

# Universities and Colleges and the Industrial Strategy: Exploring data on knowledge exchange, research and skills

Industrial Strategy Council



Research Paper

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September 2020

# About the Industrial Strategy Council

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The Industrial Strategy Council ('the Council') is an independent non-statutory advisory group established in November 2018. It is tasked with providing impartial and expert evaluation of the government's progress in delivering the aims of the Industrial Strategy. Its membership is comprised of leading men and women from business, academia and civil society.

## Acknowledgements

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The Industrial Strategy Council would like to thank the Universities UK team and Project Advisory Group for their contribution to this paper.

### Project Advisory Group

- Professor Peter Mathieson, Principal of the University of Edinburgh (Chair)
- Mr Filip Balawejder, Economic Advisor, Industrial Strategy Council
- Professor Karen Cox, Vice-Chancellor, University of Kent
- Ms Alice Frost, Director of Knowledge Exchange, UK Research & Innovation
- Dame Jayne-Anne Gadhia, Gadhia Group and member of the Industrial Strategy Council
- Dr Cristina Garcia-Duffy, Head of Technology, Strategy and Integration, Aerospace Technology Institute
- Ms Angela Joyce, Principal of Warwickshire College Group
- Sir Paul Marshall, Marshall Wace and member of the Industrial Strategy Council
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### Universities UK team

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- Ms Abigail Whiteley, Policy Officer, Universities UK (principal researcher).

# Foreword

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In 2019 the Industrial Strategy Council posed the question: “is there an easy way of identifying the extent to which universities and colleges contribute to prosperity locally and regionally across the UK?” Since the answer was deemed to be “no”, a piece of work was commissioned to develop a tool to fill some of the gaps. I was invited to form and chair a steering group and Universities UK (UUK) agreed to provide personnel to collate data, project manage and develop interactive maps to address the perceived need. I would like to express my sincere thanks to all the contributors, particularly to the UUK team who did most of the hard work. We sought to include Further Education Colleges but recognised from the outset that their data was likely to be harder to ascertain.

It was established early on that there exists a plethora of data on the topic: what was previously lacking is a user-friendly way of accessing and interrogating the data, making reliable assessments of the UK-wide distribution of activity and shining a light on regions or subjects which could benefit from further investment. We were conscious of the UK Government’s “levelling up” agenda and the importance in UK national policy of “place”. We were also conscious that Universities/Colleges should not “mark their own homework”. We resolved to collate, amalgamate and display publicly available datasets and not, in the first instance at least, to undertake new primary research.

The work was not significantly impacted by the COVID-19 pandemic, but we fully recognise that the data reflects the pre-COVID-19 situation, we believe it will be more important than ever for policy makers to have an accurate and user-friendly set of tools to examine the underlying position as the UK adapts to the post-COVID-19 world.

We have produced a series of interactive maps of the UK in which data sets can be amalgamated or interrogated by year, by place, by subject area etc. The maps illustrate data on knowledge exchange activities including consultancy agreements and various types of spin-outs; on spatial distribution of industries in Great Britain; regional movement of UK-domiciled graduates in work; graduate migration patterns; graduate retention data; skills vacancies by UK region and sector; and various indices of funding inputs into research and innovation.

The immediate visual impact is to be able to assess distribution across the UK and scale of activity in any given institution or region. The user can devise and answer their own questions and conclusions.


Some of our findings are surprising, not conforming to our pre-conceived ideas or to the perceived wisdom about “the usual suspects”. We also highlight some strikingly uneven distributions across the UK of research and innovation funding. The available

data did not allow detailed correlation analysis, but we suggest that there is no obvious correlation between funding inputs and spin-outs or other indices of contributions to local/regional prosperity.

The UK's higher education sector is a key driver of both national and local prosperity. Whether through research & development spending, associated spin-outs, skills training, graduate start-ups, social enterprises or assorted revenue streams from private sector collaboration, our tertiary education institutions can and should be pillars of a knowledge-based economy. As we prepare for a post-Brexit world, adapting to the consequences of the COVID-19 pandemic, the UK faces key decisions about how we allocate a much higher public R&D spending budget to maximise prosperity, and how universities and colleges can play their part in the wealth creation process. Previously, limited user-friendliness of the available data has prevented simple and accessible analysis of the extent to which our higher education institutions contribute to the local and national economy, and how far the inputs (R&D grants, Catapult funding, teaching grants, etc.) translate into outputs. We believe that our report will help fill that gap.

The recent publication by the UK Government of a roadmap for research & development is welcome. This report provides a user-friendly assessment of the starting point of the journey that the roadmap mandates.

I hope you find the information interesting and informative.

A handwritten signature in black ink that reads "Peter Mathieson". The signature is written in a cursive style with a large initial 'P'.

Peter Mathieson

Principal, the University of Edinburgh and Chair of the Steering Group

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## Executive summary

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The Industrial Strategy Council asked Universities UK to undertake a data exploration project to better understand the contribution of further and higher education to the UK's Industrial Strategy. The work was overseen by an independent Project Advisory Group, including two members of the Industrial Strategy Council.

This research paper summarises the key findings and supplements a more detailed set of data visualisations that have been made freely available. The visualisations focus on three themes: knowledge exchange, research and innovation, and skills development.

The contributions of further and higher education to the UK's prosperity are generally believed to include:<sup>1</sup>

- turning ideas into products and services on which the industries of the future will be built;
- providing people with higher level skills that are needed by employers according to national and local needs;
- investing in the excellence and impact of research to ensure the sustainability of research infrastructure;
- creating and helping businesses to support the business environment;
- being the centre around which places and local economies build rich innovation ecosystems.

Through these contributions, universities and colleges also provide skills, insights, and connections to support the UK's Sector Deals and Grand Challenges.

But the evidence on the contribution of universities and colleges to UK prosperity is far from complete. This project aimed to add to the evidence by using granular data to provide analytical insights about how universities support the business environment via knowledge exchange and skills development, as well as funding distributions across the Grand Challenges. While the data has its limitations, we believe this report provides useful insight and the accompanying visualisations allow users to devise and answer their own questions and reach their own conclusions.

## Headline Findings

Previous research has explored the aggregate contribution made by universities and colleges to the UK's prosperity. For example, econometric analysis has shown that UK universities and their students accounted for £95 billion of gross output and nearly 944,000 jobs in 2014/15. On these estimates around £1 in every £34 of UK

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<sup>1</sup> These are all highlighted in the 2017 Industrial Strategy White Paper. See BEIS (2017). *Industrial Strategy: building a Britain fit for the future*, November. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

gross domestic product (GDP) was “attributable to the activities of universities and the expenditure of international students and visitors”.<sup>2</sup> This paper does not provide an exhaustive literature review of previous research on the aggregate impacts. It considers what we can learn from looking at more granular data on knowledge exchange, research and innovation and skills development. Given the role of the Industrial Strategy Council, it focuses specifically on how universities and colleges support the business environment as well as funding distributions across the Grand Challenges.

This report and accompanying visualisations were developed prior to the COVID-19 outbreak. Therefore, this project does not look to answer questions regarding the contributions to short-term management or longer-term recovery from this virus.

## How universities support the business environment

The project explored how universities support the business environment through knowledge exchange activities. Knowledge exchange is the action of sharing knowledge between education institutions and partner organisations and turning this into impact on society and the economy.<sup>3</sup> This includes the production of spin-outs (companies set up to utilise intellectual property from higher education providers), start-ups (companies set up by graduates or provider staff) and services such as contract research or consultancy. The project also explores where graduates migrate to and how they could address business skills shortages.

- Spin-out activity and the provision of business services in the UK is highly variable by region. University-owned spin-outs (firms using university developed ideas) generated £1.4 billion across the UK in 2018/19. The University of Oxford leads the way with spin-outs reporting turnover of nearly £450 million.
- There were 20,039 newly-registered graduate start-ups in the last 5 years and they are more prominent at modern universities than older, research-intensive universities. There is surprising evidence of the distribution of university services for businesses, particularly for SMEs, where there is significant institutional diversity among the partnerships developed.
- Graduate start-ups from teaching-led institutions on average have received less external investment than those from research-intensive institutions but have produced comparable collective turnover. The University of Northumbria stands out, being in the top two (by turnover) in all 5 years of the dataset.

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<sup>2</sup> Oxford Economics, UUK (2017). The economic impact of universities in 2014-15. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/the-economic-impact-of-universities.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/the-economic-impact-of-universities.pdf)

<sup>3</sup> GuildHE, UUK (2020). *Concordat for the advancement of knowledge exchange in higher education*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf)

- More evidence would be welcomed on the correlation between research and knowledge exchange funding inputs and provider outputs, to identify effective approaches for public spending in the UK to create short- and long-term benefits for the economy. The recently published Knowledge Exchange Concordat will “inform relevant funding approaches by providing assurance on the value being delivered by public funds”.<sup>4</sup>
- Innovative firms are more likely to partner with research-intensive universities regardless of place, while less innovative firms are more likely to look to local partners. Local and extra-local partnerships with universities both have considerable, but different, value to the business landscape. Extra-local partnerships can encourage more innovation and be more lucrative, while local partnerships support small firms and develop effective local ecosystems.
- There is significant variation in rates of graduate progression by region and sector. Mapping geographic, subject and employment data together can help employers, government, and others to consider where there are opportunities to address businesses’ skill-shortages and improve skills development.

## How universities are contributing to progress on the Grand Challenges

The project explored how funding for universities is distributed for industry-focussed research across the Grand Challenges and how this distribution corresponds with funding for businesses.

- For most Grand Challenges, funding for businesses is concentrated in London and the South East, even when large businesses are removed to mitigate the headquarter effect. Funding for universities is distributed more widely, particularly among research-intensive institutions, but there is a clear skew towards London and the South East in the Ageing Society and AI and Data Economy Grand Challenges. There is only limited evidence for a relationship between funding for universities and businesses.
- Funding for Clean Growth is widely distributed for universities, while London, Scotland, and the South East lead funding for businesses. In the Future of Mobility, funding for universities is concentrated in the East and West Midlands, and Yorkshire and the Humber. The West Midlands also receives a large proportion of funding for businesses, but London and the South East lead funding for businesses despite employing fewer people in the sector.
- There is evidence of mutually beneficial relationships in collaborative research, particularly with Catapult Centres.

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<sup>4</sup> GuildHE, UUK (2020). *Concordat for the advancement of knowledge exchange in higher education*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf)



## Visualisations

Visualisations can be accessed through the following links:

### Box 1: Visualisation hyperlinks

#### **Knowledge exchange**

[KE1 to KE3: University affiliated businesses, business services and community engagement, 2014/15 to 2018/19](#)

[KE4: Grant funding for Knowledge Transfer Partnerships, 1988 to 2018](#)

#### **Research**

[R1: Innovate UK project funding, 2003 to 2019](#)

[R2: Horizon 2020 Societal Challenges, 2014 to 2019](#)

[R3: Industrial Strategy Challenge Fund contributions, 2017 to 2020](#)

[R4: UK Research Partnerships Investment Fund allocations, 2012 to 2020](#)

[R5: Spatial distribution of industries in Great Britain, 2015](#)

#### **Skills**

[S1: Regional movement of UK-domiciled graduates in work, 2012/13 to 2016/17](#)

[S2: Graduate migration patterns from domicile to location of employment, 2012/13 to 2016/17](#)

[S3: Graduate retention and employer vacancies, 2017](#)

# Introduction

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The Industrial Strategy notes that a key attribute of strong local economies is a rich innovation system, often built around a university. It also notes that higher education brings economic benefits through “the provision of higher-level skills that are needed by employers both nationally and within local areas”.<sup>5</sup> That means universities and colleges should make important contributions to the aims of the Industrial Strategy. For example:

- Universities produce and translate world-leading research through local, regional, and international networks, which drives innovation and generates ideas to address the Grand Challenges.<sup>6</sup>
- At the local and regional level, universities and colleges support growth by educating the current and future workforce, providing and creating jobs, attracting talent, and driving social mobility. The diversity of education provision allows people to undertake lifelong learning to raise aspirations, address skills shortages and meet changing employer needs through an adaptable workforce.
- Many businesses are developed from, or supported through, university infrastructures such as spin-out companies or graduate start-ups, while other businesses utilise university resources, research, and talent. Institutions also invest in capital and local services to regenerate regions and support job growth and invest in their data infrastructures to support open research.<sup>7</sup>
- Universities and colleges engage with communities locally and regionally through collaborations with businesses, employers, and researchers. These networks can create a productive business environment. Collaborations between education providers and their localities can boost an area’s competitiveness and growth, attract skilled workers, and create jobs.

As regional anchors, universities can help to identify how places can best be supported and how local innovation ecosystems can be developed. For example, places could be enhanced by closing the gap between research innovation and its translation or implementation, or by collaborating with local businesses to ensure learning incorporates relevant skills. Furthermore, universities and colleges have a key role in the interrelated physical, social, and cultural dimensions of places. In the

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<sup>5</sup> BEIS (2017). *Industrial Strategy: building a Britain fit for the future*, November. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

<sup>6</sup> BEIS (2019). *The Grand Challenges*, September. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges](http://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges)

<sup>7</sup> Open Research Data Taskforce. (2017). *Research Data Infrastructures in the UK: Landscape Report*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/research-policy/open-science/Documents/ORDTF%20report%20nr%201%20final%2030%2006%202017.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/research-policy/open-science/Documents/ORDTF%20report%20nr%201%20final%2030%2006%202017.pdf)

context of the COVID-19 pandemic, this includes reconnecting people and places, using innovative practices and generating economic activity.<sup>8</sup>

Despite this, the evidence on the contribution of universities and colleges to UK prosperity is far from complete. While previous research has explored aggregate contributions in some detail, more granular evidence is less readily available. This project aimed to address this by exploring more granular data on knowledge exchange, research and innovation and skills development. As such, this paper is not an exhaustive literature review of previous research.

## Project scope

Visualisations have been produced from existing data sources to investigate three areas of activity:

- **Knowledge exchange.** Knowledge exchange is the action of sharing knowledge between education institutions and partner organisations and turning this into impact in society and the economy.<sup>9</sup> This project explores data on:
  - graduate start-ups, spin-offs, and social enterprises;
  - university business services, including consultancy, contract research and facility/equipment-related services;
  - engagement with the community through exhibitions, public lectures, performance arts and museum education;
  - Knowledge Transfer Partnership (KTP) funding.
- **Research and innovation.** Interrelated with knowledge exchange, research and innovation data is used to explore:
  - where funding is allocated to industry-focused research at UK higher education providers;
  - institutional and regional research strengths and sectoral specialisation;
  - how sector research, through business collaborations, helps to address the Grand Challenges.
- **Skills development.** This project explores the education sector in the context of the UK's ambitions to support business performance. Data for this project is used to consider:

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<sup>8</sup> Coe, J. (2020). *Universities' role in economic recovery*. WonkHE: 28 April. Retrieved from: <https://wonkhe.com/blogs/universities-role-in-economic-recovery/>

<sup>9</sup> GuildHE, Research England, UUK (2020). *Concordat for the Advancement of Knowledge Exchange in Higher Education*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf)

- regional graduate retention;
- the skills required by industries and UK regions, and how far graduates address these skills shortages.

All visualisations have been made available online, with a snapshot of some reproduced below as examples.

Although discussed separately in the report, the three project strands overlap in terms of their overall contributions to the UK's prosperity. For example, knowledge exchange activities support the development and application of research, while students are provided with skills that allow them to innovate and develop businesses. In order to become an innovative, knowledge-based economy, and to raise productivity, the UK requires a talented and skilled workforce.<sup>10</sup> The three strands also have a regional context, including how local innovation clusters are developed and how the needs of local businesses are addressed.

The higher and further education sectors have both distinct and interrelated roles to play. The sectors work together with employers in innovative and diverse ways to provide joined-up routes to higher level skills, for learners on “more vocational and technically focused programmes, as well as traditional, academic routes”.<sup>11</sup>

### Note on categorising higher education institutions

There are several approaches to grouping higher education providers, based on factors such as financial data, membership of mission groups, and student cohort composition.<sup>12</sup> We have adapted a segmentation approach from the Association of University Directors of Estates (AUDE), as research intensive providers may have different facilities through which to commercialise research.<sup>13</sup> Where this is discussed, research-intensive institutions are those which generate over 20% of their income from research, while teaching-led institutions are those which generate over 80% of their income from teaching. Institutions are also included in the specialist category where they receive the specialist targeted allocation from the Office for Students, or where their public-facing materials specifically identify the institution as a specialist provider.<sup>14</sup>

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<sup>10</sup> NCUB (2019). *State of the relationship: Report 2019*. Retrieved from:

[www.ncub.co.uk/images/reports/State-of-the-Relationship-Report-2019.pdf](http://www.ncub.co.uk/images/reports/State-of-the-Relationship-Report-2019.pdf)

<sup>11</sup> UUK (2018). *Routes to high-level skills*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2018/routes-to-high-level-skills.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2018/routes-to-high-level-skills.pdf)

<sup>12</sup> Hewitt-Dundas (2012). *Research intensity and knowledge transfer activity in UK universities*. Retrieved from: <https://doi.org/10.1016/j.respol.2011.10.010>

Coates-Ulrichsen (2018). *Knowledge Exchange Framework Metrics: A Cluster Analysis of Higher Education Institutions*. Retrieved from: <https://re.ukri.org/documents/2018/kef-cluster-analysis-report/>

<sup>13</sup> Method used from AUDE (2017). *AUDE Higher Education Estates Management Report 2017*. Retrieved from: [www.sustainabilityexchange.ac.uk/files/emr\\_2017\\_final.pdf](http://www.sustainabilityexchange.ac.uk/files/emr_2017_final.pdf)

<sup>14</sup> OfS (2019). *Guide to funding 2019-20: How the Office for Students allocates money to higher education providers*. Retrieved from: [www.officeforstudents.org.uk/media/784a1671-6e18-45e5-8fa8-8a676f2c9530/ofs2019\\_18.pdf](http://www.officeforstudents.org.uk/media/784a1671-6e18-45e5-8fa8-8a676f2c9530/ofs2019_18.pdf)

## Limitations of the research

- This project does not provide an exhaustive account of contributions, or provide a comprehensive literature review, but rather serves as a data exploration exercise. More comprehensive public data exists on university activities than college activities.
- For most knowledge exchange activities, little data is available about the relevant sector of the activity or knowledge exchange partners. This limits the extent to which observations can be made about specific sectors. Due to a lack of data about universities' business partners, reference to other literature has been used to consider geographical tendencies in partnerships.
- Data on research funding is informative about the systems for funding industry-facing university research but does not capture universities' outputs directly. The time lag between research funding and impact can also be considerable; in some industries, research impacts can take decades to manifest.
- Some data, such as the business and community interactions data, is self-reported by higher education providers.
- The HESA Destinations of Leavers from Higher Education Survey that is used to explore graduate mobility in this project, is being replaced by HESA's Graduate Outcomes Survey.<sup>15</sup>

Further details of the research and data limitations are discussed in the Technical Appendix.

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<sup>15</sup> HESA (2020). *Graduate Outcomes Data*. Retrieved from: [www.hesa.ac.uk/data-and-analysis/graduates](http://www.hesa.ac.uk/data-and-analysis/graduates)

## Section 1: Knowledge exchange

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Education providers can drive innovation and boost the economy by facilitating knowledge exchange.<sup>16</sup> In the context of higher education, knowledge exchange captures “activities, processes and skills that enable close collaboration between universities and partner organisations to deliver commercial, environmental, cultural and place-based benefits, opportunities for students and increased prosperity”.<sup>17</sup> The agents of this collaboration from education providers may be academic or non-academic staff, or students. Non-academic partners can include businesses, non-commercial organisations, or the broader community. While further education institutions cultivate important partnerships with employers and the community, very little data is available on these activities. Further education is discussed where this data is available, but more data would be invaluable in this area. Knowledge exchange is a key vehicle for institutions to use their resources for the public good by collaborating with businesses and engaging with the wider public.<sup>18</sup>

This chapter considers the following questions:

- **How do knowledge exchange activities support the UK’s business environment?**
- **How does external funding support knowledge exchange activities?**

### Data sources

This section uses data from the Higher Education Statistics Agency (HESA) Higher Education Business and Community Interaction Survey (HE-BCIS), the latest data being for the 2018/19 academic year. It also includes data on higher education innovation funding (from Research England, the Scottish Funding Council, and the Department for the Economy) and grant funding for Knowledge Transfer Partnerships from Innovate UK.

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<sup>16</sup> Coates-Ulrichsen, T. (2014). *Knowledge Exchange Performance and the Impact of HEIF in the English Higher Education Sector*. Retrieved from: <https://core.ac.uk/download/pdf/20090197.pdf>  
Muscatelli, A. (2019). *The Muscatelli Report*. Retrieved from: [www.gla.ac.uk/media/Media\\_700300\\_smx.pdf](http://www.gla.ac.uk/media/Media_700300_smx.pdf)

<sup>17</sup> GuildHE, Research England, UUK (2020). *Concordat for the Advancement of Knowledge Exchange in Higher Education*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/knowledge-exchange-concordat.pdf)

<sup>18</sup> Zawdie, G. (2010). *Special Issue: Knowledge exchange and the Third Mission of universities*. Retrieved from: <http://pdfs.semanticscholar.org/6a26/b5a8b6ca85bcbccc2f597111305654a1ec34.pdf>

## How do knowledge exchange activities support the UK's business environment?

### Visualisation

[KE1 to KE3: University affiliated businesses, business services and community engagement, 2014/15 to 2018/19](#)

### University-affiliated businesses

Universities support their staff and students in entrepreneurial enterprises, creating new businesses, and bringing products developed through advanced research to market. In this way, they develop the business environment and provide jobs, products, and services for use in the wider economy.

The diversity of universities' knowledge exchange is illustrated in HE-BCIS data. The HE-BCIS reports on three kinds of university-affiliated businesses: start-ups (launched by both staff and graduates), spin-offs (with and without university ownership), and social enterprises. There are clear distinctions between the universities whose staff and graduates are successful in launching different kinds of business. While international comparisons between firm generation and research commercialisation in the UK and other countries can be insightful, this is a complex area and was beyond the scope of this report.<sup>19</sup>

### Spin-outs

Spin-outs are companies commercialising university-generated intellectual property (IP).<sup>20</sup> These companies build on research and discoveries developed at universities. Over £1.4bn was generated in turnover from university-owned spin-outs across the UK in 2018/19, the highest annual figure since 2014/15, when this data was first available. According to the HE-BCIS, the number of active spin-outs has steadily increased since 2014/15, and in 2018/19 was at its highest at 1,316. There are marked differences between the distributions of spin-outs with higher education provider ownership and those without, with the former type generating more turnover in recent years. Spin-outs without university ownership are not discussed at length here, but relevant data is available through the accompanying visualisations. The data examined shows that research-intensive universities are the most successful in spin-out creation, maintenance, and growth (see Figure 1). The University of Oxford was particularly successful here: its spin-outs reported nearly £450m turnover in 2018/19, and over £490m external investment. While Oxford's spin-outs reported the highest figures for a single institution, spin-outs from research institutions were generally more lucrative. Eight of the 10 universities reporting the highest turnover

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<sup>19</sup> Coates-Ulrichsen, T., Hughes, A. and Moore, B. (2014). *Measuring University-Business Links in the United States*. Retrieved from: [https://dera.ioe.ac.uk/21103/1/2014\\_businesslinksus.pdf](https://dera.ioe.ac.uk/21103/1/2014_businesslinksus.pdf)

<sup>20</sup> Wright, M. and Fu, K. (2016). *University spin-outs: What do we know and what are the policy implications? Evidence from the UK*. Retrieved from: [https://ijooes.fe.up.pt/index.php/jim/article/view/2183-0606\\_003.004\\_0002](https://ijooes.fe.up.pt/index.php/jim/article/view/2183-0606_003.004_0002)



for their spin-outs were research-intensive institutions; the exceptions were Coventry University, a teaching-led institution reporting £57m spin-out turnover; and the Royal College of Art, a specialist institution reporting £31m turnover. It should be noted that this data is highly skewed: the five institutions reporting the highest turnover for university-owned spin-outs accounted for 63% of all spin-out income in 2018/19.

Together, firms partly owned by the University of Oxford, Queen's University Belfast, and the University of Edinburgh accounted for 54% of spin-out turnover nationally. Extreme density of spin-out activity in a small number of institutions was also observed in a comprehensive review of several datasets of university spin-outs.<sup>21</sup> This is characteristic of these businesses, as spin-out creation is highly specialised and the data can be skewed by the success of individual firms.<sup>22</sup> These observations are consistent with other findings that research-intensive universities tend to produce more spin-outs, and that spin-outs from such universities are generally more successful in terms of turnover than those spun out from less research-intensive universities.<sup>23</sup> While research volume may correspond with greater research commercialisation, developing spin-outs is a highly specialised process, and it is useful to identify institutions which have succeeded in this.<sup>24</sup> Field specialisation, and its attractiveness to investors, also impacts spin-out numbers.<sup>25</sup>

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<sup>21</sup> Coates-Ulrichsen, T. (2019). *Developing University Spinouts in the UK*. Retrieved from: <http://re.ukri.org/documents/2019/developing-university-spinouts-in-the-uk-tomas-coates-ulrichsen-v2-pdf/>

<sup>22</sup> Coates-Ulrichsen, T. (2019). *Developing University Spinouts in the UK*. Retrieved from: <http://re.ukri.org/documents/2019/developing-university-spinouts-in-the-uk-tomas-coates-ulrichsen-v2-pdf/>

Scott, A. (2019). *Top UK universities ranked by spinout grants*. Retrieved from: [www.beauhurst.com/blog/top-universities-by-spinout-grants/](http://www.beauhurst.com/blog/top-universities-by-spinout-grants/)

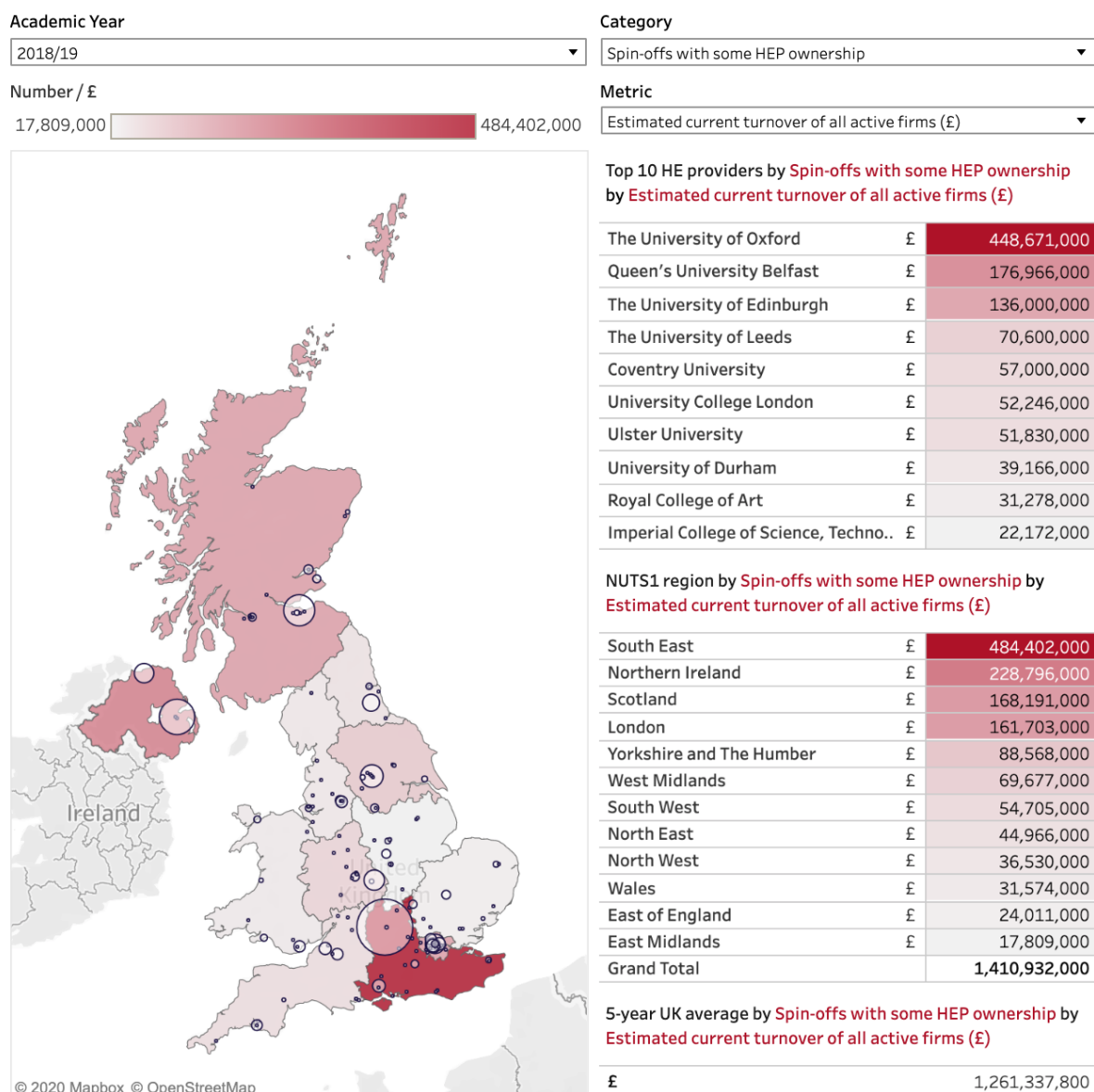
<sup>23</sup> Hewitt-Dundas, N. (2012). *Research intensity and knowledge transfer activity in UK universities*. Retrieved from: <https://doi.org/10.1016/j.respol.2011.10.010>

<sup>24</sup> Vohora, A., Wright, M., and Lockett, A. (2004). *Critical junctures in the development of university high-tech spinout companies*. Retrieved from: [https://doi.org/10.1016/S0048-7333\(03\)00107-0](https://doi.org/10.1016/S0048-7333(03)00107-0)

<sup>25</sup> Coates-Ulrichsen, T. (2019). *Developing University Spinouts in the UK*. Retrieved from: <https://re.ukri.org/documents/2019/developing-university-spinouts-in-the-uk-tomas-coates-ulrichsen-v2-pdf/>



Figure 1: Visualisation example - Estimated current turnover of all active firms – spin-offs with some higher education provider ownership, 2018/19



## Start-ups

Graduate start-ups across the UK turned over more than £1bn in 2018/19.

Universities where graduates have been successful in launching and growing start-ups (new businesses) have a different profile. The 8,585 active start-ups from graduates of teaching-led institutions have a three-year survival rate of 49%, compared to the 46% survival rate from research-intensive universities and 45% from specialist institutions. Although there were many more graduate start-ups from teaching-led institutions, their average turnover was lower than start-ups from research-intensive institutions (total turnover was also lower but comparable).

However, there are considerable disparities in external investment: start-ups from research-intensive universities attracted nearly £310m in external investment in

2017/18, compared to just £32m by start-ups from teaching-led institutions. This means that the average graduate start-up from a teaching-led university obtained nearly £4,000 in external funding, compared to an average of around £88,000 per start-up from research-intensive universities. Further research into this correlation between external funding and start-up success would be useful. Nevertheless, it demonstrates the value that teaching-led institutions add to the business environment and how this differs from research-intensive institutions, suggesting the importance of institutional diversity to firm generation and success.

## **Social enterprises**

Social enterprises are defined by HE-BCIS as organisations which “rate their success on their social outcomes equally or more than their commercial outcomes”.<sup>26</sup> Compared to spin-out and start-up activity, there is a different profile of universities that launch successful social enterprises. Specialist institutions are prominent in creating successful social enterprises: while they produce fewer social enterprises, the firms which are created are more lucrative.

University-affiliated businesses are just one part of the broader picture of knowledge exchange. While they can be a valuable means of technology transfer, their impact has been overstated in some cases.<sup>27</sup> Many spin-outs are launched before they are commercially viable, and they struggle to survive or to scale up.<sup>28</sup> While university spin-outs can have a valuable role in emerging industries, and start-up generation is an important part of a thriving economy, university-affiliated firm generation does not demonstrate the full contribution of universities to the business environment.<sup>29</sup>

## **University-business deals**

As well as developing their own businesses, universities support the business environment by providing high-value services and equipment. In this way, they make important resources available to many firms.

## **Contract research, consultancy and facilities and equipment hire**

The data on services which universities provide to businesses reinforces the diversity of the sector’s activities and the influence of institutional specialisation. In 2018/19, research-intensive institutions garnered the greatest amount of income from all three kinds of business deal reported in the HE-BCIS and received the most income from contract research. Consultancy was the most lucrative income stream

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<sup>26</sup> HESA (2020). *HE-BCI record 2018/19 - General guidance on Table 4: Intellectual property (IP)*. Retrieved from: [www.hesa.ac.uk/collection/c18032/hebci\\_b\\_table\\_4](http://www.hesa.ac.uk/collection/c18032/hebci_b_table_4)

<sup>27</sup> Siegel, D., Wright, M. and Lockett, A. (2007). *The Rise of Entrepreneurial Activity at Universities: Organizational and Societal Implications*. *Industrial and Corporate Change*. 16. 489-504. <http://doi.org/10.1093/icc/dtm015>

<sup>28</sup> Willetts, D. (2019). *The road to 2.4 per cent: Transforming Britain’s R&D performance*. Retrieved from: [www.kcl.ac.uk/policy-institute/assets/the-road-to-2.4-per-cent.pdf](http://www.kcl.ac.uk/policy-institute/assets/the-road-to-2.4-per-cent.pdf)

<sup>29</sup> Libaers, D., Meyer, M. and Geuna, A. (2006). *The Role of University Spinout Companies in Emerging Technology: The Role of Nanotechnology*. Retrieved from: <https://doi.org/10.1007/s10961-006-0005-9>

for both teaching-led and specialist institutions. Research-intensive institutions generally took a greater proportion of their income from large businesses than teaching-led or specialist institutions, with the exception of contract research delivered by specialist institutions.

This is consistent with findings elsewhere that large businesses tend to gravitate towards research-intensive institutions.<sup>30</sup> Evidence has also been presented that the research intensity of an institution can reduce the role of physical distance between partners, meaning that more research-intensive institutions attract deals from more geographically disparate partners.<sup>31</sup> This means that research-intensive universities are more likely than other institutions to be partnering with a broader range of businesses, and their partnerships are more likely to be inter-regional or international.

### **Business deals and urban centres**

The institutions reporting the highest income from contract research, particularly for large businesses and non-commercial organisations, are almost all located in large urban centres. The greater population and number of businesses in cities means there are more potential partners, particularly in cases where there is a high density of knowledge-intensive business services (KIBS). With the exception of the University of Oxford, the universities which reported the most income from contract research are largely located in KIBS-dense urban centres.<sup>32</sup> A high number of KIBS indicates a developed innovation ecosystem, with many businesses seeking out knowledge-based services.<sup>33</sup> Firms which seek out the services of KIBS are also more likely than other firms to seek out advanced services from universities, including contract research.<sup>34</sup>

Specialist institutions appear as significant earners for consultancy services. The Liverpool School of Tropical Medicine is based in a large, KIBS-dense city, but Scotland's Rural College is not. Specialist institutions have clear roles as providers of specialised knowledge - these specific strengths will intersect with their physical contexts to explain these behaviours. For example, the Office for National Statistics identified that Scotland has the second-highest density of the agriculture industry in

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<sup>30</sup> Hewitt-Dundas, N. (2012). *Research intensity and knowledge transfer activity in UK universities*. Retrieved from: <https://doi.org/10.1016/j.respol.2011.10.010>

<sup>31</sup> Tijssen, R., Van der Klippe, W., and Yegros, A. (2019). *Globalisation, localisation and glocalisation of university-business research cooperation: general patterns and trends in the UK university system*. Retrieved from: [www.researchcghe.org/perch/resources/publications/to-publishwp-50.pdf](http://www.researchcghe.org/perch/resources/publications/to-publishwp-50.pdf)

<sup>32</sup> Swinney, P., and Bidgood, E. (2014). *Fast track to growth: transport priorities for stronger cities*. Retrieved from: [www.centreforcities.org/wp-content/uploads/2014/11/14-10-17-Fast-Track-To-Growth.pdf](http://www.centreforcities.org/wp-content/uploads/2014/11/14-10-17-Fast-Track-To-Growth.pdf)

<sup>33</sup> Horváth, K., and Rabetino, R. (2017). *Knowledge-intensive territorial servitization: regional driving forces and the role of the entrepreneurial ecosystem*. Retrieved from: <http://rsa.tandfonline.com/doi/abs/10.1080/00343404.2018.1469741> - .Xqw3K6hKiUK

<sup>34</sup> Pinto, H., Fernandez-Esquinas, M., and Uyarra, E. (2013). *Universities and Knowledge-Intensive Business Services (KIBS) as Sources of Knowledge for Innovation Firms in Peripheral Regions*. Retrieved from: <https://doi.org/10.1080/00343404.2013.857396>

the UK.<sup>35</sup> This means there is likely a high demand for specialist services from Scotland's Rural College, and contextualises its success in consolidating this income stream.

This discussion demonstrates the importance of considering specific institutional strengths as well as the broader context of their institutional type and location. While the specificities of location and the immediate innovation ecosystem are relevant to universities' behaviours, they should be considered alongside institutional strengths in terms of what they can provide to their business partners. There is an extent to which these differences can be attributed to institutional preferences and the development of particular strengths in these universities over time.

## Partnerships with SMEs

There is evidence of greater institutional diversity among partnerships developed with SMEs, which has implications for local engagement. Of the five institutions across the board which reported the highest income from consultancy with SMEs, three were specialist institutions. Although the data does not allow confirmation of this point, it is likely that this income is largely obtained from firms working in a sector relevant to their specialism. In contract research, there is a tendency for one or two research-intensive institutions to account for a large proportion of a region's income from SMEs: the University of Oxford and the University of Southampton account for almost 80% of this income in the South East. In Scotland, this is more distributed: the University of Aberdeen accounted for over 40% of the region's contract research from SMEs, with several other universities accounting for a further 6-12% each. It is possible that the institutions which have succeeded at consolidating this income stream have developed a reputation which makes them an attractive partner for SMEs.

Teaching-led institutions obtain a slightly higher proportion of their contract research income from SMEs than research-intensive institutions, and considerably more of their facilities and equipment hire income. Less of their consultancy income comes from SMEs compared to research-intensive institutions. Due to the greater likelihood of SMEs to partner with local institutions, it is possible that those institutions reporting higher income and higher numbers of deals from work with SMEs are collaborating extensively with businesses in their own region.

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<sup>35</sup> ONS (2017). *The spatial distribution of industries in Great Britain*. Retrieved from: [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/the-spatial-distribution-of-industries-in-great-britain/2015](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/the-spatial-distribution-of-industries-in-great-britain/2015)

## How does external funding support knowledge exchange activities?

This section highlights examples of university innovation funding, and Knowledge Transfer Partnerships funding, to contextualise the formal support which institutions receive to support their activities. However, institutions which receive little or no formal funding for knowledge exchange complete important work in this area. Higher education funding is also a devolved matter and innovation funds do not play identical roles within these funding systems. Formal innovation support for further education institutions is rare, although some funding is available from the Scottish Funding Council and the Northern Ireland Department for the Economy.<sup>36</sup>

### Innovation funding

In England, the Higher Education Innovation Fund (HEIF) is a £213m fund rising to £250m in 2020/21, which forms part of Research England's annual grant to universities.<sup>37</sup> It is allocated to 108 institutions with the aim of supporting universities' knowledge exchange activities. There is evidence of widespread impact, both from monetised activities such as collaborative research projects, and non-monetised activities such as innovation network development and community engagement.<sup>38</sup> Receiving specialised funding to support knowledge exchange has increased engagement with these activities among universities, crowding-in further investment for knowledge exchange from private sources, and allowing institutions to diffuse innovation practices and engage businesses and communities with their work.<sup>39</sup> It includes a £50m per annum Industrial Strategy uplift for research commercialisation and other activities supporting the Industrial Strategy.<sup>40</sup> It is not weighted according to regional needs and its allocation based on HE-BCIS includes past performance, meaning there is some path dependency in the allocations.<sup>41</sup> Many English institutions do not receive HEIF, particularly smaller and specialist institutions.

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<sup>36</sup> Connected (2020). *About Connected*. Retrieved from: [www.connected.ni.org/about-connected](http://www.connected.ni.org/about-connected)  
Scottish Funding Council (2019). *College Innovation Funding 2019-20 Call for Proposals*. Retrieved from: [www.sfc.ac.uk/publications-statistics/calls-information/2019/SFCCI052019.aspx](http://www.sfc.ac.uk/publications-statistics/calls-information/2019/SFCCI052019.aspx)

<sup>37</sup> UKRI (2020). *Higher Education Innovation Fund*. Retrieved from: <http://re.ukri.org/knowledge-exchange/the-higher-education-innovation-fund-heif/>

UKRI (2019). *Minister announces new direction for knowledge exchange funding*. Retrieved from: <http://re.ukri.org/news-opinions-events/news/minister-announces-new-direction-for-knowledge-exchange-funding/>

<sup>38</sup> PACEC (2015). *Evaluating the Non-Monetised Achievements of the Higher Education Innovation Fund*. Retrieved from: [https://dera.ioe.ac.uk/24639/1/2015\\_heifeval2.pdf](https://dera.ioe.ac.uk/24639/1/2015_heifeval2.pdf)

<sup>39</sup> PACEC (2015). *Evaluating the Non-Monetised Achievements of the Higher Education Innovation Fund*. Retrieved from: [https://dera.ioe.ac.uk/24639/1/2015\\_heifeval2.pdf](https://dera.ioe.ac.uk/24639/1/2015_heifeval2.pdf)

<sup>40</sup> Research England (2019). *Research England: Universities delivering the Industrial Strategy*. Retrieved from: <http://re.ukri.org/documents/2019/heif-synthesis-report-feb-2019/>

<sup>41</sup> Goddard, J. (2007). *The engagement of higher educational institutions in regional development: an overview of the opportunities and challenges*. Retrieved from: <http://pdfs.semanticscholar.org/0ddf/4dfb86693b4fd30af1a0d2bd9048301817c1.pdf?ga=2.23630010>



Scottish universities receive the University Innovation Fund, a similar fund managed by the Scottish Funding Council, and Northern Irish institutions receive NI HEIF. These funding pots differ from the English HEIF as they are allocated in the context of different funding structures. Welsh universities have not received specific innovation funding since 2013, although this will be reintroduced for 2020/21.<sup>42</sup>

The 2019/20 round of HEIF funding in England had an institution cap of £4,395,000. All the institutions which reached this cap were research institutions. The majority of institutions which did not reach the cap but received over £4 million were also research institutions, with the exception of the large teaching-led institution London Business School. At the NUTS 2 region level, institutions in Inner London (West) received the most estimated funding per head of general population (£31.66). This region has by far the most higher education institutions at 22, which is likely to be a significant contributing factor to this figure, as no other region has more than seven. This was followed by Merseyside at £5.91 per capita, and Leicestershire, Rutland, and Northamptonshire at £5.35 per capita.

In Scotland, over £13m was allocated through the University Innovation Fund in 2019/20. The University of Glasgow and the University of Edinburgh received the greatest sums at £1.5m each. North Eastern Scotland was the NUTS 2 region where institutions received the most knowledge exchange funding per capita, at £3.70. The Scottish region with the lowest funding per capita was the Highlands and Islands, which received £1.42 per capita. This represents a much less pronounced disparity than HEIF funding in England. In Northern Ireland, Queen's University Belfast received £2.4 million under NI HEIF, and Ulster University received £1.6 million. The average funding per head of population in Northern Ireland, which is one NUTS 2 region, was £2.09.

## Knowledge Transfer Partnerships funding

### Visualisation

[KE4: Grant funding for Knowledge Transfer Partnerships, 1988 to 2018](#)

Knowledge exchange activities provide opportunities to upskill people in partnership with local businesses, directly meeting local skills needs. Knowledge Transfer Partnerships (KTPs) are key examples of these activities, providing skilled workers through means other than formal qualifications and in direct response to business interests. Through KTPs, the business and the academic partner collaborate on a research and development project, with the graduate appointed in a key strategic management position. Not all KTP partnerships are delivered with a business and academic partner located in the same region, and the regional proportions of partner

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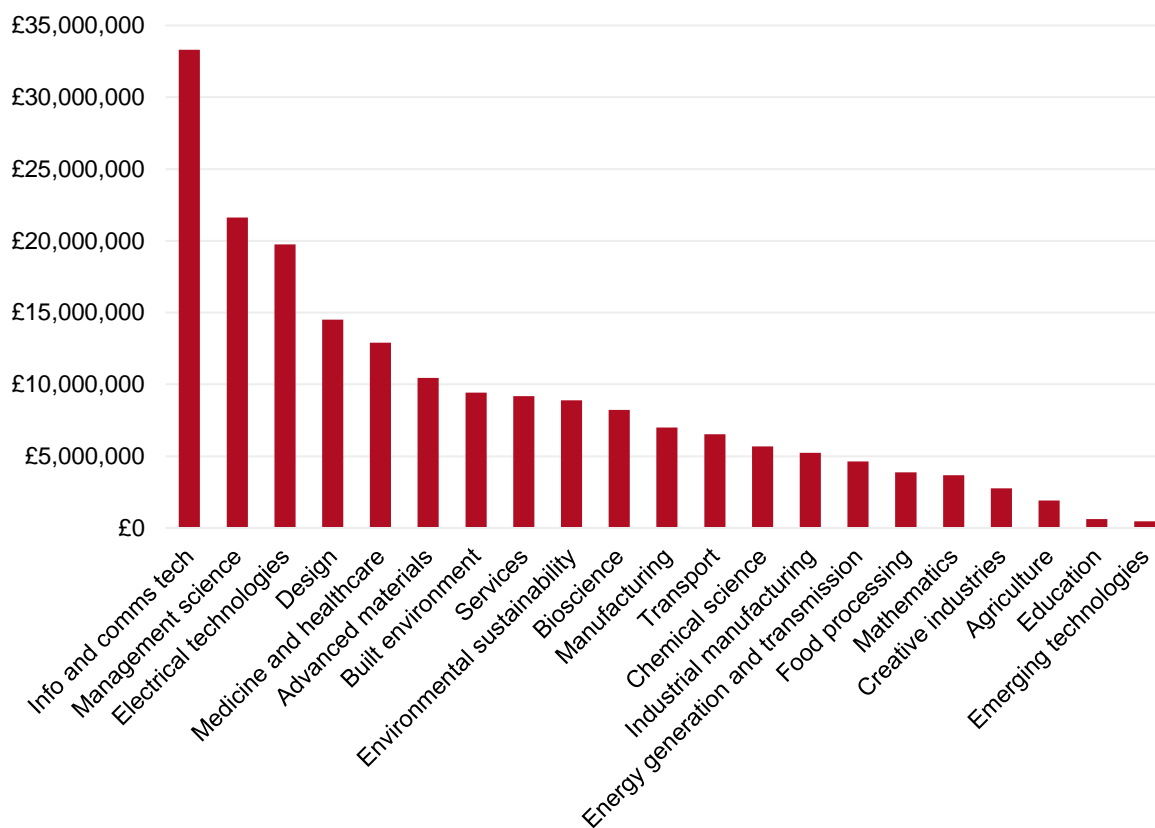
[.1079402874.1584619398-510903974.1584619398](#)

Coates-Ulrichsen, T. (2014). *Knowledge Exchange Performance and the Impact of HEIF in the English Higher Education Sector*. Retrieved from: <https://core.ac.uk/download/pdf/20090197.pdf>

<sup>42</sup> Morris, E. (2019). *Research Wales Innovation Fund: consultation outcomes*. Retrieved from: [www.hefcw.ac.uk/documents/publications/circulars/circulars\\_2019/W19%2037HE%20Research%20Wales%20Innovation%20Fund%20consultation%20outcomes.pdf](http://www.hefcw.ac.uk/documents/publications/circulars/circulars_2019/W19%2037HE%20Research%20Wales%20Innovation%20Fund%20consultation%20outcomes.pdf)

co-location vary. An independent impact review of the scheme estimated £7-8 of GVA for every £1 of investment.<sup>43</sup> They have also been cited as a positive example in broader reports on knowledge exchange.<sup>44</sup>

Figure 2: Funding for Knowledge Transfer Partnerships by sector, 2008-2018



There is engagement with KTPs from a broad range of institutions, delivering partnerships in many sectors. Between 2008 and 2018, information and communication technologies represented the highest total value of KTPs delivered. However, most institutions which have obtained significant sums over time in these sectors are research-intensive institutions. Specialist institutions are also well-represented in their relevant sectors. For example, the University of the Arts, London, and London South Bank University delivered the highest value of KTPs in the creative industries.

Several further education providers have participated in Knowledge Transfer Partnerships since the rebranding of the programme in 2003. There were the most

<sup>43</sup> Siora, G. (2015). *The Impacts of KTP Associates and Knowledge Base on the UK Economy*. Retrieved from: [http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/467142/KTP\\_Report\\_July\\_2015\\_Exec\\_summary\\_1-SEP-15\\_.pdf](http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/467142/KTP_Report_July_2015_Exec_summary_1-SEP-15_.pdf)

<sup>44</sup> Abreu, M., Grinevich, V., Hughes, A., Kitson, M., and Ternouth, P. (2008). *Universities, Business and Knowledge Exchange*. Retrieved from: <https://eprints.soton.ac.uk/357118/1/Universities%252C%2520Business%2520and%2520Knowledge%2520Exchange%2520Report.pdf>

participations by Welsh further education institutions for projects started between 2003 and 2018, with 81 partnerships completed during this period. Further education providers in Northern Ireland participated in 36 projects, while there were 24 further education participations across all English regions and Scotland during this time. A lack of data makes it difficult to compare this knowledge exchange mechanism to those of further education providers, although institutions in Wales and Northern Ireland have been particularly proactive in engaging with this income source. Management science was the leading sector for further education institutions, as £3m was allocated to 15 institutions in this sector. After this, KTPs in information and communication technologies received the most funding at £1.9m. Further exploration of knowledge exchange completed by further education institutions would be welcome, particularly to identify where these activities can be supported.

## Key findings

- The evidence presented supports the value of a diverse education sector. Universities of different kinds provide different roles and services to firms, and support staff and student entrepreneurship in different ways. The conditions which create knowledge exchange success for an institution are complex and specific to its internal and external conditions, including its sectors of expertise, the innovative capacity of firms it is surrounded by, reputation, internal priorities, and resources.
- The regional dimension of knowledge exchange is also complex. Innovative firms are more likely to partner with research-intensive universities regardless of place, while less innovative firms are more likely to look to local partners. Local and extra-local partnerships with universities both have considerable, but different, value to the business landscape. Extra-local partnerships can encourage more innovation and be more lucrative, while local partnerships support small firms and develop effective local ecosystems.
- Spin-out activity in the UK is highly variable by region. There are marked differences between the distributions of spin-outs with higher education provider ownership and those without. Graduate start-ups are in general more prominent at modern universities than older, research-intensive universities, while staff start-ups and social enterprise start-ups are unevenly distributed.
- Greater clarity would be welcomed on the correlation between research and knowledge exchange funding inputs and provider outputs. This would help identify effective approaches for public spending in the UK to create short- and long-term benefits for the economy.



## Section 2: Research and innovation

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The importance of university research in supporting industry is emphasised in the Industrial Strategy, and the strength of the UK research base is cited as a key strength in delivering it.<sup>45</sup> The role of universities is also highlighted in the government's R&D roadmap.<sup>46</sup> This chapter focuses on industry-specific research, meaning research which has been funded either to address a specific industrial priority, or to support direct collaboration between academic and industry partners. Research completed by further education practitioners remains rare, and industry-specific data on research in further education was not accessible.<sup>47</sup> This section therefore focuses on the higher education sector.

This chapter considers the following questions:

- **How does funding of universities target progress on the UK's Grand Challenges?**
- **How can institutional and regional strengths be reconciled?**

The scope was restricted to major research funding pots with an explicit aim to support industry-focussed research in universities. This means that the data presented here reflects the tendencies and idiosyncrasies of the funding system, and focuses on the projects and institutions which, for a broad range of reasons, are particularly successful in accessing these grants. The true value of the investments is greater than the figures represented here. As the Annual Report of the Industrial Strategy Council observes, these investments crowd-in private funding, increasing the impact of the public spending.<sup>48</sup>

### Data sources

The following data sources were used: Innovate UK project funding data from 2003; Industrial Strategy Challenge Fund funding allocations to universities (first allocated in 2017); the UK Research Partnerships Investment Fund, run by UKRI (established in 2012); Horizon 2020 Societal Challenges allocations (established in 2014); and the spatial distribution of industries in Great Britain for 2015, from the Office for

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<sup>45</sup> BEIS (2017). *Industrial Strategy: Building a Britain fit for the future*. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

<sup>46</sup> BEIS (2020). *UK Research and Development Roadmap*. Retrieved from: [www.gov.uk/government/publications/uk-research-and-development-roadmap/uk-research-and-development-roadmap](http://www.gov.uk/government/publications/uk-research-and-development-roadmap/uk-research-and-development-roadmap)

<sup>47</sup> Husband, G and Jones, S. (2019). *Research in further education: What's all the fuss about?* Retrieved from: <https://set.et-foundation.co.uk/publications/in-tuition/intuition-35-spring-2019/intuition-35-spring-research-supplement/research-in-further-education-what-s-all-the-fuss-about/>.

<sup>48</sup> ISC (2020). *Annual Report*. Retrieved from: <http://industrialstrategyCouncil.org/sites/default/files/attachments/ISC Annual Report 2020.pdf>

National Statistics. More information about these sources can be found in the technical appendix. While the identified universities are all undertaking valuable research relevant to the Industrial Strategy, using funding data has limitations. The amount of funding received does not directly correlate with quality of research. A university which receives little industry-focussed funding may still be contributing to the Industrial Strategy or producing high-quality research in the relevant area. Similarly, the exclusion of foundational research should not be interpreted as an indication that it is not relevant to industry. Much research which appears removed from industry has powerful “real-world” applications, and this foundational research must be completed before its industrial uses can be developed.<sup>49</sup> Industry-focussed funding for applied research has been chosen here to illustrate the mechanisms through which funders support industrial research, and to provide a clear point of reference alongside the priorities of the Industrial Strategy.

**Visualisations:**

[R1: Innovate UK project funding, 2003 to 2019](#)

[R2: Horizon 2020 Societal Challenges, 2014 to 2019](#)

[R3: Industrial Strategy Challenge Fund contributions, 2017 to 2020](#)

[R4: UK Research Partnerships Investment Fund allocations, 2012 to 2020](#)

[R5: Spatial distribution of industries in Great Britain, 2015](#)

## How does funding for universities support progress on the Grand Challenges?

The universities which have been most successful in garnering funding relevant to the Grand Challenges are described before providing some context on regional strengths beyond universities. In some cases, an apparent regional trend can be explained by a significant amount of funding being received by just one institution in the region. This will be noted where it is particularly evident. Other sectors can be explored using the visualisations provided alongside this report. An estimate of the total funding allocated to universities in each Grand Challenge can be found below. In Innovate UK funding, this excludes funding to other academic institutions, such as Catapult Centres. Horizon 2020 is excluded from this table as allocations are made in Euros. As mentioned, the scope was restricted to major research funding pots with an explicit aim to support industry-focussed research in universities, and excludes foundational research, recurrent grants for research allocated through the Office for Students, and other funding data such as allocations from the Research Councils.

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<sup>49</sup> Narin, F., Hamilton, K.S. and Olivastro, D. (1997). *The increasing linkage between U.S. technology and public science*. Retrieved from: [https://doi.org/10.1016/S0048-7333\(97\)00013-9](https://doi.org/10.1016/S0048-7333(97)00013-9)

Table 2: Estimates of total funding for schemes in scope of analysis allocated to the four Grand Challenges

| <b>Grand Challenge</b> | <b>University funding stream</b>                           | <b>Total funding for universities</b> | <b>Total funding for businesses</b>       |
|------------------------|--|---------------------------------------|---|
| Ageing Society         | Innovate UK (Ageing Society, Health & Nutrition): £150m    | £516m                                 | Innovate UK funding for businesses: £941m |
|                        | UKRPIF (Medicine and healthcare): £328m                    |                                       |   |
|                        | ISCF (Medicine and healthcare): £38m                       |                                       |   |
| Clean Growth           | Innovate UK (Clean Growth & Infrastructure): £136m         | £178m                                 | Innovate UK funding for businesses: £572m |
|                        | UKRPIF (Energy generation and transmission): £26m          |                                       |   |
|                        | ISCF (Energy generation and transmission): £16m            |                                       |   |
| Future of Mobility     | Innovate UK (Manufacturing, Materials and Mobility): £733m | £890m                                 | Innovate UK funding for businesses: £2.8b |
|                        | UKRPIF (Transport): £92m                                   |                                       |   |
|                        | ISCF (Transport): £64m                                     |                                       |   |
| AI & Data Economy      | Innovate UK (AI & Data Economy): £43m                      | £176m                                 | Innovate UK funding for businesses: £321m |
|                        | UKRPIF (Digital): £75m                                     |                                       |   |
|                        | ISCF (Digital): £59m                                       |                                       |   |

Note: Innovate UK funding was examined between 2003 and 2019; UKRPIF was examined between 2017 and 2020; ISCF was examined between 2012 and 2019.

## Ageing Society

Funding for projects in medicine and healthcare across Innovate UK, the ISCF and the UKRPIF amounts to almost £3.5bn, with an additional €485m from Horizon 2020. This figure includes allocations to academic institutions such as Catapult Centres.

Across the four funds analysed here, medicine and healthcare research funding for academic institutions is broadly concentrated in London and the South East. London has the lowest proportion of its workforce employed in human health and social care (SIC1 Q), but in absolute terms it employs the greatest number of people in this sector.<sup>50</sup> Similarly, human health and social care accounts for a small proportion of the South East's workforce compared to other regions, particularly Scotland and Wales, but it employs the second-greatest number of people in this industry.

Of the £150m of Innovate UK project funding allocated to universities for healthcare projects started between 2003 and 2019, £29m (20%) was allocated to institutions in London, and £23m (16%) to institutions in the South East. Horizon 2020 funding allocated for research in this area is particularly concentrated in London; nearly 45% of funding went to universities in the capital. This geographical concentration of healthcare funding is also reflected in the UKRPIF allocations. Four universities in London accounted for just over 50% of funding in this sector (£175m) for a total of 10 research facilities. Three facilities at the University of Cambridge accounted for a further 22% of all medicine and healthcare funding from the UKRPIF. This trend towards London is not continued in allocations from the Industrial Strategy Challenge Fund. Universities in the South East received the greatest proportion of the £38m allocated to medicine and healthcare funds, accounting for £9.5m (25%). Of this, £9.1m was allocated to the University of Oxford (£8m) and Oxford University Hospitals NHS Foundation Trust (£1.1m). Universities in the East Midlands, West Midlands, and Scotland then accounted for a further 12% of this allocation each.

## Clean Growth

There is no clear regional trend across funding allocations for universities in this area, and a diverse range of institutions are represented. UK funding for Clean Growth, which includes projects under “Energy generation and transmission” in the ISCF and UKRPIF, amounts to around £3.2bn, with an additional €86m from Horizon 2020. This includes allocations to Catapult Centres and other academic organisations. The funding which has been made available in this area from Horizon 2020 is the smallest amount of the three Grand Challenges where funding is available from this source (excluding AI & Data Economy).

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<sup>50</sup> ONS (2017). *The spatial distribution of industries in Great Britain*. Retrieved from: [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/the-spatial-distribution-of-industries-in-great-britain/2015](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/the-spatial-distribution-of-industries-in-great-britain/2015)

ONS (2020). *Business population estimates 2019*. Retrieved from: [www.gov.uk/government/statistics/business-population-estimates-2019](http://www.gov.uk/government/statistics/business-population-estimates-2019)

There was £136m of Innovate UK funding in clean growth and infrastructure allocated to universities for projects started between 2003 and 2019. Of this, £66m (48%) was received by universities in the East Midlands. The University of Nottingham accounts for £63m of this funding, reflecting an institutional specialisation rather than necessarily a regional one. The €86m Horizon 2020 funding pot for secure, clean, and efficient energy is more widely distributed than its equivalent in medicine. Universities in London again account for the highest proportion of funding (€22m, or around 25% of the total), with Scottish universities receiving the second-most (€16m, or around 18% of the total). Imperial College London has received the most funding (€9m), followed by the University of Edinburgh (€8m) and the University of Manchester (€6m). Only two institutions received UKRPIF allocations for energy generation and transmission: the University of Warwick (£15m) and Swansea University (£12m). The Industrial Strategy Challenge Fund has allocated £16m for projects in energy generation and transmission, of which nearly £5m (30%) was received by universities in the South East, particularly the University of Oxford (£2m) and the University of Southampton (£1m).

## The Future of Mobility

The total value of grants made in this area from UK sources is around £10.4bn, with €131m from Horizon 2020. This is the greatest amount of funding for any Grand Challenge in the data examined here, but it should be noted that this includes the Innovate UK funding area “Manufacturing, Materials and Mobility”. This includes around £5.6bn allocated to Catapult Centres which do not specifically address transport, but support research in a broad range of areas. This means that the data here provides some insight to progress on this Grand Challenge, but it is an extremely broad area. This is a limitation of the available data and should be taken into account when interpreting these results.

Universities in the West Midlands receive a significant proportion of funding for manufacturing, materials and mobility, as do the University of Sheffield (Yorkshire and the Humber) and the University of Nottingham (East Midlands). The West Midlands employs the greatest number of people in manufacturing, followed by the South East.<sup>51</sup>

Innovate UK has allocated £733m to universities for projects in manufacturing, materials and mobility starting between 2003 and 2019. Not all supported projects in this funding pot will be specific to the Grand Challenge, but it is the closest available equivalent. Of this, £118m (16%) was allocated to universities in Yorkshire and the Humber, particularly the University of Sheffield (£97m). This is followed by the West

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<sup>51</sup> ONS (2017). *The spatial distribution of industries in Great Britain*. Retrieved from: [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/the-spatial-distribution-of-industries-in-great-britain/2015](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/the-spatial-distribution-of-industries-in-great-britain/2015)

ONS (2020). *Business population estimates 2019*. Retrieved from: [www.gov.uk/government/statistics/business-population-estimates-2019](http://www.gov.uk/government/statistics/business-population-estimates-2019)

Midlands, where universities received £105m (14%) of funding. In the Horizon 2020 Societal Challenges funding, just under €132m has been allocated for research in smart, green, and integrated transport. Around €29m (22%) of this was allocated to universities in the East Midlands, of which the University of Nottingham accounts for the greatest proportion (€22m). More so in this area than the other two Horizon 2020 challenges discussed here, this is evidence of institutional, rather than regional, specialisation. Universities in the West Midlands accounted for £43m (47%) of the £92m transport funding under the UKRPIF. This was divided between the University of Birmingham (£28m) and the University of Warwick (£15m). These two universities also account for the West Midlands being the leading region in ISCF transport, receiving between them £17m (26%) of the £64m available in this sector.

## Box 2: Collaboration in the Future of Mobility

### Collaborative research networks

- Catapult Centres, a network of Innovate UK-funded independent research facilities with industrial specialisms, have a higher rate of collaboration with universities than businesses.<sup>52</sup> While only 10% of Innovate UK-funded projects involving a business from 2003-2019 were collaborations with an academic institution, this was 24% for projects involving a Catapult.
- Universities which host a Catapult working in the funding area of Manufacturing, Materials and Mobility are particularly successful at garnering collaborative project funding. A close relationship with a Catapult can encourage collaborative research, which has mutually beneficial results. The centre benefits from the expert staff and established practices at the university, while the university's specialism and productivity is enhanced by hosting a centre undertaking cutting-edge research in a relevant field.<sup>53</sup>
- The four universities which received the greatest sums for collaborative funding all host a Catapult. The University of Sheffield (£63m) hosts the Advanced Manufacturing Research Centre and the NAMRC; the University of Strathclyde (£33m) hosts the Advanced Forming Research Centre; the University of Bristol (£30m) hosts the National Composites Centre; and the University of Warwick (£28m) hosts the Warwick Manufacturing Group.
- This demonstrates the success of translational research centres which build on the competencies in the region, while continuing to support the core capabilities of the academic research base which provides the skilled workers and the foundational research which establishes the groundwork for commercially applicable research.<sup>54</sup>
- The evidence from collaboration in the Future of Mobility demonstrates the mutual benefit of close relationships between universities and research institutes.

<sup>52</sup> Catapult (2020). *About Catapult*. Retrieved from: <https://catapult.org.uk/>

Hauser, H. (2014). *Review of the Catapult network*. Retrieved from: <http://catapult.org.uk/wp-content/uploads/2016/04/Hauser-Review-of-the-Catapult-network-2014.pdf>

<sup>53</sup> Russell Group (2014). *Russell Group submission to Hauser Review of the Catapult Centres*. Retrieved from: [www.russellgroup.ac.uk/media/5097/50-russell-group-submission-to-hauser-review-of-the-catapult-centres.pdf](http://www.russellgroup.ac.uk/media/5097/50-russell-group-submission-to-hauser-review-of-the-catapult-centres.pdf)

Landry, R., Traore, N. and Godin, B. (1996). *An econometric analysis of the effect of collaboration on academic research productivity*. Retrieved from: <https://doi.org/10.1007/BF00138868>

<sup>54</sup> Jones, R.A.L. (2019). *A Resurgence of the Regions: rebuilding innovation capacity across the whole UK*. Retrieved from: [www.softmachines.org/wordpress/wp-content/uploads/2019/05/ResurgenceRegionsRALJv22\\_5\\_19.pdf](http://www.softmachines.org/wordpress/wp-content/uploads/2019/05/ResurgenceRegionsRALJv22_5_19.pdf)

Mansfield, I. and Owen, G. (2020). *Visions of ARPA: Embracing Risk, Transforming Technology*. Retrieved from: <http://policyexchange.org.uk/wp-content/uploads/Visions-of-Arpa.pdf>



## AI and Data Economy

Across the three UK funds represented here, AI and Data Economy received around £1.3bn in grants. This includes the “digital” sector in the ISCF and UKRPIF. There is no Horizon 2020 Societal Challenge for this sector. This is the Grand Challenge which has received the least funding across the sources used here.

The £43m of funding for universities for Innovate UK projects in this area started between 2003 and 2019 is highly concentrated in London and the South East. Universities in London account for £10m (24%), and those in the South East received around £9m (21%). In both cases, this funding is distributed among a considerable number of universities: 18 universities in London and 12 in the South East received funding for this sector. However, there is still a high concentration in a couple of institutions for each region. Imperial College of Science, Technology and Medicine received £4m and University College London received £3m, accounting for a significant majority of the funding in the region. Similarly, the University of Surrey was allocated £3m and the University of Oxford received £2m, accounting for around half of the AI and Data Economy funding in the South East. For the Industrial Strategy Challenge Fund, challenges such as “Robots for a safer world” and “Digital Security by Design” are included in a digital sector. Universities in Scotland and the North West received the greatest proportion of funding in this area: Scottish universities received £14m (23%), of which nearly £8m was allocated to Heriot-Watt University. Universities in the North West received a total of £13m (23%), of which almost £7m was given to the University of Manchester. The University of Birmingham was the institution with the largest allocation in this area from the ISCF, receiving over £8m for four projects. The UKRPIF made five allocations to support research centres in digital technologies, of which the largest was £29m offered to the Bristol Digital Futures Institute at the University of Bristol. The University of Leicester received £13m, and around £10m was allocated to the University of York, the University of Oxford, and the University of Surrey.

## How can institutional and regional strengths be reconciled?

It is perhaps unsurprising that a fairly small number of research-intensive institutions with strong backgrounds in certain sectors tend to receive the greatest sums for research in these areas, particularly given that receiving grants often increases the probability of further funding.<sup>55</sup> In some cases, such as the UKRPIF, applications are only open to universities with proven track records in the targeted sectors, reinforcing

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<sup>55</sup> Antonelli, C. and Crespi, F. (2013) *The "Matthew effect" in R&D public subsidies: The Italian evidence*. Retrieved from: <https://doi.org/10.1016/j.techfore.2013.03.008>

Bol, T., de Vaan, M. and van de Rijdt, A. (2018). *The Matthew effect in science funding*. Retrieved from: <https://doi.org/10.1073/pnas.1719557115>

this effect. However, there are interesting questions to explore about the role of universities in their regions, particularly as contributors to local industrial research ecosystems. Incorporating business data from Innovate UK allows immediate comparison between the location of universities receiving large project grants, and the regions where businesses attract funding in the same sector. This section will compare the funding data presented above with funding for businesses in the same areas.

A significant amount of evidence has previously been presented demonstrating regional “spill-over” effects of university research within regional innovation systems.<sup>56</sup> It is implicitly recognised in the Industrial Strategy, which identifies the need for specific regional outlook across its priority areas and acknowledges the “regional economic impact of existing institutions including universities”.<sup>57</sup> Spill-over effects are measured through different metrics, such as patent citations or R&D expenditure, and there is a broad base of literature demonstrating impact of university research which corresponds to geographical proximity.<sup>58</sup> These effects of university research differ across industries. For example, Abramovsky et al. (2006) studied the relationship between location of private R&D labs and highly rated university research. They found a particularly strong spill-over effect of university research in pharmaceuticals, some effect in manufacturing, and little effect in biology.<sup>59</sup> However, D’Este et al (2012) demonstrated that the role of geographical proximity diminishes with the strength of an innovation cluster, meaning that firms in advanced clusters such as the Golden Triangle are much more likely to collaborate with universities across the country.<sup>60</sup> Firms in less advanced clusters, however, were much more likely to collaborate with universities closer to them, meaning that they benefit more from targeted regional investment.

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<sup>56</sup> Howells, J. (1999). *Regional systems of innovation?* In: D. Archibugi, J. Howells and J. Michie, eds., 1999. *Innovation Policy in a Global Economy*. Cambridge: Cambridge University Press.

Sudmant, W. (2009). *The Economic Impact of the University of British Columbia*. Retrieved from: [https://president.ubc.ca/files/2013/02/economic\\_impact\\_2009.pdf](https://president.ubc.ca/files/2013/02/economic_impact_2009.pdf)

Jaffe, A. (1989). *Real Effects of Academic Research*. Retrieved from: [www.jstor.org/stable/1831431?seq=1](http://www.jstor.org/stable/1831431?seq=1)

Anselin, L., Varga, A. and Acs, Z. (1997). *Local Geographic Spillovers between University Research and High Technology Innovations*. Retrieved from: <https://doi.org/10.1006/juec.1997.2032>

<sup>57</sup> BEIS (2017). *Industrial Strategy: Building a Britain fit for the future*. Retrieved from:

[www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

<sup>58</sup> Jaffe, A.B., Trajtenberg, M. and Henderson, R. (1993). *Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations*. Retrieved from: <https://www.jstor.org/stable/2118401>

Fischer, M.M. and Varga, A. (2003). *Spatial knowledge spillovers and university research: Evidence from Austria*. Retrieved from: <https://doi.org/10.1007/s001680200115>

Deshpande, A. and Guthrie, S. (2019). *Entrepreneurial-university ecosystem: An overview of key concepts*. Retrieved from: [https://www.rand.org/pubs/working\\_papers/WR1304.html](https://www.rand.org/pubs/working_papers/WR1304.html)

<sup>59</sup> Abramovsky, L., Harrison, R. and Simpson, H. (2006). *University Research and the Location of R&D*. Retrieved from: <https://doi.org/10.1111/j.1468-0297.2007.02038.x>

<sup>60</sup> D’Este, P., Guy, F. and Iammarino, S. (2012) *Shaping the formation of university-industry research collaborations: what type of proximity does really matter?* Retrieved from: <https://doi.org/10.1093/jeg/lbs010>



## Comparing regional funding for businesses and universities

It is possible to compare funding for universities in areas relevant to the Grand Challenges with funding for nearby businesses in the same sector. While this will not capture any spillover effects, it will provide an opportunity to compare academic and industrial funding and identify any correlation at the regional level.

Data is discussed on allocations to all businesses, and to SMEs (according to their classification in the Innovate UK database). This is to provide some counter against the headquarter effect, whereby funding may be attributed to the location of headquarters of large firms rather than to the offices where the work was carried out.<sup>61</sup> Large businesses, charities, and public sector organisations and research establishments are excluded when figures are given for SMEs only. Data on all regions can be found in the accompanying visualisation (R1).

Throughout this section, comparisons are made to workforce data using one-letter SIC codes. It should be noted that this high-level mapping is imperfect and used to provide broad comparisons. SIC1 Q (human health and social care) is used for Ageing Society; the aggregate code BDE (mining, energy supply and water management) is used for Clean Growth. An appropriate SIC code was not available for AI & Data Economy, so workforce data has not been used as additional context. It should be noted that, for the Future of Mobility, SIC1 C (manufacturing) is used. This is an extremely broad area, and this workforce data will be much more inclusive than activities relevant to the Grand Challenge of Future of Mobility. Similarly, as mentioned previously, the Innovate UK funding area of “Manufacturing, Materials and Mobility” is extremely broad. For this reason, it should be understood that the discussion of the Future of Mobility provides a broad outlook on the manufacturing sector, but it cannot be identified which activities are directly relevant to the Grand Challenge. Further detail on the methodology is provided in the Technical Appendix.

### Ageing Society

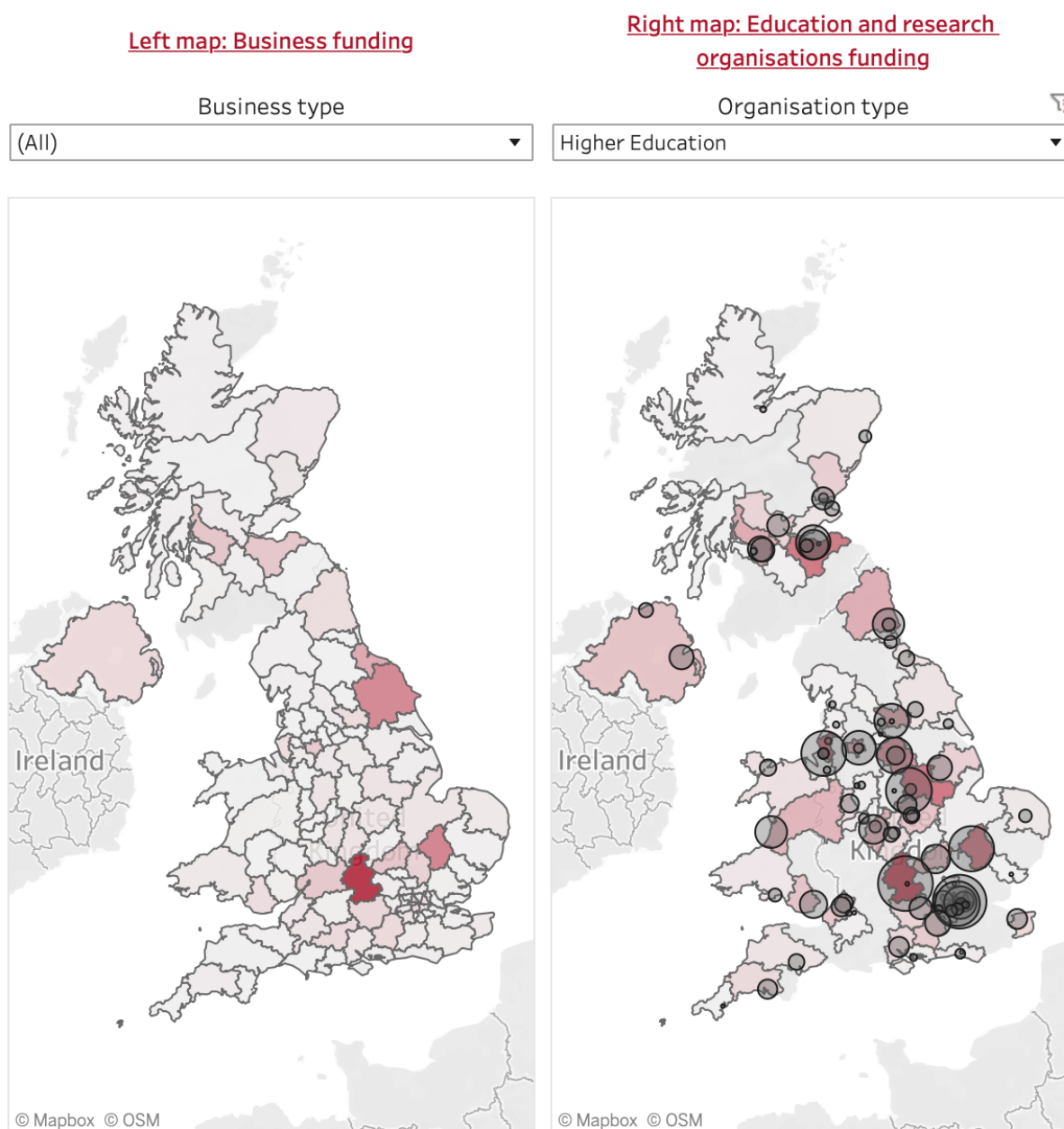
The tendency for funding for universities in the healthcare sector to be concentrated in London and the South East is also reflected in funding for businesses, with the East of England also prominent. The South East received £217m (23%) of all funding for businesses in this sector, followed by the East of England receiving £148m (16%); London receiving £135m (15%); and Yorkshire and the Humber receiving £99m (11%). This funding is also centred on major innovation clusters in these areas: businesses in the Oxford and Cambridge postcode areas received the most funding in their respective regions for this sector, both for all businesses and SMEs. London, the South East and the East of England are the three regions which

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<sup>61</sup> Dearmon, J., Evans, R., Greve, R. and Baksi, S. (2018). *The Economic and Social Impact of Headquarters and Headquarter Relocations*. Retrieved from: [www.okcu.edu/uploads/business/docs/Economics-of-Headquarter-Cities--Final-Draft.pdf](http://www.okcu.edu/uploads/business/docs/Economics-of-Headquarter-Cities--Final-Draft.pdf)

employ the most people in the healthcare sector (SIC1 Q).<sup>62</sup> This, and the presence of many prominent university research departments in the sector, may be contributing factors to this concentration of research funding.

Figure 3: Visualisation example - Innovate UK project funding (ageing society, health and nutrition), 2003 to 2019



### Clean Growth

No clear regional pattern was observable across the different funds for universities in this sector, but in Innovate UK funding for businesses there was a skew towards London, the South East and Scotland. Businesses in London accounted for the

<sup>62</sup> ONS (2020). *Business population estimates 2019*. Retrieved from: [www.gov.uk/government/statistics/business-population-estimates-2019](http://www.gov.uk/government/statistics/business-population-estimates-2019)

greatest sum of allocations, receiving 21% of funding both overall (£125m) and for SMEs only (£79m). London is the joint-fourth largest region in the energy sector by number of employees. The South East, which employs the most people in the energy sector (SIC1 BDE), accounted for 18% of funding both to all businesses (£102m) and SMEs (£68m).<sup>63</sup> Oxford and East Central London were the leading postcodes for their regions, both for all businesses and for SMEs only. A headquarter effect may also be observed in Scotland, which employs the second-most people in the sector.<sup>64</sup> Scotland was third in terms of funding for all businesses (£88m, or 15%) and fourth for SMEs (£42m, or 11%), after London, the South East and the South West. For large businesses, the greatest proportion of Scottish funding was allocated to firms in the Glasgow postcode area (£33m), while firms in the Orkney postcode of Kirkwall received the most funding when large businesses were excluded (£12m).

### **The Future of Mobility**

As mentioned previously, it should be noted that both the funding area of Manufacturing, Materials and Mobility, and the SIC1 code C, are much broader than activities directly relevant to this Grand Challenge. The leading region of funding for universities in Manufacturing, Materials and Mobility was Yorkshire and the Humber, receiving £118m, followed by the West Midlands receiving £105m. The West Midlands has the second-highest density of its labour force employed in manufacturing (SIC1 C), and the greatest number of people in this sector.<sup>65</sup> However, businesses in the West Midlands come third to the South East and London for funding across all businesses. The West Midlands is also overtaken by the East of England when large businesses are excluded. Businesses in London received the most funding in manufacturing (£778m, or 27% of all funding for businesses), even though this region has the lowest proportion of its labour force employed in manufacturing, and is eighth for number of people employed in this sector.<sup>66</sup> When large businesses are excluded, businesses in London received the third-greatest amount of funding after the South East and the East of England, accounting for £113m (13%). Businesses in the South East received the second-most funding at £474m (17%); this was £193m (22%) for SMEs. The South East has the second-lowest density of jobs in manufacturing, but it employs the most people in this sector after the West Midlands, which may explain its high position. All businesses in the

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<sup>63</sup> ONS (2020). *Business population estimates 2019*. Retrieved from: [www.gov.uk/government/statistics/business-population-estimates-2019](http://www.gov.uk/government/statistics/business-population-estimates-2019)

<sup>64</sup> ONS (2020). *Business population estimates 2019*. Retrieved from: [www.gov.uk/government/statistics/business-population-estimates-2019](http://www.gov.uk/government/statistics/business-population-estimates-2019)

<sup>65</sup> ONS (2017). *The spatial distribution of industries in Great Britain*. Retrieved from: [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/t hespatialdistributionofindustriesingreatbritain/2015](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/t hespatialdistributionofindustriesingreatbritain/2015)

<sup>66</sup> ONS (2017). *The spatial distribution of industries in Great Britain*. Retrieved from: [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/t hespatialdistributionofindustriesingreatbritain/2015](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/t hespatialdistributionofindustriesingreatbritain/2015)

<sup>66</sup> ONS (2020). *Business population estimates 2019*. Retrieved from: [www.gov.uk/government/statistics/business-population-estimates-2019](http://www.gov.uk/government/statistics/business-population-estimates-2019)

West Midlands received £417m (15%), and SMEs received £99m (11%). Businesses in the East Midlands, the region with the largest proportion of its labour force in this sector, received the sixth-most funding at £166m (6%).

### AI and Data Economy

An appropriate sector code cannot be identified to correspond to this funding pot, making it difficult to evaluate to what extent the funding allocations reflect industry size and density in different regions. However, the concentration of funding in London, the South East and the East of England does reflect the broad tendency observed elsewhere in this data and is consistent with the R&D-intensive, knowledge-based economy in these areas.<sup>67</sup> Businesses in London received the greatest proportion of funding for businesses in this sector at £100m (31%); for SMEs, this was £68m (34%). Firms located in the South East received the second-greatest amount both for all businesses (£63m, or 19%) and SMEs (£42m, or 21%). The East of England was third for all funding for businesses (£60m, or 20%), and fifth for SMEs (£15m, or 7%). Finally, the South West and Scotland were third and fourth respectively for SME funding in this sector, receiving £16m (8%) each.

### Summary

Across all sectors, there is a concentration of funding for businesses in London and the South East, while academic funding is more widely distributed. This is maintained even when large businesses are removed from the data, and when size of sector by employment is taken into account. There is not a clear correlation between funding for academic and business projects. This may be due to limited link-up between academic institutions and businesses, or it may be attributable to the mechanisms by which the funding is allocated. Some innovation clusters have developed near institutions, particularly in the Golden Triangle. There remains work to be done on strengthening innovation clusters elsewhere. While the relationship between challenge-specific funding allocated to universities and firms is not always clear, universities do represent a distributed, pervasive system of research institutions. The funding to universities currently has a much wider geographical distribution than the equivalent funding to businesses, with the exception of healthcare. In this way, universities have drawn sector-specific funding to their regions: further analysis of this data may reveal how this work interacts with regional economies. Universities have a clear role in the R&D roadmap boosting the economy and supporting recovery from COVID-19; it will be important to identify how they can best be used to innovate across the country and ensure that regional economies can benefit.

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<sup>67</sup> Forth, T. and Jones, R.A.L. (2020). *The Missing £4 Billion: Making R&D work for the whole UK*. Retrieved from: [http://media.nesta.org.uk/documents/The\\_Missing\\_4\\_Billion\\_Making\\_RD\\_work\\_for\\_the\\_whole\\_UK\\_v4.pdf](http://media.nesta.org.uk/documents/The_Missing_4_Billion_Making_RD_work_for_the_whole_UK_v4.pdf)

## Key findings

- Funding to universities is distributed more widely than funding to business, particularly among research-intensive institutions, but there is a clear skew towards London and the South East in Ageing Society and AI & Data Economy. There is only limited evidence for a relationship between funding to universities and funding to business.
- Funding for Clean Growth is quite widely distributed for universities - London, Scotland, and the South East lead funding for businesses. Universities in the West Midlands, the East Midlands and Yorkshire and the Humber account for the greatest proportions of funding in the Future of Mobility. This is consistent with high proportions of the workforce being employed in manufacturing workforce in the Midlands, and there is evidence of mutually beneficial collaborative relationships between universities and Catapult Centres in this field.
- In most Grand Challenges, funding to business is concentrated in London and the South East even when large businesses are removed to mitigate the headquarter effect. In healthcare, this is consistent with the workforce: London and the South East employ the greatest number of people in this sector. However, this also applies where a small proportion of the workforce is employed in the sector: for example, in manufacturing and mobility, businesses in London and the South East receive more funding than the West Midlands, which employs the highest proportion of people in manufacturing.

## Section 3: Skills development

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The ambitions of the UK's Industrial Strategy include creating better, higher paying jobs in every part of the UK and addressing the long tail of underperforming businesses. The Strategy highlighted that the UK's successful labour market is "underpinned by a world-class higher education system, the first choice of students and researchers around the world".<sup>68</sup> The Strategy also noted a number of challenges to meeting business needs for talent and skills, identifying improvements to the technical education system, skills shortages in STEM, regional disparities in skills and education, and barriers to under-represented groups accessing and succeeding in the labour market. It set out three policies to mitigate these challenges including: establishing a technical education system to match the higher-education system; investing £460m in STEM, digital and technical education; and creating a National Retraining Scheme to support lifelong learning and re-skilling.

Universities and colleges in the UK are well-placed to support these ambitions through the teaching and awarding of qualifications, job creation in the local area, facilitating education-business partnerships such as work placements and training provision, and measures to provide equal opportunities to upskill, reskill and broaden participation.

This chapter focuses on the student journey as a life-long learning experience and explores the following questions:

- **How do universities and colleges contribute to upskilling the UK population?**
- **To what extent are regions able to retain their graduates?**
- **What are the key skills required by industry and local areas and how far do graduates meet these needs?**

### Data sources

This section uses data from HESA's Destinations of Leavers from Higher Education (DLHE) Survey, which asks graduates about their activities six months after completing their studies. This includes information on employment or study activities. In 2016/17, 79% of UK-domiciled graduates responded to the DLHE.<sup>69</sup> This section also uses data from the DfE Employer Skills Survey (ESS), which asks UK

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<sup>68</sup> BEIS (2017). *Industrial Strategy: building a Britain fit for the future*, November. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

<sup>69</sup> HESA (2018). *Figure 3 – Response rates to the Destinations of Leavers from Higher Education (DLHE) survey by domicile*. Retrieved from: [www.hesa.ac.uk/data-and-analysis/sfr250/figure-3](http://www.hesa.ac.uk/data-and-analysis/sfr250/figure-3)



employers about the skills challenges that they face in their workforces and when recruiting. For the 2017 ESS, 87,430 employers took part in the survey.<sup>70</sup>

## How do universities and colleges contribute to upskilling the UK population?

Access to higher education has been signalled as a basic tenet of economic success,<sup>71</sup> and higher education has been shown to qualify people in ways that makes them more productive in the workplace. Widening access to further and higher education, and efforts toward greater parity in attainment, are essential to developing a diverse pipeline of talent. This talent either is channelled into further study to contribute to research and innovation activities, or into the labour market to address employment skills needs.

A diverse workforce drives economic growth.<sup>72</sup> Universities and colleges invest in measures to raise aspirations among less represented groups, to encourage them to participate and succeed in their education. The more diverse the cohorts of students entering these sectors are, the more diverse the workforce can become. However, differences in regional, demographic, and economic background contribute to disparities in access to further and higher-level education. This can impact an individual's potential for success in employment (or further study) after graduation and prevent labour force diversity.

### Raising aspirations

In 2019, there was a record UK 18-year-old entry rate to undergraduate courses through UCAS (34.1%).<sup>73</sup> However, participation rates into higher education vary among young people from different backgrounds, with socio-economic background, gender, disability status, ethnicity and region of domicile all affecting a student's ability to study and succeed at a higher level. According to research by the Confederation of British Industry, disparities in education and skills are the biggest drivers of regional variation in productivity, and "ensuring strong school performance and children getting the best results at GCSE (or equivalent) is the single most important driver of productivity differences across the UK".<sup>74</sup>

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<sup>70</sup> DfE, IFF Research (2018). *Employer Skills Survey 2017: Research Report*. Retrieved from: [http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/746493/ESS\\_2017\\_UK\\_Report\\_Controlled\\_v06.00.pdf](http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746493/ESS_2017_UK_Report_Controlled_v06.00.pdf)

<sup>71</sup> Morgan, J. (2013). *Undergraduate numbers cap "to be abolished"*. Retrieved from: [www.timeshighereducation.com/news/undergraduate-numbers-cap-to-be-abolished-osborne/2009667.article](http://www.timeshighereducation.com/news/undergraduate-numbers-cap-to-be-abolished-osborne/2009667.article)

<sup>72</sup> See Forbes, Mercer and the Harvard Business Review

<sup>73</sup> UCAS (2019). *UCAS End of Cycle Report 2019. Chapter 1: Summary of Applicants and Acceptances*. Retrieved from: <https://www.ucas.com/file/292736/download?token=xurFczbC>

<sup>74</sup> CBI/Pearson (2017). *Education and Skills Survey: Helping the UK Thrive* [www.cbi.org.uk/media/1341/helping-the-uk-to-thrive-tess-2017.pdf](http://www.cbi.org.uk/media/1341/helping-the-uk-to-thrive-tess-2017.pdf)



Young people's outcomes vary at every phase of the education pathway and disparity in opportunities to succeed in early education often limit an individual's choices for continuing education. Universities and schools partner in many ways to raise aspiration and attainment across schools. For example, universities support curriculum design, provide educational research and provide subject-specific learning.<sup>75</sup> Initiatives are often tailored to local contexts and needs.

## Supporting life-long learning

As well as inequalities that exist in the earlier stages of education, there can be other lost opportunities to education and training. The Industrial Strategy highlights that continuous learning and reskilling opportunities support solutions to the UK's Grand Challenges. Employer demand for high-level skills is growing, with results from the CBI/Pearson Education and Skills Survey showing that nearly nine in ten (85%) businesses either maintained or increased their graduate recruitment in 2019.<sup>76</sup> A report from the Industrial Strategy Council highlights that an urgent shift to a new norm of lifelong learning in the UK workforce is required to help address the scale of skills mismatch anticipated over the next ten years.<sup>77</sup>

Activities that create value from exploiting knowledge, technology and creativity drive growth in employment and in the economy.<sup>78</sup> A knowledge-led economy will not only need to recruit an increasing number of higher skilled employees, but will also need to upskill and reskill existing workers.<sup>79</sup> These changes will occur within the context of an ageing population, which could exacerbate the supply of talent, as generations of workers retire. One estimate of total replacement demand between 2016 and 2026 stands at 13.1 million openings.<sup>80</sup>

These trends may require some changes to the approaches taken to post-18 education and training, with more attention paid to the years beyond the immediate post-18 period. Increased availability of flexible lifelong learning is a key solution. However, the 2012 Fee Reforms in England, and 2012/13 changes to income-contingent loan eligibility, marked a decline in numbers of part-time and mature learners. Supporting these "lost learners" to upskill and reskill is integral as an

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<sup>75</sup> UUK (2017). *Raising attainment through university-school partnerships*, November. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/Raising-attainment-through-university-school-partnerships.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/Raising-attainment-through-university-school-partnerships.pdf)

<sup>76</sup> CBI/Pearson (2019). *Education and Skills Survey report: Education and Learning for the Modern World*. Retrieved from: [www.cbi.org.uk/media/3841/12546\\_tess\\_2019.pdf](http://www.cbi.org.uk/media/3841/12546_tess_2019.pdf)

<sup>77</sup> ISC (2019). *UK Skill Mismatch in 2030*. Retrieved from: [http://industrialstrategycouncil.org/sites/default/files/UK\\_Skills\\_Mismatch\\_2030\\_-\\_Research\\_Paper.pdf](http://industrialstrategycouncil.org/sites/default/files/UK_Skills_Mismatch_2030_-_Research_Paper.pdf)

<sup>78</sup> Wyckoff, A. (2013). *Knowledge is growth*. Retrieved from: [www.oecd.org/innovation/knowledge-is-growth.htm](http://www.oecd.org/innovation/knowledge-is-growth.htm)

<sup>79</sup> World Economic Forum (2016). *The Future of Jobs*. Retrieved from: <http://reports.weforum.org/future-of-jobs-2016/>

<sup>80</sup> Government Office for Science (2016). *The UK skills mix: Current trends and future needs*. Retrieved from:

[http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/571675/ER5\\_The\\_UK\\_s\\_Skills\\_Mix\\_Current\\_Trends\\_and\\_Future\\_Needs.pdf](http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/571675/ER5_The_UK_s_Skills_Mix_Current_Trends_and_Future_Needs.pdf)

“urgent shift to a new norm of lifelong learning in the UK workforce is required”.<sup>81</sup> Employers and government have a role in facilitating this as well as education providers.

HESA student record data highlights a decline across all regions in England in attracting potential students to higher education through any route except the post-18 full-time education pathway, with a decline in numbers of entrants into part-time study and participation in adult learning being at a 23-year low.<sup>82</sup> In 2018, a Universities UK survey found that 26% of respondents chose not to enrol in part-time study because the course was not flexible enough to fit alongside other life commitments.<sup>83</sup> In recent years, the higher education sector has been adjusting its flexible learning opportunities to include employer-based and online learning, but there are barriers to delivering this provision.<sup>84</sup>

The anticipated scale and type of skills shortfall cannot be addressed through formal education pathways such as further and higher education qualifications alone; workplace learning is a vital requirement to address skill shortages in which employers and government as well as the education sector, will have roles to play in reskilling and upskilling the workforce.<sup>85</sup>

## Alternative routes to skills

Universities and colleges provide several flexible routes to education, sometimes collaboratively, in order to develop skills. These include the following:

- **Level 4 and 5 education.** There are more than 200,000 learners of Level 4/5 education across the UK, of which 60% are over 25 and 50% studying part-time.<sup>86</sup> Level 4 and 5 qualifications are often developed to respond to specific employer needs and address local skills shortages, particularly in engineering and construction. It is a valuable progression point, with 49% of Level 4 and 5 programmes providing routes to employment and 30% providing routes to higher learning. Employers consider technical and vocational qualifications to be one of the key skills they are seeking in graduate recruitment.<sup>87</sup>

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<sup>81</sup> BEIS (2017). *Industrial Strategy: building a Britain fit for the future*, November. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

<sup>82</sup> Learning and Work Institute (2019). *Adult Participation in Learning Survey*. Retrieved from: <https://learningandwork.org.uk/resources/research-and-reports/adult-participation-in-learning-survey-2019/>

<sup>83</sup> UUK (2018). *Lost Learners*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/lost-learners.aspx](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/lost-learners.aspx)

<sup>84</sup> UUK (2019) *Flexible learning: the current state of play in UK higher education*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2018/flexible-learning-the-current-state-of-play-in-higher-education.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2018/flexible-learning-the-current-state-of-play-in-higher-education.pdf)

<sup>85</sup> ISC (2019) *UK Skill Mismatch 2030*. Retrieved from: [http://industrialstrategyCouncil.org/sites/default/files/UK\\_Skills\\_Mismatch\\_2030\\_-\\_Research\\_Paper.pdf](http://industrialstrategyCouncil.org/sites/default/files/UK_Skills_Mismatch_2030_-_Research_Paper.pdf)

<sup>86</sup> UUK (2020). *Level 4/5 education*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/level4-5-parliamentary-briefing-v3.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2020/level4-5-parliamentary-briefing-v3.pdf)

<sup>87</sup> CBI/Pearson (2019). *Education and Skills Survey report: Education and Learning for the Modern World*. Retrieved from: [www.cbi.org.uk/media/3841/12546\\_tess\\_2019.pdf](http://www.cbi.org.uk/media/3841/12546_tess_2019.pdf)

- **Apprenticeships and degree apprenticeships.** Apprenticeships enable employers to develop employees with relevant skills and behaviours, and to offer upskilling opportunities for employees at various stages of their careers. There has been significant growth in the number of firms enrolling current employees onto higher-level programmes in order to upskill or reskill their current workforce.<sup>88</sup> Apprenticeships are co-designed by employers and training providers (usually a university in the case of degree apprenticeships), with the needs of employers in mind so that they directly address skills shortages. Degree apprenticeships are referenced in the Industrial Strategy, where apprenticeships are viewed as playing a key role in closing the skills gap, so that the UK remains competitive in global markets.<sup>89</sup>

Despite these options available, take-up has been mixed. Although there is demand for level 4/5 learners, there has been a significant decline in the past few years.<sup>90</sup> Recent research from the Social Mobility Commission suggests that apprenticeships “are one of the most effective means of boosting social mobility for workers from poorer backgrounds,” but also that participation of workers from disadvantaged backgrounds is falling.<sup>91</sup>

DfE’s post-18 review of education and funding stated that was a mismatch between apprenticeship strategies across the UK and Industrial Strategy requirements.<sup>92</sup> A shortage of these skills suggests there is an opportunity to develop more apprenticeships at these levels. In an employer-led system, the establishment of more higher-level apprenticeships “needs to be driven by employer demand, to meet specific occupational needs”, while research also suggests a need for alignment between different levels of apprenticeship standards to support progression.<sup>93</sup> Introducing greater flexibility could strengthen the system further.<sup>94</sup>

Given reforms to apprenticeships, the introduction of the Levy, and the establishment of degree apprenticeships are relatively new policy positions for the education sector, it is difficult to assess whether these developments will support greater

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<sup>88</sup> CBI/Pearson (2019). *Education and Skills Survey report: Education and Learning for the Modern World*. Retrieved from: [www.cbi.org.uk/media/3841/12546\\_tess\\_2019.pdf](http://www.cbi.org.uk/media/3841/12546_tess_2019.pdf)

<sup>89</sup> BEIS (2017). *Industrial Strategy: building a Britain fit for the future*, November. Retrieved from: [www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future](http://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future)

<sup>90</sup> HEPI (2018). *Filling in the biggest skills gap: Increasing learning at Levels 4 and 5*. Retrieved from: [www.hepi.ac.uk/2018/08/23/6393/](http://www.hepi.ac.uk/2018/08/23/6393/)

<sup>91</sup> Social Mobility Commission (2020). *Apprenticeships and social mobility: fulfilling potential*. Retrieved from: [http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/894303/Apprenticeships\\_and\\_social\\_mobility\\_report.pdf](http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/894303/Apprenticeships_and_social_mobility_report.pdf)

<sup>92</sup> DfE (2019). *Post-18 review of education and funding: independent panel report* [www.gov.uk/government/publications/post-18-review-of-education-and-funding-independent-panel-report](http://www.gov.uk/government/publications/post-18-review-of-education-and-funding-independent-panel-report)

<sup>93</sup> UUK (2019). *The Future of Degree Apprenticeships*. Retrieved from: <https://universitiesuk.ac.uk/policy-and-analysis/reports/Pages/future-of-degree-apprenticeships.aspx>

<sup>94</sup> ISC (2020) *Annual Report*. Retrieved from: <http://industrialstrategyCouncil.org/sites/default/files/attachments/ISC Annual Report 2020.pdf>

participation of people from disadvantaged backgrounds, but initial findings suggest they have the potential to do so.<sup>95</sup>

## To what extent are regions able to retain their graduates?

The extent to which graduates are retained in a region will depend on several social and economic factors, this could include the scale and scope of a region's employment, skills needs, and links between education and industries. With this mind, increasing retention could help to address skills shortages and drive growth and productivity.<sup>96</sup> Understanding patterns in graduate mobility across the UK can also help to build a picture of graduate populations and the movement of their skill-sets to different parts of the UK. This will help determine how business and industry can best use the knowledge and talent available.

The movement of large numbers of graduates from across the UK into London for work is known as graduate "brain-drain" and is particularly true of graduates who move to a region in order to attend university. The idea of graduate brain drain formed part of regional economic policy to combat regional disparities in productivity. However, regions seeking to retain graduates in their local areas have struggled to make headway on this issue. Previous research from UPP suggested that, nationally, 48% of students consider moving after graduation, but significant regional variation shows that only 35% of London students contemplated a move compared to 63% in the West Midlands.<sup>97</sup> Research from Centre for Cities suggests that, although most cities experience a "brain gain", the potential gain from "bouncers" staying (those who go to study in a city then move away after graduation) would be much greater. The research adds that London "pulls in more graduates than its share of jobs would suggest" and notes that "the future economic success of the UK is increasingly dependent on the ability of its cities to both attract and retain talent".<sup>98</sup>

The motivations that lead graduates to move away from their region of study are complex, but often stem from a combination of short- and longer-term career considerations.<sup>99</sup> Job prospects and salary are important considerations when choosing whether to stay in the town or city of study. ONS data showed that in 2019,

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<sup>95</sup> OfS (2019). *Degree Apprenticeships: A viable alternative?* Retrieved from: [www.officeforstudents.org.uk/media/c791216f-a1f1-4196-83c4-1449dbd013f0/insight-2-degree-apprenticeships.pdf](http://www.officeforstudents.org.uk/media/c791216f-a1f1-4196-83c4-1449dbd013f0/insight-2-degree-apprenticeships.pdf)

<sup>96</sup> UUK (2017). *Graduate retention: Meeting local skills needs*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/graduate-retention-meeting-local-skills-needs.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2017/graduate-retention-meeting-local-skills-needs.pdf)

<sup>97</sup> UPP (2017). *Skills to pay the bills*. Retrieved from: [www.upp-ltd.com/brain-drain-jobs-housing-forcing-almost-half-graduates-leave-university-town/](http://www.upp-ltd.com/brain-drain-jobs-housing-forcing-almost-half-graduates-leave-university-town/)

<sup>98</sup> Centre for Cities (2016). *The Great British Brain Drain*. Retrieved from: [www.centreforcities.org/reader/great-british-brain-drain/](http://www.centreforcities.org/reader/great-british-brain-drain/)

<sup>99</sup> Centre for Cities (2016). *The Great British Brain Drain*. Retrieved from: [www.centreforcities.org/publication/great-british-brain-drain-where-graduates-move-and-why/](http://www.centreforcities.org/publication/great-british-brain-drain-where-graduates-move-and-why/)

8.7% of employee jobs in London were low-paid, compared with an average of 16.2% in the rest of the UK. London also had a higher proportion of high-paid jobs compared with the rest of the UK (42.5% compared with an average of 25.4%, respectively) further embedding London as an attractive destination for work.<sup>100</sup> However, research in 2019 from Unite Students found that students prioritised finding a job they were passionate about (62%) and financial security (59%) over wealth (13%) or seniority (13%).<sup>101</sup>

## Regional movement of UK-domiciled graduates in UK work

### Visualisations:

[S1: Regional movement of UK-domiciled graduates in work, 2012/13 to 2016/17](#)

Graduate mobility into employment across the UK is an important component to ensure higher-level skill shortages are best met. It is undesirable for both individuals and the economy to retain graduates in regions where their skillset is not in demand. Retention is important however, where skill shortage vacancies exist, and where employers may benefit from hiring graduates but are not doing so. Mobility and retention must be considered in the context of the individual, local area and wider economy. For example, given regional wage disparities in the UK, any work that universities outside London and the South East undertake to encourage graduate retention may in fact damage the perceived value of the education they have provided. Additionally, research has found that graduates from lower socio-economic backgrounds are less likely to be mobile, but have better outcomes if they are.<sup>102</sup> This implies that while this group of graduates may be the easiest to retain, encouraging them to seek employment in the same region that they were domiciled and studied in, may have an adverse effect on their career outcomes.

Analysis of the HESA DLHE survey shows that, in 2016/17, Scotland (95%), Northern Ireland (73%) and the North East of England (65%) had the highest proportions of working UK first degree graduates who stayed in their home domicile to study at a higher education provider. Scotland (88%), London (79%) and Northern Ireland (79%) had the highest proportions of working UK graduates who returned or remained at their home domiciles to work. The East of England had the lowest percentage of leavers who went into work in the same region as their domicile (52%).

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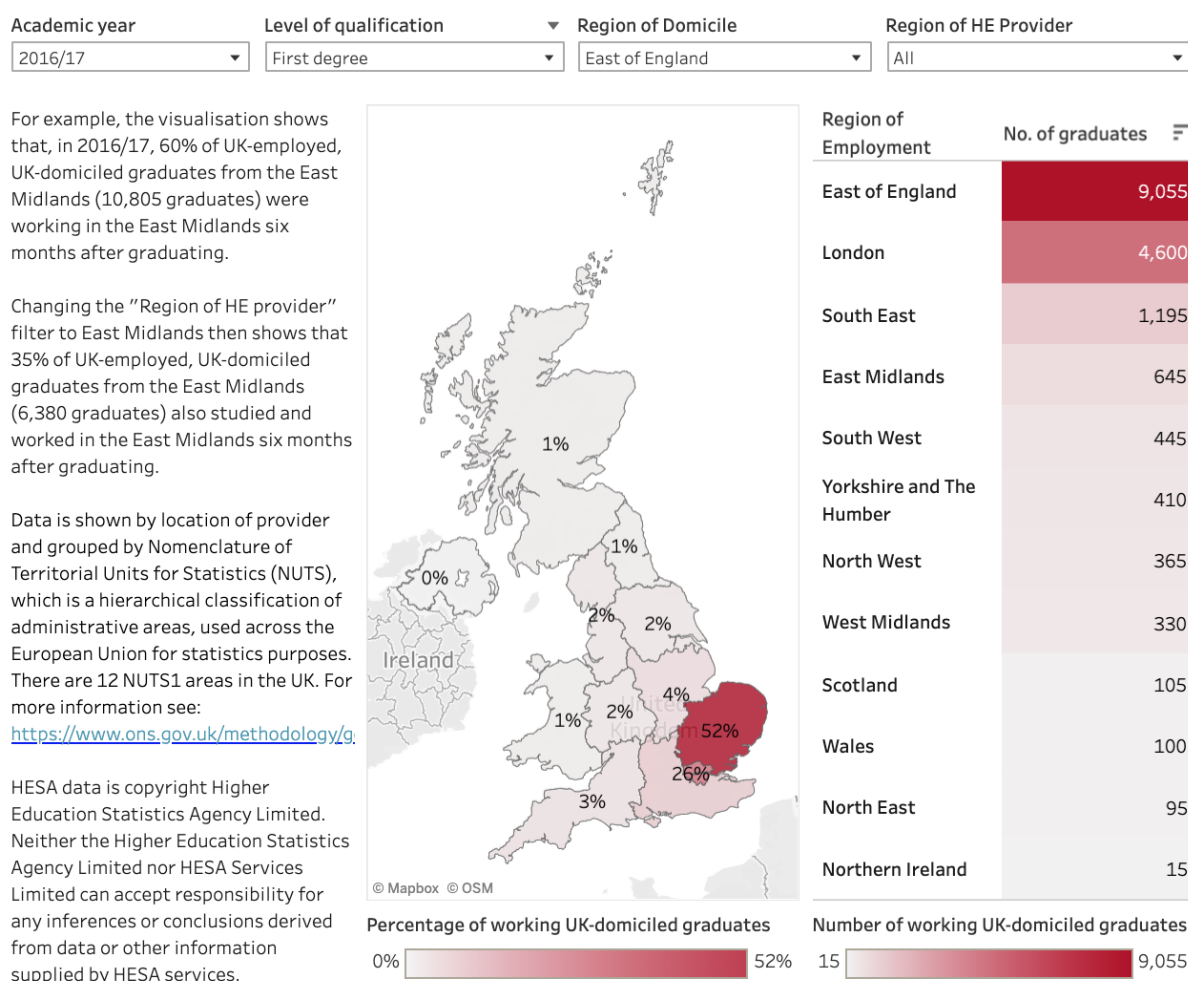
<sup>100</sup> ONS (2019). *Low and high pay in the UK*. Retrieved from: [www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/lowandhighpayuk/2019](http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/lowandhighpayuk/2019)

<sup>101</sup> UNITE students (2019). *The New Realists: Unite Students Insights report*. Retrieved from: [www.unite-group.co.uk/campaign/new-realists-report](http://www.unite-group.co.uk/campaign/new-realists-report)

<sup>102</sup> The Bridge Group (2016). *Inspiring Policy: Graduate Outcomes and Social Mobility*. Retrieved from: [www.thebridgegroup.org.uk/research-2016](http://www.thebridgegroup.org.uk/research-2016)



Figure 4: Visualisation example - Regional movement of UK-domiciled graduates in work, 2016/17



Patterns in how graduates move across the UK can highlight potential opportunities for more targeted retention. However, research on graduate movement and migration has shown the movement of graduates is impacted by several factors, and low regional retention does not imply a region being “worse off”. A graduate’s employment location is often affected by their home and university region. To explore this further, graduates working in a given area can be assigned to one of the following four groups shown in Box 3, categorised by HECSU.<sup>103</sup>

**Visualisations:**

[S2: Graduate migration patterns from domicile to location of employment, 2012/13 to 2016/17](#)

<sup>103</sup> HECSU (2015). *Graduate Migration Patterns*. Retrieved from: [https://hecsu.ac.uk/assets/assets/documents/hecsu\\_graduate\\_migration\\_report\\_january\\_15.pdf](https://hecsu.ac.uk/assets/assets/documents/hecsu_graduate_migration_report_january_15.pdf)



### Box 3: Regional movement of graduates: Loyals, stayers, returners, incomers

- **Loyals** do not move region. They study and work in the region in which they were originally domiciled. They made up 45% of 2016/17 graduates and are consistently the largest group of graduates.
- **Stayers** move away from their home region to another region to study and stay there to work. They made up 13% of 2016/17 graduates.
- **Returners** move to another region to study and then return home to work. 24% of 2016/17 graduates were Returners, they made up a particularly large proportion of employed graduates in the east, south-east and West Midlands respectively.
- **Incomers** find work in a region away from both their home and where they studied. They made up 18% of 2016/17 graduates. Over a third of all 2016/17 graduates working in London were Incomers.

In every region except London and the East of England, the largest graduate type is “Loyals”. This is important for universities who seek to better align their curriculums with the needs of local and regional industries. The proportion of “Incomers” is greater the closer a region is to the employment hotspot of London, and the Scottish labour market now sees more “Loyals” than Northern Ireland. The graduate brain-drain is especially true of graduates who moved to a region in order to attend university (“Stayers”, or “Returners”). As mentioned, while places outside of London do retain their graduates, cities do not retain most students who move there specifically to study.<sup>104</sup>

At a time when the “skills gap” has become one of the biggest barriers to national economic growth, and when local and regional uplift are key goals for the Government, universities and colleges may need to consider whether their courses are serving the needs of industry in their regions. As the data shows that most graduates will work in their region of study, universities and colleges are well-placed to align with the needs of local industry and close local skill gaps. Conversely, providers should also facilitate graduate movement and distribute skills across the UK to ensure that regional skills gaps can be addressed and to assert their crucial role in the skills system.

## What are the key skills required by industry and local areas and how far do graduates meet these needs?

### Skills shortages and graduates in professional employment

#### **Visualisations:**

[S3: Graduate retention and employer vacancies, 2017](#)

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<sup>104</sup> Centre for Cities (2016). *The Great British Brain Drain*. Retrieved from: [www.centreforcities.org/reader/great-british-brain-drain/](http://www.centreforcities.org/reader/great-british-brain-drain/)

The UK is facing a shortage of higher-level skills, and there are fewer graduates than the number of vacancies. This deficit is projected to continue until 2022, with estimates predicting shortages of up to 8%.<sup>105</sup> Research in 2019 identified that despite 94% of businesses reporting extensive links between schools, colleges and universities, nearly half were not confident in their ability to recruit higher skills.<sup>106</sup>

The DfE's biennial Employer Skills Survey (ESS) provides labour market intelligence on the skills challenges faced by UK employers. The last survey was conducted between May and October 2017. The ESS found that 13% of employers reported skills gaps in their workforce. Focusing on vacancies, 67% of hard-to-fill vacancies were caused, at least in part, by a lack of skills, qualifications or experience among applicants. These are known as "skills shortage vacancies" or SSVs. Overall in 2017, 22% of ESS-reported UK vacancies were identified as SSVs.<sup>107</sup>

The HESA DLHE survey collects data on the number of graduates in "professional employment".<sup>108</sup> Overall, in 2016/17, 42% of UK-domiciled, first degree graduates in UK employment worked in professional employment the same region they studied in six months after graduating. This varied by region, from 68% in Northern Ireland to 31% in the East Midlands. Of the same working cohort, 10% were not retained in their regions of study and were working in non-professional employment. It may be helpful to investigate whether these graduates could fill professional roles in their study regions.

## Addressing skills needs

The data suggests that there might be scope for graduates to fill the skills vacancies identified by employers. Specific skills needs and occupational vacancies vary across the regions, and will depend on local requirements. Lack of regional retention may imply that vacancies are more readily available elsewhere. However, at present, the skills vacancy data is only available by region or sector, without intersectionality.

Universities and colleges could consider the specific skills gaps identified by employers. For example, the ESS 2017 survey found that, of the employers who identified skills development needs among staff, 49% needed development of digital skills, 44% needed complex analytical skills, 53% needed management and

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<sup>105</sup> UUK (2015). *Supply and Demand for Higher-Level Skills*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2015/supply-and-demand-for-higher-level-skills.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2015/supply-and-demand-for-higher-level-skills.pdf)

<sup>106</sup> CBI/Pearson (2019). *Education and learning for the modern world*. Retrieved from: [www.cbi.org.uk/media/3841/12546\\_tess\\_2019.pdf](http://www.cbi.org.uk/media/3841/12546_tess_2019.pdf)

<sup>107</sup> DfE, IFF Research (2018). *Employer Skills Survey 2017: Research Report*. Retrieved from: [http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/746493/ESS\\_2017\\_UK\\_Report\\_Controlled\\_v06.00.pdf](http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746493/ESS_2017_UK_Report_Controlled_v06.00.pdf)

<sup>108</sup> "Professional occupations" means jobs coded 1 (managers, directors and senior officials), 2 (professional occupations), or 3 (associate professional and technical occupations) in the Standard Occupation Classification. See [www.hesa.ac.uk/support/documentation/occupational/soc2010](http://www.hesa.ac.uk/support/documentation/occupational/soc2010)

leadership skills, and 52% needed self-management skills.<sup>109</sup> Previous research from the Industrial Strategy Council notes that companies value strong relationships with HE providers and collaborate on the content and format of degree apprenticeships.<sup>110</sup> Further it could be helpful to improve understanding of why graduates choose to work in professions different to those of their study areas.<sup>111</sup>

Research from the Government Office for Science noted that although retaining or attracting graduates and high-skilled workers could improve productivity in under-performing cities, there should be more than a “zero-sum game” approach (whereby regions simply take more graduates from other areas). It also suggested that productivity “could be raised by city-level measures focused on improving the city-graduate experience”. This includes “synchronising learning, employers and work”, “building long-term engagement between SMEs and graduates”, “developing the ecosystem for knowledge-rich enterprise”, “establishing knowledge-economy strategies in cities” and “gathering better data to support graduate careers”.<sup>112</sup>

## Key findings

- Widening access to the variety of technical, further, and higher education pathways highlighted is essential for the pipeline of new skilled-employees and the reskilling/upskilling of those already in the workforce. Successful innovation can be achieved through upgrading skills and collaboration and is especially impactful when collaborative between further education, higher education, and business; examples of which are happening across the UK.
- Graduate migration patterns to region and sector of employment are complex and influenced by a variety of factors, both economic and non-economic. Universities have a significant effect on regional innovation performance via the flows of graduates into other regions.
- There is significant variation in rates of graduate progression by region and sector: mapping geographic, subject and employment data together can help employers, government and others to consider where opportunities for reducing skill-shortages and improving skill development for their specific needs may lie.

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<sup>109</sup> DfE, IFF Research (2018). *Employer skills survey 2017: Research report*. Retrieved from: [http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/746493/ESS\\_2017\\_UK\\_Report\\_Controlled\\_v06.00.pdf](http://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746493/ESS_2017_UK_Report_Controlled_v06.00.pdf)

<sup>110</sup> ISC (2020). *Rising to the UK's skills challenges*. Retrieved from: [http://industrialstrategy council.org/sites/default/files/attachments/Rising to the UK%27s skills challenges.pdf](http://industrialstrategy council.org/sites/default/files/attachments/Rising%20to%20the%20UK%27s%20skills%20challenges.pdf)

<sup>111</sup> UUK (2015). *Supply and demand for higher-level skills*. Retrieved from: [www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2015/supply-and-demand-for-higher-level-skills.pdf](http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2015/supply-and-demand-for-higher-level-skills.pdf)

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## Annex: Visualisations

| Knowledge exchange   | Research and innovation  | Skills development  |
|--|--|---|
| <p><u>KE1 to KE3: University affiliated businesses, business services and community engagement, 2014/15 to 2018/19</u></p> <p><u>KE4: Grant funding for Knowledge Transfer Partnerships, 1988 to 2018</u></p>  | <p><u>R1: Innovate UK project funding, 2003 to 2019</u></p> <p><u>R2: Horizon 2020 Societal Challenges, 2014 to 2019</u></p> <p><u>R3: Industrial Strategy Challenge Fund contributions, 2017 to 2020</u></p> <p><u>R4: UK Research Partnerships Investment Fund allocations, 2012 to 2020</u></p> <p><u>R5: Spatial distribution of industries in Great Britain, 2015</u></p> | <p><u>S1: Regional movement of UK-domiciled graduates in work, 2012/13 to 2016/17</u></p> <p><u>S2: Graduate migration patterns from domicile to location of employment, 2012/13 to 2016/17</u></p> <p><u>S3: Graduate retention and employer vacancies, 2017</u></p> |
| <b>Sources</b>   |  |   |
| <p>HESA Higher Education Business and Community Interaction Survey</p> <p>Higher Education Innovation Fund (England) – UKRI</p> <p>University Innovation Fund (Scotland) – SfC</p> <p>Northern Ireland Higher Education Innovation Fund – DfE (NI)</p> <p>Knowledge Transfer Partnerships Portal – Innovate UK</p> | <p>Innovate UK</p> <p>Horizon 2020 Dashboard – European Commission</p> <p>UK Research and Innovation</p> <p>Office for National Statistics</p>   | <p>HESA Destinations of Leavers from Higher Education Survey</p> <p>DfE Employer Skills Survey 2017</p>   |

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