



**Submission to:**

**The House of Commons Science and Technology Committee**

**Inquiry: Balance and effectiveness of research and innovation spending**

***Response to the call for written evidence***

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**From:**

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## **Background**

The publication of the government's industrial strategy, includes:

- its targets for the level of national investment in Research & Development (R&D), including increasing public funding
- the formation of UK Research and Innovation (UKRI) (with its role in co-ordinating the Research Councils, Innovate UK and Research England)

This strategy represents considerable changes in the UK's R&D landscape. These changes represent a significant opportunity to better coordinate and enhance the performance of the UK in the development and exploitation of research, which will ensure that investment targets are achieved, and perhaps more importantly, that national growth and wealth will be stimulated.

In the face of such changes to the UK's R&D infrastructure, this inquiry instigated by the House of Commons Science and Technology Select Committee is welcome. The AIRTO (the Association of Innovation, Research, and Technology Organisations) response to that inquiry is contained in this document on behalf of its member companies, who operate in the Innovation, Research & Technology (IRT) sector in the UK and overseas, with links to industry and academia. AIRTO members number more than 60 organisations, employ over 47,000 scientific and technical staff. These organisations work with a wide range of industrial sectors, and are based across the UK with some clustering in London and the South East.

A brief description of AIRTO, together with contact details, is given at the end of this document.

### **AIRTO members and R&D funding**

AIRTO members are funded by a range of public and private funding sources, with many being supported largely by private income from industrial partners (1).

Our members derive public funding largely from 'open bid' collaborative funding sources such as Innovate UK and the European Framework programme, and in some cases UK regional and European Structural Funds for the development of facilities and providing support for Small & Medium-sized Enterprises (SMEs).

Some members, such as Public Sector Research Establishments (PSREs) and the recently formed Catapult Centres, currently receive core public funding, although this is often associated with a commitment to matching private funding.

AIRTO members with sufficient underpinning research activities can be awarded Independent Research Organisation (IRO) status by the Research Councils, allowing them to receive Research Council funding. However, only a small minority of AIRTO members have this status; it forms a small amount of their overall income and is often associated with collaborations with universities.

Private funding for R&D for AIRTO members is generally derived from industrial partners both in the UK and overseas. This can be for individual contracts, joint industry projects, contributions to collaborative projects, and in some cases via membership subscriptions.

Other sources of income include grants from charities and trusts, licence fees for intellectual property rights (IPR) use, and testing and certification services.

## **The effectiveness of public spending on R&D, including through mechanisms such as the Industrial Strategy Challenge Fund**

1. The success of public funding on R&D can be seen in consistently strong academic rankings of UK universities in worldwide league tables.
2. However, as has been widely acknowledged, this academic success is not always paralleled by the effective exploitation of research by UK industry. It has been suggested that this is because of an imbalance between the funding of research and a much lower level of funding for innovation, when compared to competing nations (2). In spite of this there is a strong IRT sector in the UK, but a significant amount of its activities are carried out for overseas clients.
3. The recent formation of UKRI, and in particular the introduction of the new Industrial Strategy Challenge Fund (ISCF), may well address this imbalance between research and innovation. However, it is too early to judge the results of these new interventions. Currently, it is appropriate to use the best advice to steer their direction/actions, with the effectiveness of these interventions only becoming apparent as projects and programmes are completed.
4. With the increase in funding of R&D by the government, there is the opportunity to optimise the balance between research and innovation funding. An increase in the funding for innovation and applied research should not result in a decrease in funding for academic research, but rather any additional public funding being planned should be targeted towards driving innovation.
5. There have been a number reports published which have advocated for closer links between universities and industry, and highlighting the role of the academic research community as the solution to enhancing innovation activities (3). Whilst acknowledging that some universities have tremendous contributions to make and are very active in innovation, AIRTO would caution against the wholesale belief that the solution to improved exploitation of the UK's research base lies with the university sector. It is important to note that
  - a. These IRT institutions involved in innovation and working with industrial partners will be able to undertake the task of exploiting research in a more effective and efficient way.
  - b. A shift in emphasis of academia too far towards innovation risks detracting from the UK's world-class standing in research and teaching.
  - c. In general, academia does not have the same goals and timescales as industry – it is often said that they “speak a different language”.
6. Rather than there being two ‘players’ in the R&D landscape (universities and industry), in reality there are three (universities, the IRT sector and industry). Effective public spending on R&D needs to address all three, and seek to coordinate their efforts for an optimal return on investment. There are early signs that the ISCF and other new funding mechanisms will seek to do this.

**The rationale needed for deciding on the balance of public R&D funding between:  
Individual research disciplines, research councils and cross-disciplinary schemes**

7. From their perspective, the decision processes for deciding the balance of funding between the Research Councils and individual disciplines is opaque to organisations in the IRT sector. It is acknowledged that these processes may change with the overall coordination of UK Research and Innovation.
8. AIRTO members would welcome the opportunity to be more involved in the processes for deciding on the balance of funding between individual research disciplines and between Research Councils. Their technical knowledge and understanding of industry strategy and market demands and drivers across a range of sectors could be valuable to these processes.
9. More cross-disciplinary schemes would be welcome as technological developments have increasing political, social, ethical, legal and economic impacts. Examples (from a range of sectors) include:
  - a. Autonomous vehicles: a technological challenge but with far reaching social and economic implications.
  - b. The effect of personalised genome sequencing on health care and personal insurance.
  - c. The interaction between conservation and cultural knowledge, and modern building technology for the preservation of historical buildings.

**The two research funding streams of the 'dual support' system**

10. The dual support funding system has been a significant contributor to the success of universities in the UK, and there are lessons that could be applied to public funding for the IRT sector.
11. For future success, it is important that the correct balance is maintained between the two funding streams for research at the national, institution, department, and even research group level. Imbalances in investment where capital resources are made available without revenue programmes being fully defined, or vice versa, can be very ineffective use of public funding. This is sometimes known as a 'batteries not included' scenario.
12. Equally important is the assessment of the impact of funding invested – not necessarily to penalise the recipient institution, as it is the nature of research that results are not guaranteed. Rather it is important to examine the overall success of funding invested and to learn from this for future funding strategies.

**Research and innovation**

13. As discussed above (paragraph 2), there is currently considered to be an imbalance between the public funding of research and innovation when the UK is compared to other industrial nations. Although absolute figures and comparisons are difficult to draw, it is clear that the UK's current 10:1 ratio of public research to innovation

funding compares with up to 1:1 funding for some of our competitor nations (based on UKRI, ONS and OECD data).

14. It is crucial that the increase in public sector funding into innovation via the National Productivity Investment Fund is skewed more towards technologies and innovations that are industry-led, and more mature. In this way, the UK benefits from both its research base, and the exploitation of the knowledge generated. AIRTO Members are not advocating a reduction in the funding of university research, as they value both the prestige of the UK's research base and working with university partners. Maintaining this research base is crucial, but equally crucial is directing the greater proportion of the increase in public funding to innovation and applied research. In this way, the UK will benefit both from its research base and the exploitation of the knowledge generated.

### **Pure and applied research**

15. 'Pure' and 'applied' research are not distinct categories, but rather research is a continuum from pure (i.e. research which sits at earlier Technology Readiness Levels, [TRLs]) to applied (mid- TRLs) activities which may continue through innovation to eventual industrial exploitation (higher TRLs). This continuum is also time related – what is 'pure' research at one stage, can often become 'applied' research as the technology is developed. Funding of all aspects of the continuum is important, but it is difficult to make quantified decisions on the optimum proportions, as these will vary across different sectors, and even across different projects – it is not a 'one size fits all' approach.
16. An alternative approach to research is to look at that which is 'curiosity-driven' and that which is 'industrial pull'. The latter approach is obviously more targeted in terms of the application and will provide shorter-term benefits, but is often more difficult to define because of the communication gaps sometimes encountered between universities and industry. AIRTO members believe that there is an alternative mechanism for driving the industry pull or applied research. This involves providing organisations in the IRT sector, such as RTOs, with public funding which must be used to support research in universities.

### **Block funding, responsive mode funding and directed funding for the Industrial Strategy**

17. AIRTO favours an approach which directs funding to support industrial and societal challenges to ensure that all important aspects of market opportunity are addressed, while leaving adequate resources elsewhere in research funding for discovery-driven research. A 'block funding' approach has a place in high-level deployment of support to management functions that can address large-scale challenges. A transparent allocation and assessment of block funding is vital for its effective use.

### **The 'golden triangle' of London, Oxford and Cambridge, and the rest of the UK**

18. There is a concentration of AIRTO members in London and the South East, but members cover the UK from the South West to the North of Scotland, and from Wales to the North East of England. Industrial partners for AIRTO members are throughout the UK and the rest of the World, as are academic partners.
19. The real economic benefits to the UK will not come from R&D providers, but from the exploitation of the results of R&D by industry. Therefore, with universities and research organisations operating nationally and globally, their location should not be a prime consideration in the allocation of R&D funding.
20. Where there is existing academic or technical expertise, R&D funding should be allocated on merit rather than location. There is more freedom to consider location when new facilities are being developed, but this should be one of many factors considered.
21. The 'golden triangle' is a significant attractor of overseas R&D funding, and not supporting the research and innovation infrastructure in the South East will result in overseas investment looking elsewhere, which is unlikely to be in the UK. This would be detrimental to the UK.
22. There are exceptions to this national perspective where more local support is necessary for industrial engagement. This is particularly relevant to SMEs, where more locally focused facilities should be considered. These are likely to be relatively late TRL support to industry.
23. UKRI is supporting regional clusters of interaction between the research base and industry via the new Strength in Places Fund. This is at the assessment phase of the first call for Expression of Interest. So it is far too early to make any judgement of its success. However, monitoring and assessment of the programme will be important, as will making modifications of the programme for future calls, based on on-going assessment.

### **Global challenges and other strategic/national priorities**

24. Driving R&D investment to address global/national/strategic priorities is essential for coordinating the capability of the UK to maximum effectiveness, maintaining the world-class research base, and gaining continuing public support for the investment in R&D.
25. The identification of national priorities through the Industrial Strategy will ensure that research and innovation are coordinated and effective, and there are already signs of the galvanising effect of the 'big challenges' on researchers.
26. In parallel to the national challenges, having open calls, such as those from Innovate UK, ensures that promising ideas, outside of the main challenges, can be supported.
27. A further benefit of the targeting of global challenges is attracting researchers and R&D funding to the UK, supporting the government's ambition for the UK to be the 'go to place for R&D'.

## **The effectiveness of and balance between the different available UKRI/government levers for encouraging innovation**

28. UKRI/government levers for encouraging research and innovation are important, but can be improved:

- a. R&D tax credits are effectively used by large companies. The concept works for small companies, but in practice has some challenges. These include defining the scope of what can be included as R&D, and the cash flow implications of the scheduling of repayments. There could be scope for a programme of promotion and guidance from government, together with a short study of the benefits and restrictions.
- b. The Small Business Research Initiative (SBRI) has been successfully used for some specific sectors. However, it could be applied more widely but may need some detailed tailoring for each area of application.
- c. Innovate UK grants are a well-established mechanism for funding R&D, with the main criticism from applicants being the limited size of the calls and programmes. The ISCF will go some way to answering these criticisms.
- d. The introduction of Innovate UK loans caused significant worries when they were first announced. It must be made clear that loans are not replacing grants, but that they are intended to perform a different function. The role of these loans is to address the commercial risk of taking an innovation into production or to market, rather than the technical risks of a developing technology which is the intended purpose of grants. This means that loans are applicable at a much later stage in a development process than grants. Innovate UK loans will 'compete' with bank loans, venture capital etc., and so there has to be a differentiation for these loans from those offered in the "commercial" sector. As the initial rounds of calls for loans have been made by Innovate UK, a review of the process is timely.
- e. AIRTO welcomes the recommendations of the government's recent review of patient capital and urges its full implementation. The proposed £2.5Bn Patient Capital Programme is also welcomed, but must enable continuity of funding support for innovation from company start-up to maturity, particularly in long-term investment propositions such as offshore energy, biotech and in-orbit satellite infrastructure.
- f. Franchising for government services could be a major lever for encouraging innovation, and is used by other nations. Lessons could be learnt from these countries and introduced in the UK.
- g. A government programme to promote the benefits of investing in UK R&D, both domestically and overseas, will be an effective lever for increasing R&D investment. This should also include guidance to both the UK's research and innovation infrastructure and the routes to working with it.



**The most appropriate phasing of the increase in R&D spending by UKRI over the next few years, in order to meet the government's 2.4%/3.0% of GDP targets, and what if any changes will be needed in the forthcoming 2019 Spending Review to deliver these targets**

29. The current and planned increases in UKRI spending are strongly welcomed by AIRTO members, as is the coordination of the spending between the Research Councils and Innovate UK and the targeting of the spending through the Industrial Strategy.
30. This increase in public spending on R&D will play a significant part in achieving the government's target of 2.4% of GDP by 2027. However, with current spending commitments only to 2020/2021, it will be important for this increase in public spending on R&D to continue in real terms to 2027 and beyond. Therefore, it must be a part of the forthcoming 2019 Comprehensive Spending Review. The current activities within government departments and other organisations to prepare roadmaps to achieving the 2.4% will be a vital part of the planning for the spending review.
31. Achieving the targets of 2.4% and then 3% will require a significant increase in the UK capacity for R&D, and particularly an increase in the capacity that undertakes applied research and innovation activities. The IRT sector play a leading role in this area of activity, and actions will be needed to increase its capitalisation as a part of this increase in capacity.

**Assumptions about the public/private mix in delivering the 2.4%/3.0% of GDP targets, the extent past patterns will be replicated in future and the levers that can be used to increase private sector spend on R&D**

32. Current estimates show that the ratio of public to private spending on R&D in the UK is lower than in some competitor/comparator countries (1:1.8 in the UK compared to 1:2.4 in Germany). There is some questioning of the validity of the UK figures. However, what is certain is that an increase in private investment in R&D in the UK will be needed in addition to the increase in public investment if the government's targets of 2.4%/3.0% are to be achieved.
33. As discussed above (paragraph 14), maintaining the funding for research and increasing the funding for innovation will ensure better exploitation of technology by UK industry. It will also increase the investment in R&D by UK industry as innovation has a higher proportion of private spend because of the greater involvement of industry and the nearest to market. A second order, longer-term effect will be the further increase in private R&D spend as the effects of using new technology are realised in companies' profitability.
34. In parallel to this increased investment by UK industry, an increased in private funding of R&D will be achieved by attracting inward investment in R&D. The levers for increasing UK private investment in R&D are discussed above (paragraphs 28a-g). Attracting increased overseas investment in UK R&D is an intention of the government. In order to do this effectively, a major infrastructure needs to be

developed to promote the benefits of investing in UK R&D, and to provide an easy pathway for overseas companies making such investments.

#### **Summary of key points**

- 1. AIRTO welcomes the Industrial Strategy and the government's long-term target for the UK to achieve 3% of GDP to be invested in R&D.**
- 2. Planned incremental increases in public funding via the National Productivity Investment Fund should target innovation and the exploitation of more developed technologies that are industry-led, to match the profile of other competitor nations, such as Germany and USA.**
- 3. The Innovation, Research & Technology sector needs support by way of capitalisation in order to fuel the national growth aspirations in R&D intensity outlined in the Industrial Strategy.**

#### **References**

- 1. [The impact of the innovation, research and technology sector on the UK economy. Oxford Economics, November 2014.](#)**
- 2. [Industrial Strategy. HM Government, November 2017.](#)**
- 3. [The Dowling Review of Business-University Research Collaborations. July 2015.](#)**

## **About AIRTO**

AIRTO is the Association of Innovation, Research and Technology Organisations. Its membership comprises approximately sixty of the principal organisations operating in the UK's Innovation, Research and Technology (IRT) sector. The IRT sector has a combined turnover of £6.9Bn, employing over 57,000 scientific and technical staff (equivalent to the academic staffing of the Russell Group of universities) and, for comparison, it is significantly larger than the network of Fraunhofer Institutes in Germany both in size and its scope of activities. The sector contributes £34Bn to UK GDP. AIRTO's members work at the interface between academia and industry, for both private and public sector clients.

Members include independent Research and Technology Organisations, Catapult Centres, Public Sector Research Establishments, National Laboratories, some university Technology Transfer Offices and some privately held innovation companies.

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