# The economic impact of higher education teaching, research, and innovation

## Report for Universities UK

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# Executive Summary

London Economics were commissioned to assess the **impact of the UK higher education (HE) sector's teaching, research, and innovation activities on the UK economy**, focusing on the 2021-22 academic year. This analysis builds upon our previous analyses of the economic impact of the UK higher education sector in 2021-22, in relation to the sector's **institutional expenditures**[1] and **educational exports**[2].

## The impact of the higher education sector's research and knowledge exchange activities

To estimate the economic impact associated with the higher education sector's **research activity**, we used information on the sector's research-related income from HE funding body grants[3] and other sources of research grants and contract income (e.g. UK Research Councils, central and local government, charities etc.). This stood at **£9.70 billion** in 2021-22.

We assessed the **direct, indirect, and induced economic impacts** associated with HEPs' research activity using economic multipliers derived from a (multi-regional) Input-Output model. After accounting for a total of **£6.37 billion** of Exchequer costs, the *net* direct, indirect, and induced impact of UK HEPs' research in 2021-22 is estimated at **£14.01 billion**.

In addition, existing academic literature[4] finds strong evidence of **productivity spillovers** from investment in university research. Applying estimates from this literature, our analysis estimates an average spillover multiplier of **4.95**, suggesting that **every £1 invested (from public or private sources) in HEPs' research activities generates an additional annual economic output of £4.95 across the UK through positive productivity spillovers** to the UK private sector. This results in total estimated productivity spillovers associated with the HE sector's research of **£40.10 billion**[5].

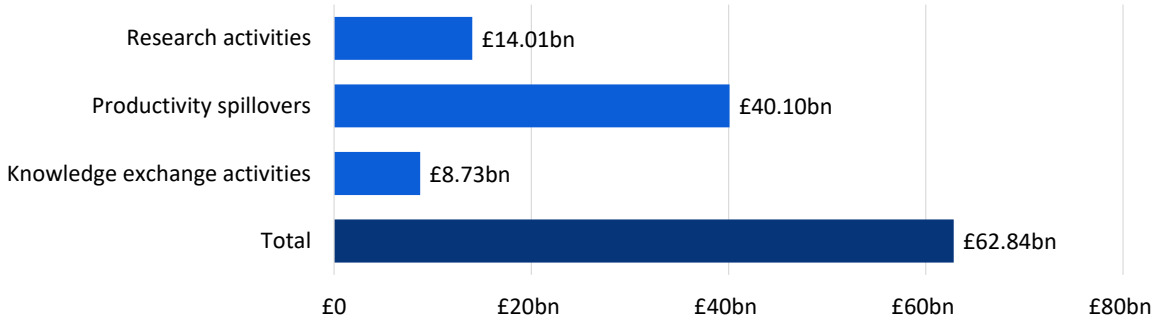
In addition to the sector's research, the analysis estimated the direct, indirect, and induced impact associated with the **knowledge exchange activities** undertaken at HEPs. These include **contract research** and **consultancy services** provided by HEPs; **business and community courses**; **facilities and equipment hire**; and **licensing of university IP** to other organisations. The analysis estimates that these knowledge exchange activities generated a total of **£8.73 billion** of impact across the UK economy in 2021-22.

The combined economic impact associated with the higher education sector's research and knowledge exchange activities in 2021-22 was therefore estimated at **£62.84 billion** (see

[1] See London Economics (2023a).
[2] See London Economics (2023b).
[3] This includes recurrent research grants from Research England, the Scottish Funding Council, the Higher Education Funding Council Wales, and the Department for the Economy Northern Ireland.
[4] See Haskel and Wallis (2010), and Haskel et al. (2014a).
[5] Note that this captures the impact of the research undertaken by HEPs in 2021-22 within that same academic year (but excludes any additional (and likely substantial) impacts in subsequent years). Therefore, the analysis here likely underestimates the true productivity spillovers associated with the research activities undertaken by the UK HE sector in 2021-22. For more information, see Section 2.1.4.

Figure 1)[6]. Comparing this impact to the associated public funding provided for these activities by the Exchequer in 2021-22 (**£6.37 billion**), we estimate a benefit-to-public-cost ratio of **9.9**. In other words, the analysis suggests that **for each £1 of publicly funded research income, the UK HE sector's research and knowledge exchange activities generate approximately £9.9 in economic impact across the UK.**

**Figure 1 Total economic impact of the UK HE sector's research and knowledge exchange activities in 2021-22**




Note: All values are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated.
***Source: London Economics' analysis***

## The impact of the higher education sector's teaching and learning activities

The analysis of the impact of the UK higher education sector's teaching and learning activities estimates the **enhanced employment and earnings benefits to graduates** and the **additional taxation receipts to the public purse** associated with higher education qualification attainment. The analysis focuses on the approximately **906,000** UK domiciled students who started HE qualifications (or standalone module/credit) at UK HEPs in 2021-22 and is adjusted for the specific characteristics of these students.

To estimate the labour market benefits of HE qualifications, we compare the earnings and employment probabilities of individuals in possession of each higher education qualification to a relevant counterfactual group. Specifically, we undertake an econometric analysis where the 'treatment' group consists of individuals in possession of the HE qualification of interest, and the 'counterfactual' group consists of individuals with comparable personal and socioeconomic characteristics but with the next highest (lower) level of qualification.

This comparison of the earnings and employment outcomes of the treatment group and the counterfactual group effectively 'strips away' (to the greatest extent possible with the relevant data) those other personal and socioeconomic characteristics that might affect labour market outcomes (such as gender, age, or sector of employment), leaving just the labour market gains attributable to the qualification itself. For first degrees or 'other undergraduate' level qualifications, the counterfactual group consists of individuals holding any (academic or vocational) qualification at RQF Level 3 as their highest qualification (e.g.

[6] A sensitivity analysis of these results with the respect to the underlying economic multipliers finds alternative estimates that range between **£55.78 billion** (lower estimate) and **£65.24 billion** (upper estimate). Further details on this sensitivity analysis are presented in Section 2.3.1.

2 or more GCE A Levels, Scottish Highers, or equivalent). For postgraduate qualifications, the counterfactual group instead consists of individuals holding first degrees as their highest qualification.

Incorporating the expected costs associated with qualification attainment during the period of study[7] as well as the labour market benefits expected to be accrued by students/graduates over their working lives, the average **net graduate premium** achieved by a representative UK domiciled student in the 2021-22 cohort completing a full-time first degree (with a Level 3[8] qualification as their highest level of prior attainment) was estimated at **£77,000** (in 2021-22 money terms). Separately, taking account of the benefits and costs to the public purse[9], the corresponding **net Exchequer benefit** associated with these students was estimated at **£75,000**.

It should be noted that these estimates only consider the economic impacts in terms of employment and earnings benefits associated with HE qualification attainment, but do not account for a range of wider/social benefits (such as improved health outcomes and reduced crime) associated with these qualifications (see Box 3 for more detail).

The net graduate premiums and net Exchequer benefits (by gender, study mode, study level, location of study, and prior attainment) were combined with information on the number of UK domiciled students in the 2021-22 cohort and expected completion rates.

The resulting total economic impact generated by UK HEPs' teaching and learning activities associated with the 2021-22 cohort stood at approximately **£94.78 billion** (see Table 2)[10]. This is split almost evenly between the Exchequer and students/graduates, with **£47.34 billion** (**50%**) of economic benefit accrued by the Exchequer, and the remaining **£47.44 billion** (**50%**) accrued by students.[11]

Comparing this total teaching and learning impact to the public funding associated with the 2021-22 cohort (estimated at **£7.27 billion**[12]), this results in a benefit-to-public-cost ratio of approximately **13.0**, indicating that **for every £1 of public funding for its teaching activities,**

[7] This includes students' direct costs of qualification acquisition, in relation to the tuition fee paid by the student net of any tuition fee support or maintenance support provided by the Student Loans Company (SLC, for students from England, Wales, and Northern Ireland) or the Students Awards Agency (SAAS, for students from Scotland). In addition, for full-time students (only), we deduct the *indirect* costs associated with qualification attainment, in terms of the foregone earnings during the period of study.

[8] Based on the Regulated Qualifications Framework (RQF) used in England, Wales, and Northern Ireland. This is equivalent to Level 6 on the Scottish Credit and Qualifications Framework.

[9] In relation to tuition fee and maintenance loans (where applicable), the student benefit (and corresponding Exchequer costs) associated with public student loan support equals the Resource Accounting and Budgeting charge (RAB charge), capturing the proportion of the loan that is expected not to be repaid. For English domiciled undergraduate students, the assumed RAB charge is based on Plan 2 loan repayment terms (for post-2012 English loan borrowers), rather the new Plan 5 repayment terms that were introduced by the Department for Education in response to the Augar Review of Higher Education (and which relate to students starting HE qualifications from 2023-24 onwards, so they do not apply to the relevant 2021-22 cohort here). More information is provided in Annex A3.2.8.

[10] A sensitivity analysis of these results with the respect to the underlying marginal earnings returns associated with higher education qualification finds alternative estimates that range between **£89.58 billion** (lower estimate) and **£100.07 billion** (upper estimate). Further details on this sensitivity analysis are presented in Section 3.3.3.

[11] As presented in Table 1, the split in economic impact between students and the Exchequer differs across different UK nations, due to the variation in how HE provision is funded in England, Wales, Scotland, and Northern Ireland (both in terms of public funding provided to students as well as to HEPs). More information on these differences is provided in Section 3.3.2 and Annex A3.2.

[12] These public costs include the recurrent teaching grant funding paid to UK HEPs, as well as the cost of providing public student support in the form of tuition fee grants and loans and maintenance grants and loans (where applicable; where any fee or maintenance loans are adjusted for the RAB charge, i.e. the proportion of these loans that is expected not to be repaid, to take account of the effective *net* cost of these loans from the Exchequer's perspective). All of these costs are calculated for students in the 2021-22 cohort, in terms of the total funding costs over the cohort's entire study duration (in present values in 2021-22 prices). Further details on these public costs are provided in Annex A3.2.8.

**the UK HE sector generates approximately £13 in economic impact from these activities across the UK.**

**Table 1 Total impact of the UK HE sector's teaching and learning activities associated with the 2021-22 cohort**

| Beneficiary and study level | HEP location (nation) | | | | |
|---|---|---|---|---|---|
| | England | Wales | Scotland | Northern Ireland | Total |
| **Students** | **£38.91bn** | **£2.71bn** | **£4.75bn** | **£1.08bn** | **£47.44bn** |
| Undergraduate | £32.10bn | £2.24bn | £3.90bn | £0.86bn | **£39.09bn** |
| Postgraduate | £6.81bn | £0.46bn | £0.85bn | £0.22bn | **£8.35bn** |
| **Exchequer** | **£40.02bn** | **£2.62bn** | **£3.70bn** | **£1.00bn** | **£47.34bn** |
| Undergraduate | £31.74bn | £2.13bn | £2.85bn | £0.78bn | **£37.50bn** |
| Postgraduate | £8.28bn | £0.49bn | £0.85bn | £0.22bn | **£9.84bn** |
| **Total** | **£78.92bn** | **£5.32bn** | **£8.45bn** | **£2.08bn** | **£94.78bn** |
| Undergraduate | £63.83bn | £4.37bn | £6.75bn | £1.64bn | **£76.59bn** |
| Postgraduate | £15.09bn | £0.95bn | £1.70bn | £0.44bn | **£18.18bn** |

Note: All estimates are presented in 2021-22 prices, discounted to reflect net present values, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated.
***Source: London Economics' analysis***

## The aggregate economic impact of the UK higher education sector

The total economic impact on the UK economy associated with the UK higher education sector's **teaching, research and innovation activities** in 2021-22 was estimated at approximately **£157.62 billion** (see Table 2). In terms of the components of this impact, the value of the HE sector's research activities stood at **£54.12 billion** (**34%** of total), and HE providers' (HEPs') knowledge exchange activities generated a total of **£8.73 billion** (**6%**) of impact. In addition, the impact associated with the sector's teaching and learning activities was estimated to be **£94.78 billion** (**60%**).

**Table 2 Total economic impact of the UK higher education sector's teaching, research and innovation activities in the UK in 2021-22**

| Type of impact | £bn | % |
|---|---|---|
| **Impact of research and knowledge exchange** | **£62.84bn** | **40%** |
| Impact of research activities | £54.12bn | 34% |
| Impact of knowledge exchange activities | £8.73bn | 6% |
| **Impact of teaching and learning** | **£94.78bn** | **60%** |
| Impact on students | £47.44bn | 30% |
| Impact on the Exchequer | £47.34bn | 30% |
| **Total economic impact** | **£157.62bn** | **100%** |

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. The percentages show the proportion of total impact associated with the strand/sub-strand of analysis. ***Source: London Economics' analysis***

Comparing this total impact (**£157.62 billion**) to the public funding cost to the UK Exchequer associated with these activities (estimated at **£13.64 billion**), this results in a benefit-to-

public-cost ratio of **11.6**. In other words, we estimate that for **every £1 of public funding, the UK HE sector's teaching, research, and innovation activities generate a total of approximately £11.6 of impact across the UK economy**.

The above estimates of the impact of the UK HE sector's teaching, research and innovation activities were then combined with our previous analyses of the impact of the sector's institutional expenditures[13] and educational exports[14].

This allows us to estimate the **combined economic impact across *all* of the UK HE sector's core activities in 2021-22**,[15] which amounts to **£265.35 billion** (see Table 3). In addition to the above **£157.62 billion** of impact associated with teaching, research, and innovation, this includes a further **£37.43 billion** of impact from the educational exports provided by UK HEPs, and **£70.31 billion**[16] from the institutional expenditures of UK HEPs.[17]

Compared to the total public funding associated with these activities in 2021-22 (estimated at **£18.54 billion**), this corresponds to a total **benefit-to-public-cost ratio of the UK HE sector's activities of approximately 14.3**.

### Table 3 Total economic impact of the UK HE sector's activities in the UK in 2021-22

| Type of impact | £bn | % |
|---|---|---|
| Impact of research and knowledge exchange | £62.84bn | 24% |
| Impact of teaching and learning | £94.78bn | 36% |
| Impact of educational exports | £37.43bn | 14% |
| Impact of HEP expenditure | £70.31bn | 26% |
| **Total economic impact** | **£265.35bn** | **100%** |

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. The percentages show the proportion of total impact associated with the strand/sub-strand of analysis. ***Source: London Economics' analysis***

[13] See London Economics (2023a). Specifically, the analysis focused on the direct, indirect, and induced economic impacts of the UK higher education sector's operating and capital expenditures on the UK economy, based on the 2021-22 academic year.

[14] See London Economics (2023b). Specifically, the study assessed the direct, indirect, and induced economic benefit of the tuition fee income, non-fee income, and visitor income associated with international students who started HE qualifications in the UK in 2021-22, net of the Exchequer cost of hosting these international students in the UK (in terms of the cost of providing general public services (such as health services) to these students).

[15] While the analysis here constitutes the most comprehensive assessment of the economic impact of the UK higher education sector's activities (to the best knowledge of the authors), there are some additional impacts that could not be included here due to wider evidence gaps; therefore, the analysis likely underestimates the true economic impact of the UK HE sector. Specifically, the analysis of the impact of teaching and learning excludes a range of wider benefits to graduates themselves and to wider society that extend beyond the economic benefits of higher education qualification attainment (such as improved health outcomes and reduced crime), while the impact of the sector's research and knowledge exchange activities excludes the economic impact of HEPs' spin-out and start-up companies. These additional impacts are explored in Box 3 and Box 2 in this report, respectively.

[16] This is smaller than the original impact figure published in London Economics (2023a), as it is adjusted for double-counting with the other strands of analysis include here. Specifically, from the original total of **£115.65 billion** of impact associated with HEPs' institutional expenditures, we deduct the direct, indirect, and induced impacts of HEPs' research (**£14.01 billion**), of their knowledge exchange activities (**£8.73 billion**), and of the fee income from international HE students (**£22.61 billion**).

[17] Due to the nature of the impacts considered, different elements of the total impact of the UK HE sector's activities associated with the 2021-22 academic year are calculated over different time frames. The impact of the sector's teaching and learning activities is calculated across the entire expected working lives of UK domiciled students starting HE qualifications in 2021-22; the impact of the sector's educational exports is estimated over the full study duration of international students who started their studies in the UK in 2021-22; and the impacts of the sector's research and knowledge exchange activities and institutional expenditures only relate to the economic effects of these activities within the 2021-22 academic year itself.

# 1 Introduction

London Economics were commissioned to assess the **impact of the UK higher education sector's teaching, research, and innovation activities on the UK economy**, focusing on the 2021-22 academic year. This analysis builds upon our previous analyses of the economic impact of the UK higher education (HE) sector in 2021-22, in relation to the sector's **institutional expenditures** (see London Economics, 2023a) as well as **educational exports** (see London Economics, 2023b).

There are more than 300 higher education providers (HEPs[18]) operating in the UK, ranging from large internationally renowned universities to smaller specialist providers. Regardless of their individual size, as a whole, UK HEPs have a substantial impact on the UK economy, through:

- Their world-class **research and knowledge exchange/commercialisation activities**, contribution to innovation and long-term economic growth;
- Their **teaching and learning activities**, boosting human capital and productivity across the UK (reflected in graduates' earnings and employment outcomes);
- Their **educational exports**, by hosting large numbers of international students each year whose presence generates substantial impacts throughout the UK economy (through these students' fee and non-fee expenditures); and
- The economic activity generated from their 'physical footprint', in terms of UK HEPs' significant **operating and capital expenditures** and the large number of staff employed by these providers throughout the UK.

The impacts generated by the UK HE sector's institutional expenditures and educational exports were already explored in two previous studies undertaken by London Economics on behalf of Universities UK (see London Economics, 2023a and 2023b, respectively). To fully capture the sector's economic contribution, for the first time[19], the estimates presented here instead assess the economic impact associated with UK HE providers' teaching and learning activities and their wide-ranging research and commercialisation activities. Similar to our previous studies on the sector's educational exports and institutional expenditures, the analysis here focuses on the 2021-22 academic year. This allows us to provide - also for the first time - an estimate of the combined total economic impact across all of UK HE providers' core activities[20], all for 2021-22.

The remainder of this report is structured as follows. In **Section 2**, we outline our estimates of the impact of the HE sector's **research and knowledge exchange activities**. To estimate

[18] Throughout this report, 'higher education providers' refers to both publicly funded HEPs and alternative providers. In addition, based on the coverage of the HE student data published by the Higher Education Statistics Agency (HESA), the impact of the HE sector's teaching and learning activities *also* includes further education colleges based in Wales (whereas further education colleges in other parts of the UK are *not* included in the HESA data). Based on this coverage, there were a total of 312 active HE providers operating in the UK in the 2021-22 academic year. These 312 HE providers include the 142 members of Universities UK, who accounted for 94% of all students, 93% of total income and spending, and 97% of research income across the UK HE sector (based on 2021-22 HESA data).

[19] To the best knowledge of the authors, this is the first time that these economic impacts have been analysed for the UK higher education sector as a whole.

[20] See Box 4 in Section 4 for further information on these total estimates.

the impact of research, we combine information on the research-related income accrued by the sector in the 2021-22 academic year with estimates from the wider economic literature on the extent to which public investment in research activity results in additional private sector productivity (i.e. positive 'productivity spillovers'). In addition, the analysis estimates the direct, indirect, and induced impact associated with this research, as well as of the sector's knowledge exchange activities (including UK HEPs' provision of contract research services; consultancy services; business and community courses; facility and equipment hire; and the licensing of UK HE providers' intellectual property (IP) to other organisations)[21].

In **Section 3**, we assess the improved labour market earnings and employment outcomes associated with higher education attainment at UK HEPs. Through an assessment of the expected lifetime benefits and costs associated with educational attainment, we estimate the **net economic benefits of teaching and learning activities to UK HE students/graduates and the public purse** (through enhanced taxation receipts), focusing on the cohort of approximately **906,000** UK domiciled students who started higher education qualifications at UK HE providers in the 2021-22 academic year.

Lastly, **Section 4** presents the aggregate economic impact of the UK higher education sector across these teaching, research, and innovation activities. Combining the findings from this analysis and our above-mentioned previous work relating to the sector's institutional expenditures and educational exports, we also present the aggregate economic impact of the sector across all of these activities. While the findings presented in Sections 2 to 4 all focus on the economic impact of the UK HE sector across the UK economy as a whole, in Annex 2, we present a breakdown of these core findings by the 'origin' of this impact in terms of the region or nation in which each HEP is located.

[21] Another core type of knowledge exchange/commercialisation activities relates to the large number and range of spin-out companies established based on UK higher education providers' IP. While an assessment of the impact of these spin-outs could not be included within the core analysis here due to data limitations, in Box 2 in Section 2, we provide indicative estimates of these effects based on our recent analysis of the economic generated by the spin-out companies associated with Russell Group universities (see London Economics, 2024a).

# 2 The economic impact of the UK higher education sector's research and knowledge exchange activities

In this section, we outline our estimates of the economic impact of the UK higher education sector's **research and knowledge exchange activities**. To achieve this, we consider both the impact of HEPs'[22] expenditures on research and knowledge exchange activities through the direct, indirect and induced effects of that spending, as well as the wider productivity spillovers that are generated through HEPs' research activities.

## 2.1 Impact of the UK HE sector's research

In this section, we outline our analysis of the **economic impact of the higher education sector's research activities**. We estimate both the **direct, indirect, and induced effects** of HEPs' research (captured by their research income and the subsequent rounds of spending this income generates across the economy), as well as the **productivity spillover effects** from HEPs' research activities.

### 2.1.1 The higher education sector's research income in 2021-22

To estimate the **direct impact** generated by the higher education sector's research activities, we used information from HESA on the total research-related income accrued by HEPs in the 2021-22 academic year.[23] This includes:

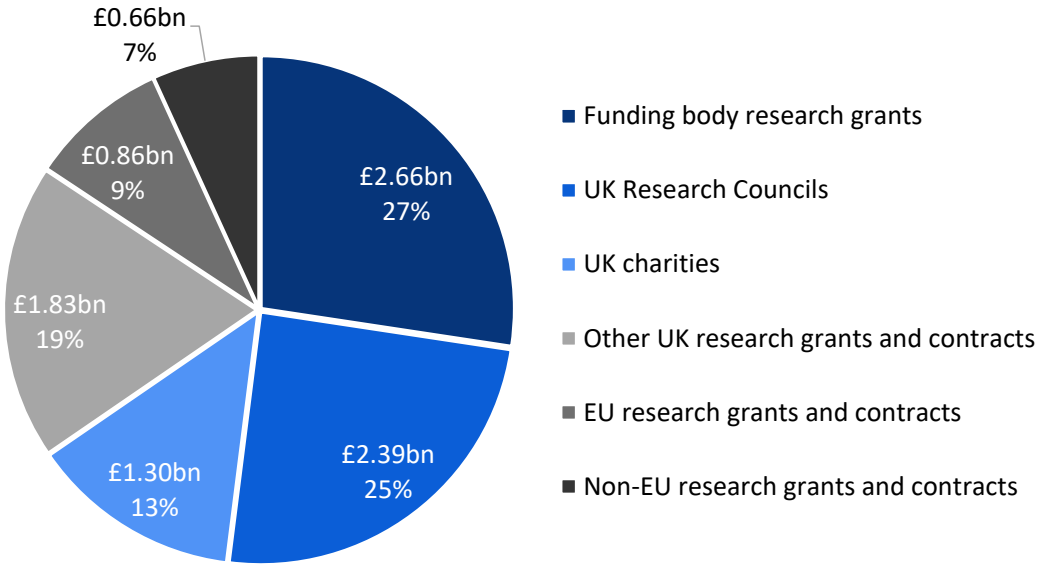
- Income from **research grants and contracts** provided by:
  - **UK sources**, including the UK Research Councils; UK-based charities; central government bodies, local authorities, and health and hospital authorities; industry and commerce; and other UK sources;
  - **EU sources**, including government bodies, charities, industry and commerce, and other sources; and
  - **Non-EU sources**, including charities, industry and commerce, and other sources; and
- **Recurrent research funding** allocated to HEPs by funding bodies in their respective Home Nations, including from Research England, the Scottish Funding Council, the Higher Education Funding Council Wales[24], and the Department for the Economy Northern Ireland.

Aggregating across these sources, the total research-related income accrued by HEPs in the 2021-22 academic year stood at **£9.70 billion** (see Figure 2).[25] Approximately **27%** (**£2.66**

[22] The analysis of the impact of research and knowledge exchange is based on **223** HEPs for which both relevant research income data (for the research impact) and data from the Higher Education Business and Community Interaction survey (relating to knowledge exchange activities) were available. This excludes a further **89** providers which report to HESA but for which data from one or both of these sources was not available for 2021-22.
[23] See Higher Education Statistics Agency (2024a).
[24] To be replaced by the Commission for Tertiary Education and Research (Medr) from August 2024 onwards.
[25] Note that we further adjust the direct impact of research for double-counting with knowledge exchange activities and for public costs (see Sections 2.1.2 and 2.1.3).

**billion**) of this total was received through recurrent research grant funding from the relevant **UK HE funding bodies**[26], with an additional **25% (£2.39 billion**) received from the **UK Research Councils**, **13%** (**£1.30 billion**) from **UK charities**, and **19%** (**£1.83 billion**) from **other UK sources**[27]. In addition, in terms of funding from international sources, **9%** (**£0.86 billion**) of UK HEPs' research-related income was derived from **EU research grants and contracts**, and the remaining **7%** (**£0.66 billion**) was from **non-EU sources**.

**Figure 2 Research income received by UK HEPs in 2021-22, £bn by source of income**




Note: All values are presented in 2021-22 prices and rounded to the nearest £0.01 billion. Funding body research grants include recurrent research grants from Research England (**£2.20 billion**), the Scottish Funding Council (**£0.30 billion**), the Higher Education Funding Council Wales (**£0.11 billion**), and the Department for the Economy Northern Ireland (**£0.05 billion**).
***Source: London Economics' analysis based on data published by the Higher Education Statistics Agency (HESA, 2024a)***

### 2.1.2 Adjustment for double-counting with knowledge exchange activities

The **£9.70 billion** of research income received by HEPs in 2021-22 includes income associated with a whole range of research activities. In particular, HEPs' income from **collaborative research** and **contract research** activities is included within this aggregate total.[28] However, the income from these two activities is *also* recorded separately within the Higher Education Business and Community Interaction Survey (HE-BCI)[29] data, which we use to separately estimate the economic impact associated with HEPs' knowledge exchange activities (described in further detail in Section 2.2).

[26] This includes recurrent research grants from Research England (**£2.20 billion**), the Scottish Funding Council (**£0.30 billion**), the Higher Education Funding Council Wales (**£0.11 billion**), and the Department for the Economy Northern Ireland (**£0.05 billion**).
[27] This income from 'other UK sources' includes **£1.33 billion** from UK central government bodies, local authorities, and health and hospital authorities; **£0.42 billion** from UK industry, commerce and public organisations; and **£0.08 billion** from other sources (numbers may not add up precisely due to rounding).
[28] 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.
[29] See Higher Education Statistics Agency (2024b).

Given that the income from these sources is included in *both* the data on HEPs' research-related income as well as the HE-BCI data on HEPs' knowledge exchange activities, to avoid any double-counting between the estimated impact of HEPs' research activities (described in this section) and knowledge exchange activities (described in Section 2.2), we made the following adjustments:

- In terms of the higher education sector's impact from **collaborative research**, we implicitly account for publicly funded and cash income from collaborative research within the **impact of the HE sector's research**. We therefore do *not* take collaborative research income into account in the analysis of knowledge exchange activities. This income represents **£1.41 billion** out of the **£9.70 billion** of total research income received by all UK HEPs in 2021-22.[30]
- In terms of **contract research**, we account for this activity within the impact of HEPs' knowledge exchange activities (see Section 2.2). Therefore, to avoid double-counting, the analysis of the impact of HEPs' research activities here is adjusted to deduct **£1.61 billion** of contract research income from the above total research-related income (**£9.70 billion**). We thus estimated that the **gross direct impact** (before deducting public costs) associated with HEPs' research activity in the 2021-22 academic year stands at **£8.09 billion**.

A schematic overview of the methodological approach adopted, including the adjustments for double-counting, is provided in Annex A3.1.1.

### 2.1.3 Direct, indirect, and induced impact of the higher education sector's research activity

The analysis then assesses the **direct, indirect, and induced economic impacts** associated with UK HEPs' research activity in 2021-22 on the UK economy. While the direct impact reflects the **research income** that HEPs received in the 2021-22 academic year[31], the indirect and induced effects reflect the chain reaction of subsequent rounds of spending throughout the economy, often referred to as a **'ripple effect'**. These are defined as follows:

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

[30] The **£1.41 billion** in collaborative research funding is made up of **£1.21 billion** of public funding and **£0.20 billion** of collaborative cash contributions. Note that any income in terms of in-kind contributions to collaborative research (**£0.48 billion**) is excluded from the analysis, since these contributions do not represent a cash transaction for which we can robustly apply economic multipliers.
[31] Net of contract research income, as discussed above.

The total of the direct, indirect, and induced effects constitutes the *gross* economic impact of higher education providers' 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 region[32].

The direct, indirect, and induced impacts are measured in terms of monetary economic output[33], gross value added (GVA)[34], and full-time equivalent (FTE) employment supported.[35]

These impacts of the higher education sector's research activities were estimated using **economic multipliers**[36] derived from Input-Output tables[37], which measure the total production output of each industry in the UK economy, and the inter-industry (and intra-industry) flows of goods and services consumed and produced by each sector. In other words, these tables capture the degree to which different sectors within the UK economy are connected, i.e. the extent to which changes in the demand for the output of any one sector impact all other sectors of the economy. To be able to achieve a breakdown of the analysis by region, we developed a **multi-regional Input-Output model**, combining UK-level Input-Output tables (published by the Office for National Statistics[38]) with a range of regional-level data. Further detail on the application of economic multipliers can be found in Annex A3.1.2.

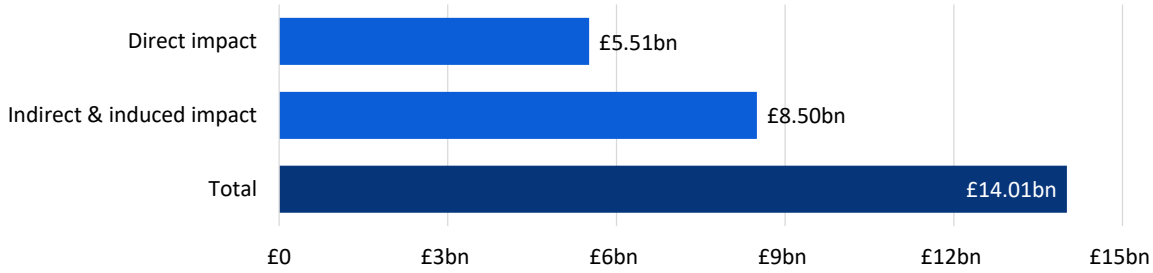
### Adjusting for public costs

To arrive at the ***net* total impact** of the higher education sector's research activities on the UK economy (**net of public costs**), we deducted the **costs to the public purse** of funding UK HEP's research activities. These public costs include the funding provided by the UK Research Councils (**£2.39 billion**), recurrent research grants provided by the relevant HE funding body in each Home Nation (**£2.66 billion**), and other research income from UK central government bodies, local authorities, and health and hospital authorities (**£1.33**

[32] It is important to note that, while the analysis (wherever possible) takes account of *leakage* (e.g. adjusting for the extent to which any additional income for supplying industries might be spent on imports of goods and services from outside the UK), the estimated impacts here are *not* adjusted for *displacement* or additionality (e.g. the extent to which the research income received by HEPs 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 HEPs' research activities in *gross* terms.
[33] In this analysis, economic output is equivalent to income (e.g. the direct research income accrued by UK HEPs in 2021-22).
[34] Gross value added is used in national accounting to measure the economic contribution of different industries or sectors and is defined as economic output minus intermediate consumption (i.e. minus the cost of goods and services used in the production process).
[35] FTE jobs represent the total number of full-time jobs supported, accounting for part-time positions on an equivalent full-time basis.
[36] Specifically, the analysis makes use of *Type II* multipliers, defined as [Direct + indirect + induced impact] / [Direct impact].
[37] 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.
[38] See Office for National Statistics (2023).

**billion**)[39,40]. These total public purse costs (**£6.37 billion**) are deducted from the direct, indirect, and induced impacts of research activity estimated using the multipliers outlined above. We thus estimated that the resulting **direct, indirect, and induced impact** (net of public costs) associated with the higher education sector's research activity in the 2021-22 academic year stood at **£14.01 billion**, with a (net) direct research impact of **£5.51 billion** (see Figure 3). In terms of GVA and FTE employment, the total direct, indirect, and induced impact associated with the higher education sector's research activity was estimated at **£7.94 billion** and **121,500** FTE jobs, respectively[41].

**Figure 3 Net direct, indirect, and induced impacts associated with higher education providers' research income in 2021-22, £bn**




Note: Estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated.
***Source: London Economics' analysis***

### 2.1.4 Productivity spillovers to the private sector

In addition to the direct, indirect, and induced impact of research, the wider academic literature indicates that investments in research & development (R&D) and other intangible assets may induce positive **externalities**. Economists refer to the term 'externality' to describe situations in which the activities of one 'agent' in the market induce (positive or negative) external effects on other agents in that market (which are not reflected in the price mechanism). In the context of 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 sector[42]. For example, spillovers are enabled through direct R&D collaborations between universities and firms (such as Knowledge Transfer

[39] This is included within the **£1.83 billion** of income from 'other UK research grants and contracts' in Figure 2 (which also includes **£0.42 billion** of income from UK industry and **£0.08 billion** from other UK sources).
[40] This may underestimate the total value of government spending on research undertaken by UK HEPs, as other types of public spending which indirectly support this research (such as the UK government's contribution to the EU to allow for access to Horizon Europe, or the spending on initiatives that support investment in research and innovation through the UK Shared Prosperity Fund) are not included.
[41] Further detail on the calculation of these estimates is provided in Annex A3.1.2.
[42] 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.

Partnerships), the publication and dissemination of research findings, or through university graduates entering the labour market and passing on their knowledge to their employers.

In order to estimate the productivity spillovers associated with the UK HE sector's research activities, we apply productivity spillover multipliers from the existing literature to the different types of research-related income received by HEPs in 2021-22 (again see Figure 2). Specifically, we assign a multiplier of **12.7**[43] to the research funding that UK HEPs received from **UK Research Councils and UK charities**[44] in 2021-22 (amounting to **£3.69 billion**), and a multiplier of **0.2**[45] to **all other research funding** received by HEPs in that academic year (amounting to **£6.01 billion**)[46]. A more detailed summary of the key relevant literature on this topic is presented in Box 1.

Using this approach, we infer a weighted average spillover multiplier associated with the higher education sector's research activities of approximately **4.95** – i.e. **every £1 invested in HE research generates additional annual economic output of £4.95 across the UK economy**. This captures the impact of the research undertaken by HEPs in 2021-22 within that same academic year (but excludes any additional (and likely substantial) impacts in subsequent years).[47] Applying this weighted average multiplier to the direct impact of research (i.e. excluding contract research, which stood at **£1.61 billion**)[48], we estimate that the research conducted by UK HEPs in 2021-22 resulted in **total market sector productivity spillovers** of **£40.10 billion**.

### Box 1 Literature relating to the productivity spillovers to the private sector associated with university research activities

Of particular interest in the context of research conducted by universities, a study by Haskel and Wallis (2010)[49] investigates evidence of **spillovers from publicly funded R&D activities**. The authors analyse productivity spillovers to the private sector from public spending on R&D by the UK Research Councils and public spending on civil and defence-

[43] This is based on a study by Haskel and Wallis (2010). See Box 1 for more information.
[44] Where the vast majority of funding provided by UK charities relates to projects commissioned through an open competitive process.
[45] This is based on a study by Haskel et al. (2014a). Again, see Box 1 for more detail.
[46] 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.
[47] Specifically, the 12.7 multiplier (based on the analysis by Haskel and Wallis (2010)) as well as the 0.2 multiplier (from Haskel et al. (2014a)) constitute the impact of research investment on *annual* UK economic output within a given year (and, in our analysis here, we use these multipliers to estimate the level of private sector spillovers occurring in 2021-22 associated with research undertaken by UK HEPs in 2021-22). However, we do *not* account for any subsequent productivity spillovers from this research that might occur in subsequent years (i.e. 2022-23 and beyond). For example, as outlined by Haskel et al. (2014a), based on their analysis, 'a one-off increase in public spending [on R&D] generates an infinitely-lived rise in the level of knowledge capital and so an infinitely-lived higher output' (see Haskel et al. (2014a), p. 48) – i.e. their findings suggest that every £1 spent on public R&D results in an additional *annual* output of £0.20 within the UK private sector *in perpetuity* (under their assumption that the public R&D knowledge stock does not depreciate, i.e. a 0% depreciation rate of public R&D; for more information, also see Haskel et al. (2014b)). Here, conservatively, we do *not* estimate any spillover effects in subsequent years, so that our analysis likely underestimates the total spillovers to the private sector associated with the research undertaken by UK HEPs in 2021-22.
[48] Note that by applying this weighted average multiplier, we implicitly assume that the source of HEPs' contract research income is representative of all other research income received by UK HEPs (in absence of information around the source of the contract research income).
[49] Also, see Imperial College London (2010) for a summary of Haskel and Wallis's findings.

related R&D[50, 51], and the relative effectiveness of these channels of public spending in terms of their impact on the 'market sector' (i.e. the private sector). They find strong evidence of the existence of market sector productivity spillovers from public R&D expenditure originating from the UK Research Councils[52]. Their findings imply that, while there is no spillover effect associated with publicly funded civil and defence R&D, the marginal spillover effect of public spending on research through the Research Councils stands at **12.7 (i.e. every £1 spent on research through the Research Councils results in an additional annual output of £12.70 within the UK private sector)**.

Another study by Haskel et al. (2014a) provides additional insight into the size of potential productivity spillovers from university research. 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[53]. The authors investigate the correlation between the combined research conducted by the UK Research Councils, the higher education sector, and central government itself (e.g. through public research laboratories)[54], interacted with measures of industry research activity, and total factor productivity within the different market sectors[55]. 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)**[56].

**How do these estimates compare to the wider literature?**

It is important to note that, to date, the studies by Haskel and Wallis (2010) and Haskel et al. (2014a) still constitute the two core pieces of UK-based evidence on the size of private sector productivity spillovers associated with public research (particularly in relation to higher education research). This is due to a number of significant data limitations and discontinuities within the key dataset on R&D expenditures in the UK, so that it is currently not possible to replicate and update the analysis using more recent

[50] 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.
[51] This is undertaken by regressing total factor productivity growth in the UK on various measures of public sector R&D spending.
[52] 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.
[53] Haskel et al. (2014a) use data on 7 industries in the United Kingdom for the years 1995 to 2007.
[54] A key difference to the multiplier for Research Council spending provided by Haskel and Wallis (2010) lies in the distinction between *performed* and *funded* research, as outlined by Haskel et al. (2014a). In particular, whereas Haskel and Wallis (2010) estimated the impact of research *funding* by the Research Councils on private sector productivity, Haskel et al. (2014a) instead focus on the *performance* of R&D. Hence, they use measures of the research undertaken by the Research Councils and the government, rather than the research funding which they provide for external research, (e.g. by higher education institutions). The distinction is less relevant in the higher education sector. To measure the research performed in higher education, the authors use Higher Education Funding Council funding where research is both funded by and performed in higher education.
[55] 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.
[56] For a summary of Haskel et al.'s (2014a) findings, also see Haskel et al. (2014b).

data[57]. Therefore, aside from these two key analyses, there is only relatively limited economic literature available on the productivity spillovers associated with publicly funded research. For example[58]:

- A report for the (former) Department for Business, Innovation and Skills (2014a) replicates the Haskel and Wallis (2010) approach, using a different (publicly-available) dataset and a slightly different methodology to explore variation in types of Research Council R&D investments in terms of their impact on private sector productivity. Despite the difference in data and approach, they find qualitatively similar findings: Research Council R&D investments yield large returns through their impact on private sector productivity[59], with the comparable productivity spillover multiplier estimated at **10.71**. Moreover, the report finds much higher returns depending on the precise approach and sample used.
- Comparable research by Elnasri and Fox (2017) applies the Haskel and Wallis (2010) approach to assess the productivity spillovers associated with publicly funded research in Australia. The authors find a similar research spillover to Haskel and Wallis (2010), albeit with a slightly lower research multiplier of **9.76**[60] (which may be expected given the different country studied).
- A US-based study by Jones and Summers (2020) undertakes an economy-wide calculation of the average social benefits of investments in innovation, including spillovers. They find a baseline benefit-to-cost ratio of **13.3:1**, although their estimates range from 5 to more than 20 depending on the assumptions made in relation to inflation bias, health benefits, and the discount rate (among other factors).
- In contrast, a study of 22 OECD countries by van Elk et al. (2019) using production function models finds that public R&D investments do not automatically result in positive returns in terms of GDP and total factor productivity growth, and that positive and statistically significant returns depend on the national context in which these investments take place.
- While there is even more limited research associated with general R&D multipliers (for other research income), a report published by the (former)

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

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

[59] 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.

[60] See London Economics (2018). The authors find an elasticity of 0.175, which we converted to a research spillover of 9.76.

Department for Business, Innovation and Skills (2014b) that focuses on internationally benchmarking the UK science and innovation system notes a rate of return in the range of 20% to 50%[61].

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

**Sensitivity analysis of the estimated productivity spillovers associated with the UK HE sector's R&D**

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

These alternative estimates, including the resulting weighted average productivity spillover multipliers, are presented in Table 4. In the first alternative model, we adjust the public sector R&D multiplier to be **0.5** (the upper bound of the range estimated in Department for Business, Innovation and Science (2014b)), whilst retaining the baseline estimate for the Research Council R&D multiplier. This results in a weighted average research multiplier of **5.14**. In the second alternative model, we adjust the Research Council R&D multiplier to be **10.7** (in line with the findings from the Department for Business, Innovation and Skills (2014a)), whilst retaining the baseline estimate for the public sector R&D multiplier. This results in a weighted average research multiplier of **4.19**. Finally, as a third alternative, we adjust both the public sector and the Research Council R&D multiplier to be **0.5** and **10.7**, respectively, which would result in a weighted average research multiplier of **4.38**.

**Table 4 Sensitivity analysis of estimated productivity spillovers**

| Model | Research Council R&D multiplier | Other public Sector R&D multiplier | Weighted average multiplier | Total spillovers from HE research |
|---|---|---|---|---|
| **Baseline** | **12.7** | **0.2** | **4.95** | **£40.10 bn** |
| Alternative 1 | 12.7 | 0.5 | 5.14 | £41.61 bn |
| Alternative 2 | 10.7 | 0.2 | 4.19 | £33.95 bn |
| Alternative 3 | 10.7 | 0.5 | 4.38 | £35.45 bn |

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

Using these alternative weighted average research multipliers, we are able to evaluate the impact of alternative multiplier assumptions on the estimated total productivity spillovers associated with the UK HE sector's research. As shown in the last column of

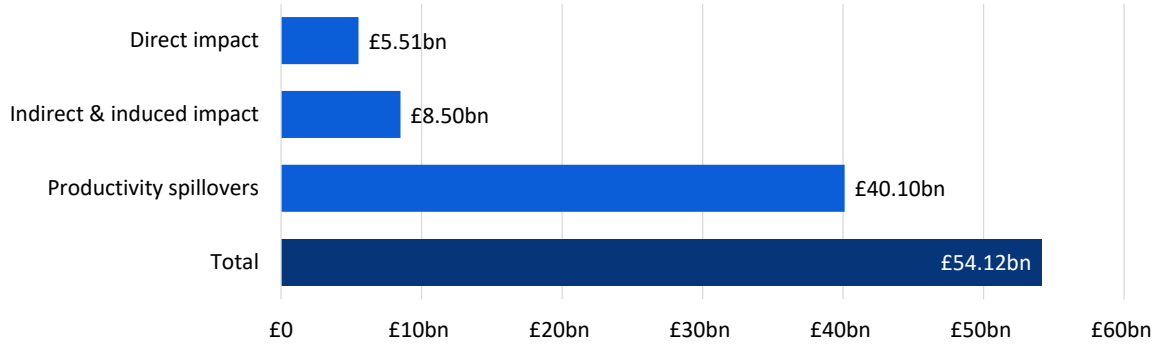
[61] See also Salter and Martin (2001).

Table 4, these alternative estimates range from a lower bound of **£33.95 billion** to **£41.61 billion**.

### 2.1.5 Aggregate impact of the higher education sector's research

Combining the **direct, indirect, and induced economic impact** of the higher education sector's research (**£14.01 billion**) with the estimated **productivity spillovers** associated with this research (**£40.10 billion**), we estimate that the total economic impact associated with UKJ HEPs' research activities in 2021-22 stood at approximately **£54.12 billion** (see Figure 4).

**Figure 4 Total impact of higher education providers' research activities in 2021-22, £bn**




Note: All values are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the total indicated

***Source: London Economics' analysis***

## 2.2 Impact of the UK HE sector's knowledge exchange activities

In addition to their research activities, UK HEPs generate significant economic impacts through a range of knowledge exchange activities. Based on HE-BCI data[62], in this section, we estimate the direct, indirect, and induced impact of the UK HE sector's knowledge exchange activities, including[63]:

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

Again, in addition to the direct impact in **economic output terms** associated with each of these activities (based on the income from each of the above knowledge exchange activities

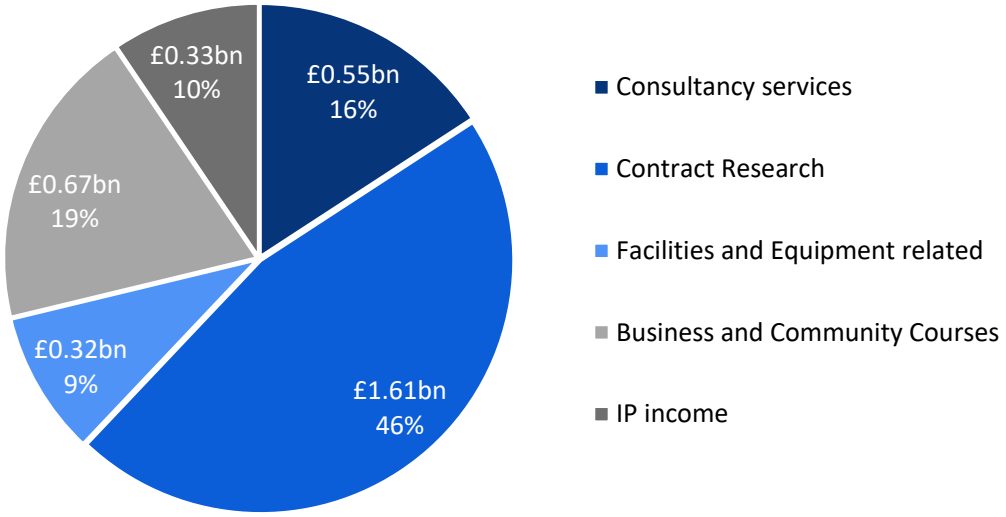
[62] Again, see HESA (2024b).

[63] Note again that the income from collaborative research is *not* included in this section, but implicitly accounted for in the impact of HEPs' research (see Section 2.1). Although this income is likely to contain funding related to knowledge exchange activities, it is difficult to attribute it with certainty to a specific activity. As such, we retain collaborative research within the research impact category (again, see Section 2.1.2 for more details).

accrued by UK HEPs in 2021-22), we estimate the impact in **GVA** and **FTE employment terms**, by multiplying the direct output by the average ratios of GVA to output and of FTE employees to output among organisations within the government, health, and education sector located in the region in which each HEP is located.

The **direct impact** of HEPs' knowledge exchange activities is made up of **£1.61 billion** in income from contract research activities, **£0.55 billion** in revenues from consultancy services, **£0.67 billion** of income generated from business and community courses, **£0.33 billion** of IP licensing income, as well as **£0.32 billion** of income associated with the hire of HEPs' research facilities (see Figure 5). The total direct impact (in economic output terms) therefore stood at **£3.48 billion** in the 2021-22 academic year. The associated direct impact in GVA terms stood at **£2.18 billion**, supporting approximately **39,600** FTE jobs.

**Figure 5 Income from knowledge exchange activities received by UK HEPs in 2021-22, £bn by source of income**




Note: All values are presented in 2021-22 prices and rounded to the nearest £0.01 billion.
***Source: London Economics' analysis based on data published by the Higher Education Statistics Agency (HESA, 2024b)***

To estimate the **total direct, indirect, and induced impacts** associated with each HEP's income from these knowledge exchange activities, we then multiplied these direct impacts by the estimated average economic multipliers associated with organisations in the government, health, and education sector in the region in which each provider operates[64]. These multipliers are the same as those used to estimate the direct, indirect, and induced impacts of the UK HE sector's research activities, discussed in Section 2.1.3[65].

Table 5 and Figure 6 present the resulting **aggregate impact** associated with UK HEPs' **knowledge exchange activities**. The analysis estimates that, in 2021-22, these activities generated a total of **£8.73 billion** of economic output across the UK economy. The

[64] This follows a similar approach as for the estimated impact of the sector's research (see Section 2.1), and again assumes that the expenditure patterns of each UK HEP are the same as for other institutions operating within the same region's government, health, and education sector. For more information, see Annex A3.1.2.
[65] Again, also see Annex A3.1.2 for more information.

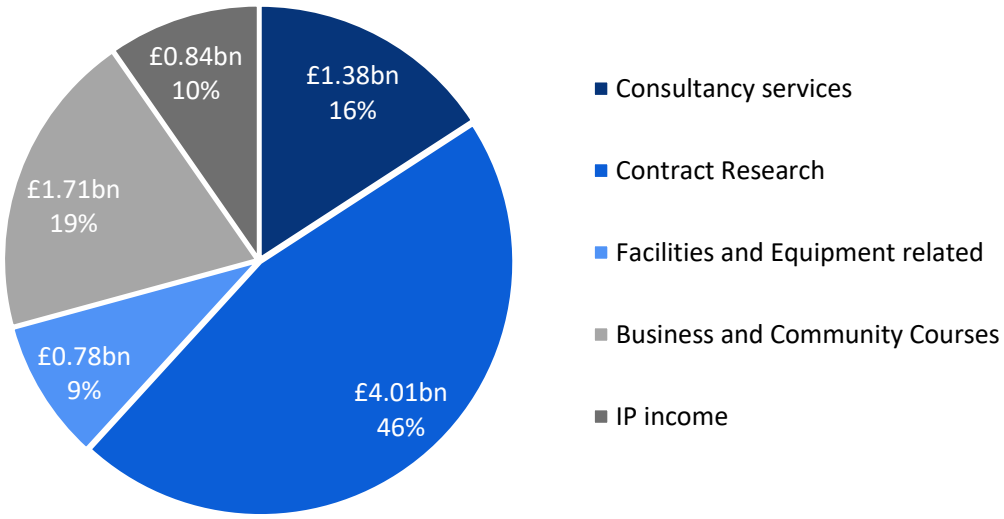
corresponding total GVA impact was estimated at **£5.00 billion**, with an estimated **77,500 FTE jobs** supported across the UK economy.

### Table 5 Economic impact associated with the HE sector's knowledge exchange activities in 2021-22

| Type of impact | Output, £m | GVA, £m | # of FTE employees |
|---|---|---|---|
| Direct impact | £3.48bn | £2.18bn | 39,600 |
| Indirect and induced impact | £5.24bn | £2.83bn | 37,900 |
| **Total impact** | **£8.73bn** | **£5.00 bn** | **77,500** |

Note: All monetary values are presented in 2021-22 prices and rounded to the nearest £0.01 billion. The employment figures are rounded to the nearest 100. Totals may not add up precisely to due to rounding.
***Source: London Economics' analysis***

### Figure 6 Total economic impact associated with the HE sector's knowledge exchange activities in 2021-22 by activity, £bn (economic output)




Note: Estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated.
***Source: London Economics' analysis***

### Box 2 The impact of the UK HE sector's spin-out companies: Indicative estimates

In addition to the above-described knowledge exchange activities, the UK HE sector also generates substantial economic impacts through the spin-out companies that are based on HE providers' IP. Ideally, an analysis of this type would consider the direct, indirect, and induced impact of these companies' activities, based on the turnover and employment of each firm and relevant economic multipliers.

However, throughout our main analysis here, it was *not* possible to include the impact of these HEP spin-out companies, for two reasons:

1. First, while aggregate data on the turnover and employment of these firms is available from the above-mentioned published HE-BCI data, the data typically **includes a range of gaps and lacks relevant turnover and/or employment information for many companies**, therefore underestimating the full economic contribution of these spin-outs.
2. Second, the high-level data **does not include information on the region or sector of these spin-out companies**, which would be necessary in order to allow us to assign the appropriate economic multipliers when calculating the indirect and induced impacts of the activities of these firms.

Nevertheless, it is possible to provide a ***lower bound* estimate** of the impact of these spin-outs, using findings from London Economics' recent analysis of the economic impact of Russell Group universities' spin-out companies (London Economics, 2024a)[66]. The study found that, in 2021-22, the **total direct, indirect, and induced impact** of the 24 Russell Group universities' spin-out companies stood at **£17.82 billion** (in economic output terms, based on turnover), supporting approximately **80,500 FTE jobs**.

To put this into context, Russell Group universities account for a substantial proportion (but not all) of the spin-out landscape of the UK HE sector[67], so that the total impact of spin-out activity across all UK HEPs would be greater than the above estimates.

## 2.3 Total impact of the UK HE sector's research and knowledge exchange activities

The total economic impact on the UK economy associated with the higher education sector's research and knowledge exchange activities in 2021-22 was estimated to be approximately **£62.84 billion** (see Figure 7). In terms of the components of this impact:

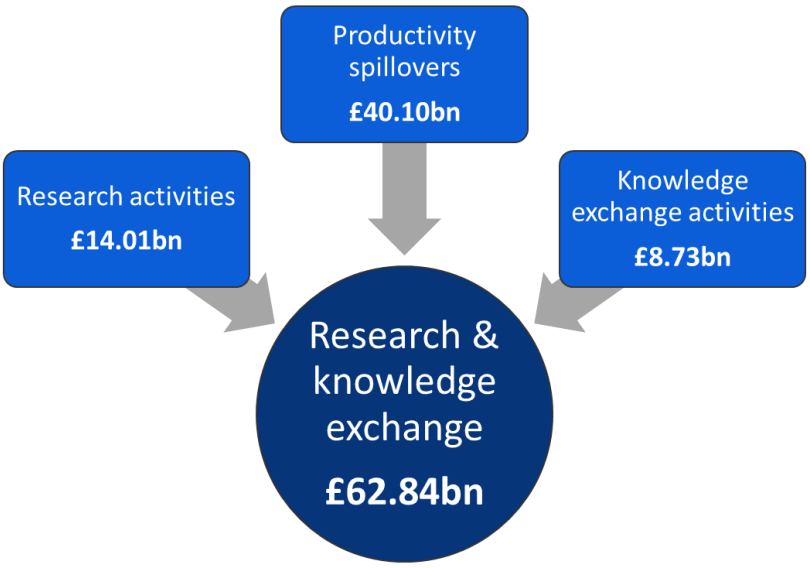
[66] 'Spin-out' companies in this context refers to any 'spin-offs with some HEP ownership' and 'formal spin-offs, not HEP owned', based on the HE-BCI data (see HESA, 2024b). As part of our analysis for the Russell Group (London Economics, 2024a), we excluded any spin-out companies that were based outside of the UK.

[67] Specifically, in 2021-22, there were **1,934** active spin-outs associated with all UK HEPs, with a turnover of **£10.15** billion and **40,300** FTE employees. Of these totals, the 24 Russell Group universities accounted for **68%** of all active spin-outs, **91%** of the total turnover of these companies, and **78%** of HEP spin-out employment.

- HEPs' **research activities** accounted for **£14.01 billion** (in terms of direct, indirect, and induced impacts);
- The associated **productivity spillovers** to the wider UK economy stood at **£40.10 billion**; and,
- The impact associated with UK HEPs' **knowledge exchange activities** is estimated to be **£8.73 billion**, including:
  - **Contract research** provided by HEPs (**£4.01 billion**);
  - **Business and community courses** provided by HEPs (**£1.71 billion**)
  - **Consultancy services** provided by HEPs (**£1.38 billion**);
  - **Licensing of IP** by HEPs to other organisations (**£0.84 billion**); and
  - **Facilities and equipment hire**, and related activities (**£0.78 billion**).

A breakdown of these impacts by 'origin' (in terms of the region or nation in which each HEP is located) is presented in Annex A2.1.

**Figure 7 Total impact of the higher education sector's research and knowledge exchange activities in 2021-22, £bn**




Note: All values are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated.
***Source: London Economics' analysis***

Comparing the total research and knowledge exchange impact (**£62.84 billion**) to the associated public funding provided for these activities by the Exchequer (**£6.37 billion**; see Section 2.1.3[68]), this results in a benefit-to-public-cost ratio of **9.9**. In other words, the

[68] These public costs include the funding provided by the UK Research Councils (**£2.39 billion**), recurrent research grants provided by the relevant HE funding bodies of each Home Nation (**£2.66 billion**), and other research income from UK central government bodies, local authorities, and health and hospital authorities (**£1.33 billion**). Through the inclusion of funding body grant income, this total also implicitly includes public funding for knowledge exchange activities from Research England (in relation to Higher Education Innovation Funding), the Higher Education Funding Council Wales (Research Wales Innovation Funding), and the Scottish Funding Council (the University Innovation Fund). Due to different approaches across the different Home Nations in relation to the inclusion of public knowledge exchange funding within the relevant HESA Finance data (HESA, 2024a), the total public costs here do *not* include the

analysis suggests that **for each £1 of *publicly* funded research income, the UK HE sector's research and knowledge exchange activities generate a total of approximately £9.9 in economic impact across the UK.**

### 2.3.1 Sensitivity analysis

To account for the inherent uncertainty surrounding these results, in addition to the above core estimates, we undertook a sensitivity analysis with respect to the assumed economic multipliers used throughout this section to present indicative lower and upper estimates of the impact of the UK HE sector's research and knowledge exchange activities. For the analysis of the direct, indirect and induced impact of research and knowledge exchange activities, we adjusted the economic multipliers upwards or downwards by 0.1, respectively[69]. For the productivity spillovers, we adjusted the assumed multipliers using alternative estimates from the existing literature, as outlined in Box 1 above.

As presented above, the core estimate of the economic impact of the UK HE sector's research and knowledge exchange activities in 2021-22 stands at **£62.84 billion**. Using the above-described adjusted multipliers, the alternative estimates resulting from the sensitivity analysis stand at between **£55.78 billion** (lower estimate) and **£65.24 billion** (upper estimate; see Table 6).

**Table 6 Sensitivity analysis of the economic impact associated with the HE sector's research and knowledge exchange activities**

| Type of impact | Core estimate | Lower estimate | Upper estimate |
|---|---|---|---|
| Impact of research activities | £14.01bn | £13.46bn | £14.56bn |
| Productivity spillovers | £40.10bn | £33.95bn | £41.61bn |
| Impact of knowledge exchange activities | £8.73bn | £8.38bn | £9.07bn |
| **Total impact** | **£62.84bn** | **£55.78bn** | **£65.24bn** |

Note: All monetary values are presented in 2021-22 prices and rounded to the nearest £0.01 billion. Totals may not add up precisely to due to rounding.
***Source: London Economics' analysis***

equivalent funding from the Department for the Economy Northern Ireland (in relation to the Northern Ireland Higher Education Innovation Fund). However, as this funding is very small relative to the total impact of UK HEPs' research and knowledge exchange activities, the exclusion of this funding from the denominator here has a negligible impact on the resulting benefit-to-cost ratio. Further, and again, note that these public costs also do not include other types of public spending that indirectly support HEPs' research (such as the UK government's contribution to the EU to allow for access to Horizon Europe, or the spending on initiatives that support investment in research and innovation through the UK Shared Prosperity Fund).

[69] For example, the core multipliers suggest that every **£1** of income from research and knowledge exchange activities received by HEPs located in Yorkshire and the Humber generates a *total* of **£2.31** of impact throughout the UK economy. We adjusted this multiplier down to **2.21** for the lower bound analysis, and up to **2.41** for the upper bound analysis.

# 3 The economic impact of the higher education sector's teaching and learning activities

In addition to the substantial research and knowledge exchange activities undertaken (discussed in Section 2), teaching and learning constitute some of the UK HE sector's primary activities, providing major benefits to the UK economy through their significant impacts on the UK's human capital and productivity. In this section, we detail our estimates of the economic impact of the teaching and learning activities undertaken across all UK HEPs, by considering the labour market benefits associated with higher qualification attainment and skills acquisition – to **both the individual and the public purse**.

To estimate the labour market benefits of HE qualifications, we compare the earnings and employment probabilities of individuals in possession of each higher education qualification to a relevant counterfactual group. Specifically, we undertake an econometric analysis where the 'treatment' group consists of individuals in possession of the HE qualification of interest, and the 'counterfactual' group consists of individuals with comparable personal and socioeconomic characteristics but with the next highest (lower) level of qualification.

This comparison of the earnings and employment outcomes of the treatment group and the counterfactual group effectively 'strips away' (to the greatest extent possible with the relevant data) those other personal and socioeconomic characteristics that might affect labour market outcomes (such as gender, age, or sector of employment), leaving just the labour market gains attributable to the qualification itself. For first degrees or 'other undergraduate' level qualifications, the counterfactual group consists of individuals holding any (academic or vocational) qualification at RQF Level 3 as their highest qualification (e.g. 2 or more GCE A Levels, Scottish Highers, or equivalent). For postgraduate qualifications, the counterfactual group instead consists of individuals holding first degrees as their highest qualification. Annex A3.2.4 outlines this approach in more detail.

In addition to these labour market benefits (in terms of the additional earnings and improved employment probabilities achieved by graduates, as well as the resulting additional tax revenues to the Exchequer), there are many wider benefits associated with higher education (such as improved health outcomes, reduced crime rates, or the intergenerational transmission of skills). While it is difficult to monetise these wider impacts of higher education (so that they are exclude from the main quantitative analysis here), some of these wider benefits are explored in Box 3 below.

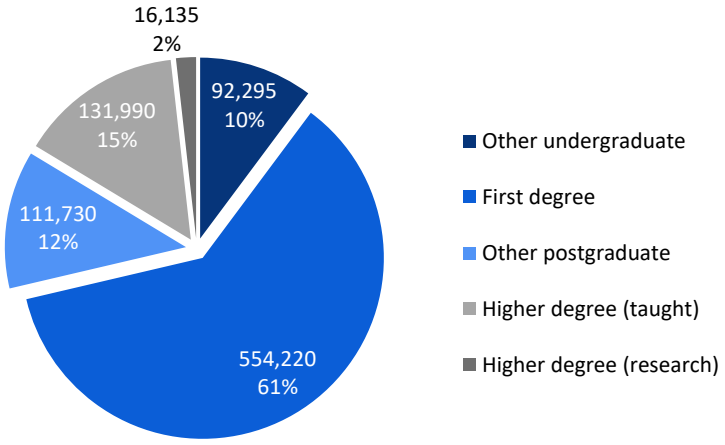
## 3.1 The 2021-22 cohort of UK domiciled students studying at UK HEPs

The analysis of the impact of the UK HE sector's teaching and learning activities is based on the **2021-22 cohort of UK domiciled students**. In other words, instead of the total of approximately **2.86 million** HE students studying in the UK in the 2021-22 academic year (including **2.18 million** UK and domiciled and **680,000** international students, *irrespective* of when these individuals may have started their studies), the analysis in this section focuses

specifically on the **906,370** UK domiciled[70] students who **started higher education qualifications (or standalone modules/credits) at UK HE providers in the 2021-22 academic year**[71, 72].

In terms of **level of study** (see Figure 8), the majority of students in this cohort (**554,220**, **61%**) were undertaking first degrees, with a further **131,990** students (**15%**) undertaking postgraduate taught degrees, and **16,135** students (**2%**) enrolled in postgraduate research degrees. An additional **92,295** (**10%**) students were undertaking other undergraduate qualifications, while the remaining **111,730** (**12%**) students were enrolled in other postgraduate qualifications.

**Figure 8 Number of UK domiciled first-year students studying at UK HEPs in 2021-22, by level of study**




Note: All student numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.
***Source: London Economics' analysis based on data published by HESA (2024c)***

In relation to **mode of study** (Figure 9), **655,980** (**72%**) students in the cohort were undertaking their studies on a full-time basis, while the remaining **250,390** (**28%**) were enrolled on a part-time basis. As shown in A3.2.1 (see Table 19), most full-time students (**76%** of full-time students) were undertaking first degrees, while only **23%** of part-time students were undertaking learning at this level (with part-time students instead being

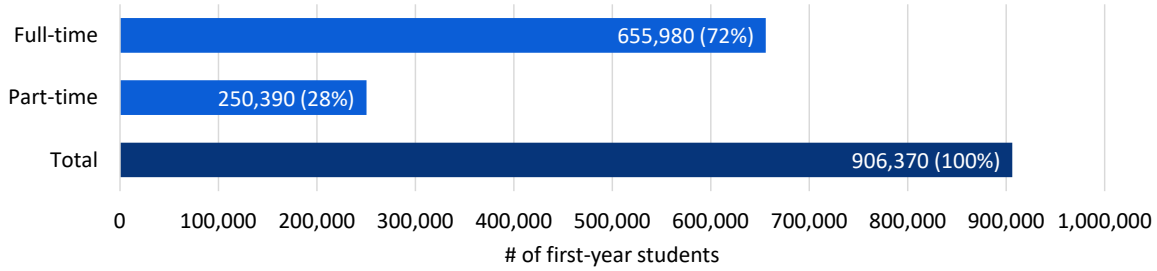
[70] While the analysis here focuses only on UK domiciled students, a proportion of international students undertaking HE programmes in the UK will remain in the UK to work following completion of their studies (e.g. see our recent analysis of the Exchequer benefits and costs associated with the UK Graduate Route visa (London Economics, 2024b)). Similarly, a proportion of UK domiciled students will leave the UK to pursue their careers in other countries. Given the uncertainty in predicting the extent to which this is the case, and the difficulty in assessing the net labour market returns for students not resident in the UK post-graduation, the analysis of teaching and learning focuses on UK domiciled students only. In other words, for the purposes of this analysis, we implicitly assume that all UK domiciled students will enter the UK labour market upon graduation, and that non-UK students will leave the UK upon completing their UK HE qualifications.

[71] The analysis of the impact of teaching and learning is based on **288** HEPs for which the required HESA student data (see HESA, 2024c) were available (including publicly funded UK HEPs and alternative providers, as well as further education colleges in Wales (whereas further education colleges in other parts of the UK are *not* covered by the HESA data)). This excludes a further **24** providers which report to HESA but for which the corresponding student data was not available for 2021-22. This analysis includes the 142 members of Universities UK, who, based on 2021-22 HESA data, accounted for 94% of all students across the UK HE sector.

[72] As outlined in further detail in Section 3.2 and Annex A3.2, the analysis of the net graduate premium and net Exchequer benefit associated with higher education qualification attainment was undertaken separately by level of study, mode, HEP location, gender, and highest prior educational attainment. The published HESA student data that were used for the analysis (see HESA, 2024c) were not sufficiently granular to provide a full breakdown of students across all of these characteristics. Therefore, it was necessary to *estimate* the full breakdown of students in the cohort across these characteristics, by combining different tables from the published HESA data. For more information, see Annex A3.2.1.

more likely to enrol in other postgraduate (**29%**) or other undergraduate (**25%**) qualifications).

### Figure 9 Number of UK domiciled first-year students studying at UK HEPs in 2021-22, by mode of study

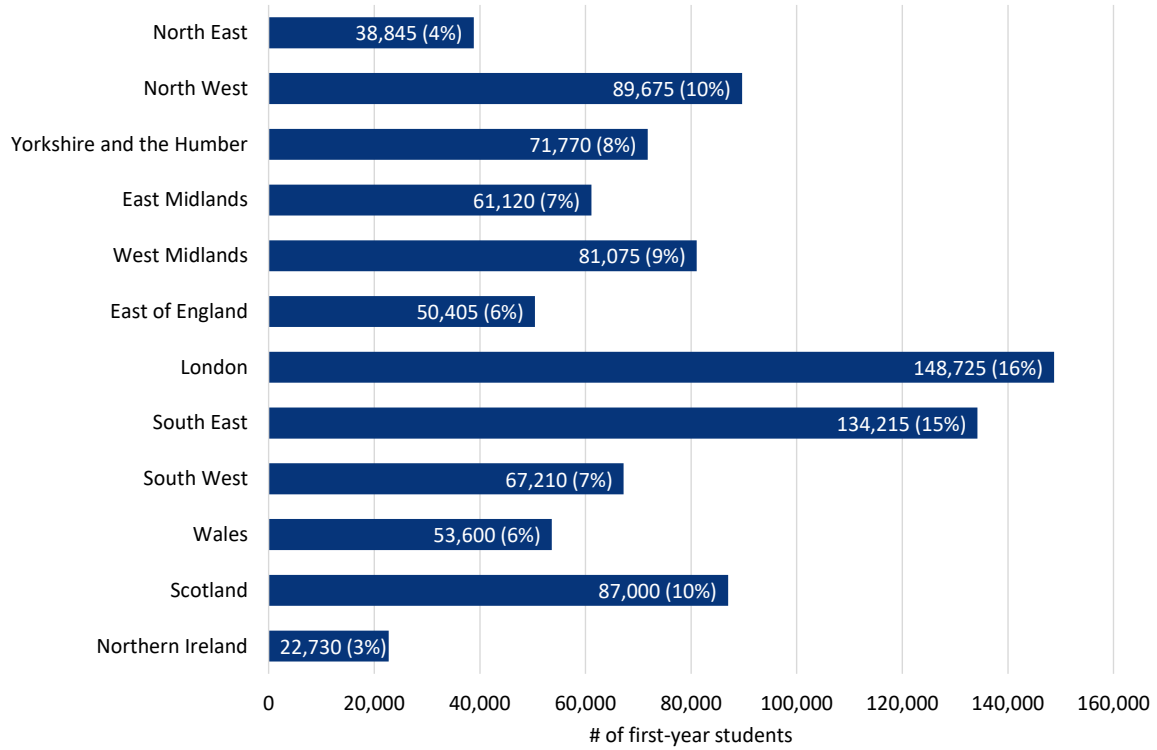



Note: All student numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.
***Source: London Economics' analysis based on data published by HESA (2024c)***

In relation to **location of study** (in terms of region/nation[73]), Figure 10 shows that UK domiciled students in the 2021-22 cohort were spread across the entire UK. A total of **743,040** students were enrolled at HEPs located in England, with **148,725** students studying in London, and a further **134,215** attending institutions in the South East. Demonstrating the spread of students across England, there were a further **89,675** students studying in the North West, **81,075** in the West Midlands, **71,770** in Yorkshire and the Humber, **67,210** in the South West, **61,120** in the East Midlands, **50,405** in the East of England, and **38,845** in the North East. In relation to the other parts of the UK, there were **87,000** UK domiciled first-year students studying in Scotland, **53,600** in Wales, and **22,730** in Northern Ireland.

[73] In all instances here, students are assigned to a particular region/nation based on the main campus location of their HE provider (i.e. based on the main provider region (associated with each HEP's primary registered address) recorded in the HESA data (see HESA, 2024c)).

## Figure 10 Number of UK domiciled first-year students studying at UK HEPs in 2021-22, by HEP location




Note: All student numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.
***Source: London Economics' analysis based on data published by HESA (2024c)***

The labour market benefits to higher education attainment vary substantially depending on the subject studied; therefore, the analysis of the marginal earnings and employment returns associated with HE qualifications (described in Section 3.2 and A3.2.5) takes account of the specific **subject mix** of students in the relevant cohort. Information on this subject mix is presented in Table 7. Overall, students in the cohort were split roughly equally across science subjects (**403,990**, **45%**) and non-science subjects (**502,370**, **55%**). Within science subjects, there were particularly large numbers of students enrolled in subjects allied to medicine (**148,560**, predominantly related to nursing), followed by psychology (**50,335**), computing (**40,545**) and engineering and technology (**39,600**). Within non-science subjects, business and management studies (**135,665**) were most popular, followed by social sciences (**97,770**), and education and teaching (**68,990**).

### Table 7 Number of UK domiciled first-year students studying at UK HEPs in 2021-22, by subject of study

| Subject of study[1] | # of students | % of total |
|---|---|---|
| Medicine and dentistry | 20,445 | 2% |
| Subjects allied to medicine | 148,560 | 16% |
| Biological and sport sciences | 37,630 | 4% |
| Psychology | 50,335 | 6% |
| Veterinary sciences | 2,760 | 0% |
| Agriculture, food and related studies | 7,710 | 1% |
| Physical sciences | 17,465 | 2% |
| Mathematical sciences | 10,590 | 1% |
| Engineering and technology | 39,600 | 4% |
| Computing | 40,545 | 4% |
| Architecture, building and planning | 18,000 | 2% |
| Geography, earth and environmental studies (natural sciences) | 10,350 | 1% |
| **Total science subjects** | **403,990** | **45%** |
| Social sciences | 97,770 | 11% |
| Law | 50,185 | 6% |
| Business and management | 135,665 | 15% |
| Language and area studies | 25,340 | 3% |
| Historical, philosophical and religious studies | 25,720 | 3% |
| Education and teaching | 68,990 | 8% |
| Media, journalism and communications | 13,920 | 2% |
| Design, and creative and performing arts | 56,630 | 6% |
| Geography, earth and environmental studies (social sciences) | 3,725 | 0% |
| Combined and general studies | 24,425 | 3% |
| **Total non-science subjects** | **502,370** | **55%** |
| **Total** | **906,370** | **100%** |

Note: All student numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.
[1] Subject of study is based on HESA's Common Aggregation Hierarchy, Level 1.
***Source: London Economics' analysis based on data published by HESA (2024c)***

## 3.2 Methodological approach

The analysis of the impact of UK HEPs' teaching and learning captures the enhanced labour market benefits and taxation receipts (minus the costs of attendance/provision) associated with students in the above-described 2021-22 cohort completing qualifications in the UK. Specifically, the fundamental objective of the analysis is to estimate the **gross and net graduate premium** to the individual and the **gross and net public purse benefit** to the Exchequer associated with higher education qualification attainment, defined as follows (and presented in Figure 11)[74]:

- The ***gross* graduate premium** associated with qualification attainment is defined as the **present value of enhanced after-tax earnings** (i.e. after income tax, National Insurance and value-added tax (VAT) are removed, and following the deduction of

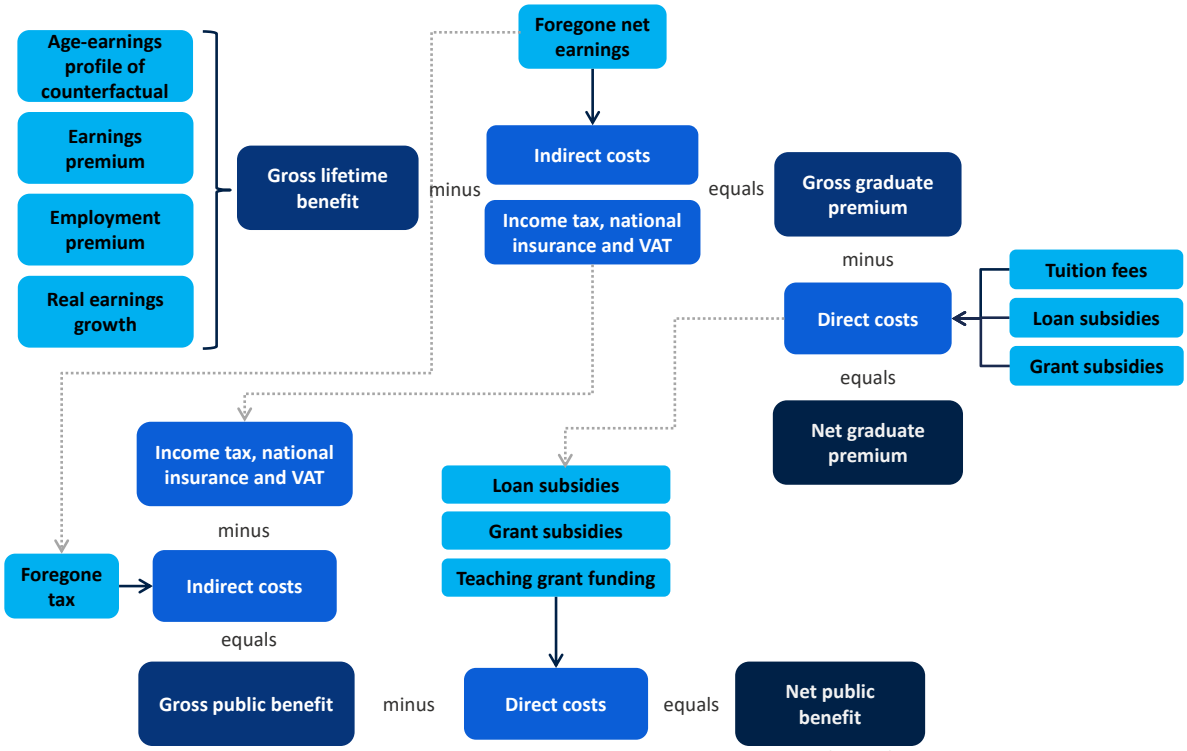
[74] The analysis of the net graduate premium and net Exchequer benefit was undertaken separately by level of study, mode, HEP location (region), gender, and highest prior educational attainment. For a more detailed description of the methodology used to estimate the impact of the UK HE sector's teaching and learning activities, see Annex A3.2.

any foregone earnings during study) relative to an individual in possession of the counterfactual qualification;

- The ***gross* benefit to the public purse** is defined as the **present value of enhanced taxation** (i.e. income tax, National Insurance and VAT, following the deduction of the costs of any foregone tax revenues during study) relative to an individual in possession of the counterfactual qualification;
- The ***net* graduate premium** is defined as the gross graduate premium *minus* the present value of the direct costs associated with qualification attainment; and
- Similarly, the ***net* benefit to the public purse** is defined as the gross public purse benefit minus the direct Exchequer costs of provision during the period of attainment.[75]

The analysis examines the benefits of the above-described single cohort of students (i.e. the cohort of 2021-22 starters) across their lifetimes in present value terms (i.e. in today's money). A detailed methodology is presented in Annex A3.2.

## Figure 11 Overview of the gross and net graduate premium and gross and net Exchequer benefit




*Source: London Economics' analysis based on Department for Business, Innovation and Skills (2011a)*

[75] In relation to tuition fee and maintenance loans (where applicable), the student benefit (and corresponding Exchequer costs) associated with public student loan support equals the RAB charge, capturing the proportion of the loan that is expected not to be repaid. For English domiciled undergraduate students, the assumed RAB charge is based on Plan 2 loan repayment terms (for post-2012 English loan borrowers), rather the new Plan 5 repayment terms that were introduced by the Department for Education in response to the Augar Review of Higher Education (and which relate to students starting HE qualifications from 2023-24 onwards, so they do not apply to the relevant 2021-22 cohort here). More information is provided in Annex A3.2.8.

## 3.3 Estimated impact of UK HEPs' teaching and learning activities

### 3.3.1 Net graduate premium and net Exchequer benefit per student

Table 8 presents the estimated average net graduate premiums and net Exchequer benefits achieved by UK domiciled students starting qualifications at UK HEPs in the 2021-22 academic year (by study mode, on average across men and women, and on average across students from all domiciles and studying anywhere in the UK)[76]. The estimates here constitute (weighted) averages across students domiciled anywhere in the UK and studying anywhere in the UK. However, driven by the significant differences in the way that higher education is funded across England, Wales, Scotland, and Northern Ireland[77], the net graduate premiums and net Exchequer benefits vary considerably between students studying in the different UK nations. A discussion of these differences by study location is presented at the end of this sub-section (see Table 9), and full estimates of the net graduate premium and net Exchequer benefit by location of study are presented in Annex A3.2.9[78].

**Table 8 Net graduate premium and net Exchequer benefit per UK domiciled student in the 2021-22 cohort, by study level and mode**

| Level of study | Net graduate premium | | Net Exchequer benefit | |
|---|---|---|---|---|
| | Full-time students | Part-time students | Full-time students | Part-time students |
| Other undergraduate[1] | £64,000 | £56,000 | £58,000 | £45,000 |
| First degree[1] | £77,000 | £62,000 | £75,000 | £49,000 |
| Other postgraduate[2] | £18,000 | £18,000 | £28,000 | £19,000 |
| Higher degree (taught)[2] | £61,000 | £57,000 | £68,000 | £55,000 |
| Higher degree (research)[2] | £99,000 | £69,000 | £121,000 | £67,000 |

Note: All estimates constitute weighted averages across men and women and across students from anywhere in the UK studying anywhere in the UK (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000.
[1] Net graduate premiums and net Exchequer benefits associated with qualifications at 'other undergraduate' and first degree level are estimated relative to possession of Level 3 qualifications (see Annex A3.2.4 for further detail).
[2] Net graduate premiums and net Exchequer benefits associated with qualifications at 'other postgraduate', higher degree (taught) and higher degree (research) level are estimated relative to the possession of first degrees.
***Source: London Economics' analysis***

The analysis indicates that the estimated average net graduate premium achieved by a representative[79] student in the 2021-22 cohort completing a **full-time first degree** at a UK HEP (with an RQF Level 3 qualification as their highest level of prior attainment[80]) is

[76] The full set of net graduate premiums and net Exchequer benefits (for all prior attainment levels, and separately by location of study (i.e. England, Wales, Scotland, and Northern Ireland)) is presented in Annex A3.2.9. Given that the majority of UK domiciled students in the 2021-22 cohort were studying in England (see Section 3.1), the overall weighted averages are predominantly driven by the underlying results for England.
[77] E.g. see London Economics (2024c).
[78] Similarly, there are also significant differences in the net graduate premiums and net Exchequer benefits depending on students' domicile. However, note that our analysis here does *not* produce separate estimates disaggregated by students' domicile. Instead, all estimates are adjusted *implicitly* for the domicile distribution (and the associated different levels of HE fees and public funding) of students in the 2021-22 cohort.
[79] The analysis is based on an average age at graduation of 21 for students undertaking full-time first degrees in the 2021-22 cohort (also see Annex A3.2.6 for further information).
[80] E.g. this includes 2 or more GCE 'A' levels, Scottish Highers, (or equivalent qualifications). RQF refers to the Regulated Qualifications Framework used in England, Wales, and Northern Ireland.

approximately **£77,000** in 2021-22 money terms[81]. At postgraduate level, the average net (post)graduate premium for a representative[82] student completing a full-time **postgraduate taught** or **postgraduate research degree** (relative to a first degree) stands at approximately **£61,000** and **£99,000**, respectively.

The UK public purse also benefits significantly from the UK HE sector's teaching and learning activities. For example, the average net Exchequer benefit for a representative **full-time first degree student** (again with a Level 3 qualification as their highest level of prior attainment) stands at approximately **£75,000** – approximately mirroring the above net graduate premium (i.e. the net benefits from these qualifications are shared roughly equally between students/graduates and the public purse). The corresponding net Exchequer benefits for representative students completing a full-time **postgraduate taught** or **postgraduate research degree** (relative to a first degree) were estimated at approximately **£68,000** and **£121,000**, respectively[83].

There are also large net benefits (to both students/graduates and the Exchequer) associated with **part-time** qualification attainment. For instance, the net graduate premium for a representative part-time student in the cohort completing a **first degree** stands at **£62,000** (compared to **£77,000** for full-time students), with a corresponding net Exchequer benefit of **£49,000** (compared to **£75,000** for full-time students). Similarly, the comparable net graduate premium and net Exchequer benefit for part-time students completing **postgraduate taught degrees** stands at **£57,000** (compared to **£61,000** for full-time students) and **£55,000** (compared to **£68,000** for full-time students), respectively.

Whilst the net benefits associated with part-time study are substantial, they tend to be smaller than the corresponding net graduate premiums and Exchequer benefits for full-time students. This is due to the fact that part-time students typically undertake their qualifications later in life[84] and generally undertake their studies over a longer period of time, which results in a shorter length of time spent in the labour market after the completion of their part-time qualifications during which they accrue the employment and earnings benefits of these qualifications.

All of the above estimates constitute (weighted) averages across students studying anywhere in the UK. However, driven by the significant differences in the way that higher education is funded across England, Wales, Scotland, and Northern Ireland[85], the net graduate premiums and net Exchequer benefits vary considerably between students

[81] i.e. in net present values in 2021-22 prices.
[82] This is based on an average age at graduation in the 2021-22 cohort of 24 for full-time higher degree (taught) students and 27 for full-time higher degree (research) students. Again, see Annex A3.2.6 for further information.
[83] Compared to corresponding average net graduate premium for full-time postgraduate research degree students (**£99,000**), the much higher net Exchequer benefit (**£121,000**) predominantly reflects the relatively limited direct Exchequer costs (in terms of public funding) associated with these qualifications.
[84] For example, the estimated median age at enrolment among students in the 2021-22 cohort of UK domiciled completing first degrees at UK HEPs on a part-time basis is **34**, compared to **21** for corresponding full-time students. More details on the impact of the age of enrolment on the net benefits associated with HE qualifications are provided in Annex A3.2.6.
[85] E.g. see London Economics (2024c).

studying in the different UK nations[86]. For example, as presented in Table 9, the average net graduate premium achieved by students in the 2021-22 cohort completing a full-time first degree in Scotland (relative to an RQF Level 3 qualification) stands at **£89,000**. This compares to the above average of **£77,000** across students studying anywhere in the UK, with the larger estimate for Scotland being driven by the fact that (Scottish domiciled undergraduate) students studying in Scotland benefit from free fees, and therefore have lower costs of HE attainment. Conversely, due to the relatively high public costs of the Scottish free fee system, the net Exchequer benefit per full-time student first degree student studying in Scotland (**£66,000**) is *lower* than the overall UK average (**£75,000**)[87].

**Table 9 Net graduate premium and net Exchequer benefit per UK domiciled full-time first degree student in the 2021-22 cohort, by HEP location**

| HEP location (nation) | Net graduate premium | Net Exchequer benefit |
|---|---|---|
| England | £76,000 | £76,000 |
| Wales | £77,000 | £77,000 |
| Scotland | £89,000 | £66,000 |
| Northern Ireland | £79,000 | £75,000 |
| **UK average** | **£77,000** | **£75,000** |

Note: All estimates constitute weighted averages across men and women and across students from anywhere in the UK studying in each nation (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Again, the net graduate premiums and net Exchequer benefits associated with first degrees are estimated relative to possession of Level 3 qualifications.
***Source: London Economics' analysis***

### 3.3.2 Total impact of the UK HE sector's teaching and learning activities

Combining the information on the number of UK domiciled students in the 2021-22 cohort (see Section 3.1), expected completion rates, and the net graduate and public purse benefits associated with the different qualification levels (relative to students' specific prior attainment), the **aggregate economic benefit of the UK higher education sector's teaching and learning activities** associated with the 2021-22 cohort was estimated at approximately **£94.78 billion** (see Table 10):

- In terms of the breakdown by **beneficiary**, this total is split almost evenly between the Exchequer and students, with **£47.34 billion** (**50%**) of economic benefit accrued by the Exchequer, and the remaining **£47.44 billion** (**50%**) accrued by students.
- In terms of **study level**, **81%** (**£76.59 billion**) of the total impact is generated by the undergraduate students in the cohort, with the remaining **19%** (**£18.18 billion**) generated by postgraduate students.
- In terms of **study location** (i.e. the impact 'origin' in terms of the nation in which each HEP is located), mirroring the distribution of students in the cohort, **83%** (**£78.92 billion**) of the total is associated with students studying at HEPs in England,

[86] Similarly, there are also significant differences in the net graduate premiums and net Exchequer benefits depending on students' domicile. However, note that our analysis here does *not* produce separate estimates disaggregated by students' domicile. Instead, all estimates are adjusted *implicitly* for the domicile distribution (and the associated different levels of HE fees and public funding) of students in the 2021-22 cohort.
[87] A full breakdown of these net graduate premiums and net Exchequer benefits across all levels of study, modes of study, and separately for students studying in England, Wales, Scotland, and Northern Ireland, is provided in Table 28 to Table 31 in Annex A3.2.9.

**6%** (**£5.32 billion**) is associated with students studying in Wales, **9%** (**£8.45 billion**) is generated by students studying in Scotland, and the remaining **2%** (**£2.08 billion**) is associated with Northern Irish HE providers.

A full breakdown of these impacts by 'origin' in terms of the region or nation in which each HEP is located is presented in Annex A2.2.

### Table 10 Total impact of the UK HE sector's teaching and learning activities associated with the 2021-22 cohort (£bn), by beneficiary, HEP location, and study level

| Beneficiary and study level | HEP location (nation) | | | | |
|---|---|---|---|---|---|
| | England | Wales | Scotland | Northern Ireland | Total |
| **Students** | **£38.91bn** | **£2.71bn** | **£4.75bn** | **£1.08bn** | **£47.44bn** |
| Undergraduate | £32.10bn | £2.24bn | £3.90bn | £0.86bn | **£39.09bn** |
| Postgraduate | £6.81bn | £0.46bn | £0.85bn | £0.22bn | **£8.35bn** |
| **Exchequer** | **£40.02bn** | **£2.62bn** | **£3.70bn** | **£1.00bn** | **£47.34bn** |
| Undergraduate | £31.74bn | £2.13bn | £2.85bn | £0.78bn | **£37.50bn** |
| Postgraduate | £8.28bn | £0.49bn | £0.85bn | £0.22bn | **£9.84bn** |
| **Total** | **£78.92bn** | **£5.32bn** | **£8.45bn** | **£2.08bn** | **£94.78bn** |
| Undergraduate | £63.83bn | £4.37bn | £6.75bn | £1.64bn | **£76.59bn** |
| Postgraduate | £15.09bn | £0.95bn | £1.70bn | £0.44bn | **£18.18bn** |

Note: All estimates are presented in 2021-22 prices, discounted to reflect net present values, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated.
***Source: London Economics' analysis***

Comparing the total teaching and learning impact for the 2021-22 cohort (**£94.78 billion**) to the associated public funding provided for these activities by the Exchequer (estimated at **£7.27 billion**[88]), this results in a benefit-to-public-cost ratio of approximately **13.0**. In other words, the analysis suggests that **for every £1 of *public* funding for its teaching activities, the UK HE sector generates a total of approximately £13.0 in economic impact from these activities across the UK.**

### Box 3 Wider benefits associated with higher education attainment

While the focus of our analysis here relates to the monetised labour market benefits achieved by graduates and the associated Exchequer tax revenues, higher education qualifications confer a broad range of wider benefits to graduates themselves and to wider society that extend beyond these relatively narrow economic benefits. For example:

[88] As outlined in further detail in Annex A3.2.8, these public costs include the recurrent teaching grant funding paid to UK HEPs (by the Office for Students (for HEPs in England), the Higher Education Funding Council Wales (for HEPs in Wales), the Scottish Funding Council (for HEPs in Scotland), and the Department for the Economy Northern Ireland (for HEPs in Northern Ireland)), as well as the cost of providing public student support in the form of tuition fee grants and loans and maintenance grants and loans (where applicable; where any fee or maintenance loans are adjusted for the Resource Accounting and Budgeting Charge (RAB charge), i.e. the proportion of these loans that is expected not to be repaid, to take account of the effective *net* cost of these loans from the Exchequer's perspective). All of these costs are calculated for students in the 2021-22 cohort, in terms of the total funding costs over the cohort's entire study duration (in present values in 2021-22 prices).

- In addition to the increased productivity achieved by graduates themselves (captured here by the enhanced earnings and employment outcomes of graduates associated with their HE attainment), a significant strand of academic literature investigates the extent to which **the acquisition of human capital results in positive productivity externalities**, where raising one's education has a positive effect not only on own productivity, but also on **coworkers' productivity**[89] (e.g. through agglomeration effects). The literature suggests that the size of these human capital productivity spillovers crucially depends on the geographical proximity of the workers concerned, with spillovers occurring between workers within the same region, city, industry, or firm.
- Another body of literature examines the extent to which educational attainment is positively associated with various **health outcomes** (also referred to as the 'health education gradient'). For example, these effects are driven by the impact of education on improved health literacy and health knowledge, on making healthier and more informed lifestyle choices, and a lower likelihood of engaging in high-risk behaviours (e.g. smoking)[90].
- Related to high-risk behaviours, a wide range of literature further points to the impact of educational attainment on **reducing crime rates**[91] (e.g. as education increases individuals' likelihood of finding legitimate work opportunities (thus discouraging them from participating in crime); raises incomes; improves individuals' decision-making process and patience; and supports the formation of better peer groups).
- There is additional existing evidence that educational attainment positively affects **civic participation** (including political participation) and **social cohesion**[92].
- Finally, numerous studies[93] point to the existence of **intergenerational benefits** of education (e.g. as children whose parents have higher levels of education themselves show better educational performance and reduced behavioural problems, for example as parents with higher levels of education have better knowledge about the education system and are more likely to be able to support their child's learning).

### 3.3.3 Sensitivity analysis

Similar to the analysis of the HE sector's research and knowledge exchange activities, to reflect the inherent uncertainty underlying the estimates, in the following, we present a sensitivity analysis of the estimated impact of HEPs' teaching and learning activities. Specifically, we assess how the estimates would change if the marginal earnings returns

[89] For example, see Moretti (2004), Battu et al. (2003), Metcalfe and Sloane (2007), and Mas and Moretti (2009).
[90] For example, see Grossman (2006), Cutler and Lleras-Muney (2010), Clark and Royer (2013), and Liu et al. (2024).
[91] For example, see Machin et al. (2010), Hjalmarsson and Lochner (2012), and Bell et al. (2018).
[92] For example, see Green et al. (2003) and Lambert (2021).
[93] For example, see Currie and Moretti (2003) and Carneiro et al. (2012).

associated with HE qualifications were either 1 percentage point lower or higher than our core estimates here[94].

As presented in Section 3.3.2, our core estimate of the economic impact of the UK HE sector's teaching and learning activities associated with the 2021-22 academic year stands at **£94.78 billion**. Instead, if there was a 1 percentage point *reduction* in the marginal earnings returns associated with HE qualification attainment, this impact would decrease to **£89.58 billion**; in contrast, under a 1 percentage point *increase* in the marginal earnings returns, the estimated impact would rise to **£100.07 billion** instead (see Table 11).

### Table 11 Sensitivity analysis of the economic impact associated with the HE sector's teaching and learning activities

| Beneficiary | Core estimate | Lower estimate | Upper estimate |
|---|---|---|---|
| Students | £47.44bn | £44.64bn | £50.28bn |
| Exchequer | £47.34bn | £44.95bn | £49.79bn |
| **Total** | **£94.78bn** | **£89.58bn** | **£100.07bn** |

Note: All monetary values are presented in 2021-22 prices, discounted to reflect net present values, and rounded to the nearest £0.01 billion. Totals may not add up precisely to due to rounding.
***Source: London Economics' analysis***

[94] For more information on the estimated marginal earnings returns used throughout the analysis here, see Table 22 in Annex A3.2.5. We assume no change to the marginal employment returns.

# 4 The aggregate economic impact of the UK HE sector

Combining the above two strands of analysis, the total economic impact on the UK economy associated with the UK higher education sector's teaching, research, and innovation activities in the 2021-22 academic year was estimated at approximately **£157.62 billion** (see Table 12). In terms of the components of this impact:

- The UK higher education sector's **research activities** accounted for **£54.12 billion** (**34%**) of this total (including **£14.01 billion** of direct, indirect, and induced impact, and **£40.10 billion** of productivity spillovers associated with this research);
- The impact generated by UK HE providers' **knowledge exchange activities** stood at **£8.73 billion** (**6%**); and
- The impact associated with UK HEPs' **teaching and learning activities** was estimated at **£94.78 billion** (**60%**).

**Table 12 Total economic impact of the UK higher education sector's teaching, research and innovation activities in the UK in 2021-22 (£bn and % of total)**

| Type of impact | £bn | % |
|---|---|---|
| **Impact of research and knowledge exchange** | **£62.84bn** | **40%** |
| Impact of research activities | £54.12bn | 34% |
| Impact of knowledge exchange activities | £8.73bn | 6% |
| **Impact of teaching and learning** | **£94.78bn** | **60%** |
| Impact on students | £47.44bn | 30% |
| Impact on the Exchequer | £47.34bn | 30% |
| **Total economic impact** | **£157.62bn** | **100%** |

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. The percentages show the proportion of total impact associated with the strand/sub-strand of analysis.
***Source: London Economics' analysis***

Again, to put these estimates into context, we calculate a benefit-to-public-cost ratio by comparing the total impact of the UK HE sector's research and knowledge exchange and teaching and learning activities (**£157.62 billion**) to the public funding cost to the UK Exchequer associated with these activities (estimated at **£13.64 billion**[95]). This results in a combined benefit-to-public-cost ratio of **11.6**, suggesting that for **every £1 of public funding, the UK HE sector's teaching, research, and innovation activities generate a total of approximately £11.6 of impact across the UK economy**.

A breakdown of this total impact by 'origin' of impact (again in terms of the nation of region in which each HEP is located) is presented in Annex A2.3. Finally, while the above estimates focus only on the sector's teaching and learning and research and knowledge exchange activities, in Box 4, we present our estimate of the aggregate economic impact of the sector across *all* of its core activities.

[95] This includes the Exchequer cost of public funding to support the UK HE sector's research (**£6.37 billion**, see Section 2.3) as well as the public cost of funding HE provision for the 2021-22 cohort of UK domiciled students undertaking HE qualifications at UK HE providers (**£7.27 billion**, see Section 3.3.2).

## Box 4 Total economic impact of the UK higher education sector in 2021-22 across all activities

The above estimates of the impact of the UK higher education sector's teaching, research and innovation activities can be combined with our previous analyses relating to the impact of the sector's institutional expenditures[96] and its educational exports[97]. This allows us to estimate the **total economic impact of the UK HE sector in 2021-22**.[98]

The total economic impact on the UK associated with UK HEPs' activities in 2021-22 was thus estimated at approximately **£265.35 billion** (see Table 13). Within this total:

- HEPs' **research and knowledge exchange activities** accounted for **£62.84 billion** (**24%**) of impact;
- The impact of the UK higher education sector's **teaching and learning** activities stands at **£94.78 billion** (**36%**);
- The impact of the **educational exports** provided by UK HEPs contributed **£37.43 billion** (**14%**) of impact; and
- UK HEPs' **institutional expenditures** accounted for **£70.31 billion** (**26%**) of impact[99].

### Table 13 Total economic impact of the UK HE sector's activities in the UK in 2021-22 (£bn and % of total)

| Type of impact | £bn | % |
|---|---|---|
| Impact of research and knowledge exchange | £62.84bn | 24% |
| Impact of teaching and learning | £94.78bn | 36% |
| Impact of educational exports | £37.43bn | 14% |
| Impact of HEP expenditure | £70.31bn | 26% |
| **Total economic impact** | **£265.35bn** | **100%** |

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. The percentages show the proportion of total impact associated with the strand/sub-strand of analysis. ***Source: London Economics' analysis***

[96] See London Economics (2023a). Specifically, the analysis focused on the direct, indirect, and induced economic impacts of the UK higher education sector's operating and capital expenditures on the UK economy, based on the 2021-22 academic year.

[97] See London Economics (2023b). Specifically, the study assessed the direct, indirect, and induced economic benefit of the tuition fee income, non-fee income, and visitor income associated with international students who started higher education qualifications in the UK in the 2021-22 academic year, net of the Exchequer cost of hosting these international students in the UK (in terms of the cost of providing general public services (such as health services) to these students).

[98] While the analysis here constitutes the most comprehensive assessment of the economic impact of the UK higher education sector's activities (to the best knowledge of the authors), there are some additional impacts that could not be included here due to wider evidence gaps; therefore, the analysis likely underestimates the true economic impact of the UK HE sector. Specifically, the analysis of the impact of teaching and learning excludes a range of wider benefits to graduates themselves and to wider society that extend beyond the economic benefits of HE qualification attainment (such as improved health outcomes and reduced crime), while the impact of the sector's research and knowledge exchange activities excludes the economic impact of HEPs' spin-out and start-up companies. These additional impacts are explored in Box 3 and Box 2 above, respectively.

[99] This is smaller than the original impact figure published in London Economics (2023a), as it is adjusted for double-counting with the other strands of analysis include here. Specifically, from the original total of **£115.65 billion** of impact associated with HEPs' institutional expenditures, we deduct the direct, indirect, and induced impacts of HEPs' research (**£14.01 billion**), of their knowledge exchange activities (**£8.73 billion**), and of the fee income from international HE students (**£22.61 billion**).

Compared to the total public funding associated with these activities in 2021-22 (**£18.54 billion**[100]), this corresponds to a **benefit-to-public-cost ratio of approximately 14.3**.

[100] The total public funding cost here includes the Exchequer cost of public funding to support the UK HE sector's research (**£6.37 billion**, see Section 2.3); the public cost of funding HE provision for the 2021-22 cohort of UK domiciled students undertaking HE qualifications at UK HE providers (**£7.27 billion**, see Section 3.3.2); and the cost associated with the provision of general public services to international students who started HE qualifications in the UK in 2021-22, over their entire study duration (**£4.45 billion**, see London Economics (2023b)). We have also included an additional **£0.45 billion** of public funding body capital grants paid to UK HEPs in 2021-22 (in terms of capital grants recognised in the year, based on financial data published by HESA (2024a)).

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# Annex 1 References

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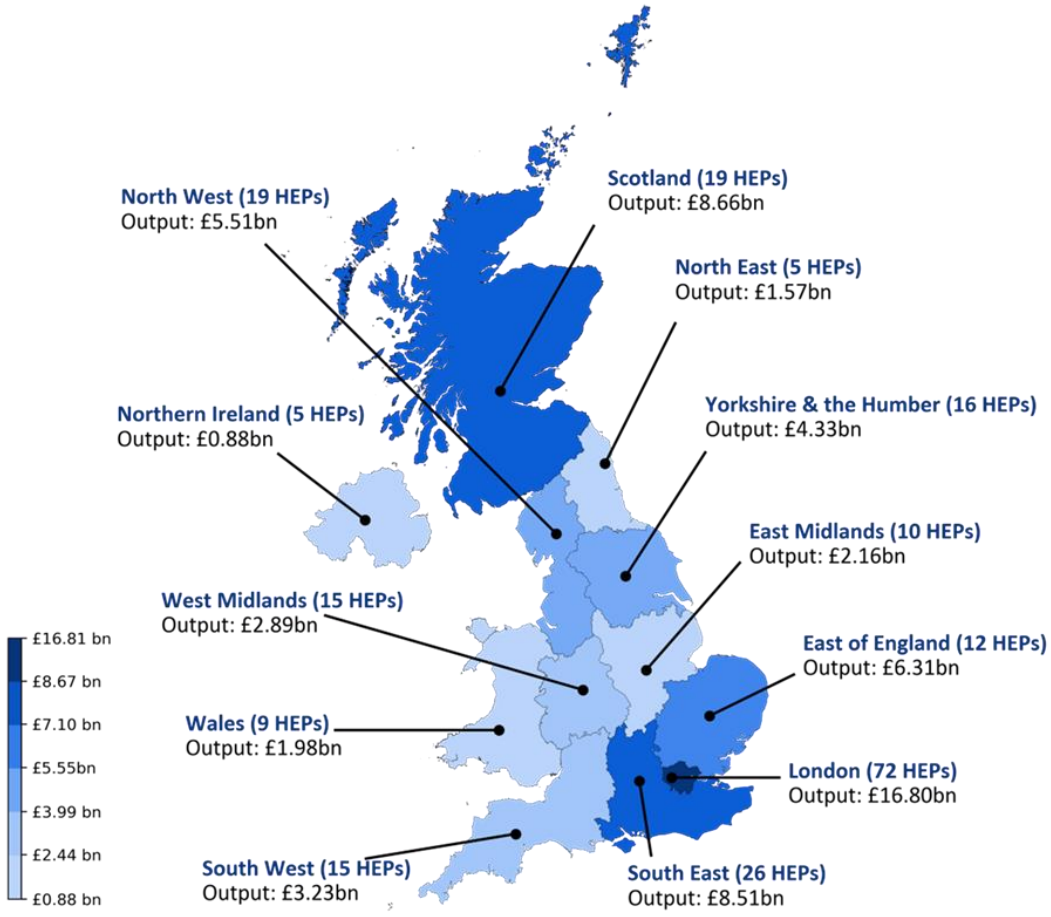
# Annex 2 Economic impact by 'origin' region and nation

In the following, we present our estimates of the economic impact of UK HEPs' activities by the 'origin' of this impact, in terms of the region or nation in which each HEP is located. In other words, this captures the economic impact *on the UK* of HE providers located in each region or nation.

## A2.1 Research and knowledge exchange activities

Of the total impact of **£62.84 billion** generated across the UK HE sector (see Section 2.1.5), predominantly reflecting the large level of research income received by London-based HE providers, the research and knowledge exchange activities of HEPs based in **London** generated an economic impact on the UK of **£16.80 billion**, accounting for **27%** of the total impact across all UK HEPs (Figure 12). This is followed by the additional substantial impacts associated with HEPs located in **Scotland** (**£8.66 billion**, **14%**), the **South East** (**£8.51 billion**, **14%**) and the **East of England** (**£6.31 billion**, **10%**).

**Figure 12 Impact of the UK HE sector's research and knowledge exchange activities in 2021-22, by HEP location**




Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. Out of the total of **312** active UK HEPs in 2021-22, the analysis here is based on **223** HEPs for which both the required HESA research income data and HE-BCI data were available.
***Source: London Economics***

In Table 14, we compare the total research and knowledge exchange impact for HE providers located in each UK nation to the associated public funding from the Exchequer. This results in an overall **benefit-to-public-cost ratio** of **9.9** across all UK HEPs[101], with an estimated (similar) ratio of **9.9** for HEPs in England, **7.6** for Welsh HEPs, **10.8** for HEPs in Scotland, and **6.7** for HEPs located in Northern Ireland.

**Table 14 Benefit-to-public cost ratio for the UK HE sector's research and knowledge exchange activities in 2021-22, by HEP location (UK nation)**

| Indicator | England | Wales | Scotland | Northern Ireland | Total |
|---|---|---|---|---|---|
| Total impact | £51.32bn | £1.98bn | £8.66bn | £0.88bn | **£62.84bn** |
| Public cost | £5.18bn | £0.26bn | £0.80bn | £0.13bn | **£6.37bn** |
| **Benefit-to-public cost ratio** | **9.9** | **7.6** | **10.8** | **6.7** | **9.9** |

Note: 'Public cost' here refers to the level of publicly funded research income received by HEPs in each nation in 2021-22.
***Source: London Economics' analysis***

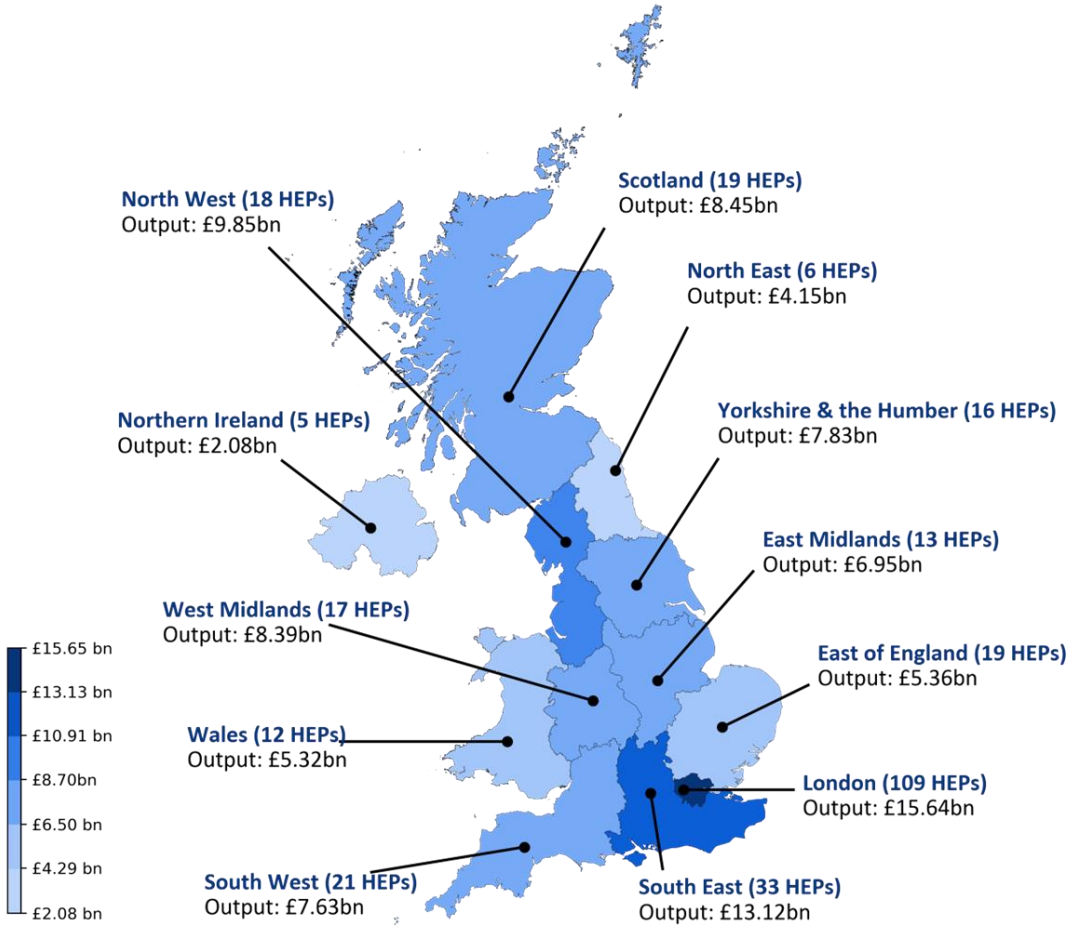
## A2.2 Teaching and learning activities

As outlined in Section 3.3.2, the teaching and learning activities of UK HEPs associated with the 2021-22 cohort of students generated a total economic impact of **£94.78 billion**. As with the impact of research and knowledge exchange, the concentration of HEPs in the capital implies that **London**-based HE providers accounted for the largest share of this total, standing at **£15.64 billion** (**17%**; see Figure 13). However, note that this impact is somewhat less concentrated than the impact of HEPs' research and knowledge exchange activities discussed above. The large impact for London was followed by additional substantial impacts generated by HEPs located in the **South East** (**£13.12 billion**, **14%**), the **North West** (**£9.85 billion**, **10%**), and **Scotland** (**£8.45 billion**, **9%**).

Table 15 again provides a breakdown of the resulting **benefit-to-public cost ratio** associated with the HE sector's teaching and learning activities by UK nation (i.e. separately for English, Welsh, Scottish, and Northern Irish HE providers). While the overall benefit-to-public-cost ratio of these activities across all UK HEPs was estimated at **13.0**[102], the ratio stood at **13.9** for HEPs in England, **13.6** for Welsh HEPs, **8.2** for Scottish HEPs, and **11.7** for HEPs located in Northern Ireland.

[101] Also see Section 2.3 for further detail.
[102] Also see Section 3.3.2 for further detail.

## Figure 13 Impact of the UK HE sector's teaching and learning activities in 2021-22, by HEP location




Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. Out of the total of **312** active UK HEPs in 2021-22, the analysis here is based on **288** HEPs for which the required HESA student data were available.

***Source: London Economics***

## Table 15 Benefit-to-public cost ratio for the UK HE sector's teaching and learning activities in 2021-22, by HEP location (UK nation)

| Indicator | England | Wales | Scotland | Northern Ireland | Total |
|---|---|---|---|---|---|
| Total impact | £78.92bn | £5.32bn | £8.45bn | £2.08bn | **£94.78bn** |
| Public cost | £5.66bn | £0.39bn | £1.03bn | £0.18bn | **£7.27bn** |
| **Benefit-to-public cost ratio** | **13.9** | **13.6** | **8.2** | **11.7** | **13.0** |

Note: 'Public cost' here includes the recurrent teaching grant funding paid to UK HEPs (by the Office for Students (for HEPs in England), the Higher Education Funding Council Wales (for HEPs in Wales), the Scottish Funding Council (for HEPs in Scotland), and the Department for the Economy Northern Ireland (for HEPs in Northern Ireland)), as well as the cost of providing public student support in the form of tuition fee grants and loans and maintenance grants and loans (where applicable; where any fee or maintenance loans are adjusted for the RAB charge, i.e. the proportion of these loans that is expected not to be repaid, to take account of the effective *net* cost of these loans from the Exchequer's perspective). All of these costs are calculated for students in the 2021-22 cohort, in terms of the total funding costs over the cohort's entire study duration (in present values in 2021-22 prices). See Annex A3.2.8 for further detail.

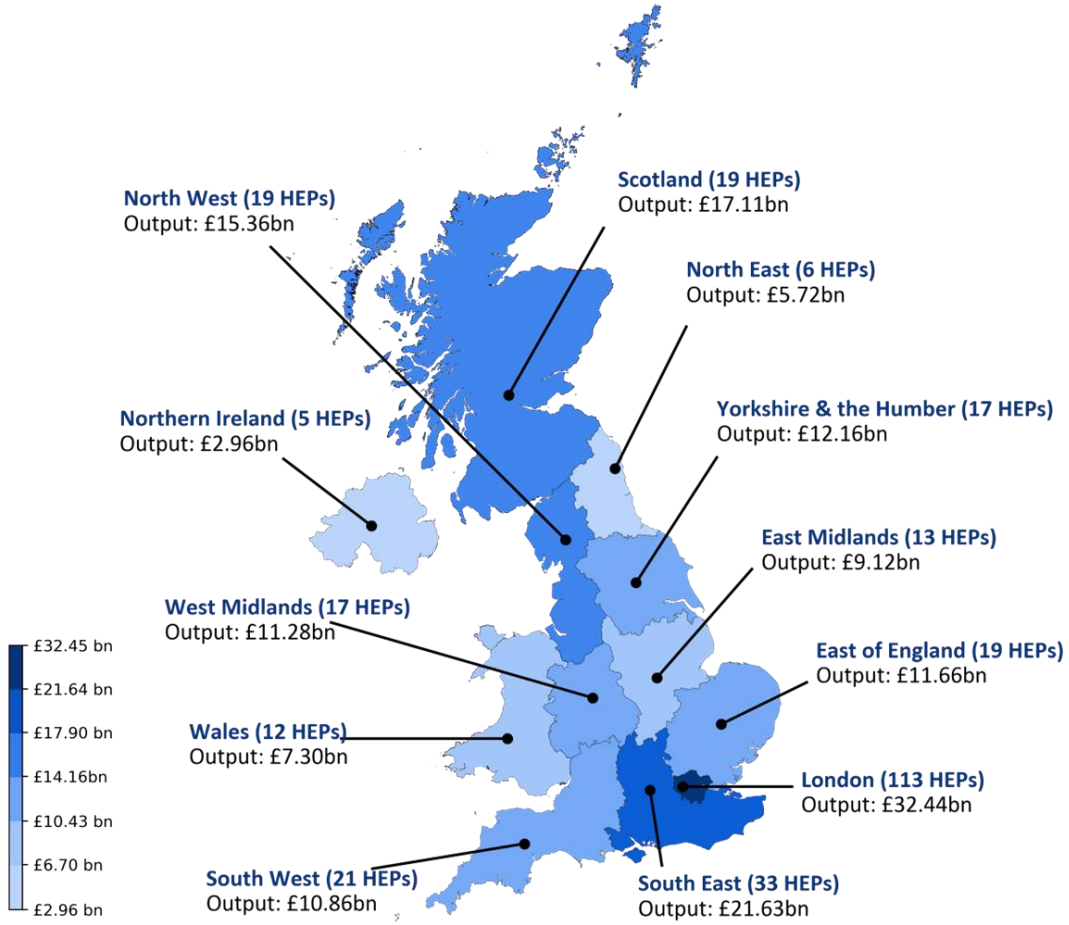
***Source: London Economics' analysis***

## A2.3 Aggregate economic impact

### A2.3.1 Total impact of teaching, research, and innovation

Figure 14 presents the aggregate economic impact of UK HEPs' research, knowledge exchange, and teaching and learning activities. Of the total economic impact of the UK HE sector of **£157.62 billion**, **London** accounted for **£32.44 billion** (**21%**), which is again larger than for any other region or nation. Particularly large impacts also originated from the activities of HEPs located the **South East** (**£21.63 billion**, **14%**), **Scotland** (**£17.11 billion**, **11%**) and the **North West** (**£15.36 billion**, **10%**). In addition, HE providers in **Yorkshire and the Humber**, the **East of England**, the **West Midlands**, and the **South West** all generate benefits to the UK economy in excess of £10 billion.

**Figure 14 Total impact of the UK HE sector's teaching, research, and knowledge exchange activities in 2021-22, by HEP location**




Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. Out of the total of **312** active UK HEPs in 2021-22, the analysis here is based on **294** HEPs for either the required HESA research income data and HE-BCI data (for the analysis of the impact of research and knowledge exchange) or the required HESA student data (for the analysis of the impact of teaching and learning) – or both - were available.
***Source: London Economics***

Table 16 presents these impacts broken down by type of activity and UK nation. Over four-fifths of the total economic impact associated with teaching and learning and research and knowledge exchange activities is generated by HEPs based in **England** (**£130.24 billion**,

**83%**). Again, as discussed above, HEPs located in **Scotland** account for more than 10% of the total impact these activities (**£17.11 billion**, **11%**). The remaining economic impact originates in **Wales** (**£7.30 billion**, **5%**) and **Northern Ireland** (**£2.96 billion**, **2%**).

**Table 16 Total economic impact of the UK higher education sector's teaching, research, and innovation activities in the UK in 2021-22 by nation**

| Type of impact | England | Wales | Scotland | Northern Ireland | UK |
|---|---|---|---|---|---|
| **Impact of research & knowledge exchange** | **£51.32bn** | **£1.98bn** | **£8.66bn** | **£0.88bn** | **£62.84bn** |
| Impact of research | £43.89bn | £1.80bn | £7.71bn | £0.71bn | £54.12bn |
| Impact of knowledge exchange | £7.43bn | £0.18bn | £0.95bn | £0.17bn | £8.73bn |
| **Impact of teaching and learning** | **£78.92bn** | **£5.32bn** | **£8.45bn** | **£2.08bn** | **£94.78bn** |
| Impact on students | £38.91bn | £2.71bn | £4.75bn | £1.08bn | £47.44bn |
| Impact on the Exchequer | £40.02bn | £2.62bn | £3.70bn | £1.00bn | £47.34bn |
| **Total economic impact** | **£130.24bn** | **£7.30bn** | **£17.11bn** | **£2.96bn** | **£157.62bn** |

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. ***Source: London Economics' analysis***

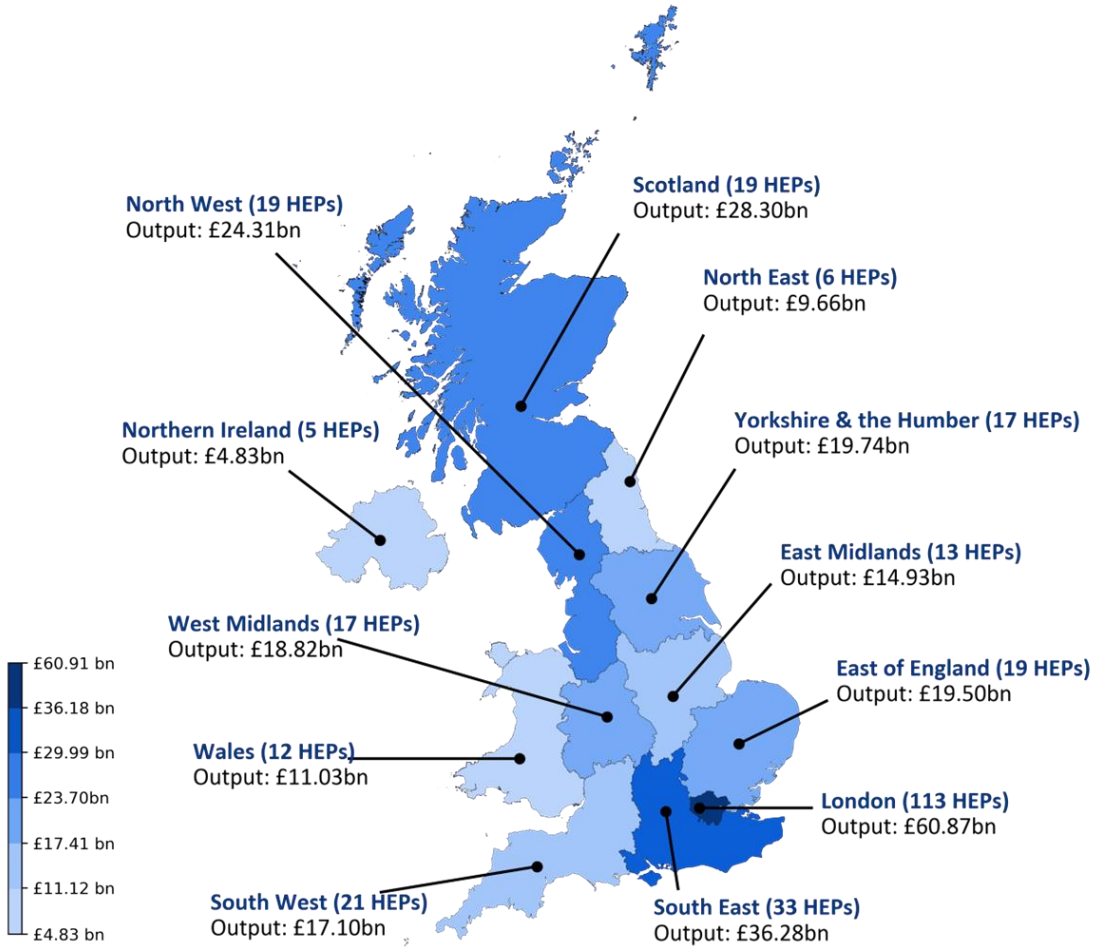
### A2.3.2 Total impact across all activities

Figure 15 considers the above-described impact relating to the research, knowledge exchange and teaching and learning activities of UK HEPs, but *also* uses London Economics' previous analyses relating to the sector's institutional expenditures (London Economics, 2023a) and educational exports (London Economics, 2023b). This allows us to estimate the total impact of the UK HE sector across all activities, which stood at **£265.35 billion** in 2021-22 (for more information, see Box 4 in Section 4). HEPs based in **London** again contribute the largest share of impact (**£60.87 billion**, **23%**) across all UK regions or nations. The **South East** (**£36.28 billion**, **14%**) and **Scotland** (**£28.30 billion**, **11%**) also contributed more than **10%** each of the total impact of all UK HEPs in 2021-22.

Compared to the total public funding associated with these activities in 2021-22, while the overall **benefit-to-public-cost ratio** across all UK HEPs was estimated at **14.3**[103] (see Table 17), the corresponding ratio stood at **14.9** for HEPs in England, **13.1** for Welsh HEPs, **11.7** for Scottish HEPs, and **10.2** for HEPs located in Northern Ireland.

[103] See Box 4 in Section 4 for more detail.

## Figure 15 Total impact of the UK HE sector across all activities in 2021-22, by HEP location




Note: This includes the economic impact of the UK HE sector's teaching and learning, research and knowledge exchange, educational exports and institutional expenditure activities. Monetary estimates are presented in 2021-22 prices, rounded to the nearest £0.01 billion, and may not add up precisely to the totals indicated. Based on **294** HEPs for which all of the required HESA data were available.
***Source: London Economics, London Economics (2023a), London Economics (2023b)***

## Table 17 Benefit-to-public cost ratio for the UK HE sector's combined activities in 2021-22, by HEP location (UK nation)

| Indicator | England | Wales | Scotland | Northern Ireland | Total |
|---|---|---|---|---|---|
| Total impact | £221.20bn | £11.03bn | £28.30bn | £4.83bn | **£265.35bn** |
| Public cost | £14.81bn | £0.84bn | £2.41bn | £0.47bn | **£18.54bn** |
| **Benefit-to-public cost ratio** | **14.9** | **13.1** | **11.7** | **10.2** | **14.3** |

Note: 'Public cost' here includes the Exchequer cost of public funding to support the UK HE sector's research; the public cost of funding HE provision for the 2021-22 cohort of UK domiciled students undertaking HE qualifications at UK HE providers; and the cost associated with the provision of general public services to international students who started HE qualifications in the UK in 2021-22, over their entire study duration ( see London Economics (2023b)). In addition, we have included public funding body capital grants paid to UK HEPs in 2021-22 (in terms of capital grants recognised in the year, based on financial data published by HESA (2024a)). For more information, see Box 4 in Section 4.
***Source: London Economics' analysis***

# Annex 3 Technical Annex

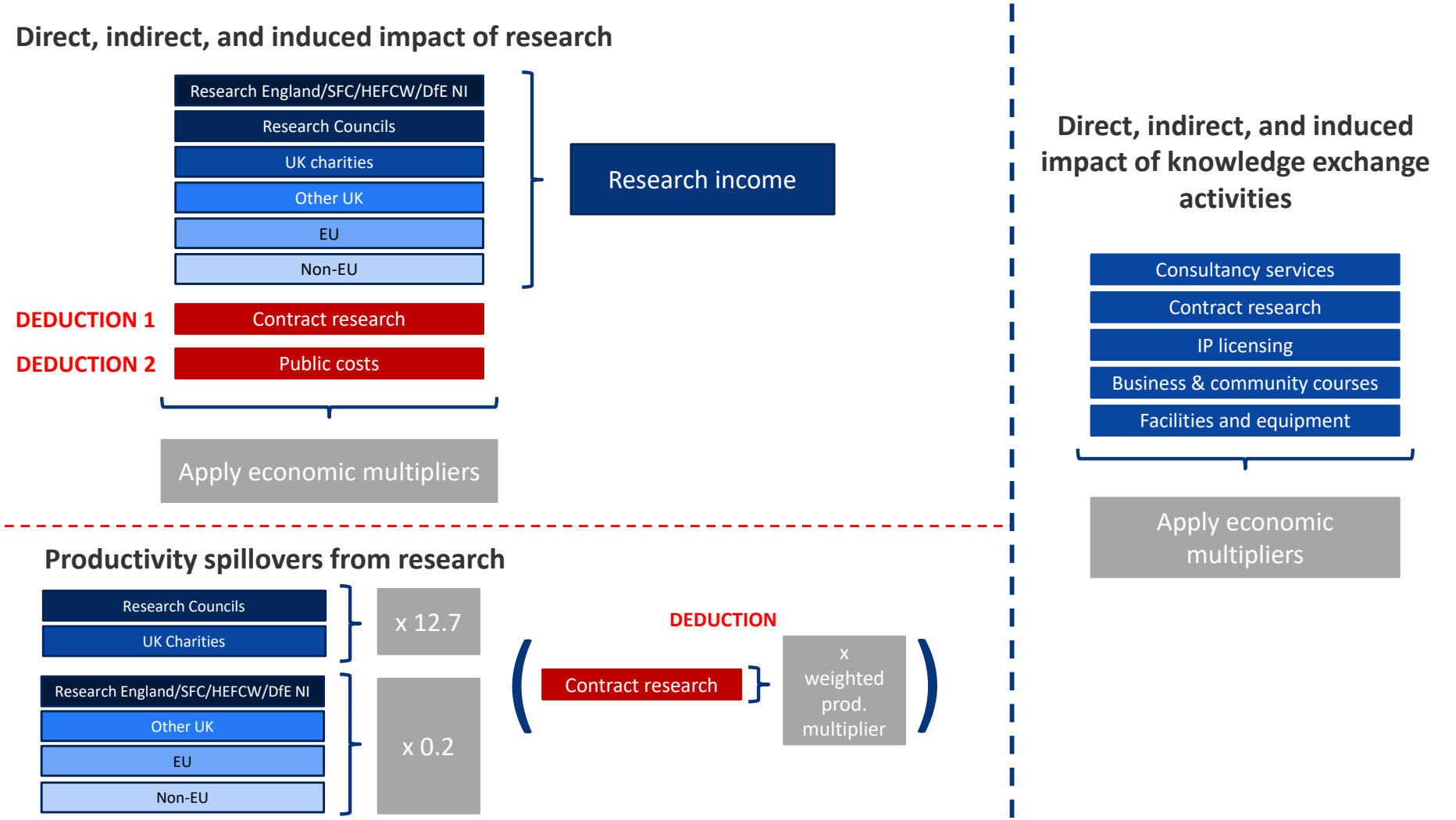
## A3.1 Impact of the UK higher education sector's research and knowledge exchange activities

### A3.1.1 Overview of the analysis of research and knowledge exchange activities

Figure 16 provides a schematic overview of the methodological approach adopted to analyse the economic impact of the UK higher education sector's research and knowledge exchange activities in terms of:

- The direct, indirect, and induced impact of research (Section 2.1.3);
- The productivity spillovers associated with this research (Section 2.1.4); and,
- The direct, indirect, and induced impact of the sector's knowledge exchange activities (Section 2.2).

## Figure 16 Overview of the analysis of research and knowledge exchange activities




Note: Research funding includes collaborative research funding, which is divided into public, cash, and in-kind funding. Cash and public funding fall under and are included in the research categories. In-kind funding 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 knowledge exchange activities.

***Source: London Economics analysis***

### A3.1.2 Estimating indirect and induced impacts

As outlined in Section 2, the assessment of the indirect and induced economic impacts associated with the research and knowledge exchange activities of HE providers in the UK is based on **economic multipliers**[104] derived from a **multi-regional Input-Output analysis**. The analysis is based on a multi-regional Input-Output model, combining UK-level Input-Output tables (for 2019, published by the Office for National Statistics[105]) with a range of regional-level data[106] to achieve a granular breakdown by sector[107] *and* region[108].

The multi-regional Input-Output analysis allowed us to derive multipliers by sector and region within the UK economy. To estimate the economic impact of higher education providers' research and knowledge exchange activities, we then multiplied the direct economic output, GVA, and FTE staff[109] associated with these activities by the estimated **average economic multipliers associated with organisations in the government, health, and education sector in each region** (assigning relevant multipliers based on the region within which each provider operates). This approach implicitly assumes that the spending patterns of higher education providers reflect the average spending patterns across all organisations operating in the government, health, and education sector within the same region. We thus arrive at the **total economic contribution associated with each provider's research and knowledge exchange activities (in terms of economic output, GVA, and jobs supported) to the UK economy.**

For example, to assess the direct, indirect, and induced impacts associated with the activities of any given HE provider located in Yorkshire and the Humber, we multiplied the HEP's direct impact by the average economic multiplier associated with organisations in Yorkshire and the Humber's government, health, and education industry. These multipliers (separately for each region or nation) are presented in Table 18. For example, the multipliers for HEPs located in Yorkshire and the Humber suggest that every **£1** of income from research and knowledge exchange activities received by HEPs located in Yorkshire and the Humber generates a *total* of **£2.31** of impact throughout the UK economy. In terms of

[104] Specifically, the analysis makes use of *Type II* multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].
[105] See Office for National Statistics (2023).
[106] 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).
[107] 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 sectors.
[108] 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.
[109] To estimate the direct GVA and employment associated with each HEP's research and knowledge exchange income, we multiplied this income by the average ratio of GVA to output and FTE employees to output within the government, health, and education sector in the HEP's region (based on the above-described multi-regional Input-Output model).

employment, we assume that, for every **1,000** (FTE) staff employed directly by HEPs in Yorkshire and the Humber, a total of **1,810** staff are supported throughout the UK.

**Table 18 Assumed economic multipliers associated with the research and knowledge exchange activities of UK HEPs, by provider location**

| HEP location | Economic multiplier (impact on the UK economy) | | |
|---|---|---|---|
| | Economic output | GVA | FTE employment |
| North East | 2.11 | 1.90 | 1.62 |
| North West | 2.48 | 2.30 | 1.95 |
| Yorkshire and the Humber | 2.31 | 2.10 | 1.81 |
| East Midlands | 2.22 | 1.98 | 1.72 |
| West Midlands | 2.28 | 2.07 | 1.79 |
| East of England | 2.34 | 2.07 | 1.76 |
| London | 2.92 | 2.86 | 2.56 |
| South East | 2.64 | 2.41 | 2.01 |
| South West | 2.31 | 2.14 | 1.90 |
| Wales | 2.20 | 2.00 | 1.72 |
| Scotland | 2.45 | 2.37 | 2.03 |
| Northern Ireland | 2.02 | 1.84 | 1.58 |

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

## A3.2 Impact of the UK higher education sector's teaching and learning activities

In the following, we provide further details on the underlying methodological approach used to arrive at our estimates of the economic impact of teaching and learning activities associated with the cohort of first-year UK domiciled students who started HE qualifications at UK HEPs in the 2021-22 academic year.

### A3.2.1 Additional information on the 2021-22 cohort of UK domiciled students studying at UK HEPs

**Breakdown by level, mode, and HEP location**

Table 19 provides further information on the 2021-22 cohort of UK domiciled students studying in the UK, in terms of the breakdown of these students by study level, mode, and location of HE provider.

## Table 19 Number of UK domiciled first-year students studying at UK HEPs in 2021-22, by level, mode, and HEP location

| Level and mode of study | HEP location | | | | |
|---|---|---|---|---|---|
| | England | Wales | Scotland | Northern Ireland | Total |
| **Full-time** | | | | | |
| Other undergraduate | 22,650 | 4,165 | 2,340 | 25 | **29,180** |
| First degree | 420,245 | 24,635 | 40,735 | 10,065 | **495,680** |
| Other postgraduate | 33,256 | 1,432 | 4,187 | 697 | **39,571** |
| Higher degree (taught) | 67,228 | 4,069 | 6,533 | 1,568 | **79,398** |
| Higher degree (research) | 9,922 | 484 | 1,411 | 335 | **12,151** |
| **Total** | **553,300** | **34,785** | **55,205** | **12,690** | **655,980** |
| **Part-time** | | | | | |
| Other undergraduate | 40,055 | 7,910 | 12,150 | 3,000 | **63,115** |
| First degree | 46,535 | 4,215 | 5,845 | 1,945 | **58,540** |
| Other postgraduate | 56,332 | 3,042 | 8,628 | 4,154 | **72,157** |
| Higher degree (taught) | 43,416 | 3,438 | 4,843 | 896 | **52,592** |
| Higher degree (research) | 3,402 | 210 | 329 | 45 | **3,985** |
| **Total** | **189,740** | **18,815** | **31,795** | **10,040** | **250,390** |
| **Total** | | | | | |
| Other undergraduate | 62,705 | 12,075 | 14,490 | 3,025 | **92,295** |
| First degree | 466,780 | 28,850 | 46,580 | 12,010 | **554,220** |
| Other postgraduate | 89,588 | 4,474 | 12,815 | 4,851 | **111,728** |
| Higher degree (taught) | 110,644 | 7,507 | 11,375 | 2,464 | **131,990** |
| Higher degree (research) | 13,323 | 694 | 1,740 | 380 | **16,137** |
| **Total** | **743,040** | **53,600** | **87,000** | **22,730** | **906,370** |

Note: All student numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.
***Source: London Economics' analysis based on data published by HESA (2024c)***

### Estimation of full breakdown of students required for the analysis

The analysis of the net graduate premium and net Exchequer benefit associated with HE qualification attainment was undertaken separately by **level** of study, **mode**, **HEP region** (i.e. region of HE provider), **gender**, and **highest prior educational attainment**. The published HESA student data that were used for the analysis (see HESA, 2024c) were not sufficiently granular to provide a full breakdown of students across all of these characteristics. Therefore, it was necessary to *estimate* the full breakdown of students in the cohort across these characteristics, by combining different tables from the published HESA data, as follows:

1) We started with information on the number of first-year UK domiciled students studying at UK HEPs in 2021-22, broken down by **study level**, **mode**, and **region of HEP location**[110].
2) To estimate a breakdown of this information by **gender**, we combined this with data on the gender distribution (separately for each study level and mode) among first-year UK domiciled students studying in each UK *nation*[111] (e.g. since the required gender breakdown of students was *not* available at the regional level, we instead

[110] See HESA (2024c, Table 1).
[111] See HESA (2024c, Figure 5).

use the gender distribution across all students studying in England as a whole and apply this same distribution to each individual English region).

3) To further estimate a breakdown by **highest prior attainment**, we combined this information with the prior attainment distribution[112] (separately for each study level and mode) among first-year UK domiciled students studying *anywhere in the UK*[113] (i.e. in the absence of more granular information, we apply the same assumed prior attainment distribution to all HEP regions (i.e. to students studying anywhere in the UK) and to both male and female students).

4) Finally, the student data estimated in the previous steps only included a 4-way study level split (where the information was broken down into postgraduate (research), postgraduate (taught), first degrees, and other undergraduate qualifications). To achieve a **5-way study level split** (where postgraduate students are further split into higher degree (research), higher degree (taught), and other postgraduate qualifications), we combined the results from the previous steps with the 5-way study level distribution (separately for each gender and mode) among first-year UK domiciled students studying in each UK *nation*[114]. In other words, we use the detailed study level split across all students studying in England as a whole and apply this same distribution to each individual English region[115].

Combining all of these steps, we thus arrived at the full estimated breakdown of first-year UK domiciled students studying at UK HEPs in 2021-22 by level, mode, HEP region, gender, and highest prior attainment.

### A3.2.2 Adjusting for completion rates

Section 3.1 above provides an overview of the number of UK domiciled students *starting* qualifications or modules at UK HE providers in the 2021-22 academic year. However, to aggregate the individual-level impacts of the sector's teaching and learning activities, it was necessary to adjust the number of student 'starters' to account for **completion rates**.

To achieve this, we used information published by the Office for Students (OfS) on the historical completion outcomes of students from English HE providers, broken down by study mode and study intention (i.e. level of study)[116]. In other words, these completion data include the number of students who completed their intended qualification (or module); the remaining proportions of students (who did not complete their intended qualification) were modelled as completing learning at 'other undergraduate' level (for students who originally enrolled in first degrees or other undergraduate qualifications) or

[112] Where students were disaggregated into the following highest qualification on entry categories: Qualifications at Level 2 and below; Level 3 qualifications including A Levels and Highers; first degrees; other undergraduate qualifications; Postgraduate Certificates in Education (PGCE); other postgraduate qualifications; other qualifications; no formal qualifications; and not known.
[113] See HESA (2024c, Table 47).
[114] See HESA (2024c, Figure 3).
[115] i.e. this approach mirrors the above-described estimation of the distribution of students by gender.
[116] See Office for Students (2023). The data relates to UK domiciled students who studied at English HE providers, and we apply the same assumed completion rates to all UK HE providers (in the absence of comparable and consistent information for providers located in Wales, Scotland, or Northern Ireland. The data are based on full-time 2014-15 to 2017-18 entrants, and part-time 2012-13 to 2015-16 entrants to all OfS registered providers. Completion rates are defined as 'the proportion of students that were observed to have gained a higher education qualification (or were continuing in the study of a qualification) four years and 15 days after they started their course (six years and 15 days for part-time students)'.

'other postgraduate' level (for students who originally intended to complete higher degrees or other postgraduate qualifications))[117].

Table 20 presents the resulting completion rates applied throughout the analysis. For example, we assume that, of those students starting a full-time first degree in the UK in 2021-22, **89%** complete the first degree as intended, while the remaining **12%**[118] undertake one or more of the credits/modules associated with their degree before discontinuing their studies (modelled as completion at 'other undergraduate' level). Similarly, at postgraduate level, we assume that of those individuals starting a full-time postgraduate taught degree, **92%** complete the qualification as intended, while the remaining **8%** complete another (lower) qualification or undertake one or more of the credits/modules associated with the intended degree before dropping out (in this case, modelled as completion at 'other postgraduate' level). In all these cases, **the analysis of the impact of teaching and learning calculates the estimated returns associated with the *completed* qualification/standalone module(s)**.

### Table 20 Assumed completion rates among student 'starters' at UK HE providers

| Completion outcome | Study intention | | | | |
|---|---|---|---|---|---|
| | Other undergraduate | First degree | Other postgraduate | Higher degree (taught) | Higher degree (research) |
| **Full-time students** | | | | | |
| Other undergraduate | 100% | 12% | - | - | - |
| First degree | - | 89% | - | - | - |
| Other postgraduate | - | - | 100% | 8% | 9% |
| Higher degree (taught) | - | - | - | 92% | - |
| Higher degree (research) | - | - | - | - | 91% |
| **Total** | **100%** | **100%** | **100%** | **100%** | **100%** |
| **Part-time students** | | | | | |
| Other undergraduate | 100% | 54% | - | - | - |
| First degree | - | 46% | - | - | - |
| Other postgraduate | - | - | 100% | 23% | 27% |
| Higher degree (taught) | - | - | - | 77% | - |
| Higher degree (research) | - | - | - | - | 73% |
| **Total** | **100%** | **100%** | **100%** | **100%** | **100%** |

Note: Totals may not sum due to rounding to the nearest 1%.
***Source: London Economics' analysis based on data published by the Office for Students (2023)***

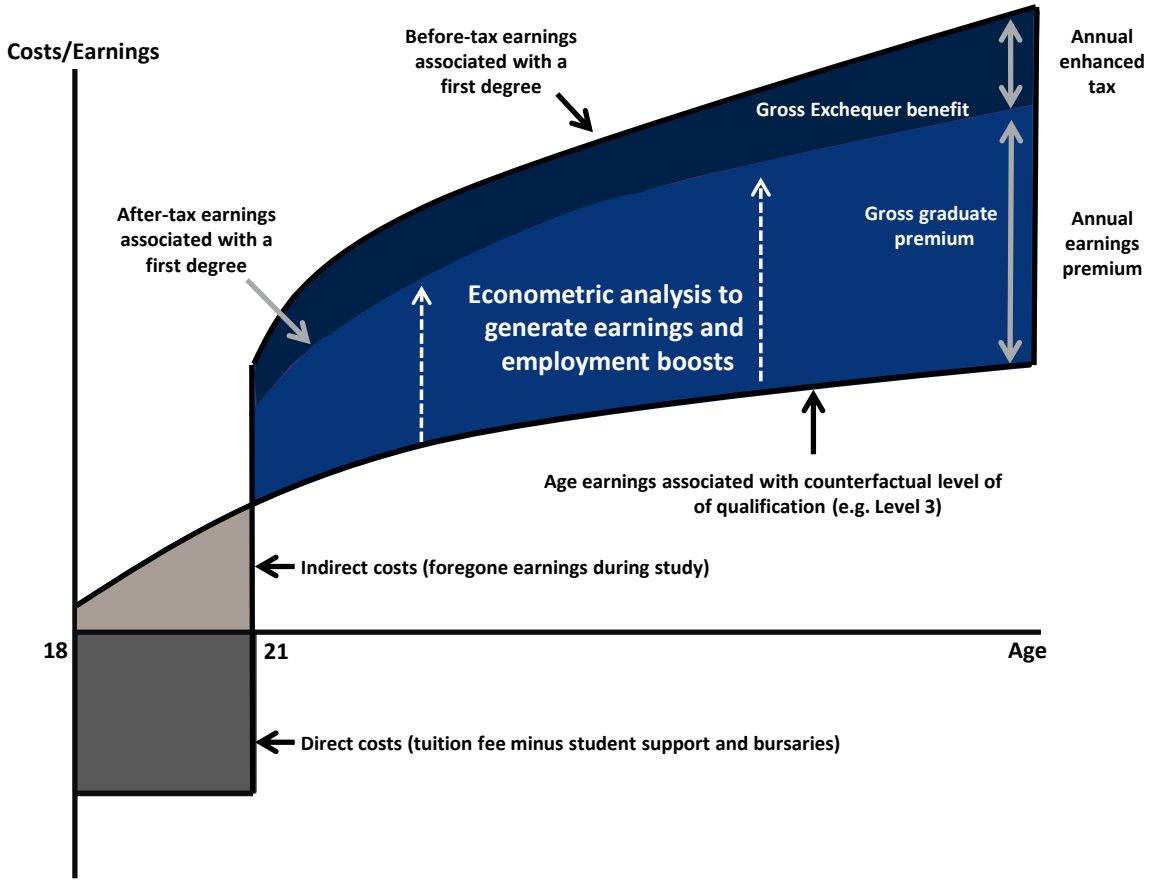
### A3.2.3 Defining the gross graduate premium and gross Exchequer benefit

As summarised in Section 3.2, to measure the economic benefits of UK HE qualifications, we estimate the **labour market value associated with these qualifications**, rather than simply assessing the labour market outcomes achieved by individuals *in possession* of these qualifications. The standard approach to estimating this labour market value is to undertake an **econometric analysis** where the 'treatment' group consists of those individuals in possession of the qualification of interest, and the 'counterfactual' group consists of

[117] In other words, we assume that students who did not complete their studies at least complete one or several standalone modules associated with their intended qualification, so that these students' completion outcomes were modelled as either completion at 'other undergraduate' or 'other postgraduate' level. As a result, the total assumed completion rates sum up to 100%.
[118] Totals may not sum due to rounding to the nearest 1%.

individuals with comparable personal and socioeconomic characteristics but with the next highest (lower) level of qualification. The rationale for adopting this approach is that the comparison of the earnings and employment outcomes of the treatment group and the counterfactual group 'strips away' (to the greatest extent possible with the relevant data) those other personal and socioeconomic characteristics that might affect labour market earnings and employment (such as gender, age, or sector of employment), leaving just the labour market gains attributable to the qualification itself (see Figure 17 for an illustration of this). The treatment and counterfactual groups, and details of the econometric approach, are presented in Annex A3.2.4 and Annex A3.2.5, respectively.

**Figure 17 Estimating the gross graduate premium and gross Exchequer benefit**




Note: The analysis assumes that the opportunity costs of foregone earnings associated with higher qualification attainment are applicable to full-time students only. For part-time students, we have assumed that these students are able to combine work with their academic studies and as such, do not incur any opportunity costs in the form of foregone earnings. This illustration is based on an assumed median age at enrolment for full-time first degree students of 18, and an average study duration for full-time first degree students of 3 years (see Annex A3.2.6 for more information).

***Source: London Economics***

Throughout the analysis, the assessment of earnings and employment outcomes associated with higher education qualification attainment (at all levels) is undertaken separately by **gender**, reflecting the different labour market outcomes between men and women. Further, the analysis is adjusted for the specific **subject composition** of UK domiciled students in the 2021-22 cohort, to reflect the fact that there is significant variation in post-

graduation labour market outcomes depending on the subject of study[119]. In addition, given the fact that part-time students generally undertake and complete higher education qualifications later in life than full-time students, the analysis for part-time students applies a **'decay function'** to the returns associated with qualification attainment, to reflect the shorter period of time in the labour market[120].

To estimate the **gross graduate premium**, based on the results from the econometric analysis, we then estimate the **present value of the enhanced post-tax earnings** of individuals in possession of different higher education qualifications (i.e. after income tax, National Insurance and VAT are removed, and following the deduction of foregone earnings) relative to an individual in possession of the counterfactual qualification (see Annex A3.2.7 for more detail).

The **gross benefits to the Exchequer** from the provision of higher education are derived from the enhanced taxation receipts that are associated with a higher likelihood of being employed, as well as the enhanced earnings associated with more highly skilled and productive employees. Based on the analysis of the lifetime earnings and employment benefits associated with HE qualification attainment and combined with administrative information on the relevant taxation rates and bands (from HM Revenue and Customs), we estimate the **present value of additional income tax, National Insurance, and VAT associated with higher education qualification attainment** (by gender, level of study, mode of study, and prior attainment; again, see Annex A3.2.7 for more detail).

### A3.2.4 Qualifications and counterfactuals considered in the econometric analysis

Our econometric analysis of the earnings and employment returns to UK HE qualifications (described in more detail in Annex A3.2.5) considered **five different higher education qualification groups** (i.e. five **'treatment' groups** for HE qualifications):

- **Three at postgraduate level** (higher degree (research), higher degree (taught) and 'other' postgraduate qualifications[121]); and
- **Two at undergraduate level** (first degrees and 'other' undergraduate qualifications[122]);

Table 21 presents these different undergraduate and postgraduate qualifications (i.e. treatment groups) considered in the analysis, along with the associated **counterfactual group** used for the marginal returns analysis in each case. As outlined above, we compare

[119] Information on the cohort's subject distribution is again based on 2021-22 student data published by HESA (2024c; see Table 47 and Figure 13 within the data).
[120] See Annex A3.2.6 for more information.
[121] 'Other' postgraduate relates to Labour Force Survey variables HIQUAL8, HIQUAL11, HIQUAL15 and HIQUAL22 value labels 'Postgraduate Certificate in Education', 'Other postgraduate degree or professional qualification' and 'Don't know', for individuals who selected 'Higher degree' (other than Masters or Doctorate degree).
[122] 'Other' undergraduate relates to Labour Force Survey variables HIQUAL8, HIQUAL11, HIQUAL15 and HIQUAL22 value labels 'other degree', 'diploma in higher education', and 'other higher education below degree'. Interviewers are instructed to use 'other higher education below degree' only if the respondent states that they have 'something from higher education but they do not know what it is'. It is therefore not possible to provide examples of typical qualifications that would normally fall under this category. The response option serves the purpose of confirming that higher education qualifications have been achieved but that the respondent is unaware of the actual qualification title itself.

the earnings of the group of individuals in possession of each higher education qualification to the relevant counterfactual group, to ensure that we assess the economic benefit associated with the qualification itself (rather than the economic returns generated by the specific characteristics of the individual in possession of the qualification). This is a common approach in the literature and allows us to control for other personal, regional, or socioeconomic characteristics that might influence *both* the determinants of qualification attainment as well as earnings/employment.

For the analysis of marginal labour market returns, postgraduate qualification holders are compared to first degree holders. In contrast, for individuals holding first degrees or 'other undergraduate' level qualifications, the counterfactual group consists of individuals holding any (academic or vocational) qualification at Regulated Qualifications Framework (RQF) Level 3 as their highest qualification (e.g. 2 or more GCE A Levels, Scottish Highers[123], or equivalent)[124].

### Table 21 Treatment and comparison groups used to assess the marginal earnings and employment returns to higher education qualifications

| Treatment group – highest qualification | Comparison group - highest qualification |
|---|---|
| **HE qualifications** | |
| Higher degree (research) | First degree |
| Higher degree (taught) | First degree |
| Other postgraduate | First degree |
| First degree | RQF Level 3 (academic or vocational) qualifications |
| Other undergraduate | RQF Level 3 (academic or vocational) qualifications |
| **Other** | |
| RQF Level 3 (academic or vocational) qualifications | 5 or more GCSEs grade A*-C[1] |

Note: [1] Or equivalent academic qualifications at RQF Level 2.
***Source: London Economics***

In addition, we also included a separate specification comparing the earnings associated with RQF Level 3 qualifications (or equivalent) to possession of 5 or more GCSEs at grades A*-C (or equivalent academic qualifications at Level 2). This additional analysis was undertaken to reflect the fact that the academic 'distance travelled' by a (small) proportion of students in the relevant 2021-22 cohort is **greater** than might be the case compared to those in possession of levels of prior attainment 'traditionally' associated with higher education entry. Similarly, for other students within the cohort, the academic 'distance travelled' is **lower** than the traditional prior attainment level (e.g. a small proportion of students intending to undertake a first degree had previously already completed a sub-degree level (i.e. 'other undergraduate') qualification).

In instances where the level of prior attainment for students in the cohort was higher or lower than the 'traditional' counterfactual qualifications outlined in Table 21, the analysis used a **'stepwise' calculation of additional lifetime earnings**. For example, to calculate the

[123] Scottish Highers sit at Level 6 of the Scottish Credit and Qualifications Framework.
[124] Individuals holding only a single A Level or AS Levels as their highest qualification were excluded from the counterfactual group in the LFS analysis here, as these qualifications are unlikely to meet the requirements for first degree admission to UK HE qualifications.

earnings and employment returns for a student in the cohort **in possession of an 'other undergraduate' qualification undertaking a first degree**, we *deducted* the returns to undertaking an 'other undergraduate' qualification (relative to the possession of an RQF Level 3 qualification) from the returns to undertaking a first degree (again relative to the possession of an RQF Level 3 qualification). Similarly, to calculate the returns for a student **in possession of 5 GCSEs A*-C (or equivalent academic qualifications at Level 2) undertaking a first degree** in the 2021-22 cohort, we *added* the returns to achieving an RQF Level 3 qualification (relative to the possession of 5 GCSEs A*-C or equivalent) to the returns to undertaking a first degree (relative to the possession of an RQF Level 3 qualification)[125].

### A3.2.5 Marginal earnings and employment returns to HE qualifications

**Marginal earnings returns**

To estimate the impact of qualification attainment on earnings, using information from the Labour Force Survey (LFS), we estimated a standard **ordinary least squares** linear regression model, where the dependent variable is the natural logarithm of hourly earnings, and the independent variables include the full range of qualifications held alongside a range of personal, regional, and job-related characteristics that might be expected to influence earnings. In this model specification, we included individuals who were employed on either a full-time or a part-time basis. This approach has been used widely in the academic literature.

The basic specification of the model was as follows:

$$ln\ (\omega_i) = \alpha + \beta X_i + \epsilon_i \quad \text{for } i = 1 \text{ to n}$$

where ln($\omega_i$) represents the natural logarithm of hourly earnings, $\epsilon_i$represents an error term, $\alpha$ represents a constant term, i is an individual LFS respondent, and $X_i$ provides the independent variables included in the analysis, as follows:

- Highest qualification held;
- Route of entry into HE (whether the individual was in possession of 2 or more GCE A Levels, or any other route of prior attainment);
- Age;
- Age squared;
- Ethnic origin;
- Disability status;
- Region of work;
- Marital status;
- Number of dependent children under the age of 16;

[125] In a very small number of instances, this stepwise calculation would result in *negative* lifetime returns to achieving higher education qualifications. As this seems illogical and unlikely in reality, any negative returns in these instances were set to zero. Hence, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be greater than or equal to zero (i.e. there can be no wage or employment *penalty* associated with any higher education qualification attainment, irrespective of the level of prior education attainment).

- Full-time / part-time employment;
- Temporary or permanent contract;
- Public or private sector employment;
- Workplace size; and
- Yearly dummies.

Using the above specification, we estimated earnings returns in aggregate and **for men and women separately**. Further, to analyse the benefits associated with different education qualifications over the lifetime of individuals holding these qualifications, the regressions were **estimated separately across a range of specific age bands** for the working age population, depending on the qualification considered. The estimated marginal earnings returns also take account of the specific subject mix of UK domiciled students in the 2021-22 cohort[126], so that the estimated marginal wage returns **adjust for the specific subject composition of the cohort**, where possible.[127]

Further note that the analysis of earnings premiums was undertaken **at a national (UK-wide) level**. However, for the calculation of the net graduate premiums and net Exchequer benefits, these UK-wide earnings premiums were then combined with the relevant differential direct costs facing the individual and/or the public purse for students by UK nation domicile (i.e. England, Wales, Scotland, and Northern Ireland) and study location.

To estimate the impact of UK higher education qualifications on labour market outcomes using this methodology, we used information from **pooled Quarterly UK Labour Force Surveys between Q1 2010 and Q4 2023**.

The resulting estimated marginal wage returns to the different qualifications of interest are presented in Table 22. In the earnings regressions, the coefficients provide an indication of the additional effect on hourly earnings associated with possession of the respective higher education qualification relative to the counterfactual level of qualification. To take an example, the analysis suggests that men aged between 31 and 35 in possession of a first degree achieve a **25.5%** hourly earnings premium compared to comparable men holding only an (academic or vocational) RQF Level 3 qualification as their highest level of attainment. The comparable estimate for women aged between 31 and 35 stands at **30.5%**.

[126] This subject mix adjustment was made by applying weights in the LFS regressions reflecting the proportion of students in the cohort enrolled in each subject area (separately by gender). The HESA Common Aggregation Hierarchy (CAH) was used to classify subject areas for HE qualification holders. The following subject groups were distinguished: (1) Medicine & dentistry, (2) Subjects allied to medicine, (3) Biological and sports sciences, (4) Psychology, (5) Veterinary science, (6) Agriculture, food & related subjects, (7) Physical sciences, (8) General & others in sciences, (9) Mathematical sciences, (10) Engineering & technology, (11) Computer science, (13) Architecture, building & planning, (14) Humanities & liberal arts (non-specific), (15) Social sciences, (16) Law, (17) Business & management, (19) Language & area studies, (20) Historical, philosophical & religious studies, (22) Education and teaching, (23) Combined & general studies, (24) Media, journalism and communications, (25) Design, and creative and performing arts, and (26) Geography, earth and environmental studies.

[127] Note that the LFS data did *not* include information on subject for students undertaking 'other undergraduate' qualifications. Therefore, the subject mix adjustment factors for other undergraduate qualifications were instead based on the subject-level returns to first degrees, weighted by the number of students in the cohort undertaking other undergraduate qualifications in each subject, and multiplied by the overall ratio of the marginal earnings returns to other undergraduate qualifications relative to first degrees (across all subjects).

## Table 22 Marginal earnings returns to higher education qualifications (weighted across subjects), in % (following exponentiation), by gender and age band

| Qualification level (vs. counterfactual) | Age band | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 |
| **Men** | | | | | | | | | |
| Level 3 (vs. 5+ GCSEs)[1] | 6.4% | 7.4% | 9.1% | 9.3% | 6.8% | 3.7% | 3.7% | 7.0% | |
| Other undergraduate (vs. Level 3)[2] | | 4.3% | 18.1% | 21.7% | 27.8% | 25.5% | 25.6% | 26.5% | 37.9% |
| First degree (vs. Level 3)[2] | 8.9% | 15.4% | 25.5% | 28.7% | 30.1% | 30.5% | 33.9% | 34.3% | 34.3% |
| Other postgraduate (vs. first degrees)[3] | 7.4% | 7.7% | 8.0% | | | | | | |
| Higher degree (taught) (vs. first degrees)[3] | 6.6% | 6.9% | 10.5% | 11.1% | 12.1% | 13.1% | 9.6% | 16.9% | 17.9% |
| Higher degree (research) (vs. first degrees)[3] | 24.5% | 13.4% | 16.0% | 14.8% | 20.1% | 33.2% | 30.7% | 19.0% | 40.5% |
| **Women** | | | | | | | | | |
| Level 3 (vs. 5+ GCSEs)[1] | 2.0% | 2.3% | | 2.6% | | | | 2.2% | |
| Other undergraduate (vs. Level 3)[2] | 5.1% | 10.2% | 15.5% | 27.9% | 28.1% | 28.9% | 29.4% | 26.9% | 31.5% |
| First degree (vs. Level 3)[2] | 9.3% | 20.2% | 30.5% | 37.0% | 36.1% | 39.2% | 39.0% | 37.0% | 33.4% |
| Other postgraduate (vs. first degrees)[3] | 6.7% | 5.9% | 9.7% | 11.0% | 11.9% | 10.4% | 14.1% | 11.0% | 13.0% |
| Higher degree (taught) (vs. first degrees)[3] | 5.1% | 5.4% | 14.2% | 17.6% | 21.3% | 22.3% | 24.0% | 32.2% | 27.6% |
| Higher degree (research) (vs. first degrees)[3] | | 14.9% | 28.0% | 33.8% | 30.7% | 38.4% | 37.4% | 45.1% | 44.3% |

Note: Regression coefficients have been exponentiated to reflect percentage wage returns. In cases where the estimated coefficients are not statistically significantly different from zero (at the 10% level), the coefficient is assumed to be zero; these are displayed as gaps in the table.

[1] Returns to holding RQF Level 3 qualifications are estimated relative to 5 or more GCSEs at A*-C (or equivalent academic qualifications at Level 2).

[2] Returns to other undergraduate qualifications and first degrees are estimated relative to individuals holding an RQF Level 3 (academic or vocational) qualification as their highest qualification (excluding those with a single A Level or AS Levels only).

[3] Returns to higher degree (taught), higher degree (research), and 'other' postgraduate qualifications are estimated relative to first degrees.

***Source: London Economics' analysis of pooled Quarterly Labour Force Survey data for 2010 Q1 - 2023 Q4***

### Marginal employment returns

To estimate the impact of qualification attainment on employment, we adopted a **probit model** to assess the likelihood of different qualification holders being in employment or otherwise. The basic specification defines an individual's labour market outcome to be either in employment (working for payment or profit for more than 1 hour in the reference week (using the standard International Labour Organisation definition) or not in employment (being either unemployed or economically inactive)). The specification of the probit model was as follows:

$$Probit(EMPNOT_i) = \alpha + \gamma Z_i + \epsilon_i \quad \text{for } i = 1 \text{ to n}$$[128]

The dependent variable adopted represents the binary variable $EMPNOT_i$, which is coded 1 if the individual is in employment and 0 otherwise.[129] We specified the model to contain a constant term ($\alpha$) as well as a number of standard independent variables, including the qualifications held by an individual (represented by $Z_i$ in the above equation), as follows:

- Highest qualification held;
- Route of entry into HE;
- Age;
- Age squared;
- Ethnic origin;
- Disability status;
- Region of usual residence;
- Marital status;
- Number of dependent children under the age of 16; and
- Yearly dummies.

Again, $\epsilon_i$ represents an error term. Similar to the methodology for estimating earnings returns, the above-described probit model was estimated in aggregate and **separately for men and women**, with the analysis further split by respective **age bands**, and adjusted for the specific **subject mix** of students in the 2021-22 cohort of UK domiciled students studying at UK HEPs. Further, and again similar to the analysis of earnings returns, the employment returns were estimated at the national (i.e. UK-wide) level.

The resulting estimated marginal employment returns to HE qualifications are presented in Table 23. In the employment regressions, the relevant coefficients provide estimates of the impact of the qualification on the probability of being in employment (expressed in percentage points). Again, to take an example, the analysis estimates that a man aged between 31 and 35 in possession of a first degree is **1.2 percentage points** more likely to be in employment than a man of similar age holding only an RQF Level 3 qualification as their highest level of attainment. The corresponding estimate for women stands at **5.6 percentage points**.

[128] Where i is again an individual LFS respondent.
[129] The probit function reflects the cumulative distribution function of the standard normal distribution.

## Table 23 Marginal employment returns to higher education qualifications (weighted across subjects), in percentage points, by gender and age band

| Qualification level (vs. counterfactual) | Age band | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 |
| **Men** | | | | | | | | | |
| Level 3 (vs. 5+ GCSEs)[1] | 2.6 | 3.9 | 2.3 | | 1.9 | 1.7 | 1.6 | 2.7 | |
| Other undergraduate (vs. Level 3)[2] | | | | | 1.9 | | | -2.9 | |
| First degree (vs. Level 3)[2] | -3.5 | 1.5 | 1.2 | 2.9 | 1.6 | 1.1 | 2.1 | | |
| Other postgraduate (vs. first degrees)[3] | | | 1.1 | | | 1.4 | 1.9 | | -6.6 |
| Higher degree (taught) (vs. first degrees)[3] | -6.0 | | | | 1.4 | | | 3.1 | 3.5 |
| Higher degree (research) (vs. first degrees)[3] | 11.4 | 2.6 | | 1.8 | 3.1 | | 4.5 | 9.2 | 9.4 |
| **Women** | | | | | | | | | |
| Level 3 (vs. 5+ GCSEs)[1] | 4.7 | 4.1 | 3.5 | 4.5 | 3.7 | 5.1 | 5.0 | 4.9 | 4.5 |
| Other undergraduate (vs. Level 3)[2] | 3.0 | | 3.5 | 4.2 | 3.0 | 2.4 | | | -3.0 |
| First degree (vs. Level 3)[2] | 1.3 | 5.4 | 5.6 | 5.7 | 4.9 | 2.6 | | | -2.9 |
| Other postgraduate (vs. first degrees)[3] | | | 2.1 | | 3.3 | 2.9 | 2.2 | 3.3 | |
| Higher degree (taught) (vs. first degrees)[3] | -4.0 | | | 2.2 | 2.6 | 2.7 | 5.4 | 4.6 | 7.0 |
| Higher degree (research) (vs. first degrees)[3] | | -4.3 | 2.5 | | 4.2 | 4.5 | 8.2 | 11.1 | 18.2 |

Note: In cases where the estimated coefficients are not statistically significantly different from zero (at the 10% level), the coefficient is assumed to be zero; these are displayed as gaps in the table.

[1] Returns to holding RQF Level 3 qualifications are estimated relative to 5 or more GCSEs at A*-C (or equivalent academic qualifications at Level 2).

[2] Returns to other undergraduate qualifications and first degrees are estimated relative to individuals holding an RQF Level 3 (academic or vocational) qualification as their highest qualification (excluding those with a single A Level or AS Levels only).

[3] Returns to higher degree (taught), higher degree (research), and 'other' postgraduate qualifications are estimated relative to first degrees.

***Source: London Economics' analysis of pooled Quarterly Labour Force Survey data for 2010 Q1 - 2023 Q4***

### A3.2.6 'Age-decay' function

Many existing economic analyses considering the lifetime benefits associated with higher education qualifications to date (e.g. Walker and Zhu, 2013) have focused on the returns associated with the 'traditional path' of higher education qualification attainment – i.e. progression directly from secondary level education to the completion of a three- or four-year undergraduate degree from the age of 18 onwards (completing by the age of 21 or 22). These analyses assume that there are **direct costs** (tuition fees etc.), as well as **opportunity costs** (the foregone earnings while undertaking the qualification full-time) associated with qualification attainment. More importantly, these analyses make the implicit assumption that any and all of the estimated earnings and/or employment benefit achieved accrues to the individual.

However, **the labour market outcomes associated with the attainment of higher education qualifications on a part-time basis are fundamentally different than those achieved by full-time students**. In particular, part-time students typically undertake higher education qualifications several years later than the 'standard' full-time student (e.g. the estimated median age at enrolment among students in the 2021-22 cohort of UK domiciled completing first degrees at UK HEPs on a part-time basis is **34**, compared to **21** for corresponding full-time students); generally undertake their studies over an extended period of time; and often combine their studies with full-time employment. Table 24 presents the assumed median age at enrolment[130], study duration[131], and age at completion for students in the relevant 2021-22 cohort.

Given these characteristics, we adjust the methodology when estimating the returns to part-time higher education attainment, through the use of an **'age-decay' function**. This approach assumes that possession of a particular higher education qualification is associated with a certain earnings or employment premium, and that this entire labour market benefit accrues to the individual *if* the qualification is attained before the age of 24 (for undergraduate qualifications) or 29 (for postgraduate qualifications).

[130] The assumed median age at enrolment is based on the number of individuals in the cohort assumed to *complete* each given qualification level (based on the assumption that some students might complete a different qualification than initially intended, or instead only complete several standalone credits/modules associated with the intended qualification (see Annex A3.2.2 for more information)). In particular, we first estimate the age at enrolment amongst student *starters* for each qualification (where we use published HESA student data (see HESA 2024c, Figure 5 and Table 58) on UK domiciled first-year students in 2021-22 by age band to *impute* a detailed distribution of students by age (separately by mode and level of study), and then calculate the resulting median age by mode and level of study). Using this information, we then calculate the weighted median age at enrolment across students in the 2021-22 cohort expected to *complete* the given qualification (weighted by the estimated number of students starting different qualification aims and completing each given qualification, separately by study mode). Note that, at postgraduate level, the information on age at enrolment was only broken down into postgraduate (research) and postgraduate (taught); hence, in the absence of alternative information, we applied the assumptions for postgraduate (research) students to higher degree (research) students in the 2021-22 cohort; and the assumptions for postgraduate (taught) students to both higher degree (taught) and other postgraduate students in the cohort.

[131] In relation to study duration, although full-time honours degrees in Scotland are generally 4 years in duration, for simplicity and for modelling purposes (given that only approximately **8%** of UK domiciled first degree students in the 2021-22 cohort were studying in Scotland), we assume that all full-time undergraduate degree are 3 years in duration.

## Table 24 Assumed median age at enrolment, study duration, and age at completion for students in the 2021-22 cohort of UK domiciled students

| Qualification level | Full-time students | | | Part-time students | | |
|---|---|---|---|---|---|---|
| | Age at enrolment | Duration (years) | Age at completion | Age at enrolment | Duration (years) | Age at completion |
| Other undergraduate | 21 | 1 | 22 | 31 | 2 | 33 |
| First degree | 18 | 3 | 21 | 28 | 6 | 34 |
| Other postgraduate | 23 | 1 | 24 | 34 | 2 | 36 |
| Higher degree (taught) | 23 | 1 | 24 | 34 | 2 | 36 |
| Higher degree (research) | 24 | 3 | 27 | 36 | 6 | 42 |

Note: All values have been rounded to the nearest integer.

***Source: London Economics' analysis based on data published by HESA (2024c; see Figure 5 and Table 58 within the data) and London Economics' assumptions (in relation to study duration)***

However, as the age of attainment increases, it is expected that a declining proportion of the earnings and employment benefit accrues to the individual[132]. This calibration ensures that those individuals completing qualifications at a relatively older age will see relatively lower earnings and employment benefits associated with HE qualification attainment (and perhaps reflect potentially different motivations among this group of learners). In contrast, those individuals attaining qualifications earlier in their working life will see a greater economic benefit (potentially reflecting the investment nature of qualification acquisition).

Table 25 presents the assumed age-decay adjustment factors which we apply to the marginal earnings and employment returns to full-time and part-time students undertaking qualifications at UK HEPs in the 2021-22 cohort. To take an example, we have assumed that a student undertaking a first degree on a full-time basis achieves the full earnings and employment premium identified in the econometric analysis (for their entire working life). However, for a part-time first degree student, we assume that because of the late attainment (at age **34** (based on the median age)), these students recoup only **73%** of the corresponding earnings and employment premiums from that age (of attainment).

[132] E.g. Callender et al. (2011) suggest that the evidence points to decreasing employment returns with age at qualification: older graduates are less likely to be employed than younger graduates three and a half years after graduation; however, there are no differences in the likelihood of graduates undertaking part-time and full-time study being employed according to their age or motivations to study.

## Table 25 Assumed age decay adjustment factors for students in the 2021-22 cohort

| Age | Other undergraduate | First degree | Other postgraduate | Higher degree (taught) | Higher degree (research) |
|---|---|---|---|---|---|
| 18 | 100% | 100% | 100% | 100% | 100% |
| 19 | 100% | 100% | 100% | 100% | 100% |
| 20 | 100% | 100% | 100% | 100% | 100% |
| 21 | 100% | 100% | 100% | 100% | 100% |
| 22 | 100% | 100% | 100% | 100% | 100% |
| 23 | 100% | 100% | 100% | 100% | 100% |
| 24 | 98% | 98% | 100% | 100% | 100% |
| 25 | 95% | 95% | 100% | 100% | 100% |
| 26 | 93% | 93% | 100% | 100% | 100% |
| 27 | 90% | 90% | 100% | 100% | 100% |
| 28 | 88% | 88% | 100% | 100% | 100% |
| 29 | 85% | 85% | 97% | 97% | 97% |
| 30 | 83% | 83% | 94% | 94% | 94% |
| 31 | 80% | 80% | 91% | 91% | 91% |
| 32 | 78% | 78% | 89% | 89% | 89% |
| 33 | 75% | 75% | 86% | 86% | 86% |
| 34 | 73% | 73% | 83% | 83% | 83% |
| 35 | 70% | 70% | 80% | 80% | 80% |
| 36 | 68% | 68% | 77% | 77% | 77% |
| 37 | 65% | 65% | 74% | 74% | 74% |
| 38 | 63% | 63% | 71% | 71% | 71% |
| 39 | 60% | 60% | 69% | 69% | 69% |
| 40 | 58% | 58% | 66% | 66% | 66% |
| 41 | 55% | 55% | 63% | 63% | 63% |
| 42 | 53% | 53% | 60% | 60% | 60% |
| 43 | 50% | 50% | 57% | 57% | 57% |
| 44 | 48% | 48% | 54% | 54% | 54% |
| 45 | 45% | 45% | 51% | 51% | 51% |
| 46 | 42% | 42% | 49% | 49% | 49% |
| 47 | 40% | 40% | 46% | 46% | 46% |
| 48 | 37% | 37% | 43% | 43% | 43% |
| 49 | 35% | 35% | 40% | 40% | 40% |
| 50 | 32% | 32% | 37% | 37% | 37% |
| 51 | 30% | 30% | 34% | 34% | 34% |
| 52 | 27% | 27% | 31% | 31% | 31% |
| 53 | 25% | 25% | 29% | 29% | 29% |
| 54 | 22% | 22% | 26% | 26% | 26% |
| 55 | 20% | 20% | 23% | 23% | 23% |
| 56 | 17% | 17% | 20% | 20% | 20% |
| 57 | 15% | 15% | 17% | 17% | 17% |
| 58 | 12% | 12% | 14% | 14% | 14% |
| 59 | 10% | 10% | 11% | 11% | 11% |
| 60 | 7% | 7% | 9% | 9% | 9% |
| 61 | 5% | 5% | 6% | 6% | 6% |
| 62 | 2% | 2% | 3% | 3% | 3% |
| 63 | 0% | 0% | 0% | 0% | 0% |
| 64 | 0% | 0% | 0% | 0% | 0% |
| 65 | 0% | 0% | 0% | 0% | 0% |

Note: Shaded areas indicate the relevant assumed median graduation age per full-time / part-time student at each level of study in the 2021-22 cohort (also see Table 24):

Full-time students Part-time students

***Source: London Economics' analysis based on data published by HESA (2024c; see Figure 5 and Table 58 within the data) and London Economics' assumptions (in relation to study duration)***

### A3.2.7 Estimating the gross graduate premium and gross Exchequer benefit

As outlined in Section 3.2, the gross graduate premium associated with qualification attainment is defined as the present value of enhanced post-tax earnings (i.e. after income tax, National Insurance, and VAT are removed, and following the deduction of foregone earnings) relative to an individual in possession of the counterfactual qualification. To estimate the value of the gross graduate premium (and the associated gross Exchequer benefit), it is necessary to extend the econometric analysis (presented in Annex A3.2.5) by undertaking the following elements of analysis (separately by qualification level, gender, and study mode):

1) We estimated the employment-adjusted **annual earnings** achieved by individuals in the counterfactual groups (e.g. RQF Level 3 qualifications or first degrees), again using pooled Quarterly UK Labour Force Survey data between Q1 2010 and Q4 2023[133].
2) We inflated these baseline or counterfactual earnings using the marginal earnings premiums and employment premiums (presented in Table 22 and Table 23 in Annex A3.2.5), adjusted to reflect late attainment (for part-time students, as outlined in Annex A3.2.6), to produce **annual age-earnings** profiles associated with the possession of each particular qualification.
3) We adjusted these age-earnings profiles to account for the fact that earnings are expected to increase over time (based on average annual earnings growth rate forecasts published by the Office for Budget Responsibility (OBR, 2023 and 2024)[134]).
4) Based on the earnings profiles generated by qualification holders, and income tax and National Insurance rates and allowances for the relevant academic year[135], we computed the future stream of net (i.e. post-tax) earnings[136]. Using similar assumptions, we further calculated the stream of (employment-adjusted) foregone earnings (based on earnings in the relevant counterfactual group[137]) during the period of study, again net of tax, for full-time students only.
5) We calculated the **discounted** stream of additional (employment-adjusted) future earnings compared to the relevant counterfactual group (using a standard real discount rate of **3.5%** (Years 1-30) and **3.0%** (Years 31+) as outlined in HM Treasury's Green Book (HM Treasury, 2022)), and the discounted stream of foregone earnings

[133] Where all earnings estimates within the data were converted to June 2021 prices, for consistency.
[134] Specifically, we make use of the Office for Budget Responsibility's short-term forecasts (for 2022-23 to 2028-29; see Office for Budget Responsibility (2024)) and long-term forecasts (for 2029-30 onwards; see Office for Budget Responsibility (2023)) of nominal average earnings growth. These forecasts were the most recent predictions available at the time that the analysis was undertaken.
[135] i.e. 2021-22. Note that the analysis assumes fiscal neutrality, i.e. it is asserted that, in subsequent years, the earnings tax and National Insurance income bands grow at the same rates of average annual earnings growth (again based on OBR forecasts).
[136] The tax adjustment also takes account of increased VAT revenues for HMT, by assuming that individuals consume 91.3% of their annual income, and that 50% of their consumption is subject to VAT at a rate of 20%. The assumed proportion of income consumed is based on forecasts of the household savings rate published by the OBR (2024), while the proportion of consumption subject to VAT is based on OBR (2024) VAT estimates.
[137] The foregone earnings calculations are based on the baseline or counterfactual earnings associated with either RQF Level 3 qualifications or first degrees. Specifically, as outlined in Annex A3.2.4, some students in the 2021-22 cohort were in possession of other levels of prior attainment. To accommodate this, as a simplifying assumption, the foregone earnings for students previously in possession of other undergraduate qualifications (other than first degrees) are based on the earnings associated with possession of RQF Level 3 qualifications as the highest qualification (adjusted for the assumed age at enrolment and completion among students in the cohort (see Annex A3.2.6)). In addition, the estimated foregone earnings for students previously in possession of postgraduate qualifications are based on the earnings of individuals in possession of first degrees.

during qualification attainment (for full-time students), to generate a present value figure. We thus arrive at the **gross graduate premium** (or equivalent for other qualifications).

6) The **discounted** stream of enhanced taxation revenues minus the tax income foregone during students' qualification attainment (where relevant) derived in Element 4 above provides an estimate of the **gross public benefit** associated with HE qualification attainment.

Note that the gross graduate premium and gross public benefit for students undertaking qualifications at a level equivalent to or lower than the highest qualification that they are already in possession of was assumed to be zero. For example, it is assumed that a student in possession of a first degree undertaking an additional degree at a UK HEP in 2021-22 will not accrue any wage or employment benefits from this additional qualification attainment (while still incurring the costs of foregone earnings during the period of study, if they studied on a full-time basis).

Further note that the analysis of gross graduate premiums and public purse benefits was undertaken at a **national** (UK-wide) level. To adjust for differences across the different UK nations (i.e. England, Wales, Scotland, and Northern Ireland), these UK-wide *gross* premiums were then combined with the relevant differential student support costs (and teaching grant costs) facing the individual and/or the Exchequer depending on students' domicile and location of study, to arrive at differential *net* graduate premiums and Exchequer benefits.

### A3.2.8 Estimating the net graduate premium and Exchequer benefit

The difference between the gross and net graduate premium relates to **students' direct costs** of qualification acquisition[138]. These direct costs refer to the **tuition fee paid by the student**[139] net of any **tuition fee support** or **maintenance support** provided by the Student Loans Company (SLC, for students from England, Wales, and Northern Ireland) or the Students Awards Agency (SAAS, for students from Scotland)[140]. In this respect, the student

[138] Note again that the *indirect* costs associated with qualification attainment, in terms of the foregone earnings during the period of study (for full-time students only), are already deducted from the above-described gross graduate premium.

[139] In relation to the average tuition fees per student per year, we first calculated the average fees charged per *full-time* UK domiciled student studying in the UK in 2021-22, by dividing published HESA data on the total fee income from these students (by mode, level, and nation of HEP location (i.e. England, Wales, Scotland, and Northern Ireland); see HESA (2024a)) by the corresponding total number of (first-year and continuing) students in 2021-22 (again by mode, level, and HEP location; see HESA (2024c)). In terms of study level, the data included information for all undergraduate students combined (so we assume the same average fees across first degrees and other undergraduate qualifications), as well as for postgraduate (taught) students, and postgraduate (research) students (and we assume that students undertaking learning at 'other postgraduate' level are included in the postgraduate (taught) category)).
To arrive at the fees per *part-time* student, we then adjusted the respective full-time rates for the average assumed study intensity amongst part-time students in the cohort (50%). In turn, the average study intensity was based on separate (unpublished) HESA data on the average study intensity among UK domiciled first-year part-time students in 2021-22; for more information, see London Economics (2024c).

[140] The analysis makes use of *average* levels of support paid per student, separately by study mode, study level (i.e. undergraduate, higher degree (taught) and higher degree (research) (and we assume that no funding is available for students undertaking qualifications at 'other postgraduate' level)), location (nation) of study, and domicile. Our estimates are based on publications by the SLC on student support for higher education in England, Wales, and Northern Ireland in 2021-22 (see Student Loans Company 2022a, 2022b and 2022c, respectively) and a publication by the Student Awards Agency for Scotland on student support for higher education in Scotland (see Student Awards Agency for Scotland, 2022). To ensure comparability across the different UK nations (i.e. across England, Wales, Scotland, and Northern Ireland), we focus only on core student support in terms of tuition fee grants, tuition fee loans, maintenance grants, and maintenance

benefit associated with public fee loan or maintenance loan support equals the **Resource Accounting and Budgeting charge** (RAB charge), capturing the proportion of the loan that is not repaid[141]. Given the significant differences in public student support funding for students from England, Wales, Scotland, and Northern Ireland (e.g. see London Economics (2024c), the direct costs incurred by students were assessed separately for students from and studying in each UK nation (i.e. separately by domicile and location of study, as well as separately by mode and level of study).

The **direct costs**[142] **to the public purse** include the **teaching grant funding** administered by the Office for Students, the Higher Education Funding Council Wales, the Scottish Funding Council, and the Department for the Economy Northern Ireland[143] (provided to English, Welsh, Scottish, and Northern Irish HEPs, respectively). In addition, the analysis takes account of the **student support** provided in the form of any fee and maintenance grants (where applicable) and the loan write-off subsidies that are associated with maintenance and tuition fee loans (i.e. the RAB charge, again where applicable). As with the above-discussed costs to students, these public costs were assessed separately by domicile and location of study, as well as by study mode and level.

loans (where applicable), but *exclude* any Disabled Students' Allowance and other targeted support. Furthermore, wherever possible, we adjusted the average levels of fee and maintenance loans for average loan take-up rates available from the same sources. In addition, where applicable, the assumed average fee loans or fee grants per student have been capped at the assumed average tuition fees charged per student in the 2021-22 cohort.

[141] Similar to the average student support levels per student, the analysis makes use of separate RAB charge estimates by domicile, location of study, mode, and level of study. For **undergraduate full-time students**, we have assumed a RAB charge of **28%** associated with tuition fee and maintenance loans for **English domiciled students** (studying anywhere in the UK). This is based on data published by the Department for Education (2023) and includes the impact on the RAB charge of the Department's recently announced changes to the existing Plan 2 loan repayment terms in response to the Augar Review of Higher Education (for post-2012 English loan borrowers – i.e. this relates to the RAB charge associated with the *revised* Plan 2 loan repayment terms; in contrast, the new Plan 5 repayment terms that were introduced in response to the Augar Review *only* relate to students starting HE qualifications from 2023-24 onwards (so that they do *not* apply to the relevant 2021-22 cohort here)). We have further assumed a RAB charge of **0% for Welsh domiciled students** (studying anywhere in the UK); **17%** for **Scottish domiciled students** studying in Scotland, and **30%** for Scottish domiciled students studying elsewhere in the UK; and **7%** for **Northern Irish domiciled students** studying in Northern Ireland, and **14%** for Northern Irish domiciled students studying elsewhere in the UK. All of these estimates are based on our modelling of the Exchequer costs associated with the current higher education fees and funding systems (for undergraduate students) operating in Wales, Scotland, and Northern Ireland, respectively (see London Economics (2024c)).

For **undergraduate part-time students**, based on the same sources, we have assumed a RAB charge of **21%** for English domiciled students, **7%** for Welsh domiciled students; and **10%** for Northern Irish domiciled students (all for students studying anywhere in the UK). There is currently no loan funding provided to Scottish domiciled undergraduate part-time students (so that no RAB charge assumptions are required).

For the loans for both **full-time and part-time postgraduate taught students** from England (studying anywhere in the UK), we have assumed a RAB charge of **0%** (based on the Department for Education's (2023) student RAB charge estimate for postgraduate Master's loans for English students). In the absence of alternative information, we have also assumed a RAB charge of **0%** for students from Wales (studying anywhere in the UK), Scotland (with loans applicable to students studying in Scotland only), and Northern Ireland (for students studying anywhere in the UK).

Finally, for **full-time and part-time postgraduate research students**, while there were no Doctorate loans available for Scottish domiciled or Northern Irish domiciled students in the 2021-22 cohort, for students from England and Wales (again studying anywhere in the UK), we have assumed a RAB charge of **25%** (again based on Department for Education (2023)).

[142] Again, any indirect costs to the public purse in terms of foregone income tax, National Insurance and VAT receipts foregone during the period of qualification attainment (applicable to full-time students only) are already incorporated in the gross public purse benefits as described above.

[143] This is based on published HESA financial information on the total relevant recurrent teaching grant received by HEPs in England, Wales, Scotland, and Northern Ireland in 2021-22 (see HESA, 2024a), divided by the total relevant number of UK domiciled and *continuing* EU students enrolled in 2021-22 (based on student data published by HESA (2024c)). From the denominator, we exclude any first-year EU students, as well as any non-EU domiciled students and higher degree (research) students (as it is assumed that there is no teaching funding associated with these students)). The inclusion of *continuing* EU students in the calculations was based on the fact that EU domiciled *first-year* students starting HE qualifications in the UK in 2021-22 were subject to the new post-Brexit rules – and, therefore, were generally no longer eligible for public teaching grant funding. In contrast, EU domiciled *continuing* students in 2021-22 were, in general, still eligible for this funding. We then adjusted for the average assumed study intensity among full-time and part-time students in the 2021-22 cohort, to arrive at separate rates of teaching grant funding by study mode.

These direct costs associated with qualification attainment to both students and the Exchequer were then calculated from start to completion of a student's learning aim. Throughout the analysis, to ensure that the economic impacts are computed in **present value** terms (i.e. in 2021-22 money terms), all benefits and costs occurring at points in the future were **discounted** using the standard HM Treasury Green Book real discount rates of **3.5%/3.0%** (again see HM Treasury, 2022). Deducting the resulting individual and Exchequer costs from the estimated gross graduate premium and gross public purse benefit, respectively, we arrive at the estimated **net graduate premium** and **net public purse benefit** per student (see Annex A3.2.9).

### A3.2.9 Estimated gross and net graduate premiums and Exchequer benefits

In the following tables, we provide more detailed estimates of the net graduate premiums and net Exchequer benefits associated with HE qualification attainment resulting from the above-outlined analysis. Specifically:

- Table 26 presents the estimated ***gross* graduate premiums and public purse benefits** per student in the 2021-22 cohort studying in the UK (i.e. at a UK-wide level[144]), broken down by study mode, level of study, and prior attainment[145]); and
- Table 27 to Table 31 then present the ***net* graduate premiums and public purse benefits**. While Table 27 presents the overall averages across students studying anywhere in the UK, Table 28 to Table 31 then provide the separate underlying estimates for students studying in England, Wales, Scotland, and Northern Ireland, respectively[146].

[144] As noted above (see Annex A3.2.7), these gross graduate premiums and public purse benefits were all assessed at a *national* (UK-wide) level. To adjust for differences across the different UK nations, these UK-wide gross premiums were then combined with the differential student support costs (and teaching grant costs) facing the individual and/or the Exchequer depending on students' domicile and location of study.

[145] While the analysis is undertaken separately for men and women, all estimates presented here constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort).

[146] In terms of students' specific domicile, note that our analysis here does *not* produce separate estimates for students from England, Wales, Scotland, or Northern Ireland. Instead, all estimates are adjusted *implicitly* for the domicile distribution (and the associated different levels of HE fees and public funding) of students in the 2021-22 cohort.

## Table 26 Gross graduate premiums and Exchequer benefits per student associated with HE qualification attainment at UK HEPs, by study mode, level, and prior attainment

| Level and mode of study | Prior attainment | | | | | |
|---|---|---|---|---|---|---|
| | Level 2 and below[1] | Level 3 | Other undergraduate | First degree | PGCE | Postgraduate (excl. PGCE) |
| **Gross graduate premiums** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £95,000 | £68,000 | -£11,000 | -£10,000 | -£10,000 | -£10,000 |
| First degree | £113,000 | £88,000 | £11,000 | -£24,000 | -£24,000 | -£24,000 |
| Other postgraduate | £163,000 | £137,000 | £62,000 | £26,000 | -£15,000 | -£15,000 |
| Higher degree (taught) | £212,000 | £185,000 | £106,000 | £70,000 | £32,000 | -£15,000 |
| Higher degree (research) | £250,000 | £220,000 | £146,000 | £106,000 | £73,000 | £22,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £76,000 | £60,000 | £0 | £0 | £0 | £0 |
| First degree | £86,000 | £72,000 | £18,000 | £0 | £0 | £0 |
| Other postgraduate | £103,000 | £91,000 | £41,000 | £25,000 | £0 | £0 |
| Higher degree (taught) | £147,000 | £134,000 | £81,000 | £65,000 | £43,000 | £0 |
| Higher degree (research) | £121,000 | £117,000 | £84,000 | £76,000 | £64,000 | £36,000 |
| **Gross Exchequer benefits** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £84,000 | £63,000 | -£2,000 | -£1,000 | -£1,000 | -£1,000 |
| First degree | £109,000 | £88,000 | £25,000 | -£3,000 | -£3,000 | -£3,000 |
| Other postgraduate | £140,000 | £121,000 | £59,000 | £29,000 | -£5,000 | -£5,000 |
| Higher degree (taught) | £186,000 | £164,000 | £100,000 | £69,000 | £38,000 | -£5,000 |
| Higher degree (research) | £241,000 | £216,000 | £156,000 | £122,000 | £94,000 | £47,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £62,000 | £49,000 | £0 | £0 | £0 | £0 |
| First degree | £71,000 | £60,000 | £15,000 | £0 | £0 | £0 |
| Other postgraduate | £84,000 | £75,000 | £34,000 | £21,000 | £0 | £0 |
| Higher degree (taught) | £123,000 | £113,000 | £70,000 | £57,000 | £38,000 | £0 |
| Higher degree (research) | £101,000 | £101,000 | £72,000 | £69,000 | £58,000 | £33,000 |

Note: [1] This includes individuals holding qualifications at RQF Level 2 and below, as well as individuals with no formal qualifications (i.e. throughout the analysis, these prior attainment levels are grouped together into a single category). All estimates constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Gaps may arise where there are no students in the relevant 2021-22 cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study is equal to or lower than the level of prior attainment. In these instances, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be larger than or equal to zero (i.e. there can be no wage or employment penalty associated with any higher education qualification attainment). Hence, each grey-shaded cell displays only the assumed underlying foregone earnings (assumed to be £0 for part-time students). ***Source: London Economics' analysis***

## Table 27 Net graduate premiums and Exchequer benefits per student associated with HE qualification attainment at UK HEPs, by study mode, level, and prior attainment

| Level and mode of study | Prior attainment | | | | | |
|---|---|---|---|---|---|---|
| | Level 2 and below[1] | Level 3 | Other undergraduate | First degree | PGCE | Postgraduate (excl. PGCE) |
| **Net graduate premiums** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £91,000 | £64,000 | -£15,000 | -£14,000 | -£14,000 | -£14,000 |
| First degree | £103,000 | £77,000 | £1,000 | -£34,000 | -£34,000 | -£34,000 |
| Other postgraduate | £155,000 | £129,000 | £54,000 | £18,000 | -£23,000 | -£23,000 |
| Higher degree (taught) | £204,000 | £177,000 | £98,000 | £61,000 | £24,000 | -£23,000 |
| Higher degree (research) | £242,000 | £213,000 | £139,000 | £99,000 | £65,000 | £15,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £72,000 | £56,000 | -£4,000 | -£4,000 | -£4,000 | -£4,000 |
| First degree | £76,000 | £62,000 | £7,000 | -£11,000 | -£11,000 | -£11,000 |
| Other postgraduate | £96,000 | £84,000 | £33,000 | £18,000 | -£7,000 | -£7,000 |
| Higher degree (taught) | £139,000 | £126,000 | £73,000 | £57,000 | £35,000 | -£7,000 |
| Higher degree (research) | £114,000 | £110,000 | £77,000 | £69,000 | £57,000 | £29,000 |
| **Net Exchequer benefits** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £79,000 | £58,000 | -£7,000 | -£6,000 | -£6,000 | -£6,000 |
| First degree | £95,000 | £75,000 | £12,000 | -£17,000 | -£17,000 | -£17,000 |
| Other postgraduate | £139,000 | £119,000 | £58,000 | £28,000 | -£6,000 | -£6,000 |
| Higher degree (taught) | £185,000 | £163,000 | £98,000 | £68,000 | £36,000 | -£6,000 |
| Higher degree (research) | £240,000 | £215,000 | £155,000 | £121,000 | £93,000 | £46,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £58,000 | £45,000 | -£4,000 | -£4,000 | -£4,000 | -£4,000 |
| First degree | £60,000 | £49,000 | £4,000 | -£11,000 | -£11,000 | -£11,000 |
| Other postgraduate | £83,000 | £74,000 | £32,000 | £19,000 | -£1,000 | -£1,000 |
| Higher degree (taught) | £122,000 | £112,000 | £69,000 | £55,000 | £37,000 | -£1,000 |
| Higher degree (research) | £100,000 | £100,000 | £71,000 | £67,000 | £57,000 | £32,000 |

Note: [1] This includes individuals holding qualifications at RQF Level 2 and below, as well as individuals with no formal qualifications (i.e. throughout the analysis, these prior attainment levels are grouped together into a single category). All estimates constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Gaps may arise where there are no students in the relevant 2021-22 cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study is equal to or lower than the level of prior attainment. In these instances, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be larger than or equal to zero (i.e. there can be no wage or employment penalty associated with any higher education qualification attainment). Hence, each grey-shaded cell displays only the assumed underlying direct *or* indirect costs associated with qualification attainment. ***Source: London Economics' analysis***

## Table 28 Net graduate premiums and Exchequer benefits per student associated with HE qualification attainment at English HEPs, by study mode, level, and prior attainment

| Level and mode of study | Prior attainment | | | | | |
|---|---|---|---|---|---|---|
| | Level 2 and below[1] | Level 3 | Other undergraduate | First degree | PGCE | Postgraduate (excl. PGCE) |
| **Net graduate premiums** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £90,000 | £63,000 | -£16,000 | -£14,000 | -£14,000 | -£14,000 |
| First degree | £101,000 | £76,000 | -£1,000 | -£35,000 | -£35,000 | -£35,000 |
| Other postgraduate | £154,000 | £128,000 | £53,000 | £17,000 | -£24,000 | -£24,000 |
| Higher degree (taught) | £204,000 | £176,000 | £97,000 | £61,000 | £23,000 | -£24,000 |
| Higher degree (research) | £242,000 | £212,000 | £138,000 | £98,000 | £65,000 | £14,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £71,000 | £56,000 | -£5,000 | -£5,000 | -£5,000 | -£5,000 |
| First degree | £75,000 | £61,000 | £6,000 | -£12,000 | -£12,000 | -£12,000 |
| Other postgraduate | £95,000 | £83,000 | £33,000 | £17,000 | -£8,000 | -£8,000 |
| Higher degree (taught) | £139,000 | £126,000 | £73,000 | £57,000 | £35,000 | -£8,000 |
| Higher degree (research) | £114,000 | £110,000 | £77,000 | £69,000 | £57,000 | £29,000 |
| **Net Exchequer benefits** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £78,000 | £58,000 | -£7,000 | -£6,000 | -£6,000 | -£6,000 |
| First degree | £96,000 | £76,000 | £13,000 | -£16,000 | -£16,000 | -£16,000 |
| Other postgraduate | £140,000 | £120,000 | £58,000 | £28,000 | -£6,000 | -£6,000 |
| Higher degree (taught) | £185,000 | £163,000 | £99,000 | £68,000 | £37,000 | -£6,000 |
| Higher degree (research) | £239,000 | £215,000 | £154,000 | £121,000 | £92,000 | £46,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £58,000 | £46,000 | -£4,000 | -£4,000 | -£4,000 | -£4,000 |
| First degree | £61,000 | £50,000 | £5,000 | -£10,000 | -£10,000 | -£10,000 |
| Other postgraduate | £84,000 | £74,000 | £33,000 | £20,000 | -£1,000 | -£1,000 |
| Higher degree (taught) | £123,000 | £113,000 | £69,000 | £56,000 | £38,000 | -£1,000 |
| Higher degree (research) | £101,000 | £100,000 | £71,000 | £67,000 | £57,000 | £32,000 |

Note: [1] This includes individuals holding qualifications at RQF Level 2 and below, as well as individuals with no formal qualifications (i.e. throughout the analysis, these prior attainment levels are grouped together into a single category). All estimates constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Gaps may arise where there are no students in the relevant 2021-22 cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study is equal to or lower than the level of prior attainment. In these instances, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be larger than or equal to zero (i.e. there can be no wage or employment penalty associated with any higher education qualification attainment). Hence, each grey-shaded cell displays only the assumed underlying direct *or* indirect costs associated with qualification attainment. ***Source: London Economics' analysis***

## Table 29 Net graduate premiums and Exchequer benefits per student associated with HE qualification attainment at Welsh HEPs, by study mode, level, and prior attainment

| Level and mode of study | Prior attainment | | | | | |
|---|---|---|---|---|---|---|
| | Level 2 and below[1] | Level 3 | Other undergraduate | First degree | PGCE | Postgraduate (excl. PGCE) |
| **Net graduate premiums** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £93,000 | £64,000 | -£15,000 | -£14,000 | -£14,000 | -£14,000 |
| First degree | £103,000 | £77,000 | £0 | -£35,000 | -£35,000 | -£35,000 |
| Other postgraduate | £156,000 | £132,000 | £56,000 | £20,000 | -£20,000 | -£20,000 |
| Higher degree (taught) | £210,000 | £182,000 | £102,000 | £66,000 | £29,000 | -£18,000 |
| Higher degree (research) | | £207,000 | £137,000 | £97,000 | £65,000 | £13,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £73,000 | £57,000 | -£3,000 | -£3,000 | -£3,000 | -£3,000 |
| First degree | £79,000 | £65,000 | £11,000 | -£7,000 | -£7,000 | -£7,000 |
| Other postgraduate | £98,000 | £86,000 | £34,000 | £19,000 | -£5,000 | -£5,000 |
| Higher degree (taught) | £143,000 | £130,000 | £78,000 | £62,000 | £39,000 | -£3,000 |
| Higher degree (research) | | | | £68,000 | £53,000 | £28,000 |
| **Net Exchequer benefits** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £81,000 | £59,000 | -£7,000 | -£6,000 | -£6,000 | -£6,000 |
| First degree | £97,000 | £77,000 | £13,000 | -£15,000 | -£15,000 | -£15,000 |
| Other postgraduate | £139,000 | £120,000 | £58,000 | £28,000 | -£6,000 | -£6,000 |
| Higher degree (taught) | £185,000 | £163,000 | £97,000 | £67,000 | £36,000 | -£8,000 |
| Higher degree (research) | | £207,000 | £155,000 | £121,000 | £95,000 | £46,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £57,000 | £44,000 | -£5,000 | -£5,000 | -£5,000 | -£5,000 |
| First degree | £56,000 | £45,000 | £1,000 | -£14,000 | -£14,000 | -£14,000 |
| Other postgraduate | £84,000 | £74,000 | £32,000 | £19,000 | £0 | £0 |
| Higher degree (taught) | £121,000 | £110,000 | £67,000 | £54,000 | £36,000 | -£2,000 |
| Higher degree (research) | | | | £67,000 | £53,000 | £32,000 |

Note: [1] This includes individuals holding qualifications at RQF Level 2 and below, as well as individuals with no formal qualifications (i.e. throughout the analysis, these prior attainment levels are grouped together into a single category). All estimates constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Gaps may arise where there are no students in the relevant 2021-22 cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study is equal to or lower than the level of prior attainment. In these instances, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be larger than or equal to zero (i.e. there can be no wage or employment penalty associated with any higher education qualification attainment). Hence, each grey-shaded cell displays only the assumed underlying direct *or* indirect costs associated with qualification attainment. ***Source: London Economics' analysis***

## Table 30 Net graduate premiums and Exchequer benefits per student associated with HE qualification attainment at Scottish HEPs, by study mode, level, and prior attainment

| Level and mode of study | Prior attainment | | | | | |
|---|---|---|---|---|---|---|
| | Level 2 and below[1] | Level 3 | Other undergraduate | First degree | PGCE | Postgraduate (excl. PGCE) |
| **Net graduate premiums** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £97,000 | £68,000 | -£10,000 | -£9,000 | -£9,000 | -£9,000 |
| First degree | £114,000 | £89,000 | £13,000 | -£22,000 | -£22,000 | -£22,000 |
| Other postgraduate | £157,000 | £132,000 | £58,000 | £22,000 | -£20,000 | -£20,000 |
| Higher degree (taught) | £209,000 | £180,000 | £101,000 | £65,000 | £27,000 | -£20,000 |
| Higher degree (research) | £245,000 | £216,000 | £140,000 | £101,000 | £69,000 | £17,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £74,000 | £59,000 | -£1,000 | -£1,000 | -£1,000 | -£1,000 |
| First degree | £83,000 | £69,000 | £15,000 | -£2,000 | -£2,000 | -£2,000 |
| Other postgraduate | £99,000 | £87,000 | £35,000 | £19,000 | -£4,000 | -£4,000 |
| Higher degree (taught) | £141,000 | £128,000 | £77,000 | £61,000 | £37,000 | -£4,000 |
| Higher degree (research) | £107,000 | | £76,000 | £71,000 | £58,000 | £30,000 |
| **Net Exchequer benefits** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £77,000 | £55,000 | -£10,000 | -£9,000 | -£9,000 | -£9,000 |
| First degree | £86,000 | £66,000 | £4,000 | -£24,000 | -£24,000 | -£24,000 |
| Other postgraduate | £135,000 | £116,000 | £55,000 | £25,000 | -£9,000 | -£9,000 |
| Higher degree (taught) | £183,000 | £160,000 | £95,000 | £65,000 | £33,000 | -£9,000 |
| Higher degree (research) | £243,000 | £219,000 | £157,000 | £123,000 | £96,000 | £48,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £56,000 | £43,000 | -£6,000 | -£6,000 | -£6,000 | -£6,000 |
| First degree | £55,000 | £44,000 | £0 | -£15,000 | -£15,000 | -£15,000 |
| Other postgraduate | £81,000 | £71,000 | £29,000 | £16,000 | -£4,000 | -£4,000 |
| Higher degree (taught) | £117,000 | £107,000 | £66,000 | £53,000 | £33,000 | -£4,000 |
| Higher degree (research) | £87,000 | | £64,000 | £68,000 | £57,000 | £33,000 |

Note: [1] This includes individuals holding qualifications at RQF Level 2 and below, as well as individuals with no formal qualifications (i.e. throughout the analysis, these prior attainment levels are grouped together into a single category). All estimates constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Gaps may arise where there are no students in the relevant 2021-22 cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study is equal to or lower than the level of prior attainment. In these instances, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be larger than or equal to zero (i.e. there can be no wage or employment penalty associated with any higher education qualification attainment). Hence, each grey-shaded cell displays only the assumed underlying direct *or* indirect costs associated with qualification attainment. ***Source: London Economics' analysis***

## Table 31 Net graduate premiums and Exchequer benefits per student associated with HE qualification attainment at Northern Irish HEPs, by study mode, level, and prior attainment

| Level and mode of study | Prior attainment | | | | | |
|---|---|---|---|---|---|---|
| | Level 2 and below[1] | Level 3 | Other undergraduate | First degree | PGCE | Postgraduate (excl. PGCE) |
| **Net graduate premiums** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £92,000 | £65,000 | -£15,000 | -£13,000 | | -£13,000 |
| First degree | £104,000 | £79,000 | £3,000 | -£32,000 | -£32,000 | -£32,000 |
| Other postgraduate | £159,000 | £133,000 | £58,000 | £23,000 | -£19,000 | -£19,000 |
| Higher degree (taught) | £204,000 | £183,000 | £102,000 | £65,000 | £29,000 | -£19,000 |
| Higher degree (research) | | £221,000 | £145,000 | £106,000 | £74,000 | £21,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £75,000 | £59,000 | -£3,000 | -£3,000 | -£3,000 | -£3,000 |
| First degree | £80,000 | £66,000 | £11,000 | -£7,000 | -£7,000 | -£7,000 |
| Other postgraduate | £100,000 | £87,000 | £35,000 | £19,000 | -£4,000 | -£4,000 |
| Higher degree (taught) | £142,000 | £129,000 | £77,000 | £61,000 | £38,000 | -£4,000 |
| Higher degree (research) | | | | £75,000 | | £34,000 |
| **Net Exchequer benefits** | | | | | | |
| **Full-time students** | | | | | | |
| Other undergraduate | £79,000 | £58,000 | -£7,000 | -£6,000 | | -£6,000 |
| First degree | £95,000 | £75,000 | £12,000 | -£16,000 | -£17,000 | -£16,000 |
| Other postgraduate | £138,000 | £117,000 | £56,000 | £26,000 | -£8,000 | -£8,000 |
| Higher degree (taught) | £178,000 | £164,000 | £97,000 | £66,000 | £36,000 | -£8,000 |
| Higher degree (research) | | £219,000 | £157,000 | £121,000 | £97,000 | £46,000 |
| **Part-time students** | | | | | | |
| Other undergraduate | £58,000 | £45,000 | -£5,000 | -£5,000 | -£5,000 | -£5,000 |
| First degree | £57,000 | £46,000 | £2,000 | -£13,000 | -£13,000 | -£13,000 |
| Other postgraduate | £82,000 | £72,000 | £29,000 | £16,000 | -£3,000 | -£3,000 |
| Higher degree (taught) | £120,000 | £109,000 | £67,000 | £54,000 | £34,000 | -£3,000 |
| Higher degree (research) | | | | £66,000 | | £32,000 |

Note: [1] This includes individuals holding qualifications at RQF Level 2 and below, as well as individuals with no formal qualifications (i.e. throughout the analysis, these prior attainment levels are grouped together into a single category). All estimates constitute weighted averages across men and women (weighted by the estimated number of student completers in the 2021-22 cohort) and are presented in 2021-22 prices, discounted to net present values, and rounded to the nearest £1,000. Gaps may arise where there are no students in the relevant 2021-22 cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study is equal to or lower than the level of prior attainment. In these instances, the analysis implicitly assumes that all calculated gross returns (*before* the deduction of any foregone earnings or other costs) can only be larger than or equal to zero (i.e. there can be no wage or employment penalty associated with any higher education qualification attainment). Hence, each grey-shaded cell displays only the assumed underlying direct *or* indirect costs associated with qualification attainment. ***Source: London Economics' analysis***

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