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The economic impact of the Russell Group universities' R&D activities

Final Report for the Russell Group

January 2024

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Acknowledgements

We would like to acknowledge the useful data, guidance and feedback provided by the Russell Group throughout this research, with particular thanks to Lily Bull. Despite the assistance, responsibility for the contents of this report remains with London Economics

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Executive Summary

London Economics were commissioned to assess the **economic impact of research and commercialisation activities undertaken by Russell Group universities** on the United Kingdom economy, for the 2021/22 academic year. Specifically, the analysis estimates the **direct, indirect, and induced economic impacts** associated with the research, wider knowledge exchange activities and spin-out companies of Russell Group universities, as well as the **wider productivity spillovers** from Russell Group research.

The total economic impact on the UK economy associated with the Russell Group's core research and commercialisation activities in 2021/22 was estimated to be approximately **£37.6 billion**. In terms of the components of this impact:

- The Russell Group universities' **research activities** accounted for **£14.3 billion**;
- The impact associated with Russell Group **spin-out companies** was estimated at **£17.8 billion**; and,
- The combined impact of the Russell Group universities' **wider knowledge exchange activities** from contract research, consultancy services, IP income, business and community courses, and facilities and equipment stood at **£5.5 billion**.

Given that the total public cost of research is **£4.4 billion** for all Russell Group universities, this suggests that every **£1** of public funding is associated with an economic impact of **£8.52 across the UK economy**.

In terms of GVA and employment measures, the analysis estimates that Russell Group universities' R&D activities generated **£20.5 billion** in GVA and supported approximately **254,140 FTE jobs**, of which **43,550** are located in **London**.

In addition, we estimate a further **£30.5 billion** may be generated in terms of **positive productivity spillovers** (see Section 2.3). This brings the total potential impact of the Russell Group's research and commercialisation activities in 2021/22 to approximately **£68.1 billion**. As opposed to the direct, indirect, and induced impacts, these spillovers reflect *intangible* impacts that occur outside the market mechanism¹ and are therefore presented separately from the final total.

As well as estimating the total impact on the UK economy as a whole, it was possible to disaggregate the direct, indirect, and induced economic impact by sector and region. In terms of the breakdown by

region, the analysis indicates that of this total of **£37.6 billion**, approximately **£9.2 billion** was generated in the **East of England** and **£8.9 billion** in **London**, with substantial impacts in **other**

Direct effect:

The economic output generated by the universities themselves, by purchasing goods and services from the economy in which they operate

Indirect effect ('supply chain impact'):

The chain reaction of subsequent rounds of spending of the universities' purchases

Induced effect ('wage spending impact'):

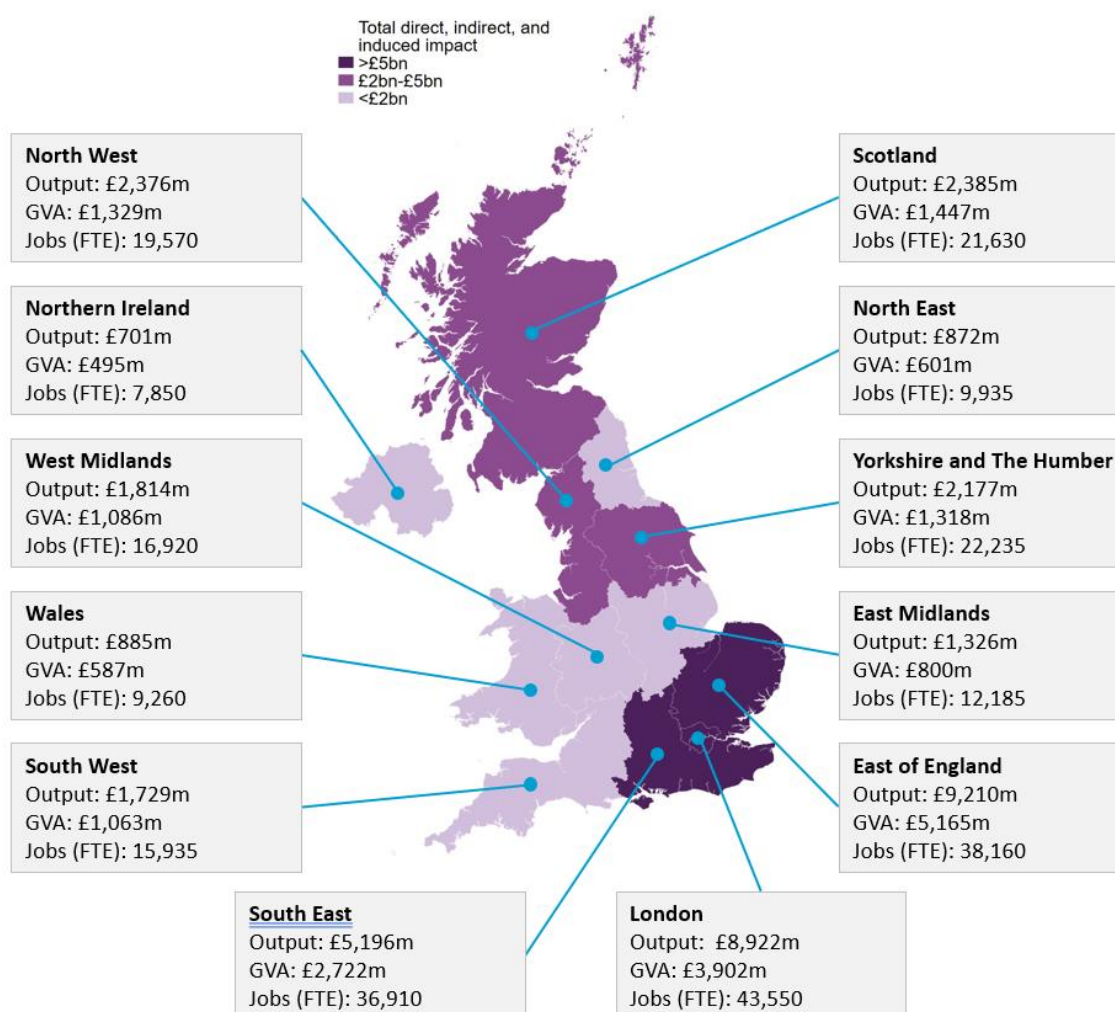
The chain reaction of subsequent rounds of spending of the universities' spending on wages and salaries

¹ Productivity spillover impacts occurring "outside the market mechanism" refer to the positive effects on overall economic efficiency and performance that extend beyond individual market transactions, influencing other sectors or aspects of the economy without being directly accounted for by buyers and sellers in a market.

regions across the UK, including **£5.2 billion** in the **South East** and **£2.4 billion** in **Scotland** (see Figure 1).²

The sector with the greatest impact is the **government, health, and education sector**, where the Russell Group's R&D activities generated an estimated total of **£9.7 billion**. Other sectors experiencing large impacts include the **professional & support activities sector (£8.7 billion)**, the **production sector (£5.5 billion)** and the **distribution, transport, hotels and restaurants sector (£5.0 billion)**.

Figure 1 Distribution of the total impact of Russell Group universities' research and knowledge exchange activities, by region



Note: Destination of impact shown. 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 of Russell Group universities' data. © ONS Geography for the administrative boundaries.

² Note that these figures indicate the destination of impact and *not* the origin of impact. It is not possible to extrapolate directly from the total economic impact in a particular region that a particular Russell Group university was entirely responsible for that impact, given that indirect and induced impacts occur across multiple regions. By considering measures of the destination of impact, we consider the impact off all Russell Group universities' economic impact on each of the regions.

1 Introduction

London Economics were commissioned to assess the **economic impact of the research and commercialisation activities at Russell Group universities** on the United Kingdom, for the 2021/22 academic year.

The report follows an analysis previously undertaken by London Economics to assess the economic impact of Russell Group universities in the 2015-16 academic year³. This previous report demonstrated that the Russell Group universities generate substantial economic benefits through their world-class research, alongside other widespread impacts through teaching and learning activities, the direct, indirect and induced impact of operational and capital expenditures throughout the universities' supply chains, as well as the hosting of international students.

Our analysis here focuses on the impacts associated with the research and commercialisation activities of Russell Group universities, by estimating the economic impact in terms of the **direct, indirect, and induced economic impacts**. We also estimate the **wider productivity spillovers** from Russell Group research.⁴ The Russell Group's world-leading research contributes to the UK's national prosperity through a range of activities and channels. Reflecting these channels of impact, the remainder of this report is structured as follows:

- Section 2 estimates the impact of the **research income** of Russell Group universities, including wider productivity spillovers;
- Section 3 covers the economic contribution of Russell Group universities' **spin-out companies**; and,
- Section 4 estimates the impact of Russell Group universities' **wider knowledge exchange activities** (e.g. consultancy services and contract research).
- Section 5 **concludes** the report.

³ See London Economics (2017).

⁴ In other words, the estimates presented here focus only on the economic impact associated with the research and knowledge exchange activities but do not consider the substantial additional economic contributions associated with the Russell Group universities' teaching and learning activities, operational and capital expenditures or their educational exports in the form of international students coming to study in the UK.

2 The impact of research at Russell Group universities

In this first chapter, we consider the **economic impact of the Russell Group universities' research activities**. We estimate both the **direct, indirect, and induced effects** of the Russell Group universities' research (captured by the research income accrued by the Russell Group and the subsequent rounds of spending this income generates across the economy), as well as the **productivity spillover effects** from the universities' research activities. In this section, all of the analysis was conducted at the **university level** before being aggregated across all 24 Russell Group universities.

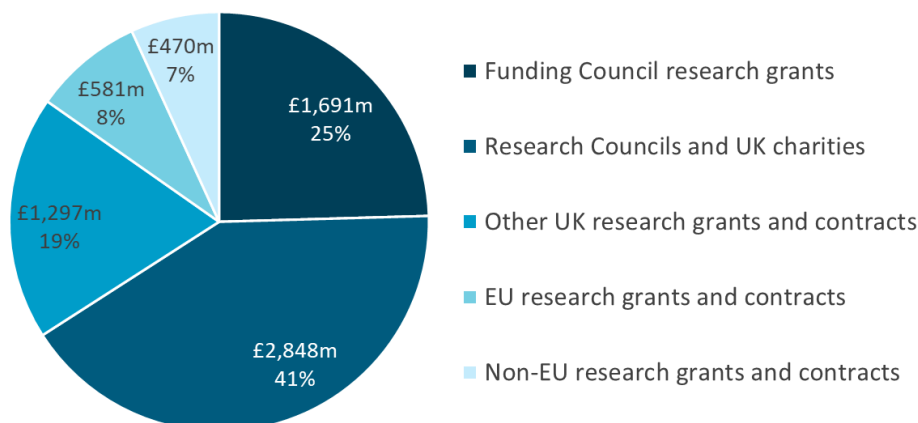
2.1 Direct research impact

To estimate the **direct impact** generated by the Russell Group universities' research activities, we used information from the Higher Education Statistics Agency (HESA) on the total research-related income accrued by each of the individual Russell Group universities in the 2021/22 academic year, including:

- 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; and
 - **Non-EU sources**, including charities, industry and commerce, and other sources; and,
- **Recurrent research funding** allocated to Russell Group universities by home nation Funding Councils.⁵

Aggregating across each university's income from each of these sources, the total research-related income accrued by Russell Group universities in the 2021/22 academic year stood at **£6.9 billion** (see Figure 2). Of this income, the universities received **£2.8 billion (41%)** from the UK Research Councils and charities, with a further **£1.7 billion (25%)** received through Funding Council research grants. Across the remaining categories (which make up approximately one third of the Russell Group's total research income), income from other UK sources accounted for **£1.3 billion (19%)**, while research income from EU sources stood at **£581 million (8%)** and non-EU sources accounted for **(£470 million, 7%)**.

⁵ "Home nation Funding Councils" refers to Research England, the Scottish Funding Council, the Higher Education Funding Council for Wales, and the Department for the Economy in Northern Ireland.

Figure 2 Total research income received by Russell Group universities, £m by source

Note: all values are presented in 2021/22 prices and are rounded to the nearest £1m.

Source: London Economics' analysis based on data provided by the Higher Education Statistics Agency (HESA, 2022a)

2.1.1 Adjustment for double counting with knowledge exchange activities

The **£6.9 billion** of research income received by the Russell Group in 2021/22 includes income associated with a whole range of research activities. In particular, the universities' **collaborative research** and **contract research** activities are included within this aggregate total.⁶ However, the income from these two activities is *also* recorded separately within the Higher Education Business and Community Interaction Survey (HE-BCI)⁷ data, which we use to separately estimate the economic impact associated with the universities' wider knowledge exchange activities (described in further detail in Section 4).

Given that the income from these sources is included in *both* the data on the universities' research-related income as well as the HE-BCI data on the universities' wider knowledge exchange activities, to avoid any double counting between the estimated impact of the Russell Group universities' research activities (described in this section) and wider knowledge exchange activities (described in Section 4), we made the following adjustments:

- In terms of the universities' impact from **collaborative research**, we implicitly account for publicly funded and cash income from collaborative research within the **impact of the universities' research** in this section. We therefore do *not* take collaborative research income into account in the analysis of wider knowledge exchange activities. This income represents **£901 million** out of the **£6.9 billion** of total research income received by Russell Group universities in 2021/22.⁸
- In terms of **contract research**, we account for this activity within the impact of the Russell Group's wider knowledge exchange activities (see Section 4). Therefore, to avoid double counting, the analysis of the impact of the Russell Group's research here is adjusted to

⁶ 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. Full definitions are provided in the Glossary in Annex 2.

⁷ See Higher Education Statistics Agency (2020b).

⁸ The **£901 million** in collaborative research funding is made up of **£799 million** of public funding and **£102 million** of collaborative cash contributions. Note that any income in terms of in-kind contributions to collaborative research (**£253 million**) is excluded from the impact analysis since these contributions do not represent a cash transaction for which we can robustly apply economic multipliers.

deduct the **£1.2 billion** of contract research income from the above total research-related income (**£6.9 billion**). We thus estimated that the **direct impact** associated with the Russell Group's research activity in the 2021/22 academic year stands at **£5.6 billion**.

A schematic overview of the methodological approach adopted including the adjustments for double counting is provided in Annex A3.1.

2.2 Total direct, indirect, and induced impact of the Russell Group's research activity

In addition to the direct impact of the Russell Group's research (**£5.6 billion**), the analysis also captures the indirect and induced economic impacts associated with each of these research activities, defined as follows:

- **Indirect effect ('supply chain impacts')**: Russell Group universities spend their research income on purchases of goods and services from suppliers, who in turn spend this revenue purchasing inputs to meet demand from the universities. 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')**: The employees of Russell Group universities (supported by their research income) use their wages to buy 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 the Russell Group's research activities. An analysis of the *net* economic impact ideally needs to account for two additional factors potentially reducing 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. the United Kingdom); and
- **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 region⁹.

The direct, indirect, and induced impacts are measured in terms of monetary economic output¹⁰, gross value added (GVA)¹¹, and full-time equivalent (FTE) employment supported.¹² In addition to measuring these impacts on the UK economy as a whole, the analysis is broken down by geographic region and sector.

⁹ It is important to note that, while the analysis 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 the Russell Group 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 Russell Group's research activities in *gross* terms.

¹⁰ In this analysis, economic output is equivalent to income or turnover (e.g. the direct economic output associated with the Russell Group's spin-out companies is captured by the turnover of these firms in 2021/22 – see Section **Error! Reference source not found.**).

¹¹ 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. the cost of goods and services used in the production process).

¹² Full-Time Equivalent (FTE) jobs represent the total number of full-time jobs supported, accounting for part-time positions on an equivalent full-time basis.

These impacts of Russell Group’s research activities were estimated using **economic multipliers** derived from Input-Output tables,¹³ 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 sector¹⁴. 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 Statistics¹⁵) with a range of regional-level data¹⁶ to achieve a granular breakdown by sector¹⁷ and region¹⁸.

As mentioned above, this strand of the analysis is conducted at the level of the individual universities before being aggregated across all 24 Russell Group universities. To estimate the total direct, indirect, and induced impact, we apply the relevant economic multipliers (derived from our above-described Input-Output analysis) associated with organisations in the government, health, and education sector in the respective region of each Russell Group university.

Based on these estimates, in terms of economic output, we assume that every **£1 million** of research income accrued by the Russell Group generates a total of **£2.53 million** of impact throughout the UK economy on average, of which **£0.65 million** is generated in London (for example), **£0.34 million** in the South East of England, and **£0.26 million** in Scotland.¹⁹ In terms of employment, again we base our assumptions on the Input-Output tables. We therefore assume that, for every **1,000** (FTE) staff employed directly by the Russell Group, a total of **1,990** staff are supported throughout the UK, of which (for instance), **320** are supported within London, **240** in the South East, and **220** in Scotland.

¹³ 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.

¹⁴ Specifically, the analysis makes use of *Type II* multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].

¹⁵ See Office for National Statistics (2023). 2019 is the latest year for which these Input-Output tables are currently available.

¹⁶ The fundamental idea of the multi-regional Input-Output analysis is that region *i*’s demand for region *j*’s output is related to the friction involved in shipments from one region to another (which we proxy by the distance between the two regions), and that cross-regional trade can be explained by the relative gross value added of the sector in all regions. The multi-regional Input-Output model was derived by combining UK-level Input-Output tables with data on geographical distances between regions; GVA and compensation of employees by sector and region ([here](#)); employment by sector and region ([here](#)); gross disposable household income by region ([here](#)); population by region ([here](#)); mean weekly total paid hours worked by industry, for full-time vs. part-time employees ([here](#)); employed residents by region of usual residence and region of workplace ([here](#)); and UK imports into each region and exports by each region, by commodity ([here](#)).

¹⁷ In terms of sector breakdown, the original UK 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 **Error! Reference source not found.** in Annex 0 for more information).

¹⁸ 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. 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. In addition, Input-Output analyses do not account for any price effects resulting from a change in demand for a given industry/output.

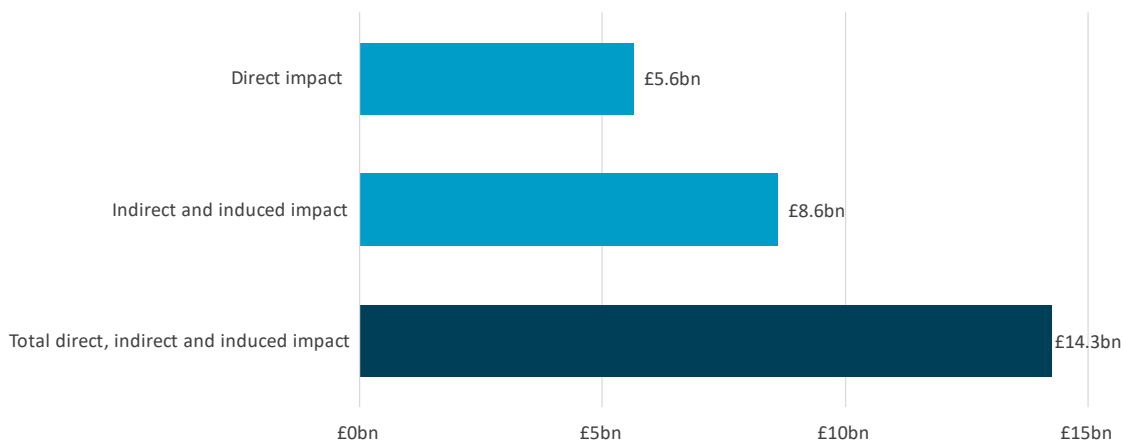
¹⁹ Note that these figures indicate the destination of impact and *not* the origin of impact. It is not possible to extrapolate directly from the total economic impact in a particular region that a particular Russell Group university was entirely responsible for that impact, given that indirect and induced impacts occur across multiple regions. By considering measures of the destination of impact, we consider the impact off all Russell Group universities’ economic impact on each of the regions

Figure 3 presents the aggregate impact associated with the Russell Group’s research income in the 2021/22 academic year, which amounted to approximately **£5.6 billion** of direct impact as well as a further **£8.6 billion** of indirect and induced impact. Combining these two figures, the total direct, indirect, and induced impact therefore stands at **£14.3 billion**.

The estimated impact of the Russell Group’s research activities in 2021/22 stood at £14.3 billion in economic output terms in addition to £8.1 billion GVA and 124,790 FTE jobs.

In terms of GVA and FTE employment, the total direct, indirect, and induced impact associated with the Russell Group’s research was estimated at **£8.1 billion** and **124,790 FTE jobs**, respectively.

Figure 3 Direct, indirect, and induced impacts associated with Russell Group research income in 2021/22 by activity (£m)



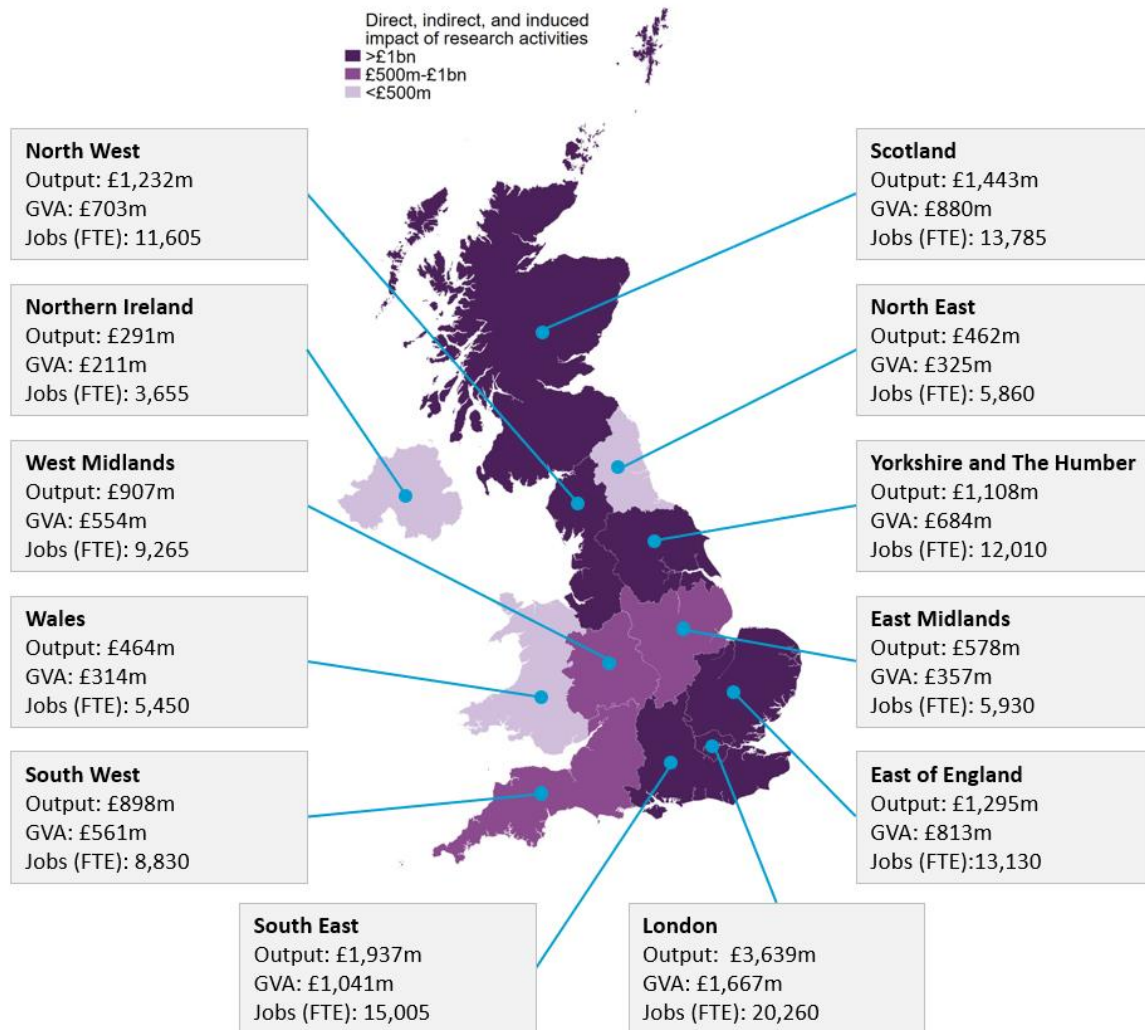
Note: Monetary estimates are presented in 2021/22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated.

Source: London Economics’ analysis

2.2.1 Regional and sectoral impact

To demonstrate the geographic spread of the impact of the Russell Group universities’ wider research activities across the United Kingdom, below we have mapped the total direct, indirect, and induced impact at the regional level. Note that these figures indicate the **destination** of impact and *not* the impact of a particular Russell Group university on the region in which they are based. Specifically, a Russell Group university based in Scotland (for instance) will have an impact on both Scotland and every other region of the United Kingdom. Similarly, every Russell Group university based outside of Scotland will generate some economic impact on Scotland in consequence of the purchase of goods and services throughout their supply chains. By considering measures of the **destination** of impact, we consider the impact off all Russell Group universities’ economic impact on each of the regions.

Figure 4 Total direct, indirect, and induced impact of the Russell Group universities’ research activities, by region

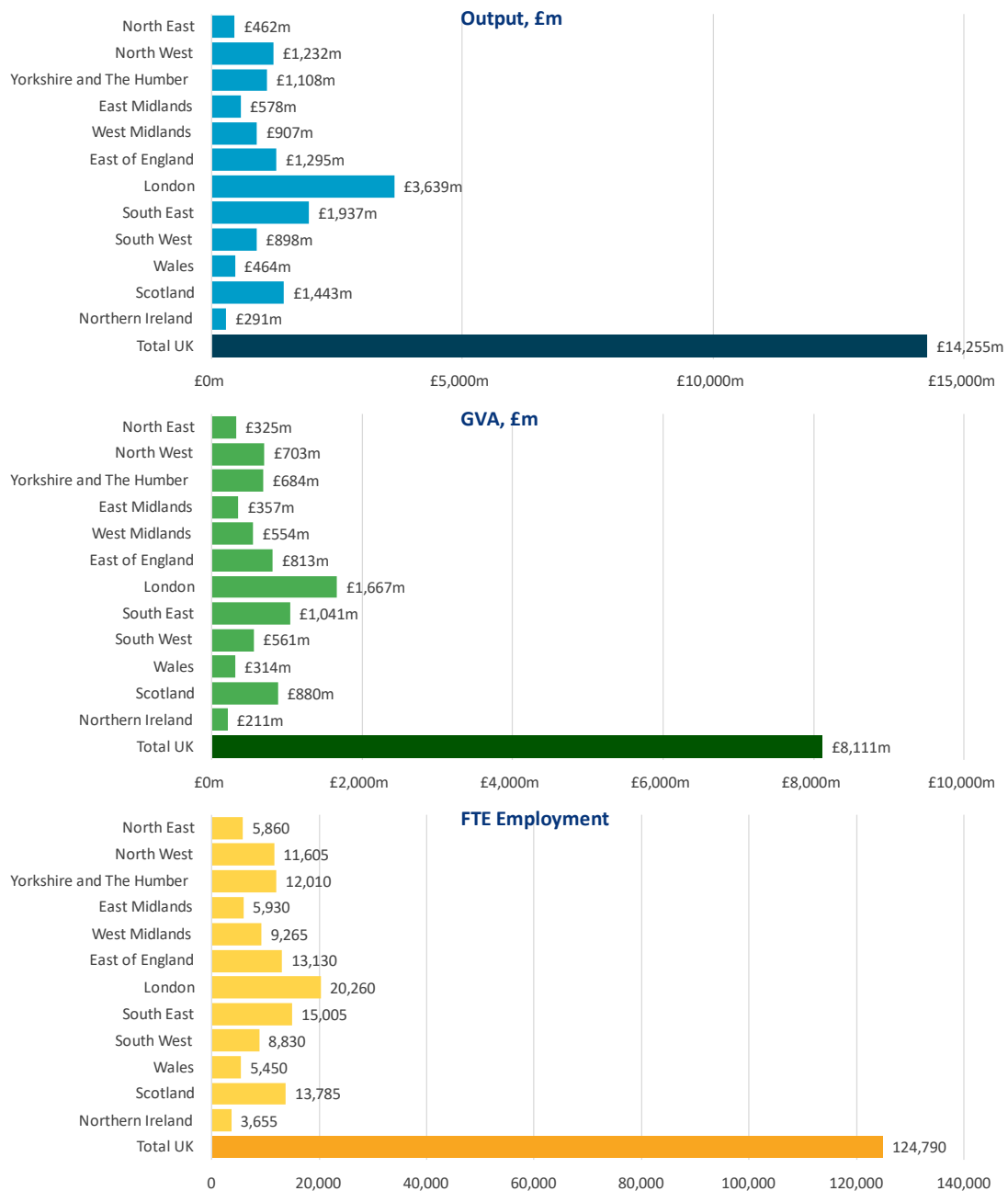


Note: Destination of impact shown. Monetary estimates are presented in 2021/22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated.

Source: London Economics analysis of Russell Group universities’ data. © ONS Geography for the administrative boundaries.

As well as mapping the impact in output terms, Figure 5 presents the aggregate impact associated with the Russell Group’s research income in the 2021/22 academic year across all UK regions (in terms of output, GVA and FTE employment) and Figure 6 by sector.

Figure 5 Estimated total economic impact associated with the Russell Group universities' research income 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.

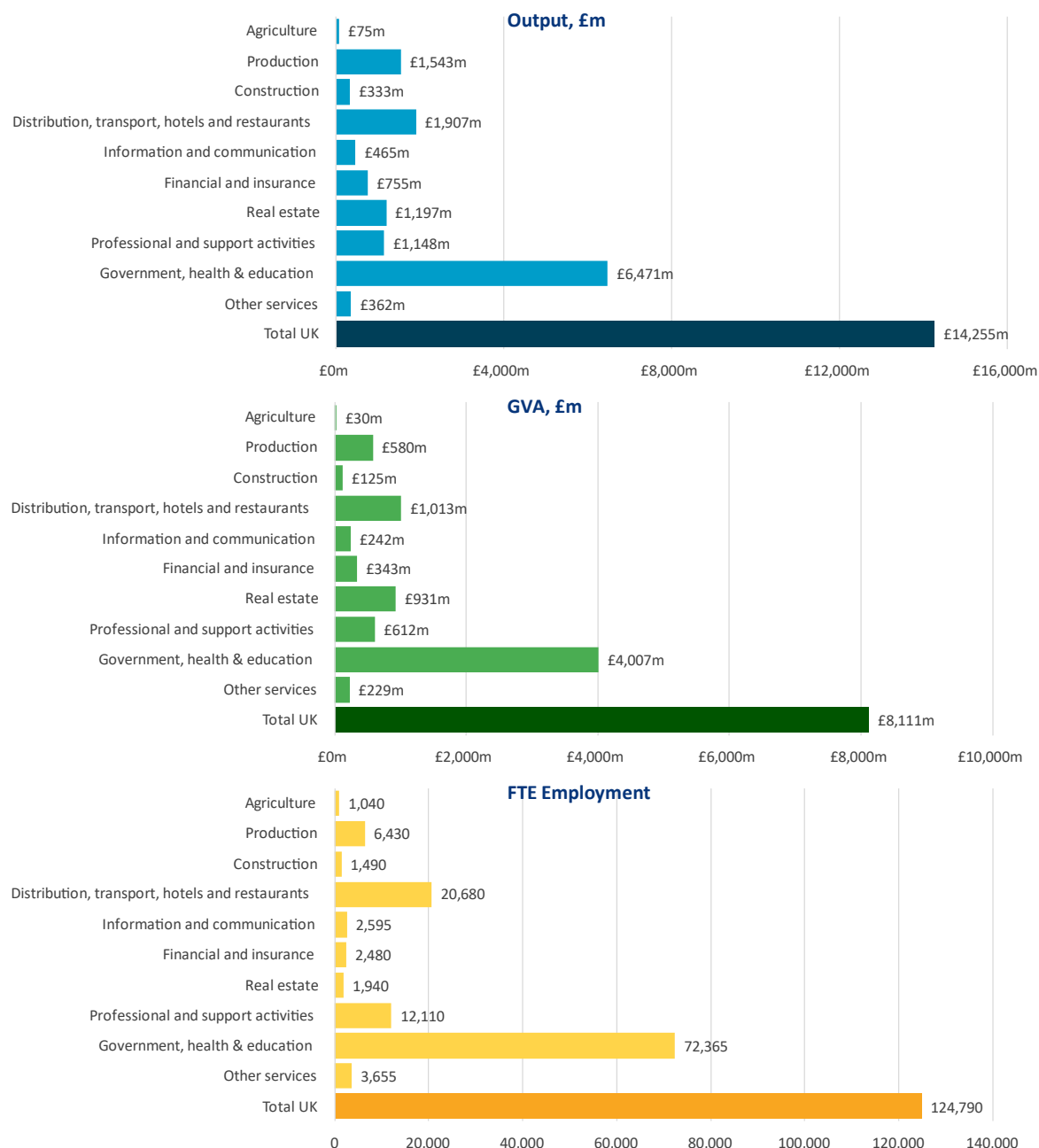
Source: London Economics' analysis

Considering the breakdown by region, in terms of **economic output** (top panel of Figure 5), the impact was spread throughout the nations and regions of the UK, with the largest impact in **London (£3.6 billion, 26%)**. However, there were also substantial impacts in other parts of the UK, particularly in the **South East (£1.9 billion, 14%)** and **Scotland (£1.4 billion, 10%)**.

In terms of **GVA** (middle panel), **£1.7 billion (21%)** of the total direct, indirect, and induced impact (**£8.1 billion**) was accrued in **London**, with **£1.0 billion** in the **South East** and **£880 million** in **Scotland**.

Finally, the Russell Group's research supported an estimated **124,790 FTE jobs** across the UK as a whole, of which approximately **20,260 (16%)** were located in **London**, **15,005 (12%)** in the **South East** and **13,785 (11%)** in **Scotland**.

Figure 6 Estimated total economic impact associated with the Russell Group's research income 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.

Source: London Economics' analysis

In terms of sector, the Russell Group's research activities resulted in particularly large impacts within the **government, health & education (£6.5 billion, 45%)**, the **distribution, transport, hotels and restaurant sector (£1.9 billion, 13%)**, and the **production sector (£1.5 billion, 11%)**.

2.3 Productivity spillovers

In addition to the direct, indirect, and induced impact associated with the high level of research income the Russell Group receives, the wider academic literature indicates that investments in Research & Development (R&D) and other intangible assets may induce positive **externalities**²⁰. In the context of the economic impact of research activities, existing academic literature assesses the existence and size of **positive productivity and knowledge spillovers**, where knowledge generated through the research 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 sector²¹. For example, spillovers are enabled through direct R&D collaborations between universities and firms, the publication and dissemination of research findings, or through university graduates entering the labour market and passing on their knowledge to their employers.

Importantly, while the direct, indirect, and induced impacts - estimated above and in the remainder of this report - reflect tangible economic impact generated through market activity, productivity spillovers reflect intangible impacts that occur outside of the market mechanism. Below, we provide an analysis of these productivity spillovers in order to illustrate the potential size of the spillover effects generated by research at Russell Group universities. Here we present this spillover total **separately** from the final totals of the direct, indirect, and induced impacts, and do not combine these alternative sources of economic impact (see Section 5).

What are the estimates of productivity spillovers?

Specifically, in the context of research conducted by UK universities, two studies authored by Jonathan Haskel remain the core studies estimating the size of productivity spillovers:

- Haskel and Wallis (2010)²² find 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)**.
- Findings from Haskel et al. (2014) 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)**.

More detailed summaries of these papers and further studies on this topic are presented in Annex A3.3.

In order to estimate the monetary value of the productivity spillovers associated with the Russell Group universities' research activities, we apply the productivity spillover multipliers from the existing literature (see above) to the different types of research-related income received by Russell Group universities in 2021/22 (see Figure 17 in Annex A3.1). Specifically, we again conduct the analysis at the university level and assign the multiplier of 12.7 to the research funding that each Russell Group university received from **UK Research Councils and UK charities**²³ in 2021/22

²⁰ Economists refer to the term 'externality' to describe situations in which the activities of one 'agent' in the market induces (positive or negative) external effects on other agents in that market (which are not reflected in the price mechanism).

²¹ 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.

²² Also, see Imperial College London (2010) for a summary of Haskel and Wallis' findings.

²³ Where the vast majority of funding provided by UK charities relates to projects commissioned through an open competitive process.

(amounting to **£2.8 billion** in aggregate), and assigning the multiplier of 0.2 to **all other research funding** received by each Russell Group university in that academic year (amounting to **£4.0 billion** in aggregate)²⁴.

We then infer a weighted average productivity spillover multiplier associated with each university and deduct the university's *contract research* income multiplied by this weighted average productivity spillover multiplier. That is, we assume that each university's deduction for contract research is associated with the average productivity spillover multiplier of that university (i.e. is 'typical' of the research activity undertaken by the university).

Having calculated the total productivity spillovers associated with each university, we sum these totals across all 24 Russell Group universities. This gives us the total estimated productivity spillovers associated with all Russell Group research activity.

We estimate that the research conducted by the Russell Group in 2021/22 resulted in **total market sector productivity spillovers** of **£30.5 billion**. This captures the spillover impact of the research undertaken by the Russell Group universities in 2021/22 within that same academic year (but excludes any additional (and likely substantial) impacts in subsequent years)²⁵. **This spillover impact is in addition to the direct, indirect, and induced impacts** outlined in Section 2.2.

Based on a total direct research impact of **£5.6 billion**, we infer a weighted average spillover multiplier associated with the Russell Group universities' aggregate research activities of approximately **5.4** – i.e. **every £1 invested in the Russell Group universities' research activities generates additional annual economic output of £5.40 across the UK economy**.

²⁴ 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.

²⁵ Note, however, that following Haskel and Wallis (2010) we take a flow approach rather than a stock measure, which implicitly assumes a 0% depreciation rate.

3 The impact of Russell Group universities' spin-out companies

This section considers the economic impact of Russell Group universities' spin-out companies in terms of their direct, indirect, and induced impact on the UK economy. In this section, all of the analysis was conducted at the **firm level** before being aggregated across all Russell Group universities.

3.1 Direct impact

To assess the direct impact associated with the Russell Group's UK-based spin-out companies, we sourced information on the turnover (as a measure of economic output) and FTE employment associated with all **UK-based spin-out companies** from the 24 Russell Group universities that were **active** in 2021/22.

The information on each company's reported turnover and employment was based on data **individually sourced from each of the 24 Russell Group universities**. For the purposes of this analysis, data was sought with each spin-out's **name, company registration number, industry, turnover** in 2021/22, **employment** (in FTEs) in 2021/22, **postcode** (of the company's registered head office address), and whether the company is predominantly **UK-based** or non-UK based.

The Russell Group and London Economics contacted and received responses from **every Russell Group university**. All universities were able to supply, as a minimum, a list of the names of the active spin-out companies that corresponded to the university's 2021/22 HE-BCI submission in relation to **Spin-outs with some HEP ownership** and **Formal spin-outs, not HEP owned**.²⁶ These two categories of spin-outs formed the basis of the analysis since the companies that fall under these categories are all based on intellectual property (IP) from within the HE provider.²⁷

The data provided by each Russell Group university was supplemented with information from Companies House and Bureau van Dijk's FAME database to validate and fill any gaps where possible. The data collection and matching to Companies House and FAME data was conducted using the 24 datasets provided by the Russell Group universities. Once the data had been matched to information in Companies House and FAME, an aggregate dataset was compiled using each of the 24 university-level datasets.²⁸

Some spin-outs were associated with more than one Russell Group university since their IP was based on cross-university research. Therefore, as part of the aggregation of the university-level datasets, we identified and removed duplicate (and "triplicate")²⁹ entries from the combined Russell

²⁶ For the publicly available aggregated totals of each university's HE-BCI submission (number of active firms, turnover, and FTE employment), see Table "Intellectual property: spin-off activities by HE provider" at <https://www.hesa.ac.uk/data-and-analysis/business-community/ip-and-startups>

²⁷ Start-ups have been excluded from this strand of analysis because start-up companies may not be based on the university's IP. See Annex A3.5 for further information on Russell Group start-up companies. For the full, publicly available breakdown, see Table "Intellectual property: spin-off activities by HE provider" at <https://www.hesa.ac.uk/data-and-analysis/business-community/ip-and-startups>

²⁸ 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.

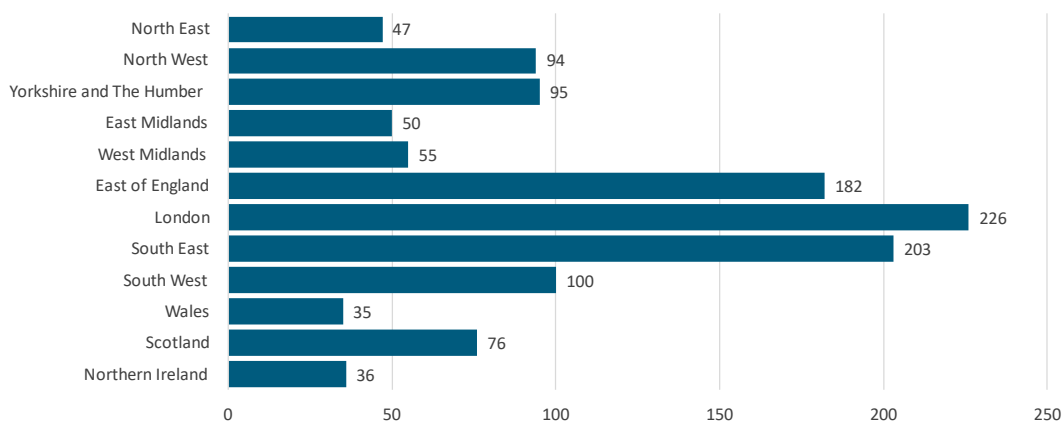
²⁹ There were 30 instances of duplicates (a spin-out company associated with two Russell Group universities) and one instance of a "triplicate" spin-out company associated with three Russell Group universities.

Group dataset. In order to avoid any double counting of the economic impact, these spin-outs were only included once.³⁰

The combined dataset of all Russell Group universities' spin-out companies (after removing duplicates) consisted of **1,291** companies. Of these, **1,199** were **active, UK-based companies** with an identifiable region and industry classification.

The analysis then made use of information on the turnover (as a measure of economic output) and FTE employment associated with these **1,199** UK-based Russell Group spin-out companies (where provided by the universities or where available in Companies House or FAME). The direct GVA generated was 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 (based on the company's registered head office address). Figure 7 shows the number of active, UK-based Russell Group spin-outs in the 2021/22 academic year, by region.

Figure 7 Number of active, UK-based Russell Group spin-out companies, by region



Note: We used information from Companies House to identify the postcodes of head office locations for each of the Russell Group university's spin-outs that were active in 2021/22.

Source: *London Economics analysis of Russell Group universities' data, Companies House, and FAME*

The largest number of spin-outs included in the analysis is located in **London (226** firms, corresponding to **19%** of the total), although the **South East** and **East of England** also host a large number of firms at **203** firms (**17%**) and **182** firms (**15%**), respectively. Russell Group spin-outs also have a strong presence in other regions across the UK including the **South West (100, 8%)**, **Yorkshire and the Humber (95, 8%)**, and the **North West (94, 8%)**.

We estimate the direct impact associated with the activities of all Russell Group spin-out companies for which data was available. For the academic year 2021/22, this was estimated at **£7.1 billion** in economic output (i.e. turnover) terms, **26,330** FTE staff³¹, and **£3.6 billion** of GVA. These estimates are likely to be **underestimates** of the total turnover and employment associated with these companies, due to **missing data** in Companies House and FAME.

3.2 Total direct, indirect, and induced impact of spin-out companies

To estimate the direct, indirect, and induced impact associated with Russell Group spin-out companies, we applied relevant economic multipliers (derived from the Input-Output analysis

³⁰ For further details on the data collection process and analysis of Russell Group spin-outs, see Annex A3.4

³¹ All employment estimates have been rounded to the nearest 5.

described in Section 2.2). Specifically, we assigned relevant economic multipliers to each active spin-out company in 2021/22, based on each firm's industry classification and the region of its main registered office address. Economic impact estimates are therefore made at the firm level before being aggregated across all **1,199** active, UK-based Russell Group spin-out companies.

Applying sector-region multipliers to the firm-level direct impacts in the manner described above, the total economic impact associated with the combined activities of all Russell Group spin-out companies in the 2021/22 academic year was estimated to be **£17.8 billion** across the UK economy, of which **£7.4 billion (41%)** occurred in the East of England. The estimated total number of FTE jobs across the UK supported stood at **80,545**. The corresponding estimate in terms of GVA stood at **£9.2 billion**. These figures (again) represent the **destination** of impact.

Based on these estimates, in terms of economic output, we infer that (on average) every **£1 million** of turnover directly accrued by Russell Group spin-out companies generates a total of **£2.51 million** impact throughout the UK economy. In terms of employment, we infer that, for every **1,000** (FTE) staff employed by these spin-out companies, a total of **3,060** staff are supported throughout the UK.

3.3 Total impact of Russell Group spin-out companies

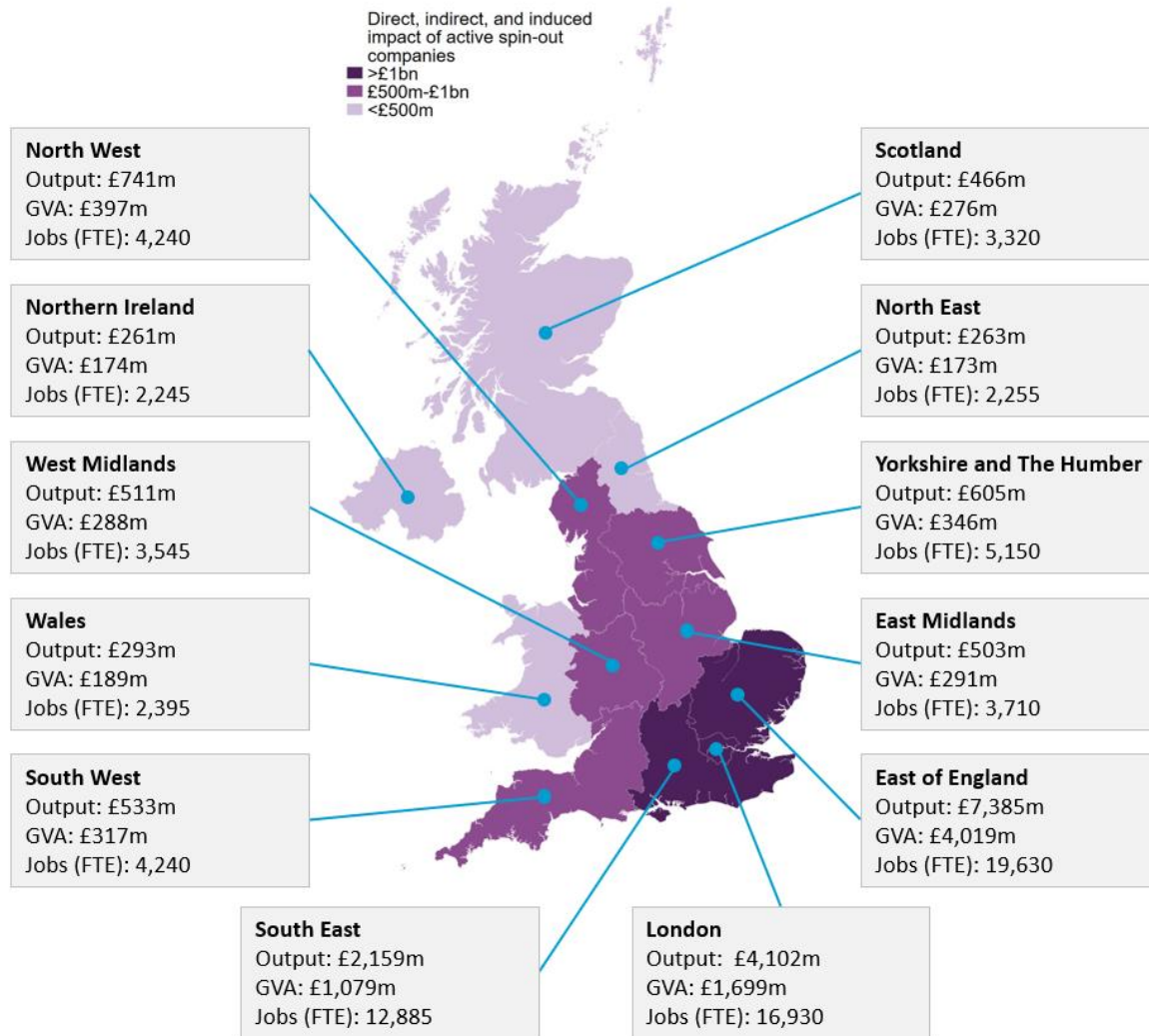
The estimated impact of the Russell Group spin-out companies in 2021/22 stood at £17.8 billion in economic output terms, in addition to £9.2 billion GVA and 80,545 FTE jobs.

The **total direct impact** of spin-out companies associated with the 24 Russell Group universities was estimated to be approximately **£7.1 billion** in economic output terms (i.e. turnover), **26,330** FTE staff, and **£3.6 billion** of GVA. This direct impact led to a total direct, indirect, and induced economic impact of **£17.8 billion** across the UK economy and an estimated total number of FTE jobs supported of approximately **80,545**. The corresponding estimate in terms of GVA stood at **£9.2 billion**.

3.3.1 Regional and sectoral impact

To demonstrate the geographic spread of the impact of Russell Group spin-out companies across the UK, we have mapped the total direct, indirect, and induced impact of active, UK-based Russell Group spin-outs at the regional level (Figure 8).

Figure 8 Total direct, indirect, and induced impact of active Russell Group spin-out companies, by region

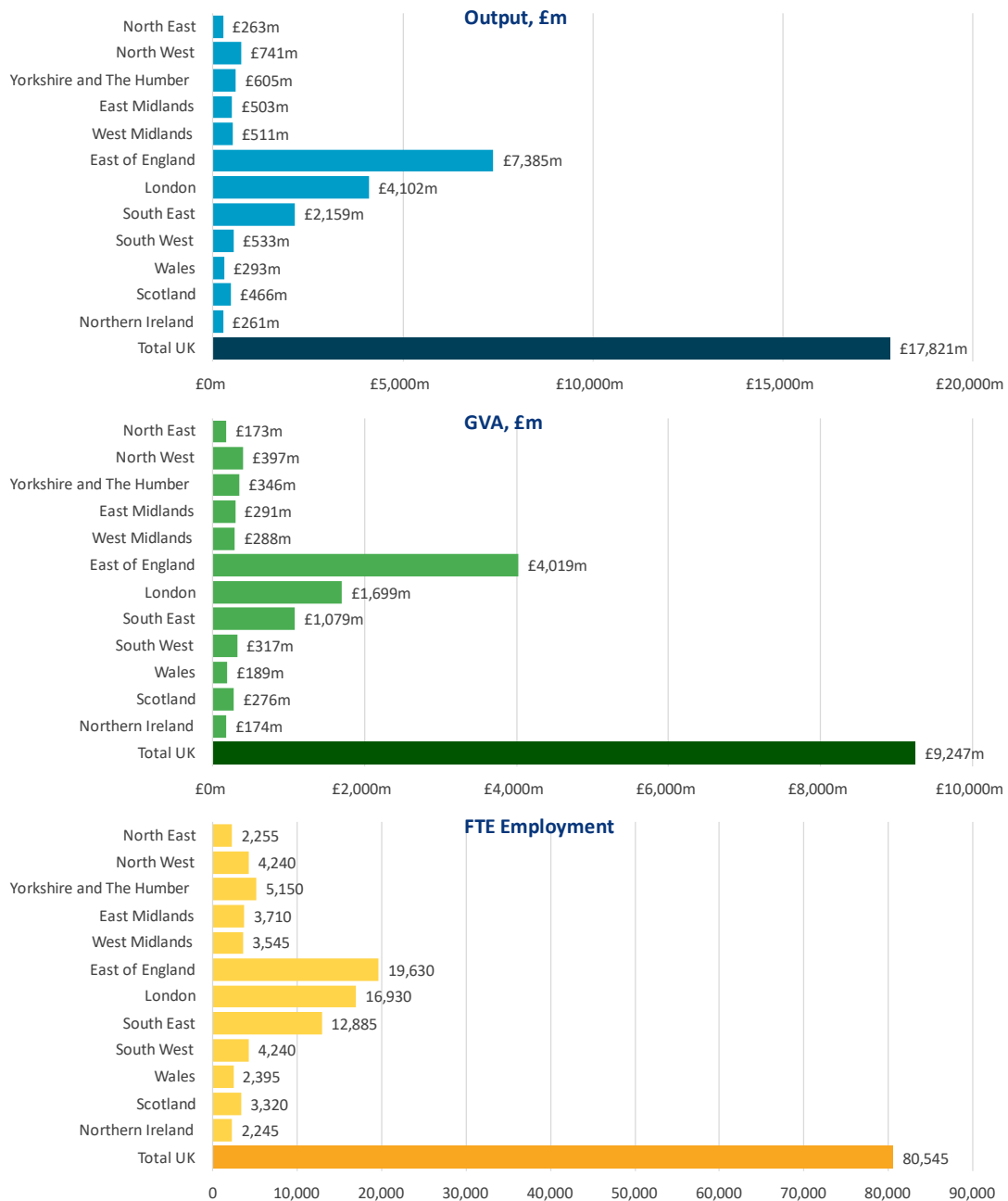


Note: Destination of impact shown. We used information from Companies House to identify the postcodes of head office locations for each of the Russell Group spin-outs that were active in 2021/22. We used the May 2023 ONS Postcode Directory to determine the local authority for each postcode included in the dataset. The data was then matched with the ONS Geography digital vector boundaries for UK regions to generate the map. 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 of Russell Group universities' data, Companies House, and FAME and the Office for National Statistics. © ONS Geography for the administrative boundaries.

As well as mapping the impact in output terms, Figure 9 presents the aggregate impact associated with the Russell Group spin-out companies in the 2021/22 academic year across all regions (in terms of output, GVA and FTE employment) and Figure 10 by sector.

Figure 9 Estimated total economic impact associated with Russell Group spin-out companies 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.

Source: London Economics' analysis

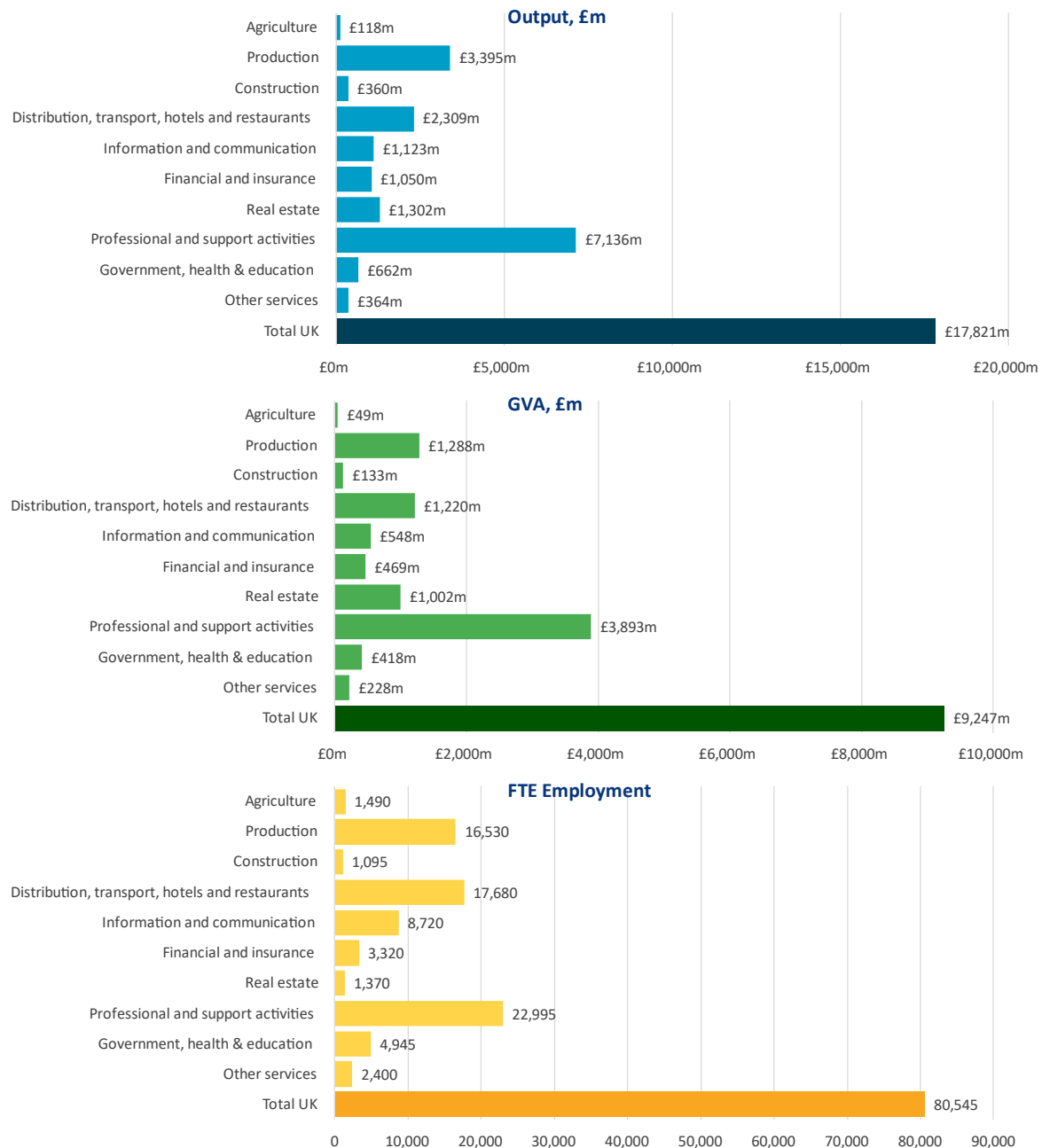
Considering the breakdown by region, in terms of economic output (top panel of Figure 9), a large proportion of the estimated total of **£17.8 billion** occurred in the **East of England (£7.4 billion, 41%)**. The remainder of the impact occurred in the rest of the UK, particularly in **London (£4.1 billion, 23%)** and the **South East (£2.2 billion, 12%)**.

In terms of GVA (middle panel), **£4.0 billion (43%)** of the total direct, indirect, and induced impact (**£9.2 billion**) occurred in the **East of England**. **London** and the **South East** were the other main

regional beneficiaries, with an estimated economic impact of approximately **£1.7 billion (18%)** and **£1.1 billion (12%)**, respectively.

Finally, Russell Group spin-outs supported an estimated **80,545 FTE jobs** across the UK as a whole, spread across different regions of the UK especially in the **East of England (19,630, 24%)**, **London (16,930, 21%)**, and the **South East (12,885, 16%)**.

Figure 10 Estimated total economic impact associated with Russell Group spin-out companies 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.

Source: London Economics' analysis

In terms of the impact by sector, the largest impact was felt within the **professional and support activities sector (£7.1 billion)**. However, there were also very sizeable impacts on the **production sector (£3.4 billion)** and the **distribution, transport, hotels and restaurant sector (£2.3 billion)**.

Similarly, for GVA, the impact was particularly large within the **professional and support activities sector (£3.9 billion)**, the **production sector (£1.3 billion)** and the **distribution, transport, hotels, and restaurant sector (£1.2 billion)**.

Across the UK, the Russell Group universities' spin-out companies supported **22,995** FTE jobs in the **professional and support activities sector (29%)**, as well as **17,680** in the **distribution, transport, hotels, and restaurant sector (22%)**, and **16,530** in the **production sector (21%)**.

4 The impact of Russell Group's wider knowledge exchange activities

In this section, we estimate the economic impact of the Russell Group universities' wider knowledge exchange activities. These are measured in HE-BCI, but are distinct from the spin-out companies founded on the basis of IP from Russell Group universities. These wider knowledge exchange activities include:

- **Contract research** provided by the Russell Group universities;
- **Consultancy services** provided by the Russell Group universities;
- Russell Group universities' **licensing of University IP** to other organisations;
- The **business and community courses** provided by the Russell Group universities; and,
- **Facilities and equipment hire**, and related activities.

As was the case with the analysis of the economic impact of the Russell Group universities' research activities, all of the analysis was conducted at the **university level** before being aggregated across all 24 Russell Group universities.

We adopt a similar approach as when estimating the direct, indirect and induced effect associated with research activity (presented in Section 2). This means that in the calculations of direct impact of output, GVA, and employment, we use the input-output multipliers associated with organisations within the government, health, and education sector located in the respective region of each Russell Group university to generate the indirect and induced output, GVA and employment impacts throughout the economy.³² University-level totals are calculated for each wider knowledge exchange activity, and these totals are then aggregated across all universities by activity.

4.1 Direct, indirect, and induced impact by activity

Contract research

To measure the direct impact associated with the Russell Group universities' **contract research**, we made use of data from HE-BCI on the total value of the contract research services provided by each of the 24 Russell Group universities in the 2021/22 academic year. In 2021/22, this stood at **£1,246 million** across all Russell Group universities.

While this provides an estimate of the direct impact in economic output terms, to arrive at comparable estimates in GVA and employment terms, we multiplied this 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 located in the respective region of each Russell Group university. Applying these assumptions, we estimate that the Russell Group universities' contract research in 2021/22 directly generated **£784 million** in GVA and supported **14,310 FTE jobs**.³³

³² This approach is based on the assumption that the income accrued by each of the Russell Group universities supports the same levels of GVA and employment (in relative/proportionate terms) as the income accrued by other universities operating in each region's government, health, and education sector. The ratios of GVA to output and employment to output were derived from the multi-regional Input-Output model as described in Section 2.2.

³³ All employment estimates have been rounded to the nearest 5.

To estimate the total direct, indirect and induced impacts associated with the Russell Group universities' income from contract research, we then multiplied these direct impacts by the relevant economic multipliers associated with organisations in the government, health, and education sector in the respective region of each Russell Group university.

Aggregating across universities, the analysis indicates that the estimated total economic impact associated with the Russell Group's contract research in the 2021/22 academic year stood at approximately **£3,112 million** across the UK economy. The estimated total number of jobs supported (in FTE) stood at **27,740**, while the corresponding estimate in terms of GVA stood at **£1,786 million**.

Consultancy services

In 2021/22, the Russell Group universities collectively received approximately **£268 million** in revenues associated with **consultancy services**. As above, this provides an estimate of the direct impact in economic output terms, but to arrive at comparable estimates in GVA and employment terms, we multiplied this 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 located in the respective region of each Russell Group university. Applying these assumptions, we estimate that the Russell Group universities' provision of consultancy services in 2021/22 directly generated **£163 million** in GVA and supported **2,910** FTE jobs.

To estimate the total direct, indirect, and induced effect throughout the UK economy, the analysis was again conducted at the level of the individual Russell Group university before being aggregated to calculate the overall economic impact. The analysis indicates that the estimated total economic impact associated with the Russell Group universities' provision of consultancy services in the 2021/22 academic year stood at approximately **£687 million** across the UK economy. The estimated total number of jobs supported (in FTE) stood at **5,870**, while the corresponding estimate in terms of GVA stood at **£387 million**.

IP licensing

The total **IP licensing income** received by the Russell Group universities in the 2021/22 academic year stood at **£256 million**. Again we multiplied this 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 located in the respective region of each Russell Group university. We therefore estimate that the Russell Group universities' IP income in 2021/22 directly generated **£161 million** in GVA and supported **2,930** FTE jobs.

Adopting the same approach as presented above to estimate the total direct, indirect, and induced effect throughout the UK economy associated with the IP licensing activities (again conducting the analysis at the individual university level before aggregating across universities), the analysis indicates that the estimated total economic impact associated with the Russell Group universities' IP income in the 2021/22 academic year stood at approximately **£646 million** across the UK economy. The estimated total number of jobs supported (in FTE) stood at **5,700**, while the corresponding estimate in terms of GVA stood at **£369 million**.

Business and community courses

Additionally, in this section, we consider the income generated from **business and community courses** such as Continuing Professional Development (CPD) and Continuing Education (CE) courses.

The 24 Russell Group universities received approximately **£218 million** in income in 2021/22 associated with business and community courses. The analysis indicates that the estimated total economic impact associated with the Russell Group universities' business and community courses in the 2021/22 academic year stood at approximately **£564 million** across the UK economy. The estimated total number of jobs supported (in FTE) stood at **4,745**, while the corresponding estimate in terms of GVA stood at **£315 million**.

Facilities and equipment

Finally, the Russell Group universities received approximately **£208 million** in income in 2021/22 associated with the **hire of their research facilities** (often relating to the hire or lease of laboratory space or computing power and capacity). Adopting the same approach as presented previously, the analysis indicates that the estimated total economic impact associated with the Russell Group universities' facilities and equipment hire in the 2021/22 academic year stood at approximately **£508 million** across the UK economy. The estimated total number of jobs supported (in FTE) stood at **4,735**, while the corresponding estimate in terms of GVA stood at approximately **£300 million**.

4.2 Total impact of the Russell Group's wider knowledge exchange activities

Combining the economic impacts generated by the Russell Group universities' contract research, consultancy services, intellectual property licensing, business and community courses, and facilities and equipment lease and hire, Table 1 presents the aggregate impact associated with the Russell Group universities' wider knowledge exchange activities in the 2021/22 academic year (across all regions, as well as by sector).

Table 1 Economic impact associated with the Russell Group universities' wider knowledge exchange activities in 2021/22

Type of impact	Output, £m	GVA, £m	# of FTE employees
Direct impact	£2,196m	£1,371m	24,940
Indirect and induced impact	£3,321m	£1,784m	23,870
Total impact	£5,517m	£3,156m	48,810

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

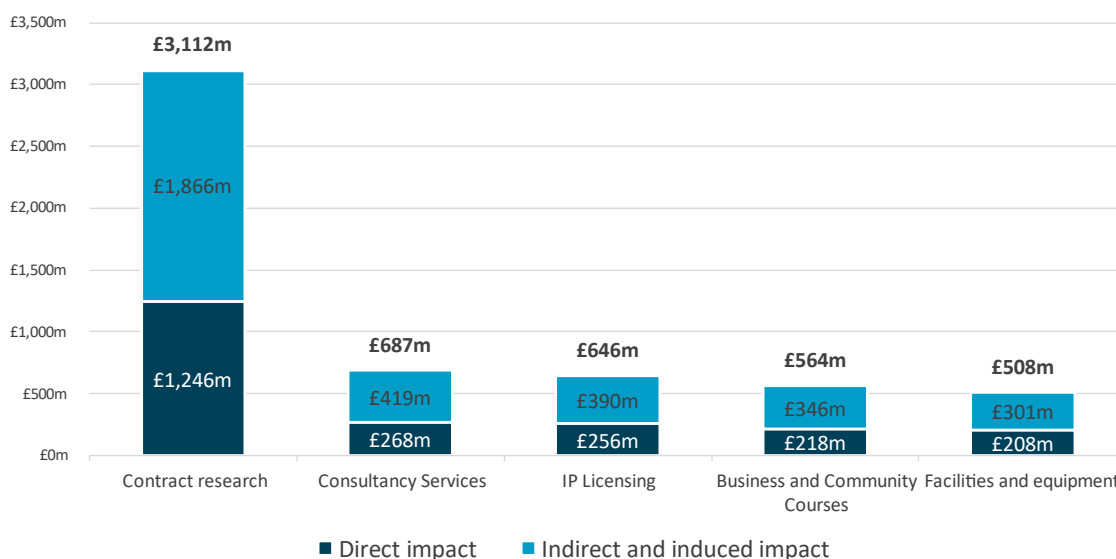
In the 2021/22 academic year, the Russell Group universities' **wider knowledge exchange activities** directly generated an estimated **£2,196 million** across the UK economy. The estimated total number of direct jobs supported (in FTE) stood at **24,940**, while the corresponding estimate in terms of direct GVA impact stood at **£1,371 million**. In addition to the direct impact, the indirect and induced impact of the Russell Group universities' wider knowledge exchange activities generated an estimated **£3,321 million** across the UK economy. The estimate of the indirect and induced GVA impact stood at **£1,784 million** and the estimate of the indirect and induced number of jobs supported (in FTE) stood at **23,870**.

The estimated impact of the Russell Group universities’ wider knowledge exchange activities in 2021/22 stood at £5.5 billion in economic output terms, in addition to £3.2 billion GVA and 48,810 FTE jobs.

Therefore, the analysis estimates that, in 2021/22, these knowledge exchange activities generated an estimated total direct, indirect and induced economic impact of **£5,517 million** across the UK economy. The total GVA impact is estimated at **£3,156 million** and an estimated **48,810 FTE jobs** were supported across the UK economy.

Of the total **£5,517 million** generated, **contract research** contributes **56% (£3,112 million)** of the total, followed by **12% (£687 million)** from **consultancy services**. Figure 11 summarises the estimated direct, indirect, and induced impacts by wider knowledge exchange activity.

Figure 11 Direct, indirect, and induced impacts associated with the Russell Group universities’ wider knowledge exchange activities in 2021/22, by activity (£m)



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.

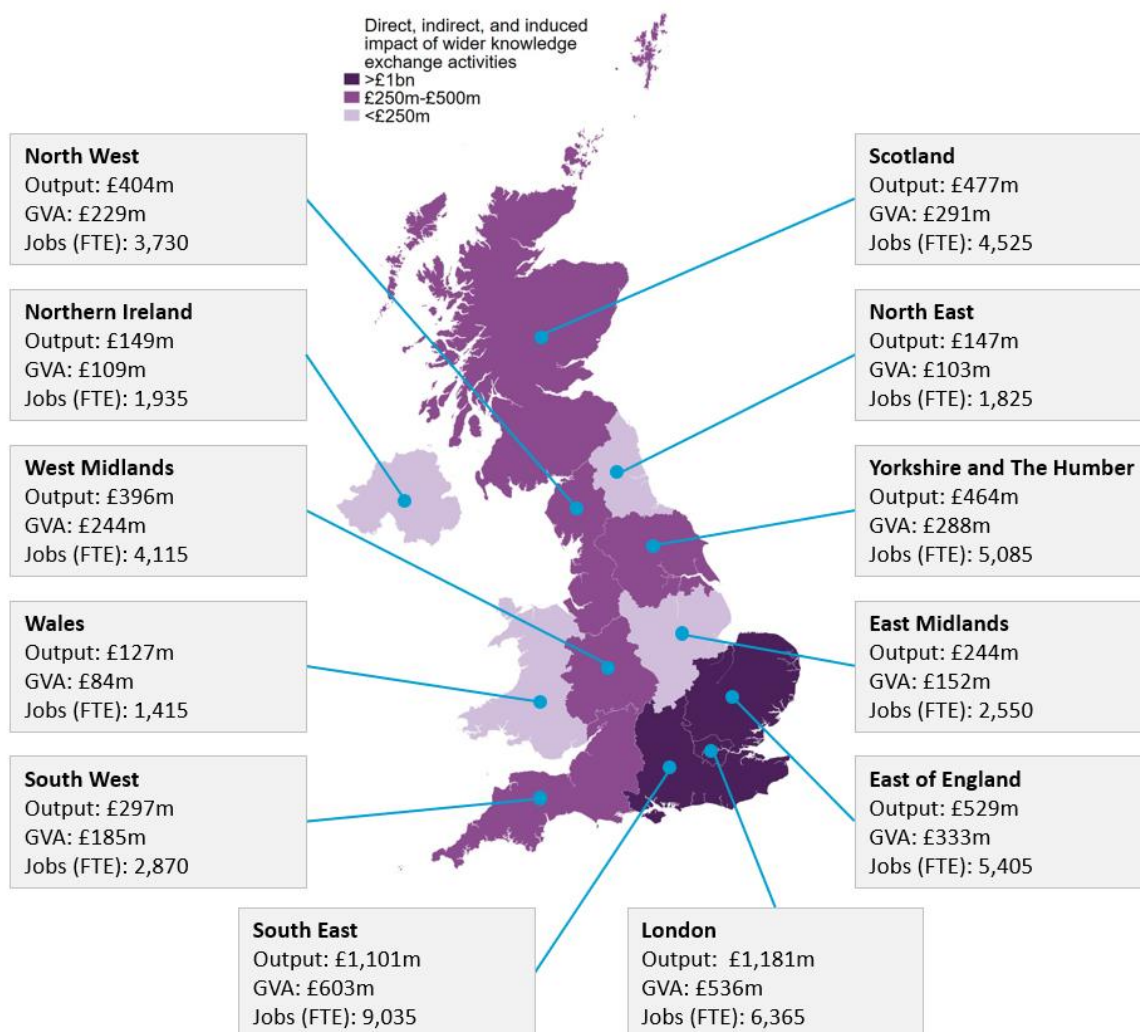
Source: London Economics’ analysis

4.2.1 Regional and sectoral impact

The impact of Russell Group universities’ wider knowledge exchange activities can also be broken down by region across the UK and across different sectors of the economy.

To demonstrate the geographic spread of the impact of the Russell Group universities’ wider knowledge exchange activities across the UK, we have mapped the total direct, indirect, and induced impact at the regional level. Note that these figures (again) indicate the **destination** of impact.

Figure 12 Total direct, indirect, and induced impact of the Russell Group universities' wider knowledge exchange activities, by region

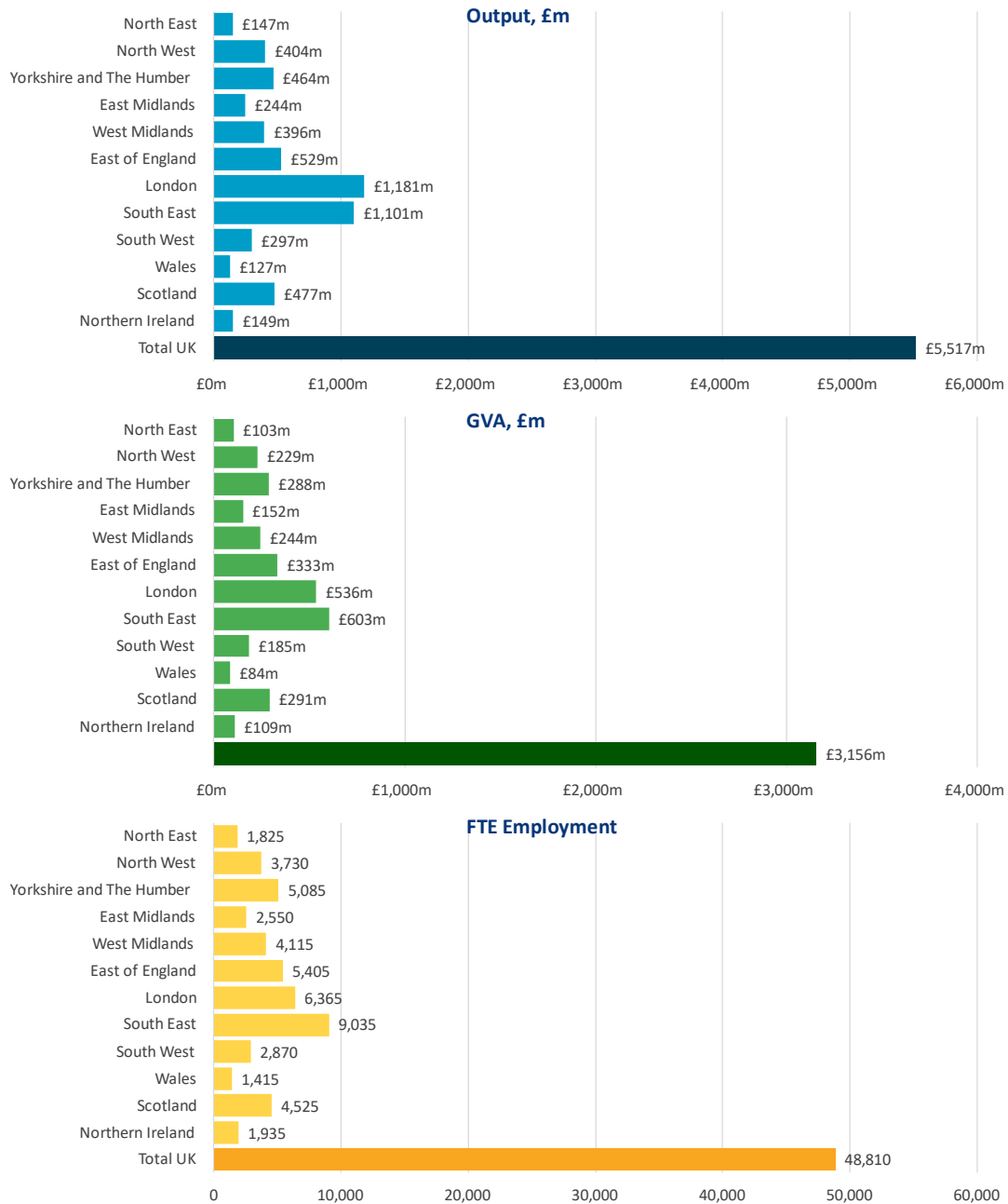


Note: Destination of impact shown. Monetary estimates are presented in 2021/22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated.

Source: London Economics analysis of Russell Group universities' data. © ONS Geography for the administrative boundaries.

As well as mapping the impact in output terms, Figure 13 presents the aggregate impact associated with the Russell Group's wider knowledge exchange activities in the 2021/22 academic year across all regions (in terms of output, GVA and FTE employment), while Figure 14 provides the comparable information by sector.

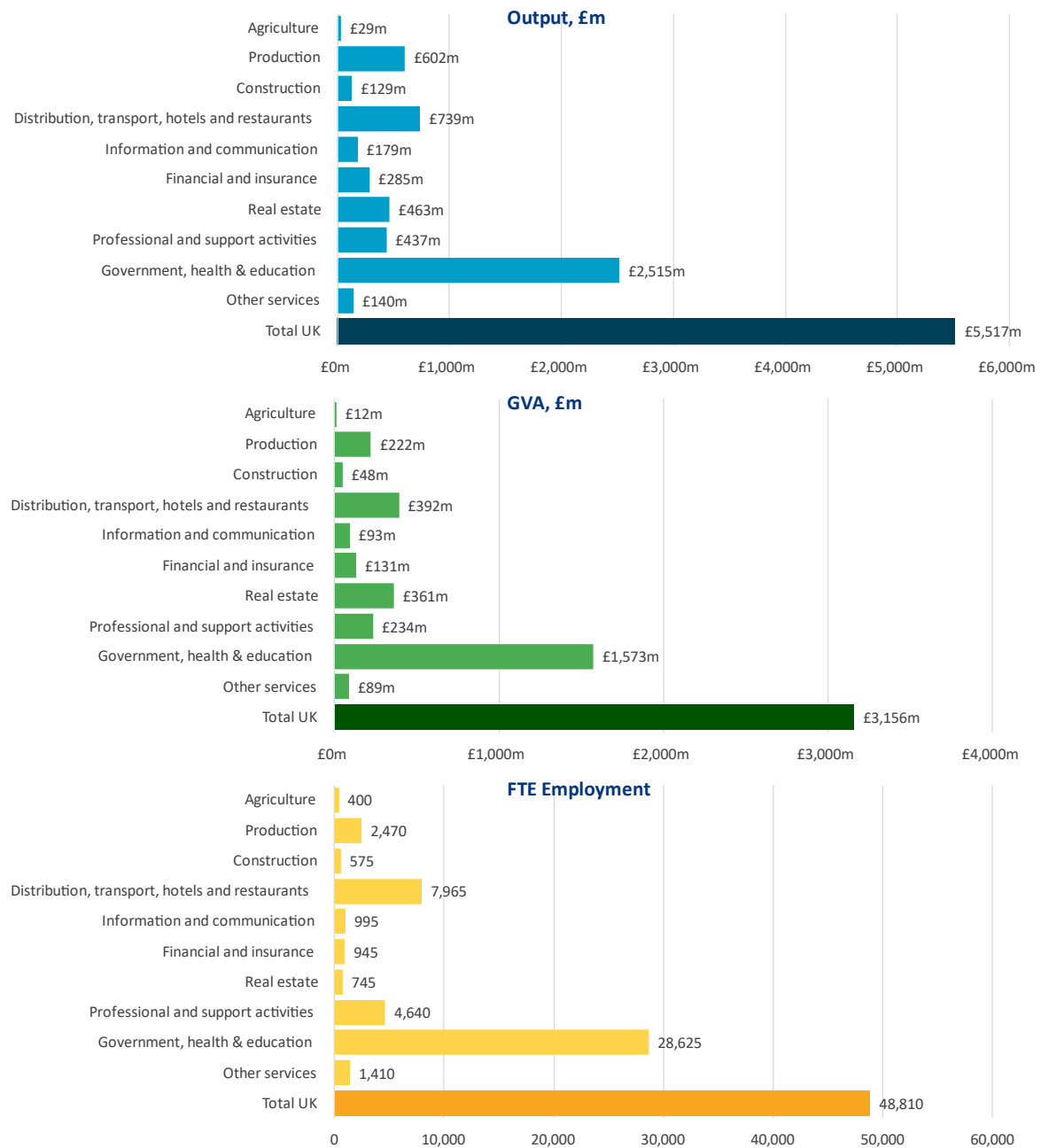
Figure 13 Estimated total economic impact associated with the Russell Group universities’ knowledge exchange activities in 2021/22, by region



Considering the breakdown by region, in terms of economic output (top panel), approximately one fifth of impact of wider knowledge exchange activity was generated in both **London (£1,181m, 21%)** and the **South East (£1,101m, 20%)**, while there were significant impacts identified in the **East of England (£529m, 10%)** and **Scotland (£477m, 9%)**.

In terms of GVA (middle panel), the impact was estimated to be approximately **£3,156 million** across the UK economy as a whole. The largest impacts were in the **South East and London (£603m and £536m, respectively)**. Finally, Russell Group universities’ wider knowledge exchange activities supported an estimated **48,810 FTE jobs** across the UK as a whole, with approximately **15,370 (32%)** occurring in the **South East and London**, and approximately **33,455 (68%)** occurring across the rest of the United Kingdom.

Figure 14 Estimated total economic impact associated with the Russell Group universities' knowledge exchange activities in 2021/22, by sector



In terms of sector of impact, the Russell Group universities' wider knowledge exchange activities resulted in particularly large impacts within the **government, health & education (£2,515 million, 46%)**, the **distribution, transport, hotels, and restaurant sector (£739 million, 13%)**, and the **production sector (£602 million, 11%)**.

5 The total impact of the Russell Group's R&D activities

The total economic impact on the UK economy associated with the Russell Group's research and commercialisation activities in 2021/22 was estimated to be approximately **£37.6 billion**.

In terms of the components of this impact:

- The Russell Group universities' **research activities** accounted for **£14.3 billion**;
- The impact associated with Russell Group **spin-out companies** was estimated at **£17.8 billion**; and,
- The combined impact of the Russell Group universities' **wider knowledge exchange activities** from contract research, consultancy services, IP income, business and community courses, and facilities and equipment stood at **£5.5 billion**.

Given that the total public cost of research is **£4.4 billion** for all Russell Group universities, every **£1** of public funding is associated with an economic impact of **£8.52 across the UK economy**.

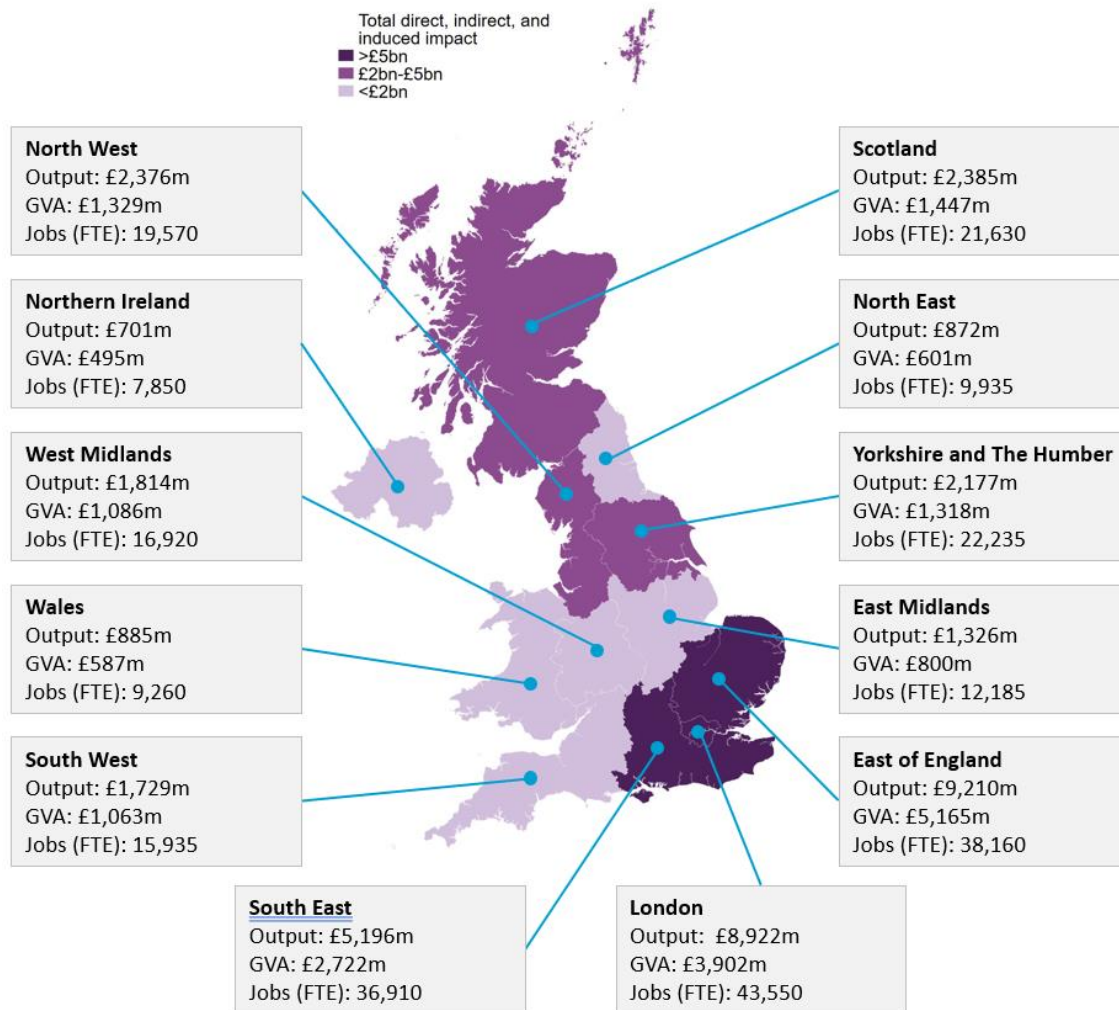
In addition, we estimate a further **£30.5 billion** may be generated in terms of **positive productivity spillovers** (see Section 2.3). This brings the total potential impact of the Russell Group's R&D activities in 2021/22 to approximately **£68.1 billion**.

As well as estimating the total impact on the UK economy as a whole, it was possible to disaggregate the direct, indirect, and induced economic impact by sector and region (and estimate the impacts in terms of GVA and FTE employment, as well as economic output). It is *not* possible to provide a breakdown of productivity spillovers by region or sector (as it is not possible to assign a geographic location or sector to each business benefiting from productivity spillovers generated by Russell Group research).

In terms of the breakdown by region, the analysis indicates that of this total of **£37.6 billion**, approximately **£9.2 billion of economic impact** occurred in the **East of England** and **£8.9 billion** occurred in **London**. There were substantial impacts in **other regions** across the UK, including **£5.2 billion** in the **South East** and **£2.4 billion** in **Scotland**.

In terms of sector, Russell Group universities' research and knowledge exchange activities resulted in particularly large impacts within the **government, health, and education sector (£9.7 billion)**, the **professional & support activities sector (£8.7 billion)**, the **production sector (£5.5 billion)** and the **distribution, transport, hotels and restaurants sector (£5.0 billion)**.

Figure 15 Distribution of the total impact of Russell Group universities' research and knowledge exchange activities, by region



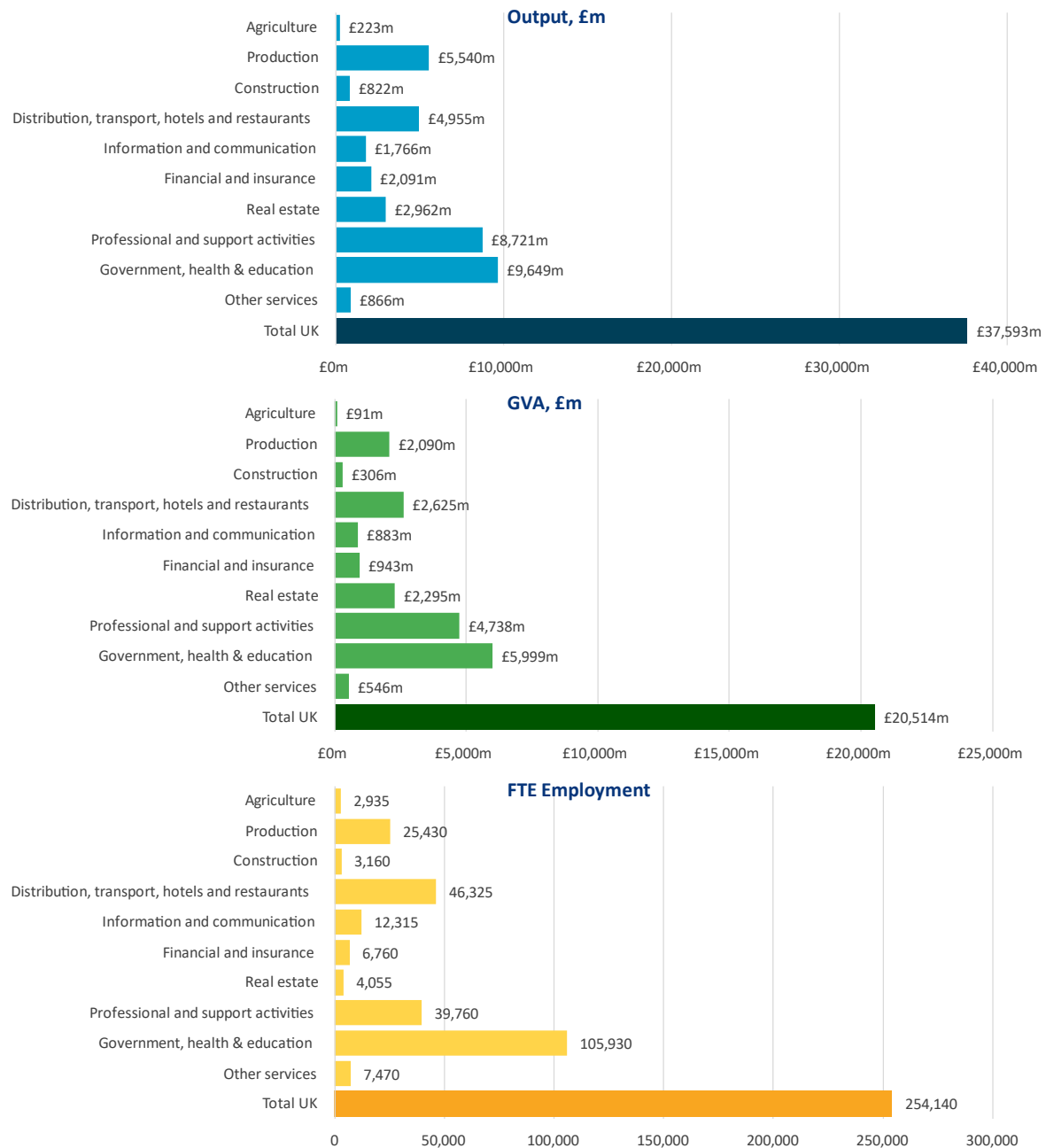
Note: Destination of impact shown. Monetary estimates are presented in 2021/22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated. Employment estimates are rounded to the nearest 5, and again may not add up precisely to the totals indicated.

Source: London Economics analysis of Russell Group universities' data. © ONS Geography for the administrative boundaries.

In terms of GVA and employment measures, the analysis estimates that Russell Group universities' R&D activities generated **£20.5 billion** in GVA and supported approximately **254,140 FTE jobs**, of which **43,550** are located in **London** (see Figure 15).

The sector experiencing the largest economic impact was identified to be the **government, health & education sector**, where Russell Group universities' research and knowledge exchange activities supported **105,930 FTE jobs** and **£6.0 billion** GVA (see Figure 16).

Figure 16 Estimated total economic impact associated with the Russell Group 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
Source: London Economics' analysis

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Annex 2 Glossary of key terms

Direct effect: This considers the economic output (e.g. turnover, GVA, employment) generated by a university (e.g. a spin-out company) itself, by purchasing goods and services (including labour) from the economy which it operates in.

Indirect effect: The university's purchases generate income for the supplying industries, which they in turn spend on their own purchases from suppliers to meet the university's demands. This results in a chain reaction of subsequent rounds of spending across industries, often referred to as the 'ripple effect'.

Induced effect: The induced effect is based on a university's status as an employer. Employees use their wages to buy consumer goods and services within the economy. This in turn generates wage income for employees within the industries producing these goods and services, who then spend their own income on goods and services. Again, this leads to subsequent rounds of wage income spending, i.e. a 'ripple effect' throughout the economy as a whole.

Productivity spillover: Knowledge generated through the research activities of one agent enhances the productivity of other organisations, known as a positive externality. This externality is captured in the productivity spillover which may include enhanced production methods, the creation of new products and services or new techniques to produce an existing product.

Spillover multiplier: The spillover multiplier captures the value of productivity spillovers in a single estimate. A spillover multiplier of X would suggest that spending £1 on direct research activities results in a boost to the wider economy, through the productivity spillover, of £X.

Spin-outs: Companies set-up to exploit IP that has originated from within the HE provider, including **Spin-outs with some HEP ownership** and **Formal spin-outs, not HEP owned**.

Staff start-ups: Companies set-up by active (or recent) HE provider staff but not based on IP from the HE provider.

Graduate start-ups: New businesses started by recent graduates (within two years) regardless of where any IP resides, but only where there has been formal business/enterprise support from the HE provider.

Collaborative research: Includes research projects with public funding from at least one public body, and a material contribution from at least one external non-academic collaborator. The collaborative contribution may be cash or 'in kind' if this is specified in a collaborative agreement and auditable.

Contract research: Includes contract income identifiable by the HE provider as meeting the specific research needs of external partners, excluding any already returned in collaborative research involving public funding and excluding basic research council grants.

Consultancy: Advice and work crucially dependent on a high degree of intellectual input from the HE provider to the client (commercial or non-commercial) without the creation of new knowledge. Consultancy may be carried out either by academic staff or by members of staff who are not on academic contracts, such as senior university managers or administrative/support staff.

Facilities and equipment related services: Use of the HE provider's physical academic resources by external parties, and captures provision which can be uniquely provided by a HE provider. Examples may include aerospace company use of a HE provider's wind tunnel, or media company use of a digital media suite. It does not include simple trading activities such as commercial hire of conference facilities or academic conferences.

Business and Community Courses: This includes revenue generated by Continuing Professional Development (CPD) courses, defined as a range of short and long training programmes for learners already in work who are undertaking the course for purposes of professional development, upskilling or workforce development.

IP income: Includes the IP income from upfront or milestone fees, royalties and patents cost reimbursement.

Annex 3 Technical annex

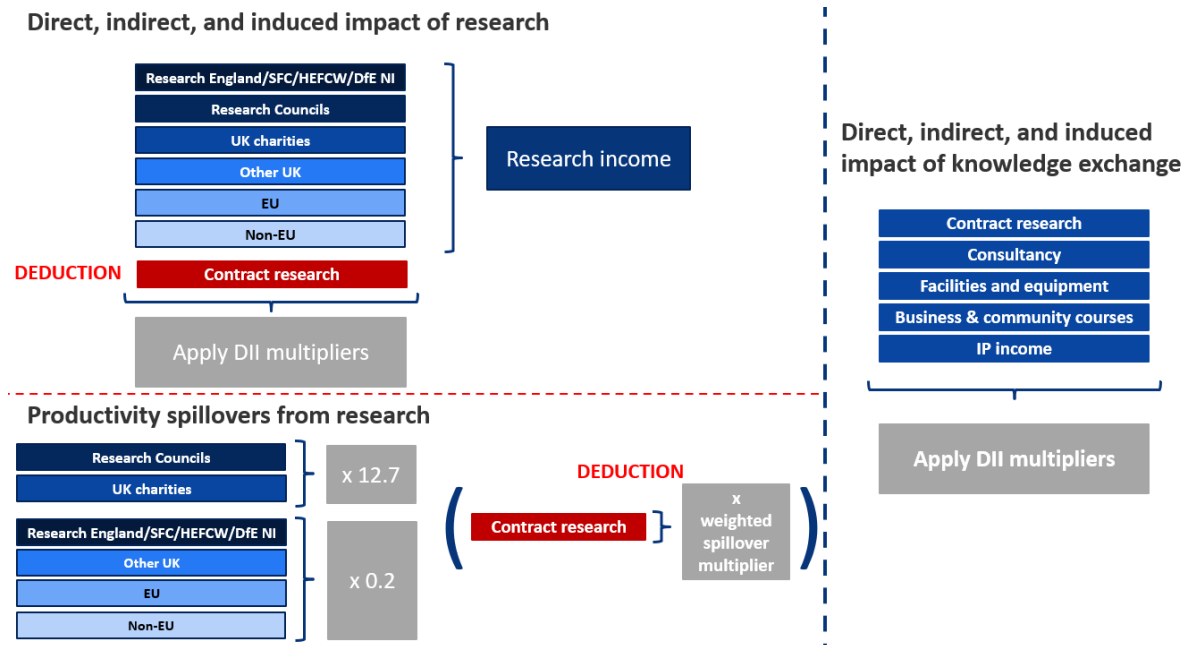
A3.1 Overview of the analysis of research and wider knowledge exchange activities

Figure 17 provides an overview of the methodological approach adopted to analyse the economic impact of the Russell Group universities in terms of:

- The direct, indirect, and induced impact of research (Section 2.2)
- Productivity spillovers from research (Section 2.3)
- The direct, indirect, and induced impact of wider knowledge exchange activities (Section 4)

The economic impact of Russell Group spin-out companies is considered separately in Section 3.

Figure 17 Overview of the analysis 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 is excluded from the impact 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. The whole analysis is conducted at the university level, before being aggregated across all 24 universities.

SFC refers to the Scottish Funding Council; HEFCW refers to the Higher Education Funding Council for Wales; DfE NI refers to the Department for the Economy in Northern Ireland. DII refers to direct, indirect, and induced impacts (see below).

Source: London Economics analysis

A3.2 Industry classifications for multi-regional Input-Output analysis

Table 2 provides an overview of the high-level industry classifications used throughout the multi-regional Input-Output analysis.

Table 2 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	
Air transport	
Warehousing and support activities for transportation	
Postal and courier activities	
Accommodation and food service activities	
Publishing activities	
Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities	Information and communication [58-63]
Telecommunications	

Industries included in original UK Input-Output table	High-level industry group [and UK SIC Codes]
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	
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 (2023) and UK SIC Codes (see Office for National Statistics, 2022)

A3.3 Literature discussing productivity spillovers

This section provides further detail on the literature associated with productivity spillovers, estimated in Section 2.3.

Of particular interest in the context of research conducted by universities, a study by Haskel and Wallis (2010)³⁴ investigates evidence of spillovers from publicly funded Research & Development 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^{35, 36}, and the relative effectiveness of these channels of public spending in terms of their impact on the ‘market sector’. They find strong evidence of the existence of market sector productivity spillovers from public R&D expenditure originating from the UK Research Councils.³⁷ 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. (2014) provides additional insight into the size of potential productivity spillovers from university research. 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.³⁸ The authors investigate the correlation between the combined research conducted by the Research Councils, the higher education sector, and central government itself (e.g. through public research laboratories)³⁹, interacted with measures of industry research activity, and total factor productivity within the different market sectors.⁴⁰ 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).

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

³⁴ Also, see Imperial College London (2010) for a summary of Haskel and Wallis’s findings.

³⁵ 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.

³⁶ This is undertaken by regressing total factor productivity growth in the UK on various measures of public sector R&D spending.

³⁷ 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.

³⁸ Haskel et al. (2014) use data on 7 industries in the United Kingdom for the years 1995 to 2007.

³⁹ 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. (2014). In particular, whereas Haskel and Wallis (2010) estimated the impact of research *funding* by the Research Councils on private sector productivity, Haskel et al. (2014) 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 universities). 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.

⁴⁰ 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.

literature is around 20-25% per year, which still implies a significant estimate of the productivity spillover.

How do these estimates compare to the wider literature?

While these research spillovers are quantitatively large; they are in line with related findings from the (relatively limited) economic literature. A report for the (former) Department for Business, Innovation and Skills (2014) 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.⁴¹ Despite the difference in data and approach, they find qualitatively similar findings: research council R&D investments yield large returns through their impact on private sector productivity. The comparable research multiplier is estimated at 10.71. Moreover, the report finds much higher returns, depending on the precise approach and sample used. Additionally, research from Australia finds a similar research spillover to Haskel and Wallis (2010), albeit with a slightly lower research multiplier of 9.76, which may be expected given the different country studied (Elnasri and Fox, 2017).⁴²

There is more limited research associated with general R&D multipliers (for other research income) although a report published for the Department for Business, Innovation and Skills, looking into the international benchmarking of the UK science and innovation system, notes a rate of return in the range of 20 to 50% (Department for Business, Innovation and Skills, 2014).⁴³ This demonstrates that researchers using different methods and datasets find similar results with regards to estimates of research spillovers.

⁴¹ 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.

⁴² See London Economics (2018), *The economic impact of the Group of Eight in Australia* (Section 2.2.1). The authors find an elasticity of 0.175, which converted to a research spillover, equals 9.76.

⁴³ See also Salter and Martin (2001).

A3.4 Collection and analysis of Russell Group spin-out data

For the analysis of the economic impact of the spin-out companies associated with each Russell Group university specifically, we required the spin-out companies that corresponded to each university's 2021/22 HE-BCI submission in relation to **Spin-outs with some HEP ownership** and **Formal spin-outs, not HEP owned**.⁴⁴ These two categories of spin-outs formed the basis of the analysis. We asked each Russell Group university to provide the following data on their associated UK-based spin-out companies that were active in 2021/22, including each company's:

- Name and company registration number;
- Industry (i.e. main UK Standard Industrial Classification (SIC) code);
- Turnover in 2021/22;
- Employment (in FTEs) in 2021/22;
- Postcode of registered head office address; and
- Whether the company is predominantly UK or non-UK based.

The Russell Group and London Economics contacted and received responses from each of the 24 individual Russell Group universities. All universities were able to supply as a minimum a list of the names of the active spin-out companies. In addition to company names; many of the 24 Russell Group universities were able to supply company registration numbers for their spin-out companies; and a smaller number of universities were able to supply turnover, FTE employment, and the other data requested for the purposes of the study.

In some cases, the number of spin-out companies provided in the university-level dataset did not correspond precisely to the total number of firms in the university's HE-BCI submission. This was due to internal revisions to the dataset within the university since the submission to HE-BCI. However, the extent of deviation from the publicly available aggregate totals was in all cases minimal. In all cases, only **UK-based** spin-outs that were **active in 2021/22** were analysed.

As highlighted above, most universities were not able to supply the fully comprehensive dataset required for the analysis. As a result, the first stage of data analysis involved matching the firm-level observations supplied by each of the universities with firm-level data from both Companies House and Bureau van Dijk's FAME database to fill any gaps in the information, where available. As a form of validation, this matching exercise was also undertaken using the datasets of universities that had provided each spin-out's company registration number and other data. In some cases, this led to revisions to the datasets provided where incorrect company name-company reference number pairs had been provided.

In cases where the turnover or employment data identified in Companies House or FAME did not correspond to the turnover or employment data supplied by the university, the presumption of the analysis was to adopt the turnover or employment provided by the university. This is because many universities are in direct contact with their associated spin-out companies and are provided with this information by the spin-outs directly. However, where appropriate, the UK-based turnover and employment identified in Companies House or FAME was adopted if it was clear that the turnover provided by the university referred to the company's global turnover. For some companies, multiple company registration numbers were identified in Companies House. This generally indicated

⁴⁴ For the publicly available aggregated totals of each university's HE-BCI submission (number of active firms, turnover, and FTE employment), see Table "Intellectual property: spin-off activities by HE provider" at <https://www.hesa.ac.uk/data-and-analysis/business-community/ip-and-startups>

ownership of one company by another company, so where identifiable, the turnover of the holding company was used.

Despite attempts to fill any gaps in the datasets provided by the 24 universities, in many cases, turnover and employment data on Companies House and FAME was **missing**. In a small number of cases, it was not possible to match the spin-out company name supplied by a university to any company in Companies House or FAME data. These spin-outs were therefore not included in the analysis. For both of these reasons, the total turnover and employment associated with Russell Group spin-out companies that is identified in this analysis is therefore likely to be an **underestimate** of the true figure.

The exercise of collecting datasets and matching them to Companies House and FAME data was conducted at the university level using the 24 datasets received, before being aggregated across all 24 universities. As part of the aggregation process, we identified and removed duplicate (and “triplicate”)⁴⁵ entries from the combined dataset. Some spin-outs are associated with more than one Russell Group university since their IP is based on inter-university research. To avoid double counting of the economic impact, these spin-outs are only included once.

In order to calculate the direct turnover and employment, the direct GVA generated was 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 (based on the company’s **main registered head office address**).

Analysis of the total direct, indirect, and induced impact was conducted using the Input-Output tables described in Section 2.2. We apply relevant economic multipliers at the **firm level** (i.e. to the direct turnover and employment of each spin-out company) in order to estimate the indirect and induced impacts associated with these companies’ activities (again assigning relevant multipliers based on the industry within which each of these companies operates and the region of their main registered head office address). Again, these effects are measured in terms of economic output, GVA, and FTE employment, and capture the impact on each region as well as on the UK economy as a whole. The results of this analysis are presented in Section 3 of this report.

⁴⁵ There were 30 instances of duplicates (a spin-out company associated with two Russell Group universities) and one instance of a “triplicate” spin-out company associated with three Russell Group universities.

A3.5 Russell Group start-up companies

In their HE-BCI return, each Russell Group university also reports the number of active start-ups associated with their university, as well as the total turnover and FTE employment of these start-ups:

- **Staff start-ups** are companies set-up by active (or recent) HE provider staff but not based on intellectual property (IP) from the HE provider.
- **Student start-ups** include all new businesses started by recent graduates (within two years) regardless of where any IP resides, but only where there has been formal business/enterprise support from the HE provider.

In the 2021/22 academic year, HESA reports **3,735** active start-up companies associated with Russell Group universities⁴⁶, with an estimated employment of **30,245** FTE and turnover of **£3.8bn**.

These companies have not been included in the overall economic impact analysis because, although the companies are set up by active (or recent) staff or recent graduates, their association with their university is irrespective of where any relevant IP resides (i.e. these companies are not necessarily a result of Russell Group universities' R&D activities). The economic impact has been estimated in the case of spin-out companies because, in the case of spin-outs, the IP used to set up the spin-out company originated with the higher education provider (i.e. within Russell Group universities themselves).

⁴⁶ For the full, publicly available breakdown, see <https://www.hesa.ac.uk/data-and-analysis/business-community/ip-and-startups>



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