

© OECD, 2003.

© Software: 1987-1996, Acrobat is a trademark of ADOBE.

All rights reserved. OECD grants you the right to use one copy of this Program for your personal use only. Unauthorised reproduction, lending, hiring, transmission or distribution of any data or software is prohibited. You must treat the Program and associated materials and any elements thereof like any other copyrighted material.

All requests should be made to:

Head of Publications Service,
OECD Publications Service,
2, rue André-Pascal,
75775 Paris Cedex 16, France.

© OCDE, 2003.

© Logiciel, 1987-1996, Acrobat, marque déposée d'ADOBE.

Tous droits du producteur et du propriétaire de ce produit sont réservés. L'OCDE autorise la reproduction d'un seul exemplaire de ce programme pour usage personnel et non commercial uniquement. Sauf autorisation, la duplication, la location, le prêt, l'utilisation de ce produit pour exécution publique sont interdits. Ce programme, les données y afférentes et d'autres éléments doivent donc être traités comme toute autre documentation sur laquelle s'exerce la protection par le droit d'auteur.

Les demandes sont à adresser au :

Chef du Service des Publications,
Service des Publications de l'OCDE,
2, rue André-Pascal,
75775 Paris Cedex 16, France.

B.1. Investment in ICT equipment and software

- Investment in physical capital is important for growth. It is a way to expand and renew the capital stock and enable new technologies to enter the production process. Information and communication technology (ICT) has been the most dynamic component of investment in recent years.
- ICT's share in total non-residential investment doubled and in some cases even quadrupled between 1980 and 2000. In 2001, ICT's share was particularly high in the United States, the United Kingdom and Sweden.
- Software has been the fastest-growing component of ICT investment. In many countries, its share in non-residential investment multiplied several times between 1980 and 2000. Software's share in total investment is highest in Sweden, Denmark and the United States.
- By 2000, software accounted for almost three-quarters of total ICT investment in Denmark and Sweden. Communications equipment was the major component of ICT investment in Austria, Portugal and Spain. IT equipment was the major component in Ireland.
- Data on investment in ICT for 2001 are currently only available for some OECD countries. They are of great interest because of the recent downturn and the large investments for Y2K. Available data indicate that ICT's share in total investment has declined from 2000 to 2001. However, while the share of IT hardware in total investment has declined everywhere, that of investment in software has grown in some countries.

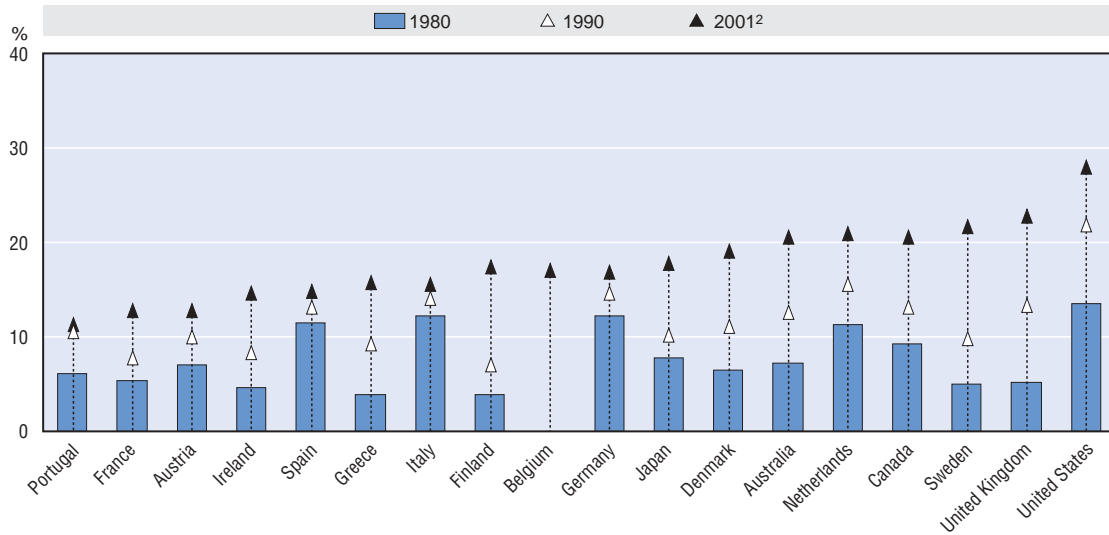
Measuring investment in ICT equipment and software

Correct measurement of ICT investment in both nominal and volume terms is crucial for estimating the contribution of ICT to economic growth and performance. Data availability and measurement of ICT investment based on national accounts (SNA93) vary considerably across OECD countries, especially as regards measurement of investment in software, deflators applied, breakdown by institutional sector and temporal coverage. In the national accounts, expenditure on ICT products is considered as investment only if the products can be physically isolated (*i.e.* ICT embodied in equipment is considered not as investment but as intermediate consumption). This means that ICT investment may be underestimated and the order of magnitude of the underestimation may differ depending on how intermediate consumption and investment are treated in each country's accounts.

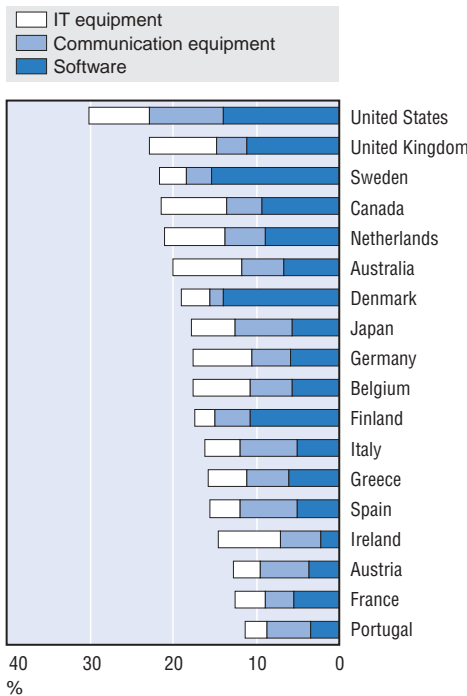
In particular, it is only very recently that expenditure on software has been treated as capital expenditure in the national accounts, and methodologies vary greatly across countries. Only the United States produces estimates of expenditure on the three different software components (*i.e.* pre-packaged, own account and customised software); other countries usually provide estimates for some software components only. The difficulties for measuring software investment are also linked to the ways in which software can be acquired, *e.g.* via rental and licences or embedded in hardware. Moreover, software is often developed on own account. To tackle the specific problems relating to software in the context of the SNA93 revision of the national accounts, a joint OECD-EU Task Force on the Measurement of Software in the National Accounts has developed recommendations concerning the capitalisation of software. For further information, see F. Lequiller, N. Ahmad., S. Varjonen, W. Cave and K.H. Ahn (2003), "Report of the OECD Task Force on Software Measurement in the National Accounts", Statistics Directorate *Working Paper* 2003/1, OECD, Paris; and N. Ahmad (2003), "Measuring Investment in Software", *STI Working Paper* 2003/6, OECD, Paris.

B.1. Investment in ICT equipment and software

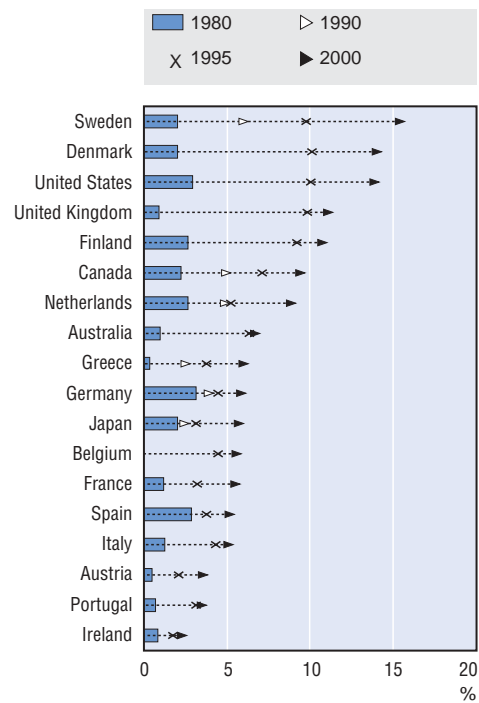
ICT investment¹ in OECD countries, 1980-2001
Percentage of non-residential gross fixed capital formation, total economy



ICT investment by asset¹ in OECD countries, 2000
Percentage of non-residential gross fixed capital formation, total economy



Software investment¹ in OECD countries, 1980-2000
Percentage of non-residential gross fixed capital formation, total economy



1. ICT equipment is defined as computer and office equipment and communication equipment ; software includes both purchased and own account software. Software investment in Japan is likely to be underestimated, owing to methodological differences.
2. 2001 for France, Spain, Italy, Belgium, Germany, Australia, Canada and the United States, and 2000 for the other countries.
Source: OECD, Database on Capital Services, May 2003.

B.2. Occupations and skills in the information economy

- Although the recent economic slowdown has resulted in an easing of tensions on the IT labour market, policy makers continue to need indicators relating to the skills required for the information economy. The data show that ICT-related occupations – both high-skill and low-skill – grew during the second half of the 1990s in the United States and Europe. In Europe, the differences between northern and southern Europe are significant.
- In the mid-1990s, the share of ICT workers was around 2.7% of total occupations in both the United States and the European Union. It has grown slightly faster in the United States than in the European Union and reached 3.4% and 3.2%, respectively, in 2001. The share of highly skilled workers in the ICT workforce remained relatively stable between 1995 and 2001 in the United States at around 80%; it increased significantly in the European Union from 48% to 63%.
- During the second half of the 1990s, highly skilled ICT workers were the fastest-growing group of highly skilled workers. In Spain and Finland in recent years, annual growth rates have been just under 20%. In 2001, their share in total occupations was highest in Sweden (3.8%) and the Netherlands (3.5%) and lowest in Greece (0.6%), Portugal (1.2%) and Italy (1.3%). The EU average was about 2%; the US average was 2.6%.
- More than eight highly skilled ICT workers in ten are computer workers (see box). Over the period 1995-2001, the number of computer workers increased substantially faster in northern Europe than in southern Europe.

Measuring ICT-related skills

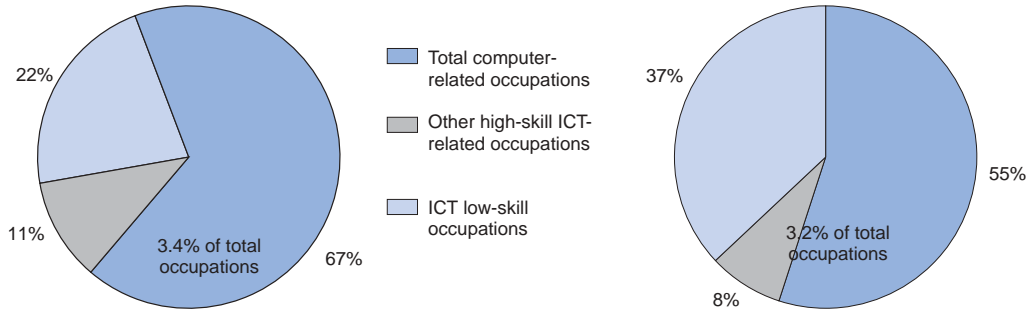
Skills are difficult to measure, and proxies are often used to capture observable characteristics such as educational attainment, on the supply side, and occupations, on the demand side. While an international classification of occupations exists (ISCO-88, International Standard Classification of Occupations, International Labour Office), there is no internationally agreed list of ICT-related occupations. An attempt was made here to match data on occupations from the US Current Population Survey (CPS) with ISCO-88-based occupation data from the Eurostat Labour Force Survey. Owing to data availability, only 3-digit ISCO-88 occupational classes could be used. To compare US and European trends in the absence of an official concordance between CPS and ISCO-88, similar classes were selected from the CPS. Some of the low-skill ICT occupations were not included in the calculations because they could not be matched to the ISCO-88 3-digit classification. These estimates of ICT-related occupations therefore constitute a lower bound. Another limitation of this type of data is that they are based on occupations that are self-declared by household members.

For Europe, the high-skill ICT-related occupations (ISCO-88) selected were computing professionals (213, including computer systems designers and analysts, computer programmers, computer engineers); computer associate professionals (312, including computer assistants, computer equipment operators, Industrial robot controllers); optical and electronic equipment operators (313, including photographers and image and sound recording equipment operators, broadcasting and telecommunications equipment operators). For low-skill ICT occupations, the only class that could be selected was electrical and electronic equipment mechanics and fitters (ISCO-88, 724). Computer workers are defined as the sum of ISCO-88 213 and 312.

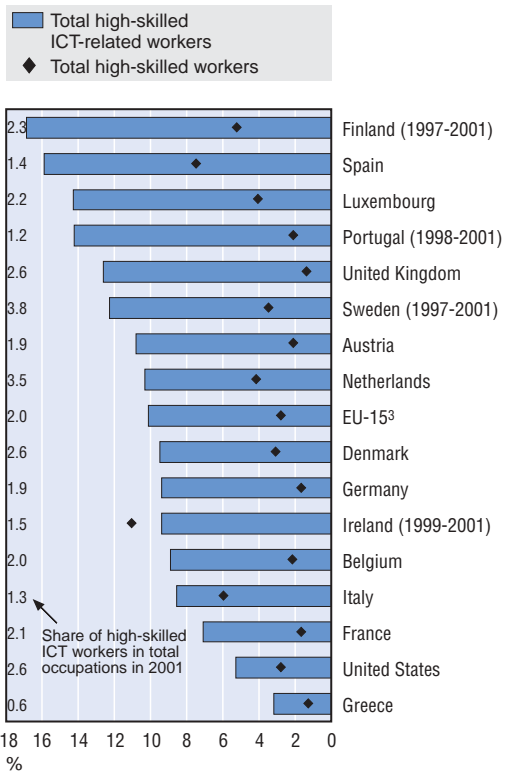
For the United States, data from the Current Population Survey, US Bureau of the Census, were used. High-skill ICT occupations include: computer systems analysts and scientists (64); operations and systems researchers and analysts (65); computer programmers (229); tool programmers, numerical control (233); electrical and electronic technicians (213); broadcast equipment operators (228); computer operators (308); peripheral equipment operators (309). Low-skill ICT occupations include: data processing equipment repairers (525); electrical power installers and repairers (577); telephone line installers and repairers (527); telephone installers and repairers (529); electronic repairers, communications and industrial equipment (523). Although the US Standard Occupational Classification (SOC) was recently revised (in 2000, see <http://stats.bls.gov/soc/>), the previous version of the US SOC was used to enable the estimation of time series.

B.2. Occupations and skills in the information economy

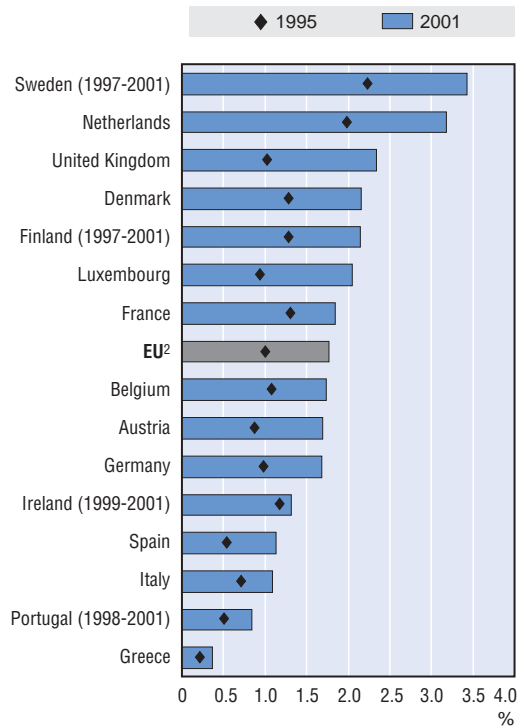
Share of high and low skills in ICT-related occupations in the European Union and the United States, 2001¹



Highly skilled ICT workers¹ and highly skilled workers² in the European Union and the United States
Average annual employment growth (1995-2001)



Computer workers¹ in the European Union
Share in total occupations, 1995 and 2001



1. High-skill ICT-related occupations are defined here as ISCO-88 classes 213, 312 and 313; computer workers refer only to the sum of the first two classes, see box.

2. High-skill occupations refer to ISCO-88 classes 1, 2 and 3.

Source: OECD, based on the Eurostat Labour Force Survey and the US Current Population Survey, May 2003.

B.3.1. Telecommunication networks

- In 25 out of 30 OECD countries, inhabitants generally have access to more than one telecommunication network (fixed or wireless). Luxembourg, the Nordic countries, Switzerland and the Netherlands have the highest rates of network penetration. Telecommunications networks have grown rapidly in recent years, especially in countries with lower penetration rates, such as Poland, Mexico and Hungary. Sweden, where penetration rates were already high, and Australia, Canada and the United States, are the only countries with average annual growth rates of under 10%.
- In 2001, most OECD countries had more than 50 fixed access channels for every 100 inhabitants. Luxembourg, Sweden, Switzerland and Denmark all had more than 70. In Mexico and Turkey penetration rates of fixed access channels are low.
- Luxembourg has the highest penetration rate for wireless networks, with close to one wireless subscriber per inhabitant. Italy, Austria, Iceland, Norway, Netherlands, Sweden and Finland also have high rates with more than 80 wireless subscribers per 100 inhabitants.
- The balance between wireless and fixed access channels is also of interest. Some three-quarters of OECD countries currently have more wireless than fixed access channels. Density of wireless access channels is generally relatively higher in countries where growth rates in telecommunication networks are quite high, such as Italy, Portugal and Austria. There are significantly fewer wireless than fixed access channels in Canada and the United States.
- Digital subscriber lines (DSL), cable modems and other broadband connections (see box) are an increasingly important indicator of broadband penetration, as they can carry telephony as well as large amounts of data. Broadband has diffused most widely in Korea, Canada, Sweden, Denmark, Belgium and the United States.

Measuring telecommunication networks

In the past, the penetration of standard access lines provided a reasonable indication of the extent to which basic telecommunications connections were available to users. Today, use of standard access lines would give a distorted view of network development, since in more than half of OECD countries, the number of standard access lines has begun to decrease as the take-up of ISDN (integrated services digital network) has increased.

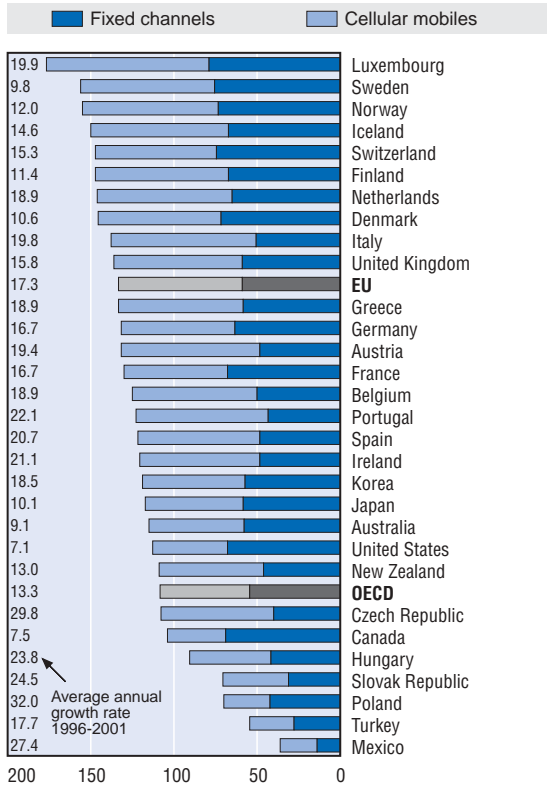
A different methodology from the one traditionally used for the penetration of standard access lines measures the penetration of telecommunication channels. Particularly problematic is the measurement of ISDN connections. Telecommunication carriers generally report data for ISDN connections in two ways. One is to report the number of basic and primary ISDN connections. A basic ISDN connection can provide two channels and a primary connection can provide 30. Alternatively, some telecommunication carriers report the total number of ISDN channels by multiplying the number of basic and primary connections by the number of channels they can provide.

To appreciate overall telecommunication penetration rates across the OECD area, it is also increasingly necessary to take into account the development of mobile communication networks and of "broadband" Internet access. The two leading technologies currently used to provide high-speed Internet access are cable modems and digital subscriber lines (DSL). Other broadband connections include satellite broadband Internet access, fibre-to-home Internet access, Ethernet LANs, and fixed wireless access (at downstream speeds greater than 256 kbps).

For further information, see OECD (2003), *Communications Outlook 2003*, OECD, Paris.

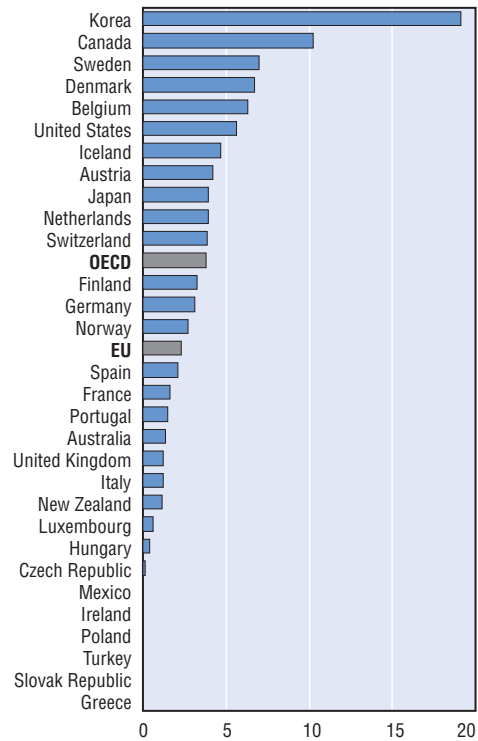
B.3.1. Telecommunication networks

Access paths¹ per 100 inhabitants, 2001



Broadband penetration rates in OECD countries

Number of DSL², cable modem and other broadband connections³ lines per 100 inhabitants, June 2002



1. Telecommunication access paths include the total of fixed access channels (standard telecommunication lines and ISDN connections) and cellular mobile subscribers.
2. Digital subscriber lines.
3. Other broadband connections includes satellite broadband Internet, fibre-to-home Internet access, Ethernet LANs, and fixed wireless subscribers (at downstream speeds greater than 256 kbps).

Source: OECD, Telecommunications database, March 2003.

B.3.2. Internet infrastructure

- The Internet continues to grow rapidly. In July 2002, there were almost 36 million Internet Web sites in the OECD area, almost double the 19 million in July 2000.
- Web sites per 1 000 population is an indicator of Internet diffusion. In July 2002, the OECD average was 34.1 sites per 1 000 inhabitants; the EU average was 37.9. At 84.7 Web sites per 1 000 inhabitants Germany had the highest number, followed by Denmark (71.7) and Norway (66.4). Mexico, Turkey, Greece and Japan all had fewer than three Web sites per 1 000 inhabitants.
- Web sites per 1 000 population grew fastest in Germany, almost doubling each year between 2000 and 2002. Denmark's annual growth rate was over 85%. Canada and the United States, which already had large numbers of Web sites in 2000, grew more slowly at approximately 20%.
- Business connections to the Internet indicate a country's level of infrastructure development. In Denmark and Sweden, one out of five enterprises accesses the Internet through a connection faster than 2Mbps. In Italy and Greece, relatively few enterprises have such a rapid Internet connection.
- In many countries, and particularly in Denmark, Finland and Spain, many enterprises have digital subscriber lines (DSL). ISDN (integrated services digital network) accounts for over 30% of all connections and is the technique most commonly used to access the Internet in countries for which information is available. In Austria and Luxembourg, more than half of all enterprises have an ISDN connection to the Internet. The use of conventional dial-up connections is also widespread. In Canada, Ireland, Spain and Sweden, more than 40% of enterprises still connect to the Internet via dial-up.

Measuring the size and growth of the Internet

Netcraft surveys Web servers in order to provide information about the software used on computers connected to the Internet. The data can be used to estimate the number of active Web sites under each domain, as well as the number of Web sites in each country, by distributing gTLD and ccTLD registrations according to the country allocation of IP address blocks.

- Servers are computers that host World Wide Web content.
- A top-level domain name (TLD) can either be a country code (for example .be for Belgium) or one of the generic top level domains (a so-called gTLD such as .com, .org, .net).
- Internet protocol (IP) addresses are the numbers used to identify computers, or other devices, on a TCP/IP network.

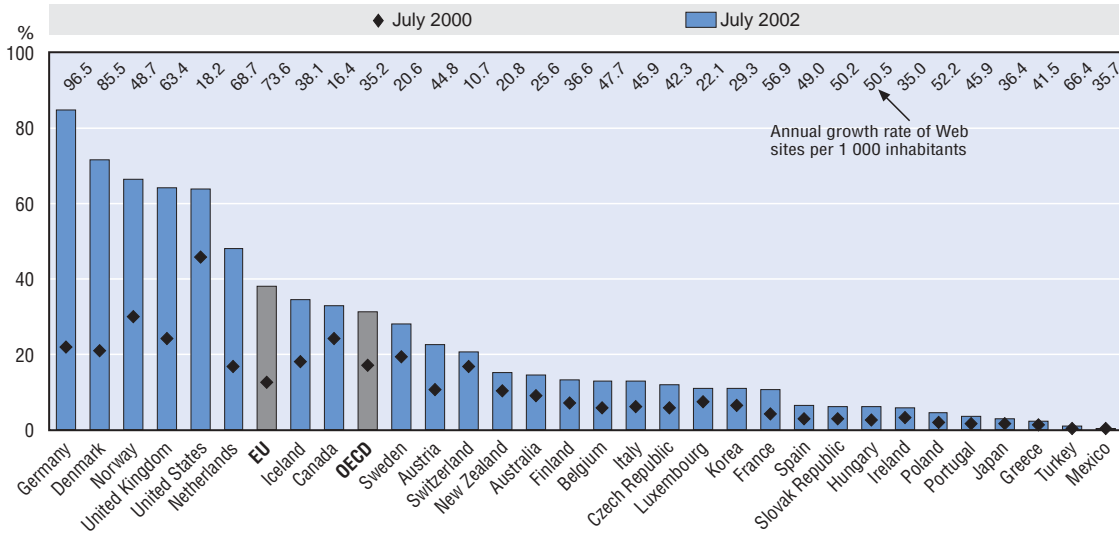
For more information, see OECD (2003), *Communications Outlook 2003*, OECD, Paris.

Data on connection of enterprises to the Internet cover all enterprises, except for those in the financial sector for some countries. Small enterprises (those with fewer than ten employees) are also excluded. If they were included, the picture would probably be different.

In addition, an enterprise may have various ways to connect to the Internet. It should therefore not be assumed that a certain percentage of enterprises use DSL exclusively since they may also use other means such as a conventional dial-up connection.

B.3.2. Internet infrastructure

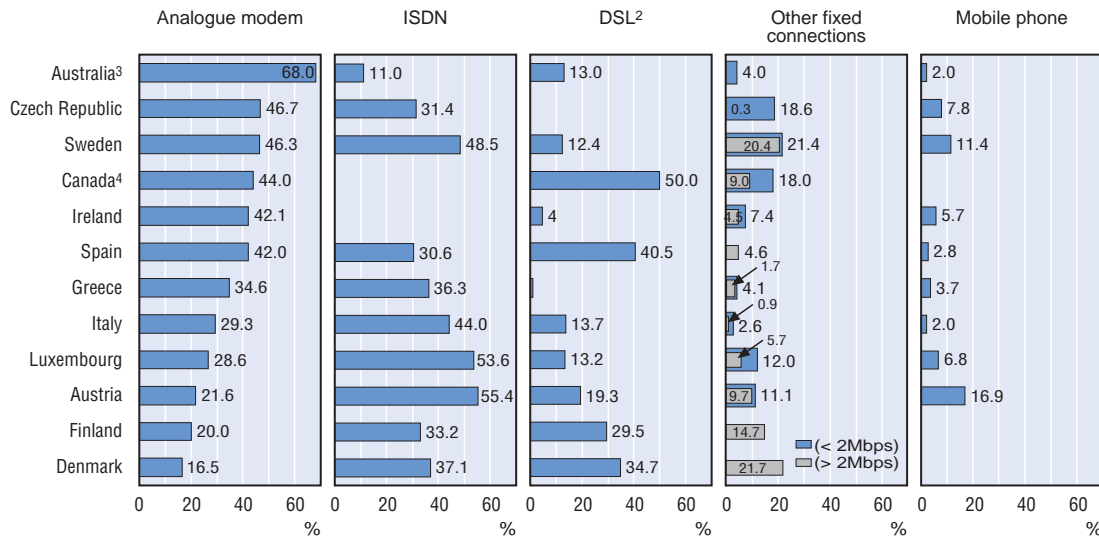
Web sites by country per 1 000 inhabitants, July 2000-July 2002
Adjusted for gTLDs¹



1. Generic top-level domains (gTLDs) are distributed to country of location.
Source: OECD, Telecommunications database, calculations based on Netcraft (www.netcraft.com), March 2003.

Broadband access in enterprises, 2002

Connection to the Internet of enterprises with ten or more employees¹



1. Excludes the financial sector in Czech Republic, Denmark, Germany, Ireland and Italy.
2. Digital subscriber lines.
3. Connections to the Internet via mobile phone include satellite connections; connections to the Internet via other fixed connections (< 2 Mbps) equals other high-speed access.
4. For Canada DSL equals high-speed ISDN/DSL line. Connection to the Internet via other fixed connections (> 2 Mbps) equals cable modem, and connections to the Internet via other fixed connection (< 2 Mbps) equals T1 line or greater (≥ 1.544 Mbps).
Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.4.1. Internet subscribers and number of secure servers

- As the number of Internet subscribers increases, so does its potential uses. Tracking the diffusion and use of the Internet is therefore of interest, despite the few internationally harmonised measures.
- At the end of 2001, there were 77.5 million Internet subscribers to fixed networks in the United States, approximately 24 million in Japan, more than 23 million in Korea, almost 15 million in Germany and 13.6 million in the United Kingdom. Between 1998 and 2001, subscriber numbers grew rapidly, fuelled by “subscription-free” Internet service providers (ISPs) and new connection technologies such as digital subscriber lines (DSL).
- A ranking in terms of Internet subscribers per capita places Iceland, Korea, Denmark, Sweden and Switzerland at the top of the list. Between 1999 and 2001 almost half of all OECD countries doubled the number of subscriptions per capita. Portugal, Austria and Iceland more than tripled the number.
- Netcraft’s Secure Socket Layer (SSL) surveys measure the number of servers with secure software, which are commonly used for purchasing goods and services or transmitting privileged information over the Internet. The number of servers with secure software is a proxy for the number of Internet applications that use a trust-enhancing mechanism. Such applications include e-commerce, e-banking, teleworking applications and e-government, which allows citizens and enterprises to communicate with the authorities.
- The number of secure servers per capita increased significantly between July 1998 and July 2002, a sign of the growing importance of secure servers for Internet applications. Iceland has the highest number of secure servers per capita, followed by the United States, Australia, Canada and New Zealand.

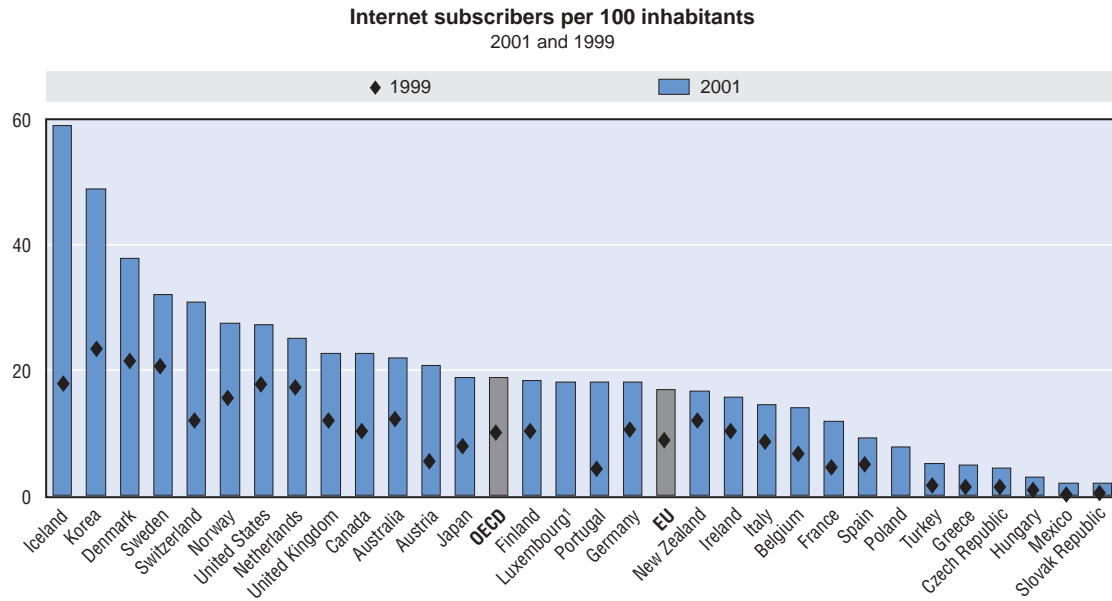
Measuring Internet access using information on subscribers

Many public-sector and private-sector organisations report on the number of “users”, “people” or “households” on line. National statistical agencies typically measure Internet access on the basis of surveys of businesses, households or individuals (see Box B.4.2). Some statistical offices also collect information on Internet subscribers by surveying Internet service providers (ISPs). These surveys are timely and provide a wide range of information, for example on type of subscriber (business, household, government), type of technology used (dial-up, cable, WAP, etc.), and sometimes even length of connection and volume of data downloaded. A problem for such surveys is the dynamism of the ISP industry with its high numbers of entries, exits and mergers.

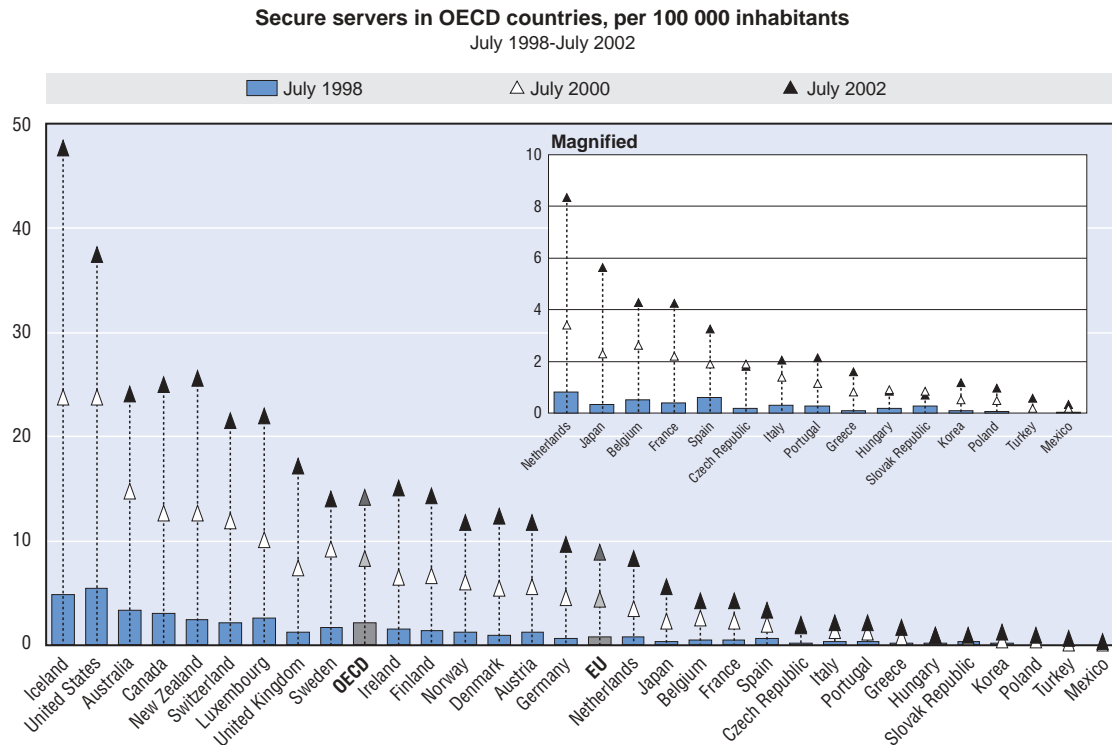
An alternative approach is to compile information on Internet subscribers from reports by the largest telecommunication carriers. These provide information on the number of subscribers to their Internet services and their estimates of market share. As these carriers manage connectivity via public switched telecommunication networks, they are often well placed to know subscriber numbers and associated market shares on an industry-wide basis. Moreover, “subscribers” has a more specific meaning than, for example, “users”. For most carriers, “subscribers” implies registered Internet accounts that have been used during the previous three months.

For further information, see OECD (2003), *Communications Outlook 2003*, OECD, Paris.

B.4.1. Internet subscribers and number of secure servers



1. Only includes P&T subscribers for 1999-2000.
Source: OECD, Telecommunications database, March 2003.



Source: OECD, Telecommunication database, calculations based on Netcraft (www.netcraft.com), March 2003.

B.4.2. ICT access by households

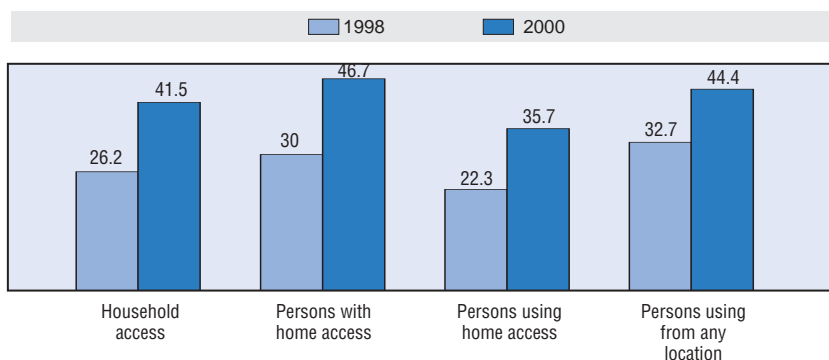
- Computers are increasingly present in homes both in OECD countries with high penetration rates and in those where adoption has lagged. Given differences in reference periods, survey methodologies and household structure, however, it is difficult to compare countries. Penetration rates are high in Denmark, Sweden and Switzerland, where approximately two-thirds of households had access to a home computer in 2001. The share in many other OECD countries is less than 50%. Some countries for which 2002 data are available, such as Germany, have seen a rapid rise in home computers over the past two years.
- The picture of households with Internet access is similar. In Denmark, Sweden and the United States, more than half of households had Internet access in 2001. In France and Portugal, on the other hand, less than one-fifth had Internet access in that year.
- Data on Internet access by household size are available for the United Kingdom, Finland, Austria and Germany. They show that more households with children have Internet access than households without children.

Comparability of household- and person-based indicators of Internet access and use and the OECD model questionnaire on ICT use in households/by individuals

Over a very short period, national statistical offices have made great progress in providing high-quality, timely indicators of the use of information and communication technology (ICT). From an international perspective, the major drawback of official statistics on ICT use is that they remain based on different standards and measure rapidly changing behaviour at different points in time. Most countries use existing surveys, such as labour force, time use, household expenditure or general social surveys. Others rely on special surveys. A first issue for international comparability is to address differences in the timeliness, scope and coverage of indicators.

Another important issue for international comparability is the choice between households and individuals as the survey unit. Household surveys generally provide information on both the household and the individuals in the household. Person-based data typically provide information on the number of individuals with access to a technology, those using the technology, the location at which they use it and the purpose of use. Statistics on ICT use by households may run into problems of international comparability because of structural differences in the composition of households (similarly, differences in countries' industrial structure affect comparability of statistics on business use of ICT). On the other hand, statistics on individuals may use different age groups, and age is an important determinant of ICT use. Household- and person-based measures yield different figures in terms of levels and growth rates. The example below uses US data referring to households and individuals aged three years and more (see *Falling through the Net: Toward Digital Inclusion*, US Department of Commerce, October 2000). Such differences complicate international comparisons and make benchmarking exercises based on a single indicator of Internet access or use misleading, since country rankings change according to the indicator used.

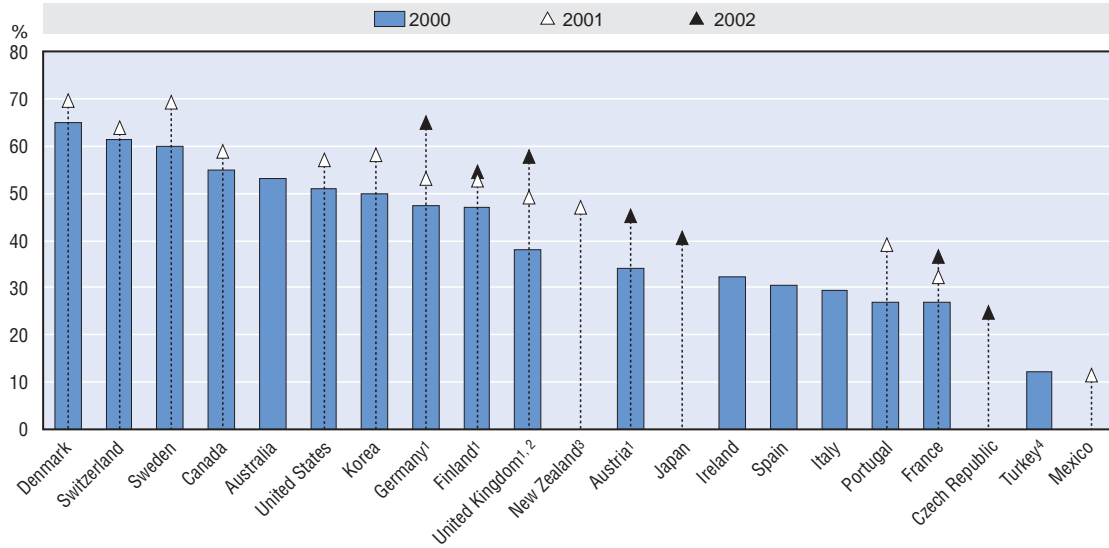
Household- and person-based measures of Internet access and use
Percentages



The OECD Working Party on Indicators for the Information Society (WPIIS) has addressed issues of international comparability by developing a model survey on ICT use in households/by individuals. The model survey is designed to be flexible; it uses modules addressing different topics so that additional components can be added as technologies reflecting usage practices and policy interests change.

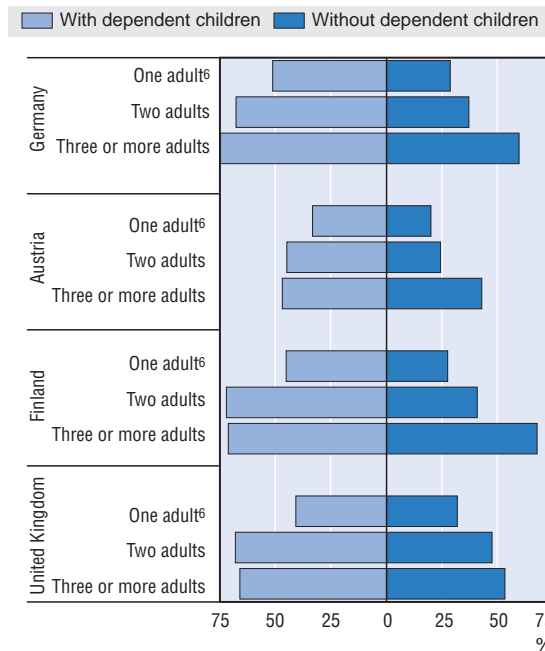
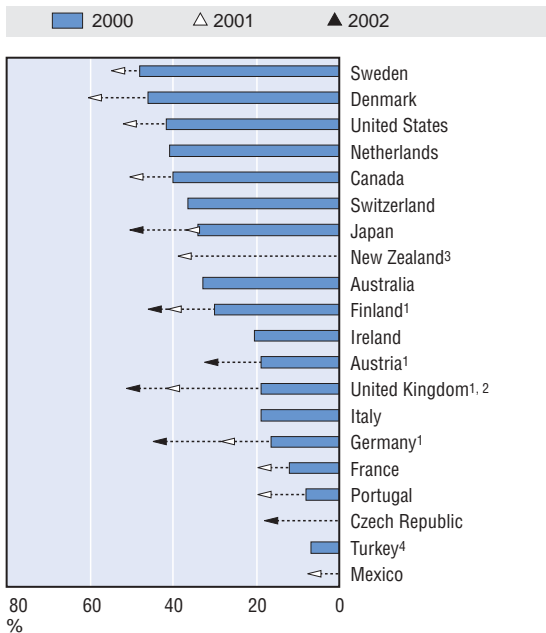
B.4.2. ICT access by households

Households with access to a home computer, 2000-02
Percentage of all households



Households with access to the Internet,⁵ 2000-02
Percentage of all households

Household Internet access by household size, 2002¹
Percentage of households in different size classes



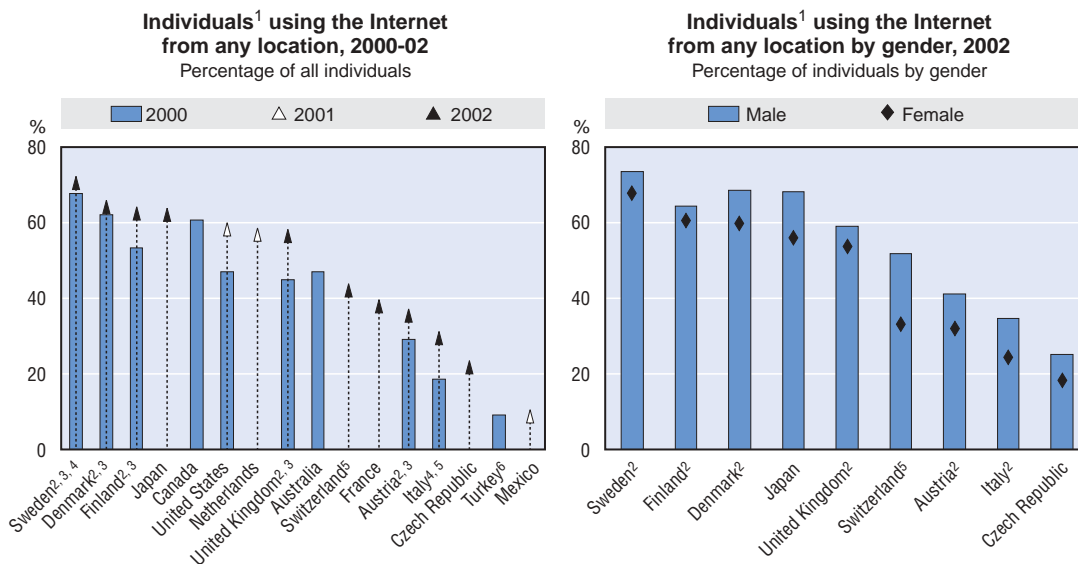
1. For 2002, data from the EU Community Survey on household use of ICT relate to the first quarter.
 2. March 2001-April 2002 (fiscal year) instead of 2001.
 3. July 2000-June 2001.
 4. Households in urban areas only.
 5. For 2000 and 2001, Internet access via any device except for Denmark, the Netherlands, Ireland, Austria, France and Turkey where Internet access is via a home computer.
 6. Single parent with dependent children, or one adult without children.
 Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in households 2002, May 2003.

B.4.3. Use of the Internet by individuals

- In many countries over half of all adults use the Internet from home, work or another location. Countries with the highest rates of Internet use by adults are Sweden (70%), Denmark (64%) and Finland (62%). However, Internet use is growing more slowly in these countries than in other OECD countries, a sign that they are reaching saturation.
- Men make greater use of the Internet than women in all countries for which data are available. The gap is largest in Switzerland where one-half of men but only one-third of women use the Internet.
- The Internet is used for different purposes in different countries. More than eight out of ten Internet users in Switzerland, Austria, the United States, Denmark and Sweden use e-mail. It is also commonly used to find

information about goods and services, particularly in Sweden, Denmark and Finland, small countries with high Internet penetration rates.

- E-business is also an important area for Internet use. In the United States, almost 40% of Internet users buy on line, as do many users in Denmark, Sweden and Finland. In Sweden and the United States, almost two-thirds of individuals use the Internet to read and/or download on-line newspapers or news magazines.
- In Portugal and Sweden, about half of all Internet users play games on line and/or download games and music. In Sweden and Denmark, more than half of all Internet users utilise e-banking and in Finland, one-third do so.

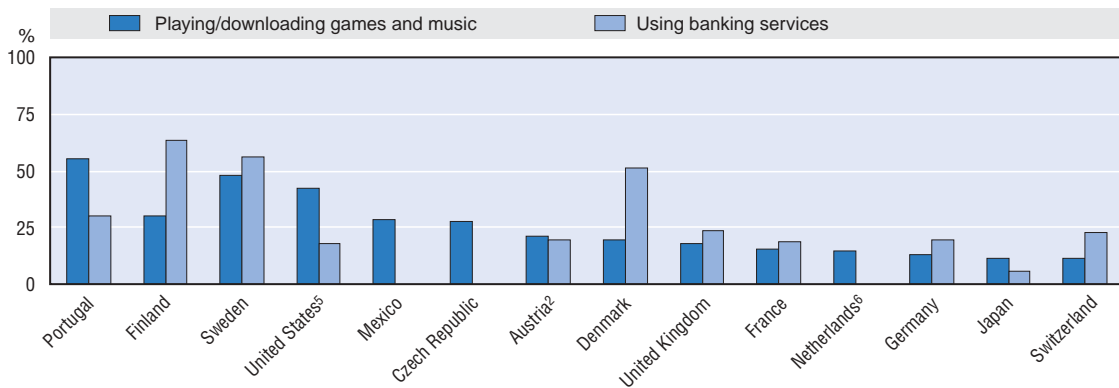
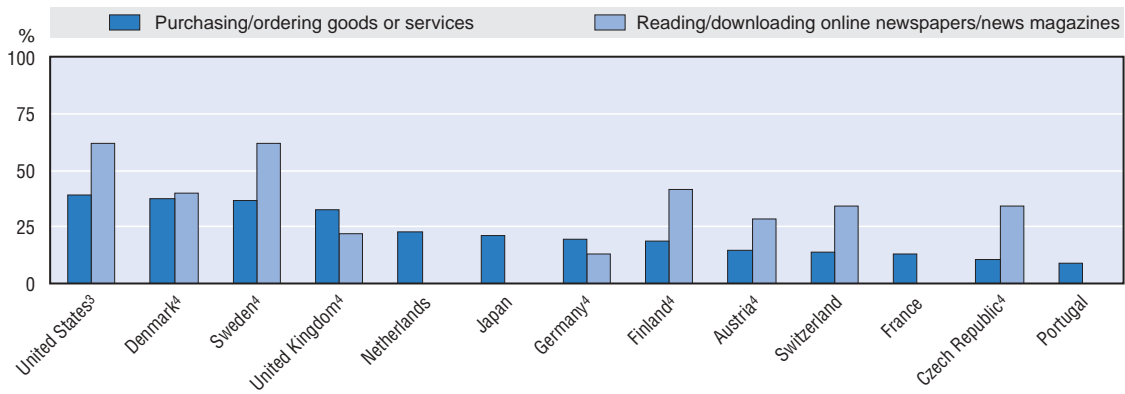
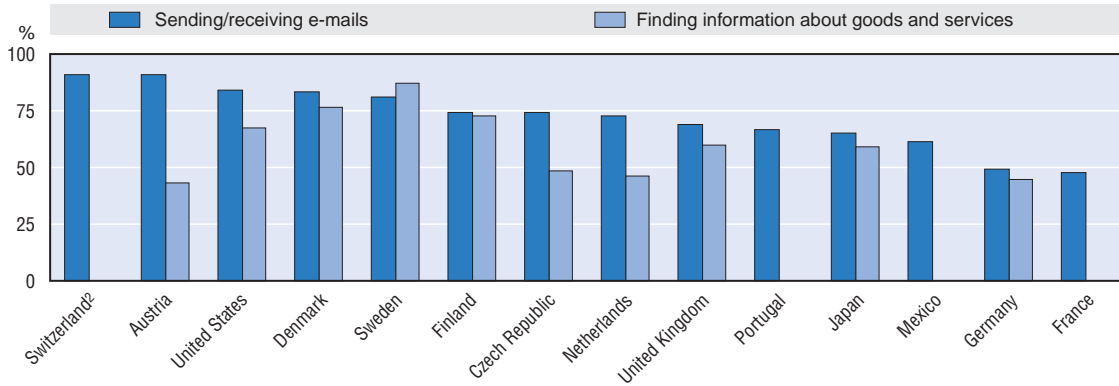


1. Age cut-off: 16 years and older except for Canada, Czech Republic and Finland (15+), the United States (3+), Italy (11+), Austria (6+), Mexico and the Netherlands (12+) and Australia and Turkey (18+).
 2. First quarter of 2002.
 3. For 2002, individuals aged 16-74 years, except for Switzerland (14+).
 4. For 2000, individuals aged 16-64 years.
 5. October 2001-March 2002.
 6. Individuals belonging to households in urban areas.

Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in households 2002, June 2003.

B.4.3. Use of the Internet by individuals

Internet use by type of activity, 2002 or latest available year¹
Percentage of individuals using the Internet



1. 2001 for France, Mexico, Netherlands, Portugal, Switzerland and the United States. Beginning of 2002 for Austria, Denmark, Finland, Germany, Sweden, the United Kingdom and 2002 for Japan.

2. Only sending e-mails instead of sending and receiving e-mails.

3. Reading/downloading newspapers also includes movies.

4. Purchasing/ordering goods or services excludes shares/financial services.

5. Playing games only instead of downloading games and music.

6. Downloading music only instead of games and music.

Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in households 2002, June 2003.

B.4.4. Internet access and use by enterprise size and industry

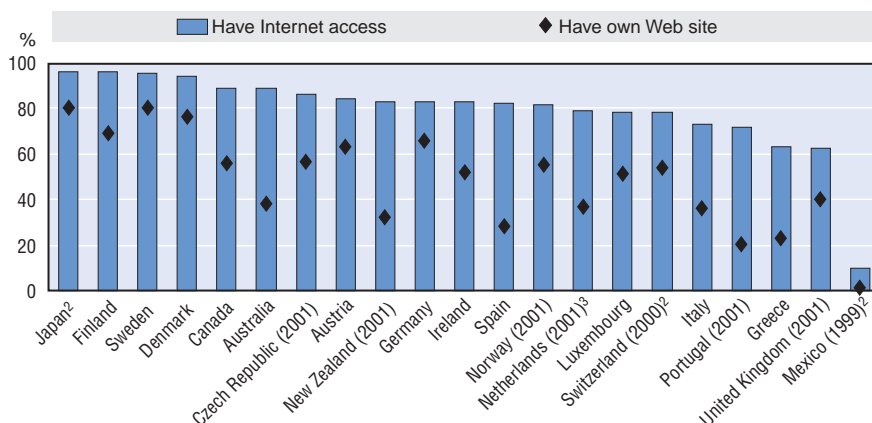
- In many countries almost all enterprises with ten or more employees use the Internet. Frequent use of the Internet seems to be positively correlated with a country's number of enterprise Web sites. In Finland, Denmark, Canada, Sweden and Ireland, two-thirds or more of all enterprises with ten or more employees have Web sites.
- The Internet is less used by smaller than by larger enterprises, and differences among countries are more striking when small enterprises are compared. Finland has the highest share of Internet use by enterprises with 10-49 employees, almost double that of Mexico, which has the lowest share in this size class.
- Internet penetration among enterprises with ten or more employees varies considerably across sectors, and this may be one source of aggregate differences. In the financial sector, almost all firms use the Internet. The retail sector seems to be lagging, particularly in countries with low overall Internet use by enterprises.

Measuring ICT access and use by businesses: OECD efforts to improve international comparability

Technology diffusion varies with business size and industry, so that indicators based on the overall "number" (proportion) of businesses using a technology can give rise to misleading international comparisons. "Share of businesses" is extremely sensitive to the size of enterprises, *e.g.* measured by number of employees, covered by national surveys. Moreover, international comparisons of information and communications technology (ICT) usage indicators are affected by differences in the sectoral coverage of surveys (see the footnotes to the figures).

International comparisons are made more difficult by the lack of harmonisation in the definitions of indicators. The OECD has developed a model survey, approved by OECD member countries in 2001, which is intended to provide guidance for the measurement of indicators of ICT, Internet use and electronic commerce. It is composed of separate, self-contained modules to ensure flexibility and adaptability to a rapidly changing environment.

Business use of the Internet and Web sites, 2002 or latest available year
Percentage of business with ten or more employees¹



1. In European countries, only enterprises in the business sector, but excluding NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation), are included. The source for these data is the Eurostat Community Survey on enterprise use of ICT. In Australia, all employing businesses are included, with the exception of businesses in: general government, agriculture, forestry and fishing, government administration and defence, education, private households employing staff and religious organisations. Canada includes the industrial sector. Japan excludes agriculture, forestry, fisheries and mining industries. New Zealand excludes electricity, gas and water supply and only includes enterprises with NZD 30 000 or more in turnover. Switzerland includes the industry, construction and services sectors.

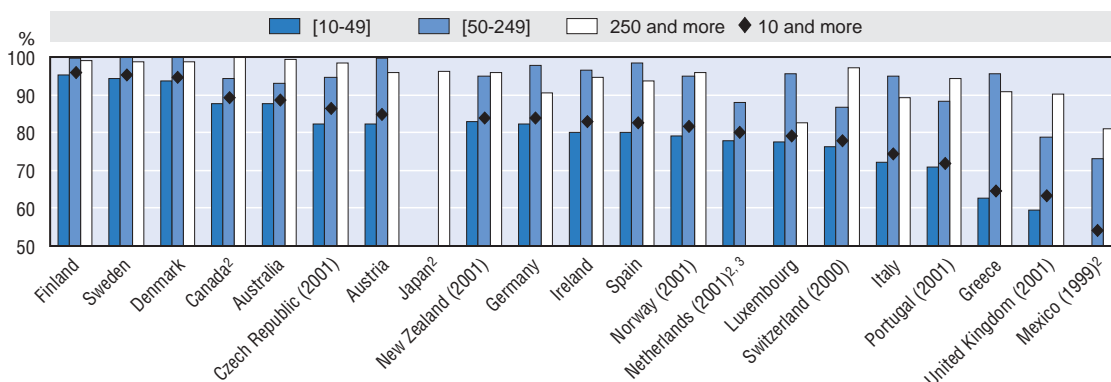
2. For Japan, businesses with 100 or more employees. For Switzerland, five or more employees. For Mexico, businesses with 21 or more employees.

3. Internet and other computer-mediated networks.

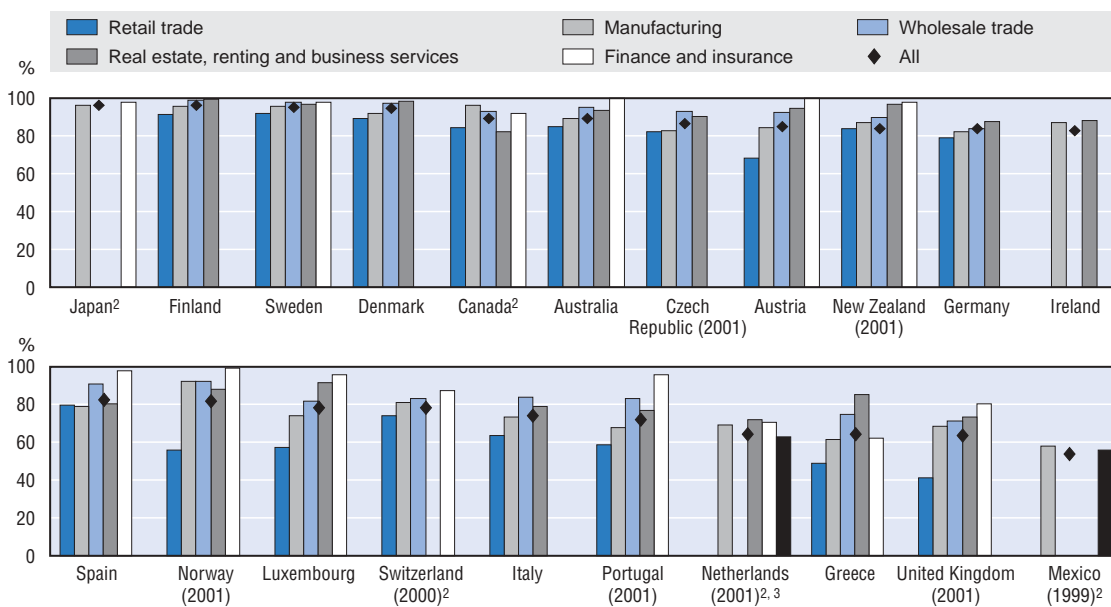
Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.4.4. Internet access and use by enterprise size and industry

Internet penetration by size class, 2001 or latest available year
Percentage of businesses with ten or more employees using the Internet¹



Internet penetration by activity, 2002 or latest available year
Percentage of businesses with ten or more employees using the Internet¹



1. In European countries, only enterprises in the business sector, but excluding NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation), are included. The source for these data is the Eurostat Community Survey on enterprise use of ICT. In Australia, all employing businesses are included, with the exception of businesses in general government, agriculture, forestry and fishing, government administration and defence, education, private households employing staff and religious organisations. Canada includes the industrial sector. Japan excludes agriculture, forestry, fisheries and mining. New Zealand excludes electricity, gas and water supply, and only includes enterprises with NZD 30 000 or more in turnover. Switzerland includes the industry, construction and service sectors.
2. For Canada, 50-299 employees instead of 50-249 and 300 or more instead of 250 or more. For Japan, businesses with 100 or more employees. For the Netherlands, 50-199 employees instead of 50-249. For Switzerland, 5-49 employees instead of 10-49 and 5 or more employees instead of 10 or more. For Mexico, businesses with 21 or more employees, 21-100 employees instead of 10-49, 101-250 instead of 50-249, 151-1 000 instead of 250 or more.
3. Internet and other computer-mediated networks.

Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.4.5. Internet and electronic commerce by size of enterprise

- A number of countries have started to measure the value of Internet and electronic sales (see box). Total Internet sales range between 0.3% and 3.8% of total sales. Electronic sales, *i.e.* sales over any kind of computer-mediated network, reach 10% or more of sales in Austria, Sweden, Finland and Ireland. In the US retail sector, the share of electronic sales in total sales grew by 70% between the fourth quarter of 2000 and the fourth quarter of 2002.
- Large firms use the Internet more frequently than small ones to sell goods and services. In Denmark, where e-commerce is widespread, one-fifth of enterprises with 10-49 employees sold over the Internet as did more than one-third of enterprises with 250 or more employees. It is more common to purchase than to sell over the Internet. As many as two-thirds or more of enterprises with 250 or more employees in Australia, Canada, Denmark, Sweden and Finland buy goods or services via the Internet.

Measuring electronic commerce: OECD definitions of Internet and electronic transactions

Only a few years ago, there were no internationally comparable official statistics of electronic commerce transactions. In April 2000, OECD member countries endorsed two definitions of electronic transactions (electronic orders), based on narrower and broader definitions of the communications infrastructure. According to the OECD definitions, the method used to place or receive the order, not the payment or the channel of delivery, determines whether the transaction is an Internet transaction (conducted over the Internet) or an electronic transaction (conducted over computer-mediated networks). In 2001, the OECD developed guidelines for interpreting the definitions of electronic commerce and encouraged member countries to use them when developing their questionnaires. To date, comparisons still need to take into account differences in the type of definition used in surveys and in their coverage.

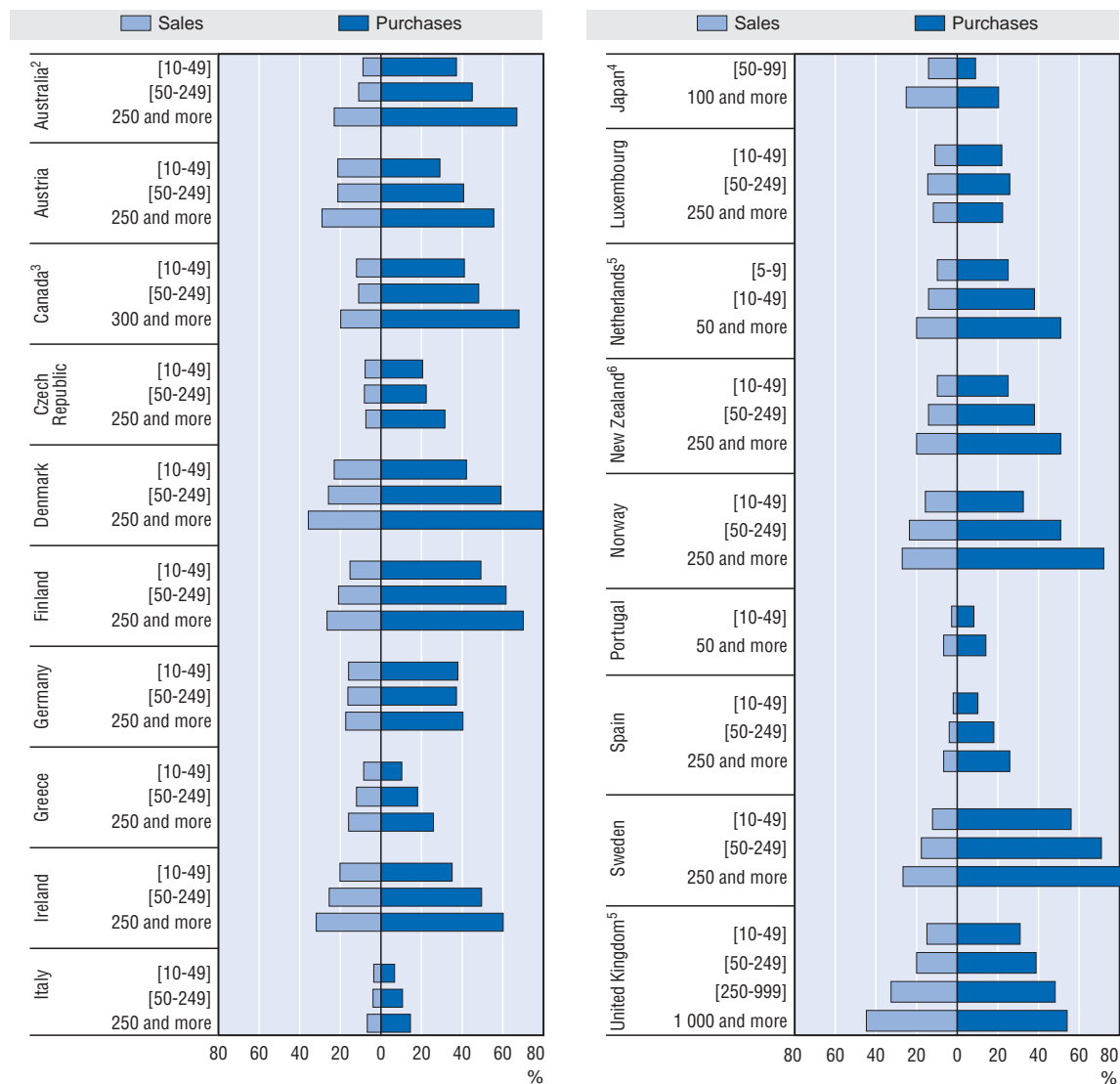
**Official estimates of Internet and electronic commerce transactions,¹
2001 or latest available year**
Percentage of total sales or revenues

	Broad		
Business sector		0.5% Canada 0.7% Australia (2000-01) 0.3% New Zealand ² (2000-01)	
Business sector (excluding financial sector)		2.0% Norway 0.7% Czech Republic 1.0% Denmark ³ 1.0% Germany ³ 0.5% Greece ³ 0.3% Spain ³ 3.8% Ireland ³ 0.3% Italy ³ 0.4% Luxembourg ³ 2.2% Austria ³ 1.1% Finland ³ 2.1% Sweden ³	10.0% Norway 3.3% Czech Republic 6.6% Denmark ³ 4.7% Germany ³ 0.8% Greece ³ 2.6% Spain ³ 15.1% Ireland ³ 2.6% Italy ³ 3.4% Luxembourg ³ 8.2% Austria ³ 11.5% Finland ³ 9.5% Sweden ³
Retail sector		0.6% Canada 0.4% Australia (2000-01)	1.50% (United States, 1st Q 2003) 1.65% (United States, 4th Q 2002) 1.31% (United States, 4th Q 2001) 1.17% (United States, 4th Q 2000)
	Narrow		Broad
		Internet commerce, <i>i.e.</i> sales over the Internet	Electronic commerce, <i>i.e.</i> sales over any kind of computer- mediated network

1. For more information, see *Measuring the Information Economy*; www.oecd.org/sti/measuring-infoeconomy
 2. Data for New Zealand exclude electricity, gas and water supply and only cover enterprises with six or more full-time equivalent employees and NZD 30 000 or more in turnover.
 3. Enterprises with ten or more employees. Data exclude NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation).
 Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.4.5. Internet and electronic commerce by size of enterprise

Internet sales and purchases by size class, 2001 or latest available year
Percentage of businesses in each size class selling or purchasing¹



1. In European countries, except the Netherlands, Portugal and the United Kingdom, the figures refer to orders received and placed over the Internet during 2001. Only enterprises in the business sector, excluding NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation), are included. The source for these data is the Eurostat Community Survey on enterprise use of ICT. All other countries, unless indicated otherwise here, refer to 2000.
 2. Data for sales and purchases refer to 2001-02. All employing businesses are included, with the exception of businesses in general government, agriculture, forestry and fishing, government administration and defence, education, private households employing staff and religious organisations.
 3. Data refer to 2002 and include the industrial sector.
 4. Data refer to 2002 and exclude agriculture, forestry, fisheries and mining industries.
 5. Orders received or placed over the Internet and other computer-mediated networks.
 6. Data refer to 2001 and include enterprises with a turnover of NZD 30 000 or more in all industries except electricity, gas and water; government administration and defence; and personal and other services.
- Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.4.6. Internet and electronic commerce by activity of enterprise

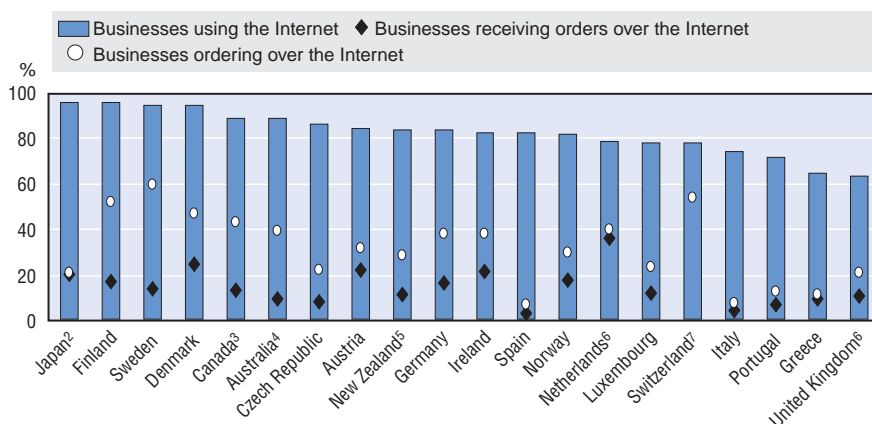
- Today, enterprises commonly use the Internet, although there are still substantial differences between larger enterprises and the smallest, those with fewer than ten employees. For example, more than 95% of Swedish and Danish enterprises with ten or more employees now use the Internet.
- The Internet is used more frequently as a tool for ordering goods and services than for selling, particularly in countries where a large share of enterprises use the Internet.
- Use of the Internet to sell goods or services varies among sectors. In many countries, the

real estate and wholesale sectors make the most use of the Internet as a sales channel. More than one-fifth of enterprises in the wholesale sector in Austria, Denmark, Finland and Japan use the Internet for this purpose. Retail sales are less common, although one-fifth of Canadian and Danish retail firms sell via the Internet.

- Real estate and wholesale trade are also the sectors that purchase the most via the Internet. In many countries, more than half of the firms in these sectors do so.

Businesses using the Internet for purchasing and selling, 2001 or latest available year¹

Percentage of business with ten or more employees



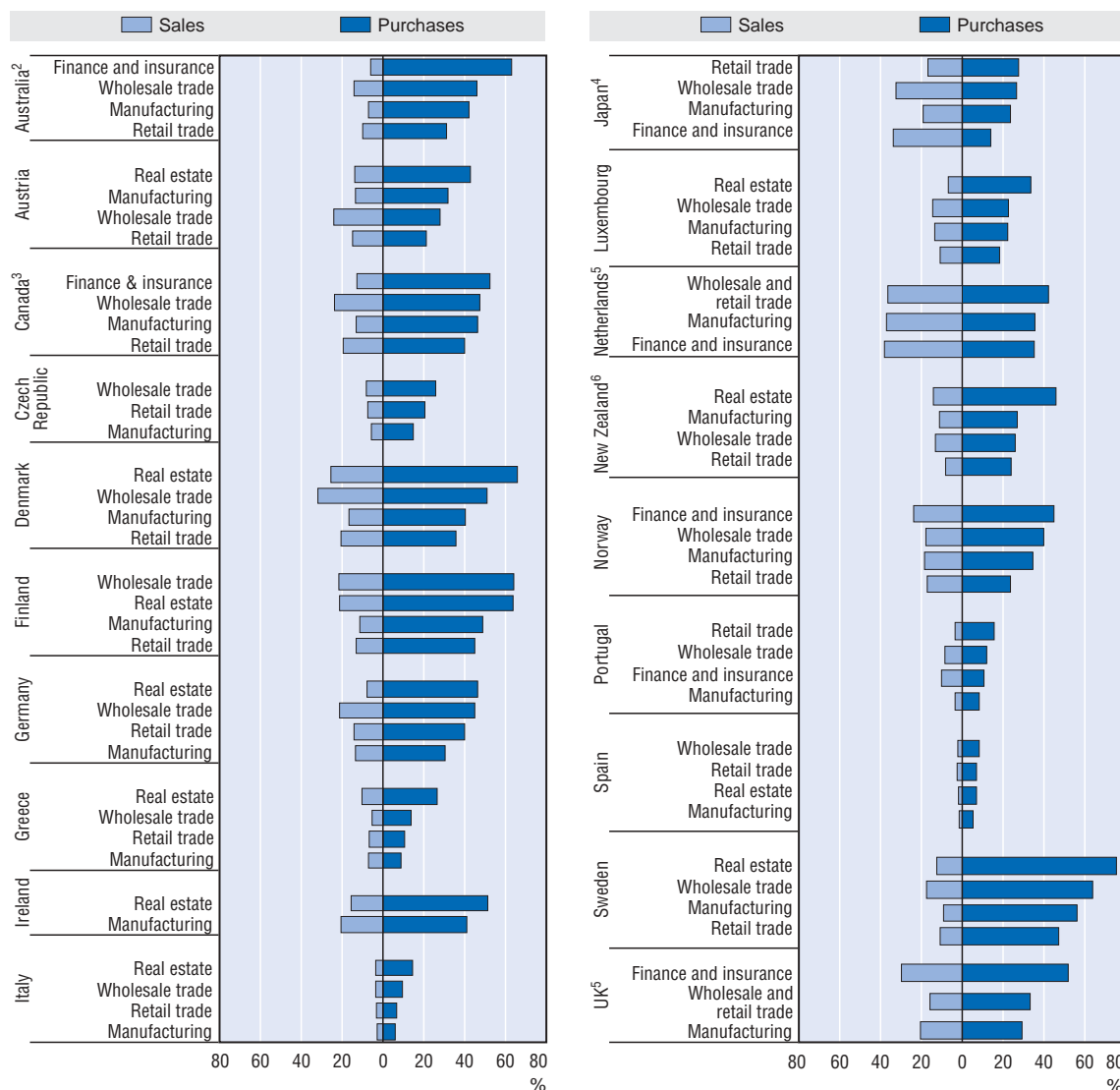
1. In European countries, except the Netherlands, Portugal and the United Kingdom, the figures refer to orders received and placed over the Internet in 2001, while the use of the Internet refers to the beginning of 2002. Only enterprises with ten or more employees in the business sector, excluding NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation), are included. The source for these data is the Eurostat Community Survey on enterprise use of ICT. All other countries, unless otherwise noted, refer to enterprises at the beginning of 2001 for Internet use and to 2000 for purchases and sales.
2. Data refer to 2002 and to enterprises with 100 or more employees. Agriculture, forestry fisheries and mining are excluded.
3. Data refer to 2002 and include the industrial sector.
4. Data to Internet use refer to 2002 while data for sales and purchases refer to 2001-02. All employing businesses are included, except businesses in: general government, agriculture, forestry and fishing, government administration and defence, education, private households employing staff and religious organisations.
5. Data refer to 2001 and include enterprises with more than ten employees in all industries except electricity, gas and water; government administration and defence; and personal and other services.
6. Use, orders received and placed refer to Internet and other computer-mediated networks.
7. Data refer to 2000 and include industry, construction and services.

Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.4.6. Internet and electronic commerce by activity of enterprise

Internet purchases and sales by activity, 2001 or latest available year¹

Percentage of businesses in each activity class



1. In European countries except the Netherlands, Portugal and the United Kingdom, the figures refer to orders received and placed over the Internet in 2001. Only enterprises with ten or more employees in the business sector, excluding NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation), are included. The source for these data is the Eurostat Community Survey on enterprise use of ICT. All other countries, unless otherwise noted, refer to 2000.
2. Data for sales and purchases refer to 2001-02. Sales for different industries refer to enterprises with ten or more employees. All employing businesses are included, except businesses in: general government, agriculture, forestry and fishing, government administration and defence, education, private households employing staff and religious organisations.
3. Data refer to 2002 and include the industrial sector.
4. Data for manufacturing and finance and insurance refer to 2002 and to enterprises with more than 100 regular employees. The data for total enterprises and other sectors refer to enterprises with more than 50 employees.
5. Orders received and placed refer to Internet and other computer-mediated networks.
6. Data refer to 2001 and include enterprises with six or more employees and a turnover of NZD 30 000 or more in all industries except electricity, gas and water; government administration and defence; and personal and other services.

Source: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002, May 2003.

B.5. The price of Internet access and use

- Increased competition in the telecommunications industry has been driving down the cost of Internet access. Prices of leased lines, which provide the infrastructure for business-to-business electronic commerce, have fallen significantly, particularly since 1998, in the wake of widespread liberalisation in Europe's communication sector. Competition is not yet strong in all markets, however, and large price differences remain. The Nordic countries have the lowest charges for leased lines, at about one-fifth of the OECD average. Elsewhere, the least expensive countries are Switzerland, Luxembourg, Ireland, Germany, and the United States. At the other end of the spectrum, the charges in the Czech Republic and the Slovak Republic are more than twice the OECD average.
- Prices for ordinary consumers also differ substantially across countries. For a dial-up Internet connection, they must often pay a fixed telephone charge, a telephone usage charge and an Internet service provider charge. The ratio of these charges differs considerably among countries.
- The total cost for 40 hours of Internet access at peak times also differs noticeably. Internet access is cheapest in Korea and Canada, where the total charge is roughly one-third of the OECD average. France, New Zealand, the United States and Finland are also among the least expensive OECD countries.
- There is no direct link between Internet access and cost. For example, Denmark and Sweden, where Internet connections at home are common, are not among the countries with the lowest cost. To assess the impact of price on Internet take-up by households, the complex structure of access prices and the means available for connecting to the Internet have to be taken into account. More in-depth information on Internet infrastructure and Internet pricing can be found in the OECD *Communications Outlook 2003*.

OECD Internet access price baskets

Leased lines (private lines in North America) provide the infrastructure for business-to-business electronic commerce. They give users that need to transmit high volumes of traffic lower prices than the public switched telephone network (PSTN). They also provide them with control over their telecommunications facilities and traffic. The basket of national leased lines includes total charges (excluding taxes) for leased lines that can carry two megabits of information per second (Mbps).

For consumers and small businesses, the price of local communication access is a significant cost for engaging in electronic commerce. The OECD basket includes line rental, public switched telephony network (PSTN) usage charges and the Internet service provider (ISP) fee. The line rental charge helps to balance countries that traditionally did not charge for local calls and had higher fixed charges against those that charged for local calls and had lower fixed charges. The use of a fixed charge does not imply that customers need an additional line to connect to the Internet, as most residential customers use their PSTN line for this purpose. In addition, some of the prices shown for a defined duration include further amounts of on-line time. This is the case for countries with unmetered access or packages that include large amounts of on-line time.

The comparisons use prices as of September 2002 for the largest telecommunications carrier in each country. Changes that had been announced but were not yet in place are not included.

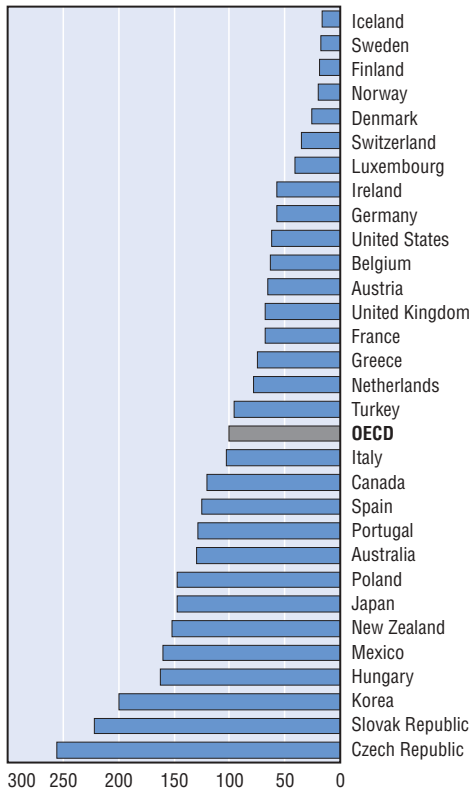
- Fixed charge: the monthly line rental for residential users.
- Usage charge: the price of local telephone calls (or special rates for Internet access) to an ISP for residential users.
- ISP charge: the price of Internet access from the largest telecommunications operator.
- Peak and off-peak times: the price of local calls at 11:00 hours (peak) and at 20:00 hours (off-peak) during weekdays.

For further information, see OECD (2003), *Communications Outlook 2003*, OECD, Paris.

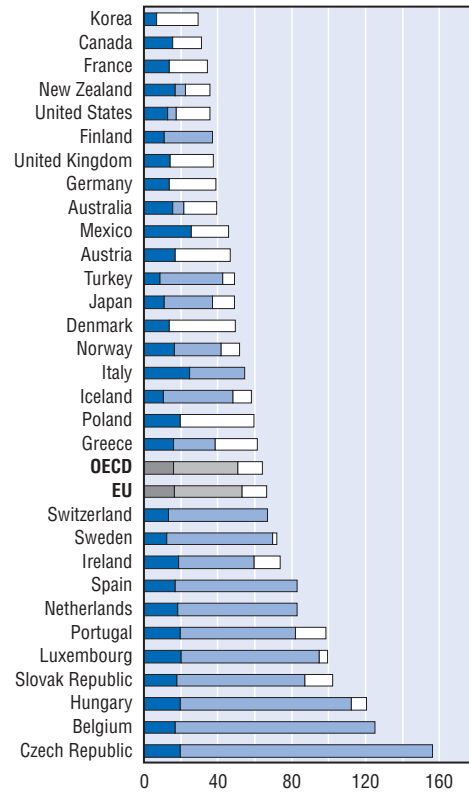
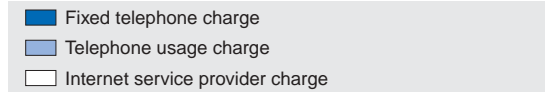
B.5. The price of Internet access and use

Price of national leased line charges, August 2002

Charges for a basket of national leased lines of 2 megabits per second, OECD average = 100



OECD Internet access basket for 40 hours at day-time discounted PSTN rates,¹ September 2002, including VAT, in USD PPP



1. In some countries ISP and PSTN usage charges are bundled.
 Source: OECD, Telecommunications database, March 2003.

B.6.1. Size and growth of the ICT sector

- Information and communication technologies (ICT) have been at the heart of economic changes for more than a decade. ICT-producing sectors play an important role, notably by contributing to rapid technological progress and productivity growth.
- The ICT sector grew strongly in OECD economies over the 1990s. Rapid growth was especially apparent in Finland, Sweden and Norway. In Finland, the ICT sector's share of value added doubled over 1995-2001 and now represents over 16.4% of total business sector value added. In 2000, the ICT sector represented between 5% and 16.5% of total business sector value added in OECD countries. The average share in a group of 25 OECD countries was about 9.8%; it was 8.7% in the European Union.
- Ireland, Finland, Korea, Japan and Mexico are specialised in the manufacturing of ICT goods. In Finland, for example, ICT accounts for almost 23% of total manufacturing value added. Except for Ireland, where computing and office equipment accounts for over 10% of manufacturing value added, the largest contribution to economic activity typically comes from the manufacture of telecommunications equipment. ICT services, such as telecommunication and computer services, often constitute between 70% and 90% of total ICT sector value added.
- In most OECD countries, ICT services have increased their relative share of the ICT sector, owing to the increasing importance of telecommunication services and software in OECD economies and, more broadly, a general shift towards a services economy.
- Most OECD countries already have a well-developed telecommunication services sector, which makes a sizeable contribution to ICT sector value added. Hungary and the Czech Republic have the highest relative share of telecommunication services. At the same time, there is a noticeable increase in the contribution of computer and related services, mainly software services. The share of computer and related services in business services value added was highest in Ireland (7% in 1999), Sweden (5.7% in 2000), and the United Kingdom (5% in 2001). Software consultancy accounts for between 60% and 80% of computer services.

The OECD definition of the ICT sector

In 1998 the OECD countries reached agreement on an industry-based definition of the ICT sector based on Revision 3 of the International Standard Industrial Classification (ISIC Rev. 3). The principles underlying the definition are the following:

For *manufacturing* industries, the products of a candidate industry:

- Must be intended to fulfil the function of information processing and communication including transmission and display.
- Must use electronic processing to detect, measure and/or record physical phenomena or control a physical process.

For *services* industries, the products of a candidate industry:

- Must be intended to enable the function of information processing and communication by electronic means.

The classes included in the definition are as follows:

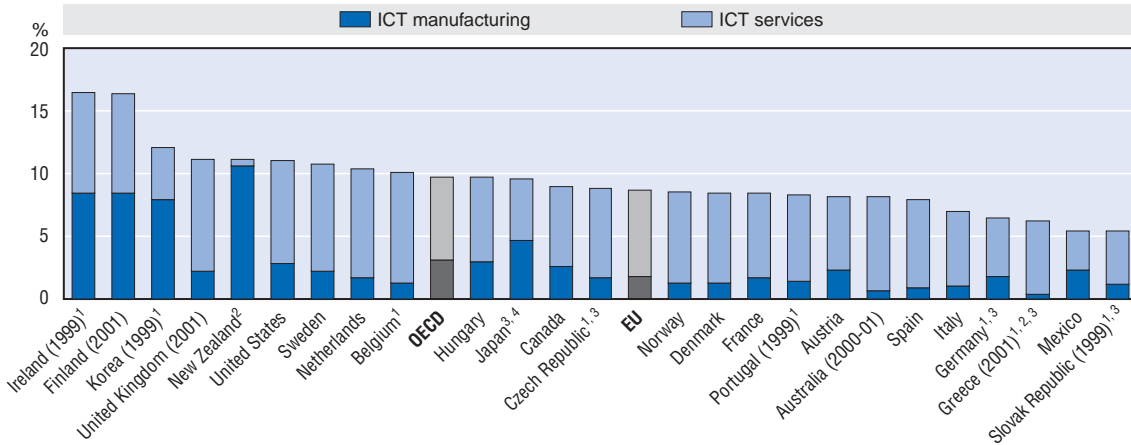
Manufacturing: 3000 – Office, accounting and computing machinery; 3130 – Insulated wire and cable; 3210 – Electronic valves and tubes and other electronic components; 3220 – Television and radio transmitters and apparatus for line telephony and line telegraphy; 3230 – Television and radio receivers, sound or video recording or reproducing apparatus, and associated goods; 3312 – Instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process equipment; 3313 – Industrial process equipment.

Services: 5150 – Wholesaling of machinery, equipment and supplies (if possible only the wholesaling of ICT goods should be included); 7123 – Renting of office machinery and equipment (including computers); 6420 – Telecommunications; 72 – Computer and related activities.

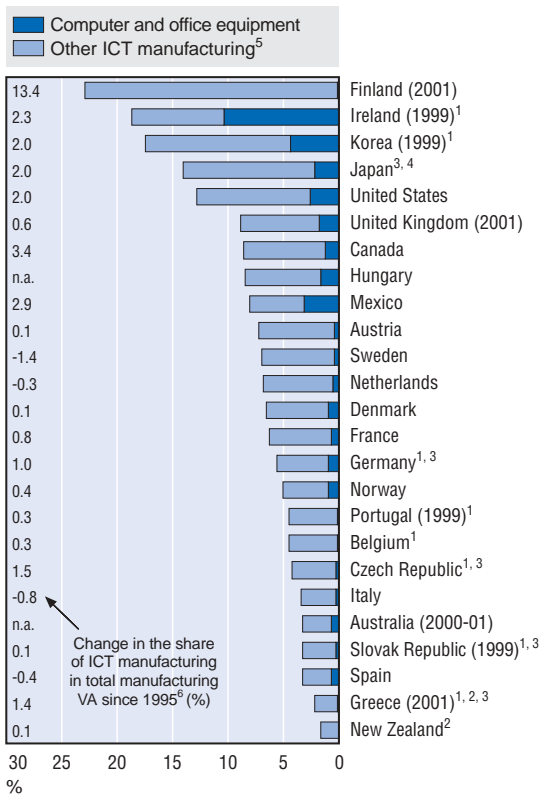
The existence of a widely accepted definition of the ICT sector is the first step towards making comparisons across time and countries possible. However, the definition is not as yet consistently applied and data provided by member countries have been combined with different data sources to estimate ICT aggregates compatible with national accounts totals. For this reason, statistics presented here may differ from figures contained in national reports and in previous OECD publications.

B.6.1. Size and growth of the ICT sector

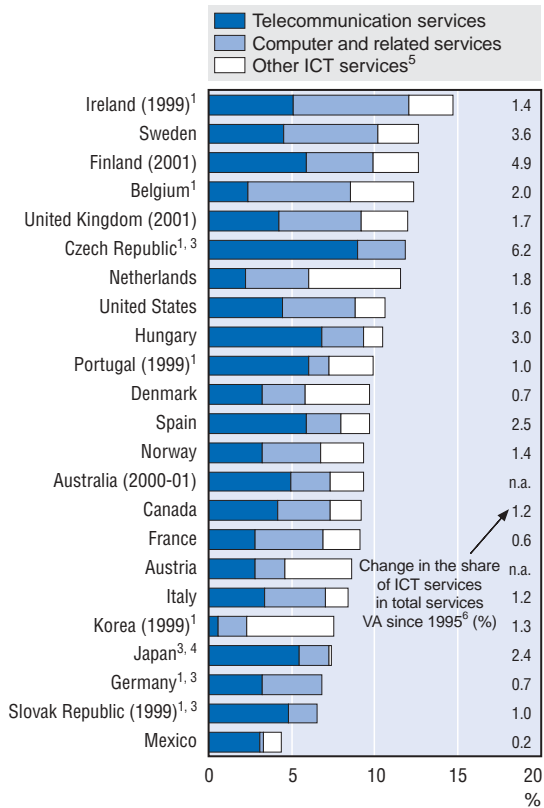
Share of ICT value added in business sector value added, 2000



Share of ICT manufacturing in total manufacturing value added, 2000



Share of ICT services in total business services value added, 2000



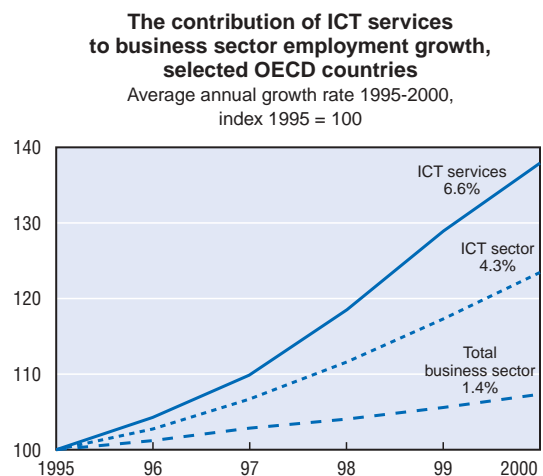
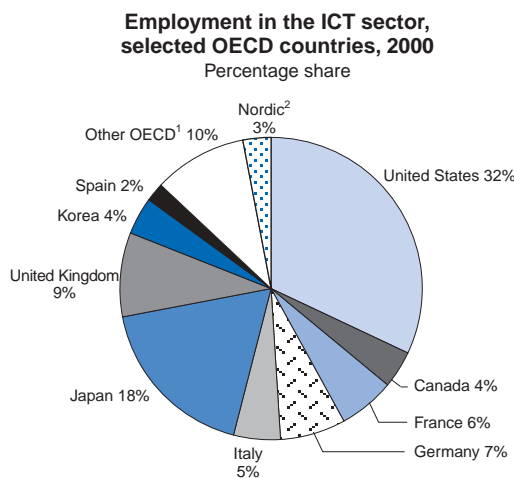
1. Data for rental of ICT goods (7123) are not available.
 2. Postal services included with telecommunications services.
 3. Data for ICT wholesale (5150) are not available.
 4. Includes only part of computer related activities (72).
 5. "Other ICT manufacturing" includes communication equipment, insulated wire and cable and precision instruments. "Other ICT service" includes wholesale and rental of ICT goods.
 6. 1996 instead of 1995 for New Zealand, Norway and Portugal.
 Source: OECD estimates, based on national sources; STAN and National Accounts databases, June 2003.

B.6.2. Contribution of the ICT sector to employment

- In 2000, the 21 OECD countries for which estimates are available employed 16.1 million persons in the ICT sector (see Box B.6.1), about 6.6% of total business employment. The United States and the EU (excluding Greece, Iceland, Ireland and Luxembourg) each represented 34% of the total; Japan employed 18% of the total.
- The ICT sector has been a major source of employment growth. Over the period 1995-2000, OECD-area employment in the sector grew by more than 3 million, *i.e.* an average annual growth rate of over 4.3% a year, more than three times that of overall business sector employment. ICT services were clearly the driver of growth, as ICT manufacturing has generally followed the decline of overall manufacturing employment, albeit to a lesser extent. Exceptions are Finland and Korea, where ICT manufacturing employment grew by over 9% a year, and Canada, the Czech Republic, the Nordic countries, Spain and the United Kingdom where it grew between 2% and 4%.
- Over 1995-2000, ICT services employment grew everywhere except in Austria. Annual

growth rates in the United Kingdom (10.5%), the Netherlands (10.2%), Finland (9.8%), the United States (9.5%) and Spain (7.3%) were above the average of the 21 OECD countries for which data are available (6.6%). Employment in computer-related services, mainly software services, was the most dynamic component, growing by an average of over 11% a year in the OECD area and by over 19% in the United Kingdom.

- In 2000, ICT employment had a larger share in total business sector employment than the OECD average in Finland (10.8%), Sweden (9.2%), Canada (8.3%), the Netherlands (8%), Japan (about 8.2%), Belgium, France and the United Kingdom (about 7.3%), Hungary (7.1%) and Denmark and Norway (6.8%).
- Over 1995-2000, the contribution of ICT manufacturing to total manufacturing employment was stable in most OECD countries. It varied widely across the OECD area, ranging from 13.8% in Korea to 1.3% in Italy. The average share of ICT services employment in market services, instead, has grown over time to reach about 5.9% in the OECD area in 2000.



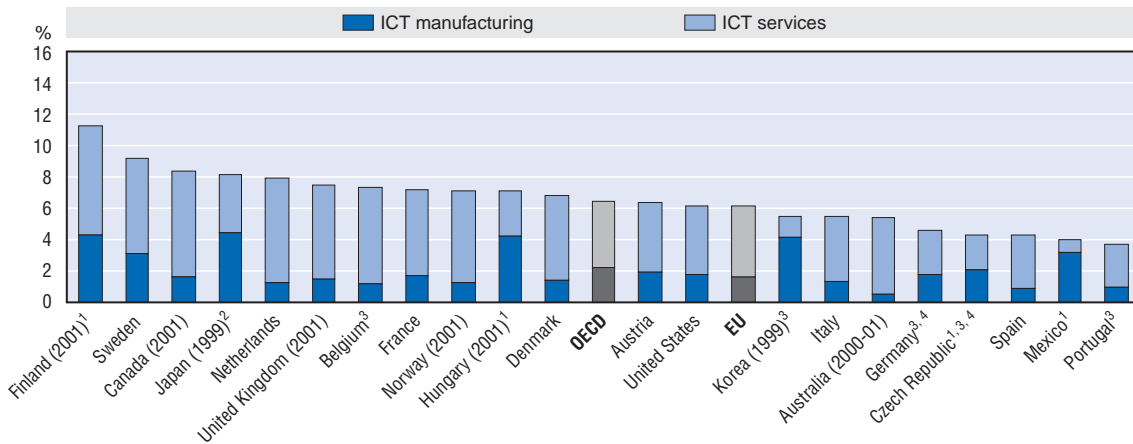
1. "Other OECD": Australia, Austria, Belgium, Czech Republic, Hungary, Mexico, the Netherlands, Spain and Portugal.

2. "Nordic": Denmark, Finland, Norway and Sweden.

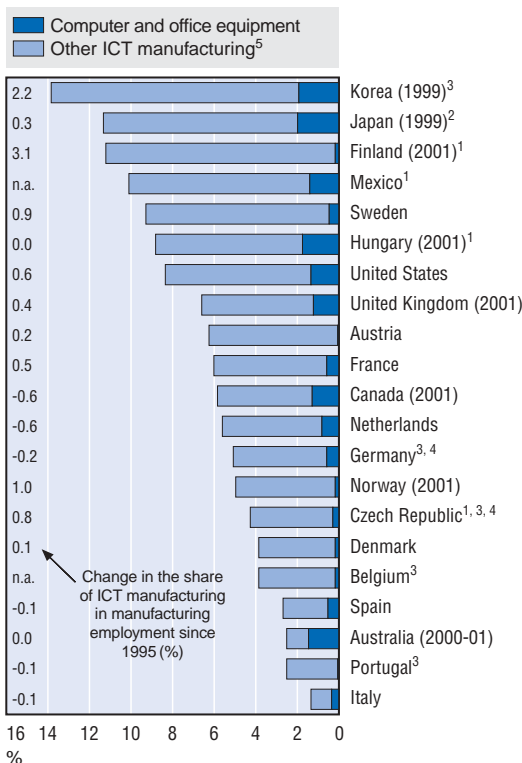
Source: OECD estimates, based on national sources; STAN and National Accounts databases, June 2003.

B.6.2. Contribution of the ICT sector to employment

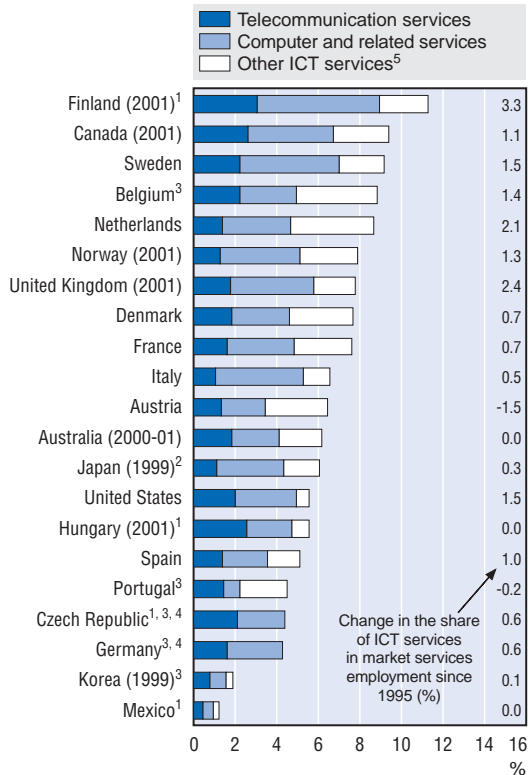
Share of the ICT sector in business sector employment, 2000



Share of ICT manufacturing in total manufacturing employment, 2000



Share of ICT services in market services employment, 2000



1. Based on data for employees only.
 2. ICT services include market research and public opinion polling.
 3. Rental of ICT goods (7123) not available.
 4. ICT wholesale (5150) not available.
 5. "Other ICT manufacturing" includes communication equipment, insulated wire and cable and precision instruments. "Other ICT services" includes wholesale and rental of ICT goods.

Source: OECD estimates, based on national sources; STAN and National Accounts databases, June 2003.

B.7. Contribution of the ICT sector to international trade

- In OECD countries, the 1990s marked a shift in the composition of international trade in manufactured goods towards ICT products. Converting trade in ICT products into trade in the ICT manufacturing sector (see box) shows the growing importance of the ICT sector in total manufacturing trade. In 1990, trade in ICT goods, defined as the average of imports and exports, accounted for over 13% of OECD-wide trade in goods. By 2000, the share had reached almost 20%. ICT imports and exports contributed to total imports and exports by roughly the same amount (18% of imports and 17% of exports).
- However, the data for 2001 mark a reversal in trend. Compared to 2000, the share of ICT manufacturing in total manufacturing trade dropped on average by 2 percentage points, with Korea and Sweden experiencing decreases of over 4 and 5 percentage points respectively. In Ireland, the share of ICT trade increased by 3.5 percentage points.
- The ICT manufacturing sector plays a particularly important role in Ireland (41% of manufacturing trade) and Korea (30%). In Hungary, the Netherlands, Mexico and Japan, it represented about a quarter of total manufacturing trade in 2001.
- The overall trade balance shows countries' relative comparative advantage in ICT manufacturing. Only six countries showed a positive ICT trade balance in 2001. The surplus was highest in Ireland, Korea and Japan. The main source of comparative advantage in Finland and Sweden is trade in telecommunications equipment; in Ireland, it is trade in computers.

Measuring ICT sector trade

In the absence of tables of international trade in goods and services by detailed industrial activity which are compatible with the national accounts, ICT sector exports and imports at current prices have been estimated using the OECD's International Trade in Commodity Statistics (ITCS) database. The OECD definition of the ICT manufacturing sector, based on ISIC Rev. 3 has been used as the basis for the ICT trade indicators. Current price exports and imports for this sector have been derived from the product-based data in the ITCS database by applying a standard Harmonised System Rev. 1 (HS1) to the ISIC Rev. 3 conversion key. Thus, the trade indicators constructed here reflect trade in goods for which the ICT manufacturing sector can be considered the origin (exports) or the destination (imports) according to the UN standard conversion table. This type of aggregation, as well as the use of a single conversion key for all OECD countries, means that the figures reported here are not strictly comparable with those published in national accounts.

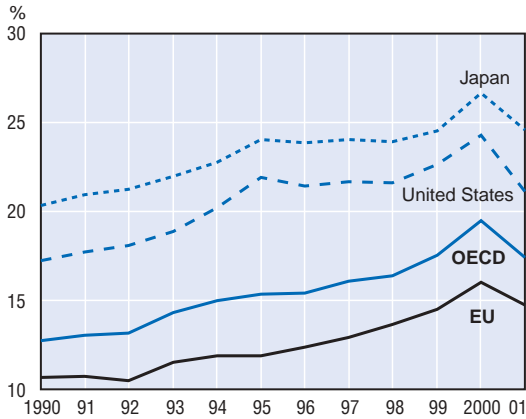
Data on selected ICT services (telecommunications and computer and related services) are instead estimated within a Balance of Payments (BPM5) framework and, as a general rule, cannot be compared to data on trade in ICT goods based on customs returns and related surveys. It was therefore not possible to calculate indicators of overall trade in ICT goods and services.

Finally, individual countries' data for both imports and exports include imported goods that are subsequently re-exported. Imports and subsequent re-exports may be in the same or in different reference periods. In the latter case, both the indicators of countries' relative trade performance and the indicators of their trade balances may be affected.

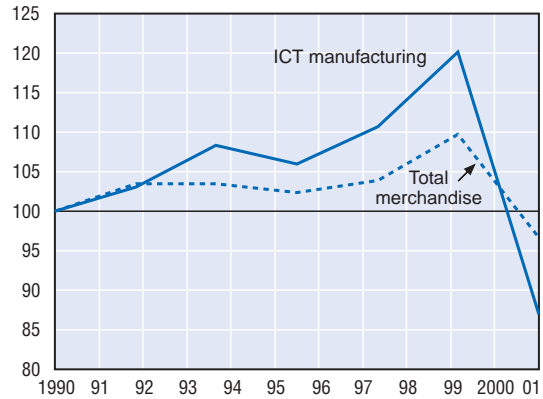
The ICT sector trade balance is calculated as ICT exports minus ICT imports divided by total manufacturing trade (the average of exports and imports).

B.7. Contribution of the ICT sector to international trade

ICT trade by area, 1990-2001^{1, 2}
Share of total manufacturing trade



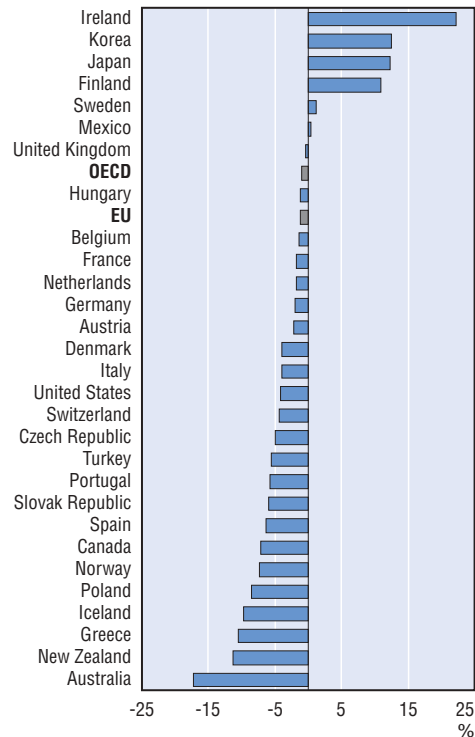
OECD and ICT-related trade, 1995 = 2001²
Index : 1995 = 100



ICT manufacturing trade,¹ 2001
Share of total goods trade



ICT sector trade balance, 2001



1. Average of imports and exports.

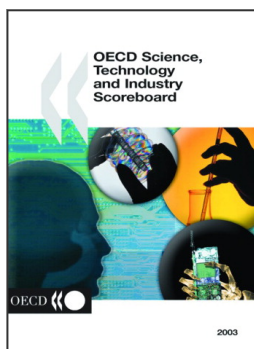
2. From 1990 to 1994, the EU includes all EU member states except Austria, Belgium and Luxembourg (EU-12). From 1990 to 1994, the OECD includes member countries with complete data from 1990 to 2001: EU-12, Australia, Canada, Iceland, Japan, Mexico, New Zealand, Norway, Switzerland, Turkey and the United States (OECD-22). In 1995 and 1996, the OECD includes all member countries except the Slovak Republic and Luxembourg (OECD-28).

Source: OECD, International Trade in Commodity Statistics (ITCS) and Structural Analysis (STAN) databases, May 2003.

TABLE OF CONTENTS

Highlights	7
A.1. Investment in knowledge	16
A.2. Trends in domestic R&D expenditure	18
A.3. R&D financing and performance	20
A.4.1. Business R&D	22
A.4.2. Business R&D by industry	24
A.4.3. R&D in selected ICT industries and ict patents.....	26
A.4.4. Business R&D by size classes of firms	28
A.5. R&D performed by the higher education and government sectors.....	30
A.6.1. Biotechnology R&D, venture capital and patents	32
A.6.2. Health-related R&D	34
A.6.3. Basic research.....	36
A.6.4. Defence R&D in government budgets	38
A.6.5. Space R&D and innovation.....	40
A.6.6. Tax treatment of R&D	42
A.6.7. Nanotechnology.....	44
A.7. Venture capital	46
A.8.1. Human resources	48
A.8.2. Flows of university graduates.....	50
A.8.3. Employment of tertiary-level graduates.....	52
A.9.1. Human resources in science and technology.....	54
A.9.2. Researchers	56
A.10.1. International mobility of human capital	58
A.10.2. International mobility of PhD students	60
A.11.1. Patent applications to the European Patent Office.....	62
A.11.2. Patent families	64
A.12.1. R&D in non-OECD economies	66
A.12.2. Patenting in non-OECD economies.....	68
A.12.3. Human resources in non-OECD economies.....	70
A.13. Scientific publications.....	72
B.1. Investment in ICT equipment and software.....	74
B.2. Occupations and skills in the information economy	76
B.3.1. Telecommunication networks	78
B.3.2. Internet infrastructure	80
B.4.1. Internet subscribers and number of secure servers	82
B.4.2. ICT access by households.....	84
B.4.3. Use of the Internet by individuals.....	86
B.4.4. Internet access and use by enterprise size and industry.....	88
B.4.5. Internet and electronic commerce by size of enterprise	90
B.4.6. Internet and electronic commerce by activity of enterprise.....	92

B.5. The price of Internet access and use	94
B.6.1. Size and growth of the ICT sector.....	96
B.6.2. Contribution of the ICT sector to employment	98
B.7. Contribution of the ICT sector to international trade.....	100
C.1. Trends in international trade and investment flows	102
C.2.1. International trade	104
C.2.2. Exposure to international trade competition	106
C.2.3. Intra-firm trade in total trade.....	108
C.2.4. Import content of exports	110
C.3.1. Foreign direct investment flows.....	112
C.3.2. Cross-border mergers and acquisitions	114
C.4.1. Activity of affiliates under foreign control in manufacturing.....	116
C.4.2. Activity of affiliates under foreign control in services	118
C.4.3. The contribution of multinationals to value added and labour productivity	120
C.5.1. Internationalisation of manufacturing R&D.....	122
C.5.2. Cross-border ownership of inventions	124
C.5.3. International co-operation in science and technology.....	126
C.5.4. Technology balance of payments	128
D.1. Differences in income and productivity.....	130
D.2. Income and productivity levels in the OECD area, 1950-2002	132
D.3. Labour productivity growth	134
D.4. Growth accounting for OECD countries.....	136
D.5. Labour productivity growth by industry.....	138
D.6. Technology- and knowledge-intensive industries.....	140
D.7. The structure of OECD economies.....	142
D.8. Services sector value-added embodied in manufactured goods.....	145
D.9.1. International trade by technological intensity	147
D.9.2. Trade in high- and medium-high-technology industries	148
D.9.3. Revealed comparative advantage by technological intensity	150
D.10. Entry, exit and survival of firms	152
<i>Annex I.</i> Classification of Manufacturing Industries Based on Technology.....	155
<i>Annex II.</i> Main OECD Databases Used	159
Statistical Annex	163



From:
**OECD Science, Technology and Industry
Scoreboard 2003**

Access the complete publication at:
https://doi.org/10.1787/sti_scoreboard-2003-en

Please cite this chapter as:

OECD (2003), "Information Economy", in *OECD Science, Technology and Industry Scoreboard 2003*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/sti_scoreboard-2003-4-en

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to rights@oecd.org. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at info@copyright.com or the Centre français d'exploitation du droit de copie (CFC) at contact@cfcopies.com.