In defence of public science

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Going Global Conference
The Challenges for Knowledge-Based Economies
Helsinki, Finland, September 21-22 2006

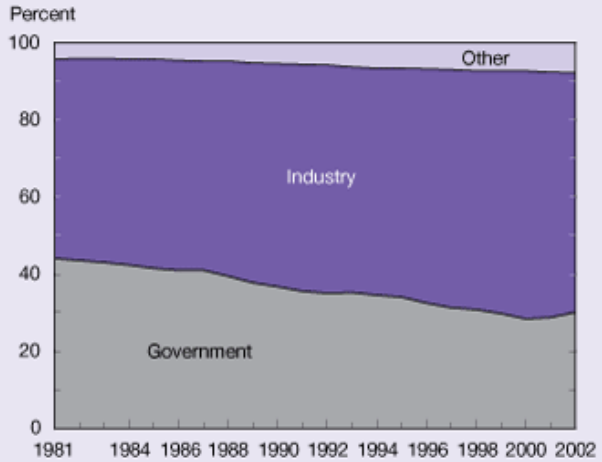
Finland second country of the world in terms of technological intensity From Archibugi and Coco, World Development, 2004

Actual ranking	Countries	**Actual ArCo Index**	Past ArCo Index	Past ranking	Growth rate from the last decade
1	Sweden	**0,870**	0,685	2	27,0%
2	Finland	**0,830**	0,617	6	34,7%
3	Switzerland	**0,799**	0,740	1	7,8%
4	Israel	**0,763**	0,647	5	17,9%
5	United States	**0,757**	0,667	4	13,5%
6	Canada	**0,755**	0,682	3	10,7%
7	Norway	**0,726**	0,586	9	24,1%
8	Japan	**0,719**	0,568	12	26,5%
9	Denmark	**0,706**	0,587	8	20,2%
10	Netherlands	**0,690**	0,570	11	21,1%
11	Australia	**0,686**	0,565	14	21,5%
12	Germany	**0,680**	0,594	7	14,4%
13	United Kingdom	**0,679**	0,567	13	19,7%
14	Iceland	**0,670**	0,483	18	38,6%
15	Taiwan	**0,662**	0,434	23	52,5%
16	New Zealand	**0,645**	0,575	10	12,1%
17	Belgium	**0,642**	0,524	15	22,5%
18	Austria	**0,615**	0,501	16	22,7%
19	France	**0,604**	0,500	17	20,9%
20	Korea, Rep.	**0,601**	0,414	31	45,2%
21	Hong Kong, China	**0,568**	0,429	26	32,5%
22	Ireland	**0,564**	0,450	20	25,2%
23	Singapore	**0,563**	0,395	37	42,7%
24	Italy	**0,526**	0,443	21	18,7%
25	Spain	**0,513**	0,409	34	25,2%

Why does Public Science need to be defended?

- More and more academia and public research centres are asked to carry out “instrumental”, “targeted” R&D
- Competitiveness and industrial development have become the key concerns of public policy
- Fund-raising and entrepreneurship become key qualities of academicians
- Quantitatively, the share of publicly-funded R&D is decreasing

Figure 4-36
Total OECD R&D, by source of funds: 1981–2002

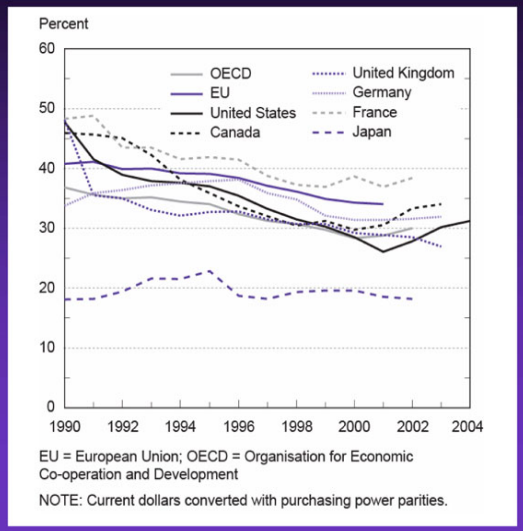


OECD = Organisation for Economic Co-operation and Development

SOURCE: OECD, *Main Science and Technology Indicators* (2004).
See appendix table 4-46.

Science and Engineering Indicators 2006

Government funds as share of gross expenditures for R&D: 1990–2004

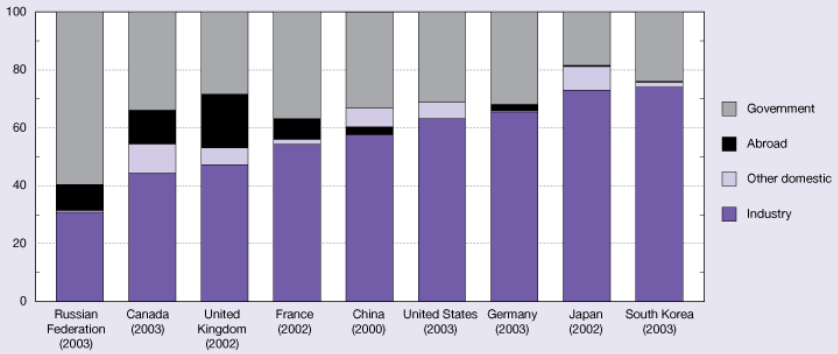


EU = European Union; OECD = Organisation for Economic Co-operation and Development

NOTE: Current dollars converted with purchasing power parities.

SOURCE: National Science Board, *Science and Engineering Indicators 2006*

Figure 4-35
R&D expenditures for selected countries, by source of funds: Selected years, 2000–03

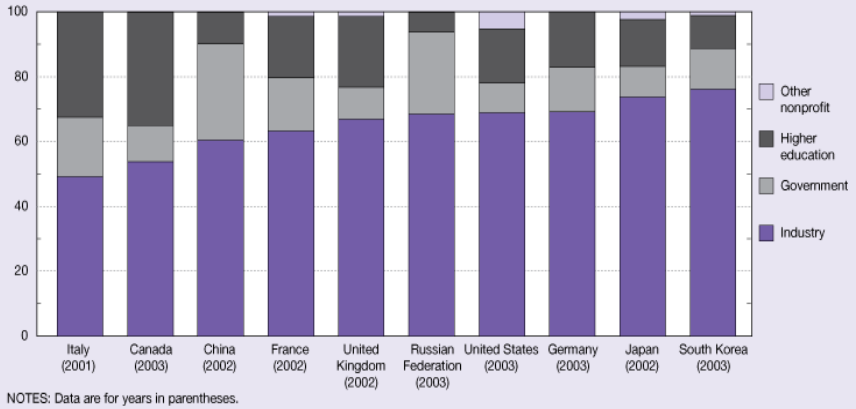


NOTES: Data are for years in parentheses. Separate data on foreign sources of R&D funding unavailable for United States but included in sector totals. In most other countries, "foreign sources of funding" is a distinct and separate funding category. For some countries (such as Canada), foreign firms are source of a large amount of foreign R&D funding, reported as funding from abroad. In United States, industrial R&D funding from foreign firms reported as industry. Data unavailable for Italy.

SOURCES: Organisation for Economic Co-operation and Development, *Main Science and Technology Indicators* (2004). See appendix table 4-44.

Science and Engineering Indicators 2006

Figure 4-34
R&D expenditures for selected countries, by performing sector: Selected years, 2001–03



NOTES: Data are for years in parentheses.

SOURCES: Organisation for Economic Co-operation and Development, *Main Science and Technology Indicators* (2004). See appendix table 4-44.

Science and Engineering Indicators 2006

Academic R&D as %age of total R&D, by country

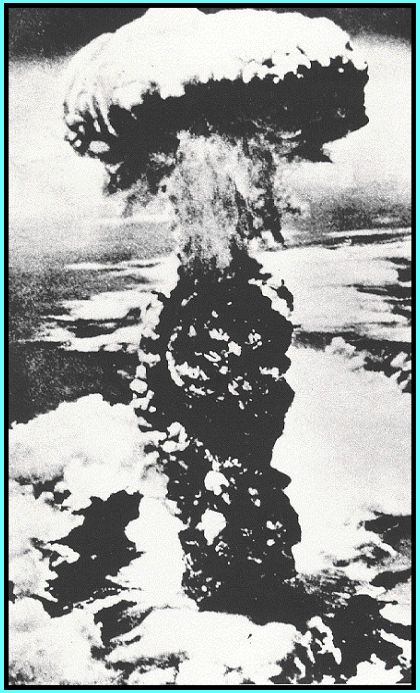
OECD = Organisation for Economic Co-operation and Development

Once upon a time… government was the leader of major scientific and technological developments

Government was in charge of basic science

Companies of the commercial applications

Theoretically, Kenneth Arrow defined basic research as the activities that are used as inputs to applied research and development



The Impact of the Manhattan Project on Science Policy

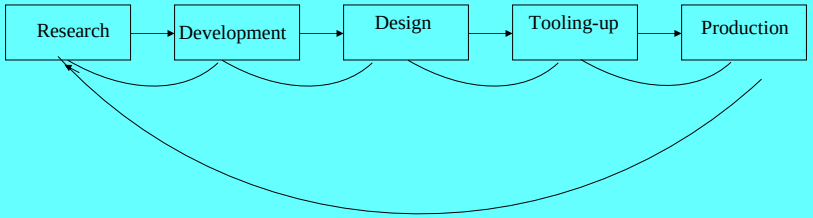
Basic idea: you concentrate and ISOLATE a relevant group of scientists, and you get what you want

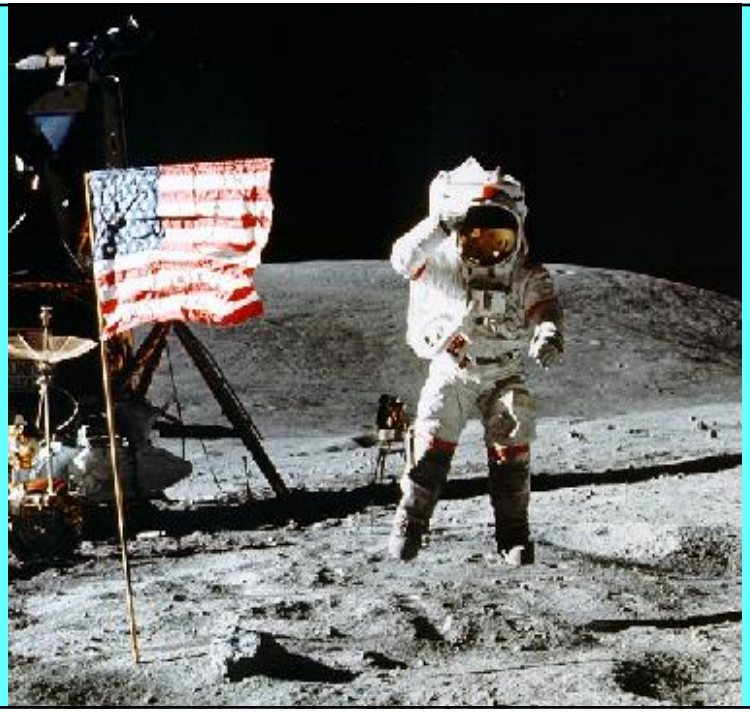
Want is Might

Do you have to be concerned about economic applications of science?

This is not necessarily the priority of public policy

THE WELL-KNOWN STRAWMAN
THE LINEAR MODEL





Play it again Sam, and land on the moon

- As in the Manhattan project, defence was a crucial reason to commit public money
- While the Manhattan project was heavily concentrated in one scientific field (nuclear physics) a much wider battery of fields were funded for the moon landing
- It was implicitly assumed that these would have created beneficial economic effects, and that the business sector could exploit with its own resources

The Schumpeterian Critique of the Linear Model

It does not exist a pre-defined link from basic research to experimental development

Since the crucial aspect of technological change is learning, the larger the interactions the better it is

Technology push policies are limited by existing scientific opportunities

There are limits to the planning of scientific research because outcomes are uncertain

Two important confirmations

1) The failure of the Soviet Research and Innovation System
2) The lack of a single cure on cancer

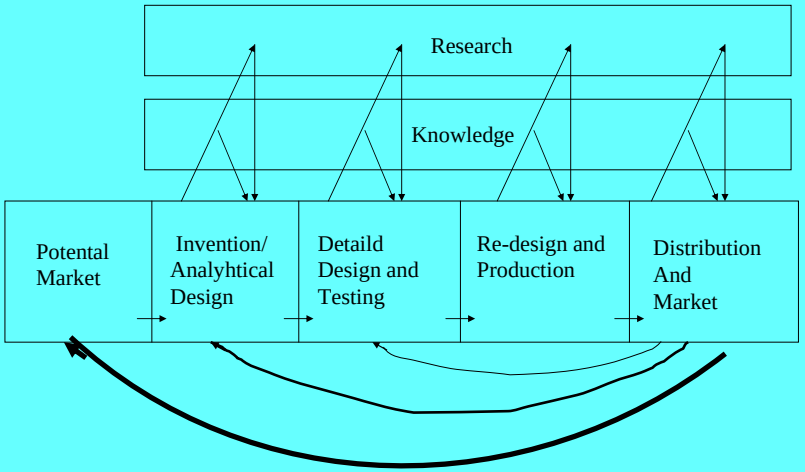
SPRU 25° Anniversary Conference
1991

Keynote address:

“The linear model is dead”

Nathan Rosenberg

The new Mantra:
The Chain-linked Model



Problems in the real life

- The largest R&D spender, the United States, was an economic crisis in 1980s
- The losers of the Second World War, Japan and Germany, had a substantial technology-driven economic development
- And in particular, this translated in *exportable* products

Interpretation provided

- The US is spending too much in public R&D (Military & Cancer)
- Japan and Germany are spending in fields directly linked to economic competitiveness
- Spill-over from public to business have a much more indirect economic effect than direct Business R&D

The New Science Policy Agenda

- Link Science to Industry
- Interaction between Academia and Business
- Science Parks
- Entrepreneurial Academicians
- Triple Helix

What are the consequences?

- If these tendencies continue for other 25 years, we will not have any longer publicly funded and performed scientific research
- Universities will get public funding for education only
- Research funding will depend on contracts from the business sector and other resources (hiring facilities and buildings)

Implications on Academic Research

- In order to get a field funded, it should have a commercial outcome
- So far, the capability of Universities and other public research centres to attract private funding have been rather limited
- Most University Technology Transfer Offices do not repay their operating costs
- Commercialization ex-post is not the real business.
- Ex-ante contract research is the only profitable alternative

Can Public Science become again the core of the Knowledge Society?

- Increase the funding of scientific research is not per se a solution
- Academic evaluation (UK, RAE – style exercises) are the wrong answer because concentrated on efficiency but not with efficacy
- Societal control over publicly paid academicians is needed

The patronage of knowledge

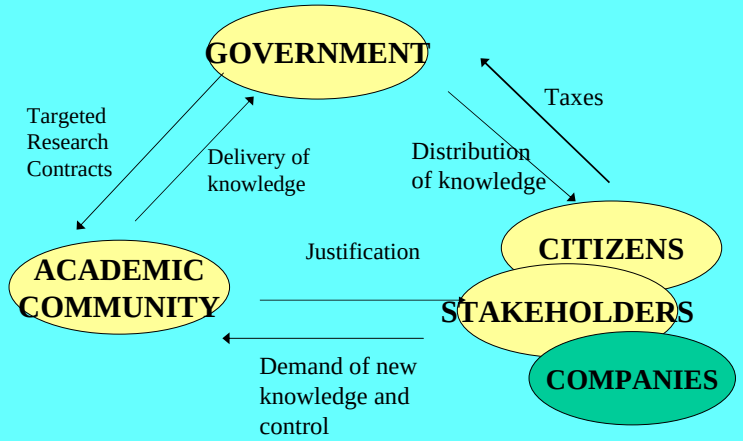
Kings and princes	From the Renaissance to the end of XIX century	Open exchange
Governments	Post-war economic boom	Open exchange
Firms	From the 1980s	Appropriation
Stakeholders ?	New model for the XXI Century?	Creative Commons

A New Ivory Tower? No, Thanks

Envisage new forms of stakeholders control over the distribution of funding for scientific research

- Need for the academic community to provide justification to the public opinion
- Funded by general taxation
- Socialization of the results rather than privatization

An alternative triple component model
For a different academic revolution



Implications for Knowledge Dissemination

- Interactions? Yes, of course
- Allow the business sector to exploit and implement the publicly generated knowledge
- Stakeholders (companies, associations, agencies) as special student

A NEW ROLE FOR THE EUROPEAN UNION

- Since EU fostering of RD&T is not on a national basis, obsession with “national competitiveness” is lower
- Increase public resources at the European rather than at the National level
- Continue to foster cooperation across countries and public and business players
- Settle some basic public priorities and induce companies to exploit them in a competitive environment