THE ECONOMIC IMPACT OF THE N8 RESEARCH PARTNERSHIP

A REPORT PRODUCED FOR THE N8 RESEARCH PARTNERSHIP BY LONDON ECONOMICS

About London Economics

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Foreword

This report sets out a powerful case: the N8 universities are not only major drivers of economic growth in the North of England – they are also delivering exceptional value for the UK as a whole.

In 2021–22 alone, the eight research-intensive universities that make up the N8 – Durham, Lancaster, Leeds, Liverpool, Manchester, Newcastle, Sheffield and York – contributed £18.8 billion to the UK economy from activities beyond teaching. This includes £8.6 billion from research, £1.7 billion from knowledge exchange, and £8.5 billion from institutional spending. Their activity supported almost 100,000 jobs across the country – with four out of five of those located in the North.

The return on public investment is striking: for every £1 of public funding, N8 research and knowledge exchange activities generated £10 in economic impact. That is world-leading value.

But this is more than an economic calculation. It is a story about how universities act as anchor institutions – rooted in their communities, connected to industry and public services, and essential to place-based innovation and inclusive growth.

From healthtech and ageing research, to materials science, biotech and advanced manufacturing, the N8 universities are working with partners to solve real-world challenges. They are supporting local industries, accelerating start-ups, and creating high-value jobs – all while contributing to the UK's global competitiveness in science and innovation.

The N8 universities are not just part of the North – they are one of the UK's most significant assets with the potential to shape the UK's future prosperity. They are globally competitive in science and research, locally rooted in partnership and purpose, and nationally vital to the Government's ambitions for growth, innovation and opportunity for all.

And yet, our capacity to deliver is now under threat. A combination of inflationary pressures, capped fees, declining international income and research funding constraints is putting universities across the UK under serious financial strain.

This is not just a sector issue. It is a national challenge – because research and innovation are critical to the UK's long-term prosperity and central to delivering the Government's five national missions– in clean energy, health, education, crime and economic growth. These all depend on the very kind of place-based, collaborative innovation that N8 universities specialise in. Whether through developing greener materials, tackling regional health inequalities, building resilient supply chains, or fostering high-tech start-ups in underserved regions, our universities are advancing the UK's strategic objectives every single day.

This report rightly celebrates the productivity spillovers of university research – but these are only part of the picture. Knowledge exchange is not a by-product of academic activity. It includes the proactive, place-based engagement that universities undertake with business, the public sector, communities and civil society. This is what drives local transformation – and national impact.

This report is comprehensive, detailed, and deeply important. It sets out the scale of the economic value that the N8 universities already deliver – and in doing so, it highlights the levers we have at our disposal to go further. It makes clear that regional growth, national productivity, and long-term fiscal resilience are not separate challenges – they are part of the same system, and universities are central to solving them.

In these challenging and volatile times, the UK Government needs to focus investment where it can deliver maximum return. This analysis offers a blueprint for how to do exactly that – by working with the N8 universities to unlock the full power of research, innovation and engagement across the North. What it reveals is not a crisis to be managed, but an opportunity to be seized. With the right support, these institutions can do even more to drive the outcomes that matter most: stronger regions, smarter public spending, and a more productive UK economy.

In that sense, this report is more than a record of impact. It is a map – and a mandate – for purposeful, place-based partnership. By backing institutions that are already delivering, we can build the conditions for sustainable growth, economic resilience, and national renewal.

Charlie Jeffery

Executive Summary

London Economics were commissioned to assess the **impact of N8 universities' research, knowledge exchange activities and institutional expenditures on the UK economy**, focusing on the 2021-22 academic year. The report follows on from a recent analysis by London Economics for Universities UK, considering the economic impact of the entire UK higher education sector in the same academic year (London Economics, 2024a).

The total economic impact on the UK economy associated with N8 universities' **research, knowledge exchange activities and institutional expenditures** in 2021-22 was estimated at approximately **£18.8 billion** (see Table 1).[1] In terms of the components of this impact, the value of N8 universities' research activities stood at **£8.6 billion** (**46%** of total), while N8 universities' knowledge exchange activities generated a further **£1.7 billion** (**9%**) of impact. In addition, the impact associated with N8 universities' institutional expenditures was estimated to be **£8.5 billion** (**45%**).

The total impact of N8 universities' research, knowledge exchange activities and expenditures on the UK economy in 2021-22 stood at £18.8 billion.

Table 1 Total economic impact of N8 universities' research, knowledge exchange activities and institutional expenditures in the UK in 2021-22 (£m and % of total)

Type of impact	£m	%
Impact of research and knowledge exchange	**£10,284m**	**55%**
Research activities	£8,594m	46%
Knowledge exchange activities	£1,689m	9%
Impact of university expenditure	**£8,542m**	**45%**
Direct impact	£3,495m	19%
Indirect and induced impacts	£5,047m	27%
Total economic impact	**£18,826m**	**100%**

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. The percentages show the proportion of total impact associated with the strand/sub-strand of analysis.
Source: London Economics' analysis

However, it should be noted that this presents an underestimate of the total impact of N8 universities' activities, as a range of additional impacts will be generated through the attraction and spending of domestic and international students, associated visits/tourism, and staff and supplier spending. Universities will also contribute significantly to culture, community and social mobility in their local areas and beyond. Further, the analysis does

[1] Parts of our analysis involve the use of indirect and induced multiplier effects, which have recently been removed from accepted methodologies in the revised Green Book (see Section 6.6 (page 57) of HM Treasury (2022)). Whilst the Green Book states that these effects should be excluded when comparing different policy options to each other, it also states that these effects 'may well form part of the higher-level analytical research that informs identification of a policy, and policy priorities', so we continue to include these methodologies in our analysis. However, to arrive at more Green Book compliant estimates, we can adjust our analysis to **remove any indirect and induced effects** that are estimated. Specifically, by removing the total indirect and induced effect estimated across all strands of **£7.2 billion** from our total economic impact of **£18.8 billion**, we arrive as a revised, lower bound estimate of the economic impact of N8 universities' research, knowledge exchange activities and institutional expenditures of **£11.6 billion**.

not take into account the impact of teaching and learning undertaken at N8 institutions, which results in substantial economic impacts through higher lifetime earnings of graduates and the increased productivity of the workforce.

In addition to assessing N8 universities' impact through these channels on the UK economy as a whole, it is also possible to estimate the economic impact of a number of strands of N8 universities' activities by region. Specifically, we estimated the direct, indirect and induced economic impacts of N8 universities' research, knowledge exchange activities and institutional expenditures.[2] Approximately **£12.2 billion** (**65%**) of N8 universities' total impact can be disaggregated geographically, of which approximately **£9.0 billion** (**74%**) occurred in the **North of England**,[3] and **£3.2 billion** (**26%**) was generated throughout the rest of the UK.

As the analysis focusses on the 2021-22 academic year, the impact found is at risk due to the current financial situation facing the higher education sector.[4] The findings in this report show that N8 universities have a substantial impact on both the Northern and UK economies. If financial challenges were to lead to higher education institutions being unable to perform their current activities to the same extent, a reduction in this economic impact would be expected, harming the Government's industrial strategy and the drive for economic growth.

[2] Note that this excludes the **£6.6 billion** of economic impact resulting from productivity spillovers associated with N8 universities' research activities, where a breakdown by region or sector is not available as it was not possible to assign the geographic location or sectors of businesses benefiting from the productivity spillovers generated by N8 universities' research.
[3] Including the North East, the North West and Yorkshire and the Humber, which are the ITL1 regions in which the N8 universities are located.
[4] For example, see here and here.

1 Introduction

London Economics were commissioned to assess the **impact of N8 universities' research, knowledge exchange activities and institutional expenditures on the UK economy**, focusing on the 2021-22 academic year. The report follows on from a recent analysis by London Economics for Universities UK, considering the economic impact of the entire UK higher education sector in the same academic year (London Economics, 2024a).

The N8 Research Partnership consists of eight leading universities in the North of England, including Durham University, Lancaster University, Newcastle University, The University of Leeds, The University of Liverpool, The University of Manchester, The University of Sheffield, and The University of York. These universities have a substantial impact on their local economies, as well as on the UK economy as a whole. This analysis focuses specifically on two channels of this impact, considering:

- Their world-class **research, knowledge exchange and commercialisation activities**, contributing to innovation and long-term economic growth;
- The economic activity generated from their 'physical footprint', in terms of N8 universities' significant **operating and capital expenditures** and the large number of staff employed by these universities.

The remainder of this report is structured as follows. In **Section 2**, we outline our estimates of the impact of N8 universities' **research and knowledge exchange activities**. To estimate the impact of the research undertaken at N8 universities, we combine information on the research-related income accrued by N8 universities in 2021-22 with estimates from the wider economic literature on the extent to which public investment in research activity results in additional private sector productivity (i.e. positive 'productivity spillovers'). In addition, the analysis estimates the direct, indirect, and induced impact associated with N8 universities' research and knowledge exchange activities, including the commercialisation activities of spinout companies associated with N8 universities; contract research provided by N8 universities; consultancy services provided by N8 universities; business and community courses; facility and equipment hire; and the licensing of N8 universities' intellectual property (IP) to other organisations.

Given that N8 universities are large employers and support their wide-ranging activities through significant operational and capital expenditures, N8 universities' substantial physical footprints support jobs and promote economic growth throughout the North of England and the wider UK economy. **Section 3** presents our estimates of the **direct, indirect, and induced economic impacts associated with the operating and capital expenditures incurred by N8 universities** in the 2021-22 academic year.

Lastly, **Section 4** presents the **aggregate economic impact** of N8 universities across their research, knowledge exchange activities and institutional expenditures. Whilst we find substantial economic impacts through these channels of impact on the UK economy, it should be noted that the analysis presents an underestimate of the total impact of N8

universities' activities, as a range of additional impacts will be generated through the attraction and spending of domestic and international students, associated visits/tourism, and staff and supplier spending. Universities will also contribute significantly to culture, community and social mobility in their local areas and beyond.

As the analysis focusses on the 2021-22 academic year, the impact found is at risk due to the current financial situation facing the higher education sector.[5] The findings in this report show that N8 universities have a substantial impact on both the Northern and UK economies. If financial challenges were to lead to higher education institutions being unable to perform their current activities to the same extent, a reduction in this economic impact would be expected, harming the Government's industrial strategy and the drive for economic growth.

[5] For example, see here and here.

2 The impact of N8 universities' research and knowledge exchange activities

This section outlines our estimates of the economic impact of N8 universities' **research and knowledge exchange activities**. To achieve this, we first consider the impact of the universities' expenditures on research and wider knowledge exchange activities, in terms of the direct, indirect and induced effects of that spending. Secondly, we assess the wider productivity spillovers that are generated through the universities' research activities. Thirdly, we estimate the economic impact generated by the spinout companies that are linked to N8 universities.

2.1 Economic impact of N8 universities' research

In this section, we outline our analysis of the **economic impact of N8 universities' research activities**. Specifically, we estimate both the **direct, indirect, and induced effects** of the universities' research (captured by the research income accrued by the universities and the subsequent rounds of spending this income generates across the economy), as well as the private sector **productivity spillover effects** from the universities' research activities.

2.1.1 N8 universities' research income in 2021-22

To estimate the **direct impact** generated by N8 universities' research activities, we used information from the Higher Education Statistics Agency (HESA) on the total research-related income accrued by the universities in the 2021-22 academic year. This includes:

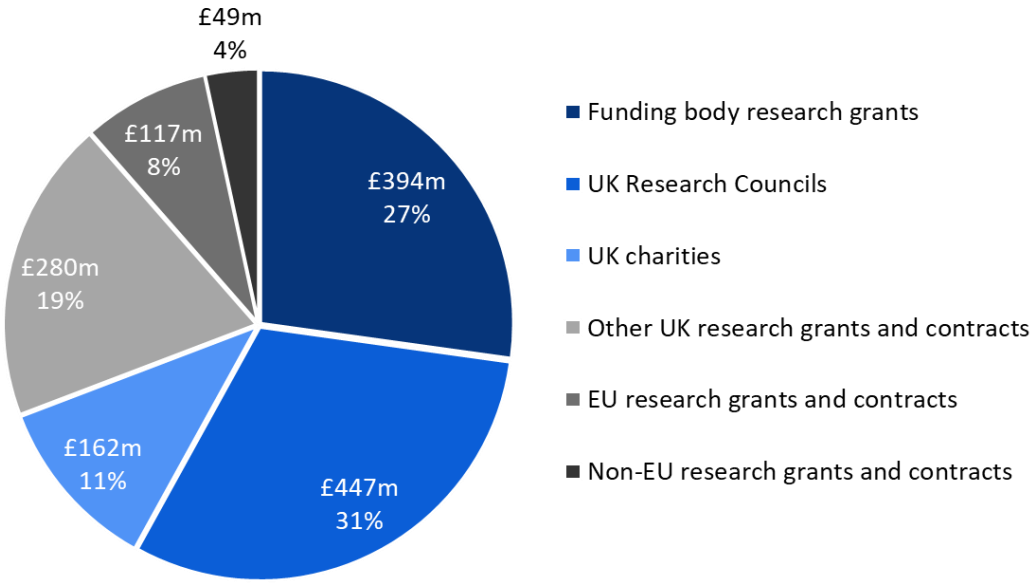
- Income from **research grants and contracts** provided by:
  - **UK sources**, including the UK Research Councils; UK-based charities; central government bodies, local authorities, and health and hospital authorities; industry and commerce; and other UK sources.
  - **EU sources**, including government bodies, charities, industry and commerce, and other sources.
  - **Non-EU sources**, including charities, industry and commerce, and other sources.
- **Recurrent research funding** allocated to the universities by Research England.

Aggregating across these sources of income across the eight higher education institutions, the total research-related income accrued by N8 universities in the 2021-22 academic year stood at **£1.4 billion** (see Figure 1).[6] Approximately **£394 million** (**27%**) of this income was received through recurrent research grant funding from **Research England**, with an additional **£447 million** (**31%**) received from the **UK Research Councils**, **£162 million** (**11%**) from **UK charities**, and **£280 million** (**19%**) from **other UK sources**.[7] In addition, in terms of

[6] Note that, for the purposes of the analysis, we then adjust this income (i.e. the estimated direct impact of research) to avoid double-counting with knowledge exchange activities, and to deduct the public costs of these research activities (see Sections 2.1.2 and 2.1.3).
[7] This income from 'other UK sources' includes **£178 million** from UK central government bodies, local authorities, and health and hospital authorities; **£92 million** from UK industry, commerce and public corporations; and **£9 million** from other sources.

funding from international sources, **£117 million** (**8%**) of the universities' research-related income was derived from **EU research grants and contracts**, and the remaining **£49 million** (**4%**) was from **non-EU sources**.

Figure 1 Research income received by N8 universities in 2021-22, £m by source



Note: All values are presented in 2021-22 prices and rounded to the nearest £1 million.
Source: London Economics' analysis based on data provided by the Higher Education Statistics Agency (HESA, 2024a)

Box 1 University of Leeds case study – Healthtech innovation

Leeds is the UK's top city for health and care research funding, according to an independent report. The city has attracted more than £200m in health and care research and innovation awards and almost £80m in NIHR funding for research and infrastructure since 2018. Leeds ranks third internationally as a location for healthtech companies.

The West Yorkshire Healthtech and Digital Tech Investment Zone, approved by government in 2024, is expected to leverage over £220 million of public and private sector investment and will include a Healthtech Innovation Hub in Leeds. The next generation of start-ups are supported via their Nexus innovation hub, which provides access to research, talent and facilities.

University of Leeds spinout adsilico, based at Nexus, received £2m investment from Northern Gritstone in 2024 to accelerate the development of virtual patient populations that will reduce costs and accelerate R&D timescales for medical device developers.

Alongside Nexus, the university is part of the Leeds Innovation Arc - a district of innovation neighbourhoods formed around universities, healthcare providers, local authorities and cultural institutions.

The University of Leeds is leveraging research expertise to create solutions to UK and international health challenges. The university is also building a skilled healthcare workforce for the future – their School of Healthcare ranks inside the world's top 40 universities for nursing. The University is also a founding member of the Leeds Health and Social Care Hub, which brings local partners and central Government together to improve health outcomes across the region.

2.1.2 Adjustment for double counting with knowledge exchange activities

The **£1.4 billion** of research income received by N8 universities in 2021-22 includes the income generated by the universities from their **collaborative research** and **contract research**.[8] However, the income from these two activities is *also* recorded separately within HESA's Higher Education Business and Community Interaction Survey (HE-BCI) data,[9] which we use to separately estimate the economic impact associated with the universities' wider knowledge exchange activities (described in further detail in Section 2.2).

The income from these sources is included in *both* the data on the universities' research-related income and the HE-BCI data on their wider knowledge exchange activities. To avoid any double-counting between the estimated impact of the universities' research activity (described in this section) and wider knowledge exchange activities (described in Section 2.2), we made the following adjustments:

- In terms of the universities' income from **collaborative research**, we implicitly account for (publicly funded and cash) income from collaborative research within the **impact of the universities' research**. We therefore do *not* take collaborative research income into account in the analysis of wider knowledge exchange activities. This income represents **£267 million** out of the **£1.4 billion** of total research income received by the universities in 2021-22.[10]
- In terms of **contract research**, we account for this activity within the impact of N8 universities' wider knowledge exchange activities (see Section 2.2). Therefore, to avoid double-counting, we deduct **£232 million** of contract research income from the above total research-related income. We thus estimated that the *gross* **direct impact** (before deducting public costs) associated with N8 universities' research activity in 2021-22 stands at **£1.2 billion**.

[8] Collaborative research involving public funding includes cash or in-kind contributions to research projects with material contributions from at least one external non-academic collaborator. Contract research meets specific research needs of external partners, excluding basic research council grants. The two activities are mutually exclusive.
[9] See Higher Education Statistics Agency (2024b).
[10] The **£267 million** in collaborative research funding is made up of **£247 million** of public funding and **£20 million** of collaborative cash contributions. Note that any income in terms of in-kind contributions to collaborative research (**£124 million**) is excluded here, since these contributions do not represent a cash transaction for which we can robustly apply economic multipliers.

A schematic overview of the methodological approach adopted, including these adjustments for double counting, is provided in Annex A2.2.1.

2.1.3 Total direct, indirect, and induced impact of N8 universities' research activity

The analysis then assesses the total **direct, indirect, and induced economic impacts** on the UK economy associated with N8 universities' research activity in 2021-22. While the direct impact reflects the research income that the universities received in the 2021-22 academic year,[11] the indirect and induced effects reflect the chain reaction of subsequent rounds of spending throughout the economy, often referred to as a 'ripple effect'. These are defined as follows:

- **Indirect effect ('supply chain impacts')**: N8 universities spend their research income on purchases of goods and services from suppliers, who in turn spend this revenue purchasing inputs to meet the universities' demands. This results in a chain reaction of subsequent rounds of spending across industries, often referred to as a 'ripple effect'.
- **Induced effect ('wage spending impacts')**: N8 universities' employees (supported by the universities' research income) use their wages to purchase consumer goods and services within the economy. This in turn generates wage income for employees within the industries producing these goods and services, again leading to subsequent rounds of spending, i.e. a further 'ripple effect' throughout the economy as a whole.

The total of the direct, indirect, and induced effects constitutes the *gross* economic impact of N8 universities' research activities. An analysis of the *net* economic impact ideally needs to account for two additional factors that potentially reduce the size of any of the above effects:

- **Leakage** into other geographical areas, by taking account of how much of the additional economic activity actually occurs in the area of consideration (i.e. within the UK).
- **Displacement** of economic activity within the region of analysis, i.e. taking account of the possibility that the economic activity generated might result in the reduction of activity elsewhere within the region.[12]

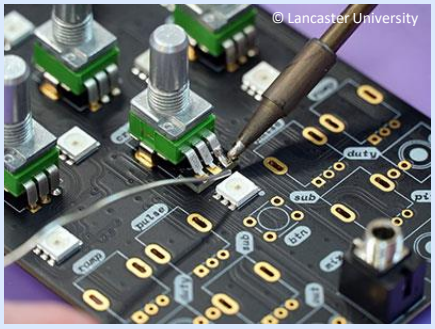
[11] Net of contract research income, as discussed above.

[12] It is important to note that, while the analysis (wherever possible) takes account of *leakage* (e.g. adjusting for the extent to which any additional income for supplying industries might be spent on imports of goods and services from outside the UK), the estimated impacts here are *not* adjusted for *displacement* or additionality (e.g. the extent to which the research income received by universities might otherwise have been used for other purposes by the organisations from which the income is received). Hence, our analysis effectively estimates the direct, indirect, and induced impacts associated with N8 universities' research activity in *gross* terms.

Box 2 Lancaster University case study - Reliability modelling and stress testing state-of-the-art micro-electronics.

MEMS (Micro-Electro-Mechanical System) are miniature components, typically less than 100 microns in size, that can be mass-produced at low cost. These components are used in a range of markets including aerospace, medical, and transport technology, where high quality performance is essential. Therefore, effective reliability modelling is crucial to ensure that these products are suitable for consumer use.

Lancaster University researchers developed reliability modelling techniques for technology that was used by ST Microelectronics, a world leading electronics manufacturing company, to integrate its inertial MEMS into commercial products such as the iPhone and Nintendo Wii series. This collaboration generated over $3.5 billion in sales revenue between 2014 and 2020.



Over the past twenty years, a team of Lancaster University researchers, led by Professor Andrew Richardson, has been at the forefront of developing modelling techniques and optimisation technology to test MEMS for mechanical and thermal stress. Early collaboration with ST Microelectronics resulted in the first validated solutions for modelling component level faults in microstructures. This project used behavioural modelling techniques based on applications of Cosserat theory, developed by Professor Robin Tucker of Lancaster University's Industrial Mathematics Group, to validate new methods for exploring mechanical fatigue in the material used in ST Microelectronics' MEMS products.

The project later expanded to test to the reliability of silicon gyroscopes. Gyroscopes are small devices used to determine how quickly an object is rotating and are widely used in smartphones and other electronics devices. Further research by the Richardson team, alongside the French National Centre for Scientific Research, the University of Paris, and commercial partners, led to the development and application of a new 'Bias Superposition' method for testing the reliability of MEMS technology during normal use.

The work of the Richardson team had a significant economic impact by facilitating the use of ST Microelectronics' inertial MEMS devices across several high-profile consumer products, including the iPhone 4 and 4S, Nintendo Wii and Wii U, and the Nintendo Switch.

As well as this Lancaster University research solidifying ST Microelectronics' position as a global leader in consumer MEMS technology, the University's reliability modelling has also supported the longer-term commercialisation of new products, including accelerometers for vehicle safety applications in the automotive market.

The direct, indirect, and induced impacts are measured in terms of monetary economic output,[13] gross value added (GVA),[14] and full-time equivalent (FTE) employment supported.[15] In addition to measuring these impacts on the UK economy as a whole, the analysis is broken down by geographic region[16] and sector.

These impacts of N8 universities' research activities were estimated using **economic multipliers** derived from Input-Output tables,[17] which measure the total production output of each industry in the UK economy, and the inter-industry (and intra-industry) flows of goods and services consumed and produced by each sector. In other words, these tables capture the degree to which different sectors within the UK economy are connected, i.e. the extent to which changes in the demand for the output of any one sector impact all other sectors of the economy. To be able to achieve a breakdown of the analysis by region, we developed a **multi-regional Input-Output model**, combining UK-level Input-Output tables (published by the Office for National Statistics[18]) with a range of regional-level data to achieve a granular breakdown by sector *and* region.[19]

To estimate the total direct, indirect, and induced impact, we apply the relevant average economic multipliers[20] derived from the Input-Output analysis associated with organisations in the government, health, and education sector in the region in which each N8 university is located.[21]

In addition to the direct, indirect, and induced economic impacts associated with N8 universities' research activities, a similar methodology is applied to estimate the direct, indirect, and induced economic effects associated with the universities' knowledge exchange activities (see Section 2.2) and operational and capital expenditures (see Section 3). Further detail on the application of economic multipliers can be found in Annex A2.1.1.

Adjusting for public costs

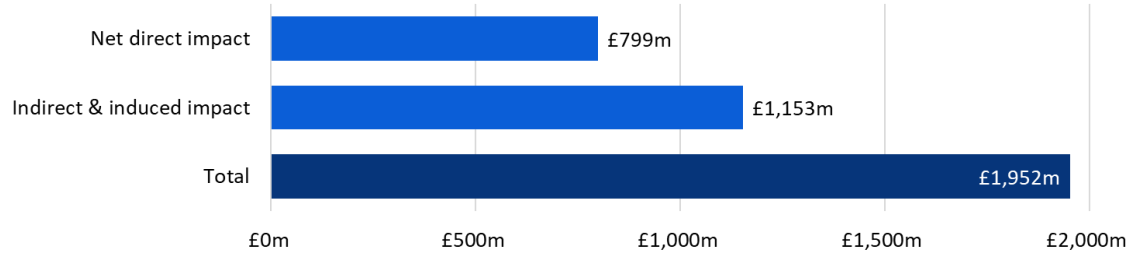
To arrive at the ***net* total impact** of N8 universities' research activities on the UK economy (**net of public costs**), we deducted the **costs to the public purse** of funding these activities. These public costs include the funding provided to the universities by the UK Research Councils (**£447 million**), recurrent research grants provided by Research England (**£394 million**), and other research income from UK central government bodies, local authorities,

[13] In this analysis, economic output is equivalent to income or expenditure (e.g. the direct research income that N8 universities accrued in 2021-22).
[14] Gross value added is used in national accounting to measure the economic contribution of different industries or sectors ,and is defined as economic output minus intermediate consumption (i.e. minus the cost of goods and services used in the production process).
[15] Full-time equivalent jobs represent the total number of full-time jobs supported, accounting for part-time positions on an equivalent full-time basis.
[16] Specifically, the underlying analysis is broken down into the UK's 41 International Territorial Level 2 (ITL2) regions (for more information, see Office for National Statistics (2024)).
[17] Input-Output tables quantify the interdependencies between different sectors and regions of an economy by detailing the origin and destination of resource flows between each sector and region.
[18] See Office for National Statistics (2023d).
[19] See Annex A2.1 for more details on the Input-Output analysis.
[20] Specifically, the analysis makes use of Type II multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].
[21] i.e. we assume that the expenditure patterns of each university are the same as for other institutions operating in the given university's ITL2 region's government, health, and education sector.

and health and hospital authorities (**£178 million**).[22] These total public purse costs (**£1.0 billion**) are deducted from the total direct, indirect, and induced impacts of research activity (estimated using the multipliers outlined above). As a result, the **direct, indirect, and induced impact** (net of public costs) associated with N8 universities' research activity in 2021-22 was estimated at **£2.0 billion**, with a (net) direct impact of **£799 million** (see Figure 2).

In terms of GVA and FTE employment, the total direct, indirect, and induced impact associated with N8 universities' research was estimated at **£1.1 billion** and **18,550** FTE jobs, respectively.[23]

Figure 2 Net direct, indirect, and induced impacts associated with N8 universities' research income in 2021-22, £m



Note: Estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated.
Source: London Economics' analysis

Box 3 University of York case study - Pioneering the future of live performance with a new R&D lab

Experts at the University of York are redefining live events with the CoSTAR LiveLAB, a brand new state-of-the-art research and development facility at Production Park in Wakefield.

The LiveLAB is a core component of CoSTAR, the £75.6m UK R&D network for creative technology, funded by the Arts and Humanities Research Council (AHRC), which is part of UK Research and Innovation. Led by the University of York, CoSTAR LiveLAB brings together a team of experts committed to advancing creative industries through cutting-edge applied research.

Facilities will include spaces dedicated to developing new technologies for screen, stage and into the metaverse. The lab will leverage novel R&D in virtual production technologies including computer generated imagery (CGI), spatial audio, motion capture and extended reality (XR) to create groundbreaking live performance experiences.

"The LiveLAB is poised to be at the forefront of innovation for live events," says Professor Gavin Kearney, Lab Director and professor of audio engineering at the

[22] This is included within the **£280 million** of income from 'other UK research grants and contracts' in Figure 1 (which also includes **£92 million** of income from UK industry and **£9 million** from other UK sources).
[23] Further detail on the calculation of these estimates is provided in Annex A2.1.2.

University of York. "We're combining York's research expertise with industry, public and third sector partners who are all dedicated to innovation in live performance."

"The way we experience live performances will be completely transformed over the next decade" adds Professor Helena Daffern, LiveLAB's Co-Director and professor of music science at the University of York. "Imagine a live concert of your favourite artists where every member of the audience can shape their own unique audio-visual experience. You'll have the ability to engage with every aspect of a production wherever you are, be it in the arena or the comfort of your own living room."

The CoSTAR LiveLAB will also significantly contribute to the growth of the UK economy and job market. "Early next year we'll launch our Access Programme," says Professor Kearney. "That will incubate startups, accelerate creative industry organisations and deliver training programmes around next generation live performance technologies."

The lab is located at Production Park, Europe's largest campus of companies dedicated to innovation in live performance. It's supported by the networking expertise of Vodafone, as well as production support and skills development from Screen Yorkshire. Business development is supported by Wakefield Council and the York and North Yorkshire Local Enterprise Partnership.

Production Park CEO Lee Brooks says: "We are delighted to be joining the University of York in leading this work, which will push innovation in the entertainment industry. It's a proud moment for Yorkshire and the North as we continue in our ambition to make Production Park a global hub for the creative industry."

CoSTAR LiveLAB includes a dynamic partnership with key industry players, including Sony Interactive Entertainment, Opera North, TAIT, Megaverse and the recently established Tileyard North.

2.1.4 Productivity spillovers to the private sector

In addition to the direct, indirect, and induced impact of research, the wider academic literature indicates that **investments in research & development (R&D) and other intangible assets may induce positive externalities**. Economists refer to the term 'externality' to describe situations in which the activities of one 'agent' in the market induce (positive or negative) external effects on other agents in that market (which are not reflected in the price mechanism). In the context of research activities, existing academic literature assesses the existence and size of **positive productivity and knowledge spillovers**,

where knowledge generated through the R&D activities of one agent enhances the productivity of other organisations.

There are many ways in which research generated at universities can induce such positive spillover effects to the private sector.[24] For example, spillovers are enabled through direct R&D collaborations between universities and firms (such as Knowledge Transfer Partnerships), the publication and dissemination of research findings, or through university graduates entering the labour market and passing on their knowledge to their employers.

In order to estimate the productivity spillovers associated with N8 universities' research activities, we apply productivity spillover multipliers from the existing literature to the different types of research-related income received by the universities in 2021-22 (again see Figure 1). Specifically, we assign a multiplier of **12.7**[25] to the universities' research funding from **UK Research Councils and UK charities**[26] (amounting to **£608 million**), and a multiplier of **0.2**[27] to **all other research funding** received by N8 universities in 2021-22 (amounting to **£840 million**).[28] A more detailed summary of the key relevant literature on this topic is presented in Box 1.

Using this approach, we infer a weighted average spillover multiplier associated with N8 universities' research activities in 2021-22 of approximately **5.45** – i.e. **every £1 invested in N8 universities' research activities generates additional annual economic output of £5.45 across the UK economy**. This is larger than the weighted average spillover multiplier of **4.95** found in a comparable analysis of the UK HE sector as a whole (London Economics, 2024a), and is also slightly larger than the comparable figure for Russell Group universities as a whole (**5.40**, see London Economics, 2024b). This captures the impact of the research undertaken by the universities in 2021-22 within that same academic year, but excludes any additional (and likely substantial) impacts in subsequent years.[29] Applying this weighted average multiplier to the direct impact of research (i.e. excluding contract research, which

[24] Note that there are also clearly significant economic and social spillovers to the *public* sector associated with university research. However, despite their obvious importance, these have been much more difficult to estimate robustly, and are not included in this analysis.

[25] This is based on a key study by Haskel and Wallis (2010). For more detail, see Box 4.

[26] Where the vast majority of funding provided by UK charities relates to projects commissioned through an open competitive process.

[27] This is based on a study by Haskel et al. (2014a). Again, see Box 4 for more detail.

[28] In terms of the large difference in magnitude between these multipliers, explaining the size of the 12.7 multiplier in particular, Haskel and Wallis (2010) argue that they would expect the productivity spillovers from Research Council funding to be large, 'given that the support provided by Research Councils is freely available and likely to be basic science'. To the best knowledge of the authors, there exists no further and recent empirical evidence to support this. As a result, we apply the separate multipliers to the different income strands.

[29] Specifically, the 12.7 multiplier (based on the analysis by Haskel and Wallis (2010)) as well as the 0.2 multiplier (from Haskel et al. (2014a)) constitute the impact of research investment on *annual* UK economic output within a given year (and, in our analysis here, we use these multipliers to estimate the level of private sector spillovers occurring in 2021-22 associated with research undertaken by N8 universities in 2021-22). However, we do *not* account for any subsequent productivity spillovers from this research that might occur in subsequent years (i.e. 2022-23 and beyond). For example, as outlined by Haskel et al. (2014a), based on their analysis, 'a one-off increase in public spending [on R&D] generates an infinitely-lived rise in the level of knowledge capital and so an infinitely-lived higher output' (see Haskel et al. (2014a), p. 48) – i.e. their findings suggest that every £1 spent on public R&D results in an additional *annual* output of £0.20 within the UK private sector *in perpetuity* (under their assumption that the public R&D knowledge stock does not depreciate, i.e. a 0% depreciation rate of public R&D; for more information, also see Haskel et al. (2014b)). Here, conservatively, we do *not* estimate any spillover effects in subsequent years, so that our analysis likely underestimates the total spillovers to the private sector associated with the research undertaken by N8 universities in 2021-22.

stood at **£232 million**),[30] we estimate that the research conducted by N8 universities in 2021-22 resulted in **total market sector productivity spillovers** of **£6.6 billion**.

Box 4 Literature relating to the productivity spillovers to the private sector associated with university research activities

Of particular interest in the context of research conducted by universities, a study by Haskel and Wallis (2010)[31] investigates evidence of **spillovers from publicly funded R&D activities**. The authors analyse productivity spillovers to the private sector from public spending on R&D by the UK Research Councils and public spending on civil and defence-related R&D,[32, 33] and the relative effectiveness of these channels of public spending in terms of their impact on the 'market sector' (i.e. the private sector). They find strong evidence of the existence of market sector productivity spillovers from public R&D expenditure originating from the UK Research Councils.[34] Their findings imply that, while there is no spillover effect associated with publicly funded civil and defence R&D, the marginal spillover effect of public spending on research through the Research Councils stands at **12.7 (i.e. every £1 spent on research through the Research Councils results in an additional annual output of £12.70 within the UK private sector)**.

Another study by Haskel et al. (2014a) provides additional insight into the size of potential productivity spillovers from university research.[35] Rather than estimating effects on the UK economy as a whole, the authors analyse the size of spillover effects from public research across different UK industries.[36] The authors investigate the correlation between the combined research conducted by the UK Research Councils, the higher education sector, and central government itself (e.g. through public research laboratories),[37] interacted with measures of industry research activity, and total factor

[30] Note that by applying this weighted average multiplier, we implicitly assume that the source of N8 universities' contract research income is representative of all other research income received by the universities (in the absence of information related to the source of their contract research income).
[31] Also, see Imperial College London (2010) for a summary of Haskel and Wallis's findings.
[32] The authors use data on government expenditure published by the (former) Department for Business, Innovation and Skills for the financial years between 1986-87 and 2005-06.
[33] This is undertaken by regressing total factor productivity growth in the UK on various measures of public sector R&D spending.
[34] Note that the authors' regressions only test for correlation, so their results could be subject to the problem of reverse causation (i.e. it might be the case that increased market sector productivity induced the government to raise public sector spending on R&D). To address this issue, the authors not only test for 1-year lags, but for lags of 2 and 3 years respectively, and produce similar estimates. These time lags imply that if there was a reverse causation issue, it would have to be the government's *anticipation* of increased total factor productivity growth in 2 or 3 years which would induce the government to raise its spending on research; as this seems an unlikely relationship, Haskel and Wallis argue that their results appear robust in relation to reverse causation.
[35] A recent publication for the Department for Science, Innovation and Technology (2024) has attempted to replicate the analysis undertaken by Haskel et al. (2014a) using updated data. However, the findings from this new study were not yet available at the time that the analysis here was undertaken, so our analysis instead still uses the Haskel et al. (2014a) paper for its central estimate regarding the rate of return on public sector research. However, a sensitivity analysis is provided later in Box 4 outlining how the use of different private sector productivity spillover multipliers impacts the results.
[36] Haskel et al. (2014a) use data on 7 industries in the United Kingdom for the years 1995 to 2007.
[37] A key difference to the multiplier for Research Council spending provided by Haskel and Wallis (2010) lies in the distinction between *performed* and *funded* research, as outlined by Haskel et al. (2014a). In particular, whereas Haskel and Wallis (2010) estimated the impact of research *funding* by the Research Councils on private sector productivity, Haskel et al. (2014a) instead focus on the *performance* of R&D. Hence, they use measures of the research undertaken by the Research Councils and the government, rather than the research funding which they provide for external research, (e.g. by higher education institutions). The distinction is less relevant in the higher education sector. To measure the research performed in higher education, the authors use Higher Education Funding Council funding where research is both funded by and performed in higher education.

productivity within the different market sectors.[38] Their findings imply a total rate of return on public sector research of **0.2 (i.e. every £1 spent on public R&D results in an additional annual output of £0.20 within the UK private sector)**.[39]

How do these estimates compare to the wider literature?

Due to a number of significant data limitations and discontinuities within the key dataset on R&D expenditures in the UK,[40] aside from the above-outlined studies by Haskel and Wallis (2010) and Haskel et al. (2014a), there is only relatively limited economic literature available on the productivity spillovers associated with publicly funded research. For example:[41]

- A recent publication for the Department for Science, Innovation and Technology (2024) replicates the Haskel et al. (2014a) approach (despite the data limitations outlined above). This paper uses more recent data than the Haskel et al. (2014) study and makes use of a more granular breakdown of industries than was previously possible. The paper finds a somewhat higher productivity multiplier estimate than that found by Haskel et al. (2014a), of 0.4. As this more recent study had not yet been published at the time that our analysis here was undertaken, we still use the Haskel et al. (2014a) paper for the central estimate regarding the rate of return on public sector research. However, below, we provide a sensitivity analysis outlining how the use of different private sector productivity spillover multipliers impacts the results.
- A report for the (former) Department for Business, Innovation and Skills (2014a) replicates the Haskel and Wallis (2010) approach, using a different (publicly-available) dataset and a slightly different methodology to explore variation in types of Research Council R&D investments in terms of their impact on private sector productivity. Despite the difference in data and approach, they find qualitatively similar findings: Research Council R&D investments yield large

[38] In particular, the authors regress the three-year natural log difference of total factor productivity on the three-year and six-year lagged ratio of total research performed by the Research Councils, government, and the Higher Education Funding Councils over real gross output per industry. To arrive at the relevant multiplier, this ratio is then interacted with a measure of co-operation of private sector firms with universities and public research institutes, capturing the fraction of firms in each industry co-operating with government or universities. The lagged independent variables are adjusted to ensure that the resulting coefficients can be interpreted as annual elasticities and rates of return.

[39] For a summary of Haskel et al.'s (2014a) findings, also see Haskel et al. (2014b).

[40] Specifically, the Office for National Statistics (ONS) recently introduced a number of major methodological improvements to its data on Gross Expenditure on R&D (GERD), which constitutes one of the core datasets measuring the scale of total R&D activities across the UK. In particular, the ONS recently improved the measurement of R&D performed by the HE sector, by introducing Transparent Approach to Costing (TRAC) data into its underlying methodology. These changes were implemented from 2018 onwards (but with no changes to previous GERD estimates), resulting in a significant structural break/discontinuity in the data series. In turn, this results in two major issues. First, there are severe limitations associated with the GERD data prior to 2018, since this earlier data omits R&D that was both performed and funded by the HE sector itself (e.g. research funded by surpluses from other activities) – thus under-recording the sector's R&D activity; in addition, the data only accounts for the *direct* costs of R&D work while omitting some *indirect* costs (such as laboratory security and cleaning costs). Second, since the methodological improvements were only made to the data for 2018 onwards, there is currently only a very limited time series (and, therefore, number of observations) available to undertake an updated assessment of the productivity spillovers associated with publicly funded research. For more information on these data issues, see Office for National Statistics (2022e). In spite of these issues, the recent analysis undertaken for the Department for Science, Innovation and Technology (2024; described in further detail below) used this dataset to re-estimate the productivity spillovers from public R&D, but acknowledges that these issues may bias the estimates (also see footnote 31 (page 18) in the study).

[41] It should be noted that much of the existing literature does *not* assume a rate of depreciation on publicly-funded R&D investments. A standard assumption of the depreciation rate from the literature is around 20%-25% per year, which still implies a significant estimate of the productivity spillover.

returns through their impact on private sector productivity,[42] with the comparable productivity spillover multiplier estimated at **10.71**. Moreover, the report finds much higher returns depending on the precise approach and sample used.

- Comparable research by Elnasri and Fox (2017) applies the Haskel and Wallis (2010) approach to assess the productivity spillovers associated with publicly funded research in Australia. The authors find a similar research spillover to Haskel and Wallis (2010), albeit with a slightly lower research multiplier of **9.76**[43] (which may be expected given the different country studied).
- A US-based study by Jones and Summers (2020) undertakes an economy-wide calculation of the average social benefits of investments in innovation, including spillovers. They find a baseline benefit-to-cost ratio of **13.3:1**, although their estimates range from 5 to more than 20 depending on the assumptions made in relation to inflation bias, health benefits, and the discount rate (among other factors).
- In contrast, a study of 22 OECD countries by van Elk et al. (2019) using production function models finds that public R&D investments do not automatically result in positive returns in terms of GDP and total factor productivity growth, and that positive and statistically significant returns depend on the national context in which these investments take place.
- While there is even more limited research associated with general R&D multipliers (for other research income), a report published by the (former) Department for Business, Innovation and Skills (2014b) that focuses on internationally benchmarking the UK science and innovation system notes a rate of return in the range of 20% to 50%.[44]

Hence, overall, although the number of relevant studies is very limited (given the inherent difficulty in identifying spillovers and the above-mentioned data issues), most of these studies suggest that there are significant productivity spillovers associated with R&D activities.

Sensitivity analysis of the estimated productivity spillovers associated with N8 universities' research

As outlined above, the (limited) existing literature has found different estimates of research spillovers, despite generally being qualitatively similar. In the following, we utilise these alternative estimates to provide a sensitivity analysis of our findings on the productivity spillovers associated with N8 universities' research activities.

These alternative estimates, including the resulting weighted average productivity spillover multipliers, are presented in Table 2. In the first alternative model, we adjust the public sector R&D multiplier to be **0.5** (the upper bound of the range estimated in

[42] The coefficient on research council spending is 10.71 in the sample up to 2008, although this is not statistically significant given the limited number of observations employed in their sample.
[43] See London Economics (2018). The authors find an elasticity of 0.175, which we converted to a research spillover of 9.76.
[44] See also Salter and Martin (2001).

Department for Business, Innovation and Skills (2014b)), whilst retaining the baseline estimate for the Research Council R&D multiplier. This results in a weighted average research multiplier of **5.63**. In the second alternative model, we adjust the Research Council R&D multiplier to be **10.7** (in line with the findings from the Department for Business, Innovation and Skills (2014a)), whilst retaining the baseline estimate for the public sector R&D multiplier. This results in a weighted average research multiplier of **4.61**. Finally, as a third alternative, we adjust both the public sector and the Research Council R&D multiplier (to **0.5** and **10.7**, respectively), which would result in a weighted average research multiplier of **4.79**.

Table 2 Sensitivity analysis of estimated productivity spillovers

Model	Research Council R&D multiplier	Other public sector R&D multiplier	Weighted average multiplier	Total spillovers from N8 universities' research
Baseline	**12.7**	**0.2**	**5.45**	**£6,642m**
Alternative 1	12.7	0.5	5.63	£6,853m
Alternative 2	10.7	0.2	4.61	£5,618m
Alternative 3	10.7	0.5	4.79	£5,830m

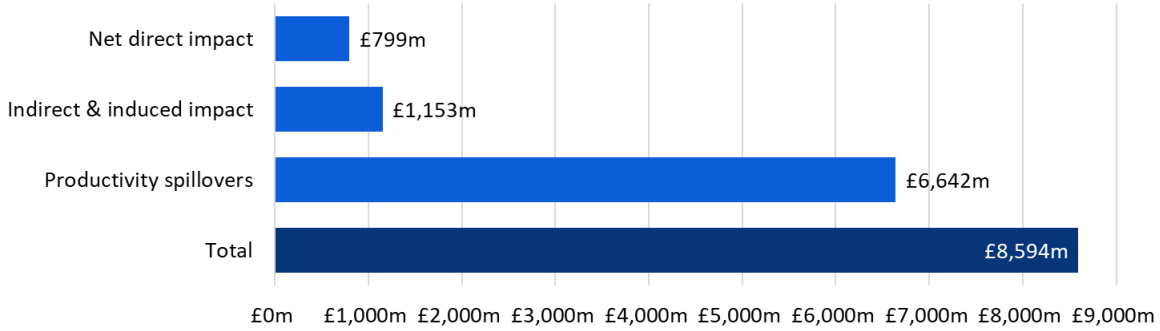
Note: The 'Baseline' here refers to the core estimates presented in Section 2.1.4 above.
Source: London Economics' analysis

Using these alternative weighted average research multipliers, we are able to evaluate the impact of alternative multiplier assumptions on the estimated total productivity spillovers associated with N8 universities' research in 2021-22. As shown in the last column of Table 2, these alternative estimates range from **£5.6 billion** to **£6.9 billion**.

2.1.5 Aggregate impact of N8 universities' research

Combining the **direct, indirect, and induced economic impact** of N8 universities' research (**£2.0 billion**) with the **productivity spillovers** associated with this research (**£6.6 billion**), we estimate that the total economic impact associated with N8 universities' research activities in 2021-22 stood at approximately **£8.6 billion** (see Figure 3).

Figure 3 Total impact of N8 universities' research activities in 2021-22, £m



Note: All values are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the total indicated.
Source: London Economics' analysis

2.2 Economic impact of N8 universities' knowledge exchange activities

In addition to their research activities, N8 universities generate significant economic impacts through a range of knowledge exchange activities. Specifically, we assess the economic impact of:

- **Spinout companies** associated with N8 universities;
- **Contract research** undertaken by N8 universities;
- **Consultancy services** provided by N8 universities;
- **Licensing of IP** by N8 universities to other organisations;
- **Business and community courses** offered by N8 universities; and
- **Facilities and equipment hire**, and related activities.[45]

Specifically, the analysis captures the direct, indirect, and induced economic impacts associated with these knowledge exchange activities, again using **economic multipliers** derived from the above-described Input-Output analysis (see Section 2.1.3 above for more detail).

2.2.1 Economic impact of N8 universities' spinout companies

To assess the **direct impact** associated with N8 universities' spinout companies, we made use of information on **turnover** (as a measure of economic output) and **FTE employment** associated with a total of **257** spinout companies that were active and based in the UK in 2021-22.[46] The information on each company's turnover and employment was based on data individually sourced from each university, supplemented with Bureau van Dijk's FAME

[45] There are other knowledge exchange activities undertaken by N8 universities, such as regeneration and development initiatives, that are not included as part of the analysis here but are implicitly included within the total impact.
[46] For each university, the analysis includes firms with some university ownership, as well as formal spinouts that are no longer owned by the university. We received data from the universities (based on their HE-BCI submissions) on a total of 272 spinouts for 2021-22, from which we exclude 15 companies that were inactive, non-UK based or had missing sectoral information. There were 4 instances in which spinout companies were associated with two N8 universities; in these instances, we removed duplicates across N8 universities to avoid any double counting of the economic impact.

database (based on Companies House information).[47] The direct **GVA** generated was then estimated by multiplying the turnover of each firm by the average ratio of GVA to output among organisations within the given company's industry and region.[48]

Using this approach, the **direct impact** of N8 universities' spinout companies in 2021-22 was estimated at **£276 million** in economic output (i.e. turnover) terms, **2,580 FTE staff**, and **£148 million** of GVA. In terms of the location of these companies, of N8 universities' total 257 UK-based active spinout companies in 2021-22, **four-fifths** (**205**) were headquartered in the North of England,[49] generating **£224 million** in turnover and employing a total of **2,065** FTE staff.

Utilising published HE-BCI data,[50] we find that spinouts from N8 universities made up **15%** of the entire UK HE spinout ecosystem in 2021-22. These companies made up **8%** of total spinout turnover, and **10%** of aggregate employment across all UK HE providers' spinout companies.

To estimate the **total direct, indirect, and induced** economic impacts associated with N8 universities' spinout companies, we again applied relevant **economic multipliers** (derived from our above-described Input-Output analysis). Specifically, we assigned relevant economic multipliers to each active company in 2021-22 based on each firm's industry classification and the region of its main registered office address.[51] Applying the resulting multipliers to the above direct impacts:

- The total economic impact associated with the activities of N8 universities' spinout companies in 2021-22 was estimated at **£667 million** across the UK economy. Of this, approximately **£418 million** occurred in the **North of England**, including **£48 million** in the **North East**, **£222 million** in the **North West** and **£148 million** in **Yorkshire and the Humber** (see Table 3).
- The estimated total number of FTE jobs supported stood at **6,465**, of which **3,920** occurred in the **North of England** (including **585** in the **North East**, **1,360** in the **North West**, and **1,975** in **Yorkshire and the Humber**).
- The corresponding estimate in terms of GVA stood at **£359 million**, of which **£231 million** occurred in the **North of England**.

[47] Given that there were a large number of companies for which no turnover and/or employment information was available from FAME, the data likely provide only an incomplete estimate of the total turnover, GVA, or employment of N8 universities' spinout companies. This particularly applies to relatively small companies falling below the reporting thresholds required by Companies House (implying that their financials would not be included in the FAME data). We identified non-zero turnover for 119 of the 257 active spinouts, and employment data for 195. The analysis made use of *any* resulting turnover or employment information available for a given company, irrespective of whether complete data (i.e. in terms of both turnover *and* employment) was available for that firm. Note also that the information is based on each company's 2021-22 financial year, which does not necessarily coincide with the 2021-22 academic year and varies across companies.

[48] Again, these ratios were derived based on the above-described multi-regional Input-Output model. Each firm's main industry classification and regional location (again, based on ITL2 regions) was based on information from FAME on the firm's SIC code and the region of its main registered address.

[49] Including the North East, the North West and Yorkshire and the Humber, which are the ITL1 regions in which the N8 universities are located.

[50] See HESA (2024b). We use the published HE-BCI data for these sector-wide calculations, rather than considering the underlying data from universities' HE-BCI returns, for comparability.

[51] Again, this was based on ITL2 regions.

Table 3 Economic impact associated with N8 universities' spinout companies in 2021-22

Location of impact	Output, £m	GVA, £m	# of FTE employees
North East	£48m	£23m	585
North West	£222m	£125m	1,360
Yorkshire and the Humber	£148m	£83m	1,975
Total UK	**£667m**	**£359m**	**6,465**

Note: All monetary values are presented in 2021-22 prices and rounded to the nearest £1 million. The employment figures are rounded to the nearest 5.
Source: London Economics' analysis

Box 5 Newcastle University case study - Atelerix

Newcastle University spin-out Atelerix has developed transformative technology that helps researchers and businesses store and transport biological materials safely at ambient temperatures, removing the need for refrigeration.

This overcomes the barriers and limitations of the current need for cryo-shipping. The company uses a patented process of encapsulating the cells and tissues in a natural alginate hydrogel made from seaweed. The cells and tissues can be recovered when needed by the addition of a gentle, cell-friendly buffer.

The method is practical and adaptable, opening up the market for the supply of cells and assays in a ready-to-use format, allowing cell suppliers to scale up their businesses, increase the range of assays available to consumers and improve access to stem cell therapy. Benefits include predictability and reliability in drug discovery models and for cells used as therapies, the opportunity for customers to use cells and assays immediately on arrival and removing the need for cryopreservation, or the alternative need for cytotoxic or animal-derived supplements.

In May 2019, Atelerix announced that they'd closed a second round of funding of £700,000 to accelerate development of its products to market. This was followed by a £500,000 funding round in February 2024, and most recently, in February 2025, the company secured an additional £750,000, further fuelling its mission to revolutionise bioscience logistics.

Atelerix is backed by Northern Accelerator, an innovative collaboration between Durham, Newcastle, Northumbria, Sunderland, Teesside and York Universities that has

transformed research commercialisation in the North East, helping address regional imbalance and strengthening the region's knowledge economy.

Northern Accelerator supports academics and business leaders to create promising spin-out businesses from their world-leading academic research: businesses which in turn create high quality jobs and raise significant investment in the North East and North Yorkshire.

2.2.2 Economic impact of N8 universities' wider knowledge exchange activities

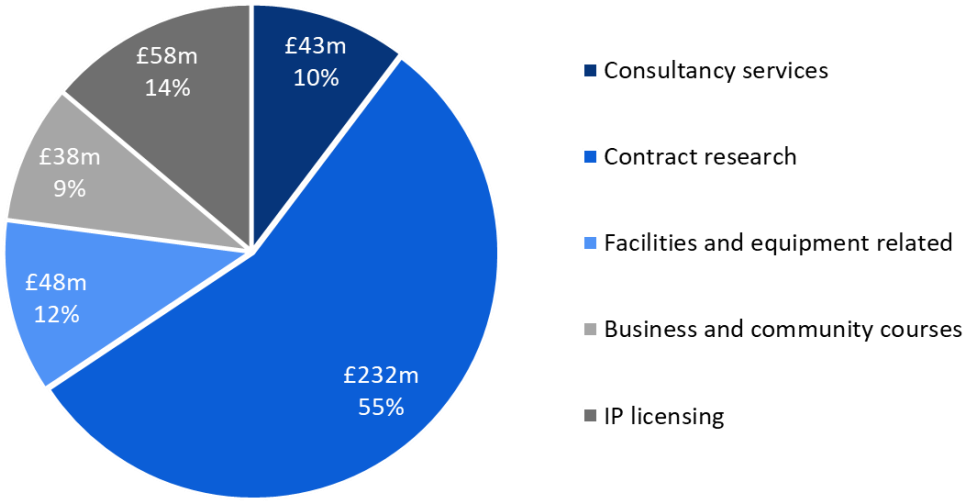
In addition to spinouts, we estimate the **economic impact of N8 universities' wider knowledge exchange activities**, which are captured in the HE-BCI data (i.e. separately from the spinout companies associated with the universities). These wider knowledge exchange activities include:[52]

- **Contract research** undertaken by N8 universities;
- **Consultancy services** provided by N8 universities;
- **Licensing of IP** by N8 universities to other organisations;
- **Business and community courses** offered by N8 universities; and
- **Facilities and equipment hire**, and related activities.

Again, in addition to the direct impact in **economic output terms** associated with each of these activities, we estimate the impact in **GVA** and **FTE employment terms**, by multiplying the direct output by the average ratios of GVA to output and of FTE employees to output among organisations within the government, health, and education sector in the region in which each N8 university is located.[53]

[52] Note again that the income from collaborative research is not included in this section, but implicitly accounted for in the impact of N8 universities' research (see Section 2.1). Although the income from collaborative research is likely to contain funding related to wider knowledge exchange activities, it is difficult to attribute it with certainty to a specific knowledge exchange activity. As such, we retain collaborative research within the research impact category (see Section 2.1.2 for more details on the adjustment for double-counting).
[53] This follows a similar approach as for the estimated impact of N8 universities' research (see Section 2.1), and again assumes that the expenditure patterns of each N8 university are the same as for other institutions operating in the university's ITL2 region's government, health, and education sector.

Figure 4 Income from knowledge exchange activities received by N8 universities in 2021-22, £m by activity



Note: All values are presented in 2021-22 prices and rounded to the nearest £1 million.
Source: London Economics' analysis based on data provided by the Higher Education Statistics Agency (HESA, 2024b)

The **direct impact** of N8 universities' wider knowledge exchange activities is made up of **£43 million** of income from consultancy services, **£232 million** associated with contract research activities, **£48 million** associated with the hire of N8 universities' research facilities, **£38 million** generated from business and community courses, and **£58 million** of IP licensing income. The total direct impact of these activities in 2021-22 therefore stood at **£418 million** (see Figure 4), with an associated impact in GVA terms of **£267 million**, supporting **5,105** FTE jobs.

To estimate the **total direct, indirect, and induced impacts** associated with these activities, we multiplied these direct impacts by the estimated average economic multipliers associated with organisations in the government, health, and education sector in the region in which each university operates. These multipliers are, therefore, the same as those used to estimate the direct, indirect, and induced impacts of N8 universities' research, discussed in Section 2.1.3 above.

Table 4 presents the resulting **aggregate impact** associated with N8 universities' **wider knowledge exchange activities**. The analysis estimates that, in 2021-22, N8 universities' wider knowledge exchange activities generated a total of **£1.0 billion** of economic output across the UK economy (including **£86 million** generated in the **North East**, **£312 million** in the **North West**, and **£360 million** occurring in **Yorkshire and the Humber**). The total GVA impact was estimated at **£597 million**, with an estimated **9,720 FTE jobs** supported across the UK economy.

Table 4 Economic impact associated with N8 universities' wider knowledge exchange activities in 2021-22

Type of impact	Output, £m	GVA, £m	# of FTE employees
North East	£86m	£52m	975
North West	£312m	£184m	3,085
Yorkshire and the Humber	£360m	£217m	3,865
Total UK	**£1,022m**	**£597m**	**9,720**

Note: All monetary values are presented in 2021-22 prices and rounded to the nearest £1 million. The employment figures are rounded to the nearest 5.
Source: London Economics' analysis

Box 6 University of Sheffield case study – How Sheffield's spinouts drive economic growth

University spinouts and tech-focused start-up companies have the potential to significantly boost the region's economy by creating skilled, high-paying jobs and bringing innovative products to market. The University of Sheffield's Commercialisation Journey provides a pathway for innovators to turn their research into tangible products or services. Since 2017, 23 new businesses have been spun out from the University ranging from advanced medical companies such as Rinri Therapeutics to 4th generation Artificial Intelligence developers such as Opteran.

The University of Sheffield was in the top five academic institutions for the number of equity deals secured by their spinout portfolios in 2023. The University has also been recognised as one of the top universities in England for developing IP and commercialising research through the latest Knowledge Exchange Framework (KEF).

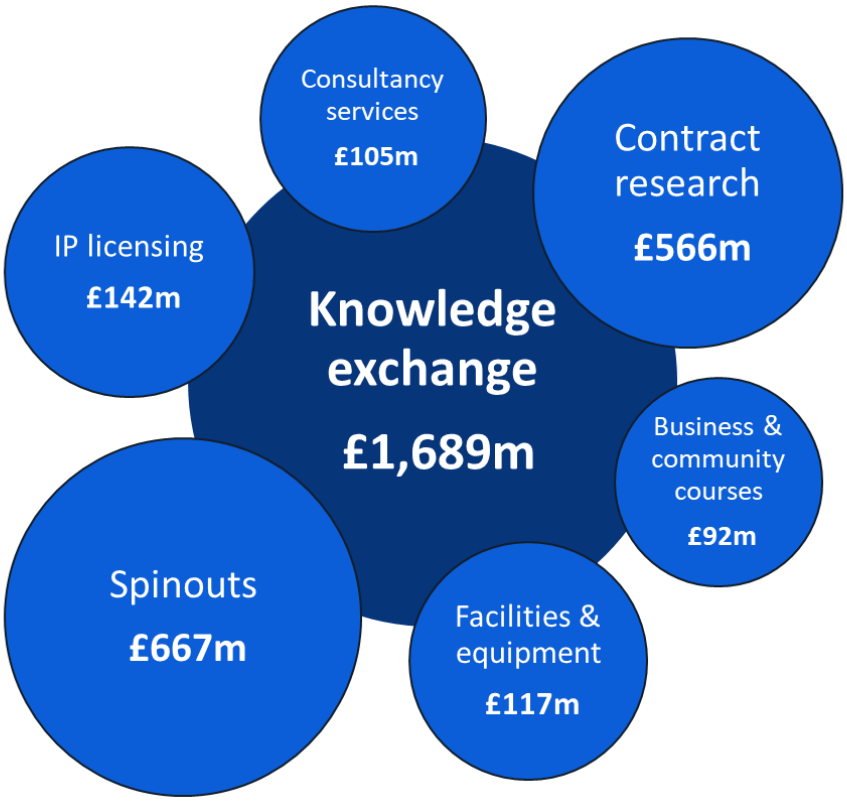
Over the last five years, the University has targeted resources towards establishing high-value spinout companies and was one of three universities that founded Northern Gritstone - a venture investment company established to boost the commercialisation of university spinouts and start-ups in the north of England. By October 2023, its activities had raised more than £312 million of investment.

2.2.3 Total economic impact of N8 universities' knowledge exchange activities

The combined knowledge exchange and commercialisation activities of N8 universities in 2021-22 *directly* generated an estimated **£695 million** of economic output across the UK economy. When accounting for the *indirect and induced impacts*, the total impact of these knowledge exchange activities on the UK economy stood at **£1.7 billion** (see Figure 5). The

corresponding estimates in GVA and employment terms stood at **£956 million** and **16,185 FTE jobs**.

Figure 5 Total economic impact associated with N8 universities' knowledge exchange activities in 2021-22, £m by activity



Note: Estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Circles are not to scale.
Source: London Economics' analysis

2.3 Total impact of N8 universities' research and knowledge exchange activities

Combining all of the above estimates, the total impact on the UK economy associated with N8 universities' research and knowledge exchange activities in 2021-22 was estimated to be approximately **£10.3 billion** (see Figure 6). In terms of the components of this impact:

- N8 universities' **research activities** accounted for **£2.0 billion**.
- The associated **productivity spillovers** to the wider UK economy stood at **£6.6 billion**.
- The impact associated with N8 universities' **knowledge exchange activities** was estimated at **£1.7 billion**, including **£667 million** from the spinout companies associated with N8 universities,

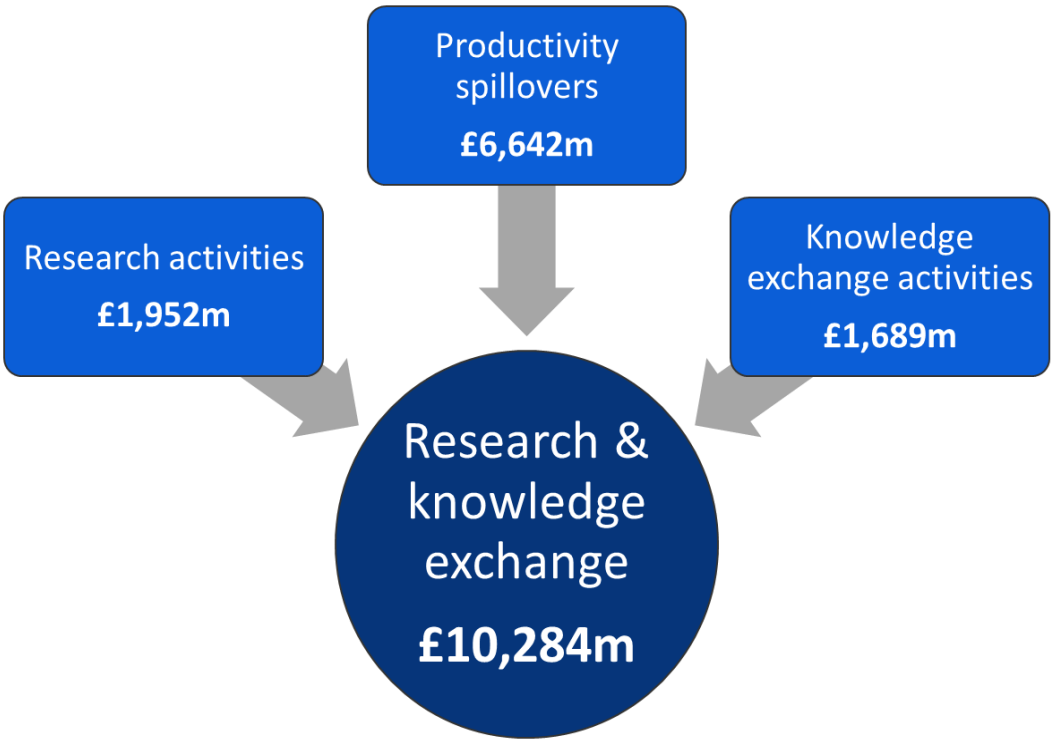
The total impact of N8 universities' research and knowledge exchange activities in 2021-22 stood at £10.3 billion.

and **£1.0 billion** associated with N8 universities' wider knowledge exchange activities.

Comparing the total research and knowledge exchange impact (**£10.3 billion**) to the associated public funding provided for these activities by the Exchequer (**£1.0 billion**; see Section 2.1.3), this results in a benefit-to-public-cost ratio of **10.10**. In other words, the analysis suggests that **for each £1 of *publicly* funded research income, N8 universities' research and knowledge exchange activities generate a total of approximately £10.10 in economic impact across the UK.**

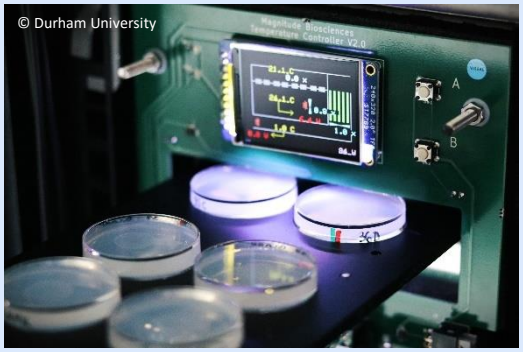
A breakdown of these impacts by region and sector (and in GVA and employment terms - where available) is presented in Annex A2.2.2, and a breakdown by ITL2 sub-region is presented in Annex 3.

Figure 6 Total impact of N8 universities' research and knowledge exchange activities in 2021-22, £m



Note: All values are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated.
Source: London Economics' analysis

Box 7 Durham University case study – Magnitude Biosciences



Founded in 2018 as a spin-out from Durham University, Magnitude Biosciences is a specialist Contract Research Organisation (CRO) revolutionising early pre-clinical drug development.

Co-founded by Prof. David Weinkove and Dr. Christopher Saunter, the company leverages the microscopic nematode worm C. elegans to provide rapid and cost-effective insights into drug efficacy and safety.

Traditional drug discovery methods are expensive and time-consuming. Many researchers rely on costly mammalian studies, delaying the identification of promising drug candidates.

To counter this, Magnitude Biosciences developed its unique and patented WormGazer® technology, automating the analysis of C. elegans to evaluate health and lifespan under different conditions.

This approach accelerates decision-making for biotech, pharma, and health industries, offering an efficient alternative to traditional models.

With support from Northern Accelerator – a collaboration between the North East's universities - Magnitude Biosciences assembled a skilled management team and expanded its workforce. Its innovative platform has enabled global researchers to identify health-extending compounds faster than ever before, contributing to advancements in ageing research and drug discovery.

By bridging academic research and industry needs, Magnitude Biosciences is able to generate repeatable, cost-efficient insights into how potential treatments affect health and lifespan, helping researchers make faster, data-driven decisions.

3 The impact of N8 universities' expenditures

In this section, we outline our estimates of the **direct, indirect, and induced impacts associated with the operational and capital expenditures of N8 universities**. The **direct impact** considers the economic output generated by N8 universities themselves, by purchasing goods and services (including labour) from the economy in which they operate. Similar to the impact associated with N8 universities' research and knowledge exchange activities (see Section 2), the **indirect and induced economic impacts** of N8 universities' expenditures reflect the chain reaction of subsequent rounds of spending throughout the economy, i.e. a 'ripple effect'. Again, these impacts can be measured in terms of economic output, GVA, and FTE employment, and are derived using the relevant multipliers derived from the above-described multi-regional Input-Output model.

3.1 Direct impact of N8 universities' expenditures

3.1.1 Gross direct impact of N8 universities' expenditures

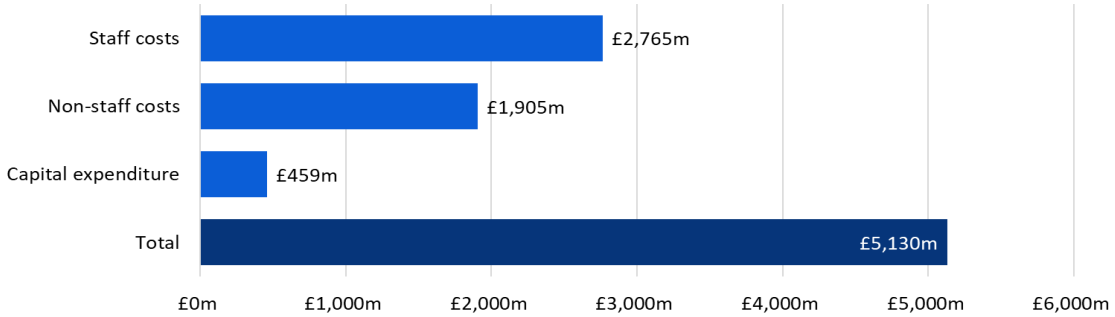
To measure the direct economic impact of the purchases of goods, services, and labour by N8 universities, we used information on the universities' operational expenditures (including staff and non-staff spending), capital expenditures, as well as the number of staff employed (in terms of full-time equivalent employees), for the 2021-22 academic year.[54]

Based on this, in terms of monetary economic **output** (measured in terms of expenditure), **the gross direct economic impact** associated with N8 universities' expenditures stood at approximately **£5.1 billion** in the 2021-22 academic year (see Figure 7). This includes **£2.8 billion** of operating expenditure on staff related costs, **£1.9 billion** of expenditure on other (non-staff) operating expenses,[55] as well as **£459 million** of capital expenditure incurred in that academic year. The gross direct economic impact of £5.1 billion constitutes **11%** of the direct economic impact of the expenditures of the entire UK HE sector, which was £46.1 billion in 2021-22 (see London Economics (2023)).

In terms of staff, N8 universities employed a total of **48,360** FTE staff in 2021-22[56] (**54,910** in headcount terms), and N8 universities' gross direct impact in terms of **GVA** stood at **£3.6 billion**.

[54] Based on staff and financial data published by HESA (2024a and 2024c).
[55] The total operational expenditure (excluding capital expenditure) of N8 universities in 2021-22 stood at **£6,143 million**. From this, for the purpose of the analysis, we excluded **£403 million** in depreciation costs (from non-staff expenditure) and **£1,070 million** in movements in pension provisions (from staff expenditure), as it is assumed that these costs are not relevant from a procurement perspective (i.e. these costs are not accounted for as income by other organisations). This results in total operational expenditure of **£4,670 million** in 2021-22 included here. Totals may not add up precisely due to rounding.
[56] Based on data published by HESA (2024c). Note that this excludes staff on atypical contracts.

Figure 7 Gross direct economic impact (in terms of output) of N8 universities' expenditure in the 2021-22 academic year, by type of expenditure



Note: All estimates are presented in 2021-22 prices and rounded to the nearest £1m.
Source: London Economics' analysis based on HESA (2024a).

3.1.2 Net direct impact of N8 universities' expenditures

Before arriving at the net direct impact associated with N8 universities' expenditures, it is necessary to deduct a number of income and expenditure items to avoid double-counting. Specifically, we deducted a total of **£1.6 billion**, including:

- The total research income (excluding contract research income) received by N8 universities in the 2021-22 academic year (**£1.2 billion**), to avoid double-counting with the estimated impact of N8 universities' research activities (Section 2.1).
- N8 universities' income from their knowledge exchange activities (excluding spinouts, but including contract research income) of **£418 million**, to avoid double-counting with the impact of N8 universities' wider knowledge exchange activities (Section 2.2).

After accounting for these deductions, the net direct impact of N8 universities' expenditure in 2021-22 stood at **£3.5 billion**.

Box 8 University of Manchester case study - Industrial Biotechnology Innovation Catalyst

The Industrial Biotechnology Innovation Catalyst (IBIC) is a £5 million initiative to promote industrial biotechnology in the North West. Led by the University of Manchester in partnership with the University of Liverpool, University of Salford and Manchester Metropolitan University, IBIC is accelerating knowledge exchange, skills development, and innovation in industrial biotechnology. In the eight months since its launch, IBIC has awarded over £200,000 in funding to individuals and researchers through its funding programmes, dedicated UKRI IBIC ICURe programme, and the North West Build A Biotech competition.

IBIC has organised 11 events that have brought together nearly 500 members of the biotechnology community, and have also hosted four webinars to date – as part of their ongoing webinar series – that translates the work of IBIC and its partners to other

members of the consortium. The series has so far seen nearly 300 people registered, all gaining new knowledge and insights from those presenting. Presenters are a mix of early career researchers, PIs and CEOs of biotechnology start-ups.

This activity is set to expand over the coming year with further rounds of funding opening up throughout the year, the inaugural IBIC conference to be held in Liverpool in June, and additional networking and business events to support the community in developing the region's skills and knowledge in industrial biotechnology.

3.2 Indirect and induced impacts of N8 universities' expenditures

As with the economic impact of N8 universities' research and knowledge exchange activities (see Section 2), the assessment of the indirect and induced economic impacts associated with the expenditures of N8 universities is based on economic multipliers derived from the above-discussed multi-regional Input-Output model.[57] We applied the estimated average economic multipliers associated with organisations in the government, health, and education sector in the region in which each N8 university is located, which mirrors the approach used to assess the impact of N8 universities' income derived from their research and wider knowledge exchange activities, since this income was accrued (and subsequently spent) by the universities themselves. Again, this approach asserts that the spending patterns of each university reflect the average spending patterns across organisations operating in the government, health, and education sector in the region in which each university operates. These multipliers are presented in Annex A2.1 and are applied to the **net direct impact** of each university's expenditures.

3.3 Aggregate impact of N8 universities' spending

Figure 8 presents the estimated total direct, indirect, and induced impacts associated with the expenditures incurred by N8 universities in the 2021-22 academic year (after the above-described adjustments have been made). The aggregate impact of these expenditures was estimated at approximately **£8.5 billion** in economic output terms (see top panel of Figure 8):

The impact of N8 universities' expenditures on the UK economy in 2021-22 stood at £8.5 billion.

- In terms of region, a third of this impact (**£2.8 billion, 33%**) was generated in the **North West**, with strong impacts also occurring in both **Yorkshire and the Humber**

[57] See Annex A2.1 for more information.

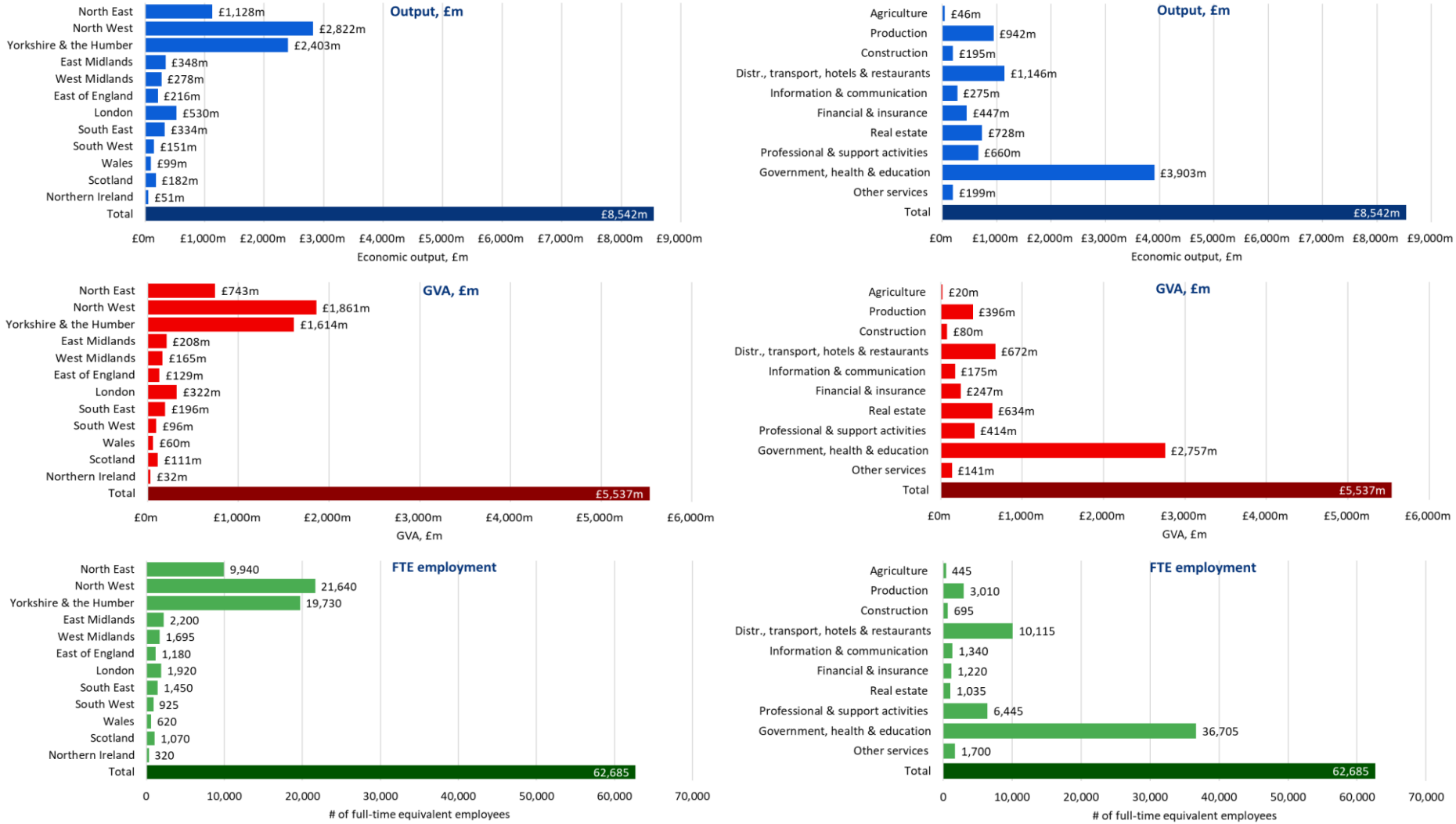
(**£2.4 billion, 28%**) and the **North East** (**£1.1 billion, 13%**).[58] The remaining **£2.2 billion** (**26%**) of impact was generated in **other regions** across the UK.

- In terms of sector, in addition to the impacts occurring in the **government, health, and education sector** itself (**£3.9 billion, 46%**), there are also large impacts felt within other sectors, including the **distribution, transport, hotel, and restaurant sector** (**£1.1 billion, 13%**), the **production sector** (**£942 million, 11%**), and the **real estate sector** (**£728 million, 9%**).[59]

In terms of the number of jobs supported (in FTE), the results indicate that N8 universities' spending supported a total of **62,685** FTE jobs across the UK economy in the 2021-22 academic year (of which **51,310** were located in the **North of England**[60]). In addition, the impact in terms of gross value added was estimated at **£5.5 billion** across the UK economy as a whole (with **£4.2 billion** accrued within the **North of England**).

[58] A more granular breakdown of the economic impact of N8 universities' expenditures by region, at the ITL2 sub-region level, is presented in Annex 3.
[59] Again, for more detail on which industries are included in this high-level sector classification, please refer to Table 7 in Annex A2.1.4.
[60] Including the North East, the North West and Yorkshire and the Humber, which are the ITL1 regions in which the N8 universities are located.

Figure 8 Total economic impact associated with N8 universities' expenditures in the 2021-22 academic year, by region and sector



Note: Monetary estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated. ***Source: London Economics' analysis***

4 The aggregate economic impact of N8 universities' research, knowledge exchange activities and expenditures

4.1 Aggregate impact

Combining the above two strands of analysis, the total economic impact on the UK economy associated with N8 universities' research, knowledge exchange activities and institutional expenditures in the 2021-22 academic year was estimated at approximately **£18.8 billion**[61] (see Table 5). In terms of the components of this impact:

- N8 universities' **research activities** accounted for **£8.6 billion** (**46%**) of this total (including **£2.0 billion** of direct, indirect, and induced impact, and **£6.6 billion** of productivity spillovers associated with this research);
- The impact generated by N8 universities' **knowledge exchange activities** stood at **£1.7 billion** (**9%**); and
- The impact associated with N8 universities' **institutional expenditures** was estimated at **£8.5 billion** (**45%**).

Table 5 Total economic impact of N8 universities' research, knowledge exchange activities and institutional expenditures in the UK in 2021-22 (£m and % of total)

Type of impact	£m	%
Impact of research and knowledge exchange	**£10,284m**	**55%**
Research activities	£8,594m	46%
Knowledge exchange activities	£1,689m	9%
Impact of university expenditure	**£8,542m**	**45%**
Direct impact	£3,495m	19%
Indirect and induced impacts	£5,047m	27%
Total economic impact	**£18,826m**	**100%**

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. The percentages show the proportion of total impact associated with the strand/sub-strand of analysis.
Source: London Economics' analysis

Compared to N8 universities' total relevant operational costs of approximately **£4.7 billion** in 2021-22,[62] the total impact of N8 universities' research, knowledge exchange activities and institutional expenditures on the UK economy was estimated at **£18.8 billion**. However, it should be noted that this presents an underestimate of the total impact of N8 universities'

[61] Parts of our analysis involve the use of indirect and induced multiplier effects, which have recently been removed from accepted methodologies in the revised Green Book (see Section 6.6 (page 57) of HM Treasury (2022)). Whilst the Green Book states that these effects should be excluded when comparing different policy options to each other, it also states that these effects 'may well form part of the higher-level analytical research that informs identification of a policy, and policy priorities', so we continue to include these methodologies in our analysis. However, to arrive at more Green Book compliant estimates, we can adjust our analysis to **remove any indirect and induced effects** that are estimated. Specifically, by removing the total indirect and induced effect estimated across all strands of **£7.2 billion** from our total economic impact of **£18.8 billion**, we arrive as a revised, lower bound estimate of the economic impact of N8 universities' research, knowledge exchange activities and institutional expenditures of **£11.6 billion**.

[62] This relates to N8 universities' total operating expenditures, excluding capital expenditures, depreciation, amortisation and movements in pension provisions.

activities, as other strands of economic impact, such as those relating to the teaching and learning offered to UK-domiciled students (measured by the enhanced labour market outcomes achieved by graduates over their working lives) or educational exports (incorporating the direct, indirect and induced effects of tuition fee and non-tuition fee expenditures) are not included within the analysis.

Despite these limitations, the analysis suggests a benefit to cost ratio of **4.0:1**. This suggests that an additional £100 million invested in N8 institutions would result in economic impacts of £400 million, through both direct, indirect and induced impacts of additional institutional expenditures, and further impacts resulting from research and knowledge exchange activities. Again, the actual economic impact resulting from an additional £100 million of investment in N8 institutions is likely to be greater than this once all strands of universities' activities are considered.

Box 9 University of Liverpool case study - A century of innovation: Shaping the future with Unilever

The University of Liverpool and Unilever, through their long-term strategic partnership, established the Materials Innovation Factory (MIF) – a world-class centre for materials chemistry and microbiome research. It is home to one of the highest concentrations, globally, of materials science robotics.

The MIF ensures the Liverpool City Region boasts the best academic labs in the world, enabling world-leading human microbiome research – exploring how the skin microbiome contributes to wellbeing, resulting in the development of first-to-market toothpaste and skincare products.

To date, the MIF has generated nearly £100 million investment and actively contributes to economic growth across the city region and beyond.

Matt Reed, Strategic Director of the MIF highlighted the civic impacts that the partnership has on the surrounding Liverpool City Region and the broader North West area. "The University, Unilever and its manufacturing abilities are key organisations that contribute a significant proportion of the economic activity in the area" he said. "They are also significant knowledge assets, undertaking large-scale activities and driving the knowledge economy, making both organisations significant assets for Liverpool."

4.2 Total impact by region and sector (where available)

In addition to the above total impact on the UK economy as a whole, it was possible to disaggregate *part* of N8 universities' economic impact by sector and region (and estimate

the impacts in terms of economic output *as well as* GVA and FTE employment). The strands of impact for which this disaggregation was achievable include:

- The direct, indirect and induced impact of N8 universities' **research activities** (**£2.0 billion**, see Section 2.1).[63]
- The impact of N8 universities' **knowledge exchange activities** (estimated at **£1.7 billion**, see Section 2.2).
- The impact associated with N8 universities' **operating and capital expenditures** (**£8.5 billion**, see Section 3).

Hence, approximately **£12.2 billion** (**65%**) of N8 universities' total economic impact through their research, knowledge exchange activities and institutional expenditures (of **£18.8 billion**) can be disaggregated in this way.

In terms of the breakdown by region (see Figure 9), the analysis indicates that of this total of **£12.2 billion**, approximately **£4.0 billion** (**33%**) occurred in the **North West**, with **£3.5 billion** (**29%**) taking place in **Yorkshire and the Humber** and **£1.5 billion** (**12%**) occurring in the **North East.** The total impact across these three regions (of **£9.0 billion**) is equivalent of **1.8%** of Northern gross domestic product (GDP) in 2022 (Office for National Statistics, 2025). The remaining **£3.2 billion** (**26%**) of economic impact took place in **other regions** across the UK.

Considering a more granular breakdown by region (see Figure 10),[64] particularly strong impacts associated with N8 universities' activities can be seen in **Greater Manchester** (**£2.1 billion**, **17%**), **West Yorkshire** (**£1.6 billion**, **13%**) and **South Yorkshire** (**£1.0 billion**, **8%**).

In terms of sector (see Figure 11), N8 universities' activities resulted in particularly large impacts within the **government, health, and education sector** (**£5.3 billion**, **43%**), the **distribution, transport, hotel, and restaurant sector** (**£1.6 billion**, **13%**), the **production sector** (**£1.4 billion**, **11%**), the **professional and support activities sector** (**£1.1 billion**, **9%**), and the **real estate sector** (**£1.0 billion**, **8%**).

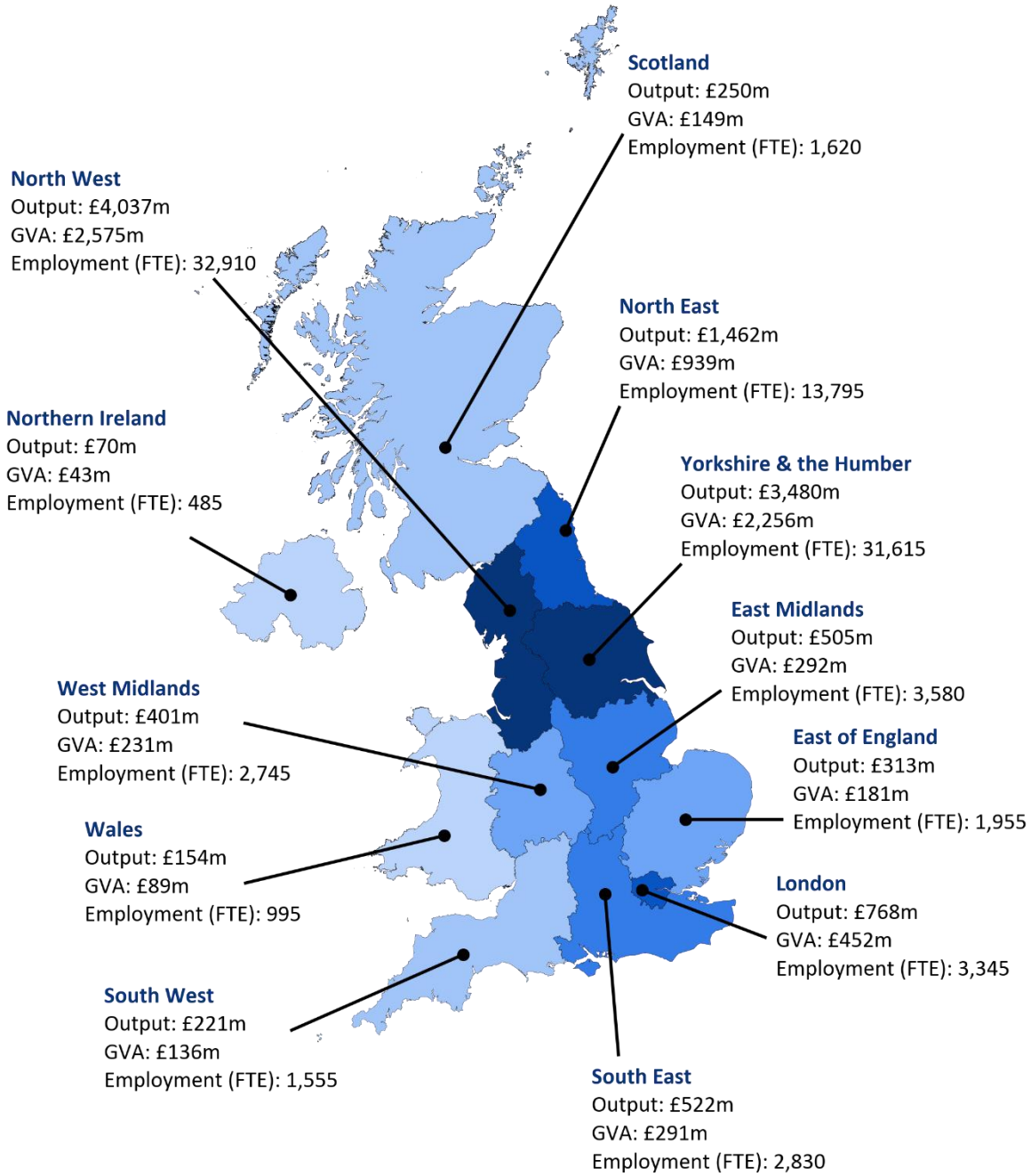
In terms of the number of FTE jobs supported, the results indicate that N8 universities' activities in 2021-22 (where available/identifiable at a regional level) supported a total of **97,425** FTE jobs across the UK economy, with **32,910** of these jobs located in the **North West**, **31,615** occurring in **Yorkshire and the Humber**, and a further **13,795** supported in the **North East**.

In addition, the impact in terms of gross value added was estimated at **£7.6 billion** across the UK economy as a whole, of which **£2.6 billion** was generated in the **North West**, a

[63] Note that this excludes the **£6.6 billion** of economic impact resulting from productivity spillovers associated with N8 universities' research activities, where a breakdown by region or sector is not available as it was not possible to assign the geographic location or sectors of businesses benefiting from the productivity spillovers generated by N8 universities' research.
[64] A breakdown of this economic impact by strand is presented in Annex 3.

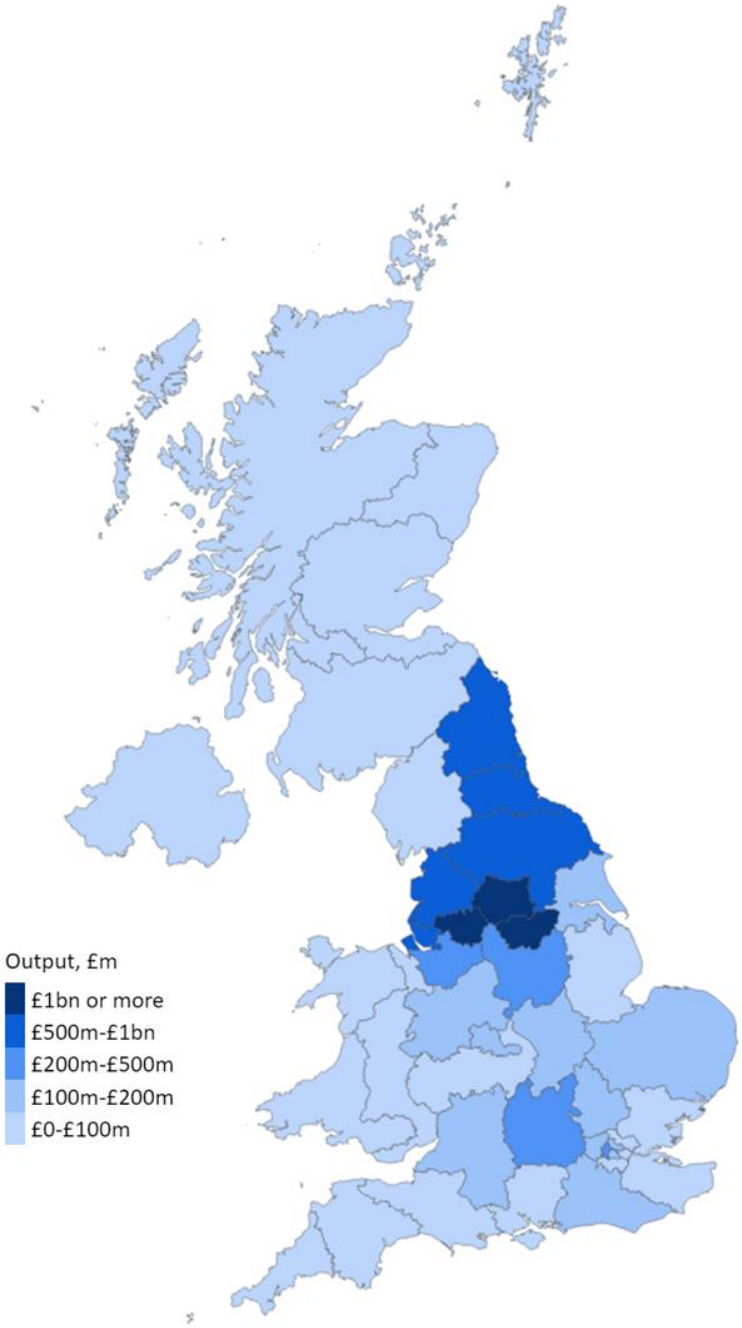
further **£2.3 billion** occurred in **Yorkshire and the Humber**, and an additional **£939 million** was generated in the **North East**.

Figure 9 Total economic impact associated with N8 universities' research, knowledge exchange activities and institutional expenditures in 2021-22, by region (where identifiable)



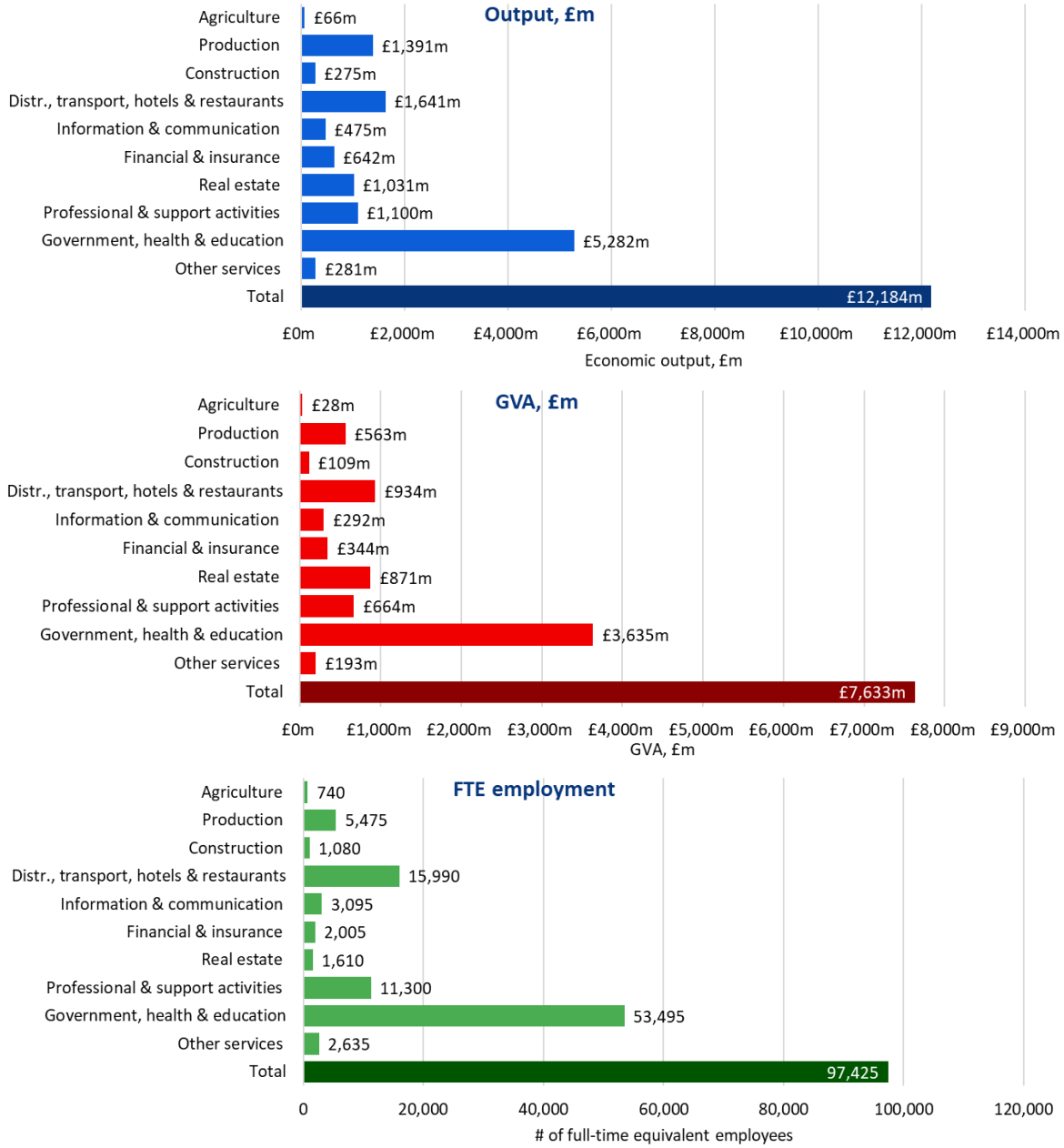
Note: Monetary estimates are presented in 2021-22 prices, rounded to the nearest £1 million and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated. The map only contains the **£12.2 billion** (of N8 universities' total **£18.8 billion**) of economic impact that can be attributed to a region.
Source: London Economics' analysis

Figure 10 Total economic impact associated with N8 universities' research, knowledge exchange activities and institutional expenditures in 2021-22, by sub-region (where identifiable)



Note: Monetary estimates are presented in 2021-22 prices, discounted to reflect net present values (where applicable), rounded to the nearest £1 million, and may not add up precisely to the totals indicated. The map only contains the **£12.2 billion** (of N8 universities' total **£18.8 billion**) of economic impact that can be attributed to a region/sub-region.
Source: London Economics' analysis

Figure 11 Total identifiable economic impact associated with N8 universities' research, knowledge exchange activities and institutional expenditures in 2021-22, by sector



Note: Monetary estimates are presented in 2021-22 prices, rounded to the nearest £1 million and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated. The map only contains the **£12.2 billion** (of N8 universities' total **£18.8 billion**) of economic impact that can be attributed to a sector.
Source: London Economics' analysis

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Annex 1 References

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Annex 2 Technical annex

A2.1 Multi-regional Input-Output analysis

A2.1.1 Derivation of economic multipliers from multi-regional Input-Output tables

This section provides further detail on the economic multipliers utilised in this analysis, as first introduced in Section 2.1.3. The economic multipliers are calculated based on the UK's 41 International Territorial Level 2 (ITL2) regions.[65]

The multi-regional Input-Output analysis is undertaken by 'regionalising' UK Input-Output tables for 2019 (see Office for National Statistics, 2023d).[66] This technique relies on the assumption that there is 'common technology' (i.e. identical input structures) across all regions. In other words, for each unit of output produced by a sector, the analysis assumes that the same number of units of input from each supplying sector are required, regardless of the region that the producing sector is located in.[67] However, a region's producing sector may not be able to source all of its required inputs from its own region's supplying sectors. The extent to which firms source production inputs from within their *own* regions is determined using Flegg Location Quotients,[68] which are based on employment data by sector and ITL2 region (see Nomis, 2023)). Trade *between* different regions is then determined using a gravity model,[69] based on the distance between each of the ITL2 regions, whether regions border each other, and the size (measured in GVA) of the supplying and producing sectors (based on GVA data by sector and region (Office for National Statistics, 2023a)).

The multi-regional Input-Output analysis relies on a wide range of data, including data on GVA components by sector and ITL2 region (Office for National Statistics, 2023a); employment by sector and ITL2 region (Nomis, 2023); gross disposable household income by ITL2 region (Office for National Statistics, 2022d); total residents by Local Authority (converted to ITL2 regions) (Office for National Statistics, 2022b); mean weekly total paid hours worked by industry, for full-time vs. part-time employees (Office for National Statistics, 2022a); employed residents by Local Authority of usual residence and workplace (converted to ITL2 regions) (Nomis, 2014); and UK imports into each ITL2 region and exports by each ITL2 region by sector, separately for goods and services (Office for National Statistics, 2023b and 2023c).

[65] For more information, see Office for National Statistics (2024). The classification is based on the ITL boundaries established as of January 2021.
[66] While more recent UK Input-Output tables have been published (for 2020), they are affected by the impact of the Covid-19 pandemic, so 2019 tables are used instead to be more reflective of a 'typical' year (see Office for National Statistics (2022c) and Office for National Statistics (2023d) for more details).
[67] i.e. all firms within a given industry (irrespective of their region) use the same production techniques and have the same input structures to produce their outputs. This assumption helps simplify the Input-Output analysis, by treating each industry as if it were a single, homogeneous entity.
[68] See Flegg & Tohmo (2014) and Flegg et al. (2021) for more detail on the implementation of Flegg Location Quotients. Similar location quotient techniques have been used to generate other Input-Output tables in the UK for different regions, such as for London (see GLA Economics (2019)) and the Glasgow City Region (see Hermannsson (2016)).
[69] Based on the specification and parameters given by Jahn (2016) and Jahn et al. (2020).

In terms of sector breakdown, the original UK-level Input-Output tables are broken down into 105 relatively granular sectors. However, the wide range of regional-level data required to generate the multi-regional Input-Output model is not available for such a granular sector breakdown. Instead, the multi-regional Input-Output model is broken down into 10 more high-level sector groups (see Table 7 below).

A2.1.2 Estimating indirect and induced impacts

The multi-regional Input-Output analysis outlined above allowed us to derive multipliers by sector and region within the UK economy. To then estimate the economic impact of N8 universities' research, knowledge exchange activities and institutional expenditures, we multiplied the direct economic output, GVA, and FTE staff[70] associated with these activities by the estimated **average economic multipliers associated with organisations in the government, health, and education sector in each region** (assigning relevant multipliers based on the region within which each university operates). This approach implicitly assumes that the spending patterns of universities reflect the average spending patterns across all organisations operating in the government, health, and education sector within the same region. We thus arrive at the **total economic contribution associated with each university's activities (in terms of economic output, GVA, and jobs supported) to the UK economy.**

For example, to assess the direct, indirect, and induced impacts associated with the activities of The University of Leeds, we multiplied the university's direct impact by the average economic multiplier associated with organisations in West Yorkshire's government, health, and education industry. These multipliers (separately for each N8 university) are presented in Table 6. For example, the multipliers for West Yorkshire suggest that every **£1** of income received by The University of Leeds generates a *total* of **£2.46** of impact throughout the UK economy. In terms of employment, we assume that, for every **1,000** (FTE) staff employed directly by The University of Leeds, a total of **1,900** staff are supported throughout the UK.

[70] To estimate the direct GVA and employment associated with each university's research and knowledge exchange income, we multiplied this income by the average ratio of GVA to output and FTE employees to output within the government, health, and education sector in the university's ITL2 region (based on the above-described multi-regional Input-Output model). The direct GVA and employment associated with institutional expenditures are estimated through the use of published finance (HESA, 2024a) and staff (HESA, 2024c) data for each university.

Table 6 Assumed economic multipliers associated with the research, knowledge exchange activities and institutional expenditures of N8 universities

University	University ITL2 region	Economic multiplier (impact on the UK economy)		
		Economic output	GVA	FTE employment
Durham University	Tees Valley and Durham	2.47	2.28	1.86
Lancaster University	Lancashire	2.51	2.30	1.87
Newcastle University	Northumberland, and Tyne and Wear	2.44	2.24	1.85
The University of Leeds	West Yorkshire	2.46	2.27	1.90
The University of Liverpool	Merseyside	2.45	2.24	1.89
The University of Manchester	Greater Manchester	2.42	2.22	1.94
The University of Sheffield	South Yorkshire	2.45	2.23	1.91
The University of York	North Yorkshire	2.37	2.16	1.96

Note: All multipliers constitute Type II multipliers, defined as [Direct + indirect + induced impact]/[Direct impact]. ***Source: London Economics' analysis***

A2.1.3 Limitations of Input-Output analyses

While Input-Output analyses are a useful tool to assess the total economic impacts generated by a wide range of activities, it is important to note several key limitations associated with this type of analysis. For example:

- Input-Output analyses assume that inputs are complements, and that there are constant returns to scale in the production function (i.e., that there are no economies of scale). The interpretation of these assumptions is that the prevailing breakdown of inputs from all sectors (employees, and imports) is a good approximation of the breakdown that would prevail if total demand (and therefore output) were marginally different.
- Input-Output analyses do not account for any price effects resulting from a change in demand for a given industry/output.
- Input-Output models are 'static' in nature, in the sense that they assume fixed relationships between inputs and outputs, not accounting for changes in technology, prices, or production methods over time.
- Given the complexity of the analysis and reliance on a wide range of industry-level data, the sectors included within Input-Output models are often highly aggregated, therefore masking likely differences between different industries.
- Input-Output models typically do not account for potential supply constraints, i.e. they assume that overall supply can meet any level of demand.

A2.1.4 Industry classifications for multi-regional Input-Output analysis

Table 7 provides an overview of the high-level industry classifications used throughout the multi-regional Input-Output analysis.

Table 7 Industry grouping used as part of the multi-regional Input-Output analysis

Industries included in original UK Input-Output table	High-level industry group [and UK SIC Codes]
Crop and animal production, hunting and related service activities	Agriculture [1-3]
Forestry and logging	
Fishing and aquaculture	
Mining and quarrying	Production [5-39]
Manufacture of food products, beverages, and tobacco products	
Manufacture of textiles, wearing apparel and leather products	
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	
Manufacture of paper and paper products	
Printing and reproduction of recorded media	
Manufacture of coke and refined petroleum products	
Manufacture of chemicals and chemical products	
Manufacture of basic pharmaceutical products and pharmaceutical preparations	
Manufacture of rubber and plastic products	
Manufacture of other non-metallic mineral products	
Manufacture of basic metals	
Manufacture of fabricated metal products, except machinery and equipment	
Manufacture of computer, electronic and optical products	
Manufacture of electrical equipment	
Manufacture of machinery and equipment n.e.c.	
Manufacture of motor vehicles, trailers and semi-trailers	
Manufacture of other transport equipment	
Manufacture of furniture; other manufacturing	
Repair and installation of machinery and equipment	
Electricity, gas, steam, and air conditioning supply	
Water collection, treatment and supply	
Sewerage; waste collection, treatment, and disposal activities; materials recovery; remediation activities and other waste management services	
Construction	Construction [41-43]
Wholesale and retail trade and repair of motor vehicles and motorcycles	Distribution, transport, hotels, and restaurants [45-56]
Wholesale trade, except of motor vehicles and motorcycles	
Retail trade, except of motor vehicles and motorcycles	
Land transport and transport via pipelines	
Water transport	

Industries included in original UK Input-Output table	High-level industry group [and UK SIC Codes]
Air transport	
Warehousing and support activities for transportation	
Postal and courier activities	
Accommodation and food service activities	
Publishing activities	Information and communication [58-63]
Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities	
Telecommunications	
Computer programming, consultancy and related activities; information service activities	
Financial service activities, except insurance and pension funding	Financial and insurance [64-66]
Insurance, reinsurance and pension funding, except compulsory social security	
Activities auxiliary to financial services and insurance activities	
Real estate activities excluding imputed rents	Real estate [68.1-2-68.3]
Imputed rents of owner-occupied dwellings	
Legal and accounting activities; activities of head offices; management consultancy activities	Professional and support activities [69.1-82]
Architectural and engineering activities; technical testing and analysis	
Scientific research and development	
Advertising and market research	
Other professional, scientific, and technical activities; veterinary activities	
Rental and leasing activities	
Employment activities	
Travel agency, tour operator reservation service and related activities	
Security and investigation activities; services to buildings and landscape activities; office administrative, office support and other business support activities	
Public administration and defence; compulsory social security	Government, health & education [84-88]
Education	
Human health activities	
Social work activities	
Creative, arts and entertainment activities; libraries, archives, museums, and other cultural activities; gambling and betting activities	Other services [90-97]
Sports activities and amusement and recreation activities	
Activities of membership organisations	
Repair of computers and personal and household goods	
Other personal service activities	
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	

Note: 'n.e.c.' = not elsewhere classified

Source: London Economics' analysis, based on Office for National Statistics (2023d) and UK SIC Codes (see Office for National Statistics, 2022f)

A2.2 Impact of N8 universities' research and knowledge exchange activities

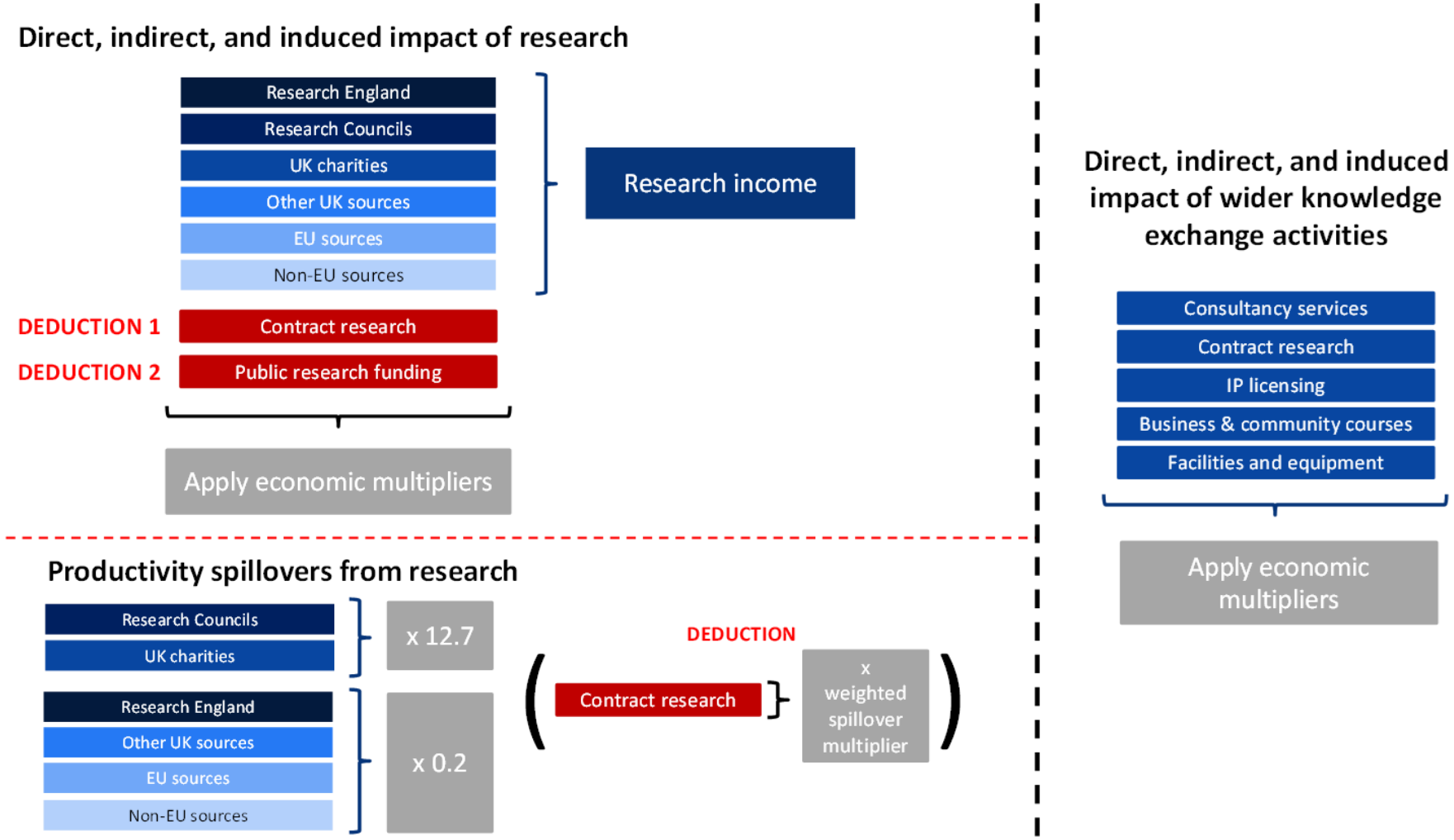
A2.2.1 Overview of the analysis of research and wider knowledge exchange activities

Figure 12 provides an overview of the methodological approach adopted to analyse the economic impact of N8 universities' research and wider knowledge exchange activities,[71] in terms of:

- The direct, indirect, and induced impact of research (Section 2.1.3).
- The productivity spillovers from N8 universities' research (Section 2.1.4).
- The direct, indirect, and induced impact of N8 universities' wider knowledge exchange activities (Section 2.2.2).

[71] For simplicity, the chart here excludes the impact of N8 universities' spinout companies.

Figure 12 Overview of the analysis of the impact of research and wider knowledge exchange activities



Note: Research funding includes collaborative research funding, which is divided into public, cash and in-kind funding. Cash and public fall under and are included in the research categories. In-kind contributions are excluded from the analysis, since these contributions do not represent a cash transaction for which we can robustly apply economic multipliers. To avoid double-counting, contract research funding is deducted from the impact of research, as this is already included within the impact of wider knowledge exchange activities.

Source: London Economics analysis

A2.2.2 Regional and sectoral impact of research and knowledge exchange activities

The total direct, indirect, and induced impact of N8 universities' research and knowledge exchange activities can also be broken down by **region** as well as by **sector**, and can be presented in GVA and FTE employment terms.[72] These disaggregated estimates are presented in Figure 13 and Figure 14, respectively.

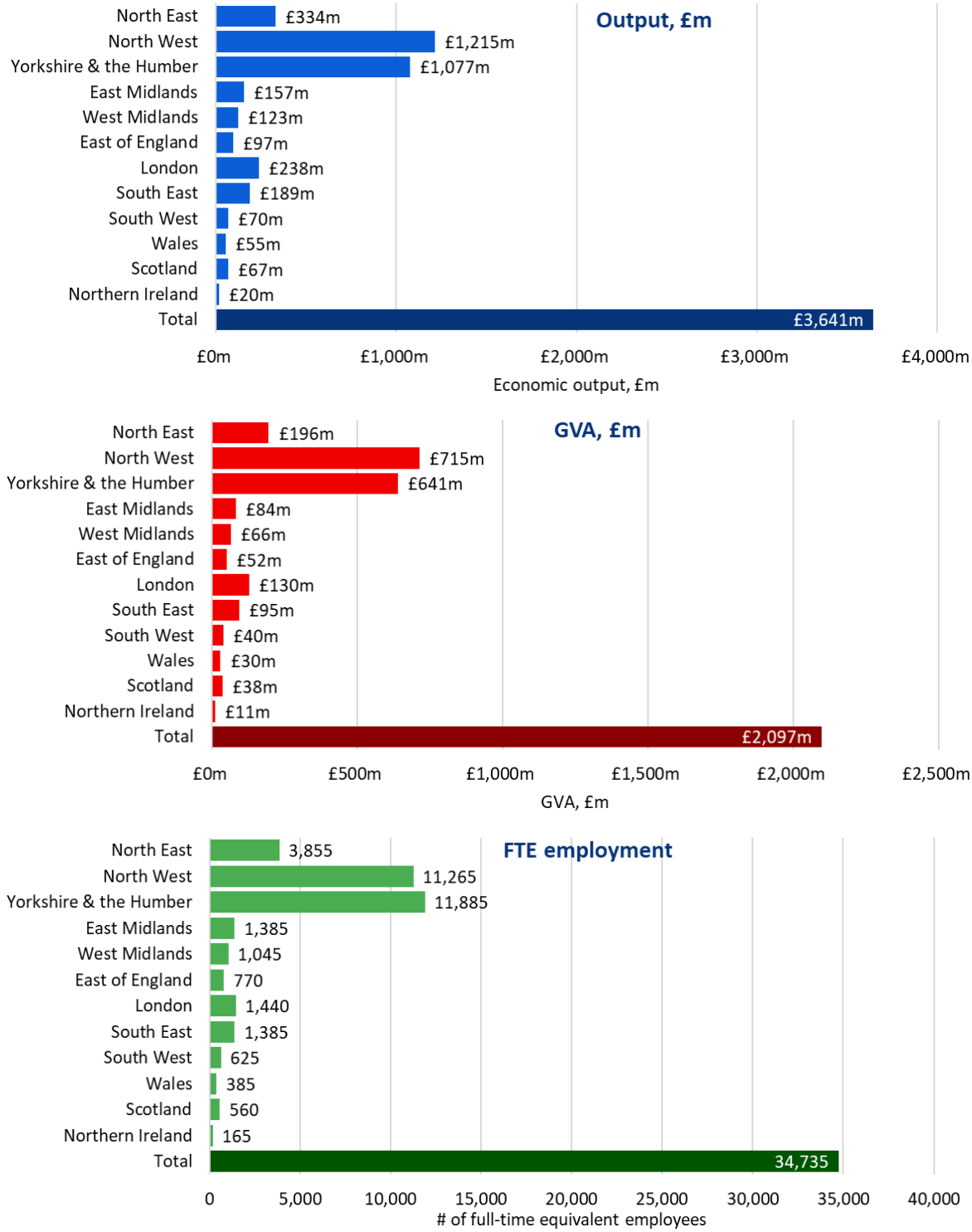
Considering the breakdown by **region**, in terms of **economic output** (top panel), **approximately one third** of the total impact of **£3.6 billion**[73] associated with N8 universities' research and knowledge exchange activities occurred in the **North West** (**£1.2 billion**, **33%**), with an additional **£1.1 billion** (**30%**) generated within **Yorkshire and the Humber** and **£334 billion** (**9%**) occurring in the **North East**. There were also significant impacts occurring in other regions, particularly in **London** (**£238 million**, **7%**) and the **South East** (**£189 million**, **5%**).

The impact in terms of **GVA** (middle panel) was estimated at **£2.1 billion** across the UK economy as a whole, of which **£715 million** occurred in the **North West**, **£641 million** was located in **Yorkshire and the Humber** and **£196 million** was generated within the **North East**. Finally, of the estimated **34,735 FTE jobs** (bottom panel) that were supported by N8 universities' research and knowledge exchange activities across the UK as a whole, **11,885** were located in **Yorkshire and the Humber**, with an additional **11,265** supported in the **North West** and a further **3,855** located in the **North East**.

In terms of **sector**, N8 universities' research and knowledge exchange activities resulted in particularly large impacts within the **government, health and education** sector **(£1.4 billion**), the **distribution, transport, hotel and restaurant** sector (**£495 million**), the **production** sector (**£448 million**), and the **professional and support activities** sector (**£439 million**).

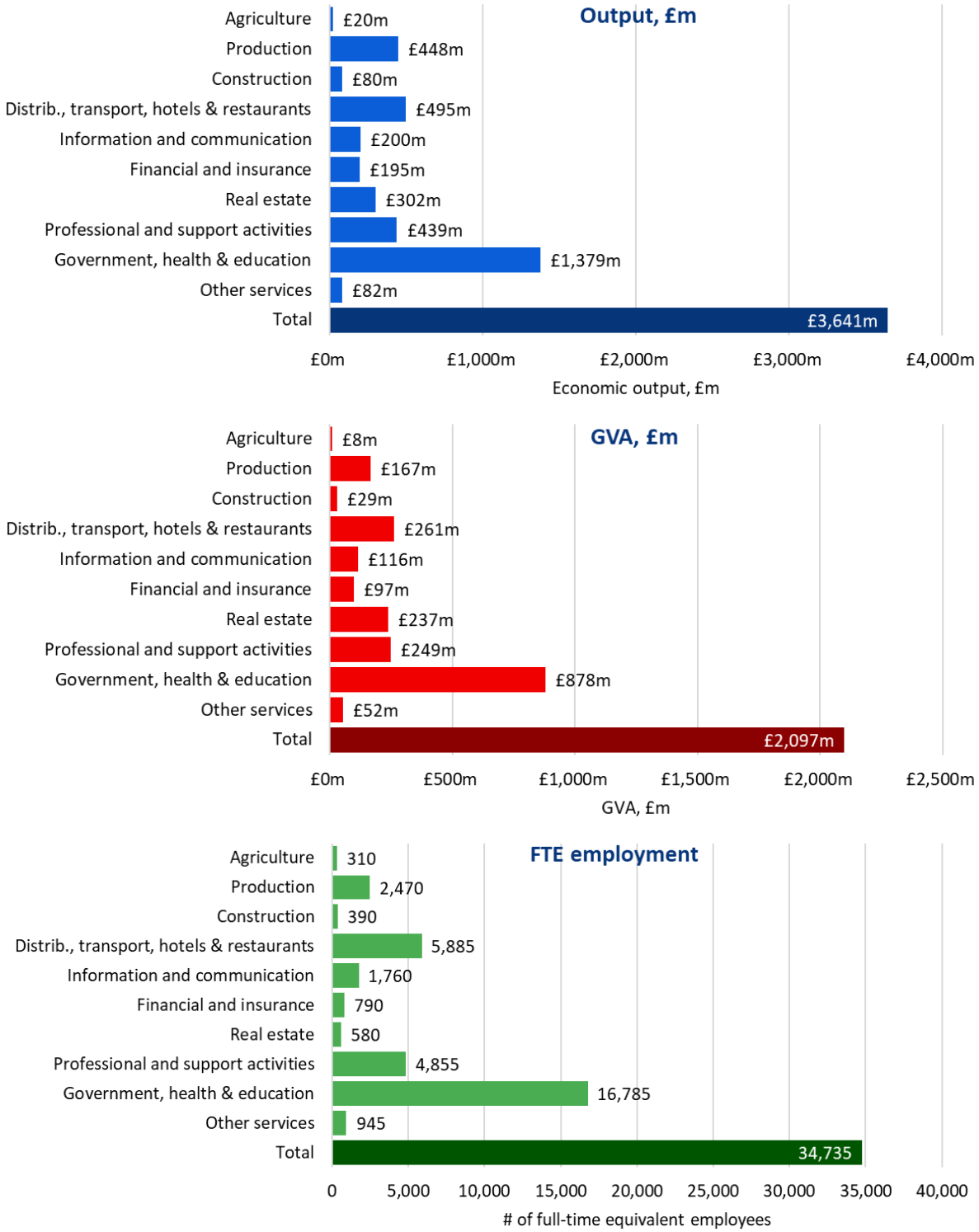
[72] Note that this breakdown does *not* include the productivity spillovers associated with the N8 universities' research (as it is not possible to assign a geographic location or sector to each business benefiting from productivity spillovers generated by N8 universities' research).
[73] Note again that this is the total impact that can be broken down by region and sector, i.e. the impact of research and knowledge exchange activities *excluding* productivity spillovers.

Figure 13 Direct, indirect and induced economic impact associated with N8 universities' research and knowledge exchange activities in 2021-22, by region



Note: Monetary estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated. The estimates here *exclude* a total of **£6.6 billion** of productivity spillovers (in economic output terms) associated with N8 universities' research.
Source: London Economics' analysis

Figure 14 Direct, indirect and induced economic impact associated with N8 universities' research and knowledge exchange activities in 2021-22, by sector



Note: Monetary estimates are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated. The estimates here *exclude* a total of **£6.6 billion** of productivity spillovers (in economic output terms) associated with N8 universities' research.
Source: London Economics' analysis

Annex 3 Economic impact by ITL2 region of the UK

Table 8 presents our estimates of the economic impact of N8 universities' activities by the destination of this impact, where possible. This analysis includes approximately **£12.2 billion** (**65%**) of N8 universities' total economic impact of **£18.8 billion**, including:

- The direct, indirect and induced impact of N8 universities' **research activities** (**£2.0 billion**, see Section 2.1).[74]
- The impact of N8 universities' **knowledge exchange activities** (estimated at **£1.7 billion**, see Section 2.2).
- The impact associated with N8 universities' **operating and capital expenditures** (**£8.5 billion**, see Section 3).

The largest impacts occur in the regions in which N8 universities are located, with particularly strong impacts taking place in **Greater Manchester** (**£2.1 billion**, **17%**), **West Yorkshire** (**£1.6 billion**, **13%**) and **South Yorkshire** (**£1.0 billion**, **8%**). However, the table also shows the extent to which N8 universities' economic impacts take place throughout the UK, with at least **£10 million** of impact occurring in each ITL2 region.

Table 8 Economic impact associated with N8 universities' activities in 2021-22, by sub-region and strand of impact (where identifiable)

ITL2 Region	Research	Knowledge exchange	Institutional expenditures	Total
Tees Valley and Durham	£71m	£59m	£546m	**£676m**
Northumberland, and Tyne and Wear	£128m	£75m	£583m	**£787m**
Cumbria	£11m	£8m	£56m	**£75m**
Cheshire	£51m	£46m	£212m	**£308m**
Greater Manchester	£370m	£316m	£1,411m	**£2,097m**
Lancashire	£102m	£67m	£477m	**£646m**
Merseyside	£148m	£96m	£666m	**£911m**
East Yorkshire and Northern Lincolnshire	£21m	£17m	£91m	**£129m**
North Yorkshire	£96m	£73m	£529m	**£699m**
South Yorkshire	£203m	£147m	£678m	**£1,028m**
West Yorkshire	£249m	£271m	£1,105m	**£1,624m**
Derbyshire and Nottinghamshire	£54m	£45m	£217m	**£316m**
Leicestershire, Rutland and Northamptonshire	£21m	£19m	£91m	**£130m**
Lincolnshire	£9m	£8m	£41m	**£58m**

[74] Note that this excludes the **£6.6 billion** of economic impact resulting from productivity spillovers associated with N8 universities' research activities, where a breakdown by region or sector is not available as it was not possible to assign the geographic location or sectors of businesses benefiting from the productivity spillovers generated by N8 universities' research.

ITL2 Region	Research	Knowledge exchange	Institutional expenditures	Total
Herefordshire, Worcestershire and Warwickshire	£15m	£15m	£64m	**£94m**
Shropshire and Staffordshire	£19m	£17m	£83m	**£119m**
West Midlands	£30m	£26m	£131m	**£188m**
East Anglia	£20m	£21m	£88m	**£129m**
Bedfordshire and Hertfordshire	£18m	£17m	£77m	**£112m**
Essex	£11m	£10m	£50m	**£72m**
Inner London - East	£28m	£27m	£122m	**£177m**
Inner London - West	£60m	£59m	£264m	**£383m**
Outer London - East and North East	£8m	£8m	£36m	**£52m**
Outer London - South	£7m	£7m	£32m	**£47m**
Outer London - West and North West	£17m	£17m	£76m	**£110m**
Berkshire, Buckinghamshire and Oxfordshire	£32m	£55m	£142m	**£229m**
Surrey, East and West Sussex	£19m	£35m	£85m	**£139m**
Hampshire and Isle of Wight	£14m	£14m	£61m	**£88m**
Kent	£10m	£10m	£46m	**£67m**
Gloucestershire, Wiltshire and Bath/Bristol area	£20m	£23m	£90m	**£133m**
Dorset and Somerset	£6m	£6m	£29m	**£41m**
Cornwall and Isles of Scilly	£2m	£2m	£11m	**£15m**
Devon	£5m	£5m	£22m	**£32m**
West Wales and The Valleys	£12m	£11m	£52m	**£75m**
East Wales	£11m	£22m	£47m	**£80m**
Eastern Scotland	£14m	£11m	£67m	**£92m**
Highlands and Islands	£2m	£2m	£10m	**£13m**
North Eastern Scotland	£3m	£3m	£16m	**£22m**
West Central Scotland	£10m	£8m	£48m	**£66m**
Southern Scotland	£9m	£6m	£41m	**£56m**
Northern Ireland	£11m	£9m	£51m	**£70m**
Total	**£1,952m**	**£1,689m**	**£8,542m**	**£12,184m**

Note: The table only contains the **£12.2 billion** (of N8 universities' total **£18.8 billion**) of economic impact that can be attributed to a region, excluding the **£6.6 billion** of economic impact resulting from productivity spillovers associated with N8 universities' research activities.

Source: London Economics' analysis

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