Economics of Information and Communication Technology

Lecture 1: Industrial Organization of High-Tech Markets

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Aim of the Course

- Analyse the main economic aspects related to *Information and Communication Technology (ICT)*

- ICT refers to the set of technologies used to manage *information*.

- *Information*: anything that can be digitalized.

- ICT includes technologies that allow storage, processing, and transmission of information.

- Thus, computers but also telecommunications, electronic and digital media products (examples: electronic payments, video games, etc.).
Some numbers

- 2/3 of Europeans surf the web.
- Half of them use Facebook.
- In Italy 50% of the population owns a laptop.
- 20% of firms with more than 10 employees purchase intermediates on the internet.
- In Italy, 87.4% of people declare to never part from their mobile phone.
ICT and Economic Growth

- Relevant industrial sectors.
- Produce inputs for other industries and the price of these inputs declines over time.
- Investment in ICT increased largely labor productivity and total factor productivity (TFP).
Share of ICT investment in R&D

- Belgium: 25.0%
- Czech Republic: 12.2%
- Denmark: 20.4%
- Finland: 57.3%
- France: 21.2%
- Germany: 12.4%
- Ireland: 33.1%
- Italy: 18.7%
- Netherlands: 24.9%
- Norway: 22.6%
- Poland: 8.6%
- Portugal: 25.1%
- Spain: 17.4%
- Sweden: 29.6%
- UK: 23.0%
- Japan: 23.5%
- USA: 30.0%
European firms with Broadband and Personal Website

![Bar chart showing broadband access and website ownership percentages by country.](Image)
Online share of total retail sales

On-line share of total retail sales

% 2010 2011 2012

Average EU 4 5,9 7,6
Italy 0,9 1,3 1,6
Poland 2,8 3,1 3,8
Spain 3 3,5 4,1
Sweden 5,9 6,9 8
France 6 7,3 8,7
Denmark 8 9,1 9,1
Norway 6,6 8,1 8,7
Switzerland 9,9 9,9 9,9
Germany 10 10 11
United Kingdom 11 12,7 12,7

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Online share of total retail sales

![Bar chart showing online share of retail sales by industry.](chart)

- **Online share of retail sales by industry:**
  - **Games:** 30%
  - **Music:** 25%
  - **Advertising:** 23%
  - **Film:** 10%
  - **News:** 3%

**Bar chart notes:**
- **Online revenues:**
- **Online growth rate:**
- **Legend:**
  - % Online revenues
  - Online growth rate
On the one hand ICT are *instruments* used by firms.

On the other hand, firms sell ICT *products* directly to consumers.

Despite the different roles they may play, high-tech sectors share a common set of features:

1. large economies of scale;
2. presence of network effects;
3. high innovation rates;
4. substantial switching costs.
Economies of scale

- Large fixed costs and small, almost zero, marginal costs (decreasing average cost function).

- Examples:
  - Infrastructures of telecommunication companies;
  - “First copy” of an innovation like a music album;
  - R&D costs.
Network Effects

The benefit an individual obtains from purchasing the technology/service depends on the total number of users of it;

“Network effects” refer to the fact that the utility of a consumer increases with the network size;

Examples:
- Windows vs Linux;
- Whatsapp vs Telegram;
- Facebook vs MySpace.
ICT industries are R&D intensive and extremely innovative.

“Winner take all races” where the innovator competes for the market rather than in the market;

Creative destruction: the leader is often replaced by the new innovator.
Switching Costs

- In ICT markets there are high switching costs when moving from one supplier to another;

- Cost is “opportunity cost”, not necessarily a monetary one;

- Example: switching from Windows to Apple.

- When switching costs are high the consumer is locked in.
The typical features of ICT markets imply that:
- large fixed costs prevent the price to converge to the marginal cost;
- firms become monopolist and engage in price discrimination;
- the price is set close to the consumer’s willingness to pay.
Industrial Organization of High-Technology Markets, by Stefano Comino and Fabio Maria Manenti, Edward Elgar.
Plan of the book

- Chapter 2: analysis of price discrimination and the associated price dispersion in online markets.
- Chapter 3: markets exhibiting network effects;
- Chapter 4: two-sided markets;
- Chapter 5: telecommunications;
- Chapter 6: cumulative innovations;
- Chapter 7: departures from traditional intellectual property;
- Chapter 8: antitrust issues.
As the user surfs the web, internet operators collect data on consumers’ preferences.

Cookies stored in users’ PC.

Online vendors use cookies to price discriminate consumers.

Price set to willingness to pay.
Markets with network effects.

How is the demand for a product influenced by network effects?

How does a technology imposes itself as a market standard?

Which compatibility strategies among rivals?
Two-sided markets.

Firms intermediate between two groups of consumers.

The utility of an agent increases with the number of agents in the other group.

Examples: credit cards; video-games consoles.

Which pricing strategy on the two sides?
Telecommunications is possibly the most important ICT sector.

Voice telephony, internet, radio and TV broadcasting.

Large liberalizations in the last 20 years.

From the one-way access model to the two-way access model.

New challenges for regulators.
Cumulative innovation.

Patents may have a conflicting effect on R&D incentives.

Design of the optimal patent policy.

Patents as legal weapons against competitors.
Departure from traditional intellectual property approach.

Striking innovation rates in sectors with low propensity to patenting.

Competitive innovation? Open source software.
Antitrust issues in ICT.

Market structure likely to favor the emergence of dominant firms.