

ASTR 4800 - Space Science: Practice & Policy

Today: *Why Does the U.S. Invest in Research?*

- Read Part III of McDougall.
- Read NASA Space Act of 1958 (web link on class website)
- Look over "Eisenhower Farewell Address" (web link)
- **Homework due by 5 pm today.**

National R&D Intensity
United States investment as a percent of GDP

Source: OECD, Main Science and Technology Indicators, March 2016. © 2016 AASU.

Astronomy 4800 - Space Science: Practice & Policy

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Federal Funding for Research

Ali Moran and Ryan Roberts

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The purpose of federal funding

- Both federal and state have research budgets
- Some decisions are best left to local government, but there must be both
 - Lewis and Clark

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Measurement of value

	low	Considerations of Use	high
high	Pure, Basic Research (Bohr)		Use-Inspired Basic Research (Pasteur)
Quest for Basic Understanding			Pure Applied Research (Edison)
low			

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Interconnectedness

"It is particularly difficult to quantify the value of knowledge"

Model of non-linear innovation modes:

Model of non-linear innovation modes: linking together interactions with commercial and academic R&D.

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1988: "giant magnetoresistive effect" (GMR) is discovered, creating the field of spintronics. *Basic research foundation: DOE funding for thin-film metallic multilayers*

1990: development of the lithium-ion battery. *Basic research foundation: DOE funding for Electrochemistry*

1988: Thin film transistor LCD displays emerge. *Basic research foundation: NIH, NSF, DOD fund liquid crystal research*

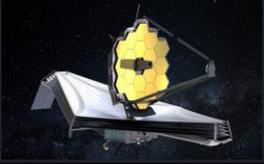
1960-70s: Very Large Scale Integration (VLSI) system and circuit design pioneered. *Basic research foundation: IBM, DARPA funding*

1965: The "Fast Fourier Transform" revolutionizes the field of signal processing. *Basic research foundation: Army Research Office funding*

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Necessary Labor

- To quantify is as important as it is hard
- In order to allocate funding, government tries to quantify this via:
 - Government performance and results act - 1993
 - List long term plans, publish annual performance report
 - President's Management Agenda - 2001
 - 5 points, graded quarterly
 - PART created (2004) to reinforce



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Class Exercise

The value of research cannot be quantified, yet the government requires it regardless. If you could change something about the current legislation surrounding this (GPRA, PMA, PART), what would it be?

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Science - The Endless Frontier

Vannevar Bush

- Commissioned 1944, published 1945
- Set solid foundation for research policy



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GI bill

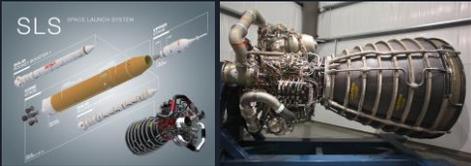
- Positive effect on research
 - Encouraged higher education
 - College seen as a public good



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Political risk

- Re-election is the goal
 - Investment in a failure looks bad
 - Short term results vs long term
- Ex. Artemis and the hydrogen problem



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Presidential oversight

- Federal distribution of money means Presidential oversight
- Each new president brings their own interests
 - Variable allocations - hard for institutions to predict
 - Source of frustration
 - Ex. NASA (on next slides)

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Kennedy

- Nationalism in Space
- Because it is hard philosophy
- Other research initiatives
- Soviet pressure
- Effects of large federal budget
- Lack of longevity for space plans



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Obama

- Shuttle Program Cancellation
- Cuts to other programs
- Reinstating programs for political reasons



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Trump

- NASA Artemis program
- Nationalism in space
- Presidential "passion project"
- Administrative red tape
- Distrust in CDC and NIH



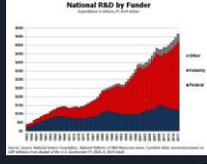
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Non NASA Research

Federal Research by Agency, FY 1995-2014



National R&D by Funder




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Public VS Private good

19th and 20th century university research and academics viewed as a public benefit or was funded by patrons.

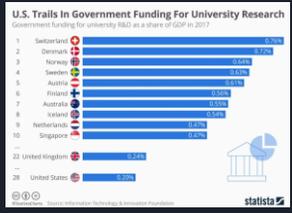
21st century university attendance has increased. College is now a means to personally benefit.

Table 2: Private vs. Public Goods		
	Pure private goods	Excludable and non-rival
Excludable	Food Car House	Cable television Bridge Motorway
	Non-excludable and rival	Pure public goods
Non-excludable	Fish in the ocean Air	Lighthouse National defence
	Rival	Non-rival

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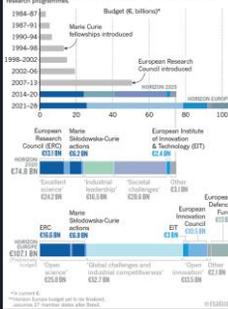
International Education and Research

U.S. Trails in Government Funding For University Research



RISING RESEARCH CASH

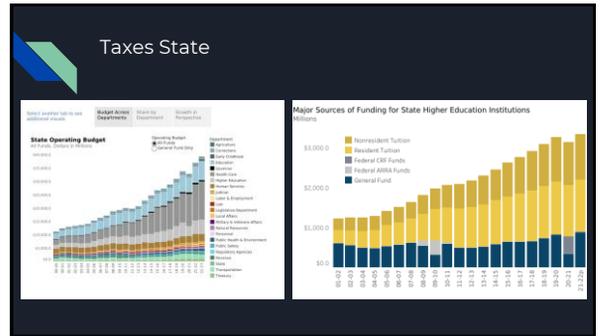
The European Union has steadily increased the value of its large framework research programmes.



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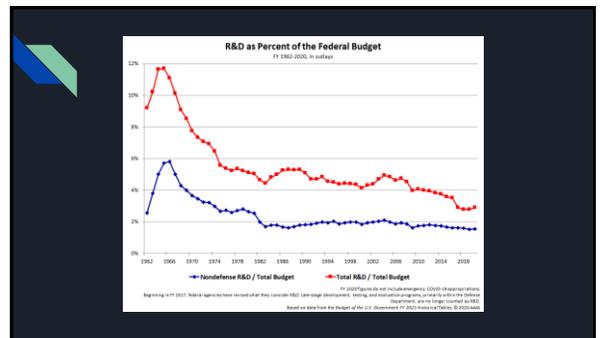
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