

# Evaluation of R&D Units in Portugal Enhancing Quality • Fostering Strategy

HEInnovate country reviews – Ireland dissemination event



Dublin City U., 31.MAI.2016

**Luis Magalhães**

IST – Instituto Superior Técnico  
U. de Lisboa



**CONTEXT**

**ORGANISATION OF PUBLIC  
R&D FUNDING IN PORTUGAL**

# Organisation of Public R&D Funding in Portugal

- **1 Public R&D Funding Organisation for all areas of Knowledge**, including Social Sciences, Humanities and Arts
  - Science and Technology Foundation (FCT)**  
Ministry of Science, Technology and Higher Education
  - projects, fellowships (PhD and PostDoc), research infrastructures, institutions (HE and not-for-profit R&D Units – Centres/Institutes/Labs)
- **FCT outsources to National Innovation Agency (ANI)** programme of **S&T-based innovation projects with industry** (ANI is owned by FCT and the Ministry of Economy agency for SME)
- **FCT supervises R&D evaluation Regional Programmes projects**
- **5 National Laboratories** of dedicated ministries (Ocean & Atmosphere, Hydrography, Energy and Geology, Civil Eng., Agriculture & Veterinary) with institutional funding  $\approx 8\%$  of total R&D expense)

**CONTEXT**

**ORGANISATIONAL MODELS  
OF UNIVERSITY RESEARCH**

# Organisational Models of University Research

(main models, much simplified)

- **With a national research performing organisation** type CNRS (France)
- **Research excellence organisations** nationally coordinated type Max Planck Society, Helmholtz Society, Fraunhofer Society (Germany)
- **Centres of excellence** (Nordic countries)
- **No specific structures.** Evaluation of parts of university departments (UK)
- **Centres/Institutes/Labs of the initiative of researchers (bottom-up), dynamically adaptable** -- a flexible layer on top of the HE system and crossing HE institutional boundaries (Portugal, since 1996)

# Portugal R&D Units Evaluation at a Glance

→ 5 national evaluation exercises: 1996, 1999, 2002, 2007, 2013, 2017

→ about 350 research units ( $\pm 10\%$ )

1996 (270), 1999 (262), 2002 (388), 2007 (388), 2013 (322)

→ all fields of Knowledge (n° research units in 2007)

Exact Sciences (49), Natural Sciences (48), Health Sciences (38),  
Engineering & Technology (67), Social Sciences (93), Arts and Humanities (83)

→ about 25 evaluation panels in each evaluation exercise

→ about 200 evaluators in each evaluation exercise (all from abroad)

→ site visits and direct interaction with researchers and PhD students

→ Research Units rated Excellent, Very Good, Good, Fair, Poor

Excellent, Very Good, Good receive a support grant up to next evaluation:  
core funding, and possibly strategic funding at evaluators recommendation  
(Evaluation Panels are asked to propose strategic funding budget allocation)

# Scope of My Remarks

**Remarks are based on all evaluation exercises except that of 2013**

**2013 evaluation had very different principles and procedures of all others** and it had as one of the explicit goals to discontinue support to half of the research units

**It received wide criticism by the research community,** many appeals but also challenged in Court

**The present Government decided to reinstate the principles and procedures of former evaluations,** with incremental improvement, and anticipated the next evaluation exercise to 2017 for damage control.

# WHAT IS THE ESSENCE OF SCIENCE



# Ideas

**to formulate and answer questions:**

What is its effect?

With what does it coexist?

Of what is it made?

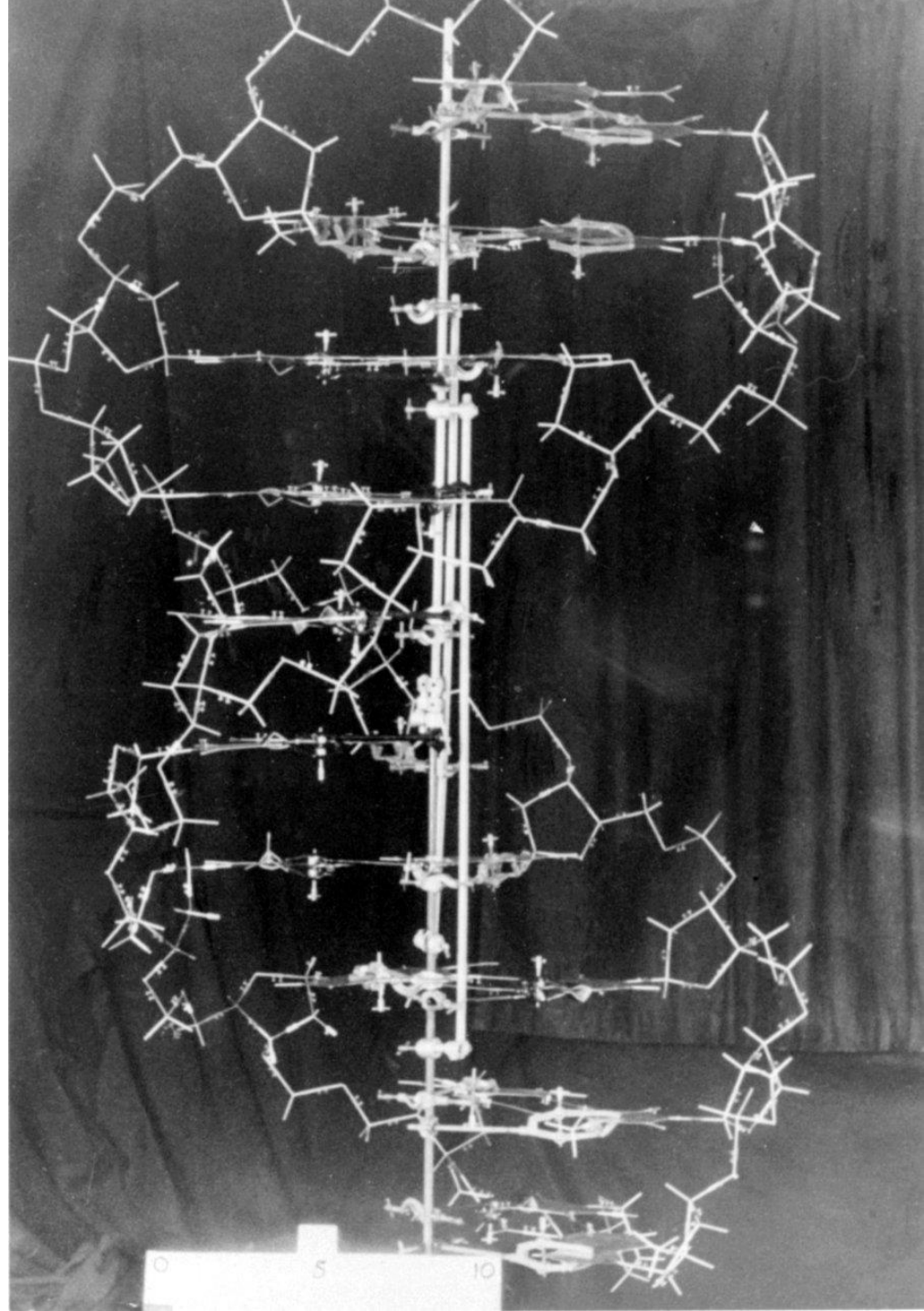
With what is it like?

How did it appear?

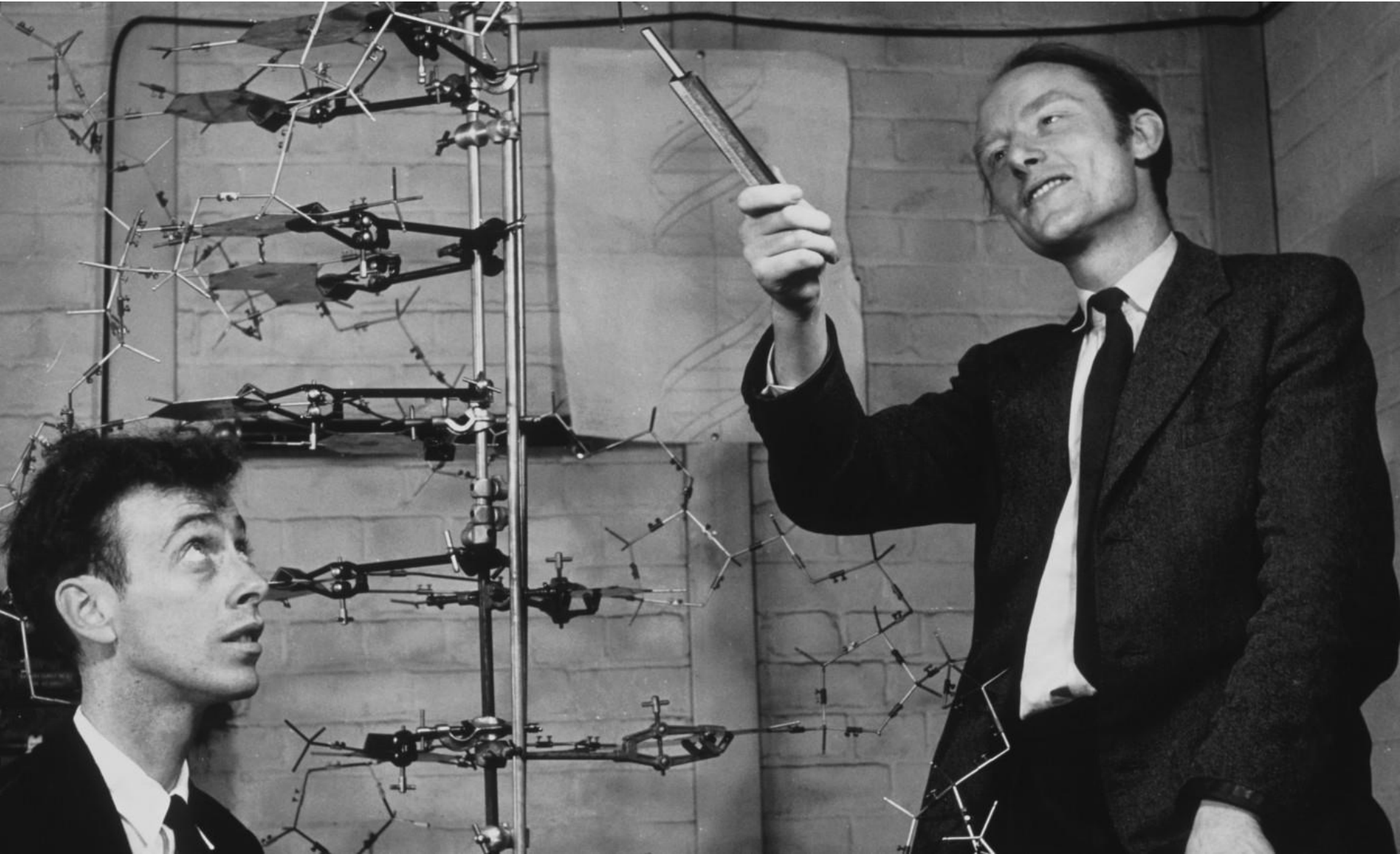
How does it function?

What can it do?

What is it?



# People



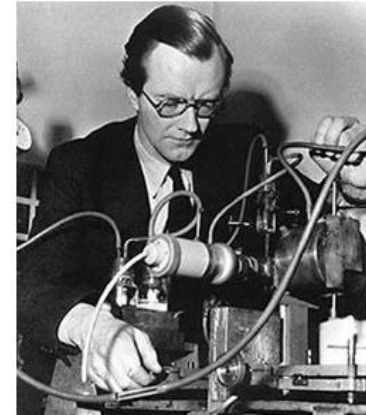
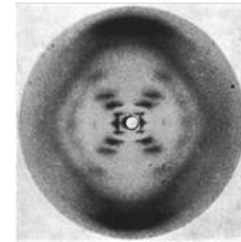
**“The invention of the method of invention”** (A.N. Whitehead)  
in universities (Berlin, Cambridge, John Hopkins), dye industry (BASF,  
Teerfarbenfabrik Meister Lucius & Co. (Hoechst), Bayer, AGFA),  
followed by electricity (Melon Park, Edison GE co.) c. 1860-70

## Institutions

| CAVENDISH PROFESSORS<br>OF<br>PHYSICS |                             |
|---------------------------------------|-----------------------------|
| 1871 - 1879                           | <i>W. G. J. Ch. Riemann</i> |
| 1879 - 1884                           | <i>Rayleigh</i>             |
| 1884 - 1919                           | <i>J. J. Thomson</i>        |
| 1919 - 1937                           | <i>Rutherford</i>           |
| 1938 - 1963                           | <i>W. Heisenberg</i>        |
| 1964 - 1971                           | <i>D. F. Matthews</i>       |



## Instruments



## Knowledge Networks



# Institutions

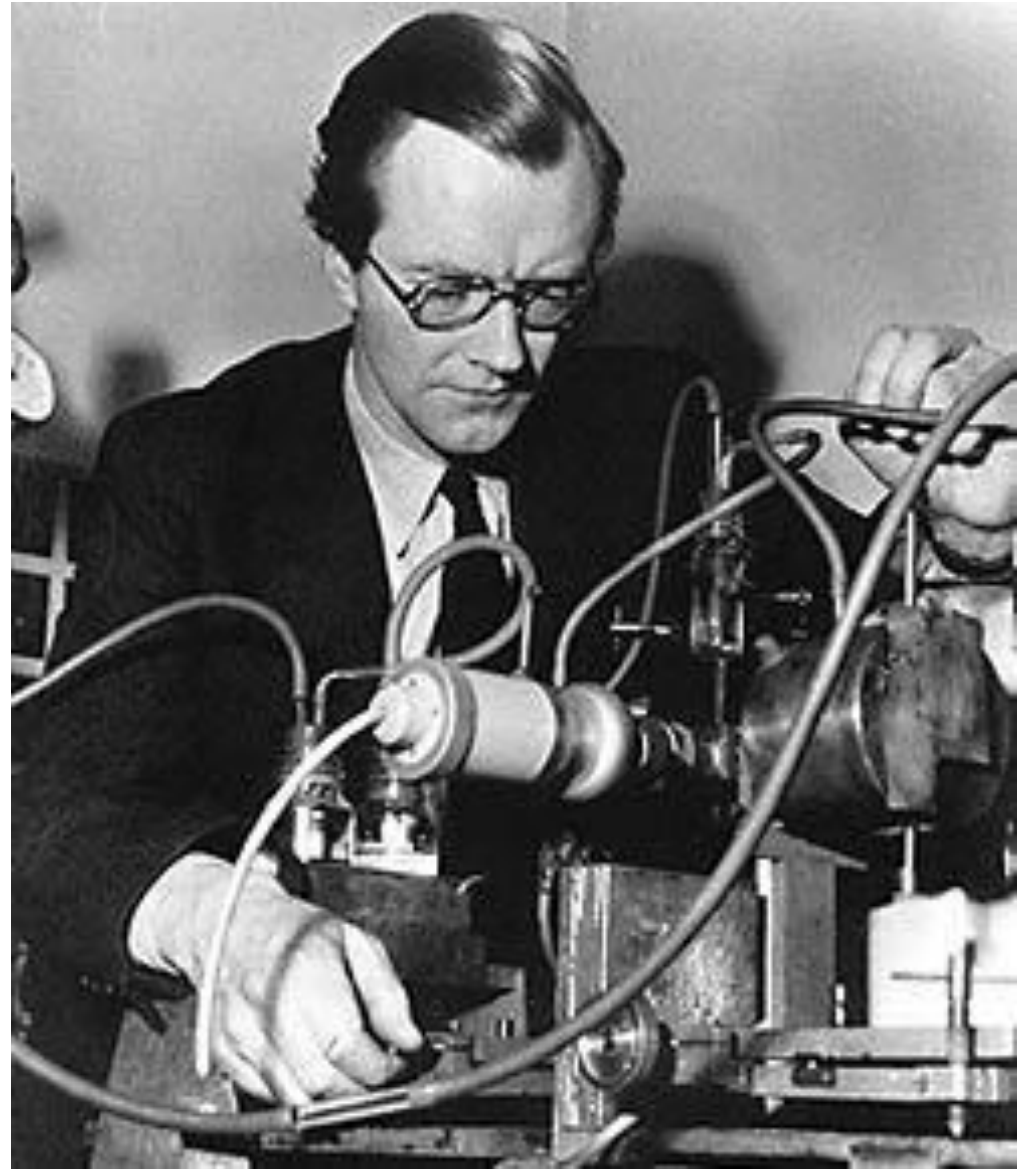
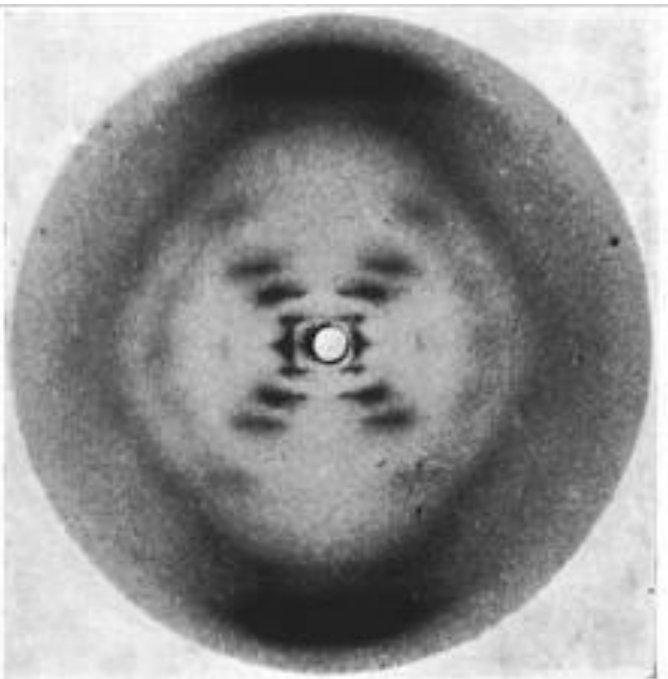


## CAVENDISH PROFESSORS OF PHYSICS

|             |                         |
|-------------|-------------------------|
| 1871 - 1879 | <i>J. Clerk Maxwell</i> |
| 1879 - 1884 | <i>Rutherford</i>       |
| 1884 - 1919 | <i>J. Thomson</i>       |
| 1919 - 1937 | <i>Rutherford</i>       |
| 1938 - 1953 | <i>W. D. Bross</i>      |
| 1954 - 1971 | <i>D. F. Mott</i>       |



# Instruments



# Knowledge Networks



# R&D Funding Agencies by Contracts

with universities  
scientists ideas  
peer evaluation

President of *Carnegie Institution*  
and Professor of *MIT*

President of Harvard U.

President of *MIT*

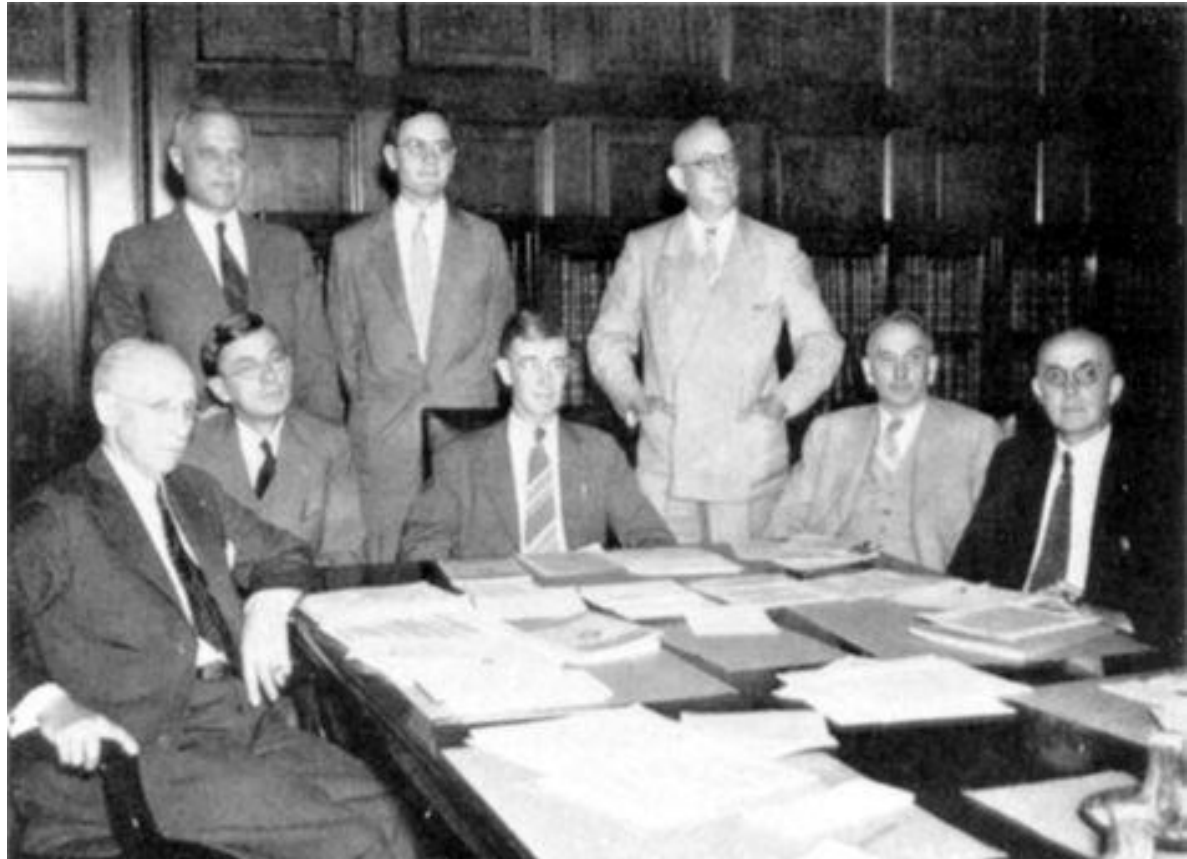
President of *National Academy of Sciences*  
and of *Bell Labs*

Commissioner for Patents

Professor of *Calthec*

General of the Army

Admiral of the Navy



**Vannevar Bush:** *MIT* (30-38), *Carnegie I.* (38-55), *NDRC* (40-42), *OSRD* (42-47)  
“*Science – The Endless Frontier*” (45); *NSF – National Science Foundation*, (50-)

# **PRINCIPLES OF INSTITUTIONAL R&D EVALUATION**



# Principles of Institutional R&D Evaluation

→ **Evaluation to foster EXCELLENCE and IMPACT**,  
not to ensure conformity or minimal quality standards

Evaluation for **conformity** or **minimal quality standards** is nonsense for **research or HE**.

HE Quality Assurance and Professors/Researchers Performance Evaluation systems presently adopted in many EU countries have serious misconceptions and are counterproductive

→ **Priority to HUMAN RESOURCES**  
**TALENT** attraction and development, postgraduate training (PhD and PostDoc)

→ **Evaluation units of RESEARCHERS INITIATIVE (trigger bottom-up process)**  
Self organised Centres/Institutes/Labs/Research Groups  
**A Research Unit must have its own IDENTITY** around a sound **conceptual project of researchers** working at the frontiers of knowledge

**Call for proposals opened before each evaluation exercise**

It is useless to evaluate if the researchers are not allowed to self organise.

# Principles of Institutional R&D Evaluation

- **Collegial judgment by PEERS**, not a simple result of numerical indicators (these just inform evaluators), not even the application of formulas to partial scores by the evaluators. Collegial decisions of **experienced and independent scientists competent at the frontier of knowledge** of the field are far superior to a spreadsheet. Research evaluation is complex; there is no good quantitative model for it.
- **Evaluation Panels made of EXPERTS OF THE RESEARCH AREA** to ensure the **specificity** required for good judgment in each research area
- **DIRECT INTERACTION of evaluators with the evaluated**  
Site visits and exchanges with researchers, PhD students and technicians to **gather additional** information, to contribute to **transparency**, **understandability** and **credibility** of results, without which the evaluation is useless.  
The ultimate objective is not to rank the evaluated, but to **foster Excellence and Impact** of future research.

# Principles of Institutional R&D Evaluation

## → EVALUATORS FROM ABROAD

- In countries with a small scientific community evaluators from abroad are necessary for **independence**

*'It is not allowed the fairest man in the world to be judge in his case' (Blaise Pascal, 1670).*

- The evaluation should have as reference the **best international practices**
- Clear and simple statement of a **internationalisation policy**
- Contributes to **international visibility** of competencies for **increased connectivity with the best international research networks**.  
Creates a network of very effective *'scientific ambassadors'*.
- Enhances **international credibility and recognition** of evaluation results
- Contributes to improve **detection of emergent competencies** and of **new opportunities of scientific leadership**  
(and of obsolete practices and declining competencies, as well)  
especially important in periods of the research community high growth

# Principles of Institutional R&D Evaluation

## → Few evaluation criteria (3 or 4)

e.g., **Productivity, Training, Relevance, Feasibility**, described extensively with **clear reference to main evaluation items to be considered** (including contributions to innovation, S&T policy and society (societal challenges, culture, arts, ... ), and **leaving room for the interpretation and application the Evaluation Panel finds appropriate** to its particular area

## → Grading of evaluation criteria in few levels (e.g. 5 levels)

not to compute a final grade by a formula,  
but to ensure attention of the evaluators to each evaluation item

## → Always precedence to originality, quality and content of research over quantity

**Quantitative indicators** (publication counts, impact factors, ... )  
**should not drive evaluation decisions**

*“Criteria that primarily measure quantity create incentives for mass production and are therefore likely to be inimical to high quality science and scholarship.”*

*‘Proposals for Safeguarding Good Scientific Practice’, DFG, revised 2013*

Besides they may induce fraud..

# Principles of Institutional R&D Evaluation

## → Full open publication of evaluation reports and recommendations

Requires **substantive Evaluation Panel reports** for each R&D Unit and for each Evaluation Panel area of knowledge, and also a global report.

Evaluation reports of each R&D Unit must be **sufficiently extensive and informative to justify and explain the evaluation result** in a way it can be understandable to both FCT and the evaluated, and **include recommendations** the Evaluation Panel deems appropriate for the future

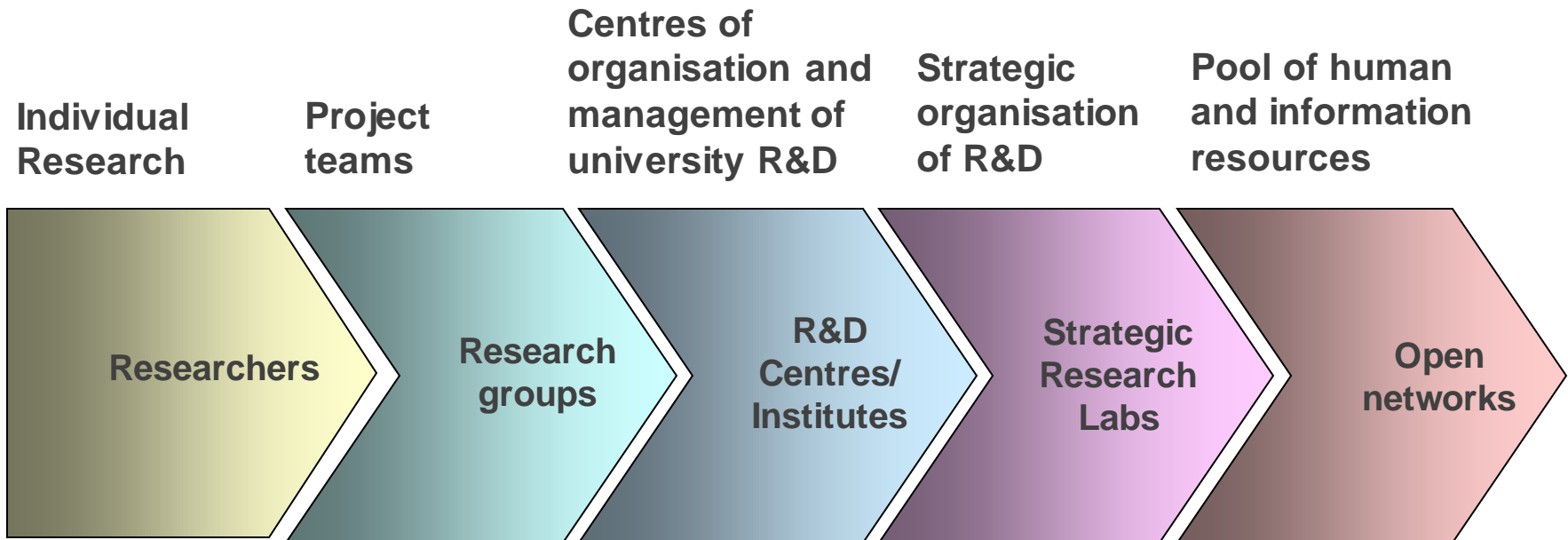
Includes lists of members of the Evaluation Panels and other evaluation system details

Includes comments on the Evaluation Panel reports requested to the respect. R&D Units to be published along with the Evaluation Panel reports

# **CONTRIBUTION TO INSTITUTIONAL BUILDING**

# Contribution to Institutional Building

→ Foster the evolution of organisational forms – *Institutional Building*



PORTUGAL WAS A LATECOMER TO SCIENCE  
AND WENT THROUGH A RAPID PHASE TRANSITION IN  
S&T CAPACITY

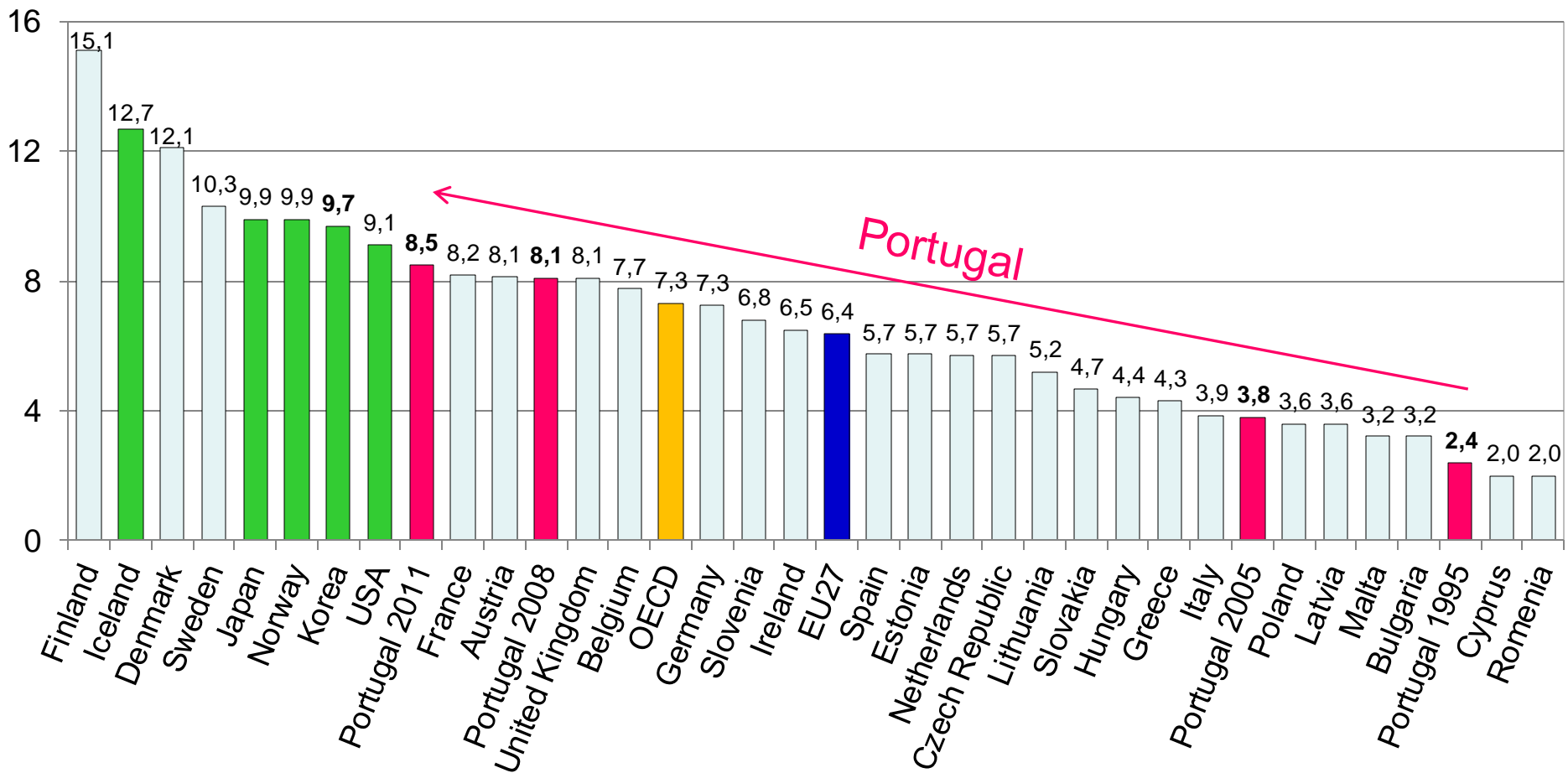
with a recognised important contribution of the  
NATIONAL R&D UNITS EVALUATION PROCESS  
1996, 1999, 2002, 2007, 2013  
carried out with evaluators from abroad



# Researchers (FTE) per Thousand Labour Force

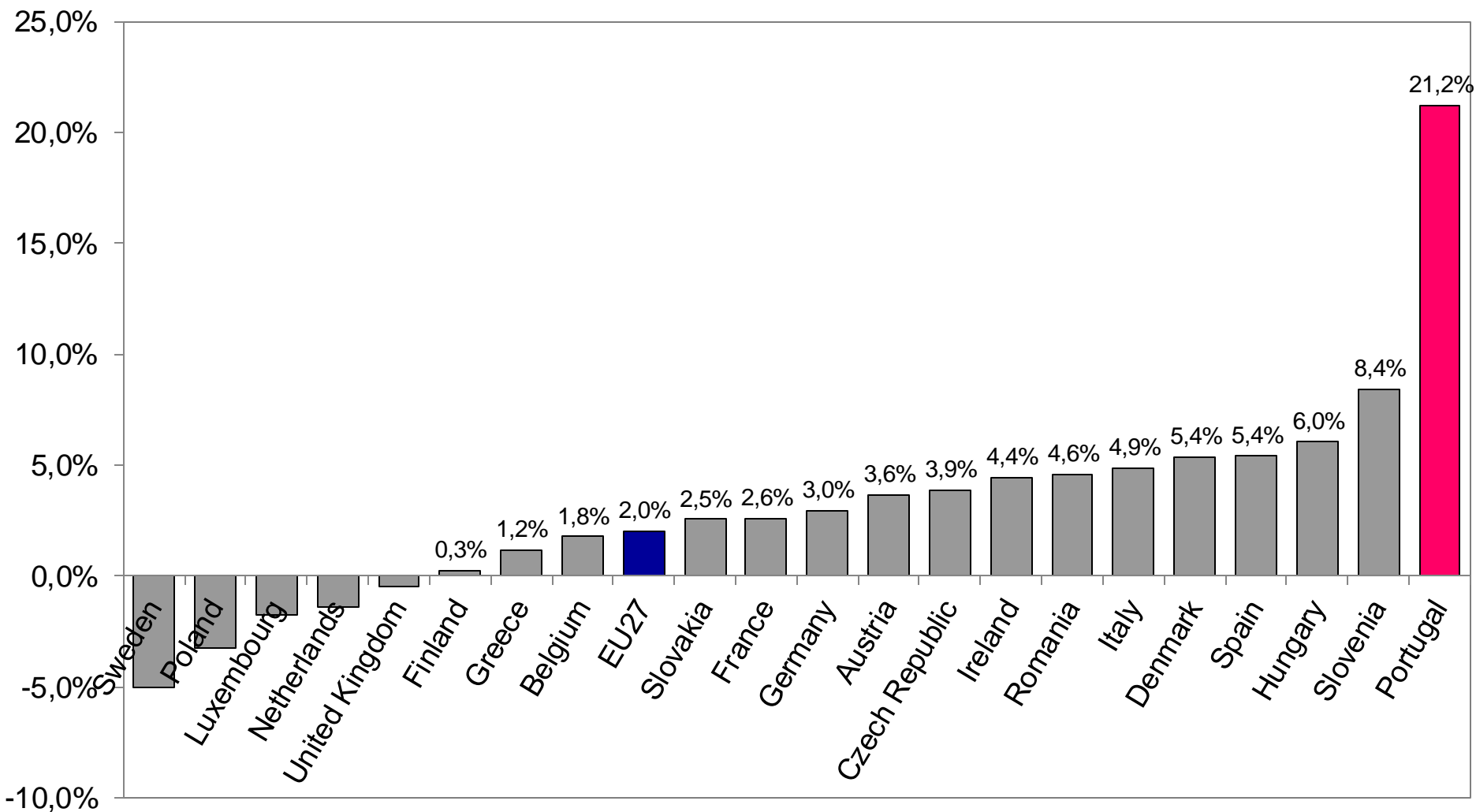
## Almost multiplied by 4 from 1995 to 2011

Portugal jumped from the tail of EU15 to the 4 top countries of EU15, just following the 3 Nordic countries and much above EU and OECD average



Source: OECD. Data for 2008, except for Portugal (1995, 2005, 2008, 2011)

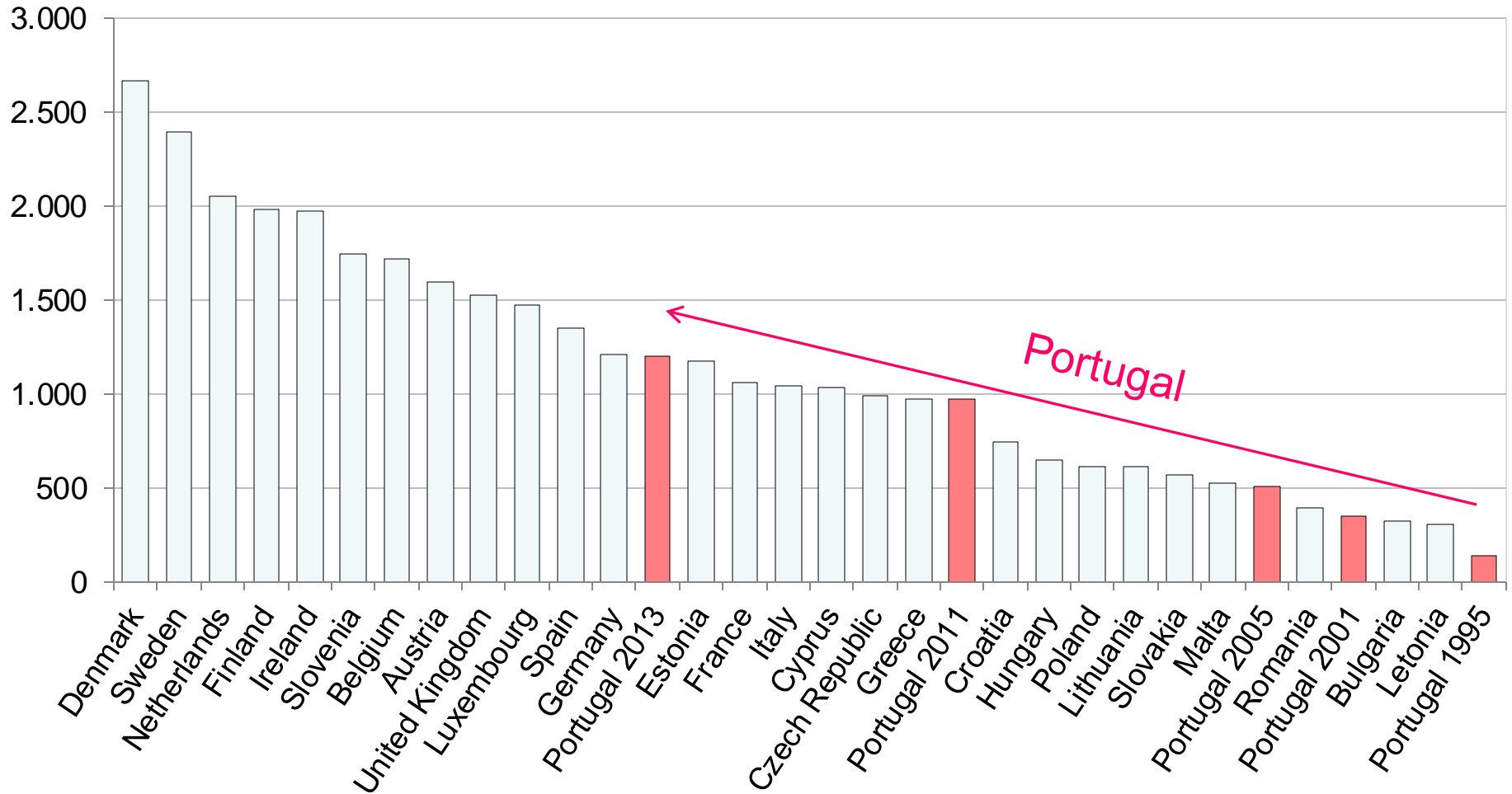
# Annual Average Growth of Researchers (FTE) per Thousand Labour Force, 2005-2009



Source: EUROSTAT.

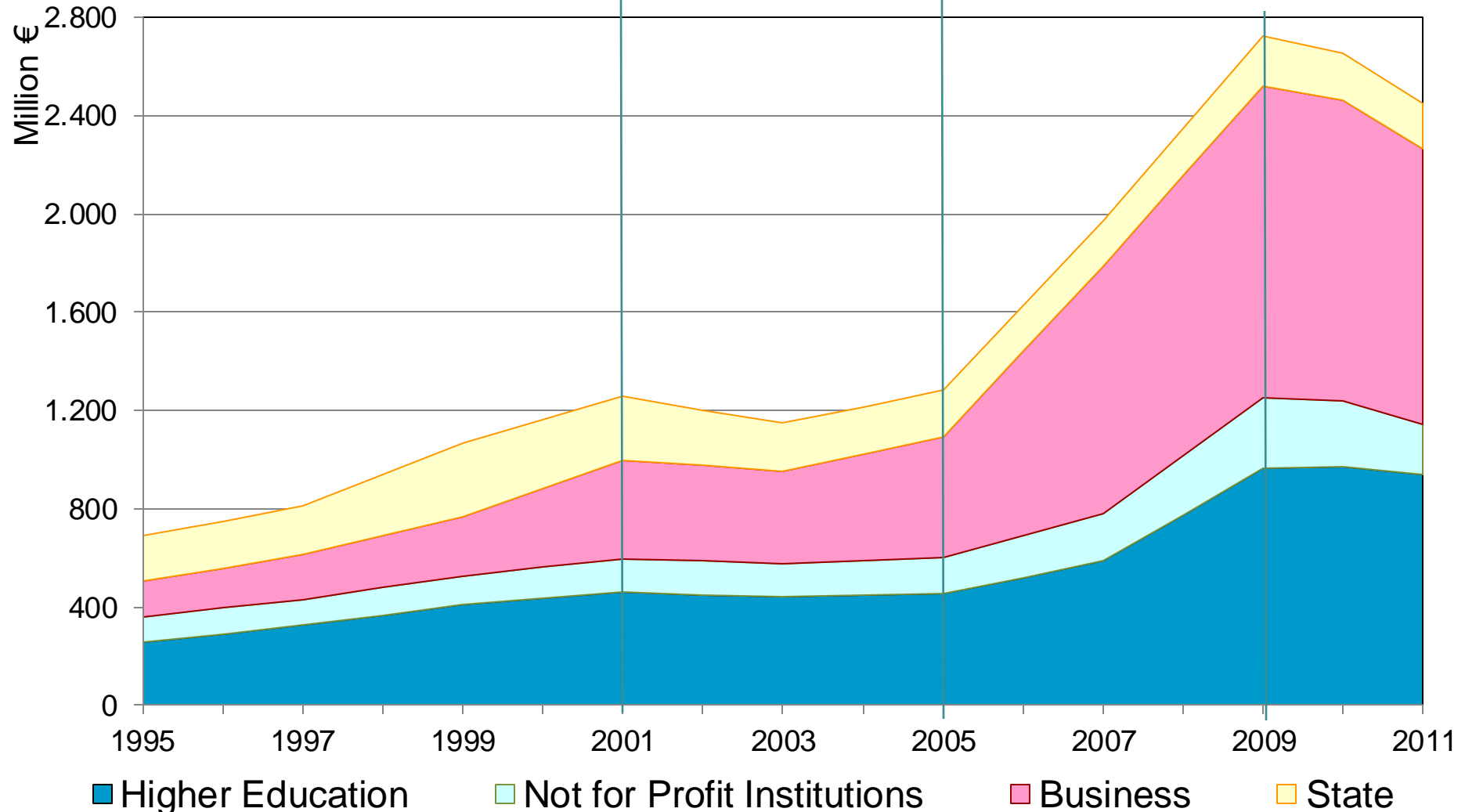
# Nº Scientific Publications Registered Internationally per Million Population, 2013

in Portugal almost multiplied by 9 from 1995 to 2013



Source: Thomson ISI Reuters. Data for 2013, except for Portugal (2005, 2008, 2010, 2013).

# R&D Expense by Performing Sector (constant prices of 2007)



Source: Before 2001: OECD. After 2001: EUROSTAT.

# Research and Innovation

High export and GVA capacity of enterprises with highest R&D expenses

**The 100 enterprises with the highest intramural R&D expenses in 2008 accounted for:**

- Joint R&D expense **>3/4 total R&D expense** of the total 2.089 enterprises that declared R&D expenses among >10.188 surveyed
- Employment of **>6.000 researchers (FTE)**
- Exports **>1/4 all national exports**
- **4 times the national exports growth** from 2007 to 2008
- **10 times the national GVA growth** from 2007 to 2008