

# The economic impact of the University of Edinburgh

Final report for the University of Edinburgh



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## Foreword

The University of Edinburgh is one of the oldest civic universities in the world. Our history and heart are rooted in this great city, but our influence and reach is global – we are one of the top 50 universities in the world and 4th in the UK for the quality and breadth of our research.

The impact of the University of Edinburgh is enormous and enduring. The University has been at the forefront of academia and critical thinking for more than 440 years. Our people are key to this success: the impressive results detailed in this analysis are down to them and I wish to extend my thanks to everyone in our community.

Thanks also to London Economics for working with colleagues to quantify the amazing work that is carried out across our institution each and every day.

We are a powerhouse for the UK economy, contributed £7.5 billion in the academic year 2021/2022. Our student community consists of over 45,000 students and our graduates contributed £857 million in the same period to the UK economy. Many go on to become future leaders in their fields and sometimes even their countries.

Our student body includes more than 10,000 new international students each year, who come to study with us from across the globe, representing more than 160 countries. They add much to the University helping to create a cosmopolitan community and culturally varied campus enhancing the experience of all. The report also confirms that fee income and money spent during their time studying at Edinburgh generates £1.8 billion in economic benefit to the UK.

Our research transforms lives and is world-changing – from understanding volcanic eruptions and investigating the influence of our genes on disease to our work at the forefront of applying technology to transform cultural practice. Our research community is made up of more than 9,200 academics who win around £300 million in research funding each year.

Breaking boundaries between disciplines, industry and community, we apply our knowledge to find solutions to the world's biggest challenges. Working with partners, our research creates a further £350 million of impact: improving patient care, financial services and sustainable energies.

Harnessing data for the good of society will be key to meeting all those challenges. Our Data Driven Innovation programme, funded initially by the Edinburgh and South East Scotland City Region Deal, is one example of our partnership approach, ambition and regional impact.

We are committed to making our ideas work for a better world. We have supported our entrepreneurs to create an impact of £162 million and support 1,830 jobs through their successful start-ups and spinouts.

We are proud to be part of our local community and that's why we offer grants to support community groups with their amazing work changing lives of people in our area. We take our responsibilities seriously in protecting and enhancing the environment and are committed to



## Foreword

reaching net zero by 2040. We are making great strides in reducing our carbon emissions through a range of programmes.

The dedication and commitment of our University community continues to drive forward innovation, ambition and resilience in the pursuit of making the world a better place. The University of Edinburgh is a world-leading institution, committed to delivering excellence for our people, research, teaching and learning, and social and civic responsibility.

We have more than 400 years of excellence behind us, but we're not done yet. Working together, we can make the next 400 years even better.

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

Professor Sir Peter Mathieson, Principal and Vice-Chancellor, the University of Edinburgh

## Executive Summary



## The aggregate economic impact of the University of Edinburgh

The total economic impact on the UK economy associated with the University of Edinburgh's activities in 2021-22 was estimated at approximately **£7.522 billion** (see Table 1)<sup>1</sup>. In terms of the components of this impact, the value of the University's **research and knowledge exchange activities** stood at **£3.180 billion (42%** of total), while the impact associated with the University's international students stood at **£1.770 billion (24%)**. The impact generated by the **operating and capital expenditures of the University** was **£1.535 billion (20%)**, and the impact of the University's **teaching and learning activities** accounted for **£857 million (11%)**. The remaining **2%** of economic impact (**£180 million**) was from the impact of **tourism** activities associated with the University.

**The total economic impact associated with the University of Edinburgh's activities in 2021-22 stood at £7.52 billion.**

**Table 1 Total economic impact of the University of Edinburgh's activities in the UK and in Scotland in 2021-22 (£m and % of total)**

Type of impact	UK - £m (%)	Scotland - £m (%)
 <b>Impact of research and knowledge exchange</b>	<b>£3,180m (42%)</b>	<b>£248m (9%)</b>
Research activities	£2,830m (38%)	n.a.
Knowledge exchange activities	£350m (5%)	£248m (9%)
 <b>Impact of teaching and learning</b>	<b>£857m (11%)</b>	<b>n.a.</b>
Students	£397m (5%)	n.a.
Exchequer	£460m (6%)	n.a.
 <b>Impact of international students</b>	<b>£1,770m (24%)</b>	<b>£1,279m (46%)</b>
Tuition fee income	£968m (13%)	£697m (25%)
Non-tuition fee income	£802m (11%)	£582m (21%)
 <b>Impact of the University's spending</b>	<b>£1,535m (21%)</b>	<b>£1,112m (40%)</b>
Direct impact	£1,243m (17%)	n.a.
Indirect and induced impact	£292m (4%)	n.a.
 <b>Impact of tourism</b>	<b>£180m (2%)</b>	<b>£133m (5%)</b>
Direct impact	£79m (1%)	n.a.
Indirect and induced impact	£102m (1%)	n.a.
<b>Total economic impact</b>	<b>£7,522m (100%)</b>	<b>£2,772m (100%)</b>

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £1m, and may not add up precisely to the totals indicated. The percentage figures in the brackets represent the proportion of total impact in that region associated with the strand/sub-strand of analysis. *Source: London Economics' analysis*

In terms of the number of full-time equivalent (FTE) jobs supported, the results indicate that the total impact generated by the University's activities supported a total of **32,760** FTE jobs across the UK economy in 2021-22, of which **24,935** were located in **Scotland**.

<sup>1</sup> All estimates here are presented in terms of economic output (equivalent to income/turnover). The impact of the University's knowledge exchange activities, educational exports, institutional expenditures and related tourism can also be converted into gross value added (GVA) and full-time (FTE) employment, and these additional findings are provided within the relevant sections throughout this report.

Compared to the University's total operational costs of approximately **£1.086 billion** in 2021-22<sup>2</sup>, the total impact of the University of Edinburgh's activities on the UK economy was estimated at **£7.522 billion**, which corresponds to a **benefit to cost ratio of 6.9:1**. This compares to an average benefit-to-cost ratio among Russell Group institutions of approximately **5.5:1**, and corresponds to a **34%** increase in the University's impact since 2015-16 (on a like-for-like basis, in real terms<sup>3</sup>).

In addition to assessing the total impact of **£7,522 million** on the UK economy as a whole, it is also possible to estimate the economic impact of a number of strands of the University's activities on Scotland. Specifically, we estimated the economic impact associated with the University's knowledge exchange activities, the impact of international students, the impact of the University's expenditure, and the impact of tourism activities associated with the University on Scotland. Given the difficulties in tracking graduate mobility over the working life nor the location where research spillovers may have been adopted, it is not possible to allocate the economic impact associated with the teaching and learning activity or the productivity spillovers associated with the University's research activities to different geographical areas.

Following this approach the analysis identified that approximately **£3,835 million (51%)** of the University of Edinburgh's total impact of **£7,522 million** can be disaggregated geographically (see Section 7.1 for more information), of which approximately **£2,772 million (72%)** occurred in Scotland.



### The impact of the University of Edinburgh's research and knowledge exchange activities

To estimate the **direct** economic impact associated with the University of Edinburgh's research, we used information on the total research-related income accrued by the University in 2021-22. The total research-related income accrued by the University in 2021-22 stood at **£423 million**. To arrive at the net impact of the University's research activities, we deducted the public costs of funding the University's research. Together, these public costs amounted to **£271 million** in 2021-22, resulting in a **net direct research impact of £152 million**.

Existing academic literature<sup>4</sup> suggests strong evidence of the existence of **productivity spillovers** from public investment in university research. Applying estimates from the literature, our analysis implies a spillover multiplier of approximately **6.3** associated with the University of Edinburgh's research income in 2021-22. Combining the **net direct impact** of the University's research activities (**£152 million**) with the resulting **productivity spillovers** accrued by other organisations across the UK (**£2,678 million**), the total impact of research conducted by the University in 2021-22 was estimated at **£2,830 million**.

In addition to the University of Edinburgh's research, the analysis estimated the impact associated with **knowledge exchange activities** (the activities of The University of Edinburgh's **spinout and start-up companies**, and **other knowledge exchange activities**). The analysis considers the direct, indirect, and induced economic impacts associated with these activities. The **direct** impact of these activities was based on the turnover/investment in the University of Edinburgh's active spinout and

<sup>2</sup> This relates to the University's total operating expenditure, excluding capital expenditure.

<sup>3</sup> See London Economics (2017). The analysis of the economic impact of all Russell Group institutions (including the University of Edinburgh) was based on the 2015-16 academic year.

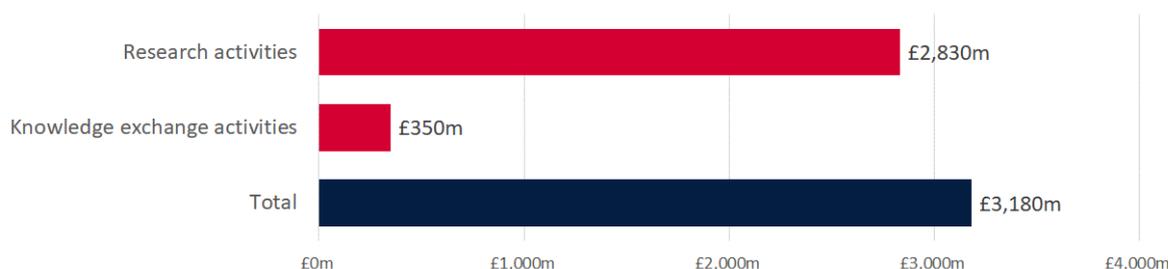
<sup>4</sup> See Haskel and Wallis (2010), and Haskel et al. (2014). It is important to note that the multipliers estimated in the academic research cover a wide range of research activities. As such, these multipliers capture the average productivity spillover associated with research undertaken by all higher education institutions and is not specific to the University of Edinburgh's research. However, to reflect the quality of the research undertaken by the University of Edinburgh, we adjust the multiplier used in this analysis to identify productivity spillovers to specifically reflect the origin of research funding received by the University.

**The impact of the University of Edinburgh's research and knowledge exchange activities in 2021-22 stood at £3,180 million.**

start-up companies, and the income generated from the various other knowledge exchange activities. The **total direct, indirect, and induced impacts** of these activities was then estimated using relevant **economic multipliers** derived from a (multi-regional) Input-Output model. Using this approach, the analysis estimates that the University of Edinburgh's knowledge exchange activities generated a total of **£350 million** of impact across the UK economy in 2021-22.

The total economic impact associated with the University of Edinburgh's research and knowledge exchange activities in 2021-22 was estimated at **£3,180 million** (see Figure 1). The University's knowledge exchange activities supported an estimated **3,745 full-time equivalent jobs** across the UK as a whole, of which the majority (approximately **2,805, 75%**) were located within Scotland.

**Figure 1 Total impact of The University of Edinburgh's research activities in 2021-22, £m**



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



## The impact of the University of Edinburgh's teaching and learning activities

The analysis of the impact of the University of Edinburgh's teaching and learning activities estimates the **enhanced employment and earnings benefits to graduates**, and, separately, the **additional taxation receipts to the public purse** associated with higher education qualification attainment at the University<sup>5</sup>. The analysis is adjusted for the characteristics of the **8,390** UK domiciled students who started a qualification at the University of Edinburgh in the 2021-22 academic year.

Incorporating both the expected costs associated with qualification attainment and the labour market benefits expected to be accrued by students/graduates over their working lives, the analysis suggests that the **net graduate premium** achieved by representative Scottish domiciled students in the 2021-22 cohort completing a **full-time first degree** (with a SCQF Level 6/RQF Level 3 qualification as their highest level of prior attainment) stands at approximately **£81,000** (in 2021-22 money terms). Separately, taking account of the benefits and costs to the public purse, the analysis indicates that the corresponding **net Exchequer benefit** associated with these students stands at **£64,000**.<sup>6</sup>

<sup>5</sup> The estimation of the net graduate premiums and net Exchequer benefits is based on a detailed econometric analysis of the Labour Force Survey. The analysis considers the impact of higher education qualification attainment on earnings and employment outcomes; however, as no information is specifically available on the particular HEI attended, the analysis is not specific to the University of Edinburgh alumni. Rather, the findings from the analysis are adjusted to reflect the characteristics of the 2021-22 cohort of the University of Edinburgh students (e.g. in terms of mode of study, level of study, subject mix, domicile, gender, average age at enrolment, duration of qualification, and average completion rates).

<sup>6</sup> The full set of net graduate premiums and net Exchequer benefits for all domiciles and characteristics is presented in Annex A2.2.5.

The net graduate premiums and net Exchequer benefits were combined with information on the number of students starting qualifications in 2021-22 and expected completion rates. The aggregate economic impact generated by teaching and learning activities associated with the 2021-22 cohort stood at approximately **£857 million** (see Section 3). This is split favourably for the Exchequer, with **£397 million (46%)** of the economic benefit generated accrued by students/graduates undertaking qualifications at the University of Edinburgh, and the remaining **£460 million (54%)** accrued by the Exchequer.

**The total economic impact of the University of Edinburgh's teaching and learning stands at £857 million.**

**Table 2 Aggregate impact of the University of Edinburgh teaching and learning activities associated with the 2021-22 entrant cohort (£m), by type of impact, domicile, and level of study**

Beneficiary and study level	Domicile				Total
	Scotland	England	Wales	Northern Ireland	
<b>Students</b>	<b>£213m</b>	<b>£171m</b>	<b>£7m</b>	<b>£7m</b>	<b>£397m</b>
Undergraduate	£172m	£124m	£4m	£5m	£305m
Postgraduate	£41m	£48m	£3m	£1m	£93m
<b>Exchequer</b>	<b>£181m</b>	<b>£261m</b>	<b>£8m</b>	<b>£10m</b>	<b>£460m</b>
Undergraduate	£129m	£187m	£4m	£8m	£328m
Postgraduate	£52m	£73m	£3m	£2m	£131m
<b>Total</b>	<b>£394m</b>	<b>£432m</b>	<b>£14m</b>	<b>£16m</b>	<b>£857m</b>
Undergraduate	£301m	£311m	£8m	£13m	£633m
Postgraduate	£93m	£121m	£6m	£3m	£224m

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



### The impact of the University of Edinburgh's educational exports

With Edinburgh being an attractive destination for many international students, the University's higher education offer represents a tradeable activity with imports and exports like any other tradeable sector. The economic impact of the University of Edinburgh's contribution to educational exports is based on the **direct** injection of **tuition fee** and **non-tuition fee income** from international students. As with the University's knowledge exchange activities, this income generates **indirect** and **induced impacts** throughout the UK economy, through supply chain and wage income effects. The analysis focuses on the cohort of **10,020** non-UK domiciled students who started qualifications at the University of Edinburgh in the 2021-22 academic year. Of these students, **1,270 (13%)** were EU-domiciled, and **8,750 (87%)** were from non-EU jurisdictions.

Combining the estimates of tuition fee income (net of the University of Edinburgh's cost of funding international students) and non-tuition fee income associated with international students in the 2021-22 cohort, the **total export income (i.e. direct impact)** generated by this cohort stood at **£682 million**. Slightly over half of this income (**£365 million**) was generated from international students' (net) tuition fee expenditure accrued by the University of Edinburgh, while just over half (**£317 million**) was generated from international students' non-tuition fees expenditure (including costs related to accommodation, subsistence, course-related purchases, and travel).

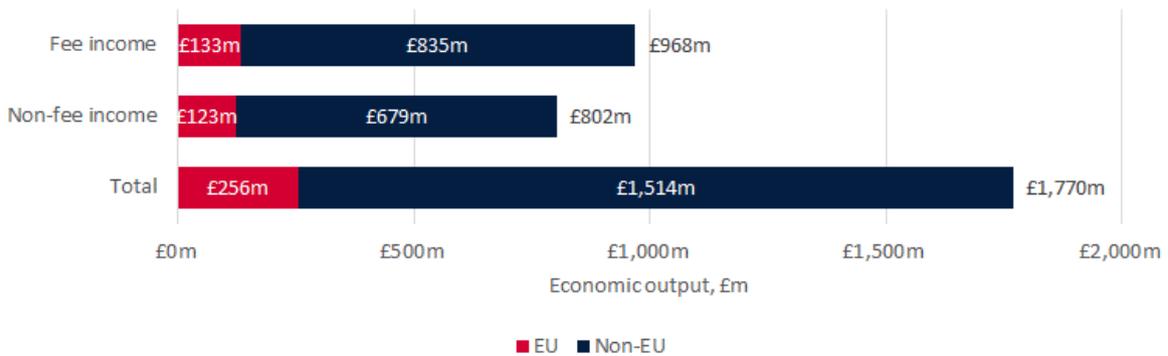
The total (direct, indirect, and induced) economic impact associated with this income was again estimated using relevant economic multipliers, identifying the extent to which the direct export

income generates additional activity throughout the UK economy. We thus estimate that the **total economic impact** on the UK generated by the (net) tuition fee income and non-tuition fee income associated with international students in the 2021-22 the University of Edinburgh cohort amounts to **£1,770 million**. Of this total, **£968 million** of this impact was associated with international students' (net) **tuition fees**, and **£802 million** was associated with these students' **non-tuition fee expenditures** over the duration of their studies at the University of Edinburgh (see Figure 2).

**The impact of the export income generated by the 2021-22 the University of Edinburgh cohort stood at £1,770 million.**

The University's activities in respect of educational exports supported an estimated **16,585 full-time equivalent jobs** across the UK as a whole, of which **12,490 jobs** were located across Scotland.

**Figure 2 Impact of the University of Edinburgh's educational exports associated with international students in the 2021-22 entrant cohort (£m), by domicile and type of income**



Note: All estimates are presented in 2021-22 prices, discounted to reflect net present values, rounded to the nearest £1m, and may not add up precisely to the totals indicated.

Source: London Economics' analysis



### The impact of the University of Edinburgh's expenditure

The University of Edinburgh's physical footprint supports jobs and promotes economic growth throughout the UK. This is captured by the **direct, indirect, and induced impact** associated with the expenditures of the institution. The **direct impact** of the University of Edinburgh's physical footprint was based on the operating and capital expenditures of the University. In 2021-22, the University of Edinburgh incurred a total of **£1,243 million** of expenditure (including **£1,086 million** of operating expenditure and **£157 million** of capital expenditure)<sup>7</sup>.

**The impact of the University of Edinburgh's expenditure on the UK economy in 2021-22 stood at £1,535 million.**

Again, the direct increase in economic activity resulting from the expenditures of the University of Edinburgh generates additional rounds of spending throughout the economy (through the University's supply chains, and the spending of staff). Applying the relevant economic multipliers, the **total direct, indirect, and induced impact**

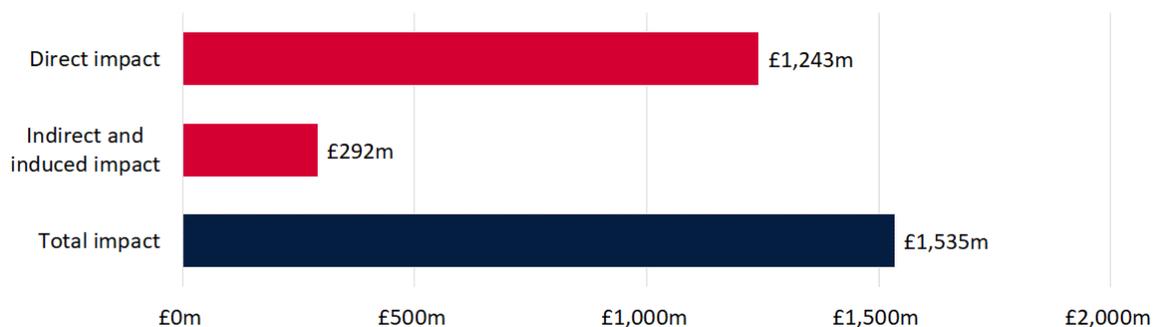
<sup>7</sup> The total operational expenditure (excluding capital expenditure) of the University of Edinburgh in 2021-22 stood at **£1,389 million**. From this, for the purpose of the analysis, we excluded **£61 million** in depreciation costs and **£242 million** in movements in pension provisions, as it is assumed that these are not relevant from a procurement perspective (i.e. these costs are not accounted for as income by other organisations).

associated with the University of Edinburgh's expenditures in 2021-22 was estimated at **£1,535 million** (see Section 5).

In terms of **region**, almost three-quarters of this impact (**£1,105 million, 72%**) occurred in **Scotland**, while the remainder (**£429 million, 28%**) was accrued across the rest of the UK.

In relation to the **sector of impact**, in addition to the impacts occurring in the government, health, and education sector itself (**£699 million, 46%**), there are also large impacts felt within other sectors, e.g. including the production sector (**£203 million, 13%**), the distribution, transport, hotel, and restaurant sector (**£200 million, 13%**), and the real estate sector (**£137 million, 9%**).

**Figure 3 Impact associated with the University of Edinburgh's expenditure in 2021-22 (£m)**



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

Source: London Economics' analysis

In terms of the number of FTE jobs supported, the University of Edinburgh's expenditure supported a total of **10,490** FTE jobs across the UK economy in 2021-22 of which **8,085 (77%)** were based in Scotland. The remaining **2,410** jobs supported by the activities of the University of Edinburgh are located across the rest of the UK<sup>8</sup>.



### The impact of the University of Edinburgh's contribution to tourism

As a final strand of impact, the University attracts a range of visitors to Edinburgh, including tourists, business visitors, friends and family visiting the University's staff and students, and participants in study trips to the University.

To understand the economic impact associated with the University's contribution to tourism through the attraction of these visitors, we estimate the number of visitors to Edinburgh in a typical year that were associated with the University's presence. Due to the impact of the pandemic and the associated restrictions, this analysis (for the 2021-22 *academic year*) is based on visits to Edinburgh in the 2019 *calendar year* (i.e. we adopt the most recently available pre-pandemic data to give an indication of the "typical" impact of tourism associated with the University of Edinburgh). The analysis focuses only on visits to Edinburgh that involved overnight stays by visitors from overseas, as it is assumed that any domestic (day or overnight) visits to Edinburgh would have displaced activity from other regions of the UK (and should not be considered 'additional' to the UK economy, although it is additional to the Scottish economy). Out of a total of **2,206,000** overnight visits from overseas visitors to Edinburgh, we estimate that approximately **78,000** resulted from the University's activities. Combined with information on the average trip expenditure per visitor, the **direct impact** of the University's contribution to tourism was estimated at **£79 million**.

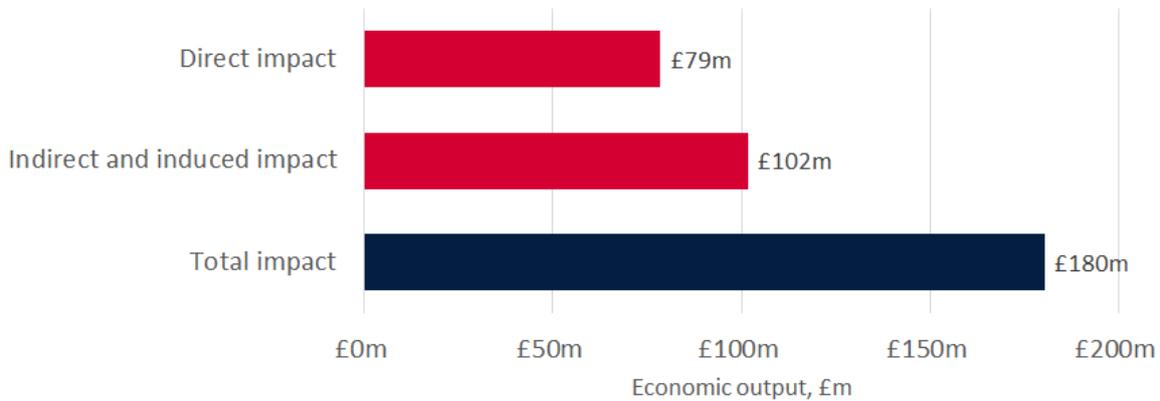
<sup>8</sup> Totals may not add up precisely due to rounding.

As with the University’s knowledge exchange activities, educational exports, and the spending of the University, this visitor expenditure results in subsequent rounds of expenditure throughout the UK economy. Again, this is measured by the **indirect, and induced impacts** associated with these expenditures, estimated by applying relevant economic multipliers to the direct impact. Using this approach, the analysis indicates that the **total direct, indirect, and induced impact** of the visitor expenditure generated by the University of Edinburgh stood at approximately **£180 million** (see Figure 4).

**The impact of the University of Edinburgh’s annual contribution to tourism stands at £180 million.**

The University’s contribution to tourism activities supported an estimated **1,960 full-time equivalent jobs** across the UK as a whole, with **1,555 jobs** of these jobs supported in Scotland.

**Figure 4 Impact associated with the University of Edinburgh’s annual contribution to tourism (£m)**



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



# 1 Introduction

London Economics were commissioned to assess the **economic impact of the University of Edinburgh to the United Kingdom**, focusing on the 2021-22 academic year. The University of Edinburgh contributes to the UK's national prosperity through a range of activities and channels, and the analysis is split into:

- The impact of the University of Edinburgh's **research and knowledge exchange activities**;
- The economic contribution of the University of Edinburgh's provision of **teaching and learning**;
- The impact of the University of Edinburgh's contribution to **educational exports**;
- The impact of the University of Edinburgh's **operating and capital expenditures**; and
- The impact of the University of Edinburgh's **contribution to tourism**.

Reflecting these channels of impact, the remainder of this report is structured as follows.

In **Section 2**, we outline our estimates of the impact of the University of Edinburgh's research and knowledge exchange activities. To estimate the impact of the world-leading research undertaken at the University of Edinburgh, we combine information on the research-related income accrued by the University of Edinburgh in 2021-22 with estimates from the wider economic literature on the extent to which public investment in research activity results in additional private sector productivity (i.e. positive 'productivity spillovers'). In addition, the analysis estimates the direct, indirect and induced impact associated with knowledge exchange activities at the University of Edinburgh, including the activities of associated spinout and start-up companies; contract research provided by the University; consultancy services provided by the University; business and community courses; and licensing of University Intellectual Property (IP) to other organisations.

In **Section 3**, we assess the improved labour market earnings and employment outcomes associated with higher education attainment at the University of Edinburgh. Through an assessment of the expected lifetime benefits and costs associated with educational attainment, we estimate the net economic benefits of the University of Edinburgh's teaching and learning activity to the University of Edinburgh's graduates and the public purse (through enhanced taxation receipts), focusing on the cohort of **8,390** UK domiciled students who started higher education qualifications at the University of Edinburgh in 2021-22.

In addition to these UK domiciled students, there were a further **10,020** international students commencing their studies in the 2021-22 cohort of the University of Edinburgh students. These students contribute to the value of UK educational exports through their tuition fees as well as their non-fee (i.e. living cost) expenditures during their studies. **Section 4** assesses the direct, indirect, and induced economic impacts generated by this fee and non-fee income associated with the University of Edinburgh's 2021-22 cohort of international students.

Given that the University of Edinburgh is a major employer and supports its core activities through significant expenditures, the University of Edinburgh's substantial physical footprint also supports jobs and promotes economic growth throughout the Scottish and UK economies. **Section 5** presents our estimates of the direct, indirect, and induced economic impacts associated with the operating and capital expenditures incurred by the University of Edinburgh in 2021-22.

In addition to domestic and international students and staff, the University of Edinburgh attracts a range of visitors to the Edinburgh region, including business visitors, friends and family visiting the University's staff and students, or participants in study trips to the University of Edinburgh. In **Section 6**, we estimate



the number of (overseas overnight<sup>9</sup>) visitors to Edinburgh in 2021-22 that resulted from the University of Edinburgh's activities, and assess the direct, indirect, and induced economic impacts generated by the associated tourism expenditure.

Finally, **Section 7** of this report **summarises** our main findings.

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<sup>9</sup> The analysis of the University of Edinburgh's contribution to tourism only focuses on visits to Edinburgh that involved overnight stays by visitors from overseas, as it is assumed that any domestic (day or overnight) visits to Edinburgh would have displaced activity from other regions of the UK (and should not be considered 'additional' to the UK economy).

## 2 The impact of the University of Edinburgh's research and knowledge exchange activities

### 2.1 Economic impact of the University of Edinburgh's research

In this section, we outline our analysis of the **economic impact of the University of Edinburgh's research activities**. We estimate both the direct effects of this research (captured by the research income accrued by the University, net of any public funding), as well as the productivity spillover effects from the University's research activities to the rest of the UK economy.

#### 2.1.1 Direct research impact

To estimate the **direct impact** generated by the University of Edinburgh's research activities, we used information on the total research-related income accrued by the University in the 2021-22 academic year, including:

- Income from **research grants and contracts** provided by:
  - **UK sources**, including the UK Research Councils; UK-based charities; central government bodies, local authorities, and health and hospital authorities; industry and commerce; and other UK sources;
  - **EU sources**, including government bodies, charities, industry and commerce, and other sources; and
  - **Non-EU sources**, including charities, industry and commerce, and other sources; and
- **Recurrent research funding** allocated to the University by the Scottish Funding Council (SFC)<sup>10</sup>.

Aggregating across these sources, the total research-related income accrued by the University in the 2021-22 academic year stood at **£423 million** (see Figure 5). Approximately **31% (£133 million)** of this income was received from the UK Research Councils, with an additional **21% (£91 million)** received through recurrent research grant funding from the Scottish Funding Council, **18% (£75 million)** from UK charities, and **14% (£59 million)** from other UK sources<sup>11</sup>. In addition, in terms of funding from international sources, **8% (£33 million)** of the University's research-related income was derived from EU research grants and contracts, and the remaining **8% (£32 million)** was from non-EU sources.

To arrive at the net direct impact of the University of Edinburgh's research activities on the UK economy, we deducted the **costs to the public purse** of funding the University of Edinburgh's research activities from the above total research income in 2021-22. These public costs include the funding provided by the UK Research Councils (**£133 million**), recurrent research grants provided by Scottish Funding Council (**£91 million**), and other research income from UK central government bodies, local authorities, and health and hospital authorities (**£47 million**). Deducting these total public purse costs (**£271 million**) from the above total research-related income (**£423 million**), we estimated that the **net direct impact** associated with the University of Edinburgh's research activity in the 2021-22 academic year stood at **£152 million**.

<sup>10</sup> This figure represents funding provided to the University by the SFC categorised as 'General fund research and knowledge exchange'.

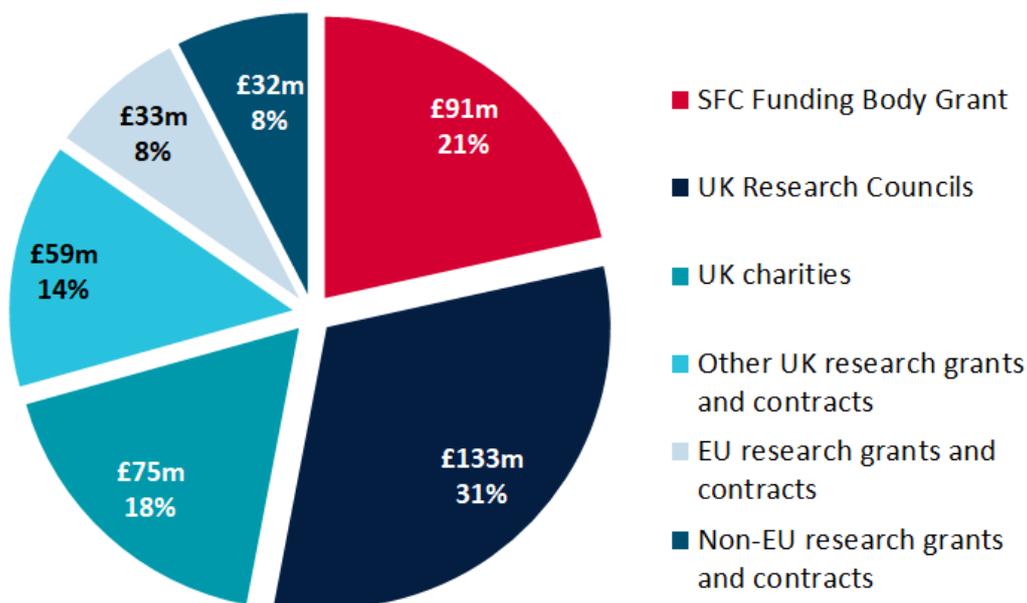
<sup>11</sup> This income from 'other UK sources' includes **£47 million** from UK central government bodies, local authorities, and health and hospital authorities; **£9 million** from UK industry and commerce; and **£4 million** from other sources (numbers may not add up precisely due to rounding).



**City Deal Region impact**

In order to provide some assessment of the geographical impact of the research income accrued by the University, previous analysis<sup>1</sup> looking at the economic impact of the University of Edinburgh (in 2013-14) assumed that just 10%<sup>1</sup> of benefits from research and adoption funding leaked outside of the Edinburgh City Deal Region.<sup>1</sup> Using this same assumption, approximately **£137 million** of the net direct research impact accrued in the Edinburgh City Deal Region.

**Figure 5** Research income received by the University of Edinburgh in 2021-22, £m by source of income



Note: All values are presented in 2021-22 prices and rounded to the nearest £1 million.  
 Source: London Economics’ analysis based on data provided by the University of Edinburgh

**2.1.2 Productivity spillovers**

In addition to the direct 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 induces (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<sup>12</sup>. For example, spillovers are enabled through direct R&D collaborations between universities and firms (such as Knowledge Exchange Partnerships), the publication and dissemination of

<sup>12</sup> 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.



research findings, or through university graduates entering the labour market and passing on their knowledge to their employers.

Of particular interest in the context of research conducted by universities, a study by Haskel and Wallis (2010)<sup>13</sup> investigates evidence of **spillovers from publicly funded Research & Development activities**. The authors analyse productivity spillovers to the private sector from public spending on R&D by the UK Research Councils and public spending on civil and defence-related R&D<sup>14, 15</sup>, and the relative effectiveness of these channels of public spending in terms of their impact on the 'market sector'. They find strong evidence of the existence of market sector productivity spillovers from public R&D expenditure originating from the UK Research Councils<sup>16</sup>. Their findings imply that, while there is no spillover effect associated with publicly funded civil and defence R&D, the marginal spillover effect of public spending on research through the Research Councils stands at **12.7 (i.e. every £1 spent on research through the Research Councils results in an additional annual output of £12.70 within the UK private sector)**.

Another study by Haskel et al. (2014) provides additional insight into the size of potential productivity spillovers from university research. Rather than estimating effects on the UK economy as a whole, the authors analyse the size of spillover effects from public research across different UK industries<sup>17</sup>. The authors investigate the correlation between the combined research conducted by the Research Councils, the higher education sector, and central government itself (e.g. through public research laboratories)<sup>18</sup>, interacted with measures of industry research activity, and total factor productivity within the different market sectors<sup>19</sup>. Their findings imply a total rate of return on public sector research of **0.2 (i.e. every £1 spent on public R&D results in an additional annual output of £0.20 within the UK private sector)**.

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

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

While these research spillovers are quantitatively large; they are in line with related findings from the (relatively limited) economic literature. A report for the (former) Department for Business, Innovation and Skills (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

<sup>13</sup> Also, see Imperial College London (2010) for a summary of Haskel and Wallis's findings.

<sup>14</sup> 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.

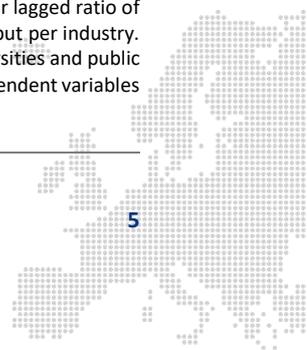
<sup>15</sup> This is undertaken by regressing total factor productivity growth in the UK on various measures of public sector R&D spending.

<sup>16</sup> 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.

<sup>17</sup> Haskel et al. (2014) use data on 7 industries in the United Kingdom for the years 1995 to 2007.

<sup>18</sup> A key difference to the multiplier for Research Council spending provided by Haskel and Wallis (2010) lies in the distinction between *performed* and *funded* research, as outlined by Haskel et al. (2014). In particular, whereas Haskel and Wallis (2010) estimated the impact of research *funding* by the Research Councils on private sector productivity, Haskel et al. (2014) instead focus on the *performance* of R&D. Hence, they use measures of the research undertaken by the Research Councils and the government, rather than the research funding which they provide for external research, (e.g. by higher education 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.

<sup>19</sup> 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.



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.<sup>20</sup> The comparable research multiplier is estimated at 10.71. Moreover, the report finds much higher returns, depending on the precise approach and sample used. Additionally, research from Australia finds a similar research spillover to Haskel and Wallis (2010), albeit with a slightly lower research multiplier of 9.76, which may be expected given the different country under consideration (Elnasri and Fox, 2017)<sup>21</sup>.

There is more limited research associated with general R&D multipliers (for other research income) although a report published for the Department for Business, Innovation and Skills, looking into the international benchmarking of the UK science and innovation system, notes a rate of return in the range of 20 to 50% (Department for Business, Innovation and Skills, 2014b).<sup>22</sup> This demonstrates that researchers using different methods and datasets find similar results with regards to estimates of research spillovers.

### What are the estimates of the productivity spillovers?

In order to estimate the productivity spillovers associated with the University's research activities, we apply these productivity spillover multipliers from the existing literature to the different types of research-related income received by the University of Edinburgh in 2021-22 (again see Figure 5). Specifically, assigning the multiplier of **12.7** to the research funding that the University of Edinburgh received from **UK Research Councils and UK charities**<sup>23</sup> in 2021-22 (amounting to **£208 million**), and assigning the multiplier of **0.2** to **all other research funding** received by the University of Edinburgh in that academic year (amounting to **£215 million**)<sup>24</sup>, we estimate that the research conducted by the University of Edinburgh in 2021-22 resulted in **total market sector productivity spillovers of £2,678 million**.

In other words, we infer a weighted average spillover multiplier associated with the University of Edinburgh's research activities of approximately **6.34** – i.e. **every £1 invested in the University's research activities generates additional annual economic output of £6.34 across the UK economy**. This captures the impact of the research undertaken by the University in 2021-22 within that same academic year (but excludes any additional (and likely substantial) impacts in subsequent years).<sup>25</sup>

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<sup>20</sup> 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.

<sup>21</sup> See London Economics (2018), *The economic impact of the Group of Eight in Australia* (Section 2.2.1). The authors find an elasticity of 0.175, which converted to a research spillover, equals 9.76.

<sup>22</sup> See also Salter and Martin (2001).

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

<sup>24</sup> 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.

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



### 2.1.3 Aggregate impact of the University of Edinburgh's research

**The estimated impact of the University of Edinburgh's research activities in 2021-22 stood at £2.83 billion.**

Combining the direct economic impact of the University's research (£152 million) with the estimated productivity spillovers associated with this research (£2,678 million), we estimate that the total economic impact associated with the University's research activities in 2021-22 stands at approximately £2,830 million (see Figure 6).

Comparing the £271 million of publicly funded research income received by the University of Edinburgh in 2021-22 to the £2,830 million impact from research activities, this suggests that for each £1 million of publicly funded research income, the University of Edinburgh's research activities generated an estimated total of £10.45 million in economic impact across the UK.

**Figure 6 Total impact of the University of Edinburgh's research activities in 2021-22, £m**



All values are presented in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the total indicated.

Source: London Economics' analysis

## Commercialisation of energy-efficient, sustainable and cost-effective domestic heat storage

Research carried out in the **School of Chemistry** at the University of Edinburgh, in collaboration with UK-based SME **Sunamp Ltd**, has resulted in the development of the **world's first commercially viable domestic heat battery**, which provides an **energy-efficient, sustainable, low-cost alternative** to the traditional gas boiler and water tank.

The core component of heat battery technology is a phase-change material (PCM) Sodium Acetate Trihydrate (SAT) that absorbs heat on melting and releases it on freezing. SAT is an ideal PCM for this purpose in domestic settings, however, development of a reliable heat battery depended on finding a way to stabilise SAT so that it could withstand repeated heating and cooling cycles for long-term use without degradation. Sunamp Ltd credits their success in overcoming this problem in large part to **Professor Colin Pulham's research** since 2009, which succeeded in producing their **new stable formulation PCM**, based on SAT that is **reproducible at scale** and at a **reasonable cost**.

Successful development of Sunamp heat batteries has resulted in **significant commercial, environmental and socio-economic benefits**. Sunamp Ltd has created **52 jobs** and **associated benefits** for more than **60 distributors, resellers and installers** across the UK, with partners in the **UK, Europe and South Korea**. By 31 December 2020, the company had raised investment of **£12m**; generated total revenue of **£10m**; sold **5,000 units** (20% internationally); had an order book worth **£50m**; and had signed a lease for a **factory in South Korea** providing capacity to meet rapidly rising demand from Asian markets.

Sunamp heat batteries offer **multiple environmental benefits** as a domestic heating system in comparison to traditional hot water boilers, cylinders and radiators. The batteries **greatly reduce heat loss**, can be **charged with off-peak electricity**, and are capable of delivering a **steadier supply** of heat. The effects of this increased efficiency are a **significant reduction in carbon emissions** (up to **26%** of the UK per capita residential emissions for each device), and a **reduction in energy usage** of up to **35%**. Where Sunamp batteries are installed in combination with solar panels, they displace combustion of gas in combi boilers to **address the net zero challenge** and provide a **cheap, renewable source** of hot water. The advertised **lifetime** of each battery is **50 years** and they can be **easily retrofitted** to existing properties to enable households to move to all-electric and renewable energy solutions.



Photo credit: Catherine Falls Commercial via Getty Images

For domestic users, these environmental benefits translate into **monetary savings** on bills (**£67 per year per household** in trials) and **increased comfort** in the home. Since 2013, Sunamp has worked with UK housing associations to install heat batteries in **1,500 properties**. Residents who previously experienced fuel poverty have reported **significant improvements** to their **quality of life**, while the heat battery system makes it simpler and cheaper for housing associations to meet their **statutory obligations** for energy efficiency and safety standards

## Software to inform public health responses to minimise damage from Ebola and SARS-CoV-2 outbreaks

The **BEAST** (Bayesian Evolutionary Analysis Sampling Trees) Software, created by **Professor Andrew Rambaut** in the School of Biological Sciences at the University of Edinburgh, has transformed the **speed** and **efficacy** with which global health organisations and governments can respond to **viral outbreaks**. Prior to 2013, genomic studies of infectious disease outbreaks were retrospective. In contrast, the BEAST software analyses gene sequence data from viruses sampled over very short time spans, enabling information about viral evolution and the rate and geographical spread of infections to be measured in real time, provide prospective information, and enable mitigation strategies.



Photo credit: hadynyah via Getty Images

Identification and control of the spread of epidemics is heavily reliant on such viral genome sequencing and the BEAST software has had **major impacts** on **international public policy, health** and **welfare** through informing mitigation strategies. This has minimised the potential damage from the recent **Covid-19** and **Ebola** outbreaks.

Professor Rambaut has also guided the development of global viral sequence data sharing through the **ARTIC network**, a large Wellcome Trust funded project that links together **diverse viral genome sequencing capabilities** throughout the world. This is frequently used by the World Health Organisation (WHO) to provide crucial sequencing capabilities that inform mitigation strategies for both epidemics and pandemics.

The impact on UK and worldwide policy in response to the **Covid-19 pandemic** was **wide ranging** and **significant**. Through the ARTIC network, Professor Rambaut's work and leadership resulted in the development of **internationally accepted protocols** for the **sequencing of SARS-CoV-2 RNA**. The BEAST software was used by the Imperial College London Covid-19 Response Team to analyse the coronavirus' evolution. As a member of the UK Government's Scientific Advisory Group for Emergencies (SAGE) committee, Professor Rambaut provided evidence regarding the virus transmission rate and his analysis was referenced by the UK Parliament in relation to the development and impact of international border restrictions. His work on understanding the origin of the coronavirus demonstrated its origins amongst animals, ultimately bats. The 'Pango' classification system of SARS-CoV-2 variants that Professor Rambaut and colleagues published in 2020 is now **universally used** on a **global basis**, including by the WHO, the UK Health Security Agency and the US Centers for Disease Control and Prevention.

In terms of **Ebola**, during the outbreak of 2014-16, Professor Rambaut's lab was able to analyse viral sequence data collected from patients within 24-48 hours. These data revealed the pathways of viral spread through communities and were used by **public health bodies** in **West Africa** to direct intervention methods by **locating transmission hotspots, deciding on appropriate mitigations** (such as contact tracing or a vaccine trial), and then **determining the effectiveness** of these **specific interventions**. BEAST was used to determine whether cases of Ebola came from a new transmission chain, a known transmission chain or from an individual infected months previously. This informed longer term follow up counselling with Ebola survivors and the production of **new WHO guidelines** for **disease outbreak management**, introduced in 2016.

## 2.2 Economic impact of the University of Edinburgh's knowledge exchange activities

In addition to its research activities, the University generates significant economic impacts through a range of knowledge exchange activities. The methodology of this section focuses on the impact on the UK economy and takes into account impact – in the first instance related to **spinout** and **start-up companies** linked to the University of Edinburgh - but also related to the wider knowledge exchange activities at the University, including:

- **Contract research** provided by the University;
- **Consultancy services** provided by the University;
- The **business and community courses** provided by the University;
- **Licensing of University IP** to other organisations.

Specifically, the analysis captures the direct, indirect, and induced economic impacts associated with a range of these knowledge exchange activities, defined as follows:

- **Direct effect:** This measures the direct economic activity generated by each of these activities, captured by the **turnover** of the University of Edinburgh's spinout and start-up companies; and the **income received** by the University of Edinburgh or **contract value** associated with contract research, consultancy services, business and community courses, and licensing of University IP.
- **Indirect effect ('supply chain impacts'):** The University of Edinburgh, and its associated spinout companies and start-ups, spend their income on purchases of goods and services from their suppliers, who in turn spend this revenue purchasing inputs to meet demand from the University or its associated spinout and start-up companies. This results in a chain reaction of subsequent rounds of spending across industries, often referred to as a 'ripple effect'.
- **Induced effect ('wage spending impacts'):** The employees of the University (supported by its income from knowledge exchange activities), and employees at spinouts and start-ups use their salaries 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 'ripple effect' throughout the economy as a whole.

The total of the direct, indirect, and induced effects constitutes the *gross* economic impact of the University of Edinburgh's knowledge exchange 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; 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<sup>26</sup>.

<sup>26</sup> It is important to note that, while the analysis takes account of *leakage* (e.g. adjusting for the extent to which any additional income for supplying industries might be spent on imports of goods and services from outside the UK), the estimated impacts here are *not* adjusted for *displacement* or *additionality* (e.g. the extent to which the IP income received by the University of Edinburgh 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 the University of Edinburgh's knowledge exchange activities in *gross* terms.

The direct, indirect, and induced impacts are measured in terms of monetary economic output<sup>27</sup>, gross value added (GVA)<sup>28</sup>, and full-time equivalent (FTE) employment supported. In addition to measuring these impacts on the UK economy as a whole, the analysis is broken down by geographic region and sector.

These impacts of the University of Edinburgh's knowledge exchange activities were estimated using **economic multipliers** derived from Input-Output tables, 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<sup>29</sup>. 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 (for 2016<sup>30</sup>) with a range of regional-level data<sup>31</sup> to achieve a granular breakdown by sector<sup>32</sup> and region<sup>33</sup>.

In addition to the impacts associated with the University of Edinburgh's knowledge exchange activities described in the following sections, a similar methodology is applied to estimate the direct, indirect, and induced economic effects associated with the University's export income (see Section 4), the operational and capital expenditures of the University of Edinburgh (see Section 5) and the tourism impact associated with the University (see Section 6).

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<sup>27</sup> Here, economic output is equivalent to income/turnover (e.g. the direct economic output associated with the University's spinout and start-up companies is captured by the organisations turnover. However, in some cases, because some organisations may operate in a 'pre-turnover' phase, investment into the company is used as a proxy for turnover for these firms in 2021-22. See Footnote 35 for more detail.

<sup>28</sup> Gross value added is used in National Accounting to measure the economic contribution of different industries or sectors and is defined as economic output minus intermediate consumption (i.e. the cost of goods and services used in the production process).

<sup>29</sup> Specifically, the analysis makes use of *Type II* multipliers, defined as  $[\text{Direct} + \text{indirect} + \text{induced impact}]/[\text{Direct impact}]$ .

<sup>30</sup> See Office for National Statistics (2020a).

<sup>31</sup> 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 (Office for National Statistics, 2019); employment by sector and region (Office for National Statistics, 2020b); gross disposable household income by region (Office for National Statistics, 2020c); population by region (Office for National Statistics, 2020d); and UK imports into each region and exports by each region, by commodity (Office for National Statistics, 2018).

<sup>32</sup> In terms of sector breakdown, the original UK Input-Output tables are broken down into 64 (relatively granular) sectors. However, the (wide range of) regional-level data required to generate the multi-regional Input-Output model is not available for such a granular sector breakdown. Instead, the multi-regional Input-Output model is broken down into 10 more high-level sector groups (see Table 21 in Annex A2.1 for more information).

<sup>33</sup> 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) in 2016 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.

## FastBlade: tidal turbine blade testing facility



Photo credit: Lesley Martin

The world's first **rapid testing facility** for **tidal turbine blades** will speed up the **development** of **marine energy technologies** while helping to **reduce cost** and maintaining Scotland's position at the **forefront** of **tidal energy development**.

**FastBlade**, which opened in 2022 is a partnership between the University of Edinburgh and **Babcock International**, based in Rosyth, Fife and made possible through **£4.1 million** in funding from the University

along with a **£1.8 million grant** from the **Engineering and Physical Sciences Research Council** (EPSRC), part of **UK Research and Innovation** (UKRI).

The **pioneering** technology at the facility, **stress tests** blades made from composite materials – which must withstand harsh ocean conditions for 20 years – more **quickly**, and using **significantly less energy** than any other facility of its kind. The facility's **75-tonne** reaction frame is capable of exerting powerful forces on turbine blades more than **50 feet** long. Tests on blades are carried out using a system of **powerful hydraulic cylinders**, which in less than three months, can simulate the stresses placed on the structures during two decades at sea. It replicates the complex forces to which tidal turbines are exposed at sea using unique digital and hydraulic technology systems developed by engineers at the University of Edinburgh.

The facility came about through a partnership with Babcock International, a leading provider of complex engineering services who have worked with the University for many years. The latest venture arose from an **Edinburgh Innovations workshop** that allowed Edinburgh academics to demonstrate to Babcock how they could apply their research to help the business overcome a number of challenges.

Following this, Babcock hosted two Edinburgh University academic secondments at their manufacturing facility in Rosyth. Through his secondment work, data architect Dr Nick Brown effectively demonstrated the value of exploiting Babcock's vast data resources to **reduce operational costs**, **improve time to results**, and underpin the company's **technical strategy**. Over time the partnership developed, resulting in the opening of the **multi-million-pound composite structures research facility**. As an **international centre of innovation**, FastBlade researches and tests composite materials and structures for a variety of industries: tidal energy, marine, transport, nuclear and aerospace.

FastBlade also helps meet requirements to **develop digital skills** in the region - in partnership with Fife College - as set by the Edinburgh and South East Scotland City Region Deal and is part of a **transformational programme** approach to skills – going from school leavers through to further and higher education.

### 2.2.1 Economic impact of the University of Edinburgh's spinout and start-up companies

To assess the direct impact associated with the University of Edinburgh's UK-based spinout and start-up companies, we made use of information on **turnover** or **investment funding** data (as a measure of economic output) and **FTE employment** associated with a total of **46** University of Edinburgh spinout companies and **36** start-ups that were active and based in the UK in 2021-22, (where available)<sup>34</sup>. The information on each company's turnover and employment was based on data provided by the University of Edinburgh, supplemented with information from Bureau van Dijk's FAME database (based on Companies House information) to validate and fill any gaps where possible<sup>35</sup>. The **direct gross value added** generated was estimated by multiplying the **turnover** of each firm by the **average ratio** of **GVA** to **output** among organisations within the given company's industry and region<sup>36,37</sup>.

Considering spinout and start-up companies in turn, we adopt the approach outlined above to estimate the direct impact associated with the activities of all the University of Edinburgh spinout companies for which data was available. For the academic year 2021-22, this was estimated at **£51 million** in economic output (i.e. turnover) terms, **480 FTE staff**, and **£33 million** of gross value added. In a similar manner, the direct impact associated with the activities of the University of Edinburgh's start-up activities in 2021-22 was estimated at **£23 million** in economic output terms, **335 FTE staff**, and **£13 million** of gross value added.

#### City Deal Region impact

Out of this **£51 million** of direct economic output, approximately **£50 million (98%)** is associated with spinouts headquartered in the City Deal Region. For the **£23 million** of economic output from start-up companies, approximately **£22 million (95%)** of output was from companies located in the City Deal Region. As such, approximately **£71 million<sup>1</sup> (97%)** of direct impact from University spinouts and start-ups might be considered to originate from the City Deal Region.

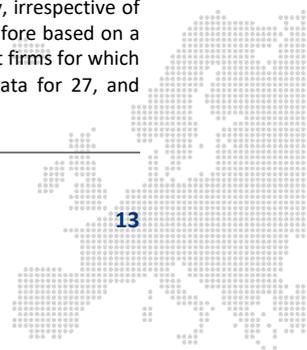
<sup>34</sup> The analysis excludes 'spin-in' companies, defined as "Companies working closely with University of Edinburgh researchers to develop a core part of their technology". We also exclude two spinouts which are primarily based outside of the UK. Note also that the information is based on each company's 2021-22 financial year, which does not necessarily coincide with the 2021-22 academic year and varies across companies.

<sup>35</sup> In spite of using FAME data to fill gaps, it is likely that the combined University of Edinburgh/FAME data still provide an incomplete estimate of the total turnover, GVA, or employment of the University of Edinburgh's spinout and start-up companies. This particularly applies to relatively small companies falling below the reporting thresholds required by Companies House (implying that their financials would not be included in the FAME data). Information provided by the University of Edinburgh contained data for the turnover of 8 of the 46 UK-based active spinouts, and 10 of the 36 UK-based active start-ups. Whilst information from FAME added data for an additional 2 spinouts and 2 start-ups.

Due to the likelihood that analysis based on such a small proportion of the University's associated spinouts and start-ups would significantly underestimate the impact of the University's affiliated companies, data on the investment received by spinouts and start-ups in the 2021-22 financial year was used to supplement the analysis. This investment data serves as a proxy for turnover in cases where turnover information was not available. Investment data was used for 14 of the 46 spinouts and 16 of the 36 start-ups.

<sup>36</sup> Again, these ratios were derived based on the above-described multi-regional Input-Output model. Each firm's main industry classification was based on information provided by the University of Edinburgh, with any gaps again filled using information from FAME. Each firm's main regional location was based on the region of the main registered address of the company recorded in FAME, apart from two spinout companies (Kynos Therapeutics and Resolution Therapeutics) which were clearly primarily active in Scotland rather than their main registered address which was outside of Scotland.

<sup>37</sup> The analysis made use of *any* resulting turnover/investment, employment, or GVA information available for a given company, irrespective of whether complete data (i.e. in terms of turnover, GVA *and* employment) was available for that firm. The direct impact is therefore based on a total of 23 spinout firms (out of the 46 active UK-based companies) for which turnover information was available, and 40 spinout firms for which employment information was available. Of the 36 start-ups considered in the analysis, we were able to obtain turnover data for 27, and employment data for 35.



We applied relevant **economic multipliers** (derived from our above-described Input-Output analysis) to estimate the **total direct, indirect, and induced** economic impacts of spinout and start-up companies associated with the University of Edinburgh. Specifically, we assigned relevant economic multipliers to each active spinout and start-up company in 2021-22, based on each firm’s industry classification and the region of its main registered office address. Table 3 presents the resulting average multipliers across all spinout companies and Table 5 presents the corresponding figures for start-ups (weighted by the underlying (direct) turnover, employment, and GVA associated with each firm)<sup>38</sup>.

Based on these estimates, in terms of economic output, we assume that every **£1 million** of turnover directly accrued by the University of Edinburgh’s **spinout** companies generates a **total of £2.17 million** impact throughout the UK economy, of which **£1.62 million** is generated in Scotland. In terms of employment, we assume that, for every **1,000** (FTE) staff employed by these spinout companies, a **total of 2,180** staff are supported throughout the UK, of which **1,630** are supported in Scotland.

**Table 3 Economic multipliers associated with the activities of the University of Edinburgh’s spinout companies**

Location of impact	Output	GVA	FTE employment
Scotland	1.62	1.58	1.63
Total UK	2.17	2.05	2.18

Note: All multipliers constitute Type II multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].

Source: London Economics’ analysis

Applying these multipliers to the above direct impacts, the total economic impact associated with the activities of the University’s spinout companies in the 2021-22 academic year was estimated to be **£111 million** across the UK economy, of which **£83 million (75%)** occurred in Scotland (see Table 4). The estimated total number of FTE jobs supported stood at **1,040** (of which **780** (or **75%**) were located in Scotland). The corresponding estimate in terms of GVA stood at **£67 million** (of which **£52 million** (or **77%**) occurred in Scotland)<sup>39</sup>.

**Table 4 Economic impact associated with the University of Edinburgh’s spinouts in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£83m	£52m	780
Total UK	£111m	£67m	1,040

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

Source: London Economics’ analysis

Based on the same approach, we assume that every **£1 million** of turnover directly accrued by the University of Edinburgh’s start-up companies generates a **total of £2.26 million** impact throughout the UK economy, of which **£1.59 million** occurs in Scotland. In terms of employment, we assume that, for every **1,000** (FTE) staff employed by these start-up companies, a **total of 2,370** staff are supported throughout the UK, of which **1,650** are supported in Scotland.

The difference between the average economic multipliers associated with the spinout (Table 3) and start-up (Table 5) companies reflects the differing regional and sectoral make-up of these companies, since some sectors or regions are associated with greater indirect and induced impacts per £1 million of revenue.

<sup>38</sup> Again, the table provides multipliers for the impact on Scotland and the UK economy as a whole. A full breakdown of impacts by regions (as well as sector) - across all of the University of Edinburgh’s knowledge exchange activities – is provided in Section 2.2.4.

<sup>39</sup> Again, a full breakdown of the total impact of all of the University of Edinburgh’s knowledge exchange activities is provided in Section 2.2.4.



**Table 5 Economic multipliers associated with the activities of the University of Edinburgh's start-up companies**

Location of impact	Output	GVA	FTE employment
Scotland	1.59	1.60	1.65
Total UK	2.26	2.24	2.37

Note: All multipliers constitute Type II multipliers, defined as  $[\text{Direct} + \text{indirect} + \text{induced impact}]/[\text{Direct impact}]$ .

Source: London Economics' analysis

Using these multipliers, the total economic impact associated with the activities of the University's start-ups was estimated to be **£51 million** across the UK economy, of which **£36 million (70%)** occurred in Scotland (see Table 6). The estimated total number of FTE jobs supported stood at **785** (of which **550** (or **70%**) were located in Scotland). The corresponding estimate in terms of GVA stood at **£29 million** (of which **£20 million** (or **71%**) occurred in Scotland)<sup>40</sup>.

**Table 6 Economic impact associated with the University of Edinburgh's start-ups in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£36m	£20m	550
Total UK	£51m	£29m	785

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

Source: London Economics' analysis

### Total impact of the University of Edinburgh's spinout and start-up companies

The **total direct impact** of spinout and start-up companies associated with the University of Edinburgh was estimated to be **£74 million** in economic output (i.e. turnover) terms, supporting **810 FTE staff**, and generating **£46 million** of gross value added<sup>41</sup>.

This led to a **total direct, indirect and induced economic impact** of **£162 million** across the UK economy, of which **£119 million (73%)** occurred in Scotland. The estimated total number of FTE jobs supported stood at **1,830** (of which **1,330 (73%)** were located in Scotland)<sup>42</sup>. The corresponding estimate in terms of GVA stood at **£96 million** (of which **£72 million (75%)** occurred in Scotland).

<sup>40</sup> Again, a full breakdown of the total impact of all of the University of Edinburgh's knowledge exchange activities is provided in Section 2.2.4.

<sup>41</sup> Note totals may not add up precisely due to rounding.

<sup>42</sup> Note totals may not add up precisely due to rounding.

## Old College Capital

**Old College Capital (OCC)** is the University of Edinburgh's **in-house venture investment fund**, managed by **Edinburgh Innovations (EI)**. The Fund aims to **support** the **University's research, staff** and **students** by **investing** in **high-growth, early-stage businesses** associated with the University, and follows a co-investment model by **partnering** with **experienced private sector investors**. Working closely with founders, investors, and the University ecosystem, OCC **accelerates** the **journey** of **start-ups** and **spinouts** that are looking to make a **positive impact** on **people** and our **planet**. Committed to investing for the long term, OCC **reinvests** its **returns** so that it can support the next **generation** of **early-stage companies**.



Photo credit: The University of Edinburgh

### Investing in impactful ideas and technologies

OCC primarily invests in University of Edinburgh-associated spinout and start-up companies<sup>43</sup>. Responsible, early-stage investment helps ideas, research, and innovation from the University transition out of labs and classrooms into the wider world where they can make an **impact** at **scale**. Successful spinouts that have benefited from OCC support include **Invizius**, which is developing solutions to **improve** the **treatment** and **prognosis** for **dialysis patients**. OCC first invested in Invizius in 2019, following its spinout in 2018. Working with a strong syndicate of co-investors, OCC has helped the company **navigate technical** and **regulatory milestones** building towards its **first clinical trials**. Among the many start-up companies that OCC has supported is **MiAlgae**, which uses co-products from **whisky distillation** to grow **Omega-3-rich algae** for use as a **raw material** in **agricultural food products**. Founded in 2018 by Douglas Martin while he was studying for a Master's degree, OCC was one of the first investors in MiAlgae, an exciting circular economy business that's helping to **ease** the **pressure** on **marine ecosystems**, while simultaneously **boosting** the **whisky industry's sustainability credentials**.

Where there is capacity, OCC can also support spin-in opportunities<sup>44</sup>. Previous spin-ins that have benefitted from OCC support include **Sunamp** (mentioned above), which is a pioneer of **innovative thermal storage solutions**. A **longstanding collaborator** with the University's School of Chemistry, Sunamp

<sup>43</sup> A spinout is a new company founded on intellectual property (IP) that has been generated from research undertaken at the University. The University owns founding shares in return for the exclusive license of the IP, support services, and/or other assets transferred to the company. A start-up is a new company formed by a University student or staff member who is actively engaged with the University. Any related IP will be owned by the founder (not the University) and transferred to the company.

<sup>44</sup> A spin-in is a company that has approached the University for collaboration, and where a University student or staff member is actively involved in the development of the company's technology or IP.

has recently been awarded the **prestigious King's Award for Enterprise**. OCC first invested in Sunamp in 2015, and has supported the company as it secured first revenue and began to scale.

### **The value of OCC support**

OCC comprises a team of **deep-tech, early-stage investment specialists** who are passionate about getting ideas from University of Edinburgh staff, students and research out into the world to make a **difference**. The team works collaboratively with a wide range of partners and companies, and has **strong relationships** with over **150 investors**. Recognising that different investors bring different perspectives, experiences and expertise, the team supports University of Edinburgh companies to find the right group of investors to help them flourish.

OCC is an **active** and **engaged shareholder** for the companies it invests in; does not charge arrangement, research or ongoing monitoring fees on invested funds; and has extensive **transaction** and **exit experience**. By providing company founders with the benefit of its expertise and significant investor network, OCC ensures that University start-ups and spinouts **fulfil their potential** and make their ideas work for a **better world**.

### 2.2.2 Economic impact of the University of Edinburgh's other knowledge exchange activities

In this section, we estimate the economic impact of the University of Edinburgh's knowledge exchange activities that are separate from the spinout and start-up activities. Amounting to approximately **£74 million** of income, these activities include:

- **Licensing of University IP** to other organisations;
- **Consultancy services** provided by the University;
- **Contract research** provided by the University;
- The **business and community courses** provided by the University.

The subsequent analysis below identifies the economic impact on the Scottish and UK economies, however, given that all of these other knowledge exchange activities are focused in or in close proximity to the University, the entire **£74 million** of direct impact from these particular knowledge exchange activities can be attributed to the City Deal Region, while the entire impact on the Scottish and UK economies can be said to originate from activities undertaken in the City Deal Region.

#### IP licensing

To measure the direct impact associated with the University's other IP licensing activities, we made use of data from the University's Higher Education Business and Community Interaction submission (HE-BCI) on the total IP licensing income received by the University of Edinburgh in the 2021-22 academic year, which stood at **£4.6 million**. While this provides an estimate of the direct impact in economic output terms, to arrive at comparable estimates in GVA and employment terms, we multiplied this direct output by the average ratios (of GVA to output and of FTE employees to output) among organisations within the government, health, and education sector located in Scotland.<sup>45</sup> Applying these assumptions, we estimate that the University's IP income in 2021-22 *directly* generates **£3.1 million** in GVA and supports **45** full-time equivalent jobs.<sup>46</sup>

To estimate the total direct, indirect, and induced impacts associated with the University of Edinburgh's IP licensing, we then multiplied these direct impacts by the estimated average economic multipliers associated with organisations in the government, health, and education sector in Scotland<sup>47</sup>. These multipliers (for the impact on Scotland and the UK economy as a whole) are presented in Table 7<sup>48</sup>. Based on these estimates, in terms of economic output, we assume that every **£1 million** of IP income accrued by the University of Edinburgh generates an *additional* **£1.54 million** of impact throughout the UK economy, of which **£0.83 million** is generated in Scotland. In terms of employment, we assume that, for every **1,000** (FTE) staff employed directly by the University of Edinburgh (supported by its IP income), an additional **1,020** staff are supported throughout the UK, of which **560** are supported within Scotland.

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<sup>45</sup> This approach is based on the fact that the IP income is generated by the University of Edinburgh itself. In other words, we assume that the income accrued by the University of Edinburgh supports the same levels of GVA and employment (in relative/proportionate terms) as the income accrued by other institutions operating in Scotland's government, health, and education sector. The ratios of GVA to output and employment to output were derived from the above-described multi-regional Input-Output model.

<sup>46</sup> All employment estimates have been rounded to the nearest 5.

<sup>47</sup> i.e. we assume that the expenditure patterns of the University of Edinburgh are the same as for other institutions operating in Scotland's government, health and education sector.

<sup>48</sup> A full breakdown of impacts by regions (as well as sector) - across all the University of Edinburgh's knowledge exchange activities - is provided in Section 2.2.4.

**Table 7 Economic multipliers associated with the University of Edinburgh's other knowledge exchange activities**

Location of impact	Output	GVA	FTE employment
Scotland	1.83	1.81	1.56
Total UK	2.54	2.46	2.02

Note: All multipliers constitute Type II multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].

Source: London Economics' analysis

Applying these multipliers to the above direct impacts, the analysis indicates that the estimated total economic impact associated with the University of Edinburgh's IP licensing activities in the 2021-22 academic year stood at approximately **£11.7 million** across the UK economy, of which **£8.4 million (72%)** was generated in Scotland (see Table 8)<sup>49</sup>. The estimated total number of jobs supported (in FTE) stood at **90** (of which **70** or **78%** were located in Scotland), while the corresponding estimate in terms of GVA stood at **£7.7 million** (of which **£5.7 million** or **74%** occurred in Scotland)<sup>50</sup>.

**Table 8 Economic impact associated with the University of Edinburgh's IP licensing in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£8.4m	£5.7m	70
Total UK	£11.7m	£7.7m	90

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

Source: London Economics' analysis

### Consultancy services

In 2021-22, the University of Edinburgh received approximately **£35.9 million** in revenues associated with consultancy services, of which approximately **£7.2 million** was received for services provided to SMEs, **£16.4 million** from other (non-SME) commercial businesses and **£12.3 million** from non-commercial organisations.

Adopting the same approach as presented previously to estimate the total direct, indirect and induced effect throughout Scotland and the UK economy associated with the contract consultancy income (using the same multipliers presented in Table 7), the analysis indicates that the estimated total economic impact associated with the University of Edinburgh's provision of consultancy services in the 2021-22 academic year stood at approximately **£91.2 million** across the UK economy, of which **£65.7 million (72%)** was generated in Scotland (see Table 9). The estimated total number of jobs supported (in FTE) stood at **945** (of which **730** or **77%** were located in Scotland), while the corresponding estimate in terms of GVA stood at **£53.7 million** (of which **£39.5 million** or **74%** occurred in Scotland).

**Table 9 Economic impact associated with the University's consultancy income in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£65.7m	£39.5m	730
Total UK	£91.2m	£53.7m	945

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

Source: London Economics' analysis

<sup>49</sup> Please note it is likely that these estimates of economic impact underestimate the true value of the University's IP, since the number of sales and royalty rates derived from the licensing arrangements are unknown.

<sup>50</sup> Again, a full breakdown of the estimated total impact of the University of Edinburgh's knowledge exchange activities is provided in Section 2.2.4.

## Contract research

Reflecting the depth, breadth and impact of the research routinely undertaken by the University of Edinburgh, in addition to the research income identified in Figure 5, the University of Edinburgh received approximately **£14.1 million** in research contract income in Scotland, of which approximately **£3.2 million** related to income generated from research contracts delivered to SMEs and **£11.0 million** related to income generated from research contracts delivered to other (non-SME) commercial businesses.

Adopting the same approach as presented above to estimate the total direct, indirect and induced effect throughout Scotland and UK economies associated with the consultancy income (and again using the same multipliers presented in Table 7), the analysis indicates that the estimated total economic impact associated with the University of Edinburgh's provision of research contract services in the Scotland academic year stood at approximately **£35.9 million** across the UK economy, of which **£25.9 million (72%)** was generated in Scotland (see Table 10). The estimated total number of jobs supported (in FTE) stood at **370** (of which **285** or **77%** were located in Scotland), while the corresponding estimate in terms of GVA stood at **£21.1 million** (of which **£15.6 million** or **74%** occurred in Scotland).

**Table 10 Economic impact associated with the University of Edinburgh's contract research income in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£25.9m	£15.6m	285
Total UK	£35.9m	£21.1m	370

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

Source: London Economics' analysis

## Business and community courses

Finally, in this section we consider the income generated from business and community courses. The University of Edinburgh received approximately **£19.3 million** in income in 2021-22 associated with business and community courses. This total consisted entirely of research income related to business and community courses provided to individuals.

Using the same multipliers presented in Table 7, the analysis indicates that the estimated total economic impact associated with the University of Edinburgh's business and community courses in the 2021-22 academic year stood at approximately **£48.9 million** across the UK economy, of which **£35.2 million (72%)** was generated in Scotland (see Table 11). The estimated total number of jobs supported (in FTE) stood at **505** (of which **390** or **77%** were located in Scotland), while the corresponding estimate in terms of GVA stood at **£28.8 million** (of which **£21.2 million** or **74%** occurred in Scotland).

**Table 11 Economic impact associated with the University of Edinburgh's business and community course income in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£35.2m	£21.2m	390
Total UK	£48.9m	£28.8m	505

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

Source: London Economics' analysis

### 2.2.3 Total impact of the University of Edinburgh's knowledge exchange activities

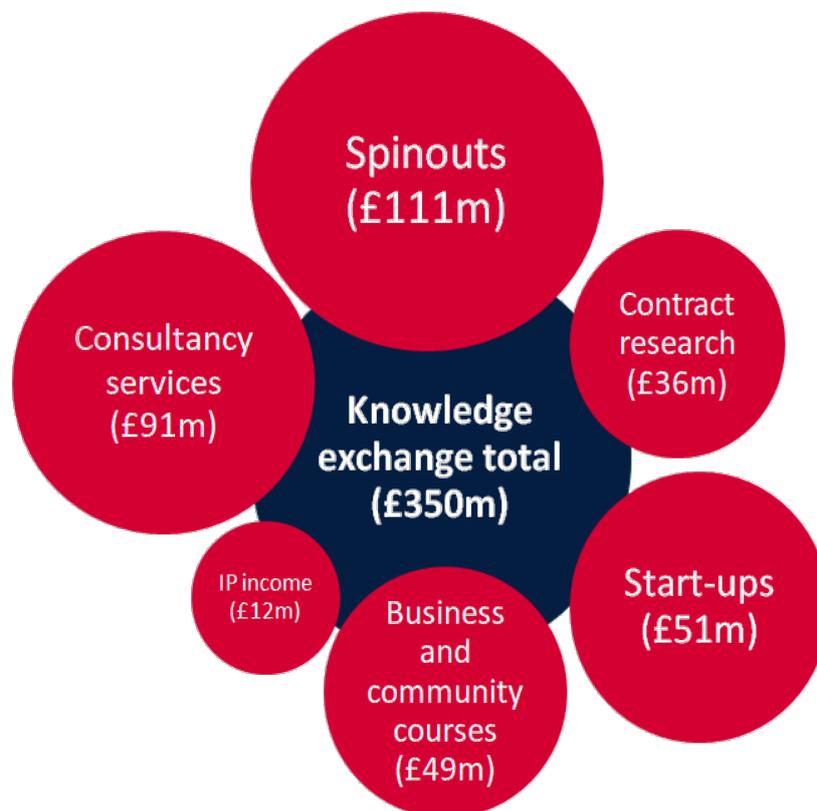
In the 2021-22 academic year, the University of Edinburgh's knowledge exchange activities generated an estimated **£350 million** across the UK economy, of which **£254 million (73%)** was generated in Scotland (see Table 12). The estimated total number of jobs supported (in FTE) stood at **3,745** (of which **2,805** or **75%** were located in Scotland), while the corresponding estimate in terms of GVA stood at **£207 million** (of which **£154 million** or **74%** occurred in Scotland).

**Table 12 Economic impact associated with the University of Edinburgh's knowledge exchange activities in 2021-22**

Location of impact	Output, £m	GVA, £m	# of FTE employees
Scotland	£254m	£154m	2,805
Total UK	£350m	£207m	3,745

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

**Figure 7 Estimated total economic impact associated with the University of Edinburgh's knowledge exchange activity in 2021-22, £m**



Note: All values are presented in economic output in 2021-22 prices, rounded to the nearest £1 million, and may not add up precisely to the totals indicated due to rounding. The size of the bubbles is not to scale.

*Source: London Economics' analysis*

**Box 1**      **Neural Network speech recognition algorithms lead to accurate speech-to text transcription deployed in diverse products and services**

**Speech recognition algorithms** developed in the **School of Informatics** at the University of Edinburgh have led to **major advances** in speech recognition technologies, resulting in applications across a range of **commercial products** and **public services worldwide**.

Research by Professor Steve Renals and Dr Peter Bell tackled the twin challenges of recording speech at a distance in challenging acoustic conditions, and **using AI** to train systems across multiple languages without having to transcribe large quantities of speech data. They also developed an automated approach to punctuating speech recognition output to enhance its readability and utility.

AI start-up company **Emotech** was founded in 2014 and has created over 50 jobs in the UK and China. Their core product, **Automatic Speech Recognition (ASR)**, drew on the University of Edinburgh research relating to distant speech recognition and forms the basis of the company's first two major products: an **award-winning AI robot** assistant named Olly, and a **Virtual Education Platform (VEP)** for learning to speak English. The VEP was made commercially viable due to the University of Edinburgh breakthroughs in language training systems. This led to a collaboration with Huawei, and as a result the VEP is being rolled out across China, the Middle East, South America and South Africa.

Spinout company **Quorate**, founded in 2012, also drew on the University of Edinburgh research to create its main product, **QSpeech**, which has had significant success in subtitling and editorial work. QSpeech has been sold on an extended trial basis to Hansard, the UK's parliamentary record, to record and automatically transcribe proceedings in the **Houses of Parliament**, debating chamber and committee meetings, and to subtitle parliamentary video streaming for the benefit of large public audiences. Hansard have reported effusive praise for the technology from editorial staff who are impressed with its accuracy, efficiency and usefulness in streamlining their workflow. Anecdotally, the technology can be a great help in mitigating repetitive strain injury from typing. Quorate's technology is also in use in parliaments in New Zealand, Australia, Canada, Guyana, Jersey and the Isle of Man. The company was acquired by the London Stock Exchange Group in 2021.

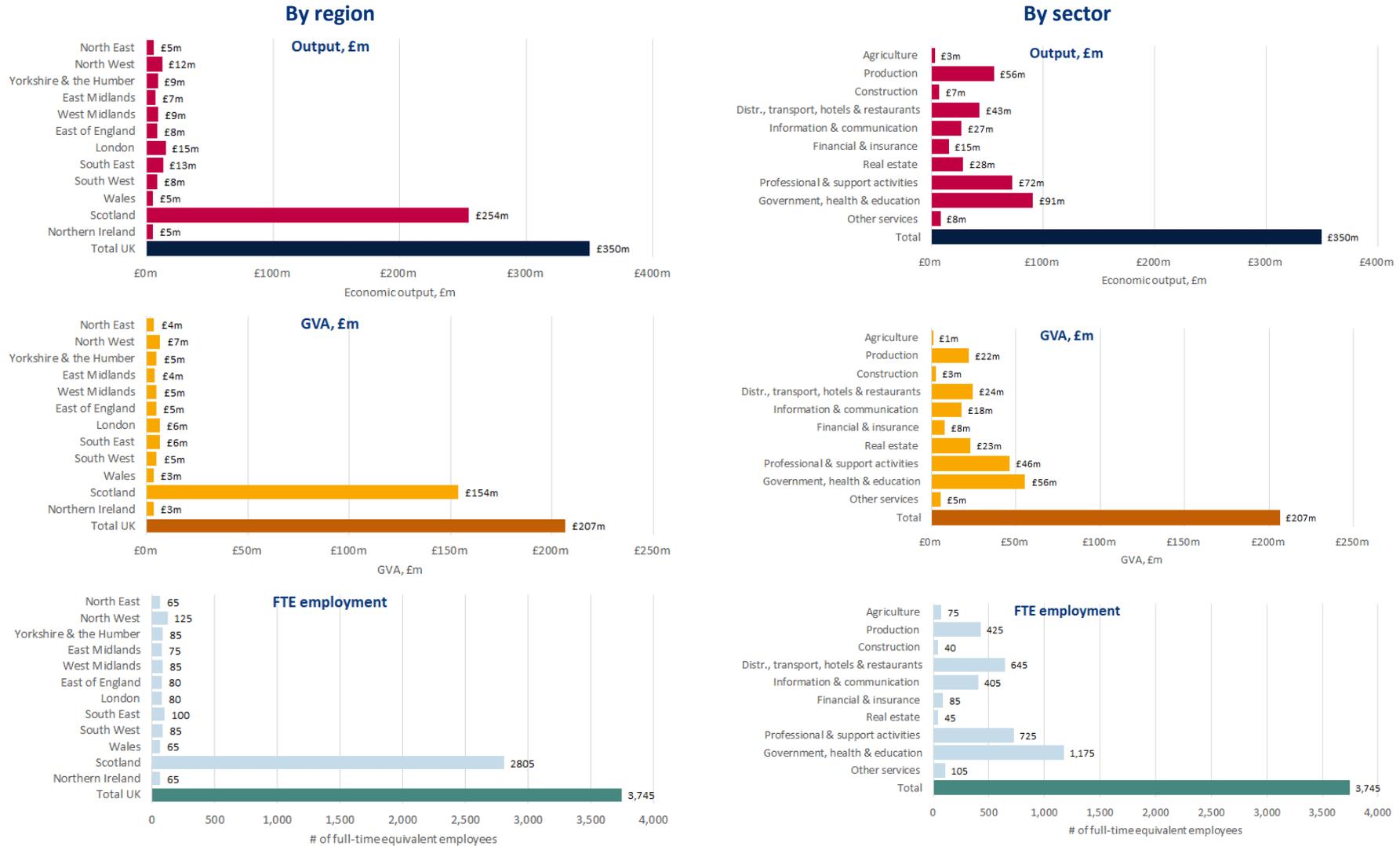
Methods underpinning the subtitling technology have been rolled out for use in **television and streaming services** by Red Bee Media, which provides subtitling for broadcasters including the UK's BBC and Channel 4, Australia's SBS and the US's ABC, as well as for unregulated video content on platforms such as YouTube and Facebook. Red Bee Media has noted **significantly improved economic efficiency** in their service, and has been able to pass on the resulting **cost-savings to their customers**. In the UK, these subtitling capabilities help broadcasters to meet requirements set by Ofcom in a cost-effective manner, and help to increase accessibility for millions of people with hearing loss as well as for international viewers.

**2.2.4**      **Regional and sectoral impact of the University of Edinburgh's knowledge exchange activities**

Combining the economic impacts generated by the University's intellectual property licensing, spinout companies, start-ups, contract research, business and community courses, consultancy services, Figure 8 presents the aggregate impact associated with the University's knowledge exchange impacts in the 2021-22 academic year (across all regions, as well as by sector).



**Figure 8** Estimated total economic impact associated with the University's knowledge exchange activities in 2021-22, by region and sector



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



In terms of **economic output** (top panel), the analysis estimates that, in 2021-22, these knowledge exchange activities generated an estimated total of **£350 million** of economic output across the UK economy:

- Considering the breakdown by region, while the majority of this impact (**£254 million, 73%**) was generated in **Scotland**, there were also significant impacts occurring in other regions across the UK, particularly in **London (£15 million, 4%)**, and the **South East (£13 million, 4%)**.
- In terms of sector, the University’s knowledge exchange activities resulted in particularly large impacts within the **government, health and education sector (£91 million, 26%)**, the **professional and support activities sector (£72 million, 21%)**, the **production sector (£56 million, 16%)** and the **distribution, transport, hotels and restaurants sector (£43 million, 12%)**.

In terms of **gross value added** (middle panel), the impact was estimated to be approximately **£207 million** across the UK economy as a whole, of which **£154 million** was accrued within Scotland. Finally, the University’s knowledge exchange activities supported an estimated **3,745 full-time equivalent jobs** across the UK as a whole, of which the majority (approximately **2,805, 75%**) were located within Scotland.

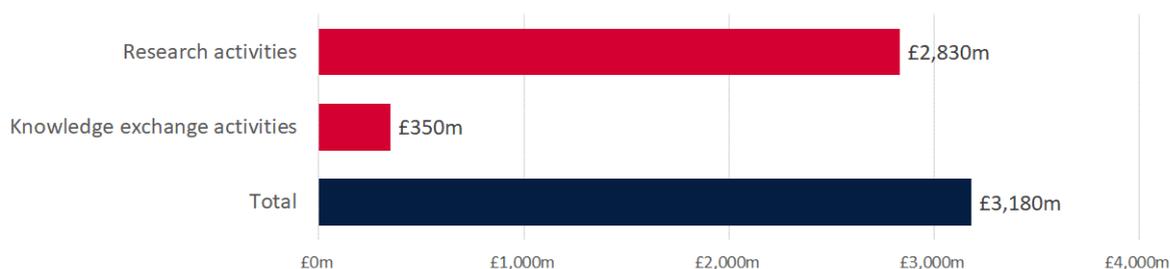
### 2.3 Total impact of the University of Edinburgh’s research and knowledge exchange activities

**The impact of the University of Edinburgh’s research and knowledge exchange activities in 2021-22 stood at £3.18 billion.**

Combining the impact of the University of Edinburgh’s research activities (**£2,830 million**) with the estimated impact associated with the University’s knowledge exchange activities (**£350 million**), we estimate that the total economic impact associated with the University of Edinburgh’s research and knowledge exchange activities in 2021-22 stands at approximately **£3,171 million** (see Figure 9).

Comparing the **£423 million** of research income received by the University of Edinburgh in 2021-22 to the **£3,180 million** impact from research and knowledge exchange activities, this suggests that **for each £1 million of research income, the University of Edinburgh’s research and knowledge exchange activities generated a total of £7.53 million in economic impact across the UK.**

**Figure 9 Total impact of the University of Edinburgh’s research and knowledge exchange activities in 2021-22, £m**



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

Source: London Economics’ analysis



## Technology Transfer and Enterprise Support creates impact from research

At the University of Edinburgh, it is policy to promote the **commercial potential** of any new ideas, discoveries or inventions arising from research, and there is an **established commercialisation process** for **transferring** them to **industry** through **Edinburgh Innovations (EI)**. EI guides University staff on how best to **create impact** and **commercialise** their **research**, depending on the type and stage of technology, the market demand, and each individual researcher's ambitions.

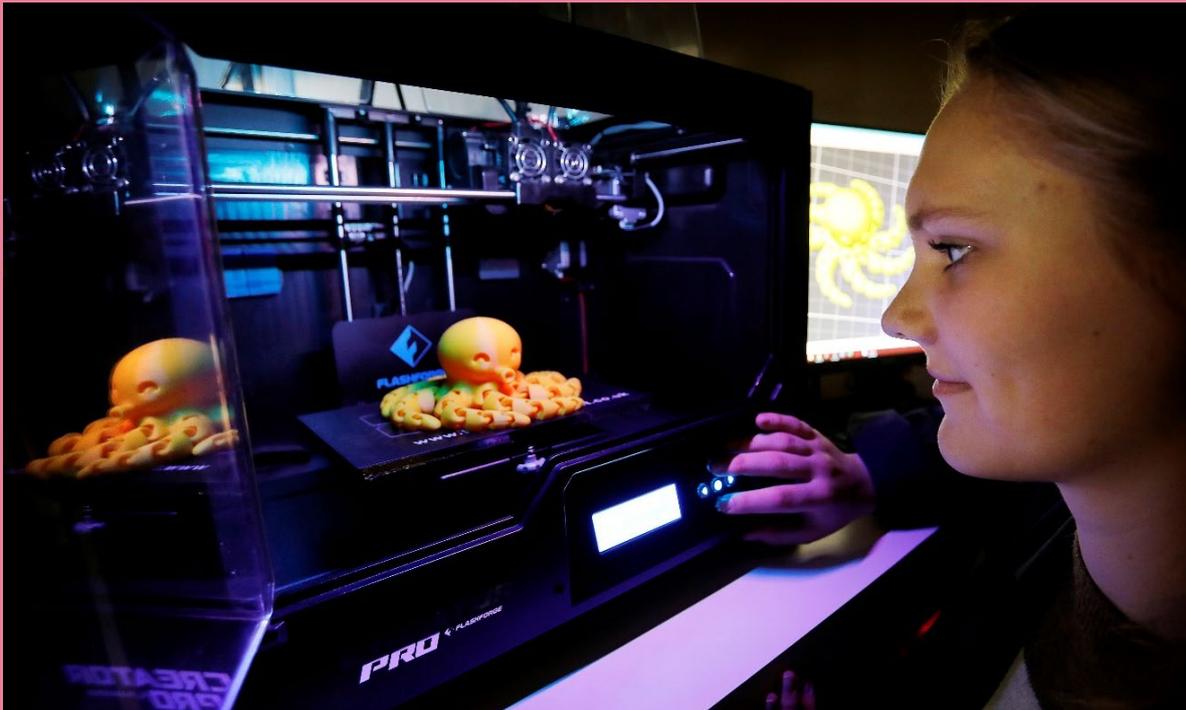


Photo credit: Paul Dodds

### Licensing technology

**Licensing** technology to an existing and market-established company enables the University to maintain ownership of its **intellectual property (IP)** and oversee that it is **developed** and **commercialised** by the **licensee**, while simultaneously generating **royalty income** from the use of that IP by industry. Licensing is generally best suited to technologies with discrete identifiable applications and a well-understood market, as was the case with the breakthrough discovery of the compound known as NXP900, which led to a **multi-million-dollar licensing deal** with US biopharmaceutical company Nuvectis Pharma Inc. to **develop medicines** for hard-to-treat **cancers**.

With support and expertise from EI, researchers Professors Neil Carragher and Asier Unciti-Broceta submitted a **patent application** to protect NXP900, which had been a **decade** in **development**. EI Technology Transfer Manager Dr Maria Lopalco, who worked with the research team from an early stage to develop the commercial proposition, brokered a **complex** and **high-value licence deal** on behalf of the University. As a result, the University entered into one of the most **significant commercial partnerships** it has ever secured. Nuvectis has licensed exclusive worldwide rights to **develop** and **commercialise cancer treatments** based on the **University's technology**.

## Company formation

Forming a company is the best course of action for **technologies** with a **wide range** of **applications**, and which require **ongoing support** or **complex chains** to bring a product to market. EI provides a leading enterprise support service, working with University staff to turn **innovations** into start-ups or spinouts (companies in which the University retains an ownership stake) and connecting them with funding and investors. This is the route that Professor Stuart Forbes took after specialist healthcare investment company Syncona Ltd discovered the **ground-breaking cell therapy research** he and his team were conducting at the University. Professor Forbes had been exploring the role of macrophage cells in **organ repair** for over a decade, so when Syncona funded a fruitful two-year research collaboration with Professor John Campbell's cell therapy group at the Scottish National Blood Transfusion Service (SNBTS), the team were able to make significant progress and file **several foundational patent applications**. The success of the collaboration motivated Syncona to invest a further **£26.6 million** to form Resolution Therapeutics in 2020 and bring the team's pioneering science to a clinical setting. In 2022 Resolution Therapeutics completed a **£10 million** financing extension from Syncona, and the company is now channelling its **leading-edge expertise** into **developing macrophage cell therapies** to treat **chronic liver disease**.

## Tailored support

EI's Business Development team members are embedded within the University's schools as first points of contact for staff seeking to commercialise their work or ideas, whether they are ready to launch or have only the beginnings of an idea. The team can **assist** with the **commercialisation process** and **development funding**, as well as pointing staff in the direction of further support and opportunities, both at EI and beyond.

### 3 The impact of the University's teaching and learning activities

Economic impact analyses of higher education institutions typically only consider the direct, indirect, and induced economic effects of a university's expenditures (generated as a result of an institution's extensive supply chains and expenditure on employing staff), as well as the economic impacts associated with the expenditures of students attending the institution. However, given that one of a university's primary activities is to provide teaching and learning, a simple study of this nature would significantly underestimate the impact of any higher education institution's activities on the UK economy.

In terms of measuring the impact of universities' teaching and learning activities, Atkinson's (2005) report to the Office for National Statistics asserted that the economic value of education and training is essentially the **value placed on that qualification as determined by the labour market**. Based on this approach, in this section of the report, we detail our estimates of the economic impact of the teaching and learning activities undertaken at the University of Edinburgh, by considering the labour market benefits associated with enhanced qualification attainment and skills acquisition – to **both the individual and the public purse**.

#### 3.1 The 2021-22 cohort of UK domiciled University of Edinburgh students

The analysis of the economic impact of the teaching and learning activities of the University of Edinburgh is based on the **2021-22 cohort of UK domiciled students**. In other words, instead of the University's entire student body of **41,250** students in 2021-22 (*irrespective* of when these individuals may have started their studies), the analysis in this section focuses on the **8,390** UK domiciled<sup>51</sup> students **starting higher education qualifications (or standalone modules/credits) in the 2021-22 academic year**<sup>52</sup>.

In terms of **level of study** (Figure 10), **60% (5,050)** students in this cohort of UK domiciled students were undertaking **first degrees**, with a further **1,585** students (**19%**) undertaking **postgraduate taught degrees**, and **550** students (**7%**) enrolled in **postgraduate research degrees**. An additional **290** students (**3%**) were enrolled in **other undergraduate qualifications**, and the remaining **910** (**11%**) were undertaking **other postgraduate qualifications**<sup>53</sup>.

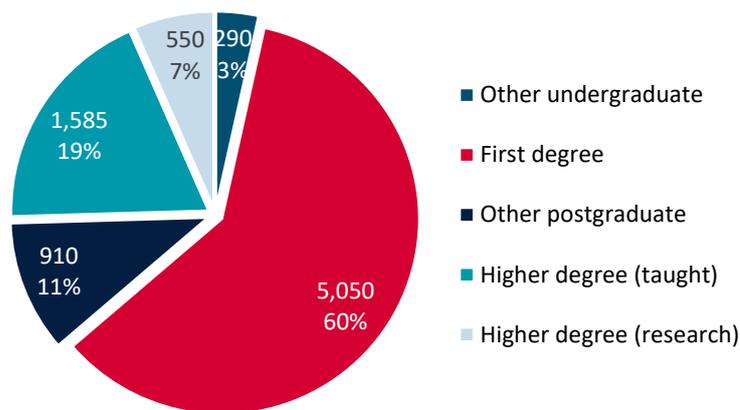
<sup>51</sup> A proportion of EU and non-EU domiciled students undertaking their studies at the University of Edinburgh will remain in the UK to work following completion of their studies; similarly, a proportion of UK domiciled students will leave the UK to pursue their careers in other countries. Given 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 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 qualifications at the University of Edinburgh.

<sup>52</sup> We received HESA data on a total of 18,475 first-year students from the University of Edinburgh. Of these, we excluded 80 students who did not have a stated gender or age and 10,020 non-UK domiciled students (who are instead considered as part of the analysis of educational exports (Section 4)). Figures may not add up precisely due to rounding to the nearest five students.

<sup>53</sup> 'Other undergraduate' learning includes Certificates and Diplomas of Higher Education, Foundation Degrees, other undergraduate-level diplomas and certificates, and undergraduate-level credits. 'Other postgraduate' learning includes taught work for credit at postgraduate level, Postgraduate Certificates in Education, Professional Graduate Diploma in Education (PGDE) and other certificates, diplomas, and qualifications at postgraduate level.



**Figure 10 UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by level of study**

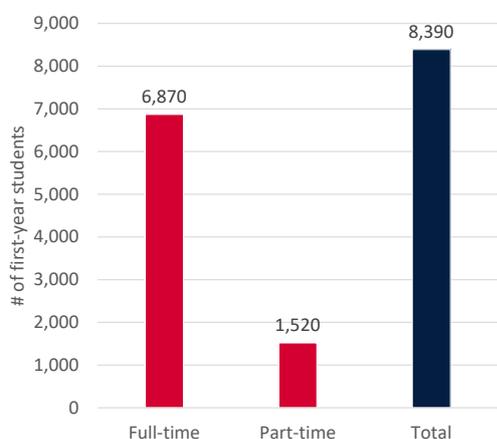


Note: All numbers are rounded to the nearest 5, and the total values may not add up due to this rounding. 'Other undergraduate' learning includes Certificates and Diplomas of Higher Education, Foundation Degrees, other undergraduate-level diplomas and certificates, and undergraduate-level credits. 'Other postgraduate' learning includes taught work for credit at postgraduate level, Postgraduate Certificates in Education, and other certificates, diplomas, and qualifications at postgraduate level.

Source: London Economics' analysis based on University of Edinburgh Higher Education Statistics Agency (HESA) data

In relation to **mode of study** (Figure 11), **6,870 (82%)** students in the cohort were undertaking their studies with the University of Edinburgh on a full-time basis, while the remaining **1,520 (18%)** were enrolled on a part-time basis. As shown in Table 13, most full-time students were undertaking first degrees (**73%** of full-time students), while part-time students in the cohort were predominantly enrolled in higher degree (taught) qualifications (**43%** of part-time students) or other postgraduate qualifications (**28%** of part-time students).

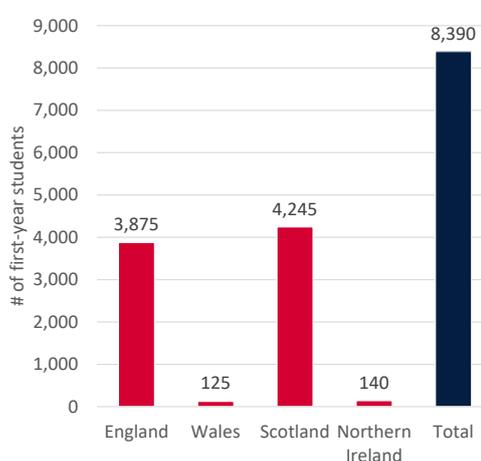
**Figure 11 UK domiciled students in the 2021-22 cohort of University of Edinburgh entrant students, by mode of study**



Note: All 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 University of Edinburgh HESA data

**Figure 12 UK domiciled students in the 2021-22 cohort of University of Edinburgh entrant students, by domicile**



Note: All 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 University of Edinburgh HESA data

In terms of **domicile** (Figure 12), approximately half (**4,245, 51%**) of UK domiciled students in the cohort were from Scotland, with a significant proportion (**46%, 3,875**) of students domiciled in England. The remainder were domiciled in Northern Ireland (**140, 2%**) and Wales (**125, 1%**).



**Table 13** UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by level of study, mode, and domicile

Level and mode of study	Domicile				
	Scotland	England	Wales	Northern Ireland	Total
<b>Full-time</b>					
Other undergraduate	0	0	0	0	0
First degree	2,415	2,415	60	95	4,985
Other postgraduate	410	60	5	10	480
Higher degree (taught)	350	540	30	10	930
Higher degree (research)	215	240	10	5	470
<b>Total</b>	<b>3,390</b>	<b>3,260</b>	<b>105</b>	<b>115</b>	<b>6,870</b>
<b>Part-time</b>					
Other undergraduate	265	25	0	0	290
First degree	65	0	0	0	65
Other postgraduate	300	120	5	10	430
Higher degree (taught)	185	445	15	15	655
Higher degree (research)	50	30	0	0	80
<b>Total</b>	<b>860</b>	<b>620</b>	<b>20</b>	<b>25</b>	<b>1,520</b>
<b>Total</b>					
Other undergraduate	265	25	0	0	290
First degree	2,475	2,415	60	95	5,050
Other postgraduate	710	175	5	20	910
Higher degree (taught)	535	985	45	25	1,585
Higher degree (research)	265	270	10	5	550
<b>Total</b>	<b>4,245</b>	<b>3,875</b>	<b>125</b>	<b>140</b>	<b>8,390</b>

Note: All numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.

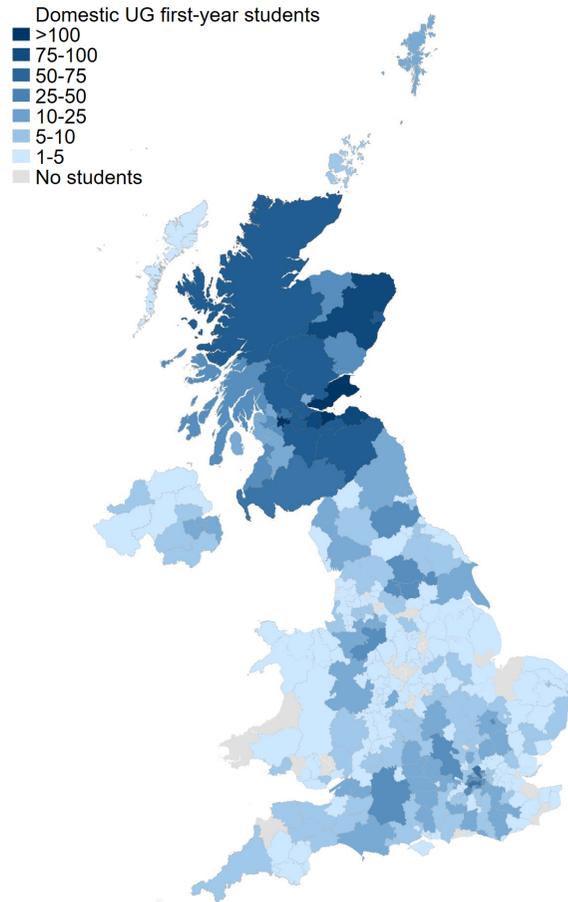
'Other undergraduate' learning includes Certificates and Diplomas of Higher Education, Foundation Degrees, other undergraduate-level diplomas and certificates, and undergraduate-level credits. 'Other postgraduate learning' includes taught work for credit at postgraduate level, Postgraduate Certificates in Education, and other certificates, diplomas, and qualifications at postgraduate level.

Source: London Economics' analysis based on University of Edinburgh HESA data

Figure 13 and Figure 14 present the distribution of the 2021-22 cohort studying undergraduate and postgraduate qualifications (respectively) by domicile at the local authority level. These maps illustrate the University of Edinburgh's geographical draw of students from every region across the UK, particularly among the postgraduate cohort. For undergraduate students, there is a greater concentration of students in Scotland, likely driven by the fact that these students are typically eligible for non-repayable fee grants to cover the full cost of their tuition fees.



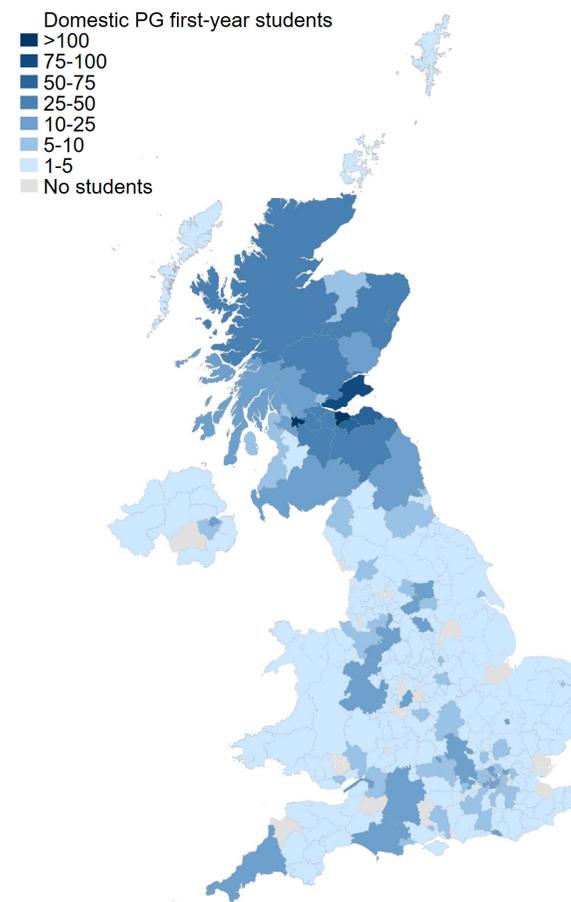
**Figure 13 UK domiciled undergraduate first-year students in the 2021-22 cohort, by local authority of domicile**



Note: We received HESA data on 5,365 first-year undergraduate UK domiciled students from the University of Edinburgh. Students from Guernsey, Jersey and the Isle of Man or those with an unspecified unknown domicile in the UK (fewer than 20 students in total) were excluded.

**Source: London Economics' analysis based on data from the University of Edinburgh and the Office for National Statistics. Contains National Statistics, OS, Royal Mail, Gridlink, ONS, NISRA, NRS and Ordnance Survey data © Crown copyright and database right 2023.**

**Figure 14 UK domiciled postgraduate first-year students in the 2021-22 cohort, by local authority of domicile**



Note: We received HESA data on 3,080 first-year UK domiciled postgraduate students from the University of Edinburgh. Students from Guernsey, Jersey and the Isle of Man or those with an unspecified unknown domicile in the UK (fewer than 35 students in total) were excluded.

**Source: London Economics' analysis based on data from the University of Edinburgh and the Office for National Statistics. Contains National Statistics, OS, Royal Mail, Gridlink, ONS, NISRA, NRS and Ordnance Survey data © Crown copyright and database right 2023.**



## Schools project gives pupils a sense of the power of data



Photo credit: Sander Meertins via Getty Images

On the evening of the 15 January 2022, the **Hunga-Tonga-Hunga-Ha'apai volcano in Tonga** erupted with a force not seen in centuries. The explosion, the biggest recorded since Krakatau blew up in 1883, was heard across the Pacific Ocean in Alaska.

Fourteen hours later and more than 10,000 miles away in Scotland, **children in Roslin Primary School** noticed abnormal readings coming from their **school's air pressure monitors**. A group of **P6 learners** leapt into action and began **investigating** how a **volcanic eruption** on the other side of the world could affect a village in Scotland. Data would be at the heart of their work. The learners' ambition was empowered by a University of Edinburgh project that is seismic in its own way, one that is giving all learners in the region a say in their digital futures.

The **University's Data Skills Gateway** is a **world-leading initiative** that brings together the **City Region's universities, colleges, schools, and The Data Lab** (Scotland's Scottish Funding Council funded Innovation Centre for data and artificial intelligence, which is also hosted by the University of Edinburgh) that provides routes into **qualifications** and **careers** in **data science** and **technology**.

The **Internet of Things in Schools programme** is part of this initiative, bringing the **latest sensor technology** into classrooms. Sensors that **measure carbon dioxide levels, temperature, humidity, air pressure** and **light levels** are being provided to all **550 schools** across the region. So far, **22 schools** across the six local authority areas have participated in the first phase of the programme. Some of the schools involved in the **£9.5 million** project have received outdoor air quality monitors, soil moisture sensors and weather stations as well. More schools will be offered access to the sensor network in the coming year.

Each device is linked to a **high-performance computer** at the University of Edinburgh where the raw data is converted into graph form, which pupils can readily access. Learning how to explore, interpret and make sense of data not only enables pupils to **improve** their **school environment** but also equips them to **navigate** an **increasingly complex digital landscape** and **prepare** them for work in new **data-driven industries**.

The programme is **learner-led** and **curiosity-led**, as can be seen by the experience at Roslin. Another school in West Lothian were interested in comparing their classroom environment with that of the animals in their local zoo so got permission to add sensors into the crocodile enclosure to compare the two datasets.

The **Data Education in Schools programme** aims to provide all learners, from early primary to senior secondary, with **opportunities** to **develop data skills**. The programme adopts a **Data Skills for all approach**, **aligning activities** to **United Nations' Sustainable Development Goals** such as the live lesson series that demonstrates how data skills can be used to address conservation and climate challenges. The programme has also worked with the **Scottish Sensory Centre** to develop a **British Sign Language glossary** for **data science** that aims to **overcome barriers** to **data science qualification** and **careers** for **deaf people**.



Photo credit: Neil Johnson via Gettv Images



## 3.2 Adjusting for completion rates

The previous section provided an overview of the number of UK domiciled students *starting* qualifications or modules at the University of Edinburgh in the 2021-22 academic year. However, to aggregate individual-level impacts of the University of Edinburgh's teaching and learning activity, it is necessary to adjust the number of 'starters' to account for **completion rates**.

To achieve this, we used information provided by the University of Edinburgh on the historical completion outcomes of students from the University – broken down by study mode, study intention, and study completion<sup>54</sup>. In other words, these completion data include the number of students who completed their intended qualification (or module); completed a different (usually lower) qualification; or discontinued their studies without being awarded a qualification (modelled as completion at 'other undergraduate' level (for students who originally enrolled in first degrees or other undergraduate qualifications) or 'other postgraduate' level (for students who originally intended to complete higher degrees or other postgraduate qualifications))<sup>55</sup>.

Table 14 presents the resulting completion rates applied throughout the analysis<sup>56</sup>. We assume that, of those students starting a full-time first degree at the University of Edinburgh in 2021-22, **87%** complete the first degree as intended, while the remaining **13%** 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, **87%** complete the qualification as intended, while the remaining **13%** 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). For those individuals starting a full-time postgraduate research degree, approximately **86%** complete the qualification as intended, with the remaining **14%** assumed to complete 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)**.

<sup>54</sup> Note that, for consistency with our above definition of 'other undergraduate' students, we combined the original separate data for undergraduate-level credits and other undergraduate learning into a single category (and proceeded similarly for postgraduate-level credits and other postgraduate learning).

<sup>55</sup> In other words, we assume that students who discontinued 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%.

<sup>56</sup> Data is based on the 2015-16 cohort of University of Edinburgh students, and excludes individuals who are still studying the course they entered on. Individuals who left within 5 weeks of entry are not included. Part-time data was not provided, so we exponentiate full-time completion rates by the power of the ratio of part-time to full-time study length.



Table 14 Assumed completion rates of University of Edinburgh student entrants

Completion outcome	Study intention				
	Other undergraduate	First degree	Other postgraduate	Higher degree (taught)	Higher degree (research)
<b>Full-time students</b>					
Other undergraduate	100%	13%	0%	0%	0%
First degree	0%	87%	0%	0%	0%
Other postgraduate	0%	0%	92%	13%	14%
Higher degree (taught)	0%	0%	8%	87%	0%
Higher degree (research)	0%	0%	0%	0%	86%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Part-time students</b>					
Other undergraduate	100%	19%	0%	0%	0%
First degree	0%	81%	0%	0%	0%
Other postgraduate	0%	0%	100%	34%	26%
Higher degree (taught)	0%	0%	0%	66%	0%
Higher degree (research)	0%	0%	0%	0%	74%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Note: Totals may not sum due to rounding. Data is based on the 2015-16 cohort of University of Edinburgh students, and excludes individuals who are still studying the course they entered on. Individuals who left within 5 weeks of entry are not included. Part-time data was not provided so we exponentiate full-time completion rates by the power of the ratio of part-time to full-time study length.

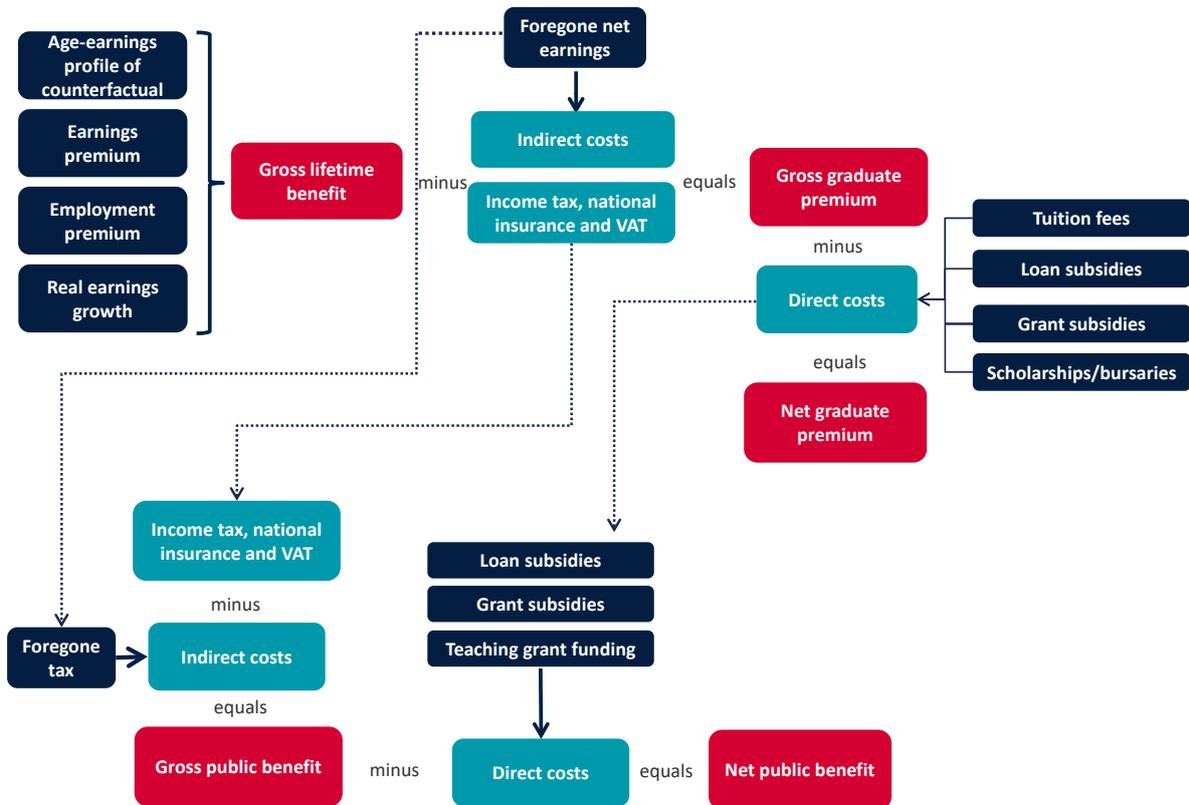
Source: London Economics' analysis based on information provided by the University of Edinburgh on the completion outcomes of the cohort of students starting qualifications in 2015-16.

### 3.3 Defining the returns to higher education qualifications

The fundamental objective of the analysis of the impact of the University of Edinburgh's teaching and learning activities 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 15):

- 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 VAT are removed, and following the deduction of 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 foregone tax earnings 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.

Figure 15 Overview of gross and net graduate premium, and gross and net Exchequer benefit



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

## Save a Life for Scotland: Improving bystander CPR rates and increasing survival in Scotland after out-of-hospital cardiac arrest

**Out-of-hospital cardiac arrest** (OHCA) is a serious health concern in Scotland with approximately **3,200** patients each year having resuscitation attempted after a cardiac arrest in the community.

Action research conducted by the **University of Edinburgh Resuscitation Research Group** (RRG) led by Dr Gareth Clegg since 2009 formed the basis of Scotland's **national improvement strategies** for OHCA published in 2015 and 2021<sup>57</sup>. These have also been adopted in Wales (2018) and by the Global Resuscitation Alliance (2018). The research highlighted how the 'Chain of Survival' following OHCA could be optimised through **specialist training** of paramedics to **create Resuscitation Rapid Response Units ('3RU')** and **community training** in cardiopulmonary resuscitation (CPR).

In 2015, the RRG formed the multi-disciplinary collaborative **Save a Life for Scotland**<sup>58</sup> partnership to **improve survival** by **increasing bystander CPR rates**. For example, they are currently launching a GoodSAM<sup>59</sup> app with the Scottish Ambulance Service, researching the **utility** of **post-training behavioural interventions** and **optimising a novel ultrabrief CPR training tool**.

Prior to the launch of Scotland's Strategy for OHCA in March 2015, bystander CPR was received by 41% of people experiencing an OHCA; by March 2022 this had **increased** to **66%**. The number of registered Public Access Defibrillators (PAD) in communities across Scotland has more than **doubled** since 2019 to nearly **5,000**. The proportion of OHCA where a PAD was used before the arrival of the Ambulance Service rose to **8%**. In Scotland, 30-day survival after OHCA gradually **increased** from 5.9% in 2011 to **11.9%** in 2019. The Covid-19 pandemic led to a significant drop in 30-days survival, but rates have since recovered to almost **10%** in 2021-22.<sup>60</sup>

RRG's **award-winning '3RU' model** has been adopted as a **national programme** by the **Scottish Ambulance Service**. The **Sandpiper Wildcat project** in rural North-East Scotland has trained **500** volunteers and **reduced** time to first resuscitation by a valuable **5 minutes, reducing regional inequalities** in access to care. This model has **informed** the **international programme** of



Photo credit: iavfish via Getty Images

<sup>57</sup> For more information, see Scottish Government at: <https://www.gov.scot/publications/scotlands-out-hospital-cardiac-arrest-strategy-2021-2026/>

<sup>58</sup> For more information, see Save A Life For Scotland at: <https://savealife.scot/>

<sup>59</sup> For more information, see GoodSAM at: <https://www.goodsamapp.org/>

<sup>60</sup> For more information, see Save A Life For Scotland at: <https://savealife.scot/ohca-report-2019-22/>

the **European Resuscitation Academy**, which has been delivered in **10 European countries**, and has been **embedded** in the **National Strategy for OHCA in Switzerland**.

International consensus suggests that an effective way to improve bystander CPR rates is to deliver training in schools. The RRG team **developed bespoke tools to facilitate CPR training in Scottish schools** with the **support** of **Education Scotland**<sup>61</sup>, which has been used for CPR training events in **over 100** schools across Scotland. All 32 local authorities in Scotland have committed to teach CPR to every secondary school pupil; by March 2019, **87%** of secondary schools in Scotland have had some form of CPR awareness activity within the last 5 years.



Photo credit: seksan Mongkhonkamsao via Gettv Images

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<sup>61</sup> For more information, see Education Scotland at: <https://education.gov.scot/improvement/learning-resources/save-a-life>

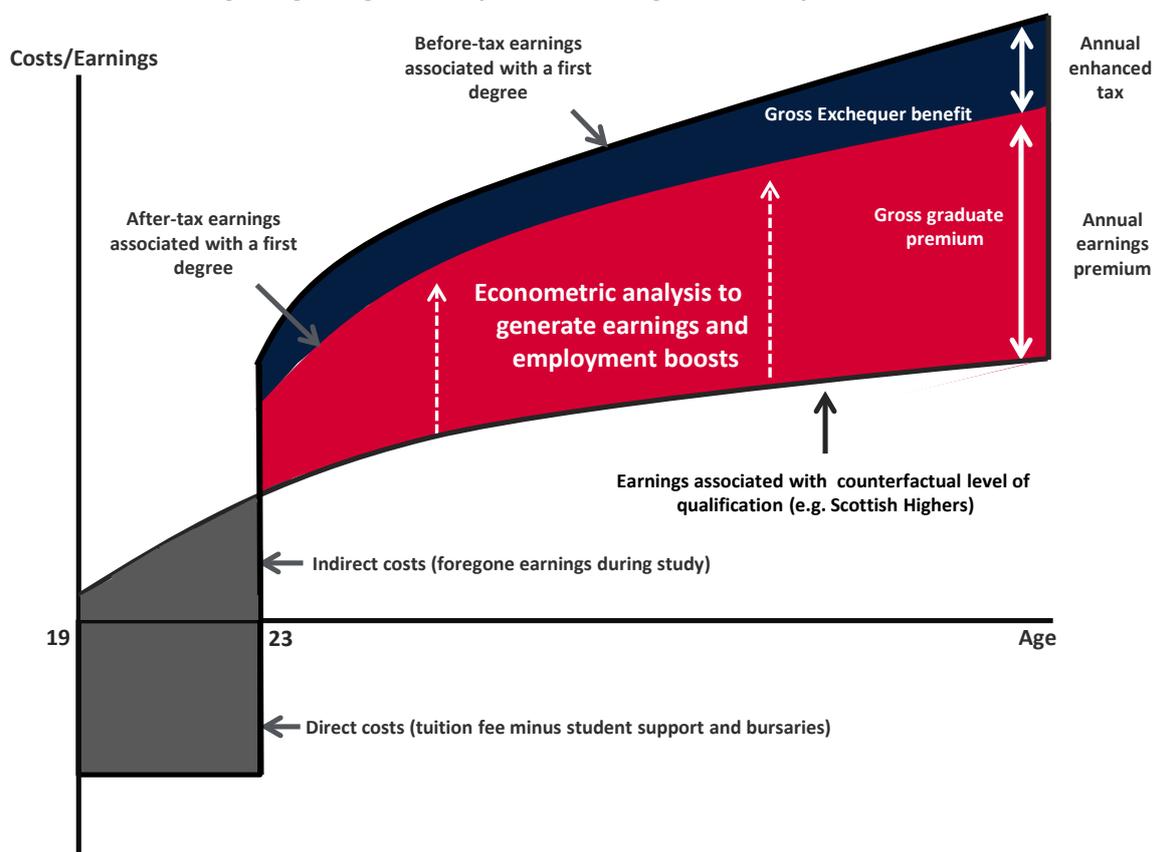


### 3.4 Estimating the returns to higher education qualifications

#### 3.4.1 Estimating the gross graduate premium and gross public purse benefit

To measure the economic benefits to higher education qualifications, we estimate the **labour market value associated with particular education qualifications**, rather than simply assessing the labour market outcomes achieved by individuals *in possession* of a higher education qualification. 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 those individuals with comparable personal and socioeconomic characteristics but with the next highest 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 16 for an illustration of this). The treatment and counterfactual groups, and details of the econometric approach, are presented in Annex A2.2.1 and Annex A2.2.2 respectively.

**Figure 16 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 analysis of the University of Edinburgh’s student cohort data for 2021-22, where the mean age at enrolment for full-time first degree students stands at 19, and we have assumed that a full-time first degree requires 4 years to complete.

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 students studying at the University of Edinburgh, to reflect the fact that there is significant variation in post-graduation labour market outcomes depending on the subject of study. 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<sup>62</sup>.

To estimate the **gross graduate premium**, based on the econometric results, 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 A2.2.4 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 higher education qualification attainment and combined with administrative information on the relevant taxation rates and bands (from HM Revenue and Customs)<sup>63</sup>, we estimated 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, please refer to Annex A2.2.4 for more detailed information on the calculation of the gross Exchequer benefit.

### 3.4.2 Estimating the net graduate premium and net public purse benefit

The difference between the gross and net graduate premium relates to **students' direct costs** of qualification acquisition<sup>64</sup>. These direct costs refer to the **proportion of the tuition fee paid by the student**<sup>65</sup> net of any **tuition fee support** or **maintenance support** provided by the Students Awards Agency for Scotland (SAAS, for students from Scotland)<sup>66</sup>, or the Student Loans Company (SLC, for students from

<sup>62</sup> See Annex A2.2.3 for more information.

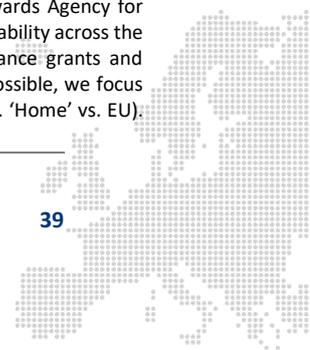
<sup>63</sup> The analysis makes use of relevant tax rates and thresholds applicable to individuals living in England, Wales, and Northern Ireland. This approach was taken for simplicity given that there is no information available on where the University's graduates live at each point throughout their working lives. However, note that there are only relatively marginal differences between the rates and thresholds for these Home Nations as compared to the Scottish tax system. As a result, it is expected that the application of Scotland-specific income tax rates and thresholds would only have a limited effect on the estimated impact of the University's teaching and learning activities on students and the Exchequer (and the *total* impact would be unaffected, as income taxes constitute a transfer between graduates and the public purse).

<sup>64</sup> 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 gross graduate premium.

<sup>65</sup> We made use of information provided by the University of Edinburgh on the average tuition fees charged per *full-time* student at the University of Edinburgh in the 2021-22 academic year, separately by domicile and study level (with data provided for all undergraduate students combined, 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 (ensuring that the estimated fees for part-time students accurately reflect the average study intensity amongst part-time students in the 2021-22 cohort), we adjusted the respective full-time rates for the average study intensity amongst part-time students in the cohort. In turn, the average study intensity was estimated separately by qualification level and calculated by dividing the number of part-time students in the cohort in full-time equivalents by the number of students in terms of headcount (again based on HESA data provided by the University of Edinburgh).

<sup>66</sup> 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)), 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 Home Nations, we focus only on core student support in terms of tuition fee grants, tuition fee loans, maintenance grants and maintenance loans (where applicable), but *exclude* any Disabled Students' Allowance and other targeted support. Wherever possible, we focus on the average level of support for students in public providers only, for the most recent cohorts possible, split by domicile (i.e. 'Home' vs. EU).



Wales, England, and Northern Ireland) minus any **fee waivers or bursaries** provided by the University of Edinburgh<sup>67</sup>. In this respect, the student benefit associated with tuition fee loan or maintenance loan support equals the **Resource Accounting and Budgeting charge (RAB charge)**<sup>68</sup>, capturing the proportion of the loan that is not repaid. Given the differing approach to public support funding for students from each of the UK Home Nations, the direct costs incurred by students were assessed separately for students from Scotland, England, Wales, and Northern Ireland<sup>69</sup>.

The **direct costs**<sup>70</sup> to the public purse include the **teaching grant funding** administered by the Scottish Funding Council (SFC; primarily applicable to Scottish domiciled students)<sup>71</sup>, the **student support** provided in the form of maintenance/fee grants (where applicable), and the **interest rate or write-off subsidies** that are associated with maintenance and tuition fee loans (i.e. the RAB charge). Again, the analysis tailors the cost of student support to the student's specific Home Nation of domicile.

These direct costs associated with qualification attainment to both students and the Exchequer (by qualification level, study mode and Home Nation domicile) are 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 rate of **3.5%** (see HM Treasury, 2022).

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Furthermore, and again 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, the assumed average fee loans or fee grants per student (where applicable) have been capped at the average tuition fees charged per University of Edinburgh student in 2021-22.

<sup>67</sup> Average fee waivers and other bursaries and scholarships per student were calculated based on information provided University of Edinburgh on the total funding through scholarships, fee waivers, and other bursaries provided by the University in 2021-22, by domicile, mode, and level of study. To arrive at the average level of funding per student (per year), we then divided the relevant total funding (by domicile, mode, and level) by the total number of (first-year and continuing) students studying at the University of Edinburgh in 2021-22 (again, by domicile, mode, and level).

<sup>68</sup> For undergraduate full-time students, we have assumed a RAB charge of 31% associated with tuition fee and maintenance loans for English domiciled students (based on data published by the Department for Education (2022a)), which includes the impact on the RAB charge of the Department's recently announced policy changes in response to the Augar Review of Higher Education (for post-2012 English loan borrowers)). We have further assumed a RAB charge of approximately 26% for Welsh domiciled students (based on London Economics' modelling of the costs associated with the Welsh higher education funding system, on behalf of the Welsh Government (*unpublished*)); 31% for Scottish domiciled students (based on Audit Scotland (2020)); and 26% for Northern Irish students (assumed to be the same as the RAB charge for Welsh domiciled students given the similar loan balance). For undergraduate part-time students, based on the same sources, we have assumed a RAB charge of 33% for English domiciled students (see Annex B in Department for Education (2022a); note however that this does *not* take account of the impact of the Department's response to the Augar Review); approximately 36% for Welsh domiciled students; and 0% for Northern Irish domiciled students (given that these students have a very small loan balance). There is currently no student loan funding provided to Scottish domiciled undergraduate part-time students (so no RAB charge assumptions are required).

For the loans for postgraduate taught students from England, Wales, and Northern Ireland, we have assumed a RAB charge of 0% for both full-time and part-time students (based on the Department for Education's (2022) student RAB charge estimates for postgraduate Master's loans for English students (again see Annex B of Department for Education(2022)). For Scottish students at postgraduate taught level, we again assumed a RAB charge of 31% (again based on Audit Scotland; unfortunately, the estimates here did not provide a breakdown of the RAB charge by study level).

Finally, for (full-time and part-time) postgraduate research students, there were no Doctorate loans available for Scottish domiciled or Northern Irish domiciled students. For students from England and Wales, we assumed a RAB charge of 19% (again based on based on Department for Education (2022a)).

<sup>69</sup> Note that, in some instances, the total financial support provided to students (through tuition fee loans and grants, maintenance loans and grants, and fee waivers/other bursaries (where applicable)) may *exceed* the costs of their University of Edinburgh tuition fees – i.e. the net graduate premium *exceeds* the gross graduate premium per student (see the results presented in Table 27 and Table 28 in Annex A2.2.5).

<sup>70</sup> 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.

<sup>71</sup> This is calculated as the total teaching grant funding divided by the total number of Scottish and *continuing* EU students enrolled with the University of Edinburgh in 2021-22 (excluding any first-year EU students, as well as any non-EU domiciled students and higher degree (research) students (i.e. 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 (so that teaching grants now typically only to Scottish domiciled students). In contrast, EU domiciled *continuing* students in 2021-22 were, in general, still eligible for this funding. Whilst the grant is primarily applicable for Scottish domiciled students, it is also used for students from the rest of the UK enrolled in strategically important expensive subjects where the estimated fee is assessed as not enough to cover costs. For the purposes of the analysis it is assumed the grant is only applied to Scottish students, due to the complex nature of its application to students from the rest of the UK.



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.

### 3.5 Estimated net graduate premium and net Exchequer benefit

Table 15 presents the net graduate premiums and net Exchequer benefits achieved by Scottish domiciled students<sup>72</sup> starting qualifications at the University of Edinburgh in the 2021-22 academic year (by study mode, on average across men and women<sup>73</sup>).

The analysis indicates that the **net graduate premium** achieved by a representative<sup>74</sup> Scottish domiciled undergraduate student in the 2021-22 cohort completing a **full-time first degree** at the University of Edinburgh (with a SCQF Level 6/RQF Level 3 qualification<sup>75</sup> as their highest level of prior attainment) is approximately **£81,000** in today's money terms. At postgraduate level, the net (post)graduate premiums for a representative<sup>76</sup> Scottish domiciled student completing a full-time postgraduate taught or postgraduate research degree at the University of Edinburgh (relative to a first degree) stand at approximately **£61,000** and **£63,000**, respectively.

**The net graduate premium for a representative full-time first degree Scottish domiciled student stands at £81,000.**

<sup>72</sup> The full set of net graduate premiums and net Exchequer benefits for all domiciles (as well as study levels, study modes, and prior attainment levels) is presented in Annex A2.2.5.

<sup>73</sup> For a breakdown of the results by gender, again see Annex A2.2.5.

<sup>74</sup> The analysis is based on an average age at graduation of 23 for students undertaking full-time first degrees at the University of Edinburgh in the 2021-22 cohort (also see Annex A2.2.3 for further information).

<sup>75</sup> As further outlined in Annex A2.2.1, this predominantly includes Scottish Highers (or equivalent qualifications). SCQF refers to the Scottish Credit and Qualifications Framework. RQF refers to the Regulated Qualifications Framework used in England, Wales, and Northern Ireland.

<sup>76</sup> This is based on an average age at graduation in the 2021-22 cohort of 25 for full-time higher degree (taught) students and 30 for full-time higher degree (research) students.



**Table 15 Net graduate premium and net Exchequer benefit per Scottish domiciled student entrants at the University of Edinburgh, by study level and mode**

Level of study	Net graduate premium		Net public purse benefit	
	Full-time students	Part-time students	Full-time students	Part-time students
Other undergraduate <sup>1</sup>	£63,000	£26,000	£50,000	£15,000
First degree <sup>1</sup>	£81,000	£62,000	£64,000	£35,000
Other postgraduate <sup>2</sup>	£28,000	£26,000	£33,000	£21,000
Higher degree (taught) <sup>2</sup>	£61,000	£61,000	£60,000	£52,000
Higher degree (research) <sup>2</sup>	£63,000	£59,000	£119,000	£59,000

Note: 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 reflect net present values, and rounded to the nearest £1,000. We assume that the gross graduate premium / Exchequer benefit associated with any HE qualification attainment can never be negative – i.e. students will never incur a wage/employment penalty from achieving additional qualifications. In instances where this would be the case, we instead assume a £0 gross graduate premium / Exchequer benefit (while the costs of qualification attainment would still be incurred).

<sup>1</sup> Net graduate premiums and net public purse benefits associated with qualifications at 'other undergraduate' and first degree level are estimated relative to possession of SCQF Level 6/RQF Level 3 qualifications (see Annex A2.2.1 for further detail). <sup>2</sup> Net graduate premiums and net public purse 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*

There are also substantial **net graduate premiums** for **part-time** students. For instance, for a first degree, the estimated net graduate premium stands at approximately **£62,000**, and the estimate for a part-time postgraduate taught degree stands at **£61,000** (the same as for full-time students). The fact that part-time students tend to complete their studies later in life<sup>77</sup> (resulting in fewer years spent in the labour market post-graduation) results in a relative reduction in the net graduate premiums for part-time students compared to full-time students. However, it is assumed that part-time students are able to combine work with their academic studies and thus do not incur any *opportunity costs* in the form of foregone earnings. Given that part-time net graduate premiums tend to be lower than (or equal to) the corresponding premiums for full-time students, the former effect likely dominates the latter.

**The net public purse benefit associated with a representative full-time first degree Scottish domiciled student stands at £64,000.**

In terms of the benefits to the public purse, the **net Exchequer benefit** for a representative Scottish domiciled **full-time** first degree student (again with a SCQF Level 6/RQF Level 3 qualification as their highest level of prior attainment) stands at approximately **£64,000** in 2021-22 money terms. The net Exchequer benefits for a representative student completing a full-time postgraduate taught or postgraduate research degree (relative to a first degree) were estimated at approximately **£60,000** and **£119,000**, respectively.

Again, there are also substantial net Exchequer benefits associated with **part-time students**. For instance, the net Exchequer benefits for a representative part-time student from Scotland undertaking a first degree was approximately **£35,000**, while the net benefits for postgraduate taught degrees or postgraduate research degrees (relative to a first degree) stand at approximately **£52,000** and **£59,000** (respectively).

### 3.6 Total impact of the University's teaching and learning activities

Combining the information on the number of UK domiciled students in the 2021-22 University of Edinburgh cohort, expected completion rates, and the net graduate and public purse benefits associated with the different qualification levels (relative to students' specific prior attainment), the analysis

<sup>77</sup> Again, see Annex A2.2.3 for more information.



estimates that the **aggregate economic benefit of the University of Edinburgh's teaching and learning activities** associated with the 2021-22 cohort in the UK stands at approximately **£857 million** (see Table 16).

This total impact is split favourably for the Exchequer relative to students, with **£460 million (54%)** of the economic benefit accrued by the Exchequer, and the remaining **£397 million (46%)** accrued by students. In terms of study level, **74% (£633 million)** of the estimated economic impact is generated by the University of Edinburgh's undergraduate students, with the remaining **26% (£224 million)** generated by the University's postgraduate students. In terms of domicile, **46% (£394 million)** of the estimated economic impact is associated with students from Scotland, **50% (£432 million)** associated with students from England<sup>78</sup>, **2% (£14 million)** from Wales, and the remaining **2% (£16 million)** is generated by students from Northern Ireland.

**The total economic impact of teaching and learning generated by the 2021-22 cohort of University of Edinburgh students stands at £857 million.**

**Table 16 Aggregate impact of the University of Edinburgh's teaching and learning activities associated with the 2021-22 entrant cohort (£m), by type of impact, domicile, and level of study**

Beneficiary and study level	Domicile				
	Scotland	England	Wales	Northern Ireland	Total
<b>Students</b>	<b>£213m</b>	<b>£171m</b>	<b>£7m</b>	<b>£7m</b>	<b>£397m</b>
Undergraduate	£172m	£124m	£4m	£5m	£305m
Postgraduate	£41m	£48m	£3m	£1m	£93m
<b>Exchequer</b>	<b>£181m</b>	<b>£261m</b>	<b>£8m</b>	<b>£10m</b>	<b>£460m</b>
Undergraduate	£129m	£187m	£4m	£8m	£328m
Postgraduate	£52m	£73m	£3m	£2m	£131m
<b>Total</b>	<b>£394m</b>	<b>£432m</b>	<b>£14m</b>	<b>£16m</b>	<b>£857m</b>
Undergraduate	£301m	£311m	£8m	£13m	£633m
Postgraduate	£93m	£121m	£6m	£3m	£224m

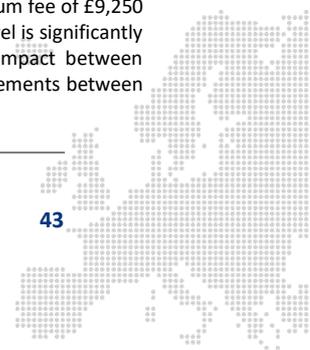
Note: All estimates are presented in 2021-22 prices, discounted to reflect net present values, rounded to the nearest £1m, and may not add up precisely to the totals indicated.

Source: London Economics' analysis

**It is important to emphasise that these impacts are associated with the 2021-22 cohort of students only.**

Depending on the size and composition of subsequent cohorts of University of Edinburgh students, a comparable estimate of the economic impact associated with teaching and learning activities would be associated with each successive cohort of starters (depending on the prevailing labour market conditions at the time).

<sup>78</sup> Whilst there were a similar number of undergraduate first year students in the 2021-22 cohort from Scotland and England, the aggregate economic benefit was much lower for English domiciled students compared to Scottish domiciled students, while the opposite is true in relation to the Exchequer. The reason for this relates to the differences between Home Nations of the UK in respect of the system of higher education fees and associated student support. Scottish domiciled undergraduate students essentially pay no tuition fees, with a limited level of Teaching Grant paid to higher education providers directly by the Scottish Funding Council. In contrast, English domiciled students pay a maximum fee of £9,250 per annum which is backed by income contingent loans. The system of funding Scottish domiciled students at undergraduate level is significantly more generous than the system of funding facing English domiciled students, which results in the different balance of impact between students/graduates and the Exchequer between the two countries. There is no effective difference in fees and funding arrangements between English and Scottish domiciled students at postgraduate level, resulting in a more comparable balance of impact.



#### City Deal Region impact

Based on **graduate outcomes** data from HESA<sup>1</sup>, we know that of **679** respondents to the most recent Graduate Outcomes survey, approximately **584 (86%)** respondents were living in Scotland 15 months after completing their studies and that **513 (76%)** were resident in the Edinburgh City Deal Region. Assuming that these graduates remain in their location as reported in the Graduate Outcomes survey, we can say that approximately **£737 million (86%)** of the total teaching and learning impact on the UK economy is associated with graduates located in Scotland and that approximately **£647 million (76%)** of the impact on the UK economy is generated from graduates located in the Edinburgh City Deal Region.



## Student Enterprise at Edinburgh Innovations

Edinburgh Innovations (EI) provides a completely free **enterprise service** to help **students** and recent **graduates** (up to two years post-graduation) **start up, sustain** and **develop** their **entrepreneurial ambitions** for any business, social enterprise, or freelance endeavour. Student Enterprise offers a range of services including **events** and **workshops, competitions, programmes** and **funding opportunities** to help students gain the **skills, knowledge,** and **confidence** they need to take their ideas or start-ups to the next level. By empowering students – no matter their field of study or level of experience – to **pursue entrepreneurship,** EI aims to **equip** every University of Edinburgh student and recent graduate with the **entrepreneurial skills** they need to help tackle some of the **world's biggest challenges.**



Photo credit: Paul Dodds

### Record breaking start-ups

There is perhaps no stronger endorsement of EI's Student Enterprise service than the record **105** student start-ups that were launched in **2021-22**. In the same academic year, student-led businesses secured record **investment** of **£30.5 million**, nearly tripling the £11 million secured in the previous year. The University of Edinburgh is ranked **first** in **Scotland** and **second** in the **Russell Group** of universities for **student entrepreneurship**, according to Higher Education Statistics Agency data from 2020/21.

Edinburgh start-ups are **addressing** some of the **world's most pressing issues**, from **improved tech performance** to **sustainable fashion**, and **better diagnostic healthcare**. **DeepQA** was founded by Artificial Intelligence MSc students Marise Treseder and Thomas Cartwright to **transform website testing** from a **costly** and **labour-intensive engineering process** into a **simple** and **sustainable business task**. By automating the process of writing and running User Interface, functional, and human-like visual tests, **DeepQA frees up developers** to focus on **mission-critical activities**. In the

healthcare space, Regenerative Medicine MSc graduate Ishan Malhotra's start-up **Carcinotech** is **manufacturing 3D printed tumours** to provide a platform for **rapid, ethical, sustainable** and **accurate drug discovery** and **testing**. Tackling fast fashion, **Outfit of Tomorrow** was founded by Business School undergraduates Ariana Davison and Asher Petit with visiting scholar Anna Kovács. The company's website and browser extension make it **quick** and **easy** for fashion consumers to **shop sustainably** and make **informed, ethical** choices.

### **A new approach**

Over the last five years, EI has made significant changes to how it supports student entrepreneurship at Edinburgh. It switched from a one-to-one advisory model, which could only support a small number of entrepreneurs, to focusing on **scaling up engagement** through **programme delivery**. The Covid-19 pandemic accelerated EI's provision of **online resources** and a suite of on-demand programmes that students are able to access and complete in their own time. The Student Enterprise team has developed a pipeline of support that can take people through from idea to impact – from basics, to builder, to financial, legal and IP support, as a company grows. Mindful that entrepreneurship can be lonely, EI has created the online **Startup Community Platform** so that students can **connect, discover opportunities** and find **team members**, and the **Student Enterprise Hub** on the University's main campus is open Monday-Friday, so that students have a physical space to use and can host in-person meetings with advisors or team members.

Overall, this new, **holistic** and **inclusive approach** taken by EI's Student Enterprise team has led to much **wider engagement** from the University's student body, and with the number of student start-ups increasing by more than **45%** since 2019-20, the results of speak for themselves.

## 4 The impact of the University of Edinburgh's educational exports

With the United Kingdom, and the University of Edinburgh in particular, being an attractive destination for many overseas students, the higher education sector is a tradeable industry with imports and exports like any other tradeable sector.

In this part of the analysis, we focus on the impact of educational exports through the injection of **overseas funding into the UK generated by the University of Edinburgh**. Specifically, we analyse overseas income in the form of tuition fee spending (net of any fee waivers and other bursaries provided by the University) and non-tuition fee (off-campus) expenditures by international (EU and non-EU domiciled) students in the 2021-22 cohort of University of Edinburgh students, over the entire course of their studies<sup>79</sup>. The analysis estimates the **direct, indirect, and induced economic impacts** associated with this export income, defined as follows:

- **Direct effect:** This is captured by the level of (net) fee income (accrued by the University of Edinburgh itself) and non-fee income (accrued by other organisations providing goods and services to international students) associated with non-UK students in the 2021-22 cohort.
- **Indirect effect ('supply chain impacts'):** The University of Edinburgh and local businesses providing other goods and services to international students spend their income on purchases of goods and services from their suppliers, which in turn use this revenue to buy inputs (including labour) to meet these demands. This results in a chain reaction of subsequent rounds of spending across industries, often referred to as a 'ripple effect'.
- **Induced effect ('wage spending impacts'):** The employees of the University of Edinburgh (supported by its tuition fee income) and of companies providing goods and services to the University of Edinburgh's international students use their wages to buy consumer goods and services. 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<sup>80</sup>.

In addition to the impacts associated with the University of Edinburgh's educational exports described in the following sections, a similar methodology is applied to estimate the direct, indirect, and induced economic effects associated with the University's knowledge exchange activities (see Section 2.2), operational and capital expenditures (see Section 5), and tourism revenues generated by the University (see Section 6).

<sup>79</sup> Note that other types of export income accrued directly by the University of Edinburgh (such as research income from international sources, or any other income received from non-UK sources) are taken account of in our analysis of the impact of the University of Edinburgh's research activity (Section 2) and the impact of the expenditures of the University of Edinburgh (Section 5), and are thus excluded from the analysis of exports to avoid double-counting.

<sup>80</sup> Our analysis excludes any similar direct, indirect, and induced effects associated with the non-fee expenditures of UK domiciled students. In this respect, we (conservatively) assume that these expenditures are *not* additional to the UK economy (i.e. that they would likely have occurred even if these students had not enrolled in programmes at the University of Edinburgh). The economic impact associated with UK students' tuition fee expenditures is instead (implicitly) included in the estimated direct, indirect, and induced impacts associated with the University of Edinburgh's own expenditures (see Section 5).



## 4.1 The 2021-22 cohort of international students at the University of Edinburgh

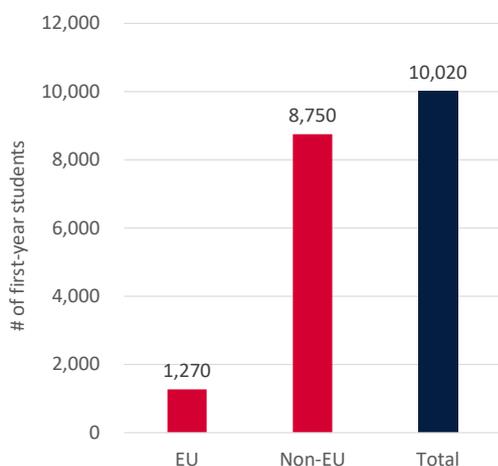
Figure 17, Figure 18, and Figure 19 present information on the number of non-UK domiciled students included in the 2021-22 cohort of University of Edinburgh students (by domicile, mode of study, and level of study, respectively).

In terms of domicile (Figure 17), of the total of **10,020** international students starting higher education qualifications at the University of Edinburgh in 2021-22, **1,270 (13%)** were domiciled within the European Union, while **8,750 (87%)** were from non-EU countries. In terms of study mode (Figure 18), the majority of international students in the cohort (**8,695, 87%**) were undertaking their qualifications on a full-time basis, with the remaining **1,325 (13%)** studying on a part-time basis.

In terms of study level (Figure 19), in contrast to UK domiciled students (see Section 3.1), the majority of non-UK domiciled students in the cohort were undertaking postgraduate qualifications (**7,570, 76%**), including **6,320** students (**63%**) enrolled in postgraduate taught degrees, **770 (8%)** undertaking postgraduate research degrees, and **480 (5%)** undertaking other postgraduate qualifications. At undergraduate level, there were **2,355 (23%)** students undertaking first degrees, while the remaining **95 (1%)** students were enrolled in other undergraduate learning<sup>81</sup>.

Figure 20 presents more detailed information on the country of domicile of international students in the 2021-22 cohort.

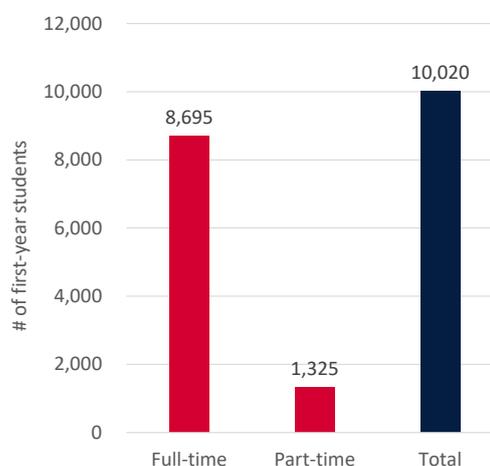
**Figure 17 Non-UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by domicile**



Note: All numbers are rounded to the nearest 5, and the total values may not add up precisely due to this rounding.

Source: London Economics' analysis based on University of Edinburgh HESA data

**Figure 18 Non-UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by study mode**

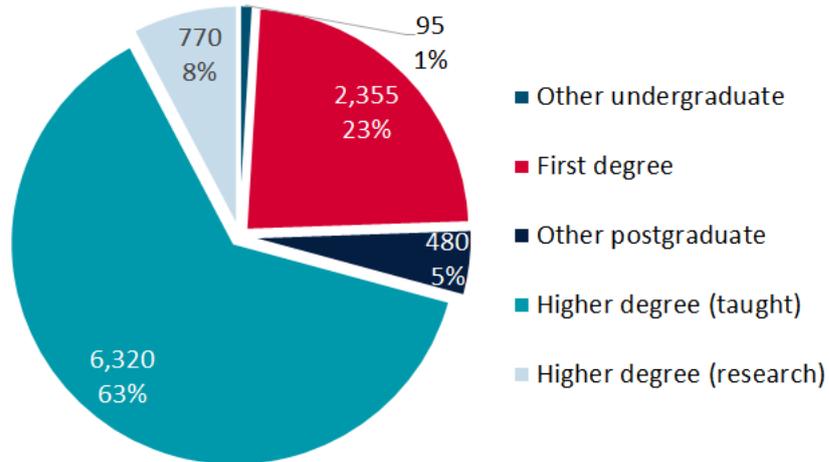


Note: All numbers are rounded to the nearest 5, and the total values may not add up precisely due to this rounding.

Source: London Economics' analysis based on University of Edinburgh HESA data

<sup>81</sup> For more detailed information on the University of Edinburgh's 2021-22 cohort of non-UK domiciled students, please refer to Annex A2.3.1.

**Figure 19** Non-UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by level of study



Note: All numbers are rounded to the nearest 5, and the total values may not add up precisely due to this rounding. 'Other undergraduate' learning includes Certificates and Diplomas of Higher Education, Foundation Degrees, other undergraduate-level diplomas and certificates, and undergraduate-level credits. 'Other postgraduate' learning includes taught work for credit at postgraduate level, Postgraduate Certificates in Education, and other certificates, diplomas, and qualifications at postgraduate level.

Source: London Economics' analysis based on University of Edinburgh HESA data

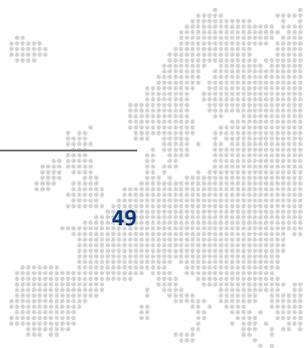
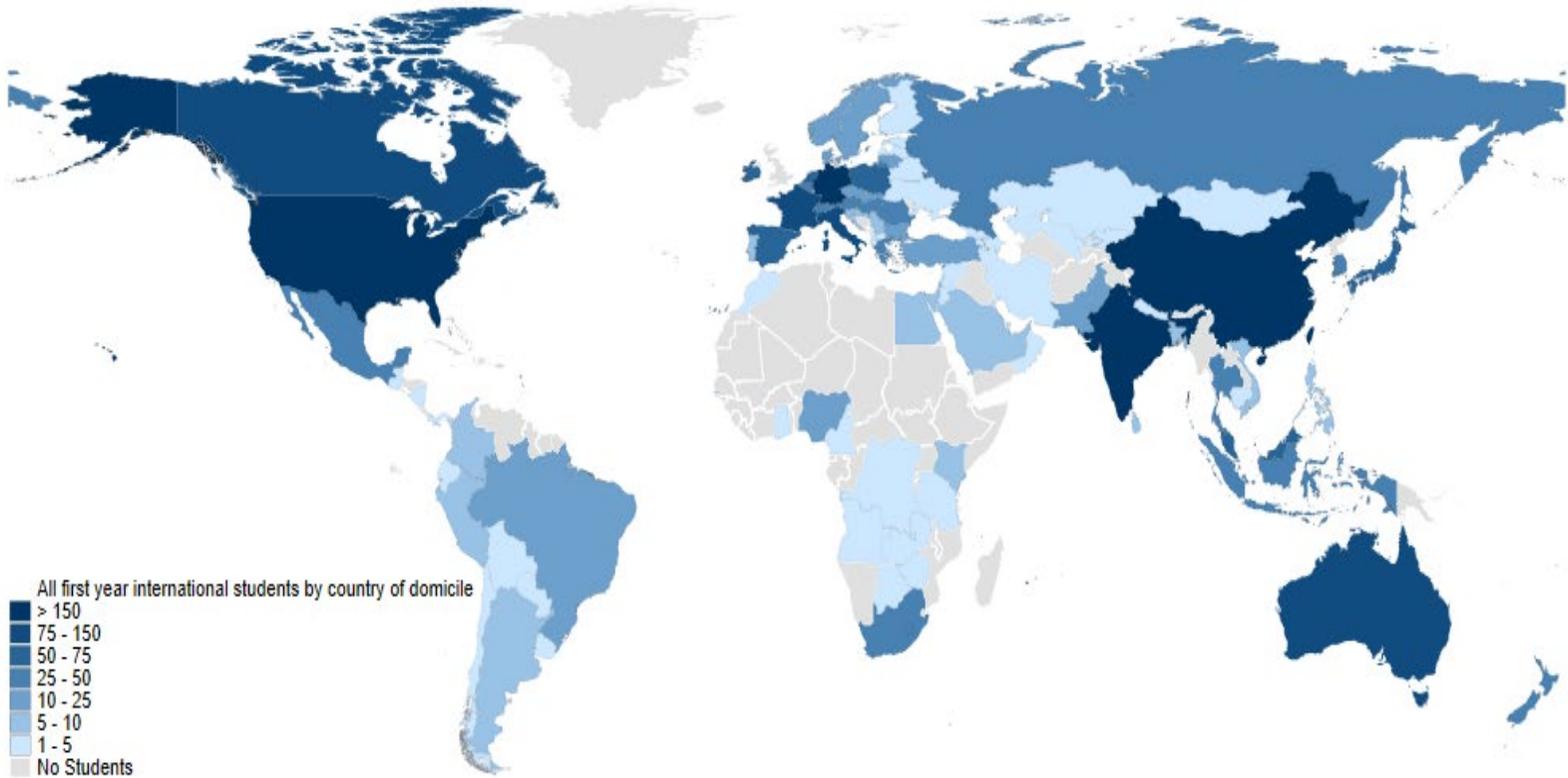


Figure 20 Non-UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by country of domicile



Note: We received HESA data on 10,024 first-year overseas domiciled students from the University of Edinburgh. This figure is slightly different to the above number of students due to rounding.  
Source: London Economics' analysis based on University of Edinburgh HESA data. © EuroGeographics for the administrative boundaries and © 2009 Bjørn Sandvik

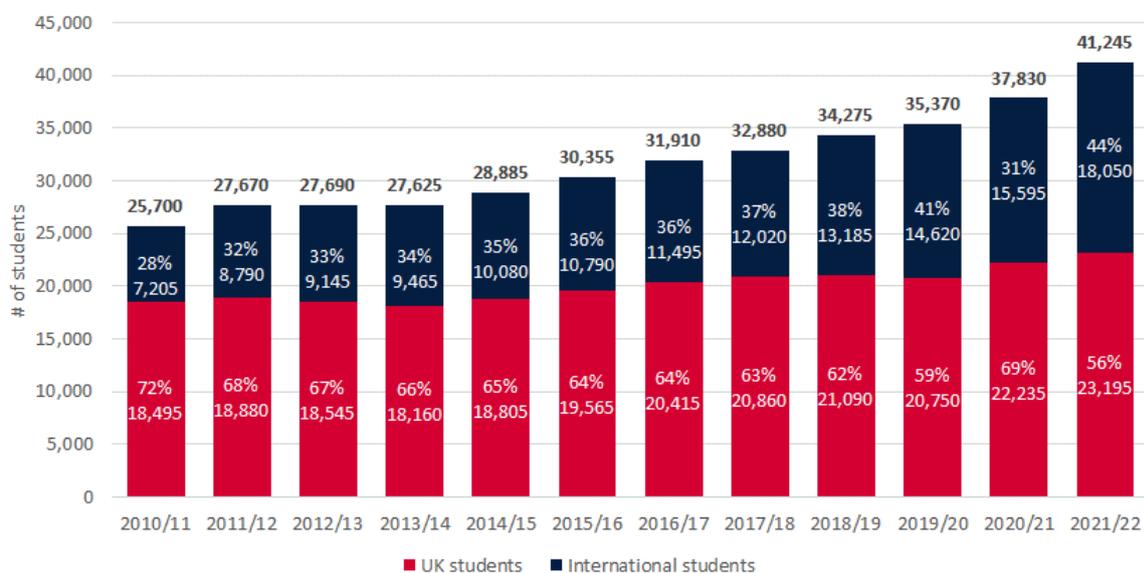


## 4.2 Changes in the number of international students at the University of Edinburgh over time

Alongside the analysis of the 2021-22 cohort of non-UK domiciled *first-year* students, we have also examined the trends in the University of Edinburgh's *entire* non-UK student body over the past twelve years (i.e. academic years 2010-11 to 2021-22).

With the University of Edinburgh being ranked consistently in the top universities in the world, the University is a highly popular destination for international students. There has been a significant increase in the number of non-UK domiciled students enrolled at the University over the last decade, increasing from **7,205** students in 2010-11 to **18,050** students in 2021-22. With the number of UK domiciled students having increased at a much slower rate across the period, the proportion of the University of Edinburgh's students that are from non-UK domiciles has increased from **28%** in 2010-11 to **44%** in 2021-22 (see Figure 21).

**Figure 21** Total number of students at the University of Edinburgh, 2010-11 to 2021-22, by domicile



Note: All numbers are rounded to the nearest 5, and the total values may not add up precisely due to this rounding.

Source: London Economics' analysis based on HESA (2011, 2012, 2013, 2014, 2015, and 2023a)

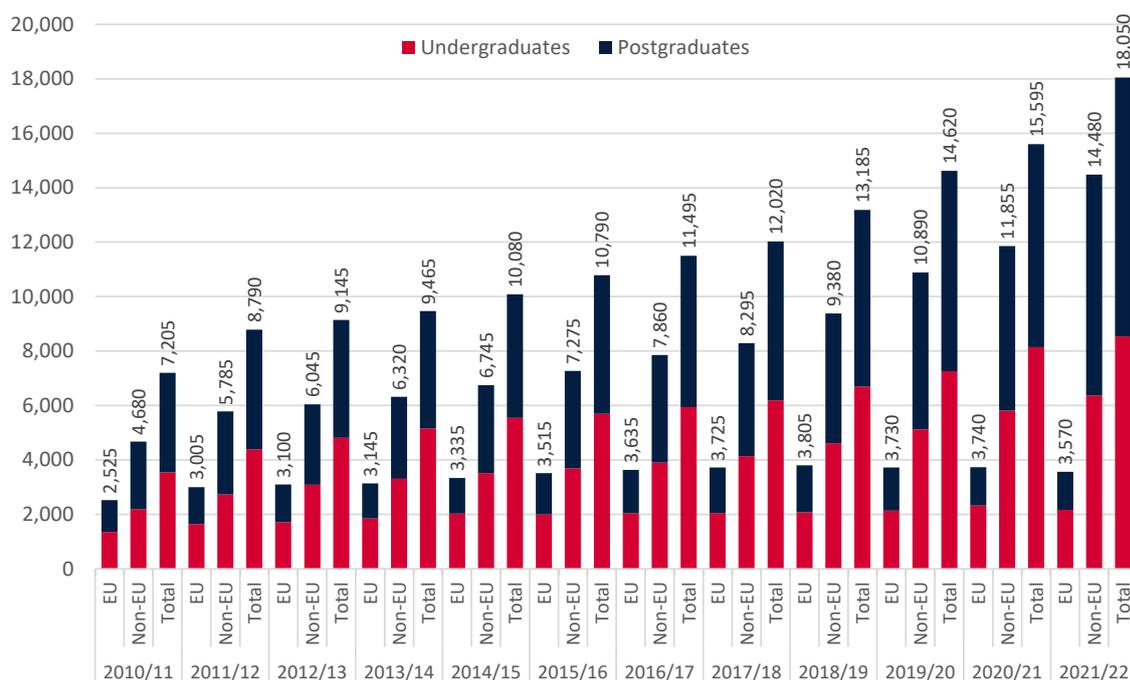
In terms of the breakdown of these non-UK students by domicile (Figure 22), the overall increase in <sup>82</sup>international students was predominantly driven by an increase in students from non-EU domiciles (from **4,680** in 2010-11 to **14,480** in 2021-22), with a relatively smaller increase in students from EU domiciles (from **2,525** in 2010-11 to **3,570** in 2021-22). This has resulted in an increase in the number of non-EU domiciled students as a proportion of the total non-UK domiciled student population, from **65%** in 2010-11 to **80%** in 2021-22. Further note the decline in the number of EU domiciled students enrolled at the University of Edinburgh between 2020-21 and 2021-22. This decrease was predominantly driven by the significant changes to the fees and funding rules for EU domiciled first-year students commencing HE qualifications in the UK from 2021-22 onwards following the UK's departure from the European Union. However, the 5% decline in the number of EU domiciled students commencing their studies at the

<sup>82</sup> The University of Edinburgh was ranked 12<sup>th</sup> in the UK by the Guardian ([link](#)) and by the Complete University Guide ([link](#)) in 2022. In addition, the University was ranked 29<sup>th</sup> globally in the 2023 Times Higher Education World University rankings ([link](#))

University of Edinburgh was much less severe than the 52% decline that was experienced across the higher education sector as a whole. More detail on these changes is provided in Section 4.3.

In terms of level of study (again see Figure 22), the increase in the number of international students studying at the University of Edinburgh occurred across both undergraduate and postgraduate students, with the number of non-UK undergraduate students increasing from 3,550 in 2010-11 to 8,540 in 2021-22, and the number of non-UK postgraduate students rising from 3,655 in 2010-11 to 9,510 in 2021-22. With similar growth at both levels, there has been a relatively even split between undergraduate and postgraduate students across the period, with the proportion of non-UK undergraduate students falling very slightly from 49% of the total in 2010-11 to 47% in 2021-22.

**Figure 22** Number of non-UK domiciled students at the University of Edinburgh, 2010-11 to 2021-22, by level of study and domicile



Note: All numbers are rounded to the nearest 5, and the total values may not add up precisely due to this rounding.  
 Source: London Economics' analysis based on HESA (2011, 2012, 2013, 2014, 2015, and 2023a)

### 4.3 The impact of Brexit on fees and funding for EU students

The UK's exit from the European Union has had several significant impacts on the fees and funding rules for EU domiciled students studying in the UK, with 2021-22 being the first academic year in which post-Brexit rules applied to these students.

In relation to **tuition fees**, pre-Brexit, EU students were eligible for 'home' fee status (i.e., they were charged the same level of tuition fees as UK domiciled students studying in the UK<sup>83</sup>) – and, given the full tuition fee grants available to 'home' students in Scotland, EU undergraduate students at the University of Edinburgh effectively paid no tuition fees. However, following the end of the Brexit transition period, EU

<sup>83</sup> Specifically, institutions were obliged to charge the same tuition fees to EU domiciled students studying in England, Wales, Scotland, or Northern Ireland as for English students studying in England, Welsh students studying in Wales, Scottish students studying in Scotland, and Northern Irish students studying in Northern Ireland (respectively).



domiciled students starting HE qualifications in the UK from 2021-22 onwards are typically no longer eligible to pay 'home' fees – since, in general, only EU nationals with pre-settled or settled status (under certain residency conditions) in the UK are eligible for these (lower) fees<sup>84</sup>. We expect that the vast majority of first-year EU domiciled students starting HE qualifications in the UK in 2021-22 do *not* have settled or pre-settled status, and therefore assume that all EU domiciled students in the 2021-22 University of Edinburgh cohort are charged the same fees as non-EU students (which are typically much higher than the tuition fees charged to 'home' students)<sup>85</sup>.

In relation to the **funding costs** associated with international students, in addition to the above-mentioned fee waivers and bursaries provided to international students by the University of Edinburgh itself, prior to 2021-22, our analysis of the impact of educational exports would also have deducted the cost of public **teaching grants** to fund the University's provision of teaching and learning activities for EU domiciled students, as well as the costs associated with public **tuition fee support** (through fee grants and/or loans<sup>86</sup>) provided to EU domiciled students studying in Scotland. However, following the end of the Brexit transition period, only EU nationals with pre-settled or settled status in the UK are generally eligible for these types of funding. Again, we expect that most EU domiciled students in the 2021-22 cohort did not hold pre-settled or settled status, and we therefore assume that there are no public teaching grant or student support costs applicable to the cohort<sup>87</sup>.

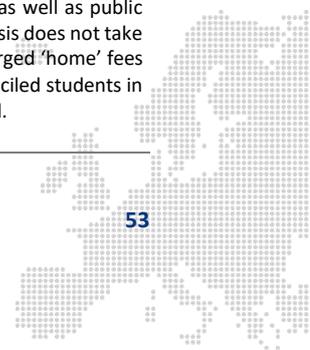
Given these simplifying assumptions, note that our analysis is likely to *overestimate* the tuition fees and *underestimate* the funding costs associated with EU domiciled students in the 2021-22 cohort. However, note that only approximately **13%** of students in the 2021-22 cohort of international students studying at the University of Edinburgh were domiciled in the EU (see Section 4.1), so these assumptions are expected to only have a relatively minor impact on the total estimates here.

<sup>84</sup> The eligibility rules for home fee status and student finance from the 2021-22 academic year following the UK's exit from the EU (Department for Education, 2022b) indicate that EU nationals with settled status can be awarded home fee status and fee and maintenance support if they have been resident in the UK (and Islands) for at least 3 years. For EU nationals with pre-settled status, the rules state that 'in practice, the Student Loans Company (SLC) will accept pre-settled status, together with ID documentation, as evidence for the purposes of awarding student support to EU, other EEA and Swiss nationals and their family members. We anticipate that providers will take the same approach when awarding home fee status where the student has 3 years' residence in the UK, Gibraltar, EEA, Switzerland or the British/EU overseas territories'.

<sup>85</sup> HESA does not collect data on the number of EU domiciled students that hold settled or pre-settled status in the UK. In the absence of this information, we have assumed that no EU domiciled students in the 2021-22 cohort have settled or pre-settled status, i.e., that all of these students pay the same fees that are charged to non-EU students. Note that HESA's definition of domicile states that a student's domicile is the 'country the student lived in for non-educational purposes before starting their course' (HESA, 2023b), but does *not* capture students' nationality (i.e., HESA's definition does not align exactly with the definition of EU students in the Department for Education's eligibility rules for home fee status and student finance (see Department for Education, 2022b)).

<sup>86</sup> Depending on the level of study.

<sup>87</sup> Note that different rules apply to Irish citizens living in the UK or Ireland, as these students are covered by the UK's Common Travel Area arrangement with Ireland, and are generally eligible for home fee status (and therefore supported by public teaching grants) as well as public tuition fee and maintenance support subject to meeting the eligibility criteria on the same basis as UK nationals. Again, our analysis does not take account of these special arrangements for students from the Republic of Ireland (i.e., the fact that these students would be charged 'home' fees and be eligible for public tuition fee support and teaching grant funding) – though note that only approximately **16%** of EU domiciled students in the 2021-22 University of Edinburgh cohort (and roughly **2%** of all international students in the cohort) were domiciled in Ireland.



## Social Investment Fund

As part of its commitment to be a **socially response** and **sustainable** university, the University has committed to be a **net zero** University by 2040, to be a **responsible investor** and to take a whole institution approach whereby all of its activities - research, learning and teaching, procurement, operations, travel and investment - **reduce harm** to **society** and the **environment**, and **maximise positive impacts**. This commitment is borne out through the University's **Social Investment Fund (SIF)**.

The University has endowment and treasury funds approaching **£1.3bn** and is the **3rd largest UK University endowment**, after Oxford and Cambridge. The University of Edinburgh was the first university in Europe to sign the **Principles for Responsible Investment** in 2013. The University has made several responsible investment commitments<sup>88</sup>, and has a clear policy on its approach to responsible investment.<sup>89</sup> As part of its overall responsible investment approach, the University has created an **£8 million** social investment fund, of which **£7 million** has now been committed.<sup>90</sup>

### Social Investment Scotland

**Social Investment Scotland (SIS)** received **£1 million** from the University's SIF for the second iteration of their **Scottish Social Growth (SSG) Fund**. This investment goes towards **supporting charities** and **social enterprises**, with a focus in Scotland, as a loan with a repayment plan agreed for up to 15 years. In 2021-22, SIS had over **£40 million** active loans and investments in **201** social enterprises, whilst it was estimated that **4.3 million** people benefited from SIS customers' activities during the same period.<sup>91</sup>

SIS supports a **wide range** of organisations, ranging from **Jambo! Radio**, the only dedicated radio station for people of African and Caribbean heritage in Scotland, to **Willow Den**, an outdoor nature-based early learning and childcare organisation. SIS's support of Willow Den helped to launch outdoor nurseries, whilst the investment in Jambo! Radio paid for a two-year subscription to Digital Audio Broadcasting (DAB) digital radio.



Photo credit: Social Investment Scotland

<sup>88</sup> For more information, see University of Edinburgh at: <https://www.ed.ac.uk/sustainability/programmes-and-projects/supply-chains-and-investments/responsible-investment>

<sup>89</sup> For more information, see University of Edinburgh at: [https://www.ed.ac.uk/files/atoms/files/responsible\\_investment\\_policy\\_statement.pdf](https://www.ed.ac.uk/files/atoms/files/responsible_investment_policy_statement.pdf)

<sup>90</sup> For more information, see University of Edinburgh at: <https://www.ed.ac.uk/sustainability/programmes-and-projects/supply-chains-and-investments/responsible-investment/social-investments>

<sup>91</sup> For more information, see Social Investment Scotland at: <https://www.socialinvestmentscotland.com/media/5llhvtjd/sis-impact-report-2021-22-final.pdf>

SIS believe that the funding from the University delivers a **powerful message** to the industry, with such a large, reputable institution supporting social investment, and helps to raise the profile of the SSG Fund and of SIS. SIS also value the **different perspective** which the University provides to other investors, noting the focus on **interests** for **young people** in Scotland.

### Social and Sustainable Capital

Social investment organisation **Social and Sustainable Capital** (SASC) was another recipient of the University's funding (**£1 million**). SASC are an **award-winning social investor**, launched in 2014, with over **£135 million** committed to more than **50** organisations across the UK. SASC focus on organisations that provide lasting solutions to social challenges, aiming to develop enduring partnerships with organisations to generate increased social impact.



Photo credit: Social and Sustainable Capital

The funding from the University went towards SASC's work with **Simon Community Scotland**, a charity **supporting** those who face **homelessness** in Scotland. The investment enabled Simon Community Scotland to **expand** its services into **Edinburgh** and buy 15 one and two-bedroom properties that provide permanent homes for people with complex needs and experiencing or facing homelessness.

SASC echoed SIS's sentiment that the University's involvement is an **important signal** to other higher education institutions regarding the social investment space. The University's funding has acted as a catalyst for funding from the **Scottish Investment Bank** and their partnership has been a **bridge** for SASC getting involved with more organisations in Scotland.

### Ada Ventures

**Ada Ventures**, London-based investment company, received **£500,000** of funding from the University of Edinburgh SIF. Ada Ventures is an **inclusive venture** firm, with the goal of finding and funding extraordinary talent building breakthrough ideas for resolving the world's toughest issues. The University's funding facilitated investment in early stage, **high impact** technology businesses in the UK across **climate, healthcare & ageing** and **economic empowerment**.

Ada Ventures believe the University's investment has helped them **attract funding** from more investors, the University's track record of investing in high growth technology businesses provides **significant credibility**.

## 4.4 Direct impact

### 4.4.1 Net tuition fee income

To assess the level of **gross tuition fee income** associated with international students in the 2021-22 cohort, we made use of data on the average tuition fees per student charged by the University of Edinburgh in 2021-22 (by study level, mode, and domicile<sup>92</sup>). Assuming the same average study durations as in the analysis of the impact of the University of Edinburgh's teaching and learning activities provided to UK-domiciled students (see Section 3), we calculated the resulting tuition fee income per international student in the cohort from the start of a student's learning aim until completion. Expressing the total fee income until completion in 2021-22 prices and using the HM Treasury Green Book real discount rate of 3.5% (see HM Treasury, 2022), we arrived at an estimate of the gross tuition fee income per student (in present value terms over the total study duration).

To calculate the **net tuition fee income** per student, we then deducted any **fee waivers and bursaries** paid to international students by the University of Edinburgh<sup>93</sup>. These costs were again calculated over students' total study duration and estimated in present value terms<sup>94</sup>.

Combining the estimates per student with information on the number of non-UK students in the 2021-22 cohort, and using the same assumptions on completion rates as for UK domiciled students (as part of the analysis of the impact of teaching and learning (see Section 3)), we arrived at estimates of the total net tuition fee income associated with EU and non-EU students in the 2021-22 cohort of University of Edinburgh students. As presented in Figure 23, the **total net tuition fee income** generated by international students in the cohort was estimated at **£365 million**, of which **£51 million (14%)** was generated by **EU students**, and **£315 million (86%)** was generated by **non-EU students**.

**Figure 23 Aggregate net tuition fee income associated with international student entrants in the 2021-22 cohort, by domicile (£m)**



Note: All estimates are presented in 2021-22 prices, discounted to reflect net present values, and rounded to the nearest £1m. Values may not add up precisely to the totals due to rounding.

Source: London Economics' analysis

<sup>92</sup> As in the analysis of the University of Edinburgh's teaching and learning activities (see Section 3), we used information provided by the University of Edinburgh on the average tuition fees charged per *full-time* student at the University of Edinburgh in the 2021-22 academic year, separately by domicile and study level (with data provided for all undergraduate students combined, 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 (ensuring that the estimated fees for part-time students accurately reflect the average study intensity amongst part-time students in the 2021-22 cohort), we adjusted the respective full-time rates for the average study intensity amongst part-time students in the cohort.

This approach was used to derive the estimated tuition fees per non-EU student (by study level and mode); as outlined in further detail in Section 4.3, following the UK's exit from the European Union, we assume that all EU students in the 2021-22 cohort were charged the same tuition fees as non-EU students (as EU students were generally no longer eligible for 'home' fee status). As a result, we apply the average non-EU fee rates to both non-EU *and* EU students (i.e. we assume the same fees per student per year for EU students as for non-EU students).

<sup>93</sup> See Section 3.4.2 for more information on our assumptions in relation to fee waivers and bursaries.

<sup>94</sup> For information on the estimated levels of net fee income per student, please refer to Annex A2.3.2.

#### 4.4.2 Non-fee income

In addition to tuition fees, the UK economy benefits from export income from overseas students' **non-tuition fee (i.e. living cost) expenditures** incurred during their studies at the University of Edinburgh. These costs include:

- **Accommodation costs** (e.g. rent costs, council tax, household bills etc.);
- **Subsistence costs** (e.g. food, entertainment, personal items, non-course travel etc.);
- **Direct course costs** (e.g. course-related books, subscriptions, computers etc.);
- **Facilitation costs** (e.g. course-related travel costs); and
- **Spending on children** (including childcare that is not related to students' course participation).

The level of non-tuition fee expenditure by overseas students is often found to be greater than their tuition fee expenditure<sup>95</sup>, making these living cost expenditures a significant component of the UK's export income from international students coming to study at UK higher education institutions.

To analyse the level of non-tuition fee expenditure associated with the 2021-22 cohort of international students studying at the University of Edinburgh, we used estimates from the **2014-15 Student Income and Expenditure Survey (SIES)**<sup>96</sup>. The survey provides estimates of the average expenditures of English domiciled undergraduate students (studying in England or Wales) on living costs, housing costs, participation costs (including tuition fees) and spending on children, separately for full-time and part-time students. For the purpose of this analysis, we made the following adjustments to the 2014-15 SIES estimates:

- We excluded estimates of **tuition fee expenditure** (to avoid double-counting with the analysis presented in Section 4.4.1).
- We deducted any **on-campus expenditure** that students might incur (to avoid double-counting with the analysis of the impacts of the expenditure of the University of Edinburgh itself (see Section 5))<sup>97</sup>.
- The SIES estimates relate to English domiciled students studying in England or Wales only<sup>98</sup>. To take account of differences in living costs between the Home Nations, we **adjusted the estimates for average price differences between England and Scotland**, based on regional consumer price levels in Scotland relative to England<sup>99</sup>.
- Since the SIES results do not provide expenditure estimates for non-UK domiciled students, our analysis implicitly assumes that non-tuition fee expenditure levels do not vary significantly between UK and international students. We do, however, adjust the SIES estimates for the longer **average stay durations** in the UK of non-EU students compared to EU students<sup>100</sup>.

<sup>95</sup> See Department for Business, Innovation and Skills (2011b).

<sup>96</sup> See Institute for Employment Studies & National Centre for Social Research (2018). At the time of writing, estimates for a more recent academic year were not available.

<sup>97</sup> Specifically, following the approach undertaken by Oxford Economics (2017) in analysing the collective economic impact of all UK higher education institutions in 2014-15, we assume that **10%** of students' non-tuition fee expenditures are spent on campus (i.e. are accrued as income by the University of Edinburgh itself).

<sup>98</sup> To the best of our knowledge, the most recent comparable SIES estimates for Scottish domiciled students relate to the 2007-08 academic year (see Scottish Government, 2009), and have not been updated since.

<sup>99</sup> The Office for National Statistics (2018) provides figures for England (excluding London) and London separately. We therefore calculated an (unweighted) average of the price levels across English regions and London to obtain the English price level. The data are based on 2016 (which is the most recent year for which the information is currently available).

<sup>100</sup> These adjustments are based on the approach outlined by the Department for Business, Innovation and Skills (2011b) in estimating the value of educational exports to the UK economy. For more information, please refer to Annex A2.3.3.



- Finally, we **inflated** the estimates to 2021-22 prices<sup>101</sup>.

Similar to tuition fees, we then calculated the non-tuition fee expenditure over the entire duration of students’ higher education courses (and discounted to reflect present values). The resulting estimates provide the total average (off-campus) non-fee expenditure per student in 2021-22 prices, by level of study, mode, and domicile<sup>102</sup>.

Again combining the estimated non-tuition fee income per student with the number of international students in the 2021-22 cohort expected to complete qualifications (or credits/modules) at the University of Edinburgh, the **total (off-campus) non-tuition fee expenditure** associated with international students in the 2021-22 cohort was estimated at **£317 million** (Figure 24). Of this total, **£49 million (15%)** was associated with **EU students**, whereas **£268 million (85%)** was generated by **non-EU students** in the cohort.

**Figure 24 Aggregate non-fee income associated with international student entrants in the 2021-22 cohort, by domicile (£m)**



Note: All estimates are presented in 2021-22 prices, discounted to reflect net present values, and rounded to the nearest £1m. Values may not add up precisely to the totals due to rounding.

Source: London Economics’ analysis

#### City Deal Region impact

To assess where the direct impact of non-fee income from international students is felt, we again draw upon previous research<sup>1</sup> undertaken for the University (see Section 2.1.1). Using the assumption that **93%** of student spending is in the City Deal Region, whilst the other **7%** is in the rest of Scotland, we attribute **£295 million** of non-fee direct impact to the City Deal Region, with the other **£22 million** attributed to the rest of Scotland.

#### 4.4.3 Total direct impact

Combining the above estimates of (net) fee and non-fee income, the total direct economic impact of the expenditures of international students in the 2021-22 University of Edinburgh cohort (in economic output terms) was estimated at **£682 million** (Figure 25). Slightly under half of this total (**£317 million**) was generated from international students’ non-tuition fee spending, while just over a half (**£365 million**) was generated from international students’ tuition fees accrued by the University of Edinburgh (net of any fee waivers or bursaries provided by the University of Edinburgh). In terms of student domicile, the majority of this impact (**£583 million, 85%**) was generated by non-EU domiciled students, while **£99 million (15%)** was associated with EU students (not presented graphically here).

<sup>101</sup> Inflation estimates are based on Consumer Price Index inflation estimates provided by the Office for National Statistics (2023).

<sup>102</sup> For information on the estimated levels of non-tuition fee income per student, please refer to Annex A2.3.4.



In addition to economic output (i.e. export income), it was possible to convert the above estimates into gross value added and the number of full-time equivalent jobs supported<sup>103</sup>. We thus estimate that the export income generated by international students in the 2021-22 University of Edinburgh cohort directly generates **£426 million** in GVA (**£222 million** from international (net) fee income and **£204 million** from non-fee income) and supports **7,345 full-time equivalent jobs** (**4,750** from (net) tuition fee income and **2,595** from non-tuition fee income<sup>104</sup>).

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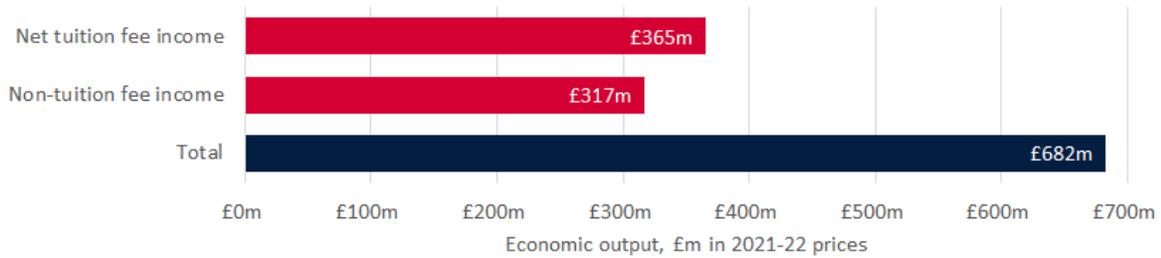
<sup>103</sup> To estimate the direct GVA and employment associated with the (net) tuition fee income generated by the University of Edinburgh's international students, we multiplied this income by the average ratio of GVA to output and FTE employees to output within Scotland's government, health, and education sector as a whole (again based on the above-described multi-regional Input-Output model).

To estimate the direct GVA and employment associated with the non-tuition fee income generated by the University of Edinburgh's international students, we instead multiplied this income by the average ratio of GVA to output and FTE employees to output associated with the expenditure of households located in Scotland (again based on the multi-regional Input-Output model). In other words, we assume that the non-tuition fee expenditures of the University of Edinburgh's international students support the same levels of GVA and employment (in relative/proportionate terms) as the expenditure of households located in Scotland more generally.

<sup>104</sup> The difference in direct employment supported by international students' tuition fee vs. non-tuition fee income is driven by the fact that the underlying ratio of FTE employees to output within Scotland's government, health, and education sector is considerably larger than the corresponding ratio for sectors producing consumer goods and services purchased by households located in Scotland (e.g. including the real estate or production sectors).

**Figure 25 Total direct impact associated with non-UK students in the 2021-22 University of Edinburgh entrant cohort, by type of impact**

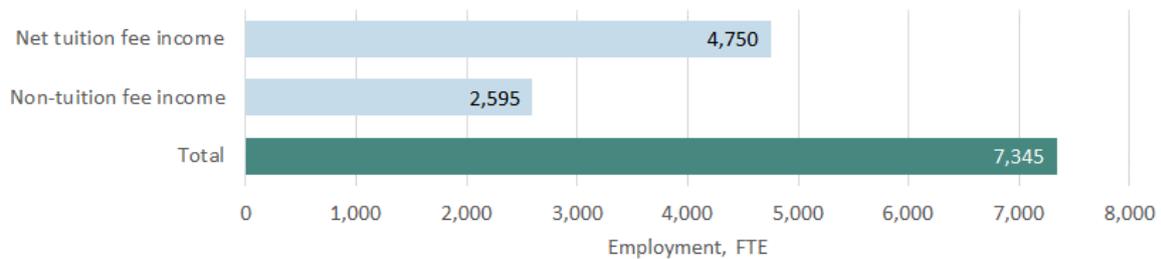
**Output, £m**



**GVA, £m**



**FTE employment**



Note: All monetary estimates are presented in 2021-22 prices, discounted to reflect net present values, and rounded to the nearest £1m. The employment figures are rounded to the nearest 5. Values may not add up precisely to the totals due to rounding.

Source: London Economics' analysis

### 4.5 Displaced non-fee domestic spending<sup>105</sup>

Using a comparable methodology as for international students, it is possible to estimate the **impact of student spending** in Scotland in the 2021-22 academic year by students domiciled in other parts of the UK ("rest of UK", henceforth "rUK").

Data provided by the University of Edinburgh indicates that the number of UK-domiciled students starting higher education qualifications in the 2021-22 academic year was **8,390**, of which, **4,140** were domiciled outside of Scotland. This analysis considers the economic impact on the Scottish economy of these **4,140** students from rUK.

<sup>105</sup> **Displacement** of economic activity from one nation or region of the UK to Scotland is not considered additional to the UK economy, and is therefore not taken into account in London Economics' main analysis. However, to provide an indication of the effect of regional student mobility, we estimate the size of the economic impact associated with rUK students attending the University of Edinburgh on the Scottish economy specifically, even if this impact is not additional to the UK economy as a whole. This analysis is based on the 2021-22 student cohort data provided by the University of Edinburgh.



The gross direct impact of the **4,140** students domiciled in rUK is calculated by combining the estimated non-tuition fee expenditure per student over the course of their studies with the number of rUK students, while the indirect and induced impacts are estimated using multipliers (as in Section 4.6). Adopting this approach, the total gross impact of the **4,140** students domiciled in rUK is calculated as:

- **£163 million of direct impact**, the vast majority of which is assumed to occur in Edinburgh itself.
- **£137 million of indirect and induced impact** on the Scottish economy.

However, not all of the **£300 million** identified economic impact can be considered **additional** to the Scottish economy. If these students had not studied at the University of Edinburgh, it may have been expected that these students enrol at a different higher education institution elsewhere in the UK instead. The spending associated with these students elsewhere in the UK economy would likely have had a (smaller) indirect and induced impact on the Scottish economy. It is therefore necessary to consider an appropriate **counterfactual** to analyse how much of the above economic impact is additional to Scotland.

To provide an indication of the counterfactual, where instead of enrolling at the University of Edinburgh, we assumed that these **4,140** students domiciled in rUK studied in the North East of England instead. In this case, the “ripple effect” associated with student expenditure in the North East would have generated an estimated **£16 million** indirect and induced impact on the Scottish economy.

Therefore, the total **additional** impact on the Scottish economy of rUK students choosing to study at the University of Edinburgh (rather than in the North East of England) is therefore estimated at a total of **£284 million**, which is broken down as:

- **£163 million of direct impact**, the vast majority of which is in Edinburgh itself.
- **£121 million** (i.e. **£137 million** minus the counterfactual estimate of **£16 million**) **of additional indirect and induced impact on the Scottish economy**, the majority of which is likely to have occurred in Edinburgh itself.

## Solar farm helps on journey to net zero

The University of Edinburgh has committed to become **zero carbon** by **2040** as a way of **mitigating** the **impact** of **climate change**. A **solar farm** on the University's Easter Bush campus was installed in 2020 to provide **15%** of the **site's electricity consumption**. The solar farm will play a **vital role** on the University's journey to becoming carbon neutral by 2040.

Almost **5,000 ground-mounted panels** were installed at the campus in Midlothian in a move that will save an estimated **£200,000 per year** in **electricity costs**. The **five-hectare** site – the equivalent of five football pitches – is connected to the Royal (Dick) School of Veterinary Studies and the Roslin Institute in Easter Bush. Its photovoltaic (PV) panels are expected to generate more than **1,400,000 kWh** of electricity a **year**, which is roughly the same as that needed to supply **500** typical **homes**. Together with existing generation capacity, **60%** of Easter Bush's electricity, and **30%** of its heat, will be generated on site from low or zero-carbon technologies.

The University of Edinburgh was an **early adopter** of PV technology. Its first panels were installed at its King's Buildings campus in **2007** and have since generated nearly **1,000MWh**. In recent years, the University's solar installations have generated an average of **265 MWh** of **electricity annually**. This latest development will **substantially increase** that figure, to an **average annual** figure of **4,500 MWh**, which will save more than **1,000 tonnes** of **carbon emissions** each **year**.

Another key aspect of the University's aim of becoming net zero by 2040 is a **long-term commitment** to **capture** and **store** its **unavoidable carbon emissions**, and benefit nature, through the restoration of peatlands and expanding forests in Scotland. Over an initial period of 50 years, by **investing** in **tree planting** and **restoring peatlands** in partnership with others, the University expects to **remove** almost **1.5 million tonnes** of **carbon dioxide** from the atmosphere. This will also yield **significant benefits** to the **institution's core purposes of research, learning and teaching**, as well as **enhancing biodiversity** for the sites. The University of Edinburgh's ambition of becoming carbon neutral by 2040 represents one aspect of the University's **commitment** to **social** and **civic responsibility** and to meeting the **United Nations' Sustainable Development Goals**.



Photo credit: India Hunkin

## 4.6 Total economic impact associated with the University of Edinburgh's educational exports

To estimate the total (direct, indirect, and induced) economic impact associated with the export income generated by international students studying at the University of Edinburgh, we used economic multipliers derived from the above-described multi-regional Input-Output model (see Section 2.2), estimating the extent to which the direct export income generates additional activity throughout the UK economy. Specifically, we applied two types of multipliers to the above-described tuition fee and non-tuition fee income associated with international students in the 2021-22 cohort, including:

- **Multipliers relating to international tuition fee income (accrued by the University of Edinburgh itself):** The multipliers used to estimate the impact of the University of Edinburgh's international tuition fee income were calculated based on the inter- and intra-industry flows of goods and services for Scotland's government, health, and education sector as a whole<sup>106</sup>.
- **Multipliers relating to income from international students' (off-campus) non-tuition fee expenditures:** These were calculated based on the final consumption expenditure patterns of households located in Scotland<sup>107</sup>, and subsequently applied to the estimated off-campus non-tuition fee expenditures of overseas students in the 2021-22 cohort of University of Edinburgh students.

Again, these multipliers are expressed in terms of **economic output, gross value added**, and (full-time equivalent) **employment**, and are calculated as **total multipliers**, capturing the aggregate impact on all industries in the UK economy arising from an initial injection relative to that initial injection.

Table 17 presents the economic multipliers applied to the income generated by international students at the University of Edinburgh (in terms of the impact on Scotland and the UK economy as a whole)<sup>108</sup>. In terms of economic output, the analysis assumes that every £1 million of **tuition fee expenditure** incurred by international students generates an **additional £1.54 million** of impact throughout the UK economy, of which **£0.83 million** is generated in Scotland. In addition, we assume that every £1 million of **non-fee expenditure** incurred by international students generates an **additional £1.53 million** of impact throughout the UK, of which **£0.84 million** is located in Scotland.

<sup>106</sup> This approach is based on the fact that the tuition fee income from international students is accrued by the University of Edinburgh itself. In other words, we assume that the expenditure patterns of the University of Edinburgh are the same as for other institutions operating in Scotland's government, health, and education sector. Specifically, we apply these multipliers to the *gross* tuition fee income generated by international students in the 2021-22 University of Edinburgh cohort, and then deduct the University of Edinburgh's cost of provision (i.e. University of Edinburgh fee waivers and bursaries) to arrive at the *net* direct, indirect and induced impact associated with this income.

<sup>107</sup> In other words, for the purpose of applying relevant economic multipliers, we assume that international students studying at the University of Edinburgh have similar expenditure patterns as households in Scotland more generally. To estimate these multipliers, we inserted a separate vector into the multi-regional Input-Output model, capturing the estimated final demand (again by industry and region) of households located in each region.

<sup>108</sup> While the table presents the multipliers for the impacts on Scotland and the UK as a whole, a full breakdown of the total impacts across all regions (as well as by sector) is provided in Figure 22.



**Table 17 Economic multipliers associated with the income from international student entrants in the 2021-22 cohort of University of Edinburgh students**

Location of impact and type of income	Output	GVA	FTE employment
<b>Tuition fee income</b>			
Scotland	1.83	1.81	1.56
Total UK	2.54	2.46	2.02
<b>Non-fee income</b>			
Scotland	1.84	1.81	1.85
Total UK	2.53	2.42	2.55

Note: All multipliers constitute Type II multipliers, defined as  $[\text{Direct} + \text{indirect} + \text{induced impact}]/[\text{Direct impact}]$ .

Source: London Economics' analysis

Applying these multipliers to the above direct economic impacts<sup>109</sup>, we estimate that the total economic impact on the UK generated by the (net) tuition fee income and non-tuition fee income associated with international students in the 2021-22 University of Edinburgh cohort amounts to **£1,770 million of economic output** (see top panel of Figure 26):

**The impact of the export income generated by the 2021-22 University of Edinburgh cohort stood at £1,770 million.**

- In terms of the breakdown by type of income from international sources, **£968 million** of this impact was associated with international students' (net) **tuition fees**, and **£802 million** was associated with these students' **non-tuition fee expenditures** over the duration of their studies at the University of Edinburgh.
- In terms of the breakdown by region, most of this impact (**£1,279 million, 72%**) was generated in **Scotland**, with the remaining **£491 million (28%)** occurring in **other regions** across the UK.
- In terms of sector, the tuition fee and non-tuition fee income generated from the University of Edinburgh's international students generated particularly large impacts within the **government, health, and education sector (£503 million (28%)**, unsurprising given that the cohort's tuition fee income is accrued as income by the University of Edinburgh itself). In addition, there are relatively large impacts felt within the **distribution, transport, hotel, and restaurant sector (£317 million, 18%)**, and the **real estate industry (£248 million, 14%)**<sup>110</sup>.

The impact in terms of gross value added was estimated at **£1,063 million** across the UK economy as a whole (with **£788 million** generated within Scotland), while the corresponding estimates in terms of employment stood at **16,585 full-time equivalent jobs** across the UK as a whole, with **12,490 jobs** supported across Scotland.

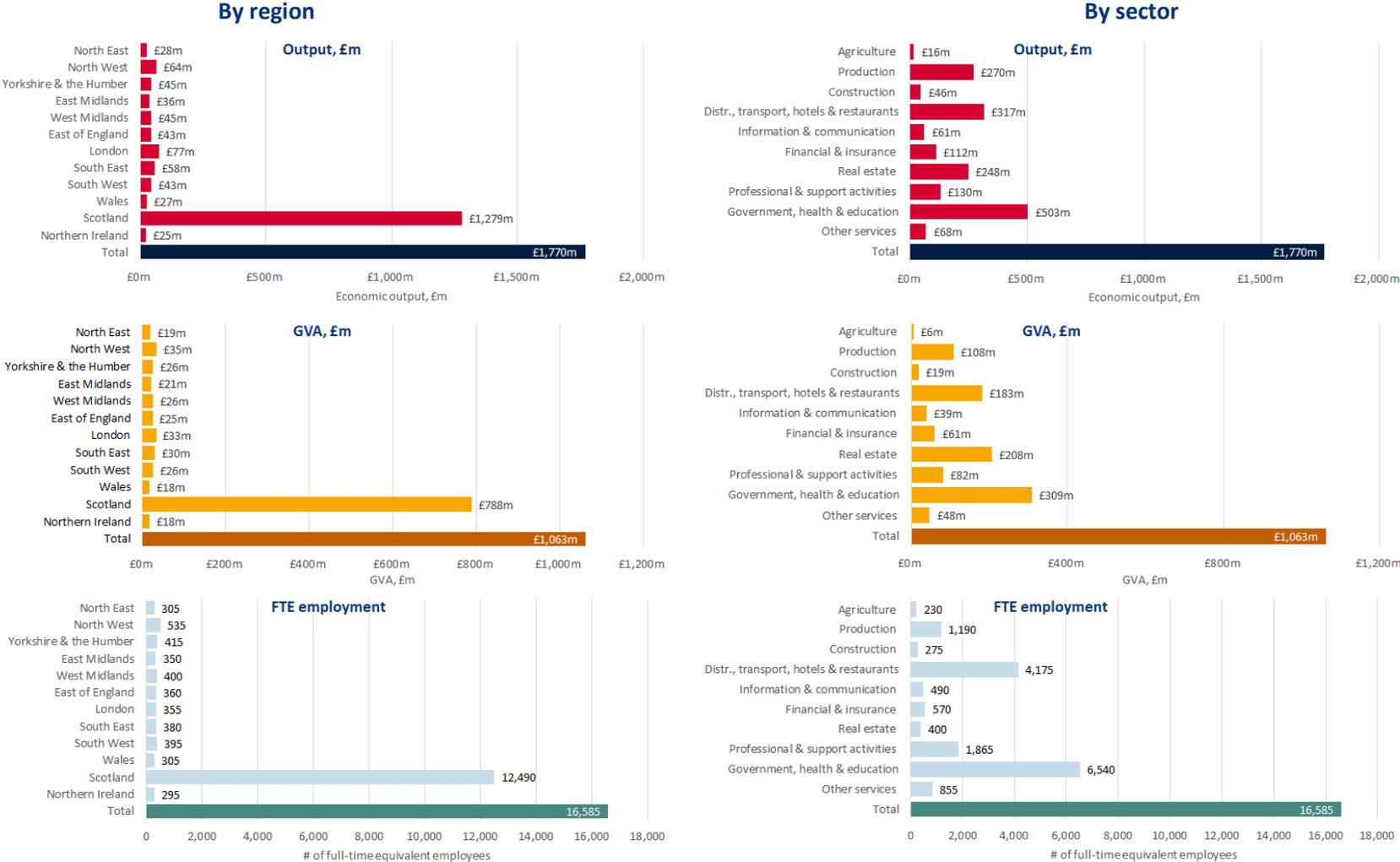
To place these estimates in context, the University attracts 2.6% of all international students coming to the UK and 22% of international students coming to Scotland. Analysis undertaken by London Economics (2023) on behalf of the Higher Education Policy Institute and UK Universities International on the economic costs and benefits associated with international students, identified the total gross economic impact to the UK economy associated with international students commencing their studies in 2021-22 to be approximately £41.9 billion. Although a slightly different methodology is adopted compared to the one presented here, this suggests that the University of Edinburgh contributes approximately 4% of the gross economic benefit to the UK economy associated with international students.

<sup>109</sup> Again, in terms of tuition fee income, note that we apply the relevant multipliers to the *gross* tuition fee income generated by international students in the 2021-22 University of Edinburgh cohort, and then deduct the University of Edinburgh's cost of provision (i.e. University of Edinburgh fee waivers and bursaries) to arrive at the *net* direct, indirect and induced impact associated with this income.

<sup>110</sup> Again, for more detail on what industries are included in this high-level sector classification, please refer to Table 21 in Annex A2.1.



Figure 26 Total economic impact associated with international students in the 2021-22 University of Edinburgh entrant cohort, by region and sector



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



## Data Driven Innovation and Economic Development at Edinburgh

Data Driven Innovation is a **£661m investment and innovation programme**, and the largest part of the **£1.3bn Edinburgh and South-East Scotland City Region Deal**, with funding from both the UK and Scottish Governments.

Through this, **six innovation hubs** are being created, with expertise and facilities to help **ten industry sectors** become more innovative with the use of data. The University of Edinburgh hosts the Bayes



Photo credit: Maverick Photo Agency

Centre, Edinburgh Futures Institute, Easter Bush Agritech Hub, Usher Institute, and the heart of DDI: the Edinburgh International Data Facility (EIDF), a computing and storage facility for the secure and trustworthy analysis of datasets. The sixth hub – the National Robotarium – is hosted by Heriot-Watt University.

These hubs allow industry, academia and the public and third sectors to work together in the same space – as Mark Logan referenced in his Scottish Technology System review, it's the 'market square' approach where innovation can thrive from the meeting of different stakeholders.

The **£270m of government capital investment** to the University of Edinburgh and Heriot-Watt University is the **largest ever single UK public sector investment in the academic sector** by a considerable margin.

The hubs will increase the contribution of research and in-demand graduate skills to the region's economy, **launching** spinout companies, **attracting** start-ups and established businesses, and **driving** public and private sector **investment**. Experts within these hubs will collaborate with partners on data-based projects in the public, private and third sectors.

Finally, another important driver of the DDI initiative is to help researchers work together at the crossroads of academic disciplines where exciting innovations take place. From food production and climate change, to exploring space and genetically-tailored healthcare, we want to bring academic disciplines together to delve into some of the world's most pressing challenges – using data to innovate.

Internally, the University acts as a change agent to future-proof the data culture and data competences at the University of Edinburgh and Heriot-Watt University. The DDI hubs will act as a **unified innovation network, supporting partnerships and enabling multidisciplinary research and learning**.

Regionally, the universities play a key role in establishing the **Scottish Tech Ecosystem** as the best in the UK. The region's skills and talent promotion are helping to deliver a competent workforce for the growing tech-enabled regional economy.

### **Danu Robotics, an emerging DDI success story**

Edinburgh-based clean tech company, **Danu Robotics**, is working with EPCC's supercomputing capabilities to develop a system which aims to **automate waste sorting** at recycling plants – also known as materials recovery facilities (MRFs) – with speed and accuracy, thereby increasing the quality of output and reducing costs.

The Danu Robotics solution is based on **machine learning software** that can visually identify recyclable and non-recyclable material and remove any items that should not be there. While trained human operators can work at an average of 10-20 picks per minute, Danu Robotics' prototype system, at the moment, can work at 40 picks per minute and reduce the contamination rates to below 1%, saving on operating costs ranging from 30% to 100%.

EPCC's Cirrus supercomputer provided significant professional software engineering support, processing the data and helping to train the software.

This technology is a key enabler for efficient and effective recycling to take place globally, can help recover valuable resources from waste and promotes the achievement of the circular economy.



THE UNIVERSITY  
*of* EDINBURGH



# **Data-Driven Innovation**

***Part of the Edinburgh & South East Scotland City Region Deal***



## 5 The impact of the University of Edinburgh's expenditures

As is commonly the approach to estimating the economic impact of a higher education's expenditure, in this section we outline our estimates of the **direct, indirect, and induced impacts** associated with the operational and capital expenditures of the University of Edinburgh. Analyses of these impacts consider universities as economic units creating output within their local economies by purchasing products and services from their suppliers and hiring employees. Similar to the impact of the University's knowledge exchange activities (see Section 2.2) and the impact of the University of Edinburgh's educational exports (see Section 4), the direct, indirect, and induced economic impacts of a university's expenditures are defined as follows:

- **Direct effect:** This considers the economic output generated by the University of Edinburgh itself, by purchasing goods and services (including labour) from the economy in which it operates.
- **Indirect effect:** The University of Edinburgh's purchases generate income for the supplying industries, which they in turn spend on their own purchases from suppliers to meet the University of Edinburgh's demands. This again results in a chain reaction of subsequent rounds of spending across industries, i.e. a 'ripple effect'.
- **Induced effect:** The employees of the University of Edinburgh and of businesses operating in the University of Edinburgh's supply chain use their wages to buy consumer goods and services within the economy. This in turn generates wage income for employees within the industries producing these goods and services, who then spend their own income on goods and services – leading to a further 'ripple effect' throughout the economy as a whole.

In line with the other strands of impact, the analysis focuses on the 2021-22 academic year. As with the impact of the University's knowledge exchange activities and the impact of the University of Edinburgh's educational exports, these impacts can be measured in terms of economic output, gross value added, and (full-time equivalent) employment.

### 5.1 Direct impact of the University's expenditures

To measure the direct economic impact of the purchases of goods, services, and labour by the University of Edinburgh, we used information on the University's operational expenditures (including staff and non-staff spending), capital expenditures, as well as the number of staff employed (in terms of full-time equivalent employees), for the 2021-22 academic year<sup>111</sup>.

Based on this, in terms of monetary economic **output** (measured in terms of expenditure), **the direct economic impact** associated with the University of Edinburgh's expenditures stood at approximately **£1,243 million** in 2021-22 (see Figure 27). This includes **£640 million** current expenditure on staff related costs, **£446 million** current expenditure on other (non-staff) operating expenses<sup>112</sup>, as well as **£157 million** of capital expenditure incurred in that academic year.

<sup>111</sup> Based on staff data provided by the University of Edinburgh and financial data from the University of Edinburgh's financial statement.

<sup>112</sup> The total operational expenditure (excluding capital expenditure) of the University of Edinburgh in 2021-22 stood at **£1,389 million**. From this, for the purpose of the analysis, we excluded **£61 million** in depreciation costs (from non-staff expenditure) and **£242 million** in movements in pension provisions (from staff expenditure), as it is assumed that these are not relevant from a procurement perspective (i.e. these costs are not accounted for as income by other organisations). This results in operational expenditure of **£1,086 million** in 2021-22.

**Figure 27 Direct economic impact (in terms of output) of the University of Edinburgh's expenditure in 2021-22, by type of expenditure**



Note: We exclude a total of **£61 million** of non-staff costs associated with depreciation, and **£242 million** of staff costs associated with movements in pension provisions, as it is assumed that these are not relevant from a procurement perspective (i.e. these costs are not accounted for as income by other organisations). All estimates are presented in 2021-22 prices, and rounded to the nearest £1m.

Source: London Economics' analysis based on HESA (2020a) and data provided by the University of Edinburgh

In addition to these total expenditures, we investigated the **geographical breakdown** of the University of Edinburgh's procurement expenditures, residential addresses of staff and staff expenditure, to demonstrate the breadth of the University of Edinburgh's impact across Scotland and the rest of the UK.

Figure 28 presents the distribution of the University of Edinburgh's procurement expenditures (based on invoice data for 2021-22) by postcode. The map illustrates a clear concentration of procurement expenditure in **Scotland** (approximately **30% of expenditure**) and **London** (approximately **26% of expenditure**)<sup>113</sup>. Although these two regions account for approximately three-fifths of the University of Edinburgh's procurement expenditure, the University of Edinburgh also spends significant amounts on goods and services from suppliers in other regions, including the **South East (19%)**, the **East of England (6%)**, and the **South West (4%)**.

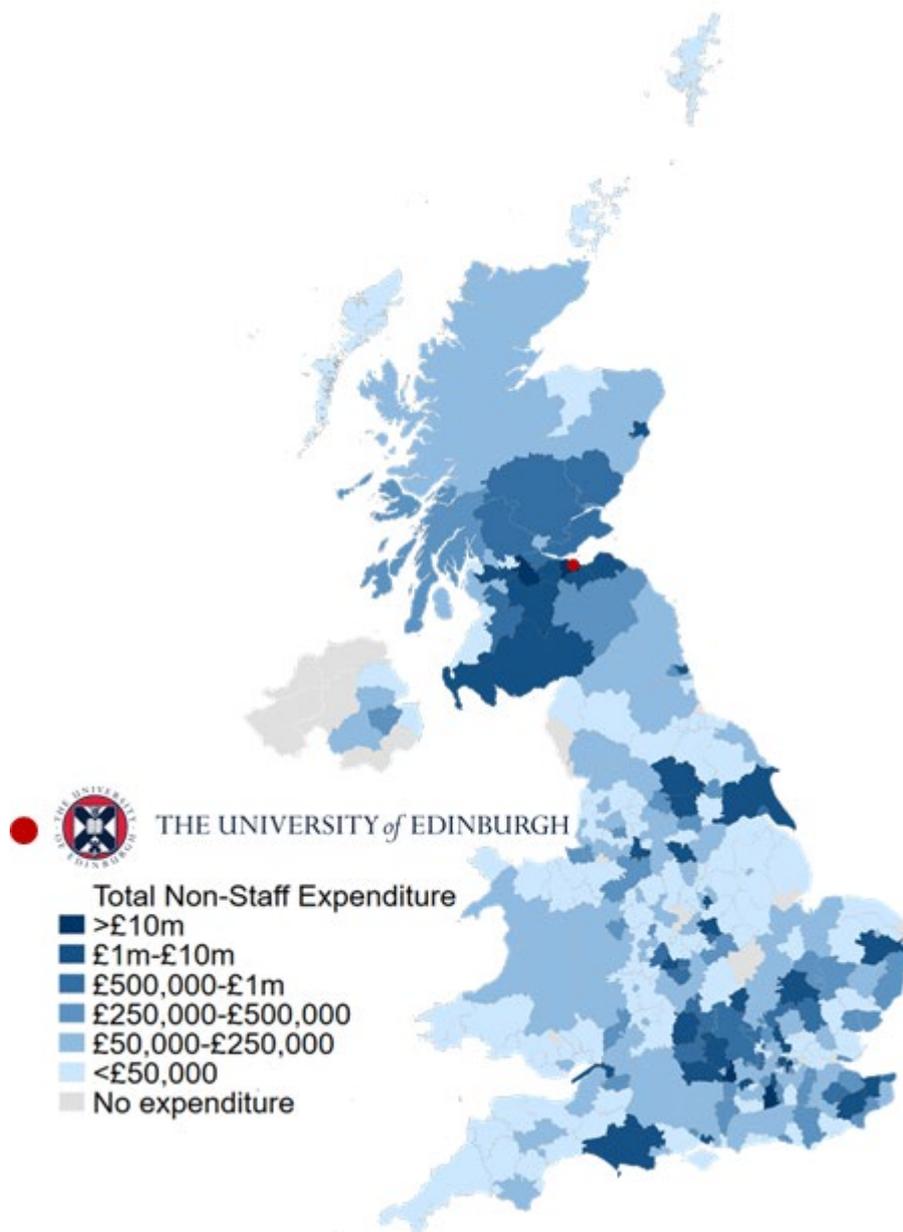
In addition to the analysis of the University of Edinburgh's procurement expenditure, Figure 29 and Figure 30 illustrate the distribution of the University of Edinburgh's staff by number and expenditure (respectively) based on the outward postcode area of employees' home address. The maps again show a large concentration of staff and staff expenditure around the University of Edinburgh (approximately **96% of staff are based in Scotland**), as would be expected, but also dispersion around the **South East** (approximately **1%**) and **London** (approximately **1%**).

### City Deal Region impact

Of the **£280 million** of non-staff expenditure, approximately **£42 million (15%)** of this was spent on suppliers based in the City Deal Region. Whereas the majority of the staff expenditure was concentrated in the City Deal Region (**£377 million, 88%**). As such, we attribute **£419 million** of direct impact from the University's expenditure to the City Deal Region.

<sup>113</sup> It is likely that the data overestimates the level of procurement expenditure occurring in London as compared to other regions, since the invoice data would reflect suppliers' head office locations, rather than reflecting the location where these activities took place.

**Figure 28** Distribution of the University of Edinburgh's procurement expenditure in 2021-22, by outward postcode area (of invoice address)

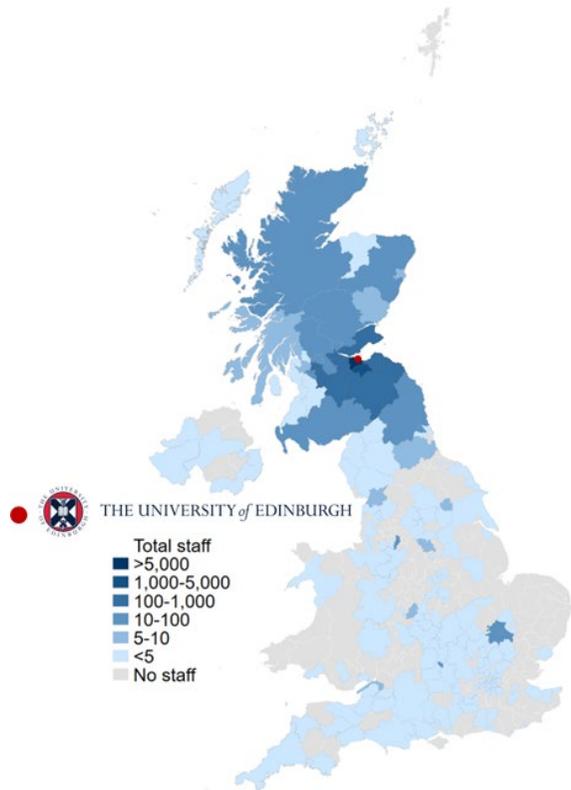


Note: We received data on the invoice outward postcodes associated with £280 million of procurement expenditure by the University of Edinburgh in 2021-22. We excluded expenditure records with negative expenditure (2 records) after these exclusions, the figure is still based on a total of £280 million of procurement expenditure (to the nearest million). We used the February 2022 ONS Postcode Directory to determine the local authority for each outward postcode included in the dataset. The data was then matched with the ONS digital vector boundaries for local authorities as of May 2021 to generate the map.

*Source: London Economics' analysis based on the University of Edinburgh's data and Office for National Statistics data. Contains National Statistics, OS, Royal Mail, Gridlink, ONS, NISRA, NRS and Ordnance Survey data © Crown copyright and database right 2021/2022*



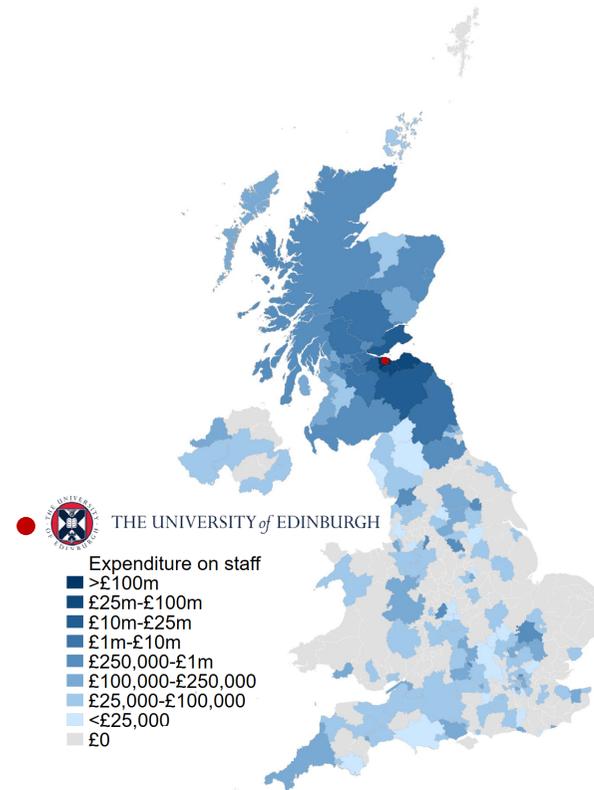
**Figure 29** Distribution of the University of Edinburgh's staff, by outward postcode area (of home address)



Note: We received data on home address outward postcode and the first character of the inward postcode for a total of 12,045 staff (in headcount) from the University of Edinburgh. Of this total, we excluded staff records where staff outward postcode is missing (259 staff). 32 outward postcodes did not originally match with the ONS database, each representing 1 member of staff. The figure is thus based on the home addresses of 11,754 staff. We used the February 2022 ONS Postcode Directory to determine the local authority for each postcode included in the dataset. The data was then matched with the ONS digital vector boundaries for local authorities as of May 2021 to generate the map.

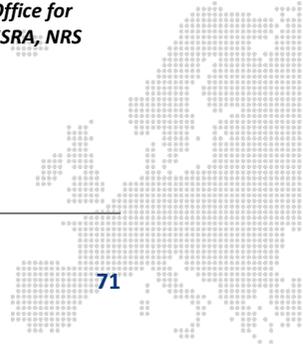
**Source:** London Economics' analysis based on the University of Edinburgh's data and Office for National Statistics data. Contains National Statistics, OS, Royal Mail, Gridlink, ONS, NISRA, NRS and Ordnance Survey data © Crown copyright and database right 2021/2022

**Figure 30** Distribution of the University of Edinburgh's expenditure on staff, by outward postcode area (of home address)



Note: The same data, as for the staff headcount map, was used to map staff expenditure. The data represented a total of £427 million of staff expenditure. The 259 missing postcodes represented £8.2 million of staff spend, whilst those unmatched with ONS data represented a further £1.1 million. The figure is thus based on the home addresses of £417 million of staff expenditure (to the nearest million, totals may not add up due to rounding). We used the February 2022 ONS Postcode Directory to determine the local authority for each postcode included in the dataset. The data was then matched with the ONS digital vector boundaries for local authorities as of May 2021 to generate the map.

**Source:** London Economics' analysis based on the University of Edinburgh's data and Office for National Statistics data. Contains National Statistics, OS, Royal Mail, Gridlink, ONS, NISRA, NRS and Ordnance Survey data © Crown copyright and database right 2021/2022



## 5.2 Indirect and induced impacts of the University's expenditures

As with the economic impact of the University of Edinburgh's educational exports (see Section 4), the assessment of the indirect and induced economic impacts associated with the expenditures of the University of Edinburgh is again based on economic multipliers derived from the above-discussed multi-regional Input-Output model<sup>114</sup>. In particular, we applied the estimated average economic multipliers associated with organisations in Scotland's government, health, and education sector. This mirrors the approach used to assess the impact of the University of Edinburgh's international tuition fee income, since this income was accrued (and subsequently spent) by the University of Edinburgh itself. Again, this approach asserts that the spending patterns of the University of Edinburgh reflect the average spending patterns across organisations operating in Scotland's government, health, and education sector.

These multipliers (for Scotland and the UK as a whole<sup>115</sup>) are presented in Table 18, indicating that every £1 million of operational or capital expenditure incurred by the University of Edinburgh generates an **additional £1.54 million** of impact throughout the UK economy, of which **£0.83 million** is generated in Scotland<sup>116</sup>. In terms of employment, we assume that, for every **1,000** (FTE) staff employed directly by the University of Edinburgh, an additional **1,020** staff are supported throughout the UK, of which **560** are located in Scotland.

**Table 18 Economic multipliers associated with the expenditures of the University of Edinburgh**

Location of impact	Output	GVA	FTE employment
Scotland	1.83	1.81	1.56
Total UK	2.54	2.46	2.02

Note: All multipliers constitute Type II multipliers, defined as  $[\text{Direct} + \text{indirect} + \text{induced impact}]/[\text{Direct impact}]$ . The figures match the assumed multipliers associated with the University of Edinburgh's international tuition fee income (see Table 17 in Section 4.6).

Source: *London Economics' analysis*

## 5.3 Adjustments for double-counting and transfers

Before arriving at the total direct, indirect, and induced impact associated with the University of Edinburgh's institutional spending, it is necessary to deduct a number of income and expenditure items to avoid double-counting, and to take account of the 'netting out' of the costs and benefits associated with the University of Edinburgh's activities between different agents in the UK economy. Specifically, we deducted:

- The total research income received by the University of Edinburgh in 2021-22 (**£423 million**), to avoid double-counting with the estimated impact of the University of Edinburgh's research activities (Section 2.1.1);
- The direct, indirect, and induced impacts associated with the University's other knowledge exchange activities (**£188 million** in economic output terms), to avoid double-counting with the impact of the University's other knowledge exchange activities (Section 2.2.2);

<sup>114</sup> See Section 4 for more information.

<sup>115</sup> Again, in addition to the impacts on Scotland and the UK as whole, the analysis estimates a full breakdown across all regions, as well as by sector. These detailed results are presented in Section 5.4.

<sup>116</sup> This exactly matches the assumed multipliers associated with the University of Edinburgh's international tuition fee income (see Table 15 in Section 4.6).

- **£16 million** in the University of Edinburgh fee waivers and other bursary spending for UK-domiciled students<sup>117</sup>, as this was included (as a benefit) in the analysis of the University of Edinburgh's teaching and learning activities (Section 3); and
- The direct, indirect, and induced impacts generated by the University of Edinburgh's (gross) international fee income associated with the 2021-22 cohort of non-UK students (**£995 million**<sup>118</sup>), to avoid double-counting with the impact of the University of Edinburgh's educational exports (Section 4).

## 5.4 Aggregate impact of the University of Edinburgh spending

Figure 31 presents the estimated total direct, indirect, and induced impacts associated with expenditures incurred by the University of Edinburgh in 2021-22 (after the above-described adjustments have been made). The aggregate impact of these expenditures was estimated at approximately **£1,535 million** in economic output terms (see top panel of Figure 31):

**The impact of the University of Edinburgh's expenditure on the UK economy in 2021-22 stood at £1.535 billion.**

- In terms of region, as with the impact of exports (Section 4), the majority of this impact (**£1,105 million, 72%**) was generated in **Scotland**, with **£429 million (28%)** occurring in **other regions** across the UK.
- In terms of sector, in addition to the impacts occurring in the **government, health, and education sector** itself (**£699 million, 46%**)<sup>119</sup>, there are also large impacts felt within other sectors, e.g. including the **production sector (£203 million, 13%)**, the **distribution, transport, hotel, and restaurant sector (£200 million, 13%)**, and the **real estate sector (£137 million, 9%)**<sup>120</sup>.

In terms of the number of jobs supported (in FTE), the results indicate that the University of Edinburgh's spending supported a total of **10,490 FTE jobs** across the UK economy in 2021-22 (of which **8,085** are located in Scotland). In addition, the impact in terms of gross value added was estimated at **£1,044 million** across the UK economy as a whole (with **£769 million** generated within Scotland).

<sup>117</sup> The University of Edinburgh's bursary support to UK domiciled students is considered as a benefit to the student in the analysis of the impact of teaching and learning (see Section 3). It was therefore necessary to deduct these bursaries from the direct impact of the University of Edinburgh's spending to correctly take account of the fact that these bursaries are a transfer from the University of Edinburgh to its students, and not an additional benefit to the UK economy.

<sup>118</sup> This is slightly larger than the above impact of the *net* tuition fee income associated with international students in the 2021-22 cohort (**£968 million**; see Section 4.6), as the value deducted here relates to the impact of the University of Edinburgh's *gross* international fee income *before* the deduction of the University of Edinburgh's funding costs associated with these students (since these costs are already deducted when estimating the impact of the University of Edinburgh's educational exports).

<sup>119</sup> The size of this impact is driven by the fact that, along with the indirect and induced impacts, it includes the *direct* level of expenditure of the University of Edinburgh (net of the above adjustments to avoid any double-counting).

<sup>120</sup> Again, for more detail on what industries are included in this high-level sector classification, please refer to Table 21 in Annex A2.1.

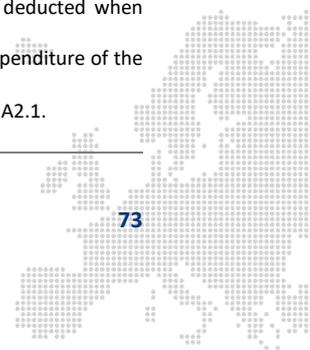
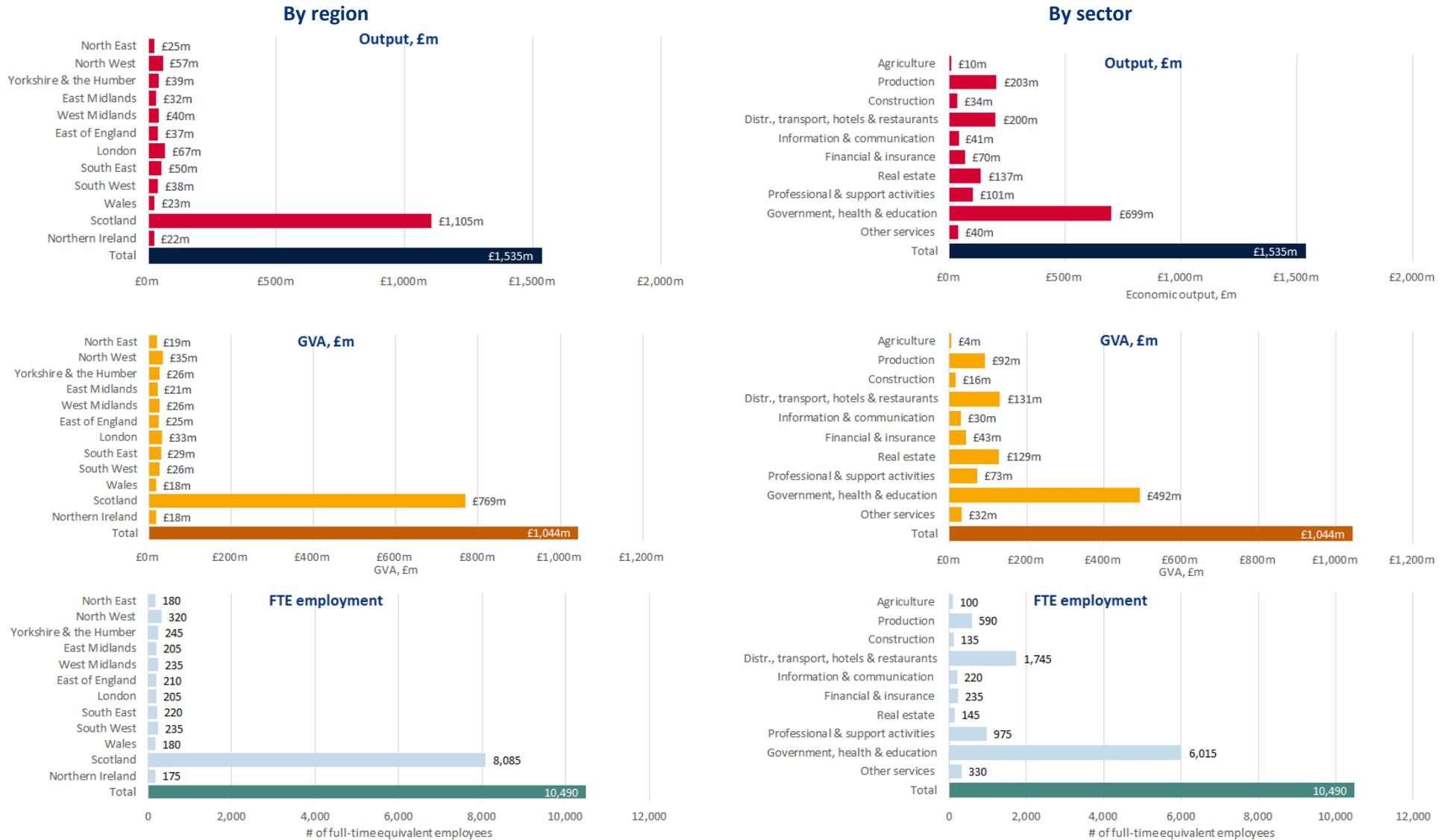


Figure 31 Total economic impact associated with the University of Edinburgh's expenditure in 2021-22, by region and sector



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

## Early Pandemic Evaluation and Enhanced Surveillance of Covid-19 (EAVE II)

EAVE II has created the most **comprehensive national Covid-19 surveillance platform** in the world. It covers **5.4 million** people, approximately **99%** of the **Scottish population**, and brings together linked GP, vaccination, testing, viral sequencing, hospitalisation, prescribing, and mortality **data** into a near **real-time national longitudinal cohort**. Results were presented to **key policy** and **decision-making bodies**, including the Scottish Government's Chief Medical Officer Covid-19 Advisory Group, the Joint Commission on Vaccination and Immunisation, Medicines and Healthcare



Photo credit: Neil Hanna

products Regulatory Agency and the World Health Organisation. It has been used to answer **urgent health policy**, **public health** and **clinical** questions in relation to:

- epidemiology and forecasting of the pandemic;
- risk stratification to identify those at highest risk of severe Covid-19 outcomes;
- uptake, effectiveness and safety of Covid-19 vaccines and therapeutics; and
- investigation of healthcare disruption and recovery.

The team showed that **first dose Covid-19 vaccines** provided **substantial protection** (>90%) against Covid-19 hospital admissions, leading to **international confidence** in the **effectiveness** of **vaccines** against **severe Covid-19 outcomes**. The study also **influenced international health policies** in several countries to make the Oxford/AstraZeneca vaccine available to older people by showing that this vaccine was equally **effective** regardless of **age**.

EAVE II also **detected** the **occurrence** of **vaccine waning**, thereby **accelerating** the **introduction** of **booster vaccine** doses. A planned national lockdown after Christmas 2021 was averted after the study reported that the Omicron variant led to less severe disease despite being more transmissible. More recently, EAVE II helped to **guide** the **prioritisation** of the **booster vaccine** roll-out in autumn 2022 to those at **increased risk** of Covid-19 hospitalisation and death: older people, people with multimorbidity and those with underlying health issues.



Photo credit: Neil Hanna

EAVE II is led from the **Usher Institute**<sup>121</sup> at The University of Edinburgh in partnership with **Public Health Scotland** – directly aligning with the needs of both **policy making** and **health care** teams. An **engaged public reference group** has assisted the research team throughout. The work exemplifies the **vision** of the Usher Institute - to **catalyse** the **transformation** of **health** in **society** by working with **people, populations** and their **data**.

<sup>121</sup> For more information, see University of Edinburgh at: <https://www.ed.ac.uk/usher/eave-ii>

## 6 The University of Edinburgh's contribution to tourism

Edinburgh is a highly successful international tourist destination known for its history, rich cultural heritage, and distinctive architecture. The city is consistently one of the top UK destinations among international travellers, second only to London.<sup>122</sup> Within Scotland, Edinburgh is the most popular destination among both domestic and international visitors, accounting for around two thirds of international visits to Scotland in 2019.<sup>123</sup>

The University of Edinburgh has strong and historic links to the city since the University's foundation in 1583, with its buildings often at the centre of events such as public lectures, exhibitions, and performances, as well as helping to play host to a range of cultural events such as the Edinburgh Festival Fringe, one of the largest arts festivals in the world.<sup>124</sup> The University plays an important role in reflecting the city's historical and architectural importance.<sup>125</sup>

As a final strand of economic contribution, this chapter outlines the analysis of the University's role in attracting a range of visitors to Edinburgh, including tourists, business visitors, friends and family visiting the University's staff and students, and visitors participating in study trips to the University. While the analysis throughout this report relates to the 2021-22 *academic year*, in many cases a lack of data availability relating to tourism means that it is difficult to estimate the economic impact during that period. Furthermore, visitor numbers to the city were heavily disrupted during 2020 and 2021 as a result of the Covid-19 outbreak and associated restrictions. These restrictions had a particular impact on tourism, including domestic and international travel. As a result, the analysis of the University of Edinburgh's contribution to tourism is based on visits to the City of Edinburgh in the 2019 *calendar year* (i.e. we adopt the most recently available pre-pandemic data to give an indication of the "typical" impact of tourism associated with the University of Edinburgh).

To understand the economic impact of tourism associated with the University, we combine information on the number of visits to Edinburgh associated with the University with information on the average expenditure per visitor. As with the University's knowledge exchange activities (Section 2.2), the expenditures of its international students (Section 4), and the spending of the University (Section 5), these visitors' expenditures result in subsequent rounds of spending and economic activity within the local economy, captured by the direct, indirect, and induced impacts associated with these expenditures. Again, these impacts are estimated using economic multipliers, and are measured in terms of the contribution to **economic output, gross value added**, and (full-time equivalent) **employment** in a "typical" year, which in this case is taken to be 2021-22.

### 6.1 Estimating the number of visitors associated with the University's activities

Data from the International Passenger Survey (IPS) by the Office for National Statistics<sup>126</sup> estimated that, in 2019, there were a total of approximately **2,206,000** overseas staying visits to Edinburgh. Domestic visits

<sup>122</sup> See Visit Britain Inbound Trends by UK town (International Passenger Survey, Office for National Statistics), available at <https://www.visitbritain.org/inbound-trends-uk-town>

<sup>123</sup> See <https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/factsheets/edinburgh-and-lothians-factsheet.pdf>

<sup>124</sup> See <https://www.edfringe.com/> for further information.

<sup>125</sup> For example, see <https://ewh.org.uk/trails/university-heritage/>

<sup>126</sup> Number of visits is based on the city's visitors' reported spending on at least one night during their trip.

are not considered in the analysis as they do not contribute additionally to the UK economy.<sup>127</sup> As a result, the remainder of this analysis focuses only on the **2,206,000** trips to Edinburgh involving overnight stays by visitors from overseas.

In addition to the total number of these overseas overnight visits, a key element of the analysis involves understanding the specific reason for these visits. Using information from the IPS (2019), of the total of **2,206,000** overnight trips to Edinburgh by overseas visitors, approximately **72% (1,592,000)** were holiday visits, **16% (357,000)** were for the purposes of visiting friends and family, **8% (183,000)** were for business trips, **2% (40,000)** were study trips to Edinburgh, and the remaining **2% (34,000)** were trips for other purposes. Using this breakdown by purpose of visit, to estimate the impact of the University of Edinburgh's contribution to tourism in a typical academic year, we made the following assumptions in relation to the **number of overseas overnight visits to Edinburgh that resulted from the University's presence:**

- Regarding **holiday visits**, we assumed that trips made to attend the University's on-campus Open Days<sup>128</sup> for prospective students were as a direct result of the University. In addition, it is assumed that each non-UK student visiting for an Open Day brings an additional **1.3** visitors with them.<sup>129</sup> This results in approximately **6,000** holiday trips directly associated with the university. No other holiday trips are assumed to have occurred as a result of the University being the sole or primary reason for the trip.
- With respect to **trips to visit family and friends**, data from the University of Edinburgh and HESA indicates that there were approximately **5,260** non-UK nationals employed by the University<sup>130</sup> (representing **1%** of the resident population of Edinburgh), as well as **18,125** non-UK domiciled students attending the University<sup>131</sup> (representing around **3%** of the resident population). Based on London Economics' previous analysis assessing the economic impact of international students on the UK economy<sup>132</sup>, it is assumed that, on average, there were **0.9** visits from overseas per non-EU domiciled student or non-EU member of staff and **3.0** visits from overseas per EU domiciled student or EU member of staff in 2021-22, which represents a weighted average of **1.3** visits per non-UK student and **2.1** visits per non-UK staff.<sup>133</sup> Based on a 2021 population estimate for the city of Edinburgh of **526,500**<sup>134</sup>, it is therefore assumed that approximately **10%** of all overseas visits to Edinburgh to visit family or friends were visits to the University's students and staff (equivalent to approximately **35,000** trips in 2021-22).
- A similar approach was adopted in relation to **business trips**. The University employed approximately **15,925** staff in 2021-22, accounting for around **5%** of the total employed population of Edinburgh in 2021-22<sup>135</sup>. Based on this, it is assumed that **5%** of business trips to

<sup>127</sup> More specifically, it is likely that any domestic (day or overnight) visits to Edinburgh would have *displaced* activity from other regions of the United Kingdom. Therefore, following standard evaluation guidance (HM Treasury, 2022), all visitor trips and associated expenditure originating from elsewhere in the United Kingdom - i.e. domestic day trips and domestic overnight trips - are excluded from the analysis.

<sup>128</sup> Note that all Postgraduate Open Days in 2021-22 academic year were virtual, and most Undergraduate Open Days, with exception of a few subject-specific on-campus Open Days, were also virtual in 2021-22. We assume that this is still due to effects of the Covid-19 pandemic. The calculation assumes a "typical" academic year, which is unaffected by the pandemic and in which several Open Days would be on-campus.

<sup>129</sup> This assumption is based on analysis assessing the economic impact of international students on the UK economy (London Economics, 2018b).

<sup>130</sup> This was estimated based on the number of total FTE staff employed across the University in 2021-22, and the number of FTE employees as a proportion of headcount employees (72%) at the University of Edinburgh, which has been calculated using HESA data from 2020/21 and assumed to be the same in 2021-22. The distribution of staff by nationality was taken from calculations made using HESA data from 2020/21 and assumed to be the same in 2021-22.

<sup>131</sup> Note that this includes *all* students enrolled with the University in 2021-22, i.e. including both first-year and continuing students.

<sup>132</sup> See London Economics (2018b).

<sup>133</sup> The previous analysis (London Economics, 2018b) estimated that the number of visits from overseas per EU and non-EU student per year. We assumed these numbers would be the same for staff receiving visits. We then used the same method to calculate the weighted average of visits for each non-UK staff employed by the University in 2021-22.

<sup>134</sup> See Nomis (2022).

<sup>135</sup> Using official labour market statistics data (Nomis, 2022), there were approximately 292,500 individuals employed (or self-employed) in Edinburgh between July 2021 and June 2022.



Edinburgh in 2021-22 were related to the University (corresponding to approximately **10,000** visits/trips).

- In terms of the **study trips** to Edinburgh, it is assumed that all trips were a result of either the University of Edinburgh, Queen Margaret University, Edinburgh Napier University or Heriot-Watt University (Edinburgh campus). Non-UK domiciled students enrolled at the University of Edinburgh accounted for **67%** of the total non-UK domiciled student population of these institutions. It is assumed that study trips by international students are made in proportion to the number of international students at each institution and therefore that **67%** of study trips to Edinburgh in 2021-22 are related to the University of Edinburgh. This corresponds to approximately **27,000** visits/trips.
- Finally, it is assumed that none of the remaining trips to Edinburgh for **other purposes** were as a result of the University.

Table 19 presents the resulting estimated number of trips to Edinburgh by overseas visitors in 2021-22 that were due to the University of Edinburgh's activities, estimated at a total of **78,000** (or **4%** of total overseas trips to Edinburgh).

**Table 19 Total number of visits to Edinburgh and University-related visits by overseas overnight visitors in 2021-22**

Type of trip	Total visits	Visits associated with the University	% associated with the University
Holidays	1,592,000	6,000	0.4%
Study trips	40,000	27,000	67%
Business trips	183,000	10,000	5%
Trips to visit friends and family	357,000	35,000	10%
Other trips	34,000	-	0%
<b>Total visits</b>	<b>2,206,000</b>	<b>78,000</b>	<b>4%</b>

Note: All numbers are rounded to the nearest 1,000, and the total values may not add up due to this rounding.

Source: *London Economics' analysis*





## 6.2 Direct impact associated with visitor expenditure

The **spend per trip** by purpose is calculated using information on the total spend by purpose and the number of visits by purpose to the Lothian region from Visit Britain (2019). Table 20 shows the spend per overseas staying visit in 2019 and these same values inflated to 2021-22 prices in the third column. Using the figures for spend per trip, the **direct impact** associated with the University's contribution to tourism in 2021-22 stood at approximately **£79 million**.

**Table 20 Spend per overseas staying trip by purpose in 2019 and in 2021-22**

Type of trip	Overseas staying visits (2019)	Overseas staying visits (2021-22)
Holidays	£510	£546
Study trips	£1,780	£1,905
Business trips	£826	£884
Trips to visit friends and family	£410	£439
Other trips	£808	£865
<b>Total visits (weighted average spend)</b>	<b>£942</b>	<b>£1,008</b>

Note: The weighted average spend includes all trips associated with the University of Edinburgh, rather than the weighted average spend of all visits to the city of Edinburgh.

Source: London Economics' analysis and data from Visit Britain (2019) 'Inbound trends by UK nation, region & county'.

<https://www.visitbritain.org/inbound-trends-uk-nation-region-county?area=1620>

In terms of the breakdown by purpose of trip, the analysis suggests that approximately **£51 million (65%)** of this total came from study trips; **£15 million (20%)** was spent during visits to see friends and family associated with the University; an estimated **£9 million (11%)** was associated with business trips, while the remaining **£3 million (4%)** came through holiday spending.

In terms of the nature of this visitor expenditure, the analysis suggests that approximately **£32 million (41%)** of this total was spent on accommodation, an estimated **£20 million (25%)** was spent on food and drink, **£14 million (18%)** was associated with general shopping activities, **£9 million (11%)** was spent on attractions, with the remaining **£4 million (5%)** spent on travel.<sup>136</sup>

In addition to economic output (i.e. visitor expenditure), the above estimates were converted into gross value added and the number of full-time equivalent jobs supported by this direct expenditure.<sup>137</sup> We thus estimated that the visitor expenditure associated with the University's activities directly generated **£47 million** in direct GVA and supported **1,075 FTE jobs**.

### City Deal Region impact

Given the nature of this impact, it is fair to assume that all **£79 million** of direct impact from University-related tourism can be attributed to the City Deal Region.

<sup>136</sup> This breakdown was estimated using a breakdown of expenditure by type provided by Edinburgh Tourism Action Group's third edition of 'Tourism in Edinburgh – Key Figures' (ETAG, 2016). See <https://www.etag.org.uk/wp-content/uploads/2016/11/Facts-and-Figures-2016-Final.pdf>

<sup>137</sup> To estimate the direct GVA and employment associated overseas visitor expenditure, we multiplied this expenditure by the average ratio of GVA to output and FTE employees to output within Scotland's distribution, transport, hotels and restaurants sector and the 'other' services sector.

### 6.3 Indirect and induced impacts associated with visitor expenditure

As with the impacts of the University's knowledge exchange activities (Section 2.2), the expenditures of its international students (Section 4), and the expenditure of the University (Section 5), the assessment of the indirect and induced economic impacts associated with visitor expenditure is again based on economic multipliers derived from the above-described multi-regional Input-Output model.<sup>138</sup> In particular, given the concentration of visitor expenditure in the distribution, transport, hotels, and restaurants sector and the 'other' services sector, we applied the estimated average economic multipliers associated with organisations in these sectors located in Scotland.

These multipliers (for Scotland and the UK as a whole; presented in Table 21) indicate that every £1 million of (overseas overnight) visitor expenditure associated with the University of Edinburgh generates an **additional £1.30 million** of impact throughout the UK economy, of which **£0.69 million** is generated in Scotland. In terms of employment, for every 1,000 (FTE) staff directly supported by this visitor expenditure, an **additional 830** staff are supported throughout the United Kingdom, of which **450** are located in the Scotland.

**Table 21 Economic multipliers associated with tourism expenditures related to the University of Edinburgh**

Location of impact	Output	GVA	FTE employment
Scotland	1.69	1.68	1.45
Total UK	2.30	2.24	1.83

Note: All multipliers constitute Type II multipliers, defined as  $[\text{Direct} + \text{indirect} + \text{induced impact}]/[\text{Direct impact}]$ . The multipliers shown are weighted averages across the assumed spend in the distribution, transport, hotels, and restaurants sector and the 'other' services sector.

Source: London Economics' analysis

### 6.4 Total impact associated with visitor expenditure

Figure 32 presents the estimated total direct, indirect, and induced impacts associated with the above visitor expenditures generated by the University's activities in 2021-22. The analysis indicates that the aggregate impact of these expenditures stood at approximately **£180 million** in economic output terms (see top panel of Figure 32). In terms of region, the majority of this impact (**£133 million, 74%**) was generated in **Scotland**, with **£47 million (26%)** occurring in other regions across the UK.

**The impact of the University's contribution to tourism in 2021-22 stood at £180 million.**

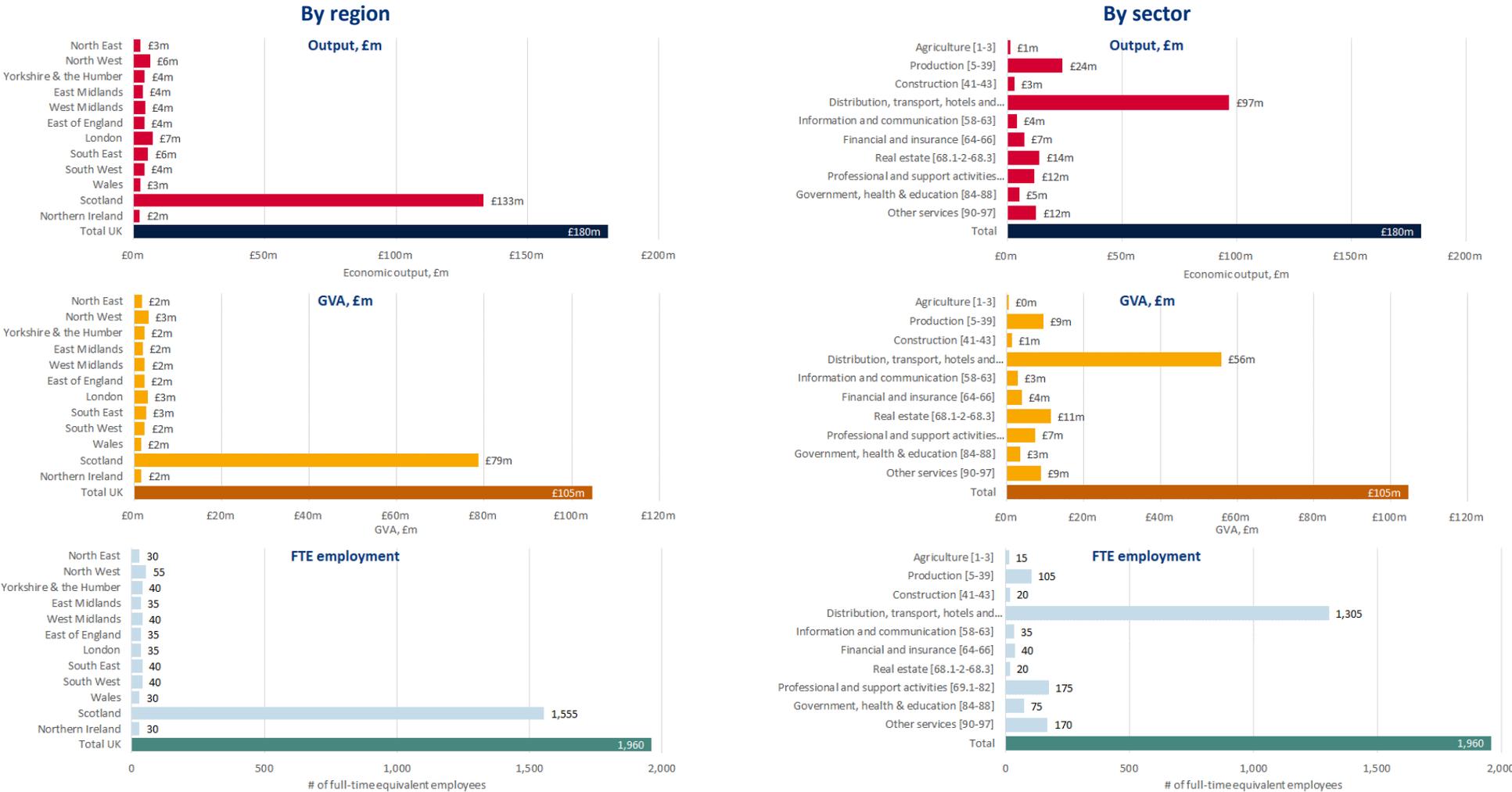
In terms of sector of impact, in addition to the impacts occurring in the **distribution, transport, hotels and restaurants sector (£97 million, 54%)**, there were also substantial impacts within other sectors, such as the **production sector (£24 million, 13%)**, the **real estate sector (£14 million, 8%)**, and the **professional and support activities sector (£12 million, 7%)**.<sup>139</sup>

In terms of the number of FTE jobs supported, the results indicate that the visitor spending generated by the University's activities supported a total of **1,960** FTE jobs across the UK economy in 2021-22, of which **1,555** were located in **Scotland** (presented in the bottom panel of Figure 32). In addition, the impact in terms of gross value added was estimated at **£105 million** across the UK economy as a whole, of which **£79 million** was generated within **Scotland** (see the middle panel of Figure 32).

<sup>138</sup> See Section 2.2 for more information.

<sup>139</sup> For more detail on what industries are included in this high-level sector classification, please refer to Table 21 in Annex A2.1.

Figure 32 Total economic impact associated with the University's contribution to tourism in 2021-22, by region and sector



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



## Edinburgh Festivals

Edinburgh is the world's **leading festival** city with a **wide range** of **major annual festivals** bringing talent from across the globe to its streets and stages. From the renowned **International Festival** to the **Science and Book Festivals** and the **world's largest open access arts festival**, the **Edinburgh Festival Fringe**, the **impact** on the **city** for **residents** and **visitors** alike is akin to no other.



Photo credit: Paul Dodds

Pre-pandemic, **Edinburgh's Festivals** delivered over **3,000 events**, reaching audiences of more than **4.9 million** – on a par with the FIFA World Cup. Media coverage includes an estimated **30.1 billion** views of online articles globally.

It is estimated that the economic impact of the festivals in 2015 was worth **£280 million** to the city and **£313 million** to the wider economy of Scotland<sup>140</sup>. For that year, combined audiences were estimated at **4.5 million**, and while Covid may have put a temporary dent in these figures, it is expected that audiences will reach these levels again post-Covid. The same study estimated that Edinburgh festivals in 2015 supported **5,660 new full-time equivalent jobs** in Edinburgh and **6,021** in Scotland,

The **University helped set up** the **Edinburgh International Festival** in 1947 and has **relationships across all 12 annual Festivals**, offering year-round collaborations with **research**, **sponsoring** and **housing** key events for the Edinburgh International and Book Festivals. The University's Talbot Rice Gallery plays a major role in the Art Festival and the University's buildings are used in Edinburgh's Hogmanay celebrations.

<sup>140</sup> For more information, see BOP Consulting report at: [https://www.edinburghfestivalcity.com/assets/000/001/964/Edinburgh\\_Festivals\\_-\\_2015\\_Impact\\_Study\\_Final\\_Report\\_original.pdf?1469537463#:~:text=Creating%20a%20sense%20of%20civic,Edinburgh%20special%20as%20a%20city](https://www.edinburghfestivalcity.com/assets/000/001/964/Edinburgh_Festivals_-_2015_Impact_Study_Final_Report_original.pdf?1469537463#:~:text=Creating%20a%20sense%20of%20civic,Edinburgh%20special%20as%20a%20city)

Staff from across the University work closely with cultural partners from around the world, as well as with the City Council and the Scottish Government to ensure shows can go ahead safely. On top of this, the University's **students** gain **valuable work** (and often performance) **experience** throughout many of the festivals.

During the summer, the University is a **bustling central hub**, providing a home to **over one third of Fringe performances**. In 2022, the University hosted over **60** performance spaces (**10,928 seats**), **28** bar and hospitality spaces, **50** dressing room, office and workshop spaces created from lecture theatres, sports halls and office rooms. This makes the university the single **largest landlord** during the month of August. 2022 saw a total number of **805,390** tickets issued for performances in University buildings over the summer months.

In 2021 and 2022, the University's College of Art (ECA) has been the temporary **home** to the **International Book Festival** and will be again in 2023. With a programme of **600 events**, featuring more than **550 writers**, artists and thinkers from around the world, the festival provides audiences with adventures, insights, personal stories and fresh perspectives. From 2024, the Edinburgh Futures Institute (EFI), which will be housed in the iconic former Royal Infirmary building at Quartermile, will become the **permanent home** of the **Book Festival**.



Photo credit: Paul Dodds

## 7 The total economic impact of the University of Edinburgh on the UK economy in 2021-22

The total economic impact on the UK economy associated with the University of Edinburgh's activities in 2021-22 was estimated to be approximately **£7.522 billion** (Table 22). In terms of the components of this impact:

- The University of Edinburgh's **research and knowledge exchange activities** accounted for **£3.180 billion (42%)** of this impact;
- The value of the University of Edinburgh's teaching and learning activities stood at **£857 million (11%)**;
- The impact of the University of Edinburgh's **educational exports** was estimated at **£1.770 billion (24%)**;
- The impact generated by the **operating and capital spending of the University of Edinburgh** stood at **£1.535 billion (20%)**; and
- The remaining **£180 million (2%)** was associated with the University's **contribution to tourism**.

**The total economic impact associated with the University of Edinburgh's activities in 2021-22 stood at £7.5 billion.**

**Table 22 Total economic impact of the University of Edinburgh's activities in the UK in 2021-22 (£m and % of total)**

Type of impact	UK - £m (%)	Scotland - £m (%)
 <b>Impact of research and knowledge exchange</b>	<b>£3,180m (42%)</b>	<b>£248m (9%)</b>
Research activities	£2,830m (38%)	n.a.
Knowledge exchange activities	£350m (5%)	£248m (9%)
 <b>Impact of teaching and learning</b>	<b>£857m (11%)</b>	<b>n.a.</b>
Students	£397m (5%)	n.a.
Exchequer	£460m (6%)	n.a.
 <b>Impact of international students</b>	<b>£1,770m (24%)</b>	<b>£1,279m (46%)</b>
Tuition fee income	£968m (13%)	£697m (25%)
Non-tuition fee income	£802m (11%)	£582m (21%)
 <b>Impact of the University's spending</b>	<b>£1,535m (20%)</b>	<b>£1,112m (40%)</b>
Direct impact	£1,243m (17%)	n.a.
Indirect and induced impact	£292m (4%)	n.a.
 <b>Impact of tourism</b>	<b>£180m (2%)</b>	<b>£133m (5%)</b>
Direct impact	£79m (1%)	n.a.
Indirect and induced impact	£102m (1%)	n.a.
<b>Total economic impact</b>	<b>£7,522m (100%)</b>	<b>£2,772m (100%)</b>

Note: All estimates are presented in 2021-22 prices, rounded to the nearest £1m, and may not add up precisely to the totals indicated. The percentage figures in the brackets represent the proportion of total impact in that region associated with the strand/sub-strand of analysis.

Source: London Economics' analysis

Compared to the University of Edinburgh's total operational costs of approximately **£1.086 billion** in 2021-22<sup>141</sup>, the total impact of the University of Edinburgh's activities on the UK economy was estimated at **£7.522 billion**, which corresponds to a **benefit to cost ratio of 6.9:1**. This compares to an average benefit-

<sup>141</sup> From the University of Edinburgh's total operating expenditure (excluding capital spending) in 2021-22 (**£1,086 million**), we excluded **£61 million** in depreciation costs and **£242 million** in movement in pension costs as it is assumed that these are not relevant from a procurement perspective (i.e. these 'non-cash' costs are not accounted for as income by other organisations). All estimates are presented in 2021-22 prices, and rounded to the nearest million.

to-cost ratio among Russell Group institutions of approximately **5.5:1**, and corresponds to a **34%** increase in the University of Edinburgh's impact of since 2015-16 (in real terms<sup>142</sup>).

## 7.1 Total impact by region and sector (where available)

In addition to the total impact on the UK economy as a whole, it was possible to disaggregate *some* strands of the University's economic impact by sector and region (and estimate the impacts in terms of economic output *as well as* GVA and FTE employment). The strands of impact for which this disaggregation was achievable include:

- The impact of the University's **knowledge exchange activities** (estimated at **£350 million**, see Section 2.2);
- The impact of the University's **educational exports** (**£1,770 million**, see Section 4);
- The impact associated with the **operating and capital expenditure of the University** (**£1,535 million**, see Section 5); and
- The impact of the University's **contribution to tourism** (**£180 million**, see Section 6).

Hence, approximately **£3,835 million (51%)** of the University of Edinburgh's total impact of **£7,522 million** can be disaggregated in this way<sup>143</sup> (see Figure 33).

In terms of the breakdown by region, the analysis indicates that of this total of **£3,835 million, £2,772 million (72%)** of the identifiable impact occurred the **Scotland**, with **£1,063 million (28%)** occurring in **other regions** across the UK.

In terms of sector, the University's activities resulted in particularly large impacts within the **government, health, and education sector** (**£1,299 million, 34%**), the **distribution, transport, hotel, and restaurant sector** (**£656 million, 17%**), the **production sector** (**£552 million, 14%**), and the **real estate sector** (**£427 million, 11%**).

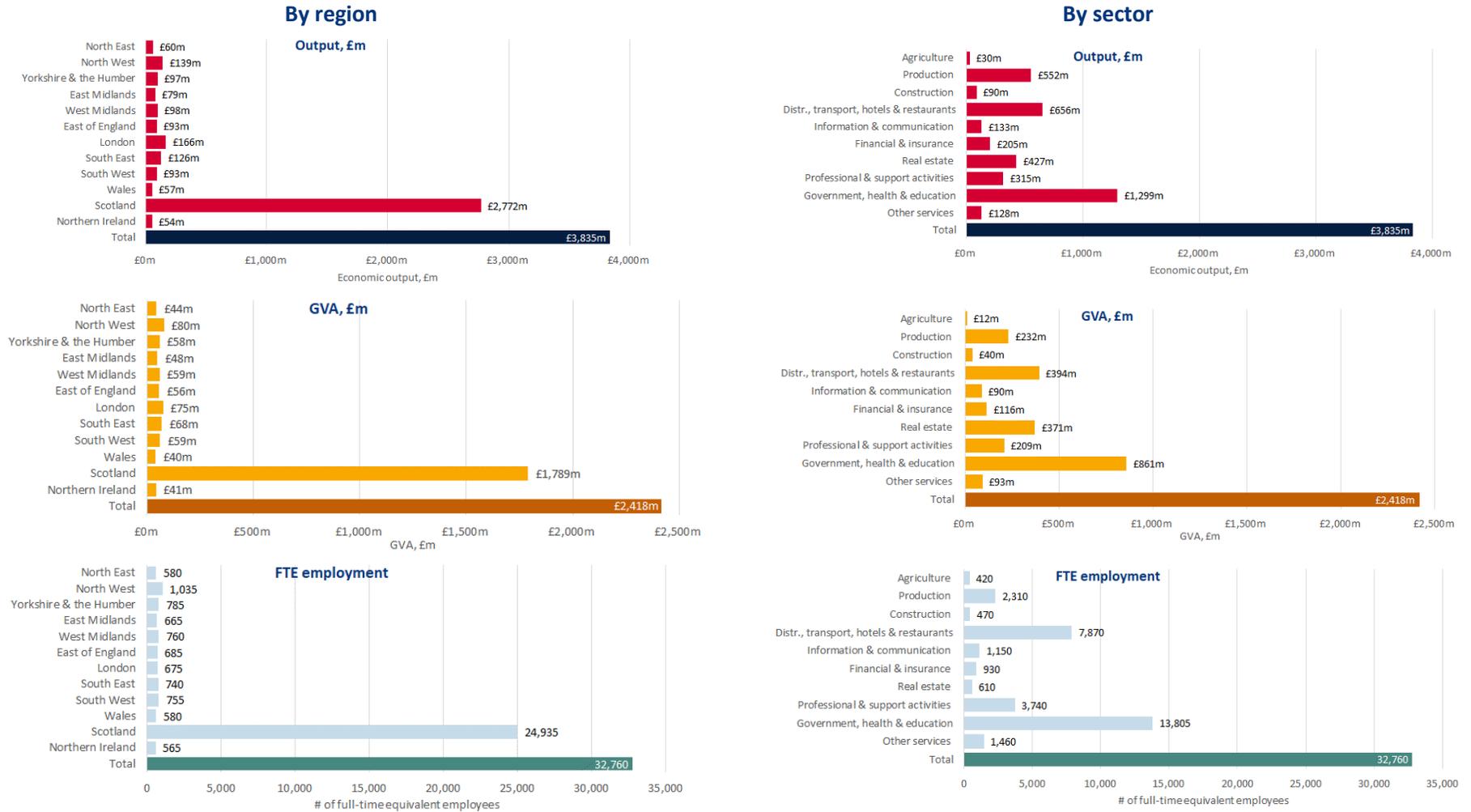
In terms of the number of FTE jobs supported, the results indicate that the total impact generated by the University's activities supported a total of **32,760 FTE jobs** across the UK economy in 2021-22, of which **24,935** were located in **Scotland** (presented in the bottom panel of Figure 33). In addition, the impact in terms of gross value added was estimated at **£2,418 million** across the UK economy as a whole, of which **£1,789 million** was generated within **Scotland** (see the middle panel of Figure 33).

<sup>142</sup> See London Economics (2017). The analysis of the economic impact of all Russell Group institutions (including the University of Edinburgh) was based on the 2015-16 academic year.

<sup>143</sup> The remaining **£3.7 billion** of impact includes the spillover effects associated with the University's **research activities** (**£2.8 billion**, where a breakdown by region or sector is not available as it was not possible to assign the geographic location or sectors of businesses benefiting from productivity spillovers generated by the University's research); and the impact of **teaching and learning activities** (**£857 million**, where a breakdown by region or sector is not available due to graduate mobility (i.e. it is very difficult to determine the region/sector of employment that graduates end up in)).



Figure 33 Total economic impact of the University of Edinburgh's activities in 2021-22, by region and sector (where possible)



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



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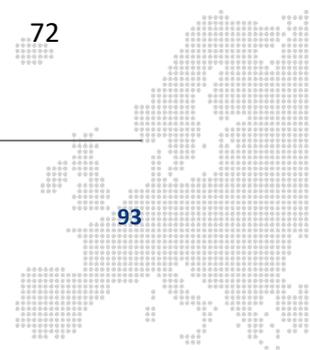


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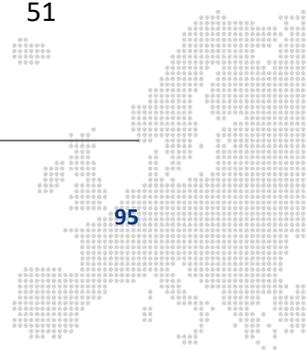


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## Annex 2 Technical Annex

### A2.1 Industry classifications for multi-regional Input-Output analysis

Table 23 provides an overview of the high-level industry classifications used throughout the multi-regional Input-Output analysis.

**Table 23 Industry grouping used as part of the multi-regional Input-Output analysis**

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

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

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

Source: London Economics' analysis, based on Office for National Statistics (2020a) and UK SIC Codes (see Office for National Statistics, 2016)

## A2.2 Impact of the University of Edinburgh's teaching and learning activities

### A2.2.1 Qualifications and counterfactuals considered in the econometric analysis

Our econometric analysis of the earnings and employment returns to higher education qualifications (described in more detail in Annex A2.2.2) considered **five different higher education qualification groups** (i.e. five **'treatment' groups**): three at postgraduate level (higher degree (research), higher degree (taught) and 'other' postgraduate qualifications<sup>144</sup>) and two at undergraduate level (first degrees and 'other' undergraduate qualifications<sup>145</sup>).

<sup>144</sup> This 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).

<sup>145</sup> This relates to Labour Force Survey variables HIQUAL8, HIQUAL11, HIQUAL15 and HIQUAL22 value label 'other higher education below degree'. Additionally, Diplomas of Higher Education, Level 4 Certificates, and Level 6 Diplomas are included. 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



Table 24 presents these different postgraduate and undergraduate level 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 in Section 3.4.1, we compare 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 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, while for individuals holding first degrees or ‘other undergraduate’ level qualifications, the counterfactual group consists of individuals holding any (academic or vocational) qualification at Level 6 of the Scottish Credit and Qualifications Framework (SCQF) or Level 3 of the Regulated Qualifications Framework (RQF)<sup>146</sup> as their highest qualification<sup>147, 148</sup>.

**Table 24 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
<b>HE qualifications</b>	
Higher degree (research)	First degree
Higher degree (taught)	First degree
Other postgraduate	First degree
First degree	SCQF Level 6/RQF Level 3 (academic or vocational <sup>1</sup> )
Other undergraduate	SCQF Level 6/RQF Level 3 (academic or vocational)
<b>Other</b>	
RQF Level 3 (academic or vocational) <sup>2</sup>	Scottish National 5 Certificate/5 GCSEs grade A-C

Note: 1. The analysis for first degrees (only) is weighted to reflect the specific prior attainment levels among UK domiciled students in the 2021-22 University of Edinburgh cohort. In other words, the analysis is weighted to reflect the proportions of students in possession of Scottish Highers or other academic (or vocational) qualifications (at SCQF Level 6/RQF Level 3) as their highest attainment prior to starting their learning at the University of Edinburgh.

2. Similar to the counterfactual group for first degrees, the analysis for the treatment group here is weighted to reflect the proportions of students in possession of Scottish Highers or other equivalent (vocational or academic) qualifications (at SCQF Level 6/RQF Level 3) as their highest attainment prior to starting their learning at the University of Edinburgh.

Source: *London Economics*

In addition to the analysis of higher education qualifications, we also included a separate specification comparing the earnings associated with SCQF Level 6/RQF Level 3 qualifications (i.e. Scottish Highers or equivalent) to possession of Scottish National 5 Certificates at grades A-C<sup>149</sup>. This additional analysis was undertaken to provide an indication of the fact that the academic ‘distance travelled’ by a (small) proportion of students in the 2021-22 University of Edinburgh cohort is **greater** than might be the case

purpose of confirming that higher education qualifications have been achieved but that the respondent is unaware of the actual qualification title itself.

<sup>146</sup> Level 3 on the RQF (in England, Wales, and Northern Ireland) is equivalent to Level 6 on the SCQF.

<sup>147</sup> Historically, across all UK higher education institutions, students starting first degrees or other undergraduate qualifications were typically in possession of Scottish Highers or 2 or more GCE ‘A’ Levels as their highest level of prior attainment. However, as this is no longer the case for all HE institutions and subject areas, the analysis reflects the fact that a (small) proportion of first degree students in the 2021-22 University of Edinburgh cohort started their degrees with SCQF Level 6/RQF Level 3 qualifications *other than* Scottish Highers (or 2 or more GCE ‘A’ Levels) as their highest prior attainment (this applies to around 2%-3% of UK domiciled first degree students in the 2021-22 University of Edinburgh cohort).

<sup>148</sup> In terms of prior attainment for HE students, note that for 56 students in the 2021-22 cohort of UK domiciled students, previous attainment levels were specified as either ‘Mature student admitted on basis of previous experience and/or admissions test’, ‘Other qualification level not known’, or ‘Not known’. For these students, we imputed their prior attainment level using a group-wise imputation approach based on the most common prior attainment among students in the cohort undertaking qualifications at the same level, separately by study mode.

<sup>149</sup> Equivalent to 5 or more GCSEs at grades A\*-C (in England, Wales, and Northern Ireland).

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 at the University of Edinburgh was higher or lower than the ‘traditional’ counterfactual qualifications outlined in Table 24, the analysis used a **‘stepwise’ calculation of additional lifetime earnings**. For example, to calculate the earnings and employment returns for a student **in possession of an ‘other undergraduate’ qualification undertaking a first degree at the University of Edinburgh**, we *deducted* the returns to undertaking an ‘other undergraduate’ qualification (relative to the possession of a SCQF Level 6/RQF Level 3 qualification) from the returns to undertaking a first degree (again relative to the possession of a SCQF Level 6/RQF Level 3 qualification). Similarly, to calculate the returns for a student **in possession of a Scottish National 5 Certificate grade A-C undertaking a first degree at the University of Edinburgh**, we *added* the returns to achieving a SCQF Level 6/RQF Level 3 qualification (relative to the possession of a Scottish National 5 Certificate grade A-C or 5 GCSEs A\*-C) to the returns to undertaking a first degree (relative to the possession of a SCQF Level 6/RQF Level 3 qualification)<sup>150</sup>.

## A2.2.2 Marginal earnings and employment returns to higher education 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;
- Gender (in the aggregate regressions only);
- Age;
- Age squared;
- Ethnic origin;
- Disability status;

<sup>150</sup> In some 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).



- Region of work;
- Marital status;
- Number of dependent children under the age of 16;
- 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 University of Edinburgh cohort<sup>151</sup>. As a result, the estimated marginal wage returns **adjust for the specific subject composition of the University of Edinburgh's student cohort**<sup>152</sup>. In addition, as outlined in Annex A2.2.1, the marginal wage returns for first degrees also reflect the specific prior level of attainment of students in the 2021-22 University of Edinburgh cohort (i.e. where the analysis is adjusted for the proportions of students in possession of Scottish Highers or other types of SCQF Level 6/RQF Level 3 qualifications as their highest prior attainment on entry).

Further note that the analysis of earnings premiums was undertaken at a national (UK-wide) level. However, to adjust for differences across the Home Nations, these UK-wide earnings premiums were then combined with the relevant differential direct costs facing the individual and/or the public purse for students domiciled in the different Home Nations.

To estimate the impact of higher education qualifications on labour market outcomes using this methodology, we used information from **pooled Quarterly UK Labour Force Surveys between 2010 and 2022**.

The resulting estimates of the marginal wage returns to higher education qualifications are presented in Table 25. 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 **22.6%** hourly earnings premium compared to comparable men holding only a SCQF Level 6/RQF Level 3 qualification as their highest level of attainment (weighted to reflect the specific prior attainment levels of first degree students in the 2021-22 University of Edinburgh

<sup>151</sup> 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. The HESA Common Aggregation Hierarchy (CAH) was used to classify subject areas. 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.

<sup>152</sup> 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).

cohort (i.e. predominantly Scottish Highers or equivalent)). The comparable estimate for women aged between 31 and 35 stands at **26.2%**.

**Table 25 Marginal earnings returns to higher education qualifications (weighted across subjects), in % (following exponentiation), by gender and age band**

Qualification level	Age band									
	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65
<b>Men</b>										
SCQF Level 6/RQF Level 3 <sup>1</sup>	5.1%	8.4%	11.7%	22.8%	26.0%	20.2%	24.9%	18.9%	22.4%	20.3%
Other undergraduate <sup>2</sup>				17.9%	20.9%	27.0%	25.2%	23.0%	29.8%	35.1%
First degree <sup>3</sup>		10.1%	16.2%	22.6%	24.0%	30.0%	19.5%	28.0%	32.0%	22.5%
Other postgraduate <sup>4</sup>				7.1%	5.2%		5.9%			
Higher degree (taught) <sup>4</sup>		4.4%	5.2%	6.0%	11.4%	13.4%	10.6%	9.3%	15.6%	15.4%
Higher degree (research) <sup>4</sup>		16.0%	8.3%	16.4%	14.3%	21.8%	31.5%	31.8%	21.9%	40.9%
<b>Women</b>										
SCQF Level 6/RQF Level 3 <sup>1</sup>	4.5%	6.4%	11.4%	12.5%	20.8%	24.9%	15.7%	17.6%	16.1%	4.5%
Other undergraduate <sup>2</sup>		3.9%	8.9%	14.0%	26.7%	25.5%	26.4%	25.0%	25.9%	
First degree <sup>3</sup>	21.9%	8.7%	16.3%	26.2%	33.9%	31.1%	31.1%	37.9%	32.0%	21.9%
Other postgraduate <sup>4</sup>		4.7%	6.2%	15.4%	11.9%	12.5%	15.1%	16.1%	17.9%	
Higher degree (taught) <sup>4</sup>		5.2%	6.3%	11.4%	20.3%	22.9%	22.8%	17.4%	31.4%	
Higher degree (research) <sup>4</sup>		8.9%	14.9%	26.1%	34.0%	31.9%	41.9%	45.6%	39.0%	

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.

<sup>1</sup> Returns to holding SCQF Level 6/RQF Level 3 qualifications are estimated relative to Scottish National 5 Certificates grade A-C (or equivalent) (weighted to reflect the proportion of first degree entrants in the 2021-22 University of Edinburgh cohort holding Scottish Highers or other SCQF Level 6/RQF Level 3 qualifications as their highest prior qualification on entry).

<sup>2</sup> Returns to other undergraduate qualifications are estimated relative to individuals holding any SCQF Level 6/RQF Level 3 qualification as their highest qualification.

<sup>3</sup> Returns to first degrees are estimated relative to individuals holding SCQF Level 6/RQF Level 3 qualifications as their highest qualification (weighted by the proportion of first degree entrants in the 2021-22 University of Edinburgh cohort holding Scottish Highers or other SCQF Level 6/RQF Level 3 qualification as their highest prior attainment).

<sup>4</sup> 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 2010Q1-2022Q3

## 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:

$$\text{Probit}(\text{EMPNOT}_i) = \alpha + \gamma Z_i + \epsilon_i \quad \text{for } i = 1 \text{ to } n^{153}$$

The dependent variable adopted represents the binary variable  $\text{EMPNOT}_i$ , which is coded 1 if the individual is in employment and 0 otherwise<sup>154</sup>. We specified the model to contain a constant term ( $\alpha$ ) as

<sup>153</sup> Where  $i$  is again an individual LFS respondent.

<sup>154</sup> The probit function reflects the cumulative distribution function of the standard normal distribution.



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;
- Gender (in the aggregate regressions only);
- 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 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 attending the University of Edinburgh. Further, and again similar to the analysis of earnings returns, employment returns were estimated at the national (i.e. UK-wide) level. In addition, marginal employment returns for first degrees again reflect the specific prior level of attainment of first degree students in the 2021-22 University of Edinburgh cohort (i.e. the proportions of students in possession of Scottish Highers or other types of SCQF Level 6/RQF Level 3 qualifications as their highest prior attainment on entry).

The resulting estimated marginal employment returns to higher education qualifications (adjusted for the University of Edinburgh's specific subject mix) are presented in Table 26. 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 **1.7 percentage points** more likely to be in employment than a man of similar age holding only a SCQF Level 6/RQF Level 3 qualification as his highest level of education (again, predominantly including Scottish Highers or equivalent). The corresponding estimate for women stands at **4.9 percentage points**.



**Table 26 Marginal employment returns to higher education qualifications (weighted across subjects), in percentage points, by gender and age band**

Qualification level	Age band									
	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65
<b>Men</b>										
SCQF Level 6/RQF Level 3 <sup>1</sup>	-7.7	2.0	3.7	2.7	1.6	1.9				
Other undergraduate <sup>2</sup>				1.7		2.0		1.8		
First degree <sup>3</sup>		-5.1	2.8	1.7	1.3	1.3		3.6		-3.6
Other postgraduate <sup>4</sup>		6.6		2.0			2.0	4.1	-6.3	
Higher degree (taught) <sup>4</sup>		-5.6	-1.7			1.2			3.0	
Higher degree (research) <sup>4</sup>		12.0	1.8		1.6	3.5		3.9	8.7	10.9
<b>Women</b>										
SCQF Level 6/RQF Level 3 <sup>1</sup>	-3.3	4.2	3.8		2.1		3.4			-3.3
Other undergraduate <sup>2</sup>		3.2		4.2	4.5	2.8	3.1	2.5		
First degree <sup>3</sup>	14.9		4.2	4.9	5.4	5.8		2.4		14.9
Other postgraduate <sup>4</sup>				4.2		4.7	2.8			
Higher degree (taught) <sup>4</sup>		-6.7	-1.6			2.5	2.0	4.3	4.3	
Higher degree (research) <sup>4</sup>		-10.2		3.1		4.3	4.4	6.8	10.9	

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.

<sup>1</sup> Returns to holding SCQF Level 6/RQF Level 3 qualifications compared to Scottish National 5 Certificates grade A-C (or equivalent) (weighted to reflect the proportion of first degree entrants holding Scottish Highers or other SCQF Level 6/RQF Level 3 qualifications as highest prior qualification on entry).

<sup>2</sup> Returns to other undergraduate qualifications are estimated relative to individuals holding any SCQF Level 6/RQF Level 3 qualification as their highest qualification.

<sup>3</sup> Returns to first degrees are estimated relative to individuals holding SCQF Level 6/RQF Level 3 qualifications as their highest qualification (weighting by the proportion holding Scottish Highers or other SCQF Level 6/RQF Level 3 qualifications as highest prior attainment when entering a first degree qualification at the University of Edinburgh and the specific subject mix undertaken by students at the University of Edinburgh).

<sup>4</sup> Returns to higher degree (taught), higher degree (research), and 'other' postgraduate qualifications are estimated relative to undergraduate degrees (weighting by the subject mix of first-year postgraduate students enrolled at the University of Edinburgh).

Source: London Economics' analysis of pooled Quarterly Labour Force Survey data for 2010Q1-2022Q3

### A2.2.3 '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 and 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 an **opportunity cost** (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 undergraduate (e.g. the estimated average age at enrolment among students in the 2021-22 cohort completing postgraduate taught degrees with the University of Edinburgh on a part-time basis is **33**, compared to **24** 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 27 presents



the assumed average age at enrolment, study duration, and age at completion for students in the 2021-22 University of Edinburgh cohort<sup>155</sup>.

**Table 27 Average age at enrolment, study duration, and age at completion for students in the 2021-22 University of Edinburgh cohort**

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	19	2	21	43	3	46
First degree	19	4	23	30	6	36
Other postgraduate	26	1	27	35	2	37
Higher degree (taught)	24	1	25	33	3	36
Higher degree (research)	26	4	30	37	8	45

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

Source: London Economics' analysis based on University of Edinburgh HESA data

Given these characteristics, we adjust the methodology when estimating the returns to part-time (and later full-time) education attainment at the University of Edinburgh, 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).

However, as the age of attainment increases, it is expected that a declining proportion of the potential value of the estimated earnings and employment benefit accrues to the individual<sup>156</sup>. This calibration ensures that those individuals completing qualifications at a relatively older age will see relatively lower earnings and employment benefits associated with higher education 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 28 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 the University of Edinburgh in the 2021-22 cohort. To take an example, we have assumed that a student undertaking a postgraduate taught 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 postgraduate taught degree student, we assume that because of the late attainment (at age **36** (on average)), these students recoup only **77%** of the corresponding earnings and employment premiums from that age (of attainment).

<sup>155</sup> The assumed average age at enrolment is based on the number of individuals in the cohort assumed to *complete* a given qualification at the University of Edinburgh (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 Section 3.2 for more information)). In particular, the age at enrolment per qualification (based on the HESA data provided by the University of Edinburgh) is calculated as the weighted average age at enrolment across students in the 2021-22 cohort expected to *complete* the given qualification (weighted by the number of students starting different qualification aims and completing each given qualification, separately by study mode).

The assumed average duration of study for both full-time and part-time students (by qualification level) is based on separate information provided by the University of Edinburgh.

<sup>156</sup> 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 28** Assumed age decay adjustment factors for students in the 2021-22 University of Edinburgh 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 relevant average graduation age per full-time / part-time student at each level of study at the University of Edinburgh:

■ Full-time students ■ Part-time students

Source: London Economics' analysis based on University of Edinburgh HESA data



Note that the application of the ‘age-decay’ function implies that, for *all* qualification levels at the University of Edinburgh, the estimated employment and earnings returns for part-time students are lower than the returns for comparable full-time students. These differences reflect the (relatively limited) wider economic literature on the returns to part-time study<sup>157</sup>.

#### A2.2.4 Estimating the gross graduate premium and gross public purse benefit

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, it is necessary to extend the econometric analysis (presented above; see Annex A2.2.2) 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 (i.e. SCQF Level 6/RQF Level 3 qualifications or first degrees).
2. We inflated these baseline or counterfactual earnings using the marginal earnings premiums and employment premiums (presented in Table 25 and Table 26 in Annex A2.2.2), adjusted to reflect late attainment (as outlined in Annex A2.2.3), 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 would be expected to increase in real terms over time (at an assumed rate of **1.6%** per annum (based on average earnings growth rate forecasts estimated by the Office for Budget Responsibility (2022 and 2023)<sup>158</sup>).
4. Based on the earnings profiles generated by qualification holders, and income tax and National Insurance rates and allowances for the relevant academic year<sup>159</sup>, we computed the future stream of net earnings (i.e. post-tax)<sup>160</sup>. Using similar assumptions, we further calculated the stream of (employment-adjusted) foregone earnings (based on earnings in the relevant counterfactual group<sup>161</sup>) during the period of study, again net of tax, for full-time students only.

<sup>157</sup> In general, these studies suggest that the economic returns to studying part-time are lower than the economic returns associated with studying full-time. This is in part because part-time students are often already employed when undertaking their studies, so the marginal (or additional) impact of the higher education qualification is lower. For instance, six months after graduation, graduates undertaking part-time study were three percentage points more likely to be employed than graduates undertaking full-time study, and less than half as likely (3% compared to 7%) to be unemployed. See Callender et al. (2011).

According to the same study, the salaries of graduates from part-time study grow at a slower pace compared with their full-time peers. Part-time graduates are less likely to see their salaries increase and are more likely to see their salaries stagnate between 6 months and 42 months after graduation: specifically, during this period, 78% of part-time graduates and 88% of full-time graduates saw their salaries rise, while 16% of part-time and 8% of full-time graduates experienced no change in salaries, and 6% of part-time and only 2% of former full-time students saw a drop in their salaries.

<sup>158</sup> Specifically, we make use of the Office for Budget Responsibility’s most recent short-term forecasts (for 2021-22 to 2027-28; see Office for Budget Responsibility (2023)) and long-term forecasts (for 2028-29 to 2071-72; see Office for Budget Responsibility (2022)) of nominal average earnings growth. The assumed 1.6% rate captures the average annual growth rate in real earnings over the total period (adjusted from nominal to real terms based on projected Consumer Price Index (CPI) inflation over the same period (and based on the same source)).

<sup>159</sup> 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 rate of annual earnings growth of 1.6%.

<sup>160</sup> The tax adjustment also takes account of increased VAT revenues for HMG, by assuming that individuals consume 94.3% 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 Office for Budget Responsibility (2023), while the proportion of consumption subject to VAT is based on VAT estimates provided by the Office for Budget Responsibility (no date).

<sup>161</sup> The foregone earnings calculations are based on the baseline or counterfactual earnings associated with either SCQF Level 6/RQF Level 3 qualification or first degrees. Specifically, as outlined in Annex A2.2.1, some students in the 2021-22 University of Edinburgh 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 SCQF Level 6/RQF Level 3 qualifications as the highest qualification (adjusted for the age at enrolment and completion associated with the relevant

5. We calculated the **discounted** stream of additional (employment-adjusted) future earnings compared to the relevant counterfactual group (using a standard discount rate of **3.5%** as presented in HM Treasury Green Book (HM Treasury, 2022)), and the discounted stream of foregone earnings 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 provides an estimate of the **gross public benefit** associated with higher education 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 taught postgraduate degree undertaking an additional postgraduate qualification at the University of Edinburgh 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 Home Nations, these UK-wide premiums were then combined with the relevant differential student support costs facing the individual and/or the Exchequer for students domiciled in the different Home Nations and studying in Scotland.

The resulting gross graduate premiums and gross public purse benefits per student (by study mode, level of study, gender, and prior attainment) are presented in Table 29.

### A2.2.5 Net graduate premium and net public benefit

Table 30 and Table 31 provide detailed information on the net graduate premiums and net public benefits for students associated with all higher education qualifications offered by the University of Edinburgh (respectively), based on the 2021-22 cohort. Each table provides detailed information on the net graduate premiums/net Exchequer benefits by student domicile, study mode, study level, prior attainment, and gender<sup>162</sup>.

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qualification obtained). In addition, the estimated foregone earnings for students previously in possession of postgraduate qualifications are based on the level of earnings associated with first degrees.

<sup>162</sup> In terms of gender, it is important to note that the lifetime economic benefits associated with higher education qualifications - expressed in *monetary terms* - are generally lower for women than men, predominantly as a result of the increased likelihood of spending time out of the active labour force. However, as with the majority of the wider economic literature, the *marginal benefits* associated with higher education qualifications - expressed as either the *percentage increase* in hourly earnings or enhanced probability of employment - are often greater for women than for men (see Annex A2.2.2).



**Table 29** Gross graduate premiums and Exchequer benefits per student entrant associated with HE qualification attainment at the University of Edinburgh, by study mode, level, gender, and prior attainment

Level of study	Previous qualification and gender													
	Scottish National 5 Certificate		SCQF Level 6/RQF Level 3 qualification		Other undergraduate		First degree		Other postgraduate		Higher degree (taught)		Higher degree (research)	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
<b>Gross graduate premiums</b>														
<b>Full-time students</b>														
Other undergraduate			£70,000	£48,000	-£18,000	-£18,000	-£15,000	-£20,000			-£15,000	-£20,000		
First degree	£167,000	£116,000	£73,000	£66,000	-£15,000	£1,000	-£36,000	-£41,000		-£41,000	-£36,000	-£41,000		-£41,000
Other postgraduate			£114,000	£157,000		£94,000	-£1,000	£50,000	-£20,000	-£20,000	-£20,000	-£20,000	-£20,000	-£20,000
Higher degree (taught)						£117,000	£49,000	£73,000	£29,000	£4,000	-£17,000	-£16,000		-£16,000
Higher degree (research)				£187,000	£85,000	£132,000	£63,000	£79,000	£44,000	£16,000	£1,000	-£6,000	-£89,000	
<b>Part-time students</b>														
Other undergraduate	£56,000	£30,000	£31,000	£19,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
First degree				£62,000	£5,000	£20,000	£0	£0	£0	£0	£0	£0	£0	£0
Other postgraduate			£78,000	£105,000	£14,000	£62,000	£9,000	£42,000	£0	£0	£0	£0	£0	£0
Higher degree (taught)				£136,000	£57,000	£92,000	£52,000	£71,000	£42,000	£27,000	£0	£0	£0	£0
Higher degree (research)					£65,000	£71,000	£65,000	£64,000	£61,000	£44,000	£43,000	£31,000	£0	£0
<b>Gross Exchequer benefits</b>														
<b>Full-time students</b>														
Other undergraduate			£99,000	£50,000	-£3,000	-£2,000	-£2,000	-£3,000			-£2,000	-£3,000		
First degree	£236,000	£118,000	£140,000	£79,000	£38,000	£28,000	-£6,000	-£8,000		-£8,000	-£6,000	-£8,000		-£8,000
Other postgraduate			£168,000	£137,000		£86,000	£17,000	£48,000	-£10,000	-£9,000	-£10,000	-£9,000	-£10,000	-£9,000
Higher degree (taught)						£105,000	£73,000	£67,000	£46,000	£10,000	-£7,000	-£6,000		-£6,000
Higher degree (research)				£196,000	£180,000	£152,000	£134,000	£106,000	£109,000	£54,000	£58,000	£37,000	-£47,000	
<b>Part-time students</b>														
Other undergraduate	£54,000	£23,000	£30,000	£14,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
First degree				£51,000	£24,000	£17,000	£0	£0	£0	£0	£0	£0	£0	£0
Other postgraduate			£107,000	£86,000	£35,000	£52,000	£11,000	£34,000	£0	£0	£0	£0	£0	£0
Higher degree (taught)				£111,000	£88,000	£75,000	£63,000	£57,000	£51,000	£21,000	£0	£0	£0	£0
Higher degree (research)					£84,000	£57,000	£75,000	£50,000	£71,000	£34,000	£48,000	£25,000	£0	£0

Note: All values are rounded to the nearest £1,000. Gaps may arise where there are no students in the 2021-22 University of Edinburgh cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study at the University of Edinburgh is equal to or lower than the level of previous 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 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. **Source: London Economics' analysis**

**Table 30 Net graduate premiums per student entrant associated with HE qualification attainment at the University of Edinburgh, by study mode, level, gender, prior attainment, and domicile**

Level of study	Previous qualification and gender													
	Scottish National 5 Certificate		SCQF Level 6/RQF Level 3 qualification		Other undergraduate		First degree		Other postgraduate		Higher degree (taught)		Higher degree (research)	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
<b>Students from Scotland</b>														
<b>Full-time students</b>														
Other undergraduate			£76,000	£54,000	-£12,000	-£11,000	-£9,000	-£13,000			-£9,000	-£13,000		
First degree	£128,000		£85,000	£78,000	-£3,000	£14,000	-£24,000	-£29,000		-£29,000	-£24,000	-£29,000		-£29,000
Other postgraduate			£108,000	£150,000		£88,000	-£7,000	£44,000	-£27,000	-£26,000	-£27,000	-£26,000	-£27,000	-£26,000
Higher degree (taught)							£45,000	£69,000	£25,000	£0	-£20,000	-£20,000		-£20,000
Higher degree (research)				£178,000	£76,000	£123,000	£54,000	£70,000	£35,000	£7,000	-£8,000	-£15,000		
<b>Part-time students</b>														
Other undergraduate	£57,000	£31,000	£32,000	£20,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000
First degree				£62,000	£4,000	£20,000	£0	£0	£0	£0	£0	£0		
Other postgraduate			£75,000	£102,000	£11,000	£60,000	£7,000	£40,000	-£2,000	-£2,000	-£2,000	-£2,000	-£2,000	-£2,000
Higher degree (taught)					£52,000	£87,000	£47,000	£66,000	£37,000	£22,000	-£5,000	-£5,000	-£5,000	-£5,000
Higher degree (research)					£60,000		£60,000	£58,000	£56,000	£38,000	£38,000	£25,000	-£6,000	
<b>Students from England</b>														
<b>Full-time students</b>														
Other undergraduate			£63,000	£41,000	-£25,000	-£24,000		-£26,000				-£26,000		
First degree	£155,000		£61,000	£54,000	-£27,000	-£11,000	-£48,000	-£53,000			-£48,000	-£53,000		
Other postgraduate							-£12,000	£39,000			-£32,000	-£31,000		
Higher degree (taught)						£106,000	£37,000	£61,000	£17,000	-£8,000	-£28,000	-£28,000		
Higher degree (research)					£74,000		£51,000	£68,000	£33,000		-£11,000	-£17,000	-£100,000	
<b>Part-time students</b>														
Other undergraduate		£36,000	£37,000		£5,000	£5,000		£5,000			£5,000	£5,000		£5,000
First degree														
Other postgraduate					£9,000	£57,000	£4,000	£37,000	-£5,000	-£5,000	-£5,000	-£5,000	-£5,000	-£5,000
Higher degree (taught)				£126,000	£46,000	£81,000	£42,000	£60,000	£31,000	£16,000	-£11,000	-£11,000	-£11,000	-£11,000
Higher degree (research)						£63,000	£57,000	£56,000		£36,000	£35,000	£23,000		

Level of study	Previous qualification and gender													
	Scottish National 5 Certificate		SCQF Level 6/RQF Level 3 qualification		Other undergraduate		First degree		Other postgraduate		Higher degree (taught)		Higher degree (research)	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
<b>Students from Wales</b>														
<b>Full-time students</b>														
Other undergraduate			£69,000	£48,000										
First degree			£73,000	£65,000	-£15,000	£1,000		-£41,000						
Other postgraduate							-£12,000	£39,000	-£31,000					
Higher degree (taught)							£41,000	£65,000						
Higher degree (research)						£124,000		£71,000			-£7,000	-£14,000		
<b>Part-time students</b>														
Other undergraduate														
First degree														
Other postgraduate				£100,000		£57,000	£4,000	£37,000		-£5,000	-£5,000			
Higher degree (taught)					£50,000	£85,000	£45,000	£64,000		£20,000		-£7,000		
Higher degree (research)														
<b>Students from Northern Ireland</b>														
<b>Full-time students</b>														
Other undergraduate			£64,000	£42,000										
First degree			£63,000	£55,000	-£25,000		-£46,000							
Other postgraduate								£40,000			-£31,000		-£31,000	-£30,000
Higher degree (taught)							£38,000	£62,000	£18,000					
Higher degree (research)							£54,000	£70,000						
<b>Part-time students</b>														
Other undergraduate														
First degree														
Other postgraduate					£9,000		£4,000	£37,000			-£5,000	-£5,000		
Higher degree (taught)					£47,000		£42,000	£61,000		£17,000	-£10,000	-£10,000		
Higher degree (research)												£22,000		

Note: All values are rounded to the nearest £1,000. Gaps may arise where there are no students in the 2021-22 University of Edinburgh cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study at the University of Edinburgh is equal to or lower than the level of previous 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 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 Exchequer benefits per student entrant associated with HE qualification attainment at the University of Edinburgh, by study mode, level, gender, prior attainment, and domicile**

Level of study	Previous qualification and gender													
	Scottish National 5 Certificate		SCQF Level 6/RQF Level 3 qualification		Other undergraduate		First degree		Other postgraduate		Higher degree (taught)		Higher degree (research)	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
<b>Students from Scotland</b>														
<b>Full-time students</b>														
Other undergraduate			£78,000	£29,000	-£24,000	-£24,000	-£23,000	-£24,000			-£23,000	-£24,000		
First degree		£77,000	£99,000	£39,000	-£3,000	-£13,000	-£46,000	-£48,000		-£48,000	-£46,000	-£48,000		-£48,000
Other postgraduate			£162,000	£130,000		£80,000	£11,000	£42,000	-£16,000	-£16,000	-£16,000	-£16,000	-£16,000	-£16,000
Higher degree (taught)							£64,000	£58,000	£37,000	£1,000	-£16,000	-£15,000		-£15,000
Higher degree (research)				£196,000	£180,000	£152,000	£134,000	£106,000	£109,000	£54,000	£58,000	£37,000		
<b>Part-time students</b>														
Other undergraduate	£47,000	£16,000	£24,000	£7,000	-£7,000	-£7,000	-£7,000	-£7,000	-£7,000	-£7,000	-£7,000	-£7,000	-£7,000	-£7,000
First degree				£35,000	£8,000	£1,000	-£16,000	-£16,000	-£16,000	-£16,000	-£16,000	-£16,000		
Other postgraduate			£103,000	£81,000	£31,000	£48,000	£7,000	£30,000	-£4,000	-£4,000	-£4,000	-£4,000	-£4,000	-£4,000
Higher degree (taught)					£82,000	£69,000	£57,000	£50,000	£44,000	£15,000	-£7,000	-£7,000	-£7,000	-£7,000
Higher degree (research)					£84,000		£75,000	£50,000	£71,000	£34,000	£48,000	£25,000	£0	
<b>Students from England</b>														
<b>Full-time students</b>														
Other undergraduate			£91,000	£42,000	-£11,000	-£11,000		-£12,000				-£12,000		
First degree	£219,000		£124,000	£63,000	£22,000	£11,000	-£22,000	-£24,000			-£22,000	-£24,000		
Other postgraduate							£17,000	£48,000			-£10,000	-£9,000		
Higher degree (taught)						£105,000	£73,000	£67,000	£46,000	£10,000	-£7,000	-£6,000		
Higher degree (research)					£179,000		£133,000	£105,000	£108,000		£57,000	£36,000	-£48,000	
<b>Part-time students</b>														
Other undergraduate		£17,000	£25,000		-£6,000	-£6,000		-£6,000			-£6,000	-£6,000		-£6,000
First degree														
Other postgraduate					£35,000	£52,000	£11,000	£34,000	£0	£0	£0	£0	£0	£0
Higher degree (taught)				£111,000	£88,000	£75,000	£63,000	£57,000	£51,000	£21,000	£0	£0	£0	£0
Higher degree (research)						£56,000	£74,000	£49,000		£33,000	£47,000	£24,000		

Level of study	Previous qualification and gender													
	Scottish National 5 Certificate		SCQF Level 6/RQF Level 3 qualification		Other undergraduate		First degree		Other postgraduate		Higher degree (taught)		Higher degree (research)	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
<b>Students from Wales</b>														
<b>Full-time students</b>														
Other undergraduate			£85,000	£36,000										
First degree			£112,000	£51,000	£10,000	-£0,000		-£36,000						
Other postgraduate							£17,000	£48,000	-£10,000					
Higher degree (taught)							£70,000	£64,000						
Higher degree (research)						£150,000		£105,000			£57,000	£36,000		
<b>Part-time students</b>														
Other undergraduate														
First degree														
Other postgraduate				£86,000		£52,000	£11,000	£34,000		£0	£0			
Higher degree (taught)					£85,000	£72,000	£60,000	£54,000		£18,000		-£3,000		
Higher degree (research)														
<b>Students from Northern Ireland</b>														
<b>Full-time students</b>														
Other undergraduate			£92,000	£43,000										
First degree			£125,000	£65,000	£23,000		-£20,000							
Other postgraduate								£48,000			-£10,000		-£10,000	-£9,000
Higher degree (taught)							£73,000	£67,000	£46,000					
Higher degree (research)							£134,000	£106,000						
<b>Part-time students</b>														
Other undergraduate														
First degree														
Other postgraduate					£35,000		£11,000	£34,000			£0	£0		
Higher degree (taught)					£88,000		£63,000	£57,000		£21,000	£0	£0		
Higher degree (research)												£25,000		

Note: All values are rounded to the nearest £1,000. Gaps may arise where there are no students in the 2021-22 University of Edinburgh cohort expected to complete the given qualification (with the given characteristics). Grey shading indicates instances where the level of study at the University of Edinburgh is equal to or lower than the level of previous 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 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**

## A2.3 Impact on educational exports

### A2.3.1 Additional information on the 2021-22 cohort of non-UK domiciled student entrants studying at the University of Edinburgh

Table 32 presents a detailed breakdown of the 2021-22 non-UK domiciled University of Edinburgh cohort, by domicile, level, and mode of study.

**Table 32 Non-UK domiciled students in the 2021-22 cohort of University of Edinburgh student entrants, by level of study, mode of study and domicile**

Level and mode of study	Domicile		
	EU	Non-EU	Total
<b>Full-time</b>			
Other undergraduate	0	40	40
First degree	365	1,990	2,355
Other postgraduate	35	95	130
Higher degree (taught)	370	5,045	5,415
Higher degree (research)	165	590	755
<b>Total</b>	<b>935</b>	<b>7,760</b>	<b>8,695</b>
<b>Part-time</b>			
Other undergraduate	15	40	55
First degree	0	0	0
Other postgraduate	145	205	350
Higher degree (taught)	170	735	905
Higher degree (research)	5	10	15
<b>Total</b>	<b>335</b>	<b>990</b>	<b>1,325</b>
<b>Total</b>			
Other undergraduate	15	80	95
First degree	365	1,990	2,355
Other postgraduate	180	300	480
Higher degree (taught)	540	5,780	6,320
Higher degree (research)	170	600	770
<b>Total</b>	<b>1,270</b>	<b>8,750</b>	<b>10,020</b>

Note: All numbers are rounded to the nearest 5, and the total values may not add up precisely due to this rounding.

'Other undergraduate' learning includes Certificates and Diplomas of Higher Education, Foundation Degrees, other undergraduate-level diplomas and certificates, and undergraduate-level credits. 'Other postgraduate learning' includes taught work for credit at postgraduate level, Postgraduate Certificates in Education, and other certificates, diplomas, and qualifications at postgraduate level.

Source: London Economics' analysis based on University of Edinburgh HESA data

### A2.3.2 Net tuition fee income per international student entrant

Table 33 presents estimates of the net tuition fee income per international student in the 2021-22 University of Edinburgh cohort (over the entire study duration), by domicile, level of study, and mode of study. Note that, as we assume the same average tuition fees charged for non-EU and EU students (see Sections 4.3 and 4.4.1 for more information), any differences by domicile are driven entirely by differences between non-EU and EU students in the average fee waivers and other bursaries provided by the University of Edinburgh.



**Table 33 Net tuition fee income per international student in the 2021-22 cohort of University of Edinburgh student entrants, by level of study, mode, and domicile**

Level	EU domiciled students		Non-EU domiciled students	
	Full-time	Part-time	Full-time	Part-time
Other undergraduate	£45,000	£10,000	£45,000	£11,000
First degree	£86,000	-	£85,000	-
Other postgraduate	£23,000	£11,000	£23,000	£9,000
Higher degree (taught)	£23,000	£22,000	£23,000	£19,000
Higher degree (research)	£47,000	£33,000	£36,000	£11,000

Note: Gaps may arise where there are no students in the 2021-22 University of Edinburgh cohort expected to complete the given qualification (of the given characteristics). All estimates are presented in 2021-22, discounted to reflect net present values, and rounded to the nearest £1,000.

Source: London Economics' analysis

### A2.3.3 Assumed average stay durations among international student entrants

As outlined in Section 4.4.2, to estimate the non-tuition fee income associated with non-UK students in the 2021-22 University of Edinburgh cohort, we adjusted the estimates of non-tuition fee expenditure per academic year from the Student Income and Expenditure Survey (based on English domiciled students) to reflect longer stay durations in the UK for international students.

In particular, following a similar approach as a study for the (former) Department for Business, Innovation and Skills (2011b), we assume that **EU domiciled postgraduate** and **non-EU domiciled undergraduate and postgraduate students** spend a larger amount of time in the UK than prescribed by the duration of the academic year (39 weeks), on average<sup>163</sup>. Hence, we assume that all international postgraduate students (both EU and non-EU domiciled) spend **52 weeks** per year in the UK (as they write their dissertations during the summer). Further, we assume that non-EU domiciled and EU domiciled undergraduate students spend an average of **42** and **39 weeks** per year in the UK (respectively). The lower stay duration for EU undergraduate students reflects the expectation that these students, given the relative geographical proximity to their home countries and the resulting relative ease and low cost of transport, are more likely to return home during holidays. These assumptions are summarised in Table 34.

**Table 34 Assumed average stay durations (in weeks) for non-UK domiciled student entrants, by study level and study mode**

Level of study	Domicile	
	EU (outside UK)	Non-EU
Undergraduate	39 weeks	42 weeks
Postgraduate	52 weeks	52 weeks

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

### A2.3.4 Non-fee income per international student entrants

Table 35 presents estimates of the non-tuition fee income per international student in the 2021-22 University of Edinburgh cohort (over the entire study duration), by domicile, level of study, and mode of study.

<sup>163</sup> There may be significant variation around these assumed average stay durations depending on individual students' circumstances, such as country of origin, parental income etc.

**Table 35 Non-fee income per international student in the 2021-22 cohort of University of Edinburgh student entrants, by level of study, mode, and domicile**

Level	EU domiciled students		Non-EU domiciled students	
	Full-time	Part-time	Full-time	Part-time
Other undergraduate	£25,000	£45,000	£27,000	£48,000
First degree	£48,000		£52,000	
Other postgraduate	£17,000	£40,000	£17,000	£40,000
Higher degree (taught)	£17,000	£60,000	£17,000	£60,000
Higher degree (research)	£65,000	£152,000	£65,000	£152,000

Note: Gaps may arise where there are no students in the 2021-22 University of Edinburgh cohort expected to complete the given qualification (of the given characteristics). All estimates are presented in 2021-22 prices, discounted to reflect net present values, and rounded to the nearest £1,000.

Source: *London Economics' analysis*







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