

The impact of the crisis on ICT and ICT-related employment

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FOREWORD

This report is a contribution to analysis of the relations between ICTs, the economic crisis and recovery requested at the December 2008 meeting of the Committee for Information, Computer and Communications Policy (ICCP Committee). It was reviewed by the Working Party on the Information Economy (WPIE) at its June 2009 meeting, and the ICCP Committee agreed to declassification of the updated report at its October 2009 meeting.

An OECD Secretariat team consisting of Christian Reimsbach Kounatze, Cristina Serra-Vallejo, and Graham Vickery, under the direction of Graham Vickery, prepared the report. It was updated to take into account all comments and the most recent data on developments through August-September 2009. These data are beginning to capture the drop in ICT-related employment following the earlier very sharp decline in ICT-related economic activity. The report should be read in conjunction with “The impact of the crisis on ICTs and their role in the recovery” [DSTI/ICCP/IE(2009)1/FINAL], which looks more broadly at ICT growth, R&D, financing, etc. in the recession and recovery. This report will contribute to preparation of the biennial *OECD Information Technology Outlook* (www.oecd.org/sti/ito). It has also been released under the code DSTI/ICCP/IE(2009)2/FINAL.

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SUMMARY

This report provides information on indicators that can be used in WPIE analysis of ICT employment trends. Analysis of short-term cyclical data show that employment is continuing to drop in the ICT sector – notably in the ICT goods sector and is remaining mostly flat in ICT services. Overall, in the second quarter of 2009, employment in ICT manufacturing in all reporting countries slumped by around 6-7% year-on-year. In most countries this is better than in the 2002-2003 period, but in some countries performance in this recession is worse than manufacturing in total. ICT services performance is heterogeneous, but is overall flat.

In terms of the employment performance of 80 global ICT firms analysed for this report, although they are shedding employees in Q1 and Q2 2009, this is not yet on the same scale as around 2002, even in semiconductor firms which are seeing very rapid declines in revenues. One explanation is the much better net cash position of ICT firms in this recession compared with the last one. In general large firms have reduced the number of employees by 1-2% (compared with 2008) during this phase of the recession, with the exception of semiconductor firms, where 4% of jobs have been cut. Current announcements by firms suggest that employment will soon drop by an additional 2-3% across all sectors. However, some niche ICT industries including green ICTs, virtualisation, and cloud computing are promising to develop new ICT employment despite the crisis. While not laying-off, some top-10 firms are considering, or have already adopted, other cost-cutting strategies such as pay freezes and cuts of social benefits including *e.g.* healthcare and pension plans.

ICT sector employment is cyclical, just as is value added, but it lags the value added recession cycle. During the last recession, employment reached a peak in 2000-2001 (2000 in manufacturing, 2001 in services), bottomed out in 2003-2004 and only started growing again in 2005, considerably later than the pick-up in production and value added. This suggests that ICT employment may be slow to pull out of this recession, even if the structural causes of the recession are different from the last one. Finally, looking more broadly across the economy at ICT-related employment, there has been continuing growth in the share of ICT specialists in the total labour force, but a flattening of the share of ICT-intensive users.

INTRODUCTION

With the deepening of this economic crisis, unemployment has risen rapidly and there is mounting pressure on existing employment. Employment in the ICT industry itself is around 5.5% of total business sector employment. Employment of ICT specialists (software engineers, IT technicians, etc.) across the whole economy is around 3-4% of total employment and up to 5% in some countries, and over 20% of total employment is taken up by intensive users of ICTs (office workers, professionals, etc.). Thus the share of employment in the ICT sector and in ICT-related areas is significant and the evolution of this employment deserves attention in the current recession and recovery. Despite forward-looking indicators showing stronger signs of recovery in most of the OECD economies (OECD Composite Leading Indicators, 11 September 2009), unemployment is expected to continue rising for some time. This follows the usual business cycle pattern of unemployment lagging declines in output.

This report presents the results of analysis of short-term movements and long-term trends in ICT-related employment and compares these with broader trends in employment across the economy. It focuses on:

- Recent trends in ICT and ICT-related employment.
- Comparisons with some measures of aggregate employment.

Related work for the *Information Technology Outlook 2010* will consider what ICT policy or broader employment policy can do to change the employment numbers or skill sets of employees in ICT and ICT-related employment. There are potential impacts on ICT employment from government strategies to deal with the economic crisis. Governments in OECD countries have announced or introduced economic stimulus packages to address the economic crisis. These packages aim to stimulate demand in the short term, by improving the flow of money and restoring the health of the banking sector, protecting existing jobs and creating new ones. Most governments also plan to foster growth through supply-side investments and demand-side measures to help restore conditions for long-term growth. In many cases, these plans are directly relevant to the ICT sector and technology diffusion. In particular, their focus on job creation coupled with a bias towards new technologies and ICT-intensive “smart” investments and “green growth” suggests considerable impacts on ICT-related employment.

The next sections look at employment indicators used previously in the *Information Technology Outlook*, and supplement these with new data and analysis on firm-level data from the top ICT firms. These indicators are used to analyse recent trends in ICT and ICT-related employment, and to compare these trends with other sectors and with aggregate employment to identify trends during the current turbulent labour market conditions. It is intended that some of the indicators and analysis presented in this overview be included in an employment Chapter in the *OECD Information Technology Outlook*, 2010 edition.

PRELIMINARY OVERVIEW OF INDICATORS

Short-term indicators of ICT goods and services employment

Some countries regularly publish official national data on employment at a disaggregated level, which can be used to analyse short-term cyclical trends in ICT sector employment. These indicators use official monthly or quarterly employment data mainly based on Labour Force Surveys. Due to rapid downward movements in employment in some countries these are presented as 3-month moving averages to iron out very short-term monthly fluctuations. These data are presented in the Annex Figures 1-13 for Canada, Germany, Japan, Korea, Sweden, the United Kingdom, the United States, China and Chinese Taipei. These data are usually available with a lag of around 3 months behind the current period, so they have not yet captured the full extent of employment performance of the ICT sector during the last months. Furthermore, declines in employment usually lag those in production and we can expect employment to continue to decline for around one year after the economy has begun to pick up.

Overall the data presented in Annex Figures 1-13 show the following developments:

- For the second quarter of 2009, employment in ICT manufacturing in all reporting countries slumped by between 6 and 7% year-on-year. Sweden is the only exception with a smaller decline (3%), but accelerating compared to the first quarter. The United States has fared worst and the turndown in ICT manufacturing employment reached 10% in September 2009.
- Compared to overall manufacturing, ICT goods employment is holding up better in Canada, Sweden, the United Kingdom and the United States. The sector fared worse than total manufacturing in Germany, Japan and China. Germany has experienced a relatively stronger drop in ICT goods employment in the second quarter of 2009 and is the only country where ICT manufacturing firms have made relatively larger employment cuts than automotive firms, possibly due to government incentives to purchase motor vehicles supporting automobile jobs.
- Comparisons over time are difficult because of lack of historical data, classification changes and lack of detailed data from some large producers. But where comparable data are available, ICT manufacturing employment is still performing better than during the last downturn in 2002-2003 (Canada, United Kingdom, United States).
- ICT services employment (including telecommunications services) has tended to be flat or increasing slightly (up to 1%) in most countries where data is available (Canada, Germany, Japan, Sweden, Chinese Taipei). Korea and China have seen even stronger employment growth rates in the most recent quarter. Employment has declined in the ICT services sector by 2% in the United Kingdom and the United States.
- Compared to other services sectors, the picture is more heterogeneous than for ICT manufacturing. In Korea, the United Kingdom and Chinese Taipei ICT services employment has fared better than the financial sector; in Sweden, the United States and China both sectors perform similarly, whereas in Japan ICT services employment is performing far worse. In Canada, ICT services employment growth is around the same as total services.

- IT services are generally performing better than telecommunications services in terms of year-on-year employment performance.

Overall, in the second quarter of 2009, employment in ICT manufacturing in all reporting countries slumped by around 6-7% year-on-year. In most countries this is better than in the 2002-2003 period, but in some countries performance in this recession is worse than manufacturing in total. ICT services performance is heterogeneous, but is overall flat.

Employment in large ICT firms

This section describes employment performance for a set of top-250 ICT firms in eight different ICT sectors to compare recent employment trends in more detail. These data are designed to supplement and expand the data available from official sources. The numbers of employees in the set of firms in each sector is pooled to make up the Top-10 firm sector groupings. Employment figures for 2007, 2008, and for the first half of 2009 are then compared with 2000, 2001, and 2002 respectively. Although the most recent employment data for the first half of 2009 cannot be compared on a year-on-year basis with earlier full years, those data provide a snapshot of the current employment situation in large ICT firms.¹

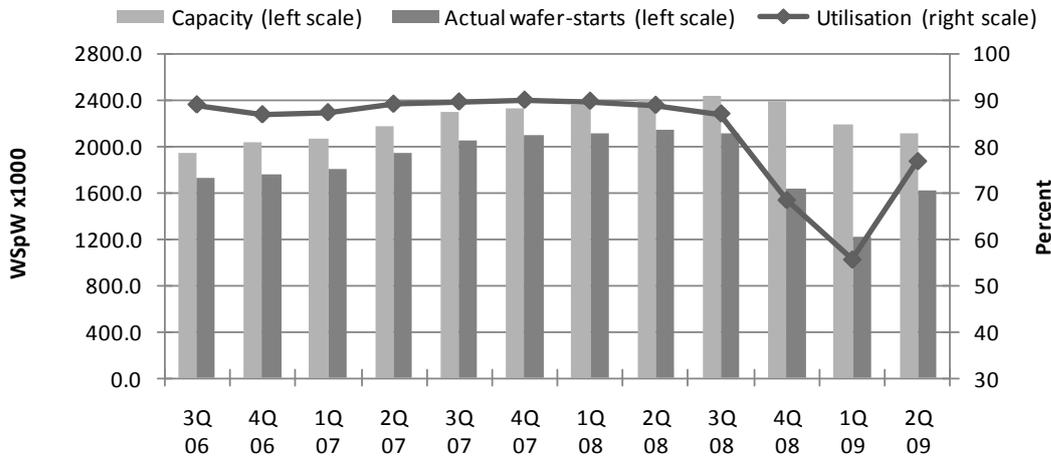
The “sectors” summarized below comprise the top-10 ICT firms in each sector, as identified in the *Information Technology Outlook 2008* (OECD, 2008). Overall the results suggest that there is considerable variation in results across sectors as would be expected in the recession. Geographical and firm-specific factors also account for a great deal of variability, but employment is generally dropping, and very sharply for some firms.

Semiconductors

The semiconductor industry, as usual, was the earliest of all ICT sectors to be hit by the economic recession. High manufacturing over-capacity in the last quarter of 2008 and the first quarter of 2009 have significantly increased the pressure on employment in the industry. Utilisation rates of semiconductor manufacturing facilities in Q1 2009 fell to almost 55%, lower than the equivalent trough in 2001 (see OECD, 2009d). In Q2 2009, the utilisation rate, however, has rocketed upwards, up to 77%, mainly due to increased wafer-starts (+3% compared to Q1 2009) and decreased capacities (-4% compared to Q1 2009) (see Figure 1). Furthermore, the year-on-year growth rate of the total quarterly revenue of top-10 semiconductor firms in Q2 2009 was the highest since the first quarterly revenue drop in Q4 2008. Increased utilisation rate and quarterly year-on-year growth in Q2 2009 suggest that the current pressure on employment in the semiconductor industry could decrease.

¹ For more details on the methodology and approach used refer to OECD (2009d).

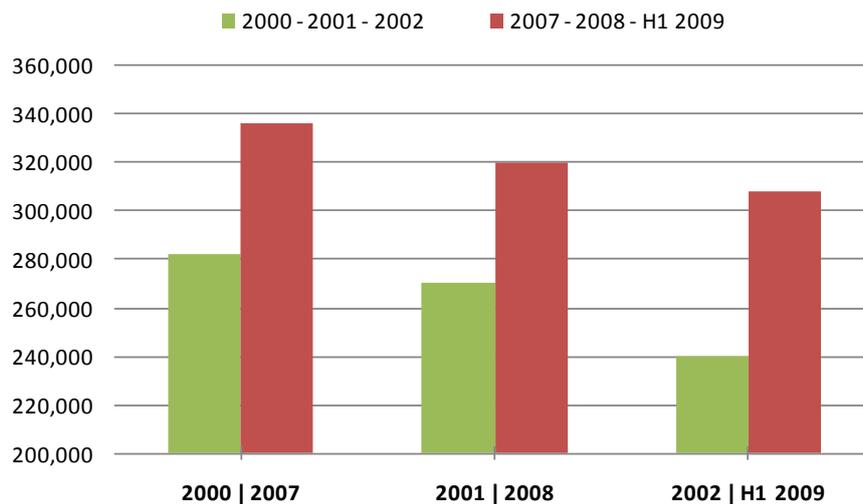
Figure 1. Utilisation rate of semiconductor manufacturing facilities



Source: Semiconductor Industry Association, August 2009.

In 2008, total employment by top-10 semiconductor firms fell by almost 5% compared to 2007, and most recent data show a further decrease in the first half of 2009 of 4% compared with 2008, but still not at the amplitude of 2002 where more than 30 000 jobs were cut (-11% of the total workforce) (Figure 2). In the first half of 2009, top-10 semiconductor firms employed almost 310 000 people. This is almost 12 000 employees less than in 2008 (-4% of total workforce) and more than 27 000 employees less than in 2007 (-8%). Infineon, ASM International, and AMD employed a significantly lower workforce in the first half of 2009 than in 2008 (almost 10% of their respective employees were laid off), and Intel, which employed more than one quarter of the total workforce of top-10 semiconductor firms in 2008, reported the highest number of job cuts among top-10 semiconductor firms (-3 400, -4%).

Figure 2. Employment by year, Top-10 "Semiconductors"



Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance based on firms' most current reports and press releases. The number of Freescale employees for H1 2009 has been estimated using press releases.

The number of job cuts could further increase until the end of 2009, as the number of lay-offs announced by top-10 semiconductor firms for this year has not been reached yet. Intel, for instance, announced cuts of up to 6 000 jobs (-7% of the total workforce) primarily at its manufacturing plants at various locations in the world, by the end of 2009.² This is 2 600 employees (3% of total workforce) more than the current reported number of lay-offs. Further examples include Texas Instruments cutting 3 400 jobs (-12%) by the end of the third quarter of 2009³, European chipmaker STMicroelectronics announcing 4 500 (net) job cuts (-8%) worldwide by the end of 2009, and Freescale announcing the closure of its fabrication facilities in Sendai, Japan and Toulouse, France by 2011, affecting around 2 000 people. Additionally, mergers such as that announced between Japanese Renesas Technology and NEC Electronics could further increase the pressure on employment in the semiconductor industry.⁴ These announcements together suggest that total employment by top-10 semiconductor firms could drop by 7% by the end of 2009 compared to 2008. Although lay-offs for 2009 in that case would still not reach the amplitude of 2002, total employment by top-10 semiconductor firms would drop below 300 000, the level in 2004.

However, those announcements must be treated carefully as many companies, strengthened by their better net cash position, are also investing and hiring (but possibly at a lower rate) in new areas such as green ICTs to assure future competitiveness (see Box 1). Furthermore, with government promoting “smart” applications, demand for controllers and sensors could be expected to increase, as they are one of the main components for most “smart” applications (see Box 2).

Box 1. Green ICT jobs in the semiconductor industry: energy efficient chips

Despite the crisis, firms continue to invest in green ICTs according to recent surveys (Gartner, 2009; Info-Tech Research, 2009; Datamonitor, 2009; Mines, 2009). As energy efficient semiconductors are the basis for green ICTs, this trend could help revenues in the semiconductor industry and as a consequence it could support employment among semiconductor firms.

Computer Processing Unit (CPU) manufacturers are taking advantage of that trend by upgrading existing or building new manufacturing facilities, to produce new energy efficient CPUs. Intel, for example, has announced that it will invest USD 7 billion in the next two years in four existing manufacturing sites in the United States,⁵ to be upgraded with the new 32 nanometer manufacturing technology enabling the production of faster and smaller energy efficient chips. Intel’s investment “will support approximately 7 000 high-wage, high-skill jobs” (Intel, 2009b).

As another example, GLOBALFOUNDRIES, a joint venture between AMD and the Advanced Technology Investment Company (ATIC),⁶ will invest USD 4.2 billion to build Fab 2, a new semiconductor manufacturing facility in New York, United States. When operational in 2012, Fab 2 will provide 32 nanometer manufacturing technology to chip-makers. It is expected to create “more than 1 400 high-tech manufacturing jobs, with an average annual salary of USD 60 000 per year” (AMD, 2009; GLOBALFOUNDRIES, 2009).

² Those locations include test facilities in Malaysia and the Philippines, as well as wafer production plants in Oregon and California, United States (Intel, 2009a).

³ The number of job cuts announced by Texas instruments includes 1 800 positions through layoffs and 1 600 through voluntary retirement (King and Garner, 2009).

⁴ The merger of NEC Electronics and Renesas Technology will create the biggest Japanese semiconductor company and the third biggest semiconductor company in the world (Wilson, 2009).

⁵ Those manufacturing sites are located in Oregon, Arizona and New Mexico (Intel, 2009b).

⁶ ATIC is an investment company owned by the Government of the Emirate of Abu Dhabi.

Box 2. Green ICT jobs in the semiconductor industry: controllers and sensors for “smart” applications

Governments in OECD countries are promoting “smart” applications such as “smart” grids, “smart” buildings, and “smart” transportation, as part of their green ICT strategies or their stimulus packages (OECD, 2009a, OECD, 2009c). Demand for controllers and sensors could therefore be expected to increase, as they are one of the main components for “smart” applications (OECD, 2009b). However, global demand for controllers and sensors is still low in general and especially in the automotive sector where controllers and sensors are used to build “smart” engines. As a consequence, employment in manufacturing of these technologies remains under pressure, despite “smart” applications being promoted by governments.

Infineon is one of the world leaders in the market for controllers and sensors for energy efficiency. Its *Industrial Electronics* segment, which mainly produces energy efficiency semiconductors for manufacturing, is the second most important segment after *Wireless Solutions* and before *Automotive* in terms of generated revenues. In the second quarter of 2009, *Industrial Electronics* generated 26% of total quarterly revenue (compared to 30% by *Wireless Solutions* and 24% by *Automotive*). In terms of year-on-year growth, however, quarterly revenues in Q2 2009 dropped significantly for *Industrial Electronics* (-21%) as well as for *Automotive* (-34%), in contrast to growth in *Wireless Solutions*, +22%. This suggests that most of the 3 000 employees that Infineon made redundant in the first half of 2009 were employed in the *Automotive* and the *Industrial Electronics* segment.

A similar pattern can be observed at STMicroelectronics in controllers and sensors. STMicroelectronics’ segment for *Analog Power and Micro-Electro-Mechanical Systems (APM)*, generated the highest share (21%) of total revenue in the first half of 2009, followed by *Wireless Multi Media* (14%) and the *Automotive Products Group (APG)* (11%). In terms of year-on-year growth, its *Automotive Products Group* and its *Analog Power and Micro-Electro-Mechanical Systems* suffered the steepest decline in revenues in the first half of 2009 (-48% and -35% respectively). This has led STMicroelectronics to announce 4 500 (net) job cuts (-8%) worldwide by the end of 2009, in particular focusing on its *Automotive Products Group* (beside its wireless and computer peripherals segment) (Ashford, 2009).

Freescale has also announced that it will reduce its number of employees, especially those working at its automotive segment. The company has announced the closure of its fabrication facility in Sendai, Japan by 2011, affecting 600 people (Akinori, 2009). In addition, Freescale is negotiating the closure of its fabrication facility in Toulouse, France by 2011 or later and 900 jobs are expected to be cut (*EE Times*, 2009). In May 2009, the company completed the closure of its fabrication facility in East Kilbride, United Kingdom, as announced in June 2008, with 800 employees being laid off (Walko, 2008). In all three locations, Freescale produces microcontrollers and sensors to increase energy efficiency mainly in the automotive market. Nevertheless, Freescale is keeping R&D in energy efficient technologies high (e.g. for motor control and power control for appliances). Its centre of excellence in Roznov, Czech Republic, is dedicated to R&D in this field and employs “nearly 100 specialists” (*EE Times*, 2009; Freescale, 2009).

IT equipment

The IT equipment industry, especially in Asia, was severely affected by the downturn due to slowing demand for computers and consumer electronics devices, and decreased spending on enterprise servers. Global PC shipment in the final quarter of 2008 declined for the first time since 2002, and total quarterly revenues of top-10 IT equipment firms started to drop in the last quarter of 2008 even faster than during the crisis in 2001-2002 (see OECD, 2009d).

Where available, employment data, however, do not reveal strong job cuts among top-10 IT equipment firms yet. On the contrary, employment has been stable since the beginning of 2009 compared with 2008. In the first half of 2009, top-10 firms employed more than 1.9 million people (see Figure 3).⁷ This is around 10 000 less than in 2008 (-1% of total workforce), but still 239 000 employees more than in 2007 (+14%). However, some top-10 IT equipment firms have significantly reduced their workforce in the first half of 2009. Dell⁸, NEC, and IBM cut around 11 000 jobs compared to 2008 (-13%, -6% and -3% of their respective workforce). A net increase in employment by Fujitsu (+20 314, +12%) has almost compensated those job cuts. However, the increase in employment numbers at Fujitsu mainly results from its acquisition of shares in Fujitsu Technology

⁷ This does not include more than 100 000 employees of ASUSTek in the beginning of 2009.

⁸ Dell is also migrating 1 900 jobs from its plant in Limerick, Ireland to Lodz, Poland with the transition completed in the beginning of 2010 (Mellor, 2009; Grajewski, 2009).

Solutions, formally owned by Siemens and the acquisition of two IT services firms based in Australia: the KAZ Group and Supply Chain Consulting.

Figure 3. Employment by year, Top-10 "IT Equipment"



Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance based on firms' most current reports and press releases. This figure does not include the number of employees of ASUSTek for all periods and of Quanta for 2002 and earlier. The number of HonHai employees for 2002 has been estimated using 2001 employment data, and for 2008 using 2007 employment data.

This development is to some extent comparable with that experienced in 2000-2002, when employment was almost stable (see Figure 3). However, companies have announced further lay-offs (*e.g.* Toshiba: 4 500 jobs, -2%; and Fujitsu (Services): 1 200 jobs in the United Kingdom, -1%), and other companies report cutting jobs but have made no public statements on the expected magnitude of cuts (HP, IBM, Hon Hai). At the same time, however, some companies point out that recruitment will continue. Overall, total employment among top-10 IT equipment firms for 2009 will most likely not change dramatically compared to 2008, particularly if the Asian upturn continues.

While not laying off, some top-10 IT equipment firms, however, have implemented a wide range of cost reduction strategies deeply effecting employment. Fujitsu, for instance, has ordered a company wide pay freeze, and has reduced the number of contractors and temporary workers, before starting job cuts as for instance in the United Kingdom in Q3 2009 (Fujitsu, 2009). Employees of HP, as another example, were facing voluntary pay-cuts, and involuntary cuts to some of their social benefits such as holidays, healthcare, and pension plan are being considered (Flinder, 2009c).

With firms continuing to invest in green ICTs (see Box 1), IT equipment firms could expect increased revenues through higher sales rates of their energy efficient servers and PCs. However, green ICT also means a threat for IT equipment firms, as it includes virtualisation⁹ as one of the main technologies. With the increasing deployment of virtualisation substituting (physical) servers, revenues of IT equipment firms could come under pressure in the long term (see section on software).

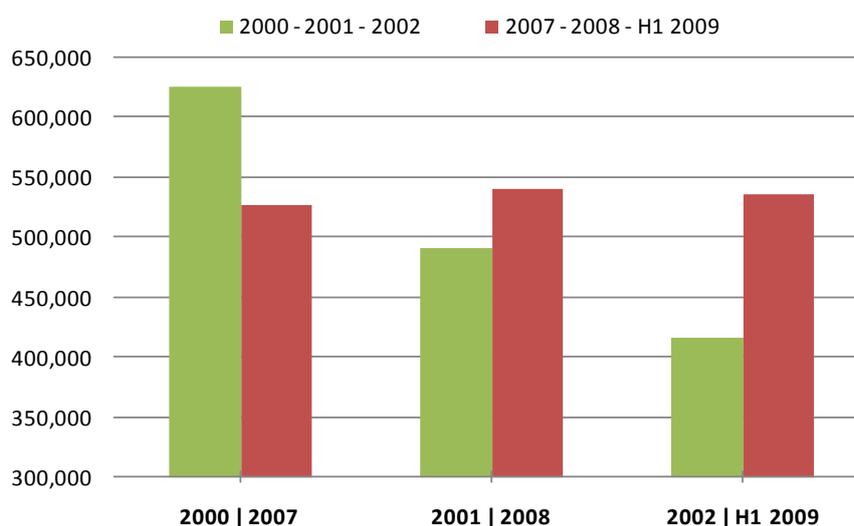
⁹ Virtualisation is a technique substituting physical machines with software applications simulating those machines. By using virtualisation, multiple servers can be consolidated through a single physical server. The power consumed by servers can be reduced as well as the need for building new data centre facilities. Virtualisation also gives IT executives greater flexibility in deploying ICT applications.

Communications equipment

Different developments in markets for handsets and ICT infrastructure have led to heterogeneous trends in the communications equipment sector. While handset sales in general slowed (-3.5% in 2008), smartphones have become a major area of growth. Furthermore, investments in infrastructure networks are expected to slow in 2009, while growth in advanced wireless broadband networks persists. Quarterly revenue of top-10 communications equipment firms increased or fell depending on their focus. Overall, total quarterly revenue dropped by 15% year-on-year since the beginning of 2009, increasing pressure on employment in the communications equipment industry (OECD, 2009d).

Most recent employment figures, however, do not show any big job cuts among top-10 communications equipment firms yet. Particularly, mass layoffs have not taken place as observed during the crisis in 2001-2002, where employment by top-10 communications equipment firms dropped by 15% in 2002 compared to 2001 and by 33% compared to 2000. In the first half of 2009, top-10 communications equipment firms employed more than 535 000 people, 1% less than in 2008 and 2% more than in 2007 (Figure 4).¹⁰

Figure 4. Employment by year, Top-10 "Communications Equipment"



Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance based on firms' most current reports and press releases. This figure does not include the number of Huawei employees.

As in other ICT hardware sectors, however, many communications equipment companies have announced job cuts for 2009 (Motorola: 4 000, 6% of total workforce; Ericsson: 5 000, 6%; Nokia; Nortel). At the same time, growing demand for some communications and Internet infrastructures leads companies such as Qualcomm to announce at least 2 600 engineering recruitments during 2009. These announcements altogether suggest that employment by top-10 communications equipment firms could drop by around 2% by the end of 2009 compared with 2008.

¹⁰

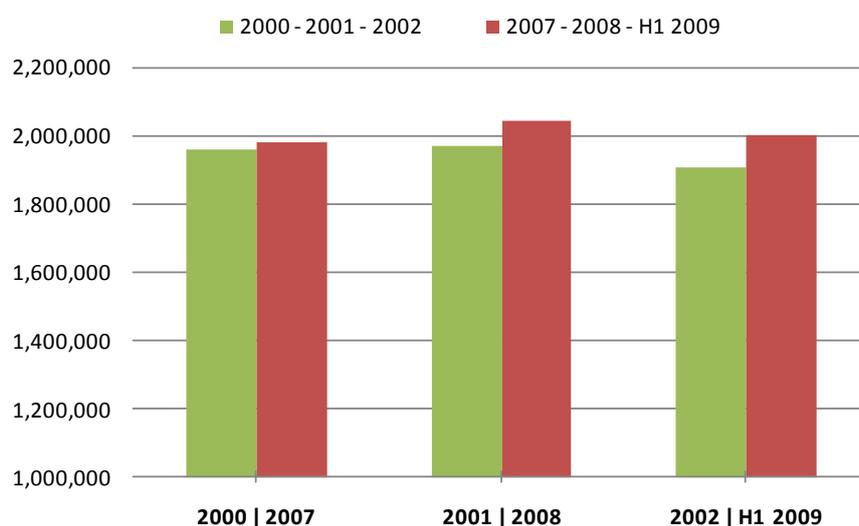
This does not include the number of people employed by Huawei.

Electronics

The electronic sector was hit by declining global sales led by falling demand for a wide range of consumer electronics and related components. Quarterly revenues started to fall in the last quarter of 2008, with Japanese firms suffering the strongest decline in the first quarter of 2009 partly due to a strong JPY, suggesting significant layoffs in Japan (OECD, 2009d).

The impact of the current crisis on employment in top-10 electronics firms until now has been, however, relatively small compared to the crisis in 2001-2002, where in 2002 more than 65 000 jobs were cut (3% of the total workforce). In the first half of 2009, top-10 firms employed 2 million people, which is almost 38 000 people less than the total number of employees in 2008 (-2% of the total workforce), however, this is still 22 000 employees more than in 2007 (+1%) (Figure 5). Employment in Japanese firms was most strongly hit by the crisis. Panasonic and Sony, for instance, have both reported a significantly reduced number of employees in the first half of 2009 compared to 2008 (Panasonic: -17 000, -6% and Sony: almost -10 000, -5%). Nevertheless, two Japanese top-10 firms are opposing this trend: Canon has increased the number of its employees by around 7 000 (+5%) in the first half of 2009 compared to 2008, and Sharp by more than 1 000 people (+2%).

Figure 5. Employment by year, Top-10 "Electronics"



Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance based on firms' most current reports and press releases. The number of employees of LG and Samsung for 2008 and of Samsung for 2001 have been estimated using employment data for 2007 and 2000 respectively. The number of Panasonic employees in 2000 has been estimated by using 2001 employment data.

Overall, total employment among top-10 electronics firms is most likely to stay at around 2 million (-2% of total workforce) until the end of 2009 as no significant lay-offs have been announced yet.¹¹ New growth markets, especially in green technologies such as efficient batteries, "smart" grids, and solar cells could stimulate or at least stabilise employment in the electronics industry (OECD, 2009d) (see Boxes 1 and 2 on green ICT Jobs in the semiconductor industry).

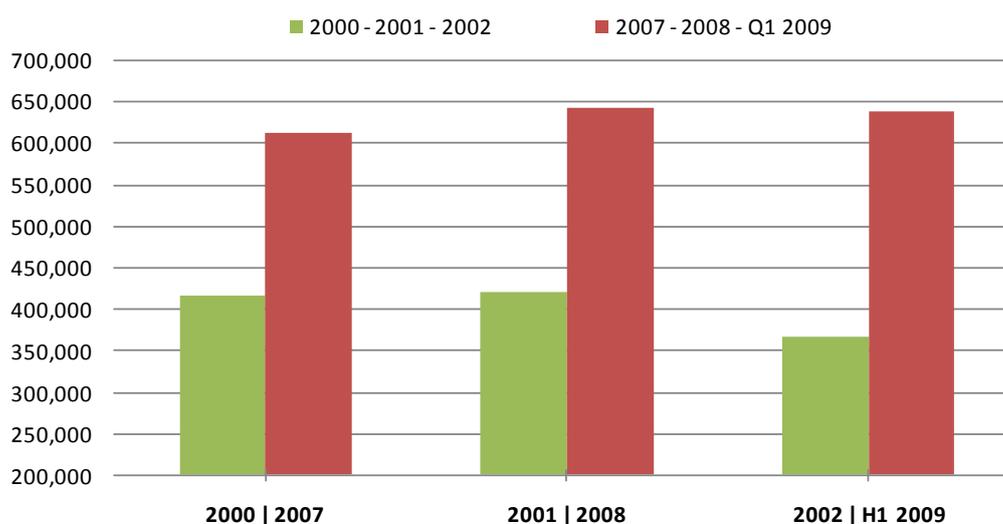
¹¹ Insignificant announcements of layoff, in terms of absolute and relative numbers, so far include Samsung announcing a cut of 500 jobs (less than 0.2% of total workforce) while upgrading its memory fabrication facility in Texas, United States.

IT services

The IT service industry has been able to maintain growth throughout most of 2008 with demands for IT and Business Process Outsourcing (ITO/BPO) holding as executives continue to focus on reducing costs via (offshore) outsourcing. In the beginning of 2009, however, quarterly revenues of the top-10 services firms started to fall, partly due to small and short-term IT projects (with short amortisation periods) being favoured over high-value and long-term IT investments and Total Contract Value (TCV)¹² falling in 2009 compared to 2008 (OECD, 2009d).

Total employment by top-10 IT services firms has slightly decreased in the first half of 2009 compared with 2008, but definitely not as strongly as in 2002, where employment dropped by up to 13%. In the first half of 2009, top-10 IT services firm employed more than 638 000 people, which is almost 4 000 employees less than in 2008 (-1% of total workforce). Compared to 2007, however, employment figure still show a 4% growth (Figure 6). Accenture, Cap Gemini, and Atos Origin, who together account for more than half of total employment in 2008 among top-10 IT service companies, have significantly reduced the number of their employees in the first half of 2009 (Accenture: -9 000, -5%; Cap Gemini: -2 000, -2%; Atos Origin: -1 500, -3%). Meanwhile, some IT services firms such as Affiliated Computer Services and Computer Sciences Corporation continued hiring in the first half of 2009, preventing a deeper decrease in employment (Affiliated Computer Services: +4 000 employees, +6%; Computer Sciences Corporation: +3 000, +3%).

Figure 6. Employment by year, Top-10 “IT services”



Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance, based on firms' most current reports and press releases.

Until now, no additional big layoffs have been announced by top-10 IT services firms, suggesting that employment will stay at almost the current level until the end of 2009.¹³ While not laying off employees, IT services firms such as Cap Gemini have announced slower hiring for 2009. This is also the case for top Indian IT services firms such as Tata Consultancy Services (TCS) and Infosys, which despite the crisis still expect to grow, albeit in single digit (see Box 3).

¹² The Total Contract Value (TCV) is the potential revenue associated with the outsourcing contract and estimated at the start of the contract.

¹³ Insignificant announcements of layoffs, in terms of absolute and relative numbers, so far include Accenture announcing a cut of 7% in its senior-executive ranks until the first quarter of 2010, which is about 336 jobs.

Box 3. Offshore outsourcing and ICT employment

As is the case for all costs, the economic crisis has put IT services costs under pressure. This may benefit outsourcing due to increased internal cost-cutting and perceived benefits from more flexible external sourcing of IT and Business Process (BP) services. In terms of total IT budgets, forward looking surveys undertaken in 2008 for the year 2009 showed that many IT executives planned to increase their IT budget in 2009 but some were already planning to cut budgets as they had done in 2008. Recent quarterly data on the outsourcing market however indicate that, despite the number of outsourcing transactions still increasing, revenue growth through IT and BP outsourcing will probably decline in 2009, due to falling Total Contract Values (TCV) (see OECD, 2009d). Contrary to the general trend, the Asia Pacific region is performing very well with TCV in the first half of 2009, increasing by more than 150% over the first half of 2008, although from a low base.

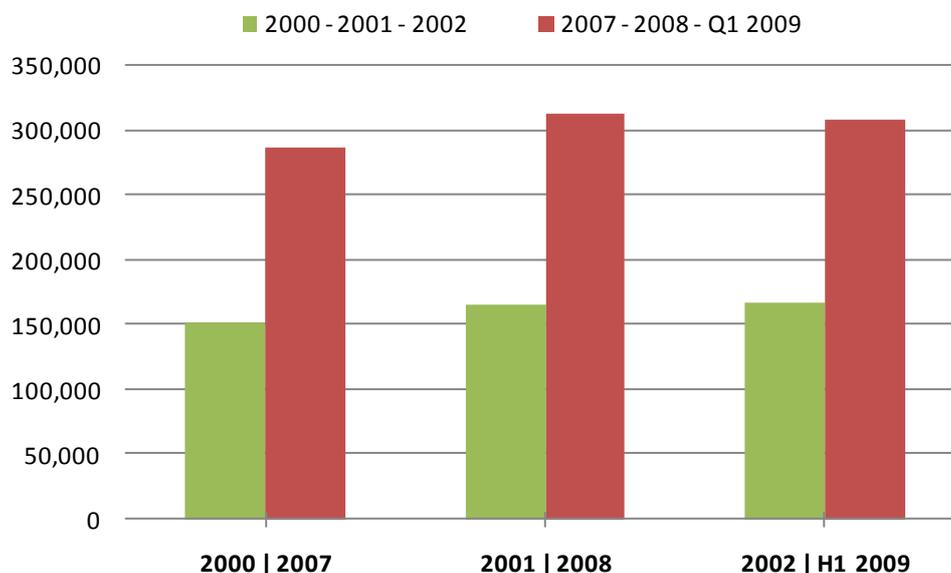
Against this background, Indian firms providing outsourcing services have remained relatively optimistic as they change their service product mix to adapt to changing market demands. They are still increasing their number of employees, although recruitment is slowing. Tata Consultancy Services (TCS), for instance, employed almost 142 000 people in the first quarter of 2009. This is a year-on-year increase of 21%. Recruitments already started to slow in the beginning of 2008, when new hiring by leading Indian service providers dropped by 22% in the first quarter of 2008 and by almost 50% in the second quarter compared to the same period one year earlier. These lower recruitment rates are also reflected in the decreasing number of new offshore centres opened by IT services firms (Everest Research Institute, 2009a).

On the client side, in contrast, IT and BP outsourcing has led to job cuts or at best to job transfers to the outsourcing providers (see for example Oates, 2009). With offshore outsourcing, however, job transfers become unlikely, and concerns have been raised (once again) whether increased offshore activities could lead to a shortage of ICT skills in OECD countries in the long term (ComputerWeekly, 2009). This could indeed not only become a serious issue for the ICT sector after the crisis, but could reinforce the need for further offshoring as ICT skill shortage is known to be a driver for offshore outsourcing (see OECD, 2006). If the number of Master and PhD graduates, especially in Science and Engineering (S&E), fall in the future and international migration of IT specialists and professionals via visa programs such as H-1B in the United States continues to be restricted, a shortage of ICT skills is most likely to occur again and reinforce the need for further offshoring. However, this vicious circle could be mitigated by Indian service firms increasingly recruiting in OECD countries as more IT staff are looking for work (Flinder, 2009a).

Software

Major software firms maintained quarterly revenue growth throughout 2008. However, slowing investment in long-term and high-value software projects has caused total quarterly revenue of top-10 software firms to fall since the first quarter of 2009, increasing the pressure for layoffs in the software industry or at least slowing hiring (OECD, 2009d).

Until now two top-10 software firms (SAP and Microsoft) reported they have employed significantly less people in the first half of 2009 compared to 2008. Both cut around 3 000 jobs compared to 2008 (-6% of SAP's workforce and -3% of Microsoft's workforce). A higher number of employees at Amdocs and Oracle could not compensate total employment decreases among top-10 software firms (Amdoc: +1 500, 9%; Oracle: +1 700, +2%). In the first half of 2009 top-10 software firms employed in total almost 310 000 people, which is around 3 000 people less than in 2008 (-1% of total workforce), but still almost 22 000 people more compared to 2007 (+8%) (Figure 7).

Figure 7. Employment by year, Top-10 "Software"

Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance, based on firms' most current reports and press releases. The number of Microsoft employees for 2008 is based on press releases.

However, total employment among top-10 software firms can be expected to decrease until end 2009, as job cuts for the near future have been announced – currently more than 7 000 jobs (over 2% of total workforce). Microsoft, for instance, announced cuts of 5 000 jobs for 2009 and 2010 (more than 5% of its employees) (Lai and Gaudin, 2009). This is 2 000 (2% of its workforce) more than the current reported number of lay-offs. This would be the first time that employment numbers at Microsoft have fallen. Overall, these announcement suggest that total employment by top-10 software firms could drop by almost 4%, to just below 300 000 by the end of 2009.

Software firms, however, could profit from increasing demands for virtualisation, which remain high despite the crisis as firms are looking for ways to reduce their IT and IT energy costs. Consequently, demand for virtualisation experts can be expected to increase (see Box 4).

Box 4. Green ICT jobs in the software industry: the effects of virtualisation

With IT budgets tightened due to the crisis, IT executives are looking for ways to reduce their IT costs including IT energy costs. According to most recent surveys, firms continue to invest particularly in virtualisation in order to consolidate and “green” corporate ICTs (Gartner, 2009; Info-Tech Research, 2009; Datamonitor, 2009; Mines, 2009). This suggests that employment in the virtualisation supply market could remain more stable over the next quarters compared to other ICT industries and that demand for virtualisation experts will increase.

Several top ICT firms are providing virtualisation solutions, whether as an integrated part of their IT solutions (e.g. Microsoft, Oracle) or as single software products (e.g. VMware, Citrix Systems). VMware is the market leader with more than 80% of virtualised computing workloads running on its platforms and the remainder shared by Microsoft’s *Virtual Server and Virtual Hyper-V products*, Citrix Systems’ *Xen*, Oracle’s *Virtual Iron*, and others (Lohr, 2009).¹⁴ In the first quarter of 2009, quarterly revenue of VMware increased by 7% (year-on-year), and remained flat in the second quarter compared to the previous year. Quarterly revenue growth of Citrix Systems in the second quarter of 2009 was slightly positive after falling to just below zero in the first quarter of 2009.

Employment in VMware and Citrix Systems was stable compared to 2008 and even increased compared to 2007. In the first half of 2009, VMware employed 6 700 people, the same workforce as in 2008, but 1 700 employees more than in 2007 (+34%). Citrix System employed 5 040 people in the first half of 2009, the same number as in 2008, but 420 more than in 2007 (+9%). Both firms have not yet announced future job cuts.

Although virtualisation may favour employment in the software industry, as the case of VMware and Citrix Systems demonstrates, it is most likely to increase pressure on employment in the IT equipment and communication equipment industry in the long term. With the deployment of virtual servers being interconnected through virtual networks, future demand for (physical) infrastructures can be expected to slow, at the expense of IT equipment and communication equipment firms’ revenues. The long-term impact on employment in the supply side appears to be a shift from hardware manufacturing towards software development. On the demand side, traditional skills such as server administration or network administration will not be enough anymore, and will need to be complemented with virtualisation skills (Dubie, 2009).

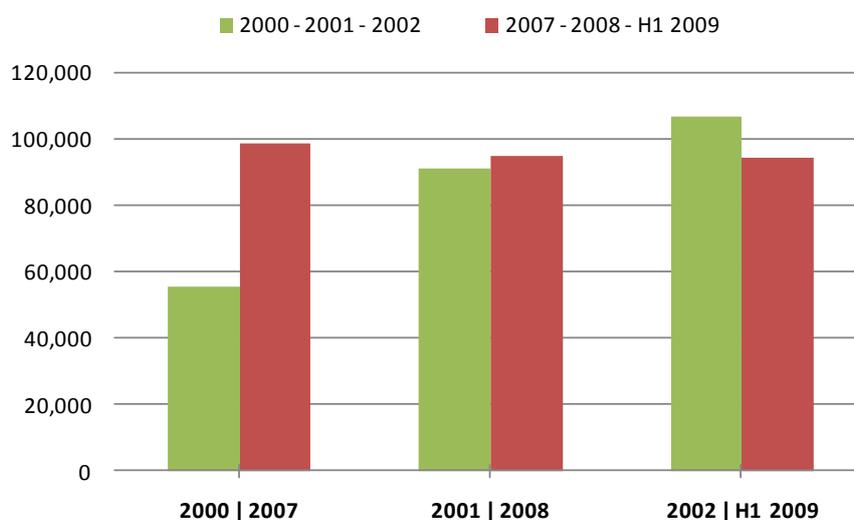
Internet

The Internet industry has benefits from growing online transactions as a share of total retail purchases (Amazon, eBay, Expedia), advertising (Google, AOL, Yahoo!, IAC), financial markets (E*Trade, TD Ameritrade), as well as growth in broadband subscriber numbers. Total quarterly revenues of top-10 Internet firms increased throughout 2008 and the first half of 2009, with growth rates, however, decreasing but remaining positive in mid-2009. Nevertheless, the majority of the top-10 Internet firms had falling quarterly revenues (y-o-y) in the last three to four consecutive quarters, increasing the pressure of lay-offs in the industry (OECD, 2009d).

In the first half of 2009, top-10 Internet firms employed more than 94 000 people, almost the same number of employees as in 2008 (-0.2% of total workforce), but still almost 4 000 employees less than in 2007 (-4%).¹⁵ Remarkably, employment trends among top-10 Internet firms since 2007 were completely the opposite of those in 2000 to 2002, when total employment increased year-on-year (see Figure 8). Amazon, which accounted for almost 22% of total employment in 2008, was the only firm reporting more employees in the first half of 2009 compared to 2008 (+1% of its total workforce) (see Box 6). Google, the other top-10 company having a similarly high share off total employment in 2008, has in contrast reduced its employees (-2% compared to 2008).

¹⁴ See also *The North American Development Survey 2008*, conducted by Evans Data Corporation (EDC) in the last quarter of 2008, according to which 56% of developers involved with virtualisation projects stated they use VMware products, compared to 37% using Microsoft virtualisation solutions (HostReview, 2008).

¹⁵ This does not include the number of people employed by AOL LLC from 2007 to H1 2009.

Figure 8. Employment by year, Top-10 "Internet"

Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance, based on firms' most current reports and press releases. Figure does not include the number of AOL LLC employees for 2007 to H1 2009 and of Expedia employees for 2000 to 2002.

Employment among top-10 Internet firms could further fall as additional redundancies of more than 3 500 employees (*i.e.* over 2% of the total workforce) have been announced. Yahoo!, for instance, announced that it would cut around 1 500 jobs (over 8% of its employees), eBay announced 1 000 job cuts (over 6%). As a result, total employment among top-10 Internet firms could drop by almost 4% year-on-year until the end of 2009, to around 91 000 employees.

However, the Internet industry could profit from cloud computing, which during the current crisis is becoming ever-more attractive for companies looking for ways to reduce capital expenditures while delivering scalable IT services. This trend could support employment in the Internet industry, as the case of Salesforce.com demonstrates (see Box 5).

Box 5. Employment in cloud computing firms

Cloud computing is increasingly attracting IT executives' attention due to its potential to reduce capital expenditures and to deliver scalable IT services at variable costs. The current financial and economic crisis has made cloud computing even more attractive with firms looking for quick returns on their investments. Some large companies are already adopting cloud computing for non-critical businesses in order to cope with peak demand for their IT services without having to buy additional IT equipment. NASDAQ, for instance, uses Amazon's Web Services as a means to provide its service on historical stock market data (*The Economist*, 2008). An increasing number of start-ups are even deploying their entire businesses into the "cloud" taking advantage of the financial flexibility and operational scalability it provides (Schonfeld, 2008). Demand for cloud computing services is therefore expected to continue to increase. According to IDC, the market for cloud computing services will grow by around 40% over the next year only (Mohammed, 2009). So employment by cloud computing service providers can be expected to remain stable if not increase over the next year.

Amazon was one of the first companies to provide cloud computing to the masses, when it started selling spare capacity of its IT infrastructure in 2006 (Naone, 2009). Some financial analysts therefore consider Amazon's Web Services (AWS) as the bellwether of the cloud computing industry. Unfortunately, however, Amazon still does not provide any details related to AWS. In the firm's financial statements, revenues generated by AWS are not listed separately but rather as part of a revenue category called "others", which also includes Amazon's Enterprise Solutions Web Hosting services and miscellaneous marketing such as co-branded credit cards. In the second quarter of 2009, revenues generated by "others" grew at 11% year-on-year. However, "others" still contributes only marginally to Amazon's overall quarterly revenue (in Q2 2009 only USD 140 million, 3%). As a consequence, the workforce employed by Amazon for AWS can be expected to be marginal too. Nevertheless, given the continuing growth rates of AWS, employment should remain stable.

Another company which provides cloud computing services for businesses is Salesforce.com. Its main services include its cloud computing-based Customer Relationship Management (CRM) service, and its cloud computing platform, *Force.com*, which enables businesses of all sizes to develop and run their own cloud computing-based applications. In the first quarter of 2009, revenue of Salesforce.com grew at 23% (year-on year), and by 20% in the second quarter of 2009. Annual revenue growth was 44% in 2008. The company also continues to increase its spending on R&D, an indicator for the increasing employment of software developers. In the first quarter of 2009, R&D spending increased by 60% year-on-year, and by 29% in the second quarter of 2009. Employment has also continuously increased since it went public in 2004, however at a much smaller magnitude since the beginning of 2009. In the first half of 2009, Salesforce.com employed more than 3 600 people. This is 100 employees more than in 2008 (+2%) and more than 1 000 more than in 2007 (+38%).

It is interesting to note that, despite Salesforce.com increasing employment by only 2% in the first half of 2009, it was able to achieve a 20% year-on-year growth of its quarterly revenues. This appears to be one of the main characteristics and differences between the cloud computing industry and the IT outsourcing industry. In contrast to the IT outsourcing industry, where the number of employees correlates with the number and size of customer projects and thus with revenues, it is the capacity and number of data centers which matter in the cloud computing industry. This is because cloud computing mainly provides standardised services such as Software as a Service (SaaS), which, once developed and deployed, can be scaled up to serve a theoretically infinite number of clients. In other words, IT outsourcing is still a human capital intensive business compared to cloud computing, which is more a data center intensive business.

Cloud computing also brings changes in terms of skills needed. On the one hand, cloud computing providers, such as Salesforce.com, are trying to make software development on their platforms easier for their clients. On the other hand, they are facing additional complexity as they need to cope with new technologies such as virtualisation and distributed computing. This increases the skill requirements for technical employees in the cloud computing industry.

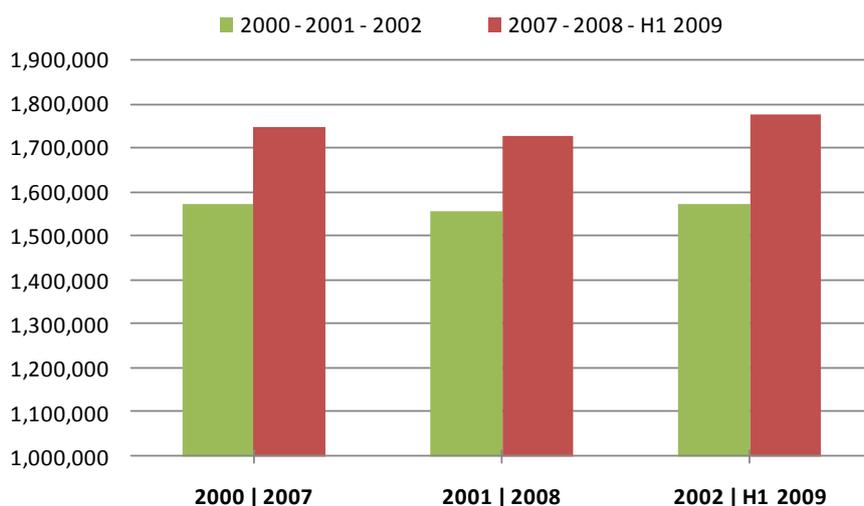
Telecommunications

Diversification in telecommunication services has led to heterogeneous trends in the industry. While the fixed-line usage and subscriber base continue to decline, the number of mobile subscribers is increasing worldwide with mobile data services rather than mobile voice telephony driving revenue growth. Furthermore, Internet access and services continue to increase. Consequently,

telecommunication companies have streamlined their internal divisions depending on their focus. Consolidation in the industry has also been observed. The two acquisitions effecting notably employment figures among top-10 telecommunication firms are: Deutsche Telekom acquiring a 30% stake in Greek operator OTE and Verizon Communications buying Alltel, a mobile telephony and Internet provider primarily based in the Southern United States.

Given these acquisitions, total employment among top-10 telecommunication firms has significantly increased in the first half of 2009 to up to 1.77 million employees (Figure 9). This is over 47 000 employees more than in 2008 (+3% of total workforce). As expected, acquisitions by Deutsche Telekom and Verizon Communications were the main cause for that increase. Of the 34 000 additional employees reported by Deutsche Telekom (+15% of their workforce), around 33 600 employees originated through the consolidation of OTE's employees into the Group's workforce.¹⁶ This is also the case with Verizon Communications' 11 000 additional employees (+5% of their workforce), who mainly came from the acquisition of Alltel. Another top-10 telecommunication firm reporting an increased number of employees in the first half of 2009 compared with 2008 is Nippon Telegraph (+ 11 000, +6%). In this case, the increase of employee numbers, however, was mainly related to seasonal effects as year-on-year comparison reveals that employment in the company in the first half of 2009 has only increased by 0.6% compared to the first half of 2008.

Figure 9. Employment by year, Top-10 "Telecommunications"



Note: Employment data for 2007-2008 and 2000-2002 are based on firms' annual reports. Data for H1 2009 are based on most recent employment numbers as provided by Google Finance, based on firms' most current reports and press releases.

Meanwhile, top-10 telecommunications firms have announced job cuts for 2009 and 2010. Verizon Communications, for instance, has announced a cut of more than 8 000 jobs (around 4% of its workforce) primarily in its landline division (Myslewski, 2009). Telecom Italia, another example, has announced cuts of 5 000 to 9 000 jobs by 2010 (6-12% of its workforce), and British Telecom, the eleventh biggest telecommunications firm, has announced cuts of 15 000 to 30 000 jobs by 2010 (10-20% of its workforce) while restructuring its Global Services business (Flinders, 2009b). All these announcements suggest that total employment by top-10 telecommunications firms could still slightly increase, by 1-2%, at the end of 2009.

¹⁶ According to Deutsche Telekom, approximately 1 200 new employees were hired permanently in the first quarter of 2009.

Longer-term trends: The ICT sector and ICT-related employment

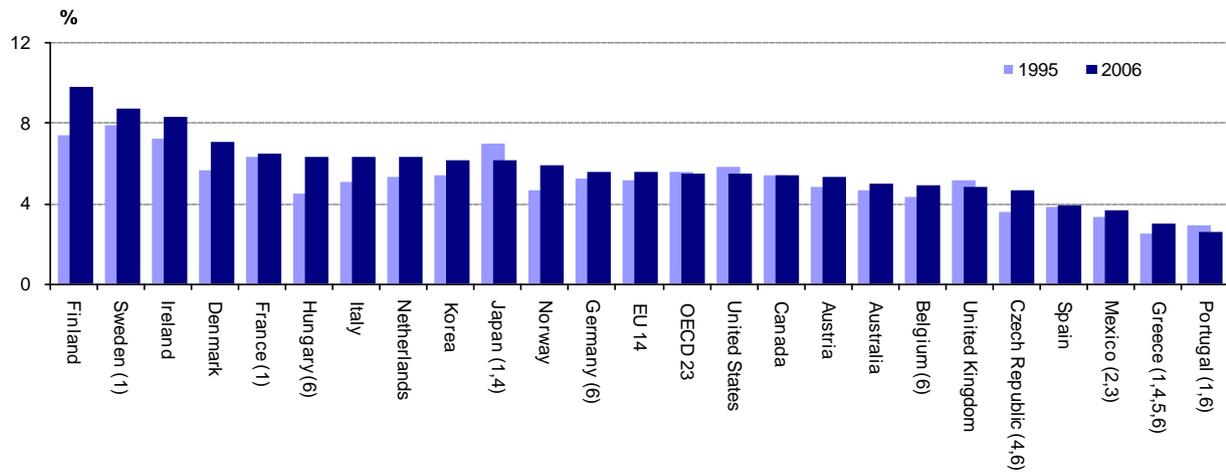
The ICT sector

Long-term structural indicators of ICT sector value added and employment are compiled annually, based on data from the OECD Structural Analysis Data Base (STAN), official statistics and partial estimations (see Figure 10). These data are national accounts-compatible. Timeliness is constrained by the relatively long delay in preparing detailed national accounts. Overall these data provide an in-depth view of longer-term trends and developments. However they do not help preparing recent or outlook indicators, and they probably cannot easily be prepared with a shorter time lag, *i.e.* less than 2 years. These data are calculated as shares of total employment, so in the current recession they may increase their share and perform better than total employment even if declining in absolute terms.

Overall, measured as shares of business value added and employment respectively, these indicators show the continuing long-term relative growth in ICT sector value added and flattening off of ICT sector employment, particularly following the last ICT-related recession and fall in employment from 2001-2002 onwards (see Figure 10). A more detailed analysis is presented in the *OECD Information Technology Outlook 2008*, Chapter 1.

Overall trends in these long-term data include:

- ICT sector employment makes up 5.5% of total business sector employment in OECD countries, or around 15 million people. Long-term growth (1995-2006) has been around the same as for total business employment, so despite adding 1.4 million employees the share has remained static. As the value added share increased, this is an indication that the sector is becoming less employment-intensive.
- Finland, Sweden and Ireland had the largest shares of employment in total business employment, over 8%, and these shares have increased markedly, as they also did in Hungary, the Czech Republic and Denmark. The share of employment in ICTs declined in some countries, an indication of the impact of increasing manufacturing and services trade with non-OECD economies; all had relative declines or very low growth in both manufacturing and services.
- Over 10 million people are employed in ICT services compared with 5 million in manufacturing. Employment in computer and related services and IT services has grown more rapidly than business services as a whole (including IT services). However, increases in ICT services employment did not counteract declines in ICT manufacturing employment, so that the ICT sector did not increase its share of total business sector employment.
- ICT employment is also more cyclical than value added, and lags the value added recession cycle; employment reached a peak in 2000-2001 (2000 in manufacturing, 2001 in services), bottomed out in 2003-2004 and only started growing again in 2005, suggesting that ICT employment may be slow to pull out of this recession, even if the structural causes are different from the last one.

Figure 10. Share of ICT employment in business sector employment, 1995 and 2006

1. 2005 instead of 2006
2. 2003 instead of 2006.
3. Based on employees figures
4. ICT wholesale (5150) is not available.
5. Telecommunication services (642) included Postal services.
6. Rental of ICT goods (7123) is not available.

Source: OECD estimates, based on national sources; STAN and National Accounts databases, April 2008.

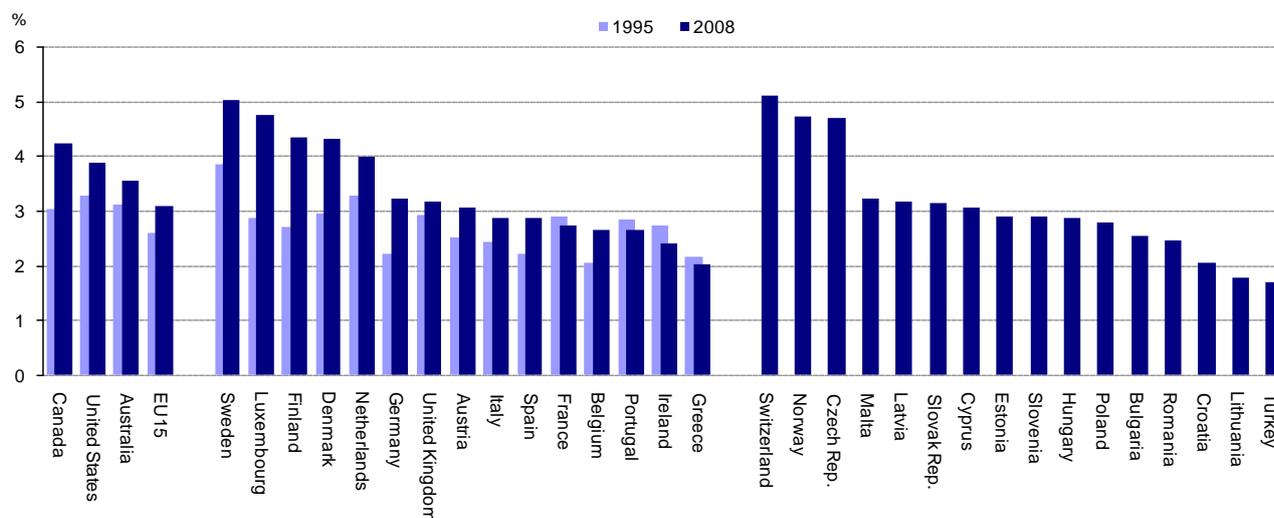
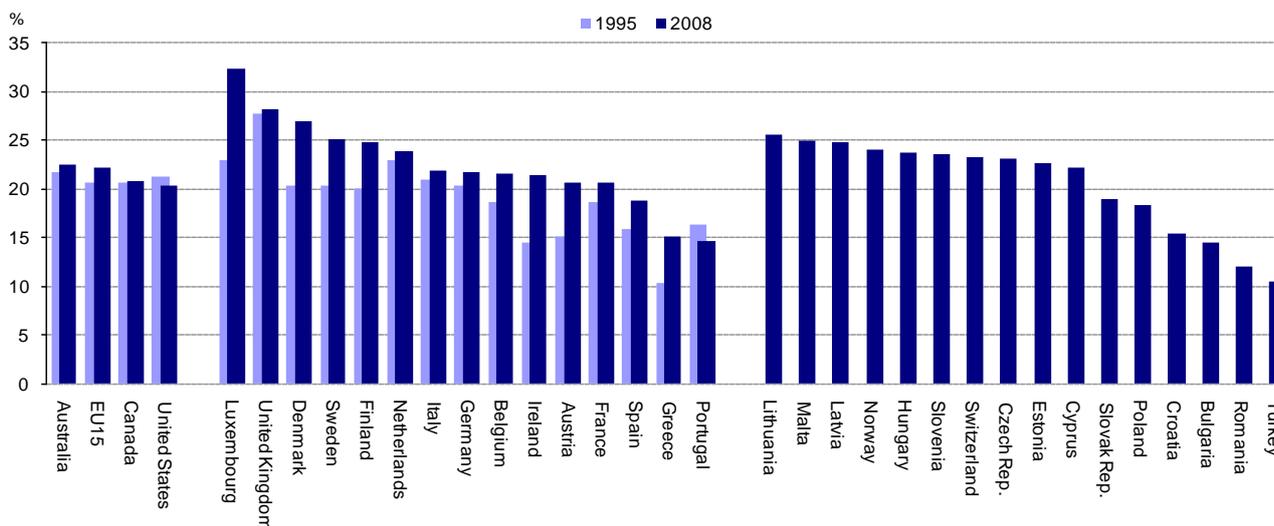
ICT employment across the economy

ICT-related employment is spread widely across the economy. Many ICT employees are elsewhere in the economy carrying out ICT tasks and some employees in the ICT sector are non-ICT. Two measures of ICT employment have been developed based on ICT occupations and ICT-related occupations. One is a narrow measure of ICT occupations, comprising ICT specialists whose job is ICTs, *e.g.* software engineers. The other is a broader measure of ICT employment where ICTs are used regularly as part of the job, but where the job is not focused on ICTs, *e.g.* a researcher or an office worker (see *OECD Information Technology Outlook 2008*, Chapter 1).

The underlying data for these measures are taken either from quarterly labour force surveys or annual labour force surveys and have a lag of around 6 months. This could be reduced somewhat for some countries, but for the total sample of countries for which appropriate data are available, they cannot be provided much more rapidly. These data are calculated as shares of total employment, so in the current recession they may increase their share and perform better than total employment even if declining in absolute terms.

The results of this analysis are shown in Figure 11, and are summarised below:

- Around 3-4% of total employment in most OECD countries was accounted for by ICT specialists in 2008 with the exception being in Eastern Europe (Figure 11a). This share has risen consistently in recent years in most countries, despite the relative stagnation in the share of ICT sector employment in business sector employment (see preceding section). The divergences between the two suggest that there is ongoing occupational specialisation as higher level ICT skills are required. These skills are used partly in the ICT sector as it restructures around more advanced products and activities, and to a larger measure across the wider non-ICT economy as ICT specialist skills are needed to produce ICT products in non-ICT sectors (software in the other sectors for example) and non-ICT products with ICTs embedded in them (automobile systems for example).
- ICT-using occupations (including specialists) make up over 20% of total employment in most countries, the exception being Eastern European countries (Figure 11b). These occupations include *e.g.* scientists and engineers, as well as office workers, but exclude teachers and medical specialists for whom the use of ICTs is in general not essential for their tasks. Overall, these estimates show the importance of ICT-related occupations across the economy and the necessity of analysing ICT-related activities and employment very broadly.
- Overall these indicators show the continuing growth of ICT specialists as a share of the total labour force, but a flattening of the share of ICT-intensive users.

Figure 11a. Share of ICT-related occupations in the total economy, specialist users, 1995⁽¹⁾ and 2008**Figure 11b. Share of ICT-related occupations in the total economy, intensive users, 1995⁽¹⁾ and 2008**

1.Except: Australia, Finland and Sweden 1997 instead of 1995.

Note: "Specialist users" corresponds to the narrow definition and "intensive users" corresponds to the broad definition, both based on methodology described in OECD (2004, *IT Outlook*, Chapter 6). The shares for non-European countries are not directly comparable with shares for European countries as the classifications were not harmonised. The EU15 aggregate has been estimated for missing years.

Source: OECD calculations from EULFS, US Current Population Survey, Statistics Canada, Australian Bureau of Statistics.

CONCLUSION

This report provided an overview of indicators that can be used and further developed for WPIE analysis of ICT employment trends. These will also contribute to the *Information Technology Outlook 2010*. Short-term indicators are based on official national monthly or quarterly data on employment at disaggregated level, mainly derived from Labour Force Surveys. Quarterly firm-level employment data for a set of top-250 ICT firms in 8 different ICT sectors were designed to supplement and expand the data available from official sources. Finally, two long-term indicators have been provided: i) a long-term structural indicator of ICT sector value added and employment, based on the OECD Structural Analysis Data Base (STAN), official statistics and partial estimations, and ii) an indicator including ICT occupations (comprising ICT specialists whose job is ICTs *e.g.* software engineers) and ICT related occupations (comprising jobs where ICTs are used regularly without focusing on ICT itself).

Preliminary analysis of short-term indicators reveals that employment is dropping in the ICT sector – notably in ICT goods sectors and mostly remaining flat in ICT services. However, despite year-on-year drops of 6-7% in ICT manufacturing employment, the large declines seen in the last downturn around 2002-2003 have not yet been seen in employment data. The picture for ICT services is much more heterogeneous across countries.

Taking another perspective, the employment performance of 80 global ICT firms appears somewhat more optimistic than the short-term cyclical data. Although these firms were shedding employees in Q1 and Q2 2009, this is not yet of the scale of around 2002, even in semiconductor firms which have experienced very sharp declines in revenues. The only exception is top-10 Internet firms where between 2000 and 2002 employment increased much faster than between 2007 and H1 2009. One rationale for large ICT firms retaining employment better is their much better net cash position in this recession compared with the last one. However, firms such as Fujitsu have a company-wide pay freeze in place, showing that employees and employment in the ICT sector are under great pressure as is the case in other sectors. Despite the crisis, some niche ICT activities including green ICTs (Boxes 1 and 2), virtualisation (Box 4), and cloud computing (Box 5) are increasing ICT employment during this phase of the recession, as firms invest in those technologies in order to remain competitive.

The analysis of longer-term trends suggests that the ICT sector is becoming somewhat less employment-intensive. The ICT sector's share of total business employment is lower than its share of business value added and employment has tended to grow less rapidly than value added. Long-term indicators based on ICT occupations and ICT-related occupations across the whole economy show a divergence between ICT specialists and ICT-related jobs. ICT specialists have grown more rapidly (around 3-4% of total employment) than ICT-related intensive users (around 20%) suggesting that there is ongoing occupational specialisation as higher level ICT skills are required. Overall these indicators show the continuing growth of ICT specialists as a share of the total labour force, but a flattening out of the share of ICT-intensive users.

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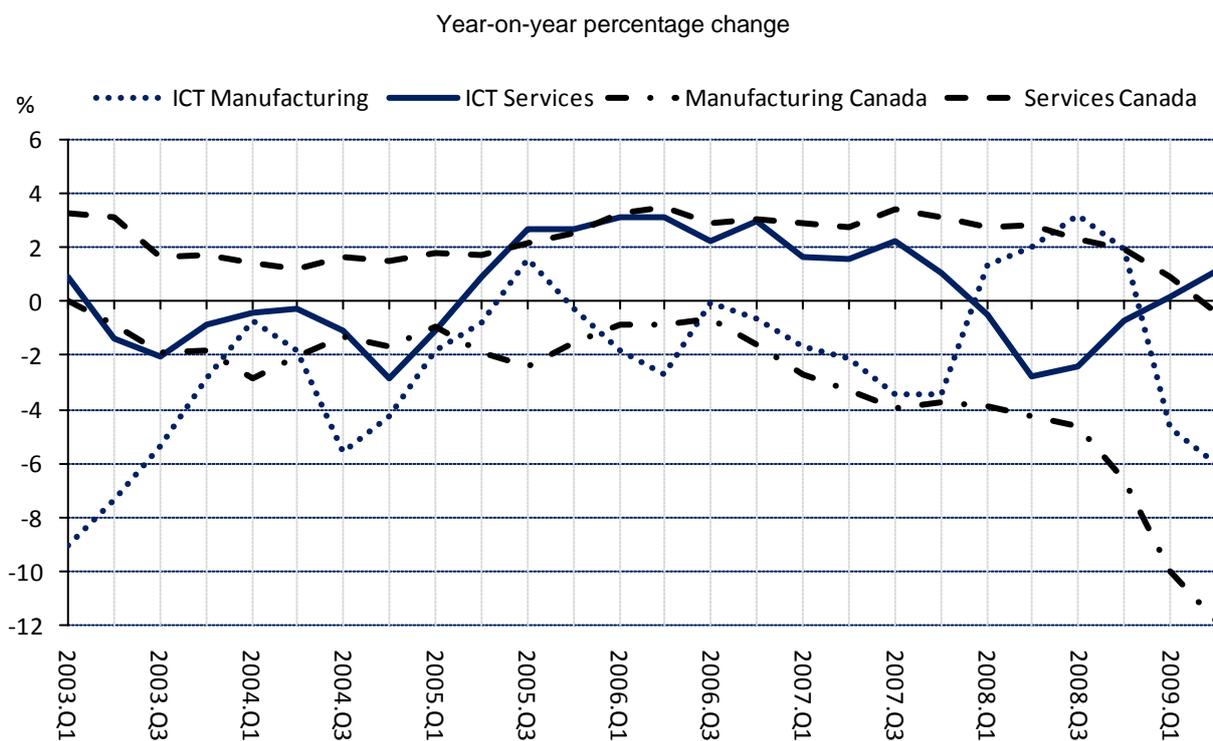
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ANNEX FIGURES

CANADA

Figure 1. Growth in employment, Q1 2003 – Q2 2009



Source: Industry Canada, Quarterly Monitor of the Canadian ICT Sector, Second Quarter 2009, September 2009.

GERMANY

Figure 2. Growth in monthly employment in selected manufacturing sectors, March 2006 – July 2009

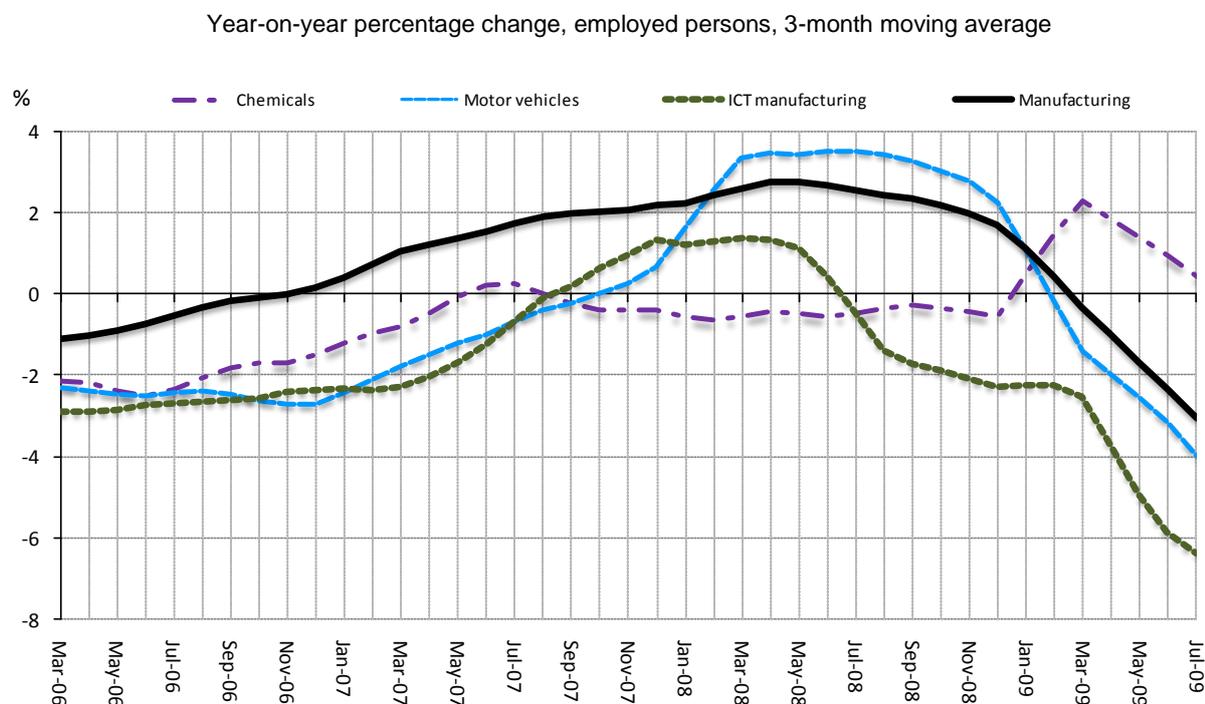
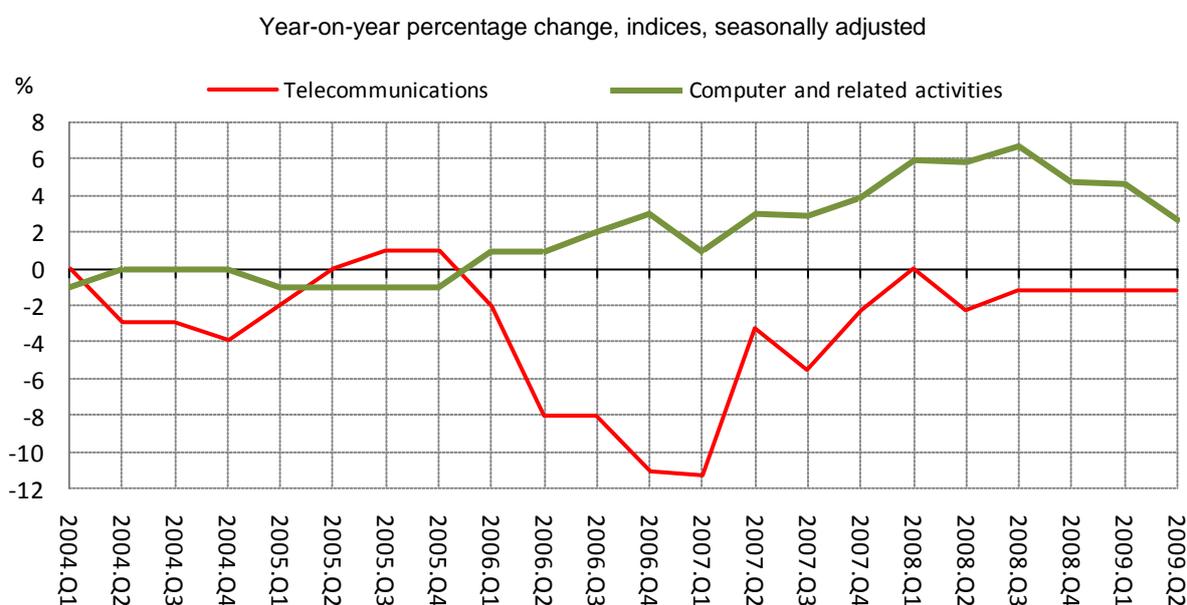


Figure 3. Growth in quarterly employment in ICT services, Q1 2004 – Q2 2009

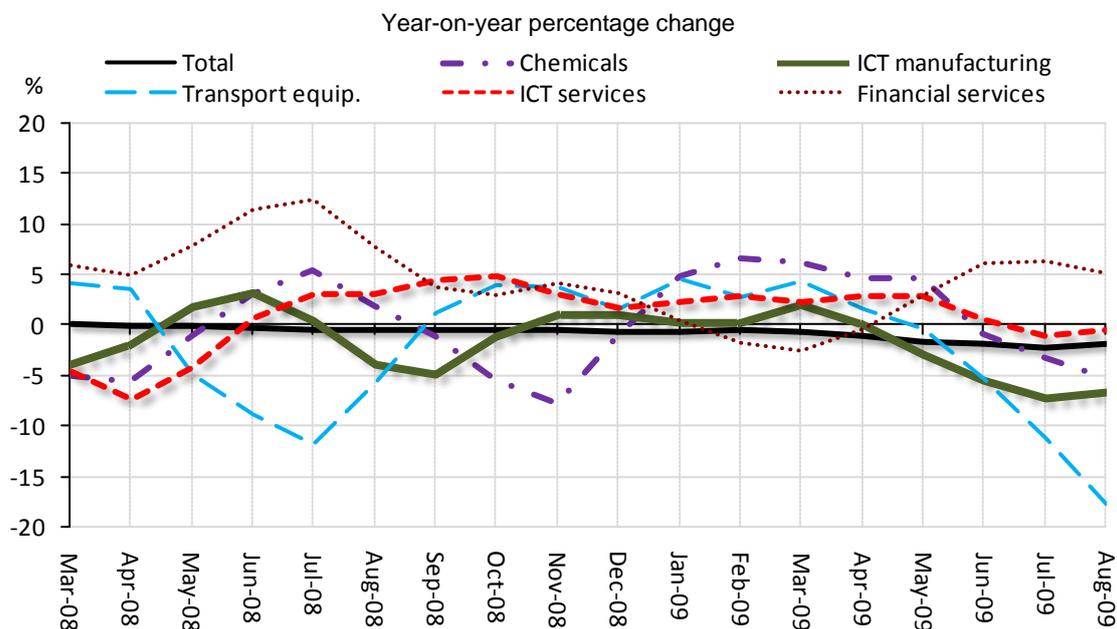


Note: Sectors according to ISIC rev. 4: ICT manufacturing (26), Telecommunications (61) and Computer programming, consultancy and related activities (62).

Source: Destatis, Federal Statistics Office, September 2009.

JAPAN

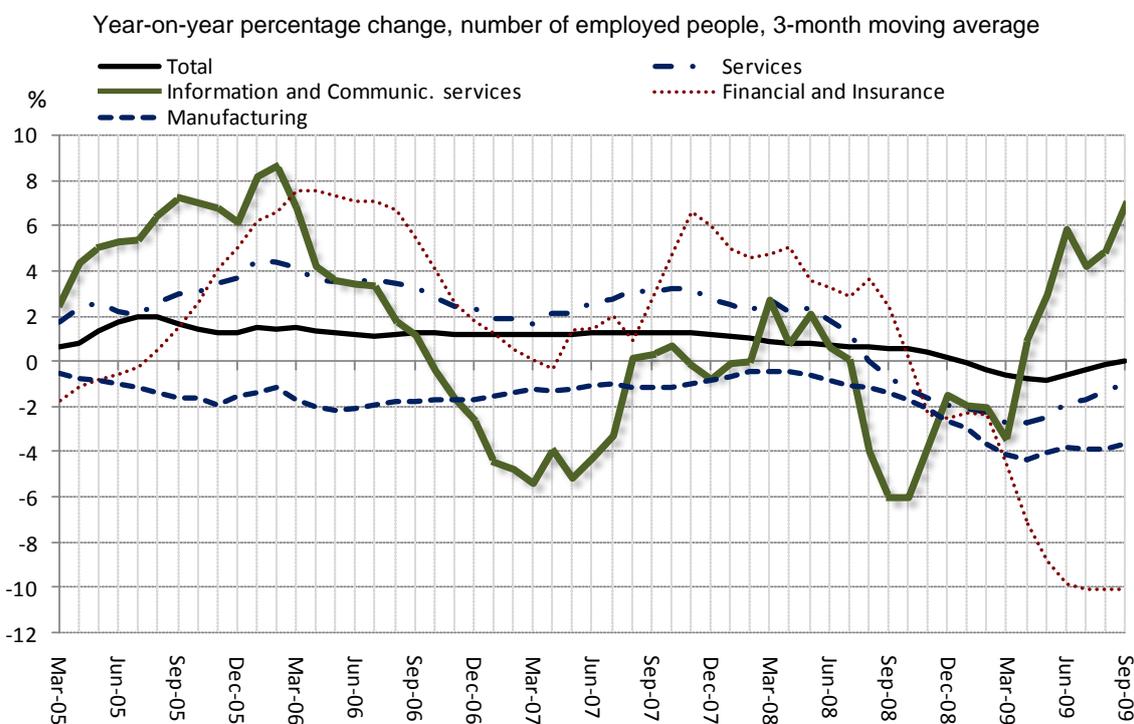
Figure 4. Growth in monthly employment in selected goods and services, March 2008 – August 2009



Source: Labour Force Survey, October 2009.

KOREA

Figure 5. Growth in monthly employment in selected goods and services, March 2005 – September 2009



Note: Total Services is composed by "Electricity, transport, telecom. & finance" services.
 Source: Korea National Statistics Office, October 2009.

SWEDEN

Figure 6. Growth in quarterly employment in ICT and selected manufacturing sectors, Q1 2000 – Q2 2009

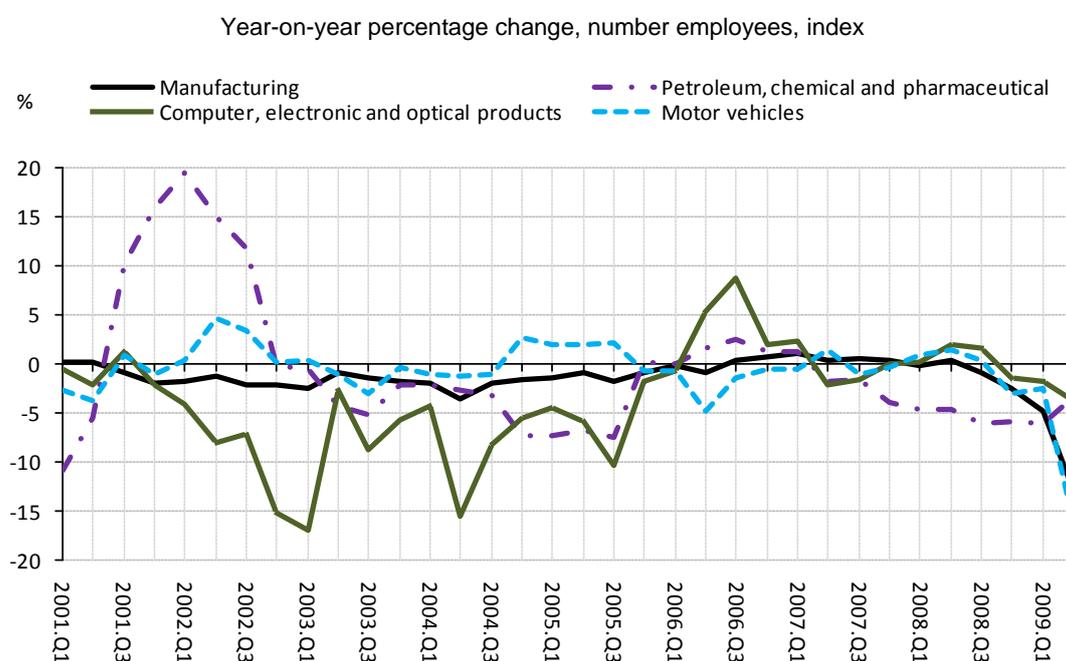
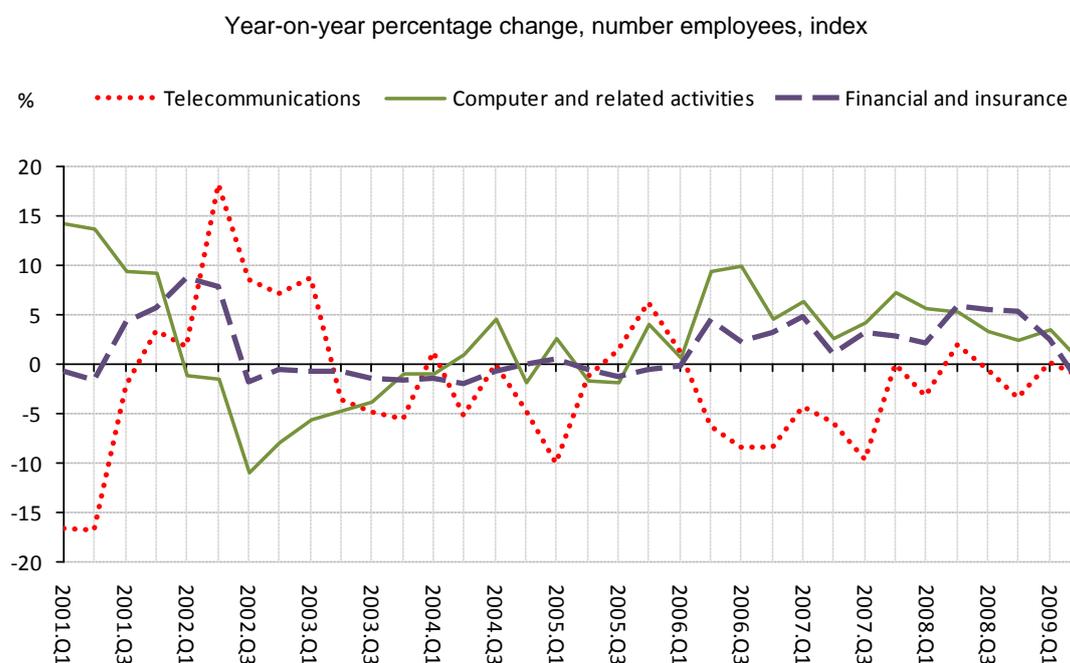


Figure 7. Growth in quarterly employment in ICT and selected services, Q1 2000 – Q2 2009



Note: Sectors according to ISIC rev.4 (C, 19-21, 26, 29) and (61, 62, K).

Source: Statistics Sweden, September 2009.

UNITED KINGDOM

Figure 8. Growth in monthly employment in ICT and selected manufacturing sectors, March 1997 – July 2009

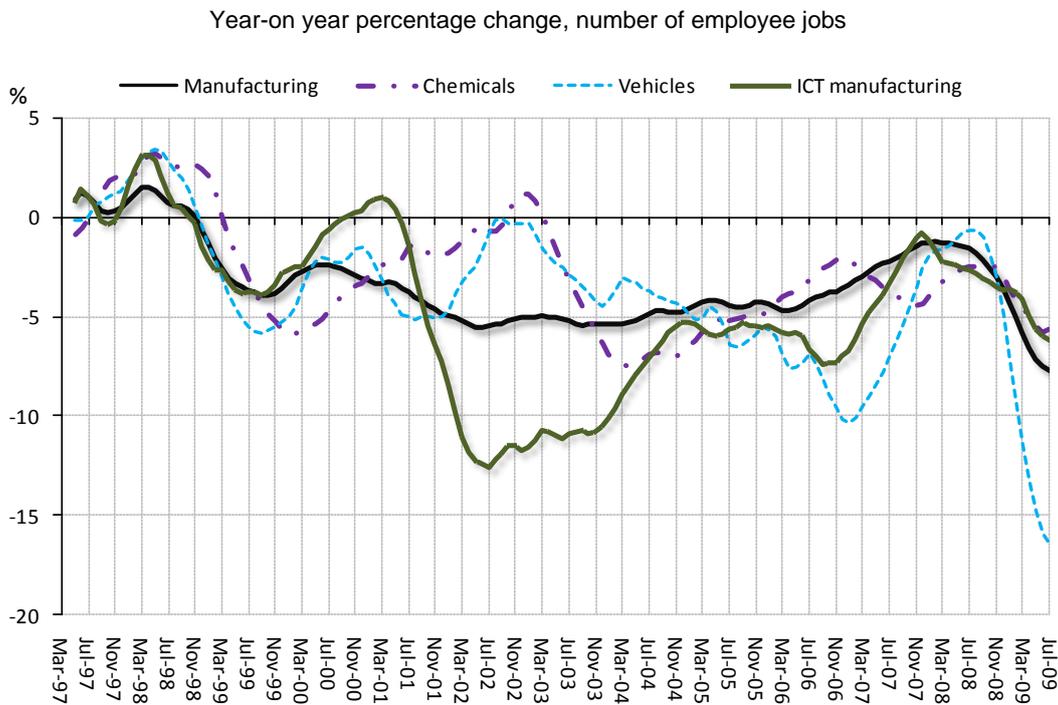
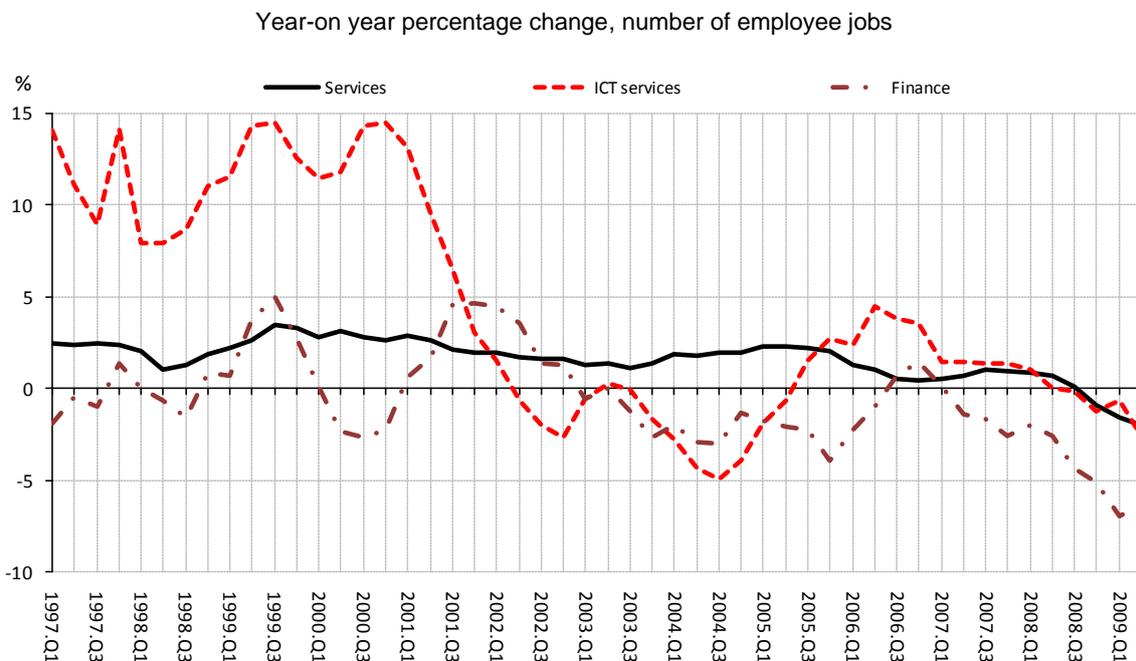


Figure 9. Growth in quarterly employment in ICT and selected services, Q1 1997 – Q2 2009



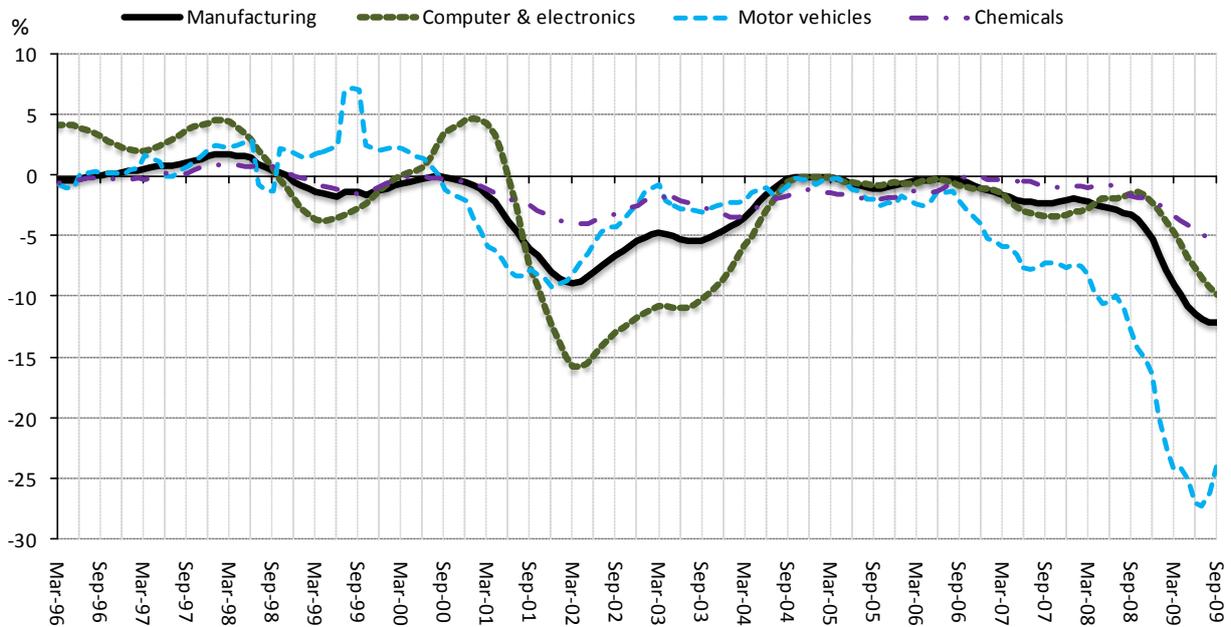
Note: Data are for Great Britain (North Ireland is not taken into account). There is a discontinuity in the employee jobs series between December 2005 and September 2006 due to improvements to the annual benchmark.

Source: National Statistics Office, September 2009.

UNITED STATES

Figure 10. Growth in monthly employment in ICT and selected manufacturing sectors, March 1996 – September 2009

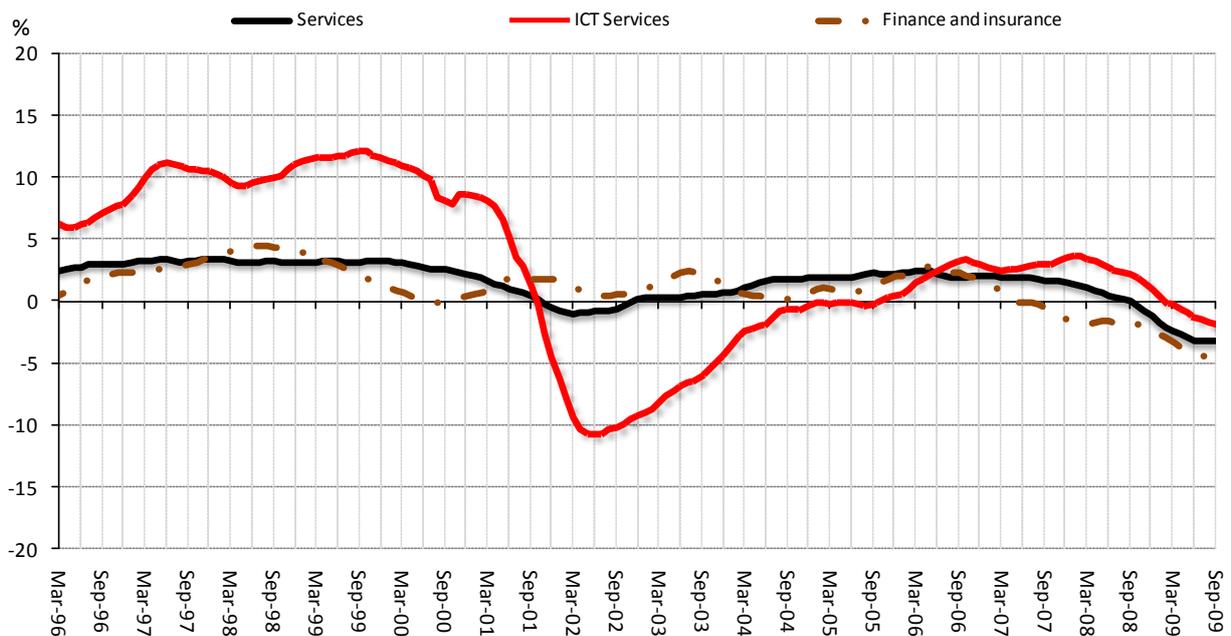
Year-on-year percentage change, number of employees, seasonally adjusted, 3-month moving average



Source: U.S. Bureau of Labour Statistics, October 2009.

Figure 11. Growth in monthly employment in ICT and selected services, March 1996 – September 2009

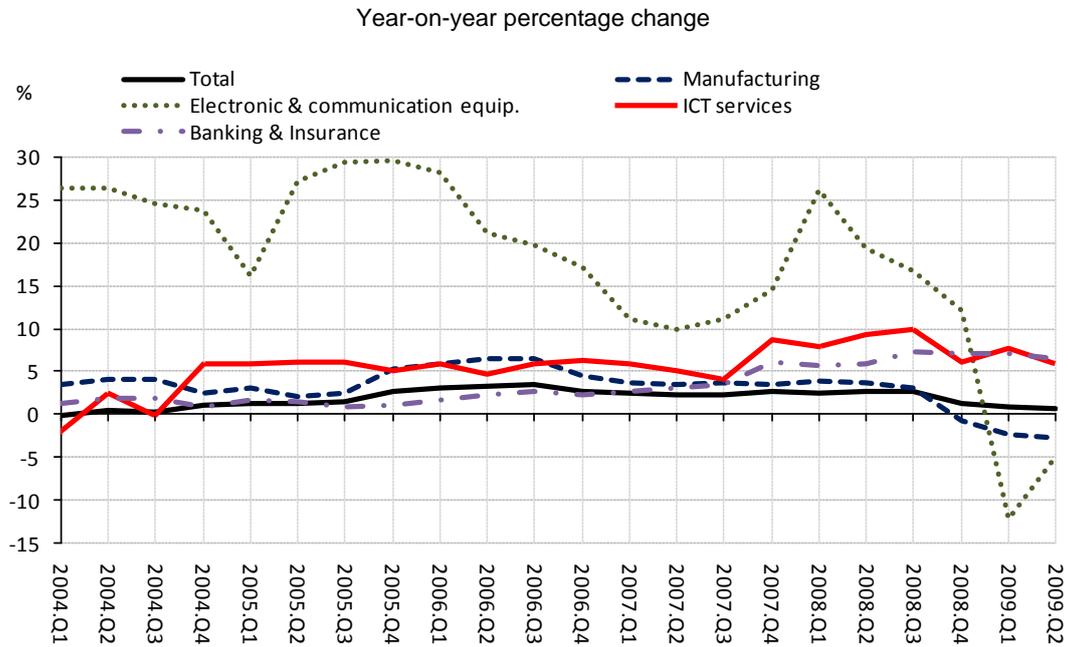
Year-on-year percentage change, number of employees, seasonally adjusted, 3-month moving average



Source: U.S. Bureau of Labour Statistics, October 2009.

CHINA

Figure 12. Growth in quarterly employment, Q1 2004 – Q2 2009

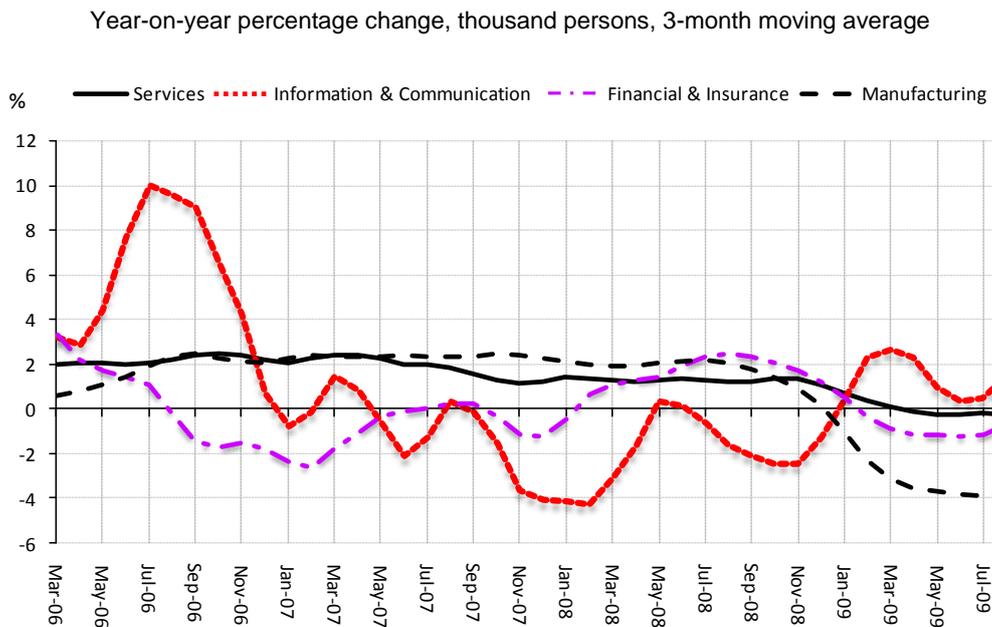


Note: ICT services are Information transmission, computer services and software.

Source: National Bureau of Statistics, September 2009.

CHINESE TAIPEI

Figure 13. Growth in monthly employment in selected services in Chinese Taipei, March 2006 - August 2009



Source: Directorate-General of Budget, Accounting and Statistics, October 2009.