JRC Scientific and Technical Reports

Policy Brief: R&D Business Investment in the EU ICT Sector

Sven Lindmark, Geomina Turlea, Martin Ulbrich

EUR 23250 EN - 2008

JRC EUROPEAN COMMISSION

ipts Institute for Prospective Technological Studies

European Commission Information Society and Media

The mission of the IPTS is to provide customer-driven support to the EU policy-making process by researching science-based responses to policy challenges that have both a socio-economic and a scientific or technological dimension.

European Commission
Joint Research Centre
Institute for Prospective Technological Studies

Contact information
Address: Edificio Expo. c/ Inca Garcilaso, s/n. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

http://ipts.jrc.ec.europa.eu
http://www.jrc.ec.europa.eu

JRC 42084

EUR 23250 EN

ISSN 1018-5593

Luxembourg: Office for Official Publications of the European Communities

Printed in Spain

Introduction

Since 2005 the Institute for Prospective Technological Studies has been running a research project on Research and Development in the Information and Communication Technologies sector in Europe. This project, called "REDICT", was launched at the request of the Directorate General Information Society of the European Commission. It collects and analyses data on R&D spending in the ICT industry. So far, the focus of the study has been on macro-economic data regarding Businesses Expenditure on Research and Development (BERD), which accounts for over 80 % of the total R&D in the ICT sector. The present policy brief succinctly presents key findings of this study, first on an aggregate EU level in comparison with the US, then by EU member state, and finally by ICT sub-sector. These findings are extracted from the full report "Mapping European Investment in ICT R&D", forthcoming from IPTS.

Executive summary

R&D business investment in the EU ICT sector

The EU spends only about half as much on R&D in ICT as the US. This holds true both in absolute amounts and relative to the size of the economy. Indeed, the ICT sector alone is responsible for as much of the overall R&D investment gap as all other sectors combined. From the current data analysis, there are no signs of the ICT R&D investment gap closing.

At ICT sector level, the R&D investment gap exists partly because the ICT sector is smaller in the EU than in the US and partly because of the lower R&D intensity of the sector in the EU. The lower R&D intensity is, in turn, primarily due to two sub-sectors: computer services and software on the one hand, and electronic measurement instruments on the other hand. On the positive side, and contrary to the rest of the ICT sector, these two sub-sectors also show strong R&D growth in the EU.

Company data indicates that EU companies have R&D intensities similar to their US counterparts in every sub-sector, but are concentrated in less R&D intensive sub-sectors (e.g. telecom services). The US companies are also larger and more numerous in most sub-sectors. These data suggest that the ICT R&D gap between the US and the EU reflects, more than anything, a lack of European firms in the ICT sector.

Among the member states, Finland and Sweden make the highest R&D effort in this sector, relative to their size. In general, Northern member states invest more than Southern member states, and the Western member states invest much more than the Eastern ones, which display very low levels of ICT R&D.

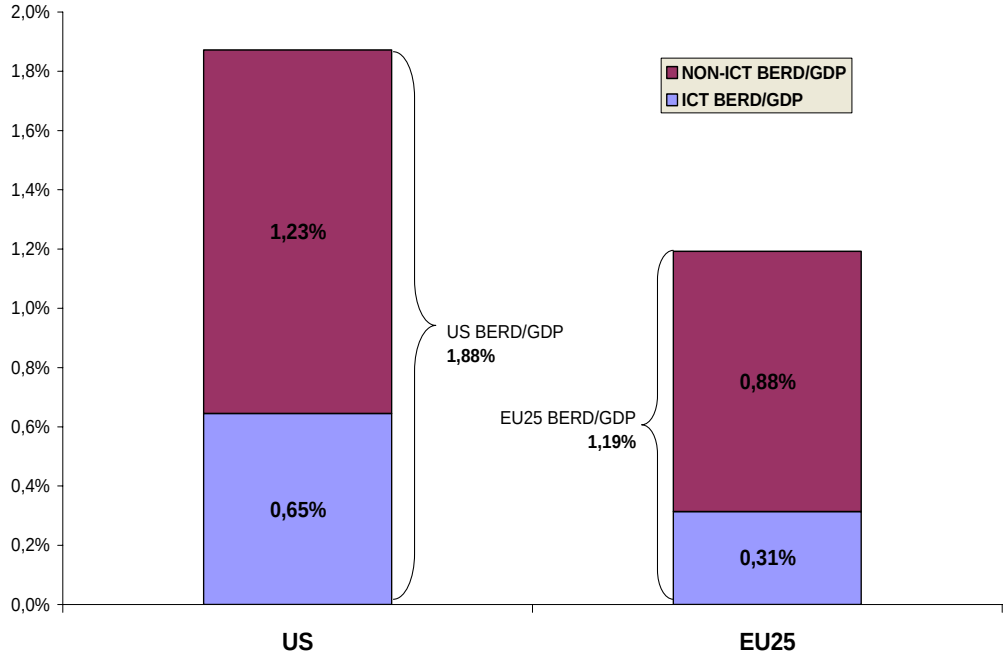
TABLE OF CONTENTS

A1 The EU spends less on ICT business R&D than the US

In 2004, the ICT business sector in the EU25 spent € 32,8 billion on R&D. This was far below the US at € 61 billion (in PPP exchange rates).

Chart 1: Contribution of ICT and non-ICT sectors of total BERD intensity

% of GDP, 2004



Source: IPTS-REDICT based on data from Eurostat, OECD, EU KLEMS

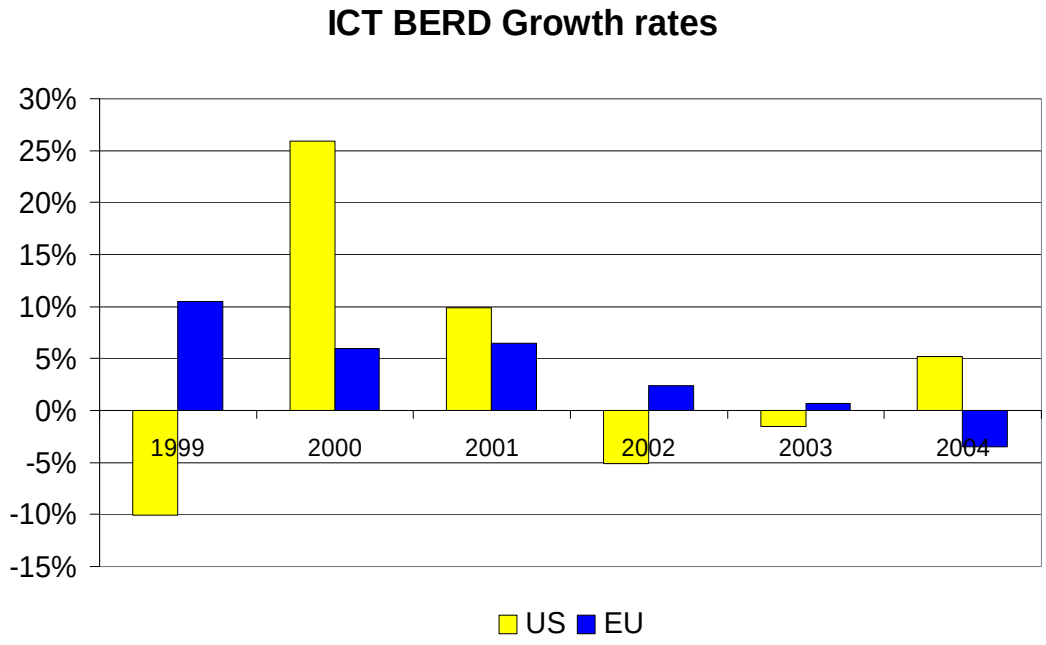
The ICT sector accounts for about half of the R&D gap between EU and US industry

Half of this gap in % of GDP is accounted for by the ICT sector, whilst the other half corresponds to all other sectors combined. One should also note that the comparison is particularly unfavourable for the ICT sector: whereas the EU ICT sector R&D amounts to less than half of its US counterpart, the ratio for the other sectors is closer to three quarters. Thus, of all economic sectors, the ICT sector is by far the biggest contributor to the R&D gap between the EU and the US.

A2 The EU does not catch up

Data on growth of ICT business sector investments in R&D shows that there is no discernible catching up of the EU relative to the US. Although since 1999 R&D expenditure grew in real terms in all years except 2004, US expenditure grew even faster during that period, mostly because of a very strong rise in 2000. Moreover, growth in the EU shows a downward trend, even if partial evidence points towards a return to growth in 2005.

Chart 2: EU and US ICT BERD growth trends



ICT R&D spending growth in the EU is much less volatile than in the US

Source: IPTS-REDICT based on data from Eurostat, OECD, EU KLEMS

It is also clear from the data that ICT R&D spending in the US is much more volatile than in the EU and reacts faster. While US R&D expenditure rose rapidly during the first Internet boom and then dropped steeply after the Internet crash, only to recover fairly rapidly, EU R&D spending grew much slower during the Internet boom, dropped much less, and took much longer to (probably) rise again. Since the Internet boom was centred in the US, perhaps the faster rise and corresponding steeper drop was only to be expected. However, the fact that US R&D growth reached its bottom already in 2002, while it took two more years for the EU to reach its (hopefully) lowest point, remains significant.

A3 The EU ICT sector is smaller and less R&D intensive

The contribution of the ICT sector to total business R&D intensity can be decomposed into two factors: (1) a size factor and (2) an intensity factor: a large sector will carry out more R&D than a comparable small sector, and an R&D-intensive sector will carry out more R&D than a non R&D intensive sector of the same size. To measure this, we have defined the size factor as the share of the ICT sector in the economy by value added, and the intensity factor as the R&D performed in the ICT sector divided by the value added in that sector.

Table 1: The ICT R&D deficit decomposed in a size and an intensity factor

	ICT BERD in the economy ($R\&D^{ICT}$/GDP)	Size (VA^{ICT}/GDP)	Intensity ($R\&D^{ICT}/VA^{ICT}$)
US	0,65 %	6,2%	10,4%
EU25	0,31 %	5,0%	6,2%

Source: IPTS-REDICT estimates based on data from Eurostat, OECD, EU KLEMS - IPTS

Lower ICT R&D intensity in the EU accounts for 2/3 of the gap with the US; the other 1/3 is due to a relatively lower size of the sector

By applying this analysis to both the EU and US, we can identify why the expenditure on ICT R&D amounted to 0,65% of US GDP, but only 0,31% of EU GDP. As we can see in Table 1, the ICT sector's size (this is what you call it in the table) in the economy is about 20% larger in the US than in the EU. Therefore, one reason why there is relatively less ICT R&D in the EU is simply that the EU ICT sector is smaller.

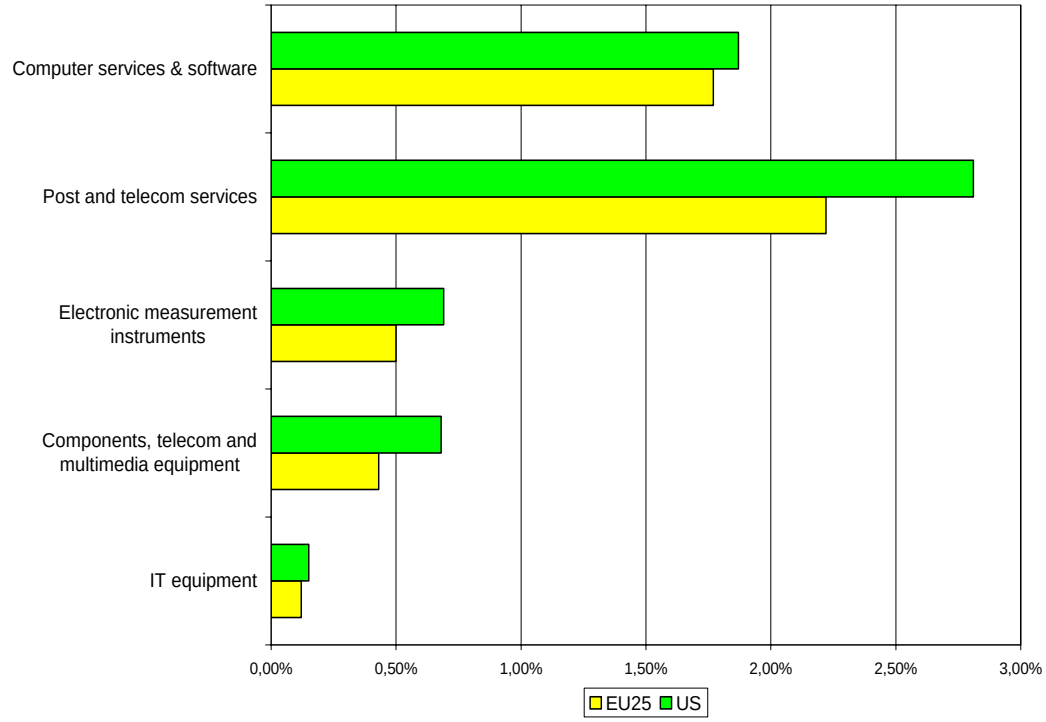
However, table 1 also shows us that the R&D intensity of the ICT sector is much higher in the US, by about 70%. Thus, another reason for the gap between the EU and the US is that the US ICT industry is much more R&D intensive. Indeed, since the difference is much bigger for the ICT R&D intensity than for the weight of the ICT sector in the economy, it accounts for the majority of the gap. By decomposing the gap into the two factors, we see that the intensity factor accounts for 64% of the gap, and the size factor for 36%.

A4 The size of the ICT sub-sectors is similar

The ICT sector as understood here is composed of five sub-sectors[1]. Three of them are manufacturing ICT products: IT equipment; components, telecom and multimedia equipment; and electronic measurement instruments. The other two are providing ICT services: post and telecom services; and computer services and software.

Chart 3: Sub-sectoral composition of the ICT sectors in the US and EU25

% of sub-sectors VA in total ICT value added, 2004



Both in the EU and in the US, ICT services account for a much larger share of the economy than ICT manufacturing

Source: IPTS-REDICT based on data from Eurostat, OECD, EU KLEMS

Looking at the weight of each of the ICT sub-sectors in the economy, we find that the structure of the ICT sector is fairly similar between the EU and the US. ICT services are dominating the sector in both economies, and IT equipment is by far the smallest sub-sector. Every single US subsector has a larger share of US GDP than its counterpart in the EU, although the differences are a bit smaller for computer services and for IT equipment. A further breakdown of the Components, Telecom and Multimedia Equipment sub-sector would show (not illustrated in the chart) that the US has a much larger share of Components, while the EU has a larger share and Multimedia Equipment. Nevertheless, the structure is essentially the same on both sides of the Atlantic.

[1]This corresponds to the operational definition of the ICT sector in the Frascati Manual (see last page)

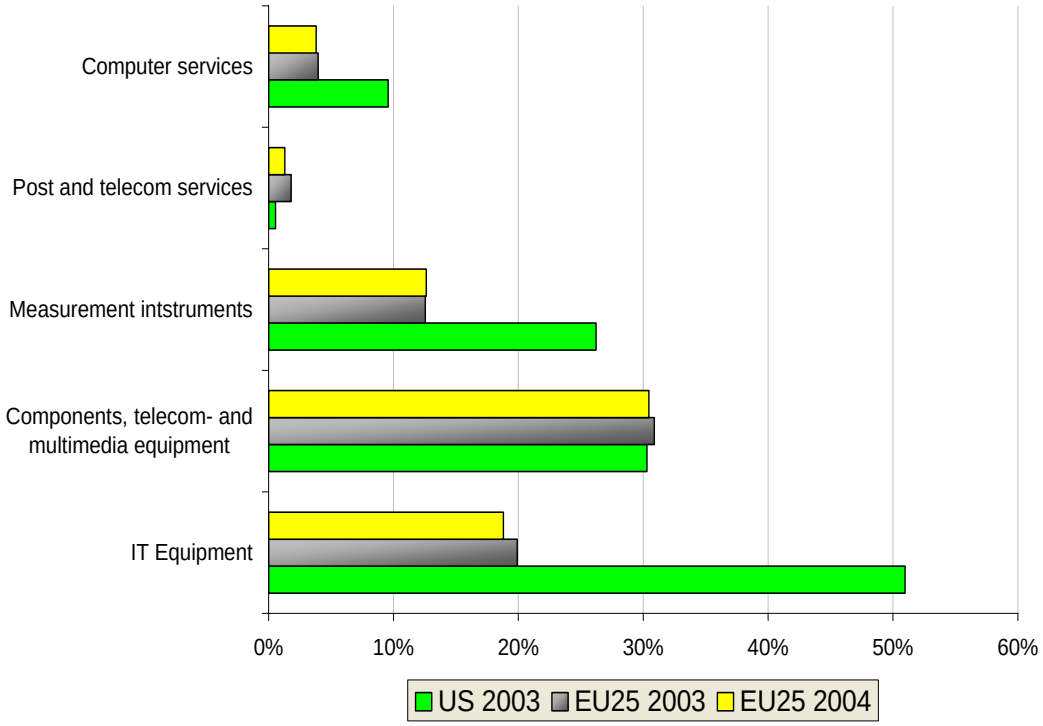
A5 The intensity of the ICT sub-sectors is different

While the five sub-sectors have very similar relative sizes in the EU and the US, they show very different R&D intensities. For components, telecom and multimedia equipment, the R&D intensity is virtually the same for both regions. For telecom services, the R&D intensity is significantly higher in the EU, albeit at a low level. However, for the other three sub-sectors, i.e. computer services & software, electronic measurement instruments, and IT equipment, the R&D intensity is at least twice as high in the US.

Therefore, these three subsectors are the ones mainly responsible for the higher R&D intensity of the ICT sector in the US. However, their contributions are not equally important. Looking at IT equipment one has to keep in mind that it is an extremely small sector; as a consequence, despite its high R&D intensity it plays a much smaller role in the R&D intensity gap than computer services and software and electronic measurement instruments.

Chart 4: ICT sub-sector R&D intensities

Sub-sectors BERD / sub-sectors VA, %, 2004 or the latest year available



Source: IPTS-REDICT based on data from Eurostat, OECD, EU KLEMS

Computer services and electronic measurement instruments account for the bulk of the difference between EU and US in ICT R&D intensity

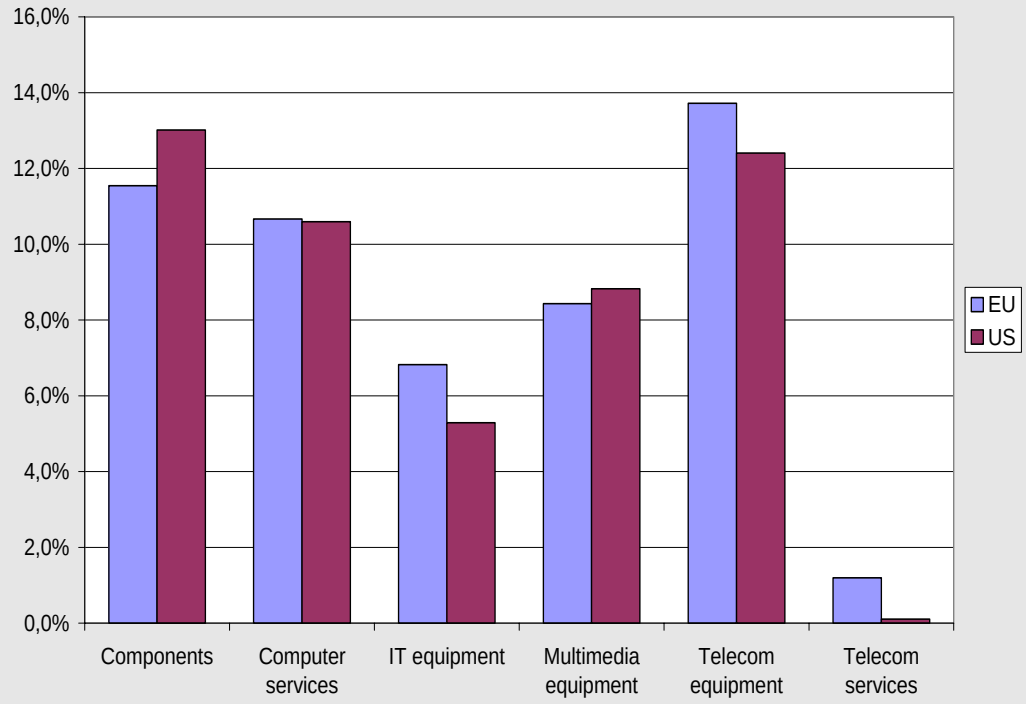
In short, the ICT sector is responsible for about half the R&D gap between the EU and the US. One third of this half is due to the fact that the ICT sector, in all its subsectors, is smaller in the EU. The other two thirds are due to lower R&D intensity, which in turn is mostly concentrated in computer services and software, and in electronic measurement instruments.

Company R&D intensities

The previous analysis has been based on national accounts data, which track R&D spending in a given country by domestic and foreign companies. However, looking at worldwide R&D spending by the largest R&D investing companies[2], the R&D intensities (measured as R&D / net sales) of the sub-sectors are similar for EU and US companies. The contrast with the comparative R&D intensities of the sub-sectors according to macro-economic data is stark.

Chart: ICT sub-sector company R&D intensities

R&D / net sales 2004



Note: Data has allowed for disaggregating components, telecom- and multimedia equipment but a lack of comparable data have prevented us from providing R&D intensities for Measurement instruments. Note also that data available for 2005 show a similar pattern.

Source IPTS-REDICT based on the 2006 EU Industrial R&D Investment Scoreboard

However, even company data confirm that the R&D intensity of the overall ICT sector is lower in the EU than in the US, although it is similar for every sub-sector. The reason for this is that EU companies are concentrated in sub-sectors with lower R&D intensity, such as telecom services, while US companies are concentrated in sub-sectors with higher R&D intensity, such as software.

In each sub-sector, EU companies have an R&D intensity similar to their US counterparts

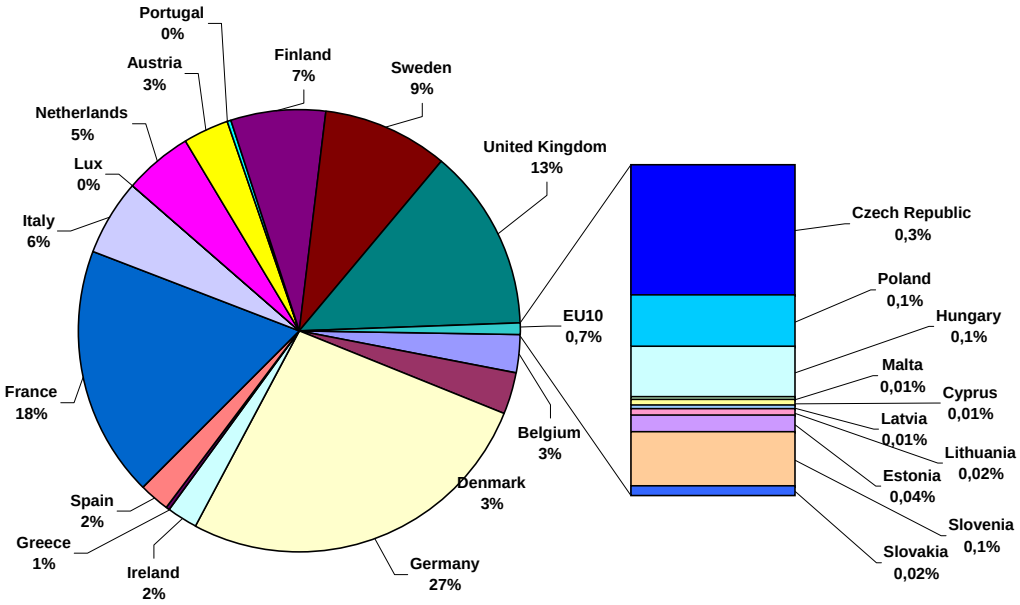
[2] Source: IPTS-REDICT based on the 2006 EU Industrial R&D Investment Scoreboard, EUR 22348, Joint Research Centre, Institute for Prospective Technological Studies, available at http://iri.jrc.es/research/docs/2006/scoreboard_06_final.pdf

B1 Most of ICT R&D takes place in the largest economies

The distribution of R&D in ICT reflects both the size of the national economies and the specialisation of these economies. The largest shares are to be found, unsurprisingly, in the largest economies, Germany, France and the UK. However, in fourth and fifth position we find the fairly small but heavily ICT-oriented economies of Sweden and Finland.

Chart 5: Distribution of ICT BERD in EU25 countries

% of total EU25 ICT BERD, 2004



Source: IPTS-REDICT based on data from Eurostat, OECD and national statistics

Finland and Sweden have much higher shares than their size would suggest

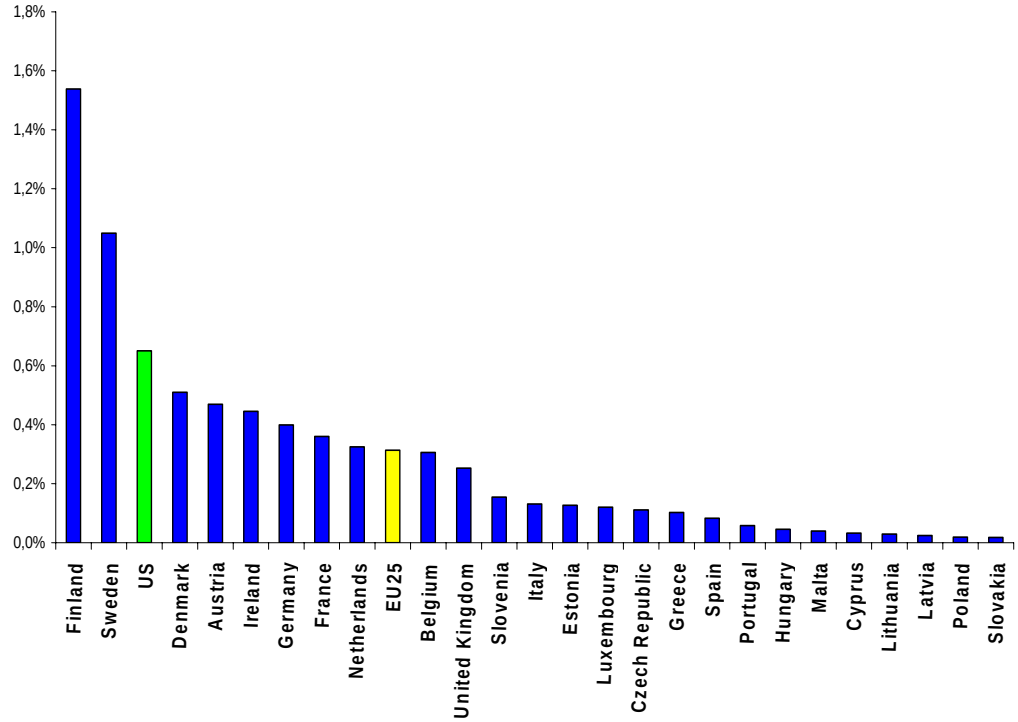
It is noticeable that the Southern member states have fairly small shares, with Italy and Spain much below what one would expect for economies of their size, and Portugal and Greece with the smallest shares of the Western member states except Luxemburg. Even more noticeable, is that the all of the Eastern member states combined provide less than 1% of total EU R&D in ICT. Among them, the Czech Republic and Slovenia have high shares relative to their sizes, while Poland is significantly underrepresented. One should keep in mind, however, that these figures are for 2004, i.e. just before and just after the accession, and can therefore not reflect any development induced by the enlargement.

B2 The ICT R&D effort differs enormously within the EU

Comparing member states by the same ratios which have been used in chapter A1 to compare the EU with the US (ICT R&D as a share of GDP) eliminates the dominating impact of the size of the large economies observed in chart 5. Chart 6 shows that R&D in ICT represents a much more important part of Finland's and Sweden's economies, by some distance, than of the other member states. These two Nordic countries display even higher significantly higher figures than the US.

Chart 6: Contribution of ICT sector to total R&D intensity – EU25 and US

ICT BERD/GDP, 2004 or the latest year available



The emerging overall picture is one of a decreasing R&D effort as one moves from North to South and from West to East.

Source: IPTS-REDICT based on data from Eurostat, OECD, EU KLEMS national statistics

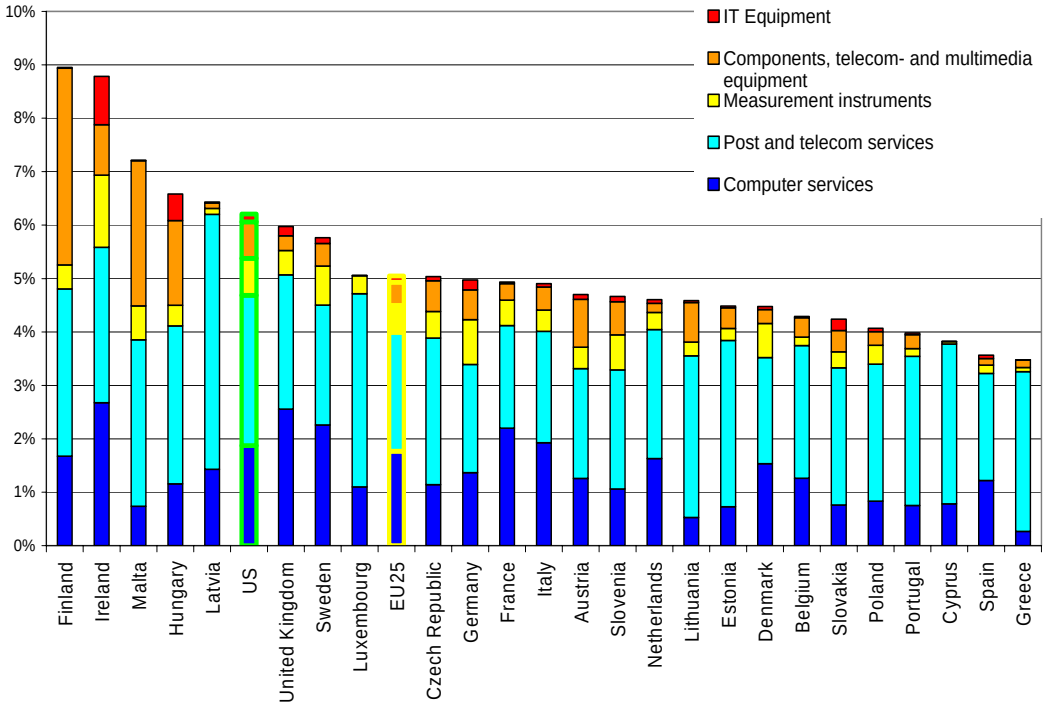
Most of the North-western member states exhibit a ratio around or slightly above the EU average, including the largest economies of Germany, France and the UK, while Italy, Greece Spain and Portugal are considerably below. The Eastern member states are in generally to be found at the lower end of the chart, indicating that their very low share in total R&D can not be explained to any significant degree by the smaller size of their economies, although Slovenia, Estonia and the Czech Republic actually have higher ratios than Greece, Spain and Portugal. However, even the highest ratio among the Eastern member states, Slovenia, corresponds to no more than half the EU average.

B3 The size of the ICT sector varies, but within limits

Similarly to the analysis of the EU ICT sector vs. the US ICT sector, the size of the ICT sector in each member state as well as at its R&D intensity influence why the ICT R&D effort is so different from one country to another. Is it because some member states have a larger ICT sector than others? Or is it because some member states have a higher R&D intensity in their ICT sector?

Chart 7: Weight of the ICT sector in the economy – EU25 and US

ICT VA / GDP, 2004



Source: IPTS-REDICT based on data from EU KLEMS and Eurostat

Within the ICT sector, ICT manufacturing displays a much higher variation that ICT services

Chart 7 confirms that the ICT sector is indeed more important in some economies than in others. Most of the differences between member states are due to differences in ICT manufacturing, rather then ICT services, although ICT services also tend to be larger where ICT manufacturing is significant. In short, it is really the components, telecom and multimedia equipment sub-sector that explain most of the differences between the highest and the lowest share of the ICT R&D in GDP.

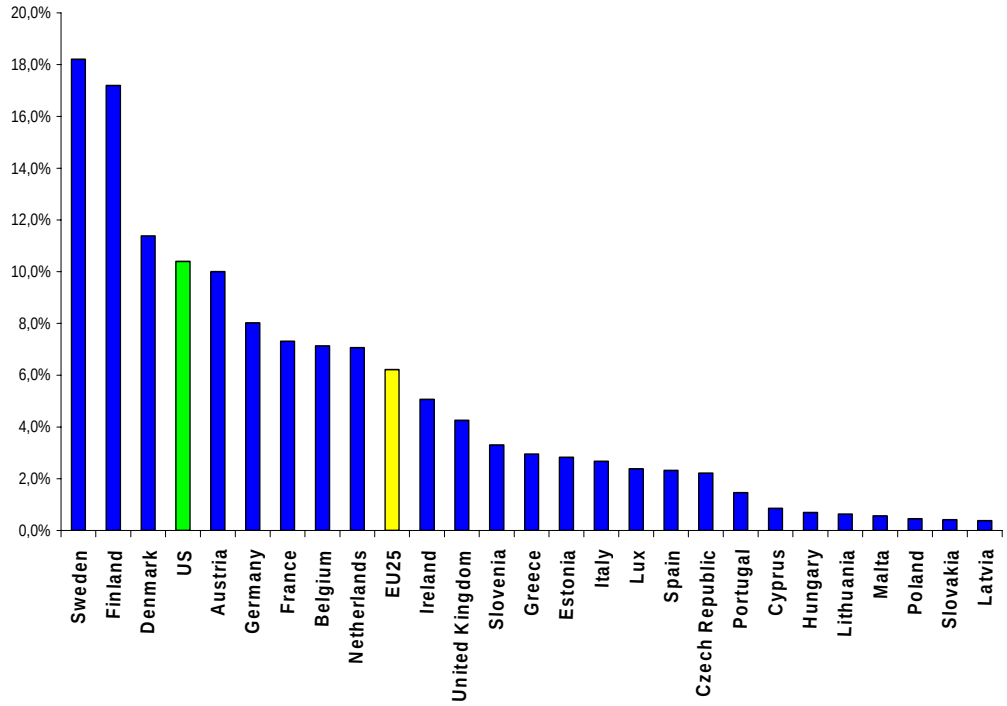
One should also note that the ranking of member states is quite different from the previous chart. Moreover, the variation between countries is much smaller than before: the largest share of the ICT sector in the economy is less than three times the smallest share, while the previous chart exhibited a factor of one to fifteen and more. Thus, the differences in size of the ICT sector can explain the variation in the contribution of the ICT sector to total R&D intensity only to small extent.

B4 The R&D of the ICT sector varies very significantly

Compared to the limited variations in the ICT sector size across member states' economies, the variations of the ICT sector R&D are much bigger. Chart 8 shows that the ICT R&D intensity varies from 18% to basically zero. Indeed, the intensities are so small in some countries that the relation between the largest and the smallest figure would go in the hundreds (it stood at less than three for the variations in size sector).

Chart 8: ICT Business R&D Intensities in EU25 member states and the US

BERD/VA, 2004 or the latest year available



Source: IPTS-REDICT based on data from Eurostat, OECD, EU KLEMS and national statistics

The R&D intensity of the ICT sector, rather than the size of the ICT sector, determines the R&D effort of a member state

Moreover, the ranking is extremely similar to the ranking of the ICT R&D investments as share of GDP in chart 6. Again, Finland and Sweden have a clear lead, with levels well above the US, followed by mostly north-western member states. Southern member states have much lower R&D intensities, and Eastern member states ever lower ones, although Slovenia, Estonia, and to a lesser degree the Czech Republic have reached the level of Greece, Italy, Spain and Portugal.

Hence, in addition to confirming the general tendency of decreasing R&D from North to South and from East to West, our analysis has shown that it is really the differences in R&D intensity of the ICT sector which explain why some economies invest much more in ICT R&D than others, and not the differences in the size of the ICT sector.

C1 ICT sub-sector overview

ICT service sectors growing

A sector comparison of the sub-sectors (Table 2) shows that more than two thirds of the turnover and value added of the ICT sector is created in the services sectors. This share has been increasing for many years, since most of the market growth in ICT sector is stemming from these services. On the other hand, the negative trade balance in the ICT sector is largely due a huge trade deficit in the IT equipment sub-sector, which is in turn largely attributable to imports of computers from East Asia.

Table 2: Key figures for the ICT sub-sectors (€ billion 2004)

Sub-sector	Turn-over	VA	Trade balance 2005	BERD	BERD / VA	BERD CAGR 00-04)
IT Equipment	59,2	12,1	-40,8	2,3	18,8%	-1,5%
IT Components	60	17,4	-7,5	4,4	25,2%	
Telecom equipment	92,3	19,9	-5,3	8,5	42,5%	-1,2%
Multimedia equipment	48,8	8,1	-2,5	0,9	11,6%	
El. Measurement Instr.	64,3	25,7	6,3*	5,4	21,4%	5,5 %*
Telecom services	394	176	-0,7	3,0	1,7%	-1,0%
Computer serv. & SW	312	185	6,3	7,1	3,8%	12,9%
Total ICT	**1031****	**444****	**-44,3***	**31,6****	**7,1%****	**2,4%****

Notes: *Includes whole ISIC 33 **Only includes 33.2/3 and 64.2. BERD is therefore slightly lower than the € 32,8 billion stated before, and BERD/VA slightly higher.

Source: REDICT-IPTS based on EUROSTAT, OECD ANBERD, national statistics, EU-KLEMS and company annual reports.

R&D growth mainly in Computer services and software

R&D intensities are highest in telecom equipment, where the EU is relatively strong, followed by IT components, electronic measurement instruments and IT equipment, which have comparable R&D intensities, and lower still in multimedia equipment. However, most of the growth of business R&D is taking place in computer services and software and, albeit more slowly, in the electronic measurement instruments sub-sector.

.

C2 IT components

IT components have the second highest R&D intensity among the ICT sub-sectors at 25%. Most of the R&D in this sub-sector is related to active components, semiconductors in particular. Most BERD in the EU is performed in Germany, France, the UK, Italy and Austria (and the Netherlands – although no reliable figures are available on sub-sector level for that country). In addition, Denmark, Belgium, Sweden and Portugal are R&D intensive member states.

R&D concentrated in a few countries, close to the large firms

The R&D efforts are dominated, in expenditure terms, by the large firms, i.e. Infineon, Qimonda, NXP and STM, but there are large number second-tier companies in Europe investing heavily in R&D, mostly fabless or IP companies. The R&D efforts of such smaller companies are geographically clustered to a few countries (Germany, UK, France, Italy and the Netherlands), often in proximity to research establishments of the above-mentioned big four.

From an international perspective, European industry has been able to compete quite successfully in some economically significant specialties, including photovoltaics. Still, the world market is dominated by US and Asian companies, whose aggregate R&D efforts also widely exceed those of European ones. In 2005, US R&D Scoreboard companies invested € 19 billion in R&D, Asian companies about € 17 billion, with EU ones trailing at € 4 billion. Even so, some cutting-edge research on semiconductors is taking place inside Europe, in particular in promising fields such as nanotechnology. However, back-end operations (mainly foundries) are moving towards cheaper locations.

C3 IT equipment

Small and shrinking R&D

While IT equipment represents a rather small share of the value added, turnover and BERD in the ICT sector in Europe, the sub-sector was responsible for more than 90% of the total EU25 trade deficit in ICT goods in 2005. BERD has declined steadily in recent years, but less rapidly than has value added, leading to rising R&D intensity. These figures hide a very high variety among EU member states. The highest R&D intensities are found in France and Nordic countries, while the UK is among the member states with very low R&D intensities.

Clearly, IT equipment is the sub-sector where the EU is least competitive. There are no large European competitors in this industry. It is also a sub-sector strongly hit by relocation, with ICT goods being produced in Asia and imported to Europe. Overall, the markets for IT equipment are characterized by declining prices. However, there are also R&D intensive niches, such as bar-code readers and price readers, in which there are competitive EU firms.

Very low R&D presence of EU firms

Company data show that the R&D investments of large EU R&D companies amount to only € 0,4 billion only, compared to € 2,3 billion BERD in the EU. This discrepancy suggests that a major part of the limited IT Equipment R&D in Europe is conducted by foreign-controlled companies or SMEs. This is clearly the case the Eastern member states where most of R&D comes from foreign direct investment from countries outside the EU.

C4 Telecom and multimedia equipment

Telecom equipment and multimedia equipment display quite different characteristics and trajectories. Telecom equipment accounts for a larger share of value added and turnover than multimedia, and an even larger share of BERD. This sub-sector is also very R&D intensive. In fact, it is the ICT-sub sector with the highest BERD as well as the highest R&D intensity of all ICT sub-sectors in the EU.

Telecom: high R&D intensity, EU strength but position weakening

Telecom equipment is Europe's traditional ICT strength, including major international players in infrastructure equipment (Ericsson, Nokia Siemens and Alcatel Lucent), and in handsets (Nokia and Sony Ericsson). However, its position has been eroded since 2000, in terms of value added and trade-balance. In addition to the usual dominant countries Germany, France and the UK, the Nordic producers have very strong R&D presence. R&D activities in the Eastern member states are limited mainly to Slovenia and the Czech Republic.

Multimedia: Weak in mass market, shrinking R&D

The multimedia sector is in quite a different situation. European producers are relatively strong in the premium segments (Bang and Olufsen, Philips), but this strength is overshadowed by the weakness in the mass market, which is a stronghold of East Asian suppliers. Moreover, R&D by European companies has actually been shrinking for several years while non-European countries continue to increase their research. Despite the notable presence of a number of Japanese-owned research centres in the EU, this is a worrying trend for an industry based on premium products.

C5 Electronic measurement instruments

This sub-sector produces a wide range of measurement instruments and industrial control equipment. Partly as a result, it is dominated by SMEs, specialised in niches. Electronic measurement instruments is the only ICT manufacturing sub-sector which shows a persistent growth in value added, BERD and R&D intensity. It is also the only ICT manufacturing sub-sector that shows a trade surplus, and even a steadily increasing one since 2000. A surplus exists in all product groups except radar and navigation systems, which might be of concern given the market potential for car and handheld navigation systems. Also, in terms of BERD the EU still lags far behind the US, which invests over € 10 billion more than the EU in R&D.

Persistent growth of all indicators, but lagging behind the US

R&D in electronic measurements instruments is geographically concentrated. Germany and France perform more than 60% of the total BERD in the sub-sector, with different specialisations: Germany is oriented towards healthcare and industrial metrology (e.g. Carl Zeiss), whilst France is more oriented towards defence (e.g. Sagem/Safran, Thales). R&D intensity on the other hand is highest in the Nordic member states.

Goods in this sub-sector are often customised for integration into other goods such as automation, defence, health, aeronautics and ICT, some of which are strategic areas (defence, aerospace) and produced on demand from member states. R&D is also much driven by safety, energy saving, health and environmental issues, which often require precise measurement. Hence, this sub-sector may respond to demand-oriented innovation policies.

C6 Telecom services

Low R&D intensity

Telecom services represent about one third of the value added and turnover of the ICT sector. Its share of BERD is much lower, at about 10 % of the total ICT BERD. This leads to low R&D intensities (1.7% BERD/VA in 2004), in fact the lowest of all ICT sub-sectors. In addition, while value added has grown persistently in recent years, driven by the mobile and broadband services, BERD has remained flat, leading to decreasing R&D intensities.

Almost all BERD in the sector is performed in the Western member states; with the Nordic countries having the highest R&D intensities. Company data show that some 90% of the corporate R&D is invested by just seven large operators: BT, FT, Telefónica, DT, TeliaSonera, Vodafone and Telecom Italia. A large part of the R&D is still performed in these operators' respective home countries. Foreign operators invest very little in R&D in Europe.

Advantage EU in telecom services R&D?

In contrast to the other ICT sub-sectors, the European BERD (€ 3,0 billion) in the telecom services sector is relatively high compared to the US (€ 1,4 billion). Company data shows that EU companies invested about half of the total 7,4 billion spent by the top global telecom R&D investors in 2005. While EU companies have been increasing their R&D investments in recent years, non-EU companies have been decreasing them. Thus, telecom services appear to be the only ICT sub-sector where the EU has an R&D advantage.

C7 Computer services and software

R&D grows faster than in any other ICT sub-sector

The computer services and software sub-sector represents more than 30% of the turnover and more than 35% of the value added generated in the ICT sector in the EU 25. Its share of BERD is somewhat smaller, but very important at more than 20 %. This leads to medium R&D intensity of just below 4% on value added. Furthermore, the sub-sector is growing rapidly in terms of value added as well as R&D. In fact, most of the BERD growth in the EU in recent years can be attributed to this sub-sector. BERD grows faster than value added which leads to rising R&D intensities. One should also note that computer services have a much lower R&D intensity than software.

In this sub-sector, the UK and Germany have the highest BERD of the EU member states. The Nordic countries, Ireland, Estonia, Greece, Belgium and the Czech Republic are relatively R&D intensive. It is notable that the differences in R&D intensity and total BERD between Western and Eastern member states are not as high as for the other parts of the ICT-sector.

EU 25 R&D grows slower and at much lower levels than in the US

However, in spite of the dynamism shown in this sector in the EU, it seriously lags the US in almost every R&D related measure – BERD is lower (€ 7bn vs. 17bn in 2003), as is R&D intensity (4,0% vs. 9,6%) and BERD growth (3,0bn vs. 7,5bn between 1999 and 2003). Also, this sub-sector is dominated by US firms (e.g. IBM, EDS, Microsoft, Oracle), who are present in most EU member states, along side a few large European ones (SAP, LogicaCMG, CapGemini) and a large number of smaller domestic ones. The top 10 US R&D spenders in the US invest € 13,5 bn in R&D compared to € 2,5 bn for EU firms. In sum, the US seems to run away in this dynamic sub-sector. There is evidence, however, that more software R&D is taking place outside the sector than inside it. In such "embedded" software R&D EU may have a stronger position.

About the project

Since 2005, the Institute for Prospective Technological Studies, one of the seven scientific institutes of the European Commission's Joint Research Centre, has been running a research project on Research and Development in the Information and Communication Technologies sector in Europe on behalf of the Directorate General Information Society of the European Commission. It collects and analyses data on R&D spending in the ICT industry. REDICT covers the 25 Member States, but not yet Bulgaria and Romania. ISIC/NACE data is included up to 2004. This paper is a summary of its findings.

Key concepts

The ICT sector refers to the "operational definition" as specified in the OECD's Frascati manual (200:188), i.e. ISIC/NACE 30, 32, 33, 64 & 72. ISIC refers to the International Standard Industrial Classification used by OECD while NACE refers to Nomenclature générale des Activites économiques dans les Communautés Européennes, which is the European standard used by Eurostat. The following table gives you an overview of the main contents of the following NACE/ISIC sectors.

Official label	Example products and
30 Office equipment	Computers, printers, scanners, photocopiers
321 Manufacture of electronic valves and tubes and other electronic components	Semiconductors, printed circuits (motherboards etc.), LCDs, TV tubes; Diodes
322 Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	Telephones, faxes, switches, routers, TV and radio emitters
323 Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods	TV, VCR, (digital) Cameras, Radios, Cassette players, CD and DVD players
3312/332 Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	Measurement instruments (sensors, readers)
3313/333 Manufacture of industrial process control equipment	Industrial process control equipment
642 Telecommunications	Telecom services
72 Computer and related activities	Hardware consultancy, software consultancy and supply, database activities, Internet, maintenance and repair

R&D is defined in accordance with the Frascati manual (OECD 2002:30) as "creative work undertaken on a systematic basis in order to increase the stock of knowledge… and the use of this stock of knowledge to devise new applications."

BERD is Business Expenditure on R&D and includes all R&D carried out in the business sector (as opposed to government, higher education and private non-profit sectors) in a given country, regardless of the source of funds.

ICT BERD measures the R&D expenditure of companies registered in the ICT sector in a given country. It thus excludes R&D carried out by companies in other sectors, such as automotive vehicles, even if the R&D concerns ICTs.

Purchasing Power Parity (PPP) exchange rates are used to equalise the purchasing power of different currencies in their home countries for a given basket of goods.

Total R&D business intensity in an economy is the sum of the BERD/GDP ratios of all economic sectors.

Company data comes from The 2006 EU Industrial R&D Investment Scoreboard, published by JRC-IPTS.

European Commission

EUR 23250 EN **– Joint Research Centre – Institute for Prospective Technological Studies**
Title: R&D Business Investment in the EU ICT Sector
Authors: Sven Lindmark, Geomina Turlea, Martin Ulbrich
Luxembourg: Office for Official Publications of the European Communities
2008
EUR – Scientific and Technical Research series – ISSN 1018-5593

Abstract

The EU spends only about half as much on R&D in ICT as the US. This holds true both in absolute amounts and relative to the size of the economy. Indeed, the ICT sector alone is responsible for as much of the overall R&D investment gap as all other sectors combined. From the current data analysis, there are no signs of the ICT R&D investment gap closing.

At ICT sector level, the R&D investment gap exists partly because the ICT sector is smaller in the EU than in the US and partly because of the lower R&D intensity of the sector in the EU. The lower R&D intensity is, in turn, primarily due to two sub-sectors: computer services and software on the one hand, and electronic measurement instruments on the other hand. On the positive side, and contrary to the rest of the ICT sector, these two sub-sectors also show strong R&D growth in the EU.

Company data indicates that EU companies have R&D intensities similar to their US counterparts in every sub-sector, but are concentrated in less R&D intensive sub-sectors (e.g. telecom services). The US companies are also larger and more numerous in most sub-sectors. These data suggest that the ICT R&D gap between the US and the EU reflects, more than anything, a lack of European firms in the ICT sector.

Among the member states, Finland and Sweden make the highest R&D effort in this sector, relative to their size. In general, Northern member states invest more than Southern member states, and the Western member states invest much more than the Eastern ones, which display very low levels of ICT R&D.

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

JRC
EUROPEAN COMMISSION

Publications Office
Publications.eu.int