

## In defence of public science

**Prof. Daniele Archibugi**

University of London, Birkbeck

Italian National Research Council, Rome

**Going Global Conference**

**The Challenges for Knowledge-Based Economies**

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

## Why does Public Science need to be defended?

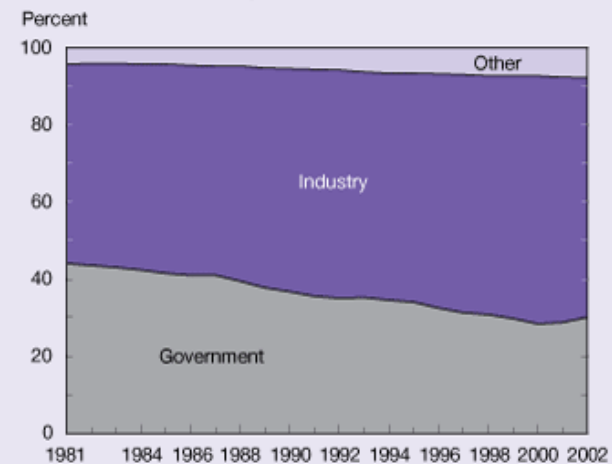
More and more academia and public research centres are asked to carry out “instrumental”, “targeted” R&D

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

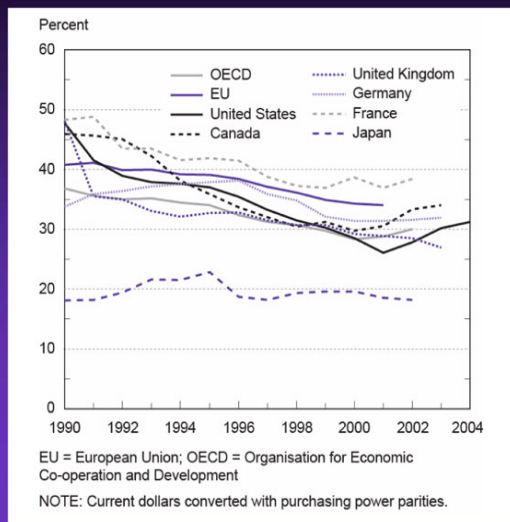
Figure 4-36  
Total OECD R&D, by source of funds: 1981–2002



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*

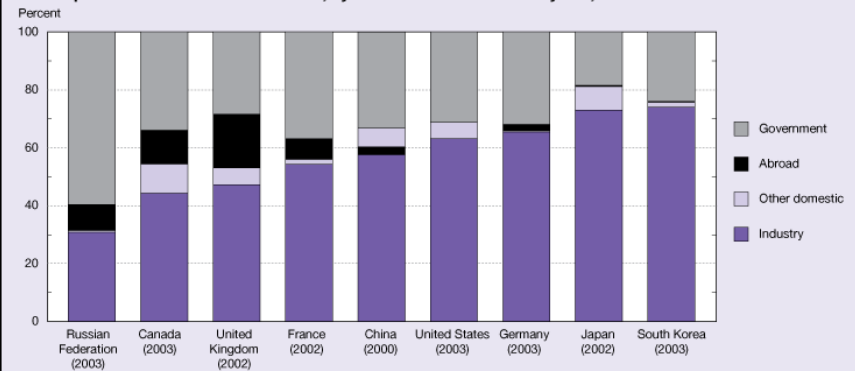
## Government funds as share of gross expenditures for R&D: 1990–2004



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



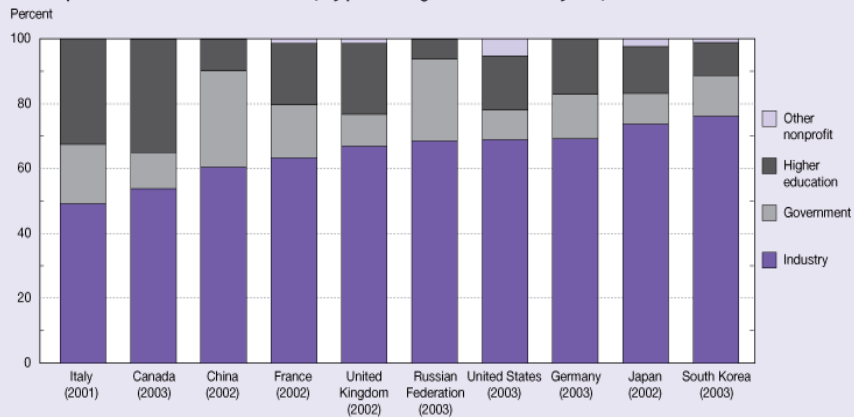
Figure 4-35  
R&D expenditures for selected countries, by source of funds: Selected years, 2000–03



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.

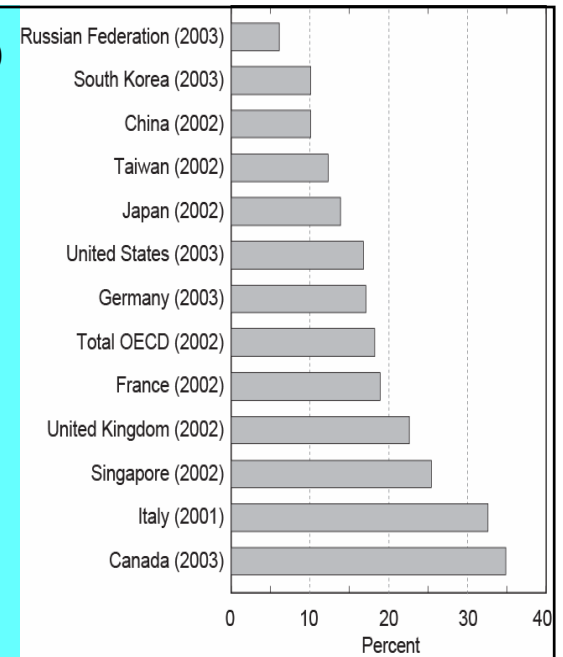
SOURCES: Organisation for Economic Co-operation and Development, *Main Science and Technology Indicators* (2004). See appendix table 4-44.  
*Science and Engineering Indicators 2006*

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**

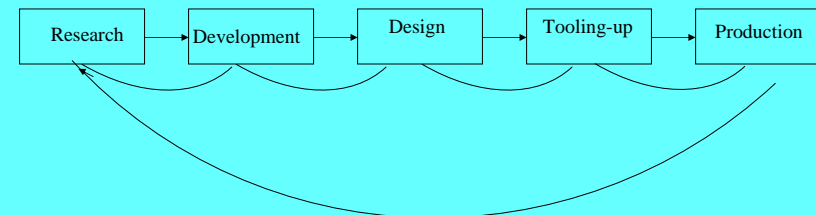
Basic idea: you concentrate and ISOLATE a relevant group of scientists, and you get what you want

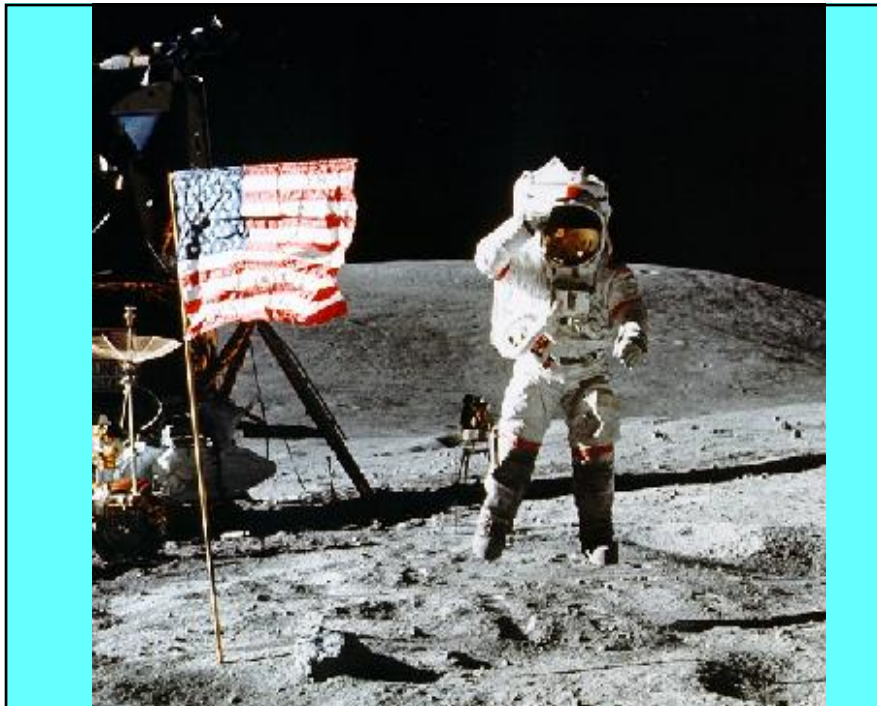
### **Want is Might**

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

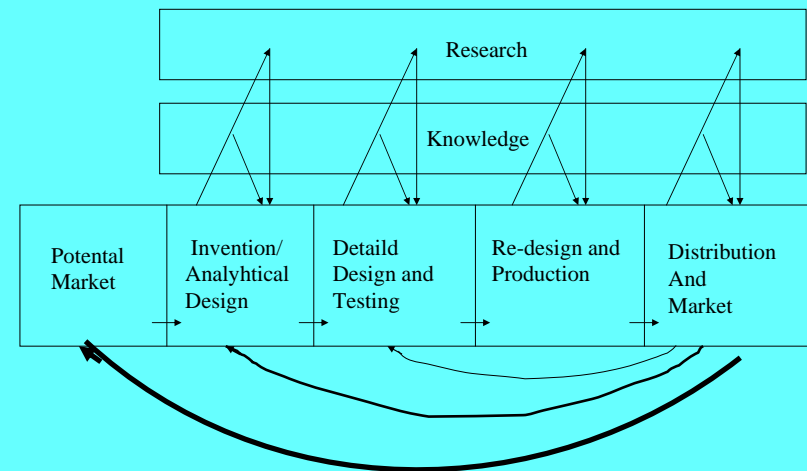
**SPRU 25<sup>o</sup> Anniversary Conference  
1991**

**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 in 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

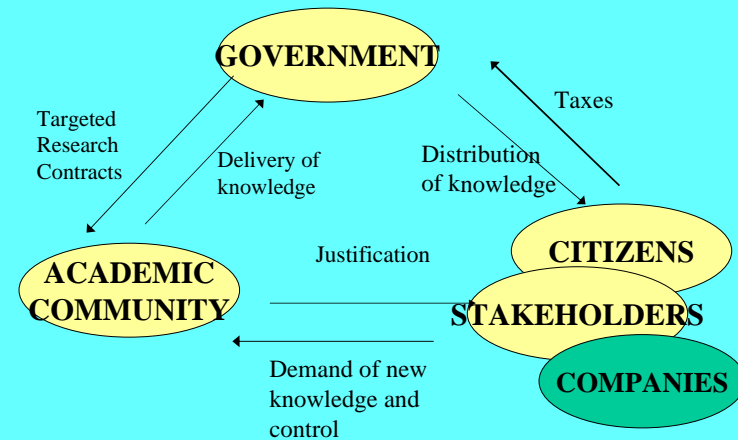
## A New Ivory Tower? No, Thanks



## 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