

The Economic Significance of the UK Science Base

A REPORT FOR THE CAMPAIGN FOR SCIENCE AND ENGINEERING

Jonathan Haskel, Alan Hughes, Elif Bascavusoglu-Moreau

The science and engineering community advocates public investment in the UK science base to drive economic growth. As an evidence-focussed community, we sought a new independent examination of the economic and societal impact of such investment by commissioning a report, *The Economic Significance of the UK Science Base*¹. The report extends previous studies by examining the contribution of the UK science base to our economy at the level of industry, universities, and individual researchers. It shows that, in each case, public investment in science and engineering leads to economic growth.

The new report provides compelling evidence that public investment in scientific research leads to:

- Economic growth through an increase in private sector productivity
- Beneficial economic and societal impacts through increased interaction between the academic and private sectors

It adds crucial evidence to support advice that government can boost economic growth by investing in science and engineering research.

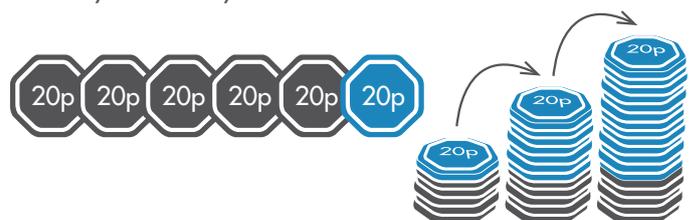
"The report provides clear evidence that academics receiving public sector research funding are also those most likely to engage with the private sector. It also provides compelling evidence that public and private sector research expenditures are complementary. They should not be seen as substitutes in the drive to enhance the productivity performance of the UK."

Professor Alan Hughes

MESSAGES FOR POLICY MAKERS

- Public expenditure on science and engineering research is an investment that generates economic growth
- There is a complementary relationship between industry and public sector research and development (R&D)
- Synergy between the public and private sectors is vital to generate economic growth
- Putting money into UK public sector R&D attracts private investment from overseas
- Public investment in research increases rather than diminishes private sector investment
- Investment in science and innovation is not and should not be seen as a zero-sum game in which public and private investment can substitute for each other
- The public sector can play an important role by connecting public and private research
- Publicly-funded academics are among the most outwardly engaged researchers

In the light of this new evidence, we call for current and future governments to recognise that public spending on science and engineering is an investment with significant benefits for the economy and society.

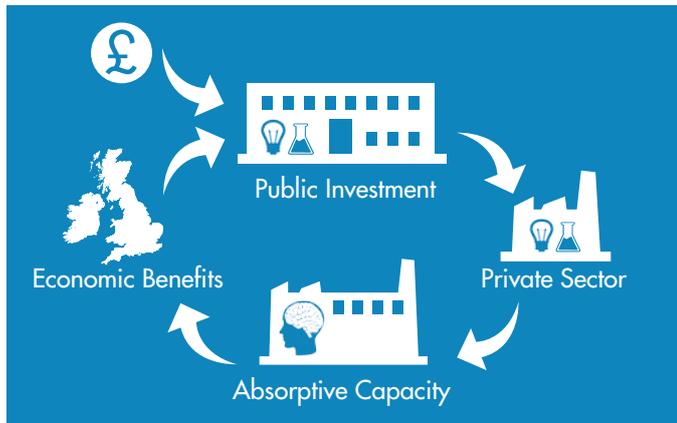


The report calculates that for every £1 spent by the government on R&D, private sector R&D output rises by 20p per year in perpetuity, by raising the level of the UK knowledge base. This effect would of course be larger if the extra public spending on R&D attracted additional private spending on R&D as the report suggests.

£
£450m

£
£1.8bn

If government made a one-off increase in public spending on R&D of £450m (5% of its £9bn total R&D spend), market sector output would rise by £90m per year, every year. Discounting this flow of extra output at 5% per year gives a total boost of £1.8bn to business sector output over time.



Based upon the evidence presented in the report, a virtuous circle can be proposed in which additional public investment in research leads to increased private sector research, which leads to an increase in absorptive capacity of the private sector to make use of public sector research, hence amplifying economic benefit.

FINDINGS

Q1 How does public-sector funding of the science base affect private involvement?

There is a strong positive correlation between public-sector funding and private involvement in research both for universities and individual researchers.

- Universities that receive higher levels of public research funding² generate more research income from other sources (e.g. charities, industry, overseas).
- Regardless of institution, individual scientists who hold Research Council grants are more likely than non-grant holders to be 'outward-facing' and interact with the wider community, for example through the commercial application of their research.

Q2 How does public science funding affect private sector productivity?

Public investment in research increases total factor productivity³ growth at industry level.

- This effect is greatest in industries that themselves conduct significant R&D or report co-operative interactions with universities.
- This is likely to be due to a combination of two factors: that publicly funded research is more applicable to high R&D industry sectors; and that companies are more likely to be able to absorb and make use of publicly funded research results if they conduct R&D themselves.

Q3 What is the role of the UK science base in influencing location decisions of UK and foreign R&D business managers to invest in the UK?

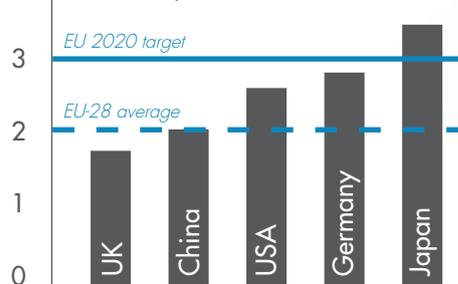
The quality of a nation's science base is an attractor for multinational R&D businesses.

- The most compelling evidence of this effect in the UK indicates that multinational pharmaceutical firms locate their laboratories near to university chemistry departments that are highly-rated by RAE for their research.

INTERNATIONAL CONTEXT

The UK is falling further behind its international competitors in measures of R&D intensity⁴. A report on international comparators says, "The UK research base shows areas of potential vulnerability... with stable or decreasing R&D expenditure or human capital inputs it may not be possible to sustain its position as a world-leading research nation on this basis indefinitely."⁵

R&D spend as a % of GDP



SCOPE

- The report examines both Funding Council and Research Council investments, confirming and extending Haskel and Wallis' 2010 observations based on Research Council funding only and reinforcing the value of the dual funding model⁶.
- The report uses short time series to examine industry sector data. The results provide evidence of an 'interactive' effect of public R&D funding on economic growth i.e. that it is mediated through the private sector. Previous studies of whole economy effects over longer time series show a 'non-interactive' effect i.e. that public R&D funding has a positive effect on the economy by itself⁶. These approaches are mutually affirming and add strength to the published evidence on this subject.
- By examining total factor productivity, this report excludes assessment of the value of delivering highly skilled people to the employment pool by normalising for talent using a proxy of wages. Therefore, the observed increase in private sector productivity in response to public investment in science is in addition to the benefits of employing highly skilled people.
- The report examines only one aspect of university activity, namely attracting external income, and does not reflect upon the many university activities that are not intended to attract external income.
- The term 'UK science base' is used to refer to all research that occurs in the private and public sectors and the people who conduct that research.

¹ www.sciencecampaign.org.uk/?page_id=14040

² Quality Related research awards and Research Council grants

³ Total factor productivity measures output per range of inputs e.g. output per labour and capital input. See p111 of report.

⁴ OECD Main Science and Technology Indicators database, data extract 3/4/2013 <https://stats.oecd.org/>

⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263729/bis-13-1297-international-comparative-performance-of-the-uk-research-base-2013.pdf

⁶ <http://ftp.iza.org/dp4772.pdf> and http://www.cbcr.ac.uk/pdf/Dual_Funding_Report.pdf

This report was commissioned by CaSE and was funded by a consortium of CaSE members: