MODELS OF ICT INNOVATION: EVIDENCE FROM THE CIS

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The aim of the study: We want to have a better understanding of how ICT firms innovate in terms of:

A) degree of novelty of the innovation performance
B) type and intensity of cooperation
C) type and location of cooperating partners
D) barriers and drivers of innovation

We build on previous work by Arundel and Hollanders and by OECD.
The aim

Box 1: List of NACE Rev. 2 ICT Sub-sectors:

<table>
<thead>
<tr>
<th>NACE rev.2</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>261</td>
<td>Manufacture of electronic components and boards</td>
</tr>
<tr>
<td>262</td>
<td>Manufacture of computers and peripheral equipment</td>
</tr>
<tr>
<td>263</td>
<td>Manufacture of communication equipment</td>
</tr>
<tr>
<td>264</td>
<td>Manufacture of consumer electronics</td>
</tr>
<tr>
<td>268</td>
<td>Manufacture of magnetic and optical media</td>
</tr>
<tr>
<td>4651</td>
<td>Wholesale of computers, computer peripheral equipment and software</td>
</tr>
<tr>
<td>4652</td>
<td>Wholesale of electronic and telecommunications equipment and parts</td>
</tr>
<tr>
<td>5820</td>
<td>Software publishing</td>
</tr>
<tr>
<td>61</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>62</td>
<td>Computer programming, consultancy and related activities</td>
</tr>
<tr>
<td>631</td>
<td>Data processing, hosting and related activities; web portals</td>
</tr>
<tr>
<td>951</td>
<td>Repair of computers and communication equipment</td>
</tr>
</tbody>
</table>

We have looked at various levels of aggregation. Here we present results for the one in which we compare the overall ICT sector to the overall economy.

Still work in progress.
The data

**The CIS:**
- Innovation activities are:
  - (i) product innovation; (ii) process innovation;
  - (iii) organizational innovation; (iv) marketing innovation).

Product and process innovations can be new to the market or new to the firm.

Product and process innovation can be developed by the firm alone or in collaboration with others (firms and institutions).

Activities for product and process innovation could be of very different types:
- (i) **R&D:** in house R&D; external R&D;
- (ii) **non R&D:** acquisition of machinery, equipment, software and buildings; acquisition of existing knowledge from others; training; marketing; design; other types of activities.
The CIS:

Sources of information and cooperation for product and process innovations:
- (i) internal;
- (ii) market sources;
- (iii) educational and research institutes;
- (iv) other sources.

Cooperating partners could be located in:
- (i) same country;
- (ii) other countries in the EU;
- (iii) other countries outside the EU.

Main barriers and drivers for ICT innovation.
Innovation output: any type of innovation

Fig 1.a - ICT vs Non ICT innovators
Innovation output: only product or process

Fig 1.b - ICT vs Non ICT Tech_innovators
Innovation activities: some attempt to innovate

Fig 1.c - ICT vs Non ICT Trying innovators

% of Trying innovators

Year

Graphs by COUNTRY
Innovation activities: no attempt to innovate

Fig 1.d - ICT vs Non ICT Non trying innovators

% of Non innovators

Year

(mean) nontrying_innovator

(mean) nontrying_innovator
Degree of innovativeness very high: product and process, in house, first in the EU or world, new to the market, international market

Fig 2.c - ICT vs Non ICT International comb
Degree of innovativeness high: product and process, in house, first in the home country, new to the market, only national market

Fig 3.c - ICT vs Non ICT Domestic comb

% of Innovators

Year
Degree of innovativeness medium: product and process, new to the market, modification of already existing product or process, international mkt.

Fig 4.c - ICT vs Non ICT Intern comb

% of modifiers vs Year

BG CY CZ DE EE
ES FR HR HU IE
IT LT LU LV NL
PT RO SE SI SK
Degree of innovativeness medium-low: product and process, new to the market, modification of already existing product or process, national mkt.

Fig 5.c - ICT vs Non ICT Domestic comb

% of modifiers

Year
R&D activities (internal and external)

Fig 6.a - ICT vs Non ICT RD

% of RD investors

Year

BG CY CZ DE EE
ES FI FR HR HU
IE IT LT LU LV
NL PT RO SE SI
SK
Non-R&D activities: acquisition of machinery, equipment, software and buildings; acquisition of existing knowledge from others; training; marketing; design; other activities.

Fig 6.b - ICT vs Non ICT Innovation investors

% of innovation investors

Year
Fig 7.b - ICT vs Non RTD funds

% of RTD fund

Year

Knowledge sources

Fig 8 - Information source

% of responses

BG CY CZ DE EE ES FI FR HR HU IT LT LU LV PT RO SE SI SK

mean of ict_s_market_ mean of ict_s_edu_ mean of ict_s_other_ mean of ict_s_int_

Graphs by COUNTRY
Fig 9.b - Type of cooperation partner

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th></th>
<th>2012</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CO within enterprise</td>
<td>14.5%</td>
<td></td>
<td>16.6%</td>
<td></td>
</tr>
<tr>
<td>CO suppliers</td>
<td>11.3%</td>
<td></td>
<td>14.0%</td>
<td></td>
</tr>
<tr>
<td>CO clients</td>
<td>23.7%</td>
<td></td>
<td>21.7%</td>
<td></td>
</tr>
<tr>
<td>CO competitors</td>
<td>22.8%</td>
<td></td>
<td>13.2%</td>
<td></td>
</tr>
<tr>
<td>CO consultants</td>
<td>14.2%</td>
<td></td>
<td>13.4%</td>
<td></td>
</tr>
<tr>
<td>CO universities &amp; government</td>
<td>13.5%</td>
<td>CO within enterprise</td>
<td>21.2%</td>
<td></td>
</tr>
</tbody>
</table>
Location of cooperating partners

**Fig 9.a - Cooperation partner by location**

### 2004
- **Co within Europe**: 32.8%
- **Co within your country**: 48.8%
- **Co within other regions**: 18.4%

### 2012
- **Co within Europe**: 33.4%
- **Co within your country**: 47.6%
- **Co within other regions**: 19.0%
Barriers to innovation: 2010

Fig 13.a - Selected Obstacles 2010

% of responses

BG CY CZ EE ES FI FR HR HU IE IT LT LU LV PT RO SE SI SK

- Lack of finance
- Lack of qual pers
- Lack of info techn
- Uncertain demand for innov
- No demand for innov
Drivers of competitiveness: 2012

Fig 10.a - Competitiveness
ICT sector

% of responses

Patents
Design reg
Copyright
Trademarks
Drivers of competitiveness: 2012

Fig 10.b - Competitiveness
ICT sector

% of responses

BE | BG | CY | DE | EE
---|----|----|----|----

ES | FI | HR | HU | IT
---|----|----|----|----

LT | LU | LV | PT | RO
---|----|----|----|----

SE | SI | SK
---|----|----
No | Low| Med| High| No | Low| Med| High| No | Low| Med| High

Legend:
- Blue: Lead time adv
- Red: Complexity of goods & serv
- Green: Secrecy
Conclusions (temptative)

- ICT firms are clearly more innovative than the average firm, not only in terms of innovation inputs (R&D) but also in terms of innovation outputs.

- When looking at measures of “Innovativeness”, ICT firms tend to be more innovative than the average firm (i.e. among High degree of “Innovativeness”).

- There are major across-country differences in innovative performance of the ICT sector.

- Some evidence that the crisis has had a negative impact on “Innovativeness”.
Conclusions (temptative)

- ICT firms show a large range of cooperation activities, in particular with clients and suppliers. At the EU level the picture in 2004 is similar to the one in 2012. However there exists relevant across-country differences.

- Cooperation with entities within the home country is more likely than cooperation with entities within the EU, which is more likely than cooperation with entities external to the EU.

- Internal and market sources of knowledge seem to be more relevant than education and research centers.

- Relative to the average, ICT firms are more likely to receive RTD funds.
Conclusions (temptative)

- IPR do not seem to be perceived as very important drivers of competitive advantage. Secrecy and lead time advantage seem to matter more. Large across country variability.

- Lack of finance, lack of qualified personnel and uncertainty over demand appear as important barriers (across country variability).
Barriers to innovation

Fig 13.a - Obstacles
ICT sector

% of responses

BG | CY | DE | EE
---|----|----|----
No | Low| Med| High

HR | HU | IT | LT
---|----|----|----
No | Low| Med| High

LV | PT | RO | SE
---|----|----|----
No | Low| Med| High

SI | SK
---|----
No | Low| Med| High

Legend:
- Price comp
- Prod comp
- Innov by competitors
- Domin mkt sh