

# ECOM181 Macroeconomics for Policy

## 2022/23 Semester 1

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# A Toolkit of Policies to Promote Innovation

Bloom, Nick, van Reenen, John, and Williams, Heidi, 2019

*Journal of Economic Perspectives*, Vol. 33(3): 163-84

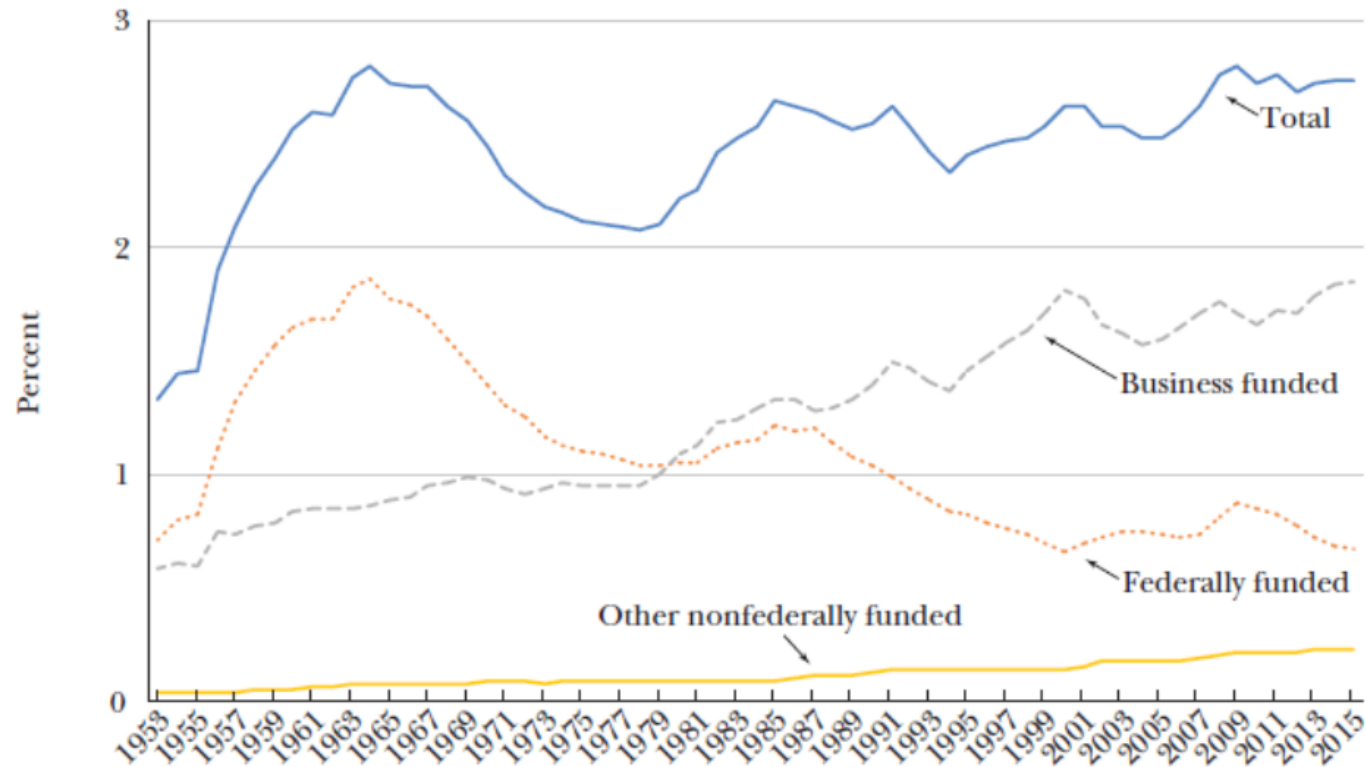
# Plan for today

- Background facts on R&D Spending
- Measuring Innovation
- Why Policy Intervention?
- What kind of policy intervention?
- Tax credits

# R&D spending as a share of GDP grew from around 1.3 percent in 1953 to around 2.7 percent in 2015

Figure 1

US Research and Development as a Share of GDP, by Source of Funds: 1953–2015



# R&D as a share of GDP in the UK is smaller than in the US, Germany and Japan

## International Comparison of Research and Development Expenditures in 2015

<i>Country</i>	<i>R&amp;D expenditures (billions of US\$)</i>	<i>R&amp;D/GDP (%)</i>
United States	496.6	2.7
China	408.8	2.1
India	50.3	0.6
Japan	170.0	3.3
Germany	114.8	2.9
Russia	38.1	1.1
Brazil	38.4	1.2
France	60.8	2.2
United Kingdom	46.3	1.7
Indonesia	2.1	0.1
OECD (average)	34.7	2.4

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# Question to discuss

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- R&D Spending
- Patenting
- Productivity growth
- ICT adoption/investment
- .....



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Market failure

- But: Frontier country?

# Financial constraints

- With tight financial conditions, firms cannot undertake R&D.
- R&D projects are intangible.
- Creditors (in case of default) won't be able to seize it (no collateral), so it will imply higher financing costs.
- Hard to convince investors of value of 'secret' new product

→ Research and development expenditures can be too low in this case

# Knowledge spillovers

- There are positive externalities in research.
  - New knowledge may spill over to other firms, making it easier to come up with yet newer inventions
  - This is through either copying or learning, without paying the full costs of R&D.
- 
- R&D is socially much more beneficial than it is from the perspective of individual firms
  - Private firms do not take into consideration how their own R&D activities benefit the whole society because they cannot appropriate the entire increase in social surplus.
- Research and development expenditures can be too low in this case

# The business-stealing effect

- Prospects for monopoly rents may be too strong.
  - As long as the firm can replace the existing rival and obtain profit, it will undertake R&D.
  - The rival will lose its market shares and profit.
  
  - What if replacing the rival by the new firm does not create any social benefit
  - Private firms do not internalize the fact that their own R&D activities will not benefit the society and instead, they just undertake R&D to seek market share.
- Research and development expenditures can be too high in this case.

# Monopoly power

- Monopolists only have incentive to keep their current dominant position.
- Less incentivized to come up with a new technology replacing themselves.
- Often hard for potential competitors to enter monopolic market with innovative product

→ Research and development expenditures can be too low in this case

# Questions to discuss

- Should we limit or promote the dominance of a few big tech companies in the UK?



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  - Neck-and-neck or Leader-follower

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# A Toolkit of Policies to Promote Innovation

## Innovation Policy Toolkit

<i>Policy</i>	<i>Quality of evidence</i> (1)	<i>Conclusiveness of evidence</i> (2)	<i>Net benefit</i> (3)	<i>Time frame</i> (4)	<i>Effect on inequality</i> (5)
Direct R&D grants	Medium	Medium	💡💡	Medium run	↑
R&D tax credits	High	High	💡💡💡	Short run	↑
Patent box	Medium	Medium	Negative	NA	↑
Skilled immigration	High	High	💡💡💡	Short to medium run	↓
Universities: incentives	Medium	Low	💡	Medium run	↑
Universities: STEM supply	Medium	Medium	💡💡	Long run	↓
Trade and competition	High	Medium	💡💡💡	Medium run	↑
Intellectual property reform	Medium	Low	Unknown	Medium run	Unknown
Mission-oriented policies	Low	Low	💡	Medium run	Unknown

*Source:* The authors.

*Notes:* This is our highly subjective reading of the evidence. Column 1 reflects a mixture of the number of studies and the quality of the research design. Column 2 indicates whether the existing evidence delivers any firm policy conclusions. Column 3 is our assessment of the magnitude of the benefits minus the costs (assuming these are positive). Column 4 delineates whether the main benefits (if there are any) are likely to be seen in the short run (roughly, the next three to four years) or in the longer run (roughly ten years or more); NA means not applicable. Column 5 lists the likely effect on inequality.

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# Tax Credit for R&D

## Research and Experimentation Tax Credit in the US in 1981 (President Reagan)

Year	Turnover (\$ million)	R&D expenditures (\$ million)
1984	100	4.0
1985	105	4.2
1986	110	4.4
1987	116	4.6
1988	122	4.9
1989	128	5.1
1990	134	5.4

How 20 % tax credit work?

- Fixed Base Percentage =  $(4.0 + 4.2 + 4.4 + 4.6 + 4.9) / (100 + 105 + 110 + 116 + 122) = 4.42 / 110.6 = 4\%$
- Base Amount for 1990 =  $4\% * (110 + 116 + 122 + 128) * 0.25 = 4.8$  million
- Credit for 1990 =  $(5.4 \text{ million} - 4.8 \text{ million}) * 20\% = 0.12 \text{ million} (= \$120,000)$

# Tax Credit for R&D

***“The tax code automatically treats research and development expenditures by firms more generously than tangible capital investment.”***

***“Most R&D expenses are current costs—like scientists’ wages and lab materials—they can be written off in the year in which they occur.”***

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(Example)

- \$10 million expenditures on R&D.
- 20% tax credit on 50% of \$10 million expenditures leads to \$1 million tax credit.
  
- Deduction will be reduced by \$1 million tax credit.
- It will increase tax liability by 20% of \$1 million (\$200,000).

The net benefit will be \$1 million - \$200,000 = \$800,000.

# UK Tax Incentives for, a.o., ICT investments

- HMRC Capital Allowances Manual
  - <https://www.gov.uk/hmrc-internal-manuals/capital-allowances-manual/ca10040>
- 100% First-year allowances targeted to encourage particular types of socially desirable investment were introduced for expenditure on:
  - **ICT by small businesses, between 1 April 2000 and 31 March 2004;**
  - energy-saving plant and machinery, from 1 April 2001 to 1/6 April 2020;
  - cars with low carbon dioxide emissions, from 17 April 2002;
  - plant or machinery for gas refueling stations, from 17 April 2002;
  - plant or machinery for use wholly in a ring-fence trade, from 17 April 2002;
  - environmentally beneficial plant and machinery, from 1 April 2003 to 1/6 April 2020.



# A Short-Run View of What Computers Do: Evidence from a UK Tax Incentive

Gaggl, Paul, and Wright, Greg C., 2017

*American Economic Journal: Applied Economics*, Vol. 9(3): 262-94

# Small businesses targeted

- At least two of the following criteria:
  - 1. annual revenue of no more than £2.8 million
  - 2. total assets of no more than £1.4 million
  - 3. no more than 50 employees

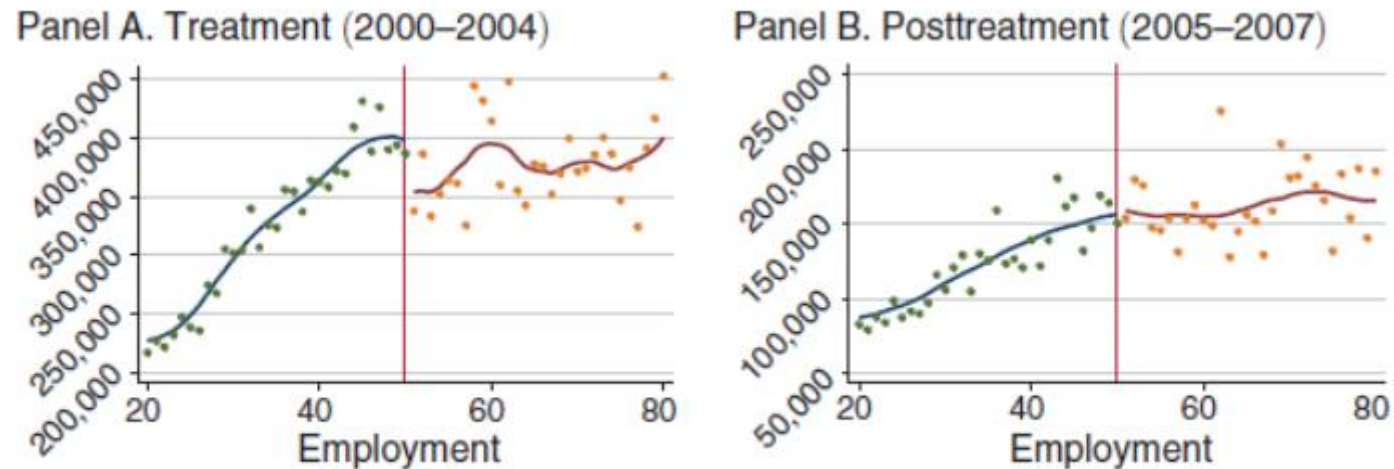


FIGURE 4. AVERAGE PLANT AND MACHINERY TAX DEDUCTIONS CLAIMED

# The tax incentives lead to more investment

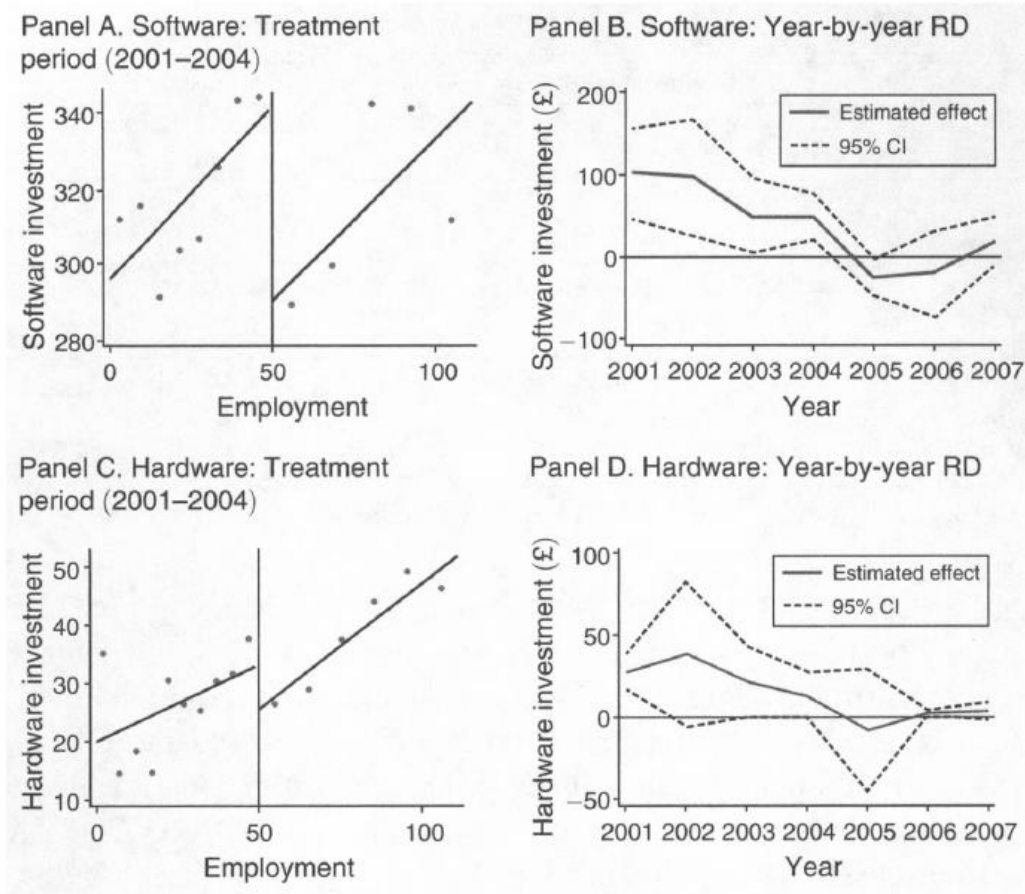


FIGURE 5. ICT INVESTMENT BY FIRM-LEVEL EMPLOYMENT