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Access for Business

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Working Party on Telecommunication and Information Services Policies

BROADBAND ACCESS FOR BUSINESS

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FOREWORD

In June 2002, this report was presented to the Working Party on Telecommunications and Information Services Policy (TISP). It was recommended to be made public by the Committee for Information, Computer and Communications Policy in October 2002.

The report was prepared by Dr Sam Paltridge of the OECD's Directorate for Science, Technology and Industry. It is published on the responsibility of the Secretary-General of the OECD.

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MAIN POINTS

Broadband access to communication networks is important for economic growth and development. This paper examines the development of broadband access for business users. Previous work has examined overall broadband development and backbone networks. The focus here is on short distance leased lines and new forms of broadband access being used by business. The paper's conclusions, in respect to broadband access for business, reinforce the recommendations found in earlier work. Infrastructure competition continues to be the best way to develop broadband access, but in many OECD countries the level of competition is insufficient and this is having a negative impact on business users.

The countries with alternative infrastructure available to business users are developing broadband access much faster than in those markets where there is only one, or at best two platforms available to provide broadband access.

Policies designed to open the local loop have, arguably, had less impact on the residential market where the main competition has been provided by cable networks. There are notable exceptions such as in Denmark and Japan where such policies are driving developments in both business and residential markets. However in many countries new entrants argue that their ability to service residential markets has been constrained because incumbents have delayed the introduction of access to unbundled local loops and co-location. There is also insufficient competition where incumbents own both platforms, resulting in very little pressure being placed on the incumbents to roll out and market DSL. Remarkably, in more than one third of OECD countries the incumbent telecommunication carrier continues to own both readily available platforms for providing broadband access. This is extremely frustrating for business users as it limits competitive choice. OECD governments should, as a matter of priority, review the impact that incumbent ownership of cable networks has on the development of broadband access and local competition in general. The other major concerns for business users and new entrants, in respect to broadband access, are, in some countries, the ongoing high cost of traditional leased line products and tardy performance in provisioning this infrastructure for competitors. In markets where alternatives are not available new entrants continue to depend on access to incumbent facilities to serve their business customers. The reason for this is that it takes time to develop alternative local infrastructure. At the same time, because experience shows that entities with monopoly power over essential facilities will act in anti-competitive ways, regulatory authorities need to apply and oversee competitive safeguards. An important means to accomplish this task involves the use of benchmarking. The main focus of this benchmarking needs to be the pricing and provision of local leased lines that business users and new entrants need to connect to their backbone networks.

Local leased line prices remain of concern where there is currently insufficient competition. For users, in those markets, this means that incumbents can continue to charge prices that are not disciplined by competition. For new entrants, in those markets, it means that incumbents may price local leased circuits in an anti-competitive manner. Leased lines were made the subject of a European Union directive in 1992, which was last amended by a Commission decision in 1998.[1] The interconnection (as opposed to the provision) of leased lines is covered by the 1997 Interconnection Directive. These directives will be repealed in July 2003 and replaced by new legislative measures that were adopted in April 2002.

In its 7th Report on the Implementation of the Telecommunications Regulatory Package, the European Commission nominated local access, in particular for broadband, as being a critical issue facing regulators.[2] In respect to leased lines, the European Commission pointed to continuing high prices, lengthy delivery times, and absence of cost orientation as being a barrier in some markets to the rollout of broadband and e-commerce. The European Commission's benchmarking pointed to tremendous variations

in pricing and provisioning and said they could not be justified in terms of local costs and conditions. In the United States, metrics already exist at the state level for the provision of unbundled elements. The FCC is also considering whether a nation-wide list of such elements should be established.

OECD governments should work together to produce comparable data for benchmarking performance in terms of pricing and provisioning of the elements needed by new entrants to develop a competitive market for broadband access. The most efficient way to accomplish this would be for regulators to mandate that operators, with significant market power, publicly report data on prices and performance. This would include reporting these data in a manner that indicate performance differences between the delivery of services to their own retail operation and in meeting the orders of new entrants.

Introduction

Traditionally, leased lines have been the main means by which telecommunication carriers provide broadband services for business users. The number and variety of users employing leased lines have increased as liberalisation has progressed. In the era of monopolies, the only users of leased lines were business users for their own private networks. As markets began to be partially liberalised, leased lines also became the staple of value-added service suppliers and resellers. In the area of value-added services it became possible, for the first time, to purchase a leased line to connect to someone else's network. One example of a value added service supplier, as they were then called, would be an internet service provider (ISP). In this case, business users would purchase a leased line to provide a connection to their ISP.

The introduction of competition in the mobile sector, in advance of the fixed network in most countries, also made wireless companies large users of leased lines for their backbone networks. Finally, with full liberalisation in fixed markets, new entrants have become large users of leased lines to provide local access to their backbone networks. These local, or short distance, leased lines are generally known as 'tails'. Tails provide the final link from a user's premises to corporate or carrier backbone networks.

That is not to say, however, that all 'tails' could be categorised as providing broadband access. These circuits did, of course, provide permanent and dedicated connectivity – in other words, the equivalent to the 'always-on' characteristic – promoted as one of the benefits of some of the more recent broadband access technologies. However, they were not always high-speed connections. Tails with a capacity of 64 kbps are still widely used by even the largest corporate networks in OECD countries. Until recently if a business user wanted high-speed access, to connect to their ISP or corporate backbone, for example, a short distance leased line was the most likely option. The capacity of such a leased line might be anything from 256 kbps to 2 Mbps and higher.

Over recent years a number of other technologies have become commercially available to provide broadband access for business users. These include DSL, cable modems, Ethernet LANs, fixed wireless, two-way interactive satellite services and so forth. Much of the innovation, and new access possibilities, have been brought about by liberalisation. The capabilities and deployment of these technologies are developing quickly in some OECD countries, raising the possibilities that they will be viewed as substitutes for traditional leased lines. Indeed, in the leading countries some substitution is already occurring. On the other hand, the pace of these development is uneven. In addition, even in the leading countries, it may be some time before technologies such as DSL are viewed as 'first choice' substitute for leased lines for new entrants or business users.

One limitation of DSL is that the distance between the exchange and the customer's premises is relatively short (*i.e.* up to five kilometres). Moreover, many business users need symmetric (*i.e.* SDSL) rather than asymmetric (*i.e.* ADSL) services, with the former having a shorter distance capability (**Table 1**). New entrants will, therefore, continue to rely on leased lines to provide local access where sub local loop unbundling is still not widely available. Sub-local loop unbundling refers to access by new entrants to parts of the local loop in the outside facilities of the incumbent (*i.e.* any part of the local loop between the local exchange and the user's premises). Accordingly, local leased lines will continue to be the only means by which new entrants can provide certain levels of service to some business customers.

Table 1. SDSL and ADSL compared

	SDSL	ADSL
Transmission style	Symmetric	Asymmetric
Transmission rate	2 Mbps in both directions	Up to 8 Mbps rate downstream and up to 640 Kbps upstream
Direct Voice Channel	No	Yes
Maximum Voice Grade Equivalents	32	10
Distance	Up to 3.5 km	Up to 5.5 km

Source : Morgan Stanley Research.

In some OECD countries the substitution of DSL services for local leased lines has already begun.

In Germany, a number of new entrants launched SDSL services for business users in 2000 and a growing number of new entrants now offer SDSL. QSC, for example, offers SDSL services for business users at five different speeds up to 2 Mbps.[3] In the United Kingdom, Fibrenet uses BT's unbundled local loops to offer SDSL services. Fibrenet says it is primarily aiming to service up to 45 000 of the United Kingdom's 110 000 small and medium-sized enterprises (SMEs) with an employee count of between 10 and 250. However, they also see a market in a further 313 000 SMEs with between two and nine employees in the UK. The main reason for this is that SDSL enable service providers to broaden the accessible market, thus making broadband access affordable to many SMEs for the first time. Fibrenet, for example, claims it can offer SDSL services at 2 Mbps for less than the price the incumbent charges for a 64kbps leased line.[4] Fibrenet also offers services to business users in Germany and France.

Incumbents are responding to the challenge of new entrants, using unbundled local loops to offer SDSL, by introducing SDSL service in competition with their own leased lines. France Telecom is one of the leading incumbents in Europe in introducing DSL products that will compete head to head with their own leased line products.[5] France Telecom sells "Turbo DSL", a top of the line DSL product which is a viable substitute for local access leased lines 2 Mbps and below. Colt, a new entrant offering DSL services in nine European countries, currently buys more than one thousand such lines in France, instead of leased lines. These connections are much less expensive than leased lines, and quality is improving as the service matures. The current 'Turbo DSL' is ADSL-based, but France Telecom has indicated a symmetrical product was introduced by mid-2002. The availability of SDSL will make an even more compelling substitute for local leased lines as it eliminates the disadvantages of asymmetric lines. In April 2002, Belgacom became one of the first incumbents to launch SDSL services. At that time, Belgacom said SDSL service would be available to 80% of business users.[6] Deutsche Telekom plans to launch a symmetric DSL service with scaleable bandwidths of 256 to 2 048 kilobits per second in the fourth quarter of 2002.[7] In the United Kingdom, BT Wholesale undertook a technical trial in 2001 and, in May 2002, was reviewing product requirements and market demand in order to build a business case to take this to the next step – market trial followed by launch.

New entrants are also offering higher speed DSL products, using unbundled local loops, than the offerings by incumbents. In the United Kingdom, Easynet offers business users ADSL connections with an enhanced range of services to include 4 Mbps and 8 Mbps access. In April 2002, BT Openworld's highest speed ADSL offer was 2 Mbps. In Norway, NextGenTel offers ADSL using Telenor's unbundled local loops. NextGenTel offers service up to 8 Mbps. In contrast, Telenor offers ADSL at speeds up to 1 Mbps.[8] This is not to single out BT or Telenor. The speeds on offer to business users are typical of the current offerings from incumbents across the OECD area. The important point is that new entrants are using unbundled local loops to increase the level of broadband service available to business users.

Some of the regulatory issues raised by access to local leased lines are recurring in respect to the network elements needed to provide services such as DSL. In all OECD countries the fact remains that incumbents control the vast bulk of local access networks. Progress is, of course, being made in the rollout of competitive facilities but experience has shown that it takes time to build alternative infrastructure at the local level. While it is arguably easier to buildout local access to business users, by their very nature networks, and business user's requirements for their networks, involve connectivity at multiple local access points. In the United States, where the build out of alternative infrastructure has been among the most extensive, the availability of alternatives depends on the market examined. For broadband access, cable reaches about as many homes as the incumbent telephone network does, and a large proportion of business locations as well. For high-speed leased lines, extensive fibre networks have been constructed, even in smaller cities. However, for voice grade loops to many smaller business locations, entrants still require the incumbent's facilities to complete their service offerings.

In Europe, local infrastructure competition is still at a nascent stage in most countries. In Ireland for example, the regulator, in its third determination of operators with significant market power, reported that the incumbent telecommunication operator had 96% of the leased line market. In the United Kingdom, infrastructure competition has had longer to develop. Oftel says that BT had a 66% market share in 2001. Significantly, for local access, Oftel's data reveal that BT's market share is largest for low-speed leased lines. For example, for leased line revenue for digital lines below 2 Mbps BT's share is 87%. For lines at 2 Mbps the share decreases to 77% and lines above 2 Mbps the share is just 36%.[9]

In Portugal, PT Comunicações was designated, by the regulator, as having significant market power in the leased lines market on 2 March 2000 and 7 February 2002. Under the terms of law decree 290-A, PT Comunicações is subject to the principles of cost orientation, transparency and non-discrimination. In the Netherlands, KPN was designated as having significant market power in the provision of leased lines up to and including 2 Mbps. This does not apply to the provision of leased lines above 2 Mbps. Under the telecommunications act, KPN is required to include in a reference interconnect proposal what is offered regarding interconnecting of leased lines at cost oriented prices. In 2001, OPTA consulted industry on how leased lines should be regulated. The main complaints were a lack of supply of leased lines on cost-oriented, non-discriminatory and transparent terms. Competitors said the prices that they had to pay to KPN for short distance leased lines were too high to compete against KPN in the end user market (*i.e.* there was a price squeeze).[10]

In the context of declarations of significant market power, it is worth remembering that incumbents in one country are frequently new entrants in another. This is to be encouraged and policies aimed at opening local access bottlenecks are the best way to attract new entrants and increase investment in telecommunication infrastructure. The following statement was submitted to OPTA by BT Ignite (Netherlands) in response to the regulator's consultation on leased lines. The names, however, of any incumbent in the OECD might be substituted for the Dutch incumbent (in their 'home' market), and KPN is itself a major beneficiary of policies designed to open access market in other countries:

> "Leased lines are such important components of many telecommunication network services that the results of this consultation will have a profound effect on how fast and how effectively the Dutch information society develops … Leased lines are purchased by both end-user business customers and other operators. As KPN is the only operator with a ubiquitous local 'access' network other operators have no choice but to purchase local tail circuits from KPN in order to connect up customers to their networks. Competition in leased line services to end-users is therefore constrained though the lack of effective competition in wholesale 'access ends'."[11]

While the migration to DSL products for local access looks very positive, there will be an ongoing need for regulators to have safeguards in place where there is insufficient infrastructure competition. DSL products will enable new entrants to significantly reduce the cost of serving business customers. On the other hand, in most countries leased lines will remain an essential product for business broadband access, even if other technologies such as SDSL will assume increasing importance.

Some research suggests that while companies of all sizes use the Internet, it has been large companies that have been more aggressive in implementing 'Internet business solutions' such as in supply chain management.[12] The development of broadband access has the potential to bring 'fast and always-on' communication capabilities to SMEs that could not previously afford these capabilities via leased lines, or did not have the traffic volume of to justify the cost of a leased line.

It is not a simple matter to compare the price of DSL services with leased lines and the prices available will depend on the intended use of the DSL connection. While the actual line between the local exchange and the DSL user is not shared, most DSL services are 'overbooked'. Overbooking entails users sharing network bandwidth, and throughput depends on the number of concurrent users. DSL services aimed at consumers are usually between 1:25 and 1:50 overbooked.[13] This ratio may be acceptable for some basic Internet access services. However, if a business wanted to use DSL for a critical service, such as the transport of voice, non-overbooked SDSL lines would be needed. Business users may get 1:25, 1:10, 1:4 and even non-overbooked lines (*e.g.* 1:1), but only at a price which is higher than standard DSL offers. Accordingly, the most accurate comparison between leased line pricing and DSL pricing would be one between a leased line and a non-overbooked symmetrical DSL service.

In September 2002, in one European country with a competitive market, a non-overbooked symmetrical 2 Mbps SDSL service from a leading supplier was USD 995 per month. This non-overbooked line enabled business users to use the connection for voice and other time and throughput critical services. Customers of that ISP were using it to replace more expensive leased line options. However, the pricing for non-overbooked lines is only indicative. The competitor with the least expensive non-overbooked offer in that country charged USD 699 while the most expensive charged USD 1 299 per month for a non-overbooked 2 Mbps line.

For a business customer willing to use an overbooked line with a 10:1 ratio, a symmetrical 2 Mbps SDSL service was USD 404 per month in the European country under discussion. At a 10:1 ratio, the ISP advised business customers that they it would not be adequate for some applications, such as voice traffic, but it would connect their LANs or carry web traffic. The price for an ADSL line at 2 Mbps/512 kbps non-overbooked was USD 644 per month and USD 351 per month with a ratio of 1:10 overbooked. The latter options were fine for non-critical Internet access services but not appropriate if the business users wanted to run a web server (because of the asymmetry) and not acceptable for business level voice services.

For some small business users, simply wanting an always-on DSL connection for basic Internet access, it is most likely that these connections will be less expensive than comparable leased lines offers from ISPs. In most OECD countries the standard DSL prices shown on ISP websites are lower than the foregoing examples that are designed to substitute for existing leased line applications. For example, in mid-2002, using overbooking, SBC had an SDSL offer for USD 349 per month for 1.5 Mbps. For business users not needing symmetrical capabilities, an asymmetric DSL line (*i.e.* 1.5 Mbps downstream/256 kbps upstream) from SBC was priced at USD 79.95 per month. ADSL offers at lower speeds (*e.g.* 768 kbps/128 kbps), that might be applicable to an SME with, for example, a LAN with six PCs, are available for less than USD 50. In the United States market, T-1 (1.5 Mbps) leased lines are still the preferred method for business Internet access. To date, DSL is not 'cannibalizing' T-1, but rather the lower priced "overbooked" DSL offerings

are extending broadband availability downward, to smaller businesses who would not have considered a T-1 connection.

Many individual business users and SMEs also use DSL offers aimed at consumers. Broadband access also makes it economically viable for corporations to connect individual employees to corporate networks with the same available capabilities. In the United Kingdom, BT has signed Microsoft as its first main client for supplying home-based workers with broadband services. Under the deal, 1 500 employees of the software company will connect to BT's broadband service from their homes.[14] Accordingly, new forms of broadband access hold the potential to reduce the cost of broadband access for large firms; enable some SME's to afford broadband access for the first time; as well as enabling new business processes and ways of working.

Business broadband access penetration and the Internet

The two leading means of broadband access currently being used by business are leased lines and DSL. Another option being used by a growing number by office buildings is Ethernet LAN connections (**Box 1**). However, the penetration and availability of Ethernet LAN connectivity is still very limited compared to leased lines and DSL. This raises the question of how penetration rates for the leading platforms vary across the OECD area.

Box 1. Ethernet LANS: Another broadband option for business users

In a growing number of OECD countries, new entrants are serving users in office buildings and residential apartments with broadband Ethernet LANs. Some of these companies include Bredbandsbolaget - B2 (Sweden) and Fastweb – e.Biscom (Italy). B2 has been discussed in previous work.[15] In Italy, Fastweb offers broadband connection of up to 10 Mbps to residential users and services beyond those speeds to business users.[16] By May 2002, Fastweb's infrastructure covered approximately 5 000 kilometres, of which half consists of urban local access links. FastWeb operates in Milan, Rome, Genoa, Turin, Naples and Bologna, with a market share of more than 10% and peaks of around 20% in areas where it has already been present for more than a year. At the end of 2001, FastWeb had 49 000 customers. Business clients, at the end of 2001, totalled over 8 600. Of these, 357 were medium and large-sized companies, 8 225 were small companies and small office/home office entrepreneurs (SOHOs) and 32 were carriers. All residents and businesses in Milan will be able to subscribe to FastWeb's broadband services by the end of 2002. Fastweb says that Milan has the most 'capillary' fibre network infrastructure of any city in the world. The number of clients of HanseNet Telekomunikation GmbH, e.Biscom's broadband operator in the Hamburg area, nearly tripled at year-end, amounting to 34 000, compared to 11 800 at the end of 2001. The breakdown of HanseNet's client base is: 7 445 business customers, 26 500 residential customers and 55 carriers.

In the United States, companies offering broadband Ethernet LAN connections include Telseon and Cogent. Since completing deployment of its network in 20 metropolitan areas, Telseon has achieved significant growth. From 2000 to 2001 the number of installed customers for Gigabit Ethernet service grew 400%. The average bandwidth consumed by these customers increased from 45 Mbps to 93 Mbps during the same time period. Cogent Communications offers Ethernet connectivity for LANs in large commercial office buildings in central business districts of major metropolitan markets. Cogent offer Internet access at speeds of 100 megabits per second (Mbps) and 1 gigabit (or 1 000 megabits) per second (Gbps).[17] As of 31 December 2001, Cogent had its broadband data network operating or constructed inside 166 office buildings with more than 65 million 'rentable' square feet and had agreements with real estate owners to install and operate its network in 967 office buildings totalling approximately 296 million 'rentable' square feet. Cogent's inter-city backbone network consists of two strands of optical fibre that they acquired from Williams Communications. Cogent has also purchased assets from several backbone operators that have gone into liquidation in the United States (*e.g.* PSINet and NetRail).

Inside buildings connected to Cogent's network, the company installs and manages a broadband data infrastructure that typically runs from the basement of the building to the customer location using the building's vertical utility shaft. Service for customers is initiated by connecting a fibre-optic cable from a customer's local area network to the infrastructure in the vertical utility shaft. The customer then has dedicated access to Cogent's network using Ethernet connections.

Cogent aims to address the 1.8 million small and medium-sized businesses in the United States, which typically employ between 10 and 500 employees. Cogent's business plan is to provide broadband access to the majority of SMEs either currently use dial-up services or using leased lines up to T1 speeds (*i.e.* 1.5 Mbps). Cogent's goal is to target this market segment by constructing their own fibre-optic broadband networks in the office buildings in which many small and medium-sized businesses are located. The company estimates that there are more than 2 800 office buildings containing more than 1 00 000 square feet which serve at least 20 unique tenants and average more than 40 tenants, and are located within servable distance (a quarter of a mile) from a planned Cogent intra-city fibre ring.

Cogent also offers broadband access services to universities.[18] Institutions such as Tufts University in Boston, Stanford University in Palo Alto, the University of Pennsylvania in Philadelphia and the George Washington University in Washington, DC, are among the universities using Cogent's broadband connections. The company's relatively inexpensive flat rate pricing structure for 100 Mbps access and 1GBps access is extremely attractive to Universities. Cogent charges business users USD 1 000 per 100 Mbps and USD 10 000 per 1 Gbps per month.

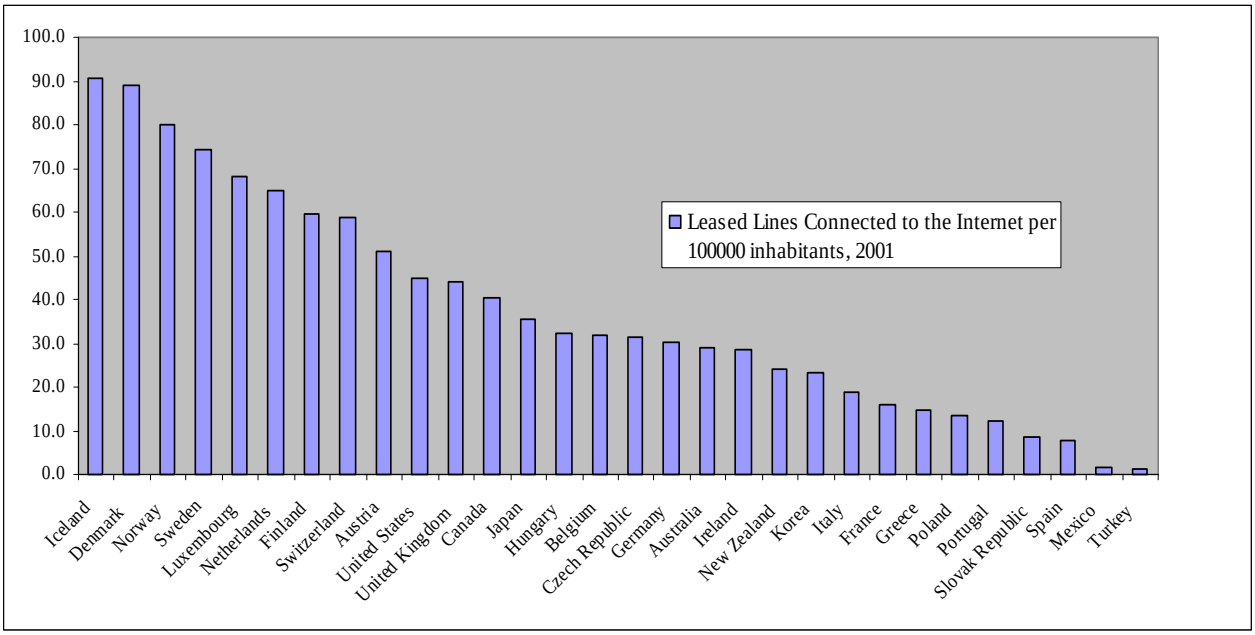
The business models of companies offering Ethernet LAN connections are being tested in the market and they currently have very small shares of the business market for broadband access on a national basis. Fastweb expects to break even by 2003 and be cash-flow positive by 2005.[19] Cogent Communications and B2 are also in a start-up phase and can provide no guarantee that they will reach profitability. Equipment companies such as Cisco and Intel have provided vendor financing (*i.e.* Cisco and Cogent) or invested directly in the company by way of venture capital (*i.e.* Intel and B2). One limitation for business users will continue to be that companies such as B2, Fastweb and Cogent can only provide services to those locations where it is economic to install Ethernet LANs. That being said, in this segment, they are providing competition to incumbent telecommunication carriers and are offering pricing that is significantly different from traditional leased line pricing.

Local leased line access to internet backbones

Few comparable data are available on the use and penetration of leased lines connected to the Internet. Some telecommunication carriers or regulators report the number of leased lines by company or country but, generally, do so without indicating the proportion that is used for providing permanent local access connections to the Internet. One alternative, which does have universal coverage using the same methodology, is to examine Netcraft's leased line survey. At the end of 2001, on a global basis, there were around 375 000 permanent leased line connections to the Internet. This represented a 30% increase over the same figure for year-end 2000.

Some 89% of leased line connections to the Internet are in OECD countries. The largest number of leased line connections is in the United States with one third of all connections in the world. Japan makes up 12% followed by the United Kingdom (7.1%), Germany (6.6%) and Canada (3.3%). Other countries representing more than 2% of all connections, at the end of 2001, were Korea, Italy, the Netherlands and France.

Figure 1. Leased line connections to the Internet



Source: Netcraft, OECD.

Weighted by population, the four Scandinavian countries have the highest penetration of leased line connections to the Internet (**Figure 1**). Luxembourg, the Netherlands, Finland, Switzerland, Austria and the United States follow. One factor to keep in mind, in looking at penetration, is that leased lines are only one technology capable of providing permanent connections to the Internet. Korea, for example, has a relatively low penetration but this may be because business users prefer other options, such as DSL. A further factor may be the pricing and availability of leased lines. It is notable that the Scandinavian countries have traditionally had some of the lowest prices for leased lines and this is reflected in their high penetration rates. By way of contrast, Korea has had relatively high prices for leased lines but relatively inexpensive prices for DSL and cable modem services.

On additional factor to note is that some DSL connections appear up in the Netcraft data. This occurs if a user has a statically allocated IP addresses and receives mail locally rather than using some external POP/IMAP service. Netcraft then count it as a permanent connection because it has the same characteristics as a leased line connection to the Internet in their survey. Virtually all residential and many business DSL connections currently use dynamically assigned IP addresses and are excluded from Netcrafts's survey.

Table 2a: Broadband access in OECD countries

	DSL subscriber lines		Cable modem subscribers		Other	Total broadband subscribers per 100 inhabitants
	2000	2001	2000	2001	2001	2001
Australia	10 000	65 000	64 000	110 000	5 000	0.94
Austria	38 500	100 600	98 900	192 000		3.61
Belgium	43 000	230 000	102 013	201 000	17 349	4.37
Canada	465 600	1 060 000	927 000	1 670 000		8.88
Czech Republic	0	100	*10 000*	12 000		0.12
Denmark	26 399	151 775	41 000	87 500		4.48
Finland	15 000	43 500	15 000	24 500		1.31
France	64 000	430 000	126 601	189 343		1.05
Germany	200 000	1 870 000	25 000	34 500	34 000	2.36
Greece	72	72	0	0		0.00
Hungary	400	6 200	3 000	17 419	2 460	0.26
Iceland	1 957	9 300	0	0	500	3.49
Ireland	300	300	0	100		0.01
Italy	114 900	390 000	0	0	49 000	0.77
Japan	9 732	1 524 348	625 000	1 303 000	12 000	2.24
Korea	2 756 843	5 178 323	1 556 072	2 936 280	31 398	17.23
Luxembourg	0	1 215	0	15		0.28
Mexico	0	29 854	15 000	15 000		0.05
Netherlands	10 000	138 000	320 000	400 000	200	3.38
New Zealand	9 676	25 579	658	2 000		0.72
Norway	943	36 137	17 477	45 339	6 379	1.96
Poland	0	1 796	0	10 000		0.03
Portugal	0	2 563	25 154	93 836		0.96
Slovak Republic	0	0	0	420		0.01
Spain	44 956	375 816	13 459	98 466		1.20
Sweden	42 000	242 100	56 000	115 000	115 800	5.33
Switzerland	1 000	35 124	*56 547*	120 000		2.16
Turkey	292	2 625	4 167	7 897		0.02
United Kingdom	38 000	140 000	19 693	208 000	2 000	0.59
United States	1 977 101	3 947 808	3 582 874	7 059 598	1 785 406	4.65
OECD	5 877 671	16 038 135	7 704 615	14 953 213	2 061 492	2.98
EU	644 127	4 115 941	842 820	1 644 260	218 349	1.59

Source : OECD.

1. Data for Czech Republic, Greece and Ireland are trials. The categories for some countries are based on the total broadband subscribers for Sweden (Cable and Ethernet) and Luxembourg (DSL). Data for cable modem in Mexico are an estimate.
2. United States data for “other” are June 2001 plus HNS DirectWay broadband satellite subscribers as at year end 2001. DSL and Cable for United States are year-end 2001.
3. The data for Germany, as with all other countries, are for installed lines by all companies. Deutsche Telekom also reports the number of lines which have been sold but are not yet installed.

Table 2b: Broadband subscribers (first half 2002)

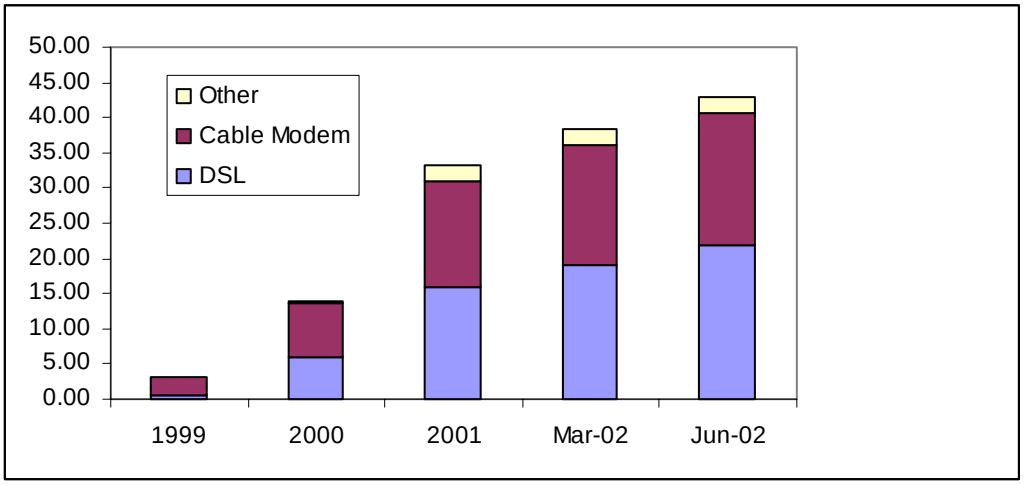
	DSL subscriber lines		Cable modem subscribers		Other		Broadband subscribers per 100 inhabitants
	March 2002	June 2002	March 2002	June 2002	March 2002	June 2002	June 2002
Australia	71 500	111 800	124 200	140 900	7 600	8 500	1.4
Austria	119 900	136 000	202 500	207 800			4.2
Belgium	312 000	362 000	249 929	259 036	19 405	23 824	6.3
Canada	1 209 110	1 330 800	1 781 100	1 848 000			10.3
Czech Republic	100	100	12 000	12 000			0.12
Denmark	197 200	233 000	104 644	121 789		784	6.7
Finland	58 971	71 738	32 750	41 000			2.2
France	587 000	730 000	208 663	233 579			1.6
Germany	2 300 000	2 500 000	35 300	39 100	42 100	50 000	3.2
Greece	72	72	0	0			0.0
Hungary	11 596	18 781	17 000	19 200			0.4
Iceland	11 515	12 900	0	0	500	500	4.8
Ireland	300	1 200	500	800			0.05
Italy	518 000	585 000	0	0	78 600	104 000	1.2
Japan	2 378 795	3 300 926	1 456 000	1 626 000	26 400	87 100	4.0
Korea	5 394 479	5 734 690	3 222 822	3 287 464	33 296	36 363	19.2
Luxembourg	1 988	2 670	15	15			0.6
Mexico	40 820	51 786	15 000	15 000			0.07
Netherlands	175 000	192 000	*400 000*	432 400	200	200	3.9
New Zealand	31 000	39 000	2 500	4 500			1.1
Norway	59 500	75 000	45 700	46 300	6 379	6 379	2.8
Poland	3 000	4 000	9 900	10 700			0.038
Portugal	3 806	5 203	117 652	143 333			1.5
Slovak Republic	0	0	420	420			0.01
Spain	527 604	660 861	132 171	180 191			2.1
Sweden	302 000	344 000	122 800	127 600	121 000	128 000	6.8
Switzerland	62 966	101 177	150 000	180 000			3.9
Turkey	2 862	2 971	8 742	11 920			0.022
United Kingdom	181 000	299 000	308 900	452 994	2 000	2 000	1.3
United States	4 498 000	5 082 865	8 288 000	9 200 000	1 785 406	1 785 406	5.8
OECD	19 060 084	21 989 531	17 049 208	18 642 041	2 122 886	2 232 956	3.9
EU	5 284 841	6 122 744	1 915 824	2 239 637	263 305	308 808	2.3

Note: Previous quarter, or mid-point data used, where data were unavailable.
Source: OECD.

DSL and cable modem broadband access

The development of broadband access networks is proceeding apace in OECD countries. Between the end of 2000 and the end of 2001, the number of subscribers (business and residential) using DSL grew from 6.3 million to 16.4 million (**Table 2**). Over the same period, the number of subscribers using cable modem services grew from 7.7 million to 14.8 million. In total, the number of broadband subscribers, using these two types of technologies, more than doubled from 14 million to just over 31 million (**Figure 2**). This number continued to increase in 2002 with total broadband subscribers exceeding 40 million (**Table 2a**). The available data for the third quarter of 2002, at the time of writing, showed the pace of growth increasing across the OECD.

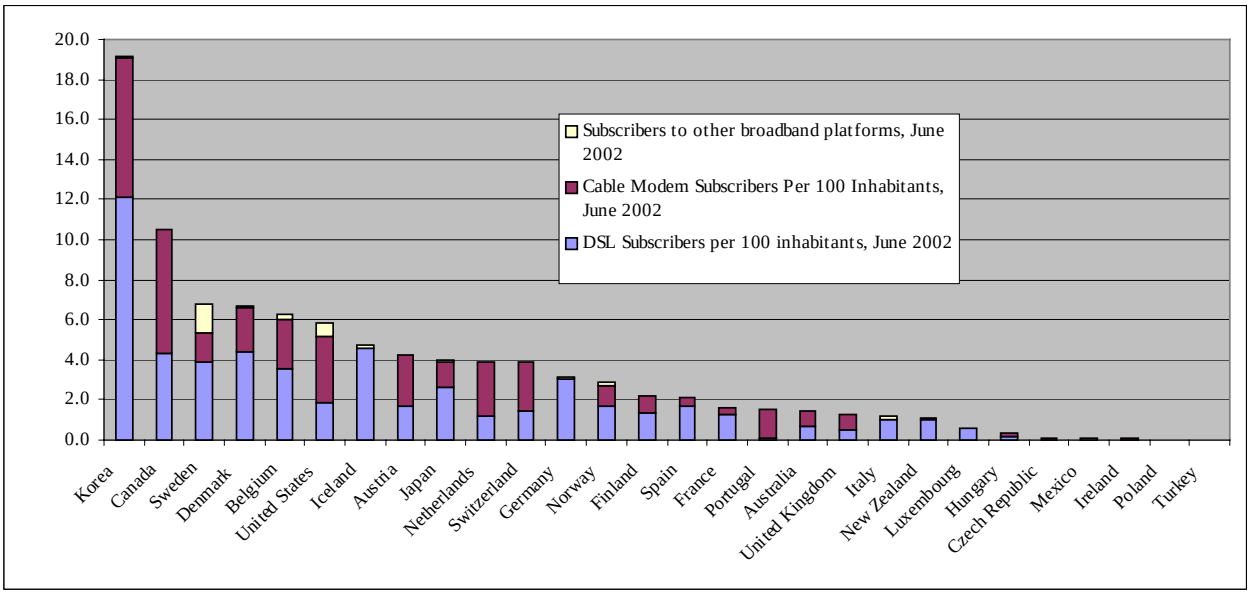
Figure 2. The growth of DSL and cable modems in the oecd area



Source: OECD.

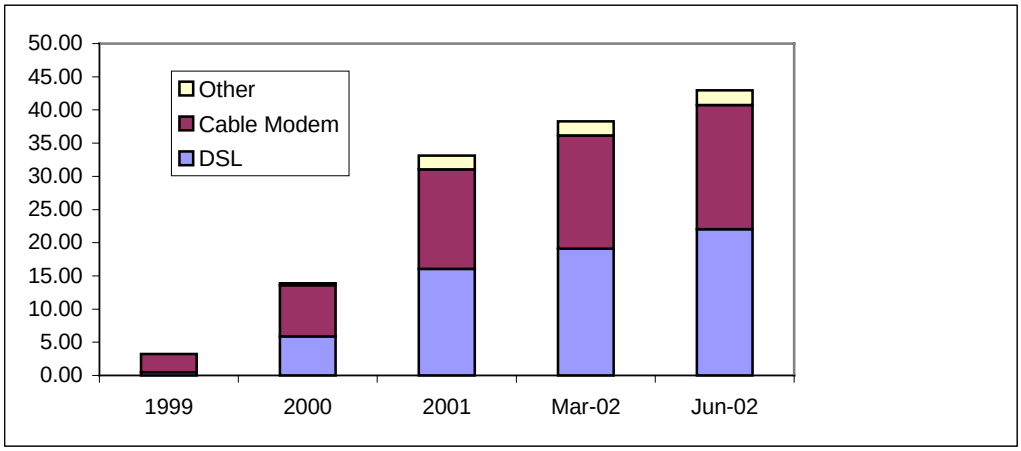
The number of subscribers using DSL surpassed the number of subscribers using cable modems, for the first time, in the final quarter of 2001. That being said the number of OECD countries, in which subscribers to DSL were outnumbered by subscribers to all other technologies, were still in the majority. The inclusion of other broadband access technologies (*e.g.* Ethernet LANs, Two-Way Direct Satellite Services, Fibre to the Home, Fixed Wireless), would increase the OECD total by just over one million subscribers to 32 million at end 2001. The latter is an important point because the initial market for some of these technologies tends to be business users. New entrants are using fixed wireless networks to connect business in metropolitan areas. Some new entrants are specialising in the use of Ethernet LANs which to connect office buildings with some of the fastest broadband connections available. At the same time, satellites are being used to provide the first broadband access to business users in areas where networks have not been upgraded to provide DSL or cable modems.

Figure 3. Penetration of Broadband Access in OECD Countries



Source: OECD.

Figure 3a. Penetration of Broadband Access in OECD Countries



Source: OECD.

Korea continues to lead broadband access development in the OECD area (**Figure 3**). By the end of 2001, Korea had 17 broadband subscribers per 100 inhabitants. Canada was the next best performer with 8.4 broadband subscribers per 100 inhabitants. Sweden, Denmark, the United States and Belgium were the other countries to have exceeded four broadband subscribers per 100 inhabitants by that date. There were no commercial DSL or cable modem service available in Greece, Ireland and the Slovak Republic at the end of 2001. In Ireland, Eircom launched a commercial DSL service in May 2002. Commercial offers are expected to be launched, in the other countries, in 2002. By June 2002, Korea was still leading broadband penetration across the OECD followed by Canada, Sweden and Denmark (**Figure 3a**).

Competition and access growth

Incumbents provide retail DSL service to around 80% of all end users across the OECD area. In the EU area this figure is higher, and is in the order of 90%. In both cases, however, if the supplier of the underlying infrastructure is considered then the incumbent's market share is much higher. This is because the majority of retail users, served by new entrants, use the incumbent's local loop (*e.g.* a fully unbundled line, line sharing or wholesale offer). As a remarkable exception, owing to successful unbundling policies, incumbents in Japan have only less than 40% of market share (i.e. 39.6% in October 2002). In October 2002, Japan added more than 400 000 DSL subscribers in one month alone.

The overall incumbent telecommunication carrier share of the cable modem market is relatively small and is in the order of just 2%. This figure is, however, misleading in terms of the impact incumbent ownership of cable networks has in the overall development of broadband access. Incumbent telecommunication carriers own cable networks in one-third of OECD countries and in some cases they are the largest service provider (*e.g.* Australia, Portugal) or own the underlying infrastructure used by retail providers (Luxembourg, Turkey). In other cases, incumbents have significant minority shares of the cable modem market (Denmark, Finland, France, Hungary, Norway, Sweden) or ownership shares of cable infrastructure even if cable modem services are not being provided (*e.g.* Germany).

One thing that is clear from developments to date is that competition is driving growth in the leading countries. Strong and growing infrastructure competition exists in all the leading countries. Plotting the penetration of independent retail broadband subscribers against those of the incumbent shows R2 = 0.7427 (**Figure 4**). The two apparent exceptions are Germany and Iceland, where although DSL is growing relatively strongly, independent infrastructure providers only have a very small part of the market. Without the inclusion of these two countries the R2 = 0.9018. In the case of Germany, the growth of DSL appears to be due to a decision by Deutsche Telekom to market DSL, at a low additional fee, to its large ISDN subscriber base. Some additional pressure has been generated by competitors' use of unbundled local lines but there is still very limited competition from cable modems. On the other hand, in Iceland, competition has been an effective spur even though new entrants have only captured a relatively small share of the market. This is due to the competition focusing on the major centres of population using fixed wireless broadband access.

Infrastructure competition has been the main driver of overall broadband penetration particularly in the residential market due to competition between DSL and cable modem services. That being said, policies, such as unbundling and line sharing, have played an important part in growing the broadband access for business users in some countries (**Table 3**). Indeed, the most successful new entrants in the DSL market have, to date, been those who have focused on business users. This is not to say that cable companies can not provide competition for business users, particularly SMEs, as they are doing so in some countries such as Canada and the United Kingdom. The ubiquitous reach of the PSTN (whereas many cable networks are often regional in some countries) does mean that it has greater possibilities to serve business users. That being said cable companies may compete for small business customers if they are given a chance. In the United Kingdom, for example, Telewest offers 2 Mbps access to business customers using cable modems.[20] In Canada, Rogers Communications has high-speed cable modem services aimed at business customers at 3 Mbps. It is therefore frustrating for business users, in more than one third of OECD countries, the incumbent telecommunication carrier owns both broadband platforms in some regions.

Figure 4. Competition and broadband access growth

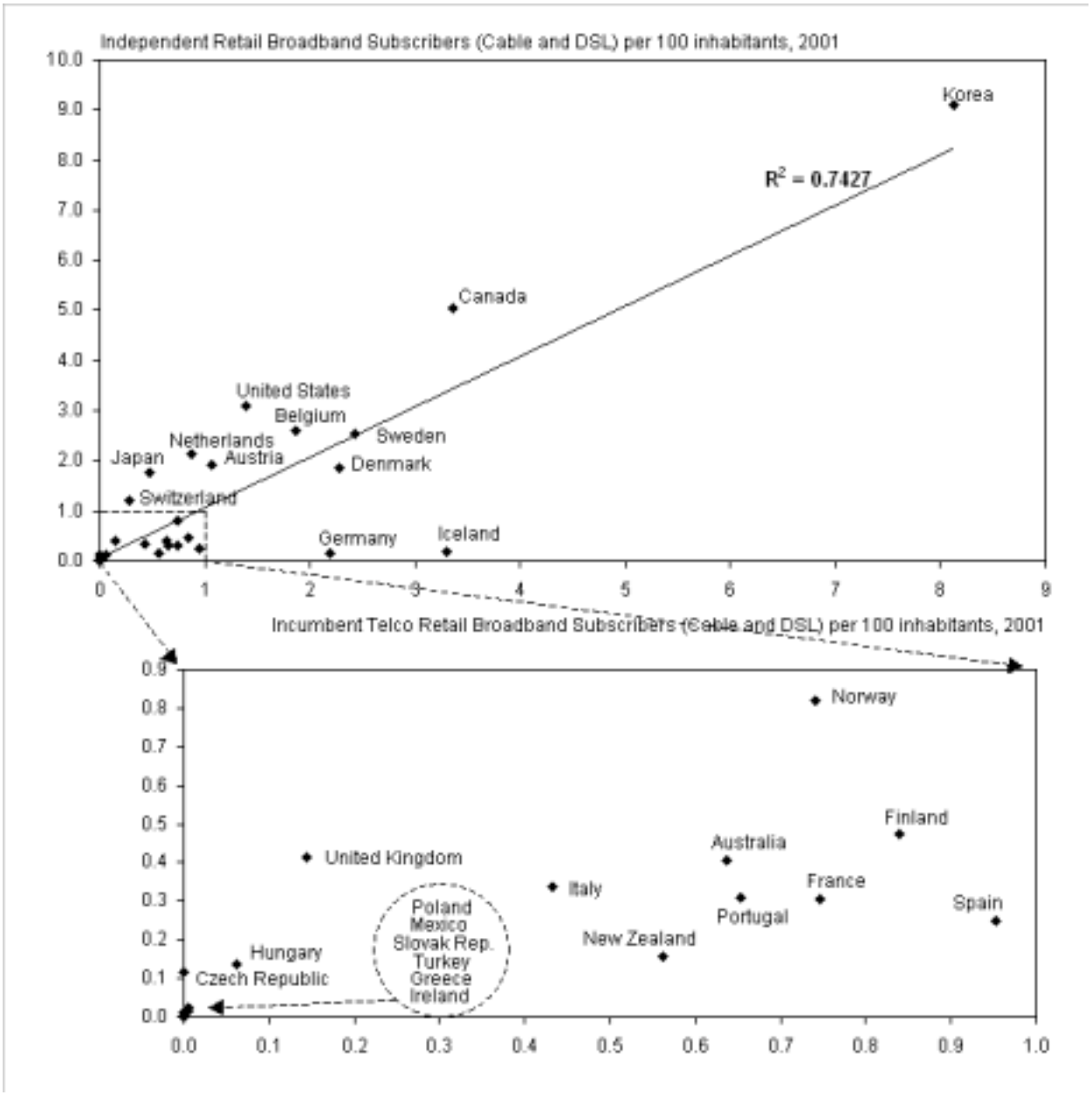


Table 3. Broadband development status

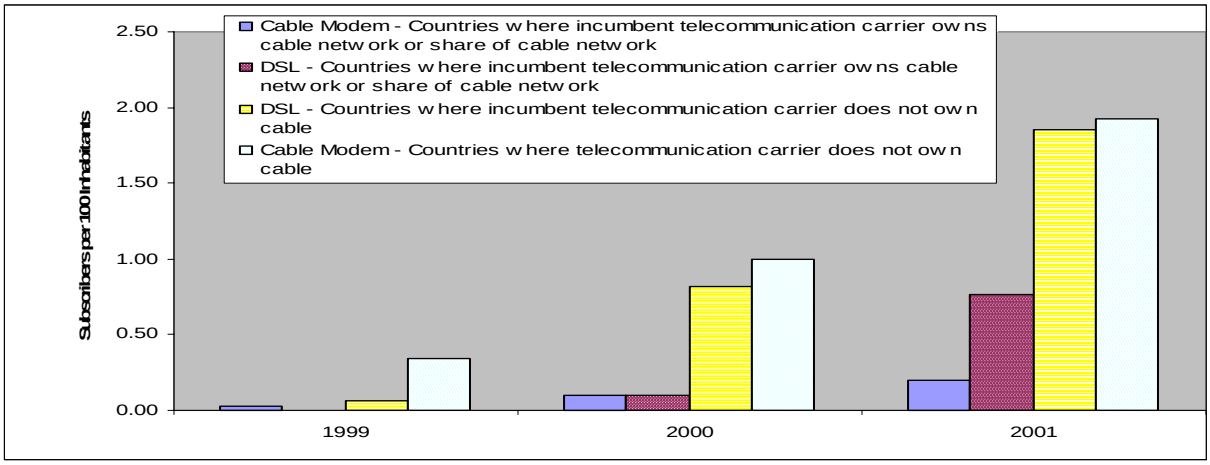
Ranked by broadband penetration, 2001	Comment
Korea	Continues to be the pace-setter with strong infrastructure competition. More than 50% of households now have broadband access.
Canada	Continuing strong growth and good competition between cable and DSL.
Sweden	Fairly strong competition between cable and DSL but less so due to incumbent ownership of major cable network. This is compensated to some extent by competition from Ethernet LAN networks. Telia is due to sell its cable network as a condition of the merger with Sonera.
Denmark	DSL being deployed rapidly but less competition than might be the case because of incumbent ownership of a major cable television network.
United States	Cable growing strongly but DSL price rises by incumbents slowed growth in 2001. Pioneered two way satellite access in 2001.
Belgium	Strong competition between DSL and cable.
Iceland	Although market share of competitors is small, competition in Reykjavik has spurred DSL and other high speed access development.
Netherlands	Strong competition between cable and DSL.
Austria	Strong competition between cable and DSL.
Germany	DSL is being developed quickly but there are still only a small number of cable modem services available to provide competition.
Japan	The pace of competition accelerated in the fourth quarter of 2001 and strong growth continued in first quarter of 2002.
Norway	Some competition is provided to the incumbent telecommunication carrier by independent cable networks, but one of the largest is owned by the incumbent, precluding competition in those areas served by only one operator. Growing competition using unbundled local loops.
Switzerland	Swisscom successfully appealed against the introduction of unbundling in 2001. The government has signaled its intention to move forward with unbundling the local loop.
Finland	The take-up of DSL and cable modem services has been relatively slow to the end of 2001. Incumbents are investors in cable networks but this may be positive where deployment is not in areas where they operate the PSTN. Use of business grade DSL lines, shared among apartment buildings, added to available competition in 2002.
Spain	Rollout of new cable networks is beginning to exert pressure on incumbent, as evident in growth in DSL and coverage.
France	The pace of DSL growth is accelerating but cable modem growth has been relatively slow. France Telecom's cable network provides the second largest number of cable modem services. Price cuts, announced in April 2002, for unbundled loops and line sharing should accelerate DSL growth when they are passed on to the market.
Australia	The incumbent telecommunication carrier leads in the take-up of both cable modems and DSL. Cable modem services face competition from independent cable networks and further initiatives to open the local loop for competition in providing DSL services occurred during the first quarter of 2002.
Portugal	The incumbent's cable modem service has been growing apace in competition with an independent cable operator but DSL growth was very slow during 2001.
Italy	The incumbent's DSL service is growing but in the absence of established cable networks, competition has come in the from Ethernet LANs in offices and apartment buildings.
New Zealand	DSL is being taken up by business users (who outnumbered residential users at the end of 2001) but residential penetration is growing only relatively slowly. Competition is provided in some urban areas by new cable networks but local loop unbundling is not available meaning that the incumbent faces little competition in many areas.

Ranked by broadband penetration, 2001	Comment
United Kingdom	DSL growth accelerated towards the end of the first quarter of 2002 following price cuts and the introduction of self-install modems. Incumbent has also announced that it will expand DSL coverage.
Luxembourg	The available data do not allow a breakdown of DSL and cable modem access. Cable modem service has been late to launch.
Hungary	The incumbent telecommunication carrier has launched DSL and cable modem services. Some competition is provided by independent cable networks in areas where they operate.
Czech Republic	Cable modem services have commenced but there was no commercial DSL service available at the end of the first quarter 2002 to apply competitive pressure.
Mexico	The incumbent has launched a DSL service but there is currently no provision for unbundling or line sharing to enable other ISPs to offer services. Growth of cable modem services has been limited due to incumbent only recently divesting its share of a cable network.
Poland	DSL and cable modem services have been launched but growth has been slow to date. Unbundling is pending and new entrants plan to launch competitive DSL services over their own infrastructure.
Turkey	Current monopoly precludes infrastructure competition but DSL service has been launched. Incumbent Telco owns the underlying cable infrastructure with cable companies providing retail services.
Ireland	No commercial cable modem or DSL service was available at the end of the first quarter 2002. Eircom launched DSL service in May 2002 but prices were relatively expensive.
Greece	No commercial cable modem or DSL service was available at the end of the first half 2002.
Slovak Republic	No commercial DSL service was available at the end of the first half of 2002.

Source : OECD.

The evidence continues to show that ownership of cable networks, by incumbent telecommunication carriers, leads to a slower roll out of broadband access (**Figure 5**). Even allowing for the large differences in growth rates the data do not reveal the full impact of an incumbent owning both platforms. This is because DSL subscribers for Germany are allocated to those countries where the incumbent telecommunication carrier has an interest in the cable market. While technically correct, at the time of writing, Deutsche Telekom had been endeavouring to sell its cable network. Without Deutsche Telekom's DSL subscribers, the average rate of growth for countries where the incumbent has an equity interest in the cable market is much lower.

Figure 5. Incumbent telecommunication carrier ownership of cable networks and broadband growth



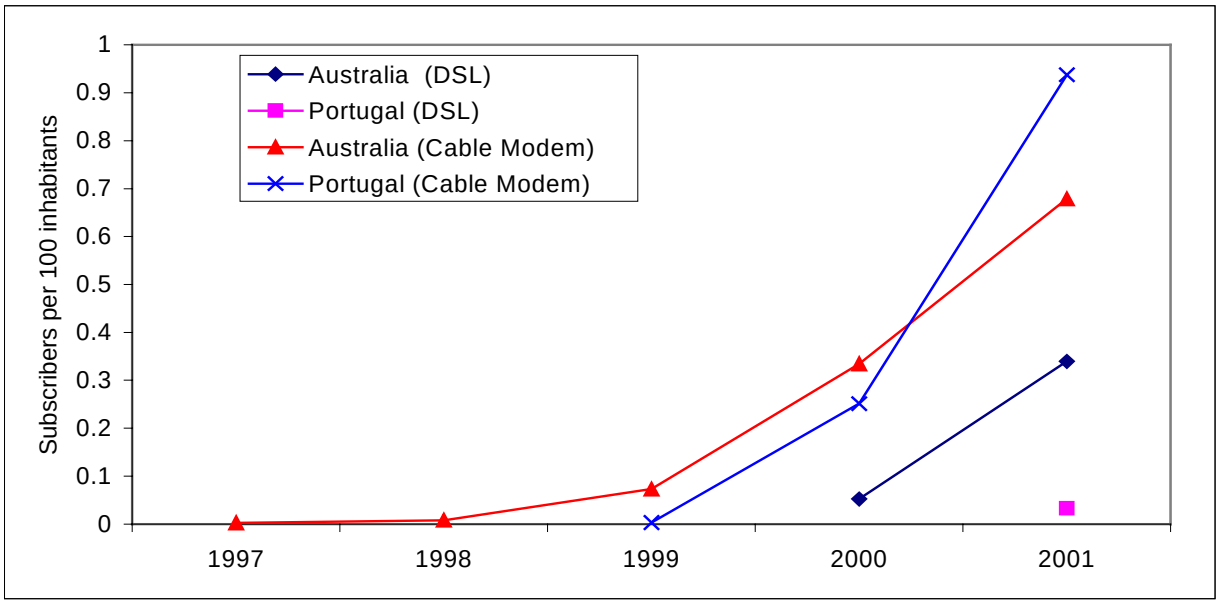
Source: OECD.

Ownership of cable networks, by incumbent telecommunication carriers, can have several impacts on the growth of broadband access for business users:

- In regions where the incumbent carrier owns both available platforms growth is lower in both the DSL and cable markets.
- In regions where the incumbent telecommunication carrier owns both available platforms, cable development may be given a low priority compared to DSL, due to potential competition from unbundling and line sharing.
- In regions where the incumbent carrier owns both platforms but competes against an independent cable company (*i.e.* down the same street) it may drive cable modem growth but appears to slow DSL growth and may therefore hold back the overall market.

The situation as described in the last bullet point tends to be rare. This occurs when two cable networks compete in the same region and one network is owned by the incumbent telecommunication carrier. This occurs, for example, in Australia and Portugal. The result, in both countries, is that cable modem services were launched well in advance of DSL services. The reason for the earlier launch of cable modem services was that there was competition in that market segment. On the other hand, the absence of competition or local loop unbundling meant there was no imperative to launch DSL. The result is, of course, a higher penetration of cable modem services than DSL in both countries (**Figure 6**). To that extent, ownership of both platforms by incumbents can be said to be less harmful to the development of cable modem services than in those cases where development is put on hold because there is no competition. Notwithstanding this, the impact on the overall broadband market may be negative because there is less incentive to develop DSL, if incumbents can meet the threat of competition from independent cable companies with their own cable service. Overall broadband growth rates are clearly higher where there is head to head competition between independently owned DSL and cable networks. Significantly, one reason incumbents like to meet competitive threats with the same technology (*e.g.* cable versus cable) is that it can impact on the ability of competitors to win customers away from the incumbent in adjacent markets (*e.g.* telephony).

Figure 6. Relative growth of broadband in australia and portugal

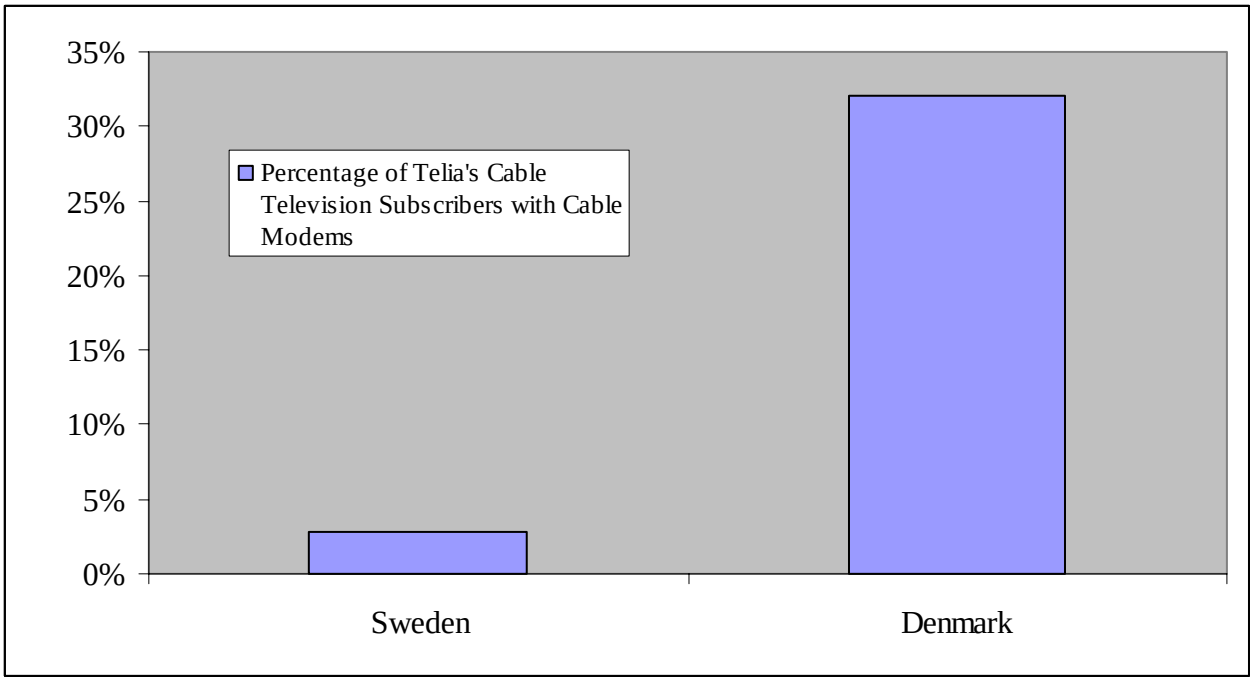


Source: OECD.

In those cases where the incumbent owns both available platforms the impact on growth of broadband access is more detrimental. In some of these markets the telecommunication carrier has focused on DSL because it faces competitive pressure from other platforms (*e.g.* LAN Ethernet) or from policies designed to open the local loop. This can also result in the potential of the cable network to provide broadband access being put on hold or simply not developed to the same extent as DSL.

In respect to performance and ownership of infrastructure it is interesting to consider the case of Denmark and Sweden. In Sweden, Telia owns the PSTN and one of the largest cable television networks. In Denmark, Telia also owns a cable television network but is a new entrant in terms of providing broadband access (*i.e.* Telia is not the incumbent carrier). In Sweden, Telia has sold cable modem connections to just 3.5% of its cable television subscribers by year end 2001. In Denmark, Telia had sold cable modem services to 32.4% of its cable network subscribers (**Figure 7**). Indeed, despite being able to market cable modem services to 1.3 million subscribers in Sweden, compared to 179 000 in Denmark, Telia managed to sell more cable modem subscriptions in Denmark than Sweden. Denmark is clearly benefiting from the additional competition Telia brings to that market, but its raises the question of whether an independently owned company would do better in developing cable modem services in Sweden using Telia's cable network. At the same time, TDC, the incumbent telecommunication carrier in Denmark also owns a cable network in Denmark. This means that, in some areas, TDC owns both readily available infrastructures capable of providing broadband access. As would be expected TDC is growing the market much faster in DSL, where it faces competition from Telia's cable network, than in those regions where it owns a cable network.

Figure 7. Proportion of Telia's cable network users with cable modems



Source: Telia.

The ownership of both infrastructures by one company not only limits choice for users but also may impact on the pace of innovation. In Denmark, Telia has announced that it will upgrade DSL services for its Danish customers using TDC's local loops. From June 2002, Telia's Danish subscribers were able to access the Internet at to 2 Mbps downstream and 512 kbps upstream.[21] The downstream speed is faster than the rate for Telia's cable modem and DSL users in Sweden.

The pace of broadband growth in the Nordic countries has been slower than it would have been otherwise , if cable networks had been independent from incumbent telecommunication carriers in their home markets. The average broadband penetration, for DSL and cable modems, for the Nordic region is a little lower than the average for the rest of the OECD. The Nordic region is usually a leader in the development of communication markets. In the Nordic countries, competition has had to come from new entrants using Ethernet LANs, fixed wireless and unbundled local loops. On the other hand, cable networks appear to be under-utilised for the provision of broadband access. The same is true for a number of countries outside the Nordic region. One development which will have a positive impact on the situation is Telia's agreement to divest its cable network in Sweden as a condition of its merger with Sonera.

In Mexico, the incumbent carrier owned a major interest in one of the largest cable companies until it divested its mobile company in 2001. Subsequently, in April 2002, the mobile company sold its 49% indirect equity interest in the Mexican cable television operator Empresas Cablevisión. Accordingly, to date, cable modem services have been fairly slow to develop in Mexico but this should change. In Germany, Deutsche Telekom is also in the process of selling its cable network infrastructure. As of May 2002, OTE was one of only two telecommunication carriers that had not yet launched a DSL service. The development of an independent cable infrastructure would add to the competitive pressure on OTE to develop DSL services.

Table 4 Broadband competitive status update

	Competing infrastructure: DSL and cable (or Ethernet LAN)	Unbundling and/or line sharing implemented or pending	Incumbent telecommunication carrier owns cable television network infrastructure
Australia	Yes	Yes	Yes (Largest)
Austria	Yes	Yes	No
Belgium	Yes	Yes	No
Canada	Yes	Yes	No
Czech Republic	Yes	Yes (pending)	No
Denmark	Yes	Yes	Yes (2nd largest)
Finland	Yes	Yes	Yes (Incumbents own shares in largest networks)
France	Yes	Yes	Yes (3rd Largest)
Germany	Yes	Yes	Yes (Divesting)
Greece	Not by end second quarter 2002	Yes	No cable network
Hungary	Yes	Yes	Yes (2nd Largest)
Iceland	Yes (Fixed Wireless)	Yes	No (but does provide TV)
Ireland	Not by end first quarter 2002	Yes	No
Italy	Yes (Ethernet LAN)	Yes	No
Japan	Yes	Yes	No
Korea	Yes	Yes	No
Luxembourg	N/A	Yes	Yes (Owns underlying infrastructure)
Mexico	Yes	No	No (Divested)
Netherlands	Yes	Yes	No (Divested)
New Zealand	Yes	No	No
Norway	Yes	Yes	Yes (2nd largest)
Poland	Yes	Yes (pending)	No
Portugal	Yes	Yes	Yes (largest)
Slovak Republic	Not by end first quarter 2002	No	No
Spain	Yes	Yes	No (largest)
Sweden	Yes	Yes	Yes (One of largest)
Switzerland	Yes	No	No
Turkey	No	No	Yes (Owns underlying infrastructure)
United Kingdom	Yes	Yes	No
United States	Yes	Yes	No

Source: OECD.

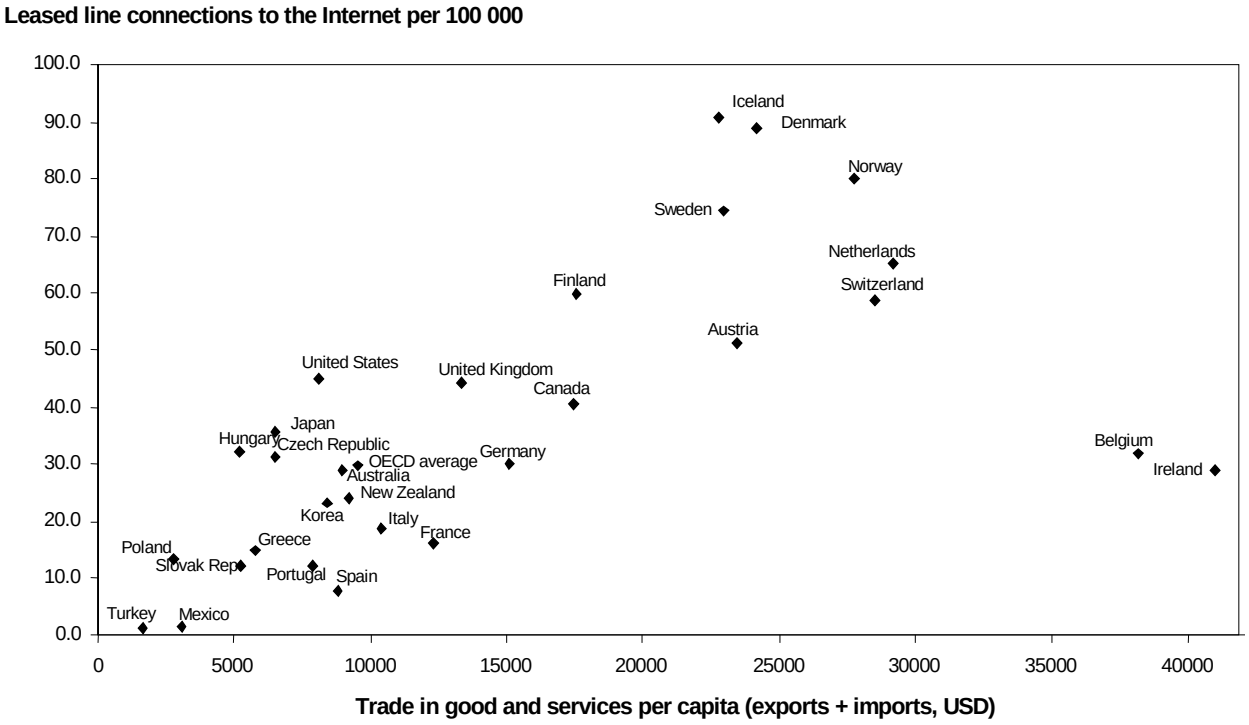
The absence of vigorous infrastructure competition, and policies to open the local loop, remain a concern to business users in a number of OECD countries (**Table 4**). They are right to be concerned. An SME that cannot obtain a broadband connection at a competitive price will not be competitive in foreign markets. An SME in one country with broadband access costing more than USD 1 000 per month cannot be expected to compete with those of other countries where the same capacity is available for less than USD 100.

Business broadband access and economic development

Communications have always been an integral part of doing business in all OECD countries. Broadband access is fundamental to the so-called 'digital economy'. The strength of all communication technologies has been their ability to overcome distance. Nowhere is distance more evident than in international trade.

Comparing the penetration of leased line Internet connections to the amount of trade in goods and services provides one example of where such tools may be being applied. The official data indicate that the countries with the highest level of trade in goods and services on a per capita basis are Luxembourg, Ireland and Belgium. There appear to relatively high amounts of re-export in the figures for these countries. On the other hand, some countries outside of Europe, such as Japan and the United States, may show lower trade figures because of internal company transfers and re-export via countries such as Belgium and Ireland. Excluding Belgium, Ireland and Luxembourg there is a high correlation between leased line connections to the Internet and trade in goods and services (R2 = 0.7341). This would be strengthened if it were possible to reallocate re-export or internal transfers from these countries to OECD countries outside of Europe. In **Figure 8** Ireland and Belgium are included to show their relative positions, but Luxembourg is excluded.

Figure 8. Leased line connections and trade in goods and services

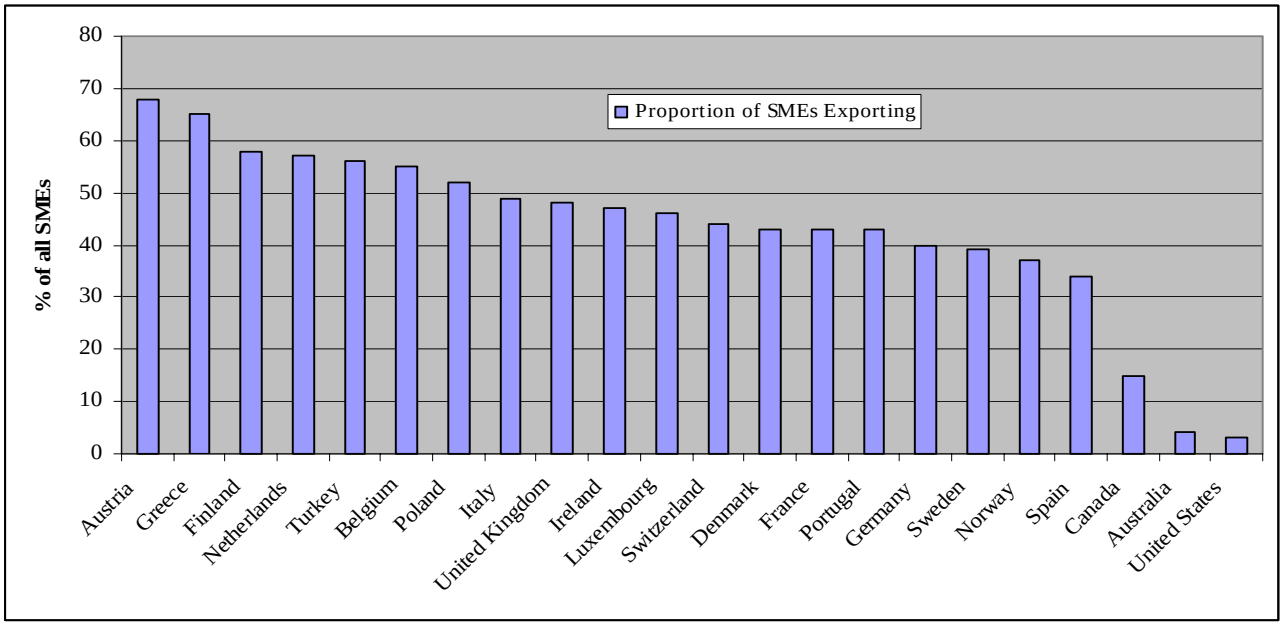


Source: Netcraft, OECD.

Correlation is, of course, no proof of causation. However, it is interesting to speculate on what may be occurring. One plausible explanation would be that business users in those countries most reliant on trade have been faster to adopt permanent connections to the Internet. In this scenario, the need for business to use the tools of the new economy has created a strong driver for the take-up of leased lines. On the other hand, for those countries with relatively low penetration rates, it might be the case that high prices or a lack of available infrastructure are holding back development of leased line access to the Internet.

Australia's Austrade has published an indicator comparing the number of SMEs that export in selected OECD countries.[22] They note that the proportion of Australian SMEs exporting is just 4% of Australian businesses (**Figure 9**). Austrade points out that geography is a major factor with Canada and the United States also having low ratios compared with European countries with many near neighbours. On the other hand, they also note that the new capabilities enabled by the Internet and the decreasing cost of communications are reducing this barrier. They cite a growing number of Australian SMEs using the Internet to enable knowledge-based exports including from traditional sectors such as agriculture and mining.

Figure 9. Proportion of SMEs exporting in selected OECD countries



Source: Austrade 2001 compiled from ABS, Grant Hattan & Associates and the US Bureau of Census, 1999, Canadian Bankers Association 1999.

The key point is that broadband access can bring efficient and permanent connectivity to global markets at a price that many SMEs could not previously afford. For economies such as Australia, Canada and the United States broadband access will increasingly enable SMEs to compete in global markets. On the other hand, those countries that already have high proportions of SMEs exporting but low rates of broadband access, will face increasing competition and their business users will be at a severe disadvantage without improvements to communications services and infrastructure.

Business users operating in more than one country also increasingly require local broadband access across markets in which they would like to integrate their service. On the one hand they would like to connect their premises and employees (including those that work from home) using a single supplier with the same hardware and software. At the same time, they would like broadband access to be available for regional

shared services, such as call centres. These services are often placed in low cost locations, outside the major centres of business, and they may, therefore, lack broadband access.

Business demand for broadband

Business demand for permanent connectivity, as expressed in sales of leased lines, continues to grow in OECD countries. In Norway, Telenor reported a 16% increase in the number of leased lines in operation during 2001. In Switzerland, Swisscom reported a 26% increase in the number of wholesale lines used for data services in 2001. In Denmark, TDC reported an 11% increase in net revenues from leased lines in 2001. In Japan, the number of NTT East and West's high speed digital circuits increased by 49% in 2000 and 15% 2001.[23] In Portugal, the number of the PT Comunicaçoes leased lines increased 12.7% in 2001. The Portuguese incumbent's sale of wholesale lines increased 21.8% and the capacity increased 113%.

At the same time the capacity of leased lines being sold is increasing. In Austria, Telekom Austria's leased line revenue increased by 12.7%, in 2001, despite a price reduction of up to 43%, due to the rising demand for higher bandwidth capacity. In the United Kingdom, Oftel estimated that there were around 450 000 end-to-end private circuits at the end of 2001. Oftel believe that around 270 000 of the leased lines are used by business. Of these as many as 70 000 have capacities of or above 2 Mbps. In the twelve months previous to March 2001, the number of leased lines at 2 Mbps or above grew 23%.

France Telecom, reported steady growth for high-speed digital leased lines in 2001 but a decrease in the number of low-speed digital leased lines. France Telecom said demand from corporate customers for high-speed digital leased lines and Internet network solutions was particularly strong in 2001, resulting in a 10.6% annual increase in revenues from corporate network services. On the other hand, leased lines revenues witnessed a slowdown in growth (+2.7 % in 2001, compared with +12.8% in 2000). France Telecom explained this by saying there had been a stabilisation of the number of leased lines requested by third party operators but a steady demand by corporate clients, stimulated by price reduction of up to 15% for high speed digital leased line products.

In a growing number of OECD countries business connections to the Internet, for medium and large business users, are almost ubiquitous. For large corporate users leased lines provide most permanent connections. For SMEs the majority of connections are dial-up. Business demand for broadband access will therefore continue to be expressed in two ways. For large users, high-speed leased circuits continue to be in demand and the most recent data, for 2001, bears this out. For SMEs, demand for broadband access can be expected as they convert from narrow-band dial-up connections (including ISDN) to broadband access. The available data also shows this market segment is increasing and that the potential market is very large.

Use of new broadband access technologies, such as DSL, is still not very common among business. In Norway, four out of five Norwegian companies with 10 or more employees had access to the Internet at the end of 2001. However, less than one in five companies with at least 10 employees currently uses broadband access.[24]

In the United Kingdom, Oftel reports almost four in five (78%) small businesses connect to the Internet using ordinary phone line/dial-up compared to two in five (37%) medium-sized businesses.[25] Medium sized businesses remain more likely to use ISDN (43%) for Internet access or leased lines (19%) than small businesses. Approximatively of 5% of SMEs in the United Kingdom connected to the Internet using DSL or cable modems at the end of 2001.

The available evidence indicates there is tremendous scope for connecting SMEs for broadband access. In countries such as Norway and the United Kingdom, with relatively low penetrations of broadband access

by the end of 2001, increasing demand is being expressed in the growing take up of DSL during the first half of 2002. In Norway, local loop unbundling is making good progress. New entrants, such as NextGenTel, are using unbundled local loops to offer business users DSL access to the Internet at up to 8 Mbps for downstream connections. In contrast, Telenor offers business users DSL services up to 1 Mbps for downstream connections.[26] NextGenTel uses its own network facilities with Telenor's unbundled local loops providing the final connection. The difference, in maximum DSL speeds on offer, illustrates one advantage unbundled local loops have, over wholesale offers, in that they enabled new entrants to offer higher access rates than the incumbent.

At the end of 2001, NextGenTel had 11 000 DSL lines in service in Norway. During the first quarter of 2002, the company increased that number to around 25 000 registered customers in geographical areas supported by local exchanges in operation or planned for operation within a short time. Significantly, that number is as many DSL lines (wholesale and retail) as the incumbent had in service at the end of 2001.

In the United Kingdom the pace of DSL growth has also increased following price reductions to wholesale DSL rates and increasing competition from cable networks. However, as in a number of countries, the number of unbundled local loops being used to provide services to business users is very low. Resale of broadband facilities is an alternative if the prices encourage competitive take-up. In Switzerland, Swisscom's wholesale rate is encouraging other ISPs to sell DSL connections. In Finland, in 2002, ISPs began reselling 2 Mbps DSL connections aimed at business users as shared connections to users in apartment buildings. These services, with up to 30 residential subscribers sharing the same connection, were individually priced at less than USD 10 per month.[27] In response the incumbent launched its own 'shared DSL' offer, for apartment buildings, at around USD 12 per month.

Wholesale pricing does not appear as favourable in a number of other countries.

In this context it is worth noting the pricing of Eircom's wholesale DSL offer which was launched in May 2002. Eircom's wholesale price for 512 kbps downstream was USD 43.49 and retail rate of USD 79.09. This wholesale rate is more expensive than BT's retail rate, for the same product in the United Kingdom, of USD 41.96 or France Telecom's retail DSL service, at the same speed, of USD 40.35. ODTR has set the price for an unbundled local loop at USD 14.94. In the absence of infrastructure competition, in May 2002, the price for an unbundled local loop looked to be the only avenue to placing pressure on Eircom's wholesale and retail DSL prices. ODTR says that Eircom's leading competitor, Esat Telecom, is advancing in its program to take advantage of local loop unbundling in 40 exchanges across Ireland.

In those OECD countries without cable modem or DSL services in 2001, demand for increased bandwidth continued to be channelled into leased lines and narrow-band ISDN. In Greece, OTE recorded a 41% increase in the number of leased lines, from 6 479 to 9 136, during 2001.[28] Much of this demand came from the mobile cellular sector. The number of basic rate ISDN lines increased 29% in 2001. OTE's revenues for leased lines and data products rose 18% in the same year. In Ireland the number of ISDN channels increased by approximately 32% during 2001 but leased lines remained relatively constant at 39 000. In Ireland the results from a survey in mid 2001, showed that leased lines are the most widely used form of broadband access for larger corporate users. ODTR's SME survey in 2001, showed that 15% of SMEs use leased lines, an increase of 3% over the previous year.[29]

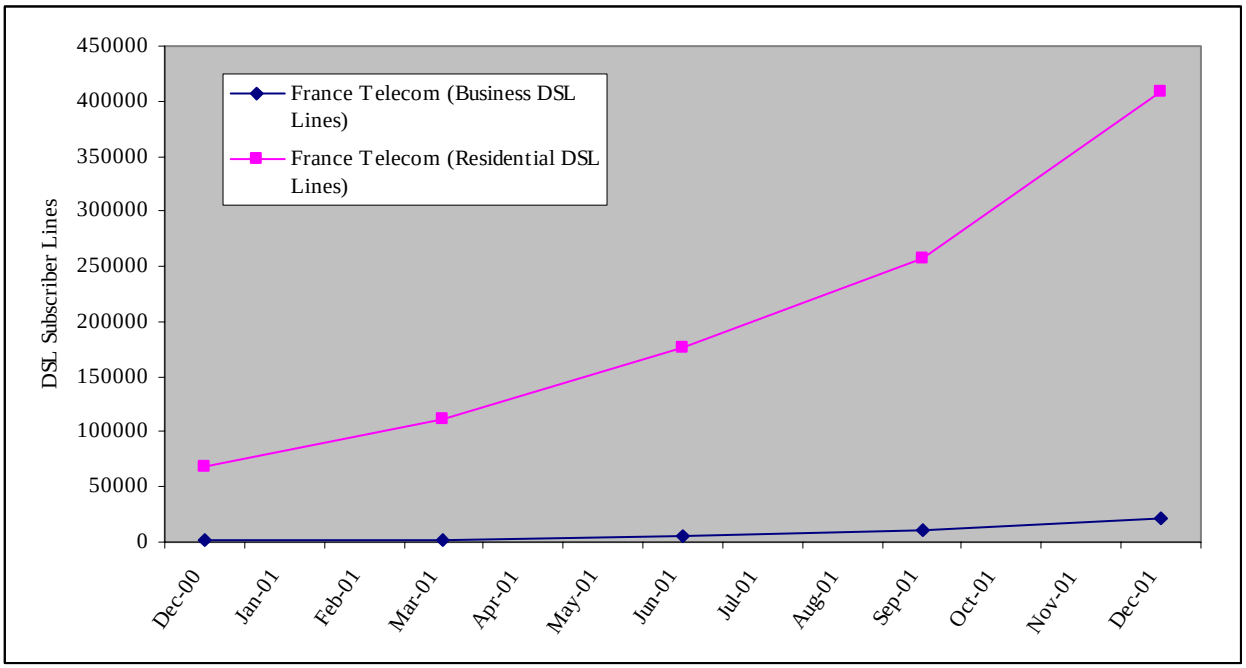
In countries with low rates of DSL penetration, at the end of 2001, the same trends are evident. In Hungary, the Matav's leased lines increased 28% from 8 920 to 11 386 during 2001. Matav's revenue from leased lines and data transmission increased 25%. The number of ISDN channels increased nearly by 50% over the period, from 305 882 December 2000 to 448 396 at the end of 2001. Some 82% of the ISDN lines in Hungary are used by business users. In the Czech Republic, Cesky Telecom's revenue from ISDN increased 46% during 2001. The number of ISDN channels grew from 122 000 to 261 000 during 2001.

The growth of ISDN in countries and regions where broadband access is not widely available demonstrates that there is demand from SMEs and residential users for more bandwidth. While the growth rates for traditional services are very strong, they are much lower than for business use of new broadband access technologies in other countries. In Italy, for example, Telecom Italia say their broadband business connections grew 269%, in 2001, from 29 000 connections to 107 000. Accordingly, in OECD countries where new forms of broadband access are not available, or not widely available at competitive prices, then business users are put at a tremendous disadvantage. Without competitive pressure, incumbent telecommunication carriers will not hurry to undercut the very profitable traditional products they already have available.

DSL take-up by business

Data on business take up of DSL services are not widely available across the OECD. The main reason for this is that only a handful of telecommunication carriers are reporting both categories. Even then, there may be some blurring of the boundaries with some SMEs using broadband access products aimed at residential users. In the United Kingdom, around 30% of the 200 000 DSL subscribers, in April 2002, were business users.[30] In the United States, figures vary by company but Bell South reports that 20% of its 729 000 DSL subscribers, in early 2002, were business users.[31]

Figure 10. France Telecom business and residential DSL growth



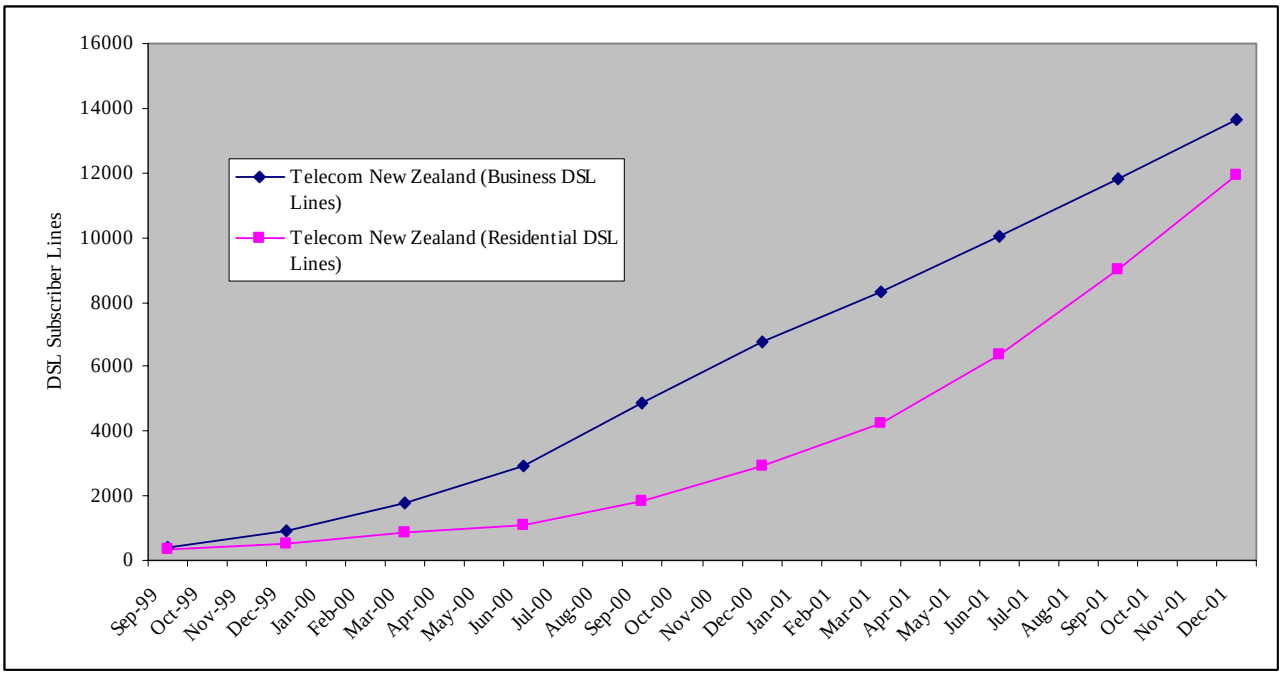
Source: France Telecom.

France Telecom is one telecommunication carrier that reports business and residential broadband subscribers lines separately. At the end of 2000, France Telecom had 1 000 DSL subscriber lines being used by business. During 2001, the number of business DSL lines grew to 22 000 (**Figure 10**). Over the same period broadband residential DSL lines grew from 68 000 to 408 000.

Telecom New Zealand also reports DSL line growth by business and residential users (**Figure 11**). At the end of 2001, Telecom New Zealand had 13 642 business DSL lines and 11 937 residential lines. These

data present a significant contrast to France Telecom. In New Zealand, at the end of 2001, the number of DSL business lines still outnumbered the number of residential DSL lines. Whereas in France the number of business DSL lines was just 5% of the total DSL lines, in New Zealand it was 53%. This raises the question of why business and residential line growth have been varied across the two countries. The DSL penetration at the end of the 2001 for the two countries is not significantly different (0.67 per 100 inhabitants for New Zealand versus 0.73 per 100 inhabitants for France) to the extent that a significant difference would be expected between business and residential DSL subscriber lines.

Figure 11. Telecom New Zealand business and residential DSL growth



Source: Telecom New Zealand.

Commercial DSL services were launched in both France and New Zealand at around the same time. The most likely explanation for the different take-up of DSL, by business and residential users, relates to pricing. In France, unmetered flat rate dial-up services were not available for residential and business users. Accordingly, the average dial-up user stays on line less than 10 hours per month. By way of contrast, France Telecom reports that the average active connection time for its 'Wanadoo' DSL lines is 128 hours per month. This suggests some of the initial demand from Internet users in France has been because users want unmetered pricing or 'always-on' connectivity. This experience is consistent with that of Austria. Telekom Austria reports the average connection time per month, for DSL, is 132 hours.

In New Zealand, unmetered dial-up access is available for residential users. This clearly has an impact on residential use of dial-up services. The average Internet user of Telecom New Zealand's dial-up Internet service stays on line for more than 30 hours per month. This pricing has very much encouraged the development of demand for e-commerce with New Zealand having one of the highest penetrations of secure servers in the OECD. On the other hand, Telecom New Zealand meters some elements of residential broadband service if users exceed 500 Mbytes per month (*e.g.* Jetstream Home 500). Telecom New Zealand has an entry-level DSL offer, with a flat rate, but its maximum downstream speed is comparable with ISDN rather than broadband access. To access the Internet at a rate above 250 kbps a user in New Zealand would have part of their service metered by their provider.

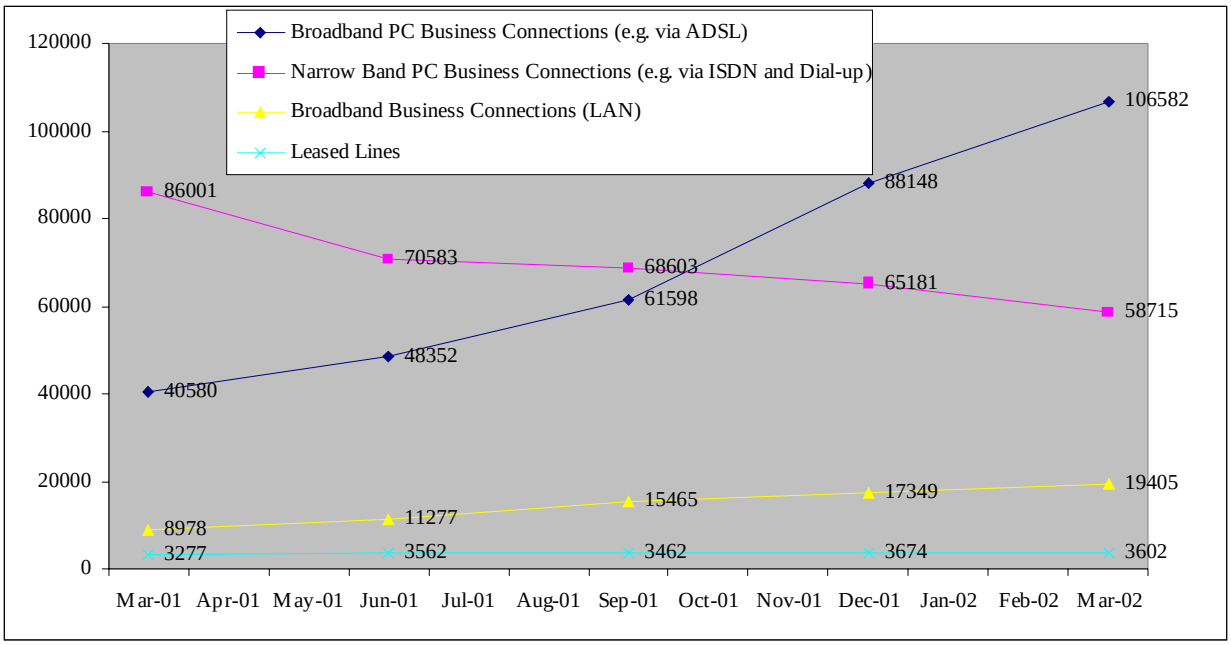
In contrast to residential users, business users in New Zealand pay local call charges to access dial-up Internet services. Where more than one person is logged on, via a dial-up connection, the hours of all users are aggregated to calculate the fee payable. Although business usage of the Internet is metered this is not done on the basis of on line time. Rather business users have an 'always-on connection' and pay for the bytes that are downloaded beyond whatever amount is included in their monthly allowance. This suggests that SMEs in New Zealand have had an incentive to shift to broadband access because it gives them an always-on connection. By way of contrast, the pricing of broadband access has not yet attracted residential users away from dial-up services in New Zealand.

For SMEs, services such as DSL can provide the first unmetered communication options at affordable prices. Leased lines have, of course, been traditionally available at unmetered prices but at a price many SMEs could not afford or justify given their volume of traffic. This is not to say that all business users favour certain pricing structures. Rather that, what business users would like is the choice of pricing options that comes with a competitive market.

In countries where there is strong infrastructure competition between cable networks, DSL and other technologies such as Ethernet LANs, a choice of pricing will be available for business. In countries with flat monthly rates for 'unbundled local loops or line sharing', the structure of pricing of DSL service can be determined by ISPs serving business users. In countries without such offers, the structure of wholesale pricing can dictate retail pricing. If one entity has control over broadband access facilities their pricing structure may not be amenable to the needs of business users. In New Zealand, for example, unmetered DSL services are not generally offered by ISPs due to Telecom New Zealand's wholesale pricing.

In Belgium, the existence of strong competition between independently owned networks, in addition to policies aimed at opening up the local loops, are driving the development of broadband access. In the nine months from March 2001 to December 2001, the number of individual business broadband access connections increased from 40 580 to 88 148 (**Figure 12**). Over the same period, the number of broadband Ethernet LAN connections increased from 8 978 to 17 349. Significantly, the number of leased line connections to the Internet only increased from 3 277 to 3 647.

Figure 12. Belgium business and residential broadband access growth



Source: Belgium ISP Association.

Broadband availability and quality of service

Leased lines coverage

One of the advantages of leased lines, in terms of providing broadband access to business users, is their widespread availability. Unlike DSL, leased lines are not limited in the distance over which they can be provided from a telecommunication exchange. In some OECD countries there is an obligation on incumbent telecommunication carriers to make leased lines available on a national basis. In Norway, for example, Telenor has an obligation to provide leased lines up to, and including, 2 Mbps over the whole country. This is, however, different from a universal service obligation, as the term is applied to basic services. This is because telecommunication carriers do not face the same obligations in terms of end user pricing, except for leased line pricing being cost oriented. In the United Kingdom, Oftel took this a step further in 2001, by ordering BT to agree a wholesale leased line product with other operators. Under this arrangement, new entrants are able to buy wholesale leased lines from BT and use them to provide a wide range of dedicated telecommunication services to their customers.[32]

DSL coverage

The ability of telecommunication carriers to offer DSL services to business users is rapidly increasing in OECD countries (**Table 5**). By the end of 2002, Belgium will likely become the first OECD country in which 100% of all lines were enabled to provide DSL. A third of OECD countries can already provide DSL services to more than 70% of their customers. It would be expected that the proportion of business users who can access DSL should be slightly higher than the figure indicated for the overall country. At the end of 2001, for example, Telecom Italia could provide DSL services to 68% of Internet users but to 74% of SMEs.

Telecom New Zealand can provide a similar coverage of SMEs with DSL similar to that of Telecom Italia, *i.e.*around 70% (**Table 6**). On the other hand, it is noteworthy that rural businesses, including farmers, will have a much lower coverage in that country. Currently 16% of farmers are covered by DSL in New Zealand and this will rise by an additional 18% if Telecom New Zealand feels there is sufficient demand. However it is unlikely that more than 50% of New Zealand's farmers, given Telecom New Zealand's projections, will be able to receive broadband via DSL. Some 30% of schools in New Zealand fall into the same category of being unlikely to be served by DSL. One option being explored in New Zealand is to use fixed wireless to provide broadband access for farmers. The broadcasting arm of TVNZ (Television New Zealand) is upgrading its wireless network to provide service to farmers. Significantly the New Zealand dairy industry is reported to have identified productivity gains in the order of USD 140 million through the use of applications and tools made available to farmers over the Internet[33].

Satellites provide one option for providing broadband access to business users in those areas that are not served by DSL. Until 2001 one of major drawbacks with using satellites for Internet access was the need to provide an upstream link via the PSTN. In 2001, the first commercial two-way interactive satellite services were launched in the United States. Other countries where satellites are being used to provide broadband access include Australia, Canada, Germany and the United Kingdom. Not all these services, however, were two-way interactive, with some still relying on the PSTN to provide the upstream link.

Table 5. DSL coverage in OECD countries

	Commercial Launch	Year End 2000	2001	2002	2003	Indicator
Australia	Aug-00	50	72	85	87	Lines
Austria	Nov-99	72	77			Lines
Belgium	Oct-99	75	93	95	96	Population
Canada	1996	69				Households
Czech Republic	Yet to launch – Trial	0	0			
Denmark	Jul-99	65	90	95	95	Lines
Finland	May 00	60				Sonera lines only
France	Nov-99	32	76	86	91	Lines
Germany	Aug-99	60	80	90		Lines
Greece	Yet to launch – Trial	0	0			
Hungary	Dec-00		20	38	45	Lines
Iceland	Beginning 2000	33	51			Lines
Ireland	May 02	.0	0	25	50	Lines
Italy	Dec-99	45	67.5			Lines
Japan	Sep-00		73.5	80	90	Households
Korea	Apr-99		70			Lines
Luxembourg	2001	0	65	89		
Mexico	Sept-01	0				
Netherlands	Jun-00	40	64	85		Lines
New Zealand	Jun-99	58	58	75		Customers
Norway	Dec-00	20	50	52	54	Lines
Poland	2001	0	3.5	10		Lines
Portugal	Dec-00	50		61		Population
Slovak Republic	Yet to launch	0	0			
Spain	1999	74	81.3	89.3		Lines
Sweden	Oct-00		70	75		Lines
Switzerland	2nd quarter 2001	0	85	90		Lines
Turkey	Feb-01	0	0.01	2.5	5	Lines
United Kingdom	Jul-00	50	60	66		Lines
United States	1997	36	50	62	65	Lines

Note: Data for United States is NTCA citing Morgan Stanley Dean Witter. Some carriers have higher availability in their service area such as Bell South with 70%. Cable modems reached 71% of households by 2002. BT say DSL may be available to 90% of population of the United Kingdom by 2005.
Source: OECD.

Table 6. Actual and projected DSL coverage in New Zealand

	June-2002 (%)	Only if demand allows it (%)	Difficult (%)	Unlikely (%)	Remainder
Potential total coverage	58	22	5	5	10
Proportion of all residential customers reached	58	19	5	5	13
Proportion of corporate sites reached	67	16	4	5	8
Proportion of all SMEs with 5 or more sites reached	73	14	3	3	7
Proportion of all other SMEs reached	70	16	4	4	6
Proportion of all farmers reached	16	18	12	12	42
Proportion of all schools reached	43	20	7	5	25
Proportion of all Health providers reached	75	15	2	2	6

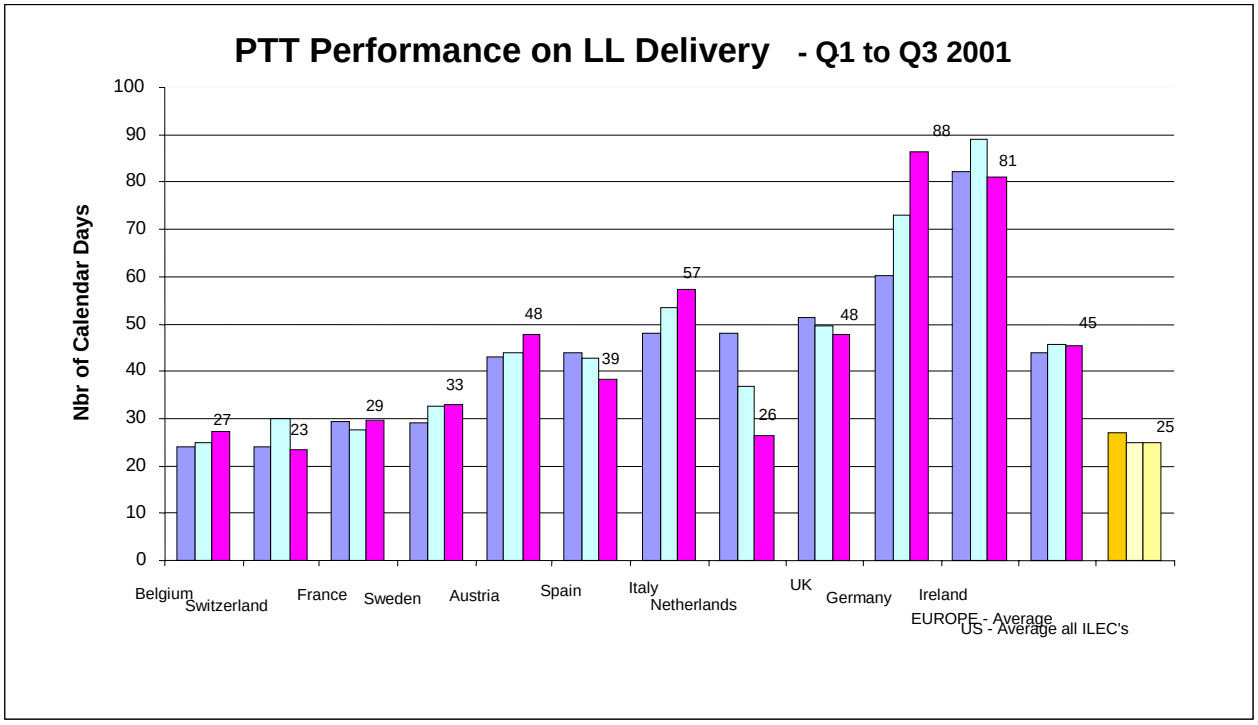
Source : Telecom New Zealand.

Leased lines and performance

One of the main criticisms new entrants have of the performance of incumbents is in the area of the time it takes to provision a leased line. Discriminatory practices are, of course, difficult to prove because of the lack of data to measure the performance of incumbent carriers serving their own business users relative to the needs of new entrants. For this reason, AT&T and other providers have argued that incumbent local exchange carriers in the United States should report their performance in relation to meeting their own requirements and those of other carriers, the main point being that there should not be a difference between the performance in providing service to retail and wholesale markets.[34]

In Europe, ECTA has produced an indicator that compares delivery times for the provisioning of leased lines (**Figure 13**). These data indicate that the best practice in Europe is a good as the average for incumbents in the United States. On the other hand, the average across Europe is significantly higher than the average for the United States. In the case of Germany and Ireland the time to provision leased circuits was nearly three times that for United States. One of the frustrations reported by new entrants is that incumbents are under no obligation to acknowledge receipt of an order or to commit to an installation date.

Figure 13. Status of Leased Lines Provisioning in Europe



Source: ECTA.

New entrants across the OECD, in their filings with regulatory authorities, point to common problems in this area. In Europe these problems have been summarised in presentations by groups such as ECTA for the ONP Committee. In the United States, they have been the subject of filings with the FCC proceeding to investigate whether to adopt performance measurements and standards governing incumbent local exchange carriers' provision of special access services.

In the case of Europe, ECTA has made the following points in relation to the provision of leased lines. First, ECTA points out that there is a lack of agreement on key performance measures and their definitions. Incumbent operators make similar points. One incumbent says that some providers calculate the lead times

excluding customer delays or excluding customer orders which have a longer lead time than the provider's standard lead time. They also say that other providers calculate their lead times for leased lines under the condition that all network resources are available. Accordingly, incumbents may not be currently reporting appropriate data to regulators. Where data are reported no distinction is made, for example, between leased line provided for new entrants and those provided for the incumbent's own business customers. Significantly, for the subject of this paper, incumbents do not separate data on the provision of local tails from end-to-end leased lines. The other recurring theme in the positions of new entrants throughout the OECD is that the penalties applied by regulators have not proved effective in combating anti-competitive practices. That being said new entrants argue that effective monitoring of performance would deter discrimination.

In Ireland, the regulator (ODTR) has introduced mandatory service level agreements (SLAs) for leased line provisioning. SLAs have been developed for leased line and interconnect circuits, which set the terms, and conditions under which operators can obtain services from the incumbent (Eircom), thereby assisting them to effectively compete in the marketplace and ultimately leading to improved levels of services to the consumer. The ODTR says it has instituted the toughest SLA penalty regime in Western Europe. Eircom must deliver circuits within 26 days or incur uncapped penalties.

The main reason ODTR introduced service level agreements was by way of corrective action for leased line delivery. In November 2000, Eircom's average delivery time for leased line circuits to new entrants was between 70 and 90 days. By January 2002 this had been reduced to 23 days.[35] For leased lines below 2 Mbps the average was 26 days and for 2 Mbps, 15 days. New entrants in some other OECD countries have urged regulators to adopt the same standards used by ODTR. In Germany, according to Deutsche Telekom, the times for provision of leased lines have been considerably improved. Deutsche Telekom says it has succeeded in reducing the number of open orders and lead times. In April 2002, the average lead time for a 2 Mbps was 49 calendar days. In July 2002, Deutsche Telekom said a customer could expect the provision of a 2 Mbps circuit within 28 calendar days.

In a determination issued on 31 May 2002, RegTP set the rules for fair access to Deutsche Telekom (DTAG) leased lines.[36] Applicable to the transmission paths competitors require for direct access to the customer as well as to the carrier leased lines competitors need to build out their networks, the ruling improves the competitive opportunities of alternative providers in the local access market and supplements the determination of October 2001 on the provision of carrier leased lines. Delivery times for leased lines providing direct access to the customer have been streamlined and made binding. There will be guaranteed delivery times of 12, 15 and 30 working days for bandwidth of 64 kbps, 128 kbps to 2 Mbps and over 2 Mbps respectively. A new system of compensation will safeguard the guaranteed delivery periods. Five percent of the monthly rental will be payable per calendar day of overrun.

DSL provisioning

In terms of timeliness of delivery, DSL should enable service providers to connect businesses faster than in the case of with leased lines. Telecom Italia aims to be able to connect users, to DSL enabled exchanges within seven days. The increasing use of self-install modems has also cut the waiting time for many users and made installation more convenient. In the first quarter of 2002, SBC's order cycle times averaged seven days with some 90% of customers selecting self-installation. In Spain, Telefonica says 85% of its new customers were opting for self-installation at the end of 2001. In Norway, Telenor's self-installation was running at 70% at the end of 2001.

At the same time, many ISPs have complained that incumbents do not make available the facilities they need to connect their business customers on a timely basis. Regulators across the OECD are responding to this concern. In Canada, the CRTC created five "competitive-related interval" indicators for reporting

compliance with intervals and standards negotiated in the CRTC Interconnection Steering Committee and approved by the Commission. These included indicators on new unbundled loop orders. The interval for the provisioning of new unbundled loops by incumbents to new entrants, are service intervals no greater than those within which the incumbents provide loops to themselves, at least 90% of the time.[37] The Commission directed telecommunication carriers to file, a quality of service monthly performance report on a quaterly basis, beginning in the third quarter of 2001. The CRTC also directed Canadian incumbents to report "competitor out-of-service trouble reports cleared within 24 hours" in their monthly quality of service reports. This means that the percentage of occasions for which new entrants and the incumbent's end-customers' initial unbundled loop trouble reports are cleared, within 24 hours, are reported separately.

The FCC is also conducting a performance review monitoring the incumbents' provision of unbundled network elements. In framing the review, the FCC invited comments on 12 proposed indicators. (**Box 2**). The extent of the FCC's unbundling rules is also currently under review. The performance monitoring in the provision of unbundled elements is already performed by the individual states. The issue before the FCC is whether the FCC should establish a core national list of these measures.

Box 2. FCC's proposed metrics for performance monitoring of unbundled local loops and interconnection

The following are the 12 metrics the Commission has set forth for comment to measure an incumbent LEC's ability to provide pre-ordering, ordering, provisioning, repair and maintenance functions that competitors use to interconnect, collocate or obtain access to unbundled network elements. However, the Commission also requested comment on whether other measurements and standards would be more effective and less burdensome.

Pre-ordering measurement

- **OSS pre-order interface response timeliness:** Measures whether an incumbent's pre-ordering systems provide reasonably prompt response times.

Order measurements

- **Order notifier timeliness:** Measures the amount of time it takes an incumbent to send a notice either confirming whether an order placed by a competitor has been accepted and indicating the date on which the requested service will be provisioned (FOC Timeliness) or informing the competitor that an order has been rejected (Reject Timeliness).
- **Order completion notifier timeliness:** Measures the amount of time between the actual order completion and the distribution of the order completion notice to the competitor.
- **Percentage of jeopardies:** Measures the number of orders with due dates that receive advance jeopardy notices.

Provisioning measurements

- **Percentage on time performance:** Measures the percentage of competitive LEC orders that were provisioned on or before the scheduled due date.
- **Average delay days on missed installation orders:** Measures the average amount of time by which an incumbent misses confirmed installation due dates.
- **Installation quality:** Measures the percentage of completed orders for which competitive LECs file trouble reports with the first 30 days after completion of the order.
- **Percentage missed appointment:** Measures the number of missed customer appointments for competitors.
- **Open orders in hold status:** Measures the percentage of circuits that are past the committed due date as of the end of the reporting period.

Maintenance and repair measurements

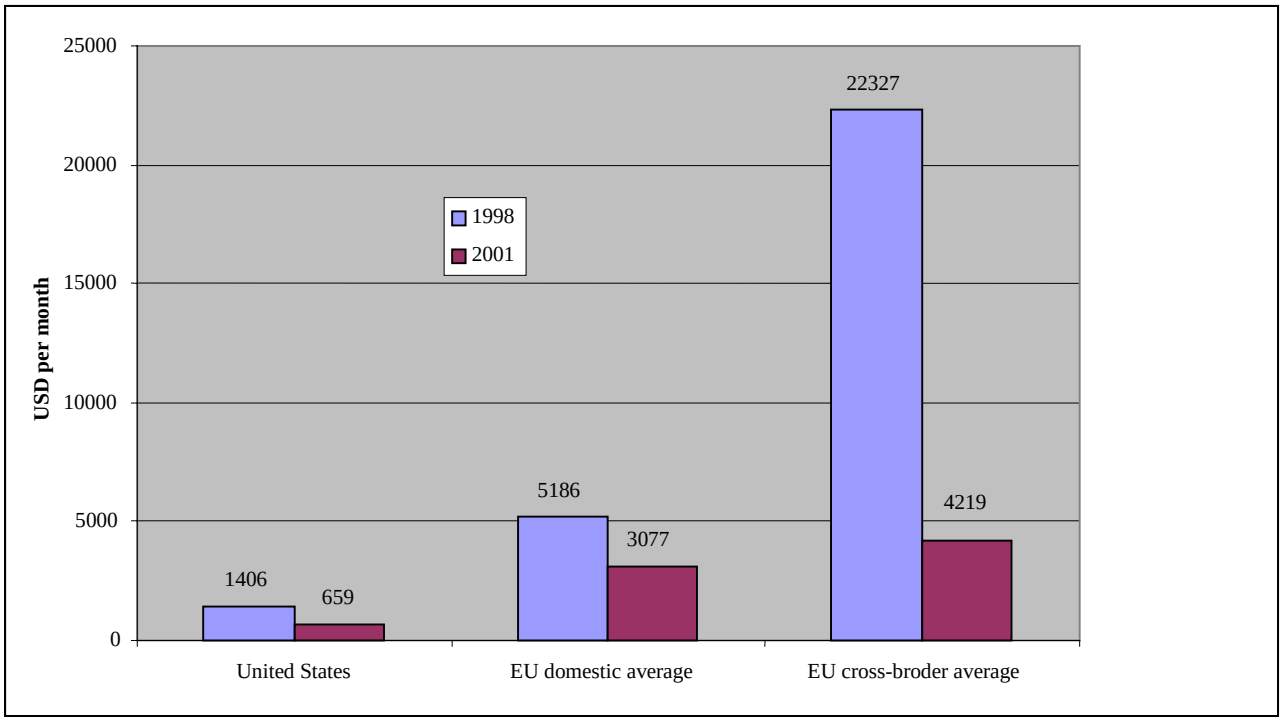
- **Trouble report rate:** Measures the percentage of provisioned loops or circuits with troubles reported within a certain period of time.
- **Repeat trouble report rate:** Measures the percentage of trouble tickets that are repeat trouble tickets, generated within a 30-day period.
- **Time to restore:** Measures the mean time required by incumbents to restore services after a competitor files a trouble ticket.

Pricing for business broadband access

The liberalisation of telecommunication markets in OECD countries has brought about significant reductions in the price of backbone capacity. Two of the key landmarks in this process were the 1996 Telecommunications Act in the United States, and market opening by a number of European countries in 1998. The benefits for business users have been readily demonstrable. Reuters is one of the largest users of leased lines in the world with annual expenditure of more than USD 500 million per annum. This raises the question of what liberalisation has meant for a company like Reuters in terms of the prices for backbone capacity.

In the United States, increasing competition between 1998 and 2001, has brought down the price of a 2 Mbps leased line, at a distance of 300 kilometres, from around USD 1 400 to around USD 660 (**Figure 14**). In Europe, the price of domestic leased lines over the same distance have also significantly decreased. However, the major benefit of liberalisation has been the dramatic reduction in cross-border leased lines over the same distance. For a company such as Reuters, the cost of an EU cross-border 2 Mbps leased line, at 300 kilometres, has fallen from more than USD 22 300 to USD 4 200. While the average prices may be higher in Europe than in the United States, the trend is very welcome. However, the pricing of local leased lines remains a concern for business users and new entrants. The reason for this is that it takes longer to roll out alternative local infrastructure, resulting in less competition at the local level over the same time period. Accordingly, there is an ongoing need for regulators to monitor the pricing of local leased lines.

Figure 14. Trends in backbone pricing from 1998 to 2001, 2 Mbps



Source: Reuters.

Local access leased line pricing

The OECD's usual approach in comparing leased line prices is to take a basket of leased lines over different distances. Some operators include the price of local tails in the total price of a leased circuit, whereas for others it represents a separate charge. Where applicable, the local tail circuits included in the OECD baskets are two kilometres long. Circuits above two kilometres include local tail circuits within the defined distance. This means that, for example, a 20 kilometre circuit will have two local tail circuits of two kilometres in length, and a main circuit o 16 kilometres in length.

As some operators include the price of local tails in the total price of a leased line, or will only make prices available on a case by case basis, it is not a simple matter to undertake a comparison of local tail prices. A second reason is that the standard list prices may not be what users pay. In competitive market discounts to standard list prices are readily available and are often not made publicly available. In addition, the discounts can differ from customer to customer depending on factors such as volume or the level of service provided. Moreover, some new entrants say that the prices available to some end users are sometimes discounted more heavily than (those) lines available to (them as) competitors. In local access markets, this places new entrants at a severe disadvantage. At the same time, it makes price comparisons more difficult because the retail prices for some users may be below the wholesale prices for competitors. This should not, of course, be the case because the wholesale provision of transmission capacity should have a lower cost base than retail leased line offerings.[38]

Table 7. Selected Local Tail Prices

	Retail monthly price for 2 Mbps local tail (USD)	Comment
TDC	91	Price for local tail.
Telia	116	Fixed price up to 3 kilometres.
Bell Canada	191 (140)	The price is for a one-year contract for a 1.5 Mbps tail. Prices reduce if users commit to longer-term contracts. The charge in brackets is for a five-year contract.
France Telecom	245	This is a wholesale price available only to other telecommunication operators. FT charges a fixed price of USD 237 per month for tails up to 10 kilometres. An additional charge of USD 8 is charged per kilometre per month. The price shown is based on a 3 kilometre tail.
Eircom	254	Eircom charges USD 169 for a local tail up to 1.5 km and then USD 6 per additional 100 metres per month. The price shown is based on a 3 kilometre tail.
Portugal Telecom	310	This is the price for a circuit link to a customer's premise from a local exchange. A significant reduction of this price is expected as an outcome of the ongoing revision of PT Comunicações leased lines offer.
Telecom Italia	288	Price for a link between customer's site and TI exchange.
Telecom New Zealand	357 (448)	TCNZ's price for its 2 Mbps service comprises two charges. One is a monthly access charge. The other charge depends on whether the user connects to a major CBD exchange or a non-CBD exchange. The figure in brackets shows the price for non-CBD tail.
Telenor	395	This charge has two components. A fixed charge USD 290 is applicable up to 1.5 kilometres. There is charge of USD 7 per each additional 100 metres.
Telmex	575	This is the Telmex fixed charge for the local part of a leased line.

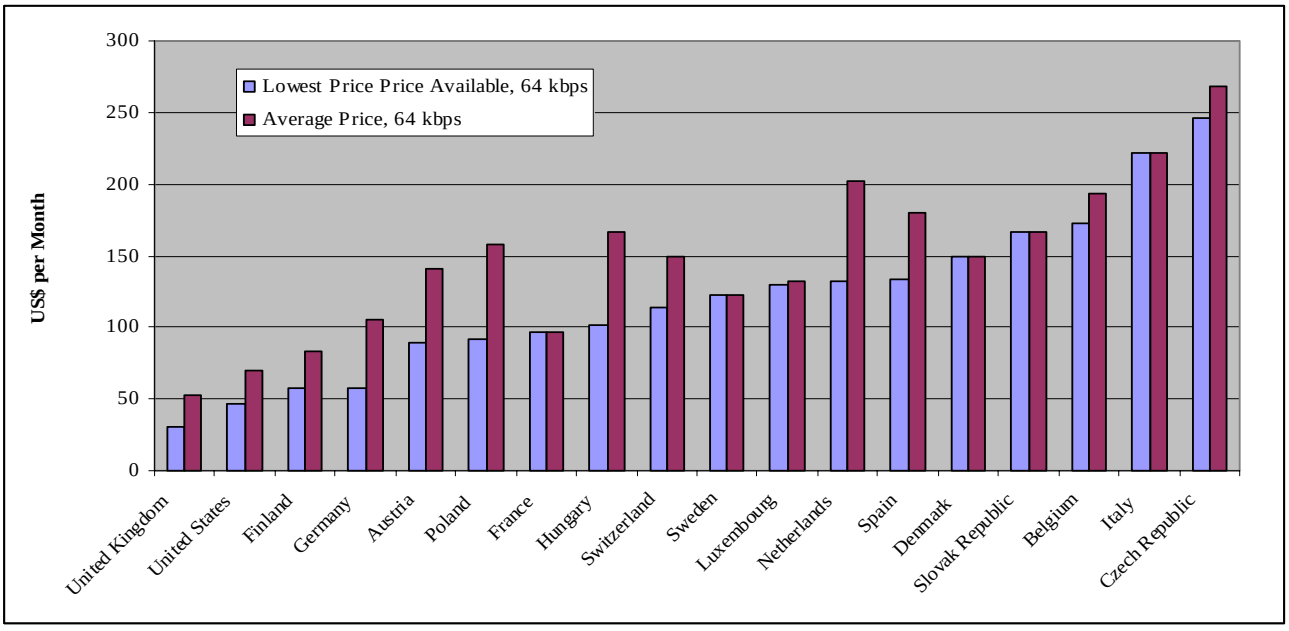
Note : Where distance charges apply, 3 kilometres was used to determine the price. France Telecom's charge is a price for other operators.
Source : Teligen, OECD.

It is possible to compare the standard list prices for local tails for some operators by way of example (**Table 7**). The least expensive local tails appear to be in Denmark where a 2 Mbps local tail costs USD 91 per month. Telia also have relatively inexpensive 2 Mbps tails up to three kilometres (USD 116). Bell Canada's tail is also relatively inexpensive, particularly for longer contract periods, but allowance should be made for it being 1.5 Mbps. In the case of Eircom, a local tail up to 1.5 kilometres is relatively inexpensive, compared to the other incumbents, costing USD 169. However, the Eircom charge for each additional 100 metres (USD 6) means that a local tail beyond that distance rapidly mounts in price. At three kilometres, the standard list price would be nearly USD 254. At five kilometres, the price appears to be just at the European Commission's recommended ceiling, which applies to local lines up that distance. Telecom Italia and Portugal Telecom's prices are below the ceiling recommended by the European Commission but considerably more expensive than the price in Denmark and Sweden. In the case of Portugal, these prices were before the announcement of a price reductions for leased lines in April 2002.[39] The prices of Telecom New Zealand, Telenor, Telmex appear to be four to five times the lowest rates available. In both countries, unbundling is not available to place competitive pressure on local tail prices.

An alternative method is to examine a comparison of what a major user pays for local leased line prices. As discussed, Reuters is one of the largest users of leased lines in the world and on that basis should be in a position to negotiate the best discounts available. It is therefore instructive to see what prices are available to Reuters in different OECD countries for local tails. The methodology used in for this indicator is to compare the price for a local leased circuit between a technical centre and a client location, within a 10 kilometre radius, with an average of three kilometres. The prices shown are the lowest price achieved by Reuters, following the application of available discounts, and the average prices available across different suppliers (if available) in that market.

The two comparisons are for local leased lines at 64 kbps and 2 Mbps. Although a leased line at 64 kbps would not be considered broadband access, it is still one of the more common network elements used by business for local connections to their backbone network. At the same time, it is usual to consider the pricing of 64 kbps as it is one of the services that may be substituted by broadband access at competitive prices. That being said, it is necessary to remember that these prices are just for a 64 kbps circuit. They do not include any value-added service such as a Internet access.

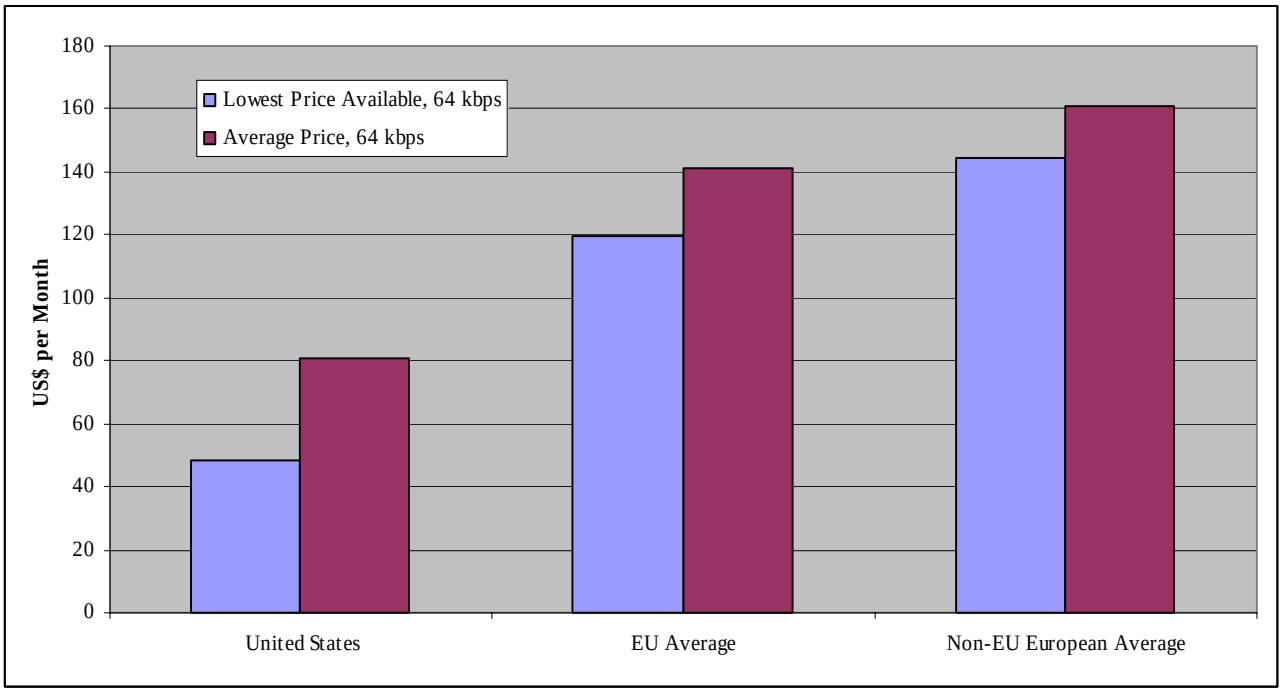
Figure 15. Comparison of 64 kbps local leased line prices for selected OECD countries



Source: Reuters.

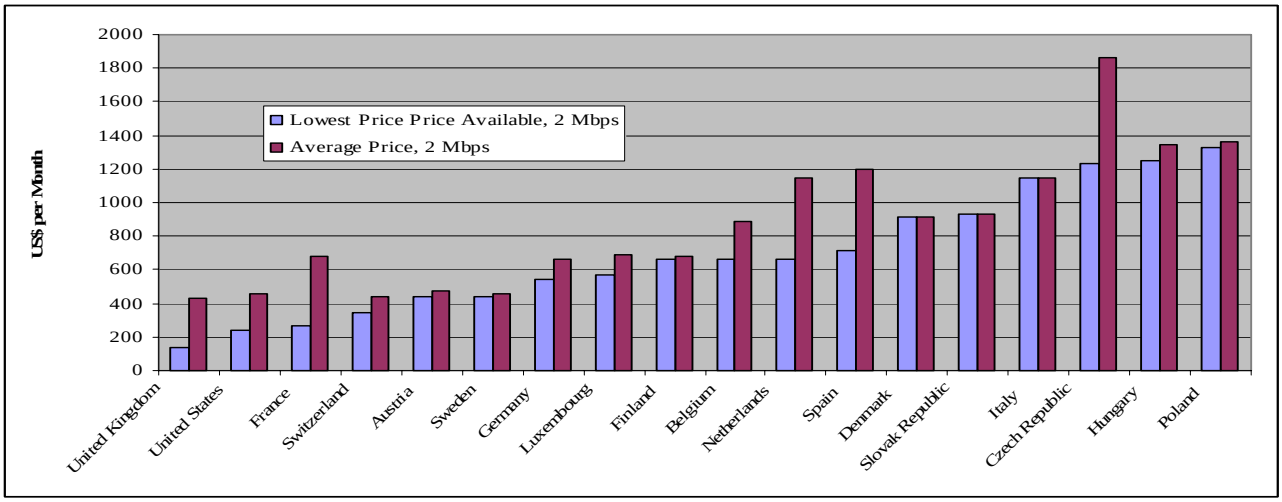
The comparison of 64 kbps local leased line prices for selected OECD countries shows that, for Reuters, the least expensive prices are available in the United Kingdom and the United States (**Figure 15**). It is worth noting that these two countries were among the first to liberalise their telecommunication markets. Finland and Germany were the next best performers. While the best available prices in Europe are similar to those of the United States, the average prices are much higher across the European Union and in other European countries (**Figure 16**). For local prices, the average, calculated by Reuters, is for all EU member countries with the exception of Portugal, Greece and Ireland. The non-EU average includes Slovak Republic, Estonia, Czech Republic, Poland, Lithuania, Latvia and Hungary.

Figure 16. Average 64 Kbps local leased line prices for United States, EU member states and selected non-EU European countries



Source: Reuters.

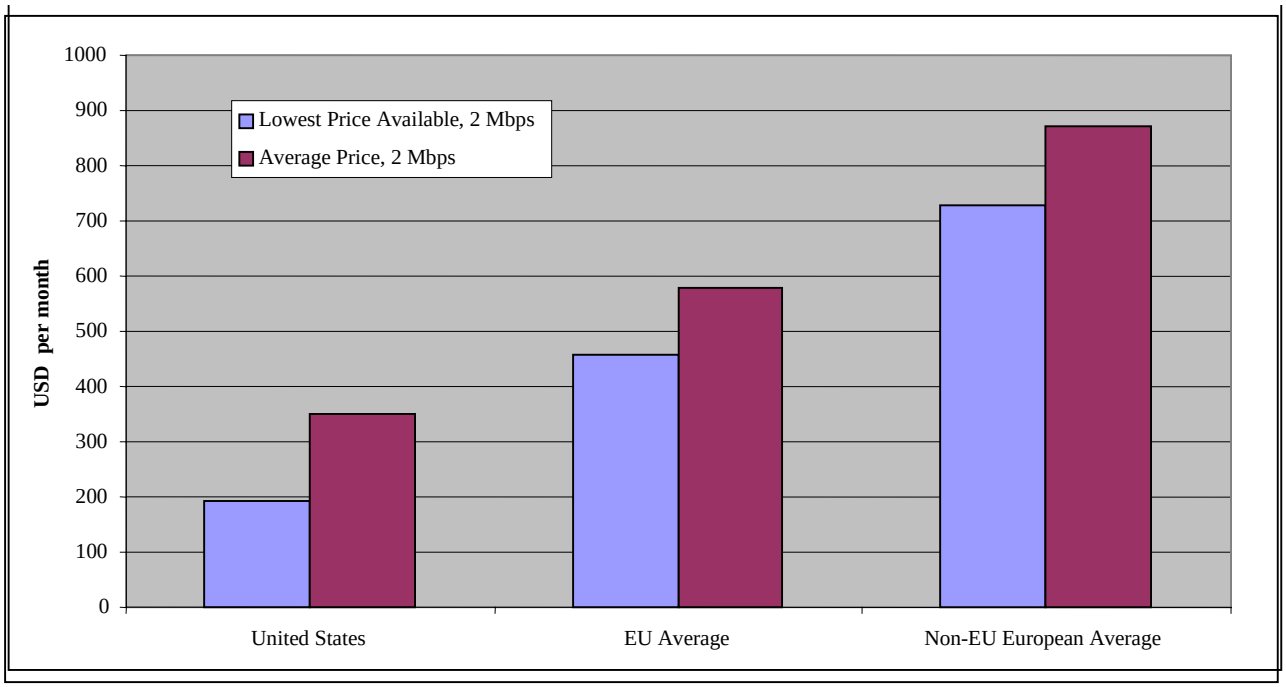
Figure 17. Comparison of 2 Mbps local leased line prices for selected OECD countries



Source: Reuters.

The comparison of 2 Mbps local leased line prices for selected OECD countries shows that, for Reuters, the least expensive prices are also available in the United Kingdom and the United States, followed by France and Switzerland (**Figure 17**). Although the best prices available in Europe match those in the United States, the European average is much higher (**Figure 18**). One reason for this is that the non-EU average includes countries that still had a monopoly in 2001 or had liberalised more recently than the leaders. In 1999, the European Commission established a recommended ceiling on the price of local tails up to five kilometres (*i.e.* USD 311). The EU average price, available to Reuters, was nearly double the ceiling recommended by the European Commission. The best average price, available to Reuters, was a third higher than the recommended ceiling.[40]

Figure 18. Average 2 Mbps local leased line prices for United States, EU member states and selected non-EU European countries



Source: Reuters.

The comparison of 2 Mbps local leased lines is also of interest in considering the potential impact of broadband access products such as DSL. There may, of course, be a number of differences in the level of service provided between a local leased line and DSL. Notwithstanding this, the very high prices shown in some countries would appear to indicate that DSL could provide a more economical alternative in a number of markets. In this context, it is noteworthy that some of the countries with the highest prices for leased lines are also ones in which there was no commercial DSL service available at the end of 2001.

Substitutability of SDSL for local leased lines

For a new entrant, 'last mile' connections represent a large proportion of the cost of serving a customer. In the United Kingdom, Fibrenet says that the cost of leased lines from BT, NTL or Colt typically make up half the cost of serving a business user. By reducing these costs through the use of SDSL, they argue they can make themselves more competitive, grow the market for broadband access and make premium

high-speed services more affordable to many more business users.[41] In Australia, one new entrant (AAPT) anticipates saving USD 1.6 million during 2002 by replacing Telstra tails with DSL.[42]

For users, SDSL services promise to significantly reduce the price of broadband access. In the United Kingdom, Easynet says the price of its 2 Mbps SDSL service over an unbundled local loop is about half the cost of a 2 Mbs leased line.[43] The difference can, of course, vary from one business user to another depending on their requirements. One of Easynet's first business users of SDSL, wanting to upgrade from ISDN, priced their service against a 2 Mbps leased line from BT. The SDSL option was nearly one-third of the price (USD 1 575 per month versus USD 550 per month).[44]

The public sector is also a large user of leased lines and will increasingly use broadband access as governments place more services on line. In the United Kingdom, local governments have begun to use SDSL to connect schools and libraries to their leased line based networks.[45] Whereas these agencies would not have had the budget to afford local leased line connections, SDSL has made this option affordable.

In the United Kingdom, SMEs connected to the Internet by a leased line spend on average in the order of USD 1 352 per month.[46] For business users the price of an SDSL 2 Mbps link will be significantly less expensive. For business users not needing symmetrical capacity, ADSL presents a much less expensive option but one that is more likely to supersede the use of ISDN and business dial-up services. At the end of 2001, an Oftel survey found that, on average, business users paid USD 147 for higher speed ADSL or cable modem service.

Several factors should also be at work to further reduce the cost of DSL. Regulators in a growing number of OECD countries have intervened to reduce the initial prices for unbundled local loops and line sharing. In addition, the costs for telecommunication carriers should decrease as economies of scale emerge in the DSL market. In 2002, SBC reported that significant economies of scale are beginning to reduce the unit cost of providing DSL services. In the first quarter of 2002, SBC achieved a 35% reduction in customer acquisition costs and a 20% reduction in per line recurring costs associated with DSL.[47] In March 2002, SBC said it was targeting a further 30% reduction in both acquisition and recurring costs. In Korea, economies of scale have already to have an impact on the financial performance of operators. In the first quarter of 2002, KT (Korea Telecom) reported increased profits based on strong growth in the broadband market.[48] In other countries, the break-even point is still to arrive. In Spain, for example, Telefonica says it expects DSL services to break even once the company has reached more than 1 million subscribers.

NOTES

1. Council of the European Communities, "Council Directive 92/44/EEC" of 5 June 1992 on the application of open network provision to leased lines. http://europa.eu.int/ISPO/infosoc/legreg/docs/9244eec.html.

2. http://europa.eu.int/information_society/topics/telecoms/implementation/annual_report/7report/documents/7report2001.pdf

3. QSC's offers are at http://www.q-dsl.de/index.php?pageId=316 Refer also to S. Marshall, "C&W Partners QSC for German SDSL in Early 2001", *Totaltele*, 19 December 2000.

4. Fibrenet, "Fibrenet Launches Wholesale DSL Service at TMA", Press Release, 25 October 2001 http://www.fibrenet.co.uk/press/current/fnet315.htm

5. Taffe, J., "SHDSL - France Telecom Moves Into SDSL Market", *Communications Week International*, 4 February 2002.

6. Belgacom, "Rapid Growth In Belgacom's Broadband Services", Press Release, 28 March 2002. http://www.belgacom.be/cgi-bin/echannel/web/index.jsp?LANGUAGE=EN

7. Deutsche Telekom, "BusinessOn line: Deutsche Telekom Presents New Symmetric Broadband Internet Solution For Business Customers", March 2002. http://www.telekom.de/dtag/presse/artikel/0,1018,x1503,00.html

8. Telenor, "Demand High For Broadband From Telenor", http://press.telenor.com/PR/200112/843914_5.html

9. Oftel, The UK Telecommunications Industry, Market Information", December 2001. http://www.oftel.gov.uk/publications/market_info/2001/mia1201.pdf

10. KPN, "Form 20F", 2001. http://www.kpn-corporate.com/nl/ir/downloads/OKTP_KPN_20-f.PDF

11. BT Ignite Netherlands, Comments submitted to "OPTA Consultation On Leased Line Tariffs", 2001. http://www.opta.nl/download/re_codo_huurlijnen_btignite_071101.pdf

12. Buckley, P. and S. Montes, "Main Street in the Digital Age: How Small and Medium Sized Businesses are Using the Tools of the New Economy", United States Department of Commerce, February 2002, p. 14.

13. See, for example, a description of Demon Internet's description of overbooking at: http://www.demon.nl/eng/products/accounts/symmetricfaq.html

14. Budden, R. "BT Satellite Broadband Targets Rural Consumers", *Financial Times*, 15 April 2001.

15. OECD, "The Development of Broadband Access in OECD Countries", OECD, 2001.

16. Information about Fastweb is available at: http://www.ebiscom.it/english_ver/index_i.html

17. Cogent Communications, “10K, for the fiscal year ended December 31, 2001”, at http://www.sec.gov/Archives/edgar/data/1158324/000091205702012716/a2075165z10-k.htm

18. PRNewswire-FirstCall, “Cogent Provides Metro-area Universities With Affordable, Ultra-High Bandwidth Service”, Cogent Press Release, 18 March 2002. http://biz.yahoo.com/prnews/020318/dcm024_1.html

19. Reuters, “Italy's Fastweb Aims For Breakeven Before 2003”, 22 November 2001, at www.totaltele.com

20. Telewest’s options for business users are at: http://www.byworkwise.com/broadband/packages.asp

21. Telia, “Telia First With Genuine Broadband For All ADSL Customers”, Press Release, 17 April 2002.

22. Austrade, “Knowing and Growing the Exporting Community”, April 2001. http://www.austrade.gov.au/cda/k_g.pdf.

23. Data are for the financial year ending in March 2000 and March 2001.

24. Solholm, R., “Norwegian Companies Use the Web”, Norway Post, 19 March 2002. http://www.norwaypost.no/content.asp?cluster_id=19123&folder_id=9.

25. Oftel, “Business Consumers' Use Of Internet, Wave 7, November 2001”, February 2002. http://www.oftel.gov.uk/publications/research/2002/q7intb0202.htm#3

26. Telenor, “Form 20F 2001”, April 2002. p41 http://www.telenor.com/reports/2001/pdf/f_20_2001.pdf

27. “Helsinki Apartment Block Offers Broadband Connection For Seven Euros Per Month”, 24 September, 2002. http://www.helsinki-hs.net/news.asp?id=20020924IE4 See also, “RPO Introduces New Broadband Service for Real Estates”, 3 October 2002. News Release at: http://www.elisa.com

28. OTE, “News Release of 2001 Results” at http://www.ote.gr/oteweb/english/investors/budgets/2001FullYearresults.pdf.

29. ODTR’s market updates are available at http://www.odtr.ie

30. Oftel, “Oftel's Broadband And Internet Brief - April 2002”, May 2002. http://www.oftel.gov.uk/publications/internet/internet_brief/broad0402.htm

31. Kary, T., “BellSouth Aims At Businesses With DSL”, C-Net News, 3 May 2002.

32. Oftel, “Oftel Orders BT To Agree Wholesale Leased Line Offer”, 29 March 2001, http://www.oftel.gov.uk/press/releases/2001/pr29_01.htm.

33. Griffin P., "Big Things Begin In Backblocks", *New Zealand Herald*, 21 August 2002. http://www.nzherald.co.nz/storydisplay.cfm?thesection=technology&thesubsection=&storyID=2350464

34. Refer to AT&T’s comments on a petition to establish performance standards for interstate special access services (8 October 2001) at: http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=651277250.8

35. ODTR, “The Irish Communications Market Quarterly Review “, 13 March 2002.

36. Details of the RegTP determination are at http://www.regtp.de/en/aktuelles/start/fs_03.html

37. Information on the CRTC decision is available at:
http://www.crtc.gc.ca/archive/ENG/Decisions/2001/DT2001-217.HTM

38. European Commission, “Commission Recommendation On Leased Lines Interconnection Pricing in Liberalised Telecommunication Markets”, 24 November 1999,
http://europa.eu.int/ISPO/infosoc/telecompolicy/en/ic-ll-final-en.pdf

39. Anacom, “Draft Decision On Leased Lines - Anacom Decides on Alterations to PT Comunicações' Offer”, 17 April 2002. http://www.anacom.pt/template20.jsp?categoryId=4599&contentId=44785.

40. The European Commission’s recommended ceiling price for 2Mbps local circuits up to 5 Kilometres is USD311. http://europa.eu.int/comm/information_society/policy/telecom/leasedlines/pdf/ic-ll-final_en.pdf.

41. Fibrenet presentation to industry analysts:
http://www.fibrenet.co.uk/corporate/presentations/briefing_files/frame.htm

42. Mitchell, G., “AAPT Business Data and Internet Division”, Telecom New Zealand Industry Briefing, 14 March 2002.

43. Allen, P., “SDSL 'Spells End' for BT Leased Lines”, 16 April 2002.
http://www.vnunet.com/News/1130848

44. Allen, P., “SDSL Steps Over the Leased Line”, 24 April 2002. http://www.vnunet.com/Analysis/1131201

45. Allen, P., “Valleys Rejoice as SDSL Links Councils”, 30 January 2002.
http://www.vnunet.com/Analysis/1128777

46. Oftel, “Business Consumers' Use of Internet, Wave 7, November 2001”. February 2002. http://www.oftel.gov.uk/publications/research/2002/q7intb0202.htm#1 Oftel add a caveat that this was based on a fairly small sample size.

47. SBC, “Investor Briefing”, 18 April 2002.
http://www.sbc.com/Investor/Financial/Earning_Info/docs/1Q_02_IB_FINAL.pdf

48. In-soo, N., “KT's Q1 Net Profit Soars on Broadband Services”, Reuters, *Totaltele*, 30 April 2002.