Pillar 5

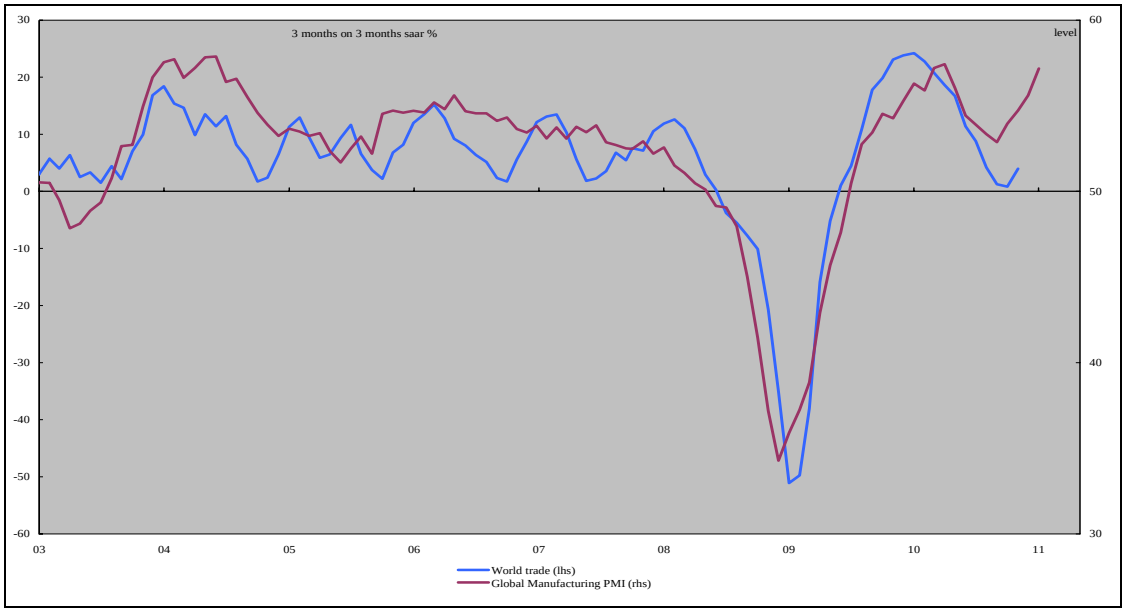
The European ICT industry at the crossroad: economic crisis and innovation

1. INTRODUCTION

This report analyses the impact of the economic crisis and of innovation trends of R&D over the period 2007-2010[1] making use of companies' financial reporting.[2] The list of companies considered in the analysis is drawn from the EU Industrial R&D Investment Scoreboard.[3]

The period 2007 – 2010 has been chosen to assess the impact of the economic crisis on the ICT industry, 2007 being the pre-recession year of reference (Figure 1) and also because this is a period of intense ICT innovation. After the crisis, in 2010, the European ICT industry is back on a positive growth path.

Figure 1: **World trade and global manufacturing purchasing managers index (PMI)**



Source: European Commission

In September 2008, the bankruptcy of Lehman Brothers led to an unprecedented fall in confidence of both consumers and business, generating a wave of destocking, fall in production, trade and capital investment.[4] The collapse of world trade has been unprecedented. During the first quarter of 2009, world exports in value terms were 31 percent

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1 The OECD IT Outlook 2010 uses a similar approach by analysing the performance of the top 250 ICT companies through 2009.

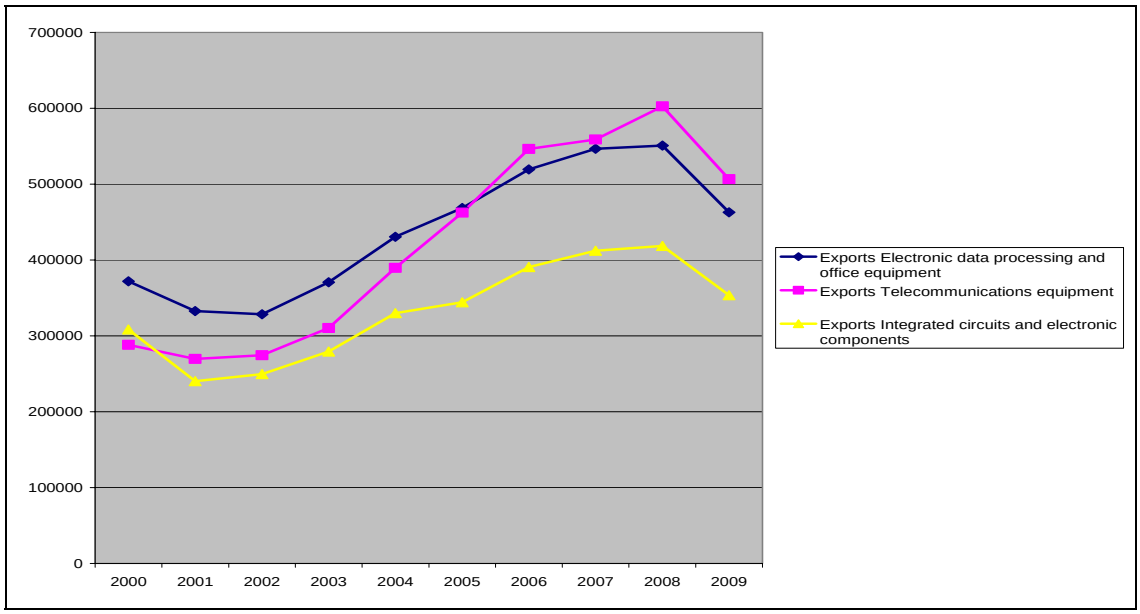
2 Unless otherwise specified, the source of all charts are companies' financial reports. Values are converted into euro using the ECB exchange rates (quarterly or yearly average). For companies ending their fiscal year before September, quarterly results have been used to cover 2010 until December. Given these changes of the original data for the need of the analysis, readers should refer to the official earning releases of the companies.

3 European Commission (JRC/IPTS) http://iri.jrc.ec.europa.eu/research/scoreboard_2010.htm

4 DG ECFIN, Economic crisis in Europe: Causes, consequences and Responses, European economy 7/2009

lower than one year before and world imports 30 percent lower. Of course, the ICT industry did not escape the worst stage of the world economic crisis (Figure 2).

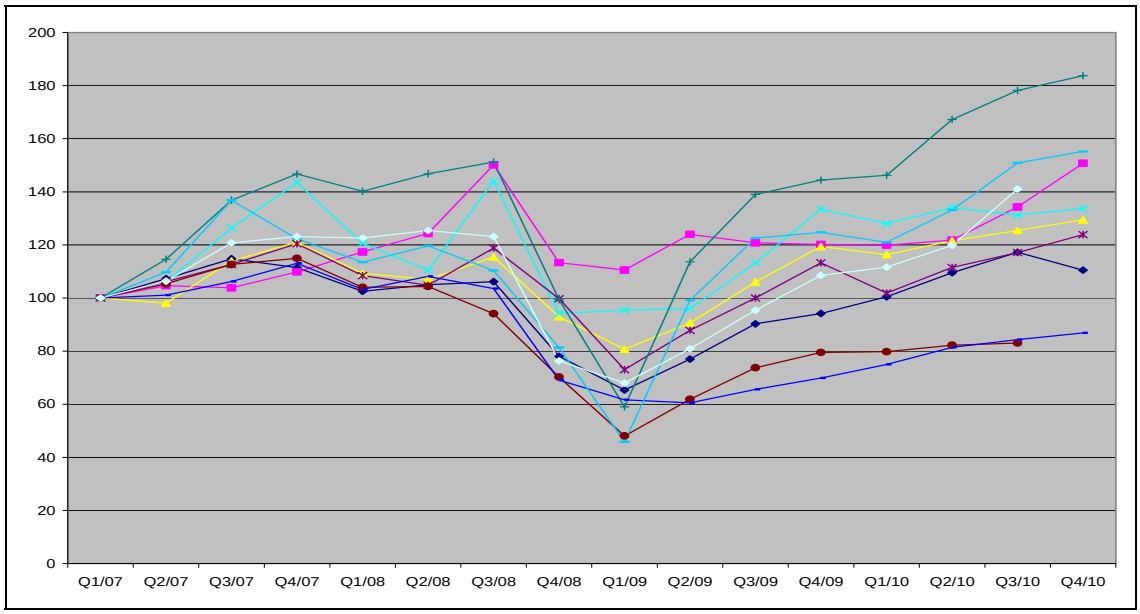
Figure 2: **ICT World Exports ($m at current prices)**



Source: WTO Statistics Database

But the crisis was short lived. The worldwide semiconductor industry, which provides the core inputs for any other ICT business segment and which is as such a leading indicator of the global ICT market, illustrates the impact of the financial crisis during Q4/2008 and Q1/2009. Yet, after two quarters of negative growth, this industry started to recover (Figure 3).

Figure 3**: World top 10 semiconductor quarterly net sales – Index Q1/2007=100**



Source: Companies' financial releases

By the end of 2009 the semiconductor industry had nearly fully recovered (in terms of revenue and margins) and even several ICT businesses suffered in 2010 from a shortage of components (in particular the telecom equipment industry). According to the latest outlook by Gartner, Inc., worldwide semiconductor revenue is expected to exceed $300 billion mark for the first time in its history.[5]

During the recession, the ICT industry was nevertheless sustained by a wave of innovations combining social networks, mobile Internet, cloud computing, and consumer electronics. Most of these innovations have to do with consumer entertainment rather than with productive investment. Thus, although the impact of the ICT sector on productivity growth is probably positive, efficiency gains in the wide economy due to increased take up of ICT by businesses are not clear cut.

2. THE EUROPEAN ICT INDUSTRY

The list of companies considered in the analysis is drawn from the EU Industrial R&D Investment Scoreboard. The 2010 EU Industrial R&D Investment Scoreboard[6] cut-off date in collecting the data is May 2010. However, for most companies fiscal year ends in the second half of the year (typically September 31 and December 31). Therefore, in order to fully cover 2010 and the economic recovery, a sub-sample of 40 European ICT companies was selected on the basis of the Scoreboard list (Table 1). Given the high degree of industrial concentration, this sub-sample is representative in so far that it represents 85% of net sales recorded by the 2010 Scoreboard.[7]

Table 1**: EU ICT sub-sample (in % of the 2010 Scoreboard sample)**

Sector	Number of companies	R&D (€m)	Net sales (€m)
Telecom operators	8	4,583	298,245 (90%)
Internet	1	10	3,971 (95%)
Telecom equipment	3	10,112	76,296 (94%)
Semiconductors	5	3,180	14,222 (85%)
Computer hardware	3	108	1,804 (90%)
Electronic office	2	266	3561(100)

5 Gartner, December 9, 2010

6 European Commission (JRC/IPTS) http://iri.jrc.ec.europa.eu/research/scoreboard_2010.htm. The Scoreboard is part of the Industrial Research Monitoring Activity carried out jointly by the Joint Research Centre (JRC) and Research (DG RTD) Directorates-General of the European Commission

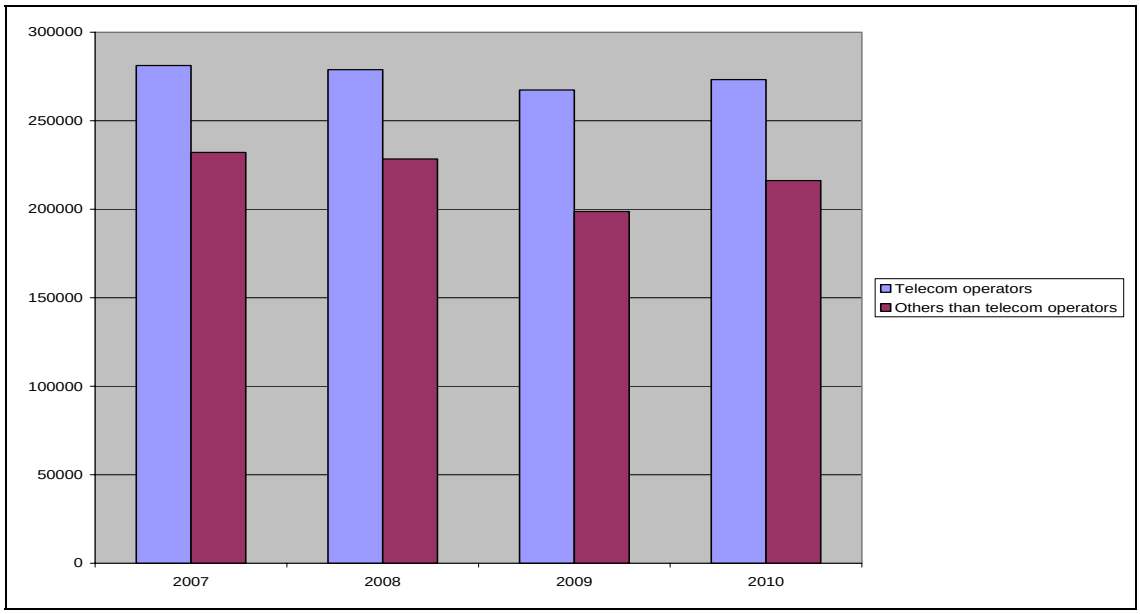
7 For additional information on growth and R&D investments of the major ICT companies worldwide, see the "2011 Report on ICT R&D in the European Union" and the report on "The Top World R&D-investing Companies from the ICT Sector: A Company-level Analysis" (2011), both available at: http://is.jrc.ec.europa.eu/pages/ISG/PREDICT.html

equipment			
Electronic equipment	10	892	14,957 (76%)
Software and computer services	15	3,504	42,860 (75%)
Leisure goods	1	1,714	23,189 (85%)

2.1. The European ICT industry: the global picture

Combined net sales of the EU top 40 ICT sample increased by 5% in 2010 compared to 2009, but are still 4.7% lower than in 2007 (Figure 4).

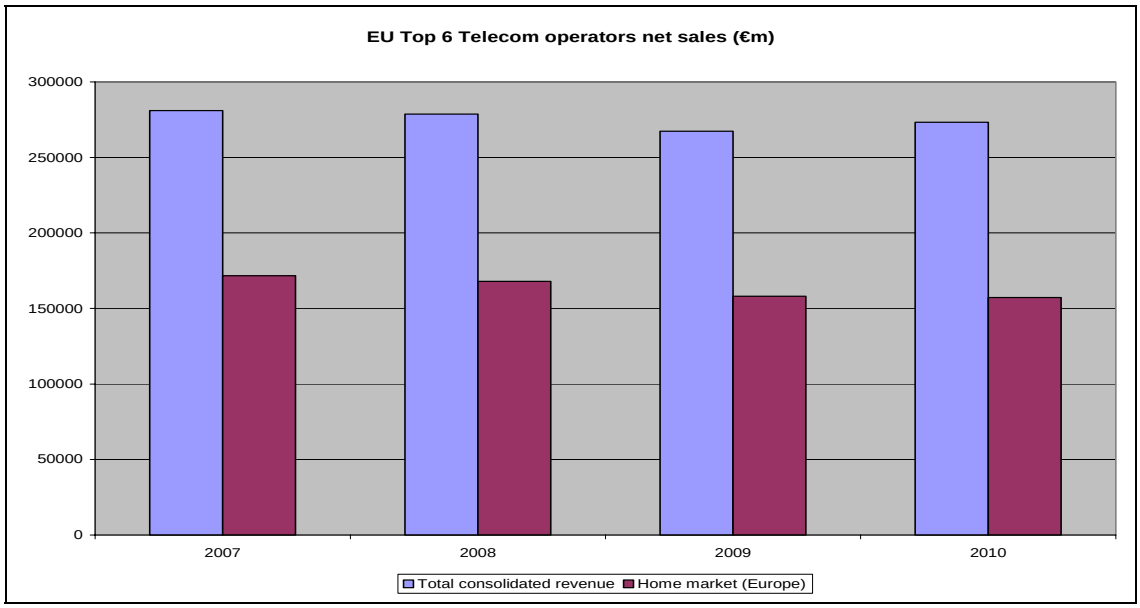
Figure 4**: EU Top-40 companies' combined net sales (€m)**



In 2010, the European telecom operators (Top 6 companies) saw their combined net sales increased by 2% year on year and a decrease of 0.5% on the European market, reflecting a stagnant EU market and regulatory adjustments, the sample being exclusively composed of incumbents (Figure 5). [8]

[8] See pillar 4 for further analysis of the telecom sector

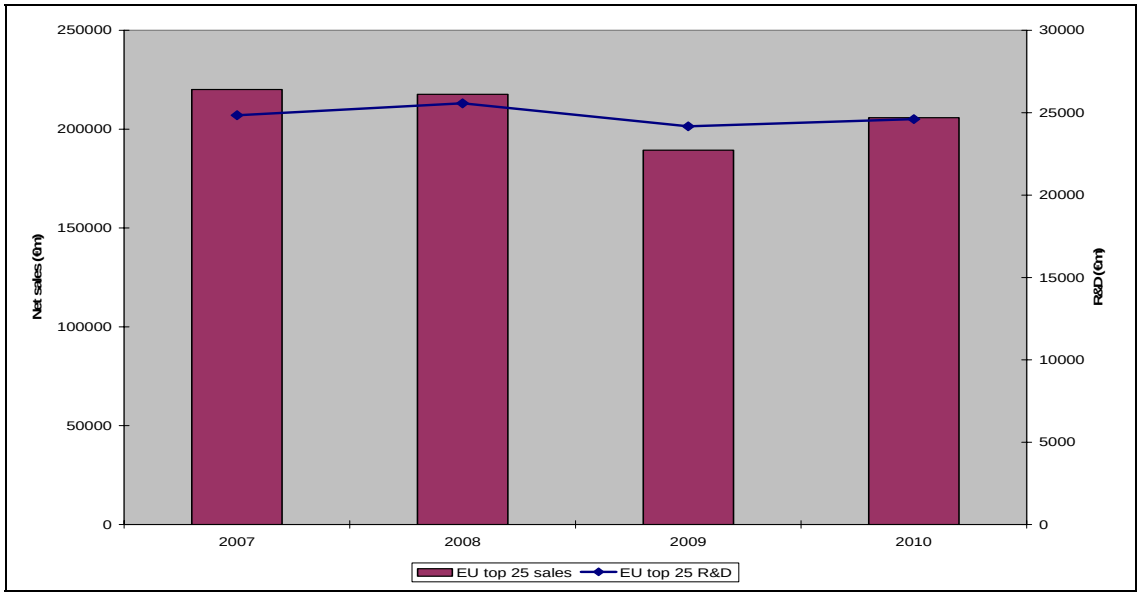
Figure 5: **EU Top 6 telecom operators combined net sales (€m)**



Net sales of companies other than telecom operators increased by 9% year-over-year, some of the growth represents a bounce back from the declines of 2009. Nevertheless, there is still a gap of 7% compared to 2007 (Figure 6).

R&D spending of the EU top-40 companies that reported R&D spending (25 companies) [9] did not change significantly over the period. It increased by 2% in 2010 (year-on-year), at a level very close to 2007 (Figure 6).

Figure 6: **EU Top 25 combined net sales and R&D spending (€m)**



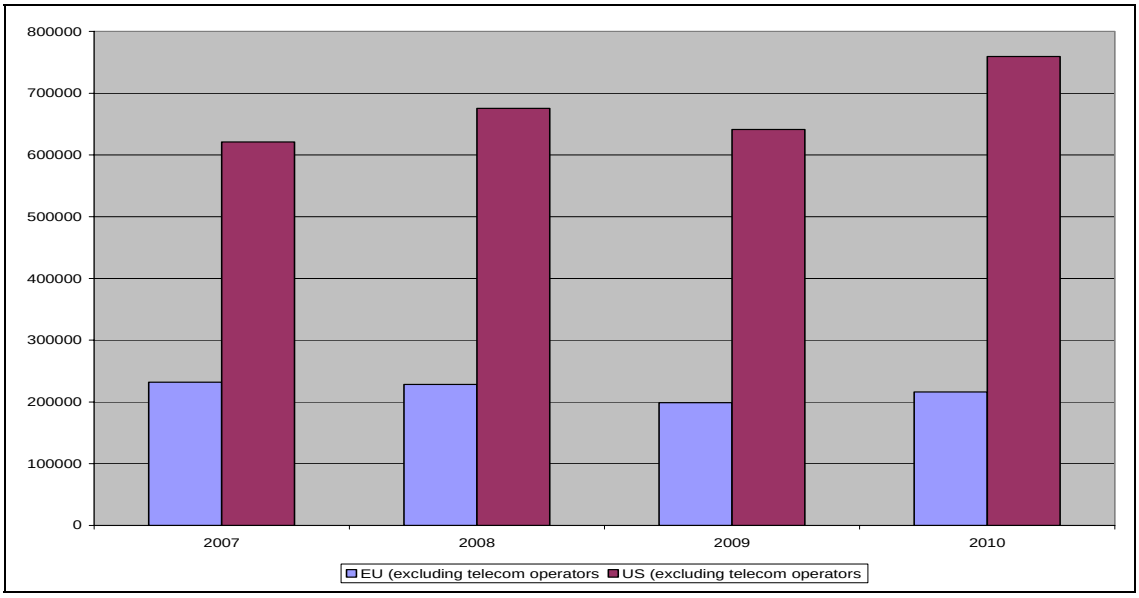
9 Their unaudited FY 2010 does not report R&D spending.

As a general rule, R&D spending is pro-cyclical since firms mainly rely on their cash flow to finance most R&D expenses. Nevertheless, looking at the EU top-10 biggest spenders on a quarterly basis, research expenses were less volatile than net sales throughout the crisis, meaning that the research effort was maintained as much as possible (Figure 7).

Figure 7**: EU top 10 R&D spenders – Index Q1/2007=100**

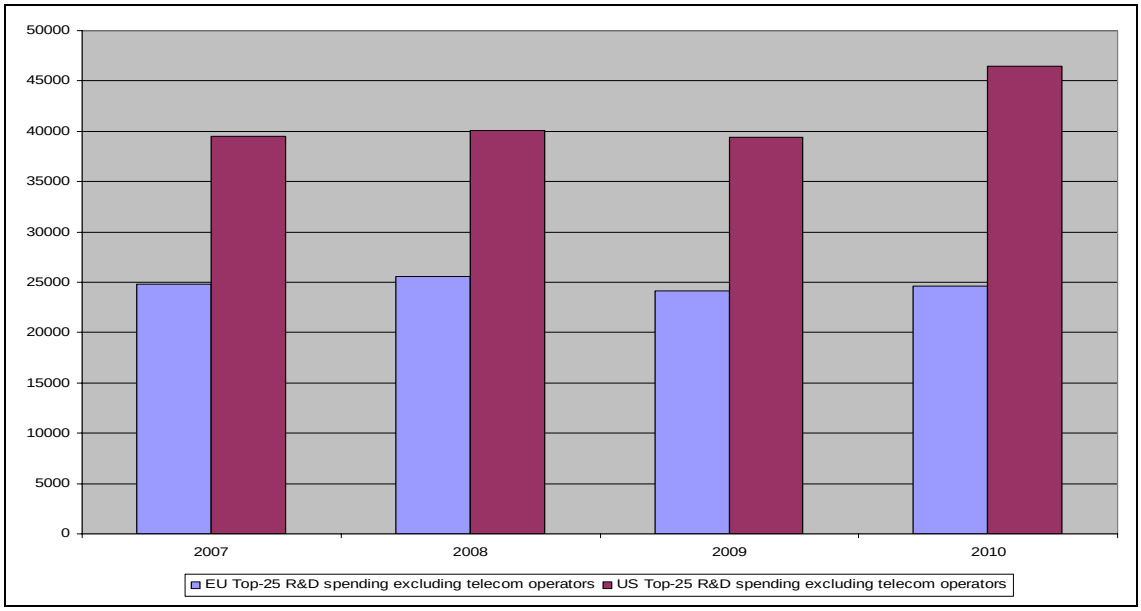
The European ICT industry, considered as a whole came out of the crisis and the sectoral analysis shows that this is true for most business segments. The US ICT industry, however, has achieved a lot more both in terms of net sales and R&D spending over the relevant period. The main factor explaining this is the 2007-2010 innovation wave. Total net sales of the Top-25 US ICT companies increased by 18 % between 2010 and 2009 and by 22% compared to the 2007 pre-recession level. These figures are compared with the EU top 40 list (figure 8).

Figure 8**: Top US and EU companies' combined net sales (€m)**



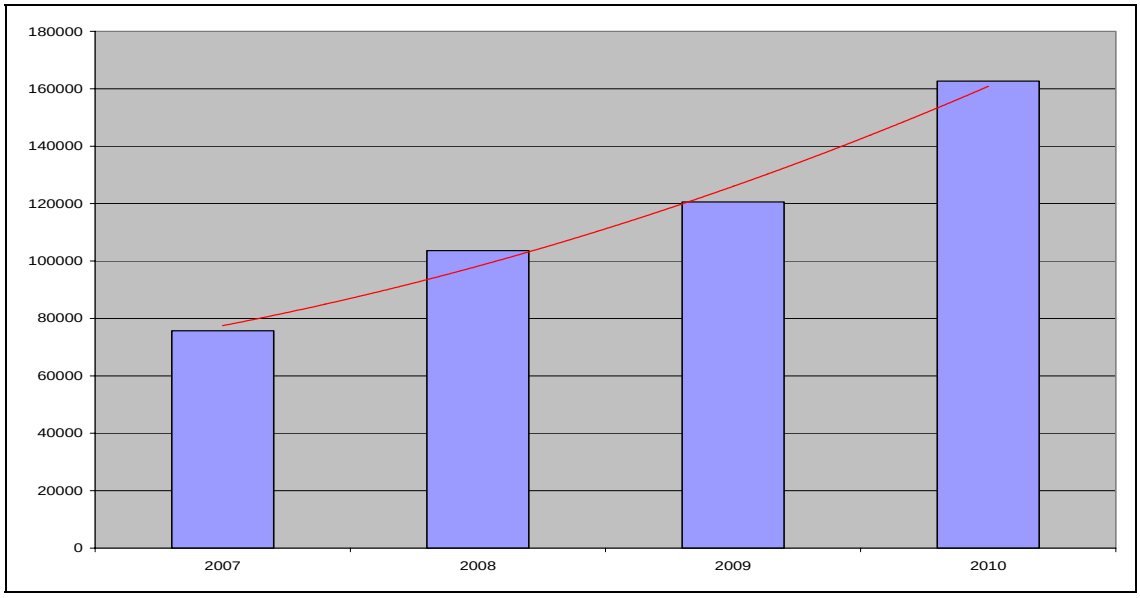
The combined R&D spending of the same list of US companies increased by 12% in 2010 compared to 2009 and by 14% compared to 2007 (figure 9).

Figure 9: **Top US and EU ICT companies' R&D (€m)**



Smartphones and electronic tablets, together with global Internet platforms, have been the main drivers of the US ICT industry growth during the 2007-2010 period. The combined revenue of the US top 6 companies delivering smartphones and Internet platform services increased by 114% between 2007 and 2010 and their R&D spending by 80% (Figure 10).

Figure 10: **US Top 6 companies supplying smartphones and global Internet platforms net sales ($m)**



When excluding these companies from the sample, the US ICT industry's total revenue still increases by 15 % between 2009 and 2010 and by 10% compared to 2007. The US ICT industry is also dominant in software and in cloud computing, partly reflecting the US

position in global Internet services, but also the strengthening of the software industry which re-merged hardware and software (one-stop shopping business model). For most companies belonging to the US sample, 2010 is the best fiscal year ever. US firms are also relatively more profitable than ICT companies from other regions (Table 2). While US companies take fifty percent of net profits, European companies' drive one quarter of the global ICT industry performances (sales, employment and profits), but more than sixty percent of the net debt.

Table 2**: Share in the total of 250 IT companies (fiscal year 2009)**

Region	Net sales	Employment	Net profit	Net debt
Asia-Pacific98 companies	41%	48%	21%	19%
Americas 93 companies	34%	29%	48%	19%
Europe 51 companies	24%	23%	23%	63% [10]

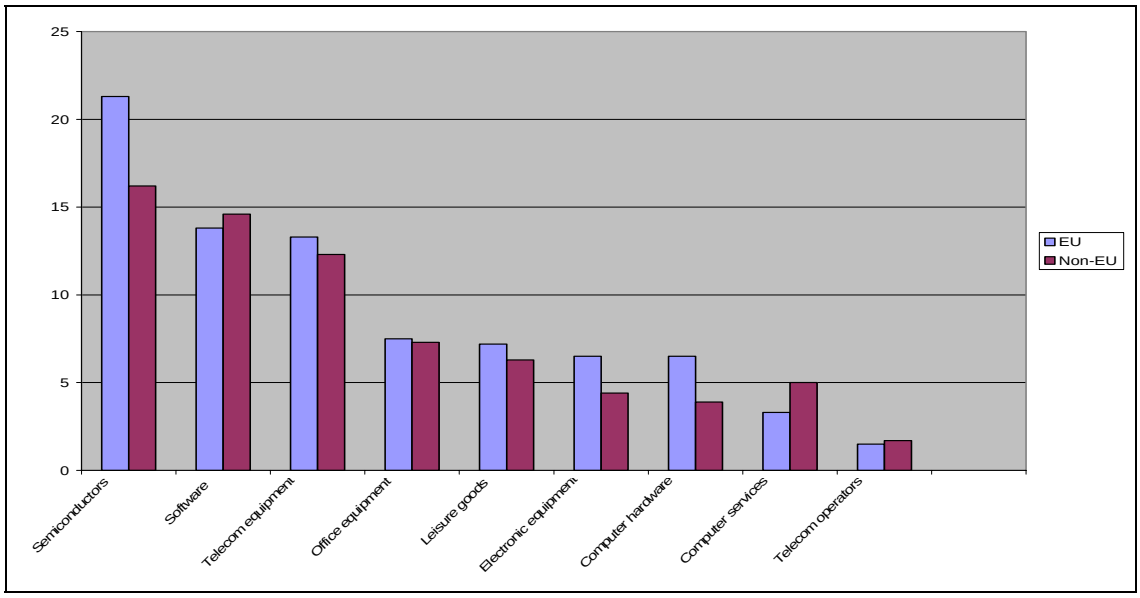
Source: OECD (2010), OECD Information Technology Outlook 2010, OECD Publishing

[10] Mainly telecom operators

2.2. The sectoral analysis of the European ICT industry

As the sector samples of companies are far more homogenous, and R&D is industry/sector specific (Figure 11), the sectoral analysis of the ICT sector provides more insights into the trends and the performance of the individual segments.

Figure 11**: R&D intensity (R&D spending in % net sales - 2010 Scoreboard sample)**



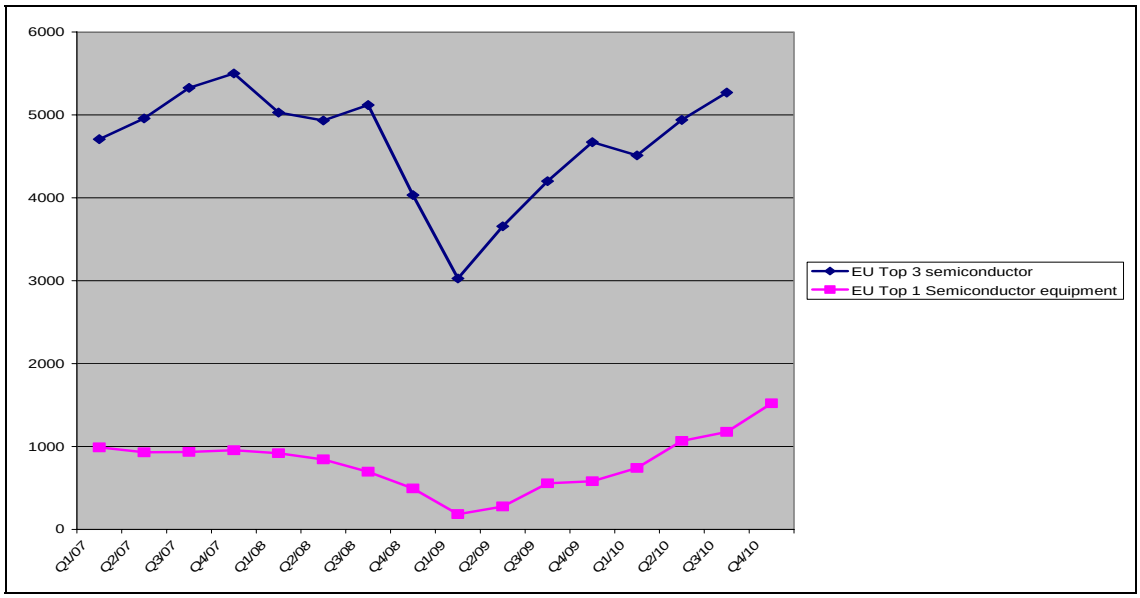
Source: European Commission – JRC/IPTS – 2010 EU Industrial R&D Investment Scoreboard

2.2.1. The semiconductor industry

Worldwide, in 2010, the semiconductor industry had recovered in terms of revenue and margins and capital expenditures are increasing. Firms are reshaping their product portfolio, specialising and favouring lighter asset strategies, in particular by relying on leading-edge foundries capacities.

The EU top 4 combined net sales and R&D spending is in line with the global chip market trend (Figure12).

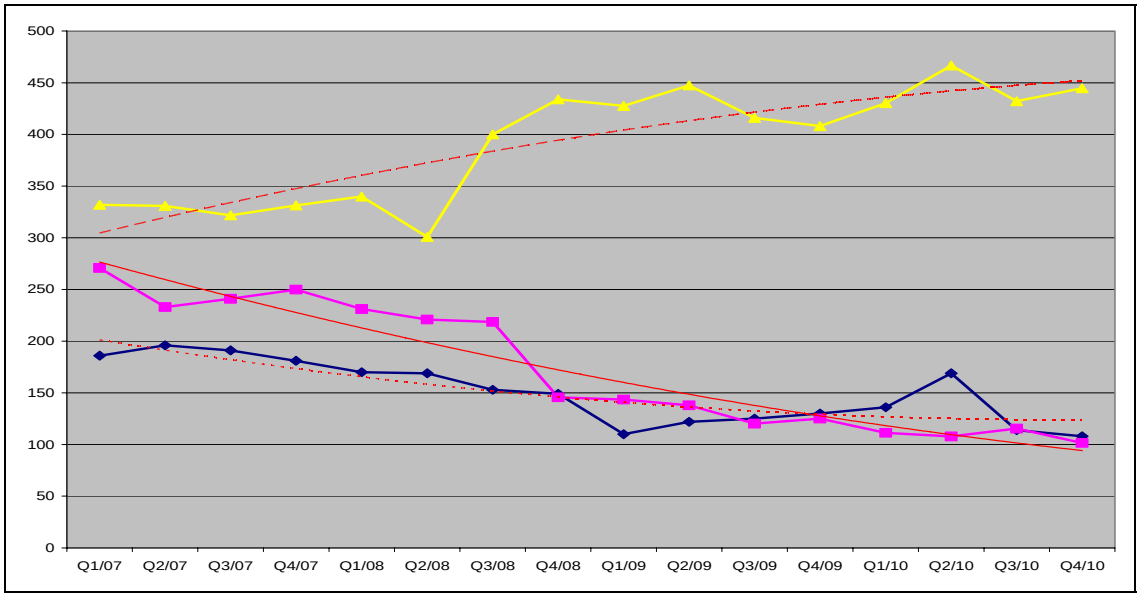
Figure 12: **EU top 3 semiconductors and top 1 semiconductor equipment net sales ($m)**



The European semiconductor industry has a strong leadership in sensors and microsystems (used in buildings, cars, manufacturing processes) in security cards (used in healthcare, ID, banking), in high-power applications (grid), computerised machine tools, and in photovoltaic (LED). Most smartphones have several European semiconductors inside (e.g. motion-sensor types – accelerometers and gyroscopes) and run on a European low power chip design.

Cash restrictions, tougher technological and market competition induced two out of the three leading European IC companies to focus their production on their best performing products through divestitures, leaving only one European company in the world top 10 (with $10 billion net sales). Of course, at firm level, these divestitures have a negative impact on R&D spending (Figure 13).

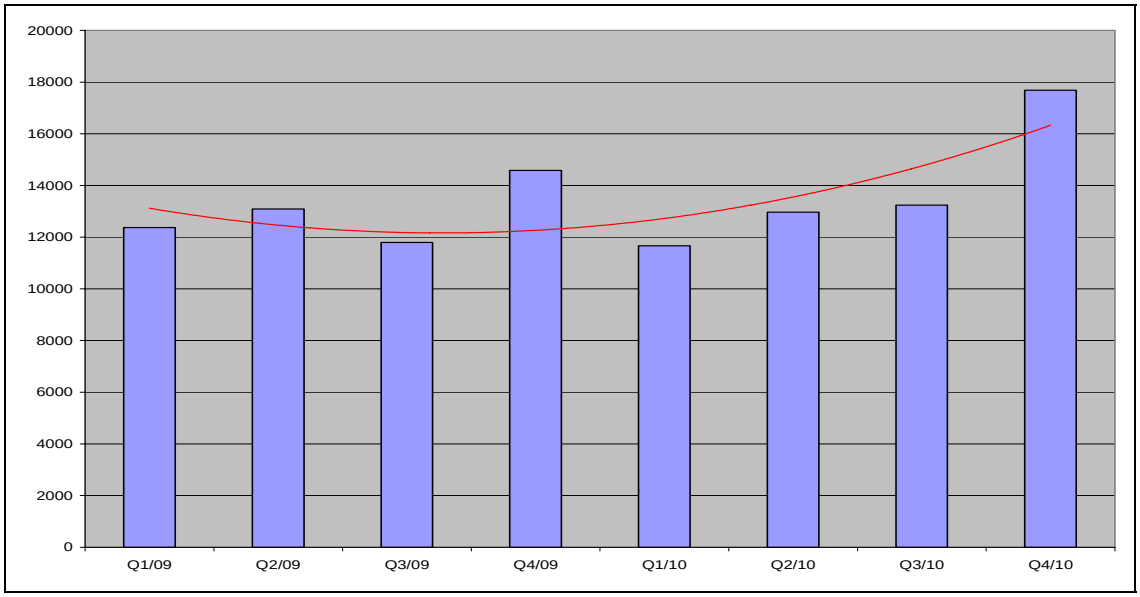
Figure 13: **EU top 3 semiconductor companies R&D spending (€m)**



2.2.2. The telecom equipment industry

Quarterly data shows that the telecom equipment segment is back on a positive growth trend (Figure 14).

Figure 14**: Network business segment of the EU top 3 telecom equipment net sales (€m)**



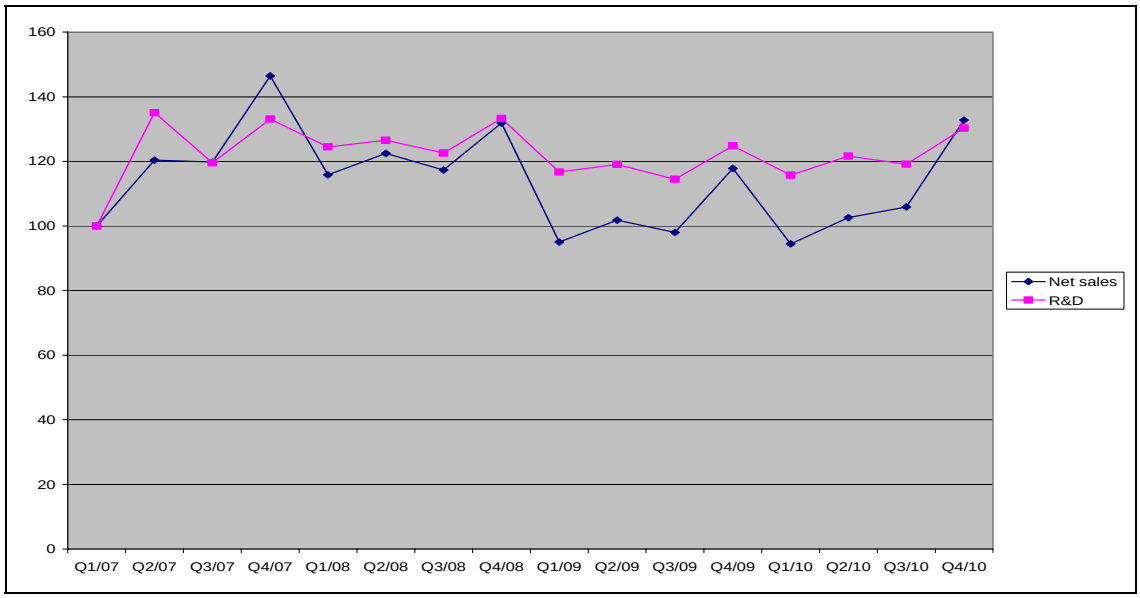
A business cycle time lag (telecom operators' capital expenditures), regulatory obstacles and uncertainties, and shortages in components hampered the recovery of the European telecom equipment industry. Q4/2010 shows a significant improvement. The European industry faces fierce competition from new entrants (mainly from China), but reinforced its global position through mergers and acquisitions (particularly on the US market).

The 2011 outlook is expected to be positively shaped by telecom operators' increased capital expenditures. 180 operators in 70 countries are currently investing in G4/LTE mobile

broadband networks. At least 64 LTE networks will be in commercial service by end 2012.[11] Gartner forecast worldwide telecom equipment spending to grow 9.1 percent in 2011.[12]

The EU Top-3 telecom equipment companies maintained their combined R&D spending, which represents 55% of the EU top 25 combined R&D spending, at a much more stable level than their combined revenues (Figure 15).

Figure 15: **EU top 3 telecom equipment companies total net sales and total R&D – Index Q1/2007=100**



2.2.3. Software and computer services industries

The software industry is extremely heterogeneous in terms of firm's size and activity. Alongside multinational companies supplying consulting services, IT outsourcing services, business and non-business application software, there are thousands of software and computer services companies being mostly active on a national or local scale.[13]

The "Truffle 100" [14]ranks and analyses the top 100 European software companies. In 2009, all but 3 top 100 vendors have revenues below €1bn and 80% have revenues below €250m.

This is confirmed by our EU top 40 sample which counts 12 software (and IT services) companies, 10 having a turnover exceeding €1 billion and one exceeding €10 billion. Their combined revenue increased by 8.5% in 2010 (Figure 16).

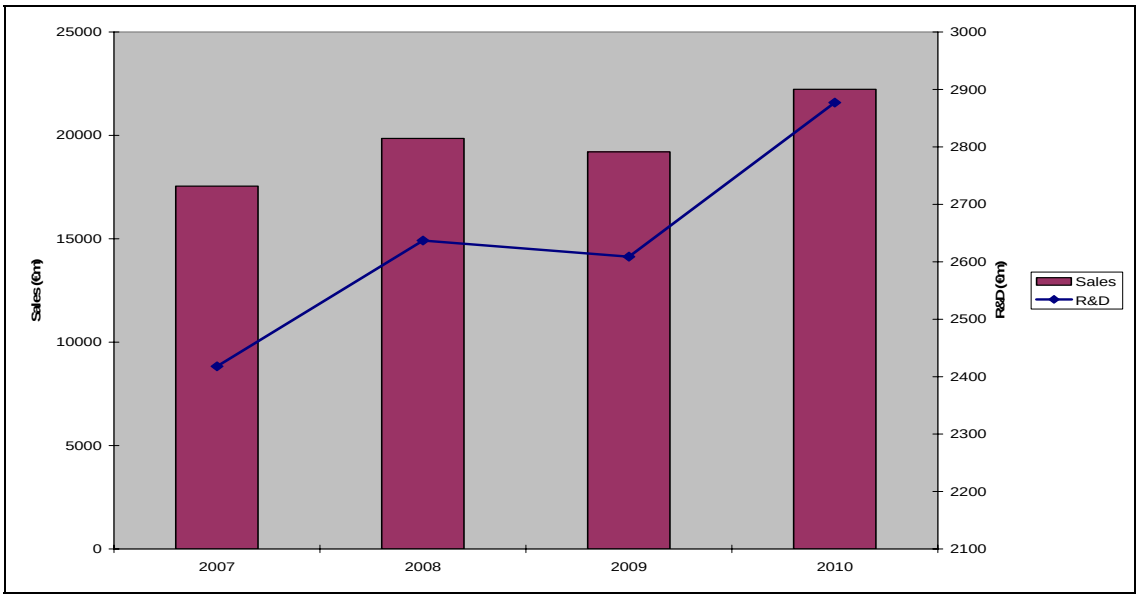
11 GSA, January 12, 2011

12 Gartner January 6,n 2011

13 Nevertheless Computer Services and Software reached 46% of ICT employment and 36% of value added in 2008

14 Database created by Truffle Capital, an independent venture capital firm investing in Europe

Figure 16: **EU top 12 Software and IT Services companies sales and R&D (€m)**



From this sample, only 8 companies reported R&D spending. In 2010, their combined R&D amounted to €2,877 billion (+10% year on year), with one company representing more than 50% of this amount (Figure 17)..

A major potential advantage of cloud computing for companies and public administrations is that they no longer need to install and maintain software and computing equipment of their own, nor manage data storage facilities in-house. Instead, they can enjoy remote access, through networks such as the Internet, to state-of-the-art software and data storage systems offered by specialist outside suppliers and so take advantage of much more affordable and efficient IT systems.[15] The European software industry however is lagging way behind its US counterpart and "it is getting more and more difficult for their European counterparts to keep up with the challenges." [16]

3. BERD AND COMPANIES' R&D EXPENSES

Companies' R&D expenses, taken from their financial accounts, do not include information on the place where R&D is actually performed. These expenses are allocated to the country where these companies are registered. The approach adopted by the Scoreboard and this analysis are fundamentally different from that of statistical office, which gather data on R&D performed in the country, whatever the nationality of the company (BERD).[17]

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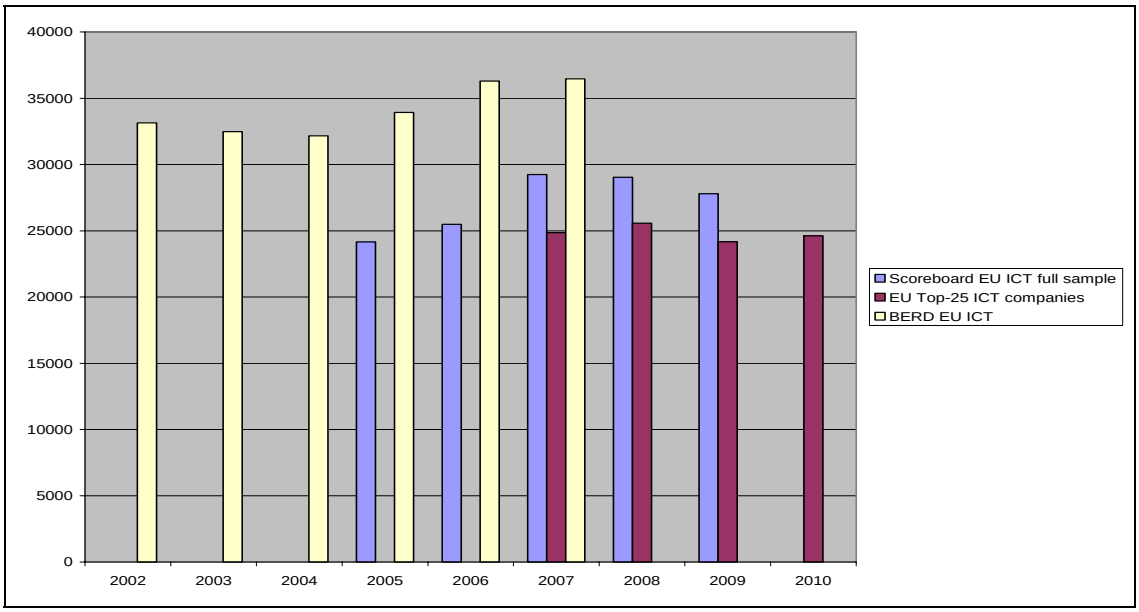
15 http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/128

16 Bernard-Louis Roques, http://www.truffle100.com/2010/interview.php

17 A detailed analysis of the differences between BERD and firm's data (Scoreboard) is presented in the PREDICT reports (2009, 2010 and 2011 Annual Reports on R&D in ICT in the European Union. European Commission, JRC-IPTS, Available at http://is.jrc.ec.europa.eu/pages/ISG/PREDICT.html) and in: "Azagra Caro, J. M. and Grablowitz, A. (2008). "Data on Business R&D: Comparing BERD and the *Scoreboard"*, Institute for Prospective Technological Studies, JRC Scientific and Technical Report, EUR 23364 EN, available online at: ftp://ftp.jrc.es/pub/EURdoc/JRC44585.pdf

At the time of writing this analysis, 2007 is the last year for which Eurostat has released BERD data by economic activity.[18] Compared with the Scoreboard data, EU ICT BERD is significantly higher (Figure 17). EU ICT BERD covers all R&D expenditures performed in the ICT industry in the EU, including smaller firms and foreign affiliates of non-European firms. Given the ICT industry high concentration rate, R&D expenditures by foreign affiliates of non-EU firms in the EU accounts formost of the gap between the two approaches. It is also to be noted that the definition of R&D is also different in the two approaches; wider for BERD than according firm's accounting rules. In addition, not all firms report their R&D expenses in their financial releases.

Figure 17**: EU ICT BERD and EU ICT companies' R&D expenses**



Sources: JRC/IPTS – 2010 EU Industrial R&D Investment Scoreboard and the JRC/IPTS 2010 Report on R&D in ICT in the European Union

From an economic point of view, the gap between BERD and Scoreboard data reflects the globalisation of R&D and the relative success of a country to attract it. If it were possible to isolate all other factors, a higher BERD than Scoreboard data means a net inflow of R&D expenses. [19]

4. CONCLUSIONS

This analysis has taken a classic view of the ICT industry and its sectors. This is becoming less and less pertinent given the contribution of ICT to nearly all economic and social

[18] ICT industry includes economic activities within NACE Rev. 1.1 codes 30 (manufacture of office machinery and computers), 32 (manufacture of radio, television and communication equipment),33 (manufacture of medical, precision and optical instruments, watches and clocks), 64 (post and telecommunication services) and 72 (computer and related services)

[19] Further analysis on this topic in available in the "2011 Report on ICT R&D in the European Union" and in a report on "Internationalisation of ICT R&D" (2011) available at: http://is.jrc.ec.europa.eu/pages/ISG/PREDICT.html

activities. Measuring the diffusion of ICT is still a difficult task given data constraints and a research topic.[20] An alternative perspective is offered by analysing the deployment of the key enabling technologies (KET's): Micro & nanoelectronics, advances materials, nanotechnology, biotechnology, photonics and advanced manufacturing systems. While not all are strictly speaking part of the ICT, all have a direct and close relationship with it.

From the KET's perspective, in terms of knowledge assets, Europe performs excellently and many non-EU experts rate the European R&D ecosystems (firm, research centre, universities) as the best in the world (Table 3).

Table 3: **KET's leading R&D actors**

	Micro and nanoelectronics	Photonics
Top R&D actors	Commissariat à l'énergie atomique (F)	Commissariat à l'énergie atomique (F)
	University of California (US)	Fraunhofer-Gesellschaft (D)
	IMEC (B)	MIT (US)
	Fraunhofer-Gesellschaft (D)	University of California (US)
	National Institute of Advanced Industrial Science and Technology (J)	US DoE
	Centre national de la recherche scientifique (F)	Centre national de la recherche scientifique (F)
	MIT (US)	National Institute of Advanced Industrial Science and Technology (J)
	Japan Science and Technology Agency	Japan Science and Technology Agency

Source: HLG KET mid-term meeting, February 2011

Europe has a technological leadership in sensors and microsystems (in buildings, car, manufacturing processes, machine tools), in security cards (healthcare, ID, payments), in high-power applications (grid), and in photovoltaic (LED). With two world leaders, Europe has a significant market share in medical equipment, which nowadays integrates the most advanced IT technologies, from chips to software. And Europe has a leading position in photovoltaic and silicon solar panels.

The issue is less about knowledge assets than growth opportunities, many of these final markets being still highly fragmented at EU level.

[20] ICTNET is a FP7 funded Support Action aimed at enhancing the coordination of the research in the economics of ICT - http://www.ict-net.eu/

5. ANNEX

The "EU Industrial R&D Investment Scoreboard" (the *Scoreboard*)[21] The *Scoreboard* is part of the Industrial Research Monitoring Activity carried out jointly by the Joint Research Centre (JRC) and Research (DG RTD) Directorates-General of the European Commission. The database contains information on the 1000 EU companies and 1000 non-EU companies investing the largest sums in R&D in their latest reporting year.

The *Scoreboard* refers to all R&D financed by a particular company from its own funds, regardless of where that R&D activity is performed. BERD refers to all R&D activities performed by businesses within a particular sector and territory, regardless of the location of the business's headquarters, and regardless of the sources of finance.

Table 1 **The 2010 Scoreboard – European ICT industry by sector** [22]

Sectors	Number of companies	Total R&D (€m) (Share in total ICT)	Total net sales (€m) (Share in total ICT)
Telecom operators	18	5,002 (18%)	328,000 (61%)
Internet	3	23 (0.08%)	4,151 (0.7%)
Telecom equipment	23	10,740 (38%)	80,920 (15%)
Semiconductors	20	3,538 (12.5%)	16,572 (3%)
Computer hardware	5	130 (0.5%)	2,015 (0.4%)
Electronic office equipment	2	266 (0.1%)	3,561 (0.6%)
Electronic equipment	37	1,271 (4.5%)	19,643 (3.6%)
Software	76	4,034 (14.5%)	29,301 (5.5%)
Computer services	21	916 (3.3%)	27,457 (5%)
Leisure goods[23]	10	1,992 (7.1%)	27,590 (5.1%)

[21] European Commission (JRC/IPTS) http://iri.jrc.ec.europa.eu/research/scoreboard_2010.htm

[22] http://iri.jrc.ec.europa.eu/research/scoreboard_2010.htm

[23] "Leisure goods" sector is not strictly ICT-related. It has in fact only one major ICT firm, Philips.

Total	215	27,912	539,912

Source: European Commission – JRC/IPTS

The cut-off date of the 2010 *Scoreboard* is May 2010 and most companies have their fiscal year ended between September and December 31. Given the number of companies, the coverage of all 2010 annual reports implies the use of a sub-sample while keeping it representative comparatively to the *Scoreboard*.

Table 2 **Sub-sample (in % of the 2010 Scoreboard sample)**

Sector	Number of companies	Total R&D (€m)	Total net sales (€m)
Telecom operators	8 (BT, France Telecom, Telecom Italia, Telefonica, Deutsche Telekom, TeliaSonera, Vodafone)	4,583	298,245 (90%)
Internet	1 (Freenet)	10	3,971 (95%)
Telecom equipment	3 (Nokia, Alcatel-Lucent, Ericsson)	10,112	76,296 (94%)
Semiconductors	5 (STMicroelectronics, Infineon, NXP, ARM, ASML)	3,180	14,222 (85%)
Computer hardware	3 (Bull, Kontron, Axis)	108	1,804 (90%)
Electronic office equipment	2 (Océ, Neopost)	266	3561(100)
Electronic equipment	10 (Agfa-Gevaert, Thomson Technicolor, TomTom, Gemalto, Ingenico, Epcos, Barco, Sick, Zumtobel, Sensata Technologies	892	14,957 (76%)
Software and computer services	15 (Indra Sistemas, Logica, Ubisoft, SAP, Dassault Systemes, Sage, Autonomy, Software AG, Cap Gemini, Wam Acquisition, Wincor Nixdorf, Sopra, Tieto, Amdocs,	3,504	42,860 (75%)

	Invensys)		
Leisure goods	1 (Philips)	1,714	23,189 (85%)
Total	47	24,321 (87%)	478,192 (88%)