ICT (industries) and the economy
An overview from the European perspective

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This presentation

**General aim:** present key findings in different areas and foster discussion on available measures and prospective analytical work.

**Two parts:**

- **global dynamics of ICT industries and their R&D**, positioning the EU and its MS vs. main competitors (this session's topics)
- **complementary aspects on ICT industries and ICTs in the economy** (scene-setting for the following sessions)
Global trends in ICT industries

- Global ICT sector's aggregate share in Value Added slightly decreasing:
  - Diverging industry patterns: fall of Manufacturing and Telecommunications; growth of Computer services
  - Persistence of regional dynamics: Asian leadership in manufacturing strengthens, Western economies continue leading in services

- Global rise of ICT sector BERD, and of R&D intensity across all ICT industries and economies
  - BERD rising in US and China, stagnating in the EU
ICT industries in Europe – a snapshot

- **Value added of the ICT sector** at ca. 4% of GDP
  - *roughly stable over time and through the crisis*
  - *Europe less specialised than the USA, China, India, Japan and Korea*

- **Labour productivity** about 50% higher than whole economy average

- **Business expenditure in R&D** 16.5% of total (down about 1 pp vs. 2006)

- **Exports of ICT goods** (net of intra-EU trade) Ca. 5% of EU merchandise exports and 6% of world total (→ both down from ca. 11% in 2000)

- **Exports of ICT services** steadily growing (globally, from 6 to 9.2% of world trade in services). EU (gross) share above 55% (almost 65% in 2000)

- **About 1 million enterprises and 6+ millions persons employed**
  - Avg. size of ICT enterprises vs. the business economy: +20% in services and +80% in manufacturing
Buoyant Asia. The USA keeps the pace and its specialisation. Europe and JPN lose ground

Very diverse patterns across regions by industry ...

... and in specialisation

Source: PREDICT project, 2016 database anticipation
Note: operational definition (excludes Ict trade and media manuf.)
Beyond the aggregate
A fast changing specialisation

• China is still very different from Europe and the USA
  → (Q: China's stats?)
• Manufacturing and telecommunications lose weight everywhere
• A **steady rise of IT services** also during the crisis years

The changing landscape of ICT industries

% shares of ICT industries in total value added in the EU28, the USA and China, 2006-2013

Source: PREDICT project, 2016 database anticipation
EU countries' relative specialisation: increasingly related to IT services

- Shares vary from 6% and above to about 3% of GDP
- Overall stability hides winners and losers:
  - With few exceptions, manufacturing and telecommunications lost ground
  - Differences among countries now mostly lie in the development of computer services

Share of ICT industries in GDP, % values, 2013 and 2006 total

The changing landscape of ICT industries

Source: PREDICT project, 2016 database anticipation
ICT BERD
USA leadership, Asia grows and the EU falls behind

• The USA alone accounts for 40% of total ICT BERD in the PREDICT group in 2013, China 16% and the EU 13%.
• Expenditure doubled in China since 2006 and increased about 25% in the USA, while in the EU it stayed still.

What lies behind these dynamics?

Source: PREDICT project, 2016 database anticipation
ICT BERD – relative measures

The effort (specialisation) counts

- Taiwan, Korea (partly the USA have a high and growing specialisation in ICT BERD.
- Europe, Japan and China reduced it
- In China and to a lesser extent KOR and TWN impressive growth of Total (and ICT) BERD.
- Europe slightly outperformed the USA in BERD growth, notwithstanding the lower dynamism of the economy

Source: PREDICT project, 2016 database anticipation
ICT BERD - Industry level dynamics
Bye Bye Europe, welcome back Europe

- Heterogeneous levels and patterns across industries
- Growth of BERD in the USA and China was diffused among all ICT industries
- In the EU, 80%+ increase of BERD in IT services, fully offsetting the fall in manufacturing and telco

ICT sector BERD dynamics by industry in major players, 2006-2013, PPS bn

Source: PREDICT project, 2016 database anticipation
Due to fall in VA

Due to rise in VA

Source: PREDICT project, 2016 database anticipation
R&D Intensity (2)
The slow growth of R&D intensity in Europe..

**Overall up,** thanks to a modest overall increase of BERD with sluggish value added dynamics

... but quite different patterns across countries

- **ICT BERD down** in Finland and the UK among larger investors, and in AT and DK among MS with high R&D intensity

- **ICT BERD (& intensity) up substantially** in IT, PL, PT and HU (moving up the value chain?). In IE BERD growth offset by increase in value added.

- **INDUSTRY PATTERNS are even more relevant**

R&D intensity in the ICT sector (BERD as a % of value added), 2006 and 2013 levels and p.p. contributions to change from the dynamics of value added and BERD

Source: PREDICT project, 2016 database anticipation
R&D Intensity (3)

... And the overarching impact of industry dynamics

Common industry-level patterns can be spotted:
- Fall of VA in Manufacturing and Telecom...
- With a mixed BERD pattern in Telecom
- Universal rise of BERD and VA in Computer services

EU R&D intensity in 2006 and 2013, and p.p. contributions to change from Value added and BERD, by industry and country

Source: PREDICT project, 2016 database anticipation
Productivity levels and dynamics (1)
The ICT sector vs the economy parade

Labour productivity in the ICT sector vs. total economy
thousands PPS per person employed, 2013

- ICT sector
- Total economy

Productivity levels very diverse across countries, overall and in the ICT sector, reflecting industrial specialisation and position in global value chains.

Productivity in the ICT sector higher than the whole-economy average (usually, Telecom highest, due to their high capital intensity)

Source: PREDICT project, 2016 database anticipation
Productivity levels and dynamics (2)

The growth mix (ICT sector and the total economy)...

Productivity levels very diverse across countries, overall and in the ICT sector, reflecting industrial specialisation and position in global value chains.

Productivity in the ICT sector higher than the whole-economy average (usually, Telecom highest, due to their high capital intensity).

Productivity growth in the ICT sector slower than in the whole economy (except IND and KOR): its contribution to productivity dynamics mostly due to job reallocation.

What is behind the EU stagnation?

Source: PREDICT project, 2016 database anticipation
... And the industry mix (individual ICT industries in the EU)

- Levels are very diverse across countries, even within the same industry, depending on the country position in global value chains
- Everywhere productivity in the ICT sector is higher than the average (Telcos highest)
- The contribution of the ICT sector to productivity growth mostly through job reallocation, rather than intrinsic dynamics
- What is behind the EU stagnation?
- **Industry performance impacted directly on both productivity and employment**

Source: PREDICT project, 2016 database anticipation
Emerging economies lead in ICT merchandise exports

From 2000 to 2013

- *ICT goods exports slower than total merchandise trade (commoditisation) & shift towards telecom eq.*
- The combined share of USA, Japan and Europe halves, from 45 to 21%. That of China goes up from 4 to almost 30%.

**Global exports of ICT products: country shares and dynamics, 2000-2013**

- KOR and TWN managed to keep production, while new Asian production hubs emerged...

**Indeed**

gross trade is not the whole story

*Source: Author’s calculations on UNCTAD, UNCTADstat*

*Note: Data (including world total) are netted of bilateral China-Hong and of Intr-EU exports*
... But ICT industries are at the forefront in the globalisation of value chains

ICT sector related goods are amongst the more *globalised*

In many countries more than half of value added underlying gross exports of ICT products is of foreign origin.

China and few others succeeded in climbing up the ladder, but they still have a long way to go.

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*Foreign VA % shares in gross exports by industry, emerging ICT exporters, 2013*

*Foreign value added shares in gross ICT exports, percentage values, 2000–2013*

Source: OECD, Trade in Value Added database Oct. 2015

(*) Includes CZE, EST, HUN, MEX, POL, SVK, CHN, HKG, MYS, THA, VNM
China's share in value added generated by its ICT exports was 45% in 2011. More than 25% went to Japan, the USA and the EU combined (down from 48% in 2000).

ICT manufacturing industries have a minority stake in this lot:
- In the EU, ICT manufacturing accounts for only 10%.
- In the EU and the USA trade, finance, R&D & other business service industries combined source about 1/3 of VA from Chinese exports.

Source: Author's calculations on OECD, Trade in Value Added database Oct. 2015
The other side of the moon: trade in ICT services

- Growing faster than in total services and ICT goods
- Resilient to the crisis
- EU (advanced economies) lose ground, but maintain the lion's share
- India new champion. Ireland the EU leader

Source: Author's calculations on UNCTAD, UNCTADstat – NOTE: European data gross of intra-EU trade
Enterprises in the EU ICT sector are dynamic

Net enterprise creation higher than the Total business economy ...

Also due to higher survival rates

Source: Author's calculations on Eurostat, Structural Business statistics
ICT enterprises lead in innovation

- ICT enterprises more innovative than parent populations in both manufacturing and services, across all countries
- Their shares are higher in particular for more complex (mixed mode) innovative activities

% shares of innovative enterprises – ICT vs. population, by innovation type, 2012

Source: Eurostat, Community innovation Survey
Measurement challenges:

International trade

- Merchandise:
  - improve coherence in intra-EU data: imp-ex discrepancy for ICT products stands at about 40% of total values

- Services:
  - Bilateral trade data hardly available
  - ICT enabled items (currently in the huge residual of other business services)

Business demographics

- Improving the reliability of business registers
- Increasing timeliness of BR data availability
- New sources of data (NESTA web-based reallocation of enterprises in the UK only example to date)
ICT usage and innovation in the economy

- ICT usage is positively related to innovative activity.
- This holds true for all main types of innovation and even for nearly saturated usage indicators (Broadband, Website).

Shares of users of selected technologies in the populations of innovators and non-innovators, 13 EU MS, 2004-2010

Source: EU ESSLAIT project Micro Moments Database
Beyond the ICT sector
ICT occupations in the economy

- Provide a perspective on ICT content of the economy
- In the EU, they largely outnumber workers in the ICT sector

EU28: Employment in ICT occupations and in the ICT sector

- Employment in ICT professions grew also through the crisis
- Countries and industries show very diverse patterns

Source: IPTS calculations on Eurostat, Labour Force Survey
Preliminary estimates, please do not cite
ICT employment intensity by industry in the EU
Incidence of ICT occupations in employment, 2014

- ICT industries lead by far, with a share of about 45% of ICT professionals in their workforce
- Hi Tech manufacturing and Knowledge Intensive services follow (link with R&D)
- ICT professionals reach 1% or more of employment even in traditional industries

**NOTE:** ranking and intensities similar to the USA, with some differences...

*Source: IPTS calculations on Eurostat, Labour Force Survey*

*Preliminary estimates, please do not cite*
ICT employment intensity
ICT industries and the knowledge economy

ICT In the Economy: employment

ICT specialists and Apparent Labour Productivity (2014)

ICT specialists and R&D (2014)

ICT specialists and education outcome (2014)

ICT specialists and ICT sector employment (2013)

ICT specialists and the diffusion of cloud services (2014)

ICT specialist and ICT skills (2012)
ICT employment intensity
ICT industries and the knowledge economy

• Cross correlation matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>ict_ratio</th>
<th>ict_sector_ratio</th>
<th>prod</th>
<th>ter</th>
<th>GERD</th>
<th>comp*</th>
<th>cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT specialists share over total employment (ICT_ratio)</td>
<td>100%</td>
<td></td>
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<tr>
<td>ICT sector employment share over total employment (ICT_sector_ratio)</td>
<td>57%</td>
<td>100%</td>
<td></td>
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<tr>
<td>Apparent productivity of labour, GDP/emp (prod)</td>
<td>20%</td>
<td>45%</td>
<td>100%</td>
<td></td>
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<tr>
<td>Percentage of people with tertiary education (ter)</td>
<td>55%</td>
<td>45%</td>
<td>45%</td>
<td>100%</td>
<td></td>
<td></td>
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<td>Gross expenditure on R&amp;D (GERD)</td>
<td>55%</td>
<td>29%</td>
<td>55%</td>
<td>21%</td>
<td>100%</td>
<td></td>
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<tr>
<td>Percentage of workers using computer at work (comp)*</td>
<td>70%</td>
<td>38%</td>
<td>53%</td>
<td>54%</td>
<td>77%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Percentage of enterprises buying cloud services (cloud)</td>
<td>55%</td>
<td>32%</td>
<td>43%</td>
<td>24%</td>
<td>54%</td>
<td>47%</td>
<td>100%</td>
</tr>
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*) based on a limited sample of PIACC survey in 2012 consisting of 17 EU member states.

• A very preliminary panel data analysis: one percentage point increase in the ICT specialists shares over total employment leads to an increase of 0.04-0.06% on the apparent labour productivity
ICT Investment in the EU economy

Volume
- +50% circa from 2000 to 2013 (less for Telco eq.)
- 2008 peak reached in 2013

Incidence in Total GFCF
- U shaped at current prices, always up in volume terms
- Resilient during crisis years (steady growth in share)

Role of ICT industries
(From data for FR+IT+UK+FI+CZ)
- Combined, account for little less than 30% of ICT GFCF
- Share stable over time, weight of IT services increasing

Dynamics of investment in ICT equipment and software in the EU*, 1999-2013:
chain linked billions of (2010) euros and percentage shares of total GFCF in volume and at current prices

(*) Includes data for AT, BE, BG, CY, CZ, DK, EL, ES, FI, FR, IT, LU, NL, PT, SE, SI, SK, and the UK (combined, these represent 75% of total GFCF in volume for the EU, excluding Croatia and Romania). Non-euro countries data at current prices corrected using the exchange rates of year 2010.

Source: Author’s estimates based on Eurostat, National Accounts.
Measurement challenges: ICT as production input ~ ICT content in the Economy

- **GFCF: coverage and comparability**: to date, Germany is lacking, and data from some other MS do not look very robust
- **Data on expenditure**: series available for the USA, might the EU include them under SBS?
- **Labour input**: data on IT skills to be mainstreamed

**OVERALL**: Target *ICT content* of the economy by different measures, in a coordinated way
Thank you!

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