European Basic Research and its Impact

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- 1. What is Basic Research
- 2. Why investing in Basic Research is important
- 3. What is done in **Europe** for Basic Research
- 4. What impacts of Basic Research in Europe
- 5. What needs and challenges for Basic Research





1. What is Basic Research

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view

Frascati Manual (OECD)



but contribution to many applications and discoveries...

Basic research is mainly publicly funded (freedom, curiosity driven)



2. Why investing in Basic Research is important

Direct Impacts of Basic Research

- Scientific knowledge
- Training of graduates and bright minds
- Quality of education in Universities

Spillovers of Basic Research (more difficult to track...)

- Innovation \rightarrow value creation, economic growth, welfare creation
- Societal challenges (climate, health, ageing population, ...)







Technologies massively financed by USA and EU public funding: Internet, GPS, touch screen, voice recognition, ...



Today world is the result of research made long ago



Mariana Mazzucato, The Entrepreneurial State, Anthem Press, 2014





REC 1: Recognition of **times scales** (<> political)



Industry needs universities and vice versa



Yrjö NEUVO Helsinki University of Technology SCIE

2. Why investing in Basic Research is important

The contribution of Basic Research to innovation





REC 2: Recognition of Basic Research Utility (and Specificity) in Innovation - Indicators and data collection for advocacy



3. What is done in Europe for Basic Research

Structures

- 1928 ..: National Research Funding or Operating Organisations
- 1954: CERN (European Organization for Nuclear Research)
- 1962: ESO (European Southern Observatory)
- **1963: EMBO** (European Molecular Biology Organization)
- 1971: European Research Framework Programs (Marie Curie, Flagship, ...)
- **1974: ESF** (European Science Foundation)
- 1975: ESA (European Space Agency)
- 2000: The Lisbon Strategy (3% GDP invested in R&D 1/3 public)
- 2007: ERC (European Research Council)

15 2013: Science Europe (science policy issues)



3. What is done in Europe for Basic Research



Share of Basic Research in public investments below 30%?

REC 3: a « right » balance between **public investments** in basic research and others + **public acceptance of investments**





OECD STI.SCOREBOARD PLATFORM

Direct impacts: publications

% of scientific publications among the world's 10% top-cited publications



Share of 25-64 year-olds with a doctorate (2018)

Direct impacts: doctorate holders

4,5% Hundreds 4,0% 3,5% CH 3,0% 2,5% **USA** 2,0% 1,5% EU 1,0% 0,5% 0.0% Sovenia hard outs ales de name hard dong eard aak and hard tale de aard stie wat de applicate and tale to be and tale tobe and tale to be and tale to be and tale to be and

Only 14 European Universities in the top 50 Shangai Ranking...

<u>OECD iLibrary | Share of 25-64 year-olds with a doctorate (2018) (oecd-ilibrary.org)</u>

Spillovers: the example of CERN



What is the universe made of and how it works?



... the world wide web...



Spillovers: the example of CERN

fnic



REC 4: Need for long-term funding of **research infrastructures**



Spillovers: from basic research to start-up ... (ex: Dr P. Cani, FNRS, Belgium)

- 15 years of basic research on interactions between intestinal bacteria and organs
- 2013: patent (reduction of risk of developing diabete and obesity)
- 2018: start-up (13 M€)
- 2021: EFSA (European Food Safety Authority) approval



REC 5: Need for long-term funding of researchers

- a. Freedom (choice of subjects)
- b. Time
- c. Money
 - Level of <u>public funding</u>

- <u>Science policy</u>: complementarity of national (*national research councils for seeding*) and international (*ERC for nurturing the stars*) funding
- Additional funds for strategic basic research: more attractive to policy makers (innovation expected at a shorter term, societal challenges)
- Private foundations

REC 6: To consolidate funding sources and adjust overall **science policy**

- a. Freedom (choice of subjects)
- b. Time
- c. Money
- **d. Talents:** <u>precarity of research carriers, risk of brain drain and/or lack of attractiveness of the research career</u>

REC 7: Developing Career Paths for Researchers in Europe

tracking of careers, # academic positions in Europe, recognition of the value of PhD training, cross-sectorial mobility, pensions issues, ...

- a. Freedom (choice of subjects)
- b. Time
- c. Money
- d. Talents (researchers'carriers)
- e. Evaluation procedures (top class, excellence, no bias)
- f. Funding instruments (specific, appropriate, effective)

transdisciplinarity

REC 8: Benchmarking and Guide of **Best Practices** *Rôle of Science Europe*

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- f. Funding instruments (specific, appropriate, effective)
- g. International collaboration (1+1 >> 2)

REC 9: Increased support (funding and instruments) to **international collaboration** *ERA-Nets, WEAVE, …*

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- h. Friendly competitive environments

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- h. Friendly competitive environments
- i. Ecosystems (to foster discoveries and innovation)

