Education and Skills Impact Measurement

Report for the Enterprise and Skills Strategic Board

LE London Economics

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1 Introduction

Background

Education, training and skills acquisition – often referred to as human capital accumulation - are one of the most influential determinants of any country's long term economic growth[1], and are associated with improved economic prosperity, living standards, and wellbeing[2]. In general, the economic benefits of human capital acquisition are shared across all sectors of the economy: individuals in possession of additional education, training and skills are typically rewarded in the labour market by both higher earnings and an increased probability of being employed; while the government (often the primary funder of human capital acquisition) benefits economically through higher expected taxation receipts, higher levels of economic activity, and lower active labour market benefit expenditure. Furthermore, businesses see an economic benefit – over and above the higher salaries paid to employees - through increased innovation and positive effects on other employees (through better knowledge transfer and skills exchange), ultimately leading to improved productivity and profitability.

However, in addition to these direct economic benefits, there are also a range of indirect economic benefits ('spillovers') and wider societal impacts. Higher levels of human capital are evidenced to be associated outcomes that reduce the strain on the public purse, such as better health outcomes and a lower incidence of interaction with the criminal justice system. Improved human capital is also associated with reduced inequality; improved social capital and cohesion; intergenerational transmission of skills; improved social mobility; the subsequent acquisition of further learning and qualifications; and improved communication and autonomy.

Despite the inherent difficulty in measuring the causal relationship between human capital acquisition and a number of these positive outcomes, the importance of education, training, and skills acquisition is unparalleled.

Scope of analysis

London Economics were commissioned by the Scottish Government's Enterprise and Skills Strategic Board to analyse the **Return on Investment (ROI)** associated with post-16 education and training[3] in Scotland. Specifically, using the **Scottish Longitudinal Educational Outcomes** (LEO) data (for the first time), we estimate the labour market outcomes associated with **higher education (HE) qualifications**, **further education (FE)/vocational qualifications**, and **Modern Apprenticeships (MAs)**. Combining this labour market analysis with information on the associated costs to the **individual** (i.e.

[1] See for example Woessmann (2015).
[2] See for example International Institute for Applied Systems Analysis (2008).
[3] Throughout this report, we also refer to these post-16 qualifications as 'post-school' qualifications.

students/graduates), the **Exchequer**, and the **employer** (for MAs only), we estimate the **Return on Investment** to each qualification.

The project was split into **three main stages**:

- **Stage 1** involved the **econometric analysis of the labour market outcomes** (represented by earnings, employment and benefit dependency outcomes) associated with post-school education and training in Scotland, using the Scottish LEO data;
- **Stage 2** involved the **estimation of the costs** (to the **individual, public purse, and employers**) associated with undertaking/funding post-school qualifications; and
- **Stage 3** involved estimating the **Return on Investment** (ROI) to these qualifications (and the associated benefit-to-cost ratios).

All of these stages focus on the labour market benefits, costs, and ROI associated with **Scottish domiciled students undertaking post-school qualifications in Scotland** (but living anywhere in the United Kingdom post-qualification).

The specific objectives of this research are therefore to estimate the following (in terms of earnings, employment and benefit dependency outcomes, and acknowledging the fact that these measures take a narrow view of the value of educational attainment):

- The return to individual investment in post-school qualifications.
- The return to public (Scottish Exchequer) investment in post-school qualifications.
- The return to employers' investment in work-based learning qualifications.

It should be noted that this report is **not** designed to be:

- An economic impact assessment of the wider university, college, or other education sector in Scotland;
- A report of earnings or employment outcomes for learners attending particular institutions (these are covered in Scottish Government LEO reports for colleges, universities and MAs), or a comparison of earnings between different learner pathways; or
- An assessment of the wider social and wellbeing returns to education, as this is covered in a separate report.

Outline of report

The remainder of this report is structured as follows:

- **Part I (Sections 2 to 6)** outlines the **econometric analysis of the Scottish LEO data undertaken to estimate the labour market returns to post-school qualifications in Scotland**:
  - In **Section 2**, we provide a detailed **overview of the Scottish Longitudinal Educational Outcomes data**, including the structure of the constituent data

components, our approach to cleaning and re-coding the data for subsequent analysis, as well as a discussion of the limitations of the data;

- In **Section 3**, we discuss the **methodological approach** used in the analysis of the Scottish LEO data to assess the labour market returns associated with post-school qualifications. This includes a detailed discussion of the selection of treatment and counterfactual groups, the labour market outcomes under consideration, as well as the specification of the econometric models;
- In **Section 4**, we present summary **descriptive statistics** on the key labour market outcomes under consideration;
- In **Section 5**, we present the findings on the econometric analysis of **the marginal earnings returns** to post-school qualifications. We first present **aggregate** marginal earnings returns to all qualifications of interest, followed by additional disaggregated analyses of the earnings returns to **first degrees** (by ethnicity, subject of study, type of Higher Education Institution attended, and prior educational pathway), as well as disaggregated results for **Modern Apprenticeships** (by subject of study and location of the off-the-job training component of the MA);
- In **Section 6**, we present the comparable findings on the **marginal employment returns** to post-school qualifications (following the same structure as the presentation of earnings outcomes in Section 5); and
- In **Section 7**, we present the comparable findings on the **marginal benefit dependency returns** to post-school qualifications (following the same structure as the presentation of earnings outcomes in Section 5).

- **Part II (Sections 8 to 9)** outlines our analysis of the **Return on Investment to post-school qualifications in Scotland**:
  - **Section 8** discusses our **methodological approach** to the ROI analysis;
  - **Section 9** presents our findings on the **ROI to post-school qualifications from the perspective of students/graduates** (for all post-school qualifications of interest)[4].

[4] The report also includes a number of Annexes, including a Technical Annex providing further information on the methodological approach underlying the econometric analysis (Annex 3); and supplementary findings in respect of the marginal earnings and employment returns and benefit dependency returns to post-school qualifications (Annex 4). We also include additional results relating to the Return on Investment analysis, in Annex 5.

PART I: THE LABOUR MARKET RETURNS TO POST-SCHOOL EDUCATION AND TRAINING

2 The Scottish Longitudinal Educational Outcomes data

2.1 Data structure

2.1.1 Overview of the different data sources included

The Scottish Longitudinal Educational Outcomes data currently consist of a total of **six different underlying datasets** (see Figure 1), including **four datasets with information on individuals' educational pathways** (in terms of educational participation and attainment at Scottish Colleges, Higher Education Institutions (HEIs), or through the Modern Apprenticeship route), and **two datasets on individuals' labour market outcomes** (in terms of earnings and employment status (from HM Revenue and Customs (HMRC)) and benefit dependency[5] from the Department for Work and Pensions (DWP)). Prior to providing the data to London Economics, the Scottish Government performed some of the required linkage of the different datasets, by combining the education datasets with the labour market data. As a result, to undertake the analysis, we were provided with **four separate data files**, including:

- **College data matched to HMRC/DWP data:** A matched dataset containing linked information on participation and qualification achievement at Scottish Colleges[6] (from the Scottish Funding Council covering the academic years 2003/04 to 2016/17 inclusive), combined in advance with HMRC labour market data on earnings and employment status and DWP data on benefit dependency (for the tax years 2004/05 to 2016/17 inclusive);
- **University data matched to HMRC/DWP data**: A matched dataset containing information on higher education participation and qualification achievement at Scottish Higher Education Institutions[7] (from the Higher Education Statistics Agency (HESA) covering the academic years 2003/04 to 2016/17 inclusive). Again,

[5] In terms of benefit dependency, specifically, the LEO data include information on individuals' receipts of welfare through the Job Seekers' Allowance (JSA), Income Support (IS), the Employment and Support Allowance (ESA), and the JUVOS Training Allowance (JTA).

[6] In terms of students' domicile (i.e. prior to undertaking their qualifications), the College data includes information on students from anywhere in the UK studying at a Scottish College. The data does not explicitly identify non-Scottish students (i.e. from the rest of the UK). However, as a proxy, it is useful to assess the proportion of individuals in the data with missing information on the Scottish Index of Multiple Deprivation (SIMD) quintile, which has missing entries for non-Scottish domiciled students, but (potentially) also for Scottish domiciled students whose SIMD quintile cannot be identified. In the raw College data, the proportion of individuals with a missing SIMD quintile amounts to only **0.8%**. This implies that the vast majority of learners in the College data (at least **99.2%**) are from Scotland.

[7] Note that, while the LEO data provided to us by the Scottish Government excluded any information on international students (i.e. EU and non-EU domiciled) studying at Scottish HEIs, it included data on students domiciled anywhere in the UK (i.e. including Scottish domiciled students as well as non-Scottish domiciled students from the rest of the UK). However, as discussed in further detail in Section 2.2.2, the analysis of the labour market returns to higher education qualifications focuses only on Scottish domiciled students attaining higher education qualifications in Scotland (i.e. we exclude any students from the rest of the UK who studied at Scottish HEIs).

the information received was linked with relevant data on earnings, employment status and benefit dependency (for the tax years 2004/05 to 2016/17 inclusive);

- **MA Leavers data matched to HMRC/DWP data:** A matched dataset containing linked information on cohorts of Scottish Modern Apprenticeships leavers[8,9] (from Skills Development Scotland (SDS) covering the tax years 2008/09 to 2016/17 inclusive). Again, this information was combined with data on earnings, employment status and benefit dependency (covering the tax years 2004/05 to 2016/17 inclusive); and
- **MA In-Training data[10]:** A dataset containing information on Modern Apprentices *in training* (as opposed to leavers) covering the tax years 2010/11 to 2019/20 inclusive (again from SDS). This data is not directly linkable to the HMRC and DWP data but can be linked to the MA cohort of leavers data (for those learners appearing in the MA Leavers data[11]) via the *Person_ID* and *Assignment_ID* identifiers (see Section 2.1.2).

2.1.2 Unique identifiers and combining the datasets

A set of unique identifiers contained in the different data files facilitated the required full linkage across all datasets. In particular:

- ***Edukey* (all data sources)**: This identifier is included in the **College**, **University** and **MA data**, and constitutes the main identifier required for the linkage of the different datasets. In particular, ***Edukey*** uniquely identifies learners across and within these three datasets; and
- ***Person_ID*** and ***Assignment_ID* (MA data only):** These identifiers were used to link the **MA Leavers data** to the **MA In-Training data**. More specifically, ***Person_ID*** identifies the same learner within and across the two datasets, whereas ***Assignment_ID*** identifies the Modern Apprenticeship programme undertaken by the learner.

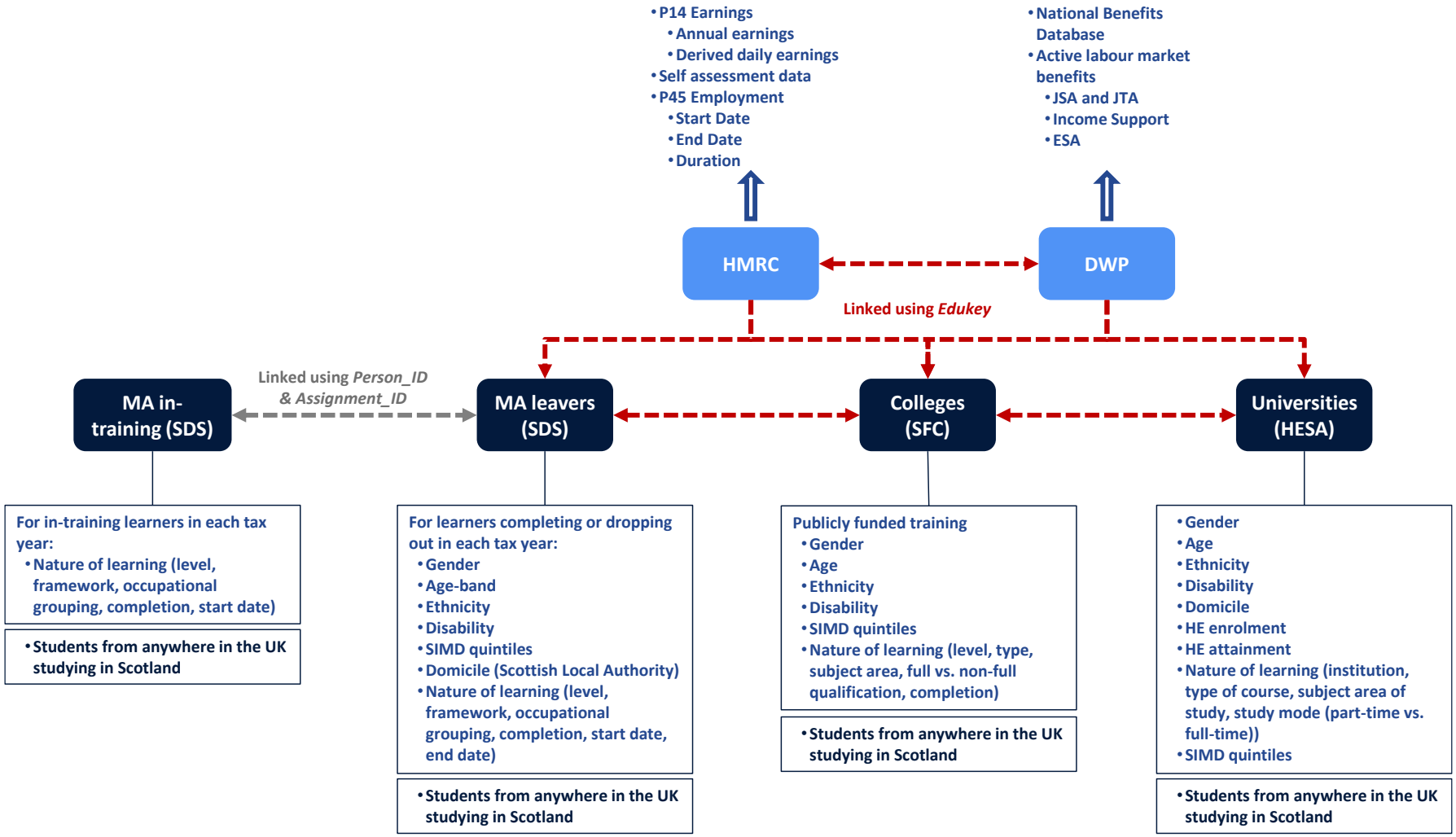
[8] Leavers of Modern Apprenticeships include both learners *completing* their MAs, as well as learners *dropping out of* MAs in a given year.

[9] In terms of learners' domicile (again, prior to undertaking their qualifications), the MA data again includes information on learners from anywhere in the UK undertaking MAs in Scotland - but does not explicitly identify non-Scottish students. However, as a proxy, the data provides information on the Local Authority domicile of each learner prior to starting their MA, which includes Scottish Local Authorities for Scottish domiciled learners, and is coded as 'unknown' for learners from outside Scotland or for Scottish domiciled learners whose Local Authority information is missing. In the raw MA data, the proportion of learners with an 'unknown' Local Authority domicile amounts to only **0.3%**. Hence, as with the College data, the MA data may potentially include a very small number of non-Scottish domiciled learners (i.e. less than **0.3%**).

[10] Note that this dataset was not part of the original Scottish LEO data, but was requested separately to ensure that the subsequent linked dataset allowed for the identification of when each individual completing/leaving a Modern Apprenticeship was undertaking their training.

[11] i.e. for those learners who dropped out of or completed a Modern Apprenticeship in any academic year up until 2016/17.

Figure 1 Datasets contained within the Scottish LEO data



Source: London Economics' analysis of Scottish LEO data

Using these identifiers, the different data sources were combined to generate a **linked dataset** summarising information on the education and training pathways and subsequent labour market outcomes of each learner across their entire post-secondary educational journey. However, to prepare the data for the subsequent econometric analysis, we first applied a range of cleaning steps to the information, described in the following section.

2.2 Data cleaning

The data cleaning process comprised two phases. The **first phase** consisted of an in-depth cleanse of each of the separate datasets included in the Scottish LEO data. In the **second phase**, the individual datasets were then combined to generate a linked dataset recording information on the post-school education pathway and subsequent labour market outcomes of each unique learner. This cleaning process is summarised in Figure 2.

2.2.1 Phase 1: Cleaning of each dataset individually

In the first phase, each dataset was recoded separately and prepared for the final data linkage.

Cleaning the College, University and MA data

For each education dataset, the following cleaning steps were undertaken:

- **Removal of HMRC and DWP data**: the HMRC and DWP data were initially removed from the education datasets and cleaned separately (as discussed in further detail below).
- **Merging MA Leavers data with MA In-Training data**: unlike the University and College data included in the Scottish LEO data, the **MA Leavers data** only includes information on cohorts of Modern Apprentices *leaving* training in each tax year (incorporating information on either completion or drop-out). In contrast, information on apprentices who were in training in each tax year was provided in the separate **MA In-Training dataset** (not directly linked to the HMRC and DWP data). In order to identify the years when a learner was in education and training, the MA Leavers and MA In-Training datasets were merged (using the above-discussed ***Person_ID*** and ***Assignment_ID*** identifiers)[12].

[12] In other words, MA learners in training are not matched to HMRC/DWP data until they leave their course (i.e. drop out or complete). As a result, one limitation of the data is that in the most recent tax years available, most Modern Apprentices in training are *not* identifiable in the MA Leavers data (unless they had previously undertaken a different MA). For example, learners who started a two-year MA in 2016/17 would typically not be identifiable in the MA Leavers data (as they would not have completed their training by the end of 2016/17 (i.e. the last tax year for which the MA Leavers data is currently available)). As a result, it is typically not possible to identify these learners in the HMRC/DWP data. This inability to identify current in-training status (in the most recent tax years) might introduce a potential bias in the analysis (affecting both the treatment and counterfactual groups), since learners in MA training might be incorrectly identified as being in full-time employment, although they were actually enrolled in a Modern Apprenticeship

- **Identification of correct demographic characteristics for each learner (based on a combination of 'prevalence' and 'most recent' selection rules[13])**: the variable ***Edukey*** allows the unique identification of a learner within and across the various datasets. We cross-checked the extent to which each unique learner might be associated with inconsistent information across the datasets in respect of their main demographic characteristics (i.e. gender, ethnic origin, disability status and age). For those learners with inconsistent information, we imputed the **most commonly occurring** (i.e. most prevalent) characteristic across all datasets (when this was shared among at least 75% of the records with the same *Edukey*). Otherwise, if the most common characteristic was shared by less than 75% of records, the characteristic contained in the **most recent record** available was selected instead.

  There was one exception to this general approach. In relation to the **geographical variables** included in the different datasets (including **Scottish Local Authority of domicile** in the MA data**, region within Scotland where the College is located** in the **College data,** and **UK region of domicile**[14] in the **University data**), we selected the value associated with the record for the **first year** of enrolment (i.e. the earliest record in the dataset). Similarly, information on the **Scottish Index of Multiple Deprivation** (SIMD) quintile was assigned based on the **first available record** in each of the datasets[15].

- **Detailed reclassification of qualifications within each education dataset**: the various qualifications included in the different datasets were consolidated and reclassified into a unique and **detailed qualifications ranking reflecting the Scottish Credit and Qualifications Framework** (SCQF)[16]. College courses not leading to a formally recognised qualification (including module-only study and courses not leading to a full vocational qualification) have been excluded from the analysis[17], along with a small number of College courses leading to academic

programme at the time (and thus earning lower wages than typical full-time employees with a similar prior qualification). However, the bias is likely to be small, and affect both treatment and counterfactual groups in a similar way. In fact, based on an analysis of historical data (for years with observable information on prior attainment at College or university and MA in-training data), the misallocation was identified as being of relatively limited importance.

[13] For example, on occasion, ethnicity, disability or gender may have been recorded differently in the college data from the HESA data (or sometimes there may have been inconsistencies within the same dataset). Therefore, a set of 'rules' was needed to be applied to ensure consistency and maintain the sample sizes for subsequent analysis. However, the incidence was not widespread, but did occur on occasion, and this approach was simply adopted to ensure the transparency of the methodological approach.

[14] i.e. UK Government Office Region (GORs).

[15] For Modern Apprenticeships, information on SIMD quintile was only available in the MA Leavers dataset (but not in the MA In-training data). When known, this information was extrapolated across records with the same *Edukey*.

[16] See Scottish Credit and Qualifications Framework (no date).

[17] Note that it was not possible to exclude standalone modules undertaken at universities, since the course information included in the University data was not detailed enough to allow for this exclusion.

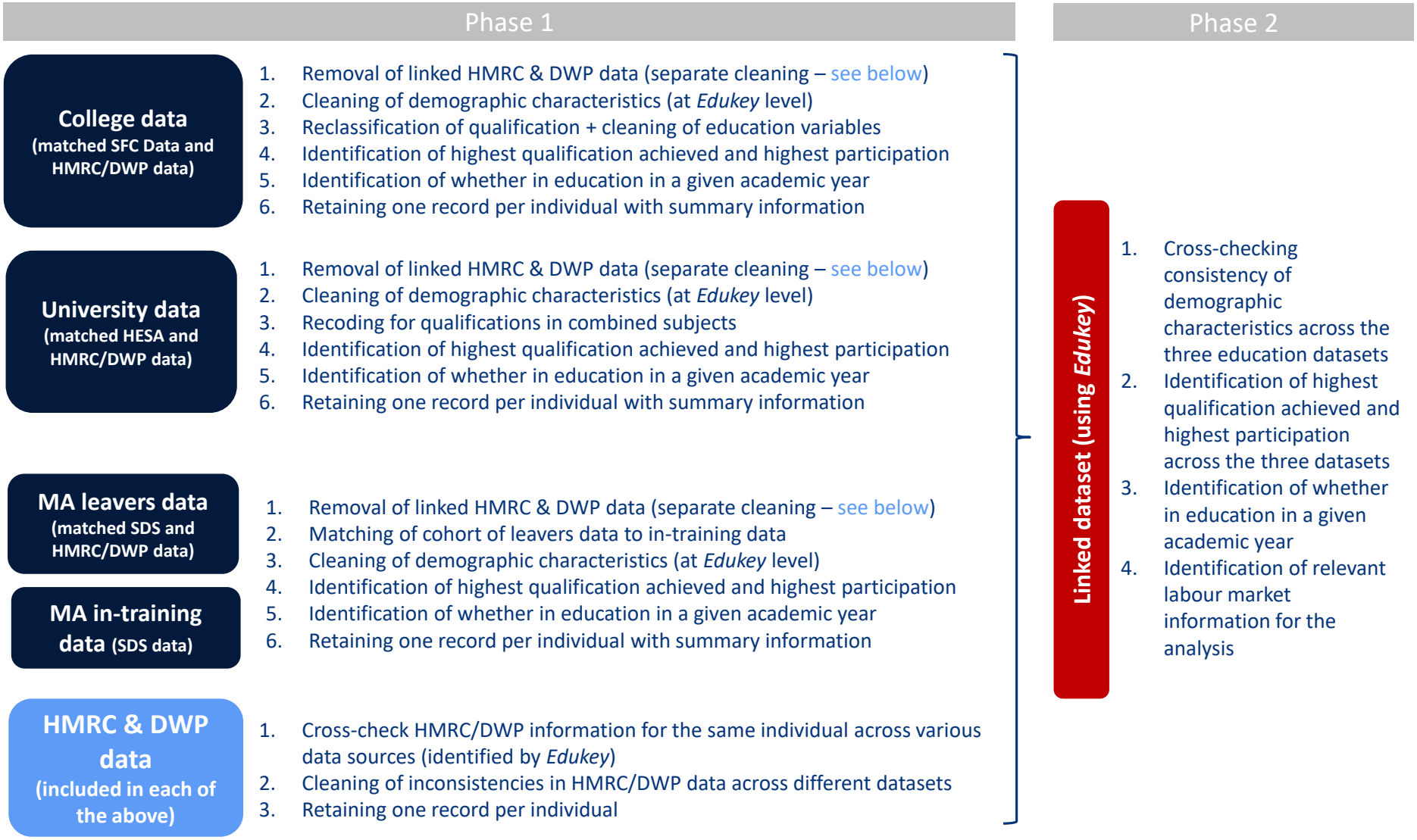
qualifications at SCQF Levels 4 to 6 (apart from Highers and Advanced Highers), and HESA qualifications classified as 'Further Education'[18].

- **Removal of observations with missing information on University attended**: there were a (small) number of observations within the University data with missing information on the institution attended. These observations were deleted from the respective datasets.
- **Identification of the highest qualification achieved and highest education participation for each learner[19], and full list of academic years when the learner was in education**: for each learner, we generated summary information on the qualifications undertaken at Colleges, Higher Education Institutions or as part of a Modern Apprenticeship. This summary information included:
  - The **highest qualification achieved** and related information (including the academic year or tax year when the qualification was achieved, subject area of study, mode of study, and institution attended (for HE qualifications only));
  - The **highest level of participation**[20] and related information (again including the academic or tax year of enrolment, subject area of study, mode of study, institution (for HE qualifications only)); and
  - **Dummy variables for each academic year**, identifying those years when the learner was in education or training.

Each dataset was then **de-duplicated** to retain only one record for each learner (i.e. one record for each unique *Edukey*).

[18] More information on the detailed qualifications ranking and exclusions is provided in Annex A3.1 (see Table 40).
[19] i.e. the highest qualification achieved at a College, Higher Education Institution, or as part of a Modern Apprenticeship programme.
[20] The highest participation identifies the highest qualification learners have enrolled in, whether achieving or not.

Figure 2 Overview of Scottish LEO data cleaning process



Source: London Economics

Cleaning the HMRC and DWP data

Following the above-described cleaning of the education datasets, we then separately cleaned the HMRC and DWP data on earnings, employment status and benefit dependency, as follows:

- **Cross-checking of HMRC/DWP information and subsequent identification of the same individual (i.e. same *Edukey* identifier) across the various datasets**: as outlined above, before the data transfer, the Scottish Government already performed some of the required linkage of the different datasets comprising the Scottish LEO data (in particular, each education dataset was attached to labour market information (i.e. HMRC/DWP data)). Hence, as a first step to cleaning the labour market data, we checked the consistency of the HMRC/DWP information for each learner (i.e. each *Edukey*) across the pre-matched education/labour market datasets received.
- **Cleaning of inconsistent information across the different datasets**: for a very limited number of *Edukey* identifiers, the labour market information retrieved from the different pre-matched datasets was inconsistent. Specifically, there were instances where a given individual's employment probability appeared to be incorrectly recorded as zero in one of the data sources (i.e. suggesting that no employment took place in that particular tax year) but as non-zero in another dataset (for the same year and *Edukey*). To overcome this issue, priority was given to the entry with the **largest value** (e.g. if the proportion of the year that an individual was in (PAYE) employment in the tax year 2004/05 was 0% in the **University** data and 41% in the **College** data (in the same tax year), the proportion of the year in employment was consistently recoded to 41% in the cleaned HMRC and DWP dataset). This affected a very small number of records (110 at most, depending on the variable considered).

Again, at the end of the cleaning process we de-duplicated the data to retain one record for each learner (i.e. for each unique *Edukey*).

2.2.2 Phase 2: Generation and recoding of linked dataset

After Phase 1 of the cleaning process, we were left with four separate datasets, including three education and training datasets (College data, University data and MA data) and one labour market information dataset (with HMRC and DWP information) – all of which were then **combined into a comprehensive linked dataset using the common *Edukey* identifier**. Following the merging of the datasets, we then applied the following cleaning/recoding steps to the linked data:

- **Cross-checking consistency of the demographic characteristics across the different education datasets, and recoding in the merged data:** In the few instances where there were inconsistencies in the demographic information recorded for a given learner across the different education datasets, priority was given to the '**most prevalent**' information (i.e. if the information was consistent for two out of three datasets, then this information was incorporated into the

final merged data). When the 'most prevalent' approach could not be applied (i.e. where all three education datasets indicated different demographic information for a given learner), based on the **relative quality** of the different datasets[21], priority was given to information contained in the MA data, followed by the University data, and then the College data (in that order).

- **Identification of the highest qualification achieved and the highest participation across the three datasets, and subsequent identification of years in education:** Information on the highest participation within each education dataset was used to identify the highest level of attainment and participation across all education datasets (again based on the above-mentioned detailed qualifications ranking[22]) and to generate a variable identifying the number of years of post-secondary education and training received by each learner.
- **Generation of summary variables on labour market outcomes at 3, 5 and 7 years post-graduation (and post drop-out (where applicable)):** The final dataset provides summary information on the labour market outcomes 3, 5 and 7 years post-graduation or completion for achievers (or drop-out in the case of non-achievers) in terms of the proportion of the year in PAYE employment, PAYE annual and daily earnings, whether in receipt of active labour market benefits at any point during the tax year (or otherwise), as well as personal characteristics and geographic information on place of residence. All earnings information has been re-based to average 2018 prices using Office for National Statistics (ONS) data on the Consumer Price Index (CPI)[23], to ensure that all earnings information is measured in consistent prices irrespective of when those earnings might have been accrued.
- **Generation of aggregated groupings of qualifications, subjects of study and Higher Education Institutions:** To ensure that sample sizes were large enough for the subsequent econometric analysis of the labour market returns to post-school qualifications in Scotland, and to ensure consistency across the different education datasets:
  - In addition to the detailed reclassification/ranking of qualifications within each education dataset (described above), we **categorised qualifications into a consistent and more aggregate grouping** across the different datasets (presented in Figure 3);
  - We grouped the detailed subjects studied within the original education datasets into a **consolidated and high-level subject area classification** (including **STEM subjects**, **Arts, Humanities and Social Sciences (AHSS) subjects**, **and other subjects**, as presented in Table 1); and
  - We further grouped individual Higher Education Institutions into a high-level HEI grouping (into **ancient, pre-1992** (excluding ancient universities) **and post-**

[21] Based on conversations with the Scottish Government.
[22] Again, see Table 40 in Annex A3.1 for more information on the detailed ranking of all qualifications within the education datasets (based on the SCQF).
[23] Office for National Statistics (2020).

1992 institutions (in addition to Scottish **Colleges** teaching undergraduate higher education programmes); see Table 2).

- **Exclusion of non-Scottish domiciled students undertaking higher education qualifications in Scotland:** Based on the information on students' domicile (prior to starting their higher education qualifications) contained in the University data, we only retained Scottish domiciled individuals undertaking higher education qualifications, and excluded any individuals from the rest of the UK studying in Scotland[24, 25]. Note that the identification of HE students' domicile relies on the availability of domicile information for each individual's first year of study. As such, the domicile of students who were in their second or third year of study in the academic years 2003/04 and 2004/05 (and who did not undertake any prior HE qualification) could *not* be identified. As a result, these students have been omitted from the analysis.

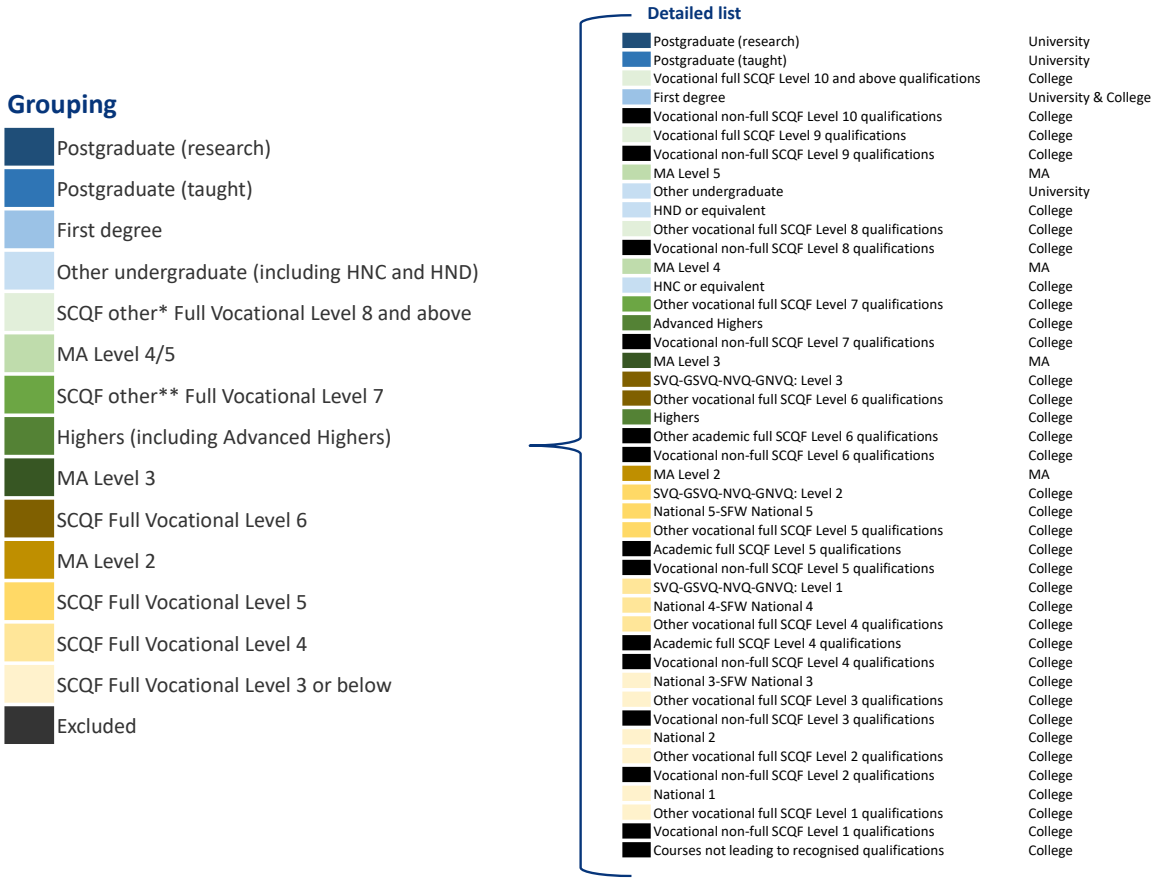
The linkage of the four datasets allowed for the generation of a comprehensive record of learners' post-secondary schooling attainment in Scotland (including qualifications attained at Colleges, through Modern Apprenticeships, or at Higher Education Institutions in Scotland). This allowed us to identify the **highest level of qualification attainment** and **participation**, as well as subsequent labour market outcomes (measured in terms of daily earnings, the proportion of the tax year spent in employment, and whether the individual was in receipt of active labour market benefits[26] at any point during the tax year).

[24] Again, international students were already excluded from the raw LEO data provided to us by the Scottish Government.

[25] As outlined above (see Footnotes 6 and 9 in Section 2.1.1), neither the College data nor the MA data allowed for an explicit identification of non-Scottish domiciled students, so it was not possible to exclude these students from the analysis. However, based on variables including specific domicile information for students from Scotland (with missing/'unknown' entries for non-Scottish students), the proportion of non-Scottish domiciled students undertaking MAs or College qualifications in Scotland stands at less than **0.3%** and **0.8%**, respectively. Therefore, the exclusion of any non-Scottish domiciled MA learners and College students from the data would be expected to have a negligible impact on the econometric results provided here.

[26] Again, this includes active labour market benefits through the Job Seekers' Allowance, Income Support, the Employment and Support Allowance, and the JUVOS Training Allowance.

Figure 3 Grouping of qualifications



Note: *Other than Modern Apprenticeships at SVQ (Scottish Vocational Qualification) Level 4 (which is equivalent to SCQF Level 8 or 9).
**Other than Modern Apprenticeships at SVQ Level 3 (equivalent to SCQF Level 7).
Source: London Economics' analysis of Scottish LEO data

Table 1 Grouping of subjects into high-level subject areas

Subjects in College data	Subjects in University data	Framework in MA data[1]	Grouped subject area
S: Agriculture, Horticulture and Animal Care	Agriculture, food and related subjects	Animal Care, Land and Water Based	STEM
	Veterinary sciences		
J: Arts and Crafts	Communications and media	Creative and Cultural Skills	AHSS
K: Authorship/ Photography/ Publishing/ Media	Creative arts and design		
L: Performing Arts			
A: Business/Management/Office Studies	Business and management	Administration and related	AHSS
		Management	
		Financial Services	
Combined and general studies	Combined and general studies	-	Other
T: Construction and Property (Built Environment)	Architecture, building and planning	Construction and related	STEM
G: Education/Training/Teaching	Education and teaching	-	Other
X: Engineering	Engineering	Automotive	STEM
Q: Environmental Protection/ Energy/ Cleansing/ Security		Engineering and Energy	
H: Family Care/Personal Development/Personal Care and Appearance	-	Personal Services	Other
-	Medicine & Dentistry	-	STEM[2]
P: Health Care/Medicine/Health and Safety	Health and social care	Sport, Health and Social Care - selected frameworks	STEM
	Pharmacology, toxicology and pharmacy		
	Nursing		
	Subjects allied to medicine		
D: Humanities (History/ Archaeology/ Religious Studies/ Philosophy)	History and archaeology	-	AHSS
	Humanities and liberal arts		
	Philosophy and religious studies		
C: Information Technology and Information	Computing	Other services – selected frameworks	STEM
	Technology		
F: Area Studies/ Cultural Studies/ Languages/ Literature	Celtic studies	-	AHSS
	English studies		

	Languages, linguistics, and classics		
N: Catering/ Food/ Leisure Services/ Tourism	-	Food and Drink	Other
		Hospitality and Tourism	
E: Politics/ Economics/ Law/ Social Sciences	Economics	-	AHSS
	Law		
	Politics		
	Sociology, social policy and anthropology		
R: Sciences and Mathematics	Biosciences	Chemicals and Biotechnology related	STEM
	Chemistry		
	Mathematical sciences		
	Physical, material, and forensic sciences		
	Physics and astronomy		
M: Sports, Games and Recreation	Sport and exercise sciences	Sport, Health and Social Care - selected frameworks	Other
B: Sales, Marketing and Distribution	-	Retail and Customer Service	Other
Y: Oil/ Mining/ Plastics/ Chemicals	-	-	Other
Z: Transport Services	-	Transport and Logistics	Other
W: Manufacturing/ Production Work	-	Other Manufacturing	Other
V: Services to Industry	Geographical and environmental studies Psychology	Other Services	Other

Note:
1. The subject grouping for MAs is based on the framework and occupational grouping of Modern Apprenticeships.
2. The analysis for STEM subjects was undertaken both including and excluding Medicine and Dentistry (applicable to higher education qualifications only). In this report, we only present the results for STEM subjects *excluding* Medicine and Dentistry (where relevant).
Source: London Economics' analysis of Scottish LEO data

Table 2 Grouping of Scottish Higher Education Institutions

Higher Education Institution	Grouping
University of Aberdeen University of Edinburgh University of Glasgow University of St. Andrews	**Ancient institutions**
Glasgow School of Art Heriot-Watt University Royal Conservatoire of Scotland Scotland's Rural College University of Dundee The Open University in Scotland University of Stirling University of Strathclyde	**Pre-1992 institutions (excluding ancient institutions)**
Edinburgh Napier University Robert Gordon University Glasgow Caledonian University University of Abertay Dundee Queen Margaret University, Edinburgh University of the Highlands and Islands University of the West of Scotland	**Post-1992 institutions**

Source: London Economics' analysis of Scottish LEO data

2.3 Overview of the linked Scottish LEO dataset

2.3.1 Sample sizes and learner characteristics

Table 3 presents information on the number of Scottish domiciled learners[27] in education in each academic year that are included in the Scottish LEO data (and for whom a matched HMRC/DWP record was available), for each education dataset separately and in total in the linked dataset[28]. The same learner may appear in more than one education dataset within the same academic year (e.g. individuals enrolled in Modern Apprenticeships who are undertaking their off-the-job training component at a Scottish College). As such, the number of learners in the linked dataset does not equal the sum of learners across each of the three separate datasets. Note that changes in the number of learners included in the data over time are driven by the particular structure of the Scottish LEO data received. Specifically:

- As outlined above (see Section 2.2.2), in the final University dataset, we included only Scottish domiciled students studying in Scotland (but excluded students from

[27] As outlined above, where possible, non-Scottish domiciled learners have been excluded from the data (see Section 2.2.2 for more information).

[28] Note that the table provides information on the number of learners in the separate and linked datasets after cleaning learners' demographic/personal characteristics (based on the cleaning steps outlined in Section 2.2), but *before* excluding College courses not leading to any recognised qualification (including module-only study), College courses leading to academic qualifications at SCQF Levels 4 to 6 (apart from Highers and Advanced Highers), and HESA qualifications classified as 'Further Education'.

the rest of the UK undertaking HE qualifications in Scotland)[29]. The identification of HE students' domicile relies on the availability of domicile information for each individual's first year of study. As such, the domicile of students who had started their studies prior to the 2003/04 academic year (and who did not undertake any prior HE qualification) could *not* be identified, so these students have been dropped from the analysis. This explains the **relatively smaller number of students in the University data throughout the early academic years included**.

- Learners who were in full-time education in the more recent academic years are less likely to be linked to the latest available HMRC or DWP data (as they are less likely to have been active in the labour market prior to their enrolment in full-time education). For instance, students who started full-time first degrees in 2012/13 are unlikely to have a HMRC record, given that they are likely to have enrolled in the degree straight after their Highers or equivalent qualification (so might not have a HMRC record prior to their enrolment at university), but also might not have entered the labour market immediately upon graduation (so would have no HMRC record before the end of the 2016/17 tax year). This explains the **decline in the number of observations available in the most recent academic years**. While this decline applies to all education datasets, it is more pronounced for individuals gaining higher education qualifications through the university sector as compared to the College sector (where programmes are typically shorter in duration and learners are older and more likely to have spent time in the labour market prior to enrolment in the course).
- Finally, the **increase in the number of MA learners** between 2009/10 and 2010/11 is due to the above-described absence of information on in-training apprentices in 2008/09 and 2009/10. Rather than including both MA leavers *and* those in training, the data for these early years includes only learners **leaving** Modern Apprenticeships (i.e. completing or dropping out of their programmes). It is also likely that the general expansion of the Modern Apprenticeship programme contributes at least in part to the increase in numbers.

[29] Note again that it was not possible to exclude non-Scottish domiciled students from the College and MA data.

Table 3 Number of Scottish domiciled learners in the LEO data who were in education in each academic year, by year and data source

Academic year	Data source			
	College data	University data	MA data*	Linked dataset
2003/04	130,000	71,000	-	**199,000**
2004/05	133,000	90,000	-	**221,000**
2005/06	141,000	105,000	-	**244,000**
2006/07	154,000	118,000	-	**269,000**
2007/08	167,000	122,000	-	**286,000**
2008/09	170,000	126,000	13,000	**305,000**
2009/10	160,000	133,000	12,000	**301,000**
2010/11	148,000	143,000	54,000	**331,000**
2011/12	130,000	145,000	57,000	**317,000**
2012/13	194,000	130,000	59,000	**361,000**
2013/14	192,000	108,000	56,000	**336,000**
2014/15	183,000	78,000	52,000	**296,000**
2015/16	179,000	49,000	45,000	**260,000**
2016/17	162,000	62,000	28,000	**243,000**

Note: All numbers are rounded to the nearest 1,000. The sample sizes are based only on those learners with a matched HMRC/DWP record (i.e. whose labour market outcomes are available in the data). The same learner can appear in several datasets in the same academic year; therefore, the number of learners in the linked dataset does *not* equal the sum of learners across the three original datasets. Note that the table provides information on the number of learners in the datasets after cleaning learners' demographic/ personal characteristics (based on the cleaning steps outlined in Section 2.2), but *before* excluding learners in possession of College courses not leading to a formally recognised qualification (including module-only study), College courses leading to academic qualifications at SCQF Levels 4 to 6 (apart from Highers and Advanced Highers), HESA qualifications classified as 'Further Education' and those who were not awarded a qualification at the end of their course.

* The information for MAs is based on tax years rather than academic years. MA data were only available from 2008/09 onwards. Data prior to 2010/11 are based on cohort of leavers only (while information from 2010/11 onwards includes leavers as well as those in-training).

Source: London Economics' analysis of Scottish LEO data

In total, after cleaning and linking the various individual datasets, the final LEO dataset used for this analysis contains information on the education pathways and linked labour market outcomes of around **1,440,000 unique learners** with at least one matched record in the combined dataset. This included approximately **346,000** unique learners (almost all from the college data) in possession of vocational courses *not* leading to formally recognised or a full qualification, and **274,000** learners who were either still engaged in study or completed the relevant course but had not been awarded a qualification at the end of the course. This left around **820,000** learners who had achieved a relevant qualification in the timeframe considered and available for subsequent analysis. This information is presented in Table 4.

Table 4 Characteristics of Scottish domiciled learners in the LEO data, by age band at completion of highest qualification

Characteristics	Age band at completion of highest qualification					
	16-21	22-25	26-30	31-35	35-64	All
Total learners	**319,740**	**135,270**	**74,270**	**56,830**	**208,710**	**820,360**
female	160,760	70,220	42,520	33,220	121,220	440,150
%	50.3%	51.9%	57.3%	58.5%	58.1%	53.7%
with disability	25,600	11,140	6,610	4,640	15,590	66,870
%	8.0%	8.2%	8.9%	8.2%	7.5%	8.2%
white ethnic background	306,720	126,480	68,230	51,370	197,710	775,510
%	95.9%	93.5%	91.9%	90.4%	94.7%	94.5%
Highest qualification achieved						
Postgraduate (research)	-	1,420	3,510	1,450	2,130	8,600
%	0.0%	1.1%	4.7%	2.6%	1.0%	1.0%
Postgraduate (taught)	3,320	26920	15,460	9,840	27,240	82,970
%	1.0%	19.9%	20.8%	17.3%	13.1%	10.1%
First degree	82,090	46400	14,800	9,140	23,560	176,360
%	25.7%	34.3%	19.9%	16.1%	11.3%	21.5%
Other undergraduate (incl. HNC & HND)	73,520	18850	13,950	11,400	31,980	150,580
%	23.0%	13.9%	18.8%	20.1%	15.3%	18.4%
SCQF Full Vocational Level 8+	1,120	470	730	800	3,950	7,110
%	0.3%	0.3%	1.0%	1.4%	1.9%	0.9%
MA Level 4/5	100	240	120	190	3,760	4,410
%	0.0%	0.2%	0.2%	0.3%	1.8%	0.5%
SCQF Full Vocational Level 7	4,350	1070	1,180	1,160	5,580	13,440
%	1.4%	0.8%	1.6%	2.0%	2.7%	1.6%
Highers (incl. Advanced Highers)	23,800	3610	3,400	2,660	6,410	41,300
%	7.4%	2.7%	4.6%	4.7%	3.1%	5.0%
MA Level 3	43,570	14850	1,860	1,860	17,300	79,450
%	13.6%	11.0%	2.5%	3.3%	8.3%	9.7%
SCQF Full Vocational Level 6	22,690	5410	5,480	5,210	21,080	60,860
%	7.1%	4.0%	7.4%	9.2%	10.1%	7.4%
MA Level 2	16,600	5140	640	620	9,930	32,940
%	5.2%	3.8%	0.9%	1.1%	4.8%	4.0%
SCQF Full Vocational Level 5	33,790	6640	7,550	6,830	28,590	91,370
%	10.6%	4.9%	10.2%	12.0%	13.7%	11.1%
SCQF Full Vocational Level 4	12,890	3230	4,100	4,090	19,570	55,710
%	4.0%	2.4%	5.5%	7.2%	9.4%	6.8%
SCQF Full Vocational Level 3 or below	1,900	1,020	1,510	1,580	7,620	15,270
%	0.6%	0.8%	2.0%	2.8%	3.7%	1.9%

Note: Numbers are based only on those learners with a matched HMRC/DWP record (i.e. with labour market outcomes available in the data). The table excludes approximately 346,000 unique learners in possession of vocational courses not leading to formally recognised or a full qualification and 274,000 learners who were either still engaged in study or completed the relevant course but had not been awarded a qualification at the end of the course. Out of the 820,000 learners, approximately 26,000 were aged 15 or below or 65 and above at the time they achieved their highest qualification. Therefore, the numbers of learners across the different columns by age band (aged between 16 and 64) do not add up to the total in the final column. Figures rounded to the nearest 10 (totals may not add up due to rounding). "-" identifies cells with fewer than 10 observations. Percentages by highest qualification achieved are rounded to the nearest decimal, and may not add up to 100% exactly. ***Source: London Economics' analysis of Scottish LEO data***

2.3.2 Cohorts included

Table 5 provides an overview of the different graduating cohorts included in the linked Scottish LEO dataset, and the tax years in which each cohorts' post-completion labour market outcomes are observed (3 years, 5 years and 7 years post-completion, respectively). The **University and College data** provide information on the labour market outcomes at 3 years post-completion for a total of 11 graduate cohorts (who completed higher education or College courses between 2003/04 and 2013/14). In addition, the data include 9 cohorts for which information on 5-year post-graduation labour market outcomes is available (who completed their courses between 2003/04 and 2011/12), and 7 cohorts with available labour market outcome information at 7 years post-graduation (who completed their courses between 2003/04 and 2009/10).

Table 5 Availability of post-completion labour market outcomes

Year of graduation	Tax year in which labour market outcomes are observed										
	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
University* and College qualifications											
2003/04											
2004/05											
2005/06											
2006/07											
2007/08											
2008/09											
2009/10											
2010/11											
2011/12											
2012/13											
2013/14											
Modern Apprenticeships**											
2008/09											
2009/10											
2010/11											
2011/12											
2012/13											
2013/14											

Note: Labour market outcomes at 3 years post-completion
Labour market outcomes at 5 years post-completion
Labour market outcomes at 7 years post-completion

* To focus on Scottish domiciled University students only, we excluded any students who had started their studies prior to the 2003/04 academic year (as their domicile could not be identified). As a result, the first cohort graduating from full-time first degrees in Scotland (with a typical study duration of four years) included in the final dataset would be the cohort of students graduating in 2006/07. In other words, the analysis of outcomes 7 years post graduation for first degrees is restricted to four cohorts.
** The information for MAs is based on tax years rather than academic years. MA data were only available from 2008/09 onwards.
Source: London Economics' analysis based on Scottish LEO data

The **MA data** are only available from 2008/09 onwards (given that Modern Apprenticeships were introduced in 2008), and therefore include a relatively smaller number of graduating cohorts. Specifically, the MA data include 6 cohorts with available information on 3-year labour market outcomes (for those completing between 2008/09

and 2013/14), 4 cohorts with 5-year labour market outcomes information (for those completing between 2008/09 and 2011/12), and only 2 cohorts (learners completing in 2008/09 or 2009/10) for whom information on labour market outcomes at 7 years post-completion is available.

2.4 Data limitations

As part of this project, the Scottish LEO data have been made available for the first time for the specific purpose of **estimating the labour market benefits associated with post-school education and skills attainment,** and, subsequently, assessing the **Return on Investment** (from the perspective of the individual, Exchequer and employer (in the case of Modern Apprenticeships)). While the above-described fully linked dataset is a hugely rich source of education and labour market data, it is important to note **several key limitations of the data**:

- **The data does not include information from either primary or secondary schools** (unlike the corresponding LEO data for England), with two main implications for the analysis:
  - First, the data does not contain information on those learners who achieved their highest qualification in secondary school – impacting the choice of counterfactual. When assessing the labour market returns to first degrees (for instance), the standard empirical approach in the literature would be to select learners in possession of the next highest level of qualification (as their highest achievement) – i.e. Highers – as the counterfactual. However, given that the Scottish LEO data currently does not include any information on attainment at Scottish primary or secondary schools (as it is not linked to the annual pupil census or examination data), the data only include those individuals who attained Highers at Scottish *Colleges*. These individuals are unlikely to be representative of the population of individuals in possession of Highers as their highest qualification, or the population of individuals with Highers who subsequently go on to undertake higher education[30]. As a result, there is likely to be a significant ability bias when comparing individuals with first degrees to individuals with Highers attained through the College route (as their highest qualification). This makes the choice of an appropriate counterfactual significantly more challenging.
  - Second, the lack of secondary school information implies that the ability bias for individuals that progressed from secondary school to university (or to MAs or higher qualifications at College) **cannot be fully mitigated by controlling for any prior attainment scores in the econometric analysis** (as a proxy of ability), as such scores are unavailable. As a result, the estimated returns may not

[30] For example, of the total of more than **186,000** entries for Highers in the 2020 academic year, only **3%** had undertaken their Highers at College (see Scottish Qualifications Authority (2020)). Also, these entries were concentrated in specific subject areas (e.g. Care, Childcare, Sociology, Psychology), implying that learners undertaking Highers through the College route only cover a small proportion of the total population of learners entering Highers and are not representative of the wider population undertaking Highers at school.

estimate the true returns to qualification achievement, with the bias likely to be larger for those qualifications (e.g. first degrees) where prior academic ability is a key driver of enrolment and achievement[31] [32].

- Related to the ability bias issue, as with the corresponding LEO data for England, the Scottish LEO data **does not contain any information on individuals' non-cognitive skills**[33], which are expected to impact earnings, employment, and benefit dependency.
- Related to the lack of information on secondary schooling, unlike the LEO data for England, the Scottish LEO data currently **does not allow for tracing specific cohorts of school students**. This is in contrast to recent analyses using the English LEO data that focused on the cohorts of Key Stage 4 leavers (aged 15 at the start of the academic year) undertaking their GCSE exams from 2001/02 onwards. By following specific compulsory schooling cohorts, it is possible to observe their post-16 educational choices and outcomes (at school, in further and higher education, and through apprenticeships) and observe their labour market outcomes at specific points in time (e.g. when they are aged 28) for the entire cohort of secondary school leavers.
- The analysis considers the labour market returns associated with the highest qualification the individual is in possession of. As such, the analysis does not fully capture the fact that a number of qualifications act as a pathway to qualification attainment at a higher level at some point in the future
- The analysis uses historical data, i.e. it covers individuals who might have acquired a qualification several years ago, and during very different economic circumstances to the present day. As such, it is not possible to conclude that comparable labour market returns will result from the more recent acquisition of those same qualifications analysed in this report.
- As discussed above[34], the information on Modern Apprentices in training could *only* be linked to the HMRC and DWP data for those learners who had either dropped out of or completed their MA before the end of the 2016/17 tax year. This means that **MA learners who were in training in the most recent tax years available in the data but had not completed/dropped out of their MA by the**

[31] The effect of including prior attainment on returns to qualifications using English LEO is discussed in recent research for the Department for Education (see CVER DP007 for vocational qualifications (link) and RR808 for an analysis relating to first degrees (link)). The estimate of labour market returns almost always decline when prior attainment is incorporated into the analysis.

[32] Note that the actual relationship might be more complicated, even in the case of university degrees. It might be the case that the estimates of labour market returns associated with attendance at high tariff universities are overestimated, while the opposite might be the case for low tariff institutions (and the estimates generated are actually underestimates of the outcomes achieved). Without additional information, it is not possible to provide a definitive conclusion.

[33] Despite their obvious importance, non-cognitive skills are inherently very difficult to measure and are not available in any administrative data set. For the role of cognitive and non-cognitive skills see https://cep.lse.ac.uk/_NEW/PUBLICATIONS/abstract.asp?index=3059

[34] See Section 2.1.1.

end of 2016/17[35] cannot be identified in the HMRC/DWP information. This inability to identify current in-training learners (in the most recent tax years) might introduce a potential bias in the analysis (in terms of both the treatment and counterfactual groups), since learners in MA training might be incorrectly identified as being in full-time employment (but in fact earning apprenticeship pay). This potential bias would only affect learners who have completed (or dropped out from) a qualification at college or higher education institution and subsequently enrolled in a Modern Apprenticeship. In terms of the **size of the bias**, based on an analysis of historical data (for years with observable information on prior attainment at College or university and MA in-training data), the misallocation was identified as being of **relatively limited importance**; also, it is likely to affect both treatment and counterfactual groups in a similar way.

- In the Scottish LEO data, **information on self-employment (from HMRC Self-Assessment tax returns) is currently only available from tax year 2013/14 onwards**. To ensure internal consistency within the data over time, the labour market outcomes measures included in this study were therefore restricted to information extracted from HMRC PAYE information only (i.e. data on employees' PAYE earnings (P14) and PAYE employment spells (P45)). This could affect estimates (especially employment estimates) for specific qualifications with a relatively high proportion of individuals working in self-employment after qualification completion (e.g. Level 3 Modern Apprenticeships).
- Learners from the rest of the United Kingdom and international students are not included in this analysis, despite the fact that many remain in Scotland contributing economically and socially to the country. While the Scottish LEO data received for the analysis provides comprehensive information on post-secondary schooling undertaken in Scotland, it **does not include any comparable information on qualifications undertaken elsewhere in the UK** (including at other HE institutions across the UK). This implies that it is not possible to identify whether an individual included in the data subsequently attained additional qualifications and skills in other nations of the UK. For example, individuals who attained a first degree in Scotland might subsequently have undertaken a postgraduate qualification elsewhere in the UK – but would be erroneously recorded in the LEO data as possessing a first degree as their highest qualification. Similarly, individuals who attained College qualifications or MAs in Scotland might subsequently have left Scotland to undertake vocational or higher education qualifications elsewhere, but this additional qualification attainment outside Scotland would not be identifiable in the data.
- In addition to the above-discussed lack of prior attainment data from primary or secondary schools, the Scottish LEO data likely only provides a **partial record of**

[35] For example, learners who started a two-year MA in 2016/17 cannot be identified in the MA Leavers data – and, therefore, the HMRC and DWP data - as they would not have completed their training by the end of 2016/17. This is only relevant if they had a previous qualification (or a non-completion record) through college or higher education institution.

the educational pathway of relatively older students as we do not observe any qualifications gained at a younger age (outside the timeframe of the LEO data)[36].

- The econometric analysis of the labour market returns to post-school education and skills is disaggregated by qualification level[37], gender, age band at completion, and years post-completion (3, 5 and 7 years). In addition, where possible, the regressions are disaggregated by ethnicity, subject area[38], institution type (for HE qualifications only[39]), and study mode (again for HE qualifications only). The feasibility of all of these breakdowns depends on the **sample sizes available within the Scottish LEO data, which, in many instances, are too small to provide a detailed disaggregation**. Throughout the presentation of econometric findings in Sections 5 and 6, we do not present any results that are based on a sample size of 100 or fewer individuals (in terms of either the treatment or counterfactual group).

  The relatively shorter timeframe of the MA data (2008/09 to 2016/17[40]) implies that there is only comparatively **limited post-qualification data available for individuals undertaking Modern Apprenticeships** – particularly at 7 years post-graduation. Specifically, the Scottish LEO data currently only include two cohorts of MA completers (learners completing in 2008/09 or 2009/10) for whom information on labour market outcomes at 7 years post-completion is available (in 2015/16 and 2016/17, respectively)[41]. These sample size issues will improve as more recent tax years are added to the Scottish LEO data over time.

[36] This issue also applies to the corresponding LEO data for other UK nations, as the data linking typically only covers relatively recent student cohorts.
[37] Based on the grouping of qualifications presented in Table 4.
[38] Based on the grouping of subjects of study presented in Table 1.
[39] Based on the grouping of Higher Education Institutions presented in Table 2.
[40] Modern Apprenticeships were first introduced in Scotland in 1996 and have been delivered by Skills Development Scotland on behalf of the Scottish Government since April 2008 (the matched data only covers MAs delivered by SDS since 2008/09).
[41] Again, see Section 2.3.2 for more information.

3 Methodological approach

This section provides an overview of the econometric approach used to assess the labour market returns to post-school education and skills in Scotland using the Scottish LEO data. In terms of the **scope** of the econometric analysis, note again that:

- The analysis assesses the **marginal labour market returns** to post-school qualifications and skills, by assessing the earnings and employment effects of different post-school qualifications for **individuals in possession of these qualifications as their *highest* level of attainment**[42];
- The different post-school qualifications considered are **based on the high-level qualifications grouping of qualifications presented in Section 2.2.2** (see Figure 3);
- In terms of timeframe, all estimated marginal labour market returns are based on **a mix of different graduate cohorts** included in the Scottish LEO data (see Section 2.3.2 for more information);
- In terms of **geographical scope**:
  - In relation to students' domicile (at the point of enrolment), the analysis **is restricted to Scottish domiciled students only**[43];
  - In relation to the location of study, the analysis focuses on **qualifications and skills attained in Scotland only (at University, College, or through Modern Apprenticeships)**; and
  - In relation to individuals' residence post-completion, the analysis includes individuals **living anywhere in the UK after completing their (highest) qualifications**.

3.1 Treatment and counterfactual groups

To estimate the marginal labour market returns associated with post-school education and skills in Scotland, the **treatment group** for each qualification of interest was defined as individuals in possession of the given qualification as their highest level of attainment (for example, the treatment group for the analysis of the marginal returns to first degrees was defined as individuals who had achieved a first degree as their highest qualification).

[42] This differs from an assessment of the *average* labour market returns, which instead measure the earnings and employment benefits associated with qualifications for *all* individuals in possession of a given qualification, irrespective of whether the qualification is their highest level of attainment.

[43] As outlined above (see Section 2.1.1), we were able to exclude any non-Scottish domiciled students obtaining higher education qualifications in Scotland from the University data (i.e. students who were categorised as non-Scottish domiciled at the point of enrolment). Neither the College data nor the MA data allowed for an explicit identification of non-Scottish domiciled students, so it was not possible to exclude these students from the analysis. However, in either case, the potential number of non-Scottish domiciled learners undertaking MAs or qualifications at Scottish Colleges is likely to be very small, so that their exclusion would be expected to have a negligible impact on the econometric results provided here.

Depending on the qualification level considered, we used **two types of counterfactual groups** throughout the econometric analysis:

1. The labour market returns to qualifications ***other than* first degrees, SCQF Full Vocational qualifications Level 4 to 8+, MAs at Level 3 and MAs at Level 2** were analysed in comparison to **individuals in possession of the next highest (i.e. adjacent) qualification (as their highest level of attainment).** For example, the analysis estimates the marginal returns to postgraduate taught qualifications (e.g. taught Masters degrees) relative to possession of first degrees as the highest qualification.
2. As discussed above[44], given the fact that secondary school information is currently not linked to the Scottish LEO data, and given the resulting lack of information on individuals in possession of Highers obtained in secondary school (as their highest qualification), **the counterfactual choice for the analysis of the returns to first degrees is more challenging**[45]. The Scottish LEO data currently only includes individuals who attained Highers at Scottish Colleges (rather than secondary schools). However, since these individuals are unlikely to be representative of the population of individuals in possession of Highers as their highest qualification or the population of individuals with Highers who subsequently go on to undertake a first degree, there is likely to be a significant **ability bias** when comparing individuals with first degrees to individuals with Highers attained at College (as their highest qualification).

   Therefore, rather than using individuals with the next highest qualification as the core counterfactual group for the analysis for **first degrees**, we instead select **individuals who started but did not complete a first degree** (i.e. **non-completers** whose first degree enrolment was their highest level of education participation) as the preferred counterfactual. Note that, while this mitigates the extent of the above-mentioned ability bias, the analysis is still likely to suffer from a **motivation bias** between individuals that complete first degrees as compared to those that drop out without completing the degree[46].

   We use similar non-completer counterfactuals for **SCQF Full Vocational qualifications Level 4 to Level 8+ and Modern Apprenticeships at Level 2 and 3**, i.e. we assess the labour market returns to MAs at Level 2 and 3 **relative to MA Level 2 and 3 non-completers**, respectively (for whom the Modern Apprenticeship was the highest level of education/training received) as SCQF level 4 vocational courses were considered to be a suboptimal counterfactual for MAs at level 2, due to the absence of a work experience component. For SCQF Full Vocational

[44] See Section 2.4.
[45] Ideally, the returns to other undergraduate (i.e. sub-degree) qualifications would also be estimated relative to individuals in possession of Highers obtained in secondary school (as their highest qualification). However, since (again) the required information on secondary schooling is currently not included in the Scottish LEO data, we instead analyse the returns to these other undergraduate qualifications relative to vocational qualifications at SCQF Level 6.
[46] As well as a residual ability bias as these individuals, although meeting the same admission criteria, may be of lower ability compared to those who completed their course.

qualifications at Level 4 to Level 8+, it was felt that due to the absence of secondary school data, using non-completers would limit the differences in unobservable characteristics between the treatment and counterfactual groups (as both groups meet the admission criteria and both self-select into courses at the same level (i.e. both expect to gain from achieving qualifications at a given level)).[47]

The list of treatment and counterfactual groups used throughout the econometric analysis is presented in Table 6.

Table 6 Treatment and counterfactual groups used throughout the econometric analysis

SCQF level	Treatment group	Counterfactual group	
		Next highest qualification level (below)	Non-completers
12	Postgraduate (research)	First degree	-
11	Postgraduate (taught)	First degree	-
9-10	First degree	-	First degree non-completers
7-8	Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	-
8-12	SCQF Full Vocational Level 8+	-	SCQF Full Vocational Level 8+ non-completers
7-8	MA Level 4/5	MA Level 3	-
7	SCQF Full Vocational Level 7	-	SCQF Full Vocational Level 7 non-completers
6-7	Highers (incl. Advanced Highers)	SCQF Full Vocational Level 5	-
6	MA Level 3	-	MA Level 3 non-completers
6	SCQF Full Vocational Level 6	-	SCQF Full Vocational Level 6 non-completers
5	MA Level 2	-	MA Level 2 non-completers
5	SCQF Full Vocational Level 5	-	SCQF Full Vocational Level 5 non-completers
4	SCQF Full Vocational Level 4	-	SCQF Full Vocational Level 4 non-completers

Note: The econometric analysis does not assess the marginal returns to Full Vocational qualifications at SCQF Level 3 or below (since these qualifications constitute the lowest level of qualification included in the linked Scottish LEO dataset); as a result, these qualifications have been excluded from the list of treatment groups. Both the treatment groups as well as the counterfactual groups are restricted to individuals who were *not* in education at the point when the labour market outcomes of the treatment and counterfactual groups are compared. ***Source: London Economics***

[47] For a comparison of the level-below and non-completers counterfactual groups using English LEO (for vocational qualifications) see CVER DP009 (comparing LEO and LFS estimates and level-below and non-completers counterfactuals, link) and CVER DP013 (using Propensity Score Matching to discuss whether there is a 'preferrable' counterfactual, link).

3.2 Labour market outcome variables

Throughout the econometric analysis, we considered three different labour market outcome variables (as dependent variables), using the HMRC and DWP information included in the Scottish LEO data:

- **Earnings: Daily PAYE earnings**, calculated by dividing total annual gross PAYE[48] pay (in constant average 2018 prices) by the total number of calendar days in PAYE employment in each tax year[49];
- **Employment:** The **proportion of the year in PAYE employment**, calculated as the number of days in PAYE employment in the tax year divided by 365 or 366; and
- **Benefit dependency**: A categorical/dummy variable capturing **whether the individual was in receipt of payments of any active labour market benefit** (including the Job Seekers' Allowance, Income Support, the Employment and Support Allowance, and the JUVOS Training Allowance) at any point in the given tax year (coded as 0 if the individual did *not* receive any of these benefits in the given year, and 1 if they did).

[48] Note again that, in the Scottish LEO data, information on **self-employment** (from HMRC Self-Assessment tax returns) is currently only available from tax year 2013/14 onwards. To ensure internal consistency within the data over time, the labour market outcomes measures included in this study were therefore restricted to information extracted from HMRC P14, P45 and P60 files only (i.e. data on employees' PAYE earnings and PAYE employment spells).

[49] The measure used is the total number of days in employment (derived from HMRC P45 and P60 files), as the Scottish LEO data do not provide information on the number of working days, or whether employment is on a part-time or full-time basis. If an individual was continuously employed for the entire calendar year, then daily earnings equal annual earnings divided by 365 or 366 (depending on whether the year is a gap year). If part-time working patterns are not uniformly distributed across treatment and counterfactual groups, then this may lead to an overestimation or underestimation of earnings returns. For instance, for a particular qualification, if the counterfactual group has a relatively high incidence of part time workers, thereby depressing the estimate of daily earnings, then the econometric model will overstate the extent of the earnings premium. Given the incidence of part-time working amongst females, this would be especially problematic if the analysis was undertaken at an aggregated level (i.e. not splitting the analysis by gender). However, even restricting the analysis of earnings by gender, the part-time issue still persists (to a greater or lesser extent) if there are fundamentally different working patterns between the treatment and counterfactual groups.
Note that it is likely that there are differences in unpaid overtime between individuals in the different treatment and counterfactual groups. However, in this specific analysis, unpaid overtime does *not* affect the measure of PAYE daily earnings (i.e. the estimated marginal earnings returns are unaffected by differences in unpaid overtime). This is because PAYE daily earnings are calculated by dividing annual gross PAYE pay by the total number of *calendar days in employment* in each tax year, which differs from the *number of hours or days worked*. Calendar days in employment are measured using contract start dates and end dates, with no adjustment for the actual number of hours or days worked. Therefore, the denominator of days in employment is unlikely to be affected by unpaid overtime, leaving PAYE daily earnings unaffected. However, it is important to note that unpaid overtime – if it is not evenly distributed by post compulsory qualification – might result in some overstatement or understatement of the returns to particular qualifications. For instance, if individuals in possession of first degrees are significantly more likely to undertake unpaid overtime compared to the relevant counterfactual group, the estimate of the earnings returns to first degrees will overstate the true return.

Again, all of these outcome variables were measured at 3, 5 and 7 years after completion of the highest qualification attained by each individual - or 3, 5 and 7 years after dropping out of their studies (for the relevant non-completer counterfactuals) - depending on the treatment/ counterfactual group considered.

3.3 Model specification

In order to estimate the marginal labour market returns associated with each post-school qualification of interest, separately for each treatment group (i.e. the level of qualification) listed in Section 3.1 (Table 6), and separately for men and women, we estimated a model of the form:

$$y_{i\,t} = \delta q_i + \beta x_i + \varepsilon_{it}$$

where

- $\boldsymbol{y_{it}}$ represents the **dependent variable** (i.e. the natural logarithm of daily earnings, the proportion of the year in employment, or a dummy variable capturing whether the individual was in receipt of any of the above-specified active labour market benefits at any point during the given tax year) measured at t years post-completion (where t=3, 5 or 7 years) of the highest qualification or drop-out for each individual (i);
- $\boldsymbol{q_i}$ represents the **highest qualification achieved** by the learner (this is coded as 1 for individuals in the treatment group with their highest level of qualification being the qualification of interest and 0 for individuals in the control group, where the control group is either individuals with the next highest level qualification or non-completers (depending on the relevant counterfactual group used, see Table 6)); and
- $\boldsymbol{x_i}$ contains a range of control variables. The educational qualifications held by an individual only account for part of the variability in individuals' earnings (as well as their employment probability and benefit dependency). Therefore, we include a range of other variables affecting earnings, including **ethnic background** (white, black, Asian, mixed, other, unknown), **disability status** (not disabled/disabled/unknown), **academic year** when the highest qualification was achieved[50], **socio-economic background** (SIMD quintile (based on the first record available for the individual[51])) and **region of residence** (at the time when the

[50] For non-completers, this variable captures the academic year when the given individual dropped out of their qualification/learning.

[51] See Section 2.2.1 for more information. Note that the SIMD quintile incorporated into the analysis relates to the first record available as opposed to the SIMD quintile the individuals might have experienced when growing up. Clearly, this is a limitation of the analysis reflecting the limitations of the data and the absence of data relating to the primary or secondary level schooling.

labour market outcomes are measured (i.e. 3, 5 and 7 years post-completion/after drop-out))[52].

The earnings regressions were estimated using **Ordinary Least Squares** regressions[53]; the employment regressions were estimated using a **Generalised Linear Model** (as the dependent variable is expressed as a proportion varying from 0% to 100%[54]); and the benefit dependency regressions were estimated using a **Probit Model** (as the dependent variable was expressed as a dummy variable equal to either 0 (never in receipt of benefits) or 1 (at least on day in receipt of benefits))[55].

In addition to separating the regressions by post-school qualification and for 3, 5, and 7 years post-completion/drop-out, all regressions were estimated **separately by gender** as well as **by age band at completion of the qualification** (i.e. for individuals who completed their highest qualification **between the ages of 16 and 21**, **between the ages of 22 and 30**, or **at age of 31 or above**[56]).

Along with these overarching breakdowns, **where possible** (i.e. where the sample size was sufficiently large), the econometric analysis was further broken down by:

- **Subject area of study** (based on the grouping of subjects into STEM, AHSS and other subjects (see Table 1 in Section 2.2.2));

[52] For individuals living in Scotland, this variable provides information on the Local Authority of residence; for individuals living in the rest of the UK, it provides information on the (more high-level) Government Office Region instead.

[53] Unfortunately there is no suitable instrument available in the LEO data to address the possibility of either ability or motivation bias. Moreover, currently the largest bias in the estimates is likely to occur due to the lack of the prior attainment data (e.g. test scores at age 16). The inclusion of the prior attainment variables would help attenuate significantly (although not entirely) the ability bias in the estimates. An alternative approach to account for ability bias (whereby the characteristics of the treatment group are not necessarily the same as the control group) might be to adopt an Instrumental Variables approach. In this approach it is necessary to identify observable characteristics or events (for instance, family characteristics, birth quarter or policy decisions that impact the decision to remain in education) that can be arguably considered as events that assign individuals randomly to different groups, but do not influence earnings (in this example). Given the fact that we are working with administrative information, none of the standard instruments adopted in the literature are available. As such, we are limited to adopting a standard Ordinary Least Squares approach.
As such, the labour market returns estimated should not be interpreted causally, but only as associations (as we do not control for all characteristics that might determine earnings (i.e. prior attainment). In other words, while certain qualifications may be associated with higher marginal earnings and/or ROI, it is not possible to say for sure that it is the qualification that is driving these higher earnings.

[54] The Generalised Linear Model was estimated using a logit link function (that is, the logit transformation of the response variable) and the binomial distribution. For more information on fractional response see Baum (2008).

[55] It was not possible to use non-binary models for benefit dependency as the distribution is highly concentrated at 0 (never in receipt of benefits during the tax year) and 1 (always in receipt of benefits). Other typically more sophisticated econometric models (e.g. Fractional Response and Zero One Inflated Beta Models) would typically not converge.

[56] Individuals' age is measured at the **start of the academic year** (on 31st August) in which they completed their highest qualification. For individuals in the non-completers counterfactual, this refers to the age at which they dropped out of their qualification (again measured at the start of the academic year).

- **Ethnic origin** (white vs. non-white)[57];
- **Type of institution attended** (for HE qualifications only, based on the grouping of HEIs into ancient, (other) pre-1992, and post-1992 institutions (see Table 2 in Section 2.2.2), as well as Colleges);
- **Mode of study** (i.e. full-time vs. part-time, for HE qualifications only);
- **Type of off-the-job training provider** (i.e. Colleges vs. private education providers, for Modern Apprenticeships only); and
- **Attainment of first degrees through the College vs. the non-College route:** This supplementary analysis estimated the marginal earnings, employment and benefit dependency returns associated with achieving first degrees (as the highest qualification) after attaining prior qualifications at Scottish Colleges[58] vs. entering first degrees through other routes (e.g. entering a first degree straight after completing Highers at secondary school[59]). Again, the marginal earnings returns were measured as compared to individuals who started but did not complete a first degree[60]. The analysis was restricted to a specific sub-sample of the Scottish LEO data, focusing on individuals who completed their first degrees between the ages of 20 and 25[61] in the 2009/10 to 2013/14 academic years[62].

[57] Due to small sample sizes, it was not possible to disaggregate the analysis into more detailed ethnic groups.
[58] For example, the College route includes individuals who undertake a Higher National Certificate (HNC) or Higher National Diploma (HND) at College before entering the second or third year of a first degree at University (also referred to as 'articulation' from College into University).
[59] Again, we are unable to explicitly control for the specific non-college route undertaken, as the Scottish LEO data do not contain information from Scottish secondary schools.
[60] However, it is important to note that it was *not* possible to disaggregate this non-completers counterfactual by learner route (i.e. we used the same common counterfactual for those that entered first degrees through the College vs. the non-College route).
[61] This focus on relatively young learners was necessary to enable us to more accurately identify whether, prior to undertaking the first degree, a given individual had been enrolled in a Scottish College qualification. Essentially, the older the learner, the less likely it is that the Scottish LEO data would allow us to observe the entire post-school educational pathway of a given individual.
[62] And the analysis groups individuals into the College vs. the non-College route based on whether they had previously achieved qualifications at a College prior to or at the age of 22.

4 Descriptive statistics on labour market outcomes

In this section, using the fully linked Scottish LEO (described in Section 2), we present descriptive statistics on the key labour market outcome variables of interest throughout this analysis.

Specifically, we provide information on **average daily PAYE earnings and the proportion of the year in PAYE employment[63] among individuals in possession of post-school qualifications from Scottish Colleges, Scottish HEIs, or obtained through a Modern Apprenticeship[64]**. In all instances, we provide information on the average outcomes amongst individuals in possession of each of the different post-school qualifications as their ***highest* level of qualification**. Further note that, while the data focus on individuals who were Scottish domiciled at the point of enrolling in their highest qualification[65], the labour market outcomes include **individuals living anywhere in the UK after completing their qualifications** (i.e. the information includes all individuals irrespective of whether they live in Scotland or elsewhere in the UK after obtaining their qualifications). In terms of the timeframe covered, the averages are based on a **mix of different graduate cohorts**, based on the cohorts currently available within the Scottish LEO data (discussed in Section 2.3.2).

The labour market outcomes presented here are **disaggregated by gender and age at completion**[66] of the highest qualification, and are measured separately **at 3, 5 and 7 years after completing the qualification.** Daily earnings have been rebased to average 2018 prices using Consumer Price Inflation rates published by the Office for National Statistics (2020).

4.1 Daily PAYE earnings

Table 7 presents information on the average daily PAYE earnings[67] of individuals in possession of each post-school qualification (as their highest qualification), by gender, age

[63] Again, in the Scottish LEO data, information from HMRC Self-Assessment tax returns is only available from tax year 2013/14 onwards. To ensure consistency of the earnings and employment information over time, in this analysis, we have focused on (employee) PAYE earnings and employment probability only.
[64] Corresponding statistics on the proportion of individuals in receipt of any active labour market benefits (at any point during the tax year) is instead provided in Annex A3.2 (see Table 45 and Table 46).
[65] As outlined above (see Section 2.2.1), based on the information provided in the University data, we excluded any non-Scottish domiciled students obtaining higher education qualifications in Scotland (i.e. students who were categorised as non-Scottish domiciled at the point of enrolment). Note again that neither the College data nor the MA data allowed for an explicit identification of non-Scottish domiciled students, so it was not possible to exclude these students from the analysis. However, the proportions of non-Scottish domiciled learners undertaking MAs or qualifications at Scottish Colleges are likely to be very small, so that their exclusion would be expected to have a negligible impact on the econometric results provided here.
[66] Again, individuals' age is measured in August of the academic year (i.e. at the beginning of the academic year) in which they completed their highest qualification.
[67] For more information on how daily earnings were calculated, see Section 3.2.

at completion (grouped into three separate age bands), and separately at 3, 5 and 7 years post-graduation.

The corresponding information for median daily PAYE earnings is presented in Table 43 and Table 44 in Annex 2 (for the group of achievers and non-completers respectively).

Overall, irrespective of the level of qualification considered, average daily earnings **increase with the time since completion/graduation** (reflecting the additional labour market experience gained)[68]. For example, on average, men achieving first degrees (as their highest qualification) between the ages of 22 to 30 earn **£72.40** per day 3 years after graduating, which successively increases to **£82.50** and **£88.30** after 5 and 7 years post-graduation (respectively). The corresponding estimates for women stand at **£65.40** at 3 years, **£71.00** at 5 years, and **£73.30** at 7 years post-graduation.

In addition, the average daily earnings **increase with the level of qualification achieved** - from vocational qualifications at SCQF Level 3 or below up to postgraduate research programmes. For example, among individuals achieving their highest qualification between the ages of 22 and 30, the average daily earnings (at 3 years post-graduation) stand at **£89.60** for men in possession of a postgraduate research qualification, compared to **£56.30** for men in possession of a vocational qualification at SCQF Level 3 or below (again, as their highest qualification). For women, the corresponding daily earnings stand at **£80.80** and **£40.70** respectively[69].

Further note the existence of a **prominent gender pay gap between men and women in possession of similar levels of qualification**. Considering individuals who achieved first degrees (as their highest qualification) between the ages of 22 and 30, the gender gap in the average daily PAYE earnings 3 years post-graduation stands at **£7.00** (**£72.40** per day for men compared to **£65.40** per day for women, representing a **10.7%** difference).

[68] However, note again that each average is based on a mix of different graduate cohorts within the Scottish LEO data (again see Section 2.3.2 for more information).

[69] Highers (including Advanced Highers) represent a key exception to this observed trend. However, it should again be noted that the Scottish LEO data currently do not include information on qualifications undertaken at secondary schools. Instead, the average earnings for Highers and Advanced Highers presented here are based on learners undertaking these qualifications at Scottish Colleges only. Of the total of **166,208** learners who achieved Highers in the 2020 academic year (at grades A-C), only **3%** had undertaken their Highers at College (see Scottish Qualifications Authority (2020)). Therefore, the labour market information for Highers presented here should be treated with caution, as it covers only a relatively small proportion of the population of learners achieving Highers (and cannot be extended to include Highers (or Advanced Highers) undertaken in secondary schools).

Table 7 Average daily PAYE earnings at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Postgraduate (research)				£89.60	£99.90	£108.00	£102.10	£101.60	£105.10
Postgraduate (taught)	£74.80	£91.70	£103.90	£79.00	£90.90	£98.50	£100.60	£103.50	£104.80
First degree	£65.60	£78.60	£88.40	£72.40	£82.50	£88.30	£84.40	£88.40	£89.30
Other undergraduate (incl. HNC & HND)	£50.50	£63.60	£70.80	£62.00	£70.50	£75.10	£81.60	£84.70	£85.40
SCQF Full Vocational Level 8+	£59.20	£66.90	£67.90	£78.80	£87.10	£93.30	£95.00	£94.40	£93.40
MA Level 4/5				£98.40			£116.80	£124.00	£118.50
SCQF Full Vocational Level 7	£64.00	£67.50	£69.30	£79.60	£84.20	£90.50	£89.40	£89.20	£88.70
Highers (at college, incl. Advanced Highers)	£32.80	£42.70	£49.70	£44.40	£52.30	£54.60	£65.60	£71.30	£74.80
MA Level 3	£73.90	£80.00	£83.20	£74.70	£79.40	£84.40	£80.80	£83.10	£83.50
SCQF Full Vocational Level 6	£52.30	£61.90	£69.50	£62.00	£71.40	£76.10	£76.00	£78.80	£77.90
MA Level 2	£49.40	£56.50		£57.00	£60.60		£66.20	£64.70	
SCQF Full Vocational Level 5	£39.30	£47.90	£55.50	£53.80	£58.40	£66.10	£71.70	£74.30	£74.50
SCQF Full Vocational Level 4	£35.10	£43.70	£49.80	£58.50	£60.00	£61.60	£71.80	£75.10	£67.20
SCQF Full Vocational Level 3 or below	£32.50	£39.80	£47.50	£56.30	£62.50	£64.50	£73.40	£74.50	£72.00
Women									
Postgraduate (research)				£80.80	£87.80	£93.40	£93.70	£97.00	£98.20
Postgraduate (taught)	£73.50	£88.60	£96.20	£73.40	£81.20	£85.70	£89.90	£91.60	£91.00
First degree	£60.60	£70.30	£76.50	£65.40	£71.00	£73.30	£72.00	£74.90	£76.80
Other undergraduate (incl. HNC & HND)	£37.60	£45.30	£49.20	£47.30	£52.20	£55.00	£58.00	£60.80	£61.30
SCQF Full Vocational Level 8+	£38.20	£40.20	£48.30	£56.20	£59.10	£62.50	£72.50	£72.70	£73.20
MA Level 4/5							£75.90	£75.20	£73.50
SCQF Full Vocational Level 7	£37.00	£43.10		£53.90	£56.90	£61.50	£60.80	£61.00	£60.50
Highers (at college, incl. Advanced Highers)	£27.10	£36.90	£41.40	£32.30	£38.10	£43.00	£41.40	£46.00	£48.80
MA Level 3	£41.90	£44.10	£46.30	£46.80	£46.90	£45.50	£56.20	£56.10	£53.60
SCQF Full Vocational Level 6	£34.10	£38.30	£40.40	£40.30	£40.70	£42.00	£49.00	£49.40	£49.60
MA Level 2	£38.40	£42.40		£40.40	£44.50		£46.20	£46.90	
SCQF Full Vocational Level 5	£31.90	£35.70	£38.20	£36.00	£38.60	£40.70	£43.10	£43.70	£44.20
SCQF Full Vocational Level 4	£27.10	£31.90	£34.80	£37.20	£39.20	£39.60	£44.40	£45.90	£45.60
SCQF Full Vocational Level 3 or below	£29.50	£29.40		£40.70	£42.90	£45.50	£48.60	£48.60	£49.30

Note: Cells based on sample sizes below 50 have been left blank. All earnings data are presented in average 2018 prices, and are rounded to the nearest £0.10. The top and bottom 1% of the earnings distribution were removed. Age measured at the start of the final academic year. ***Source: London Economics' analysis of Scottish LEO data***

Table 8 Average daily PAYE earnings among non-completers, at 3, 5 and 7 years post-drop-out, by gender and age at drop-out

Gender and highest participation	Age at drop-out and years post-drop-out								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
First degree non-completers	£45.60	£56.00	£63.60	£57.40	£63.50	£68.40	£76.50	£80.70	£82.20
SCQF Full Vocational Level 8+ non-completers	£46.20	£55.40	£58.70	£73.20	£75.70	£80.90	£97.90	£97.20	£95.20
SCQF Full Vocational Level 7 non-completers	£60.50	£62.30	£62.80	£69.60	£71.20	£72.80	£85.10	£81.50	£82.10
MA Level 3 non-completers	£50.70	£59.00	£63.40	£60.00	£65.90	£70.40	£72.80	£75.90	£77.70
SCQF Full Vocational Level 6 non-completers	£45.80	£55.40	£61.20	£60.00	£68.00	£73.10	£74.70	£76.20	£79.30
MA Level 2 non-completers	£44.90	£51.80		£52.70	£65.30		£57.40	£57.50	
SCQF Full Vocational Level 5 non-completers	£38.00	£45.90	£51.20	£47.30	£55.10	£60.80	£67.70	£70.50	£69.20
SCQF Full Vocational Level 4 non-completers	£34.20	£40.10	£47.90	£47.60	£52.00	£52.80	£59.50	£59.90	£57.90
Women									
First degree non-completers	£41.50	£48.00	£53.20	£50.40	£54.70	£58.40	£62.50	£66.80	£69.30
SCQF Full Vocational Level 8+ non-completers	£43.20	£40.90	£46.50	£58.80	£59.20	£64.10	£71.40	£71.40	£71.30
SCQF Full Vocational Level 7 non-completers	£33.20	£37.90	£44.40	£50.30	£50.80	£52.30	£61.10	£59.80	£56.00
MA Level 3 non-completers	£38.10	£41.30	£41.50	£41.30	£41.60	£44.90	£50.40	£50.30	£50.20
SCQF Full Vocational Level 6 non-completers	£33.70	£37.30	£38.40	£38.60	£39.20	£42.20	£45.60	£46.70	£47.00
MA Level 2 non-completers	£34.50	£38.00		£36.20	£37.90		£38.10	£39.30	
SCQF Full Vocational Level 5 non-completers	£30.90	£34.70	£34.70	£32.90	£34.40	£35.20	£41.30	£42.30	£42.30
SCQF Full Vocational Level 4 non-completers	£26.60	£29.20	£31.80	£34.70	£38.80	£40.40	£39.10	£41.50	£41.80

Note: Cells based on sample sizes below 50 have been left blank. All earnings data are presented in average 2018 prices, and are rounded to the nearest £0.10. The top and bottom 1% of the earnings distribution were removed. Age measured at the start of the final academic year. ***Source: London Economics' analysis of Scottish LEO data***

Supplementing the above information on individuals in possession of post-school qualifications, Table 8 presents the average daily earnings amongst individuals who dropped out of a first degree, an SCQF Full Vocational qualification Level 4 to 8+, or a Modern Apprenticeship at Level 2 or 3 – i.e. the key counterfactual groups used throughout the econometric analysis of the labour market returns to first degrees, MAs at Level 3 and MAs at Level 2, respectively (see Section 3.1 for more detail).

In general, it is worth noting that the average daily earnings for non-completers rise with age, level and time since non-completion, as they do for completers. More specifically (and as expected), the average daily PAYE earnings of each of these non-completer groups are typically lower than for individuals completing the given qualification. For example, the average daily earnings of men who dropped out of a first degree between the ages of 22 and 30 (3 years after dropping out) are estimated at **£57.40**, compared to **£72.40** for men who successfully completed a first degree (in the same age band, at 3 years post-completion). For women, the difference in earnings is of the same order of magnitude, with the corresponding estimates standing at **£50.40** and **£65.40** (for first degree non-completers and achievers, respectively). An exception to this finding is for SCQF Full Vocational Level 8+ (for instance) where we see higher average daily earnings for non-completers than achievers in the 31+ age group for men and women aged less than 21.

4.2 Proportion of the year in PAYE employment

The corresponding descriptive statistics on the average proportion of the year spent in PAYE employment[70] amongst individuals in possession of the different post-school qualifications of interest are presented in Table 9. It is important to reiterate that Table 9 only provides information on the proportion of individuals in employment. There are other economically beneficial outcomes, such as the acquisition of further education and training that should not be overlooked.

As with the above observations on daily earnings, the average proportion of the year in employment **increases with the level of qualification achieved** – i.e. on average, individuals in possession of qualifications at higher levels tend to spend a larger proportion of the year in PAYE employment compared to individuals in possession of qualifications at lower levels. This is especially the case at 5 and 7 years post-graduation, with typically smaller differences at 3 years post-completion[71].

[70] As already mentioned, this variable identifies the proportion of the tax year in PAYE employment based on employment spells recorded in the P45 data, so it should not be confused with the probability of being in employment at a given point in time. Also, we only observe the contractual number of days in employment, but do not observe the actual number of days (or hours) worked. See Section 3.2 for more information on how this was calculated.

[71] One notable exception to this general trend relates to the proportions of the year spent in employment amongst individuals in possession of **postgraduate research qualifications**, which tend to be lower than the corresponding proportions among individuals with first degrees (or postgraduate taught qualifications) – particularly for those attaining their qualifications between the ages of 22 and 30. This might be driven by the fact that individuals in possession of postgraduate research qualifications are relatively likely to be employed in academia, where the nature of many academic employment contracts (e.g. casual or fixed-term

In addition, the estimates tend **to increase with the time since completion/graduation**[72].

Table 9 Average proportion of the year in PAYE employment at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Postgraduate (research)				71%	70%	71%	73%	73%	72%
Postgraduate (taught)	80%	81%	82%	77%	77%	76%	78%	78%	77%
First degree	78%	80%	79%	77%	76%	75%	76%	75%	75%
Other undergraduate (incl. HNC & HND)	75%	78%	78%	75%	74%	74%	77%	77%	76%
SCQF Full Vocational Level 8+	76%	76%	79%	82%	78%	78%	87%	85%	83%
MA Level 4/5				93%			87%	84%	84%
SCQF Full Vocational Level 7	69%	66%	64%	64%	71%	69%	81%	82%	80%
Highers (at college, incl. Adv. Highers)	70%	74%	75%	69%	71%	70%	65%	62%	62%
MA Level 3	80%	78%	76%	80%	77%	76%	85%	82%	78%
SCQF Full Vocational Level 6	72%	73%	73%	76%	75%	73%	78%	77%	74%
MA Level 2	80%	80%	85%	84%	81%		83%	76%	
SCQF Full Vocational Level 5	69%	74%	74%	70%	72%	73%	75%	73%	72%
SCQF Full Vocational Level 4	61%	69%	72%	66%	68%	62%	69%	69%	64%
SCQF Full Vocational Level 3 or below	59%	67%	75%	72%	72%	66%	75%	73%	69%
Women									
Postgraduate (research)				72%	72%	72%	75%	73%	75%
Postgraduate (taught)	85%	86%	85%	81%	79%	78%	83%	82%	80%
First degree	82%	82%	81%	80%	79%	77%	81%	81%	80%
Other undergraduate (incl. HNC & HND)	81%	81%	79%	77%	76%	76%	79%	79%	78%
SCQF Full Vocational Level 8+	77%	84%	80%	91%	88%	89%	87%	86%	83%
MA Level 4/5				85%			87%	85%	82%
SCQF Full Vocational Level 7	76%	74%	71%	84%	80%	81%	84%	82%	78%
Highers (at college, incl. Adv. Highers)	75%	76%	76%	68%	71%	74%	70%	72%	71%
MA Level 3	84%	82%	80%	84%	81%	79%	87%	83%	80%
SCQF Full Vocational Level 6	75%	76%	74%	74%	73%	75%	80%	80%	77%
MA Level 2	80%	77%		82%	81%		85%	73%	59%
SCQF Full Vocational Level 5	71%	73%	72%	68%	70%	70%	76%	77%	75%
SCQF Full Vocational Level 4	60%	66%	69%	65%	71%	70%	73%	73%	70%
SCQF Full Vocational Level 3 or below	56%	67%	64%	68%	71%	72%	76%	75%	73%

Note: Cells based on sample sizes below 50 have been left blank. Age measured at the start of the final academic year.

Source: London Economics' analysis of Scottish LEO data

In terms of differences by gender, the data suggest that **women have a higher proportion of the year spent in PAYE employment compared with men** – particularly considering qualifications above MA Level 2 (below and including MA Level 2 there is little evidence to

contracts that are renewed on an annual basis and do not extend over the summer break) might result in a relatively lower proportion of the year spent in PAYE employment.

[72] Note that this does *not* apply to individuals in possession of Modern Apprenticeships, where the proportion of the year spent in PAYE employment tends to be lower at 7 years post-completion than at 3 years post-completion. This is likely to be driven by the lack of self-employment information included in the Scottish LEO data, where individuals in possession of Modern Apprentices in particular might be expected to have a relatively high incidence of self-employment (increasing with the labour market experience gained since completing their training).

suggest a gender gap in terms of proportion of year spent in PAYE employment). However, note again that the information relates to PAYE employment only (i.e. excluding any self-employment). In addition, and importantly, the information does not take account of differences in full-time vs. part-time work (as part-time status or working hours are not recorded in the HMRC data), but only measures the proportion of the year that an individual is in (any) employment (irrespective of differences in working hours or working patterns).

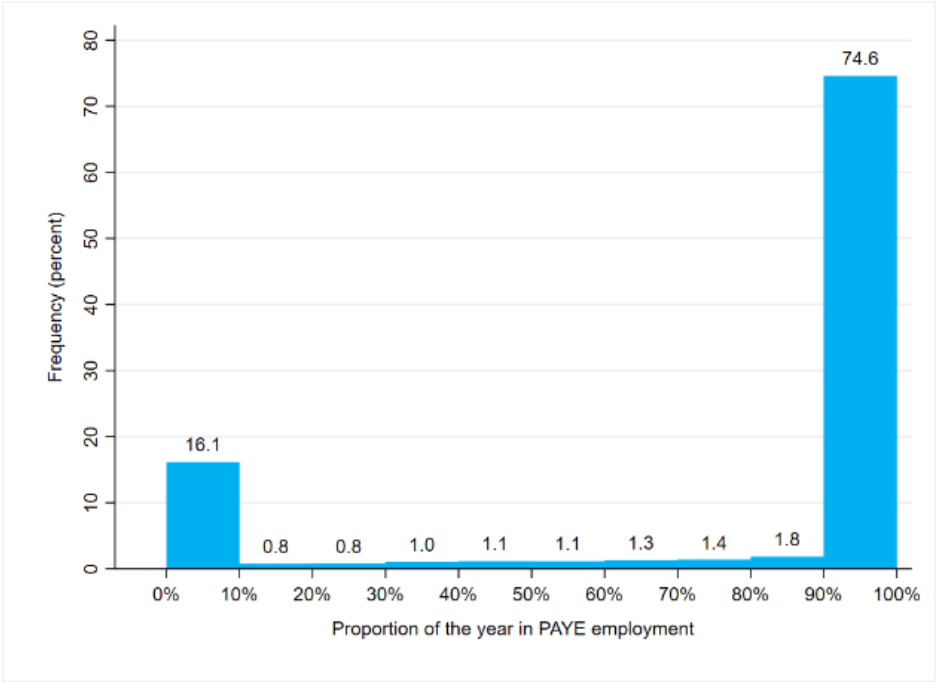
Looking in more detailed at the employment distribution, Figure 4 presents histograms showing the distribution of the proportion of the year in employment for men and women achieving a first degree by the age of 21, 5 years post-graduation: as expected there is a strong concentration at the values of **100%** (in continuous PAYE employment, standing at **75%** and **77%** for men and women, respectively) and **0%** (never in employment, standing at **16%** and **14%** for men and women respectively). The relatively significant proportion of individuals who are not in employment at any point in the year might reflect factors other than employability. In particular, a substantial proportion of these individuals might be considered as economically inactive as a result of being in continuous full-time education.

Table 10 again presents the corresponding employment outcomes for individuals who dropped out of a first degree, an SCQF Full Vocational qualification Level 4 to 8+, or a Modern Apprenticeship at Level 2 or 3 (i.e. non-completers), which are the key counterfactual groups used throughout the econometric analysis for these qualifications. As with earnings, the average proportions of the year spent in PAYE employment for each of these non-completer groups are typically lower than for individuals completing the given qualification. For example, the average proportion of the year in employment among men who dropped out of a first degree between the ages of 22 and 30 (3 years after dropping out) is estimated at **73%**, compared to **77%** for men who successfully completed a first degree (in the same age band, at 3 years post-completion or non-completion). For women, the corresponding estimates stand at **75%** and **80%** (for first degree non-completers and achievers, respectively)[73].

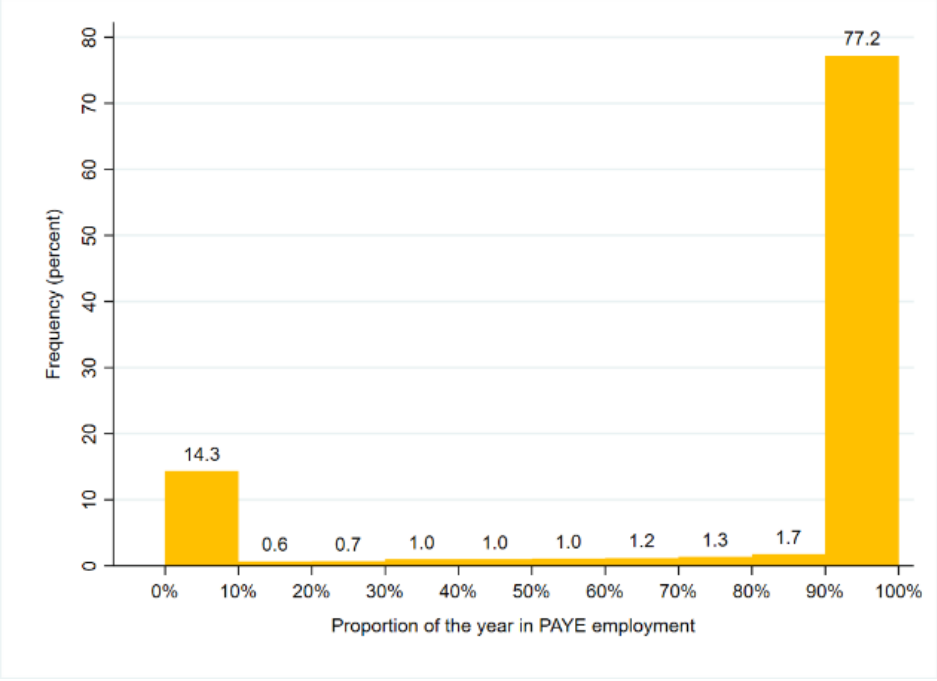
[73] Again, corresponding descriptive statistics in relation to benefit dependency are provided in Annex A3.2.

Figure 4 Proportion of the year in PAYE employment for individuals with first degrees who graduated at age 21 or below at 5 years post-graduation

Males



Females



Note: Age measured at the start of the final academic year.

Source: London Economics' analysis of Scottish LEO data

Table 10 Average proportion of the year in PAYE employment among non-completers, at 3, 5 and 7 years post-drop-out, by gender and age at drop-out

Gender and highest participation	Age at drop-out and years post-drop-out								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
First degree non-completers	74%	77%	77%	73%	73%	72%	71%	70%	71%
SCQF Full Vocational Level 8+ non-completers	72%	72%	69%	78%	77%	78%	83%	81%	80%
SCQF Full Vocational Level 7 non-completers	65%	68%	63%	74%	71%	69%	75%	75%	74%
MA Level 3 non-completers	69%	71%	69%	72%	72%	74%	79%	76%	69%
SCQF Full Vocational Level 6 non-completers	67%	71%	71%	71%	71%	74%	75%	76%	75%
MA Level 2 non-completers	68%	70%	63%	69%	71%		77%	77%	
SCQF Full Vocational Level 5 non-completers	59%	65%	67%	60%	61%	61%	66%	67%	65%
SCQF Full Vocational Level 4 non-completers	50%	58%	63%	53%	56%	52%	57%	60%	59%
Women									
First degree non-completers	79%	79%	79%	75%	76%	75%	74%	74%	74%
SCQF Full Vocational Level 8+ non-completers	71%	75%	73%	85%	83%	82%	87%	83%	81%
SCQF Full Vocational Level 7 non-completers	73%	86%	87%	78%	78%	71%	80%	78%	74%
MA Level 3 non-completers	72%	69%	70%	78%	74%	70%	81%	76%	76%
SCQF Full Vocational Level 6 non-completers	70%	68%	68%	68%	71%	72%	76%	75%	74%
MA Level 2 non-completers	68%	65%		74%	75%		77%	71%	
SCQF Full Vocational Level 5 non-completers	60%	63%	63%	55%	60%	61%	72%	73%	72%
SCQF Full Vocational Level 4 non-completers	48%	55%	54%	55%	55%	59%	67%	67%	64%

Note: Cells based on sample sizes below 50 have been left blank. Age measured at the start of the final academic year.

Source: London Economics' analysis of Scottish LEO data

5 Findings: The marginal earnings returns to post-school education and training

In this section, we present our findings from the analysis of the marginal earnings returns to post-school education and skills attainment in Scotland, using the Scottish LEO data.

Before turning to the econometric results, **Section 5.1** provides guidance on how each of set of econometric results should be interpreted. In terms of the presentation of our results, in **Section 5.2**, we first provide relatively **aggregated results** for all post-school qualifications considered (disaggregated by qualification, gender, number of years post-completion (i.e. 3, 5, or 7 years post-completion), and age band at completion). Following these aggregate results, in **Section 5.3**, we then present **disaggregated analyses of the marginal earnings returns to first degrees** (including a breakdown by ethnicity, subject area of study, type of Higher Education Institution attended, and prior educational pathway (comparing individuals who achieved first degrees after attaining prior qualifications at Scottish Colleges vs. those who achieved first degrees through other routes[74]). In **Section 5.4**, we then present **disaggregated results for the marginal earnings returns to Modern Apprenticeships** (including a breakdown by subject area of study and type of off-the-job training component (i.e. colleges vs. private education providers)[75]).

5.1 Interpretation of earnings returns

Given the above-discussed limitations of the Scottish LEO data (see Section 2.4, particularly with respect to the underlying sample sizes), throughout the presentation of our findings on the marginal earnings returns, we consistently apply **three rules that determine which results are suppressed in each of the different tables**:

1. **Blank cells** denote results where the underlying **sample size of the treatment or counterfactual group is 100 or fewer** (i.e. where there are 100 or fewer individuals in possession of the relevant post-school qualification or the corresponding counterfactual level of qualification)[76];
2. **Cells including a hyphen (-)** denote results that are **statistically insignificant at the 10% threshold** (i.e. indicating that the marginal earnings returns to the given post-school qualification are not significantly different from zero); and

[74] An additional disaggregation of the marginal earnings returns to first degrees by study mode (i.e. full-time vs. part-time) is provided in Annex A4.1.1. A key caveat of these results is that, due to sample size restrictions, we were unable to disaggregate the counterfactual group (i.e. first-degree non-completers) by study mode. In other words, the analysis was undertaken relative to an *aggregate* counterfactual group of first degree non-completers (including both full-time and part-time students). Given these limitations, the findings by study mode are included in the Annex, rather than as part of the main findings presented in this section.

[75] Note that, due to limited sample sizes, a disaggregation of the returns to Modern Apprenticeships by ethnicity was not achievable, so is not presented here.

[76] Small samples may not be representative of the overall population and lead to estimates influenced by a small number of outliers. Although there is not a specific rule, the minimum sample size may depend on the quality of the data, the overall size of the population and the number of explanatory variables used in the regression.

3. **Cells including a caret (^)** denote results that are based on **unbalanced samples**, where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is **less than 33.3% of the corresponding sample size at 3 years post-graduation**[77]. This was done to ensure that there is some consistency in the samples used at different points in time and results may compared with some degree of confidence. Entirely unbalanced samples might result in a misleading interpretation of the estimates as they might not comprise many of the same individuals (thereby limiting the extent of comparability).

In terms of interpreting the remaining (i.e. non-suppressed) findings, each marginal earnings return estimate represents the **percentage difference in daily PAYE earnings between the treatment and counterfactual**, i.e. between those in possession of the relevant post-school qualification as compared to the next highest level of qualification or compared to individuals who started but did not complete the given post-school qualification (depending on the counterfactual group of interest). For example, a **20%** estimate of the marginal earnings return implies that individuals in possession of the given post-school qualification (as their highest attainment) achieve **20%** higher daily PAYE earnings than individuals in the relevant counterfactual group[78] [79].

5.2 Aggregate earnings returns for all qualification levels

Table 11 presents the aggregate marginal earnings returns to each post-school qualification in Scotland (including information on the relevant counterfactual group used for each qualification level). The results are broken down by **gender, age band at completion of the qualification** (i.e. for individuals who completed their highest qualification between the ages of 16 and 21, between 22 and 30, or at 31 or above), and for **3, 5, and 7 years post-completion**[80]. Reflecting the priorities of the Scottish Government, the analysis of Modern Apprenticeships and first degrees were prioritised as being of greater policy interest, and more in-depth analysis is provided for these specific qualifications.

5.2.1 Modern Apprenticeships

In terms of Modern Apprenticeships, there are **consistently strong marginal earnings returns to MAs at Level 3** (compared to non-completers). The returns to MAs at Level 3 are **generally larger for men than for women** (except for the 31+ age range)[81]. Specifically, the analysis indicates that men in possession of MAs at Level 3 (as their

[77] Therefore, the caret symbols only apply to results at 5 or 7 years post-completion (where applicable), but do not apply to results at 3 years post-completion.
[78] All regression coefficients reported here have been exponentiated to reflect percentage earnings returns.
[79] Note that in the subsequent discussion, we refer to those estimates that have been demonstrated to be statistically significantly different from zero only. We do not refer at any point to either statistically insignificant results or those results that might have been supressed as a result of an unbalanced sample.
[80] The earnings for the non-completers counterfactuals (where relevant) are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
[81] Though this is offset by larger marginal employment returns for women than for men (see Section 6.2.1 for more information).

highest qualification) achieve between **14.4%** and **52.1%** higher daily PAYE earnings than men with comparable characteristics who started but did not complete MAs at Level 3[82]. The corresponding estimates for women range between **11.2%** and **17.4%**. These differences between men and women are likely driven by differences in the underlying subjects studied[83], with a greater proportion of men with MAs at Level 3 having undertaken their MA in STEM-related subjects, while women were more likely to have undertaken their MAs at Level 3 in AHSS-related or other subjects.[84]

Note that, when comparing across different age bands at completion, the marginal earnings returns for men who completed Level 3 MAs at age 22 or above are lower than the corresponding returns at age 21 or below.[85]

Where identified, the estimated **marginal earnings returns for men with Modern Apprenticeships at Level 2** range between **9.9%** and **16.7%** compared to MA Level 2 non-completers. However, note that the underlying sample sizes for Level 2 MAs are relatively small, resulting in many of the results being suppressed (so that only very limited comparisons can be drawn)[86]. For **women**, **the earnings returns to Level 2 MAs** (**between 15.1% and 29.2%**) **tend to be higher than the corresponding returns at Level 3** (**between 11.2% and 17.4%**). Due to small and unbalanced sample sizes, the estimates for MAs at Levels 4 and 5 were largely suppressed, so are not discussed here.

[82] And for whom the MA at Level 3 would have been the highest qualification achieved.
[83] Subject of study is typically a choice variable, so it is not included as an explanatory variable in the regressions. Results broken down by subject area of study are presented separately (e.g. in Table 13)
[84] The achievement of STEM MAs typically yield higher premiums after completion compared to alternative employment opportunities for those without the qualification compared to non-STEM MAs (compared to those without the qualification).
[85] A potential explanation for this finding may be linked to different self-employment rates for individuals holding MAs at different levels and belonging to different age groups: as mentioned, self-employment is *not* captured in the Scottish LEO data included in the analysis, due to the limited availability of information on self-employment in the Scottish LEO data (only available from tax year 2013/14 onwards only). As a result, the labour market outcomes measures here were therefore restricted to information extracted from HMRC PAYE information only (i.e. data on employees' PAYE earnings (P14) and PAYE employment spells (P45)). See Section 2.4 for more information.
[86] More generally, note that all earnings returns to MAs at 7 years post-completion are suppressed. This is driven by the fact that the first cohort of MA learners completed their learning in 2008/09 (as MAs were only introduced in 2008), so that there is only a relatively small number of individuals for whom the labour market outcomes can be observed at 7 years post-completion (resulting in limited and unbalanced sample sizes).

Table 11 Marginal earnings returns to post-school qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Counterfactual	Age at completion and years post-completion								
		<=21			22-30			31+		
		3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men										
Postgraduate (research)	First degree				25.2%	27.0%	29.2%	20.7%	11.1%	15.4%
Postgraduate (taught)	First degree	14.9%	21.6%	25.4%	8.9%	11.8%	14.9%	18.9%	17.3%	16.8%
First degree	First degree non-completers*	45.4%	40.0%	38.6%	26.8%	32.2%	27.5%	15.3%	12.7%	13.5%
Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	-	4.2%	-	-	-	-	-	-	6.6%
SCQF Full Vocational Level 8+	SCQF Level 8+ non-completers*							-4.8%	-	-
MA Level 4/5	MA Level 3							40.6%	46.9%	^
SCQF Full Vocational Level 7	SCQF Level 7 non-completers*	-	7.5%	14.9%	12.4%	-	18.7%	12.6%	16.0%	11.4%
Highers (at college, incl. Adv. Highers)	SCQF Full Vocational Level 5	-16.4%	-10.2%	^	-14.9%	-8.1%	^	-11.6%	-9.2%	^
MA Level 3	MA Level 3 non-completers*	52.1%	39.0%	^	28.6%	19.8%	^	14.9%	14.4%	^
SCQF Full Vocational Level 6	SCQF Level 6 non-completers*	13.3%	14.3%	17.0%	8.2%	-	-	5.5%	8.2%	-
MA Level 2	MA Level 2 non-completers*	13.7%	11.9%		9.9%			16.7%	12.1%	
SCQF Full Vocational Level 5	SCQF Level 5 non-completers*	2.5%	5.0%	8.5%	18.6%	7.3%	15.7%	11.9%	9.6%	10.0%
SCQF Full Vocational Level 4	SCQF Level 4 non-completers*	6.3%	13.9%	12.0%	22.7%	-		21.5%	19.3%	^
Women										
Postgraduate (research)	First degree				21.2%	23.2%	29.8%	19.6%	24.8%	17.0%
Postgraduate (taught)	First degree	26.8%	32.6%	32.4%	14.3%	16.4%	19.7%	24.0%	21.4%	17.6%
First degree	First degree non-completers*	52.9%	49.2%	44.3%	32.4%	33.3%	22.0%	20.4%	19.9%	13.4%
Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	6.6%	16.0%	21.4%	12.2%	22.7%	30.2%	14.1%	18.8%	22.8%
SCQF Full Vocational Level 8+	SCQF Level 8+ non-completers*				-	-	-	4.6%	4.6%	5.4%
MA Level 4/5	MA Level 3							33.7%	28.9%	^
SCQF Full Vocational Level 7	SCQF Level 7 non-completers*				15.9%	-		-	-	7.9%
Highers (at college, incl. Adv. Highers)	SCQF Full Vocational Level 5	-17.7%	-	^	-12.0%	-	-	-9.4%	-	-
MA Level 3	MA Level 3 non-completers*	17.4%	11.2%	^	15.7%	15.3%	-	15.9%	15.7%	^
SCQF Full Vocational Level 6	SCQF Level 6 non-completers*	-	6.9%	8.6%	-	11.6%	-	9.7%	9.8%	6.9%
MA Level 2	MA Level 2 non-completers*	15.2%	15.1%					29.2%	20.2%	
SCQF Full Vocational Level 5	SCQF Level 5 non-completers*	3.8%	4.9%	12.8%	7.6%	11.5%	17.0%	4.8%	2.9%	5.2%
SCQF Full Vocational Level 4	SCQF Level 4 non-completers*	-	15.7%	10.5%	9.6%	-	-	13.4%	8.8%	8.7%

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year.

* The earnings for the non-completers counterfactuals (where relevant) are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification. ***Source: London Economics' analysis of Scottish LEO data***

5.2.2 First degrees

The **marginal earnings returns achieved by first degree graduates (compared to non-completers) are consistently strong and positive**, as well as being highly statistically significant across all groups of individuals considered. Given the relatively large sample sizes available for both individuals in possession of a first degree as their highest qualification (i.e. the treatment group) as well as those who started but did not complete first degrees[87] (i.e. the counterfactual group), none of the results are suppressed. The analysis estimates that men in possession of first degrees (as their highest qualification) achieve between **12.7%** and **45.4%** higher daily PAYE earnings than men who started but did not complete first degrees. The corresponding estimates for women stand at between **13.4%** and **52.9%**. **The highest returns – for both men and women – are achieved by graduates who completed their degrees at a relatively young age** (at age 21 or below), particularly at 3 and 5 years post-graduation.

5.2.3 Other higher education undergraduate qualifications

The returns to other undergraduate (sub-degree) qualifications (including Higher National Certificates (HNCs) and Higher National Diplomas (HNDs)) are estimated **relative to the next highest level of qualification** (i.e. compared to individuals with vocational qualifications at SCQF Level 6 achieved at Scottish Colleges)[88]. Overall, the analysis indicates **positive marginal earnings returns to these other undergraduate qualifications**; however, **in general, only the estimates for women tend to be statistically significant**,[89] whereas most of the results for men are statistically insignificant.

Specifically, the marginal earnings returns for women range between **6.6%** and **30.2%**, with the highest returns achieved by women who completed their qualification between the ages of 22 and 30, at 7 years post-completion (estimated at **30.2%**). For men, the estimated earnings returns are more modest, being either statistically insignificant (i.e. not significantly different from zero) or ranging between **4.2%** and **6.6%**.

5.2.4 Postgraduate qualifications

As with the marginal earnings returns to other undergraduate (sub-degree) qualifications, the returns to postgraduate (research and taught) qualifications were estimated **relative to individuals in possession of the next highest qualification level** – in this case,

[87] And for whom the first degree would have been the highest qualification achieved.

[88] Ideally, the returns to other undergraduate qualifications would be estimated relative to individuals in possession of Highers obtained in secondary school (as their highest qualification). However, since the required information on secondary schooling is currently not included in the Scottish LEO data (see Section 3.1 for more detail), we instead analyse the returns to these other undergraduate qualifications relative to vocational qualifications at SCQF Level 6 obtained at Scottish Colleges.

[89] This gender differential may also be driven by the very low levels of earnings for women in possession of SCQF 6 vocational qualifications (which is the counterfactual used for other undergraduate qualifications), as shown in Table 7.

compared to **individuals in possession of first degrees** (as their highest level of attainment).

The analysis suggests that there are **consistently strong earnings returns to postgraduate research qualifications** for both men and women. We estimated that men in possession of postgraduate research qualifications achieve between **11.1%** and **29.2%** higher daily PAYE earnings than men with comparable characteristics in possession of first degrees, while the corresponding estimates for women range between **17.0%** and **29.8%**.

Substantial earnings returns are also associated with postgraduate taught qualifications although marginally lower compared to those associated with postgraduate research qualifications. Compared to the returns associated with first degrees, the returns associated with postgraduate taught degrees are slightly lower for both men and women if attained between the ages of 22 and 30, but slightly higher if attained at the age of 31 or above. These were estimated to range between **8.9%** and **25.4%** for men, and between **14.3%** and **32.6%** for women).

These results indicate that **the earnings returns to postgraduate taught qualifications are generally larger for women than for men, while the returns to postgraduate research qualifications are broadly similar for men and women**. However, as will be discussed in Section 6.2.4, this effect is in contrast with to the lower marginal employment returns associated with postgraduate qualifications posted by women compared for men in some instances (particularly in respect of postgraduate research qualifications).

5.2.5 Vocational qualifications

Finally, the results included in Table 11 also present our findings on the marginal earnings returns to vocational qualifications attained at Scottish Colleges. All of these returns are estimated relative to the non-completer counterfactual**.**

Comparing the results across vocational qualifications at SCQF Levels 4 to 7, the analysis indicates that individuals in possession of vocational qualifications at **SCQF Level 7** (compared to SCQF Level 7 non-completers) generally achieve the relatively highest earnings returns, ranging between **7.5%** and **18.7%** for men, and between **7.9%** and **15.9%** for women (where statistically significant), although there are relatively few results for women that are not suppressed. This is followed by the returns to **SCQF Level 6** vocational qualifications (relative to SCQF Level 6 non-completers), with the estimates standing at between **5.5%** and **17.0%** for men, and between **6.9%** and **11.6%** for women.

In general, the **marginal earnings returns associated with SCQF Levels 4, 5 and 8 and above qualifications are typically suppressed due to statistical insignificance or small/unbalanced sample sizes**. The returns to SCQF Level 8 qualifications (as compared to SCQF Level 8 non-completers) is negative (**-4.8%**) for men aged over 31, 3 years post-graduation (this is the only statistically significant result for men with SCQF Level 8 or above as their highest qualification). This result likely reflects particularly strong earnings outcomes achieved by individuals in possession of the counterfactual level of

qualification[90]. In contrast, the comparable estimates are positive for women aged over 31, and range from **4.6%** to **5.4%**. The returns to SCQF Level 5 qualifications (as compared to SCQF Level 5 non-completers) tend to be more modest (less than **10.0%**, with a few exceptions), while the analysis estimates stronger earnings returns associated with SCQF Level 4 qualifications (relative to SCQF Level 4 non-completers) ranging between **6.3%** and **22.7%** for men and between **8.7%** and **15.7%** for women[91].

5.3 In-depth analysis of the earnings returns to first degrees

In the following, we present our results from a range of disaggregated analyses of the marginal earnings returns to first degrees. As with the above-presented high-level returns to degrees (see Section 5.2.2), all of these disaggregated analyses are **based on first degree non-completers as the relevant counterfactual**.

When assessing results broken down by personal, degree subject or institutional characteristics it should be noticed that results are not estimated using a common counterfactual group, but, rather, the counterfactual groups are disaggregated by the same characteristics (e.g. first degree graduates from ancient institutions are compared to non-completers attending the same institution type). As such, results for different institutions are not directly comparable to each other as we do not use a common counterfactual (i.e. we use the relevant non-completer counterfactual for each group, under the assumption that it is the 'closest' comparison group in terms of characteristics).

5.3.1 Differences by ethnicity

Table 12 presents the marginal earnings returns to first degrees (compared to first degree non-completers) separately for **white** and **non-white[92] individuals** (in addition to the previous disaggregation by gender, age band at completion, and years since completion).

Given that there were only relatively small samples available for the non-white group (particularly in terms of non-white non-completers), most of the results on the marginal earnings returns for this group were suppressed. However, those results that are available

[90] see Table 7 and Table 8, which illustrate the fact that the average daily earnings achieved by men in possession of SCQF qualifications at Level 8+ are approximately £2.90 per day lower than the earnings posted by men who did not complete a SCQF qualification at Level 8+ (£95.00 compared to £97.90) three years after completion/non-completion.

[91] The analysis indicates negative earnings returns associated with Highers (including Advanced Highers) obtained at Scottish Colleges (relative to vocational qualifications at SCQF Level 5). However, as outlined in Section 2.4, note again that individuals obtaining Highers at College (rather than in secondary school) are unlikely to be representative of the overall population of individuals in possession of Highers as their highest qualification. In addition, it is likely that individuals in possession of vocational qualifications at SCQF Level 5 do not provide an ideal counterfactual for individuals obtaining Highers (e.g. a better counterfactual might be individuals who obtained Nationals at Scottish secondary school (which are not included in the Scottish LEO data)). Due to these limitations, we do not provide a more detailed discussion of the estimated returns to Highers here.

[92] Due to sample size limitations, it was not possible to undertake a more detailed disaggregation by ethnicity, so that individuals in the treatment and counterfactual groups were instead only grouped into white and non-white individuals.

indicate that **the earnings returns to achieving a first degree are generally much greater for non-white graduates than for white graduates**. This is especially true for men, and likely reflects the relatively lower earnings of non-white individuals who start but do not complete first degrees.[93] For example, the analysis estimates that **white men** who completed first degrees at age 21 or under (as their highest qualification) achieve **38.8%** higher daily PAYE earnings (at 5 years after completing the degree[94]) than white men who started but did not complete their degrees. The comparable return for **non-white men** was estimated at **78.5%**.

Table 12 Marginal earnings returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, ethnicity, and age at completion

Gender and ethnicity	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
White	44.1%	38.8%	38.3%	26.7%	32.1%	27.1%	14.0%	13.1%	12.5%
Non-white	83.9%	78.5%		27.0%					
Women									
White	52.5%	48.4%	42.9%	32.5%	32.9%	22.7%	19.7%	19.7%	13.2%
Non-white	69.8%			34.0%			46.5%		

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Control variables include disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year. The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.

Source: London Economics' analysis of Scottish LEO data

[93] This large gap between the estimates for individuals from white and other ethnic backgrounds is primarily driven by lower earnings achieved by the counterfactual group. Focusing on 3 years post completion for graduates who achieved first degrees at age 21 or under, males from white ethnic background had daily earnings slightly below £66, compared with £46 for non-completers (i.e. approximately £20 per day difference). The corresponding figures for male individuals from *non-white* backgrounds were £64 and £38 respectively (i.e. approximately £26 per day difference). There is also a gap for women, with first degree graduates from white ethnic background earning £61 after 3 years compared with £42 for non-completers. The corresponding figures for females from non-white ethnic backgrounds were £60 for graduates and £37 for non-completers (again all figures referring 3 years post completion for graduates who achieved first degrees at age 21 or under).

[94] Or dropping out of the degree (for non-completers).

5.3.2 Differences by subject of study

We also disaggregated the analysis of the returns to first degrees by subject of study (grouped into **STEM subjects, AHSS subjects, and other subjects**[95]). The analysis for STEM subjects was originally undertaken both including and excluding Medicine and Dentistry; here, we only present the results for STEM subjects *excluding* Medicine and Dentistry[96].

As presented in Table 13, **the earnings returns to first degrees in STEM subjects** (excluding Medicine and Dentistry) **are generally higher than the corresponding returns to degrees in AHSS subjects**. For example, for **men**, the earnings returns to achieving a first degree in **STEM** (as compared to starting but not completing a first degree in a STEM subject) at age 21 or under were estimated at **48.5%** (at 5 years post-completion). The analysis identified a **32.2%** return for individuals completing first degrees in an **AHSS** subject (as compared to starting but not completing an AHSS degree). For **women**, the corresponding returns stand at **56.3%** (**STEM** subjects) and **42.1%** (**AHSS** subjects).

Note also that there are substantial marginal earnings returns associated with first degrees in **other subjects**[97], for both male and female graduates, but for men, these are typically lower than both STEM and AHSS subject returns, whilst for women, the earnings returns to first degrees in other subjects are generally higher than in AHSS subjects[98].

Findings for England disaggregated by subject of study[99] showed that Medicine, Economics, Business, Law and STEM subject areas (in particular Engineering, Architecture and Computing) are the best performing subject areas for males in terms of earnings (while Arts and English are the worst performing subject areas for earnings). For females the highest earnings returns are observed for Medicine, Economics and STEM subject areas, while the lowest returns are found for Social Care, Creative Arts and Agriculture. However, it should be noted that these results are not directly comparable to those presented here, as the setting or context of the analysis relating to English learners is different. Specifically, in England, the analysis focus on returns estimated at the age of 29, while the counterfactual used is also different (individuals in possession of with five GCSEs A*-C but no higher education). Finally, the set of control variables used in the analysis

[95] See Section 2.2.2 (Table 1) for more information on these subject groups.
[96] In general, Medicine and Dentistry qualifications are associated with relatively high levels of financial reward, which might result in a skewed analysis of the earnings returns associated with 'more typical' STEM qualifications. We focus on the results excluding Medicine and Dentistry here but the full set of results are available in the Annex.
[97] These include education and training, psychology, geographical and environmental studies, sport and exercise sciences, and combined and general studies. Again, see Section 2.2.2 (Table 1) for more information.
[98] AHSS also covers subjects such as 'Arts and Media', 'Languages, Literature and Cultural Studies' and 'Humanities' (with typically low earnings levels and a significant number of female graduates). Conversely, 'Other' also covers 'Education and training' (with relatively high level of earnings in Scotland alongside a significant number of female graduates).
[99] See DfE RR808 section 5 (link).

relating to English learners are different (e.g. prior attainment is available in the English analysis).

Table 13 Marginal earnings returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, subject of study, and age at completion

Gender and subject group	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
STEM subjects*	55.3%	48.5%	45.6%	34.0%	35.3%	33.1%	18.8%	15.9%	16.9%
AHSS subjects	38.9%	32.2%	30.8%	10.7%	20.9%	20.9%	13.3%	12.4%	22.4%
Other subjects	27.0%	24.2%	32.4%	10.6%	20.7%	14.9%	-	-	-
Women									
STEM subjects*	64.4%	56.3%	48.5%	40.0%	36.1%	23.7%	20.3%	20.7%	15.1%
AHSS subjects	40.6%	42.1%	37.5%	13.5%	20.2%	12.9%	11.1%	10.1%	-
Other subjects	61.4%	46.6%	54.8%	28.7%	34.3%	34.1%	19.4%	25.9%	14.7%

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. The composition of the different subject groups is shown in Table 1. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year. The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
*Note that Medicine and Dentistry are excluded from STEM subjects (as well as any of the other subject groups).
Source: London Economics' analysis of Scottish LEO data

5.3.3 Differences by type of Higher Education Institution

Table 14 presents the findings on the marginal earnings returns to first degrees acquired from different groups of Scottish Higher Education Institutions, including **ancient, pre-1992** (excluding ancient) **and post-1992 institutions,** as well as **Colleges**. The classification of the different Higher Education Institution types is presented in Table 2.

The analysis indicates that **the earnings returns achieved by individuals in possession of first degrees from ancient institutions generally *exceed* the returns posted by individuals in possession of first degrees at pre-1992 or post-1992 universities**. For example, focusing on a completion age of 21 and under, 5 years post-graduation, men with degrees from **ancient universities** achieve **55.4%** higher PAYE daily earnings than individuals who dropped out of degrees at these same institutions. The comparable estimate for men with first degrees from **pre-1992 universities** (compared to non-completers from pre-1992 institutions) stands at **48.1%**. The estimate of the earnings return to first degrees from **post-1992 institutions** was estimated at **27.9%** (compared to non-completers from post-1992 institutions). The differences between institution types tend to be even greater for

women, where the earnings returns (compared to individuals not-completing first degrees at those same institutions) were estimated at **79.1%** for **ancient institutions**, **42.4%** for **pre-1992 institutions**, and **42.9%** for **post-1992 institutions**. Note that sample sizes are small for individuals aged 31 or above attending ancient institutions and so the results are typically suppressed.

In addition, the earnings returns achieved by individuals in possession of first degrees from each of the different types of Higher Education Institutions **persist over the 7-year period of analysis** (i.e. the returns continue to be statistically significant and persist over the entire period of analysis).

Note that, due to insufficient sample sizes, all earnings returns for first degrees from Colleges have been suppressed (since the number of students undertaking first degrees at Colleges is typically very small).

Table 14 Marginal earnings returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, type of Higher Education Institution, and age at completion

Gender and type of institution	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Ancient	64.3%	55.4%	48.3%	61.9%	69.3%	56.7%			
Pre-1992	54.4%	48.1%	43.8%	24.9%	30.7%	28.4%	14.1%	6.3%	10.4%
Post-1992	31.8%	27.9%	29.6%	20.0%	24.0%	21.4%	18.6%	20.2%	14.6%
Colleges									
Women									
Ancient	86.0%	79.1%	65.9%	54.4%	58.9%		51.1%		
Pre-1992	49.9%	42.4%	43.5%	31.8%	33.3%	26.9%	25.4%	21.8%	16.6%
Post-1992	46.0%	42.9%	36.8%	27.8%	26.6%	13.8%	13.4%	16.8%	9.0%
Colleges									

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. The composition of the different HEI types is shown in Table 2.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year.
The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

5.3.4 Differences by educational pathway

As a final component of the disaggregated analysis for first degrees, we estimated the earnings returns **separately for individuals who achieved first degrees after attaining prior qualifications at Scottish Colleges and for individuals who achieved first degrees through 'other' (i.e. non-College) routes – mainly entering university direct from school**. The idea was to compare students choosing different post-16 pathways to higher education and comparing outcomes for students who chose to follow the College route (e.g. attaining a SCQF level 6) compared to those who followed the academic route (e.g. attaining Highers at school). However, this analysis should be seen as exploratory only, as the data currently available do not allow for a full analysis of pathways chosen. In fact, in order to undertake a comprehensive analysis of pathways to higher education we would need to:

- Observe specific cohorts of Scottish students leaving compulsory school at a given age and follow their educational pathway over time (e.g. whether they enrol in College or stay in secondary school up to the age of 18 etc.). However, secondary schooling data are not currently merged into LEO, so that information is not available;
- Be able to control for their detailed background and characteristics, as students following the College route are likely to be dissimilar to some extent to the average student staying on at secondary school. One key driver of subsequent educational choices (including the post-16 path and the type of higher education chosen) relates to prior attainment (at age 16 and earlier), which we are currently unable to observe.

As a consequence, we were unable to identify with a good degree of certainty whether the College qualification was the qualifying course used to access higher education. Those with at least one college record (at any level) prior to enrolment in first degrees were assigned to the College route in the analysis undertaken. Also, in order to ensure some degree of consistency between the two groups (i.e. to capture the age of completion for students following the academic route), the analysis was restricted to individuals who completed first degrees between the ages of 20 and 25 (between 2009/10 and 2013/14).

It is important to note that throughout this analysis by pathway that, due to sample size limitations, we were unable to disaggregate the counterfactual group (i.e. first-degree non-completers) by educational pathway. In other words, the analysis was undertaken **relative to an *aggregate* counterfactual group of first degree non-completers** (irrespective of whether individuals in the counterfactual group had started their degrees after prior attainment at Colleges or had gone through other routes)[100].

As previously mentioned, it should be noted that those following the College route are likely to be different in terms of the personal characteristics to those not following the

[100] Also note that the analysis was restricted to a specific sub-sample of the Scottish LEO data. See Section 3.3 for more information.

College route (however, we are currently unable to adequately control for these differences as we do not have information on qualifications achieved at school or prior attainment). This 'common' counterfactual is likely to overstate the earnings returns associated with the non-College route and understate the earnings return associated with the College route (but we are unable to state to what extent). A more appropriate counterfactual might be to compare the outcomes of College-pathway first degree holders with the earnings achieved by non-completers entering Post-92 institutions (as more than four in five College-pathway first degree holders attend Post-92 higher education institutions). This would be a meaningful additional analysis in any subsequent analysis.

The analysis suggests that the **marginal earnings returns associated first degrees attained through the non-College route exceed the returns to first degrees attained through the College route**. However, importantly, the **returns associated with the College route are still positive and significant**, with particularly large returns for women. For example, we estimate that **women** who attain a first degree after attaining prior qualifications at **College** achieve **32.7%** higher PAYE daily earnings compared to non-completers (who went through either the College or non-College route) 5 years post-completion. The estimate for women who attained first degrees through the **non-College route** stands at **46.2%**, while the corresponding returns for **men** were estimated at **18.5%** (**College route**) and **42.3%** (**non-College route**).

Table 15 Marginal earnings returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender and attainment through the College vs. non-College route

Gender and educational pathway	Years post-completion		
	3 years	5 years	7 years
Men			
Non-College route	39.8%	42.3%	^
College route	22.0%	18.5%	^
Women			
Non-College route	41.0%	46.2%	^
College route	27.4%	32.7%	^

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation.
The analysis was restricted to individuals who completed first degrees at age 20 to 25, between 2009/10 and 2013/14. Individuals were grouped into the College vs. the non-College route based on whether they had previously achieved qualifications at a College prior to or at the age of 22. Due to sample size restrictions, the counterfactual group was *not* disaggregated by educational pathway.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year.
The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

5.4 In-depth analysis of the earnings returns to Modern Apprenticeships

The following sections present our results from two disaggregated analyses of the marginal earnings returns to Modern Apprenticeships (at Levels 2 and 3[101]), including a breakdown **by subject of study** as well as the **type of the off-the-job training component** of the Modern Apprenticeship (distinguishing whether the off-the-job training was undertaken at a Scottish College or private education provider)[102]. As with the above-presented aggregate returns to Modern Apprenticeships (see Section 5.2.1), these disaggregated analyses are **based on MA non-completers (at Level 2 and 3, respectively) as the relevant counterfactual**. In other words, when comparing the outcomes achieved by individuals in possession of MA Level 3 qualifications in STEM-related subjects, the counterfactual group consists of individuals not completing a MA Level 3 **also** in STEM-related subjects. As such, it is not possible to make a direct comparison of the earnings premiums achieved *across* subject areas.

5.4.1 Differences by subject of study

Given that the Scottish LEO data includes only relatively small sample sizes for MA non-completers disaggregated by subject area, many of the results on the marginal earnings returns to MAs for different subjects were suppressed due to small sample sizes (see Table 16)[103]. The composition of the different subject groups is presented in Table 1.

The results indicate **that the returns to MAs at Level 3 in STEM subjects are generally greater than for MAs in AHSS or other subjects**. To take an example, men in possession of **STEM-related MAs** at Level 3 (completed at age 21 or under) achieve a **61.9%** earnings premium relative to individuals who drop out of Level 3 MAs in STEM (3 years after completion/drop-out). This compares to **17.5%** for other subjects (compared to individuals not completing Level 3 MAs in other subjects)[104], and **8.3%** for AHSS subjects (compared to individuals not completing Level 3 MAs in AHSS subjects). The corresponding returns for women were estimated at **32.7%** (**STEM subjects**), **13.8%** (**other subjects**), and **14.0%** (**AHSS subjects**).

The estimates by subject for Modern Apprenticeships at Level 2 were largely suppressed due to small sample sizes, particularly for those aged between 22 and 30; when available the estimates indicated strong returns for men in possession of STEM MAs.

[101] Again, due to small and unbalanced sample sizes, the aggregate estimates for MAs at Levels 4 and 5 were largely suppressed, so no further disaggregation was undertaken.
[102] Again, due to small sample sizes, a disaggregation of the returns to Modern Apprenticeships by ethnicity was not achievable.
[103] Note that the exclusion of Medicine and Dentistry subjects (from the STEM subject group) is not applicable here, since there are no Modern Apprenticeships offered in these subjects.
[104] For example, these include Personal Services; Food and Drink; Hospitality and Tourism; selected frameworks in Sport, Health and Social Care; Retail and Customer Service; and Transport and Logistics. Again, see Section 2.2.2 (Table 1) for more information.

Table 16 Marginal earnings returns to Modern Apprenticeships (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, level, subject of study, and age at completion

Gender, level and subject group	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
MA Level 3									
Men									
STEM subject	61.9%	45.2%	36.6%	30.0%	23.8%	^	31.7%	28.1%	^
AHSS subject	8.3%	-					12.2%	8.1%	
Other subject	17.5%	9.7%	^	26.0%	11.9%		10.7%	10.7%	
Women									
STEM subject	32.7%	17.4%					28.5%	19.5%	
AHSS subject	14.0%	-	^				7.5%	12.4%	
Other subject	13.8%	9.3%	^	10.5%	-		17.3%	15.1%	
MA Level 2									
Men									
STEM subject	42.0%	46.8%					25.4%		
AHSS subject									
Other subject	6.0%	6.7%					17.7%	7.9%	
Women									
STEM subject	20.0%						18.6%	24.2%	
AHSS subject	19.9%								
Other subject	12.6%	12.4%					27.3%	17.1%	

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. The composition of the different subject groups is shown in Table 1.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year.
The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

5.4.2 Differences by type of off-the-job training

Finally, Table 17 presents the marginal earnings returns to Level 2 and Level 3 Modern Apprenticeships depending on the location of the off-the-job training component of the Modern Apprenticeship (distinguishing whether the off-the-job training was undertaken at a Scottish College or private education provider).

Table 17 Marginal earnings returns to Modern Apprenticeships (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, level, location of off-the-job training component, and age at completion

Gender, level and location of off-the-job training	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
MA Level 3									
Men									
Not at College	45.4%	35.7%	31.2%	23.9%	19.4%	^	15.0%	15.5%	^
At College	75.5%	52.7%	^	47.5%			24.0%	-	
Women									
Not at College	16.8%	11.2%	^	14.5%	17.0%	-	16.6%	16.7%	-
At College	20.2%	13.1%							
MA Level 2									
Men									
Not at College	11.2%	11.0%					17.2%	11.9%	
At College	26.4%								
Women									
Not at College	12.5%	15.3%					30.1%	19.9%	
At College	28.4%								

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. Age measured at the start of the final academic year.
The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

Similar to the above subject breakdown, the limited sample sizes for MAs (particularly for non-completers) results in many estimates being suppressed. However, where available, the analysis suggests that there are substantial earnings returns to Level 3 MAs undertaken at College as well as at private training providers (i.e. 'not at College'), and also that **the returns to MAs with off-the-job training components undertaken at Colleges generally exceed the returns to MAs undertaken at private providers**. For example, men in possession of Level 3 MAs (completed at age 21 or under) whose off-the-job training component was delivered at **College** achieve an estimated **75.5%** daily earnings premium relative to individuals who drop out of Level 3 MAs at College (also 3

years after completion/drop-out)[105]. This compares to a **45.4%** premium for Level 3 MAs undertaken at a **private provider**. For women, the corresponding estimates stand at **20.2%** (College) and **16.8%** (not at College). As with the above breakdown by subject, **the results by provider type for Modern Apprenticeships at Level 2 were largely suppressed**.

[105] This gap is explained, at least to some extent, by the higher incidence of males undertaking MAs in STEM subjects at college versus those undertaking MAs at private providers (e.g. 88% versus 78% at 3 years for males who completed before the age of 21 and 91% versus 54% at 3 years for males who completed between 22 and 30). Also, the gap was smaller when compared to a common counterfactual (those with MAs at Level 2), with an estimated earnings premium at 3 years of 50% for those undertaking MA Level 3 at College compared to 43% (age of achievement up to 21) and 36% versus 24% (age of achievement between 22 and 30).

6 Findings: The marginal employment returns to post-school education and training

In this section, we present our findings from the analysis of the marginal employment returns to post-school education and skills attainment in Scotland.

The structure of this section mirrors the presentation of marginal earnings returns in Section 5[106]. Again, before turning to the econometric results, Section **6.1** provides guidance on how each of these results should be interpreted. In **Section 6.2**, we first provide relatively **aggregate results** for all post-school qualifications considered. Following these aggregate results, in **Section 6.3**, we then present **disaggregated analyses of the marginal employment returns to first degrees** (again including a breakdown by ethnicity, subject area, type of Higher Education Institution, and prior educational pathway[107]), followed by **disaggregated results for the marginal earnings returns to Modern Apprenticeships** (including a breakdown by subject area and location of off-the-job training component[108]) in **Section 6.4**.

6.1 Interpretation of employment returns

As with the marginal earnings returns, in the presentation of marginal employment returns, we again apply the same **three rules that determine which results are suppressed in each of the different tables**:

1. **Blank cells** denote results where the underlying **sample size of the treatment or counterfactual group is 100 or fewer** (i.e. where there are 100 or fewer individuals in possession of the relevant post-school qualification or the corresponding counterfactual level of qualification);
2. **Cells including a hyphen (-)** denote results that are **statistically insignificant at the 10% threshold** (i.e. indicating that the marginal employment returns to the given post-school qualification are not statistically significantly different from zero); and
3. **Cells including a caret (^)** denote results that are based on **unbalanced samples**, where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is **less than 33.3% of the corresponding sample size at 3 years post-graduation**.

In terms of interpreting the findings, each marginal employment return represents the **percentage point difference in the proportion of the year spent in PAYE employment**

[106] Throughout the earnings and employment analyses (as well as the benefit dependency analysis), attention was restricted to individuals not enrolled in any education course in a given year. This was done to avoid individuals whose labour supply was constrained by undertaking further study.
[107] An additional disaggregation of the marginal employment returns to first degrees by study mode is provided in Annex A4.2.1. Due to sample size restrictions, it was not possible to disaggregate also the counterfactual group by mode of study, which means that the results should be treated with some caution.
[108] Note that, as with the analysis of marginal earnings returns, due to limited sample sizes, a disaggregation of the marginal employment returns to Modern Apprenticeships by ethnicity was not achievable, so is not presented here.

between the treatment and counterfactual[109] (i.e. between those in possession of the relevant post-school qualification as compared to the next highest level of qualification or to individuals who started but did not complete the given post-school qualification (depending on the counterfactual group of interest))[110]. For example, a coefficient of **5.0** on the relevant marginal employment return implies that individuals in possession of the given post-school qualification (as their highest attainment) are in PAYE employment for **5.0 percentage points** more of the financial year compared to individuals in the relevant counterfactual group. It is important to note that the outcome variable has an upper bound of 100% by construction (i.e. an employment spell spanning the entire year). As such, if the counterfactual group already has high levels of PAYE employment (e.g. those with a first degree), there is limited room for additional employment effects. On the other hand, high estimates for marginal employment returns for lower-level qualifications may reflect a low level for the PAYE employment variable in the counterfactual group.

6.2 Aggregate employment returns for all qualification levels

Table 18 presents the aggregate marginal employment returns to each post-school qualification in Scotland (again including information on the relevant counterfactual group used for each qualification level). The results are broken down by **gender**, **age band at completion of the qualification**, and for **3, 5, and 7 years post-completion**[111].

6.2.1 Modern Apprenticeships

Considering Modern Apprenticeships, the analysis indicates that there are **strong employment returns to Modern Apprenticeships at Level 2 and 3**[112]. The estimates suggest that men in possession of Modern Apprenticeships at Level 3 (as their highest qualification) are in PAYE employment for between **4.9** and **10.6 percentage points** more of the year than men with comparable characteristics who started but did not complete MAs at Level 3. The corresponding estimates for MAs at Level 2 (compared to MA Level 2 non-completers) range between **5.4** and **16.1 percentage points**.

In contrast to the above findings on marginal earnings returns (see Section 5.2.1), the analysis indicates that **these marginal employment returns tend to be greater for women than for men at Level 3**, with women achieving employment returns of between **5.0** and **12.9 percentage points** at Level 3. At MA Level 2, the employment effect stands at

[109] The HMRC P45 data used for the analysis provides information on contractual employment spells (calculated through a comparison of start dates and end dates) but does not provide information on the actual number of days or hours worked or employment patterns.
[110] In other words, we use the term 'marginal employment returns' to estimate the increased proportion of the year in employment for individuals who hold particular qualifications. This is distinct from an economic return, i.e. a financial reward associated with an investment in (human) capital, which is covered by wage returns in this study.
[111] As with earnings, the employment outcomes for the non-completers counterfactuals (where relevant) are measured 3, 5 and 7 years after dropping out of the particular qualification. Similarly, the different age bands capture the age at which non-completers dropped out of the qualification.
[112] As with the marginal earnings returns (see Section 5.2.1), due to small and unbalanced sample sizes, the estimates for MAs at Levels 4 and 5 were largely suppressed, so are not discussed here.

between **7.4** and **12.5 percentage** points compared to women who did not complete the training[113,114].

6.2.2 First degrees

As with the marginal earnings returns to first degrees (see Section 5.2.2), the analysis indicates that, across all groups of graduates considered, **there are consistently positive employment returns associated with first degrees**, with all results being **highly statistically significant.** We estimate that men in possession of first degrees are in PAYE employment for between **1.9** and **4.6 percentage points** more of the year than men who started but did not complete first degrees. The corresponding estimates for women stand at between **2.6** and **6.4 percentage points**.

Considering the age at which first degrees are attained, in Section 5.2.2, we observed that the highest marginal earnings returns were achieved by graduates who completed their degrees at a relatively young age (i.e. at age 21 or under). However, in contrast to the earnings analysis, the **marginal employment returns to first degrees tend to be larger for individuals who completed degrees relatively later in life**. However, this finding might reflect the different composition of individuals in possession of first degrees by mode of study across the age spectrum. In particular, amongst the older age group, there may be a higher incidence of part-time study, which is often undertaken at the same time as being in employment (either part-time or full-time). Given this, there should be some degree of caution when comparing results by age of completion.

In addition, considering differences between the number of years post-graduation, for the most common age at attainment (age 21 or under), **the employment returns for men tend to decline over time** (from **4.6 percentage points** at 3 years post-graduation to **1.9 percentage points** at 7 years post-graduation). **This decline does not apply to women, for whom we observe relatively consistent employment effects over time** (**3.0 percentage points** at 3 years post-graduation, **3.4 percentage points** at 5 years post-graduation, and **2.7 percentage points** at 7 years post-graduation).

6.2.3 Other higher education undergraduate qualifications

As with the estimated marginal earnings returns (see Section 6.2.3), the analysis indicates that there are **generally positive employment returns associated with other (sub-degree) undergraduate qualifications** (including HNCs and HNDs), relative to the **next highest level of qualification** (except for individuals aged 31 or older, 3 years post-graduation). This applies to **both men and women**, with marginal employment returns reaching up to **5**

[113] Further note that, as with the estimated earnings returns, nearly all employment returns to Modern Apprenticeships 7 years post-completion are suppressed due to small or unbalanced sample sizes.
[114] The analysis in relation to the impact of post-school qualifications on benefit dependency also indicates that Modern Apprenticeships at Levels 2 and 3 substantially reduce the likelihood of being benefit dependent at any point during a given year (see Section 7.2.1 for more information).

- 6 percentage points (whereas the marginal *earnings* returns for men were largely statistically insignificant).

The largest employment boosts – for both men and women – are achieved by individuals attaining other undergraduate qualifications at age 21 or under, which range between **2.2** and **5.6 percentage** points for men, and between **5.9** and **6.4 percentage points** for women.

6.2.4 Postgraduate qualifications

The marginal employment returns to **taught postgraduate qualifications** (relative to possession of first degrees (as the next highest level of qualification)) are **relatively modest**. The analysis indicates that men who completed postgraduate taught qualifications are in PAYE employment for between **2.1** and **3.5 percentage points** more of the year compared to men in possession of first degrees, with the estimates for women ranging between **1.3** and **5.2 percentage points**. The relatively modest returns here are likely to be driven by the fact that individuals in possession of first degrees (i.e. the counterfactual group) are already in PAYE employment for large proportions of the year (close to 100%), leaving limited room for additional employment boosts from postgraduate taught qualifications.

The analysis further suggests that **postgraduate research qualifications are associated with negative marginal employment returns** (although most results are suppressed due to statistical insignificance or insufficient sample size). Again, this outcome is likely partially driven by the relatively high employment probabilities among individuals with first degrees in the counterfactual group. In addition, part of the effect might be a result of the nature of employment amongst individuals in possession of postgraduate research qualifications. In particular, individuals with postgraduate research qualifications are more likely to be employed within the higher education sector (where there is an increasing prevalence of shorter fixed-term, casual or 'atypical' contracts, especially for individuals immediately following the completion of research degrees)[115]. As a result of possible gaps between the end of one academic year (or term) and the start of the next, this may result in a lower percentage of the year with recorded PAYE employment. Moreover, these

[115] Pooled Quarterly Labour Force Survey data for 2006-2019 show a much higher incidence of non-permanent jobs for individuals with postgraduate research degrees: in particular 24.2% of individuals with a postgraduate research degree as their highest qualification are in temporary jobs (the vast majority having a 'contract for fixed period, fixed task'), compared with 11.7% for postgraduate taught qualifications and 9.6% for first degrees (all figures refer to Scottish residents only and are restricted to respondents who achieved their highest qualification in the 10 years before the interview).

individuals may be more likely to spend time working abroad[116], which is not captured in the LEO dataset.[117]

It is also important to note that the negative effects are relatively small in absolute size (and amount to approximately 10 fewer days spent in employment in a given year) and that the negative employment returns to postgraduate research qualifications are partially offset by the strong earnings returns associated with these qualifications (see Section 5.2.4)[118].

6.2.5 Vocational qualifications

Overall, the analysis of the marginal employment returns to vocational qualifications (relative to the non-completer counterfactual) produced **mixed results**.

Employment **estimates for vocational qualifications at SCQF Level 8 and above and at Level 7** are generally unavailable apart from the older age band: for men having achieved their qualification at age 31 and above, the estimated employment returns were positive and range between **3.4** and **4.7** percentage points (Level 8 and above) and **5.6** and **6.5** percentage points (Level 7). For women, the comparable estimates ranged between **2.7** and **4.0** percentage points.

The analysis also indicates that there tend to be **positive but modest employment returns to vocational qualifications at SCQF Levels 5 and 6**, for both men and women. For example, the analysis suggests that men in possession of SCQF Level 5 vocational qualifications are in PAYE employment for between **6.0** and **10.8 percentage points** more

[116] Recent evidence from English LEO data (link) shows that 5 years after graduation 12.1% of those holding a postgraduate research qualification are recorded as 'Activity not captured', compared with 9.1% for postgraduate taught and 7.7% for first degree graduates. The 'Activity not captured' category identifies graduates who have been successfully matched to the DWP Customer Information System but do not have any employment, out-of-work benefits or further study records in the tax year of interest. Reasons for appearing in this category include moving out of the UK after graduation for either work or study, earning below the Lower Earnings Limit or voluntarily leaving the labour force.
Also, using English LEO data, DfE research Report 996 (link) shows a small positive effect (0.9 ppt and only statistically significant at the 10% level) on sustained employment rates by the age of 35 for males holding a PhD and a negative effect for females (-1.8 ppts) at the same point in time. Results are not directly comparable due to methodological differences and differences in the type of available data (e.g. on prior attainment).

[117] Note that the analysis of marginal benefit dependency returns (presented in Section 7) indicates that individuals with postgraduate research qualifications are less likely to be benefit dependent than individuals in possession of first degrees. This suggests that the negative marginal employment returns observed here reflect increased economic inactivity (i.e. potentially being between jobs) rather than structural unemployment, thus supporting the hypothesis that these individuals might be in between jobs as a result of contractual arrangements.

[118] Further note that, in spite of the negative marginal employment returns to postgraduate research qualifications, the analysis in relation to benefit dependency (Section 7.2.4) indicates that the attainment of a postgraduate research qualification reduces individuals' likelihood of being dependent on public welfare benefits in a given year, by **between 2.5 and 4.7 percentage points** for men, and **between 1.2 and 3.3 percentage points** for women. This suggests that the employment outcome relates to frictions in the labour market (i.e. being between jobs or employers) as opposed to being of a more structural issue.

of the year than SCQF Level 5 male non-completers (as their highest attainment), with the estimates for women ranging between **3.3** and **12.2 percentage points**. Men in possession of SCQF Level 6 vocational qualifications are in PAYE employment for between **2.0** and **5.4 percentage points** more of the year compared to SCQF Level 6 male in non-completers (as their highest attainment). The comparable estimates for women range between **3.1** and **7.6 percentage points**.

The marginal employment returns associated with vocational qualifications at SCQF Level 4 (obtained after the age of 21 and compared to SCQF Level 4 non-completers) were estimated to be **positive and significant,** ranging from between **4.3** and **13.3 percentage points** for women and between **4.3** and **10.4** for men.

Table 18 Marginal employment returns to post-school qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Counterfactual	Age at completion and years post-completion								
		<=21			22-30			31+		
		3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men										
Postgraduate (research)	First degree				-3.8	-3.3	-	-	-	-
Postgraduate (taught)	First degree	3.3	2.4	2.6	2.3	2.1	3.0	3.5	2.6	2.1
First degree	First degree non-completers*	4.6	2.5	1.9	3.9	2.8	2.1	4.2	4.5	4.3
Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	2.2	4.6	5.6	-	-	-	-1.3	-	-
SCQF Full Vocational Level 8+	SCQF Level 8+ non-completers*	-	-	10.4	-	-	-	3.4	4.7	4.3
MA Level 4/5	MA Level 3							2.1	-	^
SCQF Full Vocational Level 7	SCQF Level 7 non-completers*	-	-	-	-5.2	-	-	6.5	6.5	5.6
Highers (at college, incl. Advanced Highers)	SCQF Full Vocational Level 5	-	-	-	-	-	-	-8.2	-8.6	^
MA Level 3	MA Level 3 non-completers*	10.6	7.0	6.6	6.7	4.9	-	6.0	6.6	^
SCQF Full Vocational Level 6	SCQF Level 6 non-completers*	4.1	-	-	5.4	-	-	2.0	-	-
MA Level 2	MA Level 2 non-completers*	11.7	10.5		16.1			5.4	-	
SCQF Full Vocational Level 5	SCQF Level 5 non-completers*	8.9	8.0	6.4	9.6	9.8	10.8	9.4	6.9	6.0
SCQF Full Vocational Level 4	SCQF Level 4 non-completers*	10.8	9.7	7.4	10.4	6.9	-	9.5	6.5	4.3
Women										
Postgraduate (research)	First degree				-5.3	-4.1	-	-3.9	-3.8	-
Postgraduate (taught)	First degree	5.0	5.2	4.0	2.5	1.7	2.4	1.4	1.3	-
First degree	First degree non-completers*	3.0	3.4	2.7	5.9	4.4	2.6	6.4	6.1	5.6
Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	6.0	5.9	6.4	2.7	4.6	-	-1.0	-	1.7
SCQF Full Vocational Level 8+	SCQF Level 8+ non-completers*	-	13.4	-	7.3	5.6	9.4	-	2.9	2.7
MA Level 4/5	MA Level 3							-	-	-
SCQF Full Vocational Level 7	SCQF Level 7 non-completers*	-	-11.9	-	6.2	-	12.1	3.4	3.3	4.0
Highers (at college, incl. Advanced Highers)	SCQF Full Vocational Level 5	3.1	2.6	^	-	-	-	-4.1	-3.2	-3.1
MA Level 3	MA Level 3 non-completers*	12.6	12.9	^	7.3	6.9	^	5.0	7.0	-
SCQF Full Vocational Level 6	SCQF Level 6 non-completers*	5.2	7.6	6.2	5.1	-	-	3.7	4.5	3.1
MA Level 2	MA Level 2 non-completers*	12.2	12.5		11.4			7.4	-	
SCQF Full Vocational Level 5	SCQF Level 5 non-completers*	9.8	9.8	8.1	12.2	10.1	9.5	4.4	4.0	3.3
SCQF Full Vocational Level 4	SCQF Level 4 non-completers*	11.6	10.0	15.2	7.9	13.3	7.2	4.3	5.4	4.8

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.

* The employment outcomes for the non-completers counterfactuals (where relevant) are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification. Age measured at the start of the final academic year.

Source: London Economics' analysis of Scottish LEO data

6.3 In-depth analysis of the employment returns to first degrees

This section outlines the results from the disaggregated analyses of the marginal employment returns to first degrees. As with the above-presented high-level returns to degrees, all of these disaggregated analyses are **estimated relative to first degree non-completers as the relevant counterfactual**.

6.3.1 Differences by ethnicity

Table 19 presents the marginal employment returns to first degrees for white and non-white individuals (again in addition to the previous disaggregation by gender, age band at completion, and years since completion).

Table 19 Marginal employment returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, ethnicity, and age at completion

Gender and ethnicity	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
White	4.2	2.3	2.2	3.7	2.5	-	4.2	4.1	3.5
Non-white	12.7	12.2	-	6.6	-	9.9	-	-	
Women									
White	2.6	3.1	2.6	5.7	4.6	2.3	6.7	6.2	5.6
Non-white	12.6	10.1		9.2	-		-	-	

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

As with the earnings returns (discussed in Section 5.3.1), due to limited sample sizes available for the non-white group (particularly for non-completers), a number of results were suppressed. However, where identifiable, the results indicate that **the employment returns to first degrees are substantially greater for non-white graduates than for white graduates** (mirroring the findings in relation to earnings). For example, the analysis estimates that **white men** who completed first degrees at age 21 or under (as their highest qualification) are in PAYE employment for **2.3 percentage points** more of the year (5 years after completing the degree[119]) compared to white men who started but did not complete their degrees. The comparable return for **non-white men** was estimated at **12.2**

[119] Or dropping out of the degree (for non-completers).

percentage points. The estimates for women stood at **3.1 percentage points** (white women) and **10.1 percentage points** (non-white women).

6.3.2 Differences by subject of study

As with earnings returns, we further disaggregated the analysis of employment returns by subject of study[120]. Again, the analysis for STEM subjects was originally undertaken both including and excluding Medicine and Dentistry; however, here, we only present the results for STEM subjects *excluding* Medicine and Dentistry.

Table 20 Marginal employment returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, subject of study, and age at completion

Gender and subject group	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
STEM subjects*	6.0	3.1	2.4	5.8	2.9	3.2	4.2	3.0	3.7
AHSS subjects	3.5	1.8	-	2.7	3.9	^	3.6	5.4	^
Other subjects	5.1	3.9	-	-	-	-	5.0	7.1	-
Women									
STEM subjects*	4.6	3.9	3.1	7.3	4.8	3.2	6.8	5.3	5.0
AHSS subjects	2.2	3.5	^	4.1	2.9	-	3.3	6.1	5.5
Other subjects	4.6	2.8	-	8.9	9.5	6.1	6.8	7.1	6.9

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. See Table 1 for information on subject groups. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
*Note that Medicine and Dentistry are excluded from STEM subjects (as well as any of the other subject groups).
Source: London Economics' analysis of Scottish LEO data

As presented in Table 20, similar to the analysis relating to earnings[121], **the employment returns to first degrees in STEM subjects** (excluding Medicine and Dentistry) **are generally higher than the corresponding returns to degrees in AHSS subjects**. For example, for **men**, achieving a first degree in **STEM** (as compared to starting but not completing a degree in a STEM-related subject) at age 21 or under was associated with a **6.0 percentage point** employment boost (3 years post-completion). This compares to a **3.5 percentage point** effect for men completing first degrees in an **AHSS** subject (compared to

[120] See Section 2.2.2 (Table 1) for more information on these subject groups.
[121] See Section 5.3.2.

starting but not completing a degree in an AHSS subject). For **women**, the corresponding returns stand at **4.6 percentage points** (**STEM** subjects) and **2.2 percentage points** (**AHSS** subjects).

As with the analysis relating to earning outcomes, there are also substantial marginal employment returns associated with first degrees in **other subjects**[122], for both male and female graduates. Whilst more generally statistically insignificant for men, first degree returns for women in 'other' subjects are generally larger than the employment returns in either STEM or AHSS subjects.

6.3.3 Differences by type of Higher Education Institution

Table 21 presents our findings on the marginal earnings returns to first degrees from different groups of Scottish Higher Education Institutions, including **ancient, pre-1992** (excluding ancient) **and post-1992 institutions,** as well as **Colleges**[123, 124].

In contrast to the marginal earnings returns (see Table 14 in Section 5.3.3), the employment returns for individuals completing first degrees at ancient institutions (compared to non-completers) are typically lower for younger women compared with individuals who attended pre-1992 or post-1992 institutions. For instance, **women aged 21 or younger** who attended an **ancient** institution have **employment returns of 2.6 percentage points compared with returns of 3.3 and 4.7 percentage points for pre-1992 and post-1992 institutions**, respectively (3 years post-graduation). On the other hand, women aged 30 or above see that employment returns are higher for ancient institutions compared with pre-1992 or post-1992 institutions. For men, employment returns are typically higher for ancient institutions across all age groups (with the exception of individuals aged 21 or younger, 3 years post-graduation).

In terms of pre-and post-1992 institutions, mirroring the findings in terms of earnings, the analysis suggests that amongst those attaining their qualification after the age of 22, **the employment returns achieved by individuals in possession of first degrees from pre-1992 institutions generally exceed the returns posted by individuals in possession of first degrees obtained from post-1992 universities**. For example, focusing on completion between the ages of 22 and 30, 3 years post-graduation, men with degrees from **pre-1992 universities** achieve a **5.0 percentage point** employment boost compared to individuals who dropped out of degrees at these institutions. The estimate for men with first degrees from **post-1992 universities** (compared to non-completers at these institutions) stands at **3.9 percentage points**. The corresponding estimates for women are **6.7 percentage points** (pre-1992 institutions) and **5.9 percentage points** (post-1992 institutions). A similar

[122] These include education and training, psychology, geographical and environmental studies, sport and exercise sciences, and combined and general studies. Again, see Section 2.2.2 (Table 1) for more information.
[123] Again, see Section 2.2.2 (Table 2) for more information on these HEI groups.
[124] As with the marginal earnings returns, due to insufficient sample sizes, all marginal employment returns for first degrees from Colleges have been suppressed (since the number of students undertaking first degrees at Colleges is typically very small).

outcome is identified for men acquiring first degrees at age 21 or under; however, interestingly, for women attending pre-1992 institutions, the employment effect was smaller than the comparable effect identified for women completing first degrees at post-1992 institutions.

Table 21 Marginal employment returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, type of HEI, and age at completion

Gender and type of HEI	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Ancient institutions	4.3	4.0	-	6.3	5.3	-	7.6	-	
Pre-1992 institutions	5.8	3.4	-	5.0	3.0	-	3.8	4.9	3.4
Post-1992 institutions	5.3	2.5	2.3	3.9	3.0	2.9	3.8	4.0	6.1
Colleges	-								
Women									
Ancient institutions	2.6	2.3	-	6.3	-	-	14.1	15.4	11.0
Pre-1992 institutions	3.3	3.0	2.7	6.7	6.0	-	6.1	7.2	6.1
Post-1992 institutions	4.7	5.1	^	5.9	4.3	-	5.0	3.2	3.4
Colleges							-		

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. See Table 2 for information on HEI types. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

6.3.4 Differences by educational pathway

Table 22 presents the estimated employment returns **separately for individuals who achieved first degrees after attaining prior qualifications at Scottish Colleges and for individuals who achieved first degrees through 'other' (i.e. non-College) routes**. The main caveats underlying the analysis are discussed in detail in section 5.3.4.

It is important again to note that throughout this analysis by pathway, due to sample size limitations, we were unable to disaggregate the counterfactual group (i.e. first-degree non-completers) by the corresponding educational pathway. In other words, the analysis was undertaken **relative to an *aggregate* counterfactual group of first degree non-completers** (irrespective of whether individuals in the counterfactual group had started

their degrees after prior attainment at Colleges, or had gone through other non-College routes)[125].

Table 22 Marginal employment returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender and attainment through the College vs. non-College route

Gender and educational pathway	Years post-completion		
	3 years	5 years	7 years
Men			
Non-College route	3.7	2.1	-
College route	2.1	-	^
Women			
Non-College route	4.9	4.8	^
College route	3.9	-	-

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
The analysis was restricted to individuals who completed first degrees at age 20 to 25, between 2009/10 and 2013/14. Individuals were grouped into the College vs. the non-College route based on whether they had previously achieved qualifications at a College prior to or at the age of 22. Due to sample size restrictions, the counterfactual group was *not* disaggregated by educational pathway.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

In half the instances, the results were either suppressed or statistically insignificantly different from zero. However, where identified (i.e. 3 years post-completion), the analysis suggests that the **marginal employment returns associated first degrees attained through the College route and the non-College route** are positive, albeit with the non-college route showing slightly higher employment returns than the college route. Specifically, we estimate that **men** who attain a first degree after attaining prior qualifications at **College** achieve a **2.1 percentage point** employment boost 3 years post-completion, compared to **3.7 percentage points** for men completing a first degree though the **non-College route**. The effect for women who attained first degrees through the **College route** was estimated at **3.9 percentage points**, while the comparable return associated with the **non-College route** is **4.9 percentage points**.

[125] The analysis was restricted to a specific sub-sample of the Scottish LEO data. See Section 3.3 for more information.

6.4 In-depth analysis of the employment returns to Modern Apprenticeships

The following sections present our results from the disaggregated analyses of marginal employment returns to Modern Apprenticeships (at Levels 2 and 3[126]). This includes a breakdown **by subject of study** as well as the **location of the off-the-job training component** of the Modern Apprenticeship (distinguishing whether the off-the-job training was undertaken at a Scottish College or private education provider)[127]. As with the aggregate returns to Modern Apprenticeships (see Section 6.2.1), these disaggregated analyses are **based on MA non-completers** (at Level 2 and 3, respectively) as the relevant counterfactual.

6.4.1 Differences by subject of study

As with earnings, given that the Scottish LEO data includes only relatively small sample sizes for MA non-completers disaggregated by subject area, many of the results on the marginal employment returns to Modern Apprenticeships for different subjects were suppressed (see Table 23)[128].

The marginal employment returns to Modern Apprenticeships at Level 3 do not display a general pattern in terms of a certain subject group being larger or smaller than another group, with more mixed results. To take an example, men in possession of **STEM-related MAs** at Level 3 (completed at age 21 or under) achieve a **12.0 percentage point** employment boost relative to individuals who drop out of Level 3 MAs in STEM (3 years after completion/drop-out). This compares to **7.0** and **7.3 percentage points** for both AHSS and 'other' subjects, respectively[129]. The corresponding returns for women were estimated to be **9.0 percentage points** (**STEM subjects**), **12.2 percentage points** (**AHSS subjects**), and **12.3 percentage points** (**other subjects**).

As with marginal earnings returns (see Section 5.4.1), **the estimates by subject for Modern Apprenticeships at Level 2 were more commonly suppressed**, although where identified, the employment returns were strong and positive, with STEM Modern Apprenticeships providing a larger employment boost in general that AHSS or other MAs. Taking an example, men in possession of **STEM-related MAs** at Level 2 (completed at age 21 or under) achieve a **16.0 percentage point** employment boost relative to individuals who drop out of Level 3 MAs in STEM (3 years after completion/drop-out). This compares to **8.8 percentage points** for 'other' subjects. The corresponding returns for women were

[126] Again, due to small and unbalanced sample sizes, the aggregate estimates for MAs at Levels 4 and 5 were largely suppressed, so no further disaggregation was undertaken.
[127] Again, due to small sample sizes, a disaggregation of the returns to Modern Apprenticeships by ethnicity was not achievable.
[128] Note that the exclusion of Medicine and Dentistry subjects (from the STEM subject group) is again not applicable here, since there are no Modern Apprenticeships offered in these subjects.
[129] For example, these include Personal Services; Food and Drink; Hospitality and Tourism; selected frameworks in Sport, Health and Social Care; Retail and Customer Service; and Transport and Logistics. Again, see Section 2.2.2 (Table 1) for more information.

estimated to be **19.0 percentage points** (**STEM subjects**), **11.7 percentage points** (**AHSS subjects**), and **12.2 percentage points** (**other subjects**).

Table 23 Marginal employment returns to Modern Apprenticeships (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, level, subject of study, and age at completion

Gender, level and subject group	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
MA Level 3									
Men									
STEM subjects	12.0	7.0	6.1	7.8	5.7	-	7.0	6.4	^
AHSS subjects	7.0	7.6					-	6.1	^
Other subjects	7.3	6.7	^	5.3	-	-	6.4	7.2	-
Women									
STEM subjects	9.0	15.7		16.7	12.3		9.5	11.2	^
AHSS subjects	12.2	14.0	^				-	5.1	-
Other subjects	12.3	11.1	^	-	-	-	4.1	4.5	-
MA Level 2									
Men									
STEM subjects	16.0	12.5					22.3	^	
AHSS subjects									
Other subjects	8.8	8.4		14.6			3.2	-	
Women									
STEM subjects	19.1	19.8					11.4	11.5	
AHSS subjects	11.7	13.6							
Other subjects	10.2	11.4					3.5	-	

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. See Table 1 for information on subject groups. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

6.4.2 Differences by type of off-the-job training

Finally, Table 24 presents the marginal employment returns to Level 2 and Level 3 MAs depending on the location of the off-the-job training component of the Modern Apprenticeship (again distinguishing whether the off-the-job training was undertaken at a Scottish College or private education provider).

Table 24 Marginal employment returns to Modern Apprenticeships (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, level, location of off-the-job training component, and age at completion

Gender, level and location of off-the-job training	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
MA Level 3									
Men									
Not at College	9.2	6.3	6.4	7.7	6.3	-	6.4	7.0	^
At College	14.3	9.4	^	-	-		-	-	
Women									
Not at College	12.3	13.0	^	7.1	7.7	^	5.2	7.2	^
At College	15.0	11.1					-		
MA Level 2									
Men									
Not at College	10.5	10.5		16.1			5.1	-	
At College	16.9								
Women									
Not at College	12.5	11.8					7.8	-	
At College	12.4	^							

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment. The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

Mirroring the findings with respect to earnings (see Section 5.4.2), the limited sample sizes for MAs (particularly for non-completers) result in many estimates being suppressed; however, where available, the analysis suggests that there are very substantial employment returns to Level 3 MAs undertaken at College *as well as* at private training providers (i.e. 'not at College'). The analysis also suggests that, where identifiable, **the returns to MAs with off-the-job training components undertaken at Colleges are at least as large, or slightly larger, than the returns to MAs undertaken at private providers**.

For example, men in possession of Level 3 MAs (completed at age 21 or under, 3 years post-graduation) whose off-the-job training component was delivered at a **College** achieve a **14.3 percentage point** increase in the proportion of the year in PAYE employment relative to individuals who drop out of Level 3 MAs (at College), while the corresponding estimate for women stands at **15.0 percentage points**. On the other hand, for learners

undertaking Level 3 MAs at a **private provider**, the estimated employment effects were around **9.2 percentage points** for males and **12.3 percentage points** for females.

As with earnings, **the employment results by provider type for Modern Apprenticeships at Level 2 were largely suppressed**; however, where identified, the findings again illustrate the substantial employment effects associated with Modern Apprenticeships gained at both College (**16.9** and **12.4 percentage points** for men and women, respectively) and private training providers (**10.5** and **12.5 percentage points** for men and women (respectively)).

7 Findings: Impact of post-school education and training on benefit dependency

In this section, we present our findings from the analysis of the marginal benefit dependency returns to post-school education and skills attainment in Scotland.

The structure of this section exactly mirrors the presentation of marginal earnings returns in Section 5 and of marginal employment returns in Section 6. Section **7.1** provides guidance on how each of these results should be interpreted. In section **7.2**, we again first provide relatively **aggregated effects** for all post-school qualifications considered. In section **7.3**, we then present **disaggregated analyses of the marginal benefit dependency returns to first degrees** (again including a breakdown by ethnicity, subject area, type of HEI, and prior educational pathway), followed by **disaggregated results for the marginal benefit dependency returns to Modern Apprenticeships** (including a breakdown by subject area and location of off-the-job training component) in section **7.4**.

Annex A4.3 then provides **supplementary results** on the marginal benefit dependency returns to first degrees by study mode, and the returns to other higher education qualifications, broken down by subject and type of Higher Education Institution attended.

7.1 Interpretation of benefit dependency returns

As with the marginal earnings and employment returns (presented in Sections 5 and 6, respectively), for the benefit dependency returns, we again apply the same **three rules that determine which results are suppressed in each of the different tables**:

1. **Blank cells** denote results where the underlying **sample size of the treatment or counterfactual group is 100 or fewer** (i.e. where there are 100 or fewer individuals in possession of the relevant post-school qualification or the corresponding counterfactual level of qualification);
2. **Cells including a hyphen (-)** denote results that are **statistically insignificant at the 10% threshold** (i.e. indicating that the benefit dependency returns to the given post-school qualification are not significantly different from zero); and
3. **Cells including a caret (^)** denote results that are based on **unbalanced samples**, where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is **less than 33.3% of the corresponding sample size at 3 years post-graduation**.

In terms of interpreting the remaining (i.e. non-suppressed) findings, each result represents the **percentage point difference in the likelihood of receiving active labour market benefits[130] at any point in a given year between the treatment and counterfactual**, i.e. between those in possession of the relevant post-school qualification as compared to the next highest level of qualification or to individuals who started but did

[130] Again, this includes including the Job Seekers' Allowance, Income Support, the Employment and Support Allowance or the JUVOS Training Allowance.

not complete the given post-school qualification (depending on the counterfactual group of interest). For example, a marginal benefit dependency return of **-5.0** implies that individuals in possession of the given post-school qualification (as their highest attainment) are **5.0 percentage points** less likely to be in receipt of active labour market benefits in a given year than individuals in the relevant counterfactual group.

Note that, given the expected negative correlation between qualification attainment and benefit dependency (and in contrast to the marginal earnings and employment returns), any 'positive' estimates (i.e. adverse effects on benefit dependency) are presented in red font, and 'negative' estimates are presented in black font.

7.2 Aggregate benefit dependency returns for all qualification levels

7.2.1 Modern Apprenticeships

The analysis presented in Table 25 indicates that there is a **strong association between completion of Level 2 and Level 3 Modern Apprenticeships and lower benefit dependency**[131]. The estimates suggest that men in possession of Modern Apprenticeships at Level 3 (as their highest qualification) are between **5.4** and **19.1 percentage points** less likely to be in receipt of active labour market benefits compared to men who started but did not complete MAs at Level 3. The corresponding estimates for MAs at Level 2 (compared to MA Level 2 non-completers) range between **5.0** and **27.1 percentage points**.

The findings also indicate that **these marginal benefit dependency returns tend to be smaller for women than for men (at Level 3)**. Specifically, women completing a Modern Apprenticeship at Level 3 are between **3.8** and **13.4 percentage points** less likely to be benefit dependent compared to non-completers. The corresponding estimates associated with completion of Modern Apprenticeships at Level 2 stand at between **3.3** and **14.3 percentage points**[132].

7.2.2 First degrees

As with the marginal employment returns to first degrees (see Section 6.2.2), the analysis indicates that across all groups of graduates considered, **there are consistently positive benefit dependency effects associated with first degrees** (and the majority of results are **highly statistically significant**). The analysis suggests that men in possession of first degrees are between **2.9** and **5.8 percentage points** less likely to be benefit dependent compared to men who started but did not complete first degrees. The corresponding estimates for women stand at between **3.0** and **6.3 percentage points**. For both men and women, the largest benefit dependency effects are generally experienced by individuals completing their first degree between the ages of 22 and 30.

[131] As with the marginal earnings and employment returns, due to small and unbalanced sample sizes, the estimates for MAs at Levels 4 and 5 were largely suppressed, so are not discussed here.
[132] Further note that, as with the estimated earnings and employment returns, most benefit dependency returns to Modern Apprenticeships 7 years post-completion are suppressed due to small or unbalanced sample sizes.

7.2.3 Other undergraduate qualifications

There are also **consistently positive benefit dependency effects associated with other undergraduate qualifications** (including HNCs and HNDs), relative to the **next highest level of qualification** (i.e. vocational qualifications at SCQF Level 6). With the exception of one occurrence where there is a small negative impact on benefit dependency, the analysis suggests that men in possession of other undergraduate qualifications are between **3.2** and **8.4 percentage points** less likely to be benefit dependent than men in possession of vocational qualifications at SCQF Level 6. The corresponding estimates for women range between **2.2** and **6.6 percentage points**.

Mirroring the analysis relating to employment effects, the largest benefit dependency impacts – for both men and women – are achieved by individuals attaining other undergraduate qualifications at age 21 or under, ranging between **5.6** and **8.4 percentage** points for men, and between **4.1** and **6.6 percentage points** for women.

Table 25 Marginal benefit dependency returns at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Counterfactual	Age at completion and years post-completion								
		<=21			22-30			31+		
		3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men										
Postgraduate (research)	First degree				-3.8	-3.5	-2.5	-4.7	-3.4	-3.6
Postgraduate (taught)	First degree	-1.8	-2.1	-1.4	-2.5	-2.7	-2.0	-3.4	-2.4	-2.5
First degree	First degree non-completers*	-3.9	-3.1	-2.9	-5.8	-5.3	-3.3	-3.9	-3.5	-3.1
Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	-7.1	-8.4	-5.6	-4.2	-3.2	-	-	1.0	-
SCQF Full Vocational Level 8+	SCQF Level 8+ non-completers*	-	-8.6		-			-2.8	-	-2.8
MA Level 4/5	MA Level 3							-2.4	-2.3	^
SCQF Full Vocational Level 7	SCQF Level 7 non-completers*	-6.9	-8.9	-16.9	-	-6.0	-7.0	-3.0	-	-3.5
Highers (at college, incl. Advanced Highers)	SCQF Full Vocational Level 5									
MA Level 3	MA Level 3 non-completers*	-19.1	-12.4	-8.7	-12.3	-7.8	^	-6.4	-5.4	^
SCQF Full Vocational Level 6	SCQF Level 6 non-completers*	-6.2	-3.8	-6.1	-8.1	-3.4	-	-3.8	-1.7	-
MA Level 2	MA Level 2 non-completers*	-15.5	-9.4		-27.1			-6.8	-5.0	
SCQF Full Vocational Level 5	SCQF Level 5 non-completers*	-8.9	-8.2	-6.9	-8.6	-9.8	-8.3	-6.0	-3.0	-3.6
SCQF Full Vocational Level 4	SCQF Level 4 non-completers*	-7.3	-9.6	-12.0	-15.7	-8.0	-10.3	-6.6	-4.1	-4.1
Women										
Postgraduate (research)	First degree				-3.3	-2.8	-2.0	-2.4	-1.4	-1.2
Postgraduate (taught)	First degree	-1.2	-2.1	-2.0	-1.4	-1.8	-1.6	-0.9	-1.3	-1.0
First degree	First degree non-completers*	-3.5	-4.0	^	-6.3	-3.3	-4.0	-4.2	-4.0	-3.0
Other undergraduate (incl. HNC & HND)	SCQF Full Vocational Level 6	-6.6	-4.7	-4.1	-2.9	-2.2	-	-	-	-
SCQF Full Vocational Level 8+	SCQF Level 8+ non-completers*				-9.1	-	-	-2.4	-	-2.5
MA Level 4/5	MA Level 3							-	-	-
SCQF Full Vocational Level 7	SCQF Level 7 non-completers*	-9.3			-	-		-2.1	-	-3.5
Highers (at college, incl. Advanced Highers)	SCQF Full Vocational Level 5									
MA Level 3	MA Level 3 non-completers*	-13.4	-9.4	^	-8.8	-	^	-6.2	-3.8	^
SCQF Full Vocational Level 6	SCQF Level 6 non-completers*	-7.2	-6.9	-10.5	-6.5	-3.9	-6.7	-3.0	-2.8	-1.8
MA Level 2	MA Level 2 non-completers*	-14.3	-10.1		-			-6.6	-3.3	
SCQF Full Vocational Level 5	SCQF Level 5 non-completers*	-10.5	-11.5	-10.4	-10.5	-10.6	-10.0	-4.6	-3.0	-1.5
SCQF Full Vocational Level 4	SCQF Level 4 non-completers*	-9.5	-11.0	-14.8	-8.6	-7.5	-	-4.6	-4.2	-2.5

Note: * The benefit receipts for the non-completers counterfactuals (where relevant) are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification. Age measured at the start of the final academic year.
Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year. ***Source: London Economics' analysis of Scottish LEO data***

7.2.4 Postgraduate qualifications

The marginal benefit dependency effect associated **taught postgraduate qualifications** (relative to possession of first degrees (as the next highest level of qualification)) are **relatively modest**. The analysis indicates that men who completed postgraduate taught qualifications are between **1.4** and **3.4 percentage points** less likely to be in receipt of benefits compared to men in possession of first degrees. The corresponding estimates for women range between **0.9** and **2.1 percentage points**. As with the results relating to employment outcomes (see Section 6.2.4), these relatively modest benefit dependency returns are likely to be driven by the fact that individuals in possession of first degrees (i.e. the counterfactual group) are already relatively unlikely to be in receipt of active labour market benefits.

In contrast to the analysis relating to employment, the analysis suggests that **postgraduate research qualifications are associated with small reductions in the likelihood of being benefit dependent.** The analysis indicates that men who completed postgraduate research qualifications are between **2.5** and **4.7 percentage points** less likely to be in receipt of benefits compared to men in possession of first degrees. The corresponding estimates for women range between **1.2** and **3.3 percentage points**. Combined with the findings suggesting a reduced proportion of the year in employment associated with postgraduate research qualifications (Section 6.2.4), this suggests that these qualifications result in a greater likelihood of economic inactivity (potentially resulting from a higher incidence of being 'in between jobs' as a result of contractual arrangements[133]).

7.2.5 Vocational qualifications

Overall, the analysis of the marginal benefit dependency effects to vocational qualifications (relative to the non-completer counterfactual) are **relatively strong**.

The analysis indicates that there tend to be **significant positive benefit dependency outcomes associated with vocational qualifications at SCQF Levels 5 and 6**, for both men and women. The analysis suggests that men in possession of SCQF Level 5 vocational qualifications are between **3.0** and **9.8 percentage points** less likely to be benefit dependent compared to SCQF 5 non-completers, with the estimates for women ranging between **1.5** and **11.5 percentage points**. Similarly, men in possession of SCQF Level 6 vocational qualifications are between **1.7** and **8.1 percentage points** less likely to be benefit dependent compared to SCQF 5 non-completer men. The comparable estimates for women range between **1.8** and **10.5 percentage points**.

The benefit dependency effects associated with vocational qualifications at SCQF Level 4 were identified to be **similarly or slightly stronger,** ranging from between **4.1** and **15.7 percentage points** for men and between **2.5** and **14.8 percentage points** for women.

[133] Again, see Section 6.2.4 for a more detailed discussion.

7.3 In-depth analysis of the benefit dependency returns to first degrees

7.3.1 Differences by ethnicity

Table 26 presents the marginal benefit dependency returns to first degrees for white and non-white learners (again disaggregated by gender, age band at completion, and years since completion).

As with employment returns (see Section 6.3.1), due to limited sample sizes available for the non-white group (particularly for non-completers), most of the results were suppressed. However, in the three instances where results were identified (at 3 years post completion for women), the analysis suggests that the benefit dependency returns to first degrees are slightly greater for non-white graduates than for white graduates (mirroring the findings in relation to earnings and employment). Specifically, the analysis estimates that **white women** who completed first degrees at age 21 or under (as their highest qualification) are **3.6 percentage points** less likely to be benefit dependent (3 years after completing the degree[134]) compared to white women who started but did not complete their first degrees. The comparable return for **non-white women** was estimated to be **4.8 percentage points**.

Table 26 Marginal benefit dependency returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, ethnicity, and age at completion

Gender and ethnicity	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
White	-4.0	-3.1	-2.9	-6.1	-5.7	^	-4.1	-3.5	-3.1
Non-white	-	-		-	-		-		
Women									
White	-3.6	-4.0	^	-6.3	-3.5	-4.1	-4.1	-3.8	-2.9
Non-white	-4.8	-		-6.9			-5.3		

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. Control variables include disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

[134] Or dropping out of the degree (for non-completers).

7.3.2 Differences by subject of study

Table 27 presents benefit dependency effects by subject of study (again grouped into **STEM subjects, AHSS subjects, and other subjects**[135]). Again, we present the results for STEM subjects *excluding* Medicine and Dentistry.

Table 27 Marginal benefit dependency returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, subject of study, and age at completion

Gender and subject group	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
STEM subjects*	-4.0	-3.2	-3.2	-5.6	-4.6	-4.1	-3.8	-4.5	-3.4
AHSS subjects	-3.5	-2.9	^	-5.6	-5.9	-	-4.2	-	^
Other subjects	-4.8	-2.8	^	-4.7	-5.4	-	-3.3	-	-
Women									
STEM subjects*	-3.9	-4.4	^	-6.8	-3.2	-2.8	-4.4	-3.8	-3.4
AHSS subjects	-2.6	-3.4	^	-4.9	-2.9	^	-2.4	-6.1	-4.4
Other subjects	-5.5	-4.2	^	-7.9	-7.0	^	-5.7	-4.3	-

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
*Note that Medicine and Dentistry are excluded from STEM subjects (as well as any of the other subject groups).
Source: London Economics' analysis of Scottish LEO data

Mirroring the findings in relation to employment (see Section 6.3.2), **the benefit dependency returns to first degrees in STEM subjects** (excluding Medicine and Dentistry) **are generally greater than the corresponding returns to degrees in AHSS subjects** (in those cases where the results are identified). For example, for **men**, achieving a first degree in a **STEM subject** (as compared to starting but not completing a first degree in a STEM subject) at or below the age of 21 was associated with a **3.2 percentage point benefit dependency** effect (5 years post-completion), compared to a **2.9 percentage point** effect for men completing first degrees in an **AHSS** subject. For **women**, the corresponding benefit dependency effects stand at **4.4 percentage points** (**STEM** subjects) and **3.4 percentage points** (**AHSS** subjects).

[135] Again, see Section 2.2.2 (Table 1) for more information on these subject groups.

There are also positive marginal benefit dependency returns associated with first degrees in **other subjects**[136], for both female and male graduates.

7.3.3 Differences by type of Higher Education Institution

Table 28 presents our findings on the marginal benefit dependency returns to first degrees from different groups of Scottish Higher Education Institutions, again including **ancient, pre-1992** (excluding ancient) **and post-1992 institutions**, as well as **Colleges**[137] [138].

Table 28 Marginal benefit dependency returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, type of HEI, and age at completion

Gender and type of HEI	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Ancient institutions	-3.4	-4.1	^	-10.1	-8.5	-	-5.9	-	
Pre-1992 institutions	-3.0	-3.6	-3.8	-7.1	-5.9	^	-4.1	-3.5	-2.9
Post-1992 institutions	-4.4	-2.5	^	-4.4	-4.6	^	-3.3	-4.3	-3.9
Colleges									
Women									
Ancient institutions	-4.0	-5.1	^	-9.4	-5.7	^	-8.9	-13.9	-8.1
Pre-1992 institutions	-3.2	-1.8	-1.7	-7.3	-3.2	-4.5	-4.2	-2.9	-2.4
Post-1992 institutions	-3.5	-5.0	^	-5.0	-3.1	-2.8	-4.0	-4.4	-3.5
Colleges									

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

The benefit dependency returns estimated for **ancient institutions are relatively strong and are typically greater than the returns for pre-1992 or post-1992 institutions**. Overall,

[136] These include education and training, psychology, geographical and environmental studies, sport and exercise sciences, and combined and general studies. Again, see Section 2.2.2 (Table 1) for more information.
[137] See Section 2.2.2 (Table 2) for more information on these HEI groups.
[138] As with earnings and employment returns, due to insufficient sample sizes, all employment returns for first degrees from Colleges have been suppressed (since the number of students undertaking first degrees at Colleges is typically very small).

the reduction in benefit dependency associated with ancient institutions ranges from between **3.4** and **10.1 percentage points** for men and between **4.0** and **13.9 percentage points** for women.

Similarly, **the benefit dependency returns for individuals in possession of first degrees from pre-1992 and post-1992 institutions are strong**, with the impact associated with undertaking a first degree from **pre-1992 institutions typically higher than those from a post-1992 institution**. For example, focusing on completion between the ages of 22 and 30, 3 years post-graduation, men with degrees from **pre-1992 universities** are **7.1 percentage points less likely to be benefit dependent** compared to individuals who dropped out of first degrees at these institutions. The corresponding estimate for men with degrees from **post-1992 universities** (compared to non-completers at the same type of institution) stands at **4.4 percentage points**. For women, the estimates stand at **7.3 percentage points** (pre-1992 institutions) and **5.0 percentage points** (post-1992 institutions).

7.3.4 Differences by educational pathway

Table 29 presents benefit dependency returns **separately for individuals who achieved first degrees after attaining prior qualifications at Scottish Colleges and for individuals who achieved first degrees through 'other' (non-College) routes**. Again, note that throughout this analysis by pathway, due to sample size limitations, we were unable to disaggregate the counterfactual group (i.e. first-degree non-completers) by educational pathway. In other words, the analysis was undertaken **relative to an *aggregate* counterfactual group of first degree non-completers** (irrespective of whether individuals in the counterfactual had started their degrees after prior attainment at Colleges, or had gone through other non-College routes)[139].

The results for 7 years post-graduation were all either suppressed or statistically insignificantly different from zero. However, where identified (in particular, 3 and 5 years post-graduation), the analysis suggests that the **marginal benefit dependency effect associated first degrees attained through the non-college College route are slightly larger than the College route**. For example, we estimate that **men** who attain a first degree after obtaining prior qualifications at **College** achieve a **2.7 percentage point** reduction in the likelihood of being benefit dependent, compared to **4.5 percentage points** for those completing their first degree though the **non-College route**. The effect for women who attained first degrees through the **College route** is estimated to be **4.9 percentage points**, while the comparable return associated with the **non-College route** stands at **5.3 percentage points**.

[139] Note also that the analysis was restricted to a specific sub-sample of the Scottish LEO data. See Section 3.3 for more information.

Table 29 Marginal benefits dependency returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender and attainment through the College vs. non-College route

Gender and educational pathway	Years post-completion		
	3 years	5 years	7 years
Men			
Non-College route	-4.5	-2.4	^
College route	-2.7	-2.0	-
Women			
Non-College route	-5.3	-4.3	^
College route	-4.9	-4.0	-

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
The analysis was restricted to individuals who completed first degrees at age 20 to 25, between 2009/10 and 2013/14. Individuals were grouped into the College vs. the non-College route based on whether they had previously achieved qualifications at a College prior to or at the age of 22. Due to sample size restrictions, the counterfactual group was *not* disaggregated by educational pathway. Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

7.4 In-depth analysis of the benefit dependency returns to Modern Apprenticeships

7.4.1 Differences by subject of study

As with earnings and employment returns, given that the Scottish LEO data includes only relatively small sample sizes for MA non-completers disaggregated by subject area, many of the results on the marginal benefit dependency returns were suppressed (see Table 30)[140].

The results indicate that, in general, **the benefit dependency effects associated with Modern Apprenticeships at Level 3 in STEM subjects are larger than for Modern Apprenticeships in AHSS or other subjects** (mirroring the findings in relation to employment (see Section 6.4.1)). For example, men in possession of **STEM-related MAs** at Level 3 (completed at age 21 or under) achieve an estimated **21.6 percentage point** reduction in the likelihood of being benefit dependent relative to men who dropped out of Level 3 MAs in STEM subjects (3 years after completion/drop-out). This compares to

[140] Note that the exclusion of Medicine and Dentistry subjects (from the STEM subject group) is not applicable here, since there are no Modern Apprenticeships offered in these subjects.

12.9 percentage points for Level 3 MAs in **AHSS** (and **10.2 percentage points** for 'other' subjects[141]). The corresponding impacts for women were estimated at **15.5 percentage points** (**STEM subjects**), **8.7 percentage points** (**AHSS subjects**), and **13.9 percentage points** (**other subjects**). **The estimates by subject for Modern Apprenticeships at Level 2 were largely suppressed.**

Table 30 Marginal benefit dependency returns to Modern Apprenticeships (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, level, subject of study, and age at completion

Gender, level and subject group	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
MA Level 3									
Men									
STEM subjects	-21.6	-13.3	-9.5	-13.9	-10.1	^	-8.4	-8.1	^
AHSS subjects	-12.9						-5.6	-6.4	
Other subjects	-10.2	-8.5	-	-13.1	-		-6.2	-4.0	
Women									
STEM subjects	-15.5	-19.7		-20.2			-11.5	-6.5	
AHSS subjects	-8.7	-8.5	^				-2.9	-	
Other subjects	-13.9	-7.6	^	-	-		-6.7	-4.3	
MA Level 2									
Men									
STEM subjects	-24.5	-14.8					-15.4		
AHSS subjects									
Other subjects	-11.2	-7.4		-24.5			-6.0	-4.0	
Women									
STEM subjects	-21.3	^					-14.4	-7.8	
AHSS subjects	-16.7	-							
Other subjects	-12.8	-11.5					-	-	

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year. The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

[141] For example, these 'other' subjects include Personal Services; Food and Drink; Hospitality and Tourism; selected frameworks in Sport, Health and Social Care; Retail and Customer Service; and Transport and Logistics. Again, see Section 2.2.2 (Table 1) for more information.

7.4.2 Differences by location of off-the-job training

Table 31 presents the marginal benefit dependency returns to Level 2 and Level 3 MAs depending on the location of the off-the-job training component of the apprenticeship (as before, distinguishing whether the off-the-job training was undertaken at a Scottish College or private education provider).

Table 31 Marginal benefit dependency returns to Modern Apprenticeships (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, level, location of off-the-job training component, and age at completion

Gender, level and location of off-the-job training	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
MA Level 3									
Men									
Not at College	-17.0	-12.4	-9.0	-12.1	-8.7	^	-6.5	-5.3	^
At College	-27.0	-13.4	^	-15.0			-7.3	-12.7	
Women									
Not at College	-13.4	-9.5	^	-8.1	-	^	-6.3	-4.1	^
At College	-14.6	-8.8							
MA Level 2									
Men									
Not at College	-14.4	-10.1		-30.1			-6.6	-5.0	
At College	-24.3								
Women									
Not at College	-13.4	-9.2					-5.6	-3.1	
At College	-21.1	^							

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include ethnicity, disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year. The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification.
Source: London Economics' analysis of Scottish LEO data

As with earnings and employment, the limited sample sizes for MAs (particularly for non-completers) result in many estimates being suppressed. Where findings are available, the analysis suggests that there are very substantial benefit dependency returns to Level 3 MAs undertaken at College as well as at private training providers (i.e. 'not at College'). On the few occasions where comparisons can be made directly, the analysis suggests that **the returns to MAs with off-the-job training components undertaken at Colleges are**

generally either broadly comparable to or larger than the returns to MAs undertaken at private providers.

For example, men in possession of Level 3 MAs (completed at age 21 or under) whose off-the-job training component was delivered at a **College** achieve an estimated **27.0 percentage point** reduction in the likelihood of being benefit dependent relative to individuals who drop out of Level 3 MAs at College (3 years post-completion/drop-out). This compares to a **17.0 percentage point** effect for Level 3 MAs undertaken at a **private provider**. For women, the corresponding estimates stand at **14.6 percentage points** (College) and **13.4 percentage points** (not at College).

The results by provider type for Modern Apprenticeships at Level 2 were largely suppressed; however, where identified, again illustrate the generally larger benefit dependency effects associated with Modern Apprenticeships gained at College (**24.3** and **21.1 percentage point** College effect for men and women who completed a Level 2 MA at age 21 or under, 3 years post-graduation, respectively, compared to a **14.4** and **13.4 percentage point** effect for men and women (respectively) who undertook their off-the-job training component at a private provider).

PART II: THE RETURN ON INVESTMENT IN POST-SCHOOL EDUCATION AND SKILLS

8 Methodological approach for the ROI analysis

In this section, we provide an overview of our methodological approach used to assess the **Return on Investment associated with post-16 education and training in Scotland**, from the perspective of **students/graduates** and the **Exchequer** (for all qualifications).

For Modern Apprenticeships only, we also undertook an (exploratory) assessment of the Return on Investment to **employers** associated with training apprentices. The exclusion of higher education and further education qualifications here is due to the fact that the ROI calculation assumes that an initial investment has been made; however, given that employer funding of higher and further education/vocational qualifications is relatively rare, the majority of HE and FE students undertake their qualifications without receiving any sponsorship from employers (i.e. when calculating employer Benefit-to-Cost Ratios (BCRs), for most students, the denominator would be zero, so that a result cannot be calculated). As a result, an analysis of the Return on Investment to employers associated with these qualifications would be of relatively little value, so that we instead focus on the employer Return on Investment to Modern Apprenticeships only.

Before turning to the more detailed description of the methodological approach used throughout the ROI analysis (provided in the following sections), it is important to note several key definitions and points on scope:

- The analysis assesses the Return on Investment associated with **Scottish domiciled students** who started higher education qualifications, further education/vocational qualifications, or Modern Apprenticeships in **Scotland** in the **2018-19 academic year** (this is also referred to as the **'2018-19 cohort' of students** throughout this report[142]);
- Higher education qualifications attained relates to those undertaken in higher education institutions only[143];
- In relation to students' **residence post-completion of their qualifications**, mirroring the approach for the marginal earnings, employment, and benefit dependency returns (see Section 3), the analysis includes individuals **living anywhere in the UK after completing their (highest) qualifications**. In other words, the ROI is assessed from a UK-wide perspective, i.e. including the costs and benefits to students/graduates, the Exchequer, and employers irrespective of whether the student/graduate resides in Scotland or elsewhere in the UK after completing the qualification;
- In terms of **disaggregation**, the analysis is broken down by:
  - **Qualification level**, including:

[142] See Section 8.1 for more information on students in the 2018-19 cohort.
[143] In other words, the analysis focuses on HE qualifications attained at publicly funded universities as well as alternative providers, but excludes HE qualifications achieved at FE colleges.

- Postgraduate (research) qualifications, postgraduate (taught) qualifications, first degrees, and other undergraduate qualifications (at HE level);
- Vocational qualifications at SCQF Levels 4,5, 6, and 7 (at FE level);
- Modern Apprenticeships at (SVQ) Level 2 (equivalent to SCQF Level 5) and Level 3 (equivalent to SCQF Levels 6/7)[144];

For each of these qualifications, we assess the Return on Investment associated with *completing* each qualification.

- **Gender**; and
- **Mode of study** (i.e. full-time vs. part-time students, for HE and FE qualifications only (as this breakdown is not applicable to Modern Apprenticeships));

- In each instance, the analysis is based on the **characteristics of an average/'typical' learner in each group** within the 2018-19 cohort (e.g. based on the average age at enrolment and average study duration associated with each qualification (by gender and mode)[145]); and
- The ROI **counterfactuals** correspond to the counterfactuals used throughout the above analysis of the labour market returns using the Scottish LEO data[146].

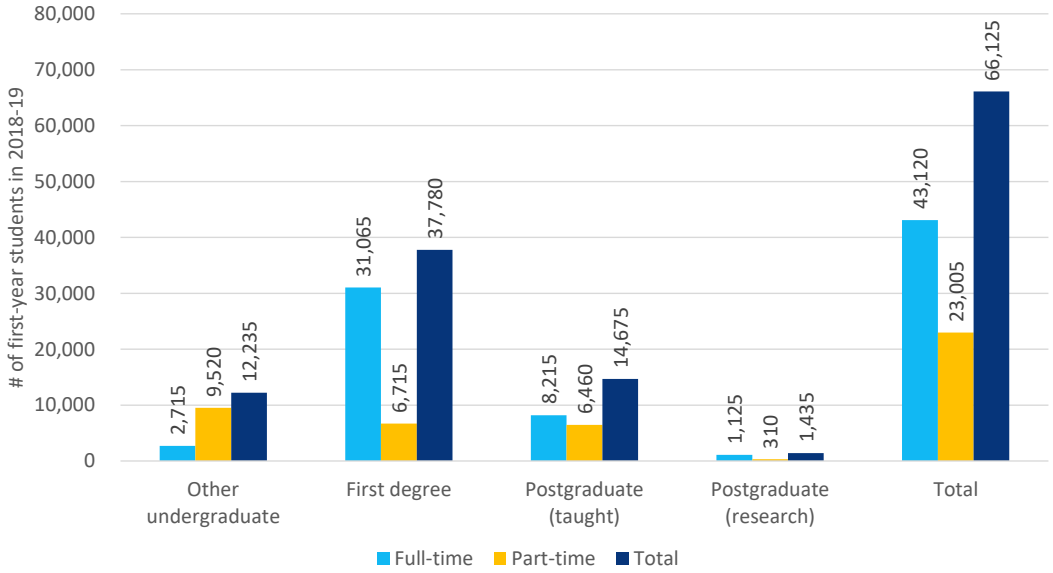
8.1 Cohort of students considered

8.1.1 Higher education students

As outlined above, the ROI analysis focuses on Scottish domiciled students who started HE qualifications, FE qualifications, or MAs in Scotland in the 2018-19 academic year.

[144] Due to small sample sizes in the Scottish LEO data, and the resulting suppression of marginal earnings and employment returns (see Table 11 in Section 5.2 and Table 18 in Section 6.2), the ROI analysis excludes vocational qualifications at SCQF Level 8 and above, as well as Modern Apprenticeships at (SVQ) Level 4/5 (equivalent to SCQF Level 8 and above).
[145] See Section 8.2 for more information on the assumptions in relation to average age at enrolment and study duration. For example, for MAs at Level 3, the analysis estimates the Return on Investment associated with apprentices who enrol in an MA at Level 3 at age 24 (the assumed average age at enrolment for both men and women) and take 4 years to complete their apprenticeship (i.e. completing at age 28).
[146] See Section 3.1 (above) and Section 8.3 (below) for more information.

Figure 5 Number of students in the 2018-19 cohort of Scottish domiciled students starting higher education qualifications in Scotland, by level and mode



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 data published by HESA (2021a)

As presented in Figure 5, for higher education qualifications, there were a total of **66,125** Scottish first-year students who started HE qualifications at higher education providers in 2018-19[147]. In terms of level, the majority (**57%**, **37,780**) of these students were undertaking first degrees, followed by **22%** (**14,675**) enrolled in postgraduate taught qualifications, **19%** (**12,235**) enrolled in other undergraduate qualifications, and **2%** (**1,435**) enrolled in postgraduate research qualifications. In terms of mode of study, **65%** (**43,120**) of students in the cohort were enrolled on a full-time basis, with the remaining **35%** (**23,005**) undertaking part-time qualifications.

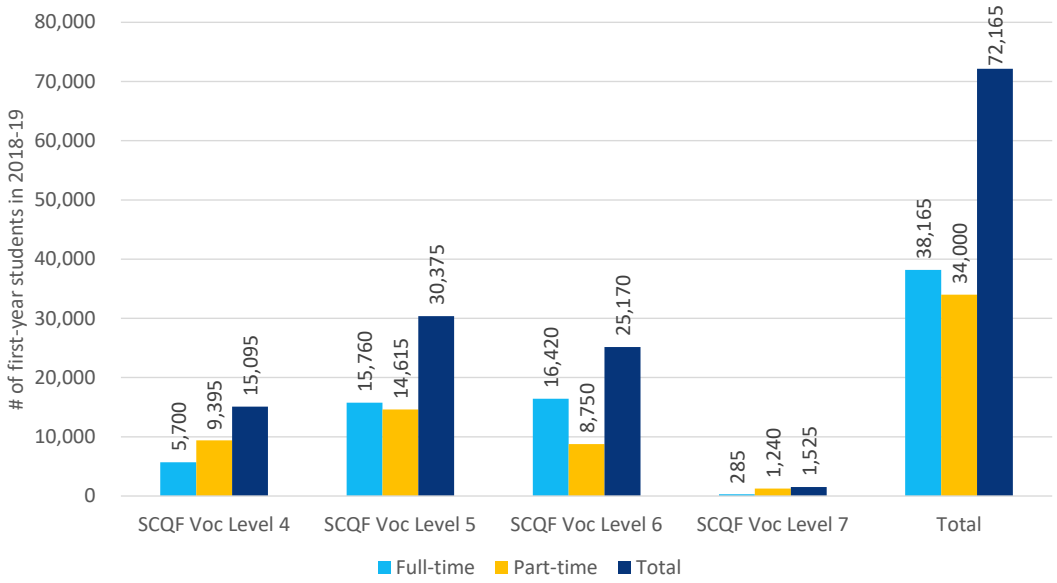
8.1.2 Further education students

Figure 6 presents comparable information on students in the 2018-19 cohort undertaking further education qualifications at Scottish colleges[148]. In terms of study level, out of the total of **72,165** further education students in the cohort, **42%** (**30,375**) were enrolled in vocational qualifications at SCQF Level 5, followed by **35%** (**25,170**) enrolled at Level 6, and **21%** (**15,095**) enrolled at Level 4. In addition, a relatively small number (**2%**, **1,525**)

[147] Based on data published by HESA (2021a). Note that the information includes higher education institutions only (including alternative providers) but *excludes* any students undertaking higher education qualifications at further education colleges.
[148] As outlined above, vocational qualifications at SCQF Level 8 and above have been excluded from the ROI analysis, and are therefore not presented here. Note that the underlying data (provided by the Scottish Funding Council) did not include a specific identifier for student domicile; however, it is expected that most of these students were domiciled in Scotland prior to starting their qualifications. In addition, note that the data explicitly focused on vocational qualification students who were *funded* by the Scottish Funding Council; here, we assume that this captures *all* students (i.e. that there are no further education students who are not funded by the SFC).

were undertaking vocational qualifications at Level 7. In terms of study mode, compared to higher education students, further education students in the cohort are more evenly distributed across full-time (**53%**, **38,165**) and part-time study (**47%**, **34,000**).

Figure 6 Number of students in the 2018-19 cohort of Scottish domiciled students starting further education qualifications in Scotland, by level and mode

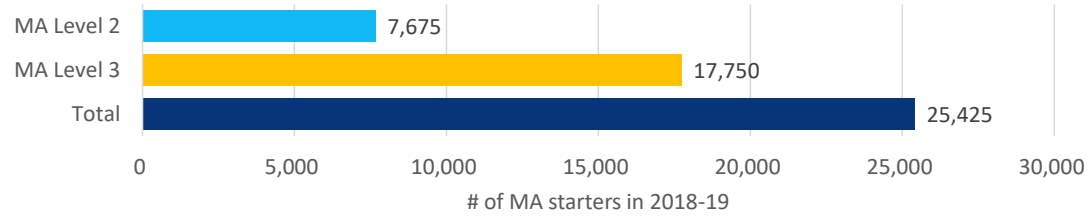


Note: All numbers are rounded to the nearest 5, and the total values may not add up due to this rounding.
Source: London Economics' analysis based on data provided by the Scottish Funding Council

8.1.3 Modern Apprentices

Figure 7 presents the number of MA learners in the 2018-19 cohort[149]. Of the total of **25,425** Modern Apprenticeship starters in 2018-19, the majority (**70%**, **17,750**) were undertaking MAs at Level 3, whereas the remaining **30%** (**7,675**) were enrolled in MAs at Level 2 instead.

Figure 7 Number of students in the 2018-19 cohort of Scottish domiciled students starting Modern Apprenticeships in Scotland, by level



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 data provided by the Skills Development Scotland

[149] As outlined above, Modern Apprenticeships at Level 4/5 have been excluded from the ROI analysis, and are therefore not presented here. As for FE qualifications, the underlying data (provided by Skills Development Scotland) did not include domicile identifier; again, it is expected that the vast majority of these students resided in Scotland prior to starting their Modern Apprenticeships.

8.2 Age at enrolment and study/training duration

As outlined above, the analysis of the Return on Investment for each of the above post-school qualifications is based on the characteristics of an average/'typical' learner in each relevant group within the 2018-19 cohort. Importantly, this includes the **average age at which students typically commence their qualifications, as well as the average number of years that they typically require to complete the qualification**. While the assumed study duration is important as it particularly affects the estimated costs of qualification attainment, the assumed age at enrolment impacts the estimated benefits, specifically in terms of the expected enhanced (employment-adjusted) earnings accrued post-attainment. Since these benefits are measured over individuals' entire working lives (i.e. from the completion of the qualification to retirement[150]), the lower the average age at enrolment, the larger the resulting post-completion benefits accrued by individuals achieving the qualification (given the larger number of years in the labour market during which these benefits are realised).

Table 32 presents our assumptions on the average age at enrolment[151], study duration[152], and age at completion (by qualification level, mode, and gender). Note that:

- In multiple instances, the assumed average ages at enrolment are relatively higher than might be expected (e.g. the average age at enrolment for MAs at Level 2 is 24 years (both men and women), and 27 and 21 years for MAs at Level 3 (for men and women, respectively)). In other words, on average, these learners do not start their qualifications immediately after completing secondary school, but instead commence their studies some years later (i.e. later into their 20s, for full-time students).
- The average age and study duration amongst part-time students are typically higher than the corresponding assumptions for full-time students (i.e. part-time students typically start their qualifications later in life, and take longer to complete them)[153].

[150] We assume an average retirement age of 65.
[151] The assumptions for Modern Apprentices were based on data provided by SDS in relation to the average age at enrolment among the learners starting MAs in 2018-19. The assumptions for vocational qualifications were based on data provided by the SFC for students starting vocational qualifications at Scottish colleges in 2018-19 and who were funded by the SFC (where, again, we assume that this captures *all* students (i.e. that there are no further education students who are not funded by the SFC)). The assumptions for higher education qualifications (excluding postgraduate research) were based on data provided by the SFC in relation to Scottish domiciled students starting higher education qualifications at Scottish universities in 2018-19 who were funded by the SFC (but *excluding* any students who started HE qualifications at further education providers). The assumptions for postgraduate research qualifications were based on separate SFC data for Scottish domiciled students starting these qualifications in the 2018-19 academic year.
[152] The assumptions on the average expected duration of study are based on data provided by SDS (for Modern Apprentices) and the SFC (for HE and FE qualifications).
[153] Note that the average study durations among part-time students are the same as for full-time students (at each level of study; based on data provided by the Scottish Funding Council). In this respect, the Scottish

Table 32 Average age at enrolment, study duration, and age at completion (in years) for students in the 2018-19 cohort, by level, mode, and gender

Level and mode	Age at enrolment		Study duration		Age at completion	
	Men	Women	Men	Women	Men	Women
Full-time students						
Postgraduate (research)	27	28	3	3	30	31
Postgraduate (taught)	28	28	1	1	29	29
First degree	20	21	4	4	24	25
Other undergraduate	22	24	1	1	23	25
SCQF Vocational Level 7	20	26	2	2	22	28
SCQF Vocational Level 6	21	25	1	1	22	26
SCQF Vocational Level 5	21	24	1	1	22	25
SCQF Vocational Level 4	20	24	1	1	21	25
MA Level 3	24	24	4	4	28	28
MA Level 2	27	21	2	2	29	23
Part-time students						
Postgraduate (research)	39	40	5	5	44	45
Postgraduate (taught)	37	38	2	2	39	40
First degree	28	33	6	6	34	39
Other undergraduate	37	37	2	2	39	39
SCQF Vocational Level 7	28	35	2	2	30	37
SCQF Vocational Level 6	26	28	1	1	27	29
SCQF Vocational Level 5	23	30	1	1	24	31
SCQF Vocational Level 4	20	22	1	1	21	23
MA Level 3	-	-	-	-	-	-
MA Level 2	-	-	-	-	-	-

Note: All values have been rounded to the nearest integer. While the average age at enrolment was estimated separately by gender, we assume the same average study across men and women. The breakdown by study mode is not applicable to Modern Apprenticeships (so all cells for part-time students are empty). ***Source: London Economics' analysis based on data provided by the Scottish Funding Council (for higher education and further education qualifications) and Skills Development Scotland (for Modern Apprenticeships)***

8.3 Counterfactuals

As outlined above, the counterfactuals applied throughout the ROI analysis match the counterfactuals used throughout the analysis of the marginal earnings, employment, and benefit dependency returns using the Scottish LEO data. As presented in Table 33[154], as a result, for most qualifications, the analysis assesses the Return on Investment associated with each qualification relative to **non-completers** of the given qualification (i.e. learners who dropped out of the qualification). The exceptions to this include postgraduate research and postgraduate taught qualifications (where we assess the ROI relative to individuals in possession of first degrees as their highest qualification), and other

Funding Council indicated that, while full-time and part-time courses might be provided at the same SCQF level, there is often a difference in *content* provided in terms of the courses attended by full-time vs. part-time students. As a result, rather than taking longer to complete, on average (at the aggregate SCQF level), part-time students have the same average expected study durations as full-time students.

[154] This table matches the information presented in Table 6 (in Section 3.1).

undergraduate qualifications (estimated relative to individuals in possession of vocational qualifications at Level 6 as their highest qualifications).

In relation to non-completers, the analysis assumes that non-completers drop out of their intended qualifications **immediately at the beginning of their studies/training**. In other words, we assume that non-completers do not accrue any of the benefits or incur any of the costs associated with achieving the given (treatment) qualification of interest[155].

In addition, for consistency (with student and Exchequer returns, and with HE and FE qualifications), note that **the employer ROI to Modern Apprenticeships is also undertaken relative to the same (non-completer) counterfactual**. In other words, the analysis assumes that instead of taking on an apprentice, employers would otherwise have employed (and paid) an individual who started but (immediately) dropped out of an MA. For example, the employer ROI to MAs at Level 3 assesses the costs and benefits associated with employing an individual completing a Modern Apprenticeship at this level compared to employing an individual who started but dropped out of an MA at Level 3[156].

Table 33 Treatment and counterfactual groups used throughout the ROI analysis

Treatment group		Counterfactual group
Higher education qualifications	Postgraduate (research)	First degree
	Postgraduate (taught)	First degree
	First degree	*First degree non-completers*
	Other undergraduate	SCQF Full Vocational Level 6
Further education qualifications	SCQF Full Vocational Level 7	*SCQF Full Vocational Level 7 non-completers*
	SCQF Full Vocational Level 6	*SCQF Full Vocational Level 6 non-completers*
	SCQF Full Vocational Level 5	*SCQF Full Vocational Level 5 non-completers*
	SCQF Full Vocational Level 4	*SCQF Full Vocational Level 4 non-completers*
Modern Apprenticeships	MA Level 3	*MA Level 3 non-completers*
	MA Level 2	*MA Level 2 non-completers*

Source: London Economics

8.4 Estimating the ROI associated with higher education qualifications

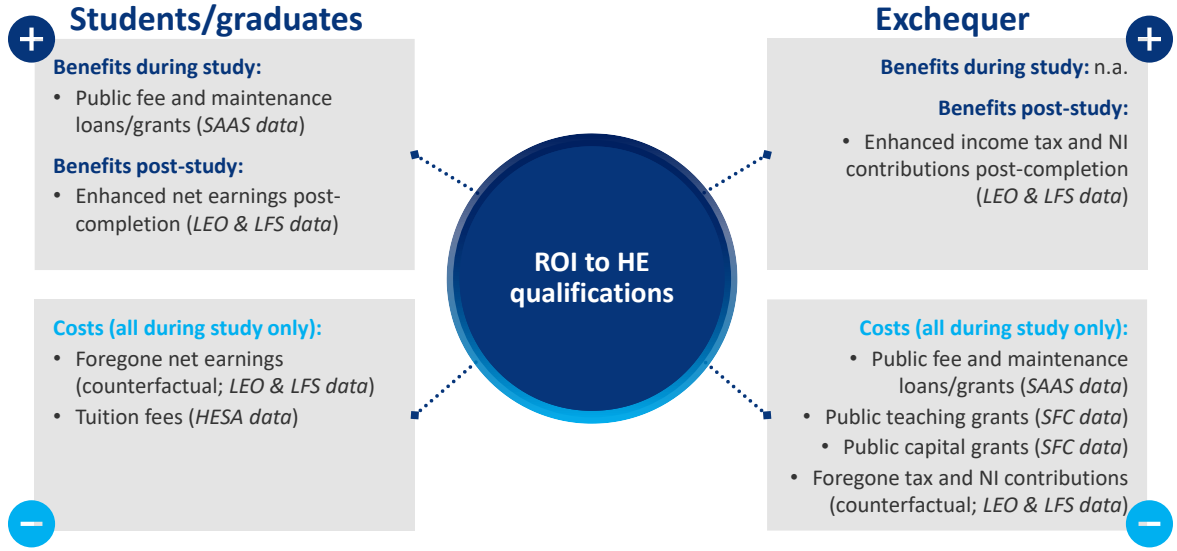
In this section, we summarise our methodological approach used to estimate the Return on Investment to higher education qualifications in Scotland, separately from the perspective of **students** (Section 8.4.1) and the **Exchequer** (Section 8.4.2). Figure 8 presents the range of different types of benefits and costs associated with achieving higher education qualifications that are included in the ROI analysis, and each of these is discussed in turn.

Throughout the analysis, note that all of these costs and benefits associated with higher education qualifications (as well as FE qualifications and MAs) were calculated in

[155] For example, we assume that first degree non-completers do not incur any tuition fee costs and receive no public student support before dropping out of their degrees, and that, post-graduation, they do not benefit from any enhanced labour market outcomes associated with achieving a first degree.
[156] Where, as outlined above, we assume that non-completers drop out immediately at the beginning of their apprenticeship.

aggregate over the total study duration/post-graduation in **net present value (NPV) terms** (discounted to 2018-19) **in constant 2018-19 prices**, using standard real annual discount rates of **3.5%** (up to Year 30) and **3.0%** (Year 31 and onwards) as presented in the HM Treasury Green Book[157] and annual Consumer Price Index (CPI) inflation forecasts published by the Office for Budget Responsibility (OBR)[158].

Figure 8 Overview of benefits and costs associated with higher education qualifications



Note: 'NI'= National Insurance. ***Source: London Economics***

8.4.1 ROI to students

Benefits: Public student support during study

As a first key type of benefit to HE students, the analysis assesses the **public tuition fee and maintenance loan/grant subsidies** provided by the Student Awards Agency Scotland (SAAS) throughout their studies. For this, we made use of data provided by SAAS on the total amount of fee and maintenance loans/grants paid by SAAS to eligible Scottish domiciled students studying at Scottish universities[159] in 2018-19 (by study mode and level[160]). To arrive at average funding rates per student (per year), we then combined these aggregate funding levels with information (published by HESA (2021a)) on the total number of Scottish domiciled students studying at Scottish higher education institutions in

[157] See HM Treasury (2022).
[158] See Office for Budget Responsibility (2020, 2021a and 2021b).
[159] Similar to the above-described assumptions on average age at enrolment, the information for higher education qualifications excludes any students undertaking HE qualifications at further education providers.
[160] In terms of study level, the postgraduate-level data provided by SAAS were *not* broken down into postgraduate taught vs. postgraduate research qualifications, so we assume the same average funding per student per year across these students.

2018-19 (again by study model and level)[161]. The resulting estimated average tuition fee loans (for postgraduate students only[162]) and maintenance loans (for undergraduate and postgraduate students) were then **adjusted for the Resource Accounting and Budgeting charge (RAB charge)**, capturing the proportion of the loan that is expected not to be repaid[163] (and, therefore, the expected student benefit associated with receiving public fee and maintenance loans).

As outlined above, we then calculated the stream of these benefits over the total study duration in net present value terms in 2018-19 prices (separately by level and mode of study)[164].

Benefits: Enhanced net earnings post-completion

The largest benefits to students relate to the **enhanced post-graduation earnings** (after tax, and adjusted for the likelihood of employment) **associated with achieving higher education qualifications**[165] (as compared to the relevant counterfactual level of qualification)[166]. A key point to note here is that the above-discussed Scottish LEO data only provide earnings and employment information for the first few years post-completion. However, for the purposes of the ROI analysis, we require information on the full lifetime earnings and employment profiles of individuals in the relevant treatment and counterfactual groups. To arrive at these lifetime earnings and employment profiles, we therefore supplemented the Scottish LEO data with pooled data from the Quarterly Labour Force Survey (LFS; 2006Q1 to 2019Q4), as follows:

1) Using the **Scottish LEO data**, we estimated the **average annual earnings**[167] **and employment probabilities**[168] **of individuals in the relevant counterfactual groups** (i.e. in possession of the level of qualification below (as their highest qualification), or non-completers of the given qualification of interest[169]), by gender and year post-

[161] Hence, rather than dividing the total funding provided by the number of students in receipt of this funding, we instead calculate the average funding across *all* relevant students in 2018-19 (to implicitly take account of the fact that not all students are eligible for public student support).
[162] Rather than tuition fee loans, Scottish domiciled undergraduate students studying in Scotland are eligible for (non-repayable) fee grants to cover their tuition fee costs. In other words, for undergraduate students, the average tuition fee per student per year (discussed in more detail below) was offset against the average tuition fee grant per student per year calculated from the SAAS data, so that the effective 'net' tuition fee per student after fee grants was (close to) £0.
[163] Based on information provided by the Scottish Government (in relation to the estimated RAB charge for the 2019-20 financial year), we assume a RAB charge of 35.2% for both undergraduate and postgraduate students and for both full-time and part-time students (separate RAB estimates by study level or mode were not available).
[164] We assume that average fee and maintenance loans/grants per student per year are constant over time, i.e. we assume the same average funding rates per year in every year of study.
[165] As well as further education qualifications (see Section 8.5) and Modern Apprenticeships (see Section 8.6).
[166] Note that the ROI analysis does *not* include a monetization of the impact of post-school qualifications on benefit dependency (which was estimated as part of the econometric analysis, see Section 7).
[167] i.e. annualised earnings (based on daily PAYE earnings) in 2018-19 prices.
[168] i.e. the proportion of the year in PAYE employment.
[169] Again, see Table 33 in Section 8.3 for an overview of the different treatment and counterfactual groups.

completion/post-drop-out (Year 3, 5 and 7). For full-time students, we used pooled LEO data for individuals aged 21 or under or 22-30 (at completion/drop-out); for part-time students, we used pooled data for age bands 22-30 or 31+.

2) Using the **pooled LFS data**, we assessed the average annual earnings and employment probabilities of individuals in possession of the different relevant counterfactual levels of qualification (as their highest qualification), by gender and year post-completion. The LFS data are based on individuals resident in the whole of the UK *excluding* London and the South East[170]. Using this information, we then calculated **annual growth rates of 3-year rolling average earnings and employment**[171], and applied maximum and minimum caps to the resulting growth rates to adjust for significant outliers[172].
3) We then applied the LFS growth rates from Step 2 to the relevant average counterfactual earnings and employment probabilities from the Scottish LEO data from Step 1, to **estimate full lifetime earnings and employment profiles for the baseline/counterfactual groups** (i.e. for each year post-completion). Table 34 shows how we matched qualifications in the LFS data to the relevant counterfactual groups from the LEO data. Note that:
   - The LFS does not include information on non-completers. For **non-completer counterfactuals**, we therefore apply earnings and employment growth rates associated with the next highest (lower) level of qualification (as their highest qualification). For example, to estimate the ROI to first degrees, we applied the LFS growth rates for Highers to the counterfactual group (i.e. to first degree non-completers). In other words, we assume that the earnings and employment of first degree non-completers grow at the same rate as for individuals in possession of Highers (as their highest qualification)[173].
   - For the **non-completer counterfactuals for vocational qualifications at SCQF Level 5 and MAs at Level 2**, *ideally*, we would apply growth rates associated with vocational qualifications at SCQF Level 4 as the assumed growth of the counterfactual earnings/employment (i.e. as the relevant next highest level of qualification). However, there were only relatively limited sample sizes available in the LFS for vocational qualifications at SCQF Level 4. Therefore, we instead

[170] Note that a restriction to Scottish residents only would have resulted in relatively low sample sizes within the LFS data, so the analysis was instead based on all UK residents excluding London and the South East. Further note that the data were restricted to individuals who completed their qualifications at age 25 or below.
[171] In terms of earnings, the pooled LFS data were all measured in 2018 prices, so that the resulting growth rates of 3-year rolling averages constitute real-terms earnings growth rates.
[172] Specifically, growth rates in Years 0-10 post-completion were capped at -10% to +10%; growth for Years 11-20 were capped at -7.5% to +7.5%; and growth rates for Years 21+ were capped at -5% to + 5%.
[173] This approximation was again required due to the fact that the Scottish LEO data currently only provide earnings and employment information for the first few years post-completion/post-drop-out, therefore necessitating the supplementary use of LFS data to arrive at full lifetime earnings and employment profiles. The merging of additional tax years and student cohorts into the Scottish LEO data will reduce the required reliance on LFS data in the future. However, for the analysis at hand, given that the LFS does not capture information on non-completers, it is difficult to say what effect this approximation has on the magnitude of the ROI estimates.

apply the growth rates associated with vocational qualifications at *SCQF Level 3 or below* to SCQF Level 5 non-completers and to MA Level 2 non-completers.

- For the **non-completer counterfactual for MAs at Level 3**, we assume that these individuals' earnings and employment grow at the same rate as for individuals in possession of MAs at Level 2 (again, as their highest level of qualification). Since Modern Apprenticeships were only introduced relatively recently (so that the sample sizes within the LFS are relatively low for later years post-completion), from Year 8 post-completion onwards, we assume the same growth rates for MAs at Level 2 (and, therefore, for Level 3 MA non-completers) as for Trade Apprenticeships.

4) To arrive at **lifetime earnings and employment profiles for the treatment groups**, we uprated the counterfactual earnings and employment profiles (from Step 3) by the estimated marginal earnings and employment returns to each post-school qualification of interest (presented in Sections 5 (Table 11) and 6 (Table 18)), based on the average age (band) at completion of students in the 2018-19 cohort (by level, gender, and mode)[174]. The relevant marginal earnings and employment returns applied for this purpose are presented in Table 36 (for full-time students only[175]). Note that:
   - Again, the marginal returns are **only available for Years 3, 5 and 7 post-completion**. To arrive at lifetime earnings and employment profiles, we apply these returns as follows:
     - Apply the marginal returns for Year 3 to Years 1-3 post-graduation;
     - Apply the marginal returns for Year 5 to Years 4-5 post-graduation; and
     - Apply the marginal returns for Year 7 to Years 6-7 post-graduation *and* all subsequent years (i.e. Years 8+).
   - In the original results from the econometric analysis, **a range of marginal earnings and employment returns were suppressed** (due to small or unbalanced sample sizes, or due to statistical insignificance). Throughout the ROI analysis, we **included these suppressed results** as point estimates (as they still provide valuable information on labour market returns, in the absence of alternative information[176]). The relevant cells in Table 36 are shaded in grey or orange.

[174] Again, see Section 8.2 for information on the average age at completion. For example, for male students undertaking full-time first degrees, the ROI analysis assumes an average age at completion of 24, so the ROI analysis uses the marginal earnings and employment returns for age band 22-30 at completion (or at drop-out, for first degree non-completers).

[175] As discussed in Section 8.2, part-time students typically complete their qualifications at a relatively higher age than full-time students; therefore, for part-time students, the ROI analysis typically makes use of the marginal earnings and employment returns associated with higher age bands (at completion/drop-out).

[176] The inclusion of these suppressed results was necessitated by the fact that the Return on Investment to a number of key qualifications (including other undergraduate qualifications, vocational qualifications at SCQF Levels 6 and 7, and Modern Apprenticeships at Levels 2 and 3) would otherwise likely be vastly underestimated. The use of suppressed results (i.e. using point estimates even if the estimates were statistically insignificant) has also been applied in other studies, e.g. by McIntosh (2007) in the assessment of the cost and benefits of apprenticeships and other vocational qualifications. As reported by McIntosh

- The ROI analysis assumes that there can be **no wage or employment penalty** associated with attaining higher qualifications. As a result, any negative marginal earnings and employment returns were set to 0 instead[177, 178].

5) The above steps estimated lifetime earnings and employment profiles for the treatment and counterfactual groups *by year post-completion*. To arrive at ***age*-earnings/-employment profiles**, it was necessary to assign each year post-completion to the relevant assumed average age at completion for each student, (by qualification level (for the treatment and counterfactual groups), gender, and study mode).
   - **Treatment groups:** For example, male students undertaking full-time first degrees in the 2018-19 cohort are assumed to complete their degree at age 24 (see Section 8.2), so we used the earnings and employment for first degrees (i.e. the **treatment group**) in Year 1 post-completion for the estimated earnings/employment at age 24 (and using Year 2 for age 25, Year 3 for age 26, etc.).
   - **Counterfactual groups:** Note again that the marginal earnings and employment returns (for the treatment vs. counterfactual group) are based on the same year post-completion/post drop-out. For example, the returns to first degrees in Year 3 compare the earnings/employment of first degree holders 3 years after completing their degree compared to non-completers 3 years after dropping out (all else equal). The marginal returns are *not* measured at the same age – and we assume that the average at drop-out/completion for the counterfactual groups is *lower* than the age at completion for the treatment groups. Specifically, for the purpose of the ROI analysis, we assume that **individuals in the counterfactual groups *complete/drop out* of their qualifications at the same average age at which individuals in the treatment groups *start* their qualifications** (i.e. average

(footnote 34) "Statistical insignificance means that the possibility of the true return being zero cannot be ruled out on statistical grounds, but neither can many other values be ruled out, and so there is no reason to take the return to be zero. In fact, the point estimate is still the best estimate of the wage return that we have, even when statistically insignificant, and so will be used". Moreover, it is expected that, with additional tax years and learner cohorts merged into the Scottish LEO data in the future, the increased sample sizes will result in more-and-more accurate (and fewer suppressed) estimates of labour market returns (since higher sample sizes will result in more estimates becoming statistically significant, and fewer instances of very small or unbalanced sample sizes underlying the estimates).

[177] For example, this applies to the (originally negative) marginal employment returns to postgraduate research qualifications, which have all been set to 0 for the purpose of the ROI analysis.

[178] Intuitively, it is unlikely that the attainment of additional (higher) levels of education would result in *reduced* earnings or employment outcomes for a given individual compared to not attaining/not completing that qualification. Any negative marginal earnings or employment returns could potentially be driven by omitted variable biases (e.g. omitted variables that are positively correlated with educational attainment but negatively correlated with earnings (or vice versa)) or other specific factors (e.g. as outlined in Section 6.2.4, the observed negative marginal employment returns to postgraduate research qualifications might be as a result of the nature of employment among individuals in possession of these qualifications). It is also important to note that the majority of ROI estimates are unaffected by this assumption (as there were only relatively few originally negative marginal earnings/employment returns that were set to zero).

age at drop-out/completion for counterfactual groups = age at enrolment for treatment groups)[179]. Using the same example as above:

- For men undertaking full-time first degrees (treatment group), we assume an average age at enrolment of 20, a study duration of 4 years, and a resulting age at completion of 24.
- For the counterfactual, we assume that first degree non-completers drop out of their degrees immediately at the beginning of their studies, so that they are assumed to be 4 years younger (i.e. aged 20) when dropping out of their degrees.
- In other words, when considering the difference in the earnings and employment of the treatment vs. counterfactual group at age 24, we compare the outcomes of first degree holders in Year 1 post-completion with the outcomes of non-completers in Year 5 post-drop-out (see Table 35)[180].

6) For both the treatment and counterfactual groups, we then **multiplied the lifetime earnings profiles by the lifetime employment profiles** (for each year post-completion), to arrive at **employment-adjusted age-earnings profiles** (by gender, level of qualification (including the treatment vs. the counterfactual group, in each instance), and study mode).
7) We then adjusted these age-earnings profiles to account for the fact that **earnings throughout the UK economy are expected to increase over time** (both in real and nominal terms, using nominal average earnings growth forecasts published by the Office for Budget Responsibility[181]).
8) Based on the resulting employment and growth-adjusted age-earnings profiles for the treatment and counterfactual groups, and the relevant Scottish income tax and National Insurance employee contribution rates and thresholds[182], we then estimated the future stream of **net (i.e. after-tax) earnings** in each instance[183].
9) Finally, we calculated the **difference in net earnings between the treatment and counterfactual group** (from Step 8) and **discounted** the results to net present value terms in 2018-19 prices.

[179] Again, as outlined above, we assume that non-completers drop out of their intended qualifications immediately at the beginning of their studies.
[180] Note that the earnings and employment of non-completers in Years 1 to 4 post-drop-out are then used to assess the costs of foregone net earnings during study (discussed in more detail below).
[181] See Office for Budget Responsibility (2020, 2021a and 2021b).
[182] We use the relevant tax and National Insurance rates and thresholds for the 2018-19 fiscal year. For subsequent years, we then assume fiscal neutrality (i.e. we assume that the earnings tax and National Insurance income thresholds grow at the forecast UK-wide nominal average annual earnings growth rates used in Step 7). Although the ROI analysis includes graduates living anywhere in the UK, we use the relevant income tax rates applicable to Scottish residents only; however, this is not expected to have a significant impact on the findings, as there are only limited differences between Scottish income tax rates and thresholds compared to those applicable throughout the rest of the UK.
[183] The deducted tax and National Insurance employee contributions (as well as additional National Insurance employer contributions) constitute the key benefit to the Exchequer associated with funding higher education qualifications (see Section 8.4.2).

Table 34 Treatment and counterfactual groups used throughout the ROI analysis

Treatment group		Counterfactual group	Earnings/employment growth applied to counterfactual (LFS)
Higher education qualifications	Postgraduate (research)	First degree	First degree
	Postgraduate (taught)	First degree	First degree
	First degree	*First degree non-completers*	Highers (incl. Advanced Highers)
	Other undergraduate	SCQF Full Vocational Level 6	SCQF Full Vocational Level 6
Further education qualifications	SCQF Full Vocational Level 7	*SCQF Full Vocational Level 7 non-completers*	SCQF Vocational Level 6
	SCQF Full Vocational Level 6	*SCQF Full Vocational Level 6 non-completers*	SCQF Vocational Level 5
	SCQF Full Vocational Level 5	*SCQF Full Vocational Level 5 non-completers*	*SCQF Vocational Level 3 or below*
	SCQF Full Vocational Level 4	*SCQF Full Vocational Level 4 non-completers*	SCQF Vocational Level 3 or below
Modern Apprenticeships	MA Level 3	*MA Level 3 non-completers*	*MA Level 2 (Yrs 1-7); Trade Apprenticeships (Yrs 8+)*
	MA Level 2	*MA Level 2 non-completers*	*SCQF Vocational Level 3 or below*

Source: London Economics

Table 35 Example of matching years post-completion/drop-out for men completing full-time first degrees (vs. non-completers)

Treatment vs. counterfactual group	Age									
	20	21	22	23	24	25	26	27	28	29
Counterfactual (first degree non-completers): Year post-drop-out	Year 1	Year 2	Year 3	Year 4	**Year 5**	Year 6	Year 7	Year 8	Year 9	Year 10
Treatment (first degree completers): Year post-completion	-	-	-	-	**Year 1**	Year 2	Year 3	Year 4	Year 5	Year 6

Source: London Economics

Table 36 Marginal earnings and employment returns used throughout the ROI analysis (full-time students only), by qualification level, year post-completion, and gender

Type of return and qualification	Counterfactual	Men				Women			
		Age band at completion	3 years	5 years	7 years	Age band at completion	3 years	5 years	7 years
Marginal earnings returns (in %)									
Postgraduate (research)	First degree	22-30	25.2%	27.0%	29.2%	31+	19.6%	24.8%	17.0%
Postgraduate (taught)	First degree	22-30	8.9%	11.8%	14.9%	22-30	14.3%	16.4%	19.7%
First degree	First degree non-completers	22-30	26.8%	32.2%	27.5%	22-30	32.4%	33.3%	22.0%
Other undergraduate	SCQF Full Voc. Level 6	22-30	0.2%	0.0%	0.0%	22-30	12.2%	22.7%	30.2%
SCQF Full Vocational Level 7	SCQF Full Vocational Level 7 non-completers	22-30	12.4%	12.1%	18.7%	22-30	15.9%	6.2%	16.5%
SCQF Full Vocational Level 6	SCQF Full Vocational Level 6 non-completers	22-30	8.2%	6.8%	5.3%	22-30	4.3%	11.6%	3.5%
SCQF Full Vocational Level 5	SCQF Full Vocational Level 5 non-completers	22-30	18.6%	7.3%	15.7%	22-30	7.6%	11.5%	17.0%
SCQF Full Vocational Level 4	SCQF Full Vocational Level 4 non-completers	<=21	6.3%	13.9%	12.0%	22-30	9.6%	2.0%	0.0%
MA Level 3	MA Level 3 non-completers	22-30	28.6%	19.8%	17.9%	22-30	15.7%	15.3%	3.8%
MA Level 2	MA Level 2 non-completers	22-30	9.9%	1.8%	0.0%*	22-30	17.9%	27.2%	n.a.
Marginal employment returns (in percentage points)									
Postgraduate (research)	First degree	22-30	0.0	0.0	0.0	31+	0.0	0.0	0.0
Postgraduate (taught)	First degree	22-30	2.3	2.1	3.0	22-30	2.5	1.7	2.4
First degree	First degree non-completers	22-30	3.9	2.8	2.1	22-30	5.9	4.4	2.6
Other undergraduate	SCQF Full Voc. Level 6	22-30	0.0	0.4	2.3	22-30	2.7	4.6	1.6
SCQF Full Vocational Level 7	SCQF Full Vocational Level 7 non-completers	22-30	0.0	0.8	1.2	22-30	6.2	2.5	12.1
SCQF Full Vocational Level 6	SCQF Full Vocational Level 6 non-completers	22-30	5.4	2.8	0.0	22-30	5.1	1.3	2.4
SCQF Full Vocational Level 5	SCQF Full Vocational Level 5 non-completers	22-30	9.6	9.8	10.8	22-30	12.2	10.1	9.5
SCQF Full Vocational Level 4	SCQF Full Vocational Level 4 non-completers	<=21	10.8	9.7	7.4	22-30	7.9	13.3	7.2
MA Level 3	MA Level 3 non-completers	22-30	6.7	4.9	2.0	22-30	7.3	6.9	9.8
MA Level 2	MA Level 2 non-completers	22-30	16.1	11.9	10.1	22-30	11.4	11.5	n.a.

Note: Orange highlighting indicates point estimates that would have been suppressed due to small/unbalanced sample sizes, while grey highlighting indicates cells that would have been suppressed due to statistical insignificance (i.e. that were suppressed in Table 11 and Table 18). Cells including "n.a." indicate instances where there was a sample size of 0 for either the treatment or counterfactual group (i.e. where no marginal earnings or employment returns could be estimated). The ROI analysis assumes that there can be no wage or employment penalty associated with any qualification attainment; as a result, any negative marginal returns were set to 0 instead.

The age band at completion is based on the assumed average age at completion among students in the 2018-19 cohort (see Section 8.2 for more information).

* In this instance, the original estimated marginal earnings returns were in excess of 100% (based on a sample size of less than 100, so this finding was suppressed in Table 11 (see Section 5.2)). As this estimate is unrealistically large (likely driven by the small sample size), for the purpose of the ROI analysis, it has been overwritten with a 0% return instead.

Source: London Economics' analysis of Scottish LEO data

Costs: Foregone net earnings during study

As a key cost component, during their studies, individuals undertaking (full-time) higher education qualifications[184] are assumed to **forego the earnings they would otherwise have achieved if they had instead entered the labour market with the counterfactual level of qualification** (level below for PG research, PG taught and other UG; or non-completers for first degrees). For this, using the same steps as above, we estimated the net earnings[185] of individuals in the relevant counterfactual groups during the period of study, again in NPV (i.e. discounted terms) in 2018-19 prices.

For simplicity, the analysis assumes that these opportunity costs of foregone earnings are applicable to full-time students only (who are assumed to forego 100% of their earnings while studying). For part-time students, we assume 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.

Costs: Tuition fees

A second cost component for students undertaking higher education qualifications relates to the **tuition fees charged by Scottish higher education institutions** (offset against the above-described tuition fee loan and grant support provided to eligible higher education students by SAAS)[186]. To estimate the average tuition fee charged per year per student in the 2018-19 cohort, we combined:

- Financial data published by HESA (2021b) on the total tuition fee income from Scottish domiciled students received by Scottish higher education institutions in the 2018-19 academic year, by study level (undergraduate, postgraduate (taught) and postgraduate (research)) and study mode; and
- Student data published by HESA (2021a) on the associated total number of (first-year and continuing) Scottish domiciled students studying in Scotland in 2018-19 (again by level and mode of study)[187].

Dividing the total fee income by the corresponding student counts, we thus arrived at the estimated average tuition fee charged per student per year (by level and mode). As with the public student support (described above), we then calculated the stream of these

[184] As well as full-time vocational qualifications (see Section 8.5), and Modern Apprenticeships (see Section 8.6).
[185] Again, these were adjusted for the likelihood of employment and future average earnings growth, and were calculated net of income tax and National Insurance employee contributions.
[186] For example, eligible Scottish domiciled students undertaking full-time undergraduate qualifications in Scotland are able to receive (non-repayable) tuition fee grants covering the entire tuition fee charged by their universities.
[187] Both the tuition fee income and student data include publicly funded universities as well as alternative providers, but exclude students undertaking higher education qualifications at further education colleges. The financial data excluded fee income received by The Open University in Scotland; for consistency, we therefore also excluded this provider from the underlying student data.

tuition fees per student over the total study duration, and discounted the results to net present value terms in 2018-19 prices (by level and mode of study)[188].

8.4.2 ROI to the Exchequer

Benefits: Enhanced tax and National Insurance contributions post-completion

As presented in Figure 8, the core benefit to the Exchequer from funding higher education qualifications relates to the **additional post-graduation income tax and National Insurance receipts (from both employer and employee contributions)** that are derived from the enhanced lifetime earnings (and higher likelihood of employment) of individuals achieving post-school qualifications (as compared to the relevant counterfactuals). These Exchequer benefits were estimated as part of the above-described estimation of the enhanced net earnings post-completion (see Section 8.4.1 for more information.

Costs: Public student support during study

Similarly, the methodological approach to estimating the **Exchequer costs associated with the provision of public tuition fee and maintenance loan and grant support** to higher education students was already discussed in Section 8.4.1. Again, note that for student loan support, the analysis takes account of the RAB charge (i.e. the proportion of the loan that is expected not to be repaid) as the Exchequer cost (and associated student benefit) associated with the provision of these loans.

Costs: Public teaching and capital grants

Another key stream of Exchequer funding costs associated with higher education qualifications relates to the **public teaching and capital grants provided to Scottish higher education institutions**. We received information from the Scottish Funding Council on the total teaching grant funding and capital grant funding[189] for Scottish domiciled students paid to Scottish higher education institutions in 2018-19[190]. To arrive at average funding rates per student (per year), in line with the approach for public student support and tuition fees (see Section 8.4.1), we divided these total funding amounts by the total number of Scottish domiciled students studying at Scottish higher education institutions in 2018-19 (by level and mode, respectively)[191]. We again calculated the total level of these

[188] As with public student support, we assume that average tuition fees per student are constant over time, i.e. we assume the same average fees per year in every year of study.
[189] Teaching grant funding includes premium funding from the Widening Access and Retention Fund and for small specialist institutions. Capital grants were apportioned from the aggregate capital funding provided in 2018-19, based on the total number of funded higher education students included in the data (as a proportion of total fundable students).
[190] The data excluded postgraduate research students, since the SFC provides no teaching or capital grant funding for these students.
[191] Again, based on HESA (2021a). In other words, as with public student support, rather than dividing the total funding provided by the number of *funded* students, we instead calculate the average funding across *all* students in 2018-19 (to implicitly take account of the fact that not all students are funded through teaching and/or capital grants).

funding streams provided over students' total study duration and discounted the results to net present value terms in 2018-19 prices (by level and mode of study)[192].

Costs: Foregone tax and National Insurance contributions during study

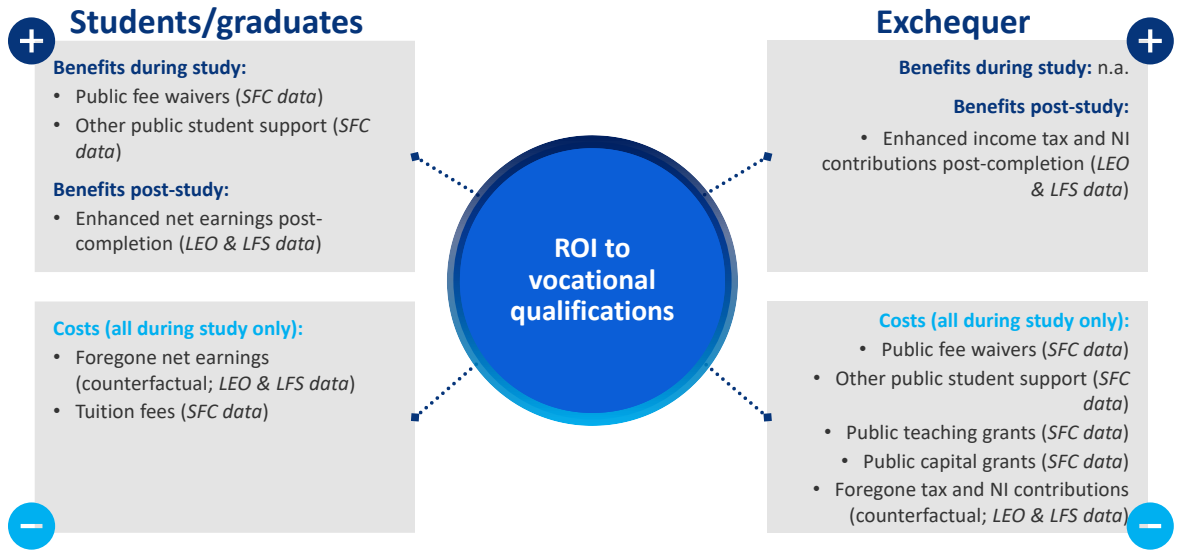
The final stream of Exchequer cost associated with higher education qualifications relates to the public opportunity cost of **foregone income tax and National Insurance revenues[193] during the period of study** (again, assumed to be applicable to full-time students only, if, instead of completing HE qualifications, these students had instead entered the labour market (with the counterfactual level of qualification). These costs were calculated as part of the above-described estimation of students' foregone net earnings during study (see Section 8.4.1 for more information).

8.5 Estimating the ROI associated with vocational qualifications

This section summarises the methodological approach for the estimation of the ROI to vocational education qualifications in Scotland, from the perspective of **students** (Section 8.5.1) and the **Exchequer** (Section 8.5.2). As presented in Figure 9, the range of benefits and costs included in the analysis for further education qualifications is similar to the benefit and cost streams included in the above-described analysis of the ROI to higher education qualifications (see Figure 8).

Again, all of these costs and benefits were calculated in aggregate over the total study duration/post-graduation in **NPV terms in constant 2018-19 prices**.

Figure 9 Overview of benefits and costs associated with further education qualifications



Note: 'NI'= National Insurance. ***Source: London Economics***

[192] Again, we assume that average funding rates per student are constant over time, i.e. assuming the same funding per student per year in each year of study.
[193] Again, including both employee and employer National Insurance contributions.

8.5.1 ROI to students

Benefits: Public fee waivers and other student support during study

In terms of benefits during study, eligible further education students have access **to tuition fee waiver grants** to cover the cost of their fees (provided by the SFC/SAAS)[194], as well as **other types of student support** (again from the SFC/SAAS, including FE bursaries, Education and Maintenance Allowance funding, FE discretionary funding, and childcare funding). We used information (provided by the SFC) on the total amount of fee waiver and other support funding provided to further education students in Scotland in 2018-19, and divided this by the underlying total number of students undertaking FE qualifications in Scotland in that year[195]. We thus arrived at assumptions on the average fee waivers and other public student support per FE student per year, by study level (i.e. vocational qualifications at SCQF Level 4, 5, 6, and 7) and mode. As before, applying these yearly rates to each year of study, we then calculated the total funding provided per student over the entire period of study, in NPV terms and 2018-19 prices[196].

Benefits: Enhanced net earnings post-completion

As for higher education qualifications, the largest benefits to further education students again relate to the **enhanced post-graduation earnings** (after tax, and adjusted for the likelihood of employment) **associated with achieving FE qualifications** (as compared to non-completers in all instances). The methodology used to estimate these benefits was described above (in relation to the ROI for higher education qualifications; see Section 8.4.1).

Costs: Foregone net earnings during study

Similarly, during their studies, (full-time[197]) further education students are expected to **forego the net earnings they would otherwise have achieved** if they had instead dropped out of their qualifications and entered the labour market. Again, see Section 8.4.1 for a more detailed description of the methodology used to estimate these costs to students.

[194] Most further education students in Scotland effectively pay no tuition fees, as the fees charged by their further education providers are entirely covered by SFC/SAAS fee waivers (so that further education is free at the point of entry).
[195] The above-presented information on the number of further education students in the 2018-19 cohort (see Section 0) was based on the same SFC dataset. Note again that the data did not include a specific identifier for student domicile; however, it is expected that most of these students were domiciled in Scotland prior to starting their qualifications. In addition, the data explicitly focused on vocational qualification students who were *funded* by the Scottish Funding Council, but we implicitly assume that there are no further education students who are *not* funded by the SFC.
[196] As for the funding and fee costs for HE qualifications, we assume that average FE fee waiver and other student support funding rates per student per year are constant throughout the period of study.
[197] As for HE students, we assume that these opportunity costs of foregone earnings are applicable to full-time FE students only, and that part-time students are able to combine work with their academic studies (and so do not incur any opportunity costs of foregone earnings).

Costs: Tuition fees

Again similar to HE qualifications, the **tuition fees charged by FE colleges** constitute another key cost to students undertaking FE qualifications (where, for most students, these tuition fees are offset against the above-described SFC/SAAS fee waiver grants (paid directly to colleges on behalf of students)). These tuition fees were estimated based on the same SFC data and methodological approach used to calculate public fee waivers and other student support[198] (see above).

8.5.2 ROI to the Exchequer

Benefits: Enhanced tax and National Insurance contributions post-completion

The **additional post-completion income tax and National Insurance contributions** associated with students completing vocational qualifications again constitute the core key benefit to the Exchequer associated with these qualifications (compared to non-completer counterfactuals). These Exchequer benefits were derived in the same manner as described above (for higher education qualifications, see Section 8.4.2).

Costs: Public fee waivers and other student support during study

While the above-discussed **public fee waiver grants and other student support grants** available to eligible further education students during their studies were treated as a benefit in the ROI to students, for the Exchequer ROI, they were deducted as a cost to the public purse. The methodology used to derive these public funding items was already described in Section 8.5.1.

Costs: Public teaching and capital grants

In addition to fee waivers and student support, as for higher education qualifications, the Exchequer also incurs the costs of **public teaching and capital grants that are paid to further education colleges throughout Scotland** to support their provision of further education teaching and learning. We calculated the average teaching and capital grant per student per year (and resulting total Exchequer cost per student over the period of study, by SCQF level and mode) based on the same SFC data and methodology used in relation to FE fee waivers, other student support, and tuition fees (described above)[199].

[198] The same SFC dataset included information on fee waivers and other public student support, tuition fees, as well as public teaching and capital grants associated with FE qualifications (discussed in further detail in Section 8.5.2).

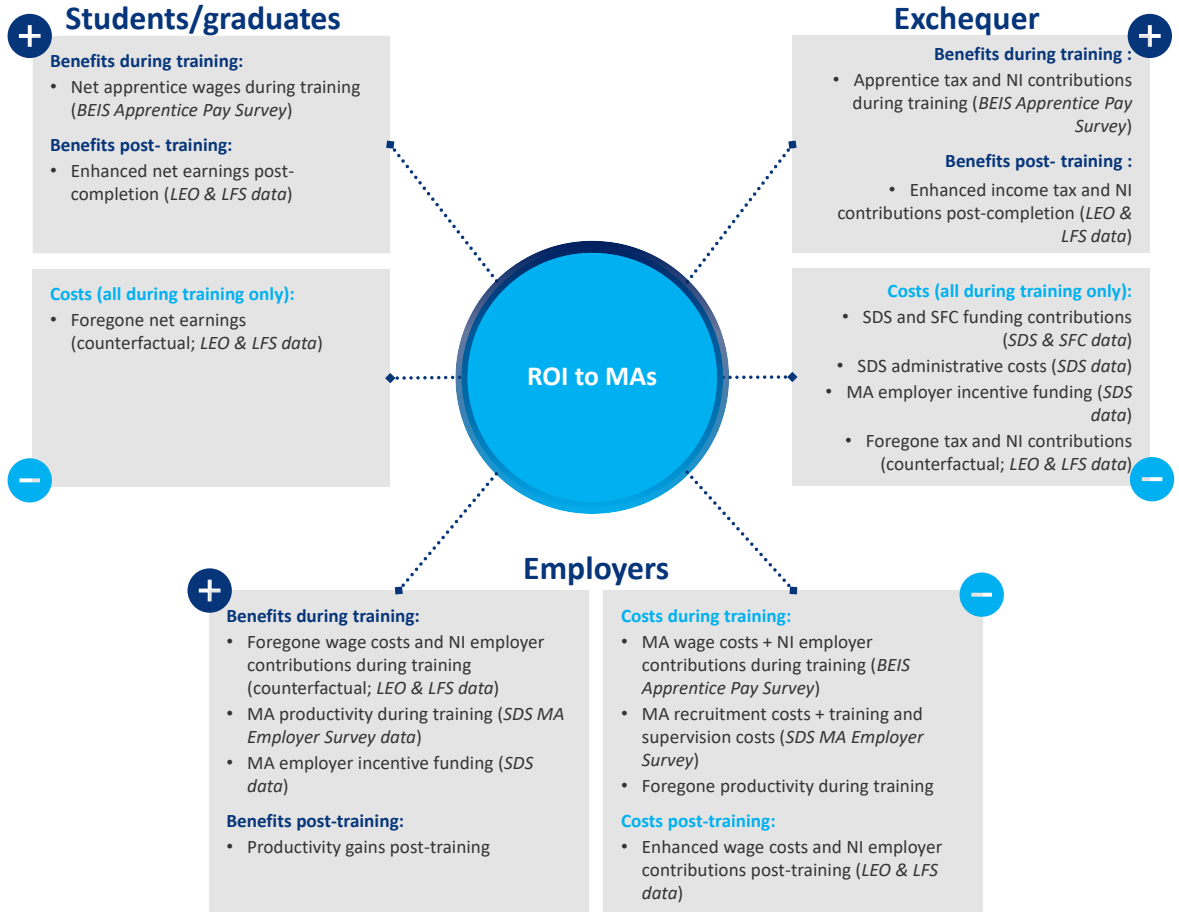
[199] Within the SFC data, capital grants were apportioned from the aggregate capital funding provided in 2018-19, based on the total number of funded further education students covered by the data (as a proportion of total FE students). As for HE qualifications, we assume that FE teaching and capital grants per student per year remain constant throughout the period of study.

Costs: Foregone tax and National Insurance contributions during study

As for higher education qualifications, the opportunity cost of **foregone income tax and National Insurance contributions during the period of study** (for full-time students only) constitute the final stream of costs considered as part of the Exchequer ROI to vocational qualifications. Section 8.4.2 above outlines how these Exchequer costs were calculated (for all qualifications of interest).

8.6 Estimating the ROI associated with Modern Apprenticeships

Figure 10 Overview of benefits and costs associated with Modern Apprenticeships



Note: 'NI'= National Insurance. ***Source: London Economics***

Finally, this section outlines our methodological approach to assessing the Return on Investment to Modern Apprenticeships, for **MA learners** (i.e. apprentices, Section 8.6.1), the **Exchequer** (Section 8.6.2), and **employers** (Section 8.6.3). The different nature of Modern Apprenticeship learning as compared to higher education and vocational qualifications implies that there are some benefit and cost streams (such as the learner benefit of apprentice wages received during training) that are specific to MAs only (see

Figure 10). As before, all of these costs and benefits were calculated in aggregate over the total study duration/post-graduation in **NPV terms in 2018-19 prices**[200].

8.6.1 ROI to apprentices

Benefits: Net apprentice wages during training

During their training, while incurring the *costs* of foregone earnings associated with the counterfactual group (i.e. non-completers; described in further detail below), MA learners receive **apprentice wages over the period of their training**. These net (after-tax) wages received during the MA training constitute a significant benefit component of the ROI to Modern Apprentice learners.

To estimate these benefits for learners in the 2018-19 cohort of MA starters, we made use of the Department for Business, Energy, and Industrial Strategy's **2018-19 Apprenticeship Pay Survey for Scotland**[201]. The survey provides detailed information on the average hourly pay[202] and number of contracted hours per week[203] amongst Scottish Modern Apprentices, with separate breakdowns available by gender, age band (16-18, 19-20, 21-24, and 25+), and MA level (Level 2 vs. Level 3 MAs).

Given that the original survey results are only published separately by *either* gender, age band or MA level, we first **estimated a combined breakdown** of apprentice wages across all three of these dimensions. Specifically, we first multiplied the pay rates by level by the ratio of overall average hourly pay for each age band relative to the overall average hourly pay at each level. In other words, we assume the same pay distribution by age band for both MAs at Level 2 and 3. We thus arrive at an estimated breakdown of hourly pay by MA level *and* age band. We then proceed similarly to estimate the breakdown by level and age band *and* gender, assuming the same pay distribution by gender across all age bands and levels.

Table 37 presents the separate breakdowns by the three dimensions (i.e. the original Apprentice Pay Survey results), while Table 38 presents our resulting estimated combined breakdown by gender, age band and level[204].

[200] The analysis follows a similar methodological approach as our previous analysis of the ROI to Modern Apprenticeships on behalf of Skills Development Scotland (which focused on the 2016-17 cohort of MA starters; see London Economics (2018)).
[201] See Department for Business, Energy, and Industrial Strategy (2020). The survey was conducted between 27th November 2018 and 10th March 2019.
[202] We use information on basic hourly pay, excluding any overtime pay (or other income, e.g. through tips from customers).
[203] Contracted hours per week exclude any paid or unpaid overtime.
[204] To provide an example, we estimate that the average hourly wage per **male MA at Level 2 aged 16-18** stands at **£5.78**, calculated as follows:
First, we multiply the average wage across all Level 2 MAs (£7.79) by the ratio of the wage amongst all 16-18 year old MAs relative to the overall average pay rate (£5.90 / £8.22 = 0.72). The result amounts to £7.79 x 0.72 = £5.59; this is the estimated average wage rate for *any* apprentice (either male *or* female) at Level 2 aged 16-18.

To estimate aggregate (net) MA pay over the total study duration, we then undertook the following calculation steps:

1. By combining the above average hourly pay rates with the associated average number of contracted hours per week (37.6, again based on the 2018-19 Apprenticeship Pay Survey for Scotland) and the average number of weeks per year (52.2[205]), we calculated **average *annual* earnings**.
2. Using the assumptions on the average age at which MA learners in the 2018-19 cohort start their training and the average duration of training (by MA level)[206], we estimated the **annual gross (i.e. pre-tax) apprentice earnings per learner over the total study duration**.
3. As with earnings post-completion, we adjusted the estimates to account for OBR **nominal average earnings growth forecasts** for the UK[207].
4. Based on the relevant (Scottish) income tax and National Insurance employee contribution rates and thresholds[208], we computed the stream of **net (post-tax) apprentice earnings**.
5. Finally, we discounted the results to **NPV terms in 2018-19 prices**.

Table 37 Average MA pay per hour in Scotland: Separate breakdowns by gender, age band and level

By level		By gender		By age band	
Level 2	£7.79	Male	£8.49	16-18	£5.90
Level 3	£8.33	Female	£7.46	19-20	£7.19
				21-24	£8.62
				25+	£10.74
Average	**£8.22**	**Average**	**£8.22**	**Average**	**£8.22**

Note: All hourly pay rates are presented in 2018-19 prices.

Source: London Economics' analysis based on Department for Business, Energy, and Industrial Strategy (2020)

Second, to arrive at breakdown of this estimate by gender, we then multiply this result (£5.59) by the ratio of the average wage amongst all male MAs relative to the overall average pay rate (£8.49 / £8.22 = 1.03). The result amounts to £5.59 x 1.03 = **£5.78**.

[205] As part of the same survey, 87% of all Level 2 and Level 3 MAs in Scotland indicated that they had written contracts with their employers covering the full year.

[206] See Section 8.2 for the assumptions on average age at enrolment, and average training duration.

[207] See Office for Budget Responsibility (2020, 2021a and 2021b).

[208] Again, we use the relevant tax and National Insurance rates and thresholds for the 2018-19 fiscal year, and assume fiscal neutrality (i.e. we assume that the earnings tax and National Insurance income thresholds grow at the forecast UK-wide nominal average annual earnings growth rates used in Step 3).

Table 38 Average MA pay per hour in Scotland: Estimated combined breakdown by gender, age band and level

Age band	Male		Female	
	Level 2	Level 3	Level 2	Level 3
16-18	£5.78	£6.18	£5.07	£5.43
19-20	£7.04	£7.53	£6.18	£6.61
21-24	£8.44	£9.02	£7.41	£7.93
25+	£10.51	£11.24	£9.24	£9.88

Note: All hourly pay rates are presented in 2018-19 prices.
Source: London Economics' analysis based on Department for Business, Energy, and Industrial Strategy (2020)

Benefits: Enhanced net earnings post-completion

Again, we used the same methodology as described above (see Section 8.4.1) to assess the **enhanced earnings achieved by Modern Apprentices after completing their training** (after tax and adjusted for the likelihood of employment, and relative to MA non-completers).

Costs: Foregone net earnings during study

Similarly, we used the same approach as already described in Section 8.4.1 to estimate the **opportunity costs of earnings** among the counterfactual groups (i.e. non-completers) that MA learners forego during their training (which are partially or wholly offset against the apprentice wages that these learners receive from their employers during their training).

8.6.2 ROI to the Exchequer

Benefits: Tax and National Insurance contributions during training

As a first key Exchequer benefit associated with MAs, we estimated the **income tax and National Insurance employee and employer contributions associated with the apprentice wages** received by MAs during their training (calculated using the above-described approach to estimating net apprentice wages during training (see Section 8.6.2)). As for learners, from the Exchequer perspective, these benefits during training need to be offset against the costs of foregone income tax and National Insurance contributions associated with the counterfactual group (i.e. non-completers; described in further detail below).

Benefits: Enhanced tax and National Insurance contributions post-completion

We again applied the same methodology as described above (see Section 8.4.2) to assess the **enhanced tax and National Insurance contributions associated with Modern Apprentices after completing their training** (relative to MA non-completers).

Costs: SFC and SDS funding contributions for MAs

A key Exchequer cost associated with Modern Apprenticeships relates to the **public funding contributions for MA training provided to FE colleges and other training providers by Skills Development Scotland and the Scottish Funding Council**. These funding costs were estimated as follows:

- **SDS MA funding contributions**: We combined information on the SDS 2018-19 MA funding contribution rates per learner with separate SDS data on the number of MA starters in 2018-19 (both by age band, SCQF level, and MA framework), to calculate (weighted) average funding rates per learner by age band and MA level (i.e. MA Level 2 vs. 3)[209]. We then applied these average funding rates to each year of the assumed training period[210], and discounted the resulting total to NPV terms in 2018-19 prices.
- **SFC MA funding contributions**: We used data provided by the SFC on the aggregate SFC funding associated with Modern Apprenticeship provision in Scottish colleges in 2018-19[211], and divided this by the total number of MA learners in training in 2018-19 (based on separate SDS data)[212], separately by MA level. We thus arrived at the average SFC funding per learner per year, applied this to each year of training[213], and again discounted the total to NPV terms in 2018-19 prices.

Costs: SDS administrative costs of MA delivery

Another stream of Exchequer costs in relation to Modern Apprenticeships involves Skills Development Scotland's **administrative costs of running the MA programme** (e.g. in relation to the costs of the staff involved in administering MAs)[214]. These were based on SDS data on the total 'costs to serve' for the Modern Apprenticeship programme in the

[209] i.e. weighted by the underlying number of MA starters in the 2018-19 cohort.
[210] SDS funding contributions for MAs are split into a start payment (£150 per learner, applicable to young MAs aged 16-19 only); milestone-based payments paid at different points throughout the training period; and a final output-based payment upon completion of the training. Start-based payments are not applicable to the ROI analysis here, since MA learners in the 2018-19 cohort are older than 16-19 at the start of their training (see Section 8.2). Our derived average funding rates capture the *total* funding per student *over the entire training period*, and we therefore divide the totals by the assumed training duration to arrive at assumed funding rates per student per year (i.e. we apply the same funding rate to each year of training). As for the funding associated with HE and FE qualifications, we thus assume that SDS funding contributions for MAs remain constant in every year of training.
[211] Note that, based on information provided by the SFC, it is likely that some of the costs included in the data do not go exclusively towards MA training. However, a more precise cost cannot be identified in the data; as a result, it is likely that the reported MA cost is likely somewhat overestimated here.
[212] The SFC funding data also included information on the underlying number of *funded* MA learners. However, as before, we instead divided by the *total* number of MA learners in training to arrive at average funding rates, again to implicitly take account of the fact that not all students are eligible for SFC funding.
[213] Again, we assume that these funding contributions remain constant in every year of training.
[214] Note that no such public administrative costs were included as part of the Exchequer ROI to higher education or further education qualifications. The analysis for MAs also does not include any administrative costs associated with Modern Apprenticeships that are incurred by the Scottish Funding Council.

2018-19 financial year[215], divided by the total number of MA learners in training in 2018-19. Again, we then spread the resulting average cost per learner per year out over the total training duration and calculated the total costs per learner in NPV and 2018-19 prices.

It should be noted that there are inherent difficulties in allocating the annual cost of programme delivery incurred by Skills Development Scotland to specific programmes, and that there is likely to be significant variation of these cost by framework, MA level, learner age, and over time (both within a given academic year, as well as between different academic years). It was not feasible or sensible to generate a more detailed breakdown of the administrative costs, so that the above-described estimated average rate per learner should be interpreted with these caveats in mind.

Costs: MA employer incentive funding

In addition to the above funding contributions and administrative costs, during the training, Skills Development Scotland provides funding to employers as part of the **'Adopt an Apprentice' employer incentive scheme**. These financial incentives are available to employers taking on a Modern Apprentice who was been made redundant from another employer, and are aimed at covering their wage and recruitment costs. We divided the total funding provided to employers through this scheme in 2018-19 (included in of the above-described MA SDS 'cost to serve') by the total number of MA learners in training in 2018-19, spread the resulting average cost per learner per year out over the total training duration[216], and discounted to NPV terms in 2018-19 prices.

Costs: Foregone tax and National Insurance contributions during study

As for HE and FE qualifications, the final public cost associated with Modern Apprenticeships included in our analysis again relates to the opportunity cost of **foregone income tax and National Insurance contributions during the period of study** (associated with individuals in the counterfactual groups, i.e. non-completers). Again, Section 8.4.2 above outlines how these Exchequer costs were calculated (for all qualifications of interest).

8.6.3 ROI to employers

While the above-described methodological approach associated with estimating the Return on Investment to MA learners and the Exchequer is generally relatively well established, the ROI to employers is much more difficult to capture. This is because:

- There is only relatively limited existing evidence (from previous econometric analyses) available to identify the economic **benefits** of training and education to

[215] The original data also included the direct cost of SDS funding contributions for MAs (discussed separately above), as well as the funding costs associated with the 'Adopt an Apprentice' employer incentive programme for MAs (discussed separately below), which we excluded from the total 'cost to serve' here to avoid double-counting.
[216] Again assuming that the funding per student per year remains constant in every year of training.

employers. For example, some of the key benefits to employers associated with apprenticeship training relate to apprentices' direct contribution to productivity during the apprenticeship, as well as the contribution to firm-level productivity following the completion of the apprenticeship. Almost by definition, these productivity benefits are inherently difficult to measure and estimate, and the evidence on the potential size of these benefits is relatively limited.

- It is also difficult to understand the **costs** associated with MA training that are borne by employers. This is again driven by only limited available evidence and data, but also because of the assumptions relating to the appropriate counterfactual (i.e. what would have happened if the employer had not hired an apprentice (discussed in further detail below)), as well as the variation in employer costs depending on the nature and type of the apprenticeship.

As a result of these issues, the analysis of the ROI to employers associated with Modern Apprenticeships is **exploratory**, and the results should be interpreted with relative caution and with these caveats in mind.

In terms of the **counterfactual**, for consistency with the above-described student and Exchequer returns (and with HE and FE qualifications), note that the employer ROI to MAs is also undertaken relative to the same (non-completer) counterfactual. In other words, **the analysis assumes that instead of taking on an apprentice, employers would otherwise have employed (and paid) a Modern Apprenticeship non-completer**. For example, the employer ROI to MAs at Level 3 assesses the costs and benefits associated with employing an individual completing a Modern Apprenticeship at Level 3 compared to employing an individual who started but dropped out of an MA at Level 3[217].

Finally, it is important to note that throughout this analysis, the employer ROI associated with MAs is assessed from the perspective of ***all* employers** (as a group) irrespective of whether they train Modern Apprentices or not. In other words, the analysis is *not* adjusted for the likelihood of an MA learner remaining with or leaving their training employer during or after completing their apprenticeship.

Benefits: Foregone employer wage costs and National Insurance contributions during training

As presented in Figure 10 above, the first key employer benefit associated with hiring and training MA learners (compared to hiring non-completers) relates to the **wage payments and National Insurance contributions that the employer foregoes during the training period** (i.e. that they would have incurred if they had employed an MA non-completer instead of taking on an apprentice)[218]. These employer benefits were estimated based on:

[217] Where, as outlined above, we assume that non-completers drop out immediately at the beginning of their apprenticeship.

[218] Where a MA non-completer would be paid a full (non-MA) wage which would normally be more than the MA in-training wage

- The estimated gross (i.e. before-tax) foregone earnings of MA learners during the training period (by MA level and gender), based on the earnings of individuals who started but dropped out of MAs (discussed in Section 8.6.1 above[219]); and
- The associated foregone National Insurance employer contributions (estimated as part of the Exchequer cost of Modern Apprenticeship training, discussed in Section 8.6.2).

Benefits: Apprentice productivity during training

In addition to MA learners' enhanced contribution to their employers' productivity following the completion of their training (discussed below), apprentices make a **productive contribution to their employers during their training period**.

To estimate the size of these employer benefits, we made use of information from the 2020 Modern Apprenticeship Employer Survey (provided by Skills Development Scotland). The survey asked employers engaged in MA training to indicate the number of hours in an average day that their apprentices spend on tasks at the level of a fully qualified worker (separately for MAs at Level 2 vs. Level 3)[220]. Dividing the results by the assumed average working hours per day for a fully qualified worker (8.0), we then calculated the **assumed average proportion of the working day that apprentices spend on tasks of a fully qualified worker** (see Table 39). Using these assumptions, we then assumed that the proportion of *tasks* of a fully qualified worker that MA learners are able to complete reflects the proportion of a fully qualified worker's *productivity* that MA learners are able to achieve.

Table 39 Assumed # of hours and proportion of working day that MAs spend on tasks of a fully qualified worker

MA level	# of hours per day spent on tasks of a fully qualified worker	Estimated % of working day spent on tasks of a fully qualified worker
Level 2	5.35	67%
Level 3	5.43	68%

Note: All results are based on employers' estimates of apprentice productivity in the middle of the MA training.

Source: London Economics' analysis based on information from the 2020 Modern Apprenticeship Employer Survey (provided by Skills Development Scotland)

To convert these proportions into monetary estimates, we thus required an estimate of the productivity generated by the fully qualified or fully experienced worker. We used *earnings* as a proxy for *productivity*, and thus used the average annual earnings of

[219] Note that, in contrast to the approach described in Section 8.6.1, the earnings estimates here were *not* adjusted for the likelihood of employment (i.e. the estimates here assume a 100% of likelihood of employing MA non-completers). This is due to the specific choice of counterfactual for the ROI to employers, assuming that, rather than taking on an apprentice, employers would instead hire an MA non-completer (i.e. with an assumed employment probability of 100%).

[220] Employers were asked to provide this information for apprentices at the start, in the middle, and at the end of their training. For simplicity, the analysis here uses the estimates for the middle of the training only, and applies these estimates to the entire assumed training duration for MAs.

individuals in possession of Modern Apprenticeships at Level 2 and Level 3 (as their highest qualification) as a measure of fully qualified workers' productivity (by gender and MA level, based on the Scottish LEO data, measured at 3 years post-completion, and based on individuals aged up to 30 at completion of their MA). We then multiplied these productivity estimates by the above-described percentages, applied the results to each year during the training period, and adjusted for assumed annual earnings growth rates as above, based on OBR forecasts), to calculate total MA productivity per learner during training (again in NPV terms in constant 2018-19 prices)[221].

Benefits: MA employer incentive funding

During the training period, eligible employers further benefit from the **funding provided through the 'Adopt an Apprentice' employer incentive scheme** administered by Skills Development Scotland. For more information on how this funding was estimated, see Section 8.6.2 above.

Benefits: Productivity gains post-training

The most significant benefit to employers associated with training Modern Apprentices relates to learners' **additional contributions to employer productivity following the completion of their apprenticeship**. As outlined above, these benefits are inherently difficult to estimate, and the analysis relies on existing literature to provide exploratory estimates of the size of these employer benefits.

Specifically, we make use of an analysis undertaken (by London Economics) on behalf of the (former) Department for Business, Innovation and Skills (2016) of the impact of training on productivity and the wage bill at the firm- and industry-level, using information[222] derived from the matched Individualised Learner Record (which contains information on all publicly funded training provided in England), and the Inter-Departmental Business Register (including information from the Annual Business Survey and the Business Register and Employment Survey). This information was combined with data on firm-level and industry-level training and general business characteristics (derived from the Employers Skills Survey). At industry level[223], the analysis suggests that a 1

[221] In other words, we implicitly assume that the apprentice wages paid to MA learners during their training period do *not* fully capture their true productive contribution to their employers. Hence, we do *not* base these productivity estimates on apprentices' wages during their training, but instead combine estimates of the earnings of fully qualified workers with the information on the proportion of their day that MAs spend on tasks of a fully qualified worker.
[222] Covering the years 2009 to 2013.
[223] Based on 2 digit SIC codes.

percentage point increase in overall training intensity is associated with an increase in productivity of **0.74%**, and around **0.36%** in employment costs (i.e. wages)[224, 225, 226].

The difference between the size of the wage and productivity effects indicate how industry-level returns to training are shared between workers and firms. In other words, these findings imply that **the (post-completion) benefits associated with staff training are shared approximately equally between the employer and the employee**, i.e. that the ratio of the productivity effect (**0.74%**) relative to the wage effect (**0.36%**) associated with publicly funded training is approximately **2.1 : 1**[227, 228].

To arrive at monetary estimates of the productivity gains to employers post-training, we applied this ratio to the (pre-tax, employment-adjusted, and discounted) enhanced earnings associated with qualification attainment (by gender and MA level), discussed in more detail in Section 8.6.1.

Costs: Apprentice wage costs and National Insurance contributions during training

Turning to employer costs associated with employing apprentices, during the training period, employers incur the **costs associated with the wages paid to Modern**

[224] Training intensity was defined as the proportion of employees in receipt of any form of training (including both publicly and privately funded training) over the past 12 months. Productivity was measured as real gross value added per worker (in log terms).

[225] The estimates used were derived from the coefficients of the Fixed Effects model in the analysis for the Department of Business, Innovation and Skills (2016). It should be noted that the Fixed Effects model does not control for the potential endogeneity, and results may be biased to some extent. The point estimates from the Generalised Method of Moments (GMM) model (controlling for endogeneity) were slightly larger for the productivity regression and quite similar for the wage regression, but never statistically significant (likely due to the fact that the analysis was based on four years of data only, so there were only a very limited number of lags). Moreover, the estimates used are fully consistent with previous evidence for the UK (discussed in the next footnote), and are therefore considered to represent a reasonable estimate for the UK.

[226] In a comparable previous analysis, Dearden et al. (2005) combined individual-level data on training from the Labour Force Survey with industry-level data from the Annual Census of Production (the predecessor of the Annual Business Survey). Their findings suggest that the overall effect of training on productivity at industry level is positive and robust, around twice as high as the wage effect, and consistent across different model specifications. Based on their results, the authors report that an increase in industry-level training intensity by one percentage point is associated with an increase in productivity of between 0.6% (GMM) and 0.7% (Fixed Effects), and an increase in wages of 0.3% (both specifications).

[227] Note that the industry-level productivity benefit captures the direct productivity benefits accrued by the training firm itself associated with the training employee, the firm-level productivity spillovers of the training on other workers (including those that might not have received the training), as well as the industry-level productivity spillovers accruing to other (training and non-training) firms.

[228] Note that the underlying analysis on behalf of the Department for Business, Innovation and Skills (2016) measured the productivity and wage effect associated with an increase in training *within the same year*, i.e. the results constitute *in-year/'in-training'* impacts of training intensity on productivity and wage costs. In the absence of other estimates, for the purpose of the ROI analysis, we then apply this ratio to estimate the *post-training* productivity effects associated with MA training. In other words, we implicitly assume that the ratio of the productivity effect relative to the wage effect remains constant over time (during the training period itself, as well as throughout all years post-training).

Apprentices, as well as the resulting National Insurance employer contributions paid to the Exchequer. These costs were estimated based on:

- The gross (i.e. before-tax) wages of Modern Apprentice during the training period (see Section 8.6.1 above for more detail); and
- The National Insurance employer contributions associated with these apprentice wages (estimated as part of the Exchequer benefits of Modern Apprenticeship training, see Section 8.6.2).

Costs: Apprentice recruitment and supervision costs during training

In addition to apprentice wages (and National Insurance employer contributions), employers also incur the **costs of recruiting, training, and supervising Modern Apprentices during the training period**. These costs were estimated based on findings from the 2020 Modern Apprenticeship Employer Survey (again provided by Skills Development Scotland), in terms of:

- The combined costs of **supervising and training** MA learners, in terms of the average total cost per learner of internal staff time spent training and supervising an apprentice (separately by MA level). To arrive at estimates of these costs per learner per year, we divided the reported total costs over the entire training period by the assumed training duration for MA learners in the 2018-19 cohort (see Section 8.2). We then applied these costs to each year of training[229], and discounted to NPV terms in 2018-19 prices.
- The costs of **recruiting** Modern Apprentices (for those employers who recruited apprentices from outside of their organisation[230]), including both the costs of **internal staff time** spent recruiting apprentices, as well as the **external costs** of advertising apprentice positions, agency fees, external venues, and other external recruitment costs (again separately by MA level). These recruitment costs were then applied to the first year of the assumed training period only.

Costs: Foregone productivity during training

While employers benefit from MA learners' productive contributions during the training period (discussed above), **employers *forego* the productivity associated with the assumed counterfactual**, i.e. the productive contributions that they would have incurred if they had instead employed a Modern Apprenticeship non-completer. To estimate these opportunity costs to employers – again using *earnings* as a proxy for *productivity* - we used the estimated gross (i.e. pre-tax) foregone earnings of MA learners during the

[229] As before, we assume that these costs of training remain constant in every year of training.
[230] i.e. this survey question was only posed to employers who recruited their apprentices externally. The resulting cost estimates therefore do not capture the (likely lower) cost to employers who recruit MAs from within their own organisation; as a result, the costs here are likely to overestimate the true employer cost of MA recruitment.

training period (discussed in Section 8.6.1) based on individuals who started but dropped out of MAs (by level and gender)[231].

Costs: Enhanced employer wage costs and National insurance employer contributions post-training

Finally, following completion of the training, employers incur the **additional costs of the enhanced wages paid to MA completers after their training**, as well as the **associated additional National Insurance employer contributions** paid to the Exchequer (again all relative to the counterfactual). The methodology used to estimate the additional (employment-adjusted, pre-tax) earnings achieved by individuals in possession of Modern Apprenticeships (relative to MA non-completers, by level and gender) was described in Section 8.6.1, while the approach used to estimate the additional National Insurance employer contributions associated with these earnings premiums was outlined in Section 8.6.2.

[231] As a result of this approach, the estimated employer *costs* of foregone productivity during training exactly equals the above-discussed employer *benefits* from the foregone (pre-tax) wage costs during training; i.e. these benefits and costs exactly offset each other in the ROI calculations.

9 Findings: The Return on Investment associated with post-school qualifications

9.1 ROI associated with higher education qualifications

This section presents our findings on the estimated Return on Investment associated with higher education qualifications obtained by Scottish domiciled students studying in Scotland in the 2018-19 cohort, from the perspective of students attaining these qualifications (Section 9.1.1) and the Exchequer funding these qualifications (Section 9.1.2). While the results presented here focus exclusively on the ROI associated with **full-time study**, corresponding findings for part-time students are provided in Annex A5.1.

In terms of the key measures provided, we present information on our estimates of:

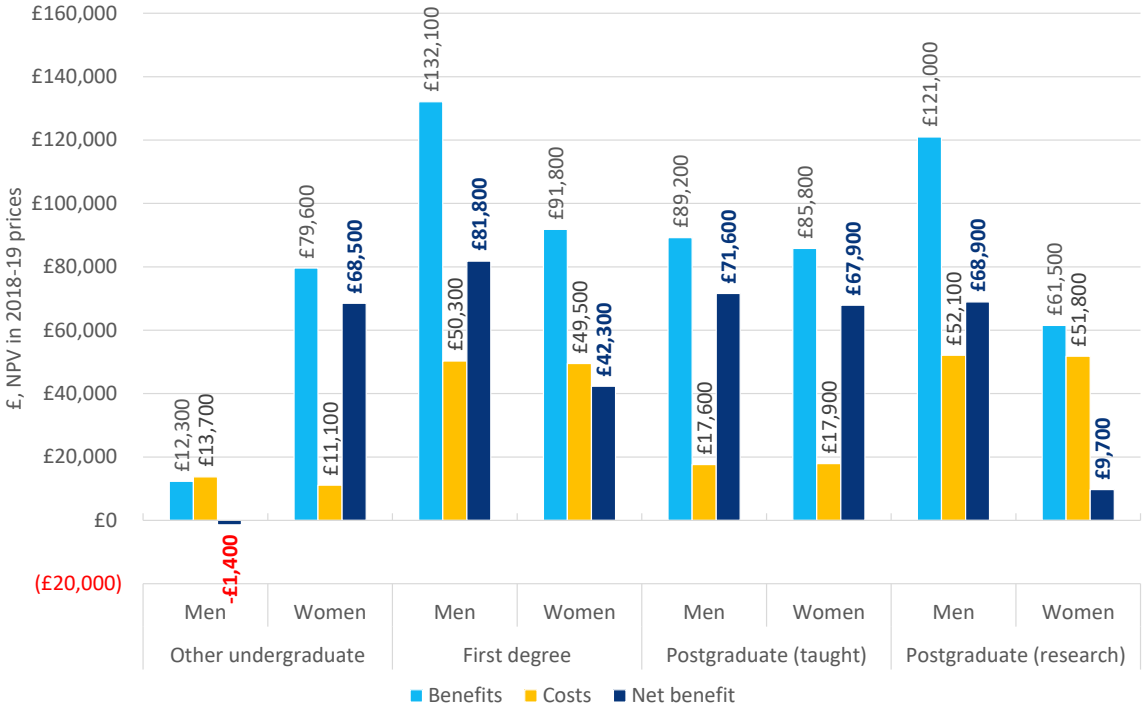
- The **net benefit per learner** student associated with attaining/funding the given qualification, defined as benefits minus costs per student over the period of study and throughout their lifetimes post-graduation[232] (in net present value terms in 2018-19 prices). Here, positive values indicate that, compared to the relevant counterfactual, the benefits of attaining/funding a given qualification outweigh the associated costs, while negative values indicate that the costs exceed the benefits; and
- Corresponding **benefit-to-cost-ratios (BCRs)**, where values larger than 1.0 indicate that benefits outweigh costs (i.e. positive net benefits associated with completing the given qualification compared to the relevant counterfactual), while results smaller than 1.0 indicate the opposite (i.e. negative net benefits associated with achieving the qualification compared to the relevant counterfactual).

9.1.1 ROI to HE students

Figure 11 presents the estimated benefits, costs, and net benefits to students in the 2018-19 cohort undertaking full-time higher education qualifications (all per student, in NPV terms in constant 2018-19 prices). Overall, there is strong variation in the estimated Return on Investment associated with these qualifications, both by qualification level and gender. While the variation across different types of HE qualifications results from differences in both the benefits and costs associated with qualification attainment, the variation by gender is largely driven by differences in the benefits of attainment only[233]. In all instances, the largest benefit component associated with HE qualifications relates to the enhanced net earnings achieved by students post-completion, while these students' foregone net earnings during study constitute the largest cost component.

[232] Again, we assume a typical retirement age of 65 (see Section 8.2 for more information).
[233] i.e. for each qualification level, the estimated costs of attainment are similar across men and women.

Figure 11 Net student benefit associated with full-time HE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.

Source: London Economics' analysis

Considering differences by qualification level, the analysis indicates that there are large net benefits accrued by male students completing **postgraduate research qualifications** (compared to male graduates in possession of first degrees as their highest level of qualifications), estimated at **£68,900** per 'typical' student/graduate. However, this compares to only **£9,700** for women. A key driver of these differences relates to the estimated average age at completion for students in the 2018-19 cohort (30 for men and 31 for women)[234]. As a result of these differences, the ROI analysis applies the (relatively higher) marginal earnings return associated with men aged between 22 and 30 when completing their qualifications, and the (relatively lower) returns associated with women aged 31+ when completing their qualifications[235]. This illustrates the sensitivity of the results with respect to small differences in the expected age at enrolment, driven by the fact that the estimation of the labour market returns to different qualifications using the Scottish LEO data was necessarily broken down into relatively wide age bands at graduation (to allow for sufficient sample size). In addition, the lower net benefit for women is driven by the relatively lower baseline/counterfactual earnings to which these marginal earnings returns are applied (i.e. based on women vs. men in possession of first

[234] Again, see Section 8.2.

[235] See Table 36 in Section 8.4.1 and Table 11 in Section 5.2.1 for more information. Note that the ROI analysis assumes that all marginal employment returns to postgraduate research qualifications are equal to 0, since the estimated marginal employment returns to these qualifications were either zero or negative, and any negative marginal returns were set to 0 (see Table 36 in Section 8.4.1 and Table 18 in Section 6.2.5).

degrees as their highest qualification). More generally, in addition to differences in marginal earnings/employment returns, the relevant level of baseline or counterfactual earnings/ employment constitute an important factor in explaining some of the observed ROI differences.

The analysis also estimated large net benefits to students undertaking **postgraduate taught qualifications**, for both men (**£71,600**) and women (**£67,900**) – again compared to individuals with first degrees as their highest qualification. While the estimated benefits to postgraduate taught qualifications are lower than for postgraduate research students (due to lower estimated labour market returns), this is offset by the significantly lower costs of attainment incurred by students undertaking postgraduate taught students (due to lower foregone earnings during study, itself driven by a shorter duration of study[236]).

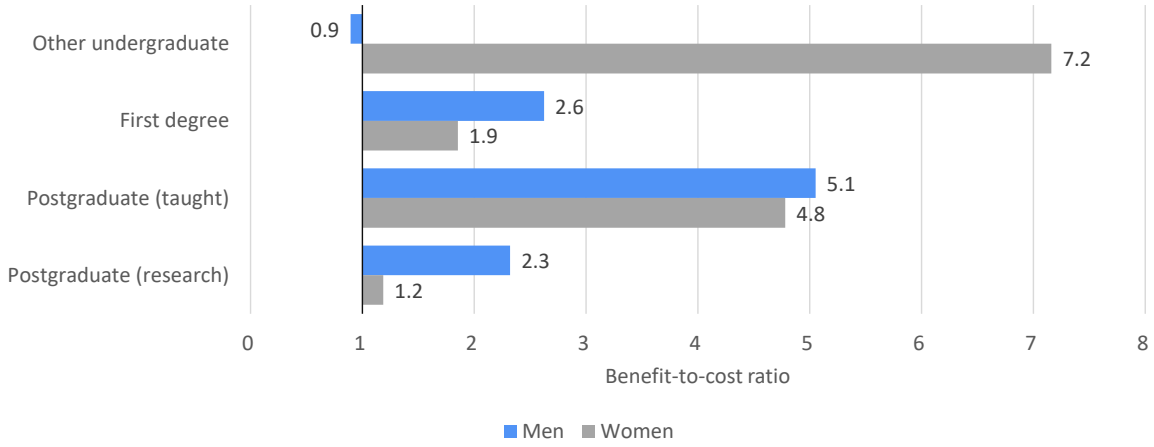
Among all (full-time) HE qualifications, the largest net benefits are achieved by men completing **first degrees**, estimated at **£81,800** per 'typical' student in the 2018-19 cohort (compared to individuals who start but do not complete first degrees). Again, the corresponding estimate for women is much lower (standing at **£42,300** per student). Here, although the relevant marginal earnings and employment returns to first degrees tend to be *higher* for women than for men[237], this is outweighed by the much lower counterfactual/baseline earnings among female first degree non-completers as compared to male first degree non-completers (to which these returns are applied).

Finally, there are also relatively strong net benefits achieved by women completing **other undergraduate qualifications** (standing at **£68,800** per student), compared to individuals in possession of vocational qualifications at SCQF Level 6 as their highest qualification. In contrast, the analysis suggests a (small) negative benefit for male students completing learning at this level (**-£1,400**) – i.e. that the costs of attainment (slightly) outweigh the benefits - due to negligible marginal earnings and employment returns observed for men[238].

Figure 12 presents the corresponding benefit-to-cost ratios achieved by (full-time) students completing higher education qualifications in the 2018-19 cohort of Scottish domiciled students studying in Scotland. As with the above-discussed net benefits to students, there are significant differences in the estimated BCRs, by both qualification level and gender. While most of these ratios were estimated to be larger than 1.0 (i.e. benefits outweigh costs), they range between **0.9** (for male students completing other undergraduate qualifications) and **7.2** (for female students completing these same other undergraduate qualifications.

[236] Again, see Section 8.2.
[237] Again, see Table 36 in Section 8.4.1.
[238] Several of the original estimated marginal earnings and employment returns for men were negative (see Table 11 in Section 5.2.1 and Table 18 in Section 6.2.5), but were set to 0 for the purpose of the ROI analysis (Table 36 in Section 8.4.1; since we assume that there can be no wage or employment penalty associated with any qualification attainment).

Figure 12 Benefit-to-cost ratios for students associated with full-time HE qualifications, by qualification level and gender



Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

When comparing these BCRs, it is important to note that, by definition, a large observed BCR does not imply that there is a large net benefit per student in *absolute* terms. For example, while the largest net benefits for HE students are achieved by men completing first degrees (**£81,800**), the associated benefit-to-cost ratio is relatively low (standing at **2.6**), since the associated costs amount to close to 40% of the associated benefits.

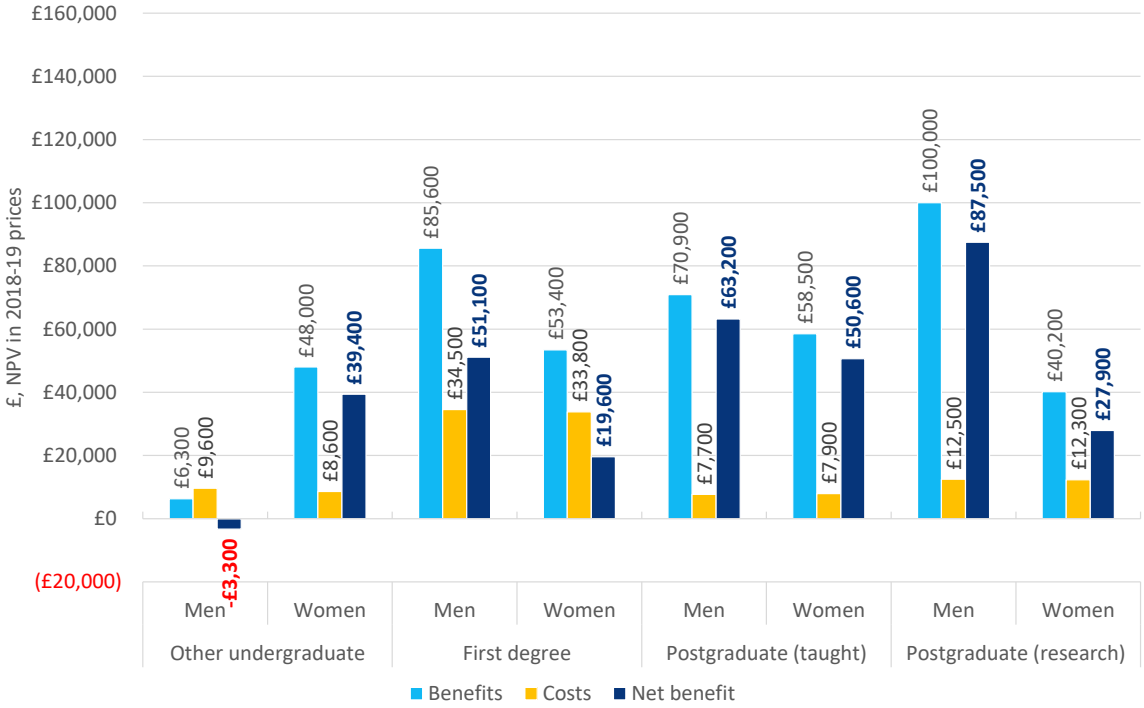
9.1.2 ROI to the Exchequer

As presented in Figure 13, the variation in the estimated net Exchequer benefits associated with HE qualifications mirrors the differences observed in the above-discussed net benefits to students. Here, the Exchequer benefits from the additional income tax and National Insurance receipts associated with the enhanced earnings (and employment) achieved by graduates post-completion, while the largest Exchequer cost relates to the tax and National Insurance revenues that are foregone during the period of study (again assuming that if, instead of completing a HE qualification, students had instead entered the labour market with the counterfactual level of qualification).

The net Exchequer benefits to **postgraduate research qualifications** (compared to first degrees) were estimated at **£87,500** per student for men, and **£27,900** for women. In both instances, the estimated net Exchequer benefits *exceed* the corresponding net benefits accrued by students[239] (**£68,900** for men and **£9,700** for women). This is driven by the relatively low Exchequer costs of funding postgraduate research qualifications (as compared to the much larger costs of attainment incurred by students undertaking these qualifications).

[239] See Section 9.1.1 for the corresponding net benefits accrued by students.

Figure 13 Net Exchequer benefit associated with full-time HE qualifications (£ per student), by qualification level and gender



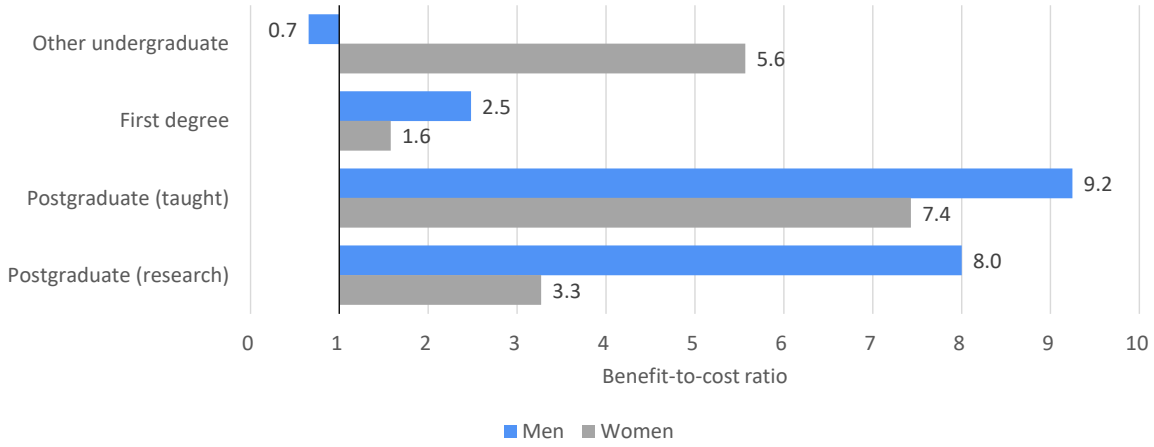
Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.
Source: London Economics' analysis

For all other higher education qualifications, the net Exchequer benefits are *lower* than the corresponding net benefits accrued by students – though typically still substantial:

- The net Exchequer benefits associated with **postgraduate taught qualifications** (relative to first degrees) were estimated at **£63,200** for men and **£50,600** for women (compared to net student benefits of **£71,600** and **£67,900**, respectively);
- The net Exchequer benefits associated with **first degrees** (relative to first degree non-completers) were estimated to be **£51,100** for men and **£19,600** for women (compared to net student benefits of **£81,800** and **£42,300**, respectively); and
- The net Exchequer benefits associated with **other undergraduate qualifications** (relative to vocational qualifications at SCQF Level 6) stand at -**£3,300** for men and **£39,400** for women (compared to net student benefits of -**£1,400** and **£68,500**, respectively).

The corresponding benefit-to-cost ratios associated with HE qualifications from the Exchequer perspective are presented in Figure 14. Compared to the corresponding BCRs from the student perspective, there is even larger variation in the Exchequer BCRs. While almost all ratios are in excess of 1.0, they range from **0.7** (for male students completing other undergraduate qualifications) to **9.2** (for men completing postgraduate taught qualifications). The ratios associated with postgraduate taught and research qualifications are particularly high, given the relatively limited public funding associated with these qualifications (i.e. small denominators on which the ratios are based).

Figure 14 Benefit-to-cost ratios for the Exchequer associated with full-time HE qualifications, by qualification level and gender



Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

9.2 ROI associated with vocational qualifications

The following presents our findings on the ROI estimates associated with vocational/further education qualifications obtained by students in the 2018-19 cohort, from the perspective of students (Section 9.2.1) and the Exchequer (Section 9.2.2). Again, the results presented here focus exclusively on the ROI associated with **full-time study**, and corresponding findings for part-time students are presented in Annex A5.2[240].

9.2.1 ROI to FE students

As presented in Figure 15, compared to higher education qualifications, there tends to be even larger variation in the estimated net student benefits associated with different (full-time) vocational qualifications (where all net benefits are estimated relative to non-completers of each qualification). As for HE qualifications, the largest benefit component associated with vocational qualifications relates to the enhanced net earnings achieved by students post-completion, while these students' foregone net earnings during study constitute the largest cost component.

The highest net student benefits (for men) are associated with **vocational qualifications at SCQF Level 5** (compared to SCQF Level 5 non-completers), estimated at **£85,100** and **£61,600** per 'typical' male and female student, respectively. These high ROI estimates are driven by the large marginal employment returns associated with these qualifications (applied to estimate the ROI; see Section 8.4.1), as well as relatively substantial marginal earnings returns. It is important to note that these ROIs are larger than the corresponding net student benefits associated with full-time first degrees (**£81,800** for men and **£42,300**

[240] As presented in Section 8.1.2, among the cohort of Scottish domiciled students who started FE qualifications in Scotland in the 2018-19 academic year, 53% were undertaking qualifications on a full-time basis, while the remaining 47% were enrolled on a part-time basis.

for women; see Section 9.1.1), evidencing the significant monetary value that students derive from these types of vocational qualifications.

There are also significant net benefits accrued by students completing vocational qualifications at **SCQF Level 7** (**48,300** for men, and **£63,400** for women, compared to SCQF Level 7 non-completers). For women, the large ROI is due to both the large marginal earnings *and* employment returns to these qualifications, while men also accrue relatively large marginal earnings returns, but lower employment returns[241]. Note also that these high net benefits for qualifications at Level 7 are observed *in spite* of the fact that these qualifications are associated with the highest costs to students in relative terms (due to a longer average study duration, and higher costs of earnings foregone during the period of study).

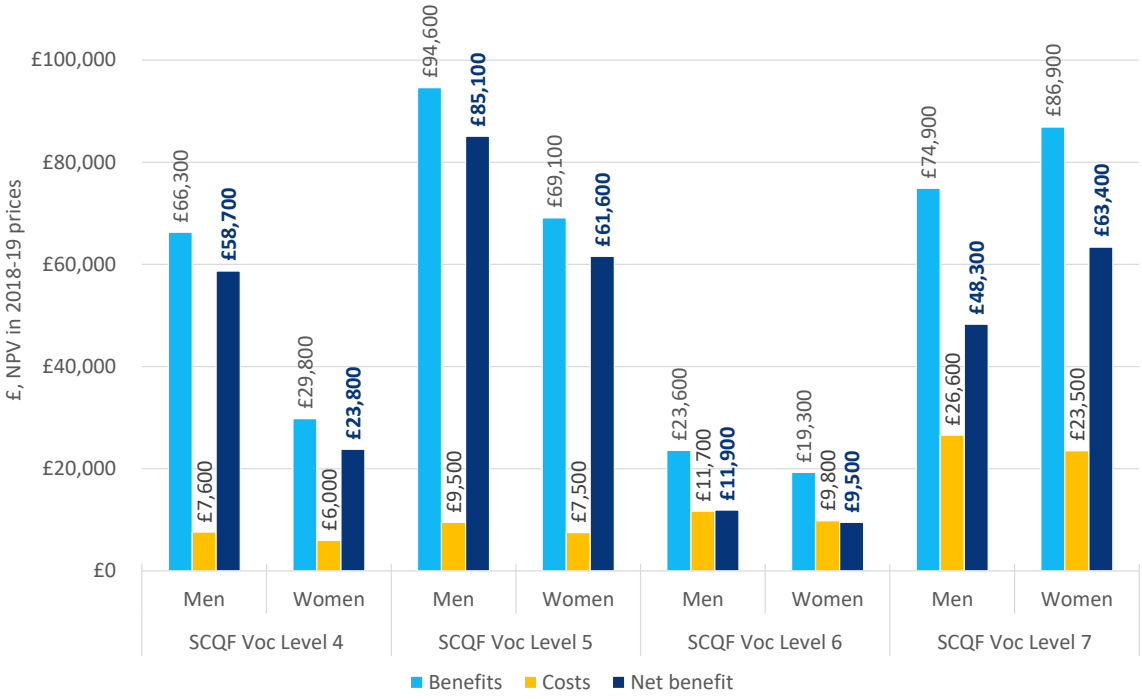
The net benefits for male students completing **vocational qualifications at SCQF Level 4** (compared to SCQF Level 4 non-completers) are also substantial (standing at **£58,700**), though the corresponding estimate for women is considerably smaller (**£23,800**). Similar to postgraduate research qualifications (see Section 9.1.1), a key driver of these differences relates to the estimated average age at completion for students in the 2018-19 cohort (21 for men and 25 for women)[242]. As a result, the ROI analysis for men applies the earnings and employment returns associated with individuals aged 21 or less, but the (relatively lower) returns associated with women aged 22-30 when completing their qualifications[243].

Finally, the lowest net student benefits among vocational qualifications are associated with **qualifications at SCQF Level 6** (**£11,900** for men, and **£9,500** for women, compared to SCQF Level 6 non-completers), due to the relatively low marginal earnings and employment returns to these qualifications (for the relevant age (band) of completion among students in the 2018-19 cohort, i.e. 22-30).

Comparing vocational to higher education qualifications, it is important to note that the costs of attainment for students associated with vocational qualifications are typically lower than for HE students (predominantly driven by lower foregone earnings during study, but also, to a lesser extent, by lower tuition fees charged to FE students). These relatively low costs, combined with often substantial benefits, result in large benefit-to-cost ratios achieved by students completing vocational qualifications (see Figure 16), ranging from **2.0** (for men and women at SCQF Level 6) to **10.0** (for male students at Level 5).

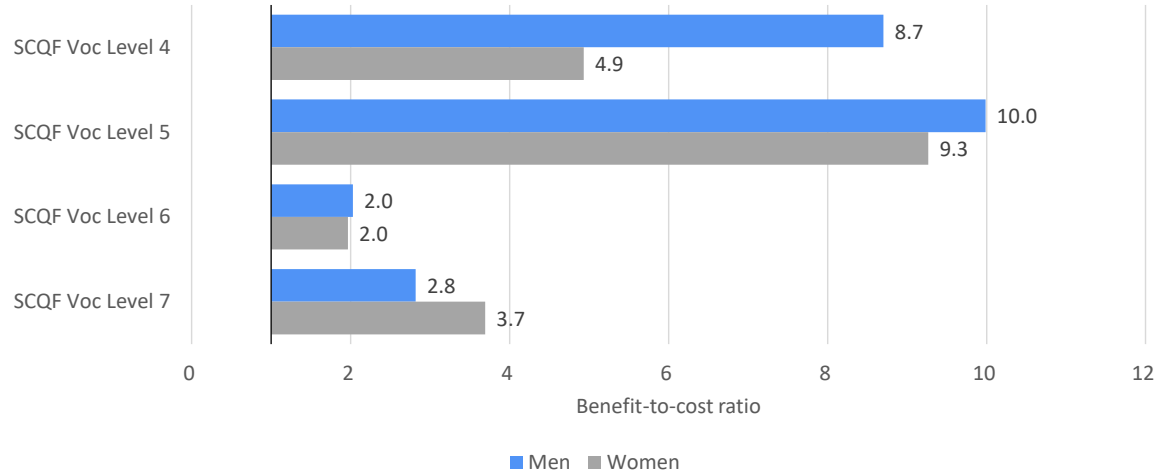
[241] Again, see Table 36 in Section 8.4.1. The result is particularly driven by a relatively large marginal employment return estimate for women from Year 7 post-completion onwards (12.1 percentage points), which we apply to estimate the ROI from Year 6 post-completion onwards (again, see Section 8.4.1 for more detail on the methodological approach used throughout the ROI analysis).
[242] Again, see Section 8.2.
[243] See Table 36 in Section 8.4.1 for more information.

Figure 15 Net student benefit associated with full-time FE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.
Source: London Economics' analysis

Figure 16 Benefit-to-cost ratios for students associated with full-time FE qualifications, by qualification level and gender



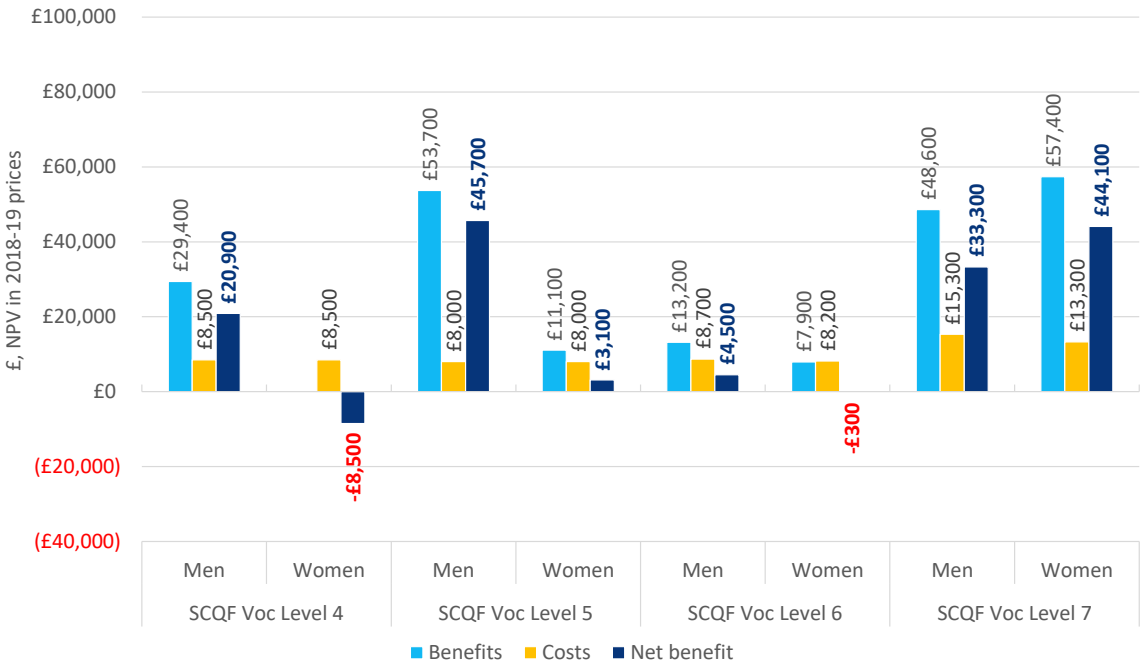
Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

9.2.2 ROI to the Exchequer

As shown in Figure 17, again, the variation in net Exchequer benefits mirrors the differences observed in the net benefits to students associated with vocational

qualifications. As for HE qualifications, the Exchequer benefits from the additional income tax and National Insurance receipts associated with the enhanced earnings (and employment) achieved by students post-completion. However, in contrast to HE qualifications, rather than foregone tax and National Insurance revenues during study, the highest Exchequer costs include the public teaching grant funding provided to Scottish FE colleges, as well as public student support funding provided to learners during the period of study.

Figure 17 Net Exchequer benefit associated with full-time FE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.
Source: London Economics' analysis

Overall, for all vocational qualifications, the net Exchequer benefits are lower than the corresponding net benefits accrued by students:

- The net Exchequer benefits associated with **vocational qualifications at Level 5** (compared to SCQF Level 5 non-completers) were estimated at **£45,700** for men and **£3,100** for women (compared to net student benefits of **£85,100** and **£61,600**, respectively[244]);
- The net Exchequer benefits associated with **vocational qualifications at Level 7** (compared to SCQF Level 7 non-completers) were estimated to be **£33,300** for

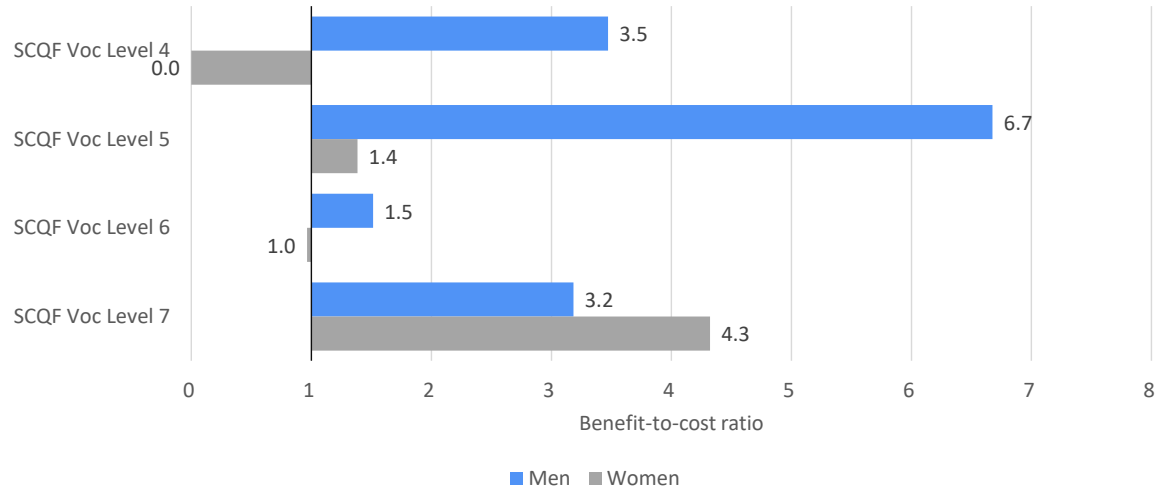
[244] While the net benefits to students are *somewhat* lower for women than for men, the net Exchequer benefits are *much* lower. This is driven by the fact that the estimated earnings of women in possession of SCQF Level 5 qualifications (vs. non-completers) are typically very low, and often do not or only marginally exceed the relevant income tax and National Insurance thresholds.

men and **£44,100** for women (compared to net student benefits of **£48,300** and **£63,400**, respectively);

- The net Exchequer benefits to **vocational qualifications at Level 4** (relative to SCQF Level 4 non-completers) stand at **£20,900** for men and **-£8,500** for women[245] (compared to net student benefits of **£58,700** and **£23,800**, respectively); and
- The net Exchequer benefits associated with **vocational qualifications at Level 6** (compared to SCQF Level 6 non-completers) are again lowest, at **£4,500** for men and **-£300** for women (compared to net student benefits of **£11,900** and **£9,500**, respectively).

Compared to the corresponding BCRs from the student perspective, there is a relatively smaller range of Exchequer BCRs associated with vocational qualifications, and the ratios tend to be smaller (except for qualifications at SCQF Level 7). Most Exchequer BCRs are larger than 1.0, but range from **0.0** (for women at Level 4 (due to zero estimated benefits, as above)) to **6.7** (for men at Level 5).

Figure 18 Benefit-to-cost ratios for the Exchequer associated with full-time FE qualifications, by qualification level and gender



Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

9.3 ROI associated with Modern Apprenticeships

Finally, this section presents our findings on the estimated Return on Investment associated with Modern Apprenticeships, from the perspective of MA learners (Section 9.3.1), the Exchequer (Section 9.3.2), and employers (Section 9.3.3).

[245] Here, note that the negative estimate for women is driven by the fact that there are *only* Exchequer costs but *no* estimated Exchequer benefits for women attaining vocational qualifications at SCQF Level 4 (since their estimated earnings profiles (compared to SCQF Level 4 non-completers) never exceed the relevant tax and National Insurance thresholds; as outlined below, this results in a BCR of 0.0)).

9.3.1 ROI to apprentices

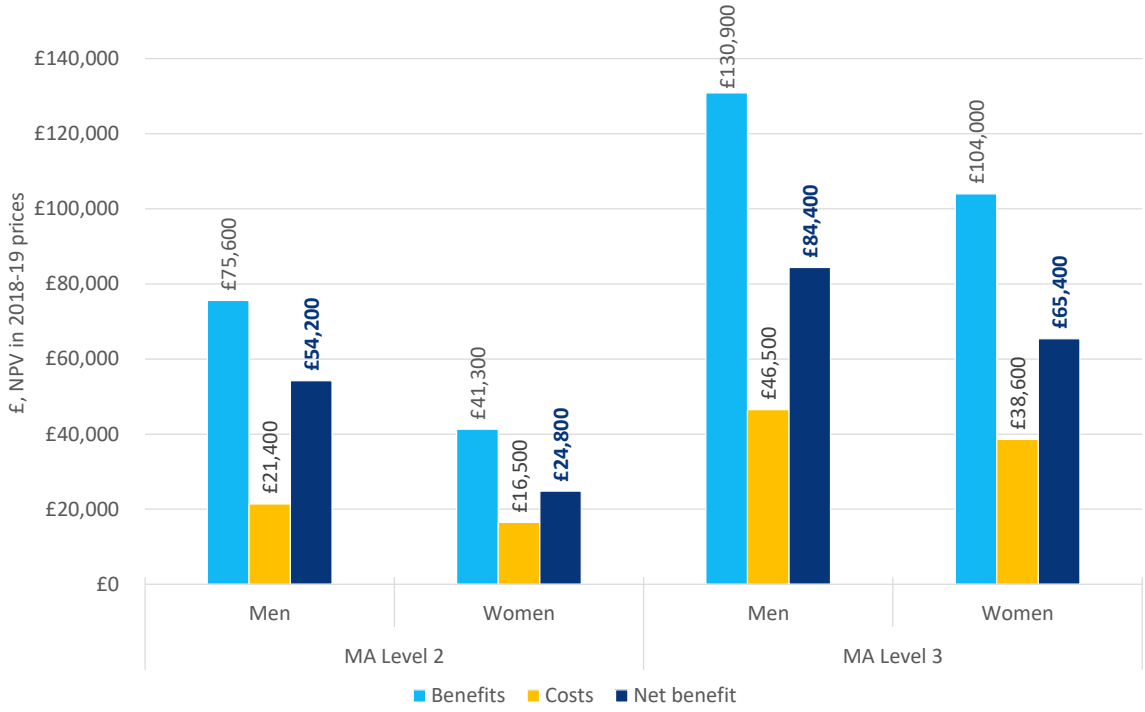
As presented in Figure 19, the analysis indicates that there are moderate to large net learner benefits associated with Modern Apprenticeships at both Levels 2 and 3, and for both men and women (all compared to MA non-completers). In terms of gender, note that for both MAs at Level 2 and 3, the estimated net benefits accrued by male apprentices consistently exceed those accrued by female learners. In terms of key benefit components, note that, in addition to the enhanced net earnings achieved post-completion, apprentices also benefit significantly from the (after-tax) wages that they are paid throughout their MA training. Against these benefits, they again incur the costs of net foregone earnings during their training (that they would have achieved if they had instead entered the labour market as MA non-completers).

There are particularly substantial net apprentice benefits associated with **Modern Apprenticeships at Level 3**, estimated at **£84,400** per 'typical' male apprentice in the cohort, and **£65,400** per female apprentice (compared to MA Level 3 non-completers). These large ROIs reflect the strong marginal earnings and employment returns to these qualifications, with particularly high marginal earnings returns observed for men[246] (which, in addition to higher counterfactual/baseline earnings which these returns are applied to, results in the larger net benefits accrued by men as compared to women). Importantly, these estimates are larger than the above corresponding net apprentice benefits associated with full-time first degrees (**£81,800** for men and **£42,300** for women; see Section 9.1.1) – and roughly comparable to the significant net benefits associated with full-time vocational qualifications at SCQF Level 5 (**£85,100** for men and **£61,600** for women; see Section 9.2.1). This illustrates the significant value-for-money that individuals typically derive from completing Modern Apprenticeships at Level 3.

Though still relatively substantial, the corresponding ROI estimates for **MAs at Level 2** are lower, standing at **£54,200** for men, and **£24,800** for women (compared to MA Level 2 non-completers). These estimates are broadly comparable to the above net benefits to apprentice associated with vocational qualifications at SCQF Level 4 (presented in Section 9.2.1). However, note that the net benefits here are likely underestimated, since, from Year 6 post-completion onwards, the ROI analysis applies zero marginal earnings returns to Level 2 MAs for men and women, and zero marginal employment returns for women (only)[247]. This is due to zero/very small sample sizes in the Scottish LEO data for Level 2 MAs at Year 7 post-completion[248]. As additional tax years and cohorts of MA learners are added to the Scottish LEO data in the future, the resulting increased sample sizes are expected to result in more accurate estimates of the ROI associated with Modern Apprenticeships at Level 2.

[246] Again, see Table 36 in Section 8.4.1 for the relevant marginal earnings and employment estimates applied throughout the ROI analysis.
[247] See Section 8.4.1 for more information on how the marginal earnings (and employment) returns are applied to estimate the enhanced earnings post-completion for individuals completing each given qualification of interest.
[248] See Table 36 in Section 8.4.1.

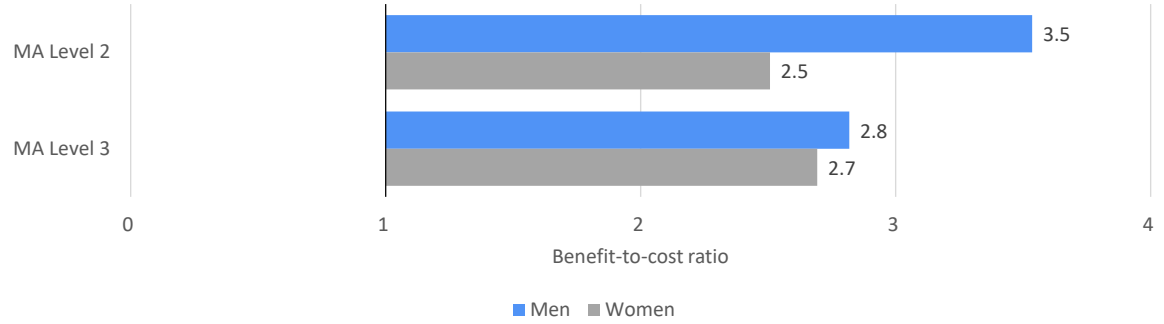
Figure 19 Net learner benefit associated with MAs (£ per learner), by level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.
Source: London Economics' analysis

As shown in Figure 20, the above strong net benefits result in strong benefit-to-cost ratios for both MAs at Level 2 and 3, ranging between **2.5** and **3.5**. Reflecting the lower costs of attainment (in term of foregone earnings during training), the BCRs associated with MAs at Level 2 are either roughly equivalent to (for women) or larger (for men) than for MAs at Level 3.

Figure 20 Benefit-to-cost ratios for learners associated with MAs, by level and gender



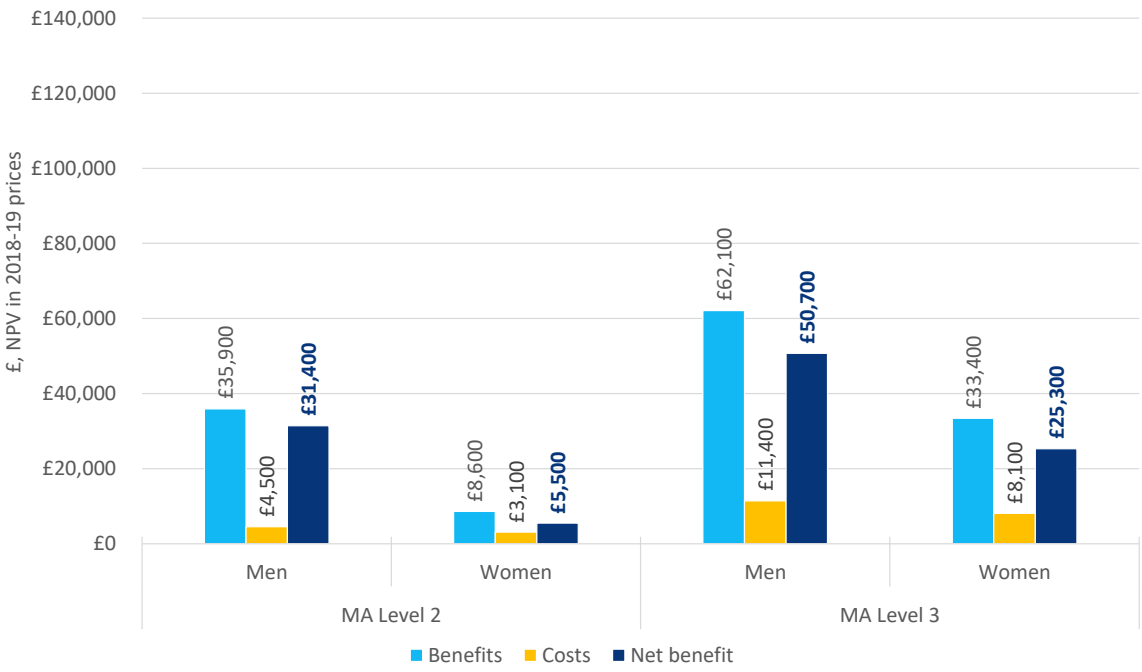
Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

9.3.2 ROI to the Exchequer

As presented in Figure 21, the variation in net Exchequer benefits again mirrors the differences in the net benefits to MA learners. As for HE and vocational qualifications, the

Exchequer accrues the benefits from the additional income tax and National Insurance receipts post-completion; in addition, for MA learners only, the Exchequer benefits from tax and National Insurance receipts during the training period (associated with apprentice wages). The highest estimated Exchequer costs associated with MAs relate to the public funding contributions provided to Scottish FE colleges and other training providers by SDS and the SFC.

Figure 21 Net Exchequer benefit associated with MAs (£ per learner), by level and gender



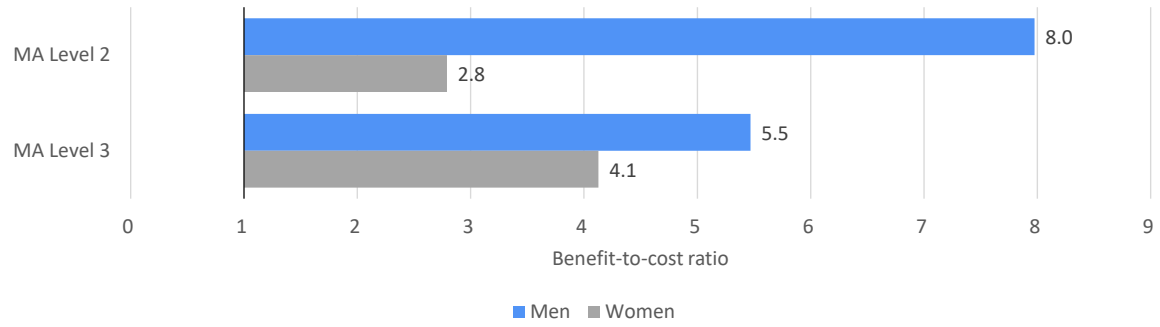
Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.
Source: London Economics' analysis

Similar to FE qualifications, the net Exchequer benefits to Modern Apprenticeships are lower than the corresponding net benefits accrued by students:

- The net Exchequer benefits associated with **MAs at Level 3** were estimated at **£50,700** for male and **£25,300** for female apprentices (compared to net apprentice benefits of **£84,400** and **£65,400**, respectively); and
- The net Exchequer benefits associated with **MAs at Level 2** were estimated to be **£31,400** for male and **£5,500** for female apprentices (compared to net apprentice benefits of **£54,200** and **£24,800**, respectively).

As for learners themselves, there are consistently strong resulting Exchequer benefit-to-cost ratios, ranging from **2.8** to **8.0**. In all instances, the Exchequer BCRs are larger than the BCRs for apprentices, driven by the disproportionately lower costs incurred by the public purse as opposed to learners completing Modern Apprenticeships.

Figure 22 Benefit-to-cost ratios for the Exchequer associated with MAs, by level and gender



Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

9.3.3 ROI to employers

Finally, Figure 23 and Figure 24 present our estimates of the ROI associated with Modern Apprenticeships from the perspective of employers. When considering these estimates, again, it is crucial to keep in mind that:

- The analysis is of a particularly **exploratory** nature, given the relatively limited evidence on and difficulty associated with estimating both the benefits and costs borne by employers associated with apprenticeship training. As a result, the estimates presented here should be interpreted with particular caution.
- The **counterfactual** for the analysis is again based on MA non-completers, i.e. we assume that instead of taking on an apprentice, employers would otherwise have employed (and paid) a Modern Apprenticeship non-completer; and
- The employer ROI is estimated form the perspective of **employers as a whole**, irrespective of whether they train Modern Apprentices or not.

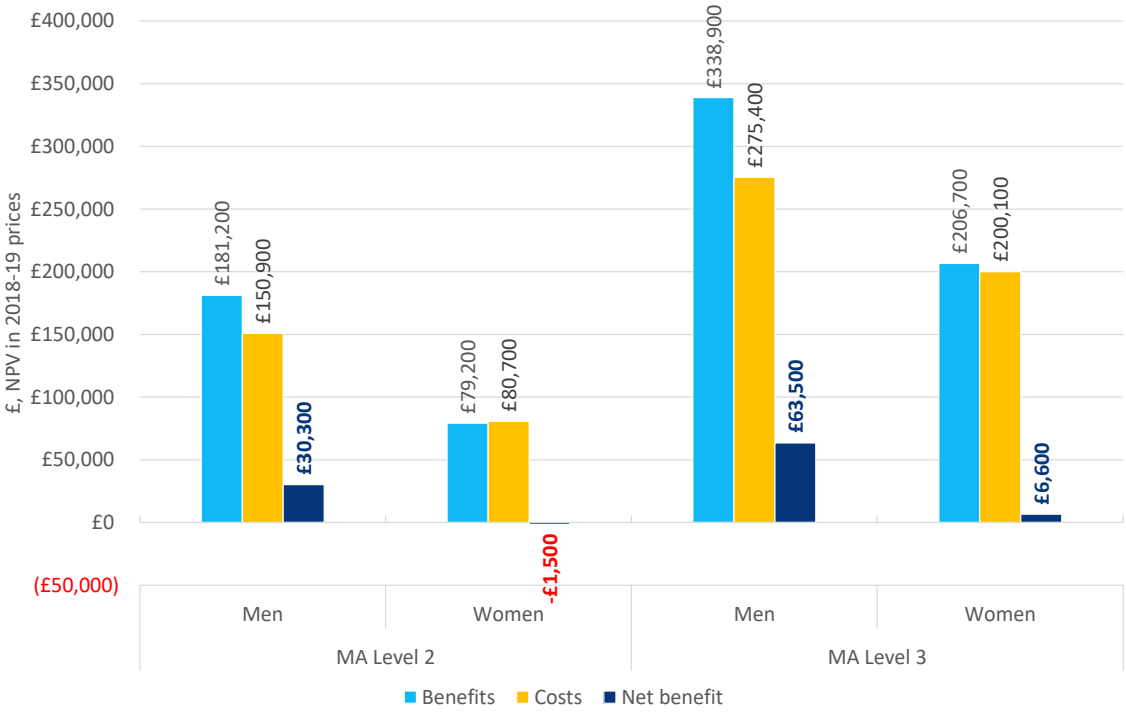
As presented in Figure 23, the estimated net benefits to employers associated with MA apprentices in the 2018-19 cohort vary significantly by gender and MA level. Notably, compared to apprentices and the Exchequer (presented above), both the estimated employer benefits and costs associated with apprentice training are significantly higher. In each instance, the largest benefit component relates to MA apprentices' additional contributions to productivity following the completion of their training (assumed to be more than double the size of the additional earnings that they achieve post-training; see Section 8.6.3). This is followed by the wage payments that the employer foregoes during the training period (associated with MA non-completers), and the contributions to productivity that MA apprentices make while in training. In contrast, the largest cost components to employers include the additional wage costs post-training, the apprentice wages paid to MAs during training, and the productivity foregone during training (again based on the counterfactual, i.e. associated with employing MA non-completers instead).

Despite the much higher estimated (gross) benefits, the significant costs incurred by employers imply that the *net* benefits to employers are typically lower than the

corresponding estimates for MA learners (in all instances) and the Exchequer (in all instances except for men completing MAs at Level 3):

- The net benefit to employers associated with **MAs at Level 3** were estimated at **£63,500** for men and **£6,600** for women. This compares to net apprentice benefits of **£84,400** and **£65,400**, and net Exchequer benefits of **£50,700** and **£25,300**, respectively.
- The estimated net benefit to employers associated with **MAs at Level 2** stand at **£30,300** for men and **-£1,500** for women[249]. In comparison, the net apprentice benefits were estimated at **£54,200** and **£24,800**, whereas the net Exchequer benefits were estimated to be **£31,400** and **£5,500**, respectively.

Figure 23 Net employer benefit associated with MAs (£ per learner), by level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100.

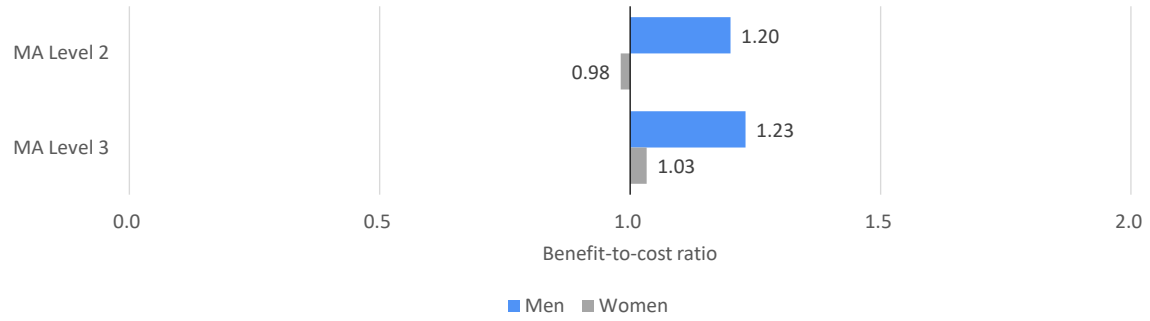
Source: London Economics' analysis

Considering the benefit-to-cost ratios from the perspective of employers (see Figure 24), given the much higher costs to employers (as compared to MA apprentices and the Exchequer), the estimated BCRs are consistently smaller than the corresponding BCRs to apprentices and the Exchequer. All employer BCRs are close to **1.0** (ranging between **1.0**

[249] Here, the negative estimate for women is driven by the zero marginal earnings and employment returns for women applied to estimate the ROI from Year 6 post-completion onwards (see Section 8.4.1 and 9.3.1), due to zero/very small sample sizes within the Scottish LEO data. As a result, the benefits to employers are (just) outweighed by the associated costs.

and **1.2**), suggesting that the employer benefit of apprentice training are slightly larger than or equal to the associated costs (relative to hiring MA non-completers).

Figure 24 Benefit-to-cost ratios for employers associated with MAs, by level and gender



Note: All ratios are rounded to the nearest 0.1.
Source: London Economics' analysis

9.4 Key limitations and caveats

The above-presented analysis provides a core contribution to the evidence on the Return on Investment to Scottish post-school qualifications, being the first time that these returns are estimated – comprehensively, for the full suite of post-school qualifications – using the Scottish Longitudinal Educational Outcomes data. However, and especially considering that this analysis is the first time the Scottish LEO data have been used for this purpose, there are a range of caveats and limitations that should be kept in mind when considering and interpreting the ROI estimates:

- In general, any assessment of the ROI to educational qualifications **relies heavily on projections of lifetime earnings and employment** of individuals in possession of these qualifications, with forecasts spanning a large number of years. These forecasts necessarily use *historical* labour market data (in this instance, the Scottish LEO data) as proxies for *future* outcomes.
- Related to the previous point, given that the analysis includes the estimation of future labour market outcomes, the estimates **rely on forecasts of nominal average earnings growth and CPI inflation** published by the Office for Budget Responsibility[250]. While we made use of the most recent short-, medium-, and long-term forecasts that were available at the time that the ROI analysis was undertaken, given the current UK (and global) economic climate, there have since been significant upwards revisions to these forecasts (particularly with regards to expected inflation) - both by the Office for Budget Responsibility itself as well as a wide range of other organisations. While the revised forecasts tend to predict much higher CPI inflation (and lower real average earnings growth) only in the relative short-term, the ROI estimates here are sensitive to changes in these

[250] See Office for Budget Responsibility (2020, 2021a and 2021b).

forecasts, as well as to any deviations of actual inflation or earnings growth from these forecasts[251].

- As outlined in more detail in Section 2.4, while the fully linked Scottish LEO dataset is a hugely rich source of education and labour market data, there are a number of **core caveats associated with the data**.
- Related to these caveats, a range of the raw results on the marginal earnings and employment returns were originally suppressed (due to small or unbalanced sample sizes, or due to statistical insignificance). Throughout the ROI analysis, we **included these suppressed results** as point estimates (as they still provide valuable information on labour market returns, in the absence of alternative information). It is expected that, with additional tax years and learner cohorts merged into the Scottish LEO data in the future, the increased sample sizes will result in more-and-more accurate (and fewer suppressed) estimated labour market returns.
- However, there were **still some cells for which *no* marginal earnings and employment returns could be generated** (i.e. not even point estimates). Specifically, due to zero/very small sample sizes at Year 7 post-completion in the Scottish LEO data, for Level 2 MAs, the marginal earnings returns (for men and women) and the marginal employment returns (for women) were missing, so that the ROI analysis applies zero returns for the majority of these learners' lifetimes. As a result, **the ROI estimates associated with Modern Apprenticeships at Level 2 are likely to be underestimated**. Again, as additional tax years and cohorts of MA learners are added to the Scottish LEO data in the future, the resulting increased sample sizes are expected to result in more accurate estimates of the ROI associated with these qualifications.
- The sample sizes available within the Scottish LEO data further implied that the estimation of the labour market returns to different post-school qualifications needed to be broken down into **relatively wide age bands at completion** (including individuals aged 21 below, 22-30, or 31+ when completing their qualifications). Given these relatively aggregate results, the analysis is particularly sensitive to the assumed average age at completion, where small differences in the assumed age amongst students in the 2018-19 cohort can lead to large differences in the estimated ROI[252].
- Related to the previous point, the analysis is **based on the characteristics of average/'typical' learners** in the 2018-19 cohort of Scottish domiciled students undertaking post-school qualifications in Scotland. The analysis therefore does not attempt to capture the – likely significant – variation across individual learners

[251] To give an indication of the sensitivity of our results to these assumptions, if we applied the most recent long-term CPI and nominal average earnings growth forecasts published by the Office for Budget Responsibility (from May 2022, link), the estimated ROI to students associated with first degrees (relative to non-completers) would decline from approximately £81,800 to £78,700 for men, and from £42,300 to £40,300 for women.

[252] For example, in Section 9.1.1, we discussed the impact of the small difference in the estimated average age at completion amongst male vs. female students completing full-time postgraduate research qualifications.

depending on their own personal characteristics and the characteristics of the specific qualifications that they are undertaking (e.g. it is expected that the ROI estimates will vary significantly by subject/sector that students are undertaking their qualifications in, or the type of institution that they are enrolled with).

- The Scottish LEO data currently only provide earnings and employment information for a **limited number of years post-completion/post-graduation**. However, the ROI analysis requires information on the full lifetime earnings and employment profiles of individuals in the relevant treatment and counterfactual groups. Therefore, **it was necessary to supplement the Scottish LEO data with separate data from the Quarterly Labour Force Survey**, which significantly differs from the LEO data in terms of purpose, scope, and coverage.
- Relevant to instances where the ROI is estimated relative to a non-completer counterfactual, the **analysis assumes that non-completers drop out of their intended qualifications immediately at the beginning of their studies/training**. In other words, we assume that non-completers do not accrue any of the benefits or incur any of the costs associated with achieving the given (treatment) qualification of interest. Due to this approach, as outlined in further detail in Section 8.4.1, the analysis therefore assumes that individuals in the counterfactual groups *complete/drop out* of their qualifications at the same average age at which individuals in the treatment groups *start* their qualifications.
- Finally, as outlined in further detail above (see Section 9.3), the **estimated employer ROI associated with Modern Apprenticeships should be considered to be exploratory**, and should therefore be treated as indicative only and interpreted with caution.

9.5 Recommendations for future analysis

The Scottish LEO data constitutes the best available dataset that allows a measurement of the labour market returns associated with Scottish educational qualifications and Modern Apprenticeships. Given the importance of this data source and the wealth of information included in it, and based on our extensive analysis of the data for the purpose of this report, we would like to make a number of key recommendations for the future maintenance, expansion, and analysis of the Scottish LEO data:

- It is crucial that the core data are regularly expanded as more information becomes available, by **periodically merging in information for additional tax years and student cohorts**. As discussed at various points throughout this report, the analysis of the labour market returns to post-school qualifications was considerably limited by the underlying sample sizes available in the Scottish LEO data. The increase in these sample sizes from future expansions of the dataset are expected to:
  - Significantly reduce the number of suppressed econometric results (e.g. this is particularly relevant for estimating the returns to Modern Apprenticeships, for which, due to their relatively recent introduction, only limited estimates were available);

  - Allow for increasingly more granular analysis (e.g. including a breakdown into more disaggregated age bands at completion); and
  - Increase the number of years of post-graduation/post-completion labour market outcomes included in the data, therefore gradually reducing the need to supplement the Scottish LEO data with additional information from the Labour Force Survey.
- Another important recommended expansion of the dataset involves the **potential merging of the Scottish LEO data with the annual pupil census/examination data**, to add information on individuals' primary and secondary school attainment (similar to what is available in the English LEO data). This would:
  - Improve the choice of counterfactual; for example, in addition to analysing the labour market returns to first degrees relative to non-completers, it would be possible to assess these returns relative to the possession of Highers from Scottish secondary schools;
  - Enable the econometric analysis to control for any prior attainment scores (as a proxy of ability), thus further mitigating the ability bias for individuals that progress from secondary school to higher education, further education, or Modern Apprenticeships. This would likely result in improved estimates of the true return to qualification attainment, and further increase the overall richness of the LEO data; and
  - Allow for analyses tracing specific cohorts of compulsory schooling students to observe their post-16 educational choices and outcomes (at school, in further and higher education, and through apprenticeships) and observe their labour market outcomes at specific points in time (e.g. when they are aged 28) for the entire cohort of secondary school leavers (e.g. similar to recent analyses of the English LEO data that focused on the cohorts of Key Stage 4 leavers (aged 15 at the start of the academic year) undertaking their GCSE exams from 2001/02 onwards).
- The Scottish LEO data could be further improved by **merging in information on self-employment (from HMRC Self-Assessment tax returns) for additional tax years** (currently only available from tax year 2013/14 onwards). This would allow any analysis of labour market outcomes include self-employment as well as HMRC PAYE information. This could particularly improve the estimates (especially in relation to employment probabilities) for specific qualifications with a relatively high proportion of individuals working in self-employment after qualification completion (e.g. Modern Apprenticeships at Level 3).

Index of Tables and Figures

Tables

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ANNEXES

Annex 1 References

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Annex 2 Glossary

Active labour market benefits	Covering Job Seekers' Allowance, Income Support, the Employment and Support Allowance, and the JUVOS Training Allowance (from DWP)
AHSS	Arts, Humanities and Social Sciences
DWP	Department for Work and Pensions
Earnings	Daily PAYE Earnings, calculated by dividing total annual gross PAYE earnings (in constant average 2018 prices) by the total number of calendar days in PAYE employment in each tax year
Employment	The proportion of the year in PAYE employment, calculated as the number of days in PAYE employment in the tax year divided by 365 or 366
HESA	Higher Education Statistics Agency
HMRC	HM Revenue and Customs
LEO	Longitudinal Education Outcomes
MA	Modern Apprenticeships
P14	Earnings and tax records from PAYE employment (HMRC)
P45	Employment spells from PAYE employment (HMRC)
PAYE	HMRC Pay as You Earn data
ROI	Return on Investment
SCQF	Scottish Credit and Qualifications Framework (ranging from 1 to 12)
SDS	Skills Development Scotland
Self-assessment	Information on self-employment from HMRC Self-Assessment tax returns
SFC	Scottish Funding Council
STEM	Science, Technology, Engineering and Mathematics

Annex 3 Technical Annex

A3.1 Detailed qualifications ranking based on the Scottish Credit and Qualifications Framework

Table 40 Reclassification of original qualifications in raw data into unique ranking based on SCQF

	Qualification name in raw data	Grouping	Academic/ Vocational/ Apprenticeship
Universities	Postgraduate (research)	Postgraduate (research)	Academic
	Postgraduate (taught)	Postgraduate (taught)	Academic
	First degree	First degree	Academic
	Other undergraduate	Other undergraduate	Academic
	Further Education	Further Education	Vocational
Colleges	First degree (honours)	First degree	Academic
	First degree (ordinary)	First degree	Academic
	Access (Group Award)	Vocational full SCQF Level 1-7	Vocational
	Advanced Certificate (bridge to HNC/D)	Vocational full SCQF Level 7	Vocational
	Advanced Certificate not specified elsewhere	Vocational full SCQF Level 7	Vocational
	Advanced Diploma not specified elsewhere	Vocational full SCQF Level 8	Vocational
	Advanced Higher (Group Award)	Advanced Higher	Academic
	Any other recognised qualification	Vocational full SCQF Level 1-11	Vocational
	Associate of professional body	Vocational full SCQF Level 6-11	Vocational
	Advanced Certificate (comprising HN units only)	Vocational full SCQF Level 7	Vocational
	Course not leading to recognised qualification (including most non-vocational courses)	Other/unknown level	-
	Diploma (HNC/D level diplomates and degree holders)	Vocational full SCQF Level 8	Vocational
	GSVQ/GNVQ: Level 1	GSVQ/GNVQ/SVQ/NVQ: Level 1	Vocational
	GSVQ/GNVQ: Level 2	GSVQ/GNVQ/SVQ/NVQ: Level 2	Vocational
	GSVQ/GNVQ: Level 3	GSVQ/GNVQ/SVQ/NVQ: Level 3	Vocational
	Graduateship of professional body	Vocational full SCQF Level 7-11	Vocational
	HN units only but not leading to certificate	Non-full qualification	Vocational
	HNC or equivalent	HNC or equivalent	Vocational
	HND or equivalent	HND or equivalent	Vocational
	Higher (Group Award)	Higher	Academic
	Higher/Skills for work Higher	Higher	Academic
	Highest level of study (course or unit) Access	Vocational full SCQF Level 1-7	Vocational
	Highest level of study (course or unit) Advanced Higher	Advanced Higher	Academic
	Highest level of study (course or units) Higher	Higher	Academic
	Highest level of study (course or units) Intermediate 1	Vocational full SCQF Level 4	Vocational
	Highest level of study (course or units) Intermediate 2	Vocational full SCQF Level 5	Vocational
	Intermediate 1 (Group Award)	Vocational full SCQF Level 4	Vocational
	Intermediate 2 (Group Award)	Vocational full SCQF Level 5	Vocational
	Membership of professional body	Vocational full SCQF Level 6-11	Vocational
	NVQ: Level 1	GSVQ/GNVQ/SVQ/NVQ: Level 1	Vocational
	NVQ: Level 2	GSVQ/GNVQ/SVQ/NVQ: Level 2	Vocational
	NVQ: Level 3	GSVQ/GNVQ/SVQ/NVQ: Level 3	Vocational
	National 1	National 1	Vocational

	Qualification name in raw data	Grouping	Academic/ Vocational/ Apprenticeship
	National 2	National 2	Vocational
	National 3 / Skills for work National 3	National 3 / Skills for work National 3	Vocational
	National 4 / Skills for work National 4	National 4 / Skills for work National 4	Vocational
	National 5 / Skills for work National 5	National 5 / Skills for work National 5	Vocational
	National Certificate Award (accredited group award)	Vocational full SCQF Level 3-6	Vocational
	National Certificate Modules alone, not leading to any qualification listed above	Non-full qualification	Vocational
	National Qualification Award (College devised no-accredited award)	Non-full qualification	Vocational
	Non-advanced qualification not specified elsewhere KB SQA Higher Award	Vocational full SCQF Level 1-7	Vocational
	Non-advanced units only but not leading to an award certificate	Non-full qualification	Vocational
	Other Non-Advanced Certificate or equivalent	Vocational full SCQF Level 1-7	Vocational
	Other Non-Advanced Diploma or equivalent	Vocational full SCQF Level 1-8	Vocational
	Other SCE/GCE/GCSE examination only	Academic full SCQF Level 4-6	Academic
	SQA National Award	Vocational full SCQF Level 2-6	Vocational
	SQA National Progression Award	Vocational full SCQF Level 3-6	Vocational
	SQA Professional Development Award	Vocational full SCQF Level 4-9	Vocational
	SQA Skills for Work Award	Vocational full SCQF Level 3-6	Vocational
	SVQ or NVQ Level 4	Vocational full SCQF Level 8-10	Vocational
	SVQ or NVQ Level 5	Vocational full SCQF Level 11	Vocational
	SVQ: Level 1	GSVQ/GNVQ/SVQ/NVQ: Level 1	Vocational
	SVQ: Level 2	GSVQ/GNVQ/SVQ/NVQ: Level 2	Vocational
	SVQ: Level 3	GSVQ/GNVQ/SVQ/NVQ: Level 3	Vocational
	Scottish Vocational Qualification or National Vocational Qualification	GSVQ/GNVQ/SVQ/NVQ: 4-11	Vocational
MAs	Modern Apprenticeship at Level 5	Modern Apprenticeship at Level 5	Apprenticeship
	Modern Apprenticeship at Level 4	Modern Apprenticeship at Level 4	Apprenticeship
	Modern Apprenticeship at Level 3	Modern Apprenticeship at Level 3	Apprenticeship
	Modern Apprenticeship at Level 2	Modern Apprenticeship at Level 2	Apprenticeship

Note: The reclassification of LEO College qualification is mainly based on the description of the qualification provided in the data. If the description was insufficient to identify the exact qualification, the information provided in the *scqf_lev* variable was used to identify the corresponding SCQF level.
Grey highlighting indicates qualifications that have been excluded from the analysis.
Source: London Economics' analysis of Scottish LEO data

A3.2 Descriptive statistics: observations and median PAYE earnings

Table 41 Number of observations with non-missing earnings information - completers

Gender and highest qualification	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Postgraduate (research)				1,240	860	600	720	500	300
Postgraduate (taught)	670	560	450	10,370	8,030	5,750	7,870	6,300	4,830
First degree	21,180	15,600	10,400	16,880	11,830	7,490	5,720	4,420	3,280
Other undergraduate (incl. HNC & HND)	13,430	9,040	6,270	5,800	3,700	2,590	6,790	5,570	4,400
SCQF Full Vocational Level 8+	260	220	180	200	150	120	950	860	710
MA Level 4/5				60			1,360	730	240
SCQF Full Vocational Level 7	1,500	1,170	850	420	240	170	1,340	930	640
Highers (at college, incl. Adv. Highers)	2,690	1,340	660	680	250	110	830	420	240
MA Level 3	13,450	9,560	4,320	3,940	2,100	900	7,070	3,960	830
SCQF Full Vocational Level 6	3,400	2,730	2,320	1,390	840	570	3,820	2,710	1,800
MA Level 2	2,510	990	50	1,130	370		3,130	1,140	
SCQF Full Vocational Level 5	6,820	4,440	2,860	2,150	1,130	790	5,770	3,860	2,740
SCQF Full Vocational Level 4	3,440	2,170	1,220	1,040	500	190	3,500	1,980	690
SCQF Full Vocational Level 3 or below	490	290	140	410	190	80	1,880	1,000	370
Women									
Postgraduate (research)				1,130	810	520	930	620	400
Postgraduate (taught)	1,580	1,270	1,010	15,550	11,460	8,410	15,080	11,880	8,880
First degree	30,440	21,450	13,770	20,000	13,690	8,430	14,110	11,150	8,360
Other undergraduate (incl. HNC & HND)	14,930	8,740	5,420	7,790	5,280	3,800	15,450	13,290	10,830
SCQF Full Vocational Level 8+	170	150	100	450	300	250	1,880	1,630	1,230
MA Level 4/5				50			530	310	120
SCQF Full Vocational Level 7	280	80	50	390	230	160	1,830	1,370	1,000
Highers (at college, incl. Adv. Highers)	5,270	2,250	1,050	1,500	630	320	2,320	1,480	960
MA Level 3	7,750	4,820	2,290	2,230	1,010	490	3,840	2,420	810
SCQF Full Vocational Level 6	2,410	1,290	830	1,630	970	670	5,730	4,470	3,250
MA Level 2	3,070	1,330		810	110		2,420	1,070	
SCQF Full Vocational Level 5	4,990	3,170	2,070	2,230	1,200	760	8,120	6,150	4,300
SCQF Full Vocational Level 4	2,180	1,370	790	1,000	620	350	4,850	3,620	1,960
SCQF Full Vocational Level 3 or below	230	120	50	400	230	130	2,240	1,530	930

Note: Cells based on sample sizes below 50 have been left blank. Figures rounded to the nearest 10. Age measured at the start of the final academic year. ***Source: London Economics' analysis of Scottish LEO data***

Table 42 Number of observations with non-missing earnings information – non-completers

Gender and highest participation	Age at drop-out and years post-drop-out								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
First degree non-completers	5,360	3,630	1,960	2,920	1,820	990	2,280	1,460	910
SCQF Full Vocational Level 8+ non-completers	110	120	90	110	100	90	760	640	500
SCQF Full Vocational Level 7 non-completers	280	320	200	200	150	130	860	700	620
MA Level 3 non-completers	4,530	3,940	1,720	680	540	380	1,750	1,310	280
SCQF Full Vocational Level 6 non-completers	1,790	1,430	1,260	560	370	310	1,470	1,190	940
MA Level 2 non-completers	1,210	700		110	60		900	660	
SCQF Full Vocational Level 5 non-completers	3,460	2,300	1,660	920	520	380	2,140	1,590	1,200
SCQF Full Vocational Level 4 non-completers	1,300	830	580	300	130	70	720	470	280
Women									
First degree non-completers	5,320	3,460	1,810	3,560	2,340	1,300	4,450	3,240	2,230
SCQF Full Vocational Level 8+ non-completers	100	100	70	250	180	150	1,200	1,000	800
SCQF Full Vocational Level 7 non-completers	90	80	60	180	110	80	780	620	450
MA Level 3 non-completers	2,100	1,300	490	390	250	150	1,020	820	230
SCQF Full Vocational Level 6 non-completers	1,230	730	520	760	510	360	2,750	2,170	1,710
MA Level 2 non-completers	1,260	660		90	60		970	780	
SCQF Full Vocational Level 5 non-completers	2,840	1,800	1,440	950	610	440	3,470	2,770	2,110
SCQF Full Vocational Level 4 non-completers	830	470	330	310	170	110	1,290	950	570

Note: Cells based on sample sizes below 50 have been left blank. Figures rounded to the nearest 10. Age measured at the start of the final academic year. ***Source: London Economics' analysis of Scottish LEO data***

Table 43 Median daily PAYE earnings at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Postgraduate (research)				£91.70	£98.60	£104.60	£100.80	£102.70	£106.70
Postgraduate (taught)	£75.90	£91.30	£100.20	£78.30	£89.00	£95.80	£100.70	£102.70	£101.40
First degree	£63.70	£74.90	£83.10	£69.60	£78.20	£83.00	£82.60	£87.20	£87.40
Other undergraduate (incl. HNC & HND)	£44.80	£55.10	£62.00	£56.20	£64.90	£69.70	£80.90	£84.00	£83.70
SCQF Full Vocational Level 8+	£48.60	£56.30	£59.50	£75.00	£80.60	£92.60	£94.40	£94.70	£94.20
MA Level 4/5				£96.10			£119.00	£128.30	£119.10
SCQF Full Vocational Level 7	£65.70	£67.90	£68.40	£75.80	£78.80	£84.50	£88.40	£88.40	£87.20
Highers (at college, incl. Advanced Highers)	£31.40	£40.70	£46.20	£42.40	£48.50	£52.20	£59.40	£64.70	£68.70
MA Level 3	£69.40	£75.30	£78.80	£69.10	£73.70	£76.70	£78.30	£80.30	£79.90
SCQF Full Vocational Level 6	£48.50	£58.30	£65.90	£57.90	£67.80	£71.40	£72.80	£75.80	£74.00
MA Level 2	£46.90	£51.90		£53.70	£57.40		£63.20	£61.70	
SCQF Full Vocational Level 5	£37.80	£45.40	£51.10	£50.50	£54.90	£62.40	£68.30	£71.70	£72.10
SCQF Full Vocational Level 4	£33.50	£42.10	£47.00	£52.10	£52.90	£56.30	£65.00	£68.50	£60.90
SCQF Full Vocational Level 3 or below	£32.00	£38.40	£46.50	£50.60	£53.70	£60.30	£67.40	£69.40	£67.40
Women									
Postgraduate (research)				£84.40	£89.40	£93.20	£93.80	£96.50	£100.70
Postgraduate (taught)	£74.90	£86.70	£95.00	£74.40	£82.80	£90.10	£91.60	£92.90	£93.10
First degree	£60.60	£69.70	£74.90	£65.10	£69.70	£72.20	£73.60	£78.00	£80.20
Other undergraduate (incl. HNC & HND)	£38.00	£44.80	£47.60	£45.00	£49.90	£51.90	£54.80	£57.40	£58.00
SCQF Full Vocational Level 8+	£36.50	£41.10	£44.70	£57.60	£57.70	£60.20	£72.20	£72.70	£73.60
MA Level 4/5							£74.80	£70.30	£71.70
SCQF Full Vocational Level 7	£34.50	£43.60		£53.30	£54.30	£56.00	£58.70	£58.30	£57.50
Highers (at college, incl. Advanced Highers)	£24.70	£36.60	£41.10	£29.30	£33.90	£38.10	£34.70	£39.60	£42.60
MA Level 3	£42.30	£44.20	£46.20	£46.00	£44.40	£41.40	£52.90	£51.80	£52.20
SCQF Full Vocational Level 6	£34.10	£38.50	£40.20	£37.30	£37.40	£39.00	£46.20	£46.90	£47.70
MA Level 2	£38.40	£41.80		£40.50	£42.40		£43.10	£44.60	
SCQF Full Vocational Level 5	£31.40	£35.80	£38.00	£32.80	£34.00	£36.70	£39.50	£39.90	£40.70
SCQF Full Vocational Level 4	£25.50	£31.60	£34.70	£33.80	£35.20	£35.30	£38.90	£40.70	£41.30
SCQF Full Vocational Level 3 or below	£25.40	£25.30		£38.00	£36.90	£37.10	£43.20	£44.10	£45.40

Note: Cells based on sample sizes below 50 have been left blank. All earnings data are presented in average 2018 prices, and are rounded to the nearest £0.10. Age measured at the start of the final academic year.
Source: London Economics' analysis of Scottish LEO data

Table 44 Median daily PAYE earnings among non-completers, at 3, 5 and 7 years post-drop-out, by gender and age at drop-out

Gender and highest participation	Age at drop-out and years post-drop-out								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
First degree non-completers	£44.60	£53.40	£59.00	£52.20	£58.40	£63.40	£72.30	£76.20	£81.00
SCQF Full Vocational Level 8+ non-completers	£43.00	£51.40	£55.80	£74.70	£76.40	£83.10	£97.40	£95.70	£95.60
SCQF Full Vocational Level 7 non-completers	£59.10	£57.90	£57.50	£65.70	£67.30	£68.50	£87.20	£83.60	£82.80
MA Level 3 non-completers	£47.60	£54.30	£59.80	£55.50	£60.80	£67.60	£68.40	£71.30	£74.30
SCQF Full Vocational Level 6 non-completers	£43.70	£51.30	£56.60	£56.60	£64.40	£69.50	£71.00	£72.70	£75.40
MA Level 2 non-completers	£43.40	£49.50	-	£48.50	£60.90	-	£54.30	£55.00	-
SCQF Full Vocational Level 5 non-completers	£37.30	£44.00	£48.30	£45.30	£53.80	£57.50	£63.20	£66.70	£65.90
SCQF Full Vocational Level 4 non-completers	£32.90	£39.20	£44.80	£44.20	£50.80	£50.00	£54.80	£53.90	£52.90
Women									
First degree non-completers	£41.50	£47.90	£52.50	£48.30	£53.10	£56.70	£60.00	£66.70	£69.90
SCQF Full Vocational Level 8+ non-completers	£44.30	£42.50	£48.40	£58.10	£61.40	£64.50	£70.00	£70.50	£69.90
SCQF Full Vocational Level 7 non-completers	£32.60	£38.10	£44.50	£49.00	£51.80	£52.80	£58.40	£56.30	£53.20
MA Level 3 non-completers	£38.10	£40.00	£39.50	£40.20	£38.30	£41.90	£46.00	£45.40	£46.80
SCQF Full Vocational Level 6 non-completers	£34.20	£37.40	£37.20	£34.90	£35.20	£37.40	£41.90	£43.10	£44.00
MA Level 2 non-completers	£33.60	£37.20	-	£36.20	£37.70	-	£36.00	£36.10	-
SCQF Full Vocational Level 5 non-completers	£30.10	£34.00	£32.80	£29.10	£29.30	£30.10	£37.80	£38.40	£39.10
SCQF Full Vocational Level 4 non-completers	£24.20	£27.80	£29.70	£28.90	£33.20	£34.60	£35.20	£37.00	£37.20

Note: Cells based on sample sizes below 50 have been left blank. All earnings data are presented in average 2018 prices, and are rounded to the nearest £0.10. Age measured at the start of the final academic year.
Source: London Economics' analysis of Scottish LEO data

A3.3 Descriptive statistics: labour market benefits

Table 45 Proportion of individuals in receipt of active labour market benefits at 3, 5 and 7 years post-completion, by gender, highest qualification, and age at completion

Gender and highest qualification	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Postgraduate (research)	-	-	-	3%	2%	1%	4%	3%	2%
Postgraduate (taught)	5%	2%	2%	5%	3%	2%	5%	4%	3%
First degree	6%	4%	3%	7%	6%	4%	9%	7%	6%
Other undergraduate (incl. HNC & HND)	10%	9%	8%	12%	11%	9%	9%	9%	7%
SCQF Full Vocational Level 8+	19%	16%	11%	8%	6%	5%	5%	5%	4%
MA Level 4/5	-	-	-	2%	-	-	3%	2%	2%
SCQF Full Vocational Level 7	19%	17%	12%	8%	11%	7%	5%	5%	4%
Highers (incl. Advanced Highers)	15%	12%	12%	19%	17%	21%	14%	12%	10%
MA Level 3	10%	6%	5%	8%	7%	5%	5%	5%	5%
SCQF Full Vocational Level 6	19%	21%	15%	16%	14%	10%	9%	7%	7%
MA Level 2	13%	8%	5%	8%	5%	-	6%	5%	-
SCQF Full Vocational Level 5	26%	21%	17%	25%	21%	17%	14%	12%	10%
SCQF Full Vocational Level 4	29%	25%	20%	24%	19%	16%	17%	12%	10%
SCQF Full Vocational Level 3 or below	30%	20%	12%	18%	13%	7%	12%	9%	7%
Women									
Postgraduate (research)	-	-	-	2%	2%	1%	2%	3%	2%
Postgraduate (taught)	4%	1%	1%	4%	3%	2%	3%	3%	2%
First degree	4%	3%	2%	6%	4%	4%	5%	5%	4%
Other undergraduate (incl. HNC & HND)	8%	8%	7%	11%	9%	9%	7%	6%	6%
SCQF Full Vocational Level 8+	19%	14%	12%	5%	7%	7%	4%	4%	4%
MA Level 4/5	-	-	-	4%	-	-	5%	5%	3%
SCQF Full Vocational Level 7	5%	10%	12%	6%	7%	5%	6%	5%	4%
Highers (incl. Advanced Highers)	11%	12%	13%	16%	15%	13%	10%	9%	7%
MA Level 3	11%	10%	7%	8%	8%	5%	6%	6%	4%
SCQF Full Vocational Level 6	15%	13%	12%	14%	12%	9%	7%	6%	6%
MA Level 2	13%	10%	-	11%	7%	-	6%	5%	3%
SCQF Full Vocational Level 5	23%	20%	18%	22%	17%	15%	9%	7%	7%
SCQF Full Vocational Level 4	30%	28%	24%	20%	17%	14%	10%	7%	6%
SCQF Full Vocational Level 3 or below	29%	21%	16%	12%	9%	6%	8%	6%	4%

Note: Cells based on sample sizes below 50 have been left blank. The table captures whether the individual was in receipt of payments of any active labour market benefit (Job Seekers' Allowance, Income Support, the Employment and Support Allowance, and the JUVOS Training Allowance) at any point (i.e. for at least one day) in the given tax year. ***Source: London Economics' analysis of Scottish LEO data***

Table 46 Proportion of individuals in receipt of active labour market benefits among non-completers, at 3, 5 and 7 years post-drop-out, by gender and age at drop-out

Gender and highest participation	Age at drop-out and years post-drop-out								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
First degree non-completers	9%	7%	7%	13%	11%	8%	13%	11%	10%
SCQF Full Vocational Level 8+ non-completers	28%	23%	13%	12%	12%	8%	6%	6%	6%
SCQF Full Vocational Level 7 non-completers	26%	21%	20%	12%	17%	13%	8%	8%	7%
MA Level 3 non-completers	29%	19%	14%	22%	17%	11%	13%	10%	11%
SCQF Full Vocational Level 6 non-completers	28%	27%	23%	25%	19%	12%	14%	10%	8%
MA Level 2 non-completers	27%	19%	18%	29%	20%	-	13%	10%	-
SCQF Full Vocational Level 5 non-completers	37%	32%	28%	36%	32%	28%	21%	16%	14%
SCQF Full Vocational Level 4 non-completers	38%	38%	34%	42%	32%	28%	26%	19%	16%
Women									
First degree non-completers	8%	8%	6%	12%	9%	9%	10%	9%	7%
SCQF Full Vocational Level 8+ non-completers	20%	19%	12%	12%	12%	6%	7%	5%	7%
SCQF Full Vocational Level 7 non-completers	17%	9%	9%	9%	10%	10%	7%	6%	7%
MA Level 3 non-completers	23%	21%	15%	17%	12%	8%	12%	10%	9%
SCQF Full Vocational Level 6 non-completers	25%	22%	22%	21%	16%	15%	10%	8%	7%
MA Level 2 non-completers	26%	20%	-	23%	22%	-	12%	9%	-
SCQF Full Vocational Level 5 non-completers	36%	34%	31%	33%	29%	24%	14%	11%	9%
SCQF Full Vocational Level 4 non-completers	41%	43%	40%	31%	25%	21%	17%	12%	11%

Note: Cells based on sample sizes below 50 have been left blank. The table captures whether the individual was in receipt of payments of any active labour market benefit (Job Seekers' Allowance, Income Support, the Employment and Support Allowance, and the JUVOS Training Allowance) at any point (i.e. for at least one day) in the given tax year. ***Source: London Economics' analysis of Scottish LEO data***

Annex 4 Supplementary econometric findings

A4.1 Marginal earnings returns to post-school education and training

A4.1.1 Returns to first degrees by study mode

In Table 47, we present information on the marginal earnings returns to first degrees, by mode of attainment. Note that the analysis compares individuals in possession of full-time or part-time first degrees to an *aggregated* non-completer counterfactual (i.e. those individuals who started but dropped out of a first degree, irrespective of the mode of study). As such, the results should be interpreted with caution.

Table 47 Marginal earnings returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, study mode, and age at completion

Gender and ethnicity	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Full-time	45.6%	40.3%	38.9%	25.1%	31.4%	26.2%	-4.0%	-	-
Part-time	42.2%	33.2%	33.5%	35.5%	36.4%	33.6%	33.9%	27.6%	26.1%
Women									
Full-time	53.0%	49.8%	45.1%	31.9%	33.7%	21.9%	8.1%	10.7%	5.7%
Part-time	51.0%	36.2%	30.2%	34.6%	31.6%	22.3%	32.5%	28.0%	19.5%

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation.
Control variables include disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns.
The earnings for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification. Due to sample size restrictions, the counterfactual group was *not* disaggregated by study mode.
Source: London Economics' analysis of Scottish LEO data

A4.1.2 Returns to other higher education qualifications by subject of study

In Table 48, we present information on the marginal earnings returns associated with other higher education qualifications (i.e. other than first degrees), by subject of study. In all cases, the analysis of earnings outcomes is compared to the next highest level of attainment, and both the treatment and counterfactual groups are disaggregated by subject (e.g. individuals in possession of higher education qualifications in STEM subjects are compared to individuals in possession of the next highest level of qualification in STEM subjects).

Table 48 Marginal earnings returns to other higher education qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, subject of study, and age at completion

Qualification level, gender and subject group		Age at completion and years post-completion								
		<=21			22-30			31+		
		3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs
Men										
Postgraduate (research) (vs. first degrees)	STEM subjects*				23.7%	25.8%	23.5%	20.0%	17.8%	21.7%
	AHSS subjects				-	19.3%	28.8%	12.3%	-	-
	Other subjects									
Postgraduate (taught) (vs. first degrees)	STEM subjects*				4.9%	6.3%	6.1%	12.9%	8.6%	-
	AHSS subjects	30.8%	40.6%	41.8%	22.3%	26.4%	31.6%	32.1%	32.2%	37.9%
	Other subjects	26.7%	20.7%	27.9%	31.2%	30.7%	29.2%	17.0%	15.7%	20.6%
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	STEM subjects*	4.6%	8.3%	3.8%	-	-	-	-	-	5.5%
	AHSS subjects	-	14.8%		-			-7.7%	-	-
	Other subjects	7.6%	17.0%	15.5%	-	20.5%	-	14.2%	23.2%	21.0%
Women										
Postgraduate (research) (vs. first degrees)	STEM subjects*				16.9%	19.3%	22.8%	16.5%	19.3%	-
	AHSS subjects				25.4%	27.8%	40.6%	11.5%	30.1%	30.4%
	Other subjects							39.5%		
Postgraduate (taught) (vs. first degrees)	STEM subjects*				5.4%	7.0%	6.0%	16.3%	14.4%	9.2%
	AHSS subjects	35.4%	51.3%	56.5%	31.6%	40.8%	47.7%	49.4%	53.2%	49.5%
	Other subjects	27.8%	24.8%	20.7%	28.6%	24.5%	23.9%	34.4%	29.0%	25.6%
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	STEM subjects*	6.9%	9.4%	18.5%	13.7%	28.9%	37.2%	19.2%	24.7%	31.9%
	AHSS subjects	8.7%	12.9%		-8.2%	-	-	-7.4%	-5.0%	-
	Other subjects	10.7%	21.0%	27.2%	9.8%	17.8%	24.3%	12.0%	16.9%	12.9%

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include ethnicity, disability, year of completion, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns.
*Note that Medicine and Dentistry are excluded from STEM subjects (as well as any of the other subject groups).
Source: London Economics' analysis of Scottish LEO data

A4.1.3 Returns to other higher education qualifications by type of Higher Education Institution

Table 49 presents the estimated marginal earnings returns to other higher education qualifications, broken down by type of Higher Education Institution attended. Note that the analysis compares individuals in possession of other higher education qualifications to individuals in possession of the next highest level of qualification; however, note that this

counterfactual group was *not* broken down by type of Higher Education Institution attended[253]. As such, some caution should be taken when interpreting the results.

Table 49 Marginal earnings returns to other higher education qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, type of HEI, and age at completion

Qualification level, gender and subject group		Age at completion and years post-completion								
		<=21			22-30			31+		
		3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs
Men										
Postgraduate (research) (vs. first degrees)	Ancient institutions				20.0%	23.7%	24.8%	19.5%	-	13.3%
	Pre-1992 institutions				34.1%	31.2%	36.9%	13.7%	14.2%	
	Post-1992 institutions							37.1%		
	Colleges									
Postgraduate (taught) (vs. first degrees)	Ancient institutions	14.8%	25.5%	28.9%	6.8%	10.8%	15.0%	15.9%	17.1%	15.7%
	Pre-1992 institutions	20.7%	24.3%	25.8%	11.6%	14.7%	17.6%	19.7%	17.3%	16.7%
	Post-1992 institutions				7.5%	7.4%	8.8%	20.7%	17.4%	18.3%
	Colleges									
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	Ancient institutions	-	-	-	-14.1%	-18.0%	-12.4%	-	-	12.6%
	Pre-1992 institutions	-	-	-	-	-	-	11.4%	14.3%	15.2%
	Post-1992 institutions	-	-	-5.0%	5.4%	-	-	5.9%	-	12.5%
	Colleges	-	5.6%	-	-	-	-5.4%	-4.9%	-	-
Women										
Postgraduate (research) (vs. first degrees)	Ancient institutions				20.7%	20.9%	30.1%	18.8%	27.5%	18.8%
	Pre-1992 institutions				22.5%	25.9%	24.4%	20.3%	21.7%	-
	Post-1992 institutions							21.1%		
	Colleges									
Postgraduate (taught) (vs. first degrees)	Ancient institutions	29.6%	34.6%	31.9%	13.0%	16.6%	17.1%	22.4%	21.6%	16.7%
	Pre-1992 institutions	26.6%	33.8%	36.0%	15.1%	17.6%	23.6%	21.9%	18.2%	15.2%
	Post-1992 institutions	15.6%	20.3%	18.5%	15.2%	13.7%	16.8%	29.0%	26.5%	22.8%
	Colleges									
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	Ancient institutions	17.7%	20.7%	26.0%	23.4%	29.8%	32.7%	42.5%	36.2%	39.9%
	Pre-1992 institutions	31.1%	39.1%	41.0%	35.3%	40.1%	53.7%	44.6%	46.5%	49.2%
	Post-1992 institutions	24.0%	27.2%	39.2%	35.1%	39.1%	51.4%	33.7%	36.0%	43.3%
	Colleges	-	9.9%	^	-	8.0%	11.1%	-4.6%	-	5.7%

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year. The counterfactual groups were *not* disaggregated by type of HEI. Control variables include ethnicity, disability, year of completion, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Log PAYE daily earnings (in constant average 2018 prices). All regression coefficients have been exponentiated to reflect percentage earnings returns. ***Source: London Economics' analysis of Scottish LEO data***

[253] For example, the analysis estimates the marginal earnings returns to postgraduate taught degrees obtained at ancient Higher Education Institutions relative to individuals in possession of first degrees obtained at *any* type of Higher Education Institution.

A4.2 Marginal employment returns to post-school education and training

A4.2.1 Returns to first degrees by study mode

In Table 50, we present information on the marginal employment returns to first degrees, broken down by mode of attainment. As with the marginal earnings returns (see Annex A4.1.1), the analysis compares individuals in possession of full-time or part-time first degrees to an aggregated non-completer counterfactual (i.e. individuals who failed to complete a first degree, irrespective of the mode of study). As such, the results should again be interpreted with caution.

Table 50 Marginal employment returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, study mode, and age at completion

Gender and ethnicity	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Full-time	4.5	2.5	1.9	3.7	2.1	-	-	-	-
Part-time	5.1	3.4	-	5.1	5.8	5.1	7.4	7.8	6.7
Women									
Full-time	2.9	3.4	2.7	5.8	4.0	2.2	5.5	4.7	3.8
Part-time	4.9	4.8	-	6.4	5.7	3.9	7.3	7.3	7.0

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
The employment outcomes for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification. Due to sample size restrictions, the counterfactual group was *not* disaggregated by study mode.
Source: London Economics' analysis of Scottish LEO data

A4.2.2 Returns to other HE qualifications by subject of study

In Table 51, we present information on the marginal employment returns to higher education qualifications (other than first degrees), by subject of study. In all cases, the analysis of employment outcomes is compared to the next highest level of attainment, and both the treatment and the counterfactual groups are disaggregated by subject (e.g. individuals in possession of higher education qualifications in STEM subjects are compared to individuals in possession of the next highest level of qualification in STEM subjects).

Table 51 Marginal employment returns to other higher education qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, subject of study, and age at completion

Qualification level, gender and subject group		Age at completion and years post-completion								
		<=21			22-30			31+		
		3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs
Men										
Postgraduate (research) (vs. first degrees)	STEM subjects*				-8.0	-6.0	-3.2	-4.8	-	-
	AHSS subjects				-	-	-	-	-	-
	Other subjects				-			-		
Postgraduate (taught) (vs. first degrees)	STEM subjects*	-			-3.2	-1.6	-	-1.7	-2.6	-2.7
	AHSS subjects	4.5	-	-	3.9	1.8	-	6.0	4.3	2.6
	Other subjects	4.3	-	-	9.1	8.7	9.6	7.1	6.2	6.7
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	STEM subjects*	-	3.8	5.7	-2.8	-	-	-	-	-
	AHSS subjects	8.4	6.1	-	-	-		-8.5	-10.1	-10.9
	Other subjects	5.7	7.3	3.8	-	-	-	-	3.8	7.7
Women										
Postgraduate (research) (vs. first degrees)	STEM subjects*				-9.0	-7.3	-5.6	-10.0	-8.3	-7.4
	AHSS subjects				-	-	-	-	-	-
	Other subjects				-	-		-	-	
Postgraduate (taught) (vs. first degrees)	STEM subjects*				-2.8	-2.2	-	-4.2	-3.8	-4.3
	AHSS subjects	7.1	7.8	6.8	4.5	3.5	3.9	6.9	4.5	-
	Other subjects	4.1	5.2	4.7	4.9	3.9	5.3	5.7	6.4	4.7
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	STEM subjects*	-	3.4	-	-	-	-3.7	-	-	2.5
	AHSS subjects	6.5	4.5	-	-	-	-	-5.1	-3.3	-
	Other subjects	9.2	7.5	8.1	4.4	8.1	^	-	-	-

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include ethnicity, disability, year of completion, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
*Note that Medicine and Dentistry are excluded from STEM subjects (as well as any of the other subject groups).
Source: London Economics' analysis of Scottish LEO data

A4.2.3 Returns to other HE qualifications by type of Higher Education Institution

Table 52 presents estimates of the marginal employment returns to other higher education qualifications, by type of Higher Education Institution attended. As with marginal earnings returns (see Annex A4.1.3), the analysis compares individuals in possession of higher education qualifications to individuals in possession of the next highest level of qualification; however, again, this counterfactual group was *not* broken down by type of institution attended. As such, some caution should be taken when interpreting the results.

Table 52 Marginal employment returns to other higher education qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, type of HEI, and age at completion

Qualification level, gender and subject group		Age at completion and years post-completion								
		<=21			22-30			31+		
		3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs
Men										
Postgraduate (research) (vs. first degrees)	Ancient institutions				-6.8	-5.5	-3.2	-	-	-
	Pre-1992 institutions				-	-	-	-	-	-
	Post-1992 institutions							-	-	
	Colleges									
Postgraduate (taught) (vs. first degrees)	Ancient institutions	-	-	-	1.7	1.5	1.6	2.3	2.0	2.3
	Pre-1992 institutions	4.6	-	4.5	2.5	3.0	4.3	3.7	2.9	2.4
	Post-1992 institutions	-			1.5	-	-	2.9	-	-
	Colleges									
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	Ancient institutions	-6.7	-5.2	-	-9.4	-7.2	-	-7.8	-5.7	-4.6
	Pre-1992 institutions	-2.7	-	3.0	-3.0	-	-	-3.3	-	-
	Post-1992 institutions	-2.6	-	2.9	-	-	-	-	-	-
	Colleges	4.0	6.3	6.4	-	-	-	-	-	-
Women										
Postgraduate (research) (vs. first degrees)	Ancient institutions				-6.7	-5.6	-5.0	-3.7	-5.0	-
	Pre-1992 institutions				-	-	-	-9.0	-7.5	-
	Post-1992 institutions							-	5.8	
	Colleges									
Postgraduate (taught) (vs. first degrees)	Ancient institutions	5.2	5.3	4.4	1.9	-	1.4	-	1.4	-
	Pre-1992 institutions	5.2	5.8	3.8	3.1	2.0	2.8	-	-	-1.5
	Post-1992 institutions	-	-	-	2.6	2.5	3.4	2.5	2.1	-
	Colleges									
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	Ancient institutions	-4.3	-	-	-5.6	-	-	-9.0	-5.6	-6.1
	Pre-1992 institutions	3.0	2.7	4.4	-	3.0	-	-4.3	-3.1	-
	Post-1992 institutions	4.7	5.2	6.1	3.8	6.5	-	-	-	2.1
	Colleges	6.5	6.4	^	2.8	4.3	-	-	1.9	2.9

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
The counterfactual groups were *not* disaggregated by type of HEI.
Control variables include ethnicity, disability, year of completion, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Proportion of the year in PAYE employment.
Source: London Economics' analysis of Scottish LEO data

A4.3 Marginal benefit dependency returns to post-school education and training

A4.3.1 Returns to first degrees by study mode

Table 53 presents the marginal benefit dependency returns to first degrees, by mode of attainment. Again, note that the analysis compares those individuals in possession of full-time or part-time first degrees to an aggregated non-completer counterfactual (i.e. individuals who failed to complete a first degree, irrespective of the mode of study). As such, some caution should again be taken when interpreting the results.

Table 53 Marginal benefit dependency returns to first degrees (compared to non-completers) at 3, 5 and 7 years post-completion, by gender, study mode, and age at completion

Gender and ethnicity	Age at completion and years post-completion								
	<=21			22-30			31+		
	3 years	5 years	7 years	3 years	5 years	7 years	3 years	5 years	7 years
Men									
Full-time	-3.9	-3.1	-3.0	-5.8	-5.2	-3.3	-1.6	-1.6	-
Part-time	-3.6	-2.1	-2.3	-6.0	-5.7	-3.3	-6.2	-5.3	-4.5
Women									
Full-time	-3.6	-4.0	^	-6.1	-3.3	-3.8	-3.1	-3.1	-2.3
Part-time	-2.9	-3.8	^	-7.1	-3.6	-4.3	-5.3	-5.0	-3.6

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include disability, year of completion/drop-out, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
The benefit receipts for the non-completers counterfactuals are measured 3, 5 and 7 years after dropping out of their qualifications. Similarly, the different age bands capture the age at which non-completers dropped out of the relevant qualification. Due to sample size restrictions, the counterfactual group was *not* disaggregated by study mode.
Source: London Economics' analysis of Scottish LEO data

A4.3.2 Returns to other HE qualifications by subject of study

In Table 54 we present information on the marginal benefit dependency returns associated with other higher education qualifications (other than first degrees), broken down by subject of study. In all cases, the analysis of benefit dependency outcomes is compared to the next highest level of attainment. Note also that both the treatment and the counterfactual groups are disaggregated (e.g. individuals completing higher education qualifications in STEM subjects are compared to individuals in possession of the next highest level of qualification in STEM subjects).

Table 54 Marginal benefit dependency returns to other higher education qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, subject of study, and age at completion

Qualification level, gender and subject group		Age at completion and years post-completion								
		<=21			22-30			31+		
		3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs
Men										
Postgraduate (research) (vs. first degrees)	STEM subjects*				-3.0	-3.6	-2.5	-3.6	-2.6	-3.4
	AHSS subjects				-4.2	-3.5	-3.6	-6.2	-4.3	-5.2
	Other subjects									
Postgraduate (taught) (vs. first degrees)	STEM subjects*	-			-2.1	-2.1	-1.9	-2.5	-	-
	AHSS subjects	-2.2	-1.4	-1.5	-4.1	-3.5	-2.3	-6.8	-4.7	-5.8
	Other subjects	-2.8	-3.8	^	-3.6	-3.2	-2.4	-2.4	-2.5	-2.0
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Voc Level 6)	STEM subjects*	-7.7	-9.5	-6.6	-5.5	-4.4	-	-	2.8	-
	AHSS subjects	-5.8	-	-	-	-		2.9	-	-
	Other subjects	-9.5	-10.5	-6.0	-3.9	-5.7	-	-	-4.3	-2.7
Women										
Postgraduate (research) (vs. first degrees)	STEM subjects*				-1.2	-2.2	-2.0	-1.3	-	-
	AHSS subjects				-4.9	-5.2	-	-4.2	-4.3	-5.1
	Other subjects				-5.9			-3.9	-2.6	
Postgraduate (taught) (vs. first degrees)	STEM subjects*				-	-	-1.1	-	-	-
	AHSS subjects	-2.7	-2.3	-2.7	-4.4	-3.4	-2.2	-3.6	-3.1	-2.0
	Other subjects	-1.4	-2.6	-2.4	-2.4	-3.0	-2.0	-1.3	-1.6	-2.2
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Voc Level 6)	STEM subjects*	-5.2	-5.9	-3.9	-	-	-2.8	-	1.0	-
	AHSS subjects	-3.5	-	-	-	3.5	6.6	2.4	-	2.5
	Other subjects	-8.7	-6.8	-6.2	-5.7	-6.5	^	-	-	-

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
Control variables include ethnicity, disability, year of completion, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
*Note that Medicine and Dentistry are excluded from STEM subjects (as well as any of the other subject groups).
Source: London Economics' analysis of Scottish LEO data

A4.3.3 Returns to other HE qualifications by type of Higher Education Institution

Finally, in Table 55, we present estimates of the marginal benefit dependency returns to other higher education qualifications, by type of Higher Education Institution attended. Again, note that the analysis compares individuals in possession of other higher education qualifications to an aggregated counterfactual (i.e. those individuals in possession of the next highest level of qualification irrespective of the type of institution attended). As such, some caution should be taken when interpreting the results.

Table 55 Marginal benefit dependency returns to other higher education qualifications at 3, 5 and 7 years post-completion, by gender, highest qualification, type of HEI, and age at completion

Qualification level, gender and subject group		Age at completion and years post-completion								
		<=21			22-30			31+		
		3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs	3 yrs	5 yrs	7 yrs
Men										
Postgraduate (research) (vs. first degrees)	Ancient institutions				-3.9	-3.4	-2.3	-4.9	-3.5	-3.6
	Pre-1992 institutions				-3.4	-3.8	-2.9	-4.3	-	-4.1
	Post-1992 institutions							-4.7	-5.3	
	Colleges									
Postgraduate (taught) (vs. first degrees)	Ancient institutions	-	-	-	-2.9	-2.7	-2.3	-3.0	-3.1	-3.0
	Pre-1992 institutions	-3.7	-2.8	-1.6	-2.6	-2.9	-2.0	-3.7	-3.1	-3.1
	Post-1992 institutions	-			-1.6	-2.1	-1.6	-3.3	-	-
	Colleges									
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	Ancient institutions	-10.8	-11.3	-6.8	-4.4	-	-	-	-	-3.0
	Pre-1992 institutions	-10.2	-10.8	-6.7	-4.1	-3.9	-3.2	-1.6	-	-1.7
	Post-1992 institutions	-7.0	-8.1	-5.6	-5.4	-3.6	-	-	1.8	-
	Colleges	-6.6	-8.2	-5.5	-3.6	-2.9	-	-	1.6	-
Women										
Postgraduate (research) (vs. first degrees)	Ancient institutions				-3.3	-2.9	-1.4	-2.9	-	-
	Pre-1992 institutions				-3.5	-2.3	-3.1	-	-	-2.2
	Post-1992 institutions							-3.1	-2.5	
	Colleges									
Postgraduate (taught) (vs. first degrees)	Ancient institutions	-1.2	-2.6	-2.3	-1.8	-1.7	-1.6	-1.2	-1.3	-0.9
	Pre-1992 institutions	-1.1	-1.7	-1.9	-1.3	-2.0	-2.0	-0.5	-1.3	-1.0
	Post-1992 institutions	-2.0	-2.7	-	-0.9	-1.6	-1.0	-1.3	-1.4	-0.9
	Colleges									
Other undergraduate (incl. HNC & HND) (vs. SCQF Full Vocational Level 6)	Ancient institutions	-4.5	-4.4	-	-	-	-	-	-	-
	Pre-1992 institutions	-9.3	-5.9	-5.9	-4.2	-3.0	-2.6	-1.4	-	-1.2
	Post-1992 institutions	-7.3	-4.5	-5.3	-4.6	-2.7	-	-	-	-
	Colleges	-6.3	-4.6	^	-1.9	-1.8	-	1.0	0.8	-

Note: Blank cells denote results where the underlying sample size of the treatment or counterfactual group is 100 or less. Cells including a hyphen (-) denote results that are statistically insignificant at the 10% threshold. Cells including a caret (^) denote instances where the sample size at 5 years or 7 years post-completion in the treatment or counterfactual group is less than 33.3% of the corresponding sample size at 3 years post-graduation. Age measured at the start of the final academic year.
The counterfactual groups were *not* disaggregated by type of HEI.
Control variables include ethnicity, disability, year of completion, region of employment, and SIMD quintile (based on the first record available for the individual). Dependent variable: Dummy variable capturing whether the individual was in receipt of public welfare benefits at any point during a given year.
Source: London Economics' analysis of Scottish LEO data

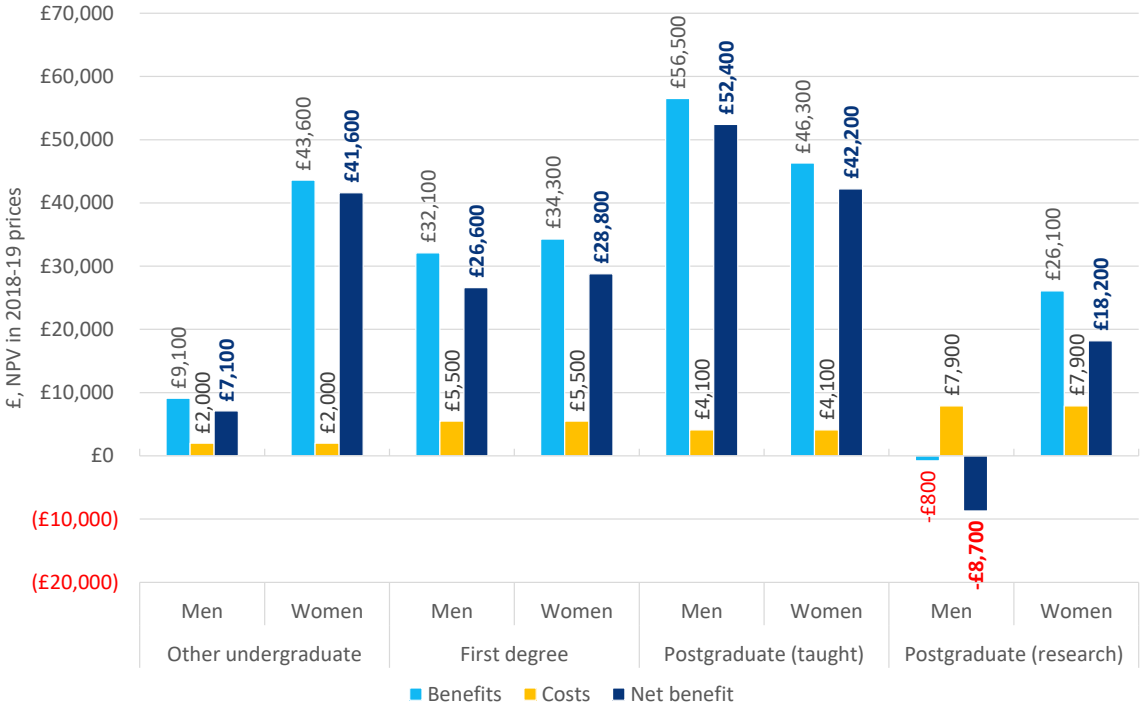
Annex 5 Supplementary ROI findings

A5.1 ROI associated with part-time higher education qualifications

A5.1.1 ROI to HE students

Figure 25 presents the estimated benefits, costs, and net benefits to students in the 2018-19 cohort undertaking part-time higher education qualifications, while Figure 26 presents the associated BCRs from the perspective of students.

Figure 25 Net student benefit associated with part-time HE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100. ***Source: London Economics' analysis***

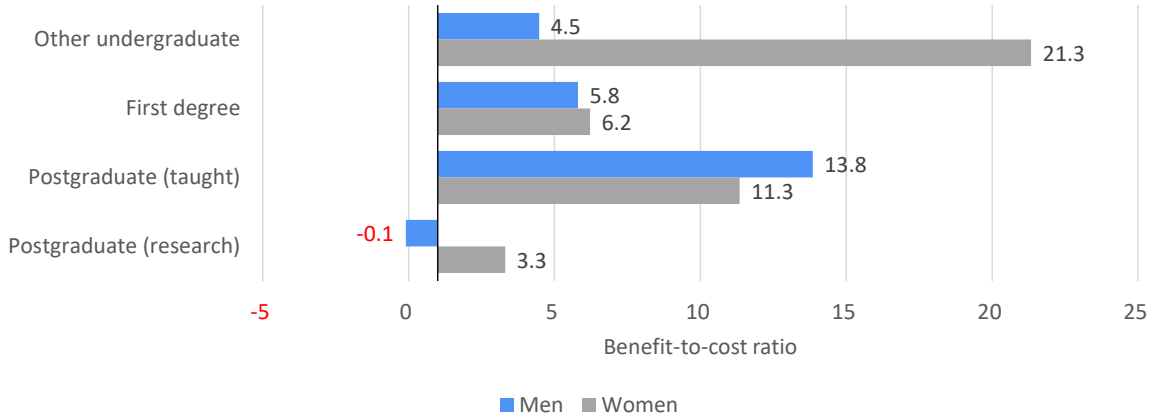
Compared to full-time students (see Section 9.1.1), the estimated net benefits to part-time students tend to be relatively *smaller*. For example, the net benefits to students completing full-time first degrees (compared to first degree non-completers) were estimated at **£81,800** for men, and **£42,300** for women. In comparison, the corresponding estimates for part-time student stand at **£26,600** for men, and **£28,800** for women. The lower net benefits for part-time students are driven by the fact that these students typically complete their qualifications much later in life[254]. As a result, post-graduation, part-time students have fewer years in the labour market during which they can reap the additional earnings and employment benefits associated with attaining their degrees. In

[254] For example, while the estimated average age at completion for male full-time students in the 2018-19 cohort stands at 24, male part-time students in the cohort are expected to complete their studies at an average age of 34 instead. Again, see Section 8.2 for more information.

addition, their higher age at completion implies that they face relatively lower marginal earnings and employment returns from their qualifications in each year post-graduation[255].

However, in addition to benefits, it is also the case that the costs of qualification attainment are significantly lower for part-time than for full-time students (as part-time students are assumed to combine their studies with employment, so that they do not incur the costs of foregone earnings during their studies). Therefore, the estimated BCRs to students associated with part-time HE qualifications tend to be much larger (ranging from **-0.1** to **21.3**) than the corresponding ratios for full-time students (ranging from **0.9** to **7.2**).

Figure 26 Benefit-to-cost ratios for students associated with part-time HE qualifications, by qualification level and gender



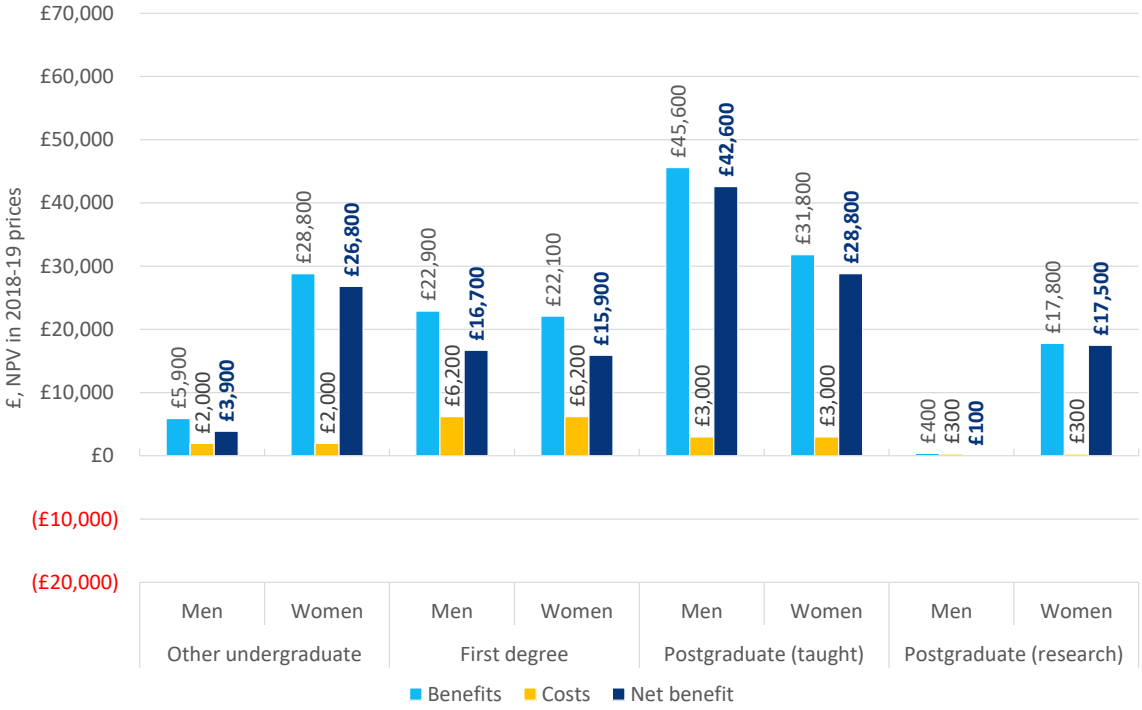
Note: All ratios are rounded to the nearest 0.1. ***Source: London Economics' analysis***

A5.1.2 ROI to the Exchequer

Figure 27 and Figure 28 present the estimated net Exchequer benefits and Exchequer BCRs associated with part-time HE qualifications. As for students, the net Exchequer benefits tend to be *lower* for part-time than for full-time qualifications[256]. Using the same example as above, the net Exchequer benefits associated with full-time first degrees were estimated at **£51,100** for men and **£19,600** for women; this compares to **£16,700** and **£15,900** for male and female part-time students, respectively. Again, the much lower costs for part-time students result in much larger Exchequer BCRs. The estimated BCRs to the Exchequer associated with part-time HE qualifications range from **1.7** to **67.6**[257], compared to **0.7** to **9.2** for full-time students.

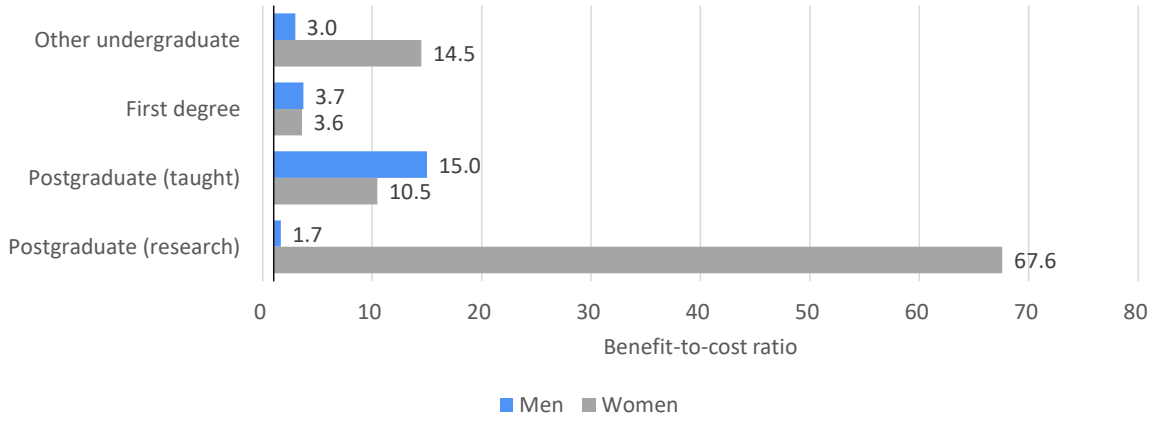
[255] See Section 8.4.1 for more information on the relevant marginal earnings and employment returns applied throughout the ROI analysis.
[256] See Section 0.
[257] For women completing part-time postgraduate research qualifications. This high ratio is due to the very low public costs of funding these students (£300, in terms of average public tuition fee loans for eligible students (adjusted for non-repayment)), compared to moderate Exchequer benefits (£17,800).

Figure 27 Net Exchequer benefit associated with part-time HE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100. ***Source: London Economics' analysis***

Figure 28 Benefit-to-cost ratios for the Exchequer associated with part-time HE qualifications, by qualification level and gender



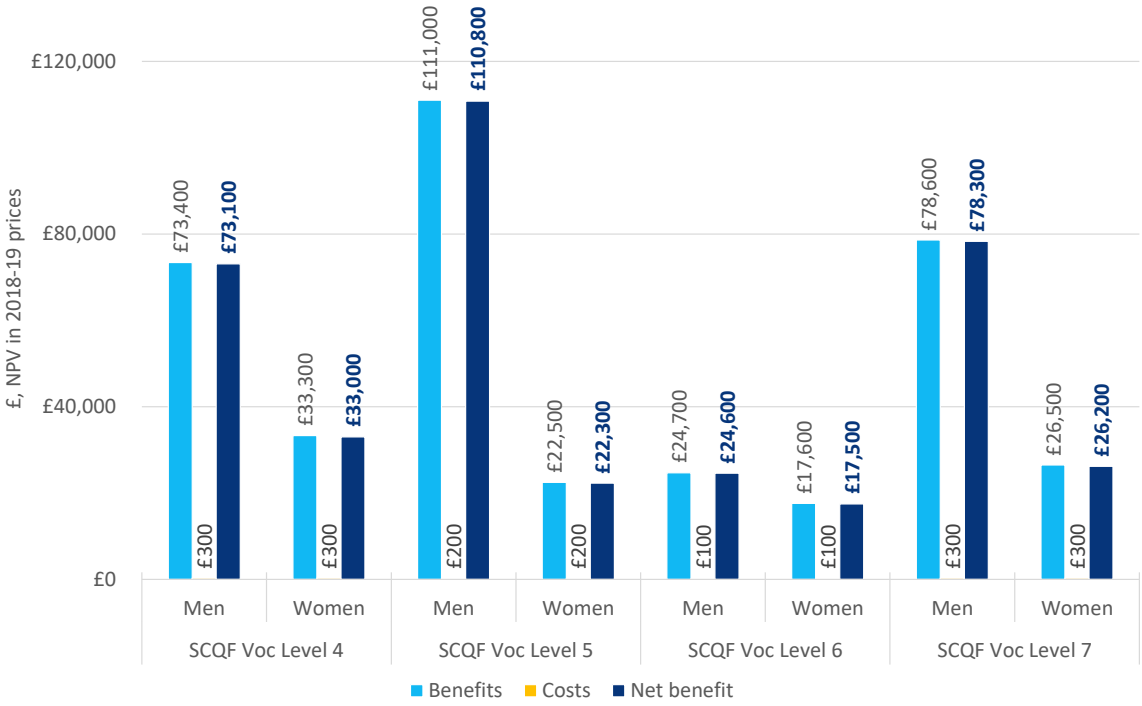
Note: All ratios are rounded to the nearest 0.1. ***Source: London Economics' analysis***

A5.2 ROI associated with part-time vocational education qualifications

A5.2.1 ROI to FE students

Figure 29 presents the estimated net benefits to students undertaking part-time vocational education qualifications, and Figure 30 presents the associated BCRs from the perspective of students.

Figure 29 Net student benefit associated with part-time FE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100. ***Source: London Economics' analysis***

Compared to full-time students (presented in Section 9.2.1), the net benefits to part-time students tend to be relatively *larger*[258]. For example, the net benefits to male students completing full-time vocational qualifications at SCQF Level 5 were estimated at **£85,100**. In comparison, the corresponding estimate for part-time student stands at **£110,800**. The higher result for part-time students is driven by both lower costs as well as higher benefits of attaining these qualifications on a part-time basis, where:

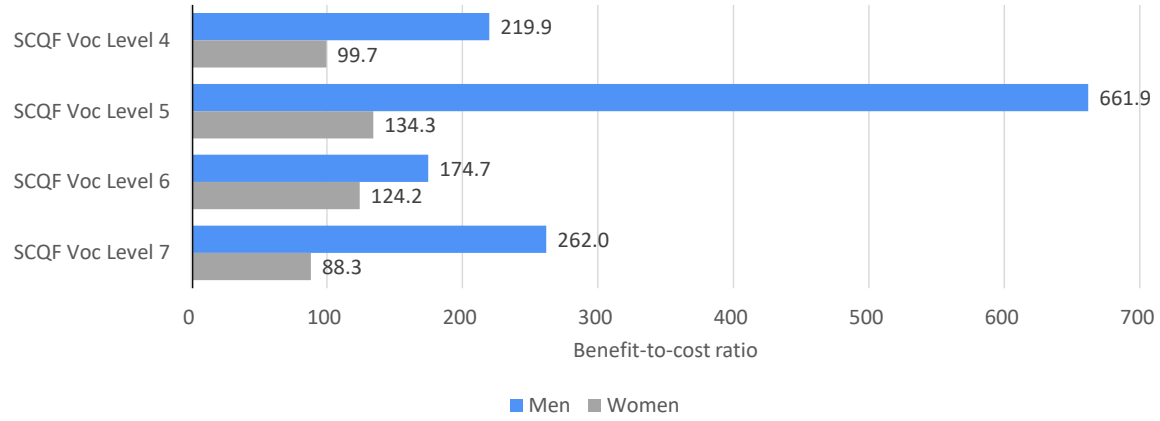
- The lower **costs** of attainment for part-time vs. full-time students are again based on the assumption that part-time students do not forego any earnings during the period of study; and
- In terms of the higher **benefits** of attainment, male part-time students completing vocational qualifications at SCQF Level 5 in the 2018-19 cohort are only *marginally* older when completing their qualifications (24, on average) than the corresponding average age at completion among full-time students (22)[259]. As a result, the ROI analysis for *both* full-time and part-time students is based on the marginal earnings and employment returns estimated for individuals aged 22-30 when finishing their qualifications[260]. However, for part-time students, these same marginal labour market returns are applied to a higher level of Baseline/counterfactual earnings and employment (from age 24 onwards, rather

[258] Except for female students completing vocational qualifications at SCQF Level 5 or 7.
[259] See Section 8.2.
[260] See Section 8.4.1.

than age 22), resulting in larger absolute net additional earnings over their lifetimes. Effectively, the age gap between male full-time and part-time male is too small to substantially reduce the net benefits associated with part-time study[261].

In terms of the resulting BCRs for part-time vocational qualifications from the student perspective (Figure 30), the very low costs of attainment for part-time students result in extremely large benefit-to-cost ratios, ranging from **88.3** (for women completing qualifications at Level 7) to as high as **661.9** (for men at Level 5).

Figure 30 Benefit-to-cost ratios for students associated with part-time FE qualifications, by qualification level and gender



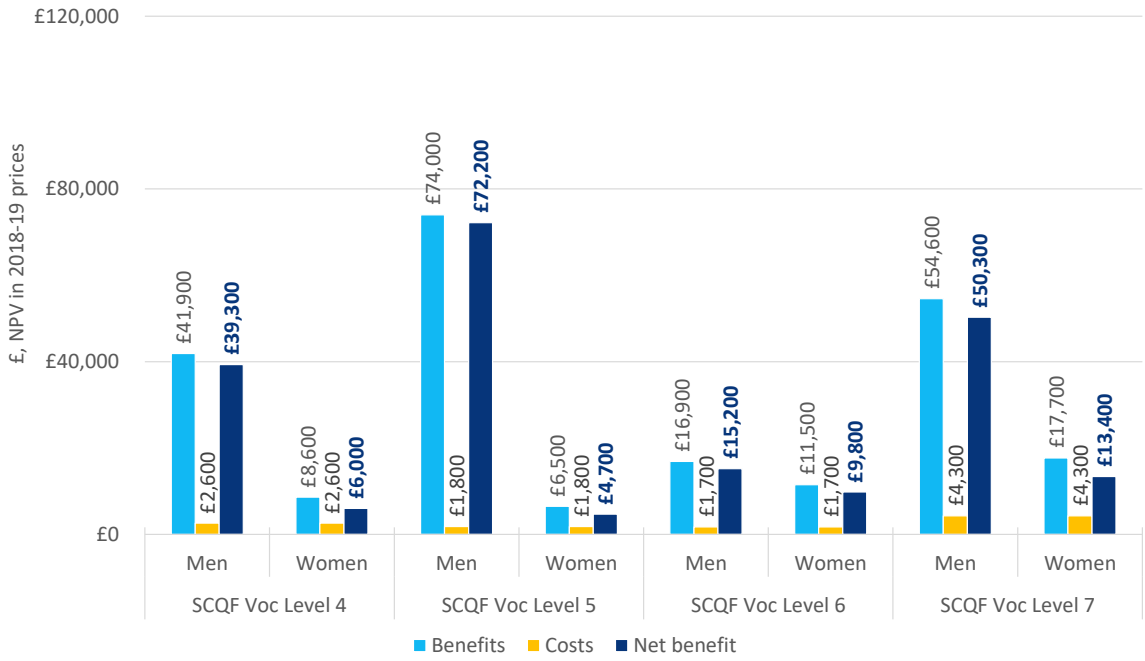
Note: All ratios are rounded to the nearest 0.1. ***Source: London Economics' analysis***

A5.2.2 ROI to the Exchequer

Finally, Figure 31 and Figure 32 present the estimated net Exchequer benefits and Exchequer BCRs associated with part-time further education qualifications. Similar to the results for students, the net Exchequer benefits are typically *higher* for part-time than for full-time qualifications[262]. Using the same example as above, the net Exchequer benefits associated with male students undertaking full-time qualifications at SCQF Level 5 were estimated at **£45,700**, compared to **£72,200** for part-time students.

[261] For female students, the age gap is somewhat larger, so that the ROI analysis applies lower marginal earnings and employment returns to estimate the ROI to part-time students as compared to full-time students (associated with age band 31+, as compared to 22-30).
[262] Except for women completing vocational qualifications at SCQF Level 7; see Section 9.2.2.

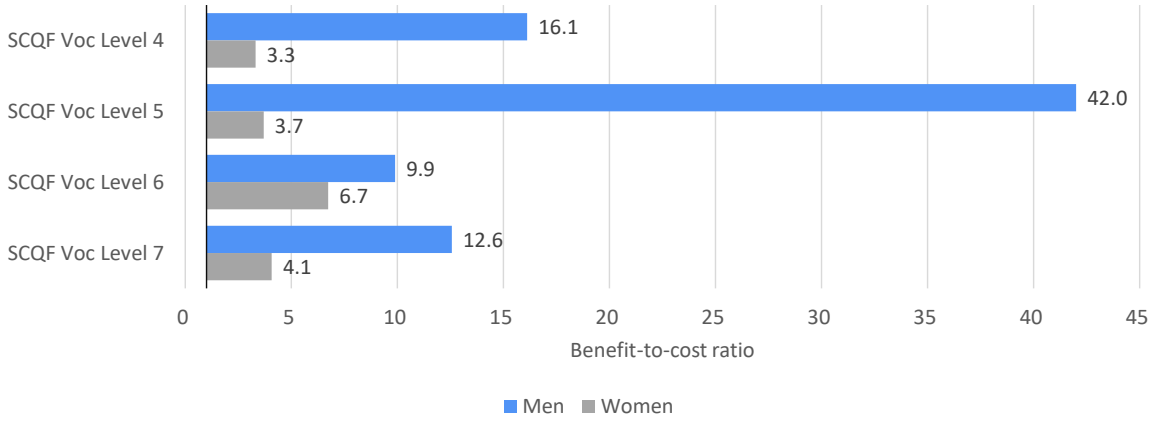
Figure 31 Net Exchequer benefit associated with part-time FE qualifications (£ per student), by qualification level and gender



Note: All estimates are presented in 2018-19 prices, discounted to net present values, and rounded to the nearest £100. ***Source: London Economics' analysis***

Again, the much lower costs for part-time students typically result in much larger Exchequer BCRs as compared to full-time students. The BCRs to the Exchequer associated with part-time FE qualifications range from **3.3** to **42.0**, compared to **0.0** to **6.7** for full-time students.

Figure 32 Benefit-to-cost ratios for the Exchequer associated with part-time FE qualifications, by qualification level and gender



Note: All ratios are rounded to the nearest 0.1. ***Source: London Economics' analysis***

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