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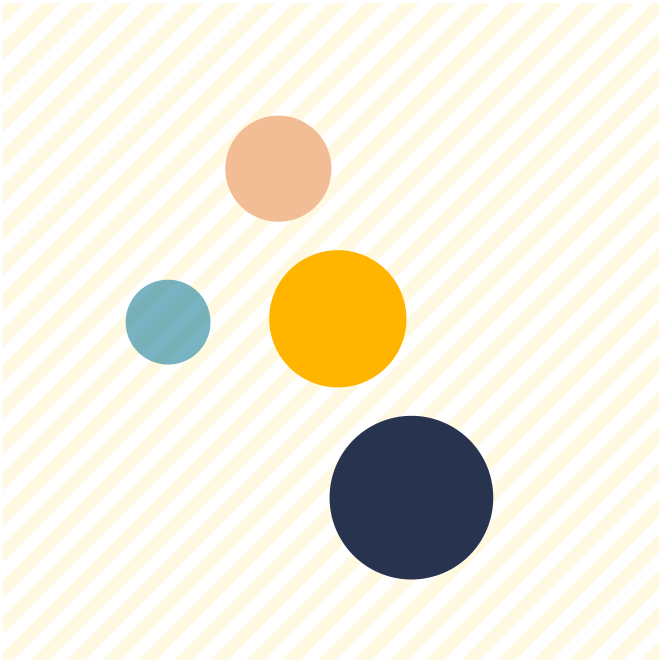
Campaign for Science and Engineering



THE POWER OF PLACE

MAXIMISING LOCAL ECONOMIC IMPACTS OF R&D INVESTMENT IN THE UK

A REPORT BY THE CAMPAIGN FOR SCIENCE AND ENGINEERING

Contents

About this report

In this report, we set out how to maximise the local economic impacts of R&D investment across the nations and regions of the UK. The report is based on views gathered from CaSE members and stakeholders through an extensive consultation exercise across the UK, conducted over the last 18 months. For a list of contributors see the end of the report.

We held evidence-gathering roundtables in Edinburgh, London, the West of England, the West Midlands, the North East, conducted phone interviews and remote discussions, and have drawn on earlier work and informal discussions across the other devolved nations and regions of England. This report is part of an on-going piece of work and we will be continuing with further roundtables and discussions in other regions over the coming months. This report contains a summary of themes across the regions and devolved nations drawing together the evidence of the local economic impact of regional R&D investment. We also make a series of policy recommendations.

Write-ups of all our round tables can be found at:
www.sciencecampaign.org.uk/our-work/campaigns/place.html

Introduction

Improving regional growth through research and development (R&D) investment alongside other investments such as in transport infrastructure is a growing political priority that has cross-party support. The Government aims to directly tackle regional economic differences through a focus on 'places' and 'levelling-up' regions. This is with the aim of supporting areas of excellence and building research capacity across all four parts of the UK to ensure communities can prosper. Investing in regional R&D can play a significant role in reaching the Government's target of increasing combined public and private R&D investment to 2.4% of GDP by 2027, and 3% in the long-term. The announcement in the Budget of an increase of public R&D investment to £22bn by 2024/25 means there is likely to be significant funding available for this agenda. This report brings together evidence that will help Government to spend this money well.

We have initiated a series of discussions across the regions and devolved nations to bring together senior representatives from academia, industry and local government to discuss the enablers and barriers of different places in increasing research intensity, the structure of partnerships between organisations and the opportunities that R&D investment could bring for local economies. Recognising different local strengths and existing local capacity for research will be vital in unlocking the potential of every region.

In our work we have covered the many different types of places in the UK, including urban metropolitan areas, smaller towns and cities and their rural hinterlands. The issues faced by those carrying out R&D in these different types of places can often be quite different.

Since we carried out the evidence gathering for this report the context in which the "levelling up" and R&D investment agenda will be taken forward has changed dramatically as a result of the Covid-19 pandemic. However, the fundamental challenge of encouraging regional economic growth will remain the same and is, in fact, likely to taken on even more importance as the UK emerges from the pandemic and looks to rebuild the economy. Furthermore, the barriers facing this agenda are unlikely to be changed by the pandemic, if anything public investment is likely to be even more crucial. Therefore, we think that while the decisions about investment will be taken in a different context, it is still important that the Government takes on board the evidence we have gathered and the recommendations we have made so that the regional investment in R&D that is made has the greatest possible economic impact.

REPORT'S FINDINGS

EXCELLENCE AND BRANDING

- Investment should be focussed on R&D excellence that already exists, whatever its size
- Brand is important: Regions should clarify their distinctive strengths and develop their pitch for national and overseas investment

LOCAL LEADERSHIP

- Strong leadership is needed from local government, civic groups and the research sector
- The best examples of regional R&D growth have been driven by strong civic leaders
- Central and local government need to work together

SUPPORTING SMALL BUSINESS

- SMEs need a helping hand from local and national government to secure academic collaborations
- A replacement for EU structural funds, that build research capacity and support small and local businesses, needs to be found

REGIONAL STRENGTHS

Scotland

The Innovation Centres program has brought together Government, business and universities to successfully take research through to applications

Northern Ireland

City deals in Belfast and Derry have enabled investment in more strategic R&D projects

North West

The National Graphene Institute at the University of Manchester enables collaborative research between academia and industry with over 80 companies involved

West Midlands

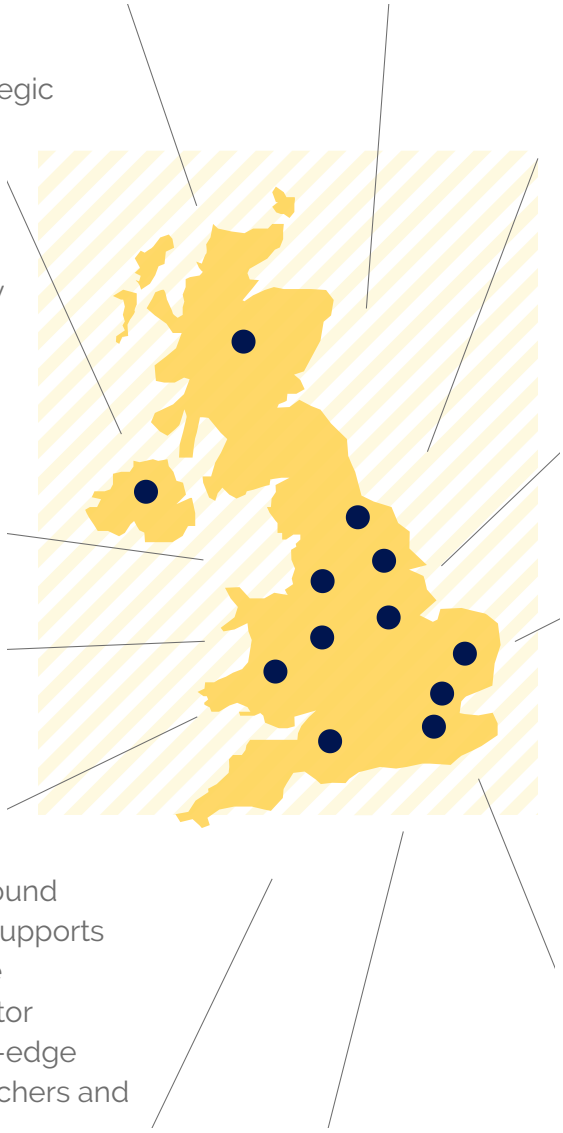
A large manufacturing base in automotive contributes to high private sector investment in R&D

Wales

The South Wales Compound Semiconductor Cluster supports innovative SMEs with the Compound Semiconductor Centre providing cutting-edge facilities that help researchers and industry work together

South West

Aerospace and advanced engineering, including in renewable energy, are major strengths with large multi-national companies based here



North East

NETPark is a strong example of local leadership bringing great benefits

Yorkshire & Humber

The University of Sheffield Advanced Manufacturing Research Centre has a global reputation for helping companies overcome manufacturing problems and has become a model for collaborative research involving universities, academics and industry, worldwide

East Midlands

The new Space Park in Leicester will build on its success as a centre of excellence for space research

East of England

The University of Cambridge and research institutes, such as Babraham, act as a focal point to attract world leading companies to the area to collaborate on research, particularly in the life sciences

London

A diverse skill base has led to a real diversity of strengths across academia and industry

South East

The Harwell science and innovation campus brings together critically important research infrastructures including the Diamond Light Source and ISIS neutron source, along with innovative companies and organisations employing thousands of people

CONCLUSIONS AND RECOMMENDATIONS

BUILDING ON EXCELLENCE AND DEVELOPING A BRAND

- Investment should be focussed on R&D excellence that already exists – even if it is small and nascent. Investment is likely to give a greater return when it builds on existing excellence and it is difficult to re-create the conditions that give rise to excellence just by spending money – it is a process that has often happened organically over many years.
- Improve the branding of a place to highlight its strengths. Places should clarify their distinctive strengths and sectors in order to present a pitch for national and overseas investment. This should be coupled with greater local and national championing to attract UK and global investment.
- Local and regional branding should, where possible, be mapped on to areas where there is already a sense of local or regional identity and the appropriate local bodies exist in order to take advantage of that brand and any investment that comes with it.

THE IMPORTANCE OF LOCAL LEADERSHIP

- There needs to be greater involvement of leaders from local authorities, combined authorities and LEPs in regional R&D conversations. Those examples we have found where regions have been successful have often been driven by strong leadership by a small number of committed individuals. However, this works both ways and it is incumbent on leaders in the research community, both in businesses and universities to build a strong narrative to show local civic leaders what R&D can do for the local growth agenda.
- Combined authorities and other local leaders should assess what levers they currently have to design and implement tailored regional interventions and should consider making the case to Government for more levers if needed.
- Central and local government should work together to improve national coordination between local and national R&D priorities. This will help maintain the breadth of the UK research base by ensuring that regions do not all focus on the same areas or disciplines.
- Improving infrastructure and housing will help equip places for increased research intensity. Making places more attractive to live will also help to retain skilled people. It is important that decisions made about regional R&D are linked up with other regional development decisions across local and national Government. UKRI has a role to play in encouraging all parts of Government to think about these issues holistically.

SUPPORTING SMALL BUSINESS

- There needs to be greater support from local and national government to enable SMEs to form collaborations with universities and others and secure R&D investment. This support could come from local or national government and universities.

- EU structural funds currently support a large number of SME collaborations and help build research capacity across the country. Careful consideration needs to be given to how domestic schemes such as the Shared Prosperity Fund replace this support.

R&D EXPENDITURE BY REGION

The UK invests 1.69% of GDP on R&D (1). Undertaking more detailed analysis, however, reveals significant differences between the research intensities of UK regions (as defined by the Office of National Statistics, NUTS). In absolute terms R&D expenditure is greatest in the South East, East of England and London and lowest in Wales, the North East and Northern Ireland.

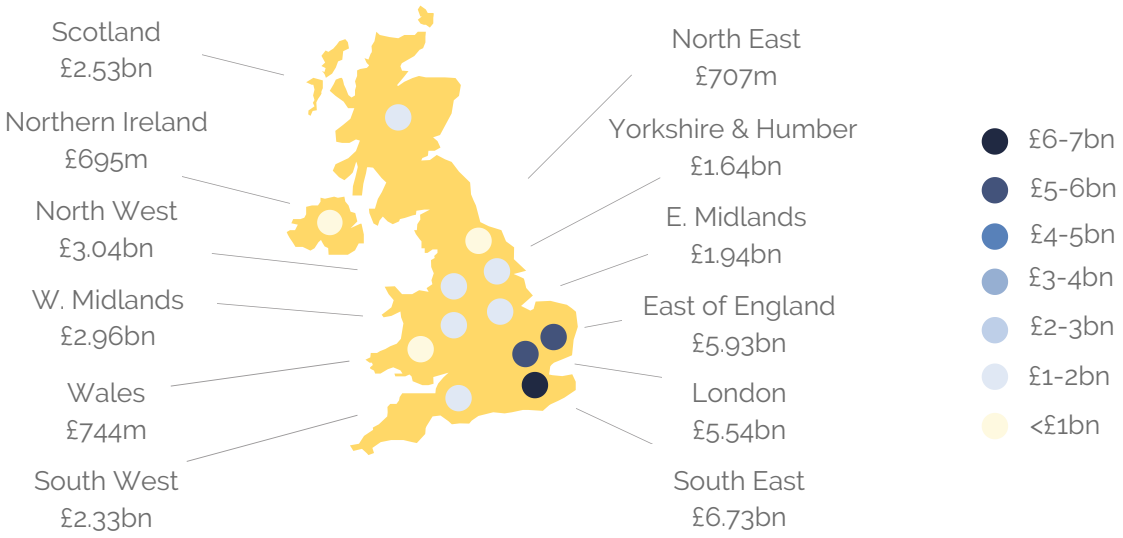


Figure 1: R&D expenditure, NUTS region, 2017 (2)

As a proportion of regional GDP, the East of England invests almost double the UK average in R&D at 3.3%, while Wales invests a little over 1% of its GDP on R&D. Normalising this data by regional GDP is a valuable way of analysing regional R&D expenditure because it takes into account the relative sizes of each region's economy. Comparison by R&D expenditure alone reveals even wider differentials. London, for example, invested over £5.5bn on R&D in 2017/18, but has a comparable research intensity to Yorkshire and the Humber that invested £1.6bn in 2017/18 because of its large GDP (3).

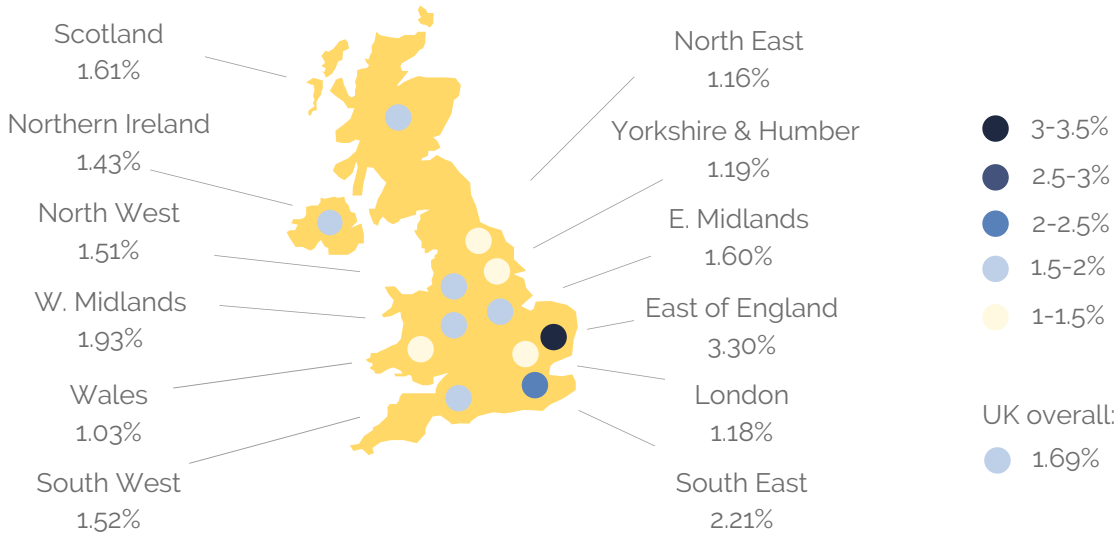


Figure 2: Regional R&D expenditure as a % of GDP, NUTS region, 2017 (4)

Another way to normalise this data is to measure research investment per capita across each region. While this yields similar results to regional investment as a proportion of GDP overall, it yields a significantly different ranking for London, which has the third highest R&D investment per capita of UK regions as opposed to the third lowest as a proportion of GDP.

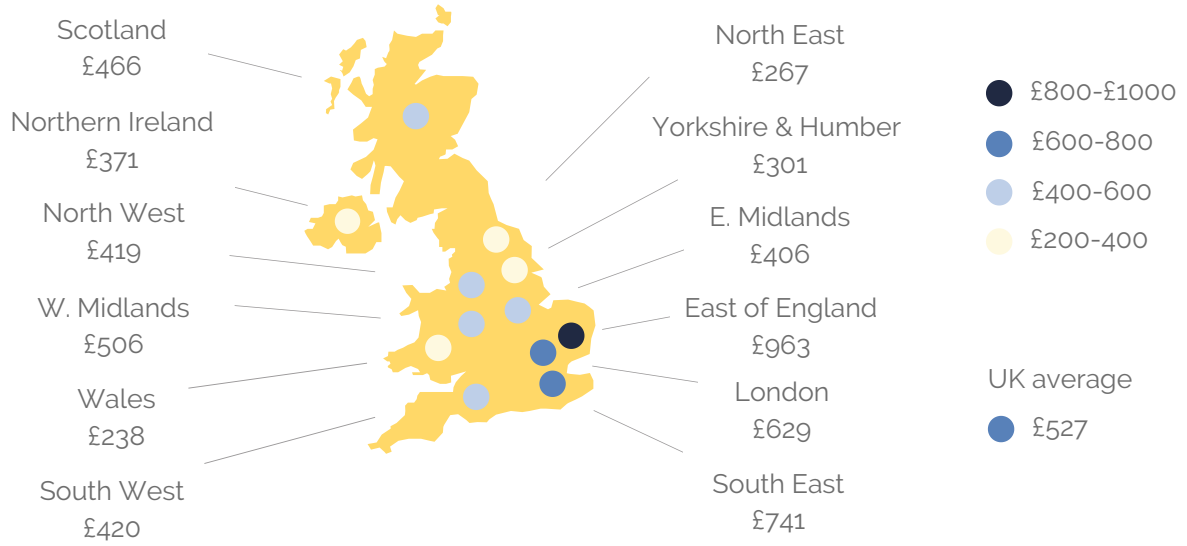


Figure 3 : R&D expenditure per capita, NUTS region, 2017 (5)

There are significant differences between the sources of R&D investment on which regions are reliant. Nationally, business research investment accounted for 68% of the total in 2017 (6). However, figure 4 below shows that while the overall UK-wide ratio between public and private investment is around 2:1 for some regions, such as London and Scotland, public investment makes up a much higher percentage of the total than in other regions (7). And for other regions, such as the West Midlands, business investment has consistently risen at a much faster rate than public sector investment, with 83% of research investment coming from businesses in 2017.

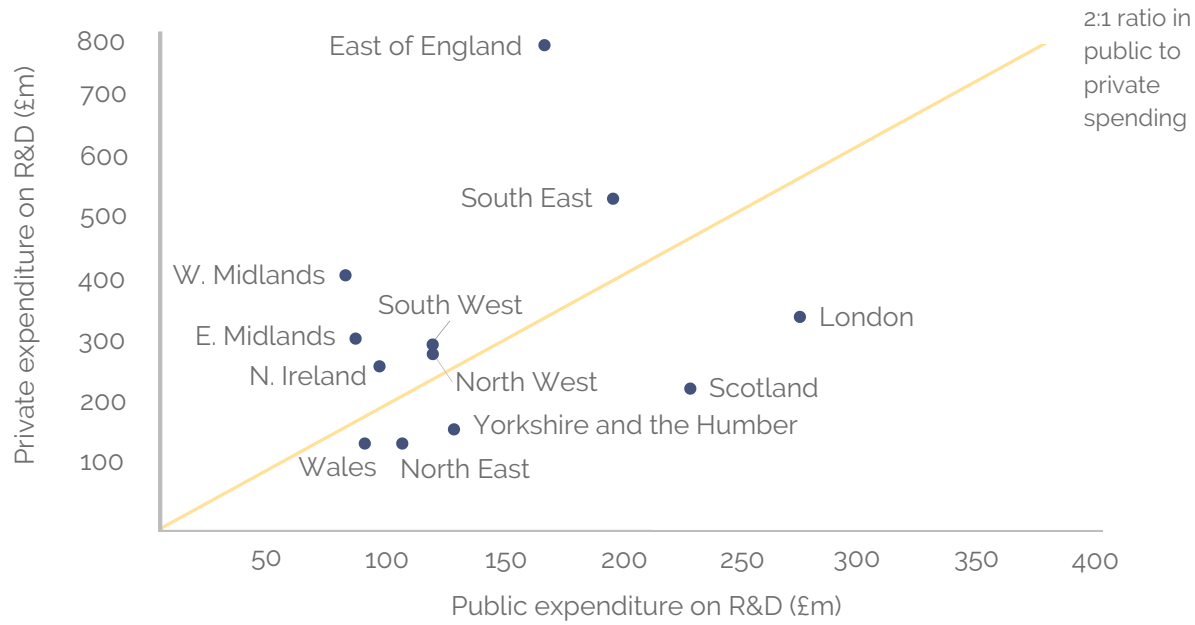


Figure 4 : R&D expenditure per capita by NUTS region, 2017 (8)

It is not possible from the data alone to draw direct conclusions – i.e. how much of the difference in the West Midlands, for example, is due to greater leverage of private investment versus underfunding of public investment. Also, the nature of private industry is different in different regions. London is dominated by the services and finance sectors, which traditionally invest less in R&D by current definitions (9), whereas there is greater automotive manufacturing in the West Midlands which invests more heavily in R&D.

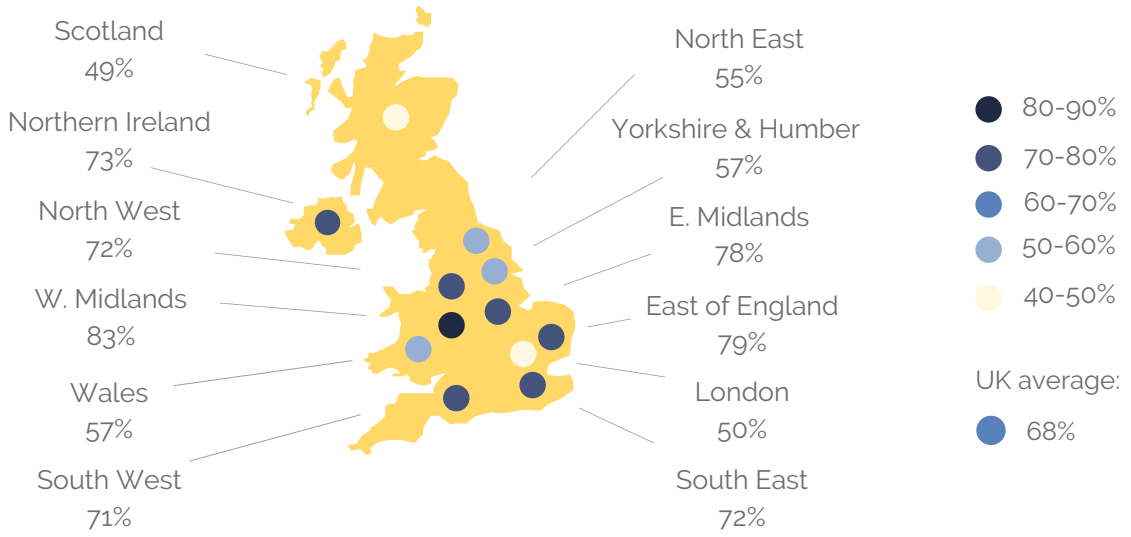


Figure 5: Proportion of R&D investment made by private enterprise, NUTS regions, 2017 (10)

All of this shows that it is important to be aware that the national picture of investment disguises quite significant regional differences. Those regions where both research intensity and absolute research spend are lower than the national average are likely to need investment to build research capacity to make the most of additional investment in R&D.

EU regional funding

Following the UK's departure from the European Union, the UK is no longer eligible to receive new EU structural funds beyond 2020. A significant proportion of these funds have historically been allocated for research and innovation, helping to support a wide array of projects building research capacity across the UK. Some regions are more reliant than others on this type of funding. It will be important for continued funding for building research capacity to be considered in any domestic replacements for structural funds – including the Shared Prosperity Fund (11).

EU structural funds significantly contribute to developing research capacity and infrastructure in Wales. The Learned Society of Wales has shown that the per capita contribution of ERDF to research and innovation in Wales is €125 per capita: five times the UK average of €23 per capita (12). Therefore, loss of EU structural funds could greatly impact Welsh research and innovation. There is an opportunity for the Welsh Government to build on the recommendations of the Reid review to ensure the R&D environment continues to thrive in Wales by winning additional funding from UKRI and other sources outside Wales (13).

BUILDING ON EXCELLENCE AND DEVELOPING A BRAND

It is important to identify and build on existing R&D excellence as it is difficult to build excellence from scratch – it has often emerged organically over extended periods of time. However, small and nascent areas of excellence can be grown with the right kind of interventions and investments, for example by providing incubator space in science parks for innovative businesses and spin-outs from universities.

We have also seen that strong branding and a clear definition of a region's strengths provides clarity on what differentiates a place from others nationally and internationally. One of the barriers to attracting R&D investment in specific places is often a lack of regional branding. Regions will need to decide what the focus of their brand is i.e. whether it associates with a specific discipline. There is a need for regions to clarify their distinctive strengths and sectors and determine how these strengths weigh up against those in other parts of the UK.

To establish and maintain brands, places will need sustained political advocacy and championing to provide them with recognition. For example, the 'Midlands Engine' and the 'Northern Powerhouse' are widely known due to political advocacy (14).

Scotland is a great place to do R&D. However, our discussions found that Scotland must focus greater efforts in showcasing its R&D capabilities to attract and retain further overseas investment. Our discussions also revealed that there was no comprehensive mapping of the Scottish innovation landscape. This creates difficulties for actors to understand how their work aligns with the wider picture as well as hindering collaborations with other organisations.

Case Study: Midlands Engine

The 'Midlands Engine' is a good example of strong branding for a region and has been a useful signaller for foreign direct investment and this has made a difference to international markets. However, it has not been without issues – some in the East Midlands felt that the West Midlands had benefitted most from the Midlands engine. The link between the East and West Midlands is probably not strong enough to ensure shared ownership and benefit of the brand.

In addition, the new West Midlands Combined Authority with a regional Mayor provides a focal point that can drive this agenda forward, whereas there is no overarching body to take on this role in the East Midlands. Therefore, this highlights the need for branding to be based on places that already have a connection and a regional identity.

Case Study: London

The diversity of strengths across academia and industry make London an attractive place to invest. However, the city's distinctive R&D brand could be more clearly defined to enable government departments to make informed decisions on where to provide support, and to present a stronger pitch globally to attract overseas investment. London is often not considered when discussing the 'place' agenda, however, on a granular level it does have quite significant inequalities and areas of social deprivation – the benefits of R&D excellence are not spread evenly across the city.

The strengths of various regions in England and Wales have been identified through science and innovation audits (15). However, science and innovation audits were conducted differently in each region and are therefore not directly comparable. Local Industrial Strategies (16), which have been published for some regions, may present a better and more coordinated picture that is easy to act upon for local and national government.

University-business collaborations

University-business collaborations are on the rise and producing successful outputs. These partnerships play a powerful role in describing a local innovation ecosystem and promoting a region. However, large businesses often go to where they can secure the best academic expertise, so these university-business collaborations are not always locally or regionally based. Universities rightly see themselves as national and international institutions so there can often be tension between this and their local or regional impact. The two are not mutually exclusive but it can be difficult to quantify and separate out the impacts. The University of Nottingham and Nottingham Trent University have worked together to produce a report quantifying their combined impact on the city of Nottingham, which could create a template for other institutions to follow (17).

Case Study: Scotland

In the last decade, Scottish HE has been more flexible and open to business collaborations to ensure that graduates have skills that are valuable to SMEs. Industry has realised that working with HE can help to scale up their businesses. A strength of Scotland is that it also has a strong sense of social purpose in pulling together business aims to meet societal aims. Schemes such as Interface (18) and the Innovation Centres programme (19) demonstrate how Government, public bodies and universities have come together to support business to develop research to application.

Case Study: Northern Ireland

The large majority of R&D projects are directed and enabled by the two universities based in Northern Ireland. Strategic projects have been centred around the city deals of Belfast and Derry (20). These projects have been determined by identifying areas of demonstrable excellence that exist, whether they have the potential to be sustainable in the long-term and where engagements from industry already exist. While the city deals have supported the identification of areas of strength, often Northern Ireland is operating at a smaller scale thus can find it difficult to compete with other areas of the UK.

Northern Ireland receives comparatively lower levels of QR and HEIF funding than other nations of the UK (21). This creates a problem in finding matched funding for significant grants from UKRI or beyond. A smaller volume of private industry also makes it difficult to meet matched funding requirements, meaning NI finds it difficult to compete for large scale investments.

Modern, and professional and technical universities often have different relationships with their places than, for example, Russell Group universities. These universities are often more civic focussed or less-research intensive and often have a deep connection to their place – drawing a greater proportion of their students from the local area, for example. There is, therefore, an opportunity for different types of universities to play different roles in the "levelling-up" agenda.

London presents strong examples of successful university-business collaborations, because it offers a rich choice of partners within close physical proximity. The West Midlands also presents some good examples of collaborative work between the combined authority, LEPs, businesses and universities, for example in battery technology. Large multinational industrial organisations invest significantly in R&D in the region which leverages good relationships with universities. Universities in the West of England also have good working relationships with business and the strong skills and capabilities across the region enable cross-sectoral collaborations. Despite this, in our discussions it was highlighted that to get the best of the region's strengths, there needs to be greater collaboration.

THE IMPORTANCE OF LOCAL LEADERSHIP

Local leadership in England

The places we have explored all demonstrate strong foundations for innovation. However, there's often a lack of coordination to bring activities together. There will continue to be a national political drive to reduce regional inequalities. To complement this, civic leaders must also provide strong advocacy to promote their region's strengths and to align with central government priorities.

Local leadership is important in driving forward each region's strategy and enabling the effects of R&D investment to directly benefit the local community. To attract more Central Government funding, local leaders would do well to think more strategically and review their strengths through the lens of Government funders. Local leaders should clearly identify their region's cross-sectoral strengths and map these onto Government priorities, such as net zero.

However, in all English regions, questions were raised on how much autonomy local leaders have to set the direction for local research and innovation. As such, there is a need to understand and refine where responsibilities and levers lie between central and local government to draw inward R&D investment and design regional innovation environments.

Case Study: NETPark and Business Durham

Business Durham (22) is the economic development arm of Durham County Council and it manages the North East Technology Park (NETPark). First opened in 2004 NETPark is a leading science, engineering and technology park for the commercialisation of cutting edge R&D from major international organisations, universities and entrepreneurs. It hosts thirty-two innovative companies providing over 450 highly skilled jobs in Sedgefield, County Durham (23).

At our round-table in the North-east it was agreed that Business Durham were a great example of local Government being innovative in its approach to support and foster local R&D (including through NETPark). In particular Business Durham were effective in increasing connectivity between a variety of agencies across the Durham County area. Business Durham have adopted initiatives to provide businesses with the tools required in order to succeed, including supporting the retention of skilled workers by helping match businesses with talented individuals and creating a Venture Capital Fund for innovative businesses.

For example, it was felt that the West Midlands lacked the finances or regulatory tools devolved from Westminster to accelerate innovation and help to secure inward investment. It was also said that the lack of autonomy in areas such as infrastructure projects means that there were fewer opportunities to enhance collaborations across the region, thus limiting the development of local innovation.

There are some good examples of how local authorities and Local Enterprise Partnerships (LEPs) can make a difference to this agenda, for example NETPark and Business Durham in the North East. However, this is not particularly widespread and is strongly dependent on whether there is strong local leadership on this agenda. There is a role for local R&D actors, including universities and business, to explain what they can do for the economic development of their place and region as well as a need for leadership from local civic bodies. As well as identifying strengths strategically in order to attract national Government funding, by showing strong local leadership and bringing forward their own R&D proposals, regions can make the case for being given greater funding from central Government.

A flourishing innovation landscape also requires Government coordination of R&D activities and for messages to be delivered across departments, to ensure the smooth integration of immigration, skills, research and environmental interests to support innovation.

Devolved leadership in Northern Ireland

Northern Ireland has had the unique challenge of having no legislature for an extended period of time, leaving it unable to enact new policy. The devolved administration has a strong policy core across the Department for the Economy (DfE) and Department of Education and the new Economy Minister has begun assembling cross-governmental groups on science and research. A challenge that remains, however, is the availability of funding for investments in new, innovative policies when there are deficits in funding for other areas of the economy such as healthcare and pre-16 education.

Leadership on infrastructure

More infrastructure will be essential to prepare places for growing research activity. This was particularly apparent in the West of England and London. For example, London offers space for 'dry' companies, whereas small businesses and 'wet' companies i.e. businesses that require laboratories face difficulties in basing themselves in the city.

It was suggested in our roundtables that making places more attractive to live will help to retain skilled people and this includes the need for better infrastructure. R&D investment cannot be considered in isolation and must be considered in a wider context of investment across Government in other aspects of its "levelling up" agenda including housing and transport infrastructure. For example, housing was considered an issue in the West of England and Oxford. UKRI has a role to play in encouraging all parts of Government to think about R&D and its benefits to local growth.

SUPPORTING SMALL BUSINESS

It is often said that innovation is local: university-SME relationships are often more locally focussed than those between universities and large businesses. However, there are barriers to these collaborations and to realise the potential of start-ups and SMEs more broadly, greater support is required, and this was reiterated throughout the regions. This can often be achieved through the co-location of universities with small businesses in science parks, for example, or the provision of incubator space for new businesses. Other support discussed at our round-tables included voucher schemes that allow SMEs to access academic expertise or research infrastructure with relatively little bureaucracy or form-filling, which often acts as a barrier to SMEs accessing support. Networks are also crucial in being able to support SME growth and some felt that they are as important, if not more important, than access to funding. Such networks can often be formed on science parks where many innovative businesses are in the same place. Market access testing is also an important ingredient in the success of a small innovative business.

In Scotland we were told that a pipeline of support that ensures the continuity of funding is required to enable businesses to thrive and remain beneficial to society. The proportion of matched funding required as part of research grants creates barriers for small businesses, whereas raising matched funding was deemed to be less of an issue for large organisations. Therefore, matched funding could be tiered to better support SMEs in Scotland.

Case Study: The Northern Accelerator

The Northern Accelerator, a partnership between four universities in the North East, helps to support and accelerate the translation of world-class research into commercial opportunities. The Accelerator also has a small seed investment fund to support ideas, and has a process for technology transfer. The Accelerator has been able to treble the number of successful spin outs in the last 3 years.

To capture the benefits of R&D, the innovation system must be made simpler for SMEs. Smaller organisations with limited resources face difficulties in navigating the research landscape which hinders them from collaborating further and easily accessing finance from larger organisations. To invest more efficiently and strategically, the processes for small companies accessing finance from large businesses should be made simpler. At our roundtables it was suggested that government could provide further support to help SMEs interface and secure partnerships with big businesses and universities. Suggestions were made on simplifying and explaining the process to forming collaborations for start-ups to allow them to better understand and navigate the system.

The West of England presents many examples of growing university spin-out successes, such as the University of Bristol's spin-out company Ziylo which was bought by global healthcare company Novo Nordisk. However, one of the challenges identified was specifying how industry and universities can leverage co-funding and attract finance to create start-ups and develop the means by which knowledge exchange takes place. While regions of the UK need to compete with the 'Golden Triangle' for business investment and talented individuals, they also have to compete against all parts of the OECD. In the North East it was thought that a comparative strength of centres such as Oxford and Cambridge is the concentration of expertise and physical proximity to other experts in areas of science, engineering and technology.

Case Study: Wales

Wales has a higher proportion of small and micro businesses, by employment, than the UK (24). This creates challenges on how to coordinate these businesses and encourage them to undertake research. The funding trend is moving towards challenge-led bids by clusters of companies working together. In some sectors, like digital health and semi-conductors, Welsh companies punch above their weight. For example, the Compound Semi-conductor applications catapult has an innovation centre in Newport, South Wales, that has acted as a focal point for a successful compound semi-conductor cluster.

Scotland has a strong Angel investor network and we heard that work is underway in building other types of venture capital investments to support innovation. In our discussions we were told Scotland is happy to innovate on innovation, both creating new schemes but importantly being unafraid to shut down schemes if they have not worked as desired. The ability to 'fail fast' means that lessons can be learned without wasting money..

Skills

An important factor in attracting and supporting local innovative businesses is the availability of highly-skilled people. Businesses are more likely to decide where to operate because of the availability of skilled workers, as opposed to R&D activities going on in the local area. Many of the places we explored demonstrated having a strong talent pool. London, the West of England and the West Midlands have a strong ability to attract and retain talent due to the concentration of research-intensive industries. However, some regions have difficulty in attracting and retaining skilled people. In those regions, it was considered easier to attract students and then convince them to stay in the local region once they graduate, rather than attracting graduates. This can be complicated, though, if the types of skills that graduates leave university with do not match the needs of local businesses. We heard that this was an issue in the North East, for example.

The mix of skills in London is a particular attractor, making it a place where you can 'do things in new ways'. The London skills base is a huge advantage for organisations in London and surrounding regions for attracting FDI. However, sharing of skills across different actors can be a weakness in London; in particular, in our discussions it was said that STEM scientists must understand and draw on social science expertise more strongly. Conversely, in the West Midlands it was felt that links between scientists and social scientists were strengthening, in part due to the restructuring of UKRI and the nature of the Strength in Places Fund which has forged new and different types of partnerships.

Developing skills is vital to keep up with the increasing pressures to develop products to market quicker. However, small companies may be disadvantaged as they may not have the capacity to acquire new skills rapidly. In the West Midlands, it was suggested that how businesses follow patterns of skilled people, and skills development, should be assessed to look at the R&D environment more holistically.

CONTRIBUTORS

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About CaSE

The Campaign for Science and Engineering (CaSE) is the UK's leading independent advocate for science and engineering. Our mission is to ensure that the UK has the skills, funding and policies to enable science and engineering to thrive. We represent over 115 scientific organisations including businesses, universities, professional bodies, and research charities as well as individual scientists and engineers. Collectively our members employ over 336,000 people in the UK, and our industry and charity members invest around £32bn a year globally in R&D.

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