

Catching the wave: harnessing regional research and development to level up

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Sanderson

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We dedicate this report to our dearly missed friend and colleague Andrew Stevenson. As the University of Lincoln's Director of Research and Enterprise, he embodied much of the approach that we set out on these pages. Andrew played a vital role towards catching the waves as they emerged in our region.

About GatenbySanderson

GatenbySanderson is the UK's leading executive recruitment and leadership development consultancy, advising public services, not for profit and education. They work within some of the most complex, challenging and highly scrutinised environments to deliver effective leadership and accelerate change. Their connection with national policymakers gives them exceptional insight into higher education as a rapidly evolving and high-profile sector, and they are able to respond to the challenges facing academic and corporate leaders within universities in a versatile way. Their specialist teams recruit and develop strategic corporate, academic and board leaders across both higher and further education at the most senior levels.

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Foreword

Julia Roberts, Practice Lead, Education, GatenbySanderson

Levelling up is vital to the Government's agenda and the future economic sustainability of the UK in this post-Brexit, post-pandemic recovery period. But how will the Government achieve this goal and what does it actually mean? In this report, Professor Mary Stuart and Liz Shutt perfectly illustrate how collaborative partnerships between universities, funders, industry and local and central government can better address the inequalities of regional economies together. This requires not just the vision and entrepreneurship of individuals but a whole-system approach and a genuine appreciation of local 'place', its assets and communities.

Now is the time for Government and universities to look up and out to identify and prioritise the skills and knowledge required for future economic development. This requires a new kind of leadership at executive and non-executive level to identify the possibilities, to look beyond immediate risk and engage civic, academic and social resources to unite and collaborate. Within these partnerships, each contributor must recognise that individual gain cannot be at the expense of regional benefit.

Mary and Liz offer a compelling insight into how the UK can use existing resources to drive development in left-behind areas. Many universities already play an integral part in the civic and economic health of a region; formalising this contribution to drive up productivity through applied research seems a natural progression. While the people and infrastructure are *in situ*, the allocation of resources needs a different approach from funding agencies.

Our higher education system is one of the best in the world and our funding strategies must empower our civic universities, which have integral links to their community and other partners. What will help to make that systemic shift in regional development? Three successful place-based case studies in this report demonstrate how each university played an anchor role in delivering long-term economic development, through their collaboration with industry and civic partners.

While this level of collaboration may exist as a good intention across sectors in the UK, it is not yet a reality. So, what is the responsibility of universities? To bring together clusters of excellence, leaders must have the courage and tenacity to see a vision through. Embracing collaboration and working across traditional boundaries might require a cultural shift. With their civic partners they must 'catch the wave' and work hard to harness opportunities that create most benefit for all and deliver workable, financially viable solutions. As we know from our work with leaders across all sectors, the agreement towards collaborative working is easy to reach; its successful delivery is a much tougher challenge requiring skillsets that may not yet exist within organisations. 'Commercial head and social heart' is one such behavioural trait we look for in high supply. Likewise, the need to shift mindsets beyond a leader's own organisational boundaries and invest emotionally and financially without direct control of resources or decision making is essential. This pioneering style of leadership challenges the status quo and is often uncomfortable; however, when combined with the ability to create an inclusive vision and pathway to engage and mobilise, it is

necessary for success. It is our role to help universities assess their leadership against these future ready traits.

It is an honour to support *Chasing the wave* and its remit, which sits at the heart of GatenbySanderson's purpose to help find and develop leaders that can shape a better society. We hope that readers will see the outcomes that can be achieved through collaboration and courage and have the curiosity to think differently.

Introduction

This report seeks to make a contribution to the debate on the role that research and development (R&D) funding could play in supporting the levelling up agenda in the UK. While our argument draws upon many of the insights already developed, here we seek to flip the debate and look at the issues through a different lens. Our starting point is to focus on productivity, how the residual value between inputs, including the input from research and knowledge exchange, affects the outputs in a sector or economy.¹ Improving productivity lies at the heart of the challenges faced by so-called 'left behind places'. There is considerable debate about solving the productivity problem that the UK faces and, we hope, in this report, to offer a contribution to addressing that problem. Hence, unlike other reports, which focus on the importance of research funding and how to allocate it between institutions, we are focusing on issues of place and the needs of our regional economies. In this report we explore how we should improve the impact of research and knowledge exchange to elevate our left-behind places. We set out the drivers behind regional inequality and the characteristics of left-behind places that must be transformed from challenges into opportunities in order to level up. We then examine the role that universities can play in supporting and securing levelling up through research and development activities.

The announced uplift in research funding to 2.4 per cent of GDP by 2027 is exciting and welcome but if it is not developed with a place-based ecosystem in mind it will not have the desired impact on inequality or productivity. As the recently published *Innovation Strategy* has recognised, despite considerable

success in research, the UK continues to lag behind many OECD countries in productivity.² Some of this lag is related to the extent of imbalance between regions. Therefore, our focus is not on research per se, but how research creates innovation that enables enhanced productivity; which in turn should support levelling up left behind places.

We argue there are several gaps in this chain within our current system:

- i. We need to work with (not for) regions to develop a shared, long-term agenda.
- ii. We can draw on regional assets to set direction.
- iii. If we want to impact regional productivity we have to deliver effective knowledge translation.
- iv. If regional transformation is the goal, then the success metrics need to reflect that transformation.

Levelling up complexities

As we await the Levelling Up White Paper, there is much speculation about definitions, targeting and potential interventions. This is all important if we are to tackle what is a long-standing and deep-seated issue for the UK economy and society. Levelling up may be the current label for this agenda but these issues have been developing and manifesting over decades.

It is true that other countries and regions around the world experience issues related to geographical inequality. However, it is also true that the UK is one of the most regionally unbalanced economies of the industrialised world, that within its regions there is also stark divergence; and that the imbalance

has grown over the last 50 years.³ The 2007/08 financial crash exacerbated many of these issues and COVID-19 has exposed some left-behind places to further economic fallout.⁴ In this light, the challenge to 'answer the plea of the forgotten people and the left-behind towns' presents an overdue opportunity to focus economic policy interventions differently with the hope of driving different outcomes and renewed opportunity for places left behind.⁵

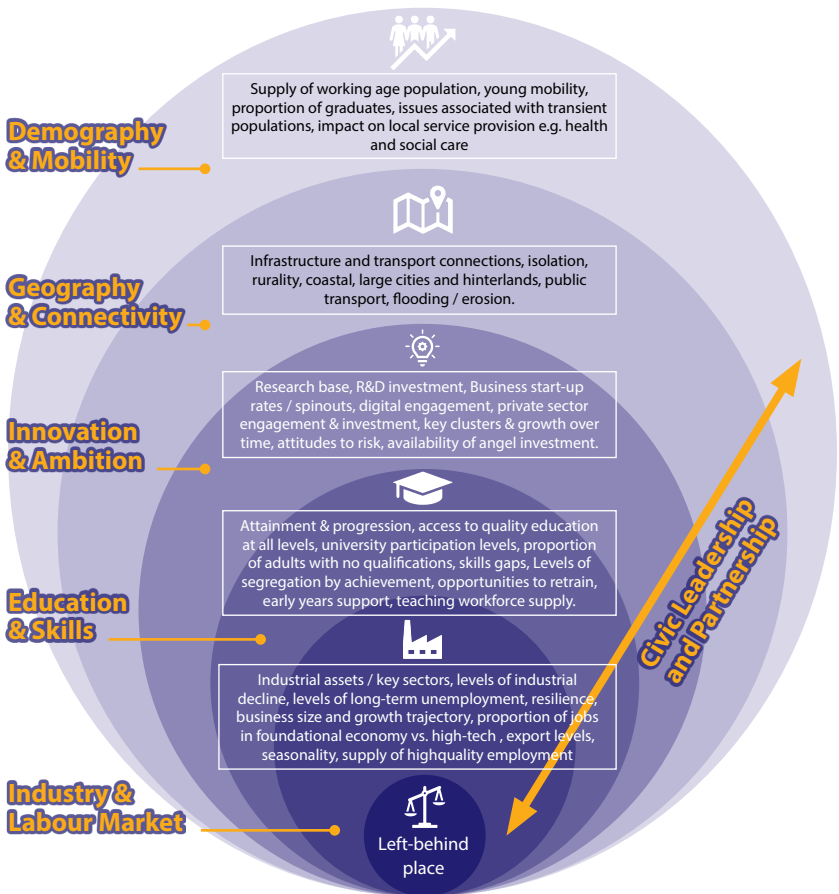
The Institute for Fiscal Studies (IFS) defines a left-behind area, in need of levelling up, as a place: 'characterised by broad economic underperformance, which manifests itself in low pay and employment, leading to lower living standards in that area'.⁶ The breadth of economic, and indeed social drivers underlying geographical inequality is a critical point. Using language that research and innovation colleagues will be familiar with, levelling up is a 'wicked problem' requiring us to work across boundaries. As Julian Pratt et al have observed:

In a single organisation, strategy serves to guide and give coherence to decisions and actions. In a whole system made up of many organisations there is just as much need for strategy [if not more] but its form has to be different. The mechanism for accountability is different in a complex system – there is no one owner or boss who is responsible for its functioning and to whom people are accountable. Decisions are made in a variety of situations and need to be sensitive to individual circumstance. The strategic question becomes; what guides our actions if we hold ourselves accountable for the behaviour of the whole system?'

The diagram below describes the multiple drivers for regional inequality. If we are to turn these around, we will need sustained civic partnerships and a new way of interacting with national level policy. The way in which these drivers layer up can help us to understand the way that social and economic inequality manifests differently in different places. As Conservative MP Danny Kruger points out, communities have been left behind in the industrial heartlands of the North and Midlands but also in coastal and rural areas across the country.⁸

On the surface level, indicators such as regional gross domestic product (GDP) per capita, wage growth or levels of public investment can indicate which places we should focus on in order to level up, but understanding the shape and intersection of these underlying drivers in different communities will help us to design more nuanced and place-appropriate interventions. This can only be done through partnership across levels of government, across public and private organisations and across sectors. The way in which these drivers layer up also creates the character of each place. Within this, we can find the jumping off points for generating opportunity and growth. We will discuss this further later in the report, and describe three places that have taken this approach.

Drivers of regional inequality



Sources: Alex Davenport and Ben Zaranko, 'Levelling up: where and how?', *Institute for Fiscal Studies*, 2020; Danny Kruger MP, *Levelling up our communities: proposals for a new social covenant*, 2020; Liz Shutt, 'Coastal Communities Alliance policy strategy', *Coastal Communities Alliance*, 2018; Danny Dorling, 'The influence of place: Geographical isolation and progression to higher education', *Bridge Group*, 2019; Department for Education, *Skills Advisory Panels: Analytical Toolkit for Local Skills Analysis*, 2018; Pedro Carneiro et al, 'The long shadow of deprivation: Differences in opportunities across England', *Social Mobility Commission*, 2020; Neil O'Brien MP, 'Measuring up for levelling up: What are we trying to achieve by "levelling up"? And what does the data say about what's happening in different places?', *Onward*, 2020.

Levelling up R&D

Within this broader levelling up landscape, the role of R&D to break cycles of decline has been an increasing focus, often centred around the *Missing £4 billion* report by Richard Jones and Tom Forth for Nesta.⁹ Jones and Forth found that while the UK's research base has many strengths, there are three main shortcomings which currently inhibit it from playing its full role in economic growth:

1. it is too small for the size of the country;
2. it is relatively weak in translational research and industrial R&D; and
3. it is too geographically concentrated in already prosperous parts of the country, often at a distance from where business conducts R&D.

The report argues that much of the imbalance arises from the aggregation of many small decisions, the entirely unconscious outcome of which is a persistent spatial bias. A key feature of this is that small initial advantages in certain places can grow over time to become larger ones as excellence stemming from earlier investment decisions is reinforced. Jones and Forth go on to assert that the UK's lack of regional hubs is a direct cause of the imbalance. The follow-on Nesta report, *Innovation after lockdown*, builds on this stating that the ability of innovation to impact productivity 'needs to take place in a friendly ecosystem – against a backdrop of other similar firms, large “anchor” institutions and informal knowledge networks – and as such, tends to cluster in particular places, creating localised hubs of innovation'.¹⁰ The key overriding point here is that

fixing the geographical R&D imbalance is not simply about redistributing funding. As Mariana Mazzucato has argued in relation to industrial strategies, innovation must have a direction as well as a rate.¹¹ This must also be true at regional level. Determining the direction of innovation is a critical part of the place-based R&D challenge that will require a significant change in the ability of all actors across the system to work with each other.

In this report, we consider three place-based case studies – San Diego in the US, Lincoln in the UK and Värmland in Sweden – where local partners have come together to do just that. On the face of it all three regions seemed unlikely prospects when local leaders decided to imagine a different future. Yet through partnership working to focus on local assets, supported by research and innovation investment, change began. In each area the partnerships identified shared priorities based on previously unrecognised comparative advantage. Working in this way, with good foresight and some luck, they have been able to catch waves at the right time in order to generate regional activity, capture national funding and create ongoing opportunities for the surrounding communities. We draw lessons from these examples and apply them to the question of how to better link the R&D system to levelling up.

1. Catching the wave, the experiences of San Diego, Lincoln and Värmland

The San Diego Case: from a sleepy town to a thriving hub of innovation

Situated on the Pacific coast of the United States of America near the Mexican border, San Diego was regarded as a sleepy town at the beginning of the twentieth century.¹² It was a place where its citizens had come to get away from the ravages of the industrial revolution. It was not considered as a place of potential for development. However, as the USA changed its focus from the west (Europe) to the east (with a clearer focus on the Pacific) in the early 1900s, the civic society of San Diego latched on to the new opportunity created and worked with the US navy to establish the town as a major base:

*A distinctive and enduring civic culture took shape ... since then the San Diego business community has been characterised by abundant boosterism, opportunism, [and] dogged persistence.*¹³

Community leaders recognised that it was well placed with the opening of the Panama Canal to provide a harbour and strategic base for defence of the whole nation. In other words, San Diego looked to use its limited assets to best effect and catch the wave of America's Pacific Century.

Between the First World War and the Second World War, San Diego expanded and city leaders worked closely with federal bodies and the military to develop a particular culture of innovation which grew in size and ambition. One of the key components of San Diego's success was the development of its higher education sector. During the 1960s it established two

major universities, building on a civic culture that included a deep respect for science, technology and higher education and their potential economic contribution.¹⁴ The University of California, San Diego (UCSD) was established in the second half of the twentieth century following a granting of land to its founders from the civic establishment. Its original purpose was to train engineers, which were in short supply. In other words, it focussed on the needs of the region as it grew and followed through on the opportunities that its partnership with the military had presented. The establishment of a university was a long held ambition of the civic planners who had envisioned the development of a university city that would foster a positive and pleasant lifestyle which would attract new residents.

Once established, the University, like the city, leveraged its connections with the military and benefited from Federal funds for its research base, enabling it to grow. A strong research culture was built on local assets. Not standing still and continuing with its mission to work locally, in the 1980s UCSD established a new programme with the explicit objective to draw together local business with researchers and students to create innovation. Its goal was 'to jump start the technological innovation and entrepreneurial process'.¹⁵ It was essential that the University was embedded in the community with its staff and students living and working with others in the city to make the programme work. The city authorities brought together the two main universities in the city, UCSD and San Diego State, to support their future plans for growth.

UCSD created *Connect*, a powerful driver of innovation leadership in the region building beyond the initial partnership with the military establishing a thriving tech hub for spin-out companies

and a whole new development of health innovation. Key to these partnerships was the ability to be nimble and respond quickly to new opportunities which surfaced through strong local connections. New ideas were easier to identify due to well established local networks and a short chain of communication between emerging small and medium-sized enterprises (SMEs), often kickstarted by graduates and local business partnerships, and the University. Mary Lindenstein Walshok and Abraham J. Shragge argue that this interaction was key to the success, they highlight the role of localised production networks embedded in innovation clusters:

*Knowledge resides within the people and organisational practices set in specific geographic regions and can be shared more quickly and accurately through continuous face to face interactions.*¹⁶

Integrating the University's ecosystem of skill development, research development and innovation implementation with trusted, long-standing partnerships with business, both universities and other civic organisations, has created a powerful connection and driver for development. Walshok and Shragge argue that re-investment has also been vital. This is a particular characteristic of the University and its civic culture in that the purpose of success is reinvestment in the development of facilities for further productivity through skill and research development.

Today the innovation economy makes a significant contribution to San Diego's economy. In 2016, it accounted for around a quarter of its total GDP, it employs 150,660 people (11 per cent of the total workforce) and the average annual salary for a job in the innovation economy is \$110,700 compared with \$51,500 for the rest of the economy. Job growth in the

innovation economy remains steady and there are a growing number of start-ups each year.¹⁷

What can we learn from this case?

- Picking winners is complex, the very notion of what is promising in innovation and productivity terms is not and cannot be a fixed state. Changes in policy, like the Pacific turn that transformed San Diego, technology, like the development of the Panama Canal which then required protection hence the need for the Navy's presence, changed the perception of what a promising place was. In other words, development in innovation is dynamic.
- Location in this case really mattered, a sea coast, close to the Mexican border changed from being a sleepy place to being ideal for growth and development. This was further developed over time as the civic society supported, encouraged and exploited Federal funding.
- Civic ability to cease a moment and catch the Pacific Century wave was also vital, without the vision and ambition the sleepy town could well have continued to be just that.
- The establishment of a local university to harness the opportunity was critical. It shared and built on the ambition and vision of civic leaders to take it further and wider than they had ever imagined. This led to an upward spiral of innovation and development that transformed the local place and enhanced the USA's Pacific power.

The Lincoln case: the re-imagining of a left behind place

The city of Lincoln has a distinguished past. Lincoln Cathedral and Lincoln Castle are major landmarks in English history, both

involved in the extensive power of Middle Age Christianity and the extensive commerce of the Middle Ages economy. During the early modern period, Lincolnshire was key to the strong economic alliance of the Hanseatic league. Innovation and development continued with the draining of the Fens in the eighteenth century, a new technology that enhanced and increased arable farm land enabling further innovation through the development of agricultural engineering through to the nineteenth century. Engineering grew and took on new elements and, by the 1980s, Lincoln was a centre for gas turbine technology.

Unlike San Diego, Lincoln and Lincolnshire had not been sleepy but had been battled over and had led economic partnerships over many centuries. However, despite its prominent past, over time Lincoln increasingly lost its industrial base and the city became like many other northern cities, a shadow of its past. Lincoln became a city with much dereliction.

Civic leaders knew that a wave of new innovation was necessary and had sought to bring a university to the city during the 1960s but had lost out in the competition to York. Yet the dream and vision for a new civic university was not diminished and through determination and local fund raising, the city gained a university without any central government funding in 1996. The University of Lincoln started with a very limited curriculum and even more limited research but over time this has grown to a full range of arts, social science and STEM subjects with a distinctive research base. The University's growth trajectory has been rapid and transformational. It is a story of incremental steps, with a clear pathway based on a

long-term vision, alongside flexibility to respond to emerging opportunities, supported by a range of funding injections.

This dynamism is clear from the numbers. The University has grown from 2,000 students in the late 1990s to over 18,000 in 2021. It has also undergone a dramatic expansion in its research base, with research income rising from £4.2 million in 2013/14 to £8.6 million in 2018/19. In the last 10 years, Innovate UK funding to the University has quadrupled and the 2015/16 Higher Education Innovation Fund (HEIF) allocation per academic was higher than those of the Universities of Oxford, Cambridge, Manchester, King's College London and Imperial College London.¹⁸

The University has continued with its civic mission throughout this time and proactively works with organisations across the region to increase economic growth and productivity, raising living standards. Working in this way is critical to delivering joined up strategies and resources that are focussed on levelling up the region over the long-term.

Like San Diego, this approach has also shaped a research portfolio that is built on the assets of the region. Agri-Food Technology became the first area of research excellence. Work focussing on engineering, defence and health inequalities have also been developed, all working in partnership with provider organisations. The University brought a focus on new technologies enabling new industrial processes for older industries. In other words, robotics and artificial intelligence (AI) in agriculture and food manufacturing, transforming gas turbines towards net zero and so on. As at San Diego, establishing innovation parks working between businesses, academics and

students has been key to high tech inward development and the local connections and short communication chains have been central to the development in the region. The Lincoln Science and Innovation Park now houses 20 start-up and grow-on businesses which are located in Lincoln. Over 100 graduate jobs have been created in five years and the Park is now expanding with two new facilities being built on the site.

The University has developed a model of working with business where there is specific need. For example, in 2010, Siemens Energy partnered with the University to establish the first new Engineering School in the UK in 20 years. Siemens was struggling to recruit engineers and the University responded with a proposal to develop the School jointly and to locate Siemens' global training facility on the University campus. Students in the School have access to real-world Siemens facilities, are taught by university and Siemens staff and are given paid work experience during vacations on the Siemens site. Siemens has described the process as a great three or four year interview process; retention of graduates into the business has grown from less than 50 per cent after five years to 98 per cent and Lincoln graduates need only a six-month graduate training programme compared to two years for those from elsewhere. Siemens has since increased its footprint in the city, establishing a second site and expanding its employment opportunities.

What can we learn from this case?

- Working with the grain of a place and finding ways to transform it requires vision, entrepreneurship and commitment, but it can pay off in so called left behind places.

- Rather than seeing the challenges as a problem, seeing them as opportunities is vital. Seeing things differently to the obvious, being prepared to take a risk and start new things and working with whole systems to achieve something new are key components to this entrepreneurial way of working. For example, many would argue that a rural county with a large agricultural base is not promising but what the Lincoln example shows is that opportunities can be found upon which research and innovation funding can be leveraged to transform the place. This can drive change in an entire industry beyond its locale all while keeping the heritage of the asset in place.
- Working fluidly, or permeably, between organisations in a place can create better outcomes and greater possibilities for innovation. In Lincolnshire, it was essential to work with local engineering companies (Siemens and their supply chain) to identify real-world problems which could be addressed through the innovation ecosystem, from skill development through to innovation in product design and logistics.
- If universities and other civic leaders work together, they can add a great deal to enhance their place. For example, joint planning and regular face-to-face interactions lead to new ideas and mutually beneficial plans for the region.
- Where public, private, local, national and international funding work together, local problems can lead to global solutions that benefit productivity across the piece and level up regions through the process. Universities can act as great brokers to achieve this.

The Värmland case: from paper region to a bioeconomy

Nicknamed as Sweden's Lake District, Värmland stretches across central-west Sweden, bordering Norway and boasting some 10,000 lakes as well as Sweden's longest river, Karälven. Värmland's economic development has historically been built on its abundant natural resources, particularly forestry and steel industries, which is why it is also known as the 'Paper Region'. However, as employment in manufacturing and production declined due to international competition, industrial automation and outsourcing, Värmland went through periods of fluctuating development and change.

Like many other non-metropolitan regions across the world, Värmland continues to face a range of socio-economic challenges related to its peripheral location, including an over-reliance on traditional industries, demographic change and relatively low participation in higher education. It was also affected by the 2007/08 financial crash. Nevertheless, Värmland has performed better than expected over the past decade.¹⁹ Despite increased international competition, the Värmland region has remained as a strong international player in the pulp and paper industry, especially with its focus on packaging materials.²⁰

The establishment of a university in Värmland's capital city, Karlstad, goes back to 1843, when it was founded as a teacher training college. Karlstad gained university branch status in the late 1960s, and later on, university college status. Karlstad University (KAU) was formally established in 1999 with 9,000 students initially, rising to 16,000 in 2017.²¹ Today, the University is characterised by a culture of co-operation and considers

itself an international institution with strong connections to the region and with many research areas that are aligned with the business communities of Värmland. Recognising the need to enhance the regional innovation system, Region Värmland and KAU decided to capitalise on their longstanding collaboration, establishing a formal partnership and joint strategy in 2008.

The initial aim of the partnership was to generate academic research in areas that were relevant to the regional needs in terms of research and development. Accordingly, a smart specialisation strategy was developed which focussed on identifying strong areas with the capacity to evolve into internationally competitive industries. As in the Lincoln example, Värmland's strategy also took into account the challenges of some of the region's traditional industries and sought to build these into opportunities. For example, the Paper Province cluster emerged out of the need to strengthen the pulp and paper industry after it faced international competition in the 1990s and early 2000s. Equally, the Compare cluster (ICT / digital) emerged out of the problem of a lack of ICT-competences. Alongside these two clusters the Glava Energy Centre, the Steel and Engineering Cluster and Visit Värmland (tourism cluster) have also been developed. To support development of the clusters, the regional government provided financial resources to Karlstad University to create the 10-professor programme.

In 2015, Region Värmland and the University decided to build the collaboration further through the establishment of the Academy for Smart Specialisation. The Academy illustrates a long-term and systemic view of innovation in non-

metropolitan areas. Together these institutions seek to create and improve the regional competitiveness and resilience. The Academy serves as a meeting-place for researchers, companies, financiers and entrepreneurs and prepares KAU students for employment to drive the industrial development in the six clusters. By linking research, innovation and education in thematic knowledge triangles, the Academy prepares students for employment which will drive industrial transformation in Värmland's prioritised areas. The Academy has been successful in filling the gap between strategy and concrete actions. It has established more than 15 new strategically important projects involving strong collaborations, ensuring the outputs benefit all actors involved. Within KAU, the Academy has helped connect different knowledge areas to common domains for research, innovation and transformation.²²

Using the clusters to identify clear and shared regional priorities has helped Region Värmland to allocate scarce resources to great effect. Today, each cluster has a dedicated cluster manager, a team of cluster advisers and strong membership of local companies. Through this partnership approach, the clusters have been able to develop clear objectives which also take the national policy environment into account.²³ The OECD identified the following important functions that the clusters are fulfilling for Värmland:

- Intelligence – gathering information from a wide range of stakeholders, and enhancing understanding of key regional challenges;
- Connecting – fostering networks that enhance knowledge spill overs between actors within the cluster and outside;

- Marketing – in national and international markets;
- Support – development of local human resources and access to research and innovation capacity; and
- Innovation – addressing societal challenges and boosting digitalisation – by identifying future skills and investment needs.

What can we learn from this case?

- A strategy that draws together all those who have a stake in the innovation capacity and economic success will inevitably lead to actions that blur the lines between blue-sky research, research translation and teaching supporting a focus on the future of work and society.
- The transformative potential of the cluster approach is directly linked to the development of trusted regional partnerships and a commitment over the long term to focus on shared priorities. Key actors include regional authorities, Karlstad University and the key cluster businesses. This alignment has been especially helpful to support the allocation of limited available resources.²⁴
- The extent of this trust is evident by the willingness of the region to invest in professorships, as well as capital, recognising the need to build research and innovation capacity within KAU so that the wider region could benefit.
- The establishment of the Academy has provided focus and resource to translate KAU's expertise in relation to each of the clusters.

- The role of the University as a central focus to create continued momentum a crowd-in effect that has brought together cluster focussed networks and enhanced spill over opportunities.

These three case studies demonstrate how unexpected and so called unpromising or left behind regions can grow and become hubs of innovation. They highlight that economies and the inputs into economies are dynamic and not fixed and it depends on foresight and successful appreciation of assets within a region to drive levelling up. Partnership and shared priorities that draw upon locally identified opportunities can support renewed innovation and economic growth in surprising ways. Drawing on these experiences, we now highlight a number of insights as to how R&D can help the UK's left-behind places to level up.

2. Working with (not for) regions to develop a shared long-term agenda

When thinking about a regional approach for R&D, we need to be careful not to reduce the region to a single entity. As our case studies demonstrate, it is the rich ecosystem of stakeholders and interests that exist at local level that are key to establishing a long-term and impactful strategy. Working 'with' rather than 'for' requires a different approach, a recognition that all players have knowledge to exchange creating a process of partnership rather than a client or service relationship.

Working across the system: recognising levelling up as a collective endeavour

As described above, levelling up is a wicked problem, requiring us to work across boundaries and tackle multiple drivers (as outlined in our drivers of regional inequality diagram). The fact that these drivers layer up differently in different places, and can even be different again at a hyper-local level within regions, means that we need to develop strong partnerships at local level and beyond. As the case studies show, it is not simply about how we apply the strengths of university R&D to the surrounding economy but about how we work with actors across communities:

- to understand drivers and find joint solutions to address them; and
- identify opportunities and clusters that can generate growth and productivity.

Directly relevant to the levelling up agenda, working cohesively has been demonstrated to have a direct effect

on productivity.²⁵ In our 2019 publication, *The Permeable University: the purpose of universities in the 21st Century*, we described the value of working permeably – removing barriers to interaction both within the institution and beyond it. Ultimately, working in a permeable way should make the full range of civic partners feel part of a well-established, collective endeavour.²⁶

Of course, creating strong and long-lasting civic partnerships is complicated in practice as partners navigate differences in perspective, capacity and absorption capability. But working across the whole place can help to establish core beliefs and values so there is a shared vision and focus. Whole-system events where you develop shared guiding principles and shape policy, establishing cross-organisational roles and involvement in Boards and so on can help to lessen boundaries with the sum of multiple 1:1 interactions helping to build trust over time. Universities can act as a linchpin within this providing a unique space to bring different groups together from all sections of society.

In addition, ensuring that these partnerships are long-lasting means continually reinvesting to understand the environment afresh as the drivers change over time. Decisions need to be based on fitness for purpose rather than historical precedent, institutional power or habit.²⁷ Indeed, following COVID, many local partners have experienced additional pressure to respond to the short-term fallout, supporting local businesses through the distribution of Business Continuity Vouchers or restructuring health and social care services, for example. The resources and bandwidth of universities have also been affected and we all need to adapt to these new pressures while

finding the space to renew collaboration in relation to longer term strategies.

Permeable innovation systems

So what does this mean for regional R&D infrastructure? Extending the R&D system to consider regional inequality is not just about expanding the current model, we need nuance, understanding, flex and partnership to develop strategies in each place based on their characteristics and the potential opportunities. The idea of an innovation system refers to a complex system of institutions – in both public and private sectors, including places where R&D is done – where skills and knowledge are transmitted and discussed, ideas and techniques are shared, both informally and formally.²⁸ In addition, we can talk about innovation systems at the regional or city level as well as at the national, or indeed supranational, level.

Central to working permeably is understanding that all of these different institutions – and the individuals that form them – have different expertise to offer. Local authorities know the history of their region, their demographic and community groups; local businesses will have a different perspective that can give clues as to the innovation and ambition levels across places and sectors; other public sector institutions can provide insight as to health and wellbeing, education and connectivity. Alongside other forms of evidence, these inputs can all be layered to create a nuanced understanding of place. Continuing the engagement can lead to a blurring of the boundaries over time such that collaborative investment can happen, drawing together scarce resources to generate new

models of innovation as well as supporting the underlying R&D – as in our case studies. We know that knowledge is not created in silos. Different groups bring different perspectives all of which are valuable for working through knotty problems and acting on them in a place.

We argue later that we need to broaden our understanding of the boundaries of the R&D system and our investment in it. As Ottoline Leyser has suggested, we also need to broaden our understanding of the key actors within the system so that the contribution of academic experts at the frontiers of knowledge can be blended with practitioners, as well as generalists that can look across the system and identify shared agendas.²⁹ Malcolm Gladwell describes three kinds of people that are needed to help ideas get to a tipping point: connectors, with large social networks; salespeople, with contagious positive energy; and mavens, who hoard information to build a depth of knowledge.³⁰ In an R&D context, broadening the actors we engage with means that we are more likely to be able to build in all of these elements. Working in this way will support higher levels of translation, ensuring that there is great emphasis on the D of R&D such that it can directly impact regional productivity and economic growth.

Alongside this, we need to consider what forms of regional infrastructure are appropriate so that our national government departments and agencies are able to tune into the local conversation and support R&D that will create lasting regional impact. For example, the practice of regional advisers is well established across the Ministry of Housing, Communities and Local Government (now the Department for Levelling Up, Housing and Communities), the Arts Council and Innovate UK

but less so in other departments or agencies engaged in the R&D agenda. That may not be the appropriate model for all but we should seek to learn lessons from those that are engaged in these activities and it may be possible to develop new hybrid models that draw together local and national actors to support better join up.

3. Drawing on regional assets to set direction

Catching the wave and building clusters

Growth and development in left-behind places is often about seeing opportunity where others do not – as in San Diego when civic leaders decided to look east instead of west to build on the advantages of the Pacific Century, or in Lincoln and Värmland where historic industries, agriculture and paper, have been supported to enter the tech-age, generating innovations that have demonstrated global significance. There has been a growing interest in clusters linked to the levelling-up agenda. This approach is particularly important for places that have less – they need to focus steadfastly on where potential is to build scale, capacity and impact. As described above, this can only be achieved as a collaborative endeavour. This will also help to ensure left behind places are not competing in the same specialisms. We need to ensure there is flex in the system so they can build their own distinctive path.

Clusters encompass an array of linked industries and other entities important to competition. They can have a positive effect on competition by: increasing the productivity of companies based in the area; driving the direction and pace of innovation, which underpins future productivity growth; and by stimulating the formation of new business, which expands and strengthens the cluster itself.³¹ The Council for Science and Technology (CST) conclude that major cities across the UK are not exploiting their agglomeration potential and that ‘universities and research centres should be the stimuli for agglomeration and local growth, and enablers of opportunity’.³²

We agree that clustering is a helpful strategy to support left-behind places become more productive but we should not just focus on major cities. As our case studies demonstrate, there are waves to be caught in all kinds of places but the support mechanisms and clustering models may need to be different. This isn't just about supporting collaboration and partnerships for structurally weaker regions, as the CST suggest, but also about recognising the power of key anchor institutions working in partnership to replicate the agglomeration effects of larger cities.³³ It is about building scale through sustained iterative steps over a long period of time and drawing on every possible asset and stakeholder in the area. Even more it is about the valuing of assets that already exist in place to create opportunity out of challenge. As the *Innovation Strategy* highlights, 'it is very difficult to create a world-leading cluster from scratch'.³⁴ One clear example of this is the development of the Agri-Food Technology Institute at the University of Lincoln. Historically rurality and agriculture has signalled 'left-behind' to policy makers and funders. Rather than seeing agriculture as a challenge, the University identified it as an opportunity to develop innovation and productivity in the sector through research turning agriculture from a problem into a developing asset for the region with new technologies developed locally that can be sold to the world.

Supporting regional clusters

R&D funding and policy interventions that build on existing strengths are more likely to be successful in the long-term and have been shown to have a positive impact on R&D employment and innovation at a regional level.³⁵ Previous work to identify these, including the Science and Innovation

Audits and Local Industrial Strategies should be built upon as we seek to develop R&D activity at a regional level.

Funding and interventions to support regional clusters cut across R&D and regional growth policy, with significant change in both areas. For example, the publication of *Build Back Better*, to replace the *Industrial Strategy*; the ongoing development of the UK Shared Prosperity Fund (to replace EU Structural Funding and Regional Growth Funding) and changes to the routes through which funding will be distributed at a regional level, with the recently announced Levelling Up Fund and community renewal funds being invested through local authorities rather than Local Enterprise Partnerships (LEPs). The role of EU Structural Funds to support regions with less R&D investment is often overlooked but has historically been a critical source of funding to build assets around regional clusters.

The launch of a Strength in Places Fund in 2018 was a significant step towards increasing regionally focussed R&D investment. However, as the *R&D Roadmap* recognises, the projects currently being funded 'represent just a handful of the great ideas out there'.³⁶ As the Fund develops, the goal of protecting and backing our most promising regional R&D clusters should remain and UKRI should seek to develop its regional-level links in order to build local intelligence about the pockets of excellence that exist across the UK. Alongside this, the Connecting Capabilities Fund, launched in 2017, has aimed to complement the HEIF by supporting collaboration in commercialisation across the higher education sector. We strongly support the recent announcement that these funds will both be extended.³⁷

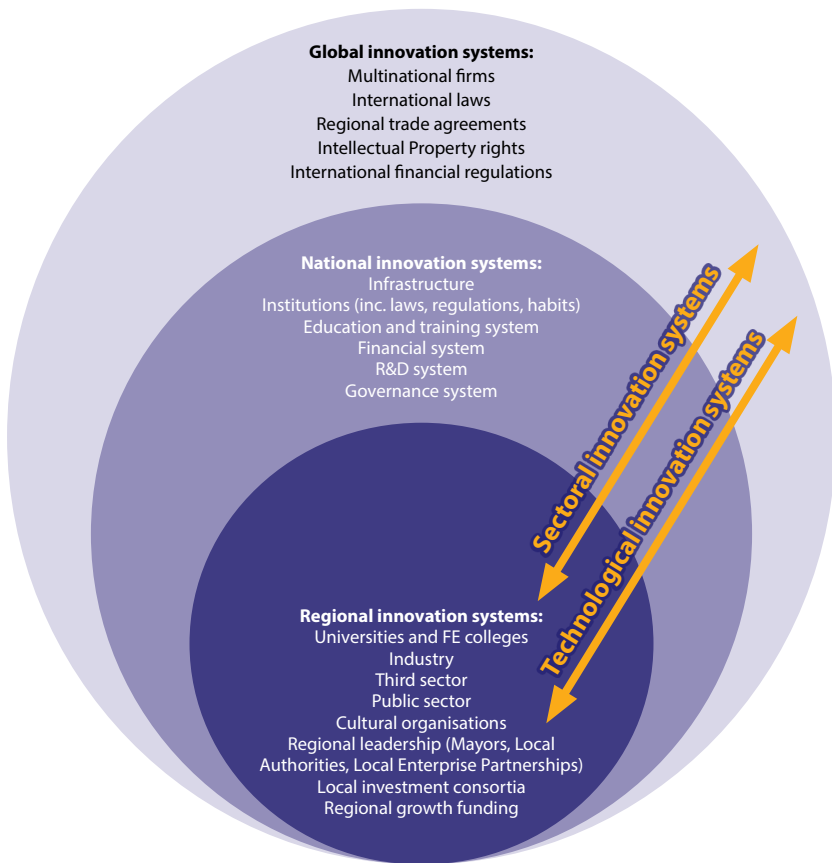
Clusters in dispersed economies

As we state above, there are waves to be caught in all kinds of places, not just large cities. It is worth considering dispersed economies in relation to this – often rural or coastal – with small towns and limited connectivity. Within these spaces, new approaches and support will be important, we cannot simply transplant methods that have worked to support clusters in larger centres and expect them to work. Dispersed rural economies need to seek scale through other means than that found in cities, with universities often playing a key role. There are basic needs to be met such as infrastructure, and broadband and support to build out networks across a wider geography. Hub-and-spoke models supporting cross-supply chain innovation, for example, can be helpful developments.³⁸

Local to global

Global and local are often presented as opposing priorities but, as the case studies demonstrate, building on local assets to generate R&D with global significance is key to creating value within regional clusters. In addition, building connections to local places in other global locations has proved effective at supporting new innovation and thinking about how to tackle a range of cross-cutting issues that left-behind places around the world are facing.³⁹ As the following diagram illustrates, global, national and regional systems of innovation are linked with sectors and technology providing a bridge between them. We need to consider how global trade policies interact with a clustering policy. For example, the Department for International Trade's work to promote High Potential Opportunities (HPOs) has been helpful additional support to bolster regional clusters.⁴⁰

Global, national regional, sectoral and technological innovation systems



Source: Adapted from Marion Frenz & Christine Oughton C, *Innovation in the UK regions and devolved administrations: a review of the literature*, Final report to the Department of Trade and Industry and the Office of the Deputy Prime Minister, 2004.

4. Delivering effective knowledge translation

Productivity and translation

As described above, the drivers of regional inequality are long-standing and complex and there are many lenses to take into account when we consider how to level up. The strong correlation between productivity levels and living standards is a central point – for example, identifying routes to deliver high-quality, highly skilled employment not just high-levels of any employment will be key to ensuring that we are increasing opportunities for people in left-behind places. Productivity requires moving beyond lower level skills through new innovations which require higher level knowledge input to improve outputs. This is critical for the discussion on regional R&D. We need to go beyond measures of R&D investment and consider impact and outputs. We need to ask questions such as: how will this intervention help industry to be more productive over time? And how will it tackle the underlying drivers of regional inequality?

The connection between innovation and productivity has been well established and has been an underlying narrative for increases in government investment in R&D over recent years. But as Nesta points out, recent UK innovation policy exhibits tendencies that make impacting productivity difficult – ‘it has under-emphasised diffusion, given little attention to equity and been hesitant to actively guide the direction of innovation.’⁴¹ David Willetts explains, ‘We all know the problem – we have great universities and win Nobel Prizes, but we don’t do so well at commercialisation’. Importantly it has also not developed and implemented indicators of success which include multifactorial productivity measures.

Invest in translation and interaction

The fact is that to have the greatest impact on productivity and levelling up, we need to add investment closer to market, or impact.⁴² Indeed, it is likely the higher the technology-readiness level (TRL) that an intervention is targeting, the more local it will need to be.⁴³ As the diagram below shows, investment is currently heavily geared towards R&D that is furthest away from application.

Addressing lagging productivity requires a different approach that takes account of the Development side of R&D. This means working with business on what their issues are and extending the TRL pipeline to include diffusion activities, including skill enhancement. This will have a more direct effect on productivity and the long tail of low-productivity firms in left behind places.⁴⁴

It is predicted that three-quarters of the productivity gains from automation will come from the broader adoption of existing technologies, rather than advances at the frontier.⁴⁵ Yet we are still at a very early stage of understanding what works in relation to later stage innovation and especially diffusion to support the long-tail. Current attempts to invest are relatively small in scale or focussed more on R&D intensive firms with significant existing operations.⁴⁶

The gap at the later end of the TRL pipeline is particularly problematic for micro and SME businesses, often more prevalent in left-behind places, as they may not have enough scale to engage even with Innovate UK funding opportunities.

An extended pipeline: funding support for different technology-readiness levels

TRL	1	2	3	4	5	6	7	8	9	9+	
R&D Activity	Basic principles / theory observed and reported	Theory / principles proven	Early proof of concept proven	Late proof of concept proven in real life conditions	Innovation refined for application in relevant environment	Initial trials validate prototype in relevant environment	Secondary trials validate prototype in operational environment	Late stage trials complete, product finalised	Product made available to market	Diffusion, Teaching, CPD, Consultancy	
Public Funding	UKRI, Research Councils										
				Innovate UK							
	Universities and Research England (including quality-related (QR) and the Higher Education Innovation Fund (HEIF))										
Private funding	Companies										
				Angel Investors							
					Venture Capital						

Source: Based on Engineering and Physical Sciences Research Council (EPSRC), The Funding Landscape (accessed 20 July 2021) <https://epsrc.ukri.org/research/ourportfolio/themes/healthcaretechnologies/strategy/toolkit/landscape/>

Knowledge Transfer Partnerships (KTPs) are frequently overlooked by policymakers but are an important part of the landscape, they are often the first point of engagement between a business and a university, which then lead to deeper collaboration as a business develops. But for the smallest companies, even these forms of innovation investment can be difficult to reach. What is required is greater permeability with on-going interaction and engagement between researchers, innovators and translators with all organisations in their region.

HEIF provides critical support for knowledge exchange activities. The funding sustains core activities and pump primes new endeavours, where the flexibility to adapt is often required. In some cases, universities have been able to use HEIF in order to address disparities in access to national funding schemes due to scale such as the Research Council Impact Acceleration Accounts. Innovation Vouchers have also been helpful towards bridging this gap. These schemes were previously been supported at national level, for example the Growth Vouchers Programme, which ran from 2014 to 2015. Randomised control trials conducted at six months found that being businesses using the vouchers reported an increase in turnover (61 per cent versus 45 per cent in the control group) and increased skill levels (82 per cent versus 12 per cent).⁴⁷ The fact that many local areas have continued to run their own schemes using the European Regional Development Fund (ERDF) funding following the end of the Government supported scheme further demonstrates their effectiveness, especially for smaller companies that may not be able to access other types of innovation investment. The ability to continue support for such schemes through the UK Shared Prosperity Fund (UKSPF) is an important consideration.

Re-framing excellence to include indicators of translation and engagement

Of course funding is only one driver among many others that incentivise universities towards R&D activities earlier in the pipeline. David Willetts highlights three systemic drivers:

- i. using university spin-outs as a metric of success, resulting in projects being spun out before they are ready;
- ii. a fear of not having enough of a stake in start-ups that are successful, driving universities to play an aggressive game on intellectual property ownership; and
- iii. the Research Excellence Framework (REF) is based on a classic academic definition of excellence, driving a certain type of research where advances at the boundaries of a discipline are rewarded over application.

The pursuit of these measures of excellence is not necessarily consistent with industrial collaboration. Indeed, a dominant focus on frontier research may lead to a widening of the gap between the knowledge produced by universities and that which can be absorbed by firms in the local environment.⁴⁸ Alongside continued support for blue-skies research at adequate levels, we need to consider how we encourage and support excellence in translation and engagement.⁴⁹ Funding and measuring more of the same will deliver more of the same.

Diffusion and skills

While we have seen a move from a largely low-skilled economy at the start of the twentieth century to an increasingly technological element in routine jobs, the fourth industrial

revolution is again increasing the range of higher skilled roles.⁵⁰ Many mid-level roles have been hollowed out as they have been replaced by technological solutions.⁵¹ While some of this process is driven by new and emerging start-ups, it is also the case that the larger more global industries have found this process of transformation more affordable. In reality, many smaller and medium-sized organisations, particularly outside of big cities, have struggled to adapt and find the skilled workforce required. The link between skills development and the higher education curriculum with research and innovation is a vital part of the ecosystem as is the link to partnership working between employers and universities. The role of education to diffuse innovation should not be overlooked.⁵²

Universities can respond to this challenge by feeding back into their own curriculum so that they are preparing students for the world that our research and innovation are creating.⁵³ They should also be supporting industrial partners to understand the changes coming and adapt their workforce plans accordingly. Taking an industry-centred approach means that we should effectively extend the technology-readiness level pipeline to recognise the role of diffusion and teaching beyond a product going to market. In other words a more permeable relationship between universities, their industrial partners and the wider community will be more successful in developing skills that feed into productivity.

While the primary business of universities focusses on higher level skills and graduates, they are increasingly involved in the wider education ecosystem through partnerships with schools, colleges and other providers. For example, the new

Institutes of Technology (IoT) which focus on Levels 4 and 5 higher technical development can, if universities share their innovations into the curriculum, be an interesting mechanism for lower level diffusion. The University of Lincoln's IoT works with all further education colleges in the region.

The curriculum has local industry involvement to help educate a traditional workforce and support them to adapt to industrial digitalisation by sharing the knowledge developed in the University's robotics and AI laboratories. Universities are also already playing an important role to support workforce up-skilling through the delivery of short courses designed in partnership with business.

5. Better success metrics

As we set out at the start, driving productivity to level up is complex, which means that measuring success will be complex too. At the moment, the research system is driven by many incentives drawing efforts away from those activities that might have a more direct impact on regional imbalance. For example, metrics that emphasise the commercialisation of research and ownership of intellectual property can be unhelpful. Similarly, as David Willetts pointed out, the emphasis on academic publication as the crucial measure of performance is one reason for our poor performance in applying research.⁵⁴

We also focus too much on single disciplinary effort rather than interdisciplinarity, including different players outside of university. The introduction and growth in the significance of Impact within the REF has been welcome but this is a small part of the overall picture.

The limitations of data means that measurements and success metrics will always show an incomplete picture but there are some adjustments that could be made to the current approach that would support a greater focus on application, productivity and therefore levelling up.

1. Dynamism and trajectory

- If we want to measure the impact of levelling up interventions, changes in productivity and get a sense of dynamism in the system, then we need to look at time-series

data to measure trajectory rather than static comparisons as we currently do. This will help us identify trends and places where new waves of innovation are emerging.

- If our measures do not highlight trends and emergence, we will see our innovation stultify and productivity will stall across the piece.
- We should also do more to measure and reward efforts to link up R&D activity and the development of skills in curricula to support foresighting and dynamism in our teaching.⁵⁵

2. Understanding the nuance to identify added value

- Benchmarking R&D output data will be particularly important in relation to levelling up, as well as analysis that takes account of the underlying drivers for different outcomes in different places. For example, proportion of SMEs, export levels, proportion of graduate employment. However this cannot focus on averages, it must recognise the specifics of areas and watch for small but relevant change.
- Over time, these assessments will help indicate where value is being added and where R&D investment is making inroads towards levelling up.
- This understanding should be considered as part of decisions about R&D funding, particular for funds with the intention of impacting place such as Strength in Places.

3. Rewarding collaboration

- We should review success metrics to ensure that we are able to reward rather than dissuade collaboration.

- For example, there is often an emphasis in the current metrics on hard commercialisation and ownership of Intellectual Property rather than partnership working, which may often be the most appropriate intervention.⁵⁶

6. Implications for the policy and funding environment

Levelling up is a collective endeavour. Working permeably across boundaries to draw out the value of innovation for this agenda will require a joined-up funding and policy environment that removes disincentives for collaboration.

Funding

- 1. Cross-innovation-system funding:** It is important to maintain a mix of funding opportunities to support businesses at different stages of their development – from Innovation Vouchers through Knowledge Transfer Partnerships to Innovate UK awards, with HEIF playing a significant supporting role alongside regional development funding.
- 2. Funding consortia:** A different approach to funding consortia is needed to include not only university-business but also place leaders and local partnerships for innovation. Evidence of whole system partnerships for solutions in regions should be part of the criteria for investment.
- 3. UK Shared Prosperity Fund:** The UK Shared Prosperity Fund must continue support for regionally focussed R&D activity that has previously been funded through the European Regional Development Fund (ERDF) as part of EU Structural Funding. The Government has committed to at least matching receipts of £1.5 billion per year but there has been no detail on the ERDF element, which includes support for research, technical development and innovation and equates to £800 million per year.⁵⁷ The

additional £1.2 billion match funding provided each year, often through Regional Growth Funding, is also a significant part of current investment that needs accounting for.⁵⁸

- 4. Regional Innovate UK funding:** Regionally focussed Innovate UK funding should be further expanded beyond the current £490 million for core budgets, with a focus on locally (and robustly) defined clusters or innovation hubs.⁵⁹ This investment should be accompanied by measures to ensure that the benefits they create are widely felt based on regional plans and local need.
- 5. Place-based Research England funding:** Further investment in the Connecting Capabilities Fund (£25 million) and Strength in Places (£127 million) is welcomed.⁶⁰ As these Funds develop, further thought should be given to how investment decisions might be tied more closely to locally defined priorities through engagement with local and regional partners beyond the R&D community. New measures that identify dynamism, the emergence of innovation and new pockets of growth should also be considered.
- 6. Venture Capital:** New levers to encourage increased business investment in the Innovation Strategy are welcomed as are efforts by the British Business Bank to increase the supply of venture capital funding outside of London and the South East. There is significant potential to be untapped here including ways of de-risking investment for areas with less of a track record. The use of clusters to identify high-growth opportunities could help towards this.

Policy

- 7. Joined-up policy:** Recognise that making a difference to deeply ingrained regional inequality across the UK will require a range of policy interventions and changes across the R&D investment portfolio and beyond. Assessments that focus on individual funding pots and particular departmental priorities will miss the bigger picture. Joined-up and cross-department policy work will be essential, just as local partnerships will enable grounded solutions.
- 8. Crowding in around clusters:** The development of regional clusters that capitalise on local assets should be co-ordinated across local and central government so there is an opportunity for investment to crowd in creating sustained impact over time – this includes the range of funding support outlined above but also policy interventions such as the Freeports, the Department for International Trade's High Potential Opportunities and work at a pan-regional level (i.e. through the Northern Powerhouse and Midlands Engine) to increase overseas investment.
- 9. Review the way we measure success:** We need to use all available levers to support a greater emphasis on productivity and impact. There should be a review of the regulatory and funding system to identify disincentives for activities that would help address the regional imbalance. This should take into account the current focus on intellectual property, academic publication and university spin-outs as measures of success.

10. UKRI regional engagement: Increase the capacity of UK Research and Investment (UKRI) to locate and engage at a regional level in a way that supports increased understanding of the local nuances and developments around the UK. This needs to be based on deeper engagement with regional partners, including the public sector, industry and universities. It must also include the ability to adapt and respond to the regional intelligence gathered at national level.

11. Innovate UK and diffusion: The inclusion of adoption and diffusion of cutting-edge innovation within the objectives of Innovate UK is an important development that will potentially expand the range of businesses that engage with the agency to include firms with lower productivity. Diffusion support should be adequately funded within Innovate UK's core funding allocation. The inclusion of skills within this is vital as the often forgotten element of research application.⁶¹

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Policymakers from across the political spectrum are committed to reducing regional inequalities and spending more on research and development. But there is a lack of detail as well as no consensus on how to deliver on these two priorities. There is also some confusion over how R&D policy and regional policy should relate to one another in the future.

This paper makes firm proposals on how to implement a new approach that are rooted in three successful case studies from around the world – in the UK (Lincoln), the US (San Diego) and Sweden (Värmland).

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