	81.34	Unlimited	0	0	1200	256
Japan	**NTT**	**40.76**	**28.81**	**Unlimited**	**0.00**	**0.00**	**1500**	**512**	**40.69**	**33.17**	**Unlimited**	**0**	**0**	**8000**	**1024**
Japan	NTT								41.13	33.53	Unlimited	0	0	12000	1024
Japan	NTT								41.57	33.89	Unlimited	0	0	24000	1024
Korea	**Korea Telecom**	**27.58**	**40.90**	**Unlimited**	**0.00**	**0.00**	**1500**	**640**	**25.46**	**40.98**	**Unlimited**	**0**	**0**	**4000**	**4000**
Korea	Korea Telecom	36.78	54.53	Unlimited	0.00	0.00	8000	640	33.61	54.09	Unlimited	0	0	8000	640
Korea	Korea Telecom								33.95	54.63	Unlimited	0	0	13000	4000
Luxembourg	**P&T**	**59.05**	**65.87**	**Unlimited**	**0.00**	**0.00**	**256**	**64**	**40.18**	**37.24**	**1000**	**0.003**	**0.003**	**1024**	**128**
Luxembourg	P&T	84.35	94.09	Unlimited	0.00	0.00	512	64	53.76	49.82	10000	0.003	0.003	1024	128
Luxembourg	P&T								76.40	70.80	15000	0.003	0.003	2048	192
Luxembourg	P&T								111.49	103.32	25000	0.003	0.003	3072	192
Mexico	**Telmex**	**58.32**	**81.46**	**Unlimited**	**0.00**	**0.00**	**256**	**128**	**37.23**	**61.16**	**Unlimited**	**0**	**0**	**256**	**128**
Mexico	Telmex	92.72	129.51	Unlimited	0.00	0.00	512	256	63.89	104.97	Unlimited	0	0	512	256
Mexico	Telmex								490.56	805.97	Unlimited	0	0	2048	512
Netherlands	**KPN**	**34.18**	**37.51**	**1000**	**0.00**	**0.01**	**256**	**64**	**24.84**	**23.04**	**N/A (4)**	**N/A**	**N/A**	**416**	**160**
Netherlands	KPN	51.10	56.07	Unlimited	0.00	0.00	512	128	33.90	31.44	N/A	N/A	N/A	1120	352
Netherlands	KPN								56.54	52.43	N/A	N/A	N/A	2240	416
New Zealand	**Telecom NZ**	**32.00**	**46.90**	**500**	**0.09**	**0.14**	**2000**	**250**	**23.24**	**26.98**	**1000**	**0 (3)**	**0 (3)**	**256**	**128**
New Zealand	Telecom NZ	41.27	60.50	1000	0.09	0.14	2000	250	26.15	30.36	1000	0 (3)	0 (3)	1024	192
New Zealand	Telecom NZ								29.06	33.73	3000	0 (3)	0 (3)	256	128
New Zealand	Telecom NZ								40.69	47.24	10000	0 (3)	0 (3)	2048	192
New Zealand	Telecom NZ								40.69	47.24	10000	0.01	0.01	2048	192
Norway	**Telenor**	**59.22**	**46.03**	**Unlimited**	**0.00**	**0.00**	**384**	**128**	**47.05**	**38.43**	**Unlimited**			**704**	**128**
Norway	Telenor	72.38	56.26	0	0.00	0.00	704	128	56.49	46.13	Unlimited			1024	256
Norway	Telenor								74.02	60.45	Unlimited			2048	256
Poland	**TPSA**	**71.58**	**138.89**	**Unlimited**	**0.00**	**0.00**	**512**	**128**	**43.35**	**90.12**	**5000**			**512**	**128**
Poland	TPSA	155.36	301.48	Unlimited	0.00	0.00	1020	256	58.94	122.54	10000			1024	256
Portugal	**Portugal Telecom**	**37.16**	**53.92**	**4000**	**0.13**	**0.18**	**512**	**128**	**39.60**	**52.03**	**20GB/2GB (6)**	**0.02**	**0.02**	**512**	**128**
Portugal	Portugal Telecom	66.50	96.48	7000	0.13	0.18	768	128	50.92	66.89	Unlimited/4GB (6)	0.02	0.02	512	128

Table 6.16. **Internet access by DSL in OECD member countries, September 2002-November 2004 (continued)**

Including tax

		September 2002							November 2004						
	Company (1)	Monthly charge (USD)	Monthly charge (USD PPP)	Mbytes included	Additional cost per mbyte (USD)	Additional cost per mbyte (USD PPP)	Speed of connection downstream (kbit/s)	Speed of connection upstream (kbit/s)	Monthly charge (USD)	Monthly charge (USD PPP)	Mbytes included	Additional cost per mbyte (USD)	Additional cost per mbyte (US$ PPP)	Speed of connection downstream (kbit/s)	Speed of connection upstream (kbit/s)
Slovak Republic	**Slovak Telecom**	**0.00**	**0.00**	**0**	**0.00**	**0.00**	**0**	**0**	**22.56**	**53.03**	**Unlimited (7)**	**0**	**0**	**384**	**64**
Slovak Republic	Slovak Telecom	0.00	0.00	0	0.00	0.00	0	0	37.77	88.79	Unlimited (7)	0	0	384	64
Slovak Republic	Slovak Telecom								47.24	111.06	1000	0.01	0.03	768	128
Slovak Republic	Slovak Telecom								95.39	224.27	15000	0.01	0.01	768	128
Slovak Republic	Slovak Telecom								69.42	163.20	1000	0.01	0.03	1536	256
Spain	**Telefonica**	**47.68**	**61.61**	**Unlimited**	**0.00**	**0.00**	**256**	**128**	**51.30**	**57.94**	**Unlimited**	**0**	**0**	**256**	**128**
Spain	Telefonica	95.22	123.04	Unlimited	0.00	0.00	512	128	98.45	111.20	Unlimited	0	0	512	128
Spain	Telefonica								157.56	177.96	Unlimited	0	0	1024	
Spain	Telefonica								197.69	223.29	Unlimited	0	0	2048	300
Sweden	**Telia**	**39.65**	**37.60**	**Unlimited**	**0.00**	**0.00**	**512**	**400**	**40.92**	**35.20**	**Unlimited**	**0**	**0**	**512**	**400**
Sweden	Telia								33.68	28.97	Unlimited	0	0	256	64
Sweden	Telia								50.58	43.51	Unlimited	0	0	2048	400
Sweden	Telia								54.20	46.62	Unlimited	0	0	8000	800
Sweden	Telia								54.20	46.62	Unlimited	0	0	10000	10000
Switzerland	**Swisscom**	**32.73**	**25.88**	**3000**	**0.03**	**0.03**	**256**	**64**	**35.47**	**25.85**	**Unlimited**	**0**	**0**	**600**	**100**
Switzerland	Swisscom	52.78	41.72	6000	0.03	0.03	512	128	49.95	36.40	Unlimited	0	0	1200	200
Switzerland	Swisscom								71.66	52.23	Unlimited	0	0	2048	200
Turkey	**Turk Telekom**	**93.70**	**218.37**	**Unlimited**	**0.00**	**0.00**	**256**	**64**	**35**	**70**	**Unlimited**	**0**	**0**	**256**	**64**
Turkey	Turk Telekom	285.98	666.46	Unlimited	0.00	0.00	512	128	70	142	Unlimited	0	0	512	128
Turkey	Turk Telekom								21	42	3000	0.01	0.01	256	64
Turkey	Turk Telekom								35	70	5000	0.01	0.01	512	128
Turkey	Turk Telekom								120	243	Unlimited	0	0	1023	256
Turkey	Turk Telekom								191	387	Unlimited	0	0	2048	512
United Kingdom	**British Telecom**	**41.51**	**39.80**	**Unlimited**	**0.00**	**0.00**	**512**	**256**	**28.67**	**27.17**	**1000 (5)**	**0.002**	**0.002**	**512**	**256**
United Kingdom	British Telecom								39.82	37.74	15000	0	0	512	256
United Kingdom	British Telecom								47.79	45.29	30000	0	0	1024	256
United States	**Verizon**	**39.95**	**39.95**	**Unlimited**	**0.00**	**0.00**	**768**	**128**	**29.95**	**29.95**	**Unlimited**	**0**	**0**	**1500**	**384**
United States	SBC								26.95	26.95	Unlimited	0	0	1500	128
United States	SBC								36.99	36.99	Unlimited	0	0	3000	384

Notes:

1. Commercial ADSL service was not available in the Czech Republic, Greece and the Slovak Republic in 2002. Modem rentals, where applicable, are excluded as in most countries these can be purchased by users.
2. Telekom Austria unlimited is at off-peak times
3. The download speed will be reduced to 64kbps for the data transmission over the monthly allowance or users can buy an additional 5Gb for USD 5.65.
4. Not applicable. The monthly allowance will vary with ISPs.
5. A BT user exceeding their montly alloance of 1Gb would pay USD 6 between 1Gb to 3 Gb, USD 12 between 3Gb and 6Gb and USD 18 for amounts over 6 GB. The usage charges for higher speed offers had not been introduced in 2004.
6. Monthly allowance of national data transfer/international data transfer. PT charges EUR 1.5 per 100MB for additional international data transfer and EUR 0.10 per 100MB for additional national data transfer over monthly allowance.
7. Slovak Telecom's DSL FLAT Basic has the contention ratio of 1:40, whereas DSL FLAT Standard has that of 1:20.

Table 6.17. **DSL pricing trends in OECD countries, 2002-2004**

Including tax

	Price change 2002 to 2004, USD	Price change 2002 to 2004, USD PPP	Change in data transfer (megabytes)	Change in data transfer price per megabyte, USD	Change in data transfer price per megabyte, USD	Change in capacity downstream (kbps)	Change in capacity upstream (kbps)
Australia	6.55	2.15	300 Mb to unlimited	-0.09	-0.11	0	0
Austria	-5.89	-10.38	-500	0.01	0.00	256	64
Belgium	6.08	0.61	0	-0.12	-0.13	2 550	64
Canada	12.20	13.00	5000 Mb to unlimited	0.00	-0.01	2 040	200
Denmark	7.75	1.40	0	0.00	0.00	256	0
Finland	-13.81	-13.59	0	0.00	0.00	0	0
France	-15.10	-19.80	0	0.00	0.00	0	0
Germany	-13.51	-18.59	Unlimited to 1500 MBb	0.02	0.02	256	0
Hungary	-16.82	-33.07	0	0.00	0.00	128	64
Iceland	18.88	14.39	Unlimited domestic	-0.11	-0.10	768	0
Ireland	-60.06	-64.04	1000	0.01	0.00	0	0
Italy	-7.03	-15.39	0	0.00	0.00	0	128
Japan	-0.07	4.36	0	0.00	0.00	6 500	512
Korea	-2.12	0.08	0	0.00	0.00	2 500	3 360
Luxembourg	-18.87	-28.63	Unlimited to 1000 Mb	0.00	0.00	768	64
Mexico	-21.09	-20.30	0	0.00	0.00	0	0
Netherlands	-9.34	-14.47	NA	NA	NA	160	96
New Zealand	-8.76	-19.92	500	NA	NA	-1 744	- 122
Norway	-12.17	-7.60	0	0.00	0.00	320	0
Poland	-28.23	-48.77	Unlimited to 5000 Mb	0.00	0.00	0	0
Portugal	2.44	-1.89	16000	-0.11	-0.16	0	0
Spain	3.62	-3.67	0	0.00	0.00	0	0
Sweden	1.27	-2.40	0	0.00	0.00	0	0
Switzerland	2.73	-0.03	3000 Mb to unlimited	-0.03	-0.03	344	36
Turkey	-58.82	-147.90	0	0.00	0.00	0	0
United Kingdom	-12.84	-12.63	Unlimited to 1000 Mb	0.00	0.00	0	0
United States	-10.00	-10.00	0	0.00	0.00	732	256
Average of above	-9.37	-16.93				586	175

Note: The offers compared are those in the first line for each country in Table 6.5.

StatLink: http://dx.doi.org/10.1787/100645627805

Table 6.18. **Cable Internet pricing trends in OECD countries, January 2005**

Country	ISP	Download speed (kbps)	Upload speed (kbps)	Monthly subscription (USD)	Telephony available
Canada	Rogers	256	64	29.14	No (2005)
Canada	Shaw	300	..	24.97	No (2005)
Canada	Rogers	5 000	800	45.82	No (2005)
Canada	Shaw	5 000	..	44.15	No (2005)
Finland	Welho	1 000	300	47.01	No
Finland	Welho	2 000	400	60.07	No
Finland	Welho	3 000	500	71.82	No
Finland	Welho	10 000	500	90.10	No
Germany	Primacom	768	256	25.99	No (2005)
Germany	Primacom	2 048	256	50.93	No (2005)
Germany	Primacom	4 096	256	90.10	No (2005)
Japan	Jcom	8 000	2 000	48.38	Yes
Japan	Jcom	30 000	2 000	53.43	Yes
Korea	Thrunet	10 000	800	35.56	..
Korea	Hanaro	10 000	800	31.82	Yes
Netherlands	UPC	256	64	19.52	Yes
Netherlands	UPC	2 048	512	43.03	Yes
Netherlands	UPC	4 096	1 024	65.23	Yes
Netherlands	UPC	8 192	1 024	104.40	Yes
Sweden	Comhem	1 000	200	51.04	Yes
Sweden	Comhem	2 000	400	57.61	Yes
Sweden	Comhem	8 000	1 000	64.90	Yes
United States	Comcast	4 000	384	56.99	Yes
United States	Earthlink	5 000	384	59.95	Yes
United States	Roadrunner	5 000	384	59.95	Yes
United States	Comcast	6 000	768	56.99	Yes

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Chapter 7

Broadcasting Services

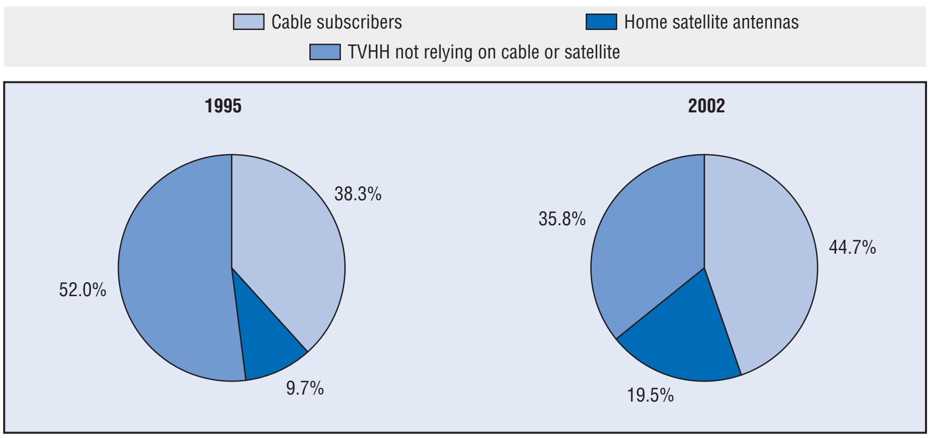
The television broadcasting sector in the OECD countries has been subject to structural changes over the last several years. Cable and direct broadcast satellite (DBS) platforms have increased their shares of total television households. At the same time, cable, DBS and terrestrial television broadcasting are also experiencing a transition from analogue to digital transmissions. The number of channels available to consumers is increasing as is the number of delivery paths for video. This chapter examines these structural changes, including convergence, and their effects on the broadcast market. Finally, the chapter considers the regulatory implications of the evolving market.

Trends

The television broadcasting sector in the OECD countries has been subject to structural changes over the last several years. An important development has been in the changing shares of multi-channel pay television platforms, primarily cable and direct broadcast satellite (DBS) which have increased their shares of total television households. At the same time, these platforms, along with terrestrial television broadcasting, are also experiencing a transition from analogue to digital transmissions. Most DBS is now digital, analogue and digital coexist in the cable realm, and most terrestrial transmissions remain analogue, although the transition to digital is well underway. Target dates for ending the transition to digital terrestrial television (DTT) and switching off analogue service range from 2006 to 2015.

Digital terrestrial television is supporting an increase in the number of terrestrial channels available and in some countries subscription bouquets of channels are offered. Overall, the number of channels available has continued to increase significantly, and the audience share of free-to-air channels is falling. Based on available data on audience shares, it appears that public service broadcasters are, at best, holding their own against the increasing competition. In many cases their shares have been gradually declining.

Figure 7.1. **Trends in media usage in the OECD ares**



StatLink: http://dx.doi.org/10.1787/720355317761

The single biggest regulatory development has been the adoption by the European Commission in 2002, and the implementation during 2003 by European Union members of a series of telecommunications directives that have some bearing on the broadcasting markets. Those directives envision a separation of content and conduit (transmission capacity), place specific limits on the regulation of conduit, and explicitly permit

EU member states to regulate content to achieve various social goals. Most OECD countries define broadcasting in a technologically neutral fashion and most do not consider video distributed over the Internet to be broadcasting. Hence they do not apply their broadcast content regulatory regime to internet video, although at least for the EU countries, it appears that national governments could do so.

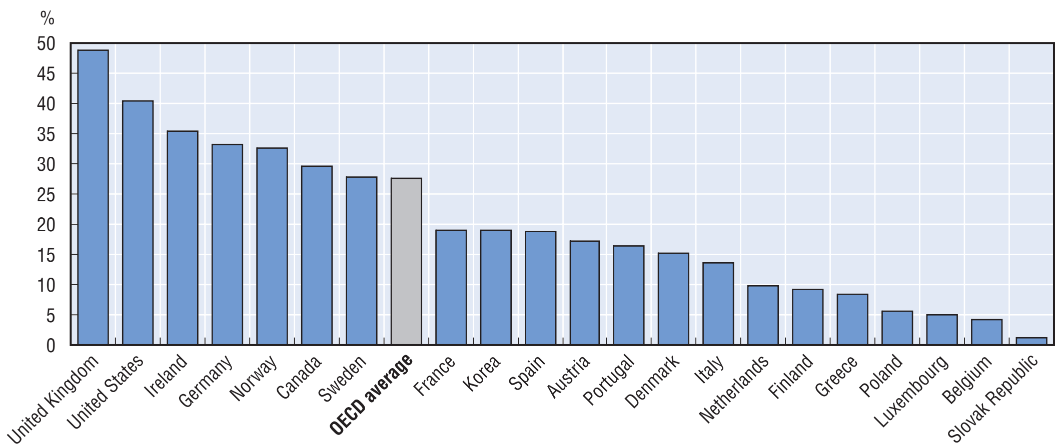
Most countries also do not consider video on demand to be broadcasting and its regulatory treatment is generally independent of the transmission system United Statesed to deliver it. Virtually all OECD countries regulate broadcast content to achieve social objectives and many of them limit media ownership by regulation.

From the broadcasting perspective, convergence is manifesting itself primarily via joint offerings of video service and high-speed Internet service, mostly *via* the cable platform. In a few countries, cable operators provide voice service as well. The advent of "voice over IP" service is likely to lead to an increase in the number of households acquiring voice, video, and data services over the same platform. A very small number of households receive video *via* ADSL, which also supports voice and data. This number is also likely to grow.

Challenges

The broadcasting industry will face some major challenges in the future. First, member states will need to complete the transition from analogue to digital terrestrial television and manage the analogue switch-off in such a way as to ensure the smooth continuation of television availability to all. Second, private channels, including pay television options, will provide increasing competition to public service broadcasters. Third, pay television channels will continue to cut into the audience of the free-to-air commercial channels. Fourth, free-to-air commercial channels will find their financial support increasingly constrained by the personal video recorder. Fifth, the advent of digital transmissions presents challenges (and opportunities for new business models) from the point of view of digital rights management.

Figure 7.2. **Digital TV households as a percentage of TV households**

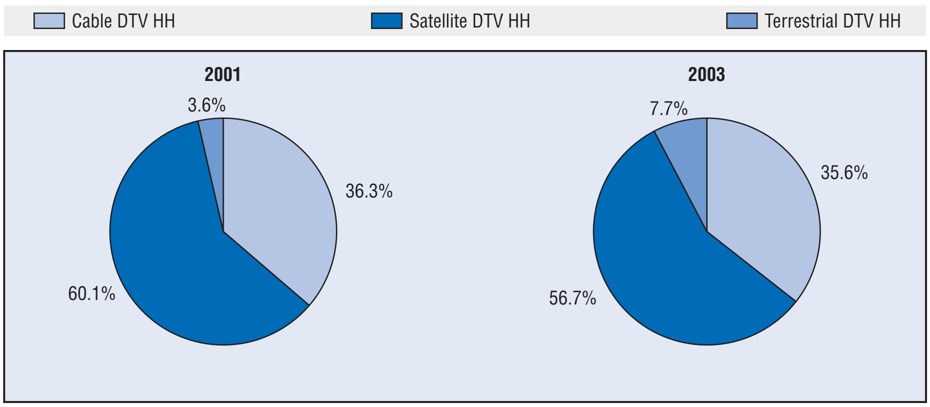


StatLink: http://dx.doi.org/10.1787/282254867464

Deciding precisely when to switch off analogue transmissions is difficult. In some countries, the high value of spectrum reclaimed from analogue television service provides an additional spur to complete the transition. It will be a challenge for DTT providers to find their business niche. In some countries, DTT may prove to be a viable competitor to the multi-channel pay platforms, cable and DBS. In other countries, it may end up as a means of ensuring universal television service, either in areas where the pay platforms are unavailable or to those households whose income does not permit subscription television (although in some countries a number of the DTT channels will be encrypted pay television channels).

Increasing competition from a variety of private channel options is likely to continue eroding the market share and influence of public service broadcasters. In this increasingly competitive world, it will be harder to achieve some of the social goals of public service broadcasting. As described below, at least one country (the United Kingdom) has begun to consider alternative models for meeting those goals.

Figure 7.3. **Composition and penetration of digital TV households, 2003**



StatLink: http://dx.doi.org/10.1787/803686165517

The increasing competition from pay television channels is also likely to put pressure on the advertiser-supported free-to-air channels. Technological advances such as the personal video recorder (another manifestation of the digital transition) will likely further constrain advertiser-supported video distribution channels. As the number and variety of pay channels increases, those channels attract an increasing share of viewers and eventually the total size of the audience for free-to-air programmes will fall. By way of example, in the United States, total viewing of pay television channels has surpassed total viewing of the free-to-air networks. The composition of video advertising revenues has shifted in favour of the pay channels that advertise. Gross advertising revenues of free-to-air broadcasters in the United States have continued to rise, most likely because they can offer larger audiences for individual programmes than the pay channels can. The pay channel audience is split among hundreds of channels, so in many cases it is more efficient for advertisers to utilise free-to-air programme to reach a large and unduplicated audience. However the gap between the average audience size on free-to-air networks and on the more popular pay television networks is falling. To the extent that the trends in audience size and fragmentation observed in the United States manifest themselves in other OECD countries, in years to come advertising may be a less significant revenue source than it is today.

The personal video recorder (PVR) also poses a threat to advertiser-supported broadcasters, both free-to-air and pay. As a threshold matter, the PVR permits the viewer to record programme for later viewing and to skip advertisements entirely. Moreover, some advertisements are time sensitive, so a time-shifted (delayed) viewing could be of diminished value to the advertiser. It is possible that the PVR could in some cases add value to advertising by permitting more comprehensive commercial messages to be targeted to viewers who express an interest in them. It is also possible that advertisers will find effective ways of reaching the mass viewer, *via* product placements, for example, or by changing the presentation of advertisements to make them more attractive and entertaining, so viewers will choose not to skip them.

Internet video distribution, which is still at an early stage, will also provide a further challenge to the industry. Although much of it today consists of downloaded content (peer-to-peer and otherwise), as broadband penetration increases and broadband capacity expands, it will become increasingly possible to reach large audiences, simultaneously or otherwise, *via* Internet video. One effect of this will be vastly to increase the range of content available to those with a broadband connection. Instead of being limited to 10 or 20 terrestrial channels or 100 or 200 cable or satellite channels, viewers may be able to access content from around the world. As noted above, most countries currently do not consider Internet video to be broadcasting and hence do not try to regulate its content. To the extent that Internet video eventually attracts significant audiences at the expense of the current broadcast platforms, those platforms may become less effective in delivering content that promotes social objectives. Due to the international nature of the Internet, it would likely be difficult to regulate it to advance national social objectives; and trying to do so could well cause harm. Thus, an important longer-run challenge is to find ways to pursue legitimate social content regulation objectives without impeding access to the worldwide cornucopia of content, video and otherwise, that is and will be available via the Internet.

Digital rights management (DRM) also raises important issues and it interacts with several of the challenges already mentioned. One consequence of the digital transition is it permits large-scale production of very high-quality copies of video content at low cost. A second consequence is that it is easy to distribute this content globally at low cost via the Internet. Unauthorised copying and widespread Internet distribution of digital content can substantially limit the revenues that creators can earn. This, of course, will reduce their incentives to create and distribute content. On the other hand, in the analogue world, viewers have become accustomed to a certain degree of freedom to copy video content. Balancing these interests appropriately, such that creative incentives are preserved and viewers retain some flexibility in when, where, and how they view video content, and doing so in a way that does not excessively limit innovation in distribution technologies or impose substantial costs on viewers is a challenge that cuts across all distribution platforms.

Structural changes

Distribution platforms and media usage

The number of television households (TVHH) in the OECD grew at an average annual rate of 2% between 1995 and 2002 (Table 7.1). The rate of growth appears to be slowing. Cable subscriber totals have grown at an average annual rate of 4.3% over the same period, a rate that has been fairly steady over this interval. Home satellite antenna usage has shown the most rapid average annual growth rate, 12.6% from 1995-2002, but this rate apparently slowed over the past few years. The number of terrestrial only TVHH in the OECD region has declined steadily since 1995.

The reliance on terrestrial television as the main access to broadcast programme varies widely across OECD countries (Table 7.2). The table provides data on usage of the major distribution platforms, terrestrial television, cable television, and satellite television, and is the source for Table 7.3, which shows the composition of television households by distribution platform for 1995, 2000 and 2002. The table indicates that the share of "terrestrial only" TVHH (calculated as total TVHH less cable TVHH less home satellite TVHH) dropped from 52 to 36%. At the high end are Greece, Italy, Mexico and Turkey, with over 80% of households relying only on terrestrial broadcasting. At the low end are Luxembourg and Switzerland, where the calculated "terrestrial only" are very low (figures are negative possibly because some households have both satellite and cable service – these have been set to zero). It must be noted that the terrestrial only figures have fallen further since 2002, but later data are not available on a widespread basis.

Between 1995 and 2000, OECD households have increased their usage of cable and satellite television (Table 7.3). For the OECD countries as a whole, the share of television households (TVHH) subscribing to cable service rose from 38 to 45% from 1995 to 2002. The share of TVHH relying on home satellite service in the OECD area increased from 10 to 20% over 1995 to 2002. The United States alone accounted for over 25% of OECD TVHH in 2002. In order not to obscure differences in trends between the United States and other member states, it is worth looking at totals without the United States. Cable television is particularly widespread in the United States, and Table 7.3 indicates that, without the United States, the cable share of TVHH was 28% in 1995 and 36% in 2002. Correspondingly the terrestrial share without the United States was 60.7% in 1995, dropping to 43.6% in 2002.

The performance of countries with respect to the development of cable television is quite varied with some countries having a very high penetration rate in terms of households passed by cable and actual subscribership, *e.g.* Belgium, Denmark, Canada, the United States; whereas for others the share is quite low, *e.g.* Greece, Italy, New Zealand, Turkey (Table 7.4). It is interesting to note that, in the United States, cable is more widely available than every OECD country except for Belgium and the Netherlands, yet the share of homes passed that subscribe to cable is smaller in the United States than it is in six of the 13 other OECD countries for which 2003 data are available. In Belgium, Denmark, Luxembourg, and Sweden, over 80% of homes passed subscribe, while in Italy and Spain the share is under 15%. Questionnaire data show that, as of mid-2004, subscribers as a percentage of homes passed to be 76.1% in Germany and 20% in New Zealand.

Digital television transition

The transition to digital television across distribution platforms is shown in Table 7.5, which presents data for the period from 2001-2003. Table 7.5 shows 91.8 million digital television (DTV) households, terrestrial, cable, and satellite in 2003, up from 65.3 million in 2001. The United States accounted for 49.3% of the 2001 totals and 52.3% of the 2003 totals. Without the United States, the 2003 total is 48 million and the 2001 figure is 32.2 million. A roughly comparable figure for 1999 (without the United States) is 10.4 million, so it is clear that DTV has spread rapidly since 1999.

The pace of the overall digital transition is also shown in Table 7.5. From 2001 to 2003 the percentage of TVHH that had digital service increased from 22.6 to 28.7%. The comparable figures without the United States are 17.6 and 22.6%. The composition of digital households has shifted in favour of digital terrestrial television (DTT), with its share rising from 3.6 to 7.7% of the total. During this period, the satellite share of DTV households dropped from 60.1% to 56.7%, while the cable share declined from 36.3% to 35.7%. Most of the DTT households (5.9 of 7.1 million in 2003) are accounted for by the United Kingdom, the United States, and Korea, although six other countries in the table had some DTT households.

Table 7.6 looks more closely at the composition and penetration of DTV households. In seven countries – Canada, Germany, Ireland, Norway, Sweden, the United Kingdom, and the United States – more than one-quarter of TVHH have digital service. This is primarily due to digital satellite service in every case but the United States (where slightly more than half of digital TVHH are cable), but Sweden and the United Kingdom each have more than 15% of digital households accounted for by DTT. The United Kingdom, with about half of its 2003 TVHH with digital service and 24.2% of digital households served by DTT, is clearly the leader in the overall transition to digital television.

There are two major DTT standards in the world today – the United States-developed ATSC standard and the European DVB standard (which has separate variants with the same basic structure for DTT, cable, and satellite transmissions). Four OECD countries – Canada, Korea, Mexico, and the United States – have chosen the ATSC standard. Japan has developed a variant of the DVB standard, known as ISDB, and the other OECD countries have chosen the DVB standard. All of these standards can accommodate both high definition television (HDTV) and standard definition television (SDTV). HDTV refers to transmissions with substantially higher resolution and picture quality than the current analogue service. Audio quality is also substantially higher than analogue. SDTV transmissions are also of higher sound and picture quality than analogue, but the resolution is not as high as HDTV. Concomitantly, SDTV transmissions require less bandwidth per video stream than HDTV. SDTV reception equipment is generally less costly as well, since the lower bit-rate requires signal-processing equipment with less memory than needed for HDTV. Moreover, it is likely that the demand for particularly large-sized video displays is lower when transmissions are SDTV than when HDTV is also available.

Table 7.7 provides some information regarding the DTT transition in OECD countries. With regard to HDTV it shows that only Australia, Japan and Korea require HDTV transmissions, although Canada apparently requires stations to pass through HDTV transmissions if they are provided. Although there is no HDTV requirement in the United States, a substantial amount of DTT programme, particularly during peak viewing hours, is in HDTV format. In addition, there are currently 17 cable television channels that offer at least some HDTV programme. In general, the European member states have chosen the SDTV route. Virtually all OECD member states have given some consideration to the question of "analogue switch-off," that is when to terminate analogue transmissions. Indeed, pursuant to the "eEurope Action Plan," European Union member states were required to publish switch-off plans by the end of 2003. Information regarding the start date for DTT and analogue switch-off for OECD countries is shown in Table 7.7. OECD countries first began offering DTT service in 1998 (Germany, United Kingdom, and United States). Many others have begun service since then, although Norway plans to begin in 2005 and Austria in 2007-2010. Planned analogue switch-off dates range from 2006 to 2015, although these dates probably should be considered as targets rather than "hard" deadlines. Some member states, notably Australia, Germany, and the United States, have specified that they will manage their analogue switch-off on a regional or market-by-market basis. Indeed Germany completed its transition for the Berlin market in 2003. In at least some countries, such as the United States, the demand to reallocate spectrum from terrestrial television service to other valuable United Stateses (mobile or fixed wireless services of various descriptions) is an important part of the discussion of an analogue switch-off date.

The role of and "business model" for DTT is still developing. In at least a few countries, it appears that DTT is or may become a competitor to other multi-channel pay platforms. Table 7.8 indicates that a few OECD countries, for example, the Netherlands and Sweden, have subscription DTT services, while the United Kingdom has a free-to-air DTT service with a significant number of channels (32). On the other hand, an earlier pay DTT service in the United Kingdom was not financially successful and a pay DTT service in Spain did not survive.

Many OECD countries require cable retransmission of at least some terrestrial television stations and a few require some satellite retransmission of at least some terrestrial television stations. It appears likely that some "must-carry" requirements will be in effect after analogue switch-off. These considerations – channel capacity disparity and signal carriage regulations – weigh in favour of the view of DTT as a complement to rather than a substitute for multi-channel pay television. This view is particularly compelling in the case of countries with very high levels of multi-channel pay television penetration, such as the United States (85% of households subscribe to cable or DBS service). On the other hand, one United States company – United States DTV – is pursuing a different business model by competing with the multi-channel platforms. United States DTV is now active in three markets and offers a package of 11 cable channels for USD 19.95 per month. Subscriber equipment also enables reception of the free-to-air DTT channels in each market.

A small number of households receive digital television via ADSL. The European Audiovisual Observatory has 2002 data for European member states of the OECD showing 14 000 ADSL DTV households. The number has undoubtedly increased since then and in other OECD countries, Korea in particular, have significant numbers of households receiving television *via* a broadband Internet connection. As noted below, most OECD member states do not subject "Internet video" to broadcasting regulations.

Trends in channel availability

In order to understand trends in broadcast service availability, it is necessary to know not only availability and usage of platforms but also to know something about the channel offerings on those platforms. Table 7.8, which provides information on service availability in the largest city in 28 of the 30 OECD member countries, illustrates the point that cable and satellite television offer a substantially wider range of choices than terrestrial television, analogue or digital, does. The number of terrestrial free-to-air channels available ranges from two in Switzerland to 32 in the United Kingdom (reflecting the "Freeview" DTT service). A few countries also have DTT subscription services, for example, the Netherlands (24 channels) and Sweden (23 channels). Premium cable television service offerings range from 28 channels in Germany to around 120 in Mexico and the United States. Satellite service bouquets range in number from 24 channels in Greece to over 175 in the Czech Republic, Mexico, and the United States. Data from the European Audiovisual

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Observatory for 1999 and 2004 indicate that the total number of channels available has increased substantially over the past five years and that the composition has shifted away from free-to-air channels, both commercial and public service, and toward pay channels. During this period, the total number of national channels available in European OECD member states almost doubled, to over 1 200. Of this total, around 130 were free-to-air public service or commercial channels with analogue terrestrial licenses. This represents a slight decline from the 1999 figures (European Audiovisual Observatory Statistical Yearbook, 1999 edition, Table 7.2; 2003 edition, Table 21.1). Because there were few national DTT channels launched in Europe during the period, it is clear that most of the increase is accounted for by cable and satellite channels. Most of these are offered on a commercial, subscription basis. United States data from the Federal Communications Commission and the cable television trade association show an increase from 214 national cable video networks in 1999 to 382 in 2004. There was little increase in national availability of free-to-air television programme during this period.

Data for the period from 1999 to 2002 on daily audience shares of public service broadcasters in 24 of the OECD countries, with separate figures for different language groups in two of them are provided in Table 7.9. In 13 of 27 cases the audience share declined between 1999 and 2002, while in 14 cases there was an increase. These data likely overestimate overall viewing for public service broadcasters, since they are shares of free-to-air viewing only. In most countries, pay television viewing has been increasing over this period, so overall viewing shares for public service broadcasters are probably lower than those reported. Indeed, there may be cases where the free-to-air share has been increasing and the overall share actually declined. The data support no definitive conclusions, but casual inspection suggests that the declines are generally larger in magnitude than the increases.

Even in the absence of clear evidence of declining viewing of public service broadcasting channels, it is worth noting that at least one OECD country, the United Kingdom, has begun to consider alternative techniques for meeting public service broadcasting objectives. The traditional method, broadly speaking, is to provide a distribution channel and funding in a package to the public service broadcaster. That broadcaster then produces some programme in-house, acquires other programme, and then distributes the programme over its transmission network. The BBC is a good example and the United States Public Broadcasting System is another. Now, however, perhaps due to the proliferation of competing services and delivery platforms, OFCOM has released a "hypothetical tender document for a public service publisher", or PSP. The PSP, as described in this exploratory document would have a "guaranteed stream of public funding" and be charged with "commissioning high-quality audio-visual content from a wide variety of external producers and distributing that content over a wide range of digital platforms".

Convergence/regulatory developments

Convergence

Convergence refers to the provision of multiple services, generally voice, video, and data (Internet access), over a single transmission/distribution platform. In the past, distribution platforms – cable, satellite, telephone company plant, or terrestrial wireless – generally did not provide all of these services over common plant. Initially convergence has involved parallel provision of multiple services over common plant. For example, some cable television companies provide traditional analogue video service on a point-to-multipoint basis but also devote some capacity to cable modem service. In the United States, a few cable companies have offered traditional circuit-switched voice service over cable plant. With the advent of "voice over IP" service, voice telephony can be provided as an application over the Internet connection. Video can also be distributed via the Internet, either on a download or streaming basis. Of course, a higher capacity connection is required to make "Internet video" a viable proposition than is needed to support Internet voice service. Nevertheless, the path of convergence could in the future lead to a world where both voice and video become standard applications provided over a (broadband) Internet connection.

Table 7.10 provides some indication of the state of convergence in OECD countries today. It indicates that in 21 of the 30 member countries, at least one cable television operator provides either Internet service, voice telephony, or both (four explicitly mention telephony). Eight countries report satellite provision of one or both services, although one of them indicates United Statese of a terrestrial return path.

Regulatory issues

The single biggest regulatory development in broadcasting over the last few years has been the adoption by the European Union in 2002 of a series of directives regarding electronic communications networks and services, several of which have provisions that bear on broadcasting. This section examines the regulatory approach to several services, reviews relevant portions of the EU Directives, examines some United States developments, and concludes with a discussion of signal carriage, media ownership, and content regulations in OECD countries.

Regulatory treatment of broadcasting and certain advanced services

Table 7.11 provides information on the definition of broadcasting, treatment of video on demand services, treatment of Internet video, and regulation of conditional access and electronic programme guide (EPG) services. With regard to the definition of television broadcasting, member states that are also EU members are governed by the definition in the "Television Without Frontiers" Directive. That definition is worth quoting because it highlights several conceptual issues. Article 1(a) of the directive states that:

> "television broadcasting" means the initial transmission by wire or over the air, including that by satellite, in unencoded or encoded form, of television programmes intended for reception by the public. It includes the communications of programmes between undertakings with a view to their being relayed to the public. It does not include communications services providing items of information or other messages on individual demand such as telecopying, electronic data banks and other similar services.

Most OECD member countries have adopted a "technologically neutral" definition of television broadcasting, applying the term to transmissions via the radio frequency spectrum, whether terrestrial or via satellite, and to transmissions via wire, including coaxial cable. Most countries also included both encrypted and unencrypted services under the heading of broadcasting. The exceptions are Mexico and the United States, which limit broadcasting to free-to-air services. The United States definition refers to "the dissemination of radio communications intended to be received by the public, directly or by the intermediary of relay stations". The "intended to be received by the public" provision

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has been interpreted as ruling out encrypted transmissions, since those generally require a subscription fee and are therefore not meant for every member of the public. Video on demand services are apparently treated in a technologically neutral way in all OECD members. Moreover, even those countries that define broadcasting to include all transmission media appear not to consider video on demand to be broadcasting.

The question of provision on individual demand comes up in the context of Internet video. Table 7.11 indicates that member countries generally do not consider Internet video to be broadcasting. However, there are a few exceptions. Belgium is one, although the question is under review at least in the French region. In Portugal, the question is subject to case-by-case analysis. Internet video is currently considered broadcasting in Spain, but this question is subject to future review. In Sweden, it appears that video streaming over the Internet would be considered broadcasting but downloading video would not be. In Canada, Internet video is considered broadcasting but the regulator has explicitly exempted such transmissions from broadcast regulation. A few countries (Denmark, the Netherlands) do subject Internet transmissions by public service broadcasters to some degree of regulation.

For reasons mentioned in the Introduction to this chapter, the status of Internet video is likely to assume increasing importance over time. As the Internet becomes a more widely available platform for broadband video distribution, Internet video could someday cut significantly into viewing on more “traditional” broadcast distribution platforms, with obvious implications for the goals of broadcast content regulation.

Table 7.11 also indicates that most OECD countries impose some regulation on conditional access and/or EPG services. As explained below, the EU directives explicitly permit this. Notable among countries that do not regulate these services are most of the non-European member states – Canada, Japan, Korea, New Zealand, and the United States, as well as Norway. In Canada certain provisions of competition law would apply to these services, specifically a general prohibition against “undue preference” for any party. This could include the proprietor of the EPG. It is likely that in some other countries, competition law could apply here as well.

The European Union Directives

In February 2002, the European Parliament and the Council of the European Union adopted four directives that have some provisions relevant to broadcasting services. EU member states are required to implement the provisions of these directives. The “Framework Directive” sets out a “common regulatory framework for electronic communications networks and services”. The other directives address universal service issues, access issues, and authorisation issues. Each directive consists of a series of findings in a preamble, followed by specific articles.

The Framework Directive includes a finding (item 5) that “it is necessary to separate the regulation of transmission from the regulation of content.” As noted above, this is consistent with the technology neutral definition of broadcasting. The finding notes that the Framework Directive’s provisions are without prejudice to content regulation at the Community or national level and refers to the “Television Without Frontiers” directive as governing content regulation. The finding does note certain connections between content and transmission, declaring that the separation of regulation:

> "… does not prejudice the taking into account of the links existing between them [content and transmission], in particular in order to guarantee media pluralism, cultural diversity and consumer protection."

Finding 6 of the preamble provides a non-exhaustive list of goals for audiovisual policy and content regulation. These "general interest objectives" include "freedom of expression, media pluralism, impartiality, cultural and linguistic diversity, social inclusion, consumer protection, and the protection of minors".

Finding 30 states the principle that "standardisation should remain primarily a market-driven process," but leaves open the possibility of mandatory standards in regard to DTV. The finding states that "a full public consultation" should precede any imposition of mandatory standards. Finding 31 encourages interoperability of "digital interactive television services and enhanced digital television equipment", including across transmission modes. The definition section makes clear that "enhanced digital television equipment" is equipment that enables reception of digital interactive television services. The finding also encourages "digital interactive television platform operators" to implement an open "application programme interface" or API.

Article 18 of the Directive is captioned "Interoperability of digital interactive television services." It instructs EU member states to "encourage" both service providers and equipment providers to utilise an open API. It also encourages API proprietors to make available to digital interactive television service providers, on reasonable and non-discriminatory terms, the information needed to provide services supported by the API "in fully functional form." The article also reserves to the European Commission the right to implement standards if it finds after review that interoperability has not been adequately achieved in at least one member state.

Article 15 of the Directive does not mention broadcasting services directly, but it is relevant nonetheless. This article sets out the procedure for market definition. The Directive contains provisions for analyzing markets to determine if any "undertakings" therein have significant market power (SMP). Undertakings with SMP are subject to regulation. A "Commission Recommendation" of 2003 identifies "product and service markets in which *ex ante* regulation may be warranted." One of those markets, at the wholesale level, is "Broadcasting transmission services, to deliver broadcast content to end United Statesers". Recently the UK regulator, OFCOM, has published a proposed finding that certain entities in this market do have SMP. The publication "Broadcasting Transmission Services: A Review of the Market", tentatively concludes that two entities have SMP in the market for access to masts and sites for delivering analogue and/or digital terrestrial broadcasting transmission services. Moreover, the two entities together are also found to have SMP in the market for "provision of terrestrial managed transmission service" to deliver a terrestrial national broadcast service, analogue and/or digital.

The Access Directive requires (Article 6 and Annex I) that member states ensure that proprietors of conditional access services make those services available on a fair, reasonable, and non-discriminatory basis. The article permits national authorities to exempt from this requirement, under certain conditions, providers found not to have SMP. Article 5 authorises national authorities to impose, if necessary obligations on operators to provide access on fair, reasonable, and non-discriminatory terms to EPGs and APIs so as to ensure accessibility for end-users to digital radio and television broadcasting services. One example of this is the recently promulgated OFCOM (UK) "Code of practice on electronic programme guides", which is designed to ensure that EPG providers give appropriate prominence to public service channels, to secure fair and effective competition, and to ensure that people with disabilities can utilise EPGs.

The Universal Service Directive includes two findings (32 and 33) that address interoperability of DTV equipment. Finding 32 states that end-users "should be able to enjoy a guarantee of interoperability" with regard to all DTV reception equipment sold in the Community and that Member States should be able to set minimum standards with regard to such equipment. Finding 33 further emphasises the importance of interoperability, encourages standards bodies to update their standards as technology changes, and empowers Member States and the Commission itself to undertake policy initiatives to encourage standardisation with regard to digital television interactive services. Article 24 directs Member States to "ensure the interoperability" of certain consumer digital television equipment. Specifically, Annex VI requires that consumer DTV equipment must be capable of descrambling according to the common European scrambling algorithm and display signals transmitted "in the clear". Moreover, both analogue and digital television sets must have at least one open interface socket.

Article 31 of the Universal Service Directive permits Member States to impose reasonable "must carry" obligations on certain distribution network(s) for transmission of certain radio and television broadcast channels and services. There are various limitations on this authority, including that it only be exercised where "a significant number of end-users" rely on the distribution network(s) in question as their "principal means" of receiving radio and television service. Moreover, Member States may specify appropriate remuneration in connection with such carriage and may act to ensure that there is no discrimination in the treatment of distribution networks with regard to must carry obligations. The Authorisation Directive requires that authorisations to US radio frequencies (including for broadcasting) should be granted through open, transparent and non-discriminatory procedures (Article 5).

US regulatory developments

In the United States, one of the most significant broadcast regulatory developments relates to the digital transition, in particular digital rights management (DRM), and those relating to media ownership. Video transmissions in digital format may be copied repeatedly with little or no quality degradation and may be widely and inexpensively redistributed via the Internet. Unrestricted copying and redistribution poses a significant threat to the revenues of content creators and could limit the incentives for creation and distribution of high-value digital content. It is also noteworthy that, in the analogue world, viewers value the opportunity to copy video programme and have developed certain expectations regarding their ability to copy for various purposes, including time-shifting and portability. The FCC has attempted to strike a balance between these competing values. Pursuant to its statutory responsibilities to ensure interoperability between cable television systems and consumer electronics equipment and to ensure retail availability of "set-top boxes" without compromising signal security, the FCC adopted in 2003 rules to ensure digital "plug and play" cable compatibility. These rules in essence require cable set-top boxes and digital television receivers to implement DRM instructions transmitted along with encrypted programme. However the rules also specify the level of DRM that may be imposed by multichannel video service providers on different categories of programme, ranging from "copy never" for pay per view or video on demand programmeming to "copy freely" for broadcast channels carried by the service.

The "plug and play" rules do not apply to free-to-air broadcast programme. Viewers are accustomed to having the ability to copy analogue broadcast programme, but not to being able to redistribute it widely without quality degradation. In view of the threat to broadcasters' advertising revenues from wholesale redistribution, in 2003 the FCC adopted its "broadcast flag" order, which includes a redistribution control system for digital broadcast television. The system is designed to prevent widespread redistribution (*e.g. via* the Internet) of broadcast programme without preventing home copying. This order has been appealed, both to a federal court and also back to the FCC for reconsideration.

There are also some important pending issues relating to digital signal carriage or "must carry" rules. Both cable systems and DBS services are subject to analogue signal carriage rules. The FCC has made it clear that, after the digital transition is completed, DTT stations will have must-carry rights on cable systems. There has been no ruling yet on digital must-carry for DBS. With regard to cable television, several important issues remain open as of January 2005. Broadcasters generally advocate "dual carriage" of stations' analogue and digital signals during the transition period. The FCC has indicated that there would be a high hurdle for advocates of this position but the question is still open. Another issue involves carriage of "multicast" programme. United States DTT stations have the capacity to transmit multiple programme streams on their digital channels. United States law requires carriage only of a station's "primary video". The FCC previously has determined that primary video means "one video stream", but various parties have petitioned for reconsideration and those petitions are pending. In addition, United States law requires that cable operators transmit television signals "without material degradation." The FCC has previously decided that issue as well, but the matter is before the Commission on reconsideration. The decision will clearly have implications for the amount of cable system capacity that would need to be devoted to fulfilling signal carriage requirements.

The FCC is required by law to review periodically its broadcast ownership, including cross-media, rules. The most recent review was concluded in 2003 and covered six rules: 1) a local market limit on the number of radio stations that a single entity can own; 2) a local market limit on the number of television stations that a single entity can own; 3) a local market cross-media limit on common ownership of radio and television stations; 4) a prohibition on common ownership of a daily newspaper and a broadcast station (radio or television) in a local market; 5) a national cap on the number of television households that can be reached by stations owned by a single entity; and 6) the "dual network" rule, which prohibits the top four commercial television networks from merging with one another. The FCC decision maintained the dual network rule and the local radio rule (although changing the method of defining the local geographic market) and relaxed the other four rules. The decision was challenged judicially and the court has remanded it to the FCC, so the pre-existing rules remain in effect with one exception. The United States Congress passed a law setting the national television ownership cap at 39% (higher than the original 35% but lower than the 45% that the FCC had specified). The Congress additionally changed the frequency of the mandatory reviews from every two years to every four years. One interesting aspect of the FCC analysis (which the court did not challenge) was the general approach to the traditional goal of diversity of political viewpoint. The FCC determined that the "product market" for viewpoint diversity comprised several media, including radio, television (in the local context free-to-air television), daily and weekly newspapers, and the Internet. In order to characterise the structure of that market, the FCC made United Statese of a "diversity index", by analogue with the Herfindahl-Hirschmann Index United Statesed in competition law analysis. The index made it possible to combine the various available media outlets into a single summary measure of market structure. The FCC then United Statesed this index as a tool to specify certain "bright-line" limits on cross-media ownership. In its remand, the court criticised the FCC methodology extensively, but appeared to accept the general analytical approach of combining media into a single "market" for diversity and United Statesing a summary measure of structure as a tool of analysis.

Signal carriage, media ownership, and content regulations

Most OECD countries have some form of regulation covering signal carriage and media ownership regulations (Table 7.12). With regard to signal carriage, 21 of the 30 OECD members indicate that they have cable must-carry regulations. Only four – Canada, Korea, Mexico, and the United States – report having must-carry regulations for satellite carriers. The UK Communications Act 2003 permits must-carry requirements to be implemented by OFCOM subject to review by the Secretary of State. The list of must-carry services in the statute includes the digital channels of Channel 3, 4, 5, S4C, and some BBC services. The Secretary of State can modify the list. Must-carry requirements can be imposed on networks that are United Statesed by a significant number of end-users as their principal means of receiving television programmes.

The domestic media ownership regulations vary widely across OECD member countries. With regard to ownership of radio or television stations, most of the limitations are local. Australia, Portugal, the Slovak Republic, Spain, and the United States are the only countries mentioning national limits on radio or television station ownership. With regard to cross-media limits, the most frequently specified prohibition is of common ownership of a newspaper and a broadcast station. Korea prohibits common ownership of a terrestrial broadcaster and a cable carrier and cable carriers are forbidden to hold a stake in a satellite broadcaster. Satellite broadcasters may own up to 33% of a terrestrial broadcaster or of a cable carrier.

Foreign ownership limits also vary. Korea and Mexico prohibit it outright for terrestrial broadcasters, while Italy and Switzerland base their decisions in part on reciprocity (conditions in the home country of the foreign owner). EEA countries are not considered "foreign" within the EEA.

Every OECD member state has some type of content regulation. As a threshold matter, the EU Television Without Frontiers Directive places some requirements on member states. Member state television broadcasters are required to reserve 50% of transmission time "where practicable", for European content. The calculation excludes news, sports events, games, advertising, and teletext. In addition, member states, again "where practicable", reserve 10% of transmission time (exclusive of news, etc.) for European producers independent of the broadcaster. An alternative is to devote 10% of the programme budget to independent productions. Not every OECD member state that is also an EU member explicitly listed this requirement. On the other hand, some of the non-EU OECD member states also have domestic content requirements. Examples are Canada (60% domestic content) and Australia.

Several member states (*e.g.* Australia, Germany, and Switzerland) also have "local content" regulations, *i.e.* requirements to provide some programme of interest to regional or local audiences within the country. Many member states have requirements for news, information, and education. Several specifically mention the promotion of the local culture and language. In a few cases (Finland, Slovak Republic, Spain) there are some requirements to cater to minority language groups in the country. Additionally, Australia's Special Broadcasting Service has a charter obligation to "provide multilingual and multicultural radio and television sevices that inform, educate and entertain all Australians, and, in doing so, reflect Australia's multicultural society".

Many member states have provisions to protect viewers, especially children, from violent, obscene, or indecent programme. Examples include Australia, Canada, New Zealand, Portugal, and the United States. In some states, such as Australia and the United States, programme not suitable for children is restricted to certain time bands. Some states explicitly mention respect for human dignity. A few (*e.g.* Canada, Portugal) explicitly mention catering to those with disabilities. Some (Portugal, United States) have political advertising requirements. Korea has a religious programme requirement. Other themes include pluralism and diversity. In several cases, content requirements are more stringent for public service broadcasters (Denmark, Germany, Hungary, Netherlands, and Switzerland).

Table 7.1. **Trends in media usage in the OECD area**

	1995	2000	2002	Annual % change, 1995-2000	Annual % change, 2000-2002	Annual % change, 1995-2002
TVHH (millions)	345.66	381.83	395.79	2.01	1.81	1.95
Cable subscribers (millions)	132.22	163.44	176.91	4.33	4.04	4.25
Home satellite antennas (millions)	33.56	66.80	77.18	14.76	7.49	12.63
TVHH not relying on cable or satellite[1] (millions)	179.88	151.59	141.69	-3.36	-3.32	-3.35

1. Calculation used: TVHH - (cable subscribers + home satellite antennas)

Source: Table 7.2.

StatLink: http://dx.doi.org/10.1787/462371710162

Table 7.2. **ITU data on television, cable and home satellite usage, 1995-2002**

	Households (000)				Television-equipped households (000)				Cable television subscribers (000)				Home satellite antennas (000)				"Terrestrial only" HH [TV-equipped households - cable television subscribers - home satellite antennas] (000)				"Terrestrial only" HH as a % of television-equipped households			
	1995	2000	2001	2002	1995	2000	2001	2002	1995	2000	2001	2002	1995	2000	2001	2002	1995	2000	2001	2002	1995	2000	2001	2002
Australia	6 690	7 250	7 366	7 488	6 500	7 000	7 100	7 100	..	800	825	925	..	450	575	575	6 500	5 750	5 700	5 600	100	82	80	79
Austria	3 131	3 283	3 311	3 337	2 648	3 182	3 198	3 250	750	1 013	1 036	1 077	972	1 450	1 560	1 560	926	719	602	613	35	23	19	19
Belgium	4 079	4 238	4 278	4 319	3 794	4 026	4 064	4 290	3 629	3 789	3 815	3 880	255	220	220	290	..	17	29	120	..	..	1	3
Canada	10 655	11 699	11 897	12 021	10 485	11 575	11 796	11 924	7 799	7 983	7 865	7 663	..	967	1 609	2 014	2 686	2 625	2 322	2 247	26	23	20	19
Czech Republic	3 880	3 822	3 828	3 822	3 213	3 409	3 365	3 166	475	955	965	965	..	..	348	470	2 095	1 884	2 052	1 731	65	55	61	55
Denmark	2 374	2 444	2 456	2 467	2 061	2 349	2 379	2 379	1 190	1 041	1 078	1 079	211	800	800	800	660	508	501	501	32	22	21	21
Finland	2 181	2 355	2 365	2 373	1 915	2 160	2 183	2 163	829	950	1 000	1 040	153	343	361	361	933	867	822	762	49	40	38	35
France	22 885	24 261	24 582	24 643	21 557	22 724	23 283	23 411	1 858	3 020	3 239	3 430	305	2 413	2 790	2 790	19 394	17 291	17 254	17 191	90	76	74	73
Germany	36 938	38 124	38 456	38 720	32 634	35 887	36 225	36 350	15 800	20 000	20 300	20 630	9 525	12 900	13 340	13 650	7 309	2 987	2 585	2 070	22	8	7	6
Greece	3 510	3 590	3 600	..	3 332	3 500	3 510	3 510	..	..	..	..	130	190	70	70	3 202	3 310	3 440	3 440	96	95	98	98
Hungary	3 795	3 751	3 759	3 780	3 773	3 599	3 630	3 700	1 381	1 607	1 593	1 727	859	..	827	827	1 533	1 992	1 210	1 146	41	55	33	31
Iceland	95	100	102	104	91	98	99	101	1	1	0	35	..	..	..	6	90	96	99	60	99	99	100	59
Ireland	1 123	1 287	1 305	1 328	991	1 220	1 225	1 287	480	670	615	562	90	150	220	286	421	400	390	439	42	33	32	34
Italy	21 168	21 176	21 488	..	16 091	20 660	20 900	20 900	..	60	80	80	479	2 350	2 550	2 550	15 612	18 250	18 270	18 270	97	88	87	87
Japan	44 108	45 545	45 664	46 005	35 377	37 274	37 679	37 953	11 005	18 705	21 254	23 332	9 430	13 088	13 493	13 761	14 943	5 481	2 932	860	42	..	8	2
Korea	12 958	15 443	15 765	16 080	14 517	15 113	15 500	15 854	7 053	9 992	10 326	11 435	..	..	..	539	7 464	5 121	5 174	3 880	51	34	33	25
Luxembourg	155	169	172	174	155	167	170	172	40	124	138	138	10	30	33	33	105	13	..	1	68	8	..	1
Mexico	18 500	23 485	23 206	24 682	16 000	21 031	21 294	23 093	1 250	2 283	2 487	2 480	..	668	869	980	14 750	18 081	17 938	19 633	92	86	84	85
Netherlands	6 559	6 954	7 041	7 041	5 850	6 600	6 740	7 000	5 842	6 200	6 320	6 500	294	330	340	500	..	70	80	..	..	1	1	..
New Zealand	1 260	1 350	1 360	1 382	1 145	1 310	1 330	1 330	2	21	27	27	..	217	300	300	1 144	1 072	1 002	1 002	100	82	75	75
Norway	1 845	1 923	1 962	1 981	1 582	1 885	1 950	1 980	677	823	839	840	232	530	520	510	673	532	591	630	43	28	30	32
Poland	13 050	13 130	13 131	13 132	11 996	12 113	12 118	12 125	2 719	3 539	3 498	3 529	..	2 500	..	2 500	9 277	6 074	8 620	6 096	77	50	71	50
Portugal	3 310	3 510	3 568	..	3 191	3 503	3 561	3 561	58	925	1 119	1 262	308	418	425	425	2 825	2 160	2 017	1 874	89	62	57	53
Slovak Republic	1 893	1 932	1 666	1 681	1 742	1 858	1 906	1 681	400	659	728	685	310	620	620	620	1 032	579	557	377	59	31	29	22
Spain	12 224	13 335	13 548	13 860	11 683	13 200	13 400	13 400	..	298	588	811	738	1 685	2 036	1 996	10 945	11 217	10 776	10 593	94	85	80	79
Sweden	4 087	4 285	4 300	4 320	3 368	4 045	4 061	4 057	1 875	1 770	2 000	2 200	705	1 050	862	1 090	788	1 225	1 199	767	23	30	30	19
Switzerland	2 970	3 005	3 020	3 035	2 435	2 984	3 010	3 030	2 325	2 629	2 671	2 739	210	295	720	850	..	60	..	..	..	2	..	..
Turkey	12 700	14 400	14 600	16 247	11 500	13 770	14 257	15 650	404	885	909	955	219	1 836	2 096	2 096	10 877	11 049	11 253	12 599	95	80	79	81
United Kingdom	23 302	24 239	24 410	24 727	20 736	23 400	23 800	24 727	1 423	3 400	3 850	3 356	3 610	5 300	6 590	6 845	15 703	14 700	13 360	13 571	76	63	56	55
United States	98 500	105 480	106 950	109 000	95 300	102 185	105 444	106 642	62 956	69 297	72 958	73 525	4 515	16 000	17 890	17 891	27 828	16 888	14 596	15 226	29	17	14	14
OECD	379 926	405 566	409 154	387 749	345 663	381 827	389 177	395 786	132 220	163 440	172 125	176 908	33 561	66 799	72 064	77 184	179 716	151 018	145 370	141 298	52	40	37	36

Note: Japan's total number of analog DBS subscribers is used instead of home satellite antennas.

Source: OECD and ITU.

StatLink: http://dx.doi.org/10.1787/033253354547

Table 7.3. **Composition of television households by distribution platform, 1995-2002**

Percentage

	1995			2000			2002		
	Cable television subscribers as a % of total TVHH	Home satellite antennas as a % of total TVHH	"Terrestrial only" HH as a % of total TVHH	Cable television subscribers as a % of total TVHH	Home satellite antennas as a % of total TVHH	"Terrestrial only" HH as a % of total TVHH	Cable television subscribers as a % of total TVHH	Home satellite antennas as a % of total TVHH	"Terrestrial only" HH as a % of total TVHH
Australia	0.0	0.0	100.0	11.4	6.4	82.1	13.0	8.1	78.9
Austria	28.3	36.7	35.0	31.8	45.6	22.6	33.1	48.0	18.9
Belgium	95.7	6.7	0.0	94.1	5.5	0.4	90.4	6.8	2.8
Canada	74.4	0.0	25.6	69.0	8.4	22.7	64.3	16.9	18.8
Czech Republic	14.8	..	65.2	28.0	..	55.3	30.5	14.8	54.7
Denmark	57.7	10.2	32.0	44.3	34.1	21.6	45.3	33.6	21.0
Finland	43.3	8.0	48.7	44.0	15.9	40.1	48.1	16.7	35.2
France	8.6	1.4	90.0	13.3	10.6	76.1	14.7	11.9	73.4
Germany	48.4	29.2	22.4	55.7	35.9	8.3	56.8	37.6	5.7
Greece	0.0	3.9	96.1	0.0	5.4	94.6	0.0	2.0	98.0
Hungary	36.6	22.8	40.6	44.6	0.0	55.4	46.7	22.3	31.0
Iceland	1.3	0.0	98.7	1.3	0.0	98.7	35.0	5.8	59.1
Ireland	48.4	9.1	42.5	54.9	12.3	32.8	43.7	22.2	34.1
Italy	0.0	3.0	97.0	0.3	11.4	88.3	0.4	12.2	87.4
Japan	31.1	26.7	42.2	50.2	35.1	14.7	61.5	36.3	2.3
Korea	48.6	0.0	51.4	66.1	0.0	33.9	72.1	3.4	24.5
Luxembourg	25.8	6.5	67.7	74.3	18.0	7.8	80.2	19.2	0.6
Mexico	7.8	0.0	92.2	10.9	3.2	86.0	10.7	4.2	85.0
Netherlands	99.9	5.0	0.0	93.9	5.0	1.1	92.9	7.1	0.0
New Zealand	0.1	0.0	99.9	1.6	16.6	81.8	2.1	22.6	75.4
Norway	42.8	14.7	42.5	43.7	28.1	28.2	42.4	25.8	31.8
Poland	22.7	0.0	77.3	29.2	20.6	50.1	29.1	20.6	50.3
Portugal	1.8	9.7	88.5	26.4	11.9	61.7	35.4	11.9	52.6
Slovak Republic	23.0	17.8	59.2	35.5	33.4	31.1	40.7	36.9	22.4
Spain	..	6.3	93.7	2.3	12.8	85.0	6.1	14.9	79.1
Sweden	55.7	20.9	23.4	43.8	26.0	30.3	54.2	26.9	18.9
Switzerland	95.5	8.6	0.0	88.1	9.9	2.0	90.4	28.1	0.0
Turkey	3.5	1.9	94.6	6.4	13.3	80.2	6.1	13.4	80.5
United Kingdom	6.9	17.4	75.7	14.5	22.6	62.8	13.6	27.7	54.9
United States	66.1	4.7	29.2	67.8	15.7	16.5	68.9	16.8	14.3
OECD	38.3	9.7	52.0	42.8	17.5	39.6	44.7	19.5	35.7
OECD without United States	27.7	11.6	60.7	33.7	18.2	48.0	35.8	20.5	43.6

Note: "Terrestrial only" HH equals TVHH - (cable subscribers + home satellite antennas)

Source: Table 7.2.

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Table 7.4. **Penetration rate of cable television in OECD countries**

	Households passed by cable (%)					Households passed by cable which subscribe (%)				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
Australia	..	35.7	35.2	35.2	37	..	32	33	37	..
Austria	55.6	55.7	56.0	57.3	58.0	39.0	38.0	39.0	40.0	40.0
Belgium	95.0	95.0	95.0	..	100.0	94.6	94.0	94.6	94.3	94.3
Canada	93.0	93.0	93.0	94.0	93.9	75.0	73.0	71.0	68.0	67.5
Czech Republic	..	..	..	..	23.0	..	14.0	12.0	16.0	21.0
Denmark	..	..	..	..	62.5	..	..	..	..	90.4
Finland	..	..	..	..	67.0	..	..	..	..	..
France	..	..	..	..	36.0	..	..	..	..	..
Germany	..	..	..	..	83.0	..	..	..	..	..
Greece	..	..	..	..	0.0	..	..	..	..	..
Hungary	..	..	..	..	73.0	..	..	..	..	74.0
Iceland	..	..	..	..	35.0	..	..	..	..	..
Ireland	..	83.0	85.0	85.0	85.0	..	64.3	61.3	55.2	53.3
Italy	4.4	4.7	5.9	8.5	9.5	4.2	4.2	3.3	2.0	4.1
Japan	..	..	..	..	47.9					
Korea	..	..	..	..	57.0	56.0	65.0	65.0	71.0	72.0
Luxembourg	..	..	..	96.4	96.4	..	..	..	85.5	85.5
Mexico	..	..	..	..	32.0	..	..	..	..	..
Netherlands	..	..	..	..	97.0	..	..	..	..	..
New Zealand	..	..	..	..	11.0	..	..	..	..	..
Norway	..	..	..	..	56.0	..	..	..	..	..
Poland	..	..	..	..	39.0	..	..	..	..	..
Portugal	54.0	63.0	60.0	67.0	69.0	18.0	19.0	22.0	25.0	27.0
Slovak Republic	..	..	..	38.5	54.9	..	..	..	70.0	70.0
Spain	10.2	25.3	36.9	42.6	42.6	8.5	9.3	12.1	14.1	..
Sweden	..	..	..	..	49.0	..	..	..	..	82.0
Switzerland	..	..	..	..	95.0	..	..	..	..	..
Turkey	..	..	..	5.8	5.8	..	..	..	..	..
United Kingdom	..	..	50.8	51.1	51.5	..	..	29.0	26.6	26.4
United States	96.6	97.0	97.1	96.8	96.6	68.6	69.2	69.0	67.4	68.4

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Table 7.5. **Total television households and digital households, 2001-2003**

Millions

	2001					2002					2003				
	Television households (TVHH)	Total digital TVHH	Cable DTV HH	Satellite DTV HH	Terrestrial DTV HH	Television households (TVHH)	Total digital TVHH	Cable DTV HH	Satellite DTV HH	Terrestrial DTV HH	Television households (TVHH)	Total digital TVHH	Cable DTV HH	Satellite DTV HH	Terrestrial DTV HH
Australia	7.1	0.4	0	0.4	0	7.1	0.5	0	0.4	0.1		1.1	0	0.8	0.3
Austria	3.2	0.16	0.02	0.14	0	3.2	0.34	0.03	0.31	0	3.2	0.55	0.05	0.5	0
Belgium	4.1	0.11	0.11	0	0	4.2	0.13	0.12	0.01	0	4.2	0.18	0.16	0.02	0
Canada	11.8	2.42	0.81	1.61	..	11.9	3.23	1.22	2.01	..	12.1	3.59	1.39	2.2	..
Czech Republic	..	..	..	..	..	..	..	..	..	..	**3.7**	**0**	**0**	**0**	**0**
Denmark	2.4	0.62	0.39	0.23	0	2.3	0.28	0.06	0.22	0	2.3	0.35	0.08	0.27	0
Finland	2.2	0.1	0.01	0.08	0	2.3	0.14	0.01	0.09	0.04	2.3	0.21	0.02	0.1	0.09
France	23.3	4.04	0.65	3.39	0	24.1	4.29	0.8	3.49	0	24.4	4.62	0.92	3.7	0
Germany	36.2	7.8	4.0	3.8	0	36.4	10.13	4.4	5.7	0.03	37.8	12.58	5.0	7.2	0.38
Greece	3.5	0.11	0	0.11	0	3	0.16	0	0.16	0	3	0.25	0	0.25	0
Hungary	..	..	..	..	..	..	..	..	..	..	**3.9**	**0**	**0**	**0**	**0**
Iceland	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ireland	1.2	0.22	0.03	0.19	0	1.2	0.35	0.06	0.29	0	1.3	0.46	0.1	0.36	0
Italy	20.9	2.6	0.03	2.57	0	20.8	2.76	0	2.76	0	20.9	2.85	0	2.85	0
Japan	37.7	..	..	3.0	..	38	..	..	7.3	..	38.2	..	..	9.1	..
Korea	15.5	0.5	0	..	0.5	15.9	1.6	0	0.5	1.1	16.4	3.1	0	1.3	1.8
Luxembourg	0.16	..	..	..	..	0.2	0.01	0	0.01	0	0.2	0.01	0	0.01	0
Mexico	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Netherlands	6.7	0.71	0.19	0.52	0	7	0.55	0.1	0.45	0	7.1	0.69	0.11	0.55	0.03
New Zealand	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Norway	..	..	..	..	..	..	..	..	..	..	**1.9**	**0.62**	**0.06**	**0.56**	**0**
Poland	..	..	..	..	..	..	..	..	..	..	**12.5**	**0.7**	**0**	**0.7**	**0**
Portugal	3.6	0.2	0.01	0.2	0	3.1	0.32	0.01	0.31	0	3.1	0.51	0.02	0.49	0
Slovak Republic	..	..	..	..	..	..	..	..	..	..	**1.8**	**0.02**	**0**	**0.02**	**0**
Spain	13.4	2.51	0	2.26	0.25	12.5	2.26	0.07	2.06	0.13	12.6	2.38	0.15	2.06	0.17
Sweden	4.1	1.03	0.28	0.66	0.09	4.4	1.03	0.15	0.74	0.14	4.5	1.25	0.17	0.88	0.2
Switzerland	..	..	..	..	..	..	..	..	..	..	**3.4**	**0**	**0**	**0**	**0**
Turkey	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
United Kingdom	24.3	8.7	2	5.5	1.2	24.7	9.6	2.1	6.3	1.2	24.6	12	2.3	6.8	2.9
United States	105.5	33.1	15.2	17.6	0.3	106.7	38	19.2	18.2	0.6	108.4	43.8	22.2	20.4	1.2
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total	326.96	65.33	23.73	42.26	2.34	329	75.68	28.33	51.31	3.34	353.8	91.82	32.73	61.12	7.07
Total without United States	221.46	32.23	8.53	24.66	2.04	222.30	37.68	9.13	33.11	2.74	245.40	48.02	10.53	40.72	5.87
Composition of total digital TVHH	..	100	36.32	60.09	3.58	..	100	37.43	58.15	4.41	..	100	35.65	56.65	7.70
Composition of total digital TVHH without United States	..	100	26.47	67.20	6.33	..	100	24.23	68.50	7.27	..	100	21.93	65.85	12.22

Sources: EU for all except Australia, Japan and Korea from OECD; United States from FCC, NCTA, CEA; TVHH 2001 from ITU; 2003 figures in bold from EPRA.

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Table 7.6. **Composition and penetration of digital television households, 2003**

	DTV households as a % of TVHH	Composition of total DTV households			
		Total Digital TVHH	Cable DTV HH	Satellite DTV HH	Terrestrial DTV HH
Australia	..	100.0	0.0	72.7	27.3
Austria	17.2	100.0	9.1	90.9	0.0
Belgium	4.3	100.0	88.9	11.1	0.0
Canada	29.7	100.0	38.7	61.3	..
Czech Republic	..	..	..	..	..
Denmark	15.2	100.0	22.9	77.1	0.0
Finland	9.1	100.0	9.5	47.6	42.9
France	18.9	100.0	19.9	80.1	0.0
Germany	33.3	100.0	39.7	57.2	3.0
Greece	8.3	100.0	0.0	100.0	0.0
Hungary	..	..	..	..	..
Iceland	..	..	..	..	..
Ireland	35.4	100.0	21.7	78.3	0.0
Italy	13.6	100.0	0.0	100.0	0.0
Japan	..	..	..	..	..
Korea	18.9	100.0	0.0	41.9	58.1
Luxembourg	5.0	100.0	0.0	100.0	0.0
Mexico	..	..	..	..	..
Netherlands	9.7	100.0	15.9	79.7	4.3
New Zealand	..	..	..	..	..
Norway	32.6	100.0	9.7	90.3	0.0
Poland	5.6	100.0	0.0	100.0	0.0
Portugal	16.5	100.0	3.9	96.1	0.0
Slovak Republic	1.1	100.0	0.0	100.0	0.0
Spain	18.9	100.0	6.3	86.6	7.1
Sweden	27.8	100.0	13.6	70.4	16.0
Switzerland	..	..	..	..	..
Turkey	..	..	..	..	..
United Kingdom	48.8	100.0	19.2	56.7	24.2
United States	40.4	100.0	50.7	46.6	2.7
OECD	27.7	100.0	35.6	56.7	7.7
OECD without United States	21.1	100.0	21.9	65.9	12.2

Source: Table 7.5.

StatLink: http://dx.doi.org/10.1787/461738820675

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Table 7.7. **Digital terrestrial television transition information**

	Digital terrestrial television start date	Analog switch-off date	Is there an HD requirement for DTT?
Australia	2001 (regional phase-in)	2009 (regional phaseout), subejct to review	Yes
Austria	2007-2010	2010	No
Belgium			
Canada	Has started	When 85% of a distributor's subscribers can receive digital signals	No (but if HD offered, broadcaster must pass it through
Czech Republic			
Denmark	2005		
Finland	2000	2007	No
France			
Germany	1998	2010 (but completed 2003 in one state)	No
Greece			
Hungary	2005	2012	No
Iceland			
Ireland			No
Italy	**2003**	2006	
Japan	2003	2011	Yes
Korea	2001	2010	Yes
Luxembourg	Tests have begun		
Mexico	2004		Yes
Netherlands	2003		No
New Zealand			
Norway	2009	2009	No
Poland			
Portugal	2003		
Slovak Republic	**2004**	2015	
Spain	**1999**	2011	No
Sweden	1999	2008	No
Switzerland	Has started		No
Turkey			
United Kingdom	**1998**	2006-2010	
United States	1998	2006	No

Source: OECD, except items in bold (from EPRA June 2004 report).

StatLink: http://dx.doi.org/10.1787/658068400054

Table 7.8. **Service availability in largest city**

	Total terrestrial FTA channels available	Premium cable service		Premium satellite service		DTT subscription service	
		Monthly fee (USD)	Number of channels	Monthly fee (USD)	Number of channels	Monthly fee (USD)	Number of channels
ustralia	5	63.60	130	63.60	130	none	none
ustria	4		..	..	..	..	..
elgium (Flemish)	8	9.00	35 [1]	..	..	..	..
elgium (French)	3	39.80	56	..	..	..	..
anada	9 [2]	50.0	83	60.70	120	..	..
zech Republic	6	34.70	37	45.40	177	..	..
enmark	4 plus "a number of local channels"	..	..	..	..	..	..
nland	13	..	..	..	..	..	..
ance						..	..
ermany	29	48.30	28	48.30	28	..	..
reece	21	..	..	60.70 [1]	24	32.60 [1]	3
ungary	7	29.50	53	54.80	45 plus many free channels (total at least 100)	..	..
eland							
eland	4	20.20 [1]	16	68.50	129	69.10	86
aly	25 plus "several local channels"	51.70	30	61.80	67 (plus some FTA channels)	..	..
apan	7	..	..	51.60	62	..	..
orea	5	14.30	78	74.77	193 (including audio, data channels)	..	..
uxembourg	3	13.50 (Eltrona)	52	..	..	..	..
exico	13	39.40	122	47.40	more than 175	..	..
etherlands	7	32.60	60	59.60	32 channels plus "around 180 free international channels"	40.20	24
ew Zealand	8	18.60	39	43.60	33 (may include some radio)	..	..
orway	10	28.10	41	56.40	35	..	..
oland	7	..	..	..	..	..	..
ortugal	4	92.30	53	89.20	44	..	..
ovak Republic	4	10.10	43	19.70	more than 100	..	..
pain	10	(with Internet and telephony)	55	56.00	62	..	..
weden	8	89.00	43	37.00	37	45.50	23
witzerland	2	17.20 [1]	80	..	..	..	..
urkey	4 [3]	4.70 [1]	45	..	..	..	..
nited Kingdom	32	..	..	..	..	..	..
nited States	22	49.00	120	77.99	more than 180	..	..

ote: Connection fees not included.

Basic service

Data from www.broadcastdialogue.com

Data from EAO 2003

StatLink: http://dx.doi.org/10.1787/806875637310

Table 7.9. **Daily audience share of public service television**

Percentage

	1999	2000	2001	2002	Change from 1999-2002
Australia	18.1	17.6	18.6	20.4	2.3
Austria	58.5	56.6	55.5	54.3	-4.2
Belgium (French)	22.2	23.2	23	21.7	-0.5
Belgium (Flemish)	30.6	31.7	33.5	36	5.4
Canada	13.25	12.58	12.02	11.29	-1.96
Czech Republic	32.1	31.2	29.2	29.4	-2.7
Denmark	66.8	68.2	67.8	70.4	3.6
Finland	43	42.3	43.3	45.3	2.3
France	42.2	42.3	45.3	45.3	3.1
Germany	42.8	43.1	43.3	44.4	1.6
Greece	9.5	10.6	9.5	10.9	1.4
Hungary	15.6	13.6	13.2	15.3	-0.3
Iceland	..	..	..	..	..
Ireland	49.7	47.3	43.4	40.5	-9.2
Italy	47.6	47.3	46.9	46.5	-1.1
Japan	..	..	..	..	..
Korea	..	..	..	..	..
Luxembourg	..	..	..	..	..
Mexico	..	..	..	..	..
Netherlands	34.5	36.4	36	35.9	1.4
New Zealand	..	..	..	..	..
Norway	39.8	40.5	41	42.4	2.6
Poland	51.1	46.2	45.4	45.9	-5.2
Portugal	32.6	29.9	25.7	26.4	-6.2
Slovak Republic	18.1	18.4	20.2	21	2.9
Spain	49.4	49.3	49.6	50.2	0.8
Sweden	47.2	43.8	41.9	42.9	-4.3
Switzerland (German)	34.6	34	34.4	36.2	1.6
Switzerland (Italian)	35.7	33.7	33.7	31.9	-3.8
Switzerland (French)	37.3	36.3	35.2	33.9	-3.4
Turkey	5.3	5.9	6.9	8.3	3
United Kingdom	49.5	48.4	47.9	47.3	-2.2
United States	5	5.1	5.4	5.7	0.7

Note: Figures are shares of total FTA viewing for all OECD countries except Canada, which is the share of total viewing (including pay TV).

Source: EAO Yearbook 2003; US data from Nielsen via NCTA; Canada data from OECD; Australian data from ABA.

StatLink: http://dx.doi.org/10.1787/452488673041

Table 7.10. **Telephony/Interent offerings by cable and satellite operators**

	Number of telephony and/or Internet access providers	
	Cable	Satellite
Australia	3	1
Austria	6 telephony; 82 Internet	..
Belgium	Many provide Internet	..
Canada	1 telephony; 69 Internet	2
Czech Republic	29 Internet	0
Denmark	Internet	..
Finland	16	2
France	..	..
Germany	4 telephony; 24 Internet	0
Greece	No cable	1 operator provides Internet (resellers provide both)
Hungary	2 telephony; 40 Internet (Nov. 2004)	1
Iceland	..	..
Ireland	Internet 4	..
Italy	1	1 (utilises telephone return path for Internet)
Japan	Telephony n/a; 322 Internet	..
Korea	119 Internet	..
Luxembourg	na	..
Mexico	1	0
Netherlands	3 telephony; 12 Internet	..
New Zealand	1	0
Norway	2	0
Poland	n/a	..
Portugal	1 telephony; 9 Internet	0
Slovak Republic	na	..
Spain	all	0
Sweden	2 Internet; 1 soon to begin telephony	1 Internet
Switzerland	47	0
Turkey	1 Internet	..
United Kingdom	2	1
United States	Many Internet and telephony	1 Internet

StatLink: http://dx.doi.org/10.1787/072625110272

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Table 7.11. **Broadcasting definitions, digital terrestrial television and convergence issues**

	Definition of broadcasting	Is regulation of video on demand technology-neutral?	Are Internet video transmissions "broadcasting?"	Are conditional access or EPG services subject to regulation?
Australia	TN, CA	TN	No	CA, EPG
Austria	TN, CA	TN	No	CA, EPG
Belgium	TN, CA	TN	Yes (but under study in French region)	CA
Canada	TN, CA	TN	Technically yes but regulator has exempted from broadcast regulation)	Nothing specific, but subject to general prohibition against "undue preference" for any party, including proprietor)
Czech Republic	TN, CA	No regulation	No	
Denmark	TN, CA	Apparently TN	No (but some type of public service obligations may apply)	EPG
Finland	TN, CA	TN		CA, EPG
France				
Germany	TN, CA	TN	Possibly	CA, EPG
Greece	TN, CA	No regulation	No (but must be "reported" to the regulator)	CA, EPG (at least for direct broadcast satellite services)
Hungary	TN, CA	No current regulation	No	CA
Iceland				
Ireland	TN, CA	No service yet	No	CA
Italy	TN, CA	Apparently TN (classified as telecom service)	No legislation re Internet	CA, EPG
Japan	TN, CA	TN	No	No
Korea	TN, CA	TN	No (subject to telecom regulation)	CA, EPG
Luxembourg	TN, CA	TN	Yes	CA, EPG
Mexico	Terrestrial free-to-air service	TN		No
Netherlands	TN, CA	No VOD offered ("near VOD is broadcasting")	No (but transmissions by public broadcasters subject to some regulation)	CA, EPG
New Zealand	TN, CA	TN	No	No (but existing statutes permit it)
Norway	TN (unclear if subscription services included)	TN	No (they are regulated as "data transmission")	No
Poland	TN, CA		No	CA, EPG
Portugal	TN, CA	TN	No (data transmission)	CA, EPG (at least for Direct Broadcast Satellite services)
Slovak Republic	TN, CA			
Spain	TN, CA	TN	Yes (but subject to future review)	CA, EPG
Sweden	TN, CA	TN	Apparently video streaming would be broadcasting but downloading would not be	CA, EPG
Switzerland	TN, CA	TN	Apparenly not (they are classified as telecommunications services)	No (but these matters will be considered in new legislation)
Turkey	TN (CA apparently included)		No regulation	
United Kingdom	TN, CA	Yes	No	Yes
United States	Free-to-air terrestrial services only	TN	No	No

TN: technologically neutral.

CA: conditional access (in column one, CA means that encrypted services are considered broadcasting).

EPG: electronic programming guide.

CA and/or EPG in the last column indicate that those services are subject to regulation (not necessarily that regulation is currently in place).

StatLink: http://dx.doi.org/10.1787/427337145822

Table 7.12. **Must-carry and media ownership regulations**

	Must-carry regulations		Media ownership regulation	Foreign ownership limits
	Cable	Satellite		
Australia	No	No	Local/national TV limit; local radio limit; cross-media limit	Commercial television 15%; no two foreign owners together greater than 20%; no more than 20% directors foreign; pay TV services 20% single, 35% foreign in aggregate
Austria	Yes	No Austrian satellite services	Local radio, local television; cross-media limits	49% terrestrial, cable, DBS (but EEA members not considered foreign)
Belgium	Yes	No	Radio limits within French and Flemish communities; television limit within French community (absence of Flemish rule may be due to no private Flemish television broadcasters)	Flemish none; French n/a
Canada	Yes	Yes	Local radio, local television; cross-media limits case-by-case	20% (33.3% if holding corporation)
Czech Republic	Yes	No	Yes (no specifics given)	..
Denmark	Yes	No	..	..
Finland	Yes	No	None	None
France				
Germany	Yes	..	Newspaper cross-media limits only	None
Greece	No cable service	..	Local radio, local television, cross-media	Terrestrial "free access" television 25%
Hungary	Yes	No	None	None
Iceland	..	..	..	..
Ireland	Yes	No	..	..
Italy	No	No	Some limits (based on concentration in content, not stations); some cross-media limits with regard to publishing	None for EEA countries;other countries limit based on reciprocity
Japan	Yes	No	Local and national radio and television limits; cross-media limits	Terrestrial broadcasters, "program-supplying broadcaster on DBS 20%; "facility-providing broadcaster on DBS 33.3%
Korea	Yes	Yes	Television and radio limits; cross media limits	Terrestrial prohibited; cable 49%, satellite 33%
Luxembourg	No	No	Local radio limit; unspecified cross-media limits	None
Mexico	Yes	Yes	No limit on number of stations; n/a for cross-media limits	Prohibited for terrestrial TV; 49% for MMDS, DBS, cable
Netherlands	Yes	No	Unclear on number of stations; newspaper-commercial broadcaster limits	None
New Zealand	No	No	None	No specific limits, but foreign investment requires approval of Overseas Investment Commission
Norway	Yes	No	No specific limits (but "general regulations of competition and media ownership apply")	None
Poland	Yes	No	None	..
Portugal	Yes (but not yet implemented)	No	Local and national radio limits; no television or cross-media limits	None
Slovak Republic	Yes	No	Local and national radio and television limits; cross-media limits	Case-by-case review
Spain	Yes	No	Local and national television limits	25% local TV or radio (no limit on EEA countries); can be higher when reciprocity applies
Sweden	Yes	No	None	None
Switzerland	Yes	No	Case-by-case on number of stations; no specific cross-media limits	For radio and television, subject to reciprocity
Turkey	..	..	Unspecified limits on number of stations; no cross-media limits	Radio and television 25%
United Kingdom	..	..	..	..
United States	Yes	Yes	Local radio limits; local and national television limits; cross-media limits	20% direct, 25% indirect for broadcast licenses (*i.e.* using spectrum); no limit for cable

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Chapter 8

Quality of Service

Most OECD countries have reached very high levels of quality of service as measured using the indicators collected by the OECD. The typical waiting time for new fixed line telephone connection is under 48 hours and the number of faults on existing lines is steadily decreasing. The number of payphones in OECD countries is also declining as the number of mobile phone subscribers increases. This chapter examines several measures of quality of service including connection time, availability of payphones, network maintenance, directory assistance charges and answer seizure ratios. In addition, the chapter discusses the changing nature of quality of service measurements given the rapid increase of mobile and broadband connectivity.

Traditionally, the OECD has measured telecommunication quality by looking at the waiting time for phone connections, the availability of payphones, network faults, directory assistance prices and answer seizure ratios. These indicators are still valuable to policy makers, especially in tracking progress in newer OECD member countries. However, most OECD countries have reached very high levels of quality of service as measured using the indicators collected by the OECD. The typical waiting time for new fixed-line telephone connection is under 48 hours in many OECD countries and, as a result, the data is often no longer reported. Variations exist among newer member countries, which are characterised by impressive service improvements. For example, the waiting time for a new line in Hungary fell from 1 058 days to 12 between 1993 and 2003 (see Table 8.1). The improvement in the Czech Republic is even more impressive. Between 1993 and 2003 the average waiting time for a new line fell from 2 170 days to 19.

Once lines are connected, they are increasingly reliable across the OECD. Faults per line have decreased dramatically over the past decade. In Canada, faults per 100 lines decreased from 26.4 in 1990 to 1.1 in 2003 (see Table 8.2). There was similar success in Portugal with the number of faults falling from 58.0 to 10.1 between 1990 and 2003.

Even if lines do go down, the percentage of lines re-established within 24 hours is also high. In most reporting OECD countries, over 70% of line faults can be re-established within 24 hours (see Table 8.3). In some countries such as the Czech Republic, Korea, Mexico and Poland over 97% of line faults are repaired within 24 hours. Despite fast repair times in most OECD countries, the time required to fix lines is actually increasing in many countries. In Portugal in 2002, 88.1% of line faults were repaired within 24 hours. In 2003, that number fell to 74.5%.

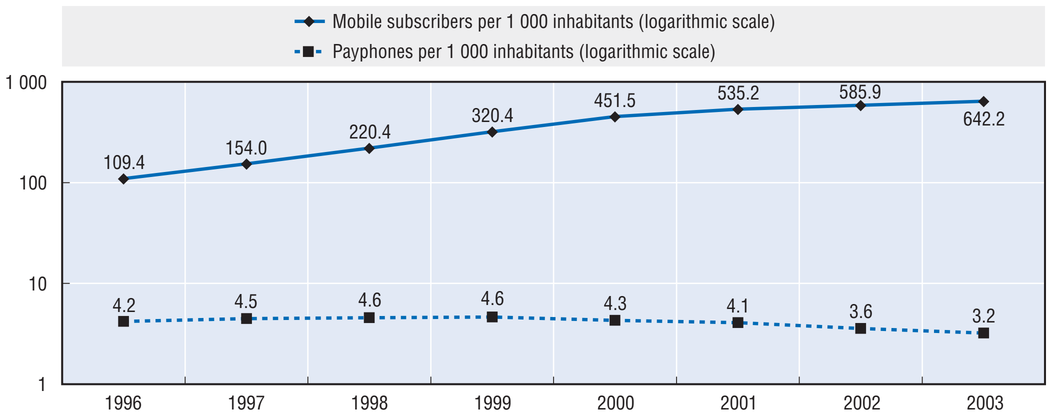
As markets evolve it may be necessary to supplement or substitute traditional quality of service measures with a new range of quality of service indicators that address these new markets. The final section of this chapter will consider a few new areas where quality of service measurements could be developed.

Payphones

Payphones have been an important part of universal service in most OECD countries. As markets opened to competition a number of new entrants also began to invest in payphones. However, with the rapid development in the mobile cellular market and widespread coverage of mobile networks the demand for payphone services declined (see Figure 8.1). The expansion of mobile phone networks and services throughout the OECD is expected to continue thus impacting the demand for public payphone services. This declining usage has led operators to look for new and innovative ways to maintain existing revenues in the face of strong mobile competition.

The number of payphones throughout the OECD began declining in 2000 (Table 8.4). In Korea, the number of payphones decreased 34% between 1999 and 2003 from 564 906 to 374 149, due partially to the rapid take-up of mobile phones and the government's

Figure 8.1. **Mobile and payphone penetration rates per 1 000 inhabitants in the OECD area, 1996-2003**



StatLink: http://dx.doi.org/10.1787/737447273743

decision to exclude private payphone services from universal service provision requirements in 2001.

In other OECD countries such as the United Kingdom, France and Italy payphones are still included under universal service obligations. This has helped spur innovation around public payphones with operators developing ways to bring callers back to the payphones. In the United Kingdom, BT has combined public call boxes with cash dispensing machines as a way to expand the reach of ATMs and attract users to public phones. In the Czech Republic, approximately half of the public payphones are equipped to send SMS messages, with approximately 5 000-7 000 messages sent daily *via* the phones. Swisscom in Switzerland was one of the early national operators to introduce the ability to send short e-mails, SMS and short faxes from public terminals for a small fee of USD 0.37 (CHF 0.50). Swiss public phone users can also find addresses and phone numbers electronically at terminals attached to the call boxes.

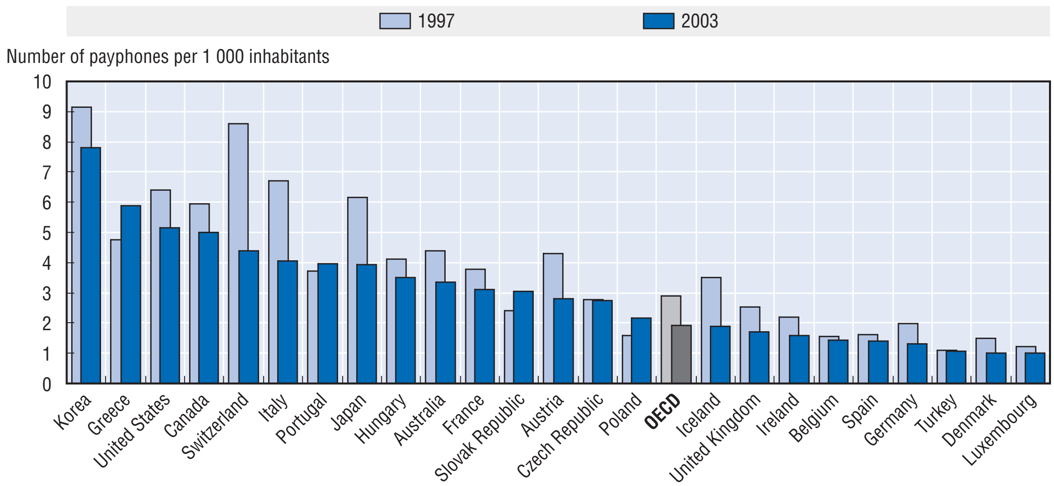
France Telecom has introduced universal calling cards in France as a way to increase traffic on the public phone network by users with fixed and/or mobile phones. A France Telecom card can be used to make calls from public telephone booths as well as private fixed lines and mobile phones, with the charge appearing on the user's fixed line telephone bill.

Operators in many OECD countries are leveraging the location of public phones to introduce Wi-Fi Internet access. In Australia, Telstra has developed a plan to spread Wi-Fi access throughout the country's business districts by adding Wi-Fi base stations to existing phone booths. BT itself is upgrading existing public phones to offer Wi-Fi connectivity through its BT Openzone Wi-Fi service. In the United States, Verizon has installed Wi-Fi connectivity in phone booths throughout New York City that can be used freely by its DSL subscribers.

Public phone operators will need to continue to innovate in order to remain competitive as users have better access to mobile and fixed services. This is increasingly important as many operators have entered into longer-term rentals and leases for phone booths, which must continue to be paid even if services are discontinued.

Finally, there will continue to remain users without access to either mobile or fixed telephony to whom payphones are still vital for communication. This market segment will

Figure 8.2. **Payphones per 1 000 inhabitants in the OECD area, 1997 and 2003**



StatLink: http://dx.doi.org/10.1787/234786238620

continue to shrink, forcing operators to attract new users to payphones, especially those who already have a mobile and/or fixed line.

The number of payphones in the OECD may be shrinking but operators are successfully keeping the remaining public phones in operation (see Table 8.5). The percentages of payphones in working order continue to increase in the OECD. In Iceland, a reported 100% of payphones in the country are operational. In Portugal, 99.3% of all public phones can be used at a given time. Hungary, the Slovak Republic, Spain and Switzerland saw slight reductions in the percentage of operational phones but all still were above 94%.

Network faults and maintenance

OECD countries are continuing to increase network reliability according to the most recent data available. The methodologies for measuring network faults vary significantly among different OECD countries, making cross-country comparisons difficult. In some countries, operators measure the number of faults found by their own reporting equipment and this number is reported to the OECD. In other countries, reported network faults indicate the number faults reported by customers. There can also be differences in this latter statistic as some operators report the raw number of complaints and others only report faults that have been verified. Therefore, the most effective way to examine network fault data is via a time series for a particular country.

All OECD countries have shown remarkable improvement in their network fault measurements over the past 13 years (see Table 8.2). Hungary reduced line faults by a factor of 55 between 1990 and 2003 to one fault per 100 lines. Canada's improvement has also been very impressive, with the number of faults falling by a factor of 24 over 13 years. Operators in Korea have also reduced the number of line faults by a factor of 15 over 13 years. Line faults in Mexico are also declining, with 11 times fewer faults over the same time period. Of all countries supplying data, only Greece had a slight increase in the number of faults per 100 between 2002 and 2003, from 11.2 to 13.6, although the total number of faults has fallen by a factor of 4 since 1990. When lines in the OECD area do go down, the majority are repaired within 24 hours (see Table 8.3). In the Czech Republic,

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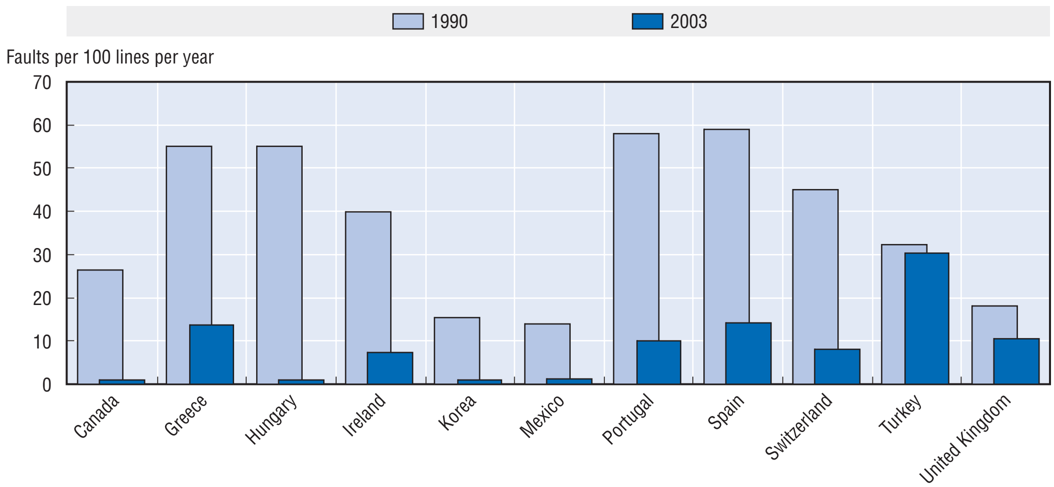
Figure 8.3. **Quality of service improvements in selected OECD countries, 1990 and 2003**



StatLink: http://dx.doi.org/10.1787/572513565075

operators claim that all faults were repaired within this time frame. Korea and Poland reported that over 97% of faults were corrected within one day.

While the number of reported faults is already low, the reliability of networks should continue to increase across the OECD as fibre optic lines are pushed deeper into networks. Fibre optic networks can be reconfigured *via* a computer terminal and usually do not require a technician to physically connect and disconnect wires to implement service as is common with legacy copper networks. Historically, operators have reported that reliability is negatively correlated with the number of times the lines must be physically handled. Several operators in OECD countries are pushing ahead with fibre-to-the-premises network rollouts to take advantage of their high speeds and increased reliability. Examples include Japan's NTT, Italy's FastWeb, and Verizon in the United States. Users in a fibre-to-the-premises (FTTP) network can subscribe to services and have them activated immediately (on demand) rather than waiting for a technician to physically connect a line.

As technology improves, users throughout the OECD are demanding better tracking of their complaints and network faults and operators are responding. For example, Australian provider Telstra has plans to introduce a new online tool for customers that help track faults and their status. In addition to providing customers with better information, these new systems introduce "up front" diagnostic tools that can help sort problems to appropriate departments and give early warnings of problem areas. Similar problem-tracking software has been available from corporate help desks throughout the OECD for several years and the technology is recently being extended to telecommunication users.

Directory assistance

Charges for directory assistance calls vary across the OECD but the common trend for most countries has been for prices to rise (see Table 8.6). In some countries, a certain number of directory assistance calls are free each month from residential subscriptions (*e.g.* Australia, United States). In Korea, operators initially provided free directory assistance for all calls but introduced a limit to three calls per month in 1997 and eliminated them completely in 2001. In Ireland, directory assistance calls started to be charged in 1997, although callers could request up to three numbers during each call.

Directory assistance calls will continue to remain an important way for many users, especially those with disabilities, to locate telephone numbers. However, the Internet will play an increasing role in providing directory assistance in the future, especially with the rollout of flat-rate, always-on broadband. In the past, many dial-up users incurred a charge to dial-up and locate a telephone number via the Internet over a metered connection. This made the cost difference between a phone call to directory assistance and an Internet lookup relatively small. Broadband connectivity can make Internet directory assistance much more cost-effective for consumers and should reduce the demand for operator-assisted directory assistance.

As the number of mobile phone subscribers increases around the OECD, so does the importance of directory assistance from mobile phones. In a residence, users often make a decision between looking up numbers in an available phone book and calling directory for assistance. Mobile users, in contrast, often have no access to a phone directory and rely on directory assistance. The price differential between mobile and fixed-line directory assistance calls may reflect different price elasticities. In Ireland for example, directory assistance calls from fixed-line operator Eircom are USD 0.74 (EUR 0.66) per call for national directory assistance while the mobile operator Vodafone has a minimum charge of USD 0.83 (EUR 0.74) for the first minute and USD 0.61 (EUR 0.54) per minute thereafter. Mobile operators charge a premium for directory assistance but will likely see the number of requests fall as more users move onto GPRS and 3G networks, making use of the mobile Internet to look up directory information. An Irish Vodafone GPRS user could visit Eircom's online directory and look up for the information for roughly USD 0.34 (EUR 0.30) or 15 KB of data at USD 0.02 (EUR 0.02) a kilobyte. Flat-rate mobile data plans will further increase the movement from voice to data for directory inquiries. Operators such as Eurotel in the Czech Republic offer unlimited GPRS use for roughly USD 28 per month, pushing the incremental cost of directory enquires over the mobile Internet to near zero.

Directory service is evolving with the mobile Internet as well. New services offer point-to-point driving directions delivered as a WAP service over a GPRS connection. In Finland, Fonecta's "Finder" users can look up a number and address, receive driving directions and download a list of banks, hotels, restaurants, and pharmacies in the vicinity *via* their mobile phone.

Answer seizure ratios

The International Telecommunication Union's Quality of Service Development Group collects data on the number of successfully connected foreign phone calls into economies (see Table 8.7). The Development Group aggregates the information for each economy and calculates an answer seizure ratio (ASR). Answer seizure ratios measure the percentage of incoming foreign calls that actually seize a circuit in the domestic market. A circuit is seized when the line is picked up and the connection established. For example, if a user in New Zealand dials a number in Spain, the circuit is seized only if the line is answered in Spain. Otherwise, the attempt to "seize the circuit" fails. The most common reason an international call does not seize a circuit is because the call goes unanswered. However, there are several other reasons a call may fail to seize the circuit, including wrong numbers, congestion in the network or simply the line is occupied (a busy signal). The

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ratios include voice, data and telex data in the compilations, but not Internet traffic that takes place over leased lines.

Answer seizure ratios are valuable statistics since they indicate the percentage of connected international calls on the network. ASRs are important to operators since they usually charge for a call only when a circuit has been engaged even though the operator still incurs costs in attempting to connect a call when no one answers or the line is busy. This could imply that the higher the ASR, the higher average revenue per attempted call. Across the OECD, the average ASR is 60.5, indicating that out of every 10 international calls, six are answered. The worldwide average is 45.9. Denmark has the highest ASR across the OECD – a place it has held for five years – with 71.3% of international calls seizing a line. Ireland, Austria, Canada and Iceland round out the top five countries. Turkey and Mexico have the lowest ASRs among OECD countries with less than 50% of lines seized, although each has made progress over the past 13 years.

Thirteen of the OECD's thirty countries saw their answer seizure ratios rise from 2002 to 2003. Among the countries seeing gains, Mexico and Iceland had the largest percentage improvements. Mexico's ASR increased 20%, from 41.2 to 49.3. Iceland had a large percentage increase of 16%, increasing from 57.2 to 66.4. Turkey and the Czech Republic had the largest percentage decreases in their respective ASRs between 2002 and 2003. Turkey's ASR fell 8% from 44.2 to 40.5. Similarly, the ASR in the Czech Republic fell 6% from 60.5 to 56.7.

There are several reasons for this dynamic that have been explored in earlier editions of the Communications Outlook. Dial-up Internet connectivity has likely reduced ASRs since standard dial-up connections occupy the voice channel of a receiving telephone, making the seizure of the line impossible for calling parties. However, with the proliferation of newer Internet technologies such as ISDN, ADSL, and cable modem technologies, users have been able to keep a line free for receiving calls while still remaining connected to the Internet. Therefore, the adoption of dial-up Internet technologies would tend to decrease ASRs while advances in always-on broadband would increase seizure rates.

The increased use of mobile telephones should also have a positive effect on increasing ASRs since mobile users carry their phones with them – increasing the likelihood of a call being answered. In addition, the digitisation of phone networks should also increase ASRs as services such as network voicemail, call forwarding and call waiting increase the chance that the line will be seized. Finally, a high number of fax machines in a country would tend to increase ASR rates.

Evolution of quality of service

Often, telecommunication users pay little attention to quality of service until service drops to unacceptable levels. Ironically, the best quality of service is often the service that goes unnoticed. An ITU-T conference on quality of service in October 2003 highlighted how the end-user's overall experience is increasingly important to measure. One of the recommendations of the conference was to introduce a new concept called "quality of experience" or QoE, which focuses on how services are delivered to end users. While a QoS measurement might be the coverage area of a network operator, a QoE measure might examine the percentage of calls that are dropped in a given area.

Box 8.1. **Possible future areas to measure quality of service**

- **Initial broadband connectivity**

While the connection time for installing fixed lines is very low across OECD countries, the initial connection times for installing broadband still varies greatly. New broadband subscribers in Korea can expect their ADSL connections to be available within 24 hours of their subscription while users in France face waiting times between 10 to 21 days from the day the fixed line is active and their subscription is registered.

- **Broadband reliability**

The reliability of broadband Internet connections is also gaining attention in OECD countries as more voice traffic moves to networks. Voice over IP services over broadband such as Sipgate in Germany and Vonage in the United States only work when the broadband connection is active and bandwidth is available. Any fault in the broadband line will also bring down telephone service so new measures of broadband reliability may play an important role in gauging QoS in the future. Indicators that measure the continuity and reliability of broadband connections will be increasingly important as network providers across the OECD proceed to offer combined video, voice, and data services over their networks.

- **Mobile reliability**

In some OECD countries such as the United Kingdom, mobile operators supply quality of service data voluntarily to the regulator. Other countries have specific regulations for quality of service on mobile networks. France, for example, undertakes regulator quality of service reviews of the mobile sector. Some countries have also inserted quality of service obligations in 3G mobile licenses. In Belgium, the maximum number of connection failures allowed during peak hours is 5% on 3G networks. In France, more than 90% of 3G calls must make it through on the first attempt.

- **Mobile coverage**

The coverage footprint of mobile networks is increasingly important as a growing number of mobile users unsubscribe from their fixed lines altogether. Dead spots on the mobile network, dropped calls, and poor voice quality all affect the overall experience of mobile users, especially in relation to the high quality and reliable connections provided over fixed lines. Thus, policies requiring coverage of a percentage of a country's geographic area or of its population, which were common among many OECD countries when licensing mobile cellular services, have been continued in 3G licensing. Mobile coverage indicators will play a key role in ensuring that operators live up to these obligations.

New quality of service measurements will also be important with regards to measuring the implementation of new regulatory requirements. For example, carrier preselection has become popular in many competitive telecommunications environments and subscribers need to know how long it takes for their number to be switched. In addition, mobile number portability has been introduced in many countries. The time taken to port numbers in order to ensure continuity of services for subscribers is also an important measure of quality of service.

Quality of service (or experience) statistics will be indispensable for operators wishing to sell differentiated service levels to users. The experience of mobile telephony has shown that users are willing to exchange some voice quality for increased mobility. Some users may be willing to pay higher rates for clearer voice calls. Business users on a conference call may pay considerably more for clear connections while teenagers may opt for the lowest quality connection at the lowest price. Users paying more would be allowed prioritised bandwidth on the network and higher quality codecs than those opting for lower quality and price. New and comparable measurements of quality are therefore important to both consumers and operators. Box 8.1 looks at several areas of quality of service that could warrant increased attention.

Table 8.1. **Network access: waiting time for a new connection**

Number of days

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	..	..	..	..	..	5	5	5	5	..	..
Austria	..	45	40	..	..	..	13	11	13	13	..
Belgium	28	..	7	5	4	5	5	5	5	..	..
Canada	3	3	4	..	..	5	5	5	5	5	5
Czech Republic	2 170	1 183	847	523	218	58	38	25	25	22	19
Denmark	8	9	8	..	..	..	..	..	..	..	..
Finland	5	5	6	4	5	5	4	5	..	..	..
France	8	8	7	6	6	..	..	..	..	..	..
Germany[1]	..	..	..	..	..	..	..	..	..	..	..
Greece	..	220	30	9	5	7	7	..	6	7	7
Hungary	1 058	839	803	657	475	115	63	47	13	15	12
Iceland	..	..	..	..	..	..	..	..	..	..	..
Ireland	..	..	13	..	11	..	..	..	..	..	..
Italy	12	10	8	..	..	..	10	9	..	7	..
Japan	..	..	..	..	..	..	..	..	..	..	..
Korea	..	..	..	..	..	..	..	..	1	1	1
Luxembourg	30	30	30	..	..	..	16	11	11	..	..
Mexico	..	..	72	36	30	30	36	33	..	..	..
Netherlands	..	..	5	..	1	..	..	..	..	..	..
New Zealand	2	2	2	2	2	2	2	2	2	..	..
Norway	..	..	..	..	..	..	..	..	..	..	..
Poland[2]	..	..	..	..	..	1 080	810	..	..	..	24
Portugal	60	19	8	9	9	4	6	4	3	3	4
Slovak Republic	..	..	..	296	175	280	149	240	20	20	13
Spain[3]	8	5	3	4	5	5	5	..	..	..	12
Sweden	..	..	5	..	..	..	..	..	..	..	..
Switzerland	4	4	4	3	3	..	..	..	..	..	..
Turkey	12	10	9	8	8	8	8	7	7	7	7
United Kingdom	..	..	..	..	..	..	..	..	..	..	..
United States	5	..	3	2	2	2	2	2	1	1	..

1. With respect to voice telephony, quality of service is assessed on the basis of the parameters set out in Annex III of Directive 2002/22/EC (Universal Service Directive) of 7 March 2002. These are not consistent with the data requested by OECD, however.

2. The average number of days for four operators.

3. The number of days in which 95% of all requests are fulfilled.

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Table 8.2. **Number of faults per 100 lines per year**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Austria[1]	35.0	19.0	19.0	18.0	19.0	17.0	8.0	7.0	7.0	7.0	5.4	5.2	..	..
Belgium	..	9.0	3.0	3.0	2.0	7.4	..	..	4.7	4.0	3.5	4.8	..	..
Canada[1]	26.4	21.6	2.0	2.0	2.0	..	..	..	..	..	2.0	2.0	1.1	1.1
Czech Republic	..	..	..	35.0	11.0	11.0	38.0	34.0	32.0	20.0	17.0	10.0	8.0	7.0
Denmark	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Finland	12.2	10.5	11.0	10.0	8.0	8.0	7.0	9.0	8.0	..	..	..	..	..
France	10.0	8.0	8.0	7.0	6.0	6.3	5.9	6.2	..	..	..	..	..	..
Germany	..	12.0	16.0	13.0	9.0	8.7	..	..	..	..	..	..	..	..
Greece	55.0	54.0	51.0	51.0	43.0	34.0	36.0	31.0	24.0	17.0	11.3	12.1	11.2	13.6
Hungary[1]	55.0	72.0	54.0	51.0	39.0	40.0	27.0	24.0	..	1.3	1.2	0.8	1.0	1.0
Iceland	35.0	..	..	..	..	..	..	..	..	..	..	..	..	..
Ireland[2]	40.0	38.0	24.0	19.0	17.0	..	14.0	15.0	..	..	..	6.0	8.9	7.2
Italy	21.0	13.0	13.0	12.0	13.0	13.0	..	17.0	16.0	17.0	17.7	17.1	20.0	..
Japan	2.0	2.0	2.0	2.0	2.0	1.7	..	..	1.4	..	..	..	..	..
Korea	15.4	13.9	12.5	12.4	17.2	17.9	15.2	14.2	1.0	1.1	1.0	1.4	1.0	1.0
Luxembourg	17.0	17.0	14.0	14.0	13.0	5.0	8.0	3.0	10.0	4.0	4.0	5.0	..	..
Mexico	14.0	9.0	9.1	7.5	6.0	4.6	3.7	3.3	2.8	2.2	2.0	1.9	1.7	1.2
Netherlands	6.0	5.0	4.0	3.0	3.0	2.5	2.2	2.4	2.7	..	..	..	..	..
New Zealand	57.0	..	28.3	..	..	..	15.4	..	..	12.1	11.5	12.1	..	..
Norway	21.0	16.0	13.0	14.0	14.0	14.0	13.0	14.0	..	..	..	..	..	..
Poland[2]	..	..	..	..	..	..	..	29.0	26.0	..	..	..	16.7	13.6
Portugal[1]	58.0	51.0	43.0	52.0	46.0	38.0	36.5	35.9	14.2	11.2	10.5	12.1	10.2	10.1
Slovak Republic[1]	..	..	..	46.0	44.0	41.5	41.7	32.5	27.3	27.9	27.0	27.5	12.0	10.0
Spain[1]	59.0	43.0	..	..	..	..	..	14.8	13.8	15.4	..	..	..	14.2
Sweden	12.0	10.0	9.0	9.0	8.0	8.0	4.0	4.0	..	..	..	..	..	..
Switzerland[1]	45.0	40.0	18.0	16.0	14.0	14.0	14.0	14.0	..	18.5	22.0	16.0	10.0	8.0
Turkey	32.3	64.0	66.0	61.0	60.0	58.0	58.6	58.4	56.1	..	..	..	37.4	30.3
United Kingdom	18.0	17.0	15.0	15.0	16.4	15.0	14.3	13.8	14.5	15.0	14.2	13.3	11.8	10.6
United States	..	..	..	..	..	..	13.5	14.5	15.0	13.7	14.0	12.0	11.6	..

1. Excludes customer premise equipment (CPE).
2. Incumbent operator data.

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Table 8.3. **Percentage of faults repaired within 24 hours**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia[1]	..	..	..	..	..	..	..	90.0	90.0	..	90.0
Austria	..	93.0	92.0	93.0	..	97.0	95.8	92.9	90.4	85.5	..
Belgium	82.0	87.0	87.0	..	90.0	90.0	90.0	90.0	80.5	..	..
Canada	..	..	..	..	..	..	..	..	82.8	82.9	81.3
Czech Republic	89.0	90.0	90.3	91.6	88.5	98.0	99.0	98.0	98.0	100.0	100.0
Denmark	85.0	86.0	91.7	91.0	..	..	..	..	..	..	..
Finland[2]	66.0	69.0	69.1	75.5	75.5	71.4	74.1	63.9	55.7	72.0	62.3
France	87.0	88.0	88.3	90.6	87.3	..	..	..	..	..	..
Germany[3]	83.0	93.0	83.4	71.0	83.2	..	85.9	..	..	..	..
Greece	57.0	58.0	58.4	64.6	77.4	83.0	90.5	89.6	86.9	80.2	82.1
Hungary	..	..	78.1	62.2	81.3	..	93.7	95.0	98.0	90.0	85.0
Iceland	..	..	..	..	..	..	..	..	..	..	..
Ireland[4]	..	100.0	75.0	78.0	76.0	..	..	..	81.7	69.3	81.0
Italy	92.0	93.0	93.3	..	..	..	92.0	87.0	86.2	91.5	..
Japan	100.0	100.0	..	..	..	..	..	..	..	..	..
Korea	98.8	95.9	92.7	98.6	97.6	99.0	99.0	99.4	96.8	98.0	98.0
Luxembourg	..	90.0	91.0	94.0	93.0	93.0	95.0	90.0	95.0	..	..
Mexico	74.1	78.7	78.8	83.9	84.4	77.8	72.9	74.3	68.7	72.1	98.2
Netherlands	..	87.0	97.0	99.0	98.0	98.0	..	..	..	..	..
New Zealand	..	73.0	73.0	60.0	67.0	79.2	79.5	82.2	85.7	..	..
Norway	75.0	74.0	73.7	76.0	73.0	..	..	..	..	..	..
Poland	..	..	..	..	..	..	..	..	..	94.9	97.5
Portugal	90.0	91.0	91.0	91.8	91.9	84.7	88.9	88.9	76.3	88.1	74.5
Slovak Republic	..	..	..	..	81.0	85.3	77.3	89.1	90.6	95.0	73.8
Spain	..	..	..	94.4	97.2	95.8	95.5	..	..	..	..
Sweden	..	85.0	85.0	..	77.0	..	..	..	..	..	..
Switzerland	92.0	94.0	94.0	92.5	92.5	..	97.0	96.0	94.0	93.0	..
Turkey[5]	94.0	95.0	90.0	92.0	90.0	90.0	61.0	57.6	61.5	56.0	55.0
United Kingdom[6]	..	81.2	80.6	82.5	82.1	80.7	79.0	70.5	72.0	74.8	73.0
United States	..	..	..	..	..	..	..	..	..	..	..

1. Telstra's percentage of faults repaired after two days in rural and remote areas. 95% of faults in urban areas were repaired within 24 hours.
2. Percentage of faults repaired within 24 hours.
3. Residential only.
4. Incumbent operator only.
5. Average repair time in 2003 was 25.1 hours.
6. Residential only.

StatLink: http://dx.doi.org/10.1787/424278882480

Table 8.4. **Number of payphones in OECD countries**

	Total public payphones											Per 1000 inhabitants	
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2002	2003
Australia[1]	..	..	84 000	81 680	81 679	80 170	78 853	78 300	75 100	71 635	67 000	3.6	3.4
Austria[2]	33 134	33 754	33 816	34 143	34 172	29 295	28 728	27 704	26 800	23 700	22 800	2.9	2.8
Belgium	14 408	14 845	14 873	15 685	15 685	15 888	16 696	19 157	16 736	15 673	14 903	1.5	1.4
Canada	176 350	179 133	181 842	181 417	178 116	180 382	182 345	174 286	171 810	165 490	158 059	5.3	5.0
Czech Republic	17 088	18 209	21 104	26 349	28 438	37 387	36 870	36 444	34 458	31 503	28 144	3.1	2.8
Denmark	8 761	8 293	8 084	7 950	7 938	7 765	6 275	5 909	5 930	5 700	5 423	1.1	1.0
Finland	20 904	23 630	25 267	24 995	23 766	21 291	16 292	12 427	8 851	6 501	..	1.2	..
France	251 000	259 000	206 000	211 000	226 000	242 872	241 721	229 620	213 993	202 418	192 273	3.3	3.1
Germany[3]	165 500	165 100	165 000	164 100	162 000	148 000	121 500	113 400	112 900	110 200	107 000	1.3	1.3
Greece	29 425	36 331	40 536	41 665	51 283	62 090	64 535	64 000	69 471	63 058	64 493	5.8	5.9
Hungary	31 200	33 900	36 528	40 504	42 408	43 883	43 242	43 900	44 500	40 494	35 644	4.0	3.5
Iceland	1 137	1 731	1 502	1 067	948	947	940	720	600	..	550	..	1.9
Ireland	6 346	6 456	6 592	7 000	8 000	8 400	9 287	11 036	9 634	7 089	6 314	1.8	1.6
Italy[4]	400 000	387 000	383 900	385 326	386 186	380 802	361 261	295 000	277 812	233 889	234 977	4.0	4.0
Japan	820 131	800 772	801 135	793 870	778 470	756 265	736 622	708 547	680 791	584 162	503 135	4.6	3.9
Korea	285 133	305 272	327 839	339 240	420 782	504 771	564 906	538 983	499 566	442 392	374 149	9.3	7.9
Luxembourg	371	382	412	449	509	525	451	447	451	..	450	..	1.0
Mexico	183 155	217 205	246 546	238 562	259 561	316 596	..	..	..	..	..	..	..
Netherlands	14 085	16 654	19 000	21 000	22 098	22 600	19 200	..	13 000	..	..	..	..
New Zealand	4 349	4 579	4 100	4 599	5 000	5 000	5 317	5 215	5 403	..	..	..	..
Norway	13 895	14 595	14 672	13 889	12 504	14 338	13 831	10 640	..	..	..	..	..
Poland[5]	..	..	58 912	67 602	61 200	69 899	91 000	98 000	94 899	93 343	82 441	2.4	2.2
Portugal	31 745	32 780	33 081	34 904	37 525	40 045	44 205	47 733	45 486	43 805	41 531	4.2	4.0
Slovak Republic	6 774	6 929	8 401	11 071	12 894	13 175	13 723	14 375	15 060	15 119	16 405	2.8	3.0
Spain[6]	46 600	51 983	52 466	58 234	63 578	64 410	66 889	..	..	..	57 552	..	1.4
Sweden	32 000	..	..	..	..	..	14 000	..	..	..	..	..	..
Switzerland[7]	57 500	57 551	58 112	57 597	61 220	54 850	52 350	45 064	40 215	36 029	32 613	4.9	4.4
Turkey	52 437	55 799	58 126	63 376	70 698	79 166	78 086	72 343	71 149	74 928	76 157	1.1	1.1
United Kingdom[8]	125 200	131 000	140 100	145 600	146 900	141 000	144 000	143 000	141 000	118 000	101 000	2.0	1.7
United States	1 528 723	1 524 615	1 432 843	1 540 813	1 748 004	1 745 058	2 121 526	2 063 718	1 919 640	1 711 061	1 495 786	6.0	5.2
OECD	4 357 351	4 387 498	4 464 789	4 613 687	4 947 562	5 088 870	5 199 704	4 868 088	4 651 672	4 096 189	3 718 799	4.2	3.7

1. Telstra only.
2. Values for 2002 refer to December; values for 2003 refer to September.
3. Public payphones.
4. Source: Telecom Italia.
5. Data for 2001 and 2002 are from the National Statistical Office (GUS). For 2003, data is for TP S.A. and three operators with the largest market share.
6. Public phones installed in private places are not included.
7. Provisional results.
8. Lines.

StatLink: http://dx.doi.org/10.1787/417121370408

Table 8.5. **Average percentage of payphones in working order**

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia[1]	96.0	96.0	96.0	94.0	98.0	98.0	98.0	99.0	..
Austria	97.0	97.0	97.5	98.0	98.5	98.7	98.2	98.5	..
Belgium	..	95.0	..	84.5	97.0	94.0	96.1	..	..
Canada	..	..	..	..	..	..	..	..	..
Czech Republic	99.0	99.0	99.5	99.5	99.5	98.0	98.5	99.9	99.3
Denmark	..	95.0	..	..	..	..	90.0	93.0	96.0
Finland	..	..	..	..	..	..	..	..	..
France	100.0	100.0	100.0	..	..	..	..	..	..
Germany	..	..	..	..	..	..	..	..	..
Greece	95.0	96.0	97.0	..	..	..	95.0	93.0	..
Hungary	91.3	94.6	95.4	95.5	95.8	96.2	96.9	97.1	95.2
Iceland	..	..	..	..	100.0	100.0	100.0	..	100.0
Ireland	92.0	95.0	95.0	..	..	..	..	..	95.6
Italy	96.0	96.0	96.0	..	98.9	99.0	98.7	98.9	..
Japan	..	..	..	..	..	..	..	..	..
Korea	80.7	82.0	85.9	87.0	88.0	90.0	91.0	99.0	99.0
Luxembourg	99.0	98.0	..	..	..	..	..	..	..
Mexico	93.0	95.5	96.6	97.9	98.2	98.3	98.4	98.7	98.7
Netherlands	95.0	96.0	98.0	..	..	..	..	..	..
New Zealand	96.4	97.9	98.4	98.7	98.8	99.2	99.3	..	..
Norway	..	..	..	..	..	..	..	..	..
Poland	..	..	..	..	..	..	..	..	..
Portugal	99.8	99.8	99.8	99.2	99.2	99.2	99.0	99.1	99.3
Slovak Republic	..	..	92.0	92.0	92.0	95.0	95.0	94.0	94.0
Spain	..	96.2	96.0	97.3	97.2	..	..	..	96.2
Sweden	..	94.0	..	..	..	..	..	..	..
Switzerland	..	..	..	..	98.0	98.0	98.0	97.0	96.7
Turkey	44.0	88.0	82.0	89.0	92.0	96.0	98.0	98.0	99.0
United Kingdom	95.5	94.9	95.2	96.0	96.0	95.7	94.5	93.3	93.0
United States	..	..	..	..	..	..	..	..	..

1. Basic availability to make emergency call, not full functionality.

StatLink: http://dx.doi.org/10.1787/862547465246

Table 8.6. **Directory assistance charges**
USD

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Notes
Australia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Directory assistance calls are free from a residential fixed phone or Telstra payphone.
Austria	0.07	0.07	0.07	0.07	..	..	..	0.70	0.71	0.71	1.28	1.52	
Belgium	0.13	0.13	..	..	..	0.82	1.24	..	..	1.96	2.08	2.47	Two requests per phone call for the fixed amount of USD PPP 2.38 including tax.
Canada	0.47	0.40	0.40	0.63	0.63	0.64	0.51	0.50	0.50	0.48	0.48	0.54	
Czech Republic	0.12	0.17	0.19	0.18	0.18	0.18	0.10	0.15	..	0.16	0.17	0.19	
Denmark	0.76	0.80	0.80	0.83	..	..	..	1.21	..	..	..	..	This is the off-peak rate per minute including a call set up charge. The call setup charge is USD 0.41, the off-peak rate is USD 0.80 per minute and the peak rate charge is USD 1.12 per minute.
Finland	0.94	0.99	..	..	..	0.33	..	..	..	..	..	..	
France	..	..	0.60	0.57	0.56	0.64	0.63	0.72	0.62	0.71	0.75	0.90	This is the price for an inquiry from a fixed line. From a payphone the charge is 10 call units.
Germany	..	..	..	0.11	0.30	0.96	0.96	0.96	1.09	1.06	1.12	1.34	Rates for the directory enquiry services provided by the incumbent, Deutsche Telekom AG (as on 1 Dec.2003): - National directory enquiries are billed at the basic rate of: USD 0.22 plus USD 1.11 per call minute or part thereof. - International directory enquiries are billed at the basic rate of: USD 1.11 plus USD 2.13 per call minute or part thereof.
Greece	0.04	0.04	0.04	0.04	0.06	0.06	..	0.18	0.16	0.14	..	..	
Hungary	..	..	..	..	0.21	0.21	0.42	0.46	0.43	0.17	0.23	0.27	
Iceland	0.19	0.19	0.00	0.37	0.36	0.36	0.33	0.41	0.34	0.38	..	..	
Ireland	..	..	..	..	..	0.61	..	..	..	0.41	..	..	
Italy	0.26	0.25	0.65	0.63	0.51	0.52	..	0.54	..	..	..	..	
Japan	0.16	0.27	0.29	0.32	0.28	0.25	0.38	0.53	0.56	0.49	0.48	0.52	This is the price for the 1st operator assisted enquiry per month between 8am-11pm. The price of subsequent enquiries during this time is USD PPP 0.57 per call. Automated calls can be made for USD PPP 0.10 plus the local telephone charge.
Korea	..	..	..	..	..	0.13	0.12	0.07	0.07	0.06	0.08	0.10	
Luxembourg	..	..	0.12	0.25	0.26	0.25	..	..	..	..	..	..	
Mexico	..	..	..	..	..	..	..	..	..	..	..	..	
Netherlands	..	0.47	0.47	0.48	0.49	0.46	..	0.98	0.83	0.80	..	..	Price per call to talk to an operator. USD PPP 0.43 for calls to the automated service.
New Zealand	..	..	0.30	0.31	..	0.34	..	0.35	0.23	0.21	..	..	This price includes two number requests.
Norway	0.45	0.45	0.44	0.43	0.86	0.85	1.25	1.21	1.07	1.05	..	..	Initial charge of USD PPP 0.99 + USD PPP 0.05 per minute.
Poland	..	..	..	..	..	0.12	..	0.16	0.07	0.07	0.14	0.21	For the incumbent operator.
Portugal	0.20	0.21	0.32	0.34	0.36	0.39	0.28	0.29	..	..	..	..	
Slovak Republic	..	..	..	..	..	..	..	0.12	0.11	0.12	0.11	0.13	
Spain	0.33	0.34	0.38	0.37	0.36	0.37	0.37	0.37	0.25	0.27	0.33	0.39	11818 service for calls made from the incumbent PTO network.
Sweden	0.51	0.51	1.11	1.13	1.16	1.17	1.17	1.17	..	..	..	..	Before 1996, there was a per-minute charge. In 1996 a set-up fee was introduced.
Switzerland	0.46	0.47	0.95	0.99	..	..	..	1.23	1.09	1.09	1.19	1.37	
Turkey	0.20	0.29	0.22	0.17	0.16	0.21	0.18	0.19	0.26	0.31	0.27	0.34	
United Kingdom	..	..	..	..	0.37	0.39	0.42	0.40	0.61	0.58	0.75	0.82	
United States	..	..	..	..	..	..	..	..	..	..	..	..	Verizon in some areas provides two free calls per month for residential and one free call for business customers and charges USD 0.55 cents for subsequent requests. Qwest allows its residential customers one free call per month and charges USD 1.25.
OECD	0.31	0.34	0.39	0.41	0.39	0.43	0.52	0.54	0.47	0.51	0.59	0.69	

StatLink: http://dx.doi.org/10.1787/102626830872

Table 8.7. **Answer seizure ratios**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	55.1	54.6	57.5	57.0	58.7	60.0	55.8	57.7	61.5	58.7	58.9	56.6	55.2	59.1
Austria	53.2	54.0	54.5	54.0	58.7	61.3	61.3	63.3	65.6	65.4	65.3	65.9	64.7	67.8
Belgium	61.1	58.6	61.6	59.4	62.5	64.8	65.2	65.9	66.5	63.3	65.6	64.1	66.2	65.1
Canada	61.6	64.9	64.3	69.3	69.5	70.7	69.4	69.4	67.9	69.3	67.3	67.2	67.9	67.5
Czech Republic	34.8	36.0	34.5	32.8	37.7	41.4	44.8	53.8	57.2	61.4	62.1	61.0	60.5	56.7
Denmark	60.2	60.4	64.5	63.4	66.6	66.9	67.2	70.1	67.7	70.4	70.1	68.4	69.9	71.3
Finland	56.6	58.3	61.5	62.4	63.2	64.3	61.6	65.1	67.3	67.3	63.2	63.2	63.4	65.7
France	61.1	61.1	63.1	63.2	66.5	67.3	65.1	65.6	69.5	66.3	66.2	67.8	64.3	62.1
Germany	54.4	55.0	57.3	57.5	60.1	60.4	61.8	62.3	63.4	61.4	61.7	61.8	61.1	59.1
Greece	33.3	37.2	38.0	39.8	44.6	46.8	49.1	52.2	51.8	50.4	54.1	51.6	55.4	58.2
Hungary	31.9	35.4	37.6	40.0	42.9	47.7	49.2	53.8	49.8	52.6	55.8	54.7	54.8	54.7
Iceland	48.2	52.0	53.5	53.6	58.3	50.5	54.1	57.2	56.7	59.1	57.9	56.1	57.2	66.4
Ireland	54.2	55.6	58.3	58.4	60.5	61.3	65.0	69.3	68.7	67.8	66.4	64.8	66.9	67.9
Italy	49.2	51.5	54.2	56.3	58.6	60.0	60.0	59.2	60.2	60.1	58.9	53.8	55.9	54.2
Japan	67.3	68.1	68.1	66.6	68.3	68.4	69.1	67.9	69.1	69.2	65.8	66.9	65.9	65.1
Korea	50.6	52.1	57.8	59.7	60.1	60.9	62.7	62.4	64.6	55.9	63.5	65.5	64.9	62.3
Luxembourg	65.2	65.5	64.3	64.9	64.0	63.8	64.7	65.6	65.5	65.5	67.6	59.6	61.9	58.5
Mexico	40.2	40.6	42.5	44.9	44.8	48.8	52.2	50.2	52.7	51.8	49.9	48.8	41.2	49.3
Netherlands	61.5	62.1	62.2	63.8	65.6	65.3	64.2	64.7	67.8	67.1	67.5	67.3	65.4	64.4
New Zealand	54.8	53.3	56.8	60.4	60.1	60.3	64.4	64.1	67.1	61.6	60.3	60.1	53.4	56.1
Norway	61.4	60.8	63.5	55.8	60.0	63.9	63.5	63.1	63.2	66.0	65.8	64.1	63.2	66.1
Poland	16.3	18.9	32.6	32.6	41.1	43.8	46.1	46.2	49.3	55.8	58.2	55.9	55.8	53.1
Portugal	40.1	44.3	49.1	52.4	54.6	60.0	60.1	57.2	59.4	59.0	56.7	55.4	55.9	54.9
Slovak Republic	34.8	36.0	34.5	32.8	37.7	38.7	42.7	47.1	49.6	53.5	57.1	57.7	56.3	54.5
Spain	45.7	48.1	51.4	52.7	57.1	60.1	60.0	59.4	64.2	61.6	61.9	62.5	60.1	58.3
Sweden	62.2	59.4	63.6	62.9	64.6	65.4	65.8	66.2	63.8	65.2	64.9	63.1	63.3	65.0
Switzerland	58.4	58.3	58.9	59.0	61.1	60.1	60.1	61.6	62.8	62.5	62.6	62.7	62.1	62.2
Turkey	33.5	40.6	41.9	36.9	41.4	45.2	45.7	43.1	47.4	42.3	44.3	44.4	44.2	40.5
United Kingdom	62.2	63.0	65.0	65.3	66.4	66.3	64.9	63.1	65.8	66.5	64.5	64.3	65.9	63.9
United States	69.4	69.9	70.0	69.7	66.6	67.8	66.1	64.1	67.9	63.3	65.6	67.4	65.9	64.7
OECD average	51.9	53.1	55.5	55.7	58.1	59.4	59.4	60.4	61.8	61.3	61.7	60.8	60.3	60.5

Source: ITU-T Quality of Service Development Group.

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Chapter 9

Employment and Productivity

Employment in telecommunication services has fallen from the levels reached during the boom years of the late 1990s, and now stands at around 2.7 million. Mobile communications has been the main driver of recent employment growth, now accounting for 18% of total telecommunication services employment and half a million jobs in OECD countries. There have also been rapid increases in access paths and revenue per employee. This chapter examines employment, labour productivity as well as skills and occupational changes within the industry.

Employment in telecommunication services has fallen from the levels reached during the boom years of the late 1990s, and now stands at around 2.7 million. The area of employment growth over recent years has been mobile communications, which now employs almost half a million people in OECD countries and accounts for 18% of total telecommunication services employment. Globalisation and the complexity and range of business mixes between firms and countries make labour productivity comparisons increasingly difficult. Nevertheless, it is clear that competition and restructuring have brought improvements in productivity – with rapid increases in access paths per employee, despite declines in traditional PSTN fixed line access in some countries; and continued increases in revenue per employee, despite lower prices. While the recent trend of contracting out is no doubt an important factor, it seems likely that there have been significant real productivity improvements.

Employment

At the end of 2003, there were some 2.86 million people employed in telecommunication services in OECD countries, down from the peak of more than 3 million reached in 2000 (Table 9.1). The United States accounted for the largest share of telecommunication employment in 2003, with just over 1 million (40%). The United Kingdom, Germany, France, Canada and Korea were the other OECD countries with more than 100 000 telecommunication employees at that time.

While down on the peak levels of 2000, telecommunication services employment is now back to the levels of the mid 1990s. Over the decade 1990 to 2000, telecommunication employment increased by 1.5% per annum, but between 2000 and 2003 employment fell by 4.5% per annum. Countries experiencing relatively strong growth in telecommunication employment over the decade to 2003 include: Luxembourg, Mexico, Iceland, United Kingdom and Finland. Those experiencing the largest relative declines include: Czech Republic, Turkey and Poland. Overall, 13 OECD countries experienced growth in telecommunications employment over the last decade, while the remaining seventeen experienced declines.

Within these overall trends, mobile communications employment has remained strong. From less than 50 000 in 1990, employment in mobile communications increased by 15% per annum to around 486 000 by the end of 2003 (Table 9.2). Although stronger during the decade 1990 to 2000, mobile communications employment has continued to increase by 10% per annum since 2000. As a result, the share of mobile communications in total telecommunication services employment has increased – from less than 5% in 1993 to 17% in 2003 (Figure 9.1). In contrast, employment in fixed line communication services declined by 6.6% per annum between 2000 and the end of 2003.

Recent telecommunication services employment trends in the United States are indicative of overall trends. They reveal a stabilisation of employment in fixed line services and communication equipment manufacturing, but renewed growth in mobile

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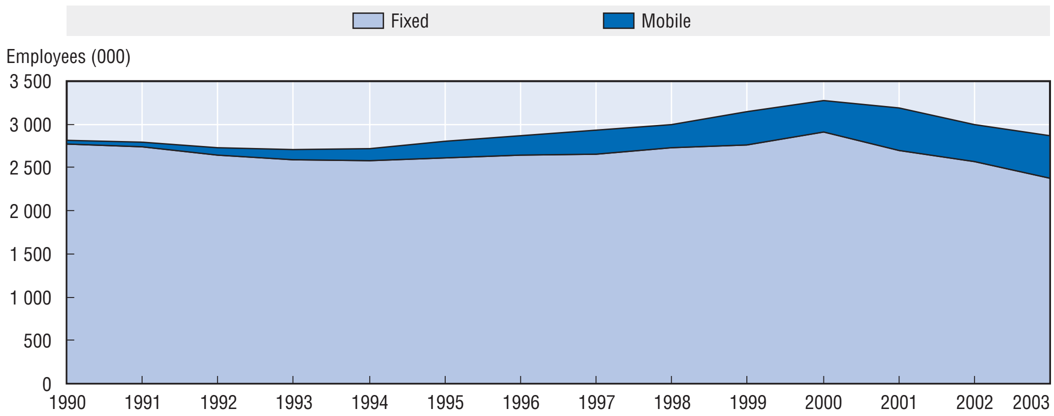
Figure 9.1. **OECD telecommunication services employment trends, 1990-2003**

Number of employees



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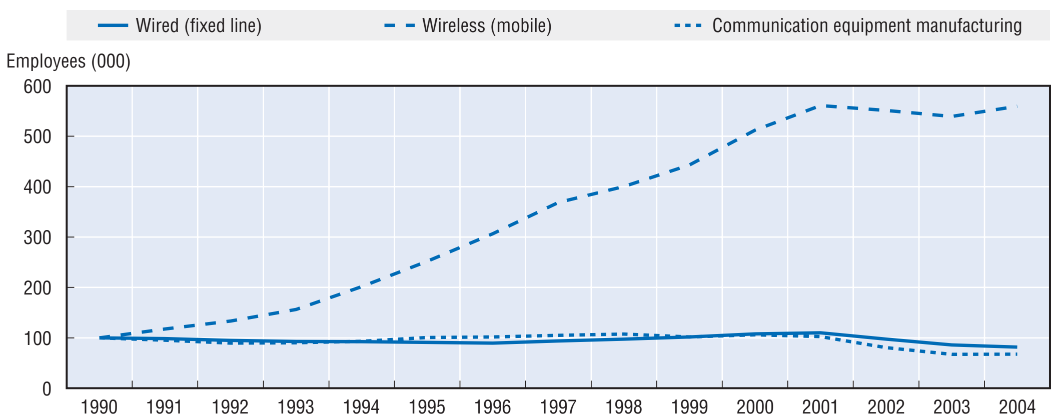
communications employment. In mid-2004, employment in fixed line telecommunication services in the United States was 18% lower than it had been in 1990 and 26% lower than its 2001 peak of 743 500. Employment in communication equipment manufacturing has followed similar trends, being 33% lower in June 2004 than it was in June 1990, and 36% lower than its 2000 peak. In contrast, employment in wireless communications in the United States was 460% higher in June 2004 than it had been in June 1990, having recovered from losses during 2001 and 2002 to regain the record levels of 2001 (Figure 9.2). Indeed, employment in mobile communications in the United States increased from just 35 600 or 5% of total telecommunication services employment in 1990, to almost 200 000 or more than 26% of the total in mid-2004.

In 2003, telecommunication services accounted for 0.57% of total employment in OECD countries, somewhat lower than has been the case over the last decade and down from the 2000 peak of 0.66%. However, there is considerable variation between countries.

Figure 9.2. **US telecommunication services employment trends, 1990-2004**

Thousands of employees

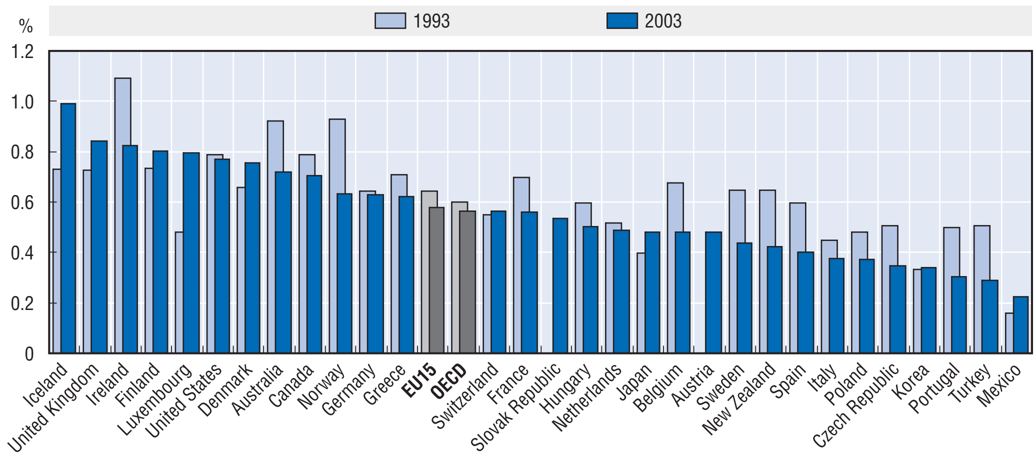


Source: OECD, compiled from US Bureau of Labor Statistics data.

StatLink: http://dx.doi.org/10.1787/116523368373

Figure 9.3. **Telecommunication services share of total employment, 1993-2003**

Percentage



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Telecommunication services employment accounted for more than 0.8% of total national employment in Iceland, the United Kingdom, Ireland and Finland in 2003. By contrast, it accounted for less than 0.4% of total employment in Mexico, Turkey, Portugal, Korea, the Czech Republic, Poland and Italy (Table 9.3). Across the OECD and the EU15 countries telecommunication services accounts for a declining share of national employment. Again, however, there is variation between countries, with telecommunications accounting for an increasing share of total employment over the last decade in Austria, Denmark, Finland, Iceland, Japan, Korea, Luxembourg, Mexico, Switzerland and the United Kingdom while declining in other countries (Figure 9.3).

Box 9.1. **Contracting out: the case of Telecom New Zealand**

In mid 2003, Telecom New Zealand (TCNZ) handed over its fixed line network management and operations to Alcatel in a five-year deal worth more than USD 100 million. Under the arrangement, Alcatel will run the operations, maintenance and much of the design and planning of the TCNZ's access and transport networks in New Zealand and for its Australia subsidiary AAPT. In an initial deal, which was effectively a trial, some 20 TCNZ staff were transferred to Alcatel. On 1 July 2003, another 300 networking operations, design and maintenance employees transferred to Alcatel.

This was not the first outsourcing deal for TCNZ, which had already contracted out management of its TDMA and CDMA networks to Ericsson and Lucent, respectively. This kind of network outsourcing has been a part of the mobile communications industry for some time. Examples include: Nokia, which has been among a number of vendors to provide outsourced solutions to new mobile operators (*e.g.* Nokia runs the 3G network for Sweden's 3GIS); and Ericsson, which operates Hutchison Telecom Australia's W-CDMA system, as well as its older 2G and paging networks.

Source: R. Clark, "Getting to the Outsource", *Telecom Asia*, August 2003.

Productivity

Liberalisation and the globalisation of telecommunication services make data collection and analysis at both the firm and national levels increasingly difficult, with major carriers spanning multiple markets. Moreover, recent trends, such as contracting out and the operation of different networks with different business mixes *vis-à-vis* fixed telephony, mobile and Internet services, are making it increasingly difficult to develop and analyse labour productivity indicators. Nevertheless, looking at the number of access paths and revenue earned per employee (indicators of partial labour productivity) reveals some interesting trends and suggests that there have been productivity improvements.

Access paths per employee

In the past, it has been common for analysts to use the number of fixed lines (access lines) per employee or, more recently, the number of mobile subscribers and access lines per employee as an indicator of partial labour productivity. Recently, however, there has been considerable development of new access technologies. Consequently, the OECD uses "access paths" instead of lines, where access paths is the sum of all forms of access – including traditional fixed lines, mobile subscribers, ISDN channels (64 kbit/s voice equivalents) and DSL broadband subscribers.[1] While the uses and capabilities of different access paths clearly vary, their provision by the carriers is indicative of telecommunication carrier productivity.[2]

Despite a fall in traditional fixed line PSTN connections in some countries, the number of access paths per employee in OECD countries continues to rise – suggesting continued improvements in partial labour productivity in telecommunication services (Figure 9.4). Access paths per employee have increased over three times from 148 in 1990 to 487 in 2003 – at an annual rate of nearly 10%. In recent years, new technologies have made a major contribution to increased productivity. The number of standard PSTN access paths per employee increased by just 2% per annum across OECD countries between 1990 and 2003. By contrast, the number of ISDN access paths per employee increased by 60% per annum and the number of mobile access paths per employee increased by 39% per annum. Over the last decade, the increase in mobile communications access paths per employee has been the most significant contributor to apparent labour productivity and enhanced access. More recently still, new means of broadband access have become available and

Figure 9.4. **Access paths per employee, 1990-2003**

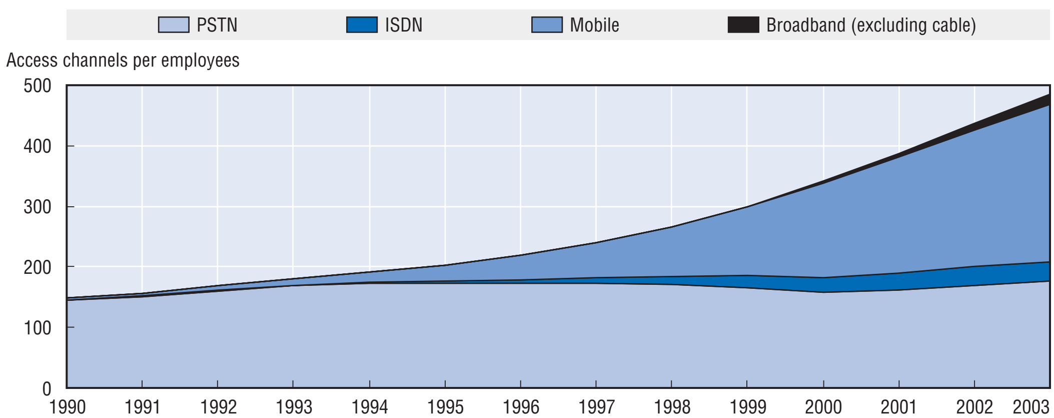

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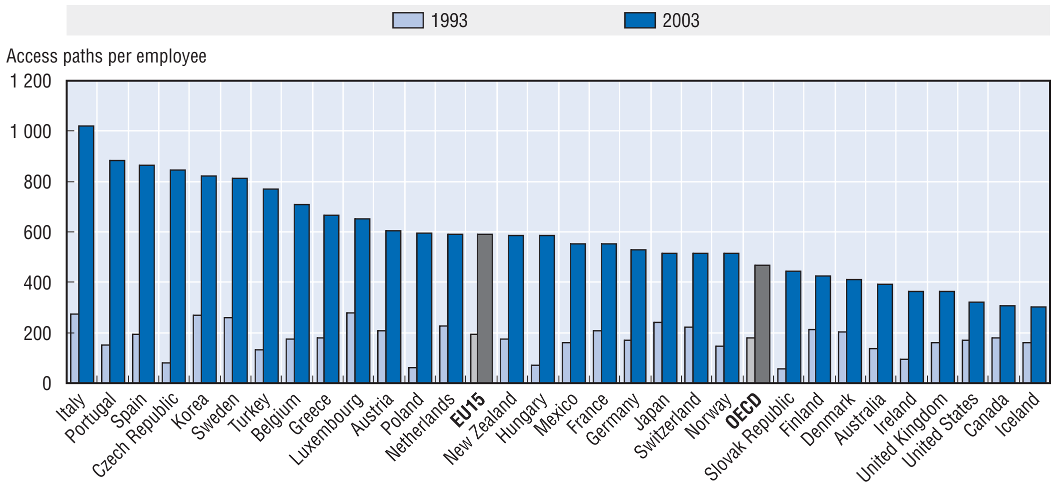
Figure 9.5. **Access paths per employee, 1993-2003**



StatLink: http://dx.doi.org/10.1787/844676635376

their rapid adoption is contributing to further access improvements. For example, at the end of 2003, there were 18 DSL broadband access paths per telecommunication services employee across the OECD.

By country, differences in the growth of mobile communications and broadband Internet access are evident, with access paths per employee in 2003 varying from less than 400 in six countries to more than 800 in six countries (Table 9.4 and Figure 9.5). Across OECD countries access paths per employee increased by 10% per annum over the last decade, with strongest growth in such countries as the Czech Republic, Poland, Hungary, the Slovak Republic, Portugal and Turkey, where substantial reductions in incumbent carrier employee headcounts have been common. Apparent productivity improvements have also been rapid in such countries as Japan, where contracting out has played a significant role. Reflecting relatively high levels of productivity at the beginning of the period, growth in the number of access paths per employee over the last decade has been slower in such countries as Canada, the United States, Iceland, Denmark and Finland.

There are many factors affecting such metrics as access paths per employee. These include such things as: high cellular mobile penetration, raising the level of some countries (*e.g.* Portugal) relative to others (*e.g.* Canada); declines in fixed line penetration, lowering the level in some countries (*e.g.* Finland); and differing rates of adoption of broadband access. Another important factor is the increasing trend towards contracting out network operations and other activities (Boxes 9.1 and 9.2). Nevertheless, the overall trend is one of increased access and improved labour productivity in the delivery of access services.

Revenue per employee

Revenue per employee continues to be a useful indicator of partial labour productivity, although different business mixes between firms and countries make simple comparisons difficult. The restructuring of operations and contracting out also affect such indicators and make comparisons difficult (see Boxes 9.1 and 9.2).[3] Results should be interpreted with these factors in mind.

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Box 9.2. **Contracting out: the case of NTT**

In November 2001, NTT and its consolidated subsidiaries, including NTT East and NTT West, reached an agreement with their labour unions regarding the implementation of structural reforms of their respective businesses. This agreement provided for a reduction in personnel expenses based on a program of significant outsourcing and a more diversified range of employment arrangements as well as other types of expense reductions. Under this plan NTT East and NTT West transferred to outsourcing companies newly established in each region (comprising one prefecture or block of prefectures) various functions, including order taking, SOHO sales, equipment maintenance, operations and repairs. At the same time, an arrangement was implemented whereby employees, primarily those 51 years of age and over, retired from NTT East and NTT West and were then re-employed by the outsourcing companies. In May 2002, these structural reforms were carried out and approximately 60 000 employees of NTT East and NTT West retired from those companies to then be rehired by the outsourcing companies at wage levels consistent with those of the specific localities and businesses.

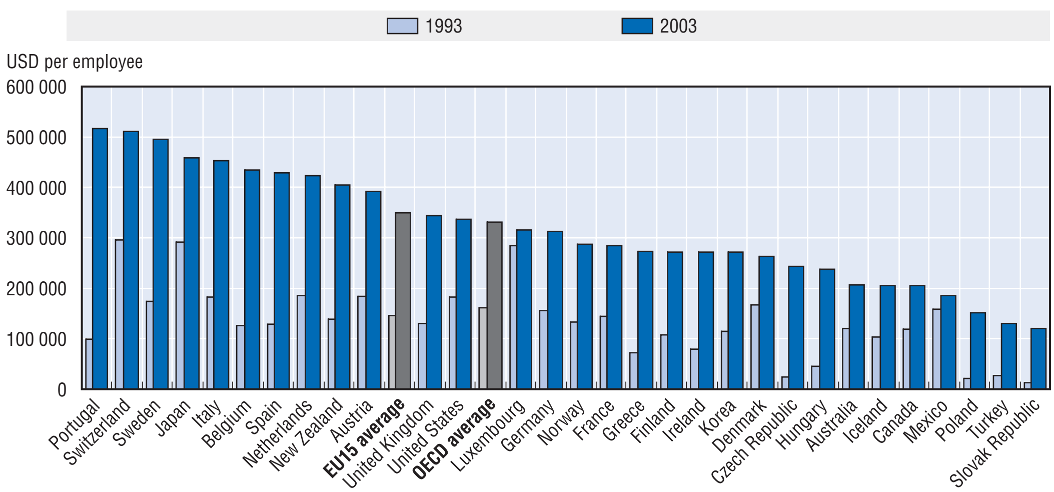
In addition, NTT, NTT East and NTT West implemented a voluntary retirement program as part of a rationalisation of their managements, under which approximately 6 500 employees in fiscal 2001, approximately 10 050 employees in fiscal 2002 and approximately 4 400 employees in fiscal 2003 participated by opting for retirement.

Source: NTT, *Annual Report 2004*, Nippon Telegraph and Telephone Corporation, Tokyo, p. 25.

Across OECD countries, communication services revenue per employee increased from around USD 136 000 in 1990 to USD 330 000 in 2003 (current prices), or by 7% per annum. Over the same period, mobile communications revenue per mobile employee increased from around USD 100 000 to more than USD 680 000, or by 16% per annum (Table 9.5). There is considerable variation between countries (Figure 9.6). Portugal, Switzerland, Sweden, Japan and Italy are among those countries with relatively high levels

Figure 9.6. **Revenue per employee, 1993-2003**

USD



StatLink: http://dx.doi.org/10.1787/828740807526

of revenue per employee, while the Slovak Republic, Turkey and Poland are among those with relatively low levels of revenue per employee. Nevertheless, the Czech Republic, Slovak Republic and Poland are among those countries to have experienced the most rapid increases in revenue per employee over the last decade – suggesting catch up improvements. Japan, where NTT has contracted out some of its activities, has also experienced strong growth in revenue per employee (Table 9.6).

While impressive, these apparent improvements in partial labour productivity should be seen in the light of the recent trend towards contracting out as shown in some examples in Boxes 9.1 and 9.2. Other examples include KPN which, between 2001 and 2003, shed around one-third of its workforce (more than 16 000 employees) through restructuring and the outsourcing of non-core activities. Such changes in employment levels and operational structures profoundly affect such measures as access paths and revenue per employee.

Productivity in mobile communications

There are a number of difficulties involved in developing and analysing partial labour productivity indicators for mobile communications – with different business mixes *vis-à-vis* large fixed network carriers with mobile communications divisions and specialist mobile carriers, variations in the way firms report mobile employment *vis-à-vis* the inclusion or exclusion of administrative and management support staff, differences in the extent and reporting of firms' retail outlets, different mixes of pre-paid and post-paid customers and voice and mobile data/Internet customers and a range of country and carrier specific factors (*e.g.* the use of "double SIM cards"), and the number of mobile virtual network operators, all affecting such indicators. Consequently, while useful, data on productivity in mobile communications should be interpreted with caution.

Across the OECD there were some 1 500 mobile subscribers per reported mobile communications employee in 2003, up from around 950 in 1999. This suggests continued productivity improvement in the provision of mobile communication services (Table 9.7). Five countries reported fewer than 1 000 mobile subscribers per mobile communications employee in 2003, while ten countries reported more than 2 000. Turkey, Japan, Korea and Luxembourg were among those countries reporting the highest number of mobile subscribers per employee during 2003 (Figure 9.7).

Mobile services revenue per mobile communications employee across OECD countries increased from around USD 500 000 in 1999 to almost USD 680 000 in 2003. In part reflecting relatively high levels of adoption of mobile data and mobile Internet, Japan and Korea were among those countries reporting the highest mobile services revenue per mobile employee in 2003 (Figure 9.8).

Productivity among major incumbent carriers

It is also possible to explore partial labour productivity indicators at the firm level. Again it should be noted that different firms have different business structures, with some having large mobile communications and cable television networks and others having none, and pursue different business strategies, with some contracting out non-core activities and others keeping them in-house. They also operate within different regulatory regimes and face different economic conditions. Comparisons of productivity performance should take such factors into account. Nevertheless, comparisons of firm performance over time are instructive.

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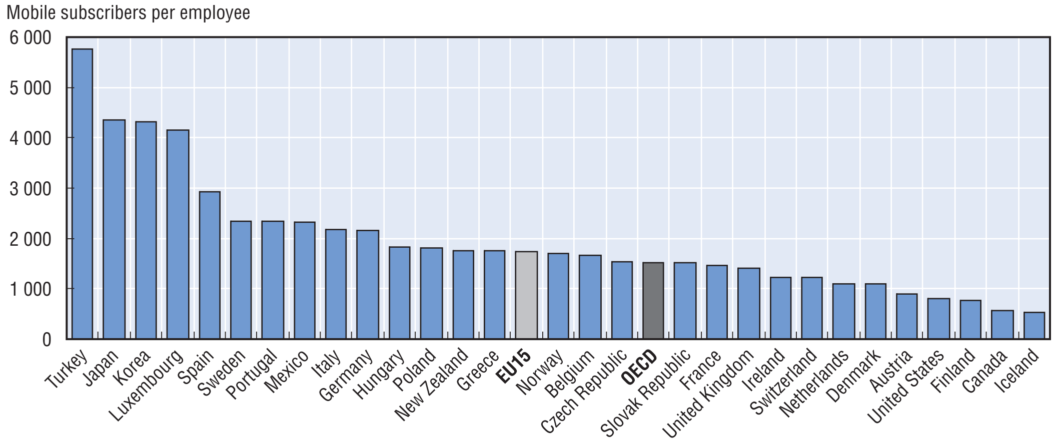
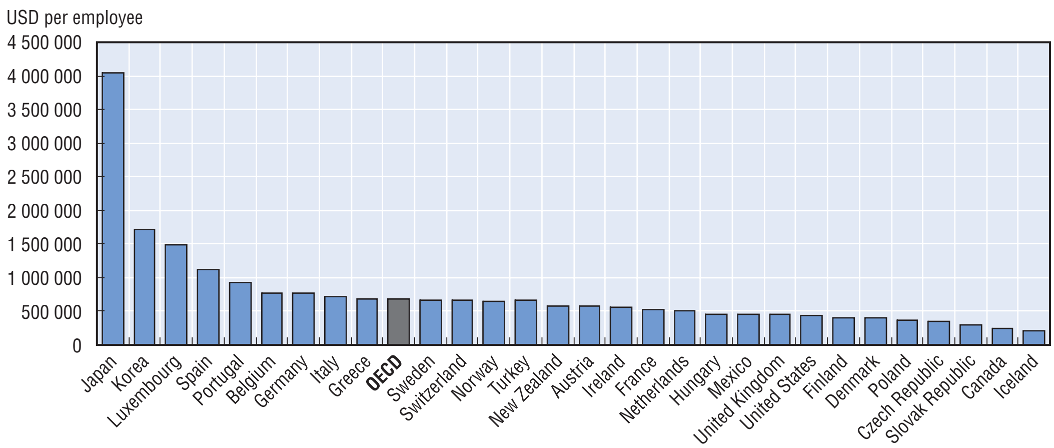
Figure 9.7. **Mobile subscribers per mobile employee, 2003**



StatLink: http://dx.doi.org/10.1787/165361374078

Figure 9.8. **Mobile services revenue per mobile employee, 2003**

USD



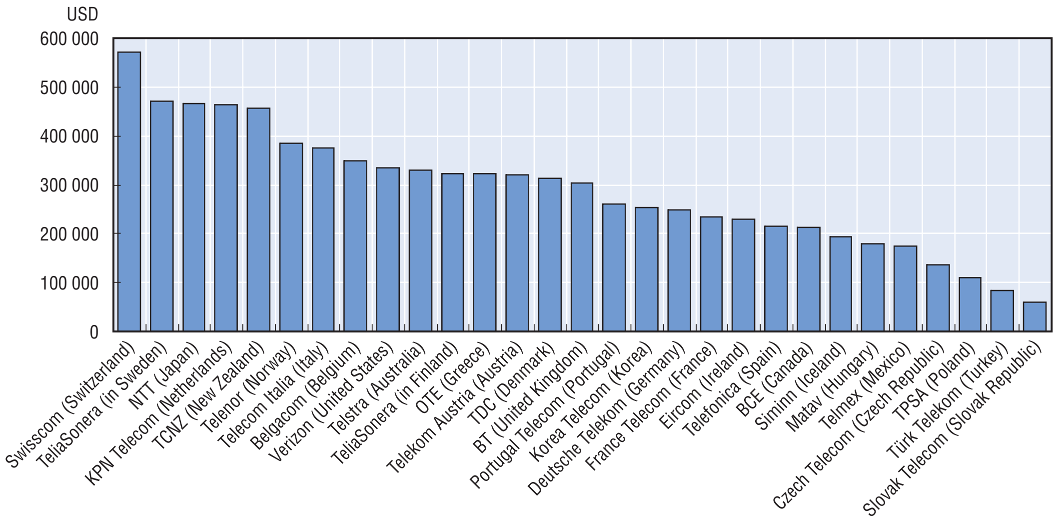
StatLink: http://dx.doi.org/10.1787/040445636228

In 2003, a sample of major incumbent carriers in OECD countries achieved an average revenue per employee of USD 290 000, compared to an average of USD 216 000 in 1999 for the same cohort (Table 9.8). Allowing for missing cases, total revenue across the cohort was up from USD 420 billion in 1999 to USD 514 billion in 2003, whereas the level of employment was down by around 170 000 to 1.77 million. Average personnel costs per employee fell slightly from 35 000 in 1999 to 34 000 in 2003.

During 2003, Swisscom (Switzerland), BT (United Kingdom), OTE (Greece), Telenor (Norway) and TDC (Denmark) were among those with above average personnel costs per employee. Telmex (Mexico), Matav (Hungary), Slovak Telecom (Slovak Republic) and TPSA (Poland) were among those below the average. Revenue per employee, an indicator of partial labour productivity, varied from USD 60 000 (Slovak Telecom) to USD 570 000 (Swisscom) (Figure 9.9). Swisscom (Switzerland), TeliaSonera (in Sweden), NTT (Japan), KPN

Figure 9.9. **PTO Revenue per employee, 2003**

USD



StatLink: http://dx.doi.org/10.1787/652200788583

(Netherlands) and TCNZ (New Zealand) were among those carriers earning relatively high levels of revenue per employee during 2003. Rapid increases in revenue per employee have been achieved between 1999 and 2003 by TeliaSonera (in Sweden), Swisscom (Switzerland), KPN (Netherlands) and Telenor (Norway).

Revenue per employee less personnel costs per employee is an approximate indicator of "value added". Data are incomplete, thereby excluding BCE (Canada), TeliaSonera (in Finland), NTT (Japan), P&T (Luxembourg), TeliaSonera (in Sweden), Türk Telekom (Turkey) and Verizon (United States) from the sample. Among the other PTOs in Table 9.8 "value added" per employee ranged from less than USD 50 000 for Slovak Telecom (Slovak Republic) and TPSA (Poland) to more than USD 300 000 for Swisscom (Switzerland), TCNZ (New Zealand), KPN (Netherlands), Telecom Italia (Italy) and Telenor (Norway). These latter appear to be achieving higher levels of labour productivity.

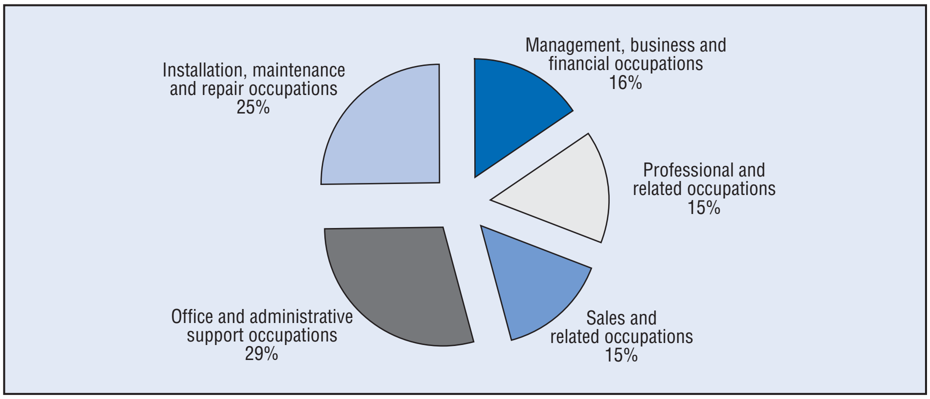
Skills and occupational change in telecommunications

Competition, technological and organisational changes are leading to significant changes in the occupational mix of those employed in telecommunications and in the skills required in the sector. Some occupations are in decline, while in other areas there are new job opportunities requiring new skills. For example, digitalisation and related technological changes reduced the need for traditional skills in such areas as maintenance and repair. At the same time, however, there is increased demand for computer and electronic engineering professionals.

The US Bureau of Labor Statistics (BLS) regularly publishes occupational and industry career guides that forecast demand for labour by occupation in various industries in the United States. Over the decade 2002 to 2012, the BLS forecast a 7% increase in telecommunications industry employment – creating an additional 80 000 jobs (Table 9.9). This compares with a predicted 16% increase in employment across all industries in the

Figure 9.10. **US telecommunications employment by occupation, 2012**

US Bureau of Labor Statistics forecast



Source: OECD, compiled from US Bureau of Labor Statistics (2004), *Employment Projections: Telecommunications*, BLS, Washington DC.

StatLink: http://dx.doi.org/10.1787/537550812735

United States. The most rapid growth is expected to be in sales, professional and related occupations, followed by management, business and financial occupations. Much slower growth is expected in office and administrative, installation, maintenance and repair occupations. The BLS forecast a 16% increase in sales and related occupations over the decade 2002 to 2012 creating 27 000 jobs, a 15% increase in professional and related occupations creating 25 000 jobs and a 12% increase in management, business and financial occupations creating 20 000 jobs. By contrast, employment in office and administrative support occupations is expected to remain static, while employment in installation and maintenance occupations is expected to increase by just 2% (Figure 9.10).

At the specific occupational level, the major areas of forecast growth over the decade 2002 to 2012 include: retail sales and advertising, marketing, promotions, public relations, and sales managers. At the same time, a forecast 57% decline in the number of telephone operators would see the loss of 22 000 jobs in that occupational category, and a 7% decline in the number of telecommunications equipment installers and repairers (excluding line installers) would see the loss of more than 10 000 jobs. Perhaps in part reflecting international outsourcing (*i.e.* "offshoring"), the BLS predict a 17% decline in telemarketers with the associated loss of 3 000 jobs.

Examples of restructuring within incumbents and new entrants in other OECD countries include the following.

- *TPSA (Poland)*. The TP Group reduced its workforce from 63 359 at the end of 2001 to 42 600 at the end of 2003, and reduced annual personnel costs from USD 950 million to USD 790 million. Retraining has been a major focus. In 1999, less than 15% of employees had tertiary education. By 2003, no less than 38% of TP Group employees had tertiary education.
- *Wind (Italy)*. At the end of 2002, Wind had 8 602 employees with an average age of just over 30. They attended 24 000 person days of technical and management training during the year, and 30% of Wind employees had a university degree.

- *BCE (Canada)*. At the end of 2003, BCE employed more than 64 000 people. With a focus on retraining and lifelong learning, BCE has established an online learning environment which has seen around 15 000 BCE employees registered for 87 000 online courses from a total “library” of 400 online programs.
- *Swisscom (Switzerland)*. As a part of continued cost savings and workforce reductions Swisscom had 1 263 (6.5%) fewer employees at the end of 2003 than at the beginning of the year. All employees who lose their job are assisted in finding new employment, and they receive their full salary for 12 to 18 months.[4]

These data and examples (see also Boxes 9.1 and 9.2) reveal the skills, human resources and organisational adjustments underpinning observed partial labour productivity improvements, and some of the strategies being adopted by telecommunications carriers to drive further productivity improvements.

Notes

1. Cable broadband connections are not included because the focus is on telecommunication services, not including cable television.
2. An alternative would be to use services rather than access paths, to reflect the shift of focus from infrastructure to services and the increasing availability of multiple services *via* a single line (*e.g.* voice and DSL).
3. Recent data may also have been affected by the use of annual average USD exchange rates at a time when there were considerable fluctuations in value.
4. Compiled from company annual reports and SEC filings.

Table 9.1. **Employment in telecommunications, 1990-2003**

	1993	1995	1997	1999	2000	2001	2002	2003	CAGR 1993-2003
Australia	70 273	75 516	79 654	74 471	76 000	77 275	77 000	67 750	-0.4
Austria	18 144	17 273	17 820	22 986	23 975	24 431	20 000	18 190	0.0
Belgium	25 344	24 908	23 611	22 699	23 938	23 096	21 016	19 430	-2.6
Canada	101 493	106 631	99 504	101 402	103 692	104 879	105 096	110 834	0.9
Czech Republic	24 742	26 097	25 821	23 685	18 810	18 493	17 659	16 419	-4.0
Denmark	16 891	16 476	17 268	18 864	21 330	22 405	21 873	20 471	1.9
Finland	15 153	16 405	17 976	21 601	24 190	25 015	22 004	18 991	2.3
France	154 548	169 498	170 043	155 297	154 522	151 191	145 487	137 414	-1.2
Germany	234 000	217 900	215 624	221 000	241 000	241 000	231 000	226 000	-0.3
Greece	26 349	24 581	22 741	25 966	25 631	26 033	24 700	25 000	-0.5
Hungary	22 463	22 657	21 765	21 732	21 047	20 870	21 046	19 763	-1.3
Iceland	995	1 010	932	1 458	1 379	1 305	1 598	1 552	4.5
Ireland	12 818	12 025	11 705	15 000	20 000	17 000	14 900	14 656	1.3
Italy	93 172	91 802	93 782	100 026	95 809	90 880	86 469	83 436	-1.1
Japan	255 938	360 135	348 008	334 179	330 383	320 876	304 221	304 221	1.7
Korea	63 929	66 921	73 323	87 025	73 978	68 779	81 202	75 168	1.6
Luxembourg	790	799	828	1 356	1 478	1 487	1 500	1 500	6.6
Mexico	49 819	50 413	69 138	86 769	93 346	94 641	90 268	89 517	6.0
Netherlands	34 359	32 288	31 229	47 500	47 500	52 171	47 953	39 197	1.3
New Zealand	9 778	10 354	9 536	7 047	7 802	7 459	8 100	8 100	-1.9
Norway	18 561	18 771	21 268	22 067	18 487	15 991	14 746	14 384	-2.5
Poland	71 500	73 267	73 100	77 187	69 013	65 498	55 901	50 533	-3.4
Portugal	22 499	21 006	20 807	19 648	18 481	18 652	18 140	15 433	-3.7
Slovak Republic	15 824	15 633	15 871	15 883	15 111	14 651	12 621	11 552	-3.1
Spain	74 389	69 543	73 000	69 273	71 521	70 669	66 743	67 026	-1.0
Sweden	26 059	32 825	34 035	29 289	30 340	28 256	20 529	18 825	-3.2
Switzerland	20 521	19 560	22 145	24 150	24 158	24 688	23 568	22 329	0.8
Turkey	93 897	74 837	73 177	72 463	72 412	69 545	63 888	61 219	-4.2
United Kingdom	185 505	153 166	168 740	206 500	230 300	231 500	255 000	242 000	2.7
United States	946 600	976 800	1 082 000	1 219 300	1 323 400	1 255 900	1 126 800	1 060 000	1.1
OECD	2 706 353	2 799 097	2 934 451	3 145 823	3 279 033	3 184 636	3 001 028	2 860 910	0.6
EU15	940 020	900 495	919 209	977 005	1 030 015	1 023 786	997 314	947 569	0.1

Note: Data for 2003 for Japan refer to 2002.

StatLink: http://dx.doi.org/10.1787/630132000472

Table 9.2. **Employment in mobile communications, 1990-2003**

	1993	1995	1997	1999	2001	2002	2003	CAGR 1993-2003
Australia	1 386	3 279	3 538	..	..	..	..	..
Austria	250	320	1 978	4 593	7 721	7 830	7 956	41.3
Belgium[1]	..	433	1 652	3 664	5 206	5 204	5 220	36.5
Canada	22 089	23 567	22 355	22 257	23 176	22 661	23 206	0.5
Czech Republic	371	713	1 397	2 656	6 036	6 353	6 321	32.8
Denmark	236	510	1 712	3 775	5 664	4 873	4 355	33.8
Finland	340	530	1 388	2 585	10 350	6 211	6 157	33.6
France	1 521	3 500	8 288	12 017	22 503	27 268	28 350	34.0
Germany	7 890	11 900	19 200	28 100	36 200	31 500	29 900	14.3
Greece	350	800	1 100	2 618	4 375	5 639	5 893	32.6
Hungary	399	..	1 932	2 540	3 735	4 114	4 362	27.0
Iceland	106	22	..	547	530	530	530	17.5
Ireland[1]	..	650	970	1 000	2 700	2 831	2 785	19.9
Italy	2 000	5 280	10 116	18 311	21 787	24 164	26 143	29.3
Japan	10 271	15 992	18 138	18 165	20 667	19 935	19 935	6.9
Korea	2 159	3 013	7 827	9 960	7 804	7 780	7 769	13.7
Luxembourg	20	22	..	58	189	..	130	20.6
Mexico	1 048	1 397	5 527	11 013	14 241	13 424	12 959	28.6
Netherlands[1]	..	600	2 300	8 000	13 788	12 697	11 837	45.2
New Zealand[1]	..	811	..	1 024	1 643	1 443	1 678	9.5
Norway	439	979	1 751	2 458	2 869	2 612	2 445	18.7
Poland[2]	..	..	..	3 918	3 399	7 330	9 636	25.2
Portugal	709	1 081	1 734	3 463	4 495	4 089	3 999	18.9
Slovak Republic	141	236	997	1 531	1 802	2 087	2 422	32.9
Spain[3]	..	..	8 950	8 535	11 543	10 568	12 793	7.4
Sweden	2 250	2 685	..	4 198	3 752	3 752	3 752	5.2
Switzerland	220	..	..	4 550	4 634	..	5 039	36.8
Turkey	40	50	..	3 785	5 636	4 669	4 840	61.5
United Kingdom	5 135	9 769	14 600	24 103	37 766	..	37 795	22.1
United States	61 500	100 300	141 500	170 000	202 100	195 600	197 400	12.4
OECD	120 870	188 439	278 950	379 424	486 311	435 164	485 606	14.9
EU15	20 701	38 080	73 988	125 020	188 039	146 626	187 064	24.6

1. CAGR for 1995-2003.
2. CAGR for 1999-2003.
3. CAGR for 1997-2003.

StatLink: http://dx.doi.org/10.1787/358241423484

Table 9.3. **Telecommunication services employment as a share of national employment, 1990-2003**

Percentage

	1991	1993	1995	1997	1999	2001	2002	2003
Australia	1.06	0.92	0.92	0.96	0.86	0.85	0.83	0.72
Austria	..	..	0.46	0.48	0.61	0.64	0.54	0.48
Belgium	0.70	0.68	0.66	0.62	0.57	0.57	0.52	0.48
Canada	0.81	0.79	0.80	0.72	0.70	0.70	0.68	0.70
Czech Republic	..	0.51	0.53	0.52	0.50	0.39	0.37	0.35
Denmark	0.69	0.66	0.63	0.65	0.70	0.82	0.80	0.76
Finland	0.80	0.73	0.78	0.83	0.94	1.06	0.93	0.80
France	0.70	0.70	0.76	0.77	0.68	0.64	0.61	0.56
Germany	0.60	0.64	0.60	0.60	0.61	0.66	0.64	0.63
Greece	0.76	0.71	0.64	0.59	0.66	0.66	0.63	0.62
Hungary	..	0.60	0.62	0.60	0.57	0.54	0.54	0.50
Iceland	0.72	0.73	0.71	0.66	0.95	0.82	1.02	0.99
Ireland	1.18	1.09	0.94	0.85	0.94	0.99	0.85	0.82
Italy	0.49	0.45	0.45	0.46	0.48	0.42	0.39	0.38
Japan	0.42	0.40	0.56	0.53	0.52	0.52	0.51	0.48
Korea	0.33	0.33	0.33	0.35	0.43	0.32	0.37	0.34
Luxembourg	0.47	0.48	0.49	0.49	0.77	0.80	0.80	0.80
Mexico	0.17	0.16	0.15	0.19	0.23	0.25	0.23	0.23
Netherlands	0.47	0.52	0.47	0.43	0.62	0.66	0.60	0.49
New Zealand	1.02	0.65	0.62	0.55	0.40	0.41	0.43	0.42
Norway	0.90	0.93	0.90	0.97	0.98	0.70	0.65	0.63
Poland	..	0.48	0.50	0.48	0.52	0.46	0.41	0.37
Portugal	0.50	0.50	0.47	0.45	0.40	0.37	0.36	0.30
Slovak Republic	..	..	0.73	0.72	0.74	0.69	0.59	0.53
Spain	0.59	0.60	0.55	0.54	0.47	0.44	0.41	0.40
Sweden	0.76	0.65	0.81	0.86	0.71	0.66	0.48	0.44
Switzerland	0.55	0.55	0.52	0.59	0.63	0.63	0.60	0.57
Turkey	0.47	0.51	0.36	0.35	0.33	0.32	0.30	0.29
United Kingdom	0.85	0.73	0.59	0.63	0.75	0.82	0.90	0.84
United States	0.82	0.79	0.78	0.84	0.91	0.92	0.83	0.77
OECD	0.65	0.60	0.60	0.61	0.64	0.63	0.60	0.57
EU15	0.67	0.64	0.60	0.60	0.62	0.63	0.61	0.58

StatLink: http://dx.doi.org/10.1787/167586433231

Table 9.4. **Access paths per employee, 1991-2003**

	1993	1995	1997	1999	2000	2001	2002	2003	CAGR 1993-2003
Australia	136	153	184	235	265	296	321	393	11.2
Austria	210	239	274	356	420	430	531	605	11.2
Belgium	176	199	262	373	461	557	631	710	15.0
Canada	178	189	233	269	290	311	319	309	5.7
Czech Republic	80	94	147	245	444	600	721	845	26.6
Denmark	203	247	274	330	336	348	375	412	7.3
Finland	213	236	288	305	299	306	362	424	7.1
France	207	209	226	351	413	471	500	551	10.3
Germany	171	210	247	324	408	451	489	527	11.9
Greece	181	221	280	370	465	544	633	666	13.9
Hungary	69	110	178	245	327	418	502	585	23.7
Iceland	162	178	247	247	297	327	283	305	6.5
Ireland	95	120	172	223	191	273	338	366	14.4
Italy	272	316	404	572	726	872	946	1 020	14.1
Japan	240	206	299	382	428	463	503	516	7.9
Korea	268	307	379	584	732	819	742	820	11.8
Luxembourg	278	323	401	352	424	525	553	650	8.8
Mexico	161	188	159	215	284	376	487	553	13.2
Netherlands	228	268	363	346	446	412	455	592	10.0
New Zealand	176	201	258	469	505	562	536	588	12.8
Norway	146	184	207	269	360	443	493	516	13.5
Poland	62	79	114	175	259	343	469	594	25.4
Portugal	150	189	264	453	595	663	711	883	19.4
Slovak Republic	57	72	100	147	201	259	353	443	22.8
Spain	196	231	284	472	598	688	796	867	16.0
Sweden	259	246	276	399	431	492	708	810	12.1
Switzerland	224	260	259	337	409	432	472	516	8.7
Turkey	131	195	237	357	463	538	665	769	19.4
United Kingdom	159	225	238	281	326	348	334	362	8.6
United States	171	194	212	226	228	255	292	321	6.5
OECD	180	203	240	300	339	382	427	470	10.1
EU15	192	228	268	362	434	487	527	590	11.9

Note: Includes mobile and broadband access paths (excluding cable) from 2000 onwards.

StatLink: http://dx.doi.org/10.1787/150448831250

Table 9.5. **OECD telecommunications employment and revenue per employee, 1990-2003**

	Employment	Revenue per employee (USD)	Revenue per employee (indexed)	Mobile employment	Mobile revenue per employee (USD)	Mobile revenue per employee (indexed)
1990	2 819 551	135 948	100	42 471	96 714	100
1991	2 790 493	139 181	102	55 347	121 551	126
1992	2 725 242	151 098	111	77 600	235 296	243
1993	2 706 353	161 028	118	120 870	224 451	232
1994	2 717 124	173 857	128	141 936	275 199	285
1995	2 799 097	194 749	143	188 439	365 684	378
1996	2 871 757	205 325	151	231 027	431 365	446
1997	2 934 451	214 662	158	278 950	443 823	459
1998	2 995 189	225 236	166	262 404	455 126	471
1999	3 145 823	241 573	178	379 424	498 535	515
2000	3 279 033	252 944	186	366 781	547 665	566
2001	3 184 636	269 174	198	486 311	527 300	545
2002	3 001 028	285 890	210	435 164	601 135	622
2003	2 860 910	330 679	243	485 606	680 233	703

Note: Totals are from partial data and allow for missing data.

StatLink: http://dx.doi.org/10.1787/662807232621

Table 9.6. **Telecommunication services revenue per employee, 1990-2003**

USD

	1993	1995	1997	1999	2000	2001	2002	2003	CAGR 1993-2003
Australia	120 357	147 391	169 018	189 309	192 840	173 179	146 824	207 179	5.6
Austria	183 655	249 289	209 627	217 375	185 214	206 434	290 670	391 374	7.9
Belgium	126 174	173 333	179 102	259 763	254 603	290 797	327 374	434 628	13.2
Canada	118 815	114 224	171 652	172 084	187 054	193 157	190 302	204 940	5.6
Czech Republic	24 347	38 141	56 232	89 083	123 130	138 319	185 158	243 532	25.9
Denmark	166 819	226 412	201 836	219 798	195 623	189 250	200 420	263 766	4.7
Finland	107 370	154 373	170 816	187 073	165 528	167 442	214 879	272 157	9.7
France	144 728	177 764	168 311	181 786	175 938	193 659	218 933	285 089	7.0
Germany	155 659	212 133	202 659	231 539	213 940	221 918	250 347	313 215	7.2
Greece	71 550	113 808	144 472	163 848	167 633	191 868	219 617	272 809	14.3
Hungary	45 133	68 024	98 217	141 334	152 533	164 809	183 821	237 089	18.0
Iceland	103 237	131 222	162 155	130 962	183 394	165 165	142 859	205 696	7.1
Ireland	78 977	115 177	143 052	128 461	112 464	145 750	214 575	271 776	13.2
Italy	182 763	201 359	254 629	266 888	255 574	297 761	348 662	452 602	9.5
Japan	291 450	313 805	334 776	428 461	494 134	488 650	425 191	458 241	4.6
Korea	115 202	158 735	124 071	155 782	245 586	263 607	230 653	271 750	9.0
Luxembourg	285 081	375 962	369 516	267 665	230 090	250 335	262 893	315 356	1.0
Mexico	158 275	128 777	126 848	129 139	153 021	169 194	187 670	184 720	1.6
Netherlands	186 015	262 273	252 657	225 653	213 675	222 483	270 843	423 616	8.6
New Zealand	138 037	202 496	235 892	308 306	285 117	283 849	304 298	405 182	11.4
Norway	132 343	166 871	169 707	117 971	146 626	180 970	235 232	287 081	8.1
Poland	21 093	29 450	35 476	59 487	78 633	100 513	123 520	151 384	21.8
Portugal	98 685	145 115	190 290	240 725	273 197	321 389	356 605	516 710	18.0
Slovak Republic	12 986	20 225	28 437	27 976	53 227	64 274	81 096	119 577	24.9
Spain	128 881	158 301	195 255	262 763	260 786	307 701	336 280	429 131	12.8
Sweden	174 347	213 034	203 020	253 370	226 321	226 545	372 944	495 350	11.0
Switzerland	295 120	412 247	306 783	361 469	341 234	354 229	403 774	510 680	5.6
Turkey	27 078	24 370	54 431	75 373	85 828	84 664	105 276	130 489	17.0
United Kingdom	129 824	186 411	212 054	274 270	276 514	284 319	279 248	344 157	10.2
United States	182 611	203 877	237 339	247 394	253 153	278 553	313 052	336 792	6.3
OECD average	161 028	194 749	214 662	241 573	252 944	269 174	285 890	330 679	7.5
EU15 average	145 468	191 315	201 019	234 830	226 432	243 628	272 148	349 406	9.2

Notes: EU and OECD are simple averages from partial data.

StatLink: http://dx.doi.org/10.1787/018686455740

Table 9.7. **Mobile employment and productivity indicators, 1999-2003**

	1999			2001			2003		
	Mobile employees	Mobile revenue per employee (USD)	Mobile subscribers per employee	Mobile employees	Mobile revenue per employee (USD)	Mobile subscribers per employee	Mobile employees	Mobile revenue per employee (USD)	Mobile subscribers per employee
Australia		..	..	..	..	..	..	..	..
Austria	4 593	482 332	936	7 721	349 801	847	7 956	575 638	892
Belgium	3 664	436 681	870	5 206	514 053	1 477	5 220	767 735	1 669
Canada	22 257	144 740	311	23 176	178 160	459	23 206	246 242	570
Czech Republic	2 656	319 988	732	6 036	234 311	1 151	6 321	349 242	1 536
Denmark	3 775	263 041	696	5 664	183 090	699	4 355	405 931	1 095
Finland	2 585	614 346	1 266	10 350	173 493	403	6 157	410 604	771
France	12 017	532 011	1 716	22 503	397 883	1 644	28 350	525 899	1 470
Germany	28 100	585 144	834	36 200	424 230	1 550	29 900	765 548	2 167
Greece	2 618	597 377	1 488	4 375	411 966	1 820	5 893	686 970	1 754
Hungary	2 540	300 945	630	3 735	351 287	1 330	4 362	462 096	1 821
Iceland	547	84 392	316	530	195 923	444	530	211 915	528
Ireland	1 000	777 177	1 600	2 700	463 624	1 026	2 785	562 568	1 229
Italy	18 311	479 760	1 642	21 787	569 648	2 345	26 143	716 943	2 169
Japan	18 165	3 304 602	3 129	20 667	3 647 507	3 620	19 935	4 053 284	4 347
Korea	9 960	731 286	2 354	7 804	1 383 897	3 722	7 769	1 713 367	4 324
Luxembourg	58	1 390 877	3 592	189	590 514	2 288	130	1 486 603	4 146
Mexico	11 013	140 028	702	14 241	320 503	1 528	12 959	458 085	2 323
Netherlands	8 000	322 450	849	13 788	299 497	834	11 837	512 581	1 107
New Zealand	1 024	470 100	1 506	1 643	372 602	1 474	1 678	586 246	1 763
Norway	2 458	309 279	1 117	2 869	347 521	1 313	2 445	648 282	1 703
Poland	3 918	361 312	996	3 399	771 138	3 163	9 636	375 357	1 806
Portugal	3 463	447 291	1 349	4 495	482 246	1 775	3 999	923 826	2 336
Slovak Republic	1 531	8 246	434	1 802	196 565	1 192	2 422	296 582	1 519
Spain	8 535	737 609	1 744	11 543	775 666	2 555	12 793	1 125 528	2 929
Sweden	4 198	365 042	1 221	3 752	418 880	1 908	3 752	669 112	2 346
Switzerland	4 550	367 017	672	4 634	495 844	1 138	5 039	657 292	1 228
Turkey	3 785	177 133	2 060	5 636	134 547	3 268	4 840	658 532	5 762
United Kingdom	24 103	326 221	993	37 766	303 931	1 189	37 795	447 626	1 402
United States	170 000	295 012	506	202 100	369 555	636	197 400	445 795	804
OECD	379 424	498 535	948	486 311	527 300	1 254	485 606	680 233	1 527
EU15	125 020	481 989	1 189	188 039	406 286	1 483	187 064	635 197	1 735

Note: Calculated from partial data (see note for Table 9.2).

StatLink: http://dx.doi.org/10.1787/075378333123

Table 9.8. **PTO labour productivity by company, 1999-2003**

Company	1999					2003				
	Employees	Personnel costs (USDm)	Personnel costs per employee (USD)	Revenue (USDm)	Revenue per employee (USD)	Employees	Personnel costs (USDm)	Personnel costs per employee (USD)	Revenue (USDm)	Revenue per employee (USD)
Telstra (Australia)	50 761	2 083	41 027	12 800	252 162	41 941	2 090	49 832	13 818	329 463
Telekom Austria (Austria)	19 347	836	43 206	3 964	204 915	13 890	786	56 587	4 460	321 094
Belgacom (Belgium)	22 071	1 382	62 629	5 152	233 428	17 541	1 175	66 986	6 128	349 353
BCE (Canada)	55 000	..	..	9 540	173 447	64 054	..	..	13 611	212 493
Czech Telecom (Czech Republic)	21 742	219	10 068	1 501	69 053	13 343	276	20 685	1 825	136 776
TDC (Denmark)	17 464	1 098	62 880	5 762	329 913	25 432	1 759	69 165	7 945	312 402
TeliaSonera (in Finland)	9 512	339	35 598	1 841	193 592	6 661	..	..	2 150	322 774
France Telecom (France)	174 262	3 845	22 063	29 000	166 414	221 657	10 626	47 939	51 821	233 789
Deutsche Telekom (Germany)	203 268	9 172	45 125	35 325	173 786	251 263	15 637	62 234	62 739	249 695
OTE (Greece)	21 588	732	33 905	3 622	167 760	17 169	1 218	70 942	5 522	321 626
Matav (Hungary)	15 377	241	15 677	1 623	105 558	15 178	83	5 468	2 724	179 470
Siminn (Iceland)	1 333	49	36 645	191	143 222	1 259	59	46 863	245	194 599
Eircom (Ireland)	12 606	..	..	1 947	154 452	7 943	424	53 380	1 829	230 266
Telecom Italia (Italy)	122 662	5 155	42 026	29 425	239 891	93 187	4 835	51 885	35 051	376 136
NTT (Japan)	223 900	20 192	90 181	91 485	408 600	205 288	..	..	95 709	466 218
Korea Telecom (Korea)	52 533	2 611	49 702	9 914	188 720	38 167	1 505	39 432	9 714	254 513
P&T (Luxembourg)	..	..	..	..	..	..	..	..	..	..
Telmex (Mexico)	72 321	..	..	10 075	139 315	62 103	215	3 462	10 829	174 372
KPN Telecom (Netherlands)	38 550	1 714	44 449	9 722	252 185	31 267	1 913	61 183	14 502	463 812
TCNZ (New Zealand)	5 717	257	44 979	2 299	402 216	6 840	345	50 439	3 128	457 310
Telenor (Norway)	23 470	1 149	48 950	4 291	182 819	19 450	1 350	69 409	7 503	385 758
TPSA (Poland)	74 682	768	10 280	3 315	44 386	42 600	790	18 545	4 701	110 352
Portugal Telecom (Portugal)	16 188	555	34 275	3 429	211 815	24 872	793	31 883	6 490	260 936
Slovak Telecom (Slovak Republic)	..	..	..	..	..	8 094	87	10 749	483	59 674
Telefonica (Spain)	165 397	4 700	28 417	24 459	147 879	148 288	5 215	35 168	31 910	215 189
TeliaSonera (in Sweden)	30 643	1 462	47 722	6 310	205 921	10 948	..	..	5 143	469 766
Swisscom (Switzerland)	21 777	1 515	69 554	7 440	341 645	19 207	1 878	97 777	10 990	572 187
Türk Telekom (Turkey)	72 463	905	12 489	5 479	75 611	61 219	..	..	5 065	82 736
BT (United Kingdom)	136 800	6 929	50 651	35 327	258 241	99 900	7 233	72 402	30 359	303 894
Verizon (United States)	260 000	..	..	64 707	248 873	203 100	..	..	67 752	333 589
Total	1 941 434	67 906	..	419 946	..	1 771 861	60 292	..	514 146	..
Average (mean of partial totals)	69 337	2 829	34 977	14 998	216 307	61 099	2 621	34 027	17 729	290 173

Notes: Personnel costs includes all wages and salaries and personnel related costs. For Telemex it includes only payments to employees. Data for Telia and Sonera reflect merged entities operations in Finland and Sweden following their merger.

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Table 9.9. **US telecommunications employment by occupation, 2002 and projected change to 2012**

Occupation	Employed ('000)	Share (%)	Change 2002-2012 (%)
Management, business, and financial occupations	*176*	*15*	*12*
Top executives	20	2	15
Advertising, marketing, promotions, public relations, and sales managers	14	1	25
Operations specialties managers	24	2	15
Management analysts	13	1	-1
Financial specialists	18	2	14
Professional and related occupations	*169*	*14*	*15*
Computer software engineers	26	2	15
Computer support specialists	12	1	15
Network and computer systems administrators	14	1	17
Electrical and electronics engineers	24	2	11
Electrical and electronic engineering technicians	16	1	4
Sales and related occupations	*164*	*14*	*16*
First-line supervisors/managers of non-retail sales workers	15	1	9
Retail salespersons	23	2	29
Sales representatives, wholesale and manufacturing	42	4	22
Telemarketers	20	2	-17
Office and administrative support occupations	*364*	*30*	*0*
First-line supervisors/managers of office and administrative support workers	29	2	-1
Telephone operators	38	3	-57
Bill and account collectors	13	1	10
Customer service representatives	134	11	20
Production, planning, and expediting clerks	12	1	4
Secretaries and administrative assistants	18	2	-3
Office clerks, general	30	3	-3
Installation, maintenance, and repair occupations	*312*	*26*	*2*
First-line supervisors/managers of mechanics, installers, and repairers	25	2	9
Telecommunications equipment installers and repairers, except line installers	152	13	-7
Telecommunications line installers and repairers	91	8	12
Total (all occupations)	*1 201*	*100*	*7*

Note: Totals may be affected by the omission of occupations with little employment.
Source: US Bureau of Labor Statistics (www.bls.gov)

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Chapter 10

Trade in Communication Equipment

OECD trade in communication equipment grew again in 2003 after two years of decline. Communication equipment trade has been expanding faster than total merchandise trade, suggesting the increasing globalisation of equipment manufacturing activities. A growing share of communication equipment imports into OECD countries are from non-member countries. This chapter examines the importation and exportation of communications equipment. It also provides statistics on the composition and direction of communications equipment trade.

OECD trade in communication equipment is now recovering from the recent downturn which had impacted the industry, with growth returning in 2003 after two years of decline. On trend, communication equipment trade has been growing faster than total merchandise trade, suggesting the increasing globalisation of equipment manufacturing activities. Since the peak of communication equipment trade activity in 2000, a growing share of imports into OECD countries are being sourced from non-member countries, suggesting increasing locational specialisation and the transfer of some electronics manufacturing activities to lower-wage locations, particularly in Asia. Recent trends also reflect the impacts of the downturn on particular firms and thereby on their host countries (*e.g.* Sweden). Nevertheless, Korea, the United States, Germany, Japan and Mexico continue to be leading exporters of communication equipment. Indeed, OECD member countries still provide around 70% of the communication equipment imports into OECD countries while sending almost 30% of their exports to non-member countries.

Trade in communication equipment

OECD trade in communication equipment (defined as the sum of exports and imports) reached USD 330 billion in 2003, up from USD 191 billion in 1996. During 2003,

Box 10.1. **The definition of communication equipment used for this analysis**

In 2003, the OECD moved to a definition of information and communication technology (ICT) equipment based upon the harmonised system of commodity classification (HS 1996).* Previous *Communication Outlooks* have used an industry-based definition (based upon SITC Revision 3), but as a result of the wider definitional changes this report uses the commodity-based HS 1996 definition. While every effort has been made to achieve as close a concordance as possible, moving to a more detailed classification system inevitably involves the exclusion of some items previously included (*e.g.* parts and components that are not specifically for communication equipment).

The new definition of communication equipment includes three major categories: telecommunications, broadcasting and other communication equipment:

- telecommunications equipment includes: telephone sets, customer premises equipment and mobile and related reception apparatus (851711, 851719, 851721, 851722, 852020 and 852790); and telecommunications line equipment (851730, 851750, 851780 and 851790).
- broadcasting equipment includes: radio reception and related equipment (852713, 852719, 852721, 852729, 852731, 852732 and 852739); television reception and related equipment (852812, 852813, 852821 and 852822); and transmission equipment relating to radio, television, radio-telephony and radio-telegraphy (852510 and 852520); and
- other communication equipment includes: a range of parts, cables, aerials and radar apparatus (852610, 852990, 852910, 854420 and 854470).

* OECD (2003) *A Proposed Classification of ICT Goods*, DSTI/ICCP/IIS(2003)1/REV2, Paris.

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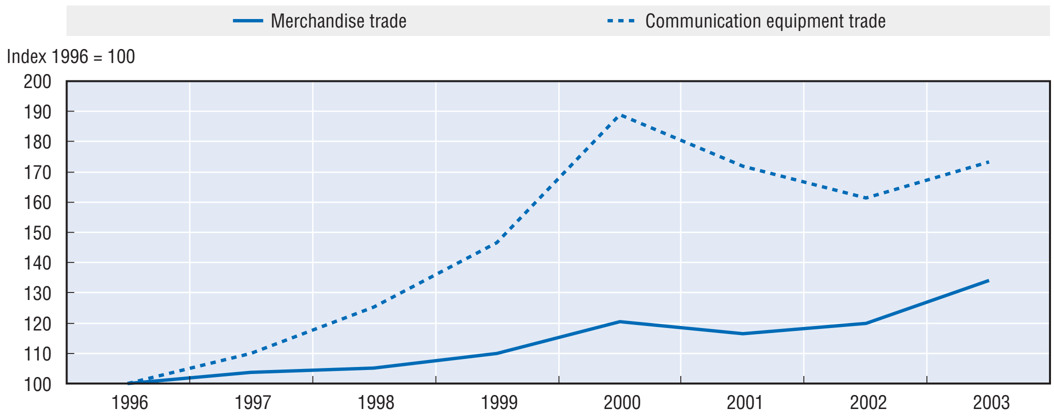
Figure 10.1. **Communication equipment and merchandise trade, 1996-2003**
USD, indexed 1996 = 100



Source: OECD International Trade Statistics Database.

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communication equipment accounted for 3.2% of the total merchandise trade of OECD countries, up from 2.5% in 1996, but down on the peak of 3.9% reached during in 2000. Nevertheless, over the period from 1996 to 2003, OECD trade in communication equipment increased by 8.2% per annum, compared with a 4.3% per annum increase in total merchandise trade (Figure 10.1). Annual growth rates for communication equipment trade reveal the impact of the "dot com" and related communications investment boom, and the subsequent decline. During 1999 and 2000 communication equipment trade increased by 17% and 29%, respectively. There was a 9% contraction in communication equipment trade during 2001, and a further 6% contraction during 2002. Data suggest a return to growth, with communication equipment trade growing by 7.5% during 2003.

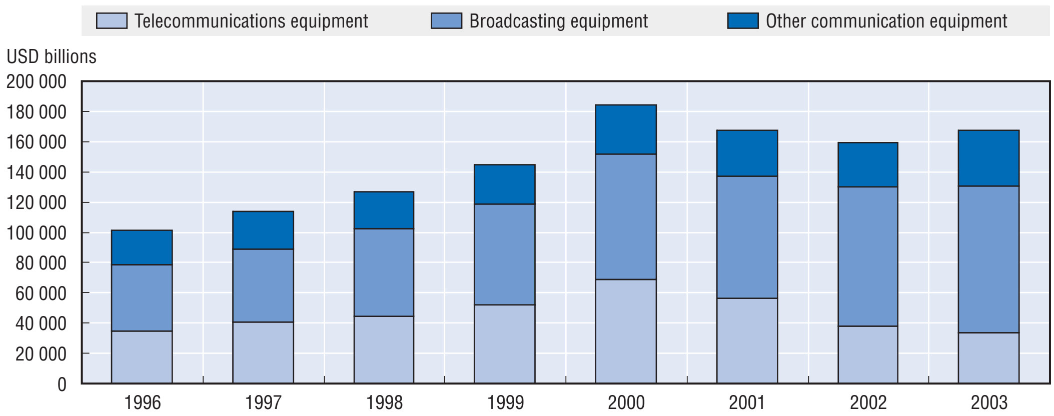
In 2003, broadcasting related equipment accounted for the largest share of communication equipment trade (59%), telecommunications equipment accounted for 21% and other communication equipment and parts for 20%. Over the period 1996 to 2003, trade in broadcasting equipment increased by 12.1% per annum, trade in other communication equipment and parts by 7.8% per annum and trade in telecommunications equipment by a slower 1.4% per annum. Customer premises equipment and handsets were the only category of communication equipment in which there was a decline in trade over the 1996 to 2003 period, with trade worth more than USD 13 billon during 1997 falling to little more than USD 8 billion during 2003. Telecommunications equipment trade has been more affected by the recent cyclical trends than other categories, both growing more rapidly during 1999 and 2000 and declining more rapidly during 2001 and 2002. Broadcasting and other communications equipment categories show a more limited decline and faster return to growth.

Exports of communication equipment

Exports of communication equipment from OECD countries were worth USD 167 billion during 2003, up by 7.5% per annum from USD 101 billion in 1996 (Table 10.1). During the boom year of 2000, OECD exports of communication equipment increased by 27%, before declining 9% and 5% during 2001 and 2002, respectively. Data for 2003 show a return to growth, with a 5.1% increase in exports. OECD exports of

Figure 10.2. **Composition of OECD communication equipment exports, 1996-2003**

USD billions



Source: OECD International Trade Statistics Database.

StatLink: http://dx.doi.org/10.1787/643840542858

broadcasting equipment have grown by almost 12% per annum since 1996, to USD 97 billion, and during 2003 they accounted for 58% of total communication equipment exports. Telecommunications and other communication equipment exports were each worth around USD 35 billion in 2003, although the latter have been increasing faster and thereby increasing their share of total communication equipment exports (Figure 10.2).

Korea, the United States, Germany, Japan and Mexico are among the largest exporters of communication equipment, each earning export revenues of between USD 13 billion and USD 20 billion during 2003. Communication equipment exports have increased over that period from all countries except Sweden and Switzerland – each of which exported less communication equipment in 2003 than they had in 1996. Those countries experiencing the most rapidly increasing communication equipment exports between 1996 and 2003 included: Iceland (from a low base), Hungary, the Czech Republic, Poland, Turkey and Greece (Table 10.2).

In 2003, communication equipment accounted for an average 3.1% of OECD merchandise exports, but it accounted for a much larger share of merchandise exports for some countries than others. For example, communication equipment accounted for almost 18% of total merchandise exports from Finland during 2003, more than 14% of exports from Hungary and 9% of exports from Mexico. By contrast, they accounted for less than 1% of total merchandise exports from Iceland, Australia, New Zealand, Switzerland, Norway and the Slovak Republic (Figure 10.3).

Those countries specialising in communications equipment exports in the mid 1990s have generally become more specialised. Of the seven countries with above average communications equipment export shares in 2003, all but Sweden have increased their production of communications equipment for export since 1996. Of those countries for which communications equipment accounted for less than 2% of merchandise trade in 2003, twelve increased their level of specialisation.

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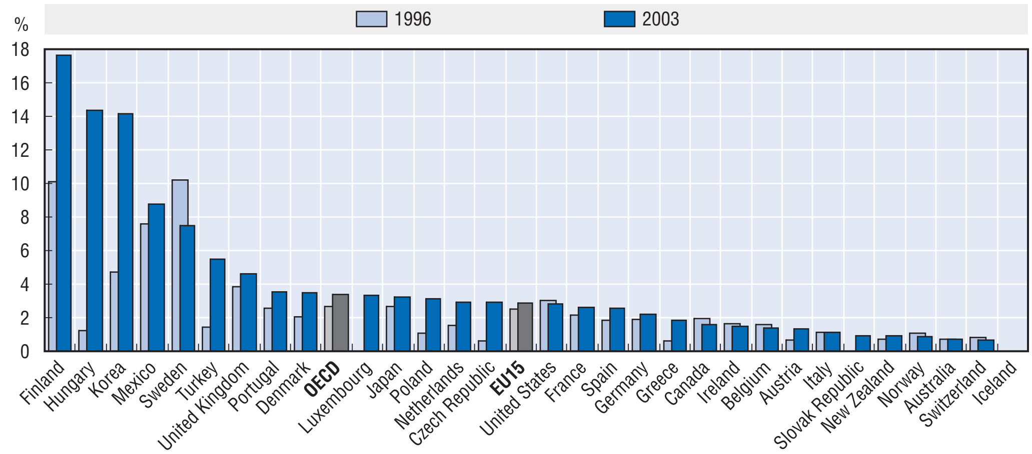
Figure 10.3. **Share of communication equipment exports in total merchandise exports, 1996-2003**

Percentage



Source: OECD International Trade Statistics Database.

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Imports of communications equipment

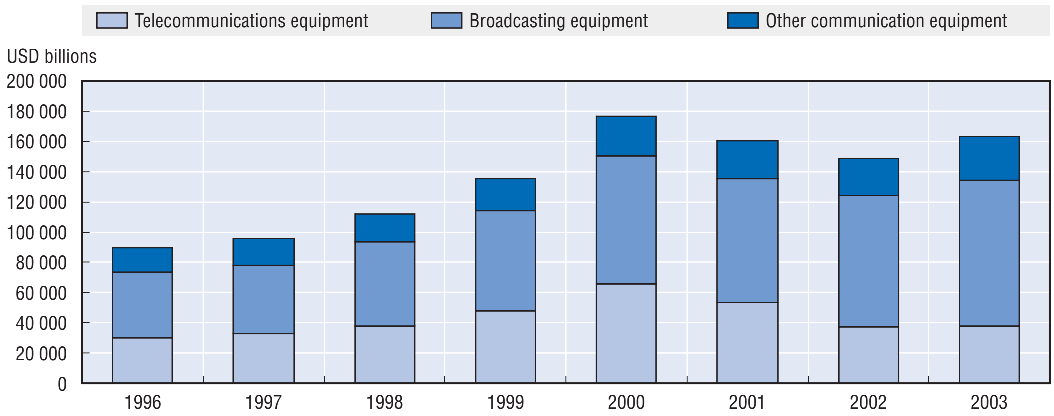
Imports of communication equipment into OECD countries were worth USD 163 billion during 2003, up by 8.9% per annum from USD 90 billion in 1996 (Table 10.1). During the boom year of 2000, OECD imports of communication equipment increased by more than 30%, before declining 9% and 7.5% during 2001 and 2002, respectively. Data for 2003 show a return to growth, with a 7.9% increase in imports during the year. Broadcasting equipment has been the fastest growing category of communication equipment imports, having increased by more than 12% per annum since 1996 – such that they accounted for 59% of all communication equipment imports during 2003 (USD 97 billion). Telecommunications equipment accounted for around 23% of communications equipment imports in 2003 (USD 38 billion) and other communication equipment imports for 18% (USD 29 billion) (Figure 10.4).

Those OECD countries importing more than USD 5 billion worth of communication equipment during 2003 included: Canada, France, Germany, Italy, Japan, Mexico, Netherlands, Spain, United Kingdom and the United States. The largest importers were the United States (USD 52 billion), Germany (USD 14 billion) and United Kingdom (USD 14 billion). Hence, in 2003, the United States accounted for one-third of all imports of communication equipment into OECD countries (Table 10.3). Imports of communication equipment into Austria, Finland, Greece, Hungary, Ireland, Mexico, Poland, and the United States grew by 10% per annum or more between 1996 and 2003, reflecting a mixture of infrastructure investment and importation of components and parts for assembly and re-export.

Communication equipment accounted for an average 3% of OECD merchandise imports during 2003, but there was some variation between countries. It accounted for 4% or more of total merchandise imports into Australia, Denmark, Finland, Hungary and Sweden while accounting for less than 2% of merchandise imports into Belgium, Switzerland and the Slovak Republic. Reflecting the increasing information and

Figure 10.4. **Composition of OECD communication equipment imports, 1996-2003**

USD billions

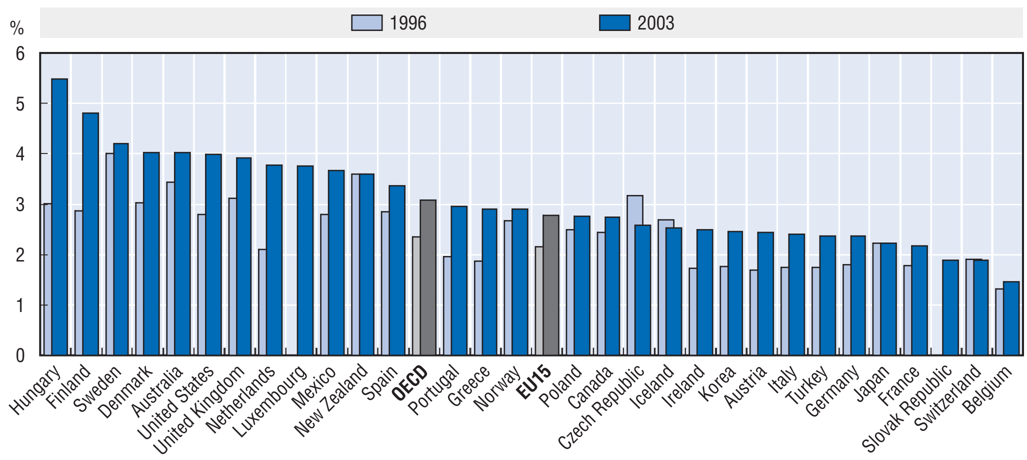


Source: OECD International Trade Statistics Database. *StatLink:* http://dx.doi.org/10.1787/767248756588

communication intensity of economic activities, communication equipment accounted for a higher share of merchandise imports in 2003 than it had in 1996 in all but four of the 30 OECD countries – namely, the Czech Republic, Iceland, Japan and Switzerland (Figure 10.5).

Figure 10.5. **Share of communication equipment imports in total merchandise imports, 1996-2003**

Percentage



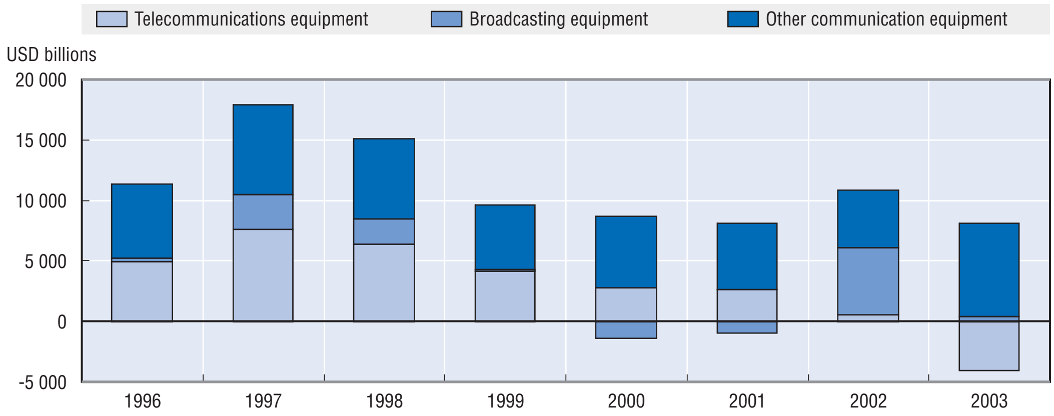
Source: OECD International Trade Statistics Database. *StatLink:* http://dx.doi.org/10.1787/388522217146

Balance of trade in communication equipment

Taken together, OECD countries have run a surplus on trade in communication equipment throughout the 1996 to 2003 period (Table 10.4). The overall surplus was worth USD 4 billion in 2003, down from the peak of more than USD 17 billion reached

Figure 10.6. **Composition of OECD communication equipment trade balance, 1996-2003**

USD billions



Source: OECD International Trade Statistics Database.

StatLink: http://dx.doi.org/10.1787/168268223075

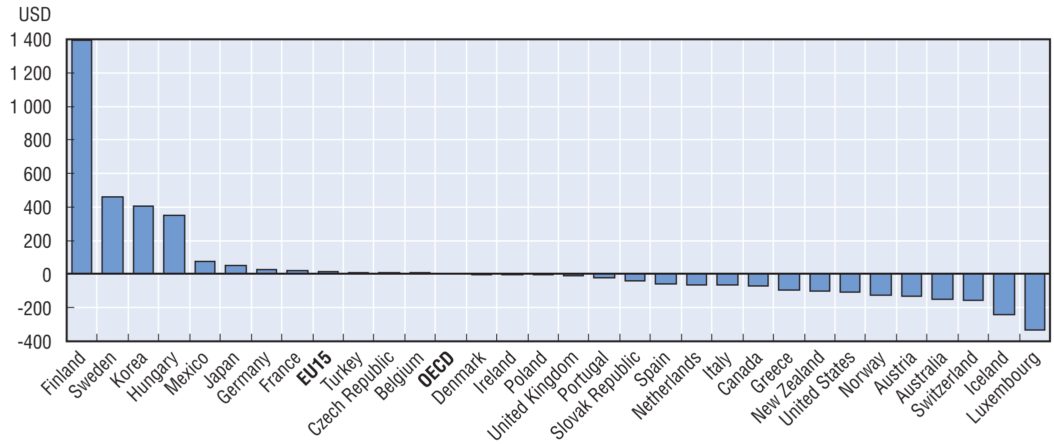
during 1997. During 2003, OECD countries had a surplus of USD 7.7 billion on trade in other communication equipment (cables and parts), a USD 0.4 billion surplus on trade in broadcasting equipment and a USD 4 billion *deficit* on trade in telecommunications equipment. Within telecommunications equipment, the deficit on handsets and customer premises equipment was smaller than that on line and switching equipment. Similarly, within the broadcasting equipment categories, OECD countries experienced a significant deficit on trade in reception equipment and a strong surplus on trade in transmission equipment relating to radio, television, radio-telephony and radio-telegraphy (Figure 10.6).

There is significant variation in the communication equipment trade balance from country-to-country. Those countries with the largest surpluses on trade in communication equipment in 2003 included: Korea (USD 19.3 billion), Mexico (USD 8.0 billion), Finland (USD 7.3 billion) and Japan (USD 6.6 billion). Those countries with the largest deficits on trade included: the United States (USD 32 billion), Italy (USD 3.7 billion) and Australia (USD 2.9 billion). Trends also vary with Korea experiencing the most rapidly growing surplus on trade in communication equipment over the 1996 to 2003 period, while the United States, Portugal, Italy, Canada and Netherlands were among those experiencing the most rapidly increasing deficits.

On a per capita basis, Finland's strong performance as an exporter of communication equipment is apparent – with a surplus on trade in communication equipment of almost USD 1 400 per inhabitant during 2003 (Figure 10.7). Sweden, Hungary, Korea and Mexico also show strongly as exporters of communication equipment. Deficits on trade in communication equipment of USD 100 per inhabitant or more were experienced in Australia, Austria, Iceland, Luxembourg, New Zealand, Norway, Switzerland and the United States.

Figure 10.7. **Communication equipment trade surplus/deficit per capita, 2003**

USD



Source: OECD International Trade Statistics Database.

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Composition of trade in communication equipment

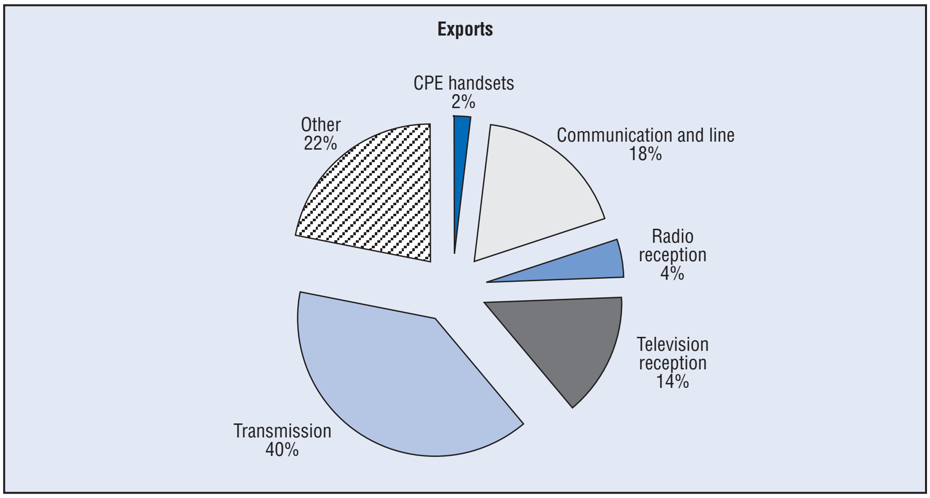
Across the OECD, transmission equipment (including that relating to radio, television and mobile telephony and telegraphy) accounted for the largest share of both exports and imports during 2003 – 40% and 33%, respectively (Figure 10.8). Other communication equipment (including a range of cables, parts and communication related apparatus) accounted for 22% of exports and 18% of imports; telecommunications line and switching equipment for 18% of exports and 20% of imports; television reception equipment for 14% of exports and 16% of imports; radio reception equipment for 4% of exports and 10% of imports; and customer premises equipment and handsets for 2% of exports and 3% of imports (Tables 10.5 and 10.6). Over time, there has been a clear trend for line, switching and transmission equipment to account for a larger share of OECD country exports, and end user line telephony and radio and television reception equipment to account for less – as the manufacture and assembly of these categories of equipment has shifted to lower wage locations.

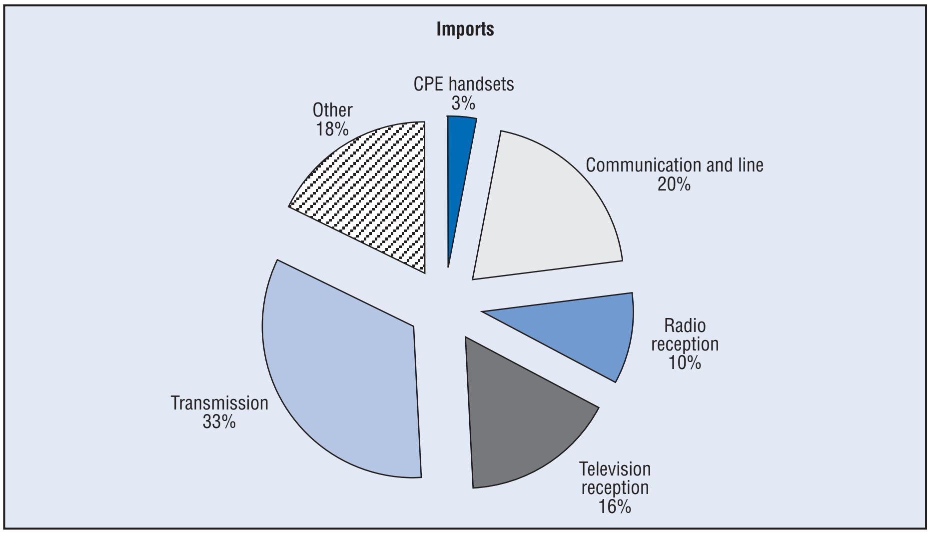
Tables 10.7 to 10.9 provide a detailed breakdown of OECD trade in telecommunications, broadcasting and other communication equipment. They reveal that:

- The largest exporters of *telecommunications equipment* during 2003 included the United States, Germany, United Kingdom, Canada, Sweden and Mexico. The largest importers of telecommunications equipment included: the United States, the United Kingdom, Germany, Japan, the Netherlands and Canada (Table 10.7). Those countries achieving the fastest growth in telecommunications equipment exports during the seven years to 2003 included: Hungary, Iceland, the Czech Republic, Poland, Greece, Portugal and Mexico while the Slovak Republic and Austria suffered the most rapid declines in telecommunications equipment exports.
- The largest exporters of *broadcasting equipment* during 2003 included Korea, Mexico, Germany, the United Kingdom, Finland, the United States and Japan (Table 10.8). The largest importers of broadcasting equipment included: the United States, Germany, the

Figure 10.8. **Composition of communication equipment, 2003**

Percentage





Source: OECD International Trade Statistics Database. *StatLink:* http://dx.doi.org/10.1787/711102640086

United Kingdom, France, Italy, Spain, Canada and the Netherlands. The Czech Republic, Iceland, Hungary, Korea, Austria, the Slovak Republic and Turkey achieved the most rapid growth in broadcasting equipment exports over the seven years to 2003, while Sweden suffered the fastest decline.

- The largest exporters of *other communication equipment* (*i.e.* cables, parts and a range of communication related equipment) during 2003 included Japan, the United States, Korea, Germany, France, Sweden, the United Kingdom, the Netherlands, Italy and Finland (Table 10.9). The largest importers included: the United States, Japan, Germany, Mexico, Korea, the United Kingdom, France, Canada and Sweden. Iceland, Hungary, Korea and the Czech Republic experienced strong growth in exports of other communication equipment, while, of the larger exporters, the Slovak Republic, Sweden and Mexico suffered declining exports.

Direction of trade

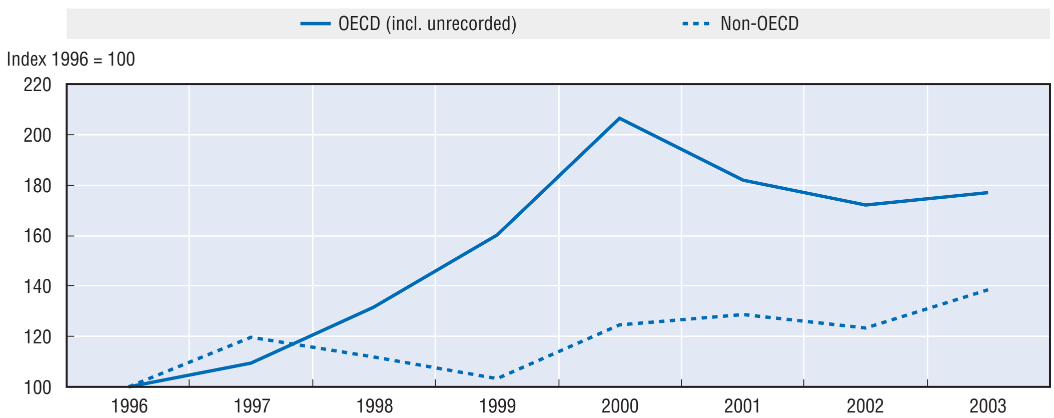
The direction of trade in communication equipment reveals evolving patterns of trade between OECD and non-OECD countries. Those patterns reflect the impacts of the "Asian Crisis" of the mid 1990s, the "dot com" and related communication infrastructure investment boom of the late 1990s and a subsequent global rationalisation of communication equipment production.

Direction of communication equipment exports

Over the period 1996 to 2003, total OECD country exports of communication equipment increased 7.5% per annum, with those to other member countries increasing 8.5% per annum and those to non-member countries increasing 4.8% per annum (Table 10.10). In the mid 1990s, OECD exports to non-member countries were increasing faster than exports to member countries. Since 1997, however, the opposite has been the case, with OECD exports to member countries increasing faster than those to non-members (Figure 10.9). These trends appear to reflect the impacts of the "Asian Crisis", the strength of communication infrastructure investment in OECD countries during the boom years of the late 1990s and, more recently, the relative growth rates of member and non-member economies.

Figure 10.9. **OECD communication equipment exports by region, 1996-2003**

USD, indexed 1996 = 100



Source: OECD International Trade Statistics Database. *StatLink:* http://dx.doi.org/10.1787/628134886512

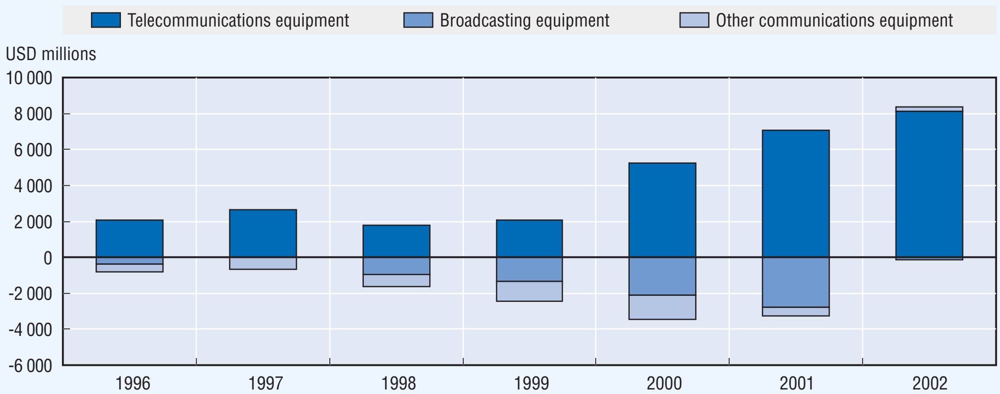
In 1996, member countries took 70% of OECD country communication equipment exports, and non-member countries took the remaining 30%. In the boom year of 2000, the share taken by member countries increased to 79% as the "dot com" boom and related communication infrastructure investment absorbed an increasing share of OECD-produced communication equipment. By 2003, the OECD member country share of OECD-produced communication equipment exports had fallen back to 75%. In 2003, non-member

Box 10.2. **China's trade in communication equipment, 1996-2002**

China's trade in communication equipment increased by 20% per annum between 1996 and 2002. Exports increased by 22% per annum from USD 5.7 billion in 1996 to USD 19 billion in 2002, while imports increased 16% per annum from USD 4.4 billion to almost USD 11 billion (Table 10.14). By 2002, communication equipment exports accounted for a growing 5.8% of China's total merchandise exports and a shrinking 3.6% of imports.

Figure 10.10. **Figure China's balance of trade in communication equipment, 1996-2002**

USD millions



Source: OECD International Trade Statistics Database. *StatLink:* http://dx.doi.org/10.1787/346334208524

Broadcasting equipment (including radio and television reception apparatus and a range of related transmission equipment) was the largest category of communication equipment exports from China during 2002, accounting for more than 60%. China's exports of transmission related equipment amounted to more than USD 6 billion, radio reception equipment exports USD 3 billion and television reception equipment exports USD 2.3 billion. China's exports of broadcasting related equipment have grown by 21% per annum since 1996. Reflecting China's role in global production systems, the largest category of communication equipment imports into China during 2002 was "other", which includes a range of wire and cable (infrastructure) and parts (components and sub-assemblies). During 2002, China realised an overall surplus on trade in communication equipment of more than USD 8 billion.

countries were the destination for 25% of OECD country communication equipment exports. Within that total, non-member countries took 28% of OECD country telecommunications equipment exports, 21% of broadcasting equipment exports and 33% of other communication equipment exports (including a range of wire, cable, parts and communication related equipment).

Location and the patterns of global production exhibited by particular communication equipment manufacturing firms influence the relative shares of country exports taken by member and non-member countries. Those countries with relatively high shares of exports going to non-member countries in 2003 included Greece, Iceland, Japan, Finland, Sweden, Korea and France. Those with relatively low shares of exports going outside the OECD included Luxembourg, Mexico, the Czech Republic, Poland, Portugal, the Slovak Republic, the Netherlands and Belgium, *i.e.* those countries located near other member countries and/or those with deep trade relationships with other member countries (Table 10.12).

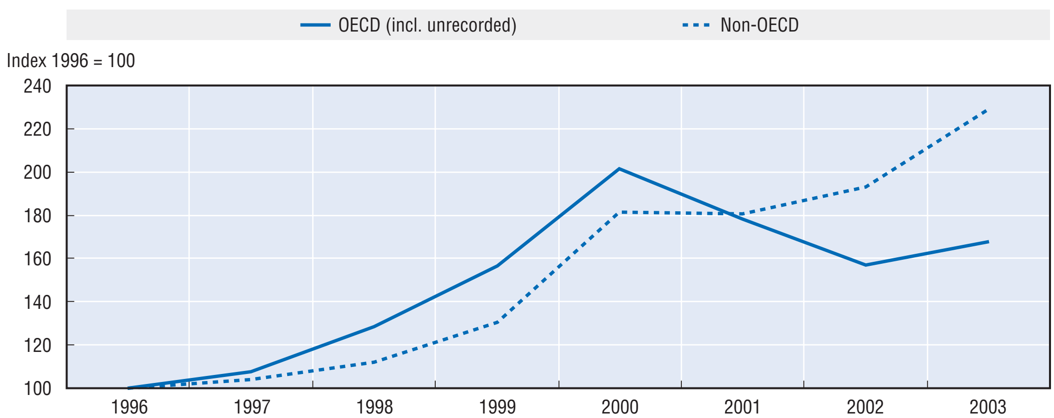
Direction of communication equipment imports

Import trends reveal more than export trends about the recent investment cycle and globalisation of communication equipment manufacturing activities. During the boom years of the late 1990s, OECD countries drew in communication equipment imports from all sources, including both member and non-member countries (Table 10.11). Since 2000, however, relative member and non-member country economic growth rates and the rationalisation of equipment production has seen OECD countries source an increasing share of their communication equipment imports from non-member countries (Figure 10.11). Between 1996 and 2003, communication equipment imports into OECD countries from other OECD countries increased by nearly 8% per annum, while imports from non-member countries increased by almost 13% per annum. In 1999, non-member countries supplied 20% of communication equipment imports into the OECD (USD 27 billion). By 2003, that share had increased to 29% (USD 48 billion).

By country, the share of communication equipment imports sourced from non-member countries during 2003 ranged from 1% (Luxembourg) to more than 71% (Japan). Other countries with relatively high shares of imports from non-member countries included: Hungary, Finland, the United States, the Czech Republic, Korea, Australia, New Zealand and Germany (Table 10.13). Again these patterns reflect the countries' location and role in global electronics production. Among those most rapidly increasing their share of communication equipment imports sourced from outside the OECD have been Hungary, Finland, the Czech Republic, Japan and Korea. Eight countries sourced a lower share of communication equipment imports from non-member countries in 2003 than they had

Figure 10.11. **OECD communication equipment imports by region, 1996-2003**

USD, indexed 1996 = 100



Source: OECD International Trade Statistics Database.

StatLink: http://dx.doi.org/10.1787/468645437382

Box 10.3. **Globalisation of communication equipment manufacturing activities**

Communication equipment manufacturers locate to take advantage of local skills and lower costs, and for access to markets. The international activities of affiliates of major multinationals are indicative.

In 2001, almost 58% of employees of Swedish-owned telecommunications equipment manufacturing enterprises were located abroad – with some 59 218 employees located abroad, compared with 43 612 in Sweden (ITPS 2003, p. 47).[1] In 2003, Ericsson employed 24 408 people in Sweden and a further 27 175 (53%) outside Sweden, of which 6 468 were located in the Asia-Pacific region, 4 460 in North America and 2 276 in Latin America. Similarly, in 2003, Nokia employed 51 605 people, of which 22 626 (44%) were in Finland, 11 479 were in other European countries, 9 947 in the Americas and 7 553 in the Asia-Pacific region.

In 2002, US communication equipment manufacturing parent firms and their affiliates employed 232 500 people, of which 103 700 (45%) were located outside the United States (BEA 2004).[2] During 2003, nearly three-quarters of Motorola's handsets were manufactured in Asia (including those manufactured by third parties). Of Motorola's USD 32 billion assets, USD 3 177 (10%) were located in China and a further USD 9 441 (30%) in other countries outside the United States. Lucent also had 11 500 (34%) of its employees located outside the United States in late 2003. Conversely, almost 70% of Nortel's assets were located in the United States in 2002, with 16% located in Canada and remainder elsewhere.

During 2003, Siemens employed an average 419 300 people in 190 countries. Around 170 000 (40%) were located in Germany, 108 000 (26%) were located elsewhere in Europe, 87 000 in the Americas and 44 000 in the Asia-Pacific region. Similarly, in 2003, Alcatel employed 60 486 people, of which 18 989 (just over 30%) were in France, 20 360 (34%) were elsewhere in Europe, 9 075 (15%) were in North America, 8 716 (14%) were in Asia and the remaining 3 346 were located elsewhere around the world.

1. ITPS (2003) *Swedish-owned enterprises with subsidiaries abroad 2001*, Swedish Institute for Growth Policy Studies Report S2003:006. Available *www.itps.nu/* accessed September 2004.
2. BEA (2004) *US Direct Investment Abroad: Financial and Operating Data for US Multinational Companies,* Bureau of Economic Analysis, Washington DC. Available at: *www.bea.gov/bea/di/di1usdop.htm*, accessed September 2004.

Source: OECD, compiled from ISTP (2003), BEA (2004), company annual reports and SEC filings.

in 1996. In 2003, non-member countries were the source of 29% of OECD country communication equipment imports. Within that total, non-member countries supplied 32% of telecommunications equipment imports, 29% of broadcasting equipment imports and 27% of other communication equipment imports (including a range of wire, cable, parts and communication-related equipment).

Globalisation of production

In the era of national monopoly provision of telecommunication services, many carriers pursued local purchasing policies. As a result, telecommunications equipment manufacturing took on a multi-domestic form, with major equipment manufacturers locating manufacturing activities in many countries. Deregulation of telecommunication services brought an end to local purchasing and the global rationalisation of equipment manufacturing, with consolidation of production activities in fewer locations and locational specialisation within activities.

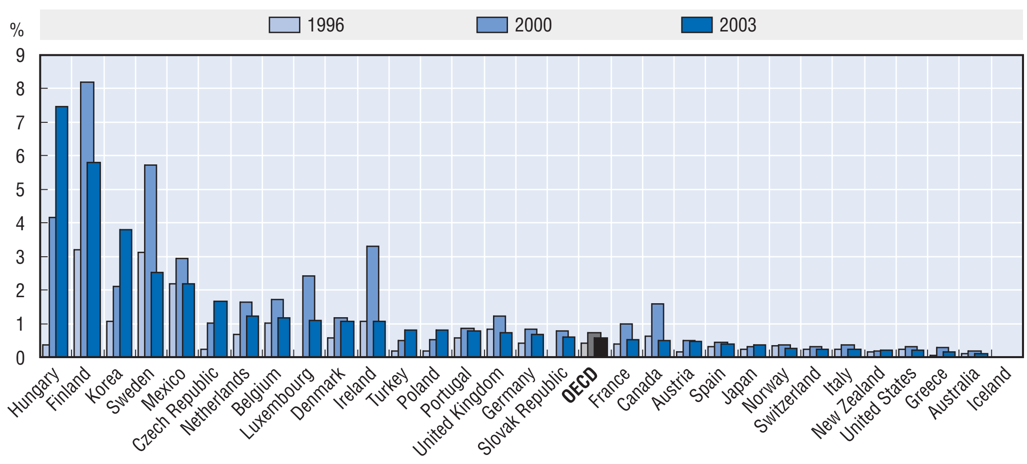
Across the OECD, communication equipment exports were equivalent to 0.57% of GDP in 2003, up from 0.42% in 1996 – reflecting the increasing intensity of production and use of ICTs. Global rationalisation of communication equipment manufacturing is evident in that eight OECD countries had a higher than average increase in the ratio of communication equipment exports to GDP, while 22 had a lower than average increase and in nine countries the ratio of communication equipment exports to GDP actually fell (Australia, Canada, Ireland, Italy, Norway, Sweden, Switzerland, the United Kingdom and the United States). The picture is somewhat clouded by the recent downturn, with many countries showing a strong growth in the ratio of communication equipment exports to GDP between 1996 and 2000, followed by a fall between 2000 and 2003 in all countries but the Czech Republic, Hungary, Japan, Korea, Poland and Turkey. This reveals the effects of either a severe decline in their major markets (*e.g.* Mexico) or the performance of particular communication equipment firms (*e.g.* Sweden and Finland). The continued growth of communication exports to GDP in several countries reflects their expanding manufacturing capabilities and the partial shift of the manufacturing value chain to lower-cost locations (Figure 10.12).

A similar picture emerges from an examination of the share of communication equipment trade in total merchandise trade (Figure 10.13). Seven OECD countries experienced an above average increase in the share of communication equipment trade in total trade between 1996 and 2003, and 23 experienced a decline. Finland, Hungary, Korea, Mexico and Sweden had the highest share of communication equipment trade in total merchandise trade in 2003, reflecting their strength as producers.

The ratio of exports to imports also indicates relative strength in production of a particular commodity for export. In 2003, 11 OECD countries had an export to import ratio greater than one, suggesting specialisation in communication equipment production. Korea, Finland, Hungary, Mexico and Sweden were among the most specialised in the production of communication equipment for export, while Iceland, Australia, Greece and New Zealand were among the least specialised (Figure 10.14).

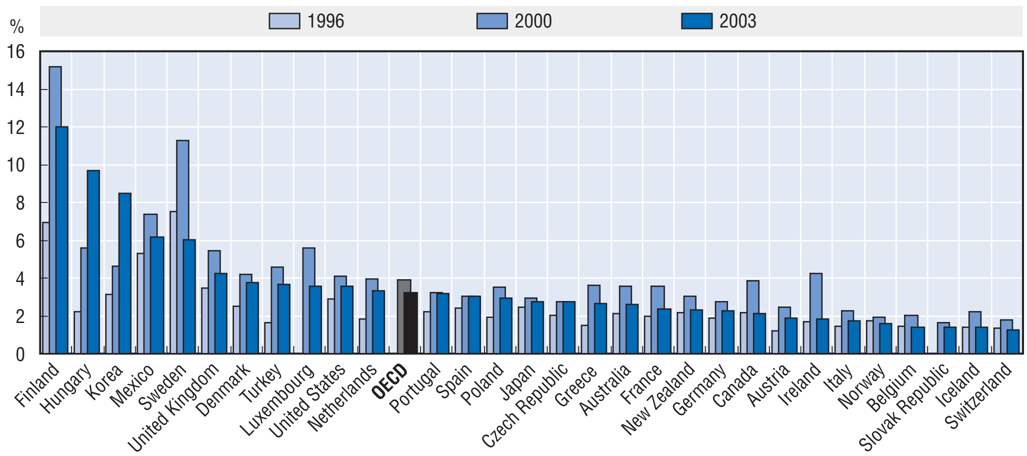
Figure 10.12. **Communications equipment exports as a share of GDP, 1996-2003**

Percentage



Source: OECD International Trade Statistics Database. *StatLink:* http://dx.doi.org/10.1787/024348474032

Figure 10.13. **Communication equipment trade as a share of total trade, 1996-2003**

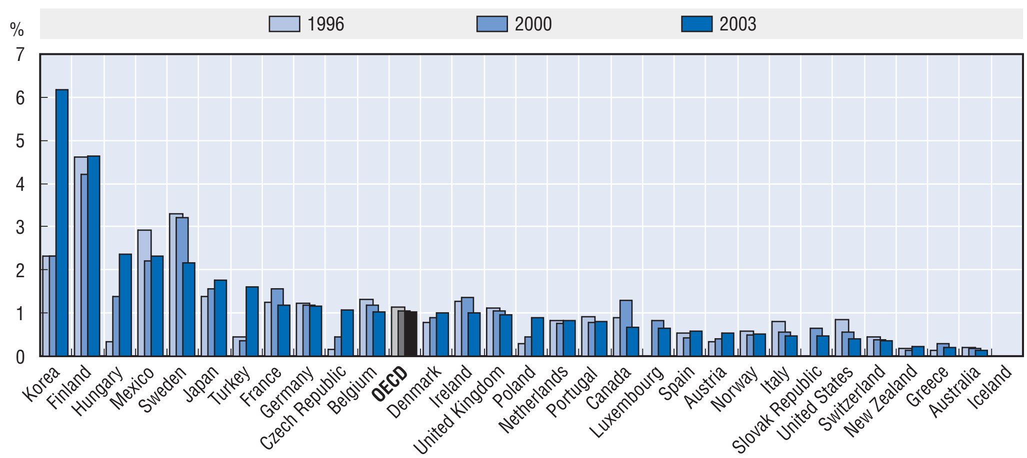


Source: OECD International Trade Statistics Database.

StatLink: http://dx.doi.org/10.1787/261842846156

Figure 10.14. **Communication equipment export/import ratio, 1996-2003**

Percentage



Source: OECD International Trade Statistics Database.

StatLink: http://dx.doi.org/10.1787/518854034415

Communication equipment trade, especially in the categories of equipment relating to telecommunications, reflects the recent cycle in which rapid investment expenditure in the late 1990s was followed by a severe downturn in demand during 2001 and 2002. Data for trade in 2003 reveal a recovery and return to growth. Despite the recent downturn, communication equipment manufacturing continues to globalise, with increasing locational specialisation within, and increasingly, outside the OECD. Indeed, in some categories of communication equipment, the recovery in demand is bringing increased sourcing from outside the OECD – reflecting the shift of some electronics manufacturing and assembly activities to lower wage locations.

Table 10.1. **OECD communications equipment trade summary, 1996-2003**
USD millions

	1996	1997	1998	1999	2000	2001	2002	2003	CAGR 1996-2003
Exports									
Telecommunications equipment	34 822	40 584	44 281	52 033	68 744	56 343	37 955	33 552	-0.5
CPE/handsets	5 674	6 439	6 017	5 538	5 275	3 824	3 348	3 052	-8.5
Communications equipment	29 148	34 145	38 264	46 495	63 469	52 519	34 607	30 501	0.7
Broadcasting equipment	43 833	48 073	57 923	66 653	83 271	80 803	92 313	97 128	12.0
Radio	7 383	7 086	7 018	7 480	7 640	6 819	7 294	7 293	-0.2
Television	14 753	15 518	17 167	16 707	18 982	19 285	21 084	24 234	7.3
Transmission equipment	21 697	25 469	33 738	42 466	56 649	54 700	63 935	65 601	17.1
Other communication equipment	22 523	25 162	24 863	26 160	32 022	30 570	29 128	36 791	7.3
Total	101 177	113 819	127 067	144 846	184 037	167 717	159 396	167 472	7.5
Communications share in total merchandise exports (%)	2.7	2.9	3.2	3.5	4.1	3.9	3.6	3.4	
Imports									
Telecommunications equipment	29 900	32 972	37 912	47 858	65 943	53 719	37 392	37 643	3.3
CPE/handsets	6 626	6 802	6 296	6 390	6 347	5 237	4 713	5 016	-3.9
Communications equipment	23 274	26 170	31 617	41 468	59 596	48 482	32 679	32 627	4.9
Broadcasting equipment	43 539	45 200	55 802	66 568	84 675	81 765	86 780	96 726	12.1
Radio	14 400	14 436	15 225	15 787	17 102	16 060	16 415	15 991	1.5
Television	13 577	14 227	17 678	17 799	19 951	20 497	23 078	26 587	10.1
Transmission equipment	15 562	16 537	22 899	32 982	47 622	45 208	47 287	54 147	19.5
Other communication equipment	16 350	17 773	18 266	20 770	26 138	25 073	24 345	29 090	8.6
Total	89 789	95 944	111 981	135 195	176 756	160 557	148 517	163 459	8.9
Communications share in total merchandise imports (%)	2.3	2.4	2.8	3.1	3.7	3.5	3.1	3.1	

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/620728233180

Table 10.2. **Communication equipment exports, 1996-2003**
USD millions

	1996	1997	1998	1999	2000	2001	2002	2003	CAGR 1996-2003
Australia	446	602	422	478	734	615	308	459	0.4
Austria	379	694	599	592	929	769	929	1 181	17.6
Belgium	2 733	2 570	3 239	2 968	3 888	4 363	3 044	3 507	3.6
Canada	3 722	4 308	4 478	6 062	11 253	5 734	4 609	4 333	2.2
Czech Republic	132	128	273	217	518	1 122	1 136	1 414	40.3
Denmark	1 048	1 299	1 586	1 751	1 867	1 852	2 813	2 253	11.6
Finland	4 088	4 777	6 396	7 227	9 797	7 848	8 277	9 270	12.4
France	6 185	7 543	9 685	10 613	13 042	11 020	9 919	9 283	6.0
Germany	9 846	11 282	11 113	13 171	15 537	16 350	16 549	16 474	7.6
Greece	69	111	156	172	320	246	228	253	20.3
Hungary	163	483	750	941	1 941	2 955	4 454	6 177	68.0
Iceland	0.01	0.03	0.1	0.2	1	1	1	0.5	72.1
Ireland	782	1 192	1 732	3 543	3 117	3 038	2 254	1 295	7.5
Italy	2 905	3 122	3 466	3 582	3 892	4 554	3 291	3 278	1.7
Japan	10 854	11 459	10 813	12 129	15 422	12 543	11 003	15 141	4.9
Korea	5 887	5 382	5 045	7 819	10 744	12 779	16 220	23 024	21.5
Luxembourg*	..	..	..	229	471	722	551	285	5.6
Mexico	7 281	8 587	10 356	12 279	17 034	17 494	16 487	14 069	9.9
Netherlands	2 794	2 727	2 951	4 174	6 009	5 500	2 958	5 129	9.1
New Zealand	100	121	112	94	98	78	86	125	3.2
Norway	545	667	657	615	601	584	508	582	0.9
Poland	260	518	757	750	861	1 145	1 434	1 686	30.6
Portugal	635	597	684	870	909	814	781	939	5.7
Slovak Republic*	..	148	169	130	158	206	197	198	5.0
Spain	1 879	2 119	2 419	2 431	2 436	2 669	2 626	3 223	8.0
Sweden	8 476	10 012	10 698	12 654	13 719	6 940	7 578	7 600	-1.5
Switzerland	668	716	722	671	791	796	631	656	-0.3
Turkey	333	479	852	763	966	1 054	1 580	1 953	28.8
United Kingdom	9 939	8 807	13 768	13 507	17 443	17 723	17 423	13 328	4.3
United States	19 027	23 370	23 169	24 412	29 538	26 203	21 523	20 354	1.0
OECD	101 177	113 819	127 067	144 846	184 037	167 717	159 396	167 472	7.5
EU15	51 758	56 852	68 491	77 486	93 376	84 409	79 220	77 299	5.9

* CAGR for available years.

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/818272578581

Table 10.3. **Communication equipment imports, 1996-2003**
USD millions

	1996	1997	1998	1999	2000	2001	2002	2003	CAGR 1996-2003
Australia	2 108	2 140	1 989	3 103	3 952	2 930	2 772	3 407	7.1
Austria	1 140	1 287	1 860	2 273	2 265	1 813	1 909	2 226	10.0
Belgium	2 086	2 247	2 724	3 101	3 288	3 936	3 238	3 421	7.3
Canada	4 185	4 974	5 316	6 146	8 634	7 051	6 365	6 488	6.5
Czech Republic	872	824	767	783	1 167	1 075	1 023	1 322	6.1
Denmark	1 361	1 454	1 703	1 810	2 079	2 044	2 650	2 266	7.6
Finland	885	895	1 155	1 327	2 330	1 944	1 667	2 003	12.4
France	4 952	5 789	6 758	7 312	8 404	8 265	6 958	7 853	6.8
Germany	8 028	8 198	9 636	10 503	13 074	14 637	13 900	14 286	8.6
Greece	505	709	1 134	1 207	1 146	952	994	1 300	14.5
Hungary	488	599	787	977	1 411	1 278	1 765	2 611	27.1
Iceland	55	58	78	79	100	64	57	71	3.8
Ireland	620	811	1 124	1 939	2 283	2 710	1 855	1 304	11.2
Italy	3 647	4 793	5 744	6 241	6 899	6 439	6 091	6 970	9.7
Japan	7 795	6 979	6 379	7 357	9 933	9 577	8 238	8 551	1.3
Korea	2 546	2 512	1 450	2 662	4 635	3 530	3 414	3 729	5.6
Luxembourg*	..	..	..	347	566	783	569	434	5.7
Mexico	2 499	3 328	4 203	5 383	7 695	7 445	5 731	6 088	13.6
Netherlands	3 416	3 747	4 343	6 208	7 939	8 403	5 141	6 157	8.8
New Zealand	529	494	449	618	710	509	448	541	0.3
Norway	951	999	1 130	1 140	1 228	1 134	1 022	1 153	2.8
Poland	927	1 266	1 556	1 796	1 975	1 822	1 713	1 871	10.5
Portugal	687	815	1 035	1 199	1 181	1 137	1 079	1 178	8.0
Slovak Republic*	..	355	354	225	241	320	357	426	3.1
Spain	3 520	3 126	3 948	5 511	5 677	4 833	4 628	5 574	6.8
Sweden	2 564	3 017	3 718	3 488	4 271	3 221	3 083	3 501	4.6
Switzerland	1 484	1 620	1 732	1 888	2 095	1 847	1 666	1 815	2.9
Turkey	761	1 048	1 428	2 211	2 788	1 102	918	1 217	6.9
United Kingdom	8 975	7 772	10 721	12 802	16 641	13 420	11 888	13 750	6.3
United States	22 205	24 086	28 759	35 558	52 149	46 338	47 380	51 944	12.9
OECD	89 789	95 944	111 981	135 195	176 756	160 557	148 517	163 459	8.9
EU15	42 385	44 660	55 603	65 268	78 042	74 537	65 648	72 224	7.9

* CAGR for available years.

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/678253518472

Table 10.4. **Balance of trade in communication equipment, 1996-2003**
USD millions

	1996	1997	1998	1999	2000	2001	2002	2003
Australia	-1 662	-1 538	-1 566	-2 624	-3 218	-2 315	-2 464	-2 948
Austria	- 761	- 594	-1 262	-1 680	-1 335	-1 044	- 980	-1 046
Belgium	646	323	515	- 133	601	427	- 194	86
Canada	- 463	- 666	- 838	- 84	2 620	-1 317	-1 755	-2 155
Czech Republic	- 739	- 695	- 493	- 566	- 648	47	114	92
Denmark	- 313	- 156	- 116	- 59	- 212	- 193	163	- 12
Finland	3 203	3 882	5 241	5 900	7 467	5 903	6 610	7 267
France	1 232	1 754	2 927	3 301	4 638	2 755	2 961	1 430
Germany	1 818	3 084	1 477	2 669	2 463	1 713	2 648	2 188
Greece	- 435	- 598	- 978	-1 035	- 826	- 706	- 766	-1 047
Hungary	- 325	- 117	- 38	- 36	530	1 677	2 689	3 565
Iceland	- 55	- 58	- 78	- 78	- 99	- 63	- 56	- 71
Ireland	163	381	608	1 604	834	328	399	- 9
Italy	- 742	-1 671	-2 278	-2 659	-3 007	-1 884	-2 800	-3 693
Japan	3 060	4 480	4 434	4 772	5 489	2 967	2 764	6 590
Korea	3 341	2 870	3 595	5 157	6 109	9 250	12 806	19 295
Luxembourg	..	..	..	- 118	- 96	- 61	- 18	- 149
Mexico	4 782	5 259	6 153	6 896	9 338	10 049	10 756	7 981
Netherlands	- 622	-1 019	-1 393	-2 034	-1 931	-2 902	-2 183	-1 028
New Zealand	- 429	- 373	- 337	- 525	- 612	- 431	- 362	- 417
Norway	- 406	- 332	- 473	- 525	- 627	- 550	- 515	- 571
Poland	- 667	- 748	- 799	-1 046	-1 114	- 677	- 279	- 185
Portugal	- 52	- 218	- 351	- 328	- 272	- 324	- 297	- 240
Slovak Republic	..	- 207	- 185	- 96	- 83	- 113	- 160	- 228
Spain	-1 641	-1 007	-1 529	-3 079	-3 242	-2 164	-2 003	-2 350
Sweden	5 912	6 994	6 981	9 166	9 449	3 720	4 495	4 099
Switzerland	- 816	- 904	-1 010	-1 218	-1 304	-1 051	-1 035	-1 160
Turkey	- 428	- 568	- 576	-1 448	-1 822	- 48	661	736
United Kingdom	964	1 036	3 047	706	802	4 303	5 535	- 422
United States	-3 178	- 716	-5 590	-11 146	-22 611	-20 135	-25 856	-31 590
OECD	11 388	17 875	15 086	9 651	7 281	7 160	10 879	4 013
EU15	9 373	12 192	12 888	12 218	15 334	9 872	13 571	5 075

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/132357028088

Table 10.5. **Composition of exports, 2003**
USD millions

	CPE & handsets	Communication & line	Radio reception	Television reception	Transmission	Other	Total
Australia	33	135	12	18	125	135	459
Austria	14	109	18	146	703	191	1 181
Belgium	34	1 165	826	1 010	123	349	3 507
Canada	213	2 161	24	78	1 028	830	4 333
Czech Republic	2	108	81	331	663	228	1 414
Denmark	15	161	103	285	1 345	344	2 253
Finland	4	1 470	3	109	6 628	1 056	9 270
France	265	1 733	304	1 105	3 697	2 178	9 283
Germany	269	2 793	940	940	8 488	3 045	16 474
Greece	4	141	8	10	71	18	253
Hungary	175	212	358	817	3 682	933	6 177
Iceland	0.01	0.07	0.003	0.03	0.25	0.10	0.47
Ireland	54	981	3	20	95	142	1 295
Italy	92	1 050	30	117	876	1 113	3 278
Japan	191	1 507	605	2 708	2 832	7 298	15 141
Korea	121	572	222	2 965	13 911	5 233	23 024
Luxembourg	1	10	2	15	251	6	285
Mexico	344	1 733	1 462	6 292	3 183	1 055	14 069
Netherlands	229	1 358	449	554	1 313	1 227	5 129
New Zealand	2	28	1	2	60	32	125
Norway	8	251	2	12	147	162	582
Poland	29	79	3	1 107	39	430	1 686
Portugal	4	44	770	20	30	71	939
Slovak Republic	3	15	1	140	4	36	198
Spain	93	455	98	1 373	861	344	3 223
Sweden	93	2 202	54	262	2 942	2 047	7 600
Switzerland	49	243	2	9	141	212	656
Turkey	2	41	0.2	1 820	11	79	1 953
United Kingdom	245	2 550	97	868	7 798	1 770	13 328
United States	462	7 192	815	1 102	4 554	6 228	20 354
OECD	3 052	30 501	7 293	24 234	65 601	36 791	167 472
EU15	1 419	16 221	3 705	6 833	35 221	13 900	77 299

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/058471165614

Table 10.6. **Composition of imports, 2003**
USD millions

	CPE & handsets	Communication & line	Radio reception	Television reception	Transmission	Other	Total
Australia	97	792	335	667	1 249	268	3 407
Austria	98	363	116	222	1 156	271	2 226
Belgium	67	950	936	581	532	354	3 421
Canada	274	1 670	796	1 020	1 435	1 292	6 488
Czech Republic	17	141	110	150	626	277	1 322
Denmark	43	487	97	240	1 108	291	2 266
Finland	17	305	62	139	521	960	2 003
France	276	1 185	627	1 443	2 788	1 533	7 853
Germany	378	2 218	1 513	2 049	5 118	3 010	14 286
Greece	35	349	83	221	493	119	1 300
Hungary	18	222	54	130	1 489	699	2 611
Iceland	1	23	4	17	18	8	71
Ireland	41	580	44	121	350	169	1 304
Italy	180	1 308	562	1 231	2 753	936	6 970
Japan	443	1 762	977	1 405	506	3 458	8 551
Korea	39	1 063	195	168	255	2 008	3 729
Luxembourg	6	43	11	44	302	29	434
Mexico	96	1 013	567	406	1 427	2 579	6 088
Netherlands	463	1 594	526	1 010	1 467	1 096	6 157
New Zealand	19	128	50	107	171	66	541
Norway	32	252	67	171	450	182	1 153
Poland	41	386	139	228	850	226	1 871
Portugal	23	203	68	182	500	202	1 178
Slovak Republic	7	71	44	38	193	74	426
Spain	116	1 227	596	849	1 978	807	5 574
Sweden	82	615	238	525	941	1 100	3 501
Switzerland	68	343	108	282	797	217	1 815
Turkey	29	137	95	93	655	208	1 217
United Kingdom	413	3 511	908	1 886	5 409	1 623	13 750
United States	1 596	9 686	6 062	10 963	18 609	5 028	51 944
OECD	5 016	32 627	15 991	26 587	54 147	29 090	163 459
EU15	2 238	14 939	6 388	10 742	25 417	12 499	72 224

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/082828317718

Table 10.7. **Telecommunications equipment trade, 1997-2003**
USD millions

	Exports			Imports		
	1997	2000	2003	1997	2000	2003
Australia	381	529	169	672	1 759	888
Austria	373	163	123	355	739	462
Belgium	824	1 843	1 199	765	1 405	1 017
Canada	2 816	8 606	2 374	1 781	3 891	1 944
Czech Republic	32	53	110	298	234	158
Denmark	293	243	177	463	650	530
Finland	1 814	3 081	1 474	283	473	322
France	1 950	3 884	1 999	1 615	2 656	1 461
Germany	4 334	4 221	3 062	2 594	4 097	2 596
Greece	75	245	146	260	465	384
Hungary	33	78	387	156	213	240
Iceland	0.01	0.09	0.08	17	32	24
Ireland	976	2 583	1 035	455	1 626	621
Italy	1 633	2 124	1 142	1 360	2 577	1 488
Japan	4 686	5 839	1 699	2 540	4 656	2 204
Korea	934	767	693	1 111	2 550	1 102
Luxembourg	..	20	11	..	82	48
Mexico	1 346	4 016	2 077	1 032	1 840	1 109
Netherlands	1 176	3 747	1 587	1 414	4 456	2 058
New Zealand	24	14	30	213	204	148
Norway	264	198	259	423	433	284
Poland	52	69	108	389	576	427
Portugal	27	24	48	262	302	227
Slovak Republic	61	34	18	157	54	77
Spain	788	787	548	1 159	2 087	1 343
Sweden	2 334	4 854	2 294	780	1 198	697
Switzerland	401	398	291	757	606	411
Turkey	44	48	43	262	774	166
United Kingdom	4 758	7 166	2 796	4 705	7 838	3 924
United States	8 154	13 108	7 654	6 695	17 470	11 281
OECD	40 584	68 744	33 552	32 972	65 943	37 643
EU15	21 355	34 986	17 640	16 470	30 650	17 178

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/264780380344

Table 10.8. **Broadcasting equipment trade, 1997-2003**
USD millions

	Exports			Imports		
	1997	2000	2003	1997	2000	2003
Australia	50	15	155	1 202	1 889	2 251
Austria	149	428	867	674	1 204	1 494
Belgium	1 435	1 742	1 959	1 244	1 514	2 050
Canada	1 071	1 913	1 130	2 279	3 296	3 252
Czech Republic	28	335	1 076	330	630	886
Denmark	772	1 297	1 732	746	1 045	1 445
Finland	2 415	5 202	6 740	310	954	722
France	3 604	7 480	5 107	2 677	3 995	4 858
Germany	5 308	9 110	10 367	4 048	7 190	8 680
Greece	26	64	90	384	549	797
Hungary	351	1 424	4 857	260	767	1 673
Iceland	0.01	0.3	0.3	33	55	39
Ireland	157	335	118	197	343	514
Italy	685	734	1 023	2 866	3 614	4 547
Japan	3 783	4 477	6 145	2 731	3 428	2 888
Korea	2 922	7 758	17 099	497	657	618
Luxembourg	..	445	268	..	469	356
Mexico	5 705	10 879	10 938	1 229	3 693	2 400
Netherlands	1 037	1 576	2 315	1 931	2 839	3 003
New Zealand	78	56	62	236	338	328
Norway	219	209	162	424	541	687
Poland	334	656	1 148	666	1 177	1 217
Portugal	510	818	819	432	594	750
Slovak Republic	26	72	144	141	140	275
Spain	1 106	1 315	2 331	1 538	2 939	3 424
Sweden	4 504	5 788	3 259	855	1 540	1 703
Switzerland	108	203	152	687	1 204	1 187
Turkey	398	874	1 831	630	1 827	843
United Kingdom	2 460	8 189	8 763	1 661	6 881	8 203
United States	8 832	9 876	6 471	14 292	29 363	35 634
OECD	48 073	83 271	97 128	45 200	84 675	96 726
EU15	24 167	44 524	45 759	19 563	35 669	42 547

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/032548544015

Table 10.9. **Other communications equipment trade, 1997-2003**
USD millions

	Exports			Imports		
	1997	2000	2003	1997	2000	2003
Australia	171	191	135	266	304	268
Austria	172	338	191	258	322	271
Belgium	311	303	349	238	369	354
Canada	421	734	830	914	1 447	1 292
Czech Republic	68	131	228	196	303	277
Denmark	234	327	344	245	384	291
Finland	548	1 514	1 056	302	904	960
France	1 988	1 679	2 178	1 497	1 752	1 533
Germany	1 640	2 206	3 045	1 556	1 788	3 010
Greece	10	11	18	65	131	119
Hungary	99	439	933	183	431	699
Iceland	0.01	0.4	0.1	8	12	8
Ireland	59	199	142	159	314	169
Italy	805	1 033	1 113	567	708	936
Japan	2 990	5 106	7 298	1 709	1 850	3 458
Korea	1 525	2 220	5 233	904	1 428	2 008
Luxembourg	..	5	6	..	15	29
Mexico	1 535	2 138	1 055	1 067	2 163	2 579
Netherlands	514	687	1 227	402	644	1 096
New Zealand	18	27	32	46	169	66
Norway	184	193	162	152	254	182
Poland	131	135	430	211	221	226
Portugal	60	67	71	121	285	202
Slovak Republic	61	52	36	58	46	74
Spain	226	333	344	428	650	807
Sweden	3 174	3 077	2 047	1 382	1 534	1 100
Switzerland	207	191	212	176	284	217
Turkey	37	44	79	155	187	208
United Kingdom	1 589	2 087	1 770	1 406	1 922	1 623
United States	6 384	6 554	6 228	3 100	5 316	5 028
OECD	25 162	32 022	36 791	17 773	26 138	29 090
EU15	11 330	13 866	13 900	8 627	11 724	12 499

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/707700183642

Table 10.10. **Direction of communication equipment exports, 1996-2003**
USD millions

From	To	1996	1997	1998	1999	2000	2001	2002	2003	CAGR 1996-2003
Values:										
OECD	World	101 177	113 819	127 067	144 846	184 037	167 717	159 396	167 472	7.5
OECD	OECD (incl. unrecorded)	70 767	77 486	93 082	113 402	146 113	128 600	121 844	125 349	8.5
OECD	Non-OECD	30 410	36 333	33 985	31 443	37 923	39 117	37 553	42 122	4.8
Shares (%):										
OECD	World	100	100	100	100	100	100	100	100	
OECD	OECD (incl. unrecorded)	70	68	73	78	79	77	76	75	
OECD	Non-OECD	30	32	27	22	21	23	24	25	

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/833628038542

Table 10.11. **Direction of communication equipment imports, 1996-2003**
USD millions

To	From	1996	1997	1998	1999	2000	2001	2002	2003	CAGR 1996-2003
Values:										
OECD	World	89 789	95 944	111 981	135 195	176 756	160 557	148 517	163 459	8.9
OECD	OECD (incl. unrecorded)	68 901	74 222	88 555	107 974	138 820	122 852	108 152	115 612	7.7
OECD	Non-OECD	20 888	21 723	23 426	27 221	37 936	37 705	40 365	47 847	12.6
Shares (%):										
OECD	World	100	100	100	100	100	100	100	100	
OECD	OECD (incl. unrecorded)	77	77	79	80	79	77	73	71	
OECD	Non-OECD	23	23	21	20	21	23	27	29	

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/040641410187

Table 10.12. **Direction of communication equipment exports, 1996-2003**
USD millions

	1996			2003		
To:	World	OECD	Non-OECD	World	OECD	Non-OECD
From:						
Australia	446	219	227	459	340	119
Austria	379	303	77	1 181	979	202
Belgium	2 733	2 355	378	3 507	3 200	306
Canada	3 722	2 988	734	4 333	3 788	545
Czech Republic	132	115	17	1 414	1 347	67
Denmark	1 048	917	131	2 253	2 024	229
Finland	4 088	2 839	1 249	9 270	5 546	3 724
France	6 185	4 265	1 919	9 283	6 102	3 181
Germany	9 846	6 249	3 597	16 474	11 659	4 815
Greece	69	46	24	253	55	199
Hungary	163	144	19	6 177	5 231	945
Iceland	0.01	0.003	0.01	0.5	0.2	0.2
Ireland	782	670	113	1 295	907	388
Italy	2 905	2 095	810	3 278	2 368	910
Japan	10 854	6 110	4 744	15 141	9 055	6 086
Korea	5 887	2 579	3 308	23 024	15 092	7 932
Luxembourg	..	..	..	285	283	3
Mexico	7 281	7 169	112	14 069	13 813	256
Netherlands	2 794	2 427	367	5 129	4 726	403
New Zealand	100	60	40	125	85	39
Norway	545	367	179	582	420	162
Poland	260	232	28	1 686	1 589	97
Portugal	635	614	21	939	880	59
Slovak Republic	..	..	..	198	184	15
Spain	1 879	1 292	586	3 223	2 851	372
Sweden	8 476	5 359	3 117	7 600	4 711	2 889
Switzerland	668	482	186	656	497	159
Turkey	333	221	112	1 953	1 748	205
United Kingdom	9 939	8 614	1 325	13 328	11 459	1 868
United States	19 027	12 038	6 989	20 354	14 410	5 944
OECD	101 177	70 767	30 410	167 472	125 349	42 122
EU15	51 758	38 043	13 715	77 299	57 751	19 548

Notes: OECD includes unrecorded. Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/280670511664

Table 10.13. **Direction of communication equipment imports, 1996-2003**
USD millions

	1996			2003		
From:	World	OECD	Non-OECD	World	OECD	Non-OECD
To:						
Australia	2 108	1 594	513	3 407	2 420	987
Austria	1 140	1 083	57	2 226	1 963	264
Belgium	2 086	1 727	360	3 421	2 723	698
Canada	4 185	3 666	519	6 488	4 963	1 525
Czech Republic	872	764	107	1 322	799	523
Denmark	1 361	1 228	132	2 266	2 076	189
Finland	885	769	116	2 003	1 159	844
France	4 952	3 951	1 002	7 853	6 097	1 756
Germany	8 028	6 352	1 676	14 286	10 296	3 989
Greece	505	446	58	1 300	1 195	106
Hungary	488	447	41	2 611	1 102	1 510
Iceland	55	50	5	71	58	13
Ireland	620	550	70	1 304	1 092	212
Italy	3 647	3 284	363	6 970	6 168	803
Japan	7 795	4 165	3 630	8 551	2 451	6 100
Korea	2 546	2 065	481	3 729	2 480	1 249
Luxembourg	..	..	..	434	429	5
Mexico	2 499	2 413	86	6 088	5 693	395
Netherlands	3 416	2 738	677	6 157	4 958	1 199
New Zealand	529	374	155	541	385	156
Norway	951	870	81	1 153	978	175
Poland	927	751	176	1 871	1 438	433
Portugal	687	640	47	1 178	1 122	56
Slovak Republic	..	..	..	426	357	69
Spain	3 520	3 127	392	5 574	4 961	613
Sweden	2 564	2 383	180	3 501	3 006	495
Switzerland	1 484	1 350	134	1 815	1 655	160
Turkey	761	631	129	1 217	1 053	165
United Kingdom	8 975	7 590	1 385	13 750	11 540	2 210
United States	22 205	13 891	8 313	51 944	30 996	20 947
OECD	89 789	68 901	20 888	163 459	115 612	47 847
EU15	42 385	35 870	6 516	72 224	58 784	13 440

Notes: OECD includes unrecorded. Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

StatLink: http://dx.doi.org/10.1787/117713656280

Table 10.14. **China's trade in communication equipment, 1996-2002**
USD millions

	1996	1997	1998	1999	2000	2001	2002
Exports							
Telecommunications equipment	1 080	1 233	1 212	1 435	1 953	2 548	2 969
CPE/handsets	823	937	801	855	838	872	926
Communications equipment	257	296	411	581	1 115	1 676	2 043
Broadcasting equipment	3 586	3 860	3 977	4 059	7 116	8 738	11 418
Radio	2 302	2 630	2 657	2 367	2 886	2 574	3 009
Television	794	655	685	800	1 296	1 573	2 340
Transmission equipment	489	575	636	892	2 934	4 591	6 069
Other communications equipment	1 063	1 223	1 273	1 551	2 487	3 302	4 535
Total	5 729	6 316	6 463	7 046	11 555	14 588	18 921
Communications share in total merchandise exports (%)	3.8	3.5	3.5	3.6	4.6	5.5	5.8
Imports							
Telecommunications equipment	1 464	1 215	2 160	2 780	4 039	5 310	3 125
CPE/handsets	81	45	55	91	83	119	127
Communications equipment	1 383	1 170	2 105	2 689	3 956	5 191	2 998
Broadcasting equipment	1 491	1 222	2 174	1 971	1 887	1 689	3 298
Radio	76	36	31	38	37	19	30
Television	246	168	128	135	54	35	30
Transmission equipment	1 169	1 018	2 014	1 799	1 796	1 635	3 238
Other communications equipment	1 476	1 871	1 947	2 644	3 830	3 807	4 305
Total	4 431	4 308	6 280	7 395	9 756	10 806	10 728
Communications share in total merchandise imports (%)	3.2	3.0	4.5	4.5	4.3	4.4	3.6

Notes: Communication equipment includes: HS (1996) 8517: Electric appliances for line telephony, 852020: Telephone answering machines, 852510: Transmission apparatus not incorporating reception apparatus, 852520: Transmission apparatus incorporating reception apparatus, 852610: Radar apparatus, 8527: Radio-broadcast receivers (excl. 852712: Pocket-size radio cassette-players), 8528: Reception apparatus for television, incl. Video monitors (exclu. 852830: Video projector), 8529: Parts & accessories for apparatus of heading 8525 to 8528, 854420: Co-axial cable and other co-axial electric conductors, 854470: Optical fibre cables.

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Chapter 11

Regulatory Reform and the Global Digital Divide

Telecommunication markets and regulatory policies in OECD countries have been particularly successful at extending access to rural and remote regions. While the digital divides in developing economies are often much more pronounced than those faced in the OECD, elements from OECD country experiences can be extracted and applied in developing economies as a first step towards improving access to ICTs. This chapter considers policies that have had the most success throughout the OECD, namely liberalising telecommunication markets, developing a sound regulatory framework and fostering effective competition among telecommunication providers.

Telecommunication markets and regulatory policies in OECD countries have been particularly successful at extending access to rural and remote regions. While the digital divides in developing economies are often much more pronounced than those faced in the OECD, the fundamental problem remains the same: extending access to all in a society. Elements from OECD country experiences can be extracted and applied in developing economies as a first step towards improving access to ICTs. Policy makers in developing economies should consider the policy tools which have shown the most success throughout the OECD, namely liberalising telecommunication markets, developing a sound regulatory framework and fostering effective competition among telecommunication providers.

The scope of the digital divide

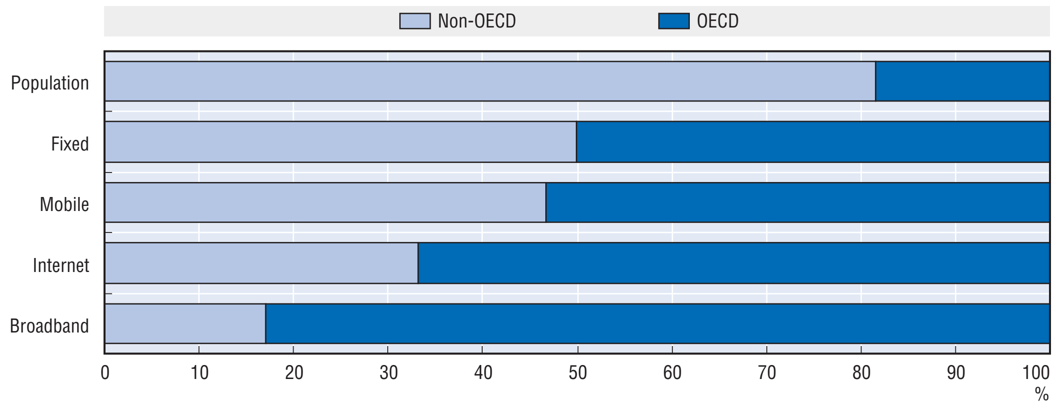
The digital divide is a complex problem that can not be solved simply by building out telecommunication networks and infrastructure. The divide is the result of a wide range of social, economic, political and environmental factors. These factors include, but are not limited to income, literacy, language, physical infrastructure, telecommunication investment, regulatory certainty, political stability, topography, and population density. Effective policy discussions about the digital divide must address all key factors.

This chapter will only examine one narrow aspect of the digital divide, the effects of regulatory reform on extending access to ICTs. While an economy's regulatory regime is only one element of the overall digital divide, proper implementation of key policies can effectively help expand networks, reduce prices, improve quality of service and increase user access. Indeed, regulatory reform can play a key role in helping telecommunication markets bridge some of the gaps on their own. It is therefore imperative that policy makers consider regulatory reform as a necessary but not sufficient step towards overcoming the digital divide.

The digital divide has become much more pronounced for many developing economies, as settlement payments from international voice calls have fallen, decreasing the availability of hard currency for network investments. Technologies such as Voice over Internet Protocol (VoIP) offer benefits to users, but also reduce revenues for traditional fixed-line operators who may be responsible for providing access.

Policy makers have been concerned about access inequalities since the introduction of telephone service more than 100 years ago. In the 1990's, the focus started shifting from providing access to voice services over fixed lines to dial-up Internet access. In 1995, 1998 and 2000, the United States Department of Commerce released its *Falling through the Net* reports that examined unequal access between rural and urban areas, race, education level, gender and age. In 2000, the OECD released *Understanding the Digital Divide*, which examined the unequal distribution of access throughout OECD countries. These reports, and many others from the same period, focused on Internet access at speeds of 14.4 to

Figure 11.1. **Global ICT subscriber and population ratios (OECD and non-OECD)**



Source: ITU World Telecommunication Indicators Database.

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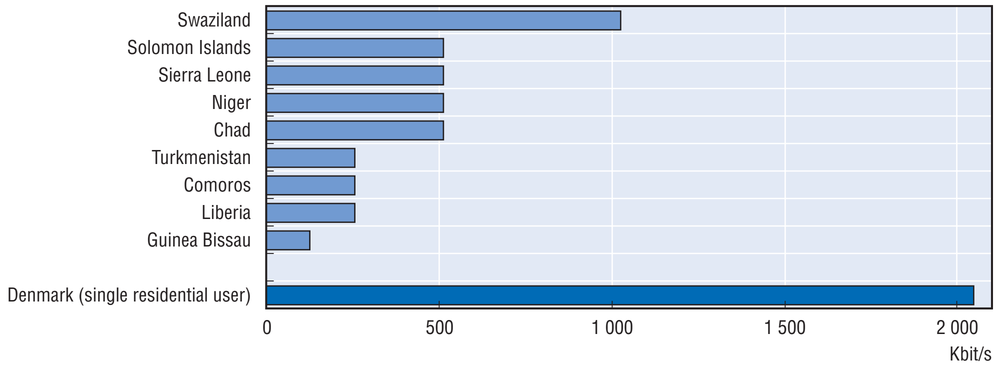
56 kbit/s. Only a few years later, those previously characterised as "haves" as dial-up users would be considered "have nots" for the emerging broadband divide.

The digital divide has narrowed according to several measures of access around the world, although the divide varies significantly by technology (Figure 11.1). OECD member countries account for only 18% of the world population but a majority of the world's fixed, mobile, Internet and broadband subscribers. Non-OECD countries have made significant gains in fixed telephony, accounting for just fewer than 50% of the world's fixed lines. The penetration of mobile telephony is also expanding quickly outside the OECD, in part due to calling-party-pays billing and pre-paid mobile plans. Non-OECD countries make up 46% of the world's total mobile subscribers.

The gains made throughout non-OECD countries in Internet and broadband are impressive but there remains much room for increased growth. Internet subscribers in non-OECD countries accounted for only one-third of the world's Internet subscriber base in 2003. The subset of broadband subscribers shows an even greater disparity. Only 17% of the world's broadband subscribers were from outside the OECD in 2003. The significant progress among non-OECD countries in fixed and mobile telephony has taken time so as new technologies emerge, especially in OECD countries, there may be more pronounced gaps between OECD and non-OECD countries.

The digital divide has been most pronounced in the lowest income areas of the world. Often, the lack of basic network infrastructure significantly hampers the adoption of new end-user technologies. Internet technologies, which often require an expensive outside connection from the country to the world, have been particularly slow to reach users in low-income economies. As an example, the total population of Liberia must share an international Internet connection of just 256 kbit/s, the equivalent of just one baseline residential broadband connection in the OECD. Other developing economies face similar bandwidth constraints. A single 100 Mbit/s broadband user in Japan has access to as much international connectivity as the 45 countries with the lowest international connectivity combined. Figure 11.2 compares the total international Internet bandwidth available in several developing economies with broadband speeds available to a single residential user in Denmark.

Figure 11.2. **Total international Internet bandwidth in developing economies**



Source: ITU World Telecommunication Indicators Database, *ITU Internet Reports: The Portable Internet*.

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The problem is particularly acute in many developing economies with low Internet connectivity and little local content available to domestic users. International bandwidth demands will remain high until Internet content and services are available on servers in domestic markets. The rollout of new Internet exchanges in developing economies has helped keep some data exchange local and lowered the international bandwidth costs. In Egypt, for example, investments in Internet exchange points have typically had a return on investment of six months. Operators have reported that the maintenance costs are negligible compared to the dramatic cost savings of keeping Internet data exchange local.

Local content and services – especially in local languages – will be a key to increasing demand. There is a symbiotic relationship between the development of content and the development of connectivity in many OECD countries. The experiences in developing economies should be similar, with increases in connectivity facilitating the development of local content.

In addition to more international exchanges, high-speed, international infrastructure is becoming more accessible in developing economies. A recent example is the new SAT3/WASC/SAFE submarine fibre cable extending from Spain and Portugal, down the west coast of Africa, around the Cape and over to the west coast of India. Costal countries in Africa can tap into the fibre, while landlocked countries can establish connections *via* costal countries. International Internet connectivity via satellite and terrestrial wireless services is also falling in price.

The digital divide is not simply about a lack of cabled or wireless telecommunication infrastructure to users. The actual network interfaces such as mobile handsets, PCs and PDA-type devices are often too expensive for individual users in many developing economies. However, secondary markets for handsets and computers are helping supply much-needed terminals to users in developing economies at affordable prices. Used handsets in the developed economies, for example, are often turned in and may eventually make their way to users in developing economies, providing inexpensive, mobile connectivity for users with low monthly incomes (see Box 11.1).

Much of the digital divide effort is focused on extending telecommunication infrastructure and supplying terminals to users. However, illiteracy and a lack of IT skills

Box 11.1. **Used handsets fuelling mobile growth in Cambodia**

Cambodia's fixed-line penetration has grown from 0.04 to 0.22 lines per 100 inhabitants in the ten years leading up to 2003. Cambodia's low fixed-line penetration rate was more of a concern in 1993 than in 2003, due to the rapid take-up of mobile telephony. In 2003, Cambodia had 750 000 mobile subscribers compared to 30 000 subscribers on the fixed-line network – a ratio of 25 mobile phone subscribers per fixed line.

Much of Cambodia's rapid take-up of mobile phones has been due to the availability of second-hand mobile handsets and pre-paid mobile phone plans. Users can purchase mobile handsets for roughly USD 10 to use with a pre-paid GSM SIM card. With Cambodia's gross national income per capita at USD 310 in 2003, the initial handset cost is roughly 3% of annual income. Mobile tariffs are relatively inexpensive with users often spending USD 5 per month on calls.

Internet access penetration rates in Cambodia are very low due to the low number of PCs (12 000 in the country), a sporadic electrical supply, expensive access charges and a lack of Khmer-language content. While PC-based Internet access has been slow to expand, Internet access provided over a mobile phone may offer the best method for delivering data services, especially as next generation handsets start reaching secondary markets.

Source: Ministry of Posts and Communications of Cambodia.

are major components of the digital divide and must be considered and addressed alongside efforts to expand the physical network.

The combination of low literacy levels and low bandwidth presents policy makers in developing economies with a bandwidth paradox. Users in developing economies often do not have literacy or ICT skills sufficient to take advantage of low-bandwidth, text communication. Illiterate ICT users require audio and video technologies to take advantage of ICTs, helping to partially explain the rapid take-up of mobile telephony in developing economies. However, users in developing economies have such limited access to bandwidth that usually their only choices for communication are text-based. The result is an entire segment of the population underserved by text-based communication technologies.

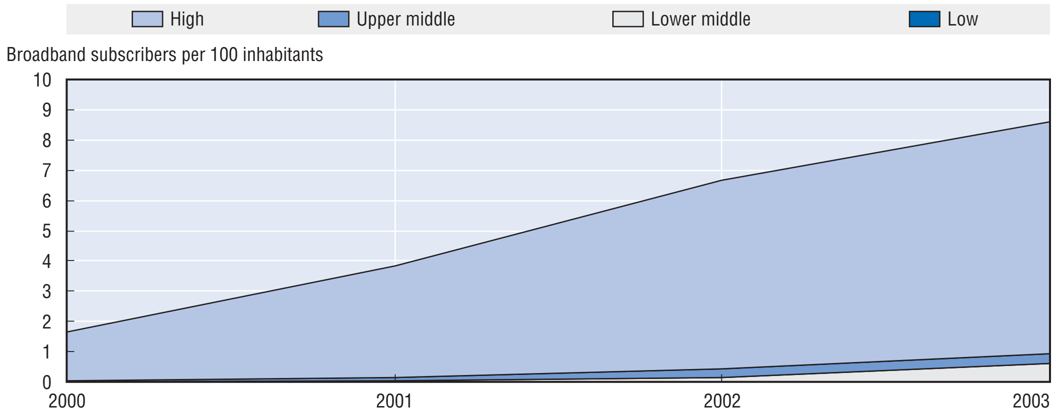
Digital progress

While the digital divide is a very significant problem in developing economies, recent data show that people around the world have much better access to ICTs than they did even ten years ago, with the largest improvements in middle-income countries. This has been possible with advances in technology and regulatory reform. However, just as the connectivity for a certain technology (*e.g.* dial-up Internet access) improves across income levels, a new technology (*e.g.* broadband) appears – leaving users in developing economies continually "playing catch-up" (Figure 11.3).

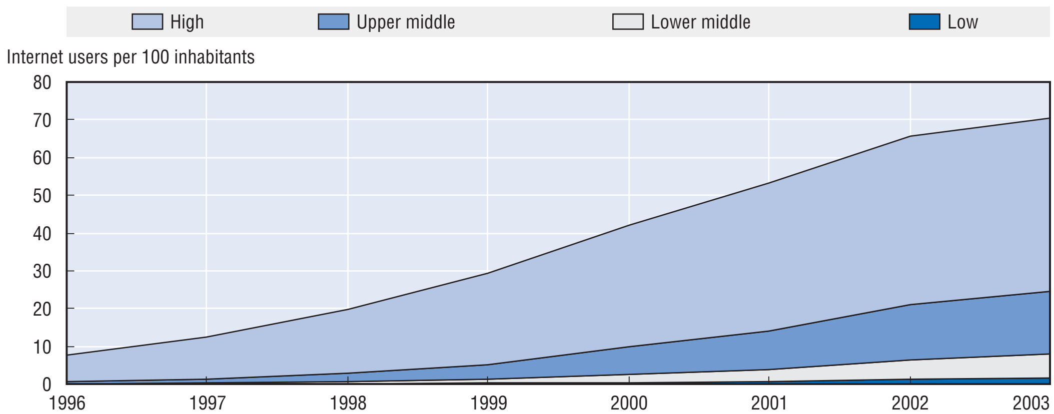
The cycle of technological development is likely to continue along the same path: adoption and commercialisation of new ICT technologies in higher-income economies, slower penetration into lower-income markets, and the subsequent development of new technologies. In such a rapidly changing market, the "technologies of the day" are less important than the overall efficiency of the market and the regulatory environment. In a

Figure 11.3. **Internet users and broadband subscribers per 100 inhabitants worldwide**

A. Broadband subs per 100 inhabitants, by income level



B. Internet users per 100 inhabitants, by income level



Source: ITU World Telecommunication Indicators Database.

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well functioning market, only technologies that are economically viable and efficient will survive. Therefore, the role of policy makers should be to create an efficient and agile market that is capable of quickly integrating new technologies and keeping prices low for consumers via competition.

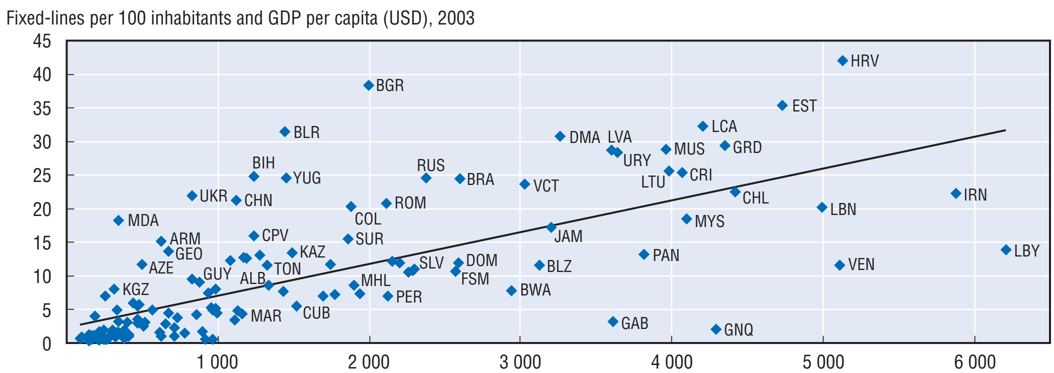
Over the past 20 years, the OECD has been urging governments to liberalise the telecommunication sectors in their countries. These policies have included setting up a regulatory framework, creating an independent and separate regulator, developing a strong foundation for regulatory action, encouraging competition throughout the sector and privatising telecommunication operators. These policies, when introduced, were sometimes met with scepticism. However, over a period of two decades they have proven to be, on the whole, very effective.

In 2003, the 30 OECD countries accounted for 50% of the world's fixed-line subscribers, 53% of mobile subscribers, 67% of Internet subscribers, and 83% of the world's broadband subscribers. High income levels have certainly played a role in telecommunication penetration rates throughout the OECD, but sound policy, efficient markets and effective regulation have also been important components in the success.

While telecommunication liberalisation is in the advanced stages throughout the OECD, policy makers in some non-OECD economies have also successfully applied the same market principles in their own economies with similar success. This chapter will re-examine some of the basic policy instruments, with a focus on how policy makers outside the OECD are implementing them.

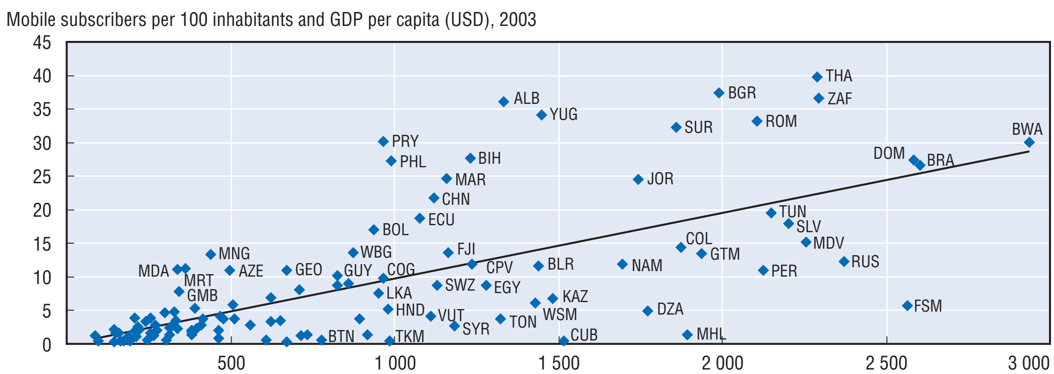
Before looking into specific policies, it is worth noting which countries have the highest telecommunication penetration rates at certain income levels. This allows policy makers to examine policy and market conditions that may have played a role in a country's ICT success. Penetration rates are only one measure of an ICT market, but it can be helpful to compare the adoption of communication technologies among countries at similar income levels. Policy makers have long noted the relationship between ICT access and GDP. Scatter plots of penetration rates over GDP can offer an effective way to see how countries compare with similar-income counterparts (see Figures 11.4, 11.5 and 11.6).

Figure 11.4. **Fixed-line penetration and GDP per capita**



Source: ITU World Telecommunication Indicators Database. *StatLink:* http://dx.doi.org/10.1787/807870856705

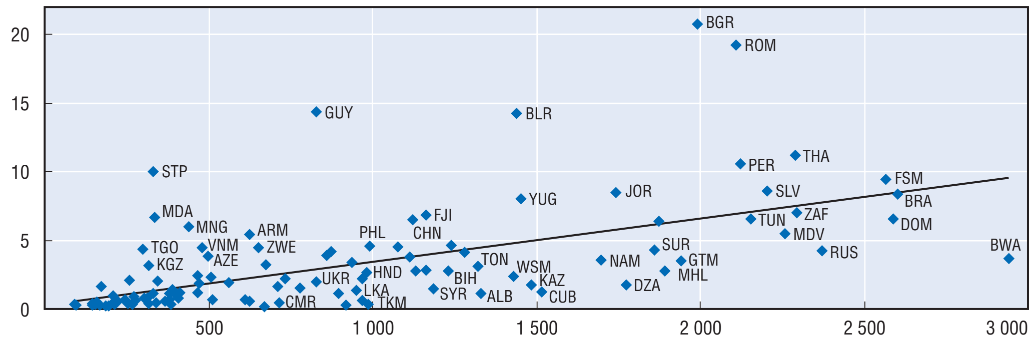
Figure 11.5. **Mobile penetration and GDP per capita**



Source: ITU World Telecommunication Indicators Database. *StatLink:* http://dx.doi.org/10.1787/451165266302

Figure 11.6. **Internet users per 100 inhabitants and GDP per capita**

Internet users per 100 inhabitants and GDP per capita (USD), 2003



Source: ITU World Telecommunication Indicators Database. *StatLink:* http://dx.doi.org/10.1787/657255484512

Figures 11.4, 11.5 and 11.6 show scatter plots of various ICT subscriptions per 100 inhabitants by income level. A simple linear trend line is included for basic comparison but should not be considered a robust measure of the relationship between GDP and penetration rates. Economies are represented by their ISO 3-digit codes.

Figure 11.4 shows mainline penetration and GDP throughout the world in 2003. There is substantial variation among penetration rates at similar income levels with several economies having much higher penetration rates than their incomes alone would predict. The former Soviet Republics such as Armenia, Belarus, Estonia, Georgia, Latvia, Lithuania, Moldova, Ukraine and the Russian Federation all have higher penetration rates than other countries at similar income levels. At lower income levels, other examples include Cape Verde, China, Colombia, Romania, Brazil, Dominica, Mauritius, Sri Lanka, Grenada and Suriname. At higher income levels, non-OECD economies with relatively higher penetration levels include Bulgaria, St. Lucia, Bosnia and Herzegovina, St. Kitts and Nevis, Malta, Chinese Taipei, and Cyprus.

Figure 11.5 examines the relationship between the number of mobile subscribers per 100 inhabitants and GDP. The figure again includes a fitted trend line. Some economies in the chart have mobile penetration rates significantly higher than their levels of GDP would suggest. Examples include Paraguay, Albania, Bulgaria, Morocco, Thailand, South Africa, Romania, the Philippines, China, Ecuador, Bolivia and Mongolia. At higher income levels, economies with relatively higher penetration rates include Jamaica, Estonia, Lithuania, Seychelles, Malta, Slovenia, Chinese Taipei, and Hong Kong (China).

Figure 11.6 shows the relationship between GDP and Internet access. Several economies with relatively low income levels have impressive penetration levels. These include Bulgaria, Romania, Belarus, Guyana, São Tomé and Principe and Moldova. At higher income levels, economies such as Jamaica, Chile, Barbados, Latvia, Estonia, Slovenia, Chinese Taipei, Malaysia, Singapore and Hong Kong (China) have higher penetration rates than other economies at similar income levels.

The economies listed above have high ICT penetration rates for a variety of reasons, often particular to each economy. However, there are other elements of their success that are common among economies and OECD members as well. These typically include regulatory reform elements, such as market liberalisation, effective competition, and the presence of a separate regulator.

Market liberalisation

The level of competition in the market is often a good indicator of telecommunication penetration rates. Economies with higher levels of competition usually benefit from lower prices and higher penetration levels. The contrast between penetration rates in monopoly and competitive markets can be pronounced even within the same country (see Box 11.2).

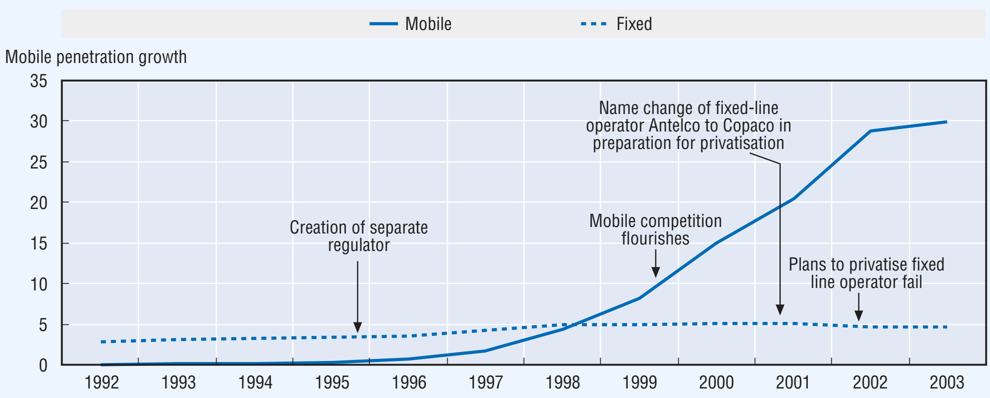
Liberalised markets in the same region and at similar income levels typically have penetration rates higher than those with non-liberalised markets. For example, the Latin American countries of Belize and Brazil have similar income levels but fixed-line penetrations vary considerably. In Belize, the incumbent operator maintains a monopoly on fixed-line provision and the penetration rate is low at only 11.3 lines per

Box 11.2. **Comparison of a competitive mobile and monopoly fixed-line network in Paraguay**

The government in Paraguay started liberalising the telecommunications market in 1996 with the creation of a separate regulator, Conatel. Mobile licenses were awarded and competition in the mobile market thrived, helping push mobile penetration rates towards 30 subscribers per 100 inhabitants in 2003. By contrast, the government-owned fixed-line operator still has a monopoly on the provision of fixed services. Plans to privatise the incumbent operator, Copaco (formerly Antelco), were initially delayed, and finally abandoned in June 2002. As a result, Paraguay's mobile market thrives while the fixed-line market languishes.

The efficiency of Paraguay's mobile market can be seen in regional comparisons. Paraguay's mobile penetration rate of 29.9 mobile subscribers per 100 inhabitants is just slightly under the regional average of 34.4 for the Americas. The fixed-line situation is very different. Paraguay's fixed-line penetration rate of 4.61 is much lower than the regional average of 34.5 fixed lines per 100 inhabitants.

Figure 11.7. **Paraguay: mobile penetration growth**



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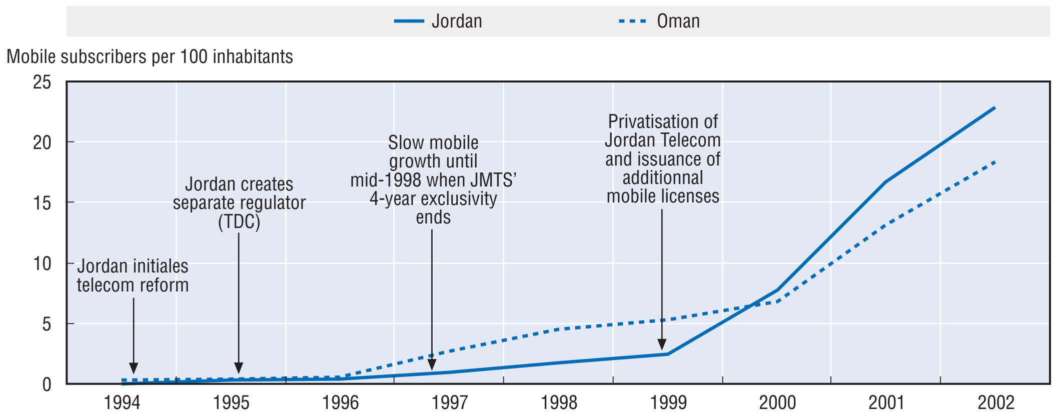
Source: ITU Telecommunication Regulatory Database.

Figure 11.8. **Mobile growth in Jordan and Oman**



Source: ITU Telecommunication Regulatory Database. *StatLink:* http://dx.doi.org/10.1787/147473851644

100 inhabitants. In Brazil, the fixed-line market is considered fully competitive and the penetration rate is more than double that of Belize, at 24.1 subscribers per 100 inhabitants.

Mobile markets show similar trends. Competitive mobile markets typically show higher penetration rates than those which have not been liberalised. Jordan and Oman are good examples. Jordan's GDP per capita in 2003 was roughly USD 1 800, less than one fourth of Oman's GDP per capita of USD 8 000. However, Jordan's mobile penetration rate of 22.9 in 2002 was higher than Oman at 18.3 (see Figure 11.8).

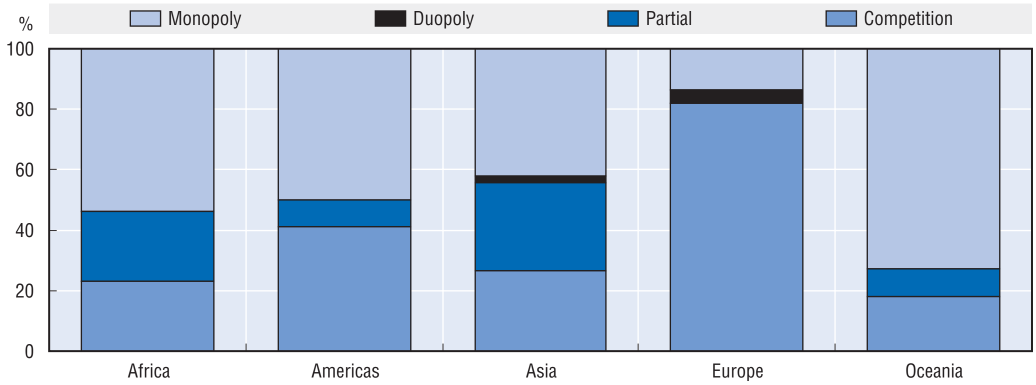
Much of Jordan's success in the mobile market can be attributed to the regulatory reforms started in 1994. Jordan lagged behind Oman in mobile penetration until competition was introduced into the mobile market in 1999. Oman's mobile growth has still been considerable, given the mobile operator's monopoly position. However, the liberalised market in Jordan eclipses Oman's growth, despite differences in income levels between the two.

Finally, markets with effective Internet competition often have higher penetration rates than their incomes alone would suggest. This can be seen in countries such as Latvia and Estonia, where penetration rates are as high as those found in many of the world's richest economies. Latvia's Internet penetration rate of 40.6 Internet users per 100 inhabitants in 2003 was higher than Chinese Taipei, France, Switzerland, Italy and Belgium despite the country having a GDP per capita of USD 3 600 per year. Both Latvia and Estonia have very efficient ISP markets with a large number of licenses awarded to Internet service providers (ISPs). In 2004, Latvia had 195 ISP licenses, while Estonia had 112.

The examples of Paraguay, Brazil, Jordan, Estonia and Latvia highlight the key role competition plays in increasing access. In the markets with competition, penetration rates increased faster than in similar markets with monopoly market structures.

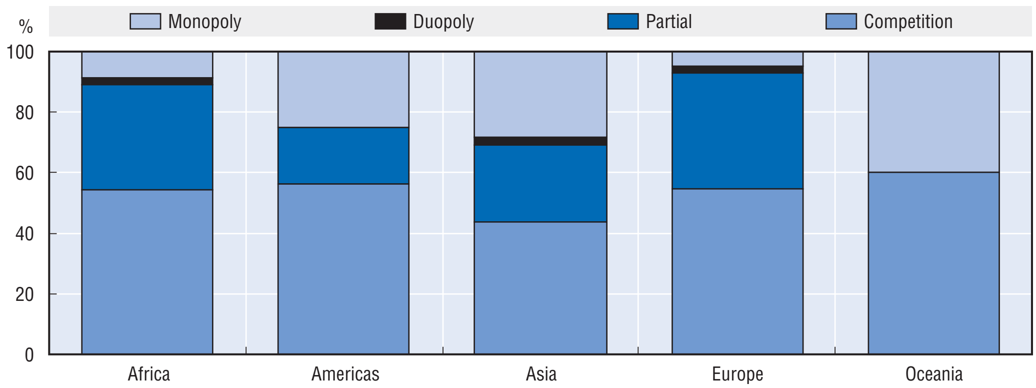
Regional statistics on the status of telecommunication markets highlight certain areas where competition has taken a greater hold than others. Figures 11.9 and 11.10 show the regional breakdown of market structure in mobile and fixed lines in 2003. At the end of 2003, slightly more than 80% of European economies had full competition in the fixed-line market. Monopoly providers operated in around 14% of economies. In Africa a majority of economies (54%) have markets with fixed-line monopolies. Only 23% of economies in

Figure 11.9. **Status of fixed-line competition**



Source: ITU Telecommunication Regulatory Database. *StatLink:* http://dx.doi.org/10.1787/014761077125

Figure 11.10. **Status of mobile competition**



Note: "Partial" refers to partial competition where there are three competitors. "Competition" refers to a market structure with four or more competitors.

Source: ITU Telecommunication Regulatory Database. *StatLink:* http://dx.doi.org/10.1787/681344482073

Africa are fully competitive. In Asia, nearly 42% of economies still have monopoly fixed-line provision, in contrast with 55% with either partial (3 competitors) or full competition (4+ competitors).

Competition in the mobile sector is higher than fixed lines in all regions except for Europe. The level of full mobile competition in Africa, at 54%, is similar to the percentages for both Europe and the Americas. Competition in Africa's mobile sector helps account for Africa's robust growth in mobile services and increasing penetration levels.

On a global level, mobile markets have been traditionally more competitive than fixed-line markets. While fixed-line networks are characterised by an element of natural monopoly relating to the access network, mobile markets typically have multiple providers, each with a different frequency band assigned by the regulator. This typically allows for much more robust competition in the mobile market than fixed-lines.

Competition in mobile markets is responsible for an innovation that has arguably played a vital role in reducing the digital divide throughout the world, pre-paid telephony.

Since users in developing economies often have little or no access to credit, the introduction of pre-paid services in markets around the world has allowed users without credit to have mobile service. Pre-paid accounts now comprise 36% of all mobile accounts in the world.

Regulatory independence

As telecommunication markets evolve, so does the need for a strong, effective regulatory regime. Effective regulation is important to ensure that markets function properly and services are delivered to consumers and businesses efficiently and fairly. Evidence shows that one of the key elements of regulatory success is the existence of an independent and separate regulator, outside the influence of both government policy and private-sector interests.

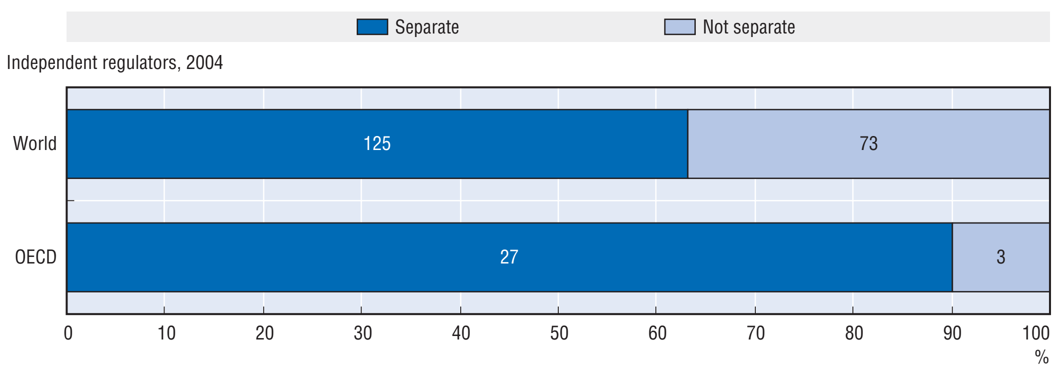
The evolution of telecommunication regulation in developing economies is closely following earlier experiences in the OECD. In most countries of the world, telecommunication services were initially provided by the government. As the technologies improved and penetration rates increased, the limitations of monopoly provision became more pronounced.

In many countries, the first step was to separate the duties of service provision and regulation and put them into separate entities. This process is essential to promote impartiality and create a truly separate regulator who is not beholden to outside interests. The second step was to separate policy from regulatory functions ensuring that the regulator had sufficient authority to implement policy effectively.

In 2004, 90% of OECD countries had a separate regulator in comparison to 58% worldwide (Figure 11.11). The role of the regulator varies from country to country, but common policy tools include privatising state-owned operators, licensing new entrants, determining interconnection policy, ensuring non-discriminatory access, setting price controls in non-competitive market segments, developing and enforcing competition regulation, and mandating universal service requirements.

Certain regions with traditionally low penetration rates have benefited from the introduction of a separate regulator to oversee the development of the telecommunication market. In Africa, roughly two-thirds of economies have separate regulators. In several African markets the introduction of a separate regulator has been immediately followed by

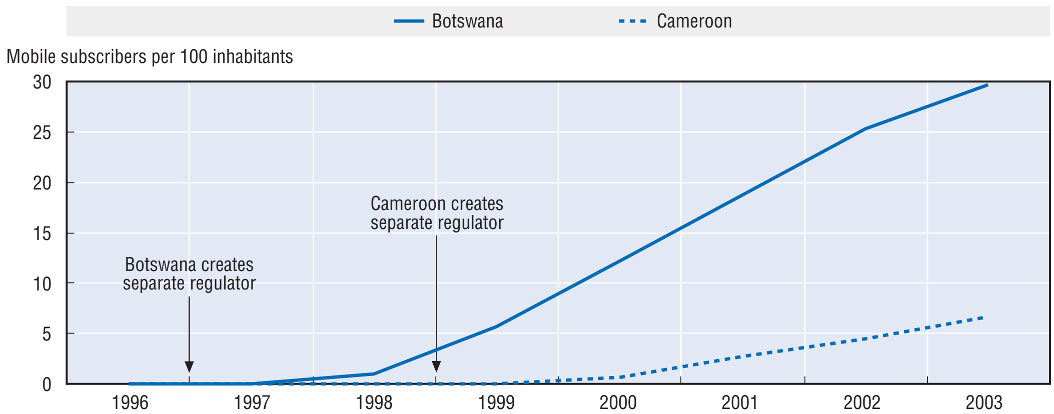
Figure 11.11. **The status of independent regulation in the OECD and worldwide**



Source: ITU World Telecommunication Indicators Database.

StatLink: http://dx.doi.org/10.1787/658826360356

Figure 11.12. **Growth in Africa and the creation of separate regulators**



Source: ITU World Telecommunication Indicators Database. *StatLink:* http://dx.doi.org/10.1787/552755517544

rapid growth in mobile penetration. The examples of Cameroon and Botswana are given in Figure 11.12.

The introduction of a separate regulator is an important first step to liberalise a telecommunication market. However, the existence of a separate regulator, in itself, does not guarantee the success of a market. Several other elements must be in place to ensure the success of the regulatory body. First, the existing legal framework for telecommunications must be created. This usually entails the creation of a telecommunication law that facilitates the opening of the market and sets out the powers of the regulatory body. Second, the law must give the regulator the authority, autonomy, and means to effectively apply regulations in a market. These characteristics are important, especially in markets where incumbent operators have extensive political and financial power. At the same time, the regulator must have the authority to enact policies that will be vital to the development of the telecommunications market. These include, but are not limited to, mandating interconnection, unbundling the local loop and imposing open access requirements.

Regulatory reform is a process that takes time to achieve results, especially regulatory and administrative capacity building. Investment in capacity building in all countries involves initial costs but delivers high future returns.

Spectrum policy and wireless connectivity

Wi-Fi (IEEE 802.11b) adoption has been very high throughout the OECD as users install wireless home systems, operators roll out commercial networks and equipment manufacturers build Wi-Fi connectivity into their products. The rapid adoption of Wi-Fi has pushed prices down and allowed entrepreneurs in developing economies to use off-the-shelf equipment to quickly roll out wireless networks.

These new wireless networks usually operate in license-exempt spectrum bands. Policy makers can help spur innovation in these wireless networks by making certain frequency bands license-exempt. On a global scale, the World Radio Conference in 2003 allocated spectrum in the 5 GHz band for license-exempt use. However, the most common and least-expensive Wi-Fi equipment operates in the 2.4 GHz band which has not been harmonised for use worldwide. Spectrum policy makers in developing economies should thus examine ways to allow the rollout of Wi-Fi based systems.

New and evolving technologies such as WiMAX will also require new spectrum from regulators. Difficulties in obtaining spectrum for new wireless technologies will hamper the market in providing innovative solutions to the digital divide. Regulators in developing economies should examine existing spectrum allocations and work to accommodate new wireless technologies.

Success stories

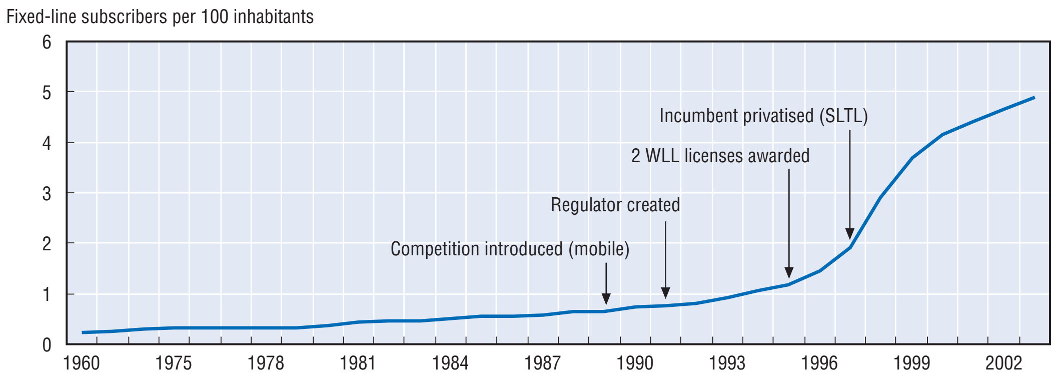
Asia has recently received considerable attention from telecommunication policy makers as Asian economies top the rankings in broadband penetration, broadband speeds, mobile penetration and mobile Internet use. Asian economies such as the Republic of Korea, Japan, Chinese Taipei and Hong Kong (China) have received the most attention due to their top tier rankings. However, several developing economies in Asia have made significant progress in bridging the digital divide and building out networks. This section examines regulatory developments in three Asian countries: Sri Lanka, India and China.

The introduction of competition to markets has a profound effect on penetration rates, even when the competition comes via a different technology. Evolving wireless technologies such as WiMAX may dramatically increase the reach of backbone networks in developing economies, but other wireless technologies have already been implemented and have made a difference in competitive markets around the world.

The Telecommunications Regulatory Commission of Sri Lanka introduced competition to the fixed-line market in 1996 with the awarding of wireless local loop (WLL) licenses to Suntel and Lanka Bell. The licenses allowed each company to set up wireless last-kilometre connections to end users and started a period of strong competition for fixed-line services. The awarding of licenses was part of a new regulatory framework put into place in 1991 with the creation of the separate regulator. The new regulatory framework and subsequent competition for fixed lines has led to rapid growth in Sri Lanka's access opportunities (see Figure 11.13).

Sri Lanka's fixed-line market benefited from the competition provided by a wireless technology, highlighting the importance of inter-modal competition in telecommunication

Figure 11.13. **Competition in Sri Lanka *via* wireless local loop**



Source: ITU World Telecommunication Indicators Database and *www.comunica.org/samarajiva.html*.

StatLink: http://dx.doi.org/10.1787/866438100620

markets. As inter-modal competition continues to grow, so will the importance of technologically-neutral regulation.

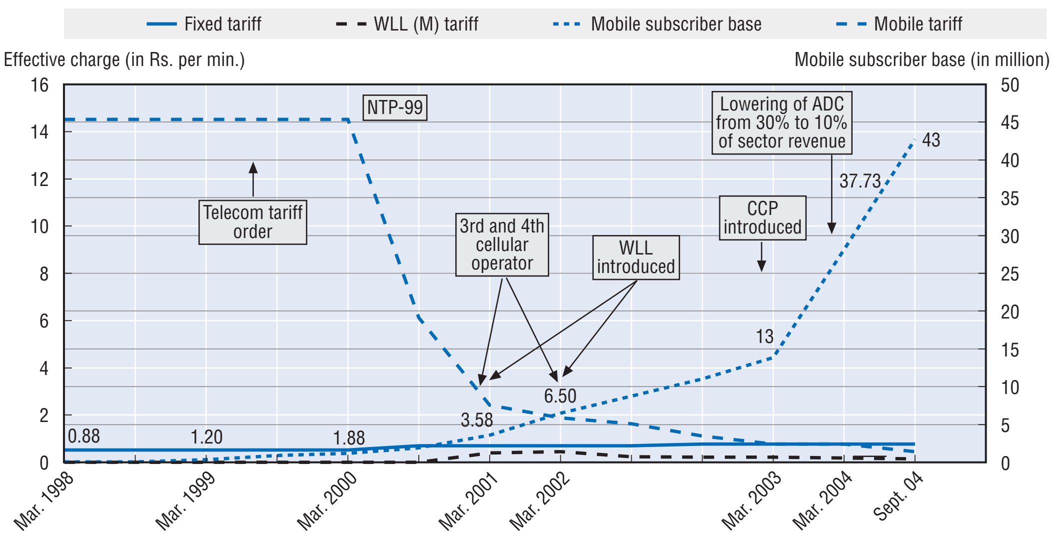
In India, the Telecom Regulatory Authority of India (TRAI) has completely restructured its regulatory framework to promote technological neutrality and take advantage of inter-modal competition. The decision was made, in part, due to the astounding success of several unregulated services (*e.g.* SMS, VoIP) that compete directly with regulated services. As a result, TRAI has been in the process of moving towards a unified licensing regime that would replace separate licensing based on technology, service or geographic area. Any licensee with one wired or wireless connection will be able to provide any service including: telephony, Internet access, broadband, television and other value-added services.

Also as part of the new regulatory framework, TRAI introduced new competition by issuing additional mobile licenses in 2001 and 2002 and awarding wireless local loop (WLL) licenses in 2002. In another important step, India moved from receiving-party-pays (RPP) to a calling-party-pays (CPP) structure in an effort to spur mobile take-up. India's reforms have been very successful, with a marked increase in mobile subscribers and a fall in mobile tariffs (see Figure 11.14). The reforms introduced by TRAI in India may eventually have an impact on the global telecommunication market, given India's large population and potential market size.

While India's large telecommunication market continues to grow, China now has the largest mobile and fixed-line markets in the world. In July 2004, there were 299 million fixed-line subscribers and 310 million mobile subscribers. Internet subscribers reached 87 million with a penetration rate of 6.7 subscribers per 100 inhabitants. Chinese broadband infrastructure is also growing at the rate of nearly 1 million new subscribers per month, with 18.8 million subscribers in July 2004.

Much of China's recent growth is a result of effective competition in the Chinese mobile and fixed-line markets. The Chinese government introduced competition into the

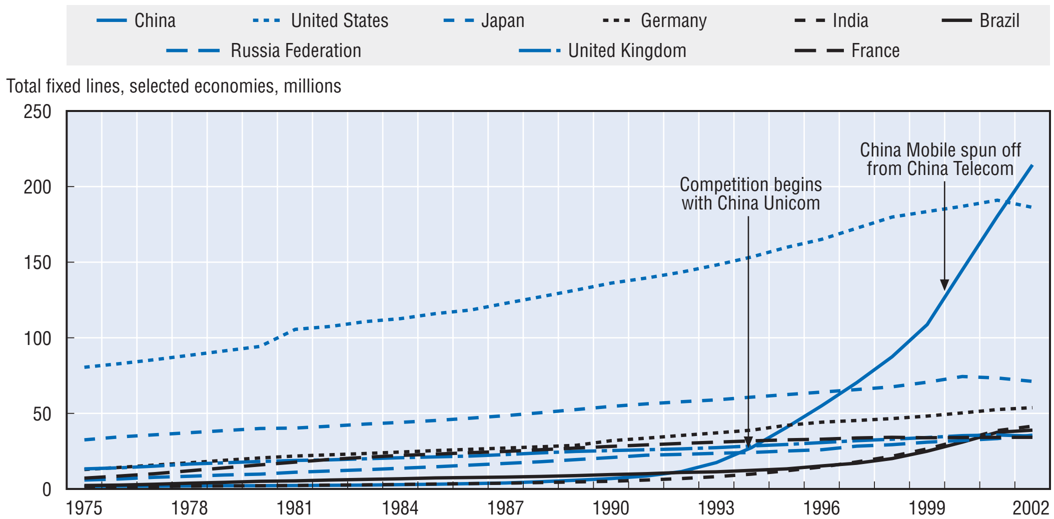
Figure 11.14. **The effect of India's successful regulatory reforms on mobile penetration and price**



Source: Telecom Regulatory Authority of India.

StatLink: http://dx.doi.org/10.1787/635224378618

Figure 11.15. **China's regulatory reform and infrastructure growth**



Source: China Academy of Telecommunications Research. *StatLink:* http://dx.doi.org/10.1787/726800580340

market in 1994, with the creation of China Unicom. Neither the incumbent, China Telecom, nor China Unicom has been privatised but competition flourishes. The result of this competition has been a dramatic increase in both mobile and fixed access (Figure 11.15).

Conclusion

As highlighted in Chapter 2, communications was the fastest-growing consumption sector in the OECD in 2003. Markets are providing new services, prices are falling and the reach of network infrastructure is improving. OECD countries are benefiting from strong and effective regulatory frameworks that have opened markets and increased competition. Digital divides still occur in the OECD, especially with newer telecommunication infrastructure such as broadband. However, markets in the OECD have functioned well and infrastructure rollouts, such as DSL, are increasing at rates surpassing initial expectations. The digital divide will remain a concern throughout the OECD, especially in rural and remote areas, but market reforms introduced by all OECD countries over the past two decades lay a competitive foundation in member countries that allows markets to work.

The development of the communications sector is not just important because of content and services available to consumers. Telecommunications infrastructure plays a key role in economic development. Developing economies have increasingly been able to attract IT and service outsourcing from developed economies and these gains rely on a high-quality telecommunications infrastructure.

Developing economies are often faced with much more pronounced divides than those found in the OECD. Nevertheless, the fundamentals remain the same. First, connectivity must be available and affordable. Second, users must have basic skills to use the technology. Finally, there must be compelling services and content that make connectivity worthwhile.

Policy makers around the world can examine the experiences of OECD countries and adapt successful policies and reforms to their market's unique situation. Many developing

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economies have followed the OECD path of regulatory reform with impressive results. Among developing economies, those that have implemented regulatory reforms often have higher penetration rates and lower prices than non-liberalised markets with similar income levels. While the establishment of a strong regulatory framework and the introduction of competition are just two components of a coordinated approach to bridging the digital divide, they should be considered vital first steps for economies working to expand access to ICTs.

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Glossary

. .	Data not available
2G	Second generation of mobile communications technology
3G	Third generation of mobile communications technology
ACA	Australian Communications Authority
ACCC	Australian Competition and Consumer Commission
ADSL	Asymmetric digital subscriber line
AfriNIC	African Network Information Centre
ANACOM	National Communications Authority (Portugal)
API	Application programme interface
APNIC	Asia-Pacific Network Information Centre
ARIN	American Registry for Internet Numbers
AS (ASes)	Autonomous systems
ASN	Autonomous systems numbers
ASR	Answer seizure ratio
BB	Broadband
BIPT	Belgian Institute for Postal Services and Telecommunications
BLS	Bureau of Labor Statistics (United States)
CAGR	Compound annual growth rate
ccTLD	Country code top level domain
CDMA	Code division multiple access
CPE	Customer premises equipment
CPI	Consumer price index
CPP	Calling party-pays
CRTC	Canadian Radio-television and Telecommunications Commission
CWTA	Canadian Wireless Telecommunications Association
DBS	Direct broadcast satellite
DNS	Domain name system
DRM	Digital rights management
DS1	Digital Signal 1 via Wikipedia
DS3	Digital Signal 3 via Wikipedia
DSL	Digital subscriber lines
DTT	Digital terrestrial television
DTV	Digital television
EC	European Commission
EPG	Electronic programming guide
EPO	European Patent Office
EU	European Union
FCC	Federal Communications Commission (United States)

FDC	Fully distributed cost
FL-LRIC	Forward looking long run incremental cost
FTP	File transfer protocol
FTS	Foreign trade statistics
FTTP	Fibre-to-the-premises
GDP	Gross domestic product
GFCF	Gross fixed capital formation
GPRS	GSM packet radio service
GSM	Global system for mobile communications
gTLD	Generic top level domain
HDTV	High definition television
HICP	Harmonised indices of consumer prices
HS	Harmonised system
HTML	Hypertext mark-up language
HTTP	Hypertext transfer protocol
ICANN	Internet Corporation for Assigned Names and Numbers
ICT	Information and communication technology
IEEE (802 Standards)	Institute of Electrical and Electronics Engineers
IMT-2000	International Mobile Telecommunications 2000
IP	Internet protocol
IPv4	Internet protocol version 4
IR	Internet registries
ISDN	Integrated services digital network
ISO	International Organization for Standardization
ISP	Internet service provider
IT	Information technologies
ITU	International Telecommunication Union
JPO	Japanese Patent Office
Kbit/s	Kilobits per second (Kbps)
LACNIC	Latin American and Caribbean Internet Addresses Registry
LAN	Local area network
LLU	Local loop unbundling
LRIC	Long run incremental cost
Mbit/s	Megabits per second (Mbps)
MDF	Main distribution frames
MIC	Ministry for Information and Communications (Japan)
MiTT	Minutes of international telecommunication traffic
MMS	Multimedia messaging service
MVNO	Mobile virtual network operators
NRAs	National regulatory authorities
OCN	Open computer network
OFCOM	Office of Communications (United Kingdom)
PBX	Private branch exchange
PC	Personal computer
PCB	Public call boxes
PCS	Personal communications service
PDA	Personal digital assistant

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PPI	Producers price index
PPP	Purchasing power parities
PSP	Public service publisher
PSTN	Public switched telecommunication network
PTO	Public telecommunications operator
PVR	Personal video recorder
R&D	Research and development
RIPE NCC	Réseaux IP Européens Network Co-ordination Centre
RPP	Receiving party pays
SDTV	Standard definition television
SIC	Standard industrial classification
SIM (card)	Subscriber identity module
SITC	Standard industrial trade classification
SMEs	Small and medium-sized enterprises
SMP	Significant market power
SMR	Specialised mobile radio
SMS	Short message service
SNA	Statistics of national accounts
SSL	Secure sockets layer
TCP/IP	Transmission control protocol/Internet protocol
TDMA	Time division multiple access
TLD	Top level domain
TRAI	Telecom Regulatory Authority of India
TVHH	Television households
UMTS	Universal mobile telecommunications system
URL	Uniform resource locator
USPTO	United States Patents and Trademark Office
VAT	Value-added tax
VDSL	Very high data rate digital subscriber line
VoIP	Voice over Internet protocol
WAP	Wireless application protocol
W-CDMA	Wideband code division multiple access
WIDE	Widely integrated distributed environment
Wi-Fi	Wireless fidelity
WiMAX	Wireless interoperability for microwave access
W-LAN	Wireless local area network
WLL	Wireless local loop

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Annex Tables

Annex Table A.1. **Average annual exchange rates**

In national currency units per USD

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	1.28	1.28	1.36	1.47	1.37	1.35	1.28	1.35	1.59	1.55	1.72	1.93	1.84	1.54
Austria	0.83	0.85	0.80	0.85	0.83	0.73	0.77	0.89	0.90	0.94	1.09	1.12	1.06	0.89
Belgium	0.83	0.85	0.80	0.86	0.83	0.73	0.77	0.89	0.90	0.94	1.09	1.12	1.06	0.89
Canada	1.17	1.15	1.21	1.29	1.37	1.37	1.36	1.38	1.48	1.49	1.49	1.55	1.57	1.40
Czech Republic	21.15	27.92	28.37	29.15	28.79	26.54	27.14	31.70	32.28	34.57	38.60	38.04	32.74	28.21
Denmark	6.19	6.40	6.04	6.48	6.36	5.60	5.80	6.60	6.70	6.98	8.08	8.32	7.89	6.59
Finland	0.64	0.68	0.75	0.96	0.88	0.73	0.77	0.87	0.90	0.94	1.09	1.12	1.06	0.89
France	0.83	0.86	0.81	0.86	0.85	0.76	0.78	0.89	0.90	0.94	1.09	1.12	1.06	0.89
Germany	0.83	0.85	0.80	0.85	0.83	0.73	0.77	0.89	0.90	0.94	1.09	1.12	1.06	0.89
Greece	0.47	0.53	0.56	0.67	0.71	0.68	0.71	0.80	0.87	0.90	1.07	1.12	1.06	0.89
Hungary	63.21	74.74	78.99	91.93	105.16	125.68	152.65	186.79	214.40	237.15	282.18	286.49	257.89	224.31
Iceland	58.28	59.00	57.55	67.60	69.94	64.69	66.50	70.90	70.96	72.34	78.62	97.42	91.66	76.71
Ireland	0.77	0.79	0.75	0.86	0.85	0.79	0.79	0.84	0.89	0.94	1.09	1.12	1.06	0.89
Italy	0.62	0.64	0.64	0.81	0.83	0.84	0.80	0.88	0.90	0.94	1.09	1.12	1.06	0.89
Japan	144.79	134.71	126.65	111.20	102.21	94.06	108.78	120.99	130.91	113.91	107.77	121.53	125.39	115.93
Korea	707.76	733.35	780.65	802.67	803.45	771.27	804.45	951.29	1401.44	1188.82	1130.96	1290.99	1251.09	1191.61
Luxembourg	0.83	0.85	0.80	0.86	0.83	0.73	0.77	0.89	0.90	0.94	1.09	1.12	1.06	0.89
Mexico	2.81	3.02	3.09	3.12	3.38	6.42	7.60	7.92	9.14	9.56	9.46	9.34	9.66	10.79
Netherlands	0.83	0.85	0.80	0.84	0.83	0.73	0.77	0.89	0.90	0.94	1.09	1.12	1.06	0.89
New Zealand	1.68	1.73	1.86	1.85	1.69	1.52	1.45	1.51	1.87	1.89	2.20	2.38	2.16	1.72
Norway	6.26	6.48	6.21	7.09	7.06	6.34	6.45	7.07	7.55	7.80	8.80	8.99	7.98	7.08
Poland	0.95	1.06	1.36	1.81	2.27	2.42	2.70	3.28	3.48	3.97	4.35	4.09	4.08	3.89
Portugal	0.71	0.72	0.67	0.80	0.83	0.75	0.77	0.87	0.90	0.94	1.09	1.12	1.06	0.89
Slovak Republic	0.00	0.00	0.00	30.77	32.04	29.71	30.65	33.62	35.23	41.36	46.04	48.35	45.33	36.77
Spain	0.61	0.62	0.62	0.76	0.81	0.75	0.76	0.88	0.90	0.94	1.09	1.12	1.06	0.89
Sweden	5.92	6.05	5.82	7.78	7.72	7.13	6.71	7.63	7.95	8.26	9.16	10.33	9.74	8.09
Switzerland	1.39	1.43	1.41	1.48	1.37	1.18	1.24	1.45	1.45	1.50	1.69	1.69	1.56	1.35
Turkey	2609	4172	6872	10985	29609	45845	81405	151865	260724	418783	625218	1225590	1507230	1500890
United Kingdom	0.56	0.57	0.57	0.67	0.65	0.63	0.64	0.61	0.60	0.62	0.66	0.69	0.67	0.61
United States	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Note: Data for EMU member countries are given in euros (EUR). Data relating to years prior to year of Euro Zone accession (1999) has been converted from national denomination into EUR denomination by applying the irrevocable EUR/national currency conversion rate.
Source: OECD Main Economic indicators.

StatLink: http://dx.doi.org/10.1787/818010165155

Annex Table A.2. **Purchasing power parities**

In national currency units per USD

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	1.39	1.37	1.36	1.34	1.33	1.32	1.32	1.32	1.31	1.30	1.32	1.34	1.36	1.37
Austria	0.92	0.93	0.94	0.94	0.95	0.95	0.94	0.94	0.94	0.93	0.93	0.93	0.94	0.94
Belgium	0.91	0.91	0.92	0.93	0.93	0.92	0.92	0.93	0.93	0.94	0.93	0.91	0.91	0.91
Canada	1.27	1.26	1.24	1.23	1.22	1.22	1.22	1.21	1.19	1.19	1.21	1.20	1.19	1.22
Czech Republic	5.45	7.16	7.85	9.28	10.31	11.13	11.79	12.61	13.78	14.08	14.14	14.32	14.77	14.78
Denmark	8.78	8.70	8.74	8.65	8.63	8.59	8.56	8.56	8.53	8.41	8.51	8.47	8.66	8.70
Finland	0.98	0.97	0.96	0.96	0.96	0.98	0.97	0.96	0.97	0.98	0.99	0.99	1.01	1.00
France	0.98	0.97	0.97	0.97	0.96	0.96	0.95	0.93	0.93	0.93	0.93	0.91	0.91	0.91
Germany	0.99	0.99	1.01	1.02	1.03	1.03	1.01	1.01	1.01	1.00	0.99	0.99	0.99	0.98
Greece	0.34	0.39	0.44	0.49	0.54	0.58	0.61	0.64	0.66	0.68	0.69	0.70	0.70	0.71
Hungary	0.00	29.81	35.36	41.88	49.03	60.25	71.12	83.39	92.76	99.85	108.60	111.76	118.63	125.77
Iceland	71.18	74.26	74.91	74.71	74.67	75.17	75.27	76.50	79.06	81.03	84.30	90.05	95.39	93.44
Ireland	0.80	0.79	0.79	0.81	0.81	0.82	0.83	0.83	0.87	0.92	0.97	1.00	1.01	1.00
Italy	0.69	0.72	0.73	0.74	0.75	0.78	0.80	0.81	0.80	0.81	0.82	0.83	0.85	0.86
Japan	191.20	189.92	188.42	185.00	181.44	176.70	171.97	169.22	166.95	162.04	155.66	149.67	145.56	139.61
Korea	562.38	601.55	632.00	660.83	697.02	730.77	744.67	753.33	781.73	754.89	731.19	731.99	735.69	740.15
Luxembourg	0.96	0.94	0.95	0.99	1.00	1.00	1.01	1.02	1.01	0.98	1.00	1.01	1.02	1.03
Mexico	1.45	1.72	1.92	2.05	2.18	2.94	3.77	4.35	4.96	5.63	6.19	6.43	6.65	6.96
Netherlands	0.92	0.91	0.91	0.90	0.90	0.90	0.90	0.90	0.91	0.93	0.94	0.93	0.95	0.96
New Zealand	1.53	1.49	1.47	1.48	1.47	1.47	1.48	1.45	1.46	1.43	1.44	1.47	1.46	1.46
Norway	9.57	9.44	9.16	9.15	8.95	9.01	8.94	9.08	9.35	9.21	9.13	9.25	9.44	9.50
Poland	0.26	0.39	0.53	0.67	0.91	1.13	1.31	1.48	1.63	1.73	1.84	1.88	1.88	1.86
Portugal	0.48	0.50	0.55	0.58	0.60	0.61	0.63	0.64	0.65	0.65	0.66	0.67	0.68	0.68
Slovak Republic	..	..	9.84	11.09	12.32	13.25	13.47	14.23	14.79	15.63	16.23	16.51	16.63	17.12
Spain	0.62	0.64	0.66	0.68	0.69	0.71	0.72	0.73	0.73	0.73	0.75	0.76	0.77	0.79
Sweden	8.90	9.36	9.23	9.29	9.31	9.42	9.32	9.38	9.47	9.34	9.31	9.47	9.65	9.71
Switzerland	1.98	2.03	2.03	2.04	2.03	2.01	2.02	1.94	1.91	1.95	1.94	1.94	1.91	1.90
Turkey	1 545	2 368	3 785	6 201	12 542	22 979	39 815	71 529	124 109	191 716	274 412	430 136	618 281	745 064
United Kingdom	0.60	0.61	0.62	0.62	0.62	0.62	0.63	0.62	0.63	0.64	0.64	0.63	0.63	0.64
United States	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: Data for EMU member countries are given in euros (EUR). Data relating to years prior to year of Euro Zone accession (1999) has been converted from national denomination into EUR denomination by applying the irrevocable EUR/national currency conversion rate.
Source: OECD Main Economic indicators.

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Annex Table A.3. **Gross domestic product**

USD millions

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	310 848	317 659	313 406	303 640	343 188	371 301	412 495	414 177	370 816	402 233	388 620	369 549	412 036	528 068
Austria	160 967	168 505	189 789	188 559	203 546	240 447	236 197	208 024	213 760	212 793	193 020	192 494	205 975	254 092
Belgium	196 796	201 318	224 611	215 194	234 988	276 889	268 751	243 984	250 257	250 727	227 453	226 922	246 343	302 861
Canada	572 621	586 645	569 679	554 722	554 071	582 701	605 913	629 695	608 345	649 336	712 109	704 603	726 387	857 199
Czech Republic	29 607	26 997	29 701	37 171	43 631	55 263	61 188	56 313	60 796	59 050	55 701	60 864	73 753	90 420
Denmark	133 330	134 008	146 998	138 913	151 842	180 314	182 912	169 140	172 449	173 030	158 287	159 316	172 460	211 928
Finland	137 625	123 593	109 344	86 545	99 875	130 496	128 096	123 023	129 234	127 644	119 399	120 954	132 343	161 053
France	1 216 078	1 220 326	1 341 180	1 281 020	1 345 085	1 555 064	1 554 074	1 405 801	1 450 946	1 441 598	1 302 879	1 317 486	1 440 397	1 749 713
Germany	1 663 482	1 767 294	2 016 500	1 946 118	2 090 964	2 467 534	2 381 429	2 102 921	2 143 778	2 104 894	1 862 385	1 851 786	1 988 019	2 391 236
Greece	83 215	91 136	99 713	93 840	100 425	117 540	123 734	121 544	121 578	125 207	113 739	117 269	133 492	171 961
Hungary	..	33 740	37 603	38 960	41 896	44 669	45 162	45 723	47 050	48 043	46 680	51 834	64 913	82 780
Iceland	6 239	6 668	6 830	6 002	6 163	6 861	7 162	7 253	8 022	8 427	8 419	7 639	8 502	10 570
Ireland	47 158	47 695	53 379	50 278	54 709	66 494	73 289	79 730	87 170	95 167	94 555	103 065	120 747	151 445
Italy	1 100 247	1 162 550	1 224 647	996 743	1 028 808	1 098 871	1 228 054	1 166 233	1 192 243	1 178 717	1 070 228	1 087 978	1 189 083	1 461 715
Japan	3 039 746	3 475 870	3 793 858	4 354 621	4 794 103	5 283 034	4 688 215	4 305 623	3 930 910	4 452 851	4 745 870	4 162 325	3 972 422	4 300 988
Korea	267 009	312 047	332 660	365 403	425 444	517 118	557 644	516 283	345 432	445 399	511 658	481 896	546 934	605 354
Luxembourg	11 060	11 947	13 406	13 771	15 339	18 103	18 088	17 406	18 897	19 935	19 522	19 661	21 514	26 917
Mexico	262 953	314 287	364 186	402 627	420 166	286 140	332 313	400 792	420 826	480 511	580 418	622 200	647 659	625 509
Netherlands	293 447	301 820	333 090	325 288	346 406	414 018	409 168	374 972	393 549	397 947	369 074	383 344	419 962	510 422
New Zealand	43 520	42 149	40 470	44 055	51 669	60 973	67 061	66 715	54 794	57 444	52 201	52 062	60 134	80 108
Norway	116 102	118 794	127 262	117 125	123 712	147 862	159 213	157 192	149 952	158 082	166 940	169 770	190 749	220 860
Poland	63 084	81 620	90 406	92 062	106 070	136 185	153 491	153 699	169 357	164 362	166 411	185 965	191 449	209 492
Portugal	71 573	81 092	98 176	86 484	90 287	107 769	111 987	106 913	112 180	114 926	106 007	109 420	122 224	146 642
Slovak Republic	..	..	..	13 369	15 470	19 404	20 830	21 198	22 181	20 409	20 288	20 886	24 237	32 668
Spain	512 170	552 576	595 137	502 300	501 247	583 716	610 857	561 523	586 639	601 510	560 129	583 863	656 800	836 802
Sweden	240 104	253 305	262 780	198 463	213 185	248 282	270 513	247 475	248 034	251 395	239 625	219 666	241 575	301 415
Switzerland	235 672	240 045	248 799	242 112	268 415	315 466	301 607	262 478	269 097	265 263	245 875	249 991	276 323	321 012
Turkey	150 676	151 041	159 095	180 422	130 652	169 319	181 465	189 878	200 307	184 858	199 264	145 573	184 162	239 700
United Kingdom	995 179	1 028 332	1 071 674	957 748	1 046 832	1 140 290	1 191 578	1 328 095	1 431 027	1 456 721	1 440 244	1 441 028	1 558 425	1 805 313
United States	5 757 200	5 946 900	6 286 800	6 604 300	7 017 500	7 342 300	7 762 300	8 250 900	8 694 600	9 216 200	9 764 800	10 075 900	10 434 800	10 951 300
OECD	17 717 709	18 799 959	20 181 178	20 437 854	21 865 689	23 984 424	24 144 784	23 734 702	23 904 224	25 164 676	25 541 802	25 295 306	26 463 820	29 639 541

Source: OECD Main Economic Indicators.

StatLink: http://dx.doi.org/10.1787/288237621287

Annex Table A.4. **Total population**

Thousands

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	17 065	17 284	17 495	17 766	17 961	18 196	18 420	18 609	18 814	19 038	19 273	19 529	19 755	19 998
Austria	7 718	7 823	7 884	7 992	8 030	7 948	7 959	7 968	7 977	7 992	8 012	8 032	8 053	8 098
Belgium	9 967	10 005	10 045	10 086	10 116	10 137	10 155	10 180	10 203	10 222	10 246	10 281	10 330	10 374
Canada	27 701	28 031	28 377	28 703	29 036	29 302	29 611	29 907	30 157	30 404	30 689	31 021	31 362	31 630
Czech Republic	10 362	10 309	10 318	10 330	10 334	10 331	10 315	10 304	10 295	10 283	10 273	10 224	10 201	10 202
Denmark	5 141	5 154	5 171	5 189	5 206	5 230	5 262	5 285	5 303	5 321	5 338	5 357	5 376	5 390
Finland	4 986	5 029	5 042	5 066	5 089	5 108	5 125	5 140	5 153	5 165	5 176	5 188	5 201	5 213
France	56 709	56 976	57 240	59 006	59 221	59 419	59 624	59 831	60 047	60 297	60 594	60 916	61 237	61 540
Germany	63 254	79 984	80 595	81 179	81 422	81 661	81 896	82 052	82 029	82 087	82 188	82 340	82 482	82 520
Greece	10 089	10 200	10 322	10 558	10 606	10 634	10 709	10 777	10 835	10 883	10 917	10 938	10 950	10 981
Hungary	10 365	10 346	10 324	10 294	10 261	10 329	10 311	10 291	10 267	10 238	10 211	10 188	10 159	10 130
Iceland	255	258	261	264	266	267	269	271	274	277	281	285	288	290
Ireland	3 503	3 524	3 549	3 574	3 586	3 601	3 626	3 661	3 711	3 751	3 800	3 859	3 926	3 991
Italy	56 737	56 760	56 859	57 049	57 204	57 301	57 397	57 512	57 588	57 646	57 762	57 894	57 994	58 095
Japan	123 480	123 960	124 430	124 670	124 960	125 570	125 864	126 166	126 486	126 686	126 926	127 291	127 435	127 619
Korea	42 869	43 296	43 748	44 195	44 642	45 093	45 525	45 954	46 287	46 617	47 008	47 343	47 640	47 925
Luxembourg	384	390	395	398	404	410	416	421	427	433	439	442	446	450
Mexico	81 250	83 265	84 902	87 797	89 352	90 164	92 159	93 938	95 786	97 199	98 658	100 051	101 398	102 708
Netherlands	14 947	15 068	15 182	15 290	15 381	15 460	15 526	15 607	15 703	15 809	15 922	16 043	16 147	16 224
New Zealand	3 363	3 477	3 514	3 598	3 648	3 707	3 762	3 803	3 829	3 851	3 873	3 912	3 976	4 039
Norway	4 241	4 262	4 287	4 312	4 337	4 358	4 381	4 405	4 432	4 462	4 491	4 513	4 539	4 565
Poland	38 119	38 245	38 365	38 459	38 544	38 596	38 625	38 654	38 668	38 655	38 646	38 248	38 230	38 204
Portugal	9 877	9 865	9 833	9 974	9 998	10 030	10 058	10 091	10 129	10 172	10 226	10 293	10 368	10 444
Slovak Republic	5 298	5 283	5 307	5 325	5 347	5 363	5 374	5 384	5 391	5 396	5 401	5 403	5 391	5 380
Spain	38 851	38 920	39 011	39 096	39 166	39 223	39 279	39 348	39 453	39 626	39 927	40 266	40 546	40 809
Sweden	8 559	8 617	8 668	8 719	8 781	8 827	8 841	8 846	8 851	8 858	8 872	8 896	8 925	8 959
Switzerland	6 712	6 800	6 875	6 989	7 037	7 081	7 105	7 113	7 132	7 167	7 209	7 285	7 343	7 405
Turkey	56 203	57 305	58 401	59 491	60 573	61 646	62 695	63 745	64 789	65 819	67 461	68 610	69 666	70 802
United Kingdom	57 561	57 808	58 006	57 672	57 797	57 928	58 043	58 167	58 305	58 481	58 643	59 031	59 207	59 375
United States	249 973	252 665	255 410	260 011	263 194	266 588	269 714	272 958	276 154	279 328	282 425	285 358	288 240	291 085
OECD	1 025 539	1 050 909	1 059 816	1 073 052	1 081 498	1 089 509	1 098 046	1 106 386	1 114 474	1 122 162	1 130 886	1 139 035	1 146 811	1 154 444

Source: OECD Annual Labor Force Statistics.

StatLink: http://dx.doi.org/10.1787/321343000151

Annex Table A.5. **Gross fixed capital formation**

USD millions

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Australia	70 521	66 516	67 238	66 981	79 818	82 667	91 866	95 906	87 421	97 167	84 512	83 905	100 436	129 382
Austria	37 047	40 368	44 515	42 379	46 619	53 174	52 222	46 393	47 816	47 014	43 923	42 298	43 339	54 661
Belgium	44 198	42 218	46 485	42 964	45 772	55 058	53 449	49 818	51 604	52 455	48 281	47 403	48 033	57 258
Canada	123 808	116 877	108 455	101 608	105 807	104 378	110 249	126 696	122 862	130 517	138 438	140 399	144 869	169 554
Czech Republic	7 845	6 812	8 684	10 407	12 362	17 464	19 197	16 857	17 182	15 927	15 412	16 788	19 649	24 032
Denmark	26 543	25 586	26 322	23 813	26 256	33 546	33 934	33 153	35 566	34 211	31 721	32 351	35 603	42 289
Finland	39 478	30 212	21 973	14 454	15 813	21 964	22 271	22 941	24 883	24 991	23 627	24 758	25 075	29 569
France	274 398	267 887	280 788	248 280	256 587	292 234	287 147	252 346	267 361	277 029	263 251	265 091	279 085	335 669
Germany	389 270	419 847	484 813	448 224	483 675	553 753	518 312	450 719	458 500	453 606	403 661	375 563	369 585	426 742
Greece	19 223	20 557	21 234	19 009	18 721	21 863	24 090	24 060	25 687	28 366	26 837	27 933	31 867	44 156
Hungary	..	7 432	7 863	7 741	8 873	8 954	9 666	10 166	11 122	11 489	10 983	12 192	15 188	18 462
Iceland	1 249	1 352	1 270	1 009	1 011	1 108	1 399	1 473	1 975	1 901	2 028	1 699	1 588	2 248
Ireland	8 825	8 171	8 996	7 791	9 048	11 704	14 197	16 648	19 590	23 044	23 219	24 146	27 324	35 756
Italy	236 011	244 606	250 692	183 768	185 182	201 573	225 206	212 940	220 328	224 066	211 863	214 789	235 154	279 517
Japan	982 383	1 106 505	1 158 955	1 277 047	1 356 772	1 468 197	1 333 169	1 208 042	1 056 687	1 172 819	1 250 244	1 072 253	960 441	1 027 445
Korea	101 291	123 875	125 048	134 401	155 788	192 954	209 033	183 920	104 831	132 406	159 075	142 365	159 099	179 458
Luxembourg	2 595	3 019	2 869	3 269	3 436	3 905	3 865	3 874	4 277	4 743	4 068	4 478	4 715	5 324
Mexico	47 015	58 624	71 374	74 737	81 320	46 216	59 353	78 219	87 965	101 862	124 133	124 406	125 226	120 880
Netherlands	65 886	66 032	72 014	67 375	70 223	84 037	86 209	80 539	84 700	89 560	81 610	82 922	87 332	102 962
New Zealand	8 584	6 920	6 759	8 127	10 501	13 086	14 398	13 649	10 545	11 553	10 156	10 555	12 347	17 562
Norway	24 954	23 489	24 330	23 149	24 699	29 424	32 342	34 752	37 736	34 850	30 996	31 027	33 751	36 907
Poland	12 380	14 882	14 189	13 673	17 791	23 721	29 774	33 797	40 001	39 469	39 179	38 437	36 357	38 551
Portugal	18 770	20 228	23 284	19 231	20 098	24 609	26 134	27 323	30 139	31 343	29 743	29 695	30 346	33 136
Slovak Republic	..	..	..	4 010	4 114	4 855	6 716	7 244	7 998	6 039	5 262	6 019	6 695	8 387
Spain	132 434	138 806	137 619	106 782	105 799	128 333	132 088	122 818	134 132	145 039	141 597	147 663	165 804	213 974
Sweden	55 552	52 861	48 041	31 086	33 031	39 671	43 736	38 877	40 818	43 381	42 468	38 298	40 253	47 536
Switzerland	68 558	66 410	61 640	56 351	63 402	73 601	66 887	56 878	60 154	59 234	56 153	55 476	59 536	67 360
Turkey	34 459	35 993	37 600	47 840	32 164	40 360	45 530	50 165	49 244	40 428	44 541	26 444	30 548	37 057
United Kingdom	204 107	184 525	176 461	150 787	166 637	186 425	197 330	219 305	250 900	249 431	244 258	239 861	256 261	294 059
United States	1 003 400	966 600	1 016 500	1 102 100	1 208 000	1 301 600	1 410 700	1 533 700	1 664 700	1 807 100	1 944 200	1 929 600	1 870 500	1 976 200
OECD	4 040 785	4 167 209	4 356 010	4 338 390	4 649 317	5 120 434	5 160 470	5 053 218	5 056 725	5 391 037	5 535 441	5 288 814	5 256 007	5 856 093

Source: OECD Main Economic Indicators.

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