Economics and Policy of Innovation

Academic year 2015/2016

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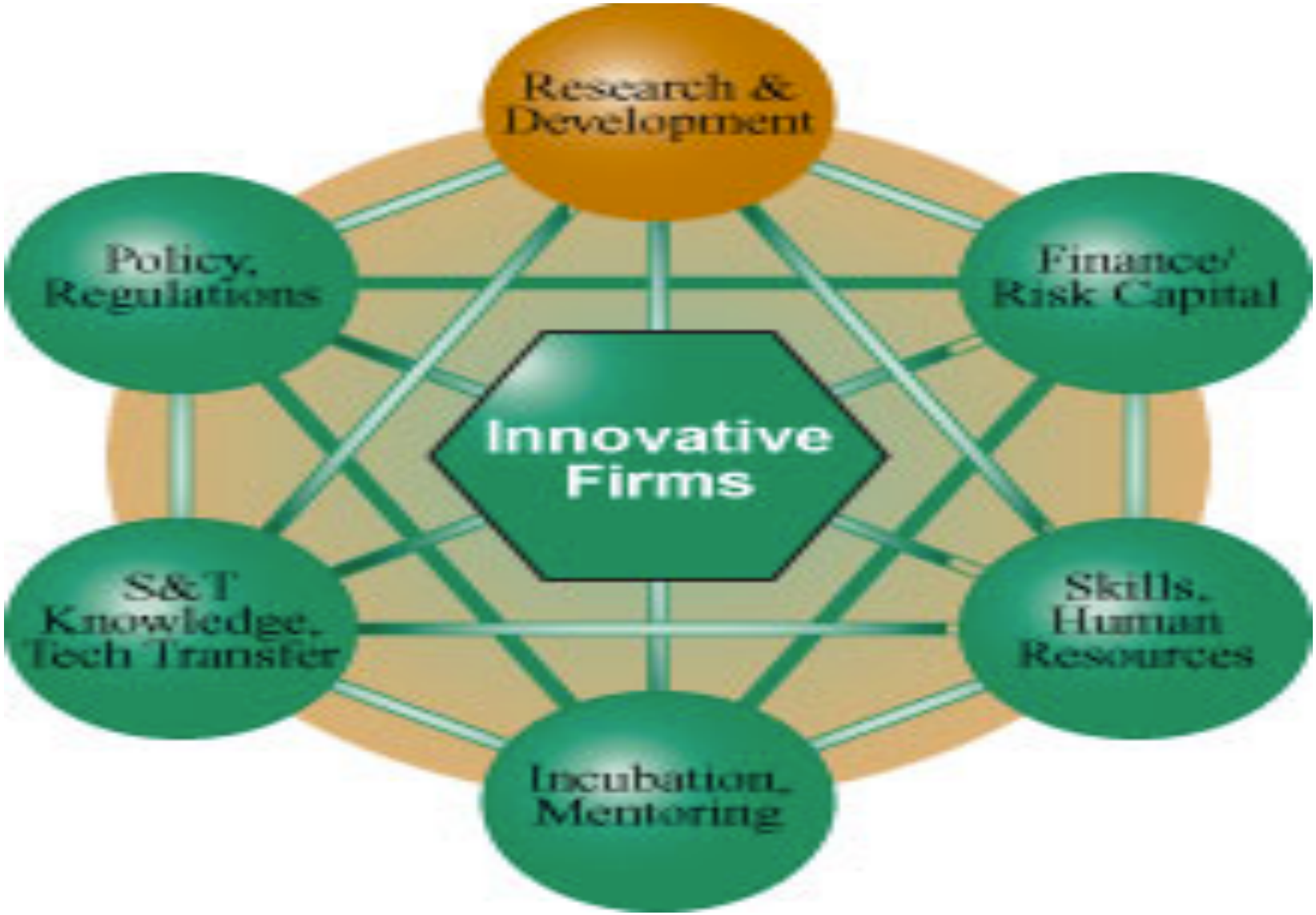
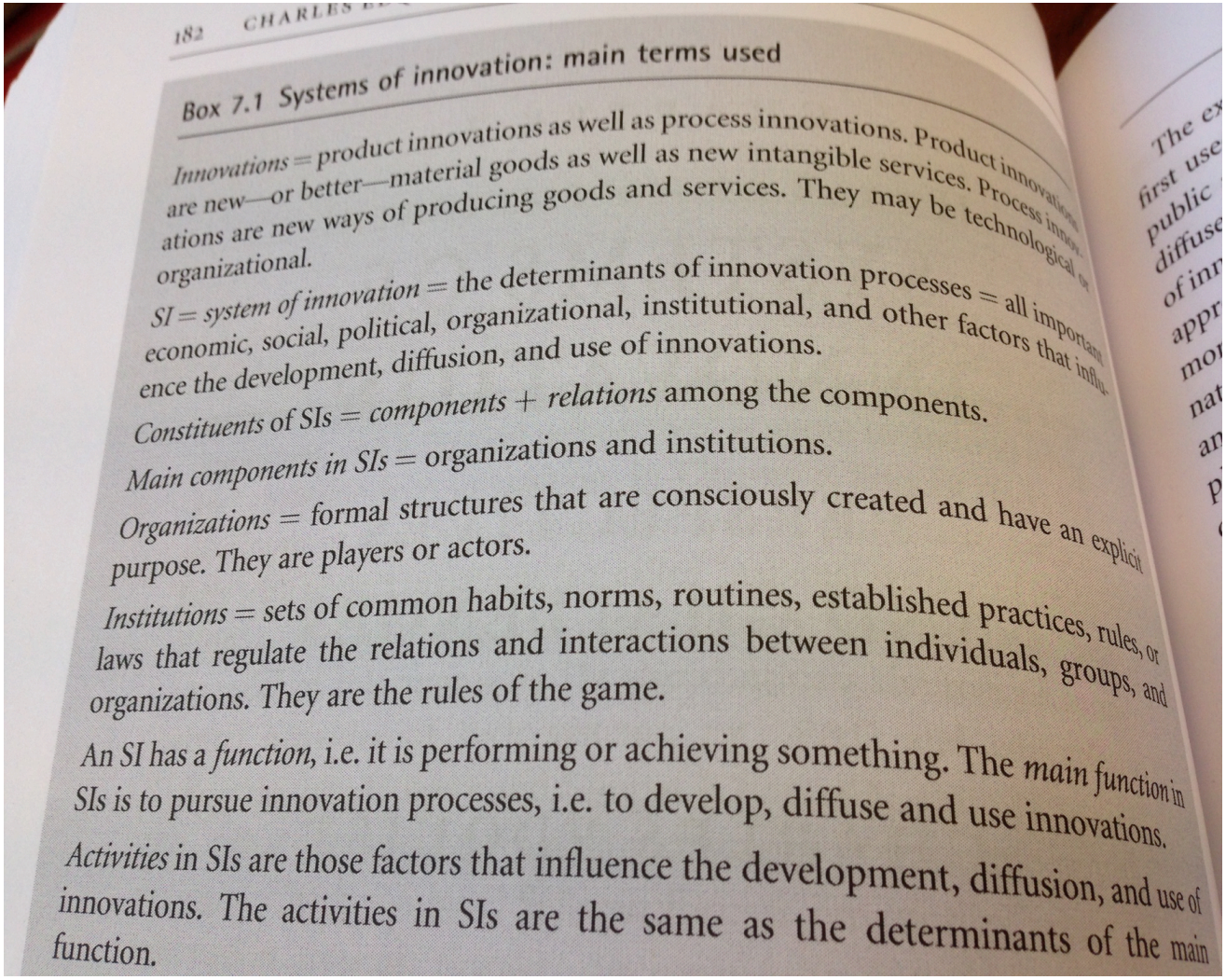
Systems of Innovation

(Chapter 7)

The system in a picture



Main terms used (page 182)



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Box 7.1 Systems of innovation: main terms used

Innovations = product innovations as well as process innovations. Product innovations are new—or better—material goods as well as new intangible services. Process innovations are new ways of producing goods and services. They may be technological or organizational.

SI = system of innovation = the determinants of innovation processes = all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations.

Constituents of SIs = components + relations among the components.

Main components in SIs = organizations and institutions.

Organizations = formal structures that are consciously created and have an explicit purpose. They are players or actors.

Institutions = sets of common habits, norms, routines, established practices, rules, or laws that regulate the relations and interactions between individuals, groups, and organizations. They are the rules of the game.

An SI has a *function*, i.e. it is performing or achieving something. The *main function* in SIs is to pursue innovation processes, i.e. to develop, diffuse and use innovations.

Activities in SIs are those factors that influence the development, diffusion, and use of innovations. The activities in SIs are the same as the determinants of the main function.

The organisations / main actors

- Firms;
- Education system (Universitites);
- Public Research Organisations (PROs);
- Financial institutions;
- Political institutions.

A note on “institutions” (section 7.3.3): they are often defined in a contradictory way. Some mean “actors”, others mean “institutional rules”.

A first definition (Freeman, 1987)

A national system of innovation (NSI) is a "*network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies"*.

As a consequence, they influence the direction of a society technological change.

Two elements/constituents: actors and their interactions. Or, in other words as in the book: components + relations among the components.

System is made of

elements/***constituents*** = ***components*** + *relations* among components

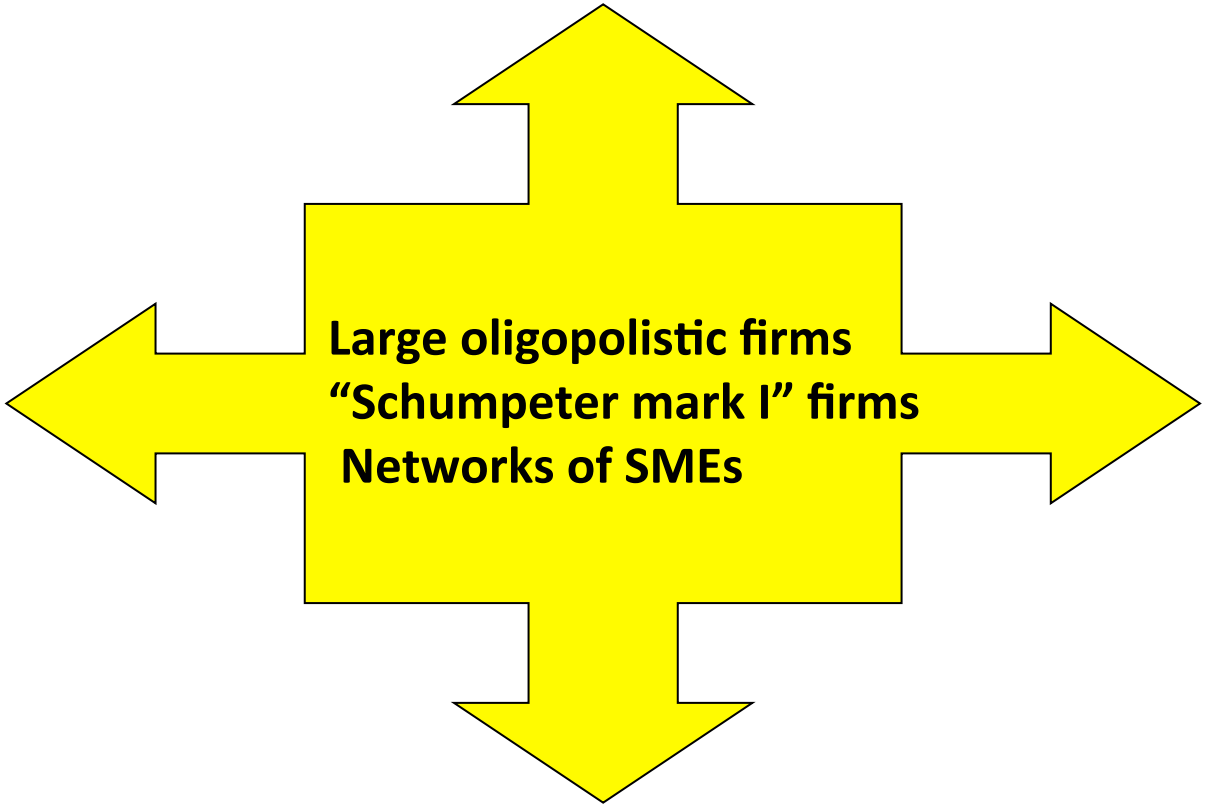
Main ***components*** = **organisations** & **institutions**

Organisations = *public and private actors*

Institutions = "*the rules of the game*"

Different types of innovation systems have been studied: national, sectorial, regional/local.

Firms are the core of the system



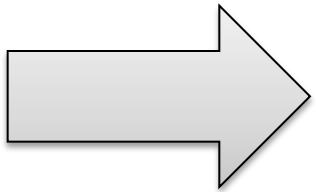
All around it exists an extensive network of **vertical and horizontal relations**, aimed at exchanging technological knowledge

Vertical relations/interactions: clients/suppliers

We already know that several sources of information can exist:

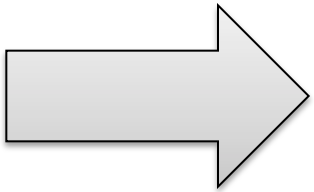
- Technology embodied in goods/components (e.g. a new machinery)
- Interactive learning
- A qualified demand of clients

Vertical relations/interactions: clients/suppliers (2)



Type of relations:

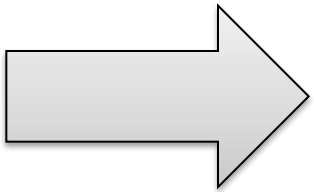
more stable, based on trust



less uncertainty

lower transaction costs

codes, common languages



tacit knowledge

Horizontal relations/interactions: competitors

Innovation sources:

- Strategic alliances
- Technological cooperation
- Informal relations
- Common institutions

Horizontal relations/interactions: competitors (2)

Type of relations:

technological cooperation

networks of firms

uncertainty, due to the persistence of competition

spatial concentation

Education system and Scientific Research

Investments (mainly by Universities and PROs) in:

- Human Resources
  - » Cultural improvement of society
  - » Development of techno-scientific competences
  - » Exchange of knowledge and personnel
- Basic and Applied Research
  - » Diffusion of results
  - » Collaboration projects

Education system and Scientific Research (2)

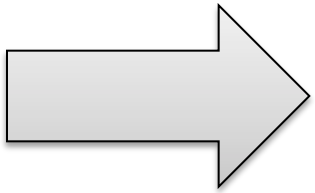
Main difficulties in the interaction between public and private organisations:

Diversity in objectives

incentives

languages

organisational modalities



need of bridging institutions and/or units capable of mediation

Interaction between public and private

Benefits

- Funding
- Access to firm resources
- Access to know how and application of knowledge
- Creation of research spin-offs
- Job market for students
- Commercial exploitation of innovations (patents)
- Reputation

Interaction between public and private (2)

Risks and problems

- Reduction in basic research investments
- Lower quality of basic research
- Direct influence on research topics
- Indirect influence (incentives to perform R&D mainly on topics of interest for firms)
- Low request (in some countries) from firms, especially where many SMEs exist (because of their limited absorptive capacity)

Role of government and technological policies

1. Policies aimed at creating and developing specific technologies:
   - R&D funded by the government;
   - Policies protecting newly-born industries (cases of Korea and Japan)

2. Policies for the reinforcement of competition

3. Policies for IPR protection

Role of government and technological policies (2)

4. Policies aimed at:
   - The development of technological infrastructures (including telecommunications, transport, buildings etc.)
   - The development of formal organisations and networks supporting innovation:
     - Generic (chambers of commerce, industrial associations, etc.)
     - Specific (Technological Industrial Districts, Scientific Parks, Technological Poles, etc.)

The EU Innovation Policy

Lisbon Strategy → EU2020 targets

- 2000 – The European Council launched the Lisbon Strategy, **aimed at transforming the EU by 2010 into 'the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion'**

- 2002 – In Barcelona, a further aim was added, namely to **spend by 2010 at least 3 % of GDP on research**, of which two thirds should be financed by the business sector

- 2010 – Launch of the **Europe 2020** Strategy

EU 2020 Strategy

Since we study Economics and **Policy** of Innovation, we need to know the EU 2020 growth strategy.

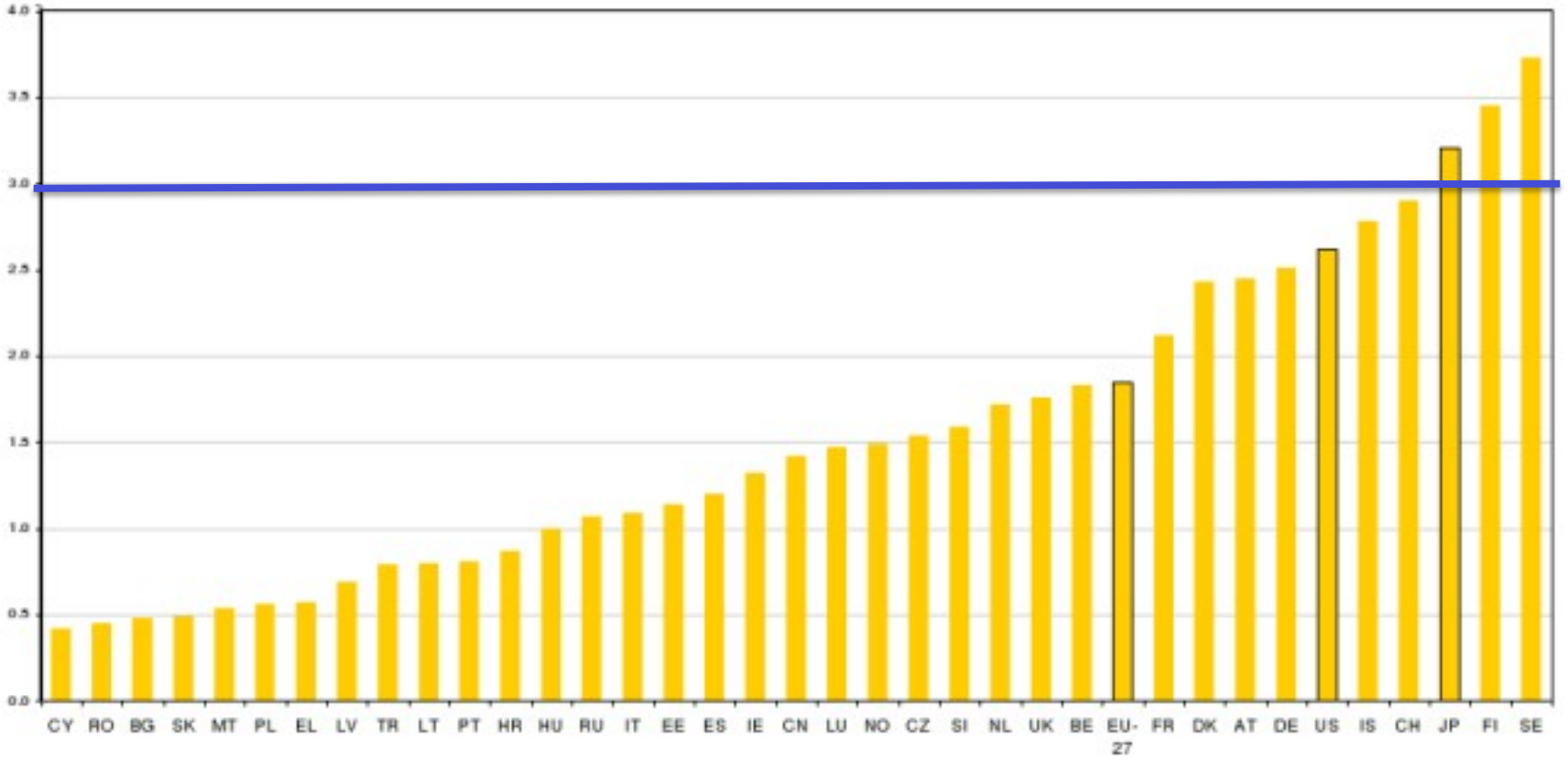
It has 3 priorities:

- **Smart growth**
- Sustainable growth
- Inclusive growth

What is Smart growth?

http://ec.europa.eu/europe2020/priorities/smart-growth/index_en.htm

Have Lisbon Strategy targets been achieved?



Exceptions to the reference year: 2005: IT, PT, UK, IS and TR 2004: CH
Eurostat estimate: EU-27. National estimates: BE, DK, EE, ES, FR, CY, MT, SI and NO.

Source: Eurostat - R&D statistics and OCDE-MSTI
Provisional data: DE, EL, LU, AT, NL and US.

The Italian NSI

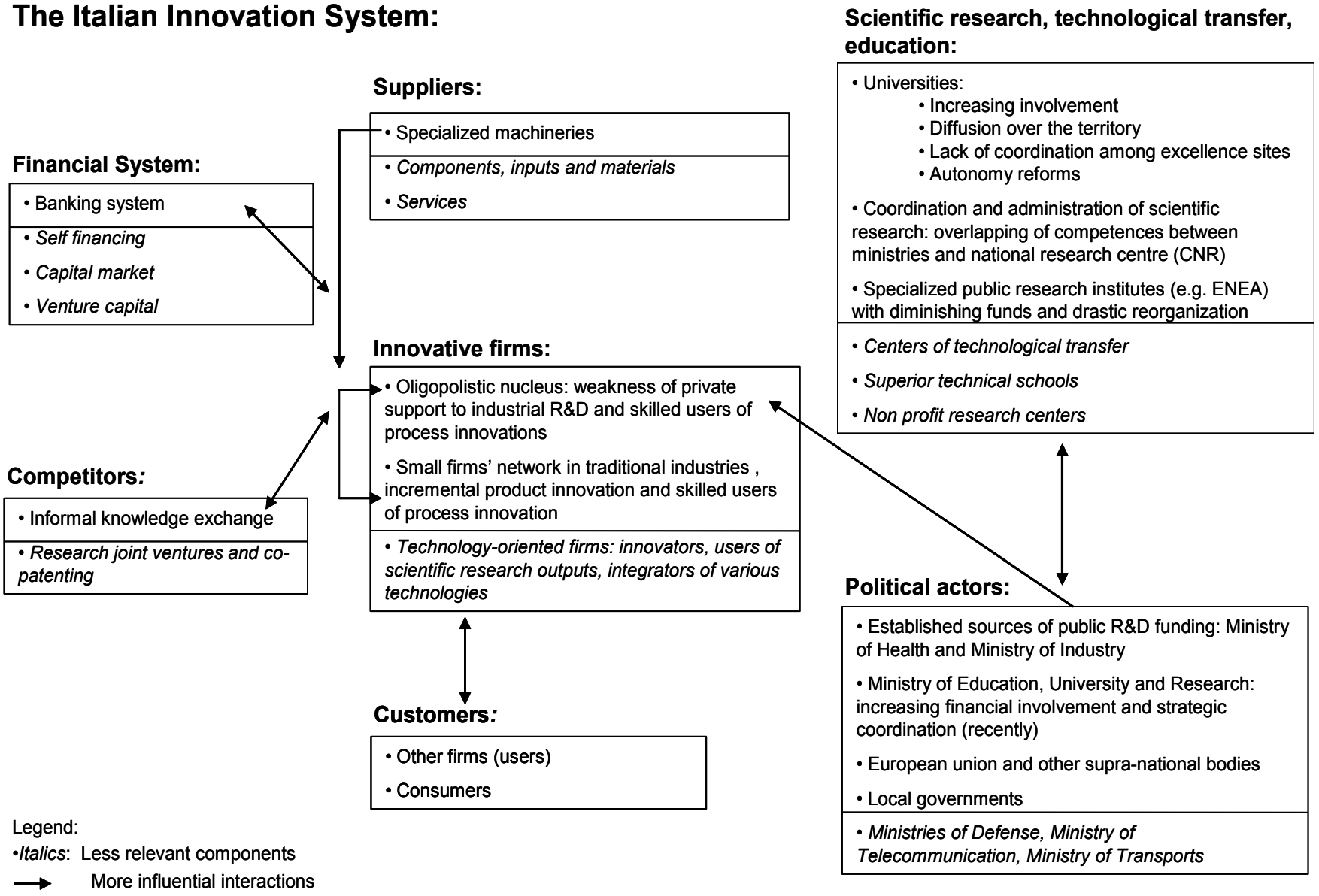
Main EC data source:

RIO

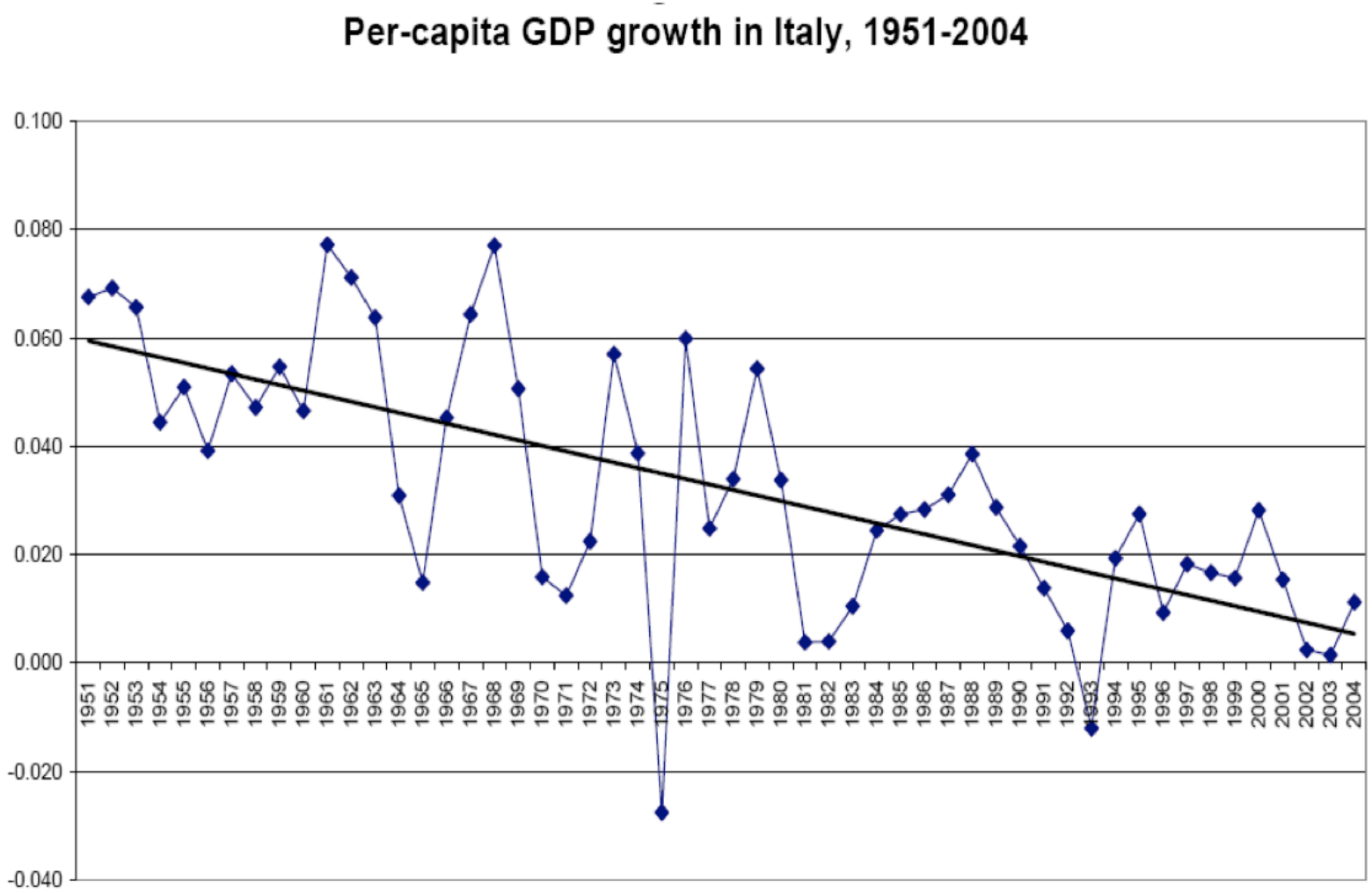
(Research and Innovation Observatory)

https://rio.jrc.ec.europa.eu/en

The Italian Innovation System:



Before getting to the Italian NSI

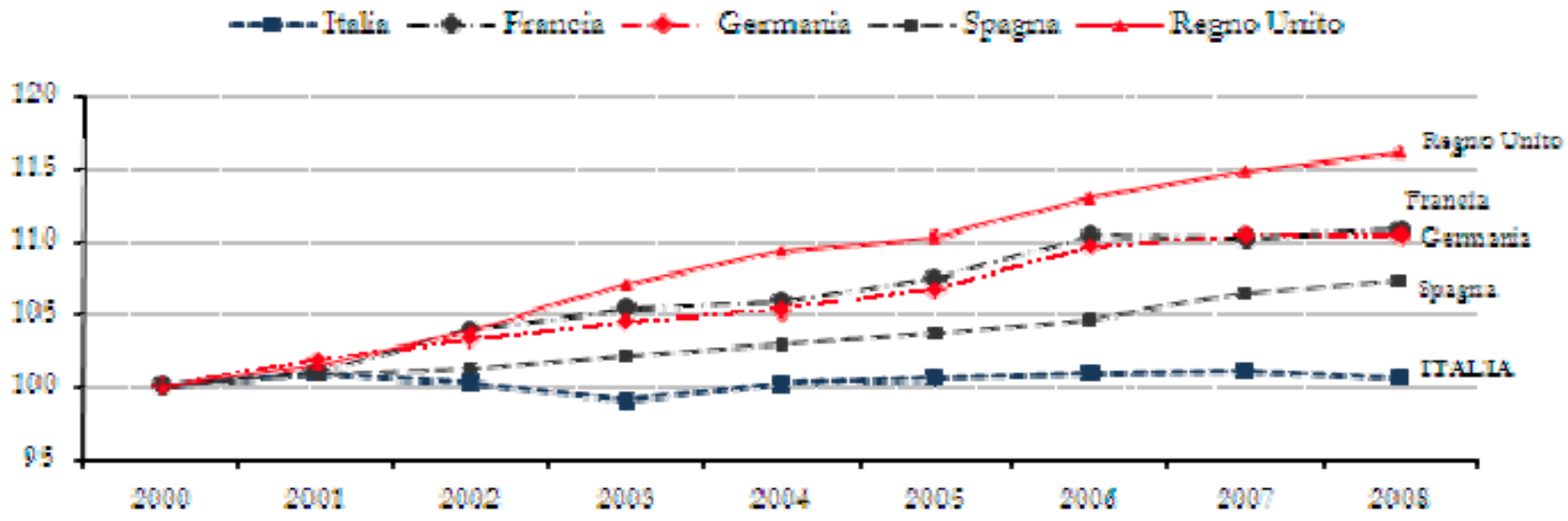


Growth rates in Italy

- 1950-2005: 3.2%
- **‘50s: +5.5%**
- **‘60s: +5.1%**
- **‘70s: +3.1%**
- ‘80s: +2.2%
- ‘90: +1.4%
- 2000-05: +0.6%
- **‘08: -1.2%**
- **‘09: -5.5%**
- ‘10: +1.8%
- ‘11: +0.4%
- **‘12: -2.2%**

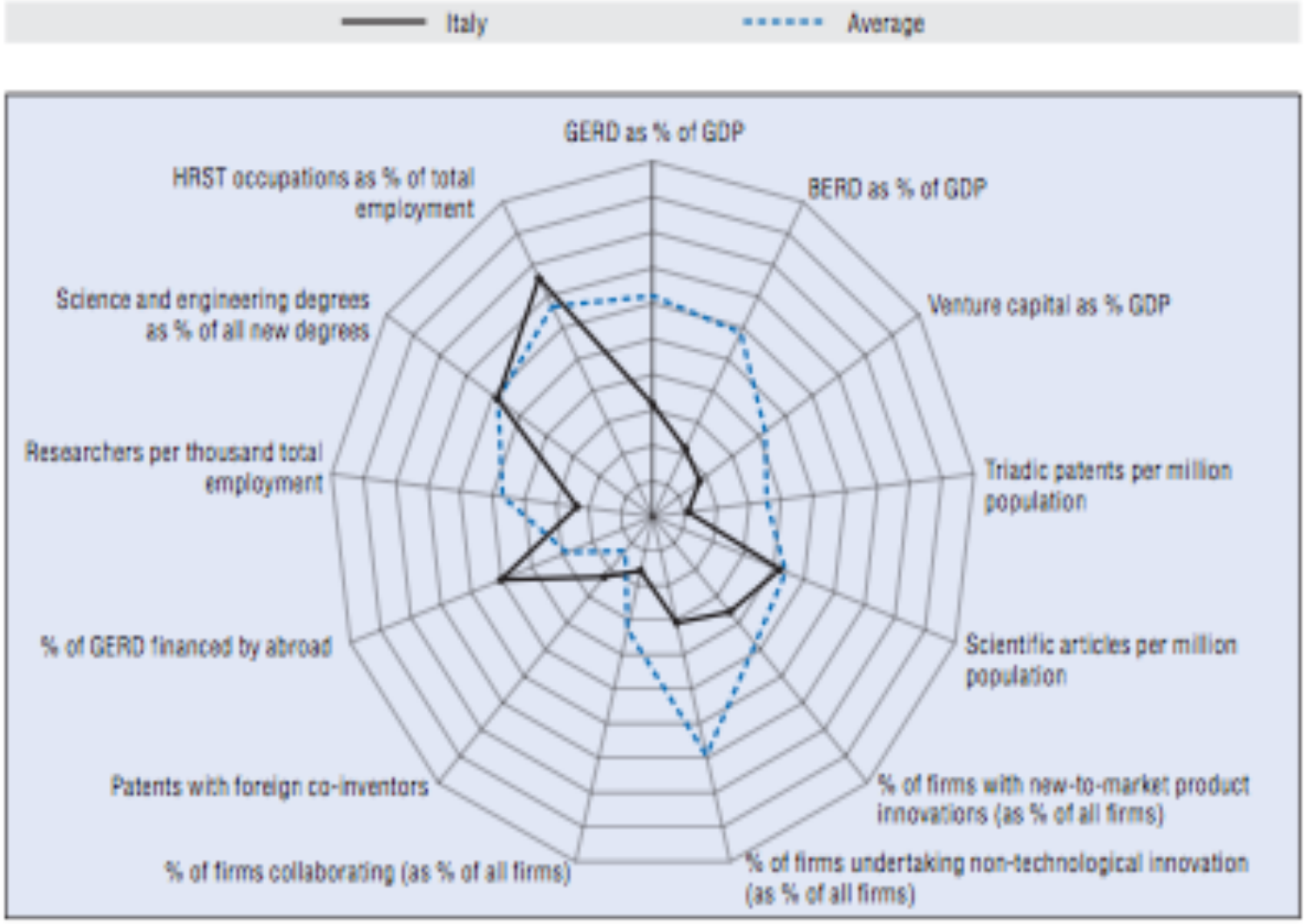
Labour productivity not growing

Produttività del lavoro nei principali paesi europei, 2000 - 2008 (base 2000=100)



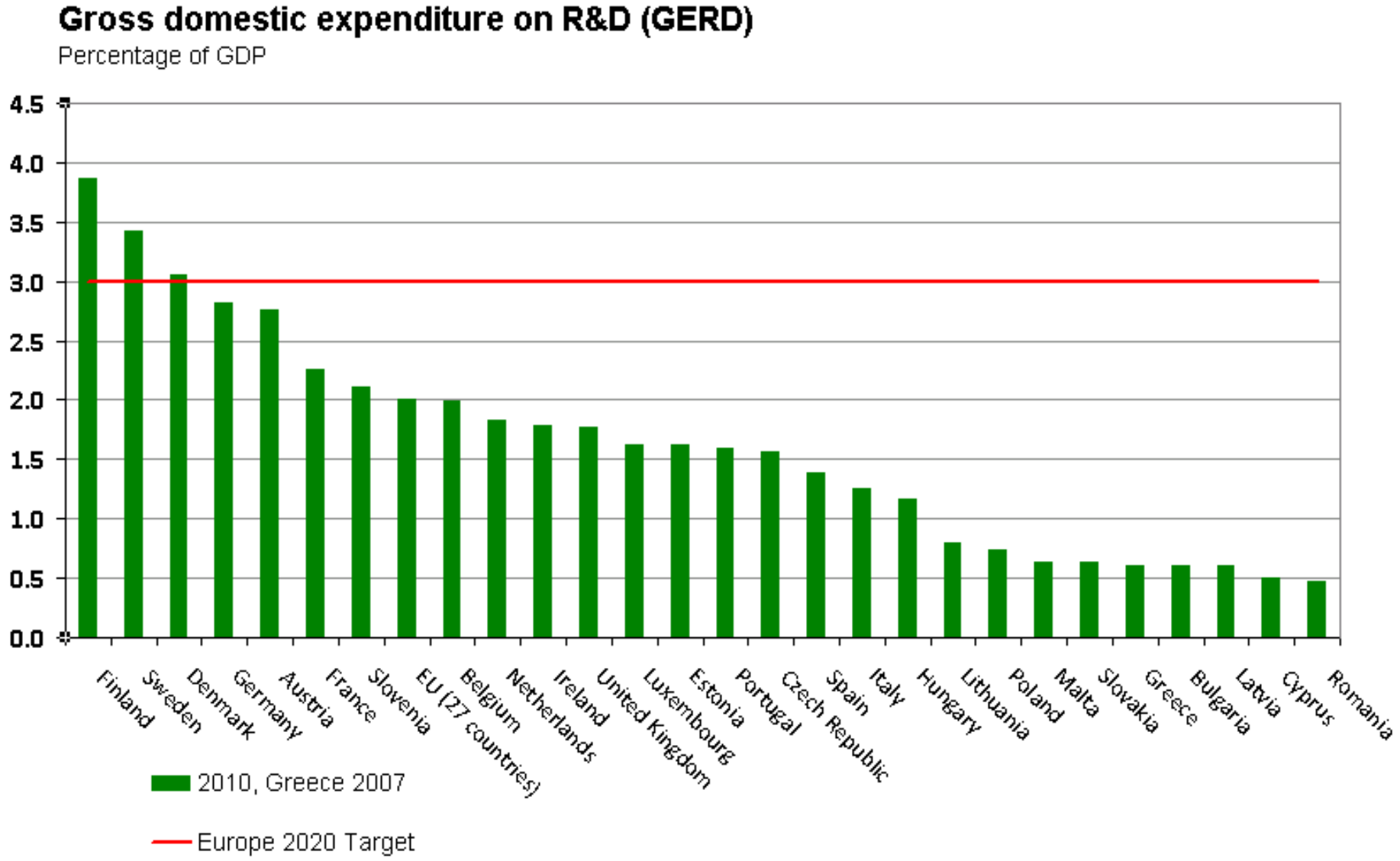
Fonte: Productivity Statistics and OCSE (2008)

Science and innovation profile of Italy



StatLink http://dx.doi.org/10.1787/888932334222

Low R&D expenditures



Distribution of R&D expenditures

Fig. 1 – Distribuzione percentuale delle spese in R&S per settore istituzionale, anni 1963-2004

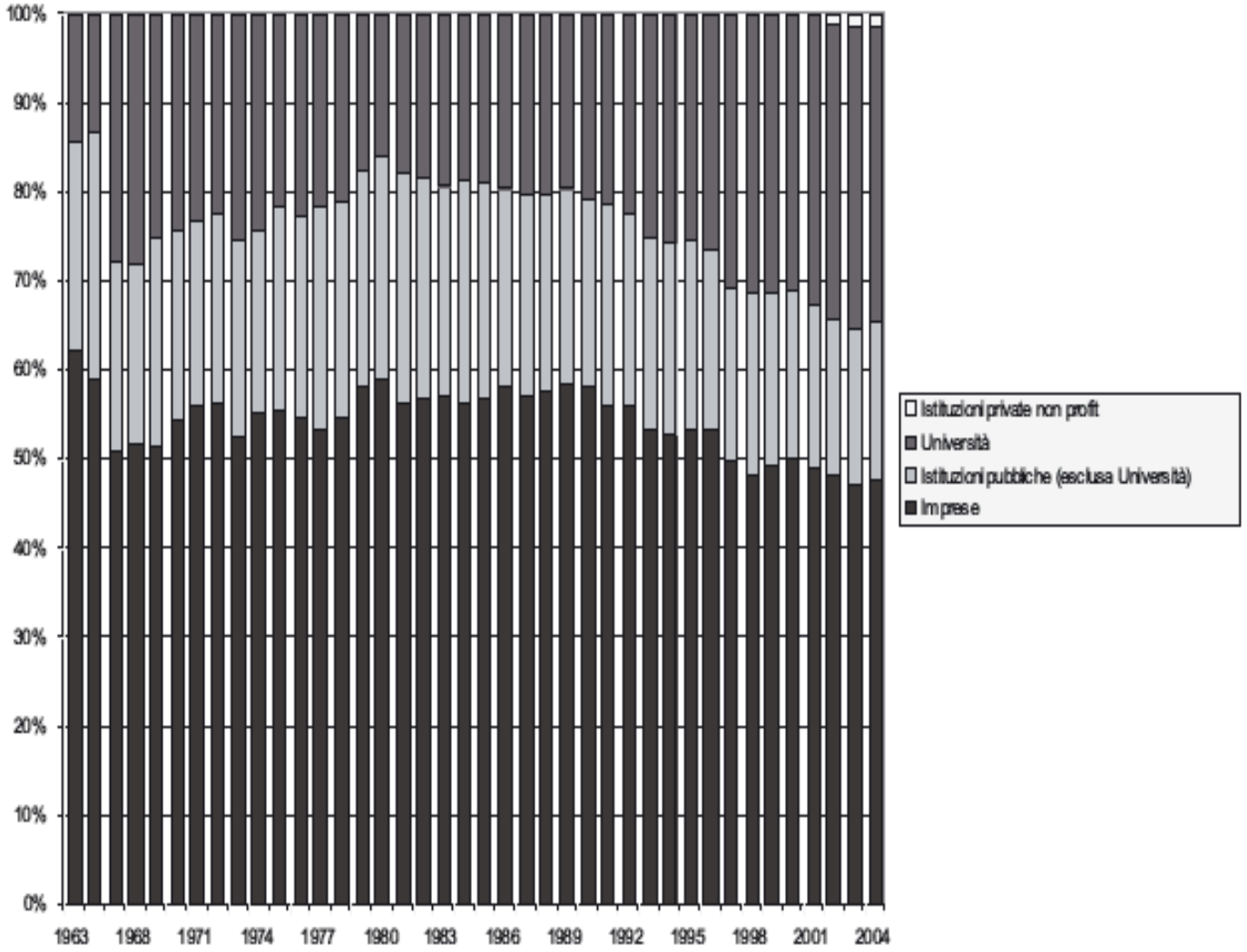
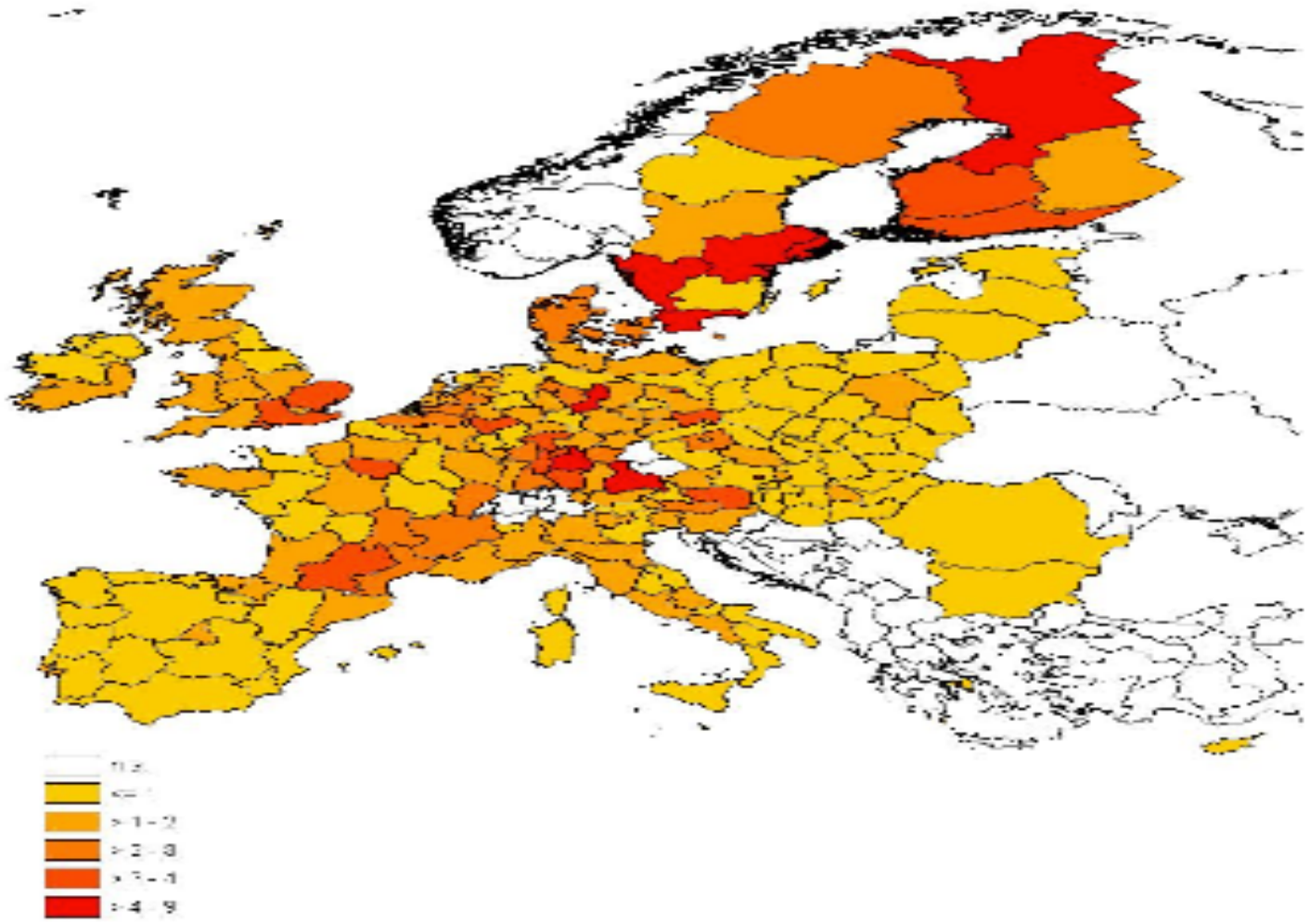


Figure 8: R&D intensity (GERD as % of GDP), 2003



Note: NUTS 2 data do not include BE, BG, RO, UK and GR other than Athens; NUTS 1 data used for BE and UK; NUTS 0 data used for BG, RO; UK data for 1999 (last available).
Source: Regional Key Figures database, own compilation; 196 regions included

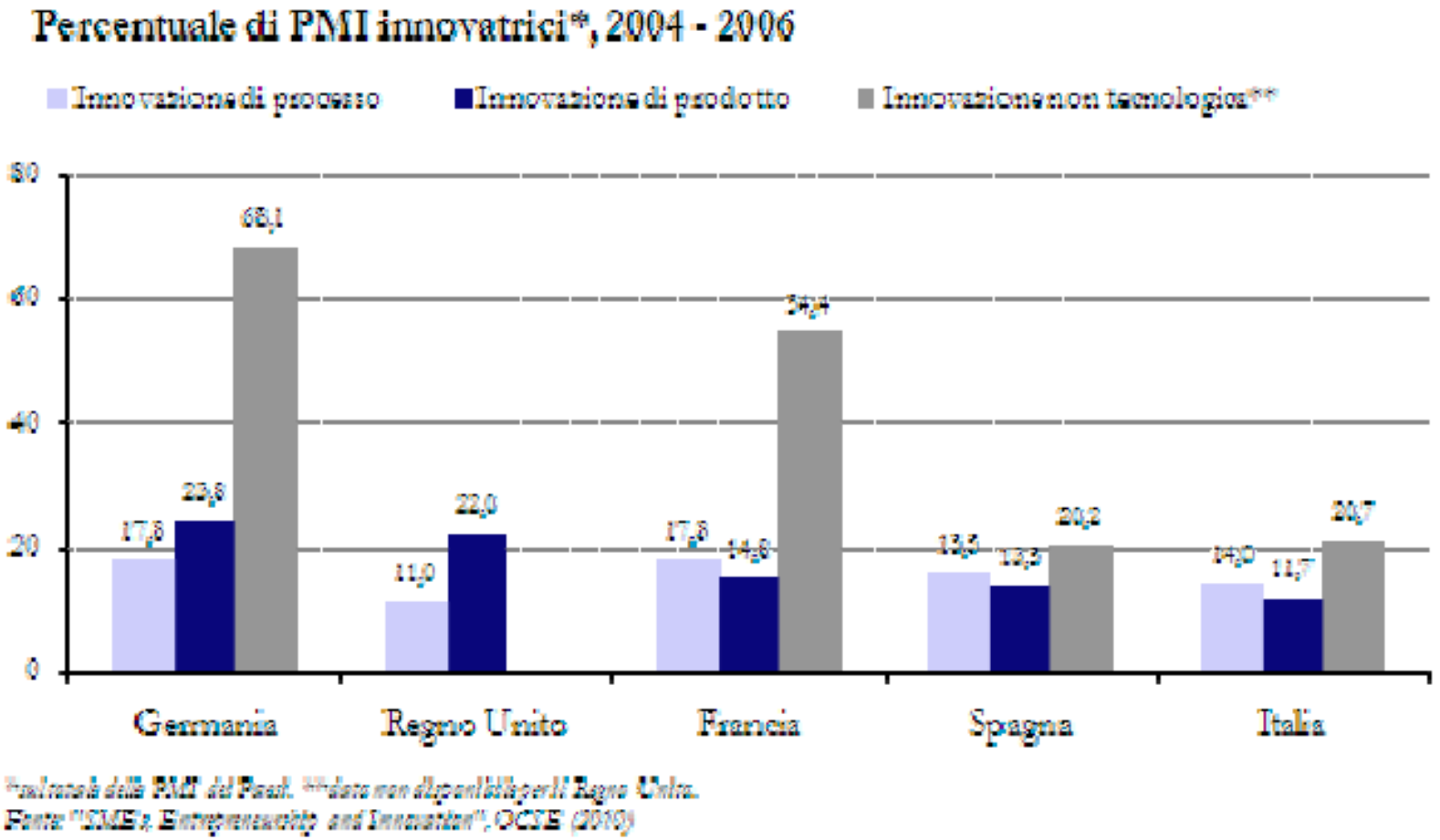
Low business R&D expenditures…

	Industria	Governo
Corea del Sud (2005)	76,9%	11,9%
Giappone (2004)	75,2%	9,5%
USA (2006)	71,1%	11,0%
Germania (2005)	69,9%	13,6%
Cina (2005)	68,3%	21,8%
Russia (2005)	68,0%	26,1%
Regno Unito (2004)	63,0%	10,3%
Francia (2005)	61,9%	17,3%
Canada (2006)	52,4%	8,8%
Italia (2004)	47,8%	17,9%

… and rarely top business R&D players

EU rank	Company	Country	Industry (3-digit ICB)	R&D-2011 €m	R&D 1-year growth %
1	Volkswagen	Germany	Automobiles & parts	7203,0	15,1
2	Daimler	Germany	Automobiles & parts	5629,0	16,0
3	Nokia	Finland	Technology hardware & equipment	4910,0	-0,6
4	Sanofi-Aventis	France	Pharmaceuticals & biotechnology	4795,0	9,2
5	GlaxoSmithKline	UK	Pharmaceuticals & biotechnology	4377,0	-2,4
6	Siemens	Germany	Electronic & electrical equipment	4278,0	0,9
7	Robert Bosch	Germany	Automobiles & parts	4242,0	10,9
8	AstraZeneca	UK	Pharmaceuticals & biotechnology	3668,0	10,4
9	Ericsson	Sweden	Technology hardware & equipment	3656,9	19,6
10	BMW	Germany	Automobiles & parts	3373,0	21,6
11	EADS	The Netherlands	Aerospace & defence	3249,0	5,4
12	Bayer	Germany	Chemicals	3045,0	-5,2
13	Peugeot (PSA)	France	Automobiles & parts	2634,0	9,7
14	Boehringer Ingelheim	Germany	Pharmaceuticals & biotechnology	2516,0	2,6
15	Alcatel-Lucent	France	Technology hardware & equipment	2514,0	-1,8
16	Fiat	Italy	Automobiles & parts	2175,0	12,3
17	Renault	France	Automobiles & parts	2064,0	19,4
18	Volvo	Sweden	Industrial engineering	1965,2	7,9
19	Finmeccanica	Italy	Aerospace & defence	1960,0	-0,4
20	SAP	Germany	Software & computer services	1939,0	12,1

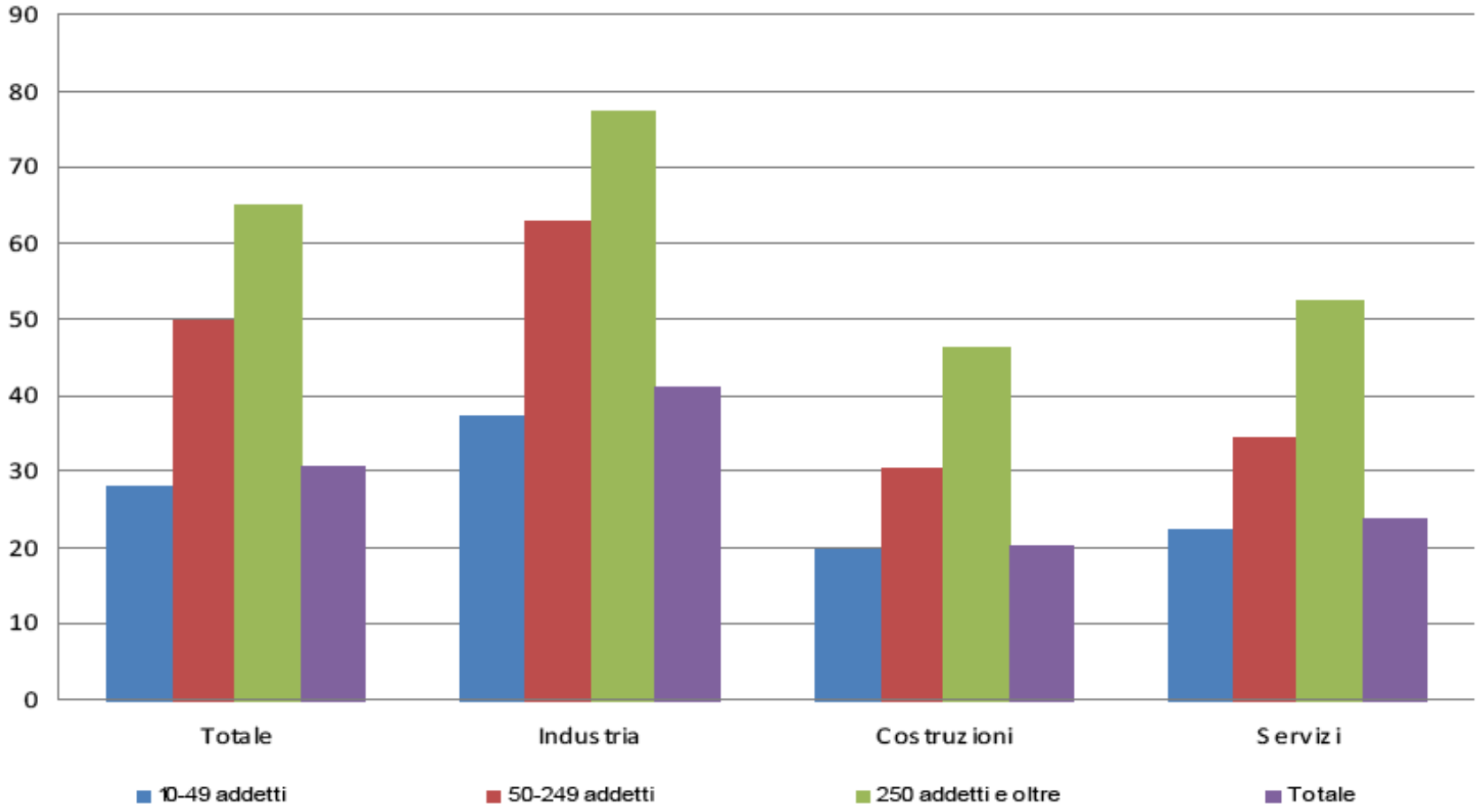
Low rates of innovative SMEs



*valori delle PMI del Panel. **dato non disponibile per il Regno Unito.
Fonte: "SMEs, Entrepreneurship and Innovation", OCDE (2010)

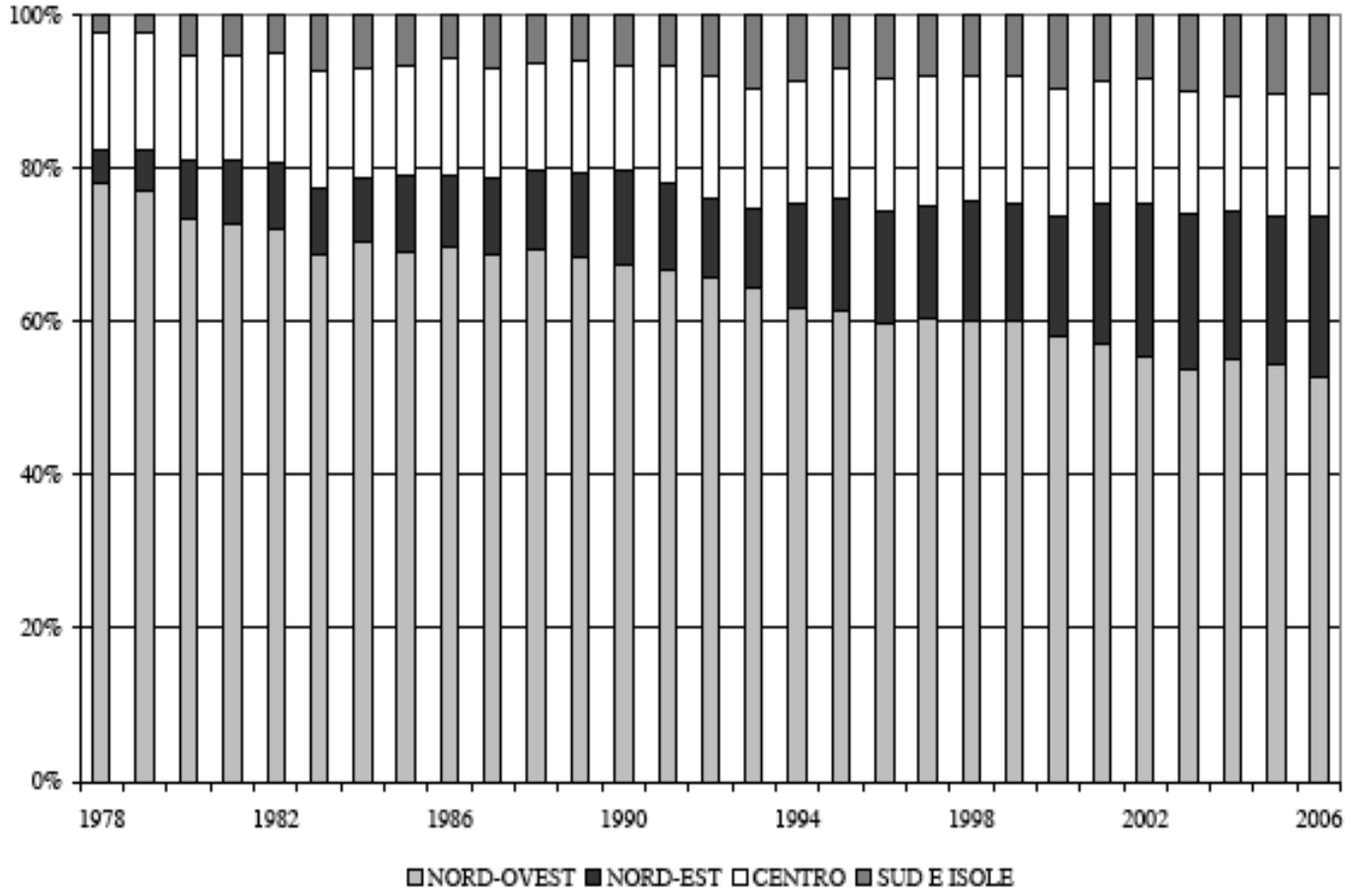
Low rates of innovative SMEs (2)

Figura 1 - Imprese innovatrici per macrosettore e classe di addetti - Anni 2006-2008
(in percentuale del totale)



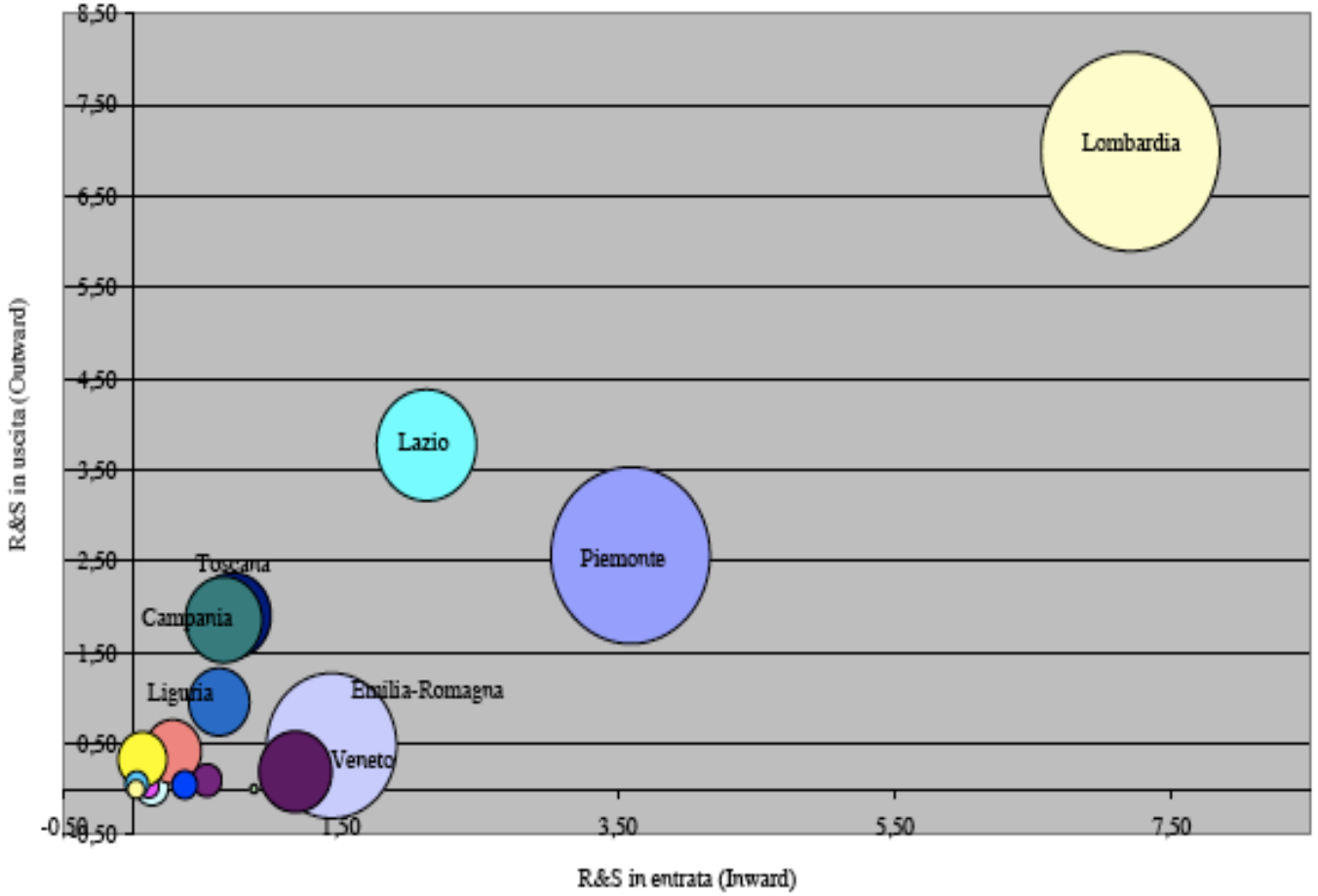
Increasing distribution of R&D expenditures across Italian regions...

Fig. 1 – distribuzione percentuale della spesa in R&S delle imprese italiane, per ripartizione, anni 1978-2006



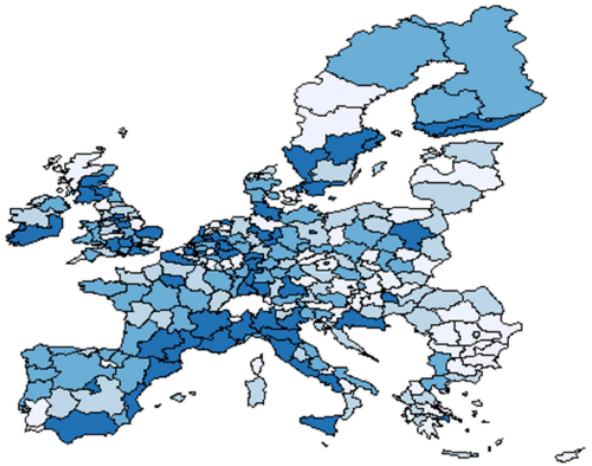
… but still very concentrated

Fig. 10 – Indice di Autonomia, di R&S in entrata e di R&S in uscita, per regione, media periodo 2001-2005



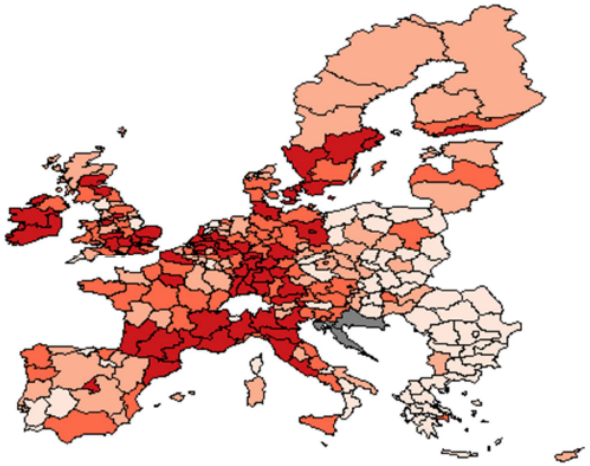
Good performance in outputs, but only thanks to few regions

Publications at Regional level



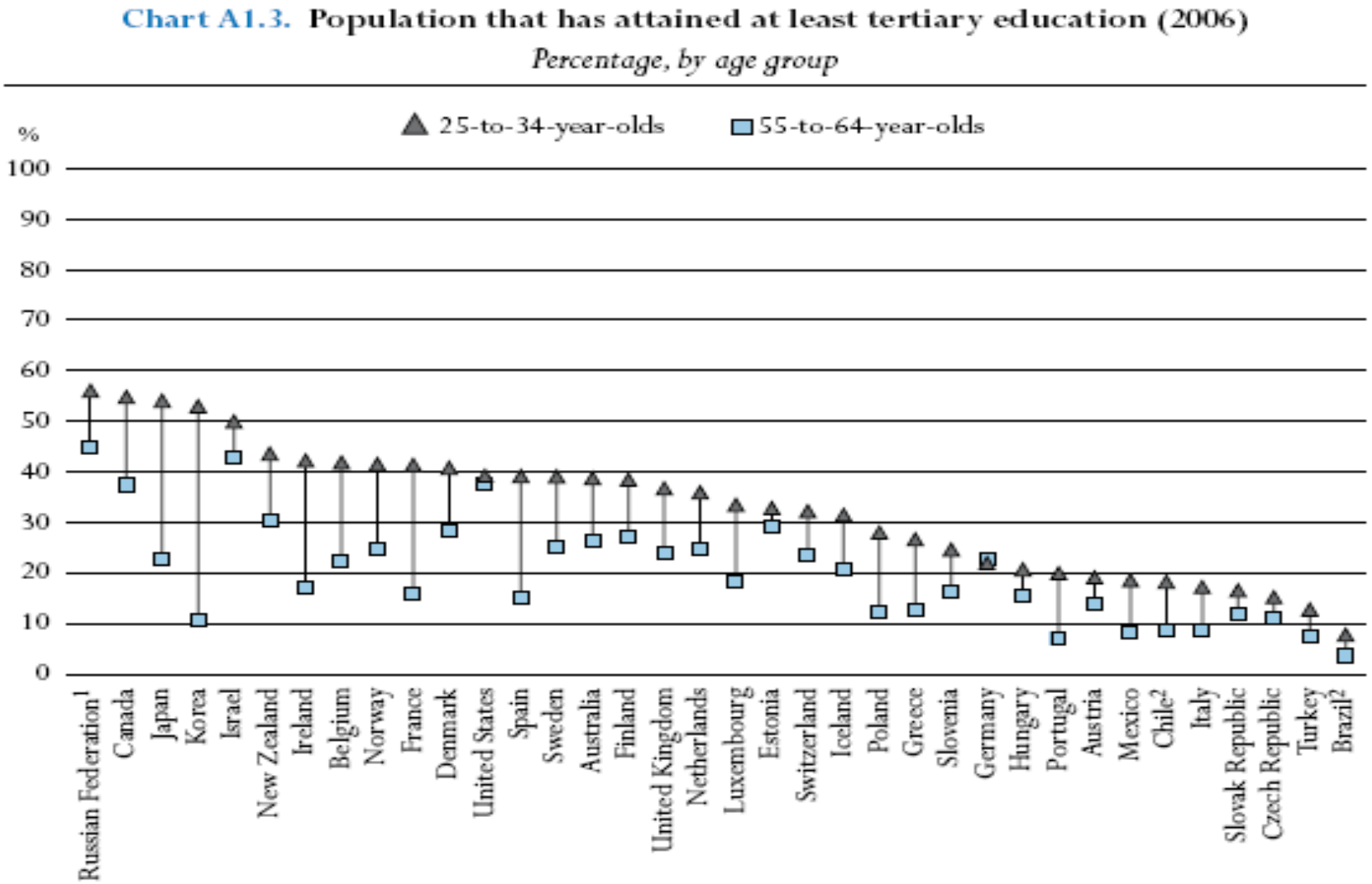
Publications at National level

Patents at Regional level



Patents at National level

Late on tertiary education



Not technology importers, nor exporters