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1. Introduction

In the second half of 2008, the dramatic worsening of the financial crisis led to severe disruptions in credit intermediation and a significant fall in consumer and business confidence. As the financial crisis intensified last autumn, economic indicators deteriorated and global economic activity fell sharply during the last quarter of 2008, with historical drops in trade and production. The economic outlook remains uncertain as the world faces its worst crisis since the Second World War. The crisis has important repercussion on the European economy.

The Commission's interim forecast (19 January 2009) estimates that economic growth has dropped to about 1% in 2008 (down from around 3% in 2007). In 2009, real GDP is expected to fall by less than 2% both in the EU and in the euro area, with the downswing expected to affect all countries, although at different rates (Table 1 in Annex). GDP growth is expected to turn moderately positive in 2010 as macroeconomic policies gradually stabilise world economies. Such a severe economic downturn will have a profound impact on labour market developments (Table 2) with negative impacts on disposable income growth and private consumption. Private investment is in general severely affected by the economic deterioration, with strong repercussions in particular on manufacturing industries.

This note recalls the role ICTs have played in driving growth and productivity in the past decade and provides a snapshot of current trends in the ICT sector on the basis of recent updates of leading consulting analysts. As changes take place rapidly, and forecasts are frequently updated, it is important to note that market forecasts at this time include a very high element of uncertainty about the length and the severity of the economic downturn. Thus, estimates provided in what follows should be treated with caution.

2. The economic impact of ICT: a reminder

In the context of the current economic and financial crisis, it is important to remember the central role played by the production and take up of ICT in driving innovation, productivity and growth[1]. Firstly, ICT-producing industries contribute directly to productivity and growth through their own rapid technological progress; secondly, ICT use improves the productivity of other factors of production; and thirdly, there are spill over effects on the rest of the economy as ICT diffusion leads to innovation and efficiency gains in other sectors.

The development of the EUKLEMS database, supported by the 6th Framework Programme, has allowed a direct comparison of the divergent productivity experiences of the US and the EU and the identification of the contribution of ICT to such divergence. Labour productivity growth in the US accelerated form 1.2% in the period 1973-1995 to 2.3% in 1995-2006. Conversely, the 15 EU countries that constituted the Union until 2004 experienced a productivity growth slowdown between these two periods (from 2.4% to 1.5%). Most of the economic literature attributes these divergent trends to the slower emergence of the knowledge economy in Europe as opposed to the US.[2]

In the mid-90s, the US experienced a productivity boost due to higher productivity originating from ICT-producing industries, as well as from a capital deepening effect due to investment in ICT assets throughout the economy. These changes were driven by the rapid pace of innovation in ICT, fuelled by the continuing fall in semiconductor prices. By contrast, the EU experienced lower productivity and growth contributions from investment in ICT and from ICT-producing industries (due to a smaller share of the ICT industry). However, the largest difference between the EU and the US, and for that matter between EU countries themselves, was due to the contribution of the overall efficiency of the production process. "Multifactor productivity growth" (which measures the joint influences on economic growth of technological change, efficiency improvements, returns to scale and other factors) accelerated from 0.5% to 1.4% in the US, while in the EU it fell from 0.9% to 0.3% . In particular, the

[1] A detailed analysis of the issue was produced in the i2010 HLG note "The economic impact of ICT: evidence and questions" (2006), available at http://ec.europa.eu/information_society/eeurope/i2010/docs/high_level_group/note_on_economic_impact_of_ict.pdf

[2] B. Van Ark, O'Mahony M. and Timmer M.P. (2008), "The productivity gap between Europe and the United States: Trends and causes", Journal of Economic Perspectives, vol. 22, No 1, pp 25-44.

US experienced more rapid productivity growth in market services, such as trade, finance and business services, than the EU.

For Europe to increase its productivity potential, therefore, it needs to find mechanisms to exploit service innovations for greater efficiency gains, and a new model of innovation and technological change, with greater emphasis on human capital, organisational change and other intangible investments, to make use of its own innovative capabilities. Further, a more flexible approach towards labour, product and capital markets would allow resources to flow to their most productive uses; and structural reforms in the context of the renewed Lisbon agenda are already delivering on these aspects. Finally, the achievement of a truly single market is important in order to exploit competition benefits as well as economies of scale.

The potential role of ICT in solving the crisis:

More specifically, ICT can contribute to a better handling and more swift recovery from the crisis. Firstly, ICT increases the productivity of those in work and leads to further innovation, productivity and growth. Indeed, during an economic crisis, the increased pressure on firms to be more efficient can lead to new innovations, including organisational ones. These innovations will be crucial for Europe's future growth once the crisis has faded. Secondly, investment in ICT infrastructure provides jobs to workers with a variety of skills. Thirdly, as the unemployment rate rises and more and more people are looking for a job, the use of ICT by jobseekers can make job matching more efficient and facilitate a swifter return to work. Fourthly, the ICT sector itself is an important source of jobs and growth. While it is not immune to the crisis, some segments such as software appear more robust than others, providing important sources of jobs and growth. Finally, direct support to facilitate the diffusion of ICT also contributes directly to employment and growth in the short/medium term. What are the implications at the time of the economic crisis?

- Direct support to the diffusion of ICT has a positive impact, as it contributes to efficiency gains throughout the economy. Measures aiming at the further spread of broadband, as in the recovery package, facilitate take-up and contribute directly to short-term employment measures.
- More could be done to stimulate intangible investments in organisational processes. Measures aiming at stimulating ICT-take up by enterprises in general, and investment in software in particular, should be continued as organisational innovation makes them more efficient and resilient to the crisis.
- Structural Funds and Rural Development Funds are available to strengthen investment in ICT. The Commission is providing faster avenues for spending, but the economic situation may make co-funding by Member States more difficult than under ordinary times.
- Companies and governments should not be cutting back on R&D and innovation activities, as R&D effort lays the foundation today to ensure the technological progress on which Europe will capitalise in the future. There is a risk, however, that because of the crisis firms in the ICT sector may cut back from the co-funding of R&D public-private partnerships.
- The ICT industry operates internationally and many ICT markets are global. ICT both facilitates the single market and globalisation and benefits from it. A coordinated EU policy response is needed to exploit the benefits from increased economies of scale, economies of scope, larger markets and greater competition.

The ICT sector is in fact being hit by the crisis, like all other sectors. The next section will look more in detail at the impact of the crisis on the ICT sector in Europe.

3. The ICT sector

The performance of the ICT sector, investment and markets remained moderately good until the third quarter of 2008, but the outlook deteriorated afterwards as in the rest of the economy. Growth however has not yet collapsed, as it did in the 2001-2 dot com bubble, and the restructuring which took place then has strengthened companies' resilience to the crisis. Nevertheless, the deterioration of the economic climate and the weakening of consumers' confidence have determined downward revisions for the performance of most ICT segments. According to EITO, growth in the ICT sector in Western Europe[3] is estimated at 1.2% in 2008. Some segments of the ICT sector are expected to weather the storm better than others. Spending in software, IT services and core communications-related services

[3] France, Germany, Italy, Spain, UK, Austria, Belgium, Denmark, Finland, Greece, Ireland, Luxembourg, Netherlands, Portugal, Sweden, Norway, and Switzerland

are expected to continue, although infrastructure investment may be postponed at the detriment of the manufacturing segments.

The ICT sector is the largest R&D investor in Europe and research activities are largely concentrated in its manufacturing segments. The economic slowdown, its uncertain outlook and the expected brake on earnings suggest a slowdown in the growth of R&D expenditure. There is a risk that the current financial crisis may undermine the recent positive development in R&D investment rate by European businesses. As the private sector will tend to limit its R&D spending, it would become all the more important to ensure that the public sector sustains, and even increases, its support to R&D.

3.1 Consumer goods and services

Worldwide spending in **computer hardware** is expected to fall sharply in 2009 (-5%), according to the outlook published by Gartner in December 2008, revising its June 2008 forecast (+4%). A 4% rebound of the same market is expected in 2010. The forecast is however gloomier for Western Europe, where the computer hardware market is expected to shrink by 8% in 2009 and to remain flat in 2010 with a mere 1% increase in 2011. Eastern and Central Europe IT markets[4] are expected to recover strongly in 2010 (+8%), after a 2% decline in 2009.

Problems in the personal computer business have increased the likelihood that 2009 will bring the first decline in PC sales since 2001[5], as Lenovo reported negative earnings, showing that corporate buyers in particular are cutting back, and low-priced machines could replace sales of traditional laptops. Negative expectations are also reflected in the sentiment of the European IT hardware producers. In November 2008, the confidence indicator[6] for the European computer industries[7] was at its worst level in more than 20 years and the situation was confirmed in December, with likely layoffs to accommodate the impact of weaker demand on balance sheets.

The impact of the current economic downturn should be relatively mild on the world demand for **software**. According to Gartner (December 2008), growth in global software spending should still be positive in 2009, even if a clear slowdown is expected in 2009 (7% against 14% in 2008), with faster growth restored in 2010 and 2011. Regional market performance will however experience different patterns, with growth expected at 8% in Eastern/Central Europe in 2009 and at a mere 2% in the more mature markets of Western Europe. Global markets growth in **IT services** will also remain in positive territory, even if the rate will plunge from +9% in 2008 to +1% in 2009 and experiences a strong downward revision since June 2008.

The combined expectations for software and IT services markets suggests that businesses will keep on spending to keep their information systems running, but may tend to postpone new projects. Nevertheless, increased pressure on profitability might push businesses to invest in solutions leading to better process efficiency. Furthermore, regulation in the financial sector is expected to have a significant impact on demand for software.

In 2008, the European **telecom service sector** continued to grow (1.3% in real terms), and investment was still on the rise (about 53 billion euro). Operators were hit hard by the crisis in 2001, but the effort made to restructure and alleviate debt then is paying off today. The essential nature of telecoms services and the stability of cash flows, ensured by the increasing take up of flat-rate bundled services, should help operators withstand the current slowdown relatively better than other sectors. On the contrary, still highly indebted companies and business plans based on pre-paid or usage-based customers approaches will suffer more. Moreover, like the rest of the economy, the sector is now facing higher borrowing costs which could affect its capacity to invest and have negative repercussions on equipment manufacturers. Investments planned for the first half of 2009, however, seem to have gone ahead, while conservative operating and capital spending plans are expected for the following year.

According to EITO (November 2008) growth in consumption of telecom services is forecast to decline in Western Europe in 2009, with a positive return to growth in 2010. The decline was already evident in 2007, driven by the maturity of some markets. In 2008, before the crisis unfolded, operators were looking for improvements in ARPU through deployment of new services, cuts in OPEX by means of NGN deployment, and investment in dynamic economies in Eastern Member States or in emerging economies like South America. In future, however, lower spending capacity by businesses and households may slow the adoption of new services (as consumers rationalize spending plans to focus on core telecom services) and make major operators focus on domestic markets instead. The credit crunch and uncertainty in terms of take-up may delay investment in high-speed and mobile broadband (in the

[4] However, their value is only 35%of that of Western Europe.
[5] FT, 9.2.2009: http://www.ft.com/cms/s/0/855ae2ce-f648-11dd-a9ed-0000779fd2ac.html
[6] http://ec.europa.eu/economy_finance/db_indicators/db_indicators8650_en.htm. It includes: assessment of order-book levels, assessment of stocks of finished products (negative sign), production expectations for the months ahead.
[7] NACE 30: Computer and office machines. Seasonally adjusted values.

second half of 2009). The evolution of the crisis in emerging economies is not helping the strengthening of the revenues generated outside Europe. Finally, it is not clear yet whether consolidation will take place. While smaller companies are exposed to acquisitions, the credit crunch may put a brake on M&A activities.

3.2 The ICT manufacturing sector

The rapid deterioration of the economic conditions since the last quarter of 2008 is reflected in estimates of expenditure in **telecom equipment**, both with regards to infrastructure equipment[8] and to mobile handsets. In December 2008 Gartner estimated the year-on-year growth rate for the segment for 2009 at 2% at the global level and at 1.3% and 2.4% for Western and Eastern Europe respectively.[9]

While a slowdown in sales of **mobile handsets** can be blamed for most of the decline, estimates confirm that expenditure in **infrastructure equipment** is expected to increase by 4.4%, although this is half of what was expected in June 2008, and seems to relate more to investment in upgrades of mobile rather than of fixed networks.

European manufacturers remain world leaders in the production of network equipment, with around 70% of the worldwide market, leveraging on their technological leadership and multinational presence.

Nonetheless views on the impact of the current climate on growth are diverging. With the exception of Ericsson, both Alcatel-Lucent and Nokia Siemens Networks have seen negative annual growth rates in revenues in the last quarter of 2008. One manufacturer expects a lift in demand driven by data traffic growth, boosted by uptake of wireless data cards in laptops, while the two others are less optimistic, with one forecasting a reduction between 8% and 12% in revenues from telecommunications equipment and related deployment services.

- While the handset divisions of equipment manufacturers may expect a bad financial year in 2009, there are diverging views on how increasing traffic in mobile broadband and investment in next generation fixed broadband access will spur demand for communications infrastructure by telecom operators;
- Manufacturers expect an increase in demand for network equipment in emerging markets such as China and India. Global contract sales of Huawei jumped by 46% in 2008 to €18.3 billion; the company also forecasted sales of more than € 23.5 billion in 2009 and has proved the best performing company in the segment. Its low prices, in part related to the strength of the euro, may represent a further barrier to the recovery of European companies.

Semiconductors are a key intermediate input into ICT equipment, as well as into other goods, such as cars. Production is highly cyclical (dropping sharply during downturns and recovering quickly in upturns) and the current slowdown is no exception. According to Gartner (December 2008), 2009 will witness negative growth in worldwide chip sales (-2%), driven by a slowdown in PC purchases, digital appliances and mobile handsets. Semiconductor companies have already cut their production by closing some facilities or by lowering the utilisation rate and are tightening inventory control. This should have a positive impact on market prices. The uncertainties of the semiconductor industry ultimately reflect the overall economic and financial turmoil. 2010 and 2011 are however expected to be strong rebound years. [10]

However, not all the difficulties in the semiconductor industry can be attributed to the economic crisis. The crisis comes on top of chronic oversupply, for example in the dynamic random access memory market (DRAM), which has seen many conglomerates separate or sell their semiconductor business over the last two years in order to restore their own profitability. The beginning of this year already saw Qimonda (controlled by Infineon and the world's fifth-largest manufacturer of DRAM chips), file for bankruptcy as a result of the combined effect on its business of the slide in chip prices and decreased access to financing on the capital markets. Other important players are also suffering severely from the crisis.

Within the ICT sector, the semiconductor industry features the highest R&D intensity[11]. Its development relies on interactions and collaborative relationships between the manufacturer, the semiconductor equipment and materials industry and R&D research centres. Despite a decline in its global market share, Europe can still be praised for its world-class innovation eco-system in semiconductors, on whose health other European industrial sectors rely for a secure supply of these

[8] Infrastructure equipment is divided into seven major segments: access, switching, routing, transport, business support systems, operations support systems and mobile infrastructure

[9] This result reflects a strong downward revision with respect to the June 2008 forecast (a reduction in expected growth by 6.4 and 11.3 percentage points respectively).

[10] Gartner Dataquest, "Impact of the financial crisis on semiconductor growth profile", 30.10.2008

[11] R&D spending over sales

basic components. It is because of its crucial nature for the European economy that the European semiconductor industry should not be allowed to fail.

Annex

Table 1: GDP at constant prices (annual % change)

	2006	**2007**	**Estimates 2008**	**Forecasts 2009**
BE	3.0	2.8	1.3	-1.9
DE	3.0	2.5	1.3	-2.3
IE	5.7	6.0	-2.0	-5.0
EL	4.5	4.0	2.9	0.2
ES	3.9	3.7	1.2	-2.0
FR	2.2	2.2	0.7	-1.8
IT	1.8	1.5	-0.6	-2.0
CY	4.1	4.4	3.6	1.1
LU	6.4	5.2	1.0	-0.9
MT	3.2	3.9	2.1	0.7
NL	3.4	3.5	1.9	-2.0
AT	3.4	3.1	1.7	-1.2
PT	1.4	1.9	0.2	-1.6
SI	5.9	6.8	4.0	0.6
SK	8.5	10.4	7.1	2.7
FI	4.9	4.5	1.5	-1.2
€ area	2.9	2.7	0.9	-1.9
BG	6.3	6.2	6.4	1.8
CZ	6.8	6.0	4.2	1.7
DK	3.3	1.6	-0.6	-1.0
EE	10.4	6.3	-2.4	-4.7
LV	12.2	10.3	-2.3	-6.9
LT	7.8	8.9	3.4	-4.0
HU	4.1	1.1	0.9	-1.6
PL	6.2	6.7	5.0	2.0
RO	7.9	6.2	7.8	1.8
SE	4.2	2.5	0.5	-1.4
UK	2.8	3.0	0.7	-2.8
EU	**3.1**	**2.9**	**1.0**	**-1.8**
US	2.8	2.0	1.2	-1.6
JP	2.0	2.4	-0.1	-2.4

Source: European Commission Interim Forecast, January 2009

Table 2: Number of unemployed (as % of the labour force)

	2006	**2007**	**Estimates 2008**	**Forecasts 2009**
BE	8.3	7.5	6.9	8.0
DE	9.8	8.4	7.1	7.7
IE	4.5	4.6	6.5	9.7
EL	8.9	8.3	8.3	9.0
ES	8.5	8.3	11.3	16.1
FR	9.2	8.3	7.8	9.8
IT	6.8	6.1	6.7	8.2
CY	4.6	4.0	3.9	5.1
LU	4.6	4.1	4.1	4.9
MT	7.1	6.4	6.5	7.4
NL	3.9	3.2	2.9	4.1
AT	4.8	4.4	4.1	5.1
PT	7.8	8.1	7.8	8.8
SI	6.0	4.9	4.5	5.2
SK	13.4	11.1	9.8	10.6
FI	7.7	6.9	6.4	7.8
€ area	**8.3**	**7.5**	**7.5**	**9.3**
BG	9.0	6.9	6.0	6.3
CZ	7.2	5.3	5.0	5.7
DK	3.9	3.8	3.5	4.5
EE	5.9	4.7	5.1	8.8
LV	6.8	6.0	6.5	10.4
LT	5.6	4.3	5.4	8.8
HU	7.5	7.4	7.7	8.8
PL	13.9	9.6	7.4	8.4
RO	7.3	6.4	6.2	7.0
SE	7.0	6.1	6.2	7.9
UK	5.4	5.3	5.7	8.2
EU	**8.2**	**7.1**	**7.0**	**8.7**

Source: European Commission Interim Forecast, January 2009