Generating coherent and effective R&D and innovation policies

British Academy Policy Programme on Economic Strategy: R&D, technology and innovation Working Group

June 2025

The British Academy

About the Academy

The British Academy is the UK's national academy for the humanities and social sciences. We mobilise these disciplines to understand the world and shape a brighter future. From artificial intelligence to climate change, from building prosperity to improving well-being – today's complex challenges can only be resolved by deepening our insight into people, cultures and societies. We invest in researchers and projects across the UK and overseas, engage the public with fresh thinking and debates, and bring together scholars, government, business and civil society to influence policy for the benefit of everyone.

Paper Authors

R&D, technology and innovation Working Group Co-chairs

Professor Paul Nightingale FAcSS - Professor of Strategy at Sscience Policy Research Unit, University of Sussex

Dr Molly Morgan Jones - Director of Policy, The British Academy

British Academy leads

Dr Eleanor Hopkins - Deputy Head of Higher Education and Research Policy

Sarah Cowan - Head of Higher Education and Research Policy

Acknowledgements

The authors would like to thank the members of the British Academy Economic Strategy Programme's R&D, technology and innovation Working Group for their detailed advice and discussions that have informed this paper. Their names are included here but are not necessarily indicative of endorsement of the entire content of this paper:

Professor Ammon Salter

Professor David Edgerton FBA

Professor Dame Diane Coyle DBE FAcSS

Professor Elvira Uyarra

Professor Hasan Bakhshi

Processor Henry Overman OBE FBA

Professor Jack Stilgoe

Professor Jane Gingrich

Professor Jonathan Michie OBE FAcSS

Professor Katy Shaw

Professor Neil Lee

The authors would also like to thank Dr Anna Valero, who joined this group as a co-Chair from the outset of the project but stepped down in summer 2024 due to a new role on the Economic Advisory Council. All contributions to this project took place prior to Dr Valero's role in HM Treasury. We would also like to thank Professor Carol Propper FBA, who contributed to discussions earlier in the process.

The appendix highlights some of the evidence base that has informed the Working Group and the writing of this document, and the reader is also referred to the detailed meeting notes in the Programme Evidence Hub from each of the four meetings the Working Group has held to date. This paper should also be read in tandem with the wider synthesis paper and Economic Strategy discussion papers

Contents

1. Introduction

Given the important role innovation plays in productivity growth, policies to support R&D, technology and innovation are vital components of any economic strategy. However, despite improved government funding for R&D, UK productivity growth (along with the rest of the world) has been poor. In addition, the UK continues to have one of the most geographically uneven economies in the G7.[1] This low productivity growth has reduced the financial resources the government has to invest at a time when new security, geopolitical and sustainability challenges are creating additional demands on limited resources.

Given this context, what can the UK government do to better utilise and leverage the potential of R&D and innovation for improving economic outcomes in the long-term?

The UK has many high-quality assets. Improving how they are utilised can create positive outcomes at relatively little cost. Over the last decade, successive UK governments have sought to boost academic R&D spending, and to commercialise high-tech products and processes developed in universities. These policies have contributed significantly to an increase in UK business expenditure on R&D of £3.0 billion since 2021, to £49.9 billion in 2022.[2] Total "civil"[3] net expenditure on R&D and knowledge transfer activities increased by 32.6%, from £10.4bn in 2011 to £13.7bn in 2022.[4]

While this increase is welcome, it still means the UK is lagging in R&D intensity among OECD countries.[5] This is a challenge, but not one without opportunities. The Working Group discussed six such opportunities to improve the economic outcomes from R&D and innovation:

- **Strengthen the evidence base on how we measure research and innovation inputs and outputs.** In the UK, we lack an understanding as to why investment in R&D has not led to significantly improved economic outcomes. This is indicative of a lack of good data on R&D and innovation in key research disciplines, sectors, industries and regions. This gap has made it more difficult to generate shared agreement about what the problems are and what policies should be implemented to address them.[6] This will require a more nuanced understanding of the complex interactions between the stages and nature of research, innovation and industry.
- **Increase policy stability and build more effective R&D and innovation policy.** While UK *science* policy has been consistent over decades, UK *industrial* policy has constantly changed, creating uncertainty for industry and international investors.[7] There is a need to build long-term funding commitments and political stability into both science and industrial policy to create a more productive and integrated policy system.

1 Kenny, M., McCann, P., Ortega-Argilés, R., Westwood, A. (2024), 'Regional productivity inequalities, potential causes, and institutional challenges', *The Productivity Agenda*, eds Coyle, D., Pendrill, J. The Productivity Institute. [March 25].

2 ONS (2015) 'Business enterprise research and development, UK: 2014' and ONS (2024) 'Business enterprise research and development, UK: 2022'. [Oct 2024].

3 Civil R&D refers to R&D expenditure not related to defence, encompassing all R&D activities undertaken by business, government, and academia in non-military sectors.

4 ONS (2024) 'Research and development expenditure by the UK government: 2022'. [Oct 2024].

5 Breslin, M., Velez Ospina, J. (2024), *UK Business R&D: A worrying decline*, National Centre for Universities and Business. [March 25].

6 Bakhshi, H., Breckon, J., Puttick, R., (2021), 'Understanding R&D in the arts, humanities and social sciences', *Journal of the British Academy* 9 [Jan 2025] and Bakhshi, H., Schneider, P., Walker, C. (2008), Arts and Humanities Research and Innovation, AHRC and NESTA. [Jan 2025].

7 Coyle, D., Muhtar, A. (2021), 'The UK's Industrial Policy: Learning from the Past?', *Productivity Insights Paper 2*, The Productivity Institute and Agar, J., Clarke, S., Craig, C., Edgerton, D., Flanagan, K. (2019), *Lessons from the History of UK Science Policy*, The British Academy and Department for Business, Energy, & Industrial Strategy. [Sept 2024].

- **Recognise that most of the science and technology that benefits UK firms is likely to be developed overseas.** The UK only produces about 7% of global scientific output. Policy focused solely on investing in the creation of new technologies here in the UK risks under-emphasising the adoption, adaptation and diffusion of those technologies.
- **Invest in talent, not just technology.** Productivity benefits are typically associated with adoption rather than creation. However, adoption and diffusion cannot happen without a well-trained, world-class research base ready to do the translation required. We need to invest in both.
- **Ensure a realistic understanding of the system and clarify the overall goals of innovation policy.** A range of evidence suggests that policy in other nations is increasingly interventionist and typically addresses all parts of the innovation system, from traditional R&D to downstream adoption. This covers managerial practices, diffusion, skills and access to international talent, infrastructure and planning, as well as connections to global technology supply chains and export markets.
- **Develop a range of structures and mechanisms appropriate for the UK to support innovation.** Arms-length funding bodies and innovation agencies direct funds, but central, regional and devolved innovation bodies also deliver that funding on the ground. To achieve positive outcomes, different structures need embedded expertise, alongside clarity of their purpose in their landscape. However, there will be inevitable trade-offs that need to be clearly articulated and understood.

Simply boosting the supply of translational research may be ineffective if it is not being appropriately used. Innovation, no matter its form, should not be taken for granted as "good": innovation has a direction as well as a rate of change that must be noted and actively managed.[8] Similarly, research and innovation are iterative processes, requiring experimentation, uncertainty, risk and, often, failure.[9] Building from these starting points, this paper identifies the following policy choices:

1. **Bolster data and evidence-bases across innovation systems:** Effective innovation policy needs to be underpinned by a solid research and evidence base, that reflects the breadth of activity associated with innovation, for use by both civil servants and researchers.
2. **Understand and build on existing strengths:** R&D and innovation policy needs to be pragmatic and based on a clear understanding of the UK's relative strengths and weaknesses. This will require policymakers to build a better understanding of existing skills, industrial capabilities and innovation capacities in different regions of the UK.
3. **Look beyond frontier technologies:** Innovation policy should support the entire innovation process and ecosystem, not only the parts that generate improvements at the technological frontier.
4. **Create longer term innovation policy:** Embed more stability and reduce policy uncertainty to encourage private sector investment. Ensure that the design and utilisation of institutions align with overall policy need and goals.
5. **Align new policy to the existing policy mix:** The interconnection between innovation policy and other areas of public policy requires policymakers to take a coordinated approach to the wider policy mix to generate growth.

---

8 Coad, A., Nightingale, P., Stilgoe, J., Vezzani, A. (2021), 'Editorial: the dark side of innovation', *Industry and Innovation* 1 [Jan 2025].

9 Bakhshi, H., Freeman, A., Potts, J. (2011), *State of Uncertainty: Innovation policy through experimentation*, Provocation 14, Nesta. [Jan 2025].

2. Background

The terms research & development (R&D) and innovation are used throughout this document in line with the OECD definitions from the Frascati and Oslo manuals. The Frascati Manual defines R&D as:

> *Creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.*

As a set of common features, it identifies five core criteria for an activity to be considered R&D. The activity must be novel, creative, uncertain, systematic, and transferable and/or reproducible to increase knowledge and devise new applications. Total R&D spending is roughly split as two thirds development and one third research, with most development work undertaken in firms, and most research split between firms, universities and research organisations, and hospitals.

Innovation, as defined by the Oslo Manual, refers to a process to develop a "new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations". Innovation also refers to the outputs of that process. These innovations typically have to be made available to potential users or brought into use by the actor responsible. The process of developing and adapting existing technology often throws up new problems, some of which require R&D and basic research to address, some of which require a new process.

The UK has historically been a pioneer in innovation-led growth, with a strong economic, social and cultural foundation to support it. It has a large, open and outward looking economy with a well-educated, talented and entrepreneurial workforce. It has a world-class university system, excellent financial and professional services and a flexible labour market. Industry is well regulated, and regulation focuses on supporting consumers rather than protecting producers. The UK legal system is also well regarded, including its patent courts. And setting up and running a business is significantly easier than in many other European nations. These successes have partly been driven by decades of public policy that has aimed at improving the inputs to the economy, in the hope that it would lead to improved economic growth.

While many of those policies have been successful, the expected economic growth that they were intended to generate has not materialised. Stagnating productivity since 2007 is a global problem, but the UK's performance is among the worst and it now has one of the most geographically uneven economies in the G7. The UK's middle-tier cities have lower productivity than similarly sized cities in Europe, and the UK has failed to generate new technology-based industries of the kind seen in the USA.[10] As a result, the UK economy is about a fifth smaller than it would have been had the trend in productivity growth continued after 2007.

[10] Resolution Foundation (2023) *Ending Stagnation: A New Economic Strategy for Britain.* [Jan 2025].

The British Academy's R&D, Technology and Innovation Working Group reviewed a wide range of evidence to look at why current levels of R&D and innovation are not leading to improvements in the UK's growth performance. As many scholars and analysts have found, it is not easy to understand why.

Part of the explanation for the lack of performance lies with the global turmoil that has hit the UK. The economic and political disruption caused by Brexit, the long-term impact of the Global Financial Crisis and the response to it, the Covid-19 pandemic and, more recently, inflation caused by changes in energy prices following the Russian invasion of Ukraine have all played a role. However, even taking these shocks into account, the UK economy is underperforming.

UK R&D and innovation policy has tended, by default, to utilise two main policy levers to support R&D: supporting research in higher education institutions and incentivising business R&D through tax credits. These levers adopt a model of innovation that assumes all innovation follows from R&D, and especially from universities via spinouts. This can lead to increasing input measures – such as targets on R&D as a share of GDP – becoming the main focus.

Within this policy framing, any lack of impact on economic growth is thought to have been caused by a lack of R&D investment. This made sense as official data previously suggested the UK had lower national investment in R&D compared to other nations, which helped explain the UK's weaker productivity growth since 2007. However, in November 2022, the Office for National Statistics (ONS) published a temporary patch on their Business Enterprise R&D (BERD) data during the development of a better sampling frame to capture Small & Medium-Sized Enterprise (SME) R&D investment. While the figures may change again as they update historic data, this patch substantially increased the level of business R&D in official statistics.[11] In other words, we were already spending a large amount on R&D but not seeing the productivity gains it was assumed would follow.

So, what is the problem? Is it about investment? Is it that the UK is not effective in translating good and important investments in R&D into productivity growth? Is the problem about overcoming the translational gaps between research and innovation through to commercialisation? Is it about wider geopolitics and international trade? The Working Group analysed some of these underlying issues by choosing to examine four cross-cutting questions over the course of its meetings.[12] Each is covered in turn in the following section.

11 ONS (2024) *Gross domestic expenditure on research and development, UK: 2022*. [Sept 2024].

12 These are not necessarily an exhaustive set of questions, but they were the ones the group thought most relevant to discuss given the focus of the programme and complementarity with the other Working Groups.

3. Foundational thinking

3.1 What is the state of the evidence base on R&D and innovation and how do we think about it?

Compared with many other policy areas, such as education or welfare, R&D and innovation is an area where there is less high-quality data, analysis and evidence, particularly at regional and sectoral levels, and it is difficult to find causal relationships around 'what works' and why.

This is partly a conceptual and partly a measurement problem. Conceptually, R&D and innovation have distinct definitions and international standards. However, the two are often used interchangeably. R&D is generally understood to be about creating and contributing to new knowledge and developing new or improved products or inventions, whereas innovation is the iterative process through which these new ideas are taken up, diffused and adopted by society and markets.

Yet while they are distinct activities and require different policy support, we should not assume that they do not overlap, or that innovative activity always starts with research. Research needs trial and error, and the cumulative impact of incremental advances and the learning from failure can both be considerable. Innovations can and do fail – it is always a feature, though less studied. The iterative nature, level of risk and overlap of R&D and innovation makes it harder to gather clear evidence on these processes.

Similarly, the evidence base about what happens during and after R&D and innovation processes is difficult to pin down. First is the conceptual difficulty of distinguishing R&D from innovation as outlined above. Second, identifying what innovation looks like across sectors and what different types of innovation exist as distinct from frontier technologies can be nuanced and complex. Non-technical R&D and organisational innovation are vital to improved productivity across sectors. However, they are less easily measured and captured.[13] Similarly, incremental innovation is different from radical innovation, and both have different methods for understanding change.

We know that different sectors are likely to have different patterns of innovation. Organisation and process innovation are particularly important in modern service-based economies like the UK when compared to high-tech manufacturing. Since the services sector makes up around 80% of the UK economy, this is an important element to measure and understand in order to leverage innovation for improved productivity and economic outcomes.[14]

These issues around measurement are exacerbated by existing measures of R&D in the UK, which have inconsistent definitions across policy areas and as a result are likely to be significantly undercounting R&D in the social sciences and humanities in particular.[15] Without a solid evidence base across all areas of R&D, types of innovation, sectors and geographies, we are not able to make good policy decisions.

Despite these gaps, the evidence clearly shows that innovation is often driven by demand. Lack of attention to what users and customers want and are willing to pay for can cause policy to be caught up in short-term fads and fashions for promising, but ultimately unviable, frontier technologies.

---

13 Tether and Tajar, 'Beyond industry-university links'.

14 Tether, B., Tajar, A. (2008), 'The organisational-cooperation mode of innovation and its prominence amongst European service firms', *Research Policy* 37 pp.720-739. [March 25].

15 The British Academy (2014) *Understanding SHAPE in R&D: bridging the evidence gap.* [March 25].

There is also increasing recognition that across all sectors, organisational innovation (including managerial and other non-technological innovation) is required for the utilisation of new technologies. This organisational innovation can be internal and/or external, and can change relationships with networks of suppliers, customers, competitors, regulators and other institutions. Innovation therefore includes, but is not limited to, high-tech R&D-based activity. It involves production, marketing, sales, finance, HR and strategy – all of which will draw on a wide range of skills and inputs.

The ability of a firm to identify and integrate all these components and then create the conditions for innovation is often referred to as the absorptive capacity of a firm.[16] Absorptive capacity creates a vital positive feedback loop to R&D, relying on the skills and capabilities developed in universities.[17] The Group concluded that an important output of university research should be celebrated as talented people. Graduates and researchers have the ability to understand and judge the quality of research conducted elsewhere, as well as produce new knowledge and generate technology advancements and breakthroughs. Investment in universities is not only an investment in R&D, but more broadly an investment in absorptive capacity.

This is why too much discussion of innovation policy which assumes a closed economy where the only source of growth is national R&D, can miss the importance of world-class talent in the international flows of technology and research, suppliers and other firms. These are all important components of innovation. Productive R&D and innovation policy requires policymakers to think in a multifaceted and systematic way.

3.2 What are the overall goals of R&D and innovation policy and how do different policies relate to different aims of an economic strategy?

Given the complexity of the system, a wide range of public policies support innovation. While there have been repeated attempts to undertake a more activist approach to innovation and industrial policy in the UK, these approaches have been inconsistent, with strategies regularly changing in recent years. The UK has lacked a clear, and widely shared, understanding for why some policies should be introduced and how this maps to other national outcomes.

This may be in part due an assumption that innovation is inherently a 'good' to the economy and society. In fact, the way in which the components of a distributed innovation system, in which innovation is distributed across multiple actors in the system, interact and align will influence both the rate of innovation (how much is generated) and its direction (what kinds of innovation and innovation outcomes are produced).[18]

The fact that innovation has directionality requires policymakers to consider the purpose of fostering R&D and innovation. Is it to improve productivity, create economic growth, and/or foster higher living standards? No matter the answer to any of these questions, it is vital to start from a clear vision of what a successful economic strategy looks like (and for whom) in 15 years' time. What research base is needed to support that vision? What services do we need to produce to reach it? What innovation do we need to invest in now?[19] Such reverse engineering of innovation policy can be one of the tools to answer these questions.

16 Cohen, W., Levinthal, D. (1990), 'Absorptive Capacity: A New Perspective on Learning and Innovation', *Administrative Science Quarterly* 35.1 pp.128-152. [March 25].

17 Salter, A., et al. (2000), *Talent, Not Technology: The Impact of Publicly Funded Research on Innovation in the UK*, SPRU. [May 25].

18 Stirling, A. (2024), 'Responsibility and the hidden politics of directionality: opening up "innovation democracies" for sustainability transformations', *Journal of Responsible Innovation* 11(1) [Sept 2024].

19 Breznitz, D. (2021), *Innovation in Real Places: Strategies for prosperity in an unforgiving world,* Oxford University Press.

However, there will be tensions and trade-offs in defining the purpose of R&D and innovation. They include different kinds of outcomes (economic growth vs environmental impacts), different capabilities (basic research vs commercialisation) and (mis)aligned incentives (R&D tax credits vs adoption incentives). This is particularly the case if policy is only set at a national level that fails to take account of regional or local needs and strengths or address all parts of the value chain.[20] Different contexts and conditions will shape the outcomes of R&D and innovation policy. These effects could include, for example, deepening economic inequality or damages to the environment. How will we consider these trade-offs?

There are useful examples to learn from where R&D and innovation policy have helped address problems such as regional inequalities. Austria, for example, has had the second largest increase in R&D spending in the OECD – after South Korea – between 1980 and 2020, concentrated in traditionally low-R&D intensive sectors.[21] The Styria region had the same industrial composition as Wales in the 1970s. Since then, their relative economic performance has diverged, with GDP per capita in Wales lagging compared to Styria.

Part of the explanation for this lies in the fact that in Styria, policy focused on enhancing existing institutional and industrial strengths, upgrading local research infrastructure and linking it to local businesses and global supply chains.[22] Similarly, Switzerland has been able to maintain a highly innovative economy in a wide range of areas like financial services, speciality steels, automobile component production, digital technology, pharmaceuticals and chemicals. Swiss policymakers focused on where firms could be successful and supported them to innovate and move up the value chain.[23] These are examples of where integrated R&D and innovation policy seems to have paid off.

These examples highlight that policy goals must take into account the complexity of the innovation system and the connections across it. In recent decades, UK R&D and innovation policy goals have tended to emphasise supporting R&D at the technological frontier, with a focus on university research as the main input. However, generating wider economic outcomes from R&D and innovation requires a focus *on both* frontier technology and scientific discovery (what we might conceptualise as scientific breakthroughs and invention) *and* wider support for the successful translation, commercialisation, adoption and diffusion of innovation.

Holistic approaches have been adopted successfully in other contexts and, as a result, there is a solid evidence base for policy to draw on. In cases where regional innovation has been successful, innovation policy has co-evolved in tandem with society, with attention to the needs of the ecosystem, and the dynamic processes in which ecosystems change over time.[24] This includes the Taiwanese Industrial Technology Research Institute's (ITRI) development and tailoring of tools to ensure diffusion in response to an ecosystem which had low absorptive capacity.[25] In Singapore, innovation policy does not only focus on R&D investment.[26] Instead, Singaporean innovation policy also takes a highly pragmatic, whole systems view that includes attention to immigration and visas, legal services, education, and infrastructure.[27] Policy is coordinated across multiple areas to deliver outcomes in ways that are less visible. There are important learnings here for the UK. The outcomes of policy trade-offs are hard to predict *ex ante*. The point is to be strategic, and to utilise coordination across policies that support a wider goal, while being realistic about the trade-offs associated with approaches.

---

20 As noted in the introduction, please see the Annex and the Programme Briefing Book for further literature and Working Group discussions related to the assertions and hypotheses in this paragraph.

21 Lee, N. (2024), *Innovation for the Masses: How to share the benefits of the high-tech economy*, University of California Press, pp.9-14.

22 Lee, *Innovation for the Masses*, pp.108-114.

23 Ibid. pp.68-89.

24 Breznitz, D. (2021), 'Looking for Better Options: The science of innovation policies and agencies in a globally fragmented world', *Innovation in Real Places: Strategies for prosperity in an unforgiving world*, Oxford University Press, pp.118-9. Ibid,

25 p. 129.

26 Lee, N., Ni, M., Boey, A. (2024), 'The Scale-up State: Singapore's Industrial Policy for the Digital Economy', *Southeast Asia Working Paper Series*, 11 LSE Southeast Asia Centre, pp.20-22. [March 25].

27 Ibid.

3.3 How can we better utilise R&D and innovation to generate wider economic benefits?

A lack of attention to the global economic context of commercialisation and diffusion of technology can lead to unrealistic science, technology and innovation policy (this has been referred to as the 'closed system fallacy').[28] This can also lead to an over-emphasis on academic scientific discovery, without considering the broader ecosystem required to generate wider social benefits. Building on concepts in section 3.1, this question explores how integrating policy across the innovation system may support wider economic goals.

The UK benefits from technologies developed elsewhere and has been successful in adopting them into its economy, creating significant gains.[29] History shows us that generating positive productivity outcomes requires an R&D and innovation environment that is open to the world.[30] Across the globe most change is not new-to-the-world. It is new-to-the-nation or even new-to-the-firm and is based on the diffusion, adoption and adaption of existing technologies that come from inside *and* outside that country.[31] Here, the UK has considerable strengths as an open, outwardly facing economy. The UK is a medium sized player in a global innovation system, and sensible policy needs to carefully balance a focus on frontier research that plays to our strengths, alongside the adoption and diffusion of technologies developed elsewhere.

Support for frontier research is important not only for discovery and invention, but also as a means of creating the skills and talent to support absorptive capacity. The UK has notable success at the frontier. For example, it has incubated more new AI ventures than the EU on a per capita basis. These firms have received considerable VC funding, and the UK is well-positioned to lead in AI adoption and development. This is in part a result of the UK's investment in building up research in computer science, maths and other disciplines, and reflects institutional investment, such the Institute of Coding and doctoral training centres in AI. We have also benefitted from the long-term location here of DeepMind, which is an anchor for many AI activities.

Creating positive productivity outcomes from this research base calls our attention to the less visible aspects of the UK's innovation system. These include translational research skills; management capability development within firms; legal, economic and financial expertise; and investment in the infrastructure needed for the adoption of technologies from elsewhere.[32] These processes of technology adoption, as history tells us, are often not straightforward, and nor do they represent clean breaks from previous technology use.[33] As such, we also need a more integrated framework of supporting policies, that recognise iterations between the frontier, adoption, adaption and diffusion. This includes a broader approach to lifelong learning that creates capabilities to deal with new technologies as they emerge.[34]

---

28 Flanagan, K. (2019), 'Introduction – Why now is an important time to consider history', *Lessons from the History of UK Science Policy*, British Academy, pp.10-13. [March 25].

29 Edgerton, D. (2006), *The Shock of the Old: Technology & Global History*, 2019 eds, Profile Books, p.111.

30 Hesham, H., Lipartito, K., Watson, P. (2022), *The Global Innovator: How nations have held and lost the innovative edge*, Think Twice Books.

31 The exception to this is the United States in the 20th century, which accounted for 50% of the global economy and 50% of global R&D.

32 Edgerton, 'Political Economy of Science' and Costa, et al. (2023), 'Learning to Grow: How to situate a skills strategy in an economic strategy', *The Economy 2030 Inquiry*, Resolution Foundation. [April 2024].

33 Edgerton, *The Shock of the Old* and Wilkes, G. (2025), 'The hunt for £45bn', *Freethinking Economist*. [May 25]

34 Michie, J. (2021), 'Developing flexible lifelong learning in line with changing needs and opportunities', *Times Higher Education*. [Sept 2024]. See also the Working Group Paper on Skills from this Programme.

3.4 How can stable policy structures support regional R&D and innovation policy?

The Group's final discussion addressed the benefits of regional R&D and innovation policy. While the Group found there is broad consensus about the importance of R&D and innovation across the political spectrum in the UK, industrial policy has been subject to significant swings in approach, especially at regional and local levels.

We know that R&D and innovation benefits from both a degree of policy stability and flexibility to respond to a changing environment. However, there is now a need to embed more stability and reduce policy uncertainty, and to encourage more private sector investment nationally and regionally. There is extensive evidence that public investment in R&D can increase the value of private sector R&D, and lead to crowding-in of complementary private sector investment.[35] However, constant changes to policy can increase investment uncertainty and damage this crowding-in effect. The 'churn' of industrial policy can make it difficult to build and maintain relationships and expertise, especially the kind of long-term expertise and historical understanding that is so valuable to R&D and innovation policy.

This is particularly the case at local and regional levels. If political structures and mechanisms are to support innovation policy and generate positive economic outcomes, there is a need to be clear about the role and untapped potential of central and more regional and devolved policy and funding. Innovation policy can build on regional strengths and needs if policymakers have embedded expertise and are clear about the structures and mechanisms that are most appropriate for given policy goals or targeted sectors. Regional innovation policy is likely to have impact if it is undertaken with considerable knowledge of the local region, including skills capabilities, industry need, and existing areas of strength in knowledge chains.[36]

Innovation agencies often play a crucial role in developing and implementing innovation policy that co-evolves with regional industry. Effective innovation agencies range from large, powerful organisations, to small and modestly funded ones.[37] For example, GTS Institutes in Denmark are lightly funded, and act as embedded knowledge translators connecting local industry, university research and foreign technology.[38] At the other end of the scale, the institutional design of the Defense Advanced Research Projects Agency (DARPA) in the US focuses on using significant funding to conduct and co-ordinate R&D, engaging industry and fostering large-scale socioeconomic change.[39] The nature and culture of such institutions matter.

Alongside building innovation agencies that support overall goals and build regional capacity, devolved policymaking is likely to become an increasingly important area of policy coordination for the UK. In 2024, innovation was included in the Level 4 devolution framework, aimed solely at Mayoral Combined Authorities (MCAs)[40] in England, with the goal of supporting local government in building regional innovation capabilities. These devolution deals create the opportunity for innovation, alongside areas within skills, transport, and business and trade, to be part of an optional level 4 package for MCAs.[41] This may mean that power and budget for innovation policy continues to become more decentralised, particularly under the current

35 National Centre for Universities and Business (2024) *Unlocking Growth: The impact of public R&D spending on private sector investment in the UK*. [March 25].

36 De Lyon, J. et al. (2022), 'Enduring Strengths: Analysing the UK's current and potential economic strengths, and what they mean for its economic strategy, at the start of the divisive decade', *The Economy 2030 Inquiry*, Resolution Foundation. [April 2024] and Coyle, D. et al. (2018), *Background Paper: The emerging impact of devolution*, Greater Manchester Independent Prosperity Review. [Sept 2024].

37 Breznitz, D. (2021), 'Looking for Better Options', p.120.

38 Ibid, pp.121-2.

39 Ibid, pp.127-9.

40 Mayoral Combined Authorities will automatically become Mayoral Strategic Authorities if the Government's 2024 English Devolution White Paper passes into legislation

41 Department for Levelling Up, Housing & Communities (2024) *Technical paper on Level 4 devolution framework*. [Sept 2024].

Government's focus on deepening and expanding devolution.[42] Devolution may also create an opportunity for decentralised authorities to be seen as 'labs for experimentation', with different approaches and policies tailored to local contexts.

Even in the process of devolving innovation policy, there are again trade-offs to consider, including complexity in coordination, gaps in regional capabilities and policy fragmentation.[43] Devolved innovation policy will be aligned to the Government's mission-led approach, which may create a tension between devolution and centralisation, and complicate delivery. But this should not put policymakers off. In England, different regions are at different stages of their journey, and devolution deals vary in their scope and effectiveness. In some areas the role of devolution is already providing the opportunity to mobilise unrecognised assets and create a joined-up approach across the policy mix. Greater Manchester and the West Midlands have a good four years' progress on some of the newer trailblazer areas like West Yorkshire and the North East in terms of innovation policy. Capability building will happen at different stages dependant on the maturity of the MCA. Creating cultures that embed the expertise and skills needed to make the most of devolved innovation policy will be vital to its long-term success.

42 UK Labour Party (2024) *Power and Partnerships: Labour's plan to power up Britain*, pp.10-11. [March 25].

43 Ehrlich, M. V., Overman, H. (2020), 'Place-Based Policies and Spatial Disparities across European Cities', *Journal of Economic Perspectives* 34(3) pp.128-149. [Sept 2024].

4. Policy choices

The evidence and thinking set out in this paper raise core policy choices that should be considered in order to better utilise R&D and innovation to improve economic outcomes in the long-term.

Bolster data and evidence-bases across innovation

- Effective innovation policy needs to be underpinned by a solid research and evidence base, that reflects the breadth of activity associated with innovation, for use by both civil servants and researchers.

Innovation policy at different levels of government requires high quality evidence. The gaps in existing data and evidence are extensive in many areas – for example, in relation to regional learning and development, future skills need, digital use and sector specific knowledge. This has been made increasingly evident by the gap in our understanding as to why the levels of R&D funding in the UK have not led to increased productivity.

The UK would benefit from deepening its evidence base on the relative strength of academic science, R&D and the demand for different kinds of research from industry (possibly building on successful policy instruments, such as the Areas of Research Interest, which have been so productive in central government). Building the evidence-base will require different kinds of evidence and analytical capacities at multiple levels of government. More could be done to make the data that we do have more accessible to researchers to further build the evidence base for policymaking.

Understand and build on existing strengths

- R&D and innovation policy needs to be pragmatic and based on a clear understanding of the UK's relative strengths and weaknesses. This may require policymakers to build a better understanding of existing regional skills capacity, industrial capability, and the strengths and weaknesses of different regions of the UK.

Many other nations have developed and implemented successful innovation policies based on a robust understanding of their innovation ecosystems and areas of strength. Appropriate support for realising the benefits of innovation is likely to require knowledge of existing skills, industrial capability, strengths and needs.

This may suggest a more devolved approach is needed in some areas (existing devolved powers in England are being strengthened in this area by the current Government). However, devolution also comes with trade-offs and costs, including increased fragmentation, reduced scale, and inconsistent approaches. R&D and innovation policy should be clear about the different roles of central, devolved and regional policy actors.

Look beyond the frontier

- Innovation policy should support the entire innovation process and ecosystem, not only the parts that generate improvements at the technological frontier.

A systematic approach to innovation policy would not only focus on supporting the improvements at the scientific frontier, but also on the processes of translation, commercialisation, adoption and diffusion. This would help enhance the social and economic impacts of innovation.

This includes support for less visible areas of the innovation systems, including the mechanisms, skills need, infrastructures and relationships required to adopt and diffuse technology developed elsewhere in the world. This may require expanding the scope of innovation policy to engage more with policies related to worker skills, management practices and up-grading firm-level capabilities.

Create longer term and more stable innovation policy that aligns with industrial strategies

- Embed more stability and reduce policy uncertainty to encourage private sector investment and ensure that design and utilisation of institutions align with overall policy need and goals.

The outcomes of innovation policy take time, especially if they are dependent on extensive incremental improvements to local settings. This requires a degree of stability that reduces policy uncertainty and encourages more private sector investment over a long timeframe. It may be that devolution in England will play an important role, but in order to do so it must also be adequately supported by central government. Retaining expertise on R&D and innovation within the civil service can help reduce policy churn and develop deeper engagement with stakeholders. Well designed and run institutions can help deliver different policy aims and create appropriate support structures for the UK's R&D and innovation system.

Align new policy to the existing policy mix

- The interconnection between innovation policy and other areas of public policy requires policymakers to take a coordinated approach to the wider policy mix in order to generate growth.

There are complex interactions between the range of actors involved at different stages of innovation. These relationships extend beyond the supply of research to include demand, education, regulation, infrastructure, labour markets and industry. Governments can create frameworks to help ensure the benefits of innovation are realised and shared.

It is important to get the right 'policy mix' to address trade-offs between policies and their potential impact on the innovation ecosystem. The findings outlined in this paper have strong overlaps with that of the Skills Working Group, particularly on policy-mixes, education, and skills development, including re-skilling and the 'missing middle' skills gaps.

5. Limitations

This paper has largely focused on the role of central government and needs to further develop the role of innovation policy within the devolved governments of Northern Ireland, Scotland and Wales. For instance, this paper has not extensively reviewed the recent innovation strategies from Scotland and Wales. Devolution is particularly important to approaching innovation policy through the lens of the 'policy mix', as different elements of the policy mix that interact with innovation are to varying degrees devolved and affect actors in different ways. Taking higher education as an example, education is a devolved area of policy, with implications for skills and innovation policy, but there is a varying degree of devolution at a national level for research. While research council funding and the Research Excellence Framework (REF) exercise is centralised through the UK Research & Innovation (UKRI) and Research England, recurrent research funding provided to Higher Education institutions as part of the UK's dual-funding system is devolved in allocation. These areas are less explored through this paper and members of the Working Group have advised they require further interrogation. Similarly, there is a large literature on the topic of R&D and innovation policy and the Group recognised that their discussions were not necessarily comprehensive of all aspects due to the focus of this programme and complementarity with the other Working Groups exploring international trade, skills and social value.

6. Annexes: (References and further reading section)

Agar, J., Clarke, S., Craig, C., Edgerton, D., Flanagan, K. (2019), *Lessons from the History of UK Science Policy*, The British Academy and Department for Business, Energy, & Industrial Strategy. [Sept 2024].

Bakhshi, H., Breckon, J., and Puttick, R. (2021), 'Understanding R&D in the arts, humanities and social sciences', *Journal of the British Academy* 9 [Jan 2025]

Bakhshi, H., Freeman, A., Potts, J. (2011), *State of Uncertainty: Innovation policy through experimentation*, Provocation 14, Nesta. [Jan 2025].

Bakhshi, H., Schneider, P., Walker, C. (2008), *Arts and Humanities Research and Innovation*, AHRC and NESTA. [Jan 2025].

Bloom, N., Jones, C. I., Van Reenen, J., Webb, M. (2020), 'Are ideas getting harder to find?', *American Economic Review* 110(4) pp. 1104-1144.

Bloom, N., Van Reenan, J., Williams, H. (2019) 'A Toolkit of Policies to Promote Innovation', *Journal of Economic Perspectives,* 33 (3), pp 163-84. [April 2024].

Brandily, P., Distefano, M., Shah K., Thwaites G., and Valero, A. (2023), 'Beyond Boosterism: Realigning the policy ecosystem to unleash private investment for sustainable growth', *The Economy 2030 Inquiry*, Resolution Foundation [April 2024].

Breslin, M., Velez Ospina, J. (2024), *UK Business R&D: A worrying decline*, National Centre for Universities and Business. [March 25].

Breznitz, D. (2021), *Innovation in Real Places: Strategies for prosperity in an unforgiving world,* Oxford University Press.

British Academy (2023) *Understanding SHAPE in R&D: bridging the evidence gap* [Sept 2024]

Cohen, W., Levinthal, D. (1990) 'Absorptive Capacity: A New Perspective on Learning and Innovation', *Administrative Science Quarterly*, 35(1) pp.128-152.

Costa, R., Liu, Z., McNally, S., Murphy, L., Pissarides C., Rohenkohl, B., Valero, A., and Ventura, G. (2023) 'Learning to Grow: How to situate a skills strategy in an economic strategy', *The Economy 2030 Inquiry*, Resolution Foundation [April 2024].

Coyle, D. (2021), 'The idea of productivity', *The Productivity Institute Working Paper* 3 [Jan 2025].

Coyle, D., Flanders, S., Glaeser, E., Mazzucato, M., Overman, H., Singh, D. (2018) *Background Paper: The emerging impact of devolution*, Greater Manchester Independent Prosperity Review. [Sept 2024].

Coyle, D., & Muhtar, A. (2021), 'The UK's Industrial Policy: Learning from the Past?', *Productivity Insights Paper* 2, The Productivity Institute. [Sept 2024].

Curran, B., Martin, R., Muller, S., Nguyen-Tien, V., Oliveira-Cunha, J., Serin, E., Shah, A., Valero, A., Verhoeven, D. (2022) 'Growing Clean: Identifying and investing in sustainable growth opportunities across the UK', *The Economy 2030 Inquiry*, Resolution Foundation [April 2024].

David P., Hall B., Toole, A. (2000), 'Is public R&D a complement or substitute for private R&D: A review of the econometric evidence', *Research Policy*, 29 (4-5), 497-529

De Lyon, J., Martin, R., Oliveira-Cunha, J., Shah A., Shah, K., Thwaites G and Valero, A. (2022), 'Enduring Strengths: Analysing the UK's current and potential economic strengths, and what they mean for its economic strategy, at the start of the divisive decade', *The Economy 2030 Inquiry*, Resolution Foundation [April 2024].

Department for Levelling Up, Housing & Communities (2024) *Technical paper on Level 4 devolution framework*. [Sept 2024].

Edgerton, D. (2023), 'Industry strategy or foundational economy approach?', *Progressive Review* (30) 3 pp.208-213. [April 2024].

---.(2006), *The Shock of the Old: Technology & Global History*, 2019 eds, Profile Books

---. (2017), 'The Political Economy of Science: Prospects and retrospects', *The Routledge Handbook of the Political Economy of Science*, eds Tyfield, D., Lave, R., Randalls, S., Thorpe, C. pp.21-31.

Edgerton, D. Pickstone, J. (2020) 'The United Kingdom', *The Cambridge History of Science*, eds Slotten, H., Numbers, R., Livingstone, D. pp.151-191.

Ehrlich, M. V., Overman, H. (2020), 'Place-Based Policies and Spatial Disparities across European Cities', *Journal of Economic Perspectives* 34(3) pp.128-149. [Sept 2024].

Flanagan, K., Uyarra, E., & Laranja, M. (2011). 'Reconceptualising the 'policy mix' for innovation', *Research policy* 40(5) pp.702-713. [Sept 2024]

GovGrant (2021), 'The University Spinout Report 2021: which UK universities top the rankings for turning innovation into commercial success', *Source Advisors* [April 2024]

Hesham, H., Lipartito, K., Watson, P. (2022) *The Global Innovator: How nations have held and lost the innovative edge*, Think Twice Books.

Hekkert, M. P., Suurs, R. A. A., Negro, S. O., Kuhlmann, S., Smits, R. E. H. M. (2007) 'Functions of innovation systems: A new approach for analysing technological change', *Technological Forecasting and Social Change* 7 pp.413-432.

Jansen, A., Breznitz, D. (2024) 'Effectively financing private sector innovation? Toward a conceptual policy framework', *Science and Public Policy* (00) pp.1-13.

Kenny, M., McCann, P., Ortega-Argilés, R., Westwood, A. (2024), 'Regional productivity inequalities, potential causes, and institutional challenges', *The Productivity Agenda*, eds Coyle, D., Pendrill, J. The Productivity Institute. [March 25].

Kesley, T. (2023), 'The Retreat from "High Technology" in Post-War Britain', *The English Historical Review* (183) pp.594-595. [April 2024].

Lee, N. (2024), *Innovation for the Masses: How to share the benefits of the high-tech economy*, University of California Press.

Lee, N., Ni, M., Boey, A. (2024) 'The Scale-up State: Singapore's Industrial Policy for the Digital Economy', *Southeast Asia Working Paper Series*, 11. LSE Southeast Asia Centre. [March 25].

Mealy P., Coyle, D. (2020), *Working Paper: To them that hath: economic complexity and local industrial strategy in the UK*, Bennett Institute for Public Policy [Sept 2024].

Michie, J. (2021), 'Developing flexible lifelong learning in line with changing needs and opportunities', *Times Higher Education* [Sept 2024].

Michie, J., Sheehan, M. (1999), 'No innovation without representation? An analysis of participation, representation, R&D and Innovation', *Economic Analysis* 2(2) pp.85-97. [Feb 2025].

Ministry of Housing, Communities & Local Development (2024), *English Devolution White Paper* [January 2025].

National Centre for Universities and Business (2024), *Unlocking Growth: The impact of public R&D spending on private sector investment in the UK* [March 25].

NESTA (2009) *Soft Innovation: Towards a more complete picture of innovation change* [Jan 2025].

Nightingale, P. (2010) 'Memorandum by Dr Paul Nightingale, Science Policy Research Unit (SPRU), University of Sussex', *Science and Technology Committee – Minutes of Evidence: Setting priorities for publicly funding research*, House of Lords. [Sept 2024].

OECD (2015) *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing. [Sept 2024].

---. (2018) *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing. [Sept 2024].

ONS (2015) 'Business enterprise research and development, UK: 2014'. [Oct 2024].

---. (2024) 'Business enterprise research and development, UK: 2022'. [Oct 2024].

---. (2024), 'Gross domestic expenditure on research and development, UK: 2022'. [Sept 2024].

[1]---. (2024) 'Research and development expenditure by the UK government: 2022'. [Oct 2024].

Pavitt, P. (1987), 'The Objectives of Technology Policy', *Science and Public Policy* 14(4), pp.182-8.

Resolution Foundation (2023) *Ending Stagnation: A New Economic Strategy for Britain* [Jan 2025].

Rosenberg, N. (1972), 'Factors Effecting the Diffusion of Technology', *Explorations in Economic History* 10(1), pp.3-33.

Salter, A., et al. (2000), *Talent, Not Technology: The Impact of Publicly Funded Research on Innovation in the UK*, SPRU [Accessed May 25].

Stirling, A. (2024), 'Responsibility and the hidden politics of directionality: opening up "innovation democracies" for sustainability transformations', *Journal of Responsible Innovation* 11(1) [Sept 2024].

Teece, D (1986), 'Profiting from technological innovation: implications for integration, collaboration, licensing and public policy', *Research Policy* 15(6), pp. 285-305.

Tether, B, Tajar, A (2008), 'Beyond industry-university links: Sourcing knowledge for innovation from consultants, private research organisations and the public science base', *Research Policy* 37 pp.1079-1095. [Jan 2025].

Tether, B., Tajar, A. (2008) 'The organisational-cooperation mode of innovation and its prominence amongst European service firms', *Research Policy* 37 pp.720-739. [Jan 2025].

UK Labour Party (2024) *Power and Partnerships: Labour's plan to power up Britain.* [March 25].

Uyarra, E., Zabala-Iturriagagoitia, J. M., Flanagan, K., & Magro, E. (2020), 'Public procurement, innovation and industrial policy: Rationales, roles, capabilities and implementation', *Research Policy* 49(1) 10384 [Sept 2024].

Uyarra, E., Flanagan, K. (2022), 'Going beyond the line of sight: institutional entrepreneurship and system agency in regional path creation', *Regional Studies* 56(4) pp.536-47.

Valero, A. (2024) 'Mais lecture – a serious approach for sustainable and inclusive growth', *LSE Economy and Society* [April 2024].

Valero, A., and van Ark, B. (2023) 'A new UK policy institution for growth and productivity – a blueprint', *Productivity Insights Paper* (027) The Productivity Institute [April 2024].

Van Reenen, J. (2023) 'Embedding green industrial policy in a growth strategy for the UK', *Progressive Review* (30)3 pp.175-183. [April 2024].

Wilkes, G (2025), 'The hunt for £45bn', *Freethinking Economist* [May 25]

Zenghelis, D., Serin, E., Stern, N., Valero, A., Van Reenen, J., and Ward, B. (2024), *Boosting growth and productivity in the United Kingdom through investments in the sustainable economy*, Grantham Research Institute [April 2024].

Zenghelis, D., and Valero, A. (2024) *Sustainable investment is good macroeconomics and fiscally prudent for the UK*, Grantham Research Institute [April 2024].

The British Academy
10–11 Carlton House Terrace
London SW1Y 5AH

Registered charity no. 233176

thebritishacademy.ac.uk
Twitter: @BritishAcademy_
Facebook: TheBritishAcademy

Published June 2025

ISBN: 978-0-85672-707-8

doi.org/10.5871/ecostrat/9780856727078