

Economic Impact of Brunel University London 2014/15

A report to



13th September 2016

BiGGAR Economics

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1 EXECUTIVE SUMMARY

In the academic year 2014/15 Brunel University London generated an estimated:

- **£227.0 million GVA** and **4,305 jobs** in the Borough of Hillingdon;
- **£510.1 million GVA** and **7,564 jobs** in London; and
- **£787.9 million GVA** and **10,246 jobs** in the UK.

In 2014/15, Brunel University London had a total income of £200 million and employed 2,128 full-time equivalent members of staff. This implies that:

- for each £1 the University generated as a result of its direct operations it supported **£6.30** GVA impact across the UK; and
- every person directly employed at the University supported a total of **4.8 jobs** in the UK.

The quantitative impacts which have been considered in this report are: *core operations* – including direct employment and expenditure on goods and services; *students* – including student expenditure, part-time work, volunteering and *graduate impacts*; *tourism impacts* – including visits from friends and family, conference and events attendees, and summer school visitors; *diffusion of research impacts* – including business collaboration, spin-outs, student placements and Brunel Science Park.

The University is focused on meeting the global challenges of the 21st century, and in order to do this the University has strategically organised research into three research institutes. These Institutes aim to confront the technological and societal problems of the future by bringing experts from across disciplines within one organisation, and encouraging collaboration. The Institutes will also develop strategic, long-term partnerships with other institutions, such as universities, but also with industry and government.

This forms the backbone of the University's attempts to improve its economic impact, by developing and commercialising research that is relevant to society and to industry. In addition to engaging in research, and collaborations with partners, the University has also been trying to support more home grown talent, for example through the Central Research Laboratory, which is based in the Old Vinyl Factory, and provides intensive training and support for start-ups. Although these initiatives may not generate economic impacts immediately, they are vital for sustainable long-term growth.

In addition to confronting global problems the University also contributes significantly to the Borough of Hillingdon. Through its business collaboration, as well as its work at the Central Research Laboratory, or with partners at the Heathrow Aviation Engineering University Technical College, or in delivering student placements, the University contributes substantially to the needs of the local and regional economy.

2 INTRODUCTION

This report presents the findings of a study undertaken by BiGGAR Economics in into the economic impact of Brunel University London in the academic year 2014/15.

2.1 Brunel University London

Brunel University London is a campus-based university located in Hillingdon, West London. In 2014/15 the University had approximately 13,700 students, 2,300 staff and an annual income of £200.7 million.

The University is organised into three colleges and three research institutes:

- College of Engineering, Design and Physical Sciences;
- College of Business, Arts and Social Sciences;
- College of Health and Life Sciences;
- Institute of Energy Futures;
- Institute of Environment, Health and Societies; and
- Institute of Materials and Manufacturing.

2.1.1 2013/14 Impact

In 2015, BiGGAR Economics undertook an economic impact assessment of Brunel University London's activities in the academic year 2013/14. The study found that the University is a major source of economic activity in the local area. It was estimated that in 2013/14 the University generated an estimated:

- £212.6 million GVA and supported 2,512 jobs in the London Borough of Hillingdon;
- £504.5 million GVA and supported 5,908 jobs in London; and
- £785.4 million GVA and supported 10,407 jobs in the UK.

2.2 Impact Approach

The key objective of this study is to describe and, where possible, quantify the contribution that Brunel University London makes to the local, regional and national economies.

Quantifiable economic effects were assessed using two widely accepted measures of economic impact:

- Gross Value Added (GVA), which measures the monetary contribution that the University adds to the economy through its operations; and
- employment, which is measured in terms of total jobs supported unless stated otherwise.

It takes account of impacts elsewhere in the supply chain (multiplier effects) and impacts that occur outside the study area (leakage).

The study areas considered are:

- the Borough of Hillingdon (defined by Hillingdon Council's geography);
- London (the region of London); and
- the UK.

Throughout the report, the impact in the UK includes the impact in London and the Borough of Hillingdon.

The quantitative impacts considered in this report include:

- core operations – including direct employment and expenditure on good and services;
- students – including student expenditure, part-time work, volunteering and graduate impacts;
- knowledge transfer impacts – including consultancy, contract research, commercialisation and student placements; and
- tourism impacts – including visits from friends and family, and attendees to conferences.

The quantitative impacts described in this report are likely to underestimate the full value of the contribution that Brunel University London makes to the economy as monetary figures fail to capture the full value of many types of activity. For this reason this assessment also highlights various examples of how Brunel University London contributes to the well-being of individuals and groups both locally and around the world, and discusses these qualitatively.

2.2.1 Methodology

The starting point for assessing each source of impact was the scale of activity undertaken (e.g. the number of additional tourists or the value of University expenditure on supplies). Data on the scale and location of activity was sourced directly from the University where possible.

In many cases it was necessary to supplement this data with assumptions to help quantify the value of each type of activity (e.g. the average expenditure of different types of tourists or data on student cost of living). Where this data was not available directly from the University appropriate assumptions were made based on BiGGAR Economics' previous experience of comparable institutions elsewhere in the UK and/or other relevant research findings. The various sources used are specified in the appropriate sections of the report.

Each area of impact has a direct and an indirect impact on the economy. The direct impact was estimated by applying turnover/GVA and turnover/employee ratios for appropriate sectors of the UK economy to the total value of expenditure associated with each source of impact. These ratios were obtained from the UK Annual Business Survey.¹

Each area of activity also generates indirect and induced impacts further down the supply chain. These impacts arise as a result of purchases made by the businesses that benefit directly from expenditure by the University (and its students and staff) or by the staff employed by these businesses. These effects were captured by applying appropriate GVA and employment multipliers.

¹ ONS (2015), UK Annual Business Survey 2013 Revised Results

These multipliers were based on the Type 2 multipliers published in the Scottish Government's Input-Output tables². The Scottish multipliers were adapted for each of the study areas to reflect the comparative size of the economy in each area. This source was used because it is more up to date than equivalent information published about the UK economy as a whole and because it also provides multipliers for different sectors.

2.3 Report Structure

The remainder of the report is structured as follows:

- chapter 3 considers the economic impact of the core operations of Brunel University London, its expenditure on supplies, staff expenditure and capital projects;
- chapter 4 quantifies the impacts generated by the University's students, through their expenditure, part-time employment and volunteering;
- chapter 5 outlines how the University's teaching and learning activities support greater productivity in the economy through skilled graduates;
- chapter 6 describes the University's research approach and how its activities support the wider diffusion of this research;
- chapter 7 discusses how the University supports the visitor economy by attracting additional visitors;
- chapter 8 discusses wider impacts of Brunel University London, such as the health impacts arising from research undertaken at the University and wider community benefits; and
- chapter 9 summarises the quantifiable impacts of Brunel University London.

² Scottish Government (2015), Input-Output Tables 2012

3 CORE IMPACTS

The core economic impacts associated with Brunel University London are those that occur through the day-to-day operations of the organisation and include:

- direct impact, through the University's turnover and the people it employs;
- impact on the University's supply chain;
- impact of staff expenditure; and
- impact of capital spending.

3.1 Direct Impact

In 2014/15, the total income of Brunel University London was £200.7 million and £75.2 million was spent on goods and services. The direct economic impact of an institution can be estimated by subtracting its total expenditure on goods and services from its total income. Brunel University London was therefore estimated to have a direct impact of £125.5 million GVA in 2014/15.

The direct employment impact is the number of people directly employed by the University, which was equal to 2,128 full-time equivalent (fte) employees.

Table 3.1 – Direct Economic Impact

	Value
Income (£m)	200.7
Expenditure on goods and services (£m)	75.2
Direct GVA (£m)	125.5
Direct employment (ftes)	2,128

Source: Brunel University London

3.2 Supplier Expenditure

Brunel University London has an economic impact on the wider economy through the purchase of goods and services as this increases turnover and supports employment in the companies that supply the University.

In 2014/15, the University spent £75.2 million on a wide variety of goods and services. In order to calculate the economic impact of this spend it was necessary to consider how much of the University's supplies were purchased from companies in each of the study areas. A study of a similar institution (in terms of geography and size)³ found that 97% of supplies were purchased from UK based suppliers and of this, 58% were from suppliers in the regional area. Of this, 12% of supplier expenditure was in the local area.

The economic impact of this expenditure depends on the industry in which it was spent. In order to estimate this impact economic ratios and multipliers appropriate to the sectors in which expenditure occurred were applied to the level of expenditure in each industry.

³ Oxford Economics (2013), The Economic Impact of the University of West London.

The total supplier impact is shown in Table 3.2. This shows that the total impact was estimated to be £64.6 million GVA and 1,961 jobs in the UK. Of this, £36.0 million GVA and 1,093 jobs were estimated to be in London and £5.6 million GVA and 171 jobs in the Borough of Hillingdon.

Table 3.2 – Supplier Impact

	Borough of Hillingdon	London	UK
GVA (£m)	5.6	36.0	64.6
Jobs	171	1,093	1,961

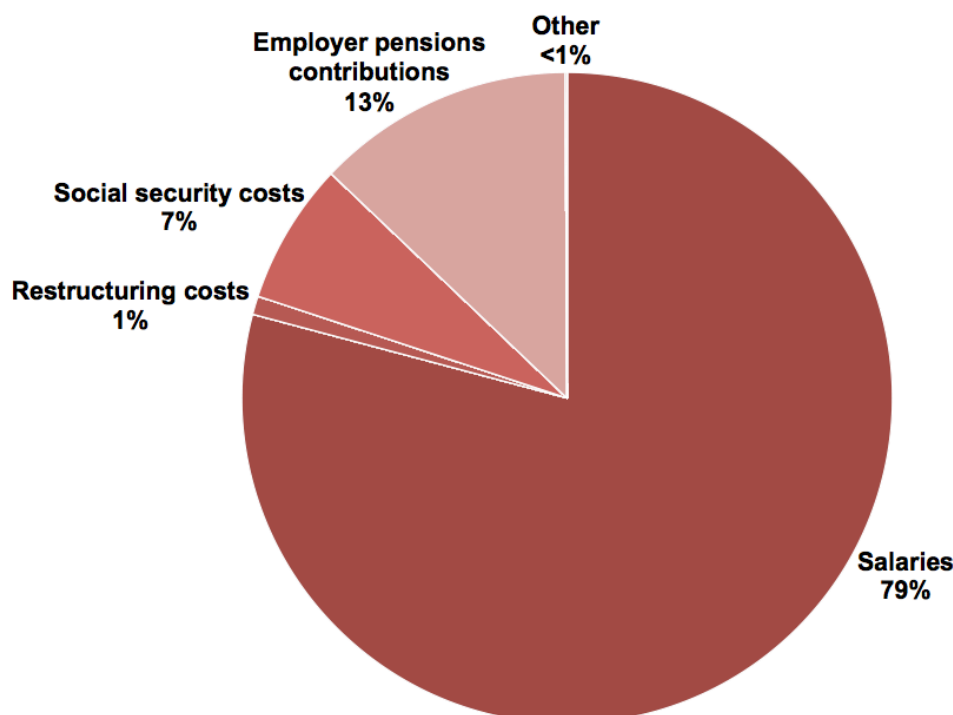
Source: BiGGAR Economics Calculations

The University's third party supplier contracts include a catering contract with Sodexo, which employs 120 people on site, along with a cleaning contract that can have 80 to 150 employees on site depending on the time of year. The cleaning contract, worth £8 million over five years has recently been let to a local company, allowing the local economy to benefit from University operations. While the economic impacts of these contracts are captured in the supplier impact, the scale of the additional employment on-site is worthy of note as these contracts provide jobs directly within the local labour market.

3.3 Staff Spending

In 2014/15, Brunel University London employed 2,128 fte staff and spent £106.1 million on staff costs. Through spending this money in the wider economy, these staff have an economic impact.

Figure 3.1 – Staff Costs



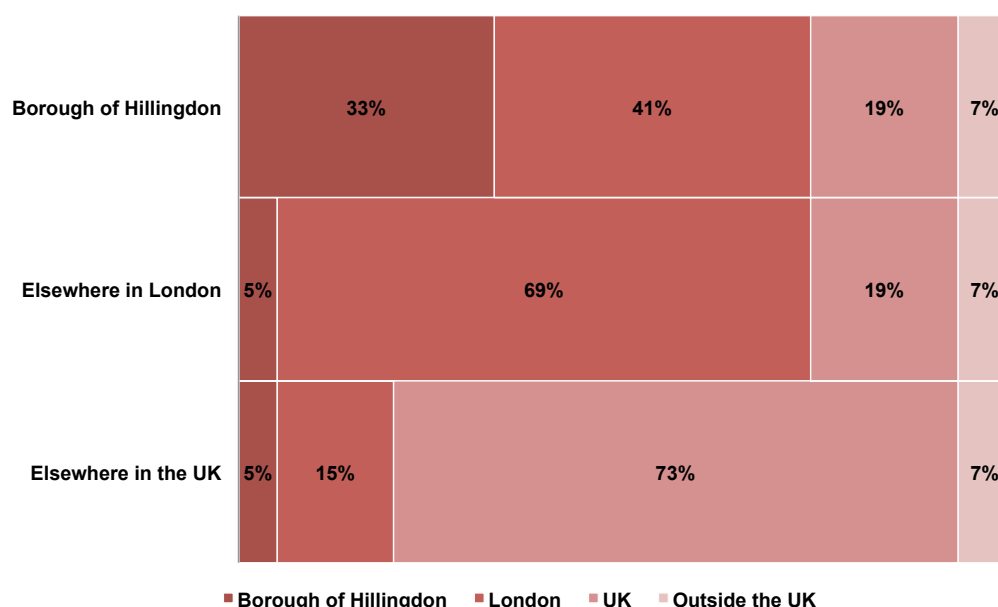
Source: Brunel University London Financial Statements 2014-15

In order to estimate this impact it was necessary to consider the total wages paid to staff in each study area. Information provided by Brunel University London indicates that all staff salaries were paid in the UK, of which 65% were paid to staff in London and 32% paid to staff in the Borough of Hillingdon.

The economic impact of this expenditure depends on the value of expenditure made in each study area, which will depend in turn on where staff salaries are paid. To estimate this impact it was therefore necessary to make assumptions about where staff might have spent their salaries.

At the regional level this was done based on Scottish input-output tables⁴. This source was used because equivalent data for the UK economy is not published. The split of more local expenditure was made based on the size of each area and its proximity to larger population centres. The spending profile of staff residing in each area is given in Figure 3.2. This shows, for example, that staff living in the Borough of Hillingdon were assumed to spend 33% of their salaries within Hillingdon, 41% elsewhere in London and 19% outside the UK and 7% outside the UK.

Figure 3.2 – Location of Staff Spending (exclusive)



Source: BiGGAR Economics

The economic impact of this spending was estimated by applying economic ratios and multipliers. In this way, it was estimated that spending by staff in 2014/15 generated £6.4 million GVA and 123 jobs in the Borough of Hillingdon, £43.1 million GVA and 791 jobs in London, and £82.1 million GVA and 1,495 jobs in the UK.

Table 3.3 – Staff Spending Impact

	Borough of Hillingdon	London	UK
GVA (£m)	6.4	43.1	82.1
Jobs	123	791	1,495

Source: BiGGAR Economics Calculations

⁴ Scottish Government (July 2015) Scottish Input Output Tables 2012

3.4 Capital Spending

Brunel University London also has an impact on the local economy as a result of the investment it makes in the construction of new buildings and in purchasing new technologies and equipment.

The scale of projects like these means that expenditure often varies substantially from year to year and therefore expenditure in any one financial year may not reflect the true impact of this activity over time. In order to account for this, the impact of capital projects was estimated based on the University's average capital spend over the last five years and anticipated spend over the next five years. Brunel University London's average annual capital spend over the period 2010-2020 was therefore calculated to be £32.1 million.

Some of this spend will be on land and buildings and this expenditure is therefore equivalent to additional turnover in the construction sector. Its impact on the economy was estimated by applying economic ratios and multipliers for the construction sector.

However, some of the spend is likely to be on plant, machinery and equipment. A study by Frontier Economics⁵ found that 23% of university capital spending is on equipment. This spend will be equivalent to additional turnover in the manufacturing sector and the impact was estimated by applying economic ratios and multipliers for the manufacturing sector.

It was then necessary to consider the location of this capital spending. Data provided by the University indicates that 92% of suppliers were based in the UK. Of this, 35% were located in London and 6% in the Borough of Hillingdon.

In this way it was estimated that Brunel University London's expenditure on capital projects generated £34.1 million GVA and 359 jobs in the UK, of which £12.0 million GVA and 126 jobs would be in London, and £1.3 million GVA and 19 jobs would be in the Borough of Hillingdon.

Table 3.4 – Capital Spending Impact

	Borough of Hillingdon	London	UK
GVA (£m)	1.3	12.0	34.1
Jobs	14	126	359

Source: BiGGAR Economics Calculations

Brunel University London has undertaken major capital investments over the last ten years with its four campuses being consolidated into one. There are quantitative economic impacts from this, in terms of GVA and jobs created, which have been captured by the quantitative analysis in this section. However, there are considerable wider impacts which are difficult to quantify.

As a result of the significant campus investment, more students have been brought into Hillingdon, bringing with them a lively and vibrant youth focused culture. Students deliver other benefits, for example, a strong volunteering effort that adds value to local third sector organisations (see Section 4.4). New buildings in themselves can stimulate economic confidence, improving the local amenity and the impression a place makes, including stimulated inward

⁵ Frontier Economics (2015), A review of HEFCE capital expenditure

investment of businesses and attraction to existing and new residents. Indeed, it is anticipated that this positive influence on the local area will increase in the future, with planned investment in three areas:

- a new health and sports centre, with a 1,500 seat arena;
- new learning and teaching facilities; and
- new engineering facilities.

The total capital spend between 2010/11 and 2014/15 was £73.9 million, which will be dwarfed over the period 2015/16 to 2019/20 by an estimated investment in the region of £247.5 million. This is in addition to the major multi-million pound academic/industry developments highlighted in Chapter 5.

3.5 Core Impacts Summary

It was estimated that Brunel University London's core activities in 2014/15 supported economic activity of £138.8 million GVA and 2,435 jobs in the Borough of Hillingdon, £216.7 million GVA and 4,138 jobs in London, and £306.4 million GVA and 5,943 jobs in the UK. These impacts are summarised in Table 3.5.

Table 3.5 – Core Economic Impact 2014/15

	Borough of Hillingdon	London	UK
GVA (£m)			
Direct	125.5	125.5	125.5
Supplier Spending	5.6	36.0	64.6
Staff Spending	6.4	43.1	82.1
Capital Spending	1.3	12.0	34.1
Total GVA	138.8	216.7	306.4
Employment (jobs)			
Direct	2,128	2,128	2,128
Supplier Spending	171	1,093	1,961
Staff Spending	123	791	1,495
Capital Spending	14	126	359
Total Employment	2,435	4,138	5,943

Source: BiGGAR Economics Calculations. Note: Totals may not sum due to rounding.

4 STUDENT ACTIVITY

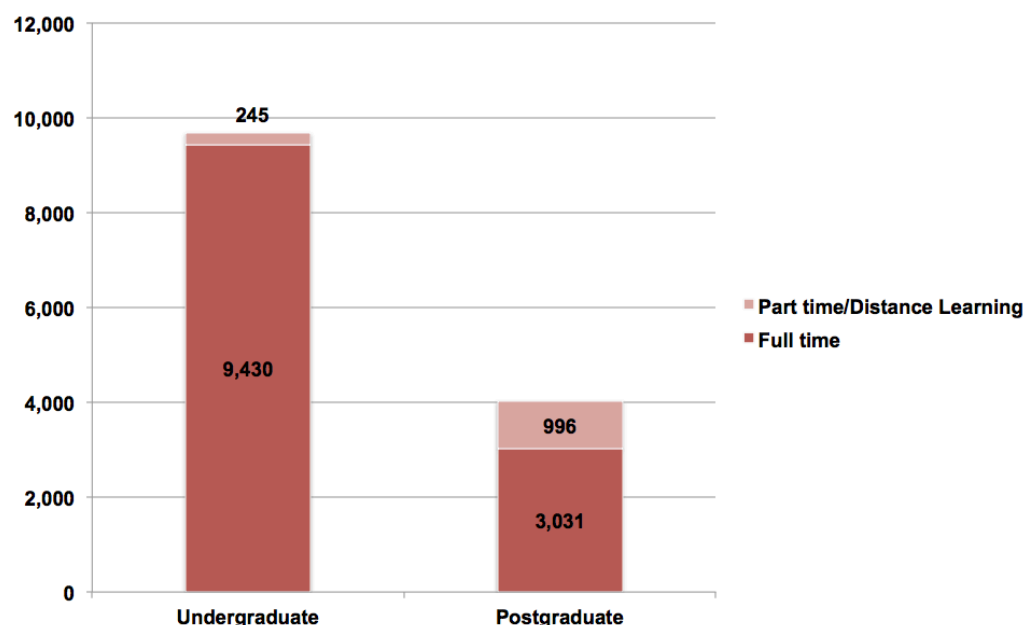
This chapter describes the impact that students at Brunel University London have on the economy. Students at the University have an impact on the economy by:

- spending money on goods and services;
- working part-time; and
- volunteering.

4.1 Student Population

In 2014/15, there were 13,721 full-time, part-time and distance learning students at Brunel University London. Of these, 12,461 were full-time students and this report only considers the economic impact of these students.

Figure 4.1 – Brunel University London Student Population 2014/15



Source: Brunel University London

4.2 Student Spending

Students at Brunel University London generate activity in the economy by spending on goods and services in the area. The basis for calculating this impact is a study undertaken by the Department of Business, Innovation and Skills⁶ that considered the level of expenditure of students studying in the UK. Adjusting for inflation, this suggests that on average students living in London spend £14,445 per year on living expenses. A breakdown of expenditure by main categories is provided in Figure 4.2.

⁶ Department for Business Innovation and Skills (2012), Student Income & Expenditure Survey 2011/12

Figure 4.2 – Student Spending by Category

Entertainment £1,042	Household goods £414	Non course travel £1,607	Travel £660	Books & Equipment £637
Housing Costs £5,661				
Personal items £2,329		Food £2,041		

Source: Department for Business, Innovation and Skills (2012), *Student Income and Expenditure Survey 2011/12*, adjusted for inflation

The type of accommodation a student lives in influences student expenditure. For example, students living in their parental or guardian home are unlikely to spend money on housing costs and will spend significantly less on food and household goods. The accommodation expenditure of students in institution maintained properties has already been included in the direct income of the University and so was excluded here.

After these adjustments it was estimated that full-time students at Brunel University London spent £107.6 million in the UK economy. By applying economic ratios and multipliers appropriate to the sectors in which the expenditure took place it was estimated that this expenditure supported a total of £35.5 million GVA and 756 jobs in the Borough of Hillingdon, £70.0 million GVA and 1,391 jobs in London, and £81.1 million GVA and 1,603 jobs in the UK.

Table 4.1 – Student Spending Impact

	Borough of Hillingdon	London	UK
GVA (£m)	35.5	70.0	81.8
Jobs	756	1,391	1,603

Source: BiGGAR Economics Calculations

4.3 Student Employment

Students at Brunel University London also contribute by working part-time while studying. As direct information about the employment of students at Brunel University London is not available, it was necessary to make assumptions about students' part-time work. Therefore, it was assumed, based on a study by the National Union of Students (NUS), that 37% of undergraduate students work and 48% of postgraduate students work.⁷ It was then assumed that they work an

⁷ NUS (2012), *Pound in Your Pocket Summary Report*

average of 14.2 hours per week⁸ and that students work in the area where they live.

However, not all of this employment will be additional to the local economy because some of these jobs might have been undertaken by other residents. The additionality of student labour was therefore assumed to be inversely proportional to the youth unemployment rate and calculated to be 77% in Hillingdon.

The economic impact of this employment was calculated based on the sectors in which the students were employed. Student part time work is concentrated in a small number of economic sectors. Over 70% of all students in employment work in either the retail sector or in the food and beverage serving sectors⁹. The economic impact of students was estimated based on the hours worked in each sector in comparison to an average worker in each sector. By considering the industries in which students habitually work appropriate economic ratios and Type 1 multipliers were applied.

In this way it was calculated that Brunel University London students undertaking part-time work contributed £22.5 million GVA and 874 jobs in the Borough of Hillingdon, £37.0 million GVA and 1,381 jobs in London, and £41.8 million GVA and 1,546 jobs in the UK.

Table 4.2 – Student Employment Impact

	Borough of Hillingdon	London	UK
GVA (£m)	22.5	37.0	41.8
Jobs	874	1,381	1,546

Source: BiGGAR Economics Calculations

The University's Placement and Careers Centre (PCC), part of the Professional Development Centre, plays a central role in stimulating employment opportunities and contributing to the local labour market. The PCC Job Shop provides access to hundreds of part-time and temporary vacancies both on campus and in the local area, through its vacancy listings. This also provides a valuable service to local employers, improving their opportunities to fill vacancies, reducing the likelihood of costly unfilled vacancies and helping to ensure the operation of an effective local labour market.

The PCC Job Shop advertises roles in business, IT, finance, media, creative industries and many more sectors. Roles on campus often offer flexible working hours or are event based, enabling students to find working solutions that enhance their student experience at Brunel. The University also runs workshops and a Part-Time Jobs Fair to help students with part-time job applications and job searching.

4.4 Student Volunteering

Brunel Volunteers is the official volunteering organisation for Brunel University London and takes a structured and resourced approach to matching students to volunteering opportunities. This is supported by the Brunel Volunteers website, which advertises vacancies and provides advice and supports to volunteers.

⁸ NUS (2010), Still in the Red

⁹ BIS (October 2013) *Working while studying: a Follow-up to the Student Income and Expenditure Survey 2011/12*

Student volunteering has the dual benefits of improving a student's skills and employability, while also providing a valuable resource for third sector organisations.

The University works alongside voluntary groups, charities and other non-profit organisations in the Hillingdon and London areas. Beneficiaries of the work include Victim Support, a charity for those who have suffered from crime, London Nightline, Kith and Kids, an organisation, which empowers families with a child with a disability, and the Alzheimers Society.

Although students are not paid for this, the work still adds value to the economy by enabling local charitable organisations to undertake additional activity that they may not be able to fund otherwise. In doing so this creates important partnerships and links with the local community.

Students are encouraged to take volunteering seriously and complete monthly timesheets indicating the number of hours volunteered and signed by a volunteer supervisor. In 2014/15, a fifth of all full-time students (2,592 students) volunteered, amounting to 21,223 hours of unpaid work.

The total hours students spend on voluntary activities throughout the year can be converted into average fte employees in this sector. The value to organisations of the hours volunteered can be estimated by assuming the average output of a student's voluntary work is equivalent to the average GVA per employee in the UK charity sector (£14,752)¹⁰. This GVA per employee can be applied to the number of employees estimated in order to estimate the GVA impact. Multiplier effects can be captured by applying GVA and employment multipliers to the direct impact. The increased activity within third sector organisations will increase activity in their supply chain companies, which will result in an increased employment in these companies, even if the volunteers themselves are not counted as employees.

Students were assumed to have undertaken their voluntary activities in the study area in which they reside during term time. The impact in each study area was attributed accordingly and in this way it was estimated that student volunteering contributed £0.2 million GVA and 3 jobs in the Borough of Hillingdon, £0.5 million GVA and 14 jobs in London, and £0.6 million GVA and 18 jobs in the UK.

Table 4.3 – Student Volunteering Impact

	Borough of Hillingdon	London	UK
GVA (£m)	0.2	0.5	0.6
Jobs	3	14	18

Source: BiGGAR Economics Calculations

This may however underestimate the true scale of volunteering at the University as not all students will complete their timesheets and many students will undertake volunteering independently of Brunel Volunteers.

In addition, there will be wider unquantifiable benefits arising from the volunteering activities themselves. Volunteering benefits service users by improving their wellbeing, which can have a further impact by resulting in cost savings in health and social services. Student volunteering not only provides valuable support to

¹⁰ NCVO, UK Civil Society Almanac 2016

local charities but also helps to enhance future career prospects for students by providing students with the opportunity to gain valuable skills.

The University also encourages staff to volunteer. As part of Brunel's commitment to staff development and the local community, the University operates an employer-supported volunteering scheme, which allows permanent staff thirty-six hours a year to volunteer with organisations in Hillingdon.

4.5 Student Impacts Summary

Through their spending, part-time work and volunteering Brunel University London students supported economic activity of £124.1 million GVA and 3,167 jobs in the UK, £107.5 million GVA and 2,785 jobs in London and £58.2 million GVA and 1,633 jobs in the Borough of Hillingdon.

Table 4.4 – Total Student Impact 2014/15

	Borough of Hillingdon	London	UK
GVA (£m)			
Student Spending	35.5	70.0	81.8
Student Employment	22.5	37.0	41.8
Student Volunteering	0.2	0.5	0.6
Total GVA	58.2	107.5	124.1
Employment (jobs)			
Student Spending	756	1,391	1,603
Student Employment	874	1,381	1,546
Student Volunteering	3	14	18
Total Employment	1,633	2,785	3,167

Source: BiGGAR Economics Calculations. Note: Totals may not sum due to rounding.

5 LEARNING IMPACTS

One of the most important ways in which Brunel University London makes an economic contribution is through its graduates. The skills, knowledge and practical experience given to students at the University enables students to become more productive employees after graduation. These long-term economic effects of Brunel University London's teaching activities are quantified in this chapter.

5.1 Graduate Productivity

This section describes the additional value that graduates from Brunel University London add to the UK economy as a result of the education they receive. The education that students at Brunel University London receive enables them to contribute more to their employer and generate a greater benefit for the UK economy than they would otherwise be able to. The GVA of this productivity gain includes the additional profits that employers are able to generate by employing graduates and the additional employment costs they are willing to pay in order to generate these additional profits.

The subject of graduate earnings premiums has been well researched so information about them is readily available and can be used to provide a measure of the additional contribution graduates make to the economy each year. Unfortunately information about the additional profits of graduate employers or the additional taxation revenue they help to generate is not readily available so the impact presented in this section is likely to underestimate the true productivity impact of learning.

Information about the graduate premium for different subject areas is provided in a research paper produced by the Department for Business Innovation & Skills¹¹, which considered data from the Labour Force Survey between 1996 and 2009. Although the data used in the report is now somewhat dated, evidence from the OECD¹² suggests that returns to higher education are fairly consistent over time. For this reason, the report remains the most robust and comprehensive source available for estimating this impact.

The analysis considered the after tax earnings of a graduate compared to the after tax earnings of a non-graduate. Direct costs, such as tuition fees less student support, and indirect costs such as foregone earnings were then subtracted from the gross graduate premium for each degree subject to give the net graduate premium.

In this way the total graduate premium gives the combined personal economic benefit that the year's graduates will obtain rather than the increase in national productivity associated with the degree, which will be higher. It therefore does not include the corporate profit associated with each graduate as well as the taxes paid to the Treasury. For these reasons (as illustrated in Figure 5.1) the impact presented in this section is likely to underestimate the full impact that graduates from Brunel University London generate for the UK economy.

¹¹ Department for Business Innovation & Skills (2011), The Returns to Higher Education Qualifications.

¹² Education at a Glance, OECD Indicators series

Figure 5.1 – Personal Graduate Premium Benefit Vs. Economic Benefit



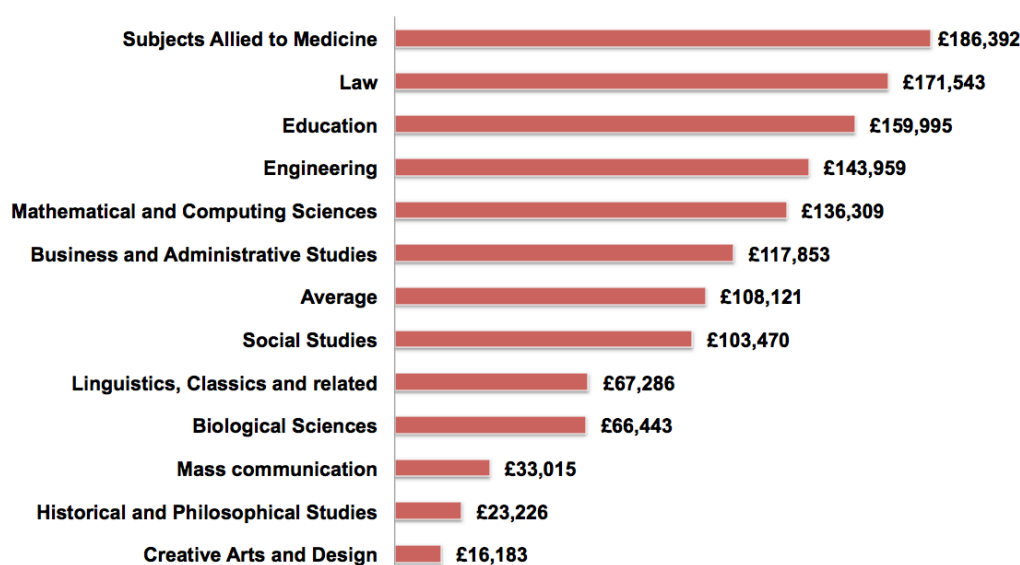
Source: BiGGAR Economics

5.1.1 Estimating the Graduate Earnings Premium

The subject that a student graduates in determines the earnings premium that they can expect to achieve over the course of their working life. The impact associated with graduates from Brunel University London was calculated by applying the graduate premium for each degree subject to the number of graduates in each study area.

On average undergraduates can expect to earn £108,121 more over their working lives than if they had not gone to University. However, there is considerable variation as graduates in subjects allied to medicine can expect to earn £186,392 over their working life, compared to £16,183 for those in creative arts. The earnings premium for degrees taught at Brunel University London is outlined in Figure 5.2.

Figure 5.2 – Graduate Premium by Subject Area



Source: Department for Business Innovation and Skills (2011), *The Returns to Higher Education*

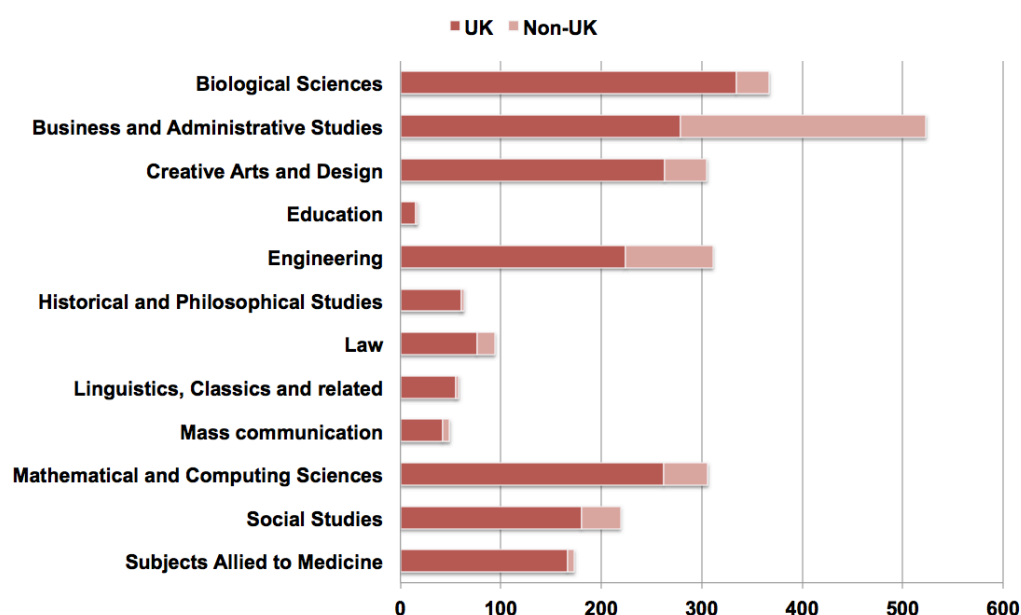
The graduate premium is realised in the area in which the graduate resides. Data from Brunel University London indicates that 99% of UK undergraduates remain in the UK, 50% remain in London and 5% in the Borough of Hillingdon. Of UK postgraduate leavers, 99% remained in the UK, 72% remained in London and 16% remained in the Borough of Hillingdon.

Data on the proportion of overseas students who remain in the UK post-graduation is not available, but national studies have found that 20% of international graduates remain in the UK¹³.

In 2014/15, 2,485 students graduated from Brunel University London with undergraduate degrees. The most popular subject area for graduations was business and administrative studies, with around a fifth of the University's graduates in this field. A split of UK and non-UK undergraduate graduates by subject area is provided in Figure 5.3.

¹³ Department of Business, Innovation and Skills (2012), *Tracking International Graduate Outcomes*

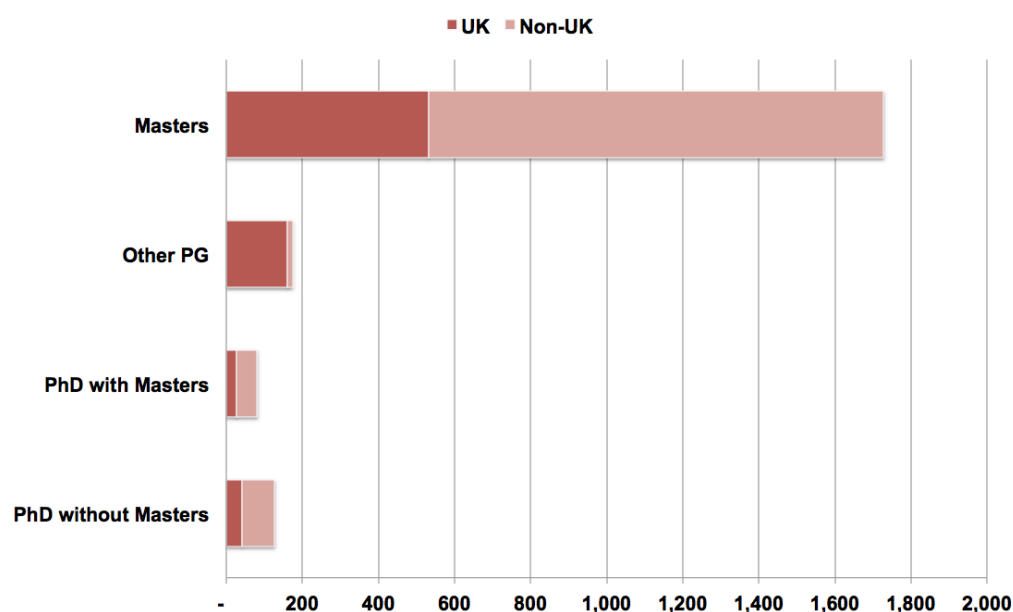
Figure 5.3 – UK and Non-UK Undergraduates by Subject Area



Source: Brunel University London

In 2014/15, 2,110 students graduated with a postgraduate qualification, the vast majority of these with a Masters degree. The BIS study does not consider the subject area of study when evaluating the economic impact of postgraduate qualifications but it does consider the level of study and PhD students have a higher earnings premium than Masters students. However, 39% of PhD students were assumed to have previously received a Masters,¹⁴ and their graduate premium was adjusted accordingly. Of the 2,110 graduates, 1,350 (64%) were from outside the UK. The split of UK and non-UK postgraduates is presented in Figure 5.4.

Figure 5.4 – UK and Non-UK Postgraduates by Subject Area



Source: Brunel University London

¹⁴ HEFCE (2011), PhD study: Trends and Profiles 1996-97 to 2009-20

Based on these assumptions, it was estimated that Brunel University London graduates who remain in the UK could expect to realise a graduate premium of £264.0 million over their working lives. Of this £145.6 million could occur in London and £18.6 million could be in the Borough of Hillingdon.

Table 5.1 – Graduate Premium Impact

	Borough of Hillingdon	London	UK
GVA (£m)	18.6	145.6	264.0

Source: BiGGAR Economics Calculations

5.2 Graduate Placement Premium

The Destinations of Leavers from Higher Education (DLHE) survey provides a snapshot of graduate activity six months after completing their studies. Data from the survey indicates that in 2013/14, 72% of Brunel University London graduates were working 6 months after graduating. It also found that 80% of graduates who undertook a placement while they were studying were employed 6 months after graduating, compared to 68% for graduates who had not undertaken a placement.

In addition to this, the average starting salary for a graduate who had undertaken a year long work placement during their studies was £3,196 higher than those who had not. In 2014/15, 712 students undertook year long work placements. Based on this information it can be estimated that the earnings premium associated with graduates undertaking year long work placements contributed £2.3 million to the UK economy.

As an example, many of Brunel University's PGCE (Postgraduate Certificate in Education) students undertake placements in local schools while studying and upon graduating contribute to the local workforce by providing skilled staff for local schools.

Table 5.2– Graduate Placement Premium (£m)

	Borough of Hillingdon	London	UK
Placement Premium	0.1	1.1	2.3

Source: BiGGAR Economics Calculations

5.3 Summary Graduate Productivity Impacts

The overall graduate productivity impacts arising from the estimated earnings premium of Brunel University London graduates and the additional premium associated with students undertaking a year long placement during their studies are summarised in Table 5.3. This indicates that productivity impacts from Brunel University London graduates contribute more than £266.2 million to the UK economy.

Table 5.3 – Graduate Productivity Impacts (£m)

	Borough of Hillingdon	London	UK
Graduate Premium	18.6	145.6	264.0
Placement Premium	0.1	1.1	2.3
Total Graduate Productivity Impact	18.7	146.7	266.2

Source: BiGGAR Economics Calculations. Note: Totals may not sum due to rounding.

6 HIGH IMPACT RESEARCH

Brunel University London's aim, in line with the approach pioneered by the University's namesake Isambard Kingdom Brunel, has always been to use academic research and rigour to generate significant, practical outcomes. The University's research has been structured with a focus on confronting the challenges of society and working with potential beneficiaries to effectively disseminate the knowledge generated.

6.1 Research Institutes

Since the establishment of the University in 1966, research has been at the heart of Brunel's academic activities. Most recently, this has involved taking a strategic approach to growing the University's research by establishing three research institutes, which encompass Brunel University's research strengths.

These research institutes include:

- Institute of Materials and Manufacturing;
- Institute of Energy Futures; and
- Institute of Environment, Health and Societies.

Each of these institutes is discussed in more detail in the following sections. The University¹⁵ has also aligned its research institutes with the strategic national research needs outlined in the BIS Science and Innovation Strategy.

By strategically organising its research, Brunel University aims to increase the visibility of its research and continue developing links with other organisations. By doing this, the University can further develop its research programme, enhance commercialisation and knowledge transfer activity and support other objectives of the University such as attracting staff and students to the University.

6.1.1 Institute of Materials and Manufacturing

Brunel University London has heavily invested, and developed expertise in a range of technologies, centred on advanced materials (one of the 8 great technologies identified by the Government), manufacturing, and structural integrity. In particular, it has experience in casting/processing metals, additive manufacturing, which is also known as 3D printing, and construction materials and structures.

The Institute integrates these research strengths together to generate new technologies and unique combinations, such as by pairing its strengths in predictive numerical modelling and sensor technology with structural integrity. The Institute also has world leading facilities and access to cutting edge technologies.

Research falls under key themes within the Institute:

- Structural Integrity – this theme focuses on analysing the safe and reliable life cycle of structures, which is of importance in key sectors such as oil and gas, aerospace, ground transport, construction and alternative energy;

¹⁵ Brunel University London (2014), BIS Science and Innovation Strategy: University Activities Alignment

- Liquid Metal Engineering – led by the Brunel Centre for Advanced Solidification (BCAST), this theme focuses on understanding the microstructure and principles of liquid engineering;
- Micro-Nano Manufacturing – conducts world-class research on the technology, systems and management of modern high-value manufacturing, including additive manufacturing;
- Materials Characterisation and Processing – undertakes research into the development and processing of new materials, as well as researching their characteristics; and
- Design for Sustainable Manufacturing – aims to develop and incorporate new technologies and design practice, in order to deliver economically and environmentally sustainable solutions, adapted for human capabilities.

The University's combination of strengths and its proactive attitude encourage collaboration with industry partners, such as TWI and Jaguar Land Rover, which are attracted by expertise in structural integrity and liquid metal processing respectively. In the field of materials characterisation, the Institute also has relationships with hundreds of SMEs.

Important partnerships include co-investment with technology engineering organisation TWI Ltd at Granta Park, Cambridge to build the National Centre for Structural Integrity. In 2012 Brunel University London was awarded £15 million of funding from the Higher Education Funding Council for England (HEFCE) as part of this new £60 million initiative, with the balance of funding, £45 million, from industry. Along with TWI Ltd. other partners include major companies from the rail, marine, aerospace and energy sectors as well as University College London, the University of Cambridge and the University of Manchester. The purpose-built National Centre will house more than 100 postgraduate taught and research students and more than 50 staff. It provides the most up-to-date facilities for engineering and materials research in the UK.

The case study in Figure 6.1 considers the Advanced Metal Casting Centre and Brunel University's strategic relationship with Jaguar Land Rover and Constellium.

Figure 6.1 – Advanced Metal Casting Centre (AMCC)

Brunel University London has research strengths in the field of manufacturing engineering, particularly within the sector of advanced materials. In fact, the preliminary findings of Sir Andrew Witty's Review of Universities and Growth featured Brunel as a University with research excellence in the advanced materials sector.

Research at Brunel within this field focuses on the recyclability of metals and is led by Professor Zhongyun Fan, Professor of Metallurgy, Director of the Brunel Centre for Advanced Solidification Technology (BCAST) and Principal Director of LiME, a national centre of excellence in liquid metal engineering at Brunel University London.

Research is fundamentally concerned with the question of how metals cool. This is important at a societal level, given the current cost and environmental impact of casting and mining metals, but also at an industrial level. For example, new technologies could make cars much lighter, significantly improving fuel efficiency.

Revolutionary new metal casting techniques developed at Brunel have proved successful in creating superior quality components from recycled metal. The challenge now faced is to scale these methods up for commercial use and show that they can reduce cost and improve quality. In order to overcome this, an Advanced Metals Casting Centre (AMCC) has been established at Brunel University London as a joint venture between the EPSRC (Engineering and Physical Sciences Research Council), Brunel University London and industry partners such as Jaguar Land Rover, Constellium and other companies in the supply chain. Industry partners have committed over £50 million of funding for the Centre.

The opening of the AMCC attracted 300 industrialists from all over the world, who are interested in the research and technologies that will be developed there. These industrial partners comprise companies involved in a wide range of metal casting sectors, such as Jaguar Land Rover, Norton Aluminium, Magnesium Elektron, Primetals Technologies and several others.

The AMCC will form part of a chain of organisations, under the auspices of BCAST, which aim to take technologies from the research stage to the point where they can be applied industrially. The intention is that these technologies will be scaled up at the AMCC in collaboration with industrial partners, thus avoiding the "valley of death" between lab-scale success and industrial application on the factory floor. The facilities include two dosing furnaces, several twin roll casting (TRC) units, pressure die casting units and a casting unit.

The University intends to build on success in this area with plans for a second and third phase of the AMCC with the objective of developing a National Metals Park at Brunel. A major research bid, worth £77 million, for the second phase of the AMCC has been successfully obtained. This would commercialise the technology developed at the University in conjunction with Jaguar Land Rover, Constellium and other companies in the supply chain, as well as ensuring that the associated economic benefits are retained within the UK.

This research and collaboration with industry has the potential to lead to the development of an entirely new sector, advanced metals casting. This would not only bring significant environmental benefits but would also support jobs and economic growth and secure a future for the manufacturing of advanced materials in the UK. It therefore provides a prime example of the role of Brunel University London in pushing the boundaries of academic discovery and supporting the diffusion of this knowledge throughout the economy, providing the basis for future productivity improvements and therefore economic growth.

Source: Brunel University London

6.1.2 Institute of Energy Futures

The Institute has a holistic approach to reducing energy costs, applying a multidisciplinary approach, which utilises the University's unique engineering, mathematics and social sciences expertise. The areas of particular focus are

transport, buildings (heating and cooling), industry and services, which are responsible for significant amounts of energy usage.

The main themes of this Institute are:

- Resource Efficient Future Cities – the two streams of research in this theme focus on end energy use demand by buildings and urban areas, and sustainable environmental development of buildings;
- Smart Power Networks – focuses on improving the distribution efficiency of the grid, and effectively integrating renewable energy sources;
- Advanced Powertrain and Fuels – improving the efficiency and reducing the energy cost of existing engines, through methods such as regenerative braking and advanced diagnostic technologies; and
- Energy Efficient and Sustainable Technologies – focuses on sustainable energy use in food chains, energy and the built environment, such as the environmental control of buildings.

The case study in Figure 6.2 considers the Centre for Sustainable Energy Use in Food Chains.

Figure 6.2 – Centre for Sustainable Energy Use in Food Chains

The Centre for Sustainable Energy Use in Food Chains at Brunel University is one of six End Use Energy Demand Centres established by the UK Research Councils. It involves a £12 million investment, about half of which came from the UK Research Councils and the Manufacturing the Future Programme, and the remainder coming from 33 manufacturers such as PepsiCo and Sainsbury's. As well as industrial partners, the Centre has been set up with the University of Manchester and the University of Birmingham.

The Centre aims to address the challenge of making the food sector resource efficient, competitive and healthy in the future, by reducing energy use and environmental impacts associated with production and consumption. The Centre envisions a circular economy within the food chain.

This will require modelling and optimisation of food production, using both top-down and bottom-up approaches. Additionally the Centre will consider ways to reduce individual processes at each stage, for example by reducing energy use or lowering energy needs. A third approach will be to consider how changes to corporate and consumer behaviour can be made, and the likely effects.

Source: Brunel University London

6.1.3 Institute of Environment, Health and Societies

The Institute combines social, health and environmental sciences with engineering and design to create cross-disciplinary approaches to creating sustainable, secure and healthy societies. This involves the delivery of solutions-focused research to develop new methods, technologies and products for a diverse and global range of problems. The Institute works in collaboration with health care providers, industries, communities and the government.

The main themes are:

- Environment and Health – conducting research that improves understanding of the links between ill health and the environment, and preventing disease to improve the quality of the environment;

- Healthy Ageing – ensuring that people age healthily and free of disability, and how to ensure that services such as transport and care are provided effectively when people's health becomes poorer;
- Health Economics – undertaking economic evaluations of a broad range of clinical and health service technologies in order to provide applied, policy relevant research, developed through rigorous and relevant research methods;
- Synthetic Biology – modifying living organisms, as well as building on sustainable systems to develop new process and products, and to tackle current and future problems;
- Biomedical Engineering – addressing unmet needs in health through innovative technology, with successful solutions derived from strong technical and clinical principles and practical application; and
- Welfare, Health and Wellbeing – improving understanding of the social processes underpinning welfare, health and wellbeing, and promoting social justice, with particular regard for vulnerable, at-risk populations.

The economic impact of this research is considered in Chapter 8.

6.2 Diffusion of Research

The diffusion of knowledge is just as important as undertaking industry relevant research. This is because the diffusion of knowledge (i.e. innovation) is crucial for productivity growth and in turn economic growth. Over an above its fundamental activities of teaching and research, Brunel University London therefore works to transfer existing and new knowledge throughout the economy through its interactions with businesses. This includes:

- collaborating with businesses through consultancy, contract research and CPD;
- facilitating knowledge transfer between academia and industry through the Knowledge Transfer Partnership programme;
- transferring knowledge to the wider business community through students undertaking placements while they are studying;
- supporting the formation of new businesses (spin-out companies); and
- supporting businesses by providing space for them to locate on its Science Park.

6.2.1 Business Collaboration

Brunel University London collaborates extensively with industrial partners, disseminating its research and the expertise of its staff widely among businesses. This generates economic impact as businesses then have a greater level of industry-leading knowledge or technology to apply to problems, resulting in new products and services, or more efficient processes. Figure 6.3 provides one example of how Brunel University facilitates business university collaborations.

Figure 6.3 – Designplus and Co-Innovate

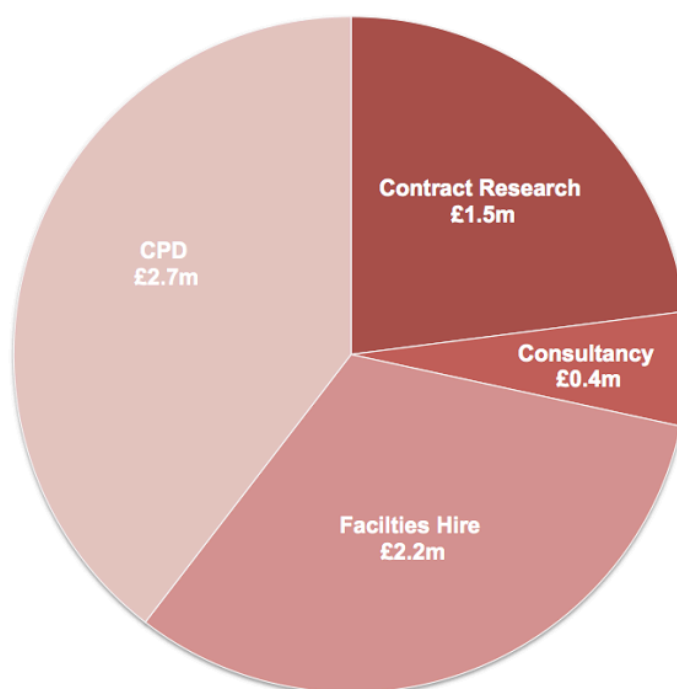
Designplus is an organisation that aims to create connections between Brunel University and industry, by building a sustainable collaboration platform, which allows businesses to harness the capabilities, knowledge and resources of Brunel Design. This is achieved by organising events and projects, while offering CPD and connecting people with a shared interest in design. Designplus works with large companies such as BT, Sony and Heinz, as well as with SMEs and charities, providing applied design support.

Co-Innovate aims to build on the success of Designplus with a specific focus of helping London based SMEs to innovate in products and services. It builds on the internationally renowned work of Brunel's School of Engineering and Design by providing advice and guidance through an open innovation model. In this way, it hopes to assist SMEs to develop new processes, products and services, and boost expenditure on R&D and innovation. Co-Innovate provides direct support to SMEs, which have access to Brunel University London's design expertise, as well as laboratory, testing and prototyping facilities.

Source: Brunel University London

In 2014/15, the University received £6.7 million from business collaboration activities. Continuing Professional Development (CPD) formed the largest component of this, with income equal to £2.7 million.

Figure 6.4 – Income from Business Collaboration Services



Source: Brunel University London (2016), HE-BCI Survey 2014/15

These services for business will impact the companies involved in different ways. Consultancy and contract research will enable the company to develop innovative solutions to problems they are looking to overcome or new processes they are looking to develop. CPD will enhance the long-term productivity of staff and hiring University facilities will allow companies to access high tech pieces of equipment without the upfront capital expense of acquiring them. In each case the company makes a conscious choice to invest in a kind of research that offers the best benefit to its productivity.

In 2013 BiGGAR Economics undertook an evaluation of Interface, the agency responsible for brokering relationships between businesses (and other organisations) and universities in Scotland¹⁶. The connections that Interface has made have covered a range of different types of engagement from small consultancy projects and access to university equipment and facilities through to company sponsored PhDs. The BiGGAR Economics evaluation found that the cost to Interface's clients of participating in this programme was £12.9 million and the direct benefit to these organisations was £46.4 million GVA. Therefore the direct return to investment was 360%. In other words, every £1 invested by businesses generated £3.60 GVA in direct economic benefits. These findings are in line with other studies that have considered the commercial benefits of investing in academic research.¹⁷

The GVA impact of business collaboration activities at Brunel University London was therefore estimated by multiplying the amount spent by businesses on these services (i.e. the income received by the University) by £3.60. In order to capture the employment impacts of this interaction and the wider impacts within the economy the appropriate economic ratios and multipliers were applied to the direct GVA. It was assumed that 0% of returns would accrue to firms in the Borough of Hillingdon, 50% in London and 100% in the UK in all areas except Facilities Hire, where more accurate information was available.

In this way it was estimated that the services that Brunel University provided to businesses in 2014/15 generated £37.7 million and 504 jobs in the UK, of which and £14.4 million GVA and 221 jobs in London, and £0.4 million GVA and 6 jobs in the Borough of Hillingdon.

Table 6.1 – Business Collaboration Impact

	Borough of Hillingdon	London	UK
GVA (£m)			
Contract Research	-	4.3	9.2
Consultancy	-	0.9	1.8
Facilities Hire	0.4	1.6	10.3
CPD	-	7.6	16.4
Total	0.4	14.4	37.7
Jobs			
Contract Research	-	57	124
Consultancy	-	14	25
Facilities Hire	6	25	139
CPD	-	125	216
Total	6	221	504

Source: BiGGAR Economics Calculations

¹⁶ BiGGAR Economics (2013), Evaluation of Interface - the knowledge connection for industry

¹⁷ PriceWaterhouseCoopers (2009), *Impact of RDA spending – National report – Volume 1 – Main Report*

6.2.2 Knowledge Transfer Partnerships

Brunel University London also participates in the UK wide knowledge transfer partnership (KTP) programme, which exists to facilitate the exchange of knowledge between academia and industry across the UK. Businesses are attracted to engaging with the University in this programme due to the University's strengths in specific research fields, and technological expertise. In 2014/15 Brunel University London was involved with 2 ongoing KTPs and has completed 7 in the past six years.

A strategic review of the KTP programme undertaken in 2010 found that on average, KTPs undertaken in London £887,000 GVA to the regional economy, equivalent to an annual impact of £147,800 in the six years after the KTP is completed. It is assumed that annual impacts for the duration of the project are only 10% of the impacts after the KTP has been completed, as the outputs of the knowledge exchange have not been fully realised. The same study found that on average, each KTP project supported the creation of 3 jobs.

By multiplying the impacts from this strategic review by the number of KTP projects undertaken by the University in each of the study areas, it was possible to estimate the economic impact that the KTPs have in each area. In this way it was possible to estimate that these partnerships contributed £0.3 million GVA and 6 jobs in London, and £1.1 million GVA and 21 jobs in the UK.

Table 6.2 – KTP Impact

	Borough of Hillingdon	London	UK
GVA (£m)	-	0.3	1.1
Jobs	-	6	21

Source: BiGGAR Economics Calculations

6.2.3 Student Placements

An important feature of studying at Brunel University London is the inclusion of student placements in many of its degree programs. All students at the University are encouraged to undertake some form of work experience, with many courses offering a one year sandwich placement, or two six month work experience placements. There are two principal benefits from schemes such as this: wages and improved productivity for students, and reductions in recruitment and training costs for employers.

Work placement benefits students in a variety of ways. They offer students the opportunity for personal development as well as contextualising the knowledge gained, while still studying. Placements can also help students to confirm their chosen career paths by opening their eyes to opportunities they had never previously considered and helping them to decide what jobs they would or would not like to do in the future.

In 2014/15, over 700 students took part in a year long work experience placement (typically lasting 44 weeks), of which 6% were in the Borough of Hillingdon, 51% were in London and 94% were in the UK. Based on consultation with the University, it was assumed that a further 500 placements of a 12 week duration were undertaken, of which 32% were in the Borough of Hillingdon, 64% were in London and 80% were in the UK. As no subject breakdown was provided, the breakdown from the 2013/14 study was applied.

The contribution of these students to the organisations that they are placed in is lower than the average output that would be expected of a worker due to a student having less experience. To reflect this it is assumed that the GVA of students on placement is 33% of the worker's GVA. To generate the appropriate GVA the sector of employment that students were employed in was assumed based on their subject or department.

The employment impact of these placements was estimated by multiplying the number and length of placements by 33% to generate the FTE equivalent. Appropriate multipliers were then applied to generate the indirect GVA and employment impacts.

Table 6.3 – Student Placements Assumptions

		Value
Year-Long Placements		712
	Borough of Hillingdon	6%
	London	51%
	UK	94%
12 week Placements		500
	Borough of Hillingdon	32%
	London	64%
	UK	80%
Productivity per worker*		33%

Source: Brunel University London. *BiGGAR Economics Assumption

In this way it was estimated that the total impact of student placements was £2.0 million GVA and 32 jobs in the Borough of Hillingdon, £14.1 million GVA and 222 jobs in London, and £25.9 million GVA and 409 jobs in the UK.

Table 6.4 – Student Placements Impact

	Borough of Hillingdon	London	UK
GVA (£m)	2.0	14.1	25.9
Jobs	32	222	409

Source: BiGGAR Economics Calculations

6.2.4 Spin-Outs

University research can generate new academic discoveries, which can lead to new, profitable applications of technology. This technology can be commercialised in University spin-outs, which make an economic contribution.

In 2014/15, Brunel University London had 2 spin-outs. As neither of these companies would have existed without research activity at the University, all of the GVA and jobs generated can be attributed to the University.

Figures for turnover at these companies were provided by the University and the GVA impact was calculated by applying turnover/GVA ratios for the relevant sectors. Employment figures were derived from the companies' websites. Economic impact was calculated by applying appropriate economic ratios and

multipliers. The impact in each area was estimated by taking account of where each company is based.

In this way it was calculated that in 2014/15 spin-outs from Brunel University London contributed £0.3 million GVA and 10 jobs in the UK. As these companies were located outwith London, their economic contribution is reflected in the UK impact.

Table 6.5– Spin-Outs Impact

	Borough of Hillingdon	London	UK
GVA (£m)	-	-	0.3
Jobs	-	-	10

Source: BiGGAR Economics Calculations

6.2.5 Brunel Science Park

Brunel Science Park was established in 1986 on the edge of the university campus, attracting a range of tenants including new start-ups and small specialist companies as well as spin-outs from established international companies. The Park offers flexible tenancy agreements designed to foster growth and offers a range of support services including guidance, access to R&D funding, patent and trademarks, training and venture finance.

Being located close to the University means that the companies based on the Science Park have easy access to the research base, facilities, business support services and business networking opportunities. These opportunities all help to support the growth of tenant companies. By providing suitable facilities with flexible leasing arrangements, the University also helps to retain these companies in the Hillingdon area.

Information provided by the University indicates that there are 9 companies located at the University, which employ a total of 76 people. In order to calculate the direct GVA impact of these companies it was necessary to apply GVA/employee ratios for the relevant sectors. The indirect impacts of the science park were then calculated by applying appropriate economic multipliers. It was then assumed that 80% of these firms would be additional to the Borough of Hillingdon, 50% to London, and 33% to the UK.

In this way it was calculated that the Brunel Science Park generated £5.8 million GVA and supported 75 jobs in the Borough of Hillingdon, £4.6 million GVA and 66 jobs in London, and £3.2 million GVA and 47 jobs in the UK.

Table 6.6 – Science Park Impact

	Borough of Hillingdon	London	UK
GVA (£m)	5.8	4.6	3.2
Jobs	75	66	47

Source: BiGGAR Economics Calculations

6.2.6 Diffusion of Research Summary

Brunel University London's research supports economic impact through the University's knowledge transfer activities. The total economic impact of this was

estimated to be £8.2 million GVA and 112 jobs in the Borough of Hillingdon, £33.3 million GVA and 515 jobs in London, and £68.1 million GVA and 991 jobs in the UK.

Table 6.7 – Total Diffusion of Research Impact 2014/15

	Borough of Hillingdon	London	UK
GVA (£m)			
Business Collaboration	0.4	14.4	37.7
KTPs	-	0.3	1.1
Student Placements	2.0	14.1	25.9
Spin-Outs	-	-	0.3
Brunel Science Park	5.8	4.6	3.2
Total GVA	8.2	33.3	68.1
Employment (jobs)			
Business Collaboration	6	221	504
KTPs	-	6	21
Student Placements	32	222	409
Spin-Outs	-	-	10
Brunel Science Park	75	66	47
Total Employment	112	515	991

Source: BiGGAR Economics Calculations. Note: Totals may not sum due to rounding.

6.2.7 Wider Impacts

As well as the quantifiable activities described thus far, Brunel University London works to share knowledge more widely with the general public. Brunel University London's annual Public Lecture Series has been running since 2009. Attendance at the lectures is free and is open to the public, providing an important educational and cultural resource in an area of the city where there is low supply of such opportunities. The lecture series attracts over 7,000 people each year from the local community and beyond.

In 2015, the University held three public lectures: Professor Peter Beresford discussed the current problems in social care, and argued that it can and should be seen as an economic generator, not a burdensome cost; Sir Mark Walport, the Government's Chief Scientific Adviser, gave a lecture tackling the big questions of science, research and policy in the 21st Century; and Dame Mary Archer, who discussed the crucial role of science in the history of good health, and potential future developments in human wellbeing. By attracting renowned speakers addressing a range of topics and sharing the research of its staff through public lectures such as these Brunel University London provides an important forum for disseminating knowledge and expertise and engaging with the public.

Public engagement activities can take many forms and have the potential to lead to significant impacts. One example of this is the documentary feature film, *A Plastic Ocean*, which examines the harmful effects of the huge amount of plastics that are in the oceans. One example of this is the Great Pacific Garbage Patch, a floating continent of plastic ten metres deep and twice the size of Texas.

Combining the academic expertise of a group of researchers from all over the world, the film chronicles the pathways through which the plastic in our oceans causes harm.

Dr Susan Jobling, a professor of human toxicology at Brunel University London, was involved in the production of the film and has considered the negative effects of this plastic on human health. For example, in Tuvalu, an island nation which has a huge problem with plastic waste, it was found that people were burning plastic in order to get rid of it, causing a spike in the rates of cancer. Additionally, as micro plastics are circulating through the marine food chain, which humans are ultimately a part of, this leads to micro plastics being ingested by humans.

The success of the film has generated significant interest around the issue and helped attract funds from philanthropic resources. Dr Jobling is pursuing the creation of an interdisciplinary plastic oceans research hub at the University. This example demonstrates how University public engagement can have significant benefits and can create the potential for economic impacts in the future.

7 TOURISM IMPACTS

This section considers the role of Brunel University London in the local tourism economy. By attracting tourists to the area the University's presence generates additional turnover in the tourism economy. These tourism impacts are generated through:

- friends and family visiting students and staff;
- attendees at conference and events; and
- attendees at summer language schools held at the University.

7.1 Visits from Friends and Relatives

Many of the staff and students at Brunel University London have moved into the area from elsewhere and it is likely that while they are working or studying at the University their friends and family will visit them from elsewhere in the UK and further afield. The expenditure of these visiting friends and relatives (VFR) increases the income of businesses in the tourism sector. This increased turnover in the sector has GVA and jobs impact.

In order to estimate the increase in turnover in the tourism sector it was necessary to calculate the how many VFR visits are from the UK and overseas and the amount of money that is spent during these visits. The frequency and spend of VFR visits from the UK and those from overseas differ greatly and therefore they are calculated separately.

The International Passenger Survey¹⁸ estimates the spend and frequency of visits from overseas. This found that there were 0.5 overseas VFR trips per person to London. It also calculated the average spend per VFR trip to London as £459. As there are 8,682 staff and students in the Borough of Hillingdon, it was estimated that there would be 4,354 trips by overseas visitors to the area, generating a total spend of £2.0 million. It was estimated that there could be an additional 2,193 trips elsewhere in London, generating an additional £1.0 million, and an additional 859 trips elsewhere in the UK, generating £0.4 million.

Data for VFR trips within the UK is sourced from the Great Britain Tourism Survey¹⁹. Using this data it was possible to estimate that there were 0.47 UK VFR trips per capita in the Borough of Hillingdon and 0.52 UK VFR trips per capita in London. The average spend on these trips was £129 in the Borough of Hillingdon and £126 in London.

Using this information it was possible to estimate that there could be an additional 4,083 trips to the Borough of Hillingdon, generating an estimated expenditure of £0.5 million, and 2,269 trips elsewhere in London, generating an additional £0.3 million of expenditure, and 889 trips elsewhere in the UK, generating an estimated expenditure of £0.1 million.

The direct economic impacts of the increased turnover in the tourism sector were estimated by applying turnover/GVA and turnover/employee ratios for the sustainable tourism sector. Indirect effects were estimated using appropriate economic multipliers.

¹⁸ Office for National Statistics (2016), International Passenger Survey

¹⁹ TNS (2015), Great Britain Tourism Survey 2014

In this way it was calculated that visits to staff and students generated an additional £1.2 million GVA and 51 jobs in the Borough of Hillingdon, £2.5 million GVA and 93 jobs in London, and £3.0 million GVA and 110 jobs in the UK.

Table 7.1– Visits from Friends and Relatives Impact

	Borough of Hillingdon	London	UK
GVA (£m)	1.2	2.5	3.0
Jobs	51	93	110

Source: BiGGAR Economics Calculations

7.2 Conferences and Events

Brunel University London also hosts a number of conferences and events, which contribute to the sustainability of the local tourism industry. The delegates and attendees to these conferences and events have an impact through their spending in the local economy. In 2014/15, 1,766 guests attended conferences and events at Brunel University London, staying for a total of 6,909 bednights.

In order to quantify this impact it was necessary to estimate the level of additional spending in each of the study areas. The level of daily spending at conferences and events was assumed to reflect that of business visitors, which is taken from the Great Britain Tourism Survey²⁰ and the International Passenger Survey,²¹ which provide the daily spend of domestic and overseas business visitors. The breakdown of domestic and overseas visitors was assumed to be the same as London as a whole.

It was also assumed that 90% of the spending of visitors to the Borough of Hillingdon was additional, although the additionality was assumed to be 33% in London and the UK. Spending on accommodation was removed from the estimated turnover, as this has already been counted in the University's income. Therefore, the increased turnover in the Borough of Hillingdon was estimated to be £0.6 million.

The economic impact of this additional spend was estimated by applying economic ratios and multipliers. In this way it was estimated that the economic impact of conferences and events at Brunel University London in 2014/15 was £0.4 million GVA and 15 jobs in the Borough of Hillingdon, £0.2 million GVA and 7 jobs in London, and £0.3 million GVA and 7 jobs in the UK.

Table 7.2– Conferences and Events Impact

	Borough of Hillingdon	London	UK
GVA (£m)	0.4	0.2	0.3
Jobs	15	7	7

Source: BiGGAR Economics Calculations

²⁰ TNS (2015), Great Britain Tourism Survey 2014

²¹ Office for National Statistics (2016), International Passenger Survey

7.3 Summer Schools

In 2014/15, 7,732 pupils attended summer schools hosted at Brunel University London and stayed for 46,582 bednights. Italian pupils attending the University's English language summer school spent a further 80,000 bednights at the University.

Although Brunel University London provided accommodation and food for these students during their stay, it is reasonable to expect that each student will have made an additional expenditure, or have had expenditure made on his or her behalf, during their stay. For example, it is usual for student attending summer schools to participate in a number of group excursions during their visit. It is also reasonable to expect that each student will spend money on things such as souvenirs, food and drink during their trip.

In order to estimate the impact of this expenditure it was assumed that each pupil would spend £25 per day. By multiplying this by the number of summer school associated bednights in 2014/15 and applying the same additionality assumptions as conferences and events it was possible to estimate expenditure by area. The economic impact of this additional spend was estimated by applying appropriate ratios and multipliers.

In this way it was estimated that the expenditure of summer school students generated £1.4 million GVA and 58 jobs in the Borough of Hillingdon, £0.7 million GVA and 25 jobs in London, and £0.7 million GVA and 27 jobs in the UK.

Table 7.3– Summer Schools Impact

	Borough of Hillingdon	London	UK
GVA (£m)	1.4	0.7	0.7
Jobs	58	25	27

Source: BiGGAR Economics Calculations

7.4 Tourism Impacts Summary

It was estimated that in 2014/15 spending by visitors attributable to Brunel University London contributed £4.0 million GVA and 144 jobs in the UK. £3.4 million GVA and 125 jobs were estimated to be in London and £3.0 million GVA and 125 jobs in the Borough of Hillingdon.

Table 7.4 – Total Tourism Impact 2014/15

	Borough of Hillingdon	London	UK
GVA (£m)			
Visits from Friends & Relatives	1.2	2.5	3.0
Conferences and Events	0.4	0.2	0.3
Summer Schools	1.4	0.7	0.7
Total GVA	3.0	3.4	4.0
Employment (jobs)			
Visits from Friends & Relatives	51	93	110
Conferences and Events	15	7	7
Summer Schools	58	25	27
Total Employment	125	125	144

Source: BiGGAR Economics Calculations

7.5 Tourism Infrastructure

Brunel University London contributes significantly to the tourism infrastructure in Hillingdon. The University owns and operates a 40 bedroom hotel onsite - Lancaster Hotel & Spa. Offering hotel, gym and spa facilities, it is marketed for its location just 5 miles from Heathrow Airport and a 20-minute walk from Uxbridge Tube station. Visitors to the University use the hotel and consultations with University staff suggest that around 35% of business is entirely external to the University. As one of the few hotels in the area (outside Heathrow airport), it provides a useful asset for the business tourism market. The hotel has preferred supplier status with major companies, such as Coca Cola which has its UK headquarters nearby, as well as supplying meeting room, function and accommodation space for local small businesses.

The University also has 4,500 bedrooms in halls of residences which are available between June and September, providing 126,582 bednights per year for international summer schools (language students). These rooms run at almost full capacity. There is no doubt that the accommodation infrastructure provided by the University plays a role in attracting summer schools and these students to the area, bringing custom to local retail and catering businesses. The impact of these students was estimated above.

7.6 Community Events

For the last seven years Brunel University London has staged an annual Bonfire and Fireworks night for the benefit of staff, students and the local community. In 2015, around 6,000 people the family-oriented event, which had activities for all ages, food stalls, entertainment provided by students and bouncy castles.

Other examples of the University's community role include a community literary festival, which took place in October 2015, as part of a month long cultural celebration, and will happen again in October 2016. The event hosted guest speakers such as Will Self, a columnist and Professor of Contemporary Thought at the University, and Benjamin Zephaniah, Professor of Poetry and Creative Writing.

8 WIDER IMPACTS

There are a number of wider impacts arising from the activities of Brunel University London. This includes the long-term economic benefits from health research undertaken at the University. In addition to this, the University generates wider benefits for the local and regional community, which although unquantifiable are nonetheless important.

8.1 Health Research

Brunel University London's Institute of Environment, Health and Societies (which is described in further detail in Section 6.1) delivers research that has a long term impact on health and quality of life, which, in turn, creates long term economic benefits.

8.1.1 Economic Returns to Health Research

Spending on health research generates economic value through two channels: through improved health outcomes for patients; and through stimulated private sector expenditure on health research. Improvements in health (net of health care costs required to deliver them) and increases in private R&D were assessed in a Wellcome Trust report, which was authored in part by the Brunel Health Economics Research Group.²²

It assessed improved health by considering Quality Adjusted Life Years (QALYs), a widely used method developed by health economists to assess how many extra months or years of reasonable quality a person might expect to gain as a result of a treatment. The Wellcome Trust considered two areas of medical research: cardiovascular disease and mental health.

The value of the health benefit was presented as an internal rate of return (IRR) on the initial expenditure on the research. The best estimate for the IRR of cardiovascular disease was 9.2% (within a range of 7.7% and 13.9%) and the best estimate for mental health was 7.0% (within a range of 3.7% and 10.8%). In order to apply these rates of return to medical research undertaken at Brunel University London the average of the two best estimates was used. Consequently it was assumed that every £1 invested in medical research would result in health gains valued at £0.08 each year in the UK in perpetuity.

Therefore, the £3.5 million of medical funding received by the University in 2014/15 would result in a return of £4.0 million GVA if the net present value of this impact was considered over a 20-year period, with a discount rate of 3.5%, as recommended by the Treasury's Green Book.

The medical research expenditure would also have an impact on GDP by stimulating investment in private sector R&D, which would in turn have positive effects on health. The Wellcome report found that a £1 investment in medical research and development in the public sector generated an increase in private R&D of between £2.20 and £5.10. The report also found that the social rate of return to private sector R&D was approximately 50%.

As with public health gains, there were a range of IRR estimates for stimulated private sector investment from a low of 20% and a high of 67%. The best

²² Wellcome Trust, Medical Research Council, Academy of Medical Sciences (2008), Medical Research: What's it worth? Estimating the Economic Benefits from Medical Research in the UK

estimate given was a 30% return. It was therefore assumed that each £1 invested in medical research at the University Brunel London generates an increase of £0.30 GDP for the UK economy each year in perpetuity.

Therefore, the £3.5 million of medical funding that the University received in 2014/15 would result in an economic return of £15.1 million if the net present value of this impact was considered over a 20 year period, at a discount rate of 3.5%.

The total return to medical research undertaken at the University is the sum of both economic and health gains. Therefore the net present value was estimated to be £19.1 million GVA in the UK. The economic impact in the other study areas was assumed to be proportional to the size of the economy. In this way, it was calculated that the impact was £0.1 million GVA in the Borough of Hillingdon and £2.5 million GVA in London.

Table 8.1 – Medical Research Impact

	Borough of Hillingdon	London	UK
GVA (£m)	0.1	2.5	19.1

Source: BiGGAR Economics Calculations

In order to understand the kind of concrete impacts that this research can have on improving healthcare outcomes it is useful to consider an example. Brunel's Health Economic Research Group, undertook an assessment of the cost-effectiveness of a screening programme for abdominal aortic aneurysms (AAA), which is estimated to have helped save just under half of the 6,800 men killed by the illness each year.

Figure 8.1 – Health Economics Research Group (HERG), AAA trial

A trial looking into the implementation of a screening programme for abdominal aortic aneurysms (AAA) is estimated to have helped save just under half of the 6,800 men killed by the illness every year. A vital part of the Multi-centre Aneurysm Screening Study (MASS) trial was an assessment of the cost-effectiveness of the screening programme – undertaken by Brunel's Health Economics Research Group (HERG) and published in the Lancet in 2002.

The assessment helped inform a policy announced by the Government in 2008 to introduce a national screening programme for all men over the age of 65 years old.

The final report into the effectiveness of the MASS trial in 2012 estimated a 42% reduction in the AAA-related mortality rate by screening men aged 65 to 74 years old. By spring 2013 the programme was fully introduced in England, offering screening to 300,000 men annually.

In 2013/14, the NHS reported that nearly 500 men went on to have potentially life-saving surgery after attending a screening. Nearly 3,700 had aneurysms detected, leading to regular monitoring.

In 2011 the Department of Health recognised the work of HERG in informing the policy research programme, saying: "This has made a significant contribution to strengthening the evidence-base for policymaking through a range of applied economic research."

Internationally, MASS is the most significant trial of AAA screening and provides the most robust evidence-based model of its cost-effectiveness. HERG's research has influenced AAA screening guidelines and policies across Europe and the USA.

Source: Brunel University London

8.2 Benefits to the Local and Regional Community

8.2.1 The Central Research Laboratory

Brunel University London has been instrumental in the development of the Central Research Laboratory (CRL) at the Old Vinyl Factory in Hayes. The CRL is an accelerator for British hardware start-ups based at the Old Vinyl Factory in Hillingdon, previously the headquarters of EMI. This building holds historical significance, as it was once a global centre of innovation in product design, technology and manufacturing - the CAT scanner, stereo sound recording and airborne radio were all invented here - as well as pressing the records of Elvis Presley, the Beatles and Jimi Hendrix.

The CRL is unique in that it is designed to support start-ups at every stage of their journey, including concept development, prototyping and production, while providing mentoring and investment. This enables firms to bring their innovative products to the marketplace. As important as the supportive work environment is the suite of prototyping labs and physical workspaces.

The pilot phase, which was launched in September 2015, accepted 11 start-ups as part of its Hardware Accelerator, and is now accepting and vetting new applicants as part of a competitive pitching process. The CRL's portfolio of firms covers a wide range of industries, involving the design of submarine drones, a electromechanical glove which interacts with the virtual environment and an evolvable walking aid.

The CRL, which is part of a wider development that will include housing, shops, restaurants and entertainment, is supported by Brunel University London, in conjunction with U+I, a property regeneration company. It has secured funding from the Mayor of London, and has a wide range of technical, industrial and community partners.

8.2.2 Growing Local Skills Capacity

The University is also taking steps to grow local skills capacity, for example, through its involvement in the Heathrow Aviation Engineering University Technical College (UTC). Sponsored by Brunel University London, the UTC is focused on developing future aviation engineers. It aims to meet the growing local need for technically competent, employable young people to join the expanding aviation industry. Along with 39 other UTCs, it will provide a practical grounding in mathematics, science and engineering for young people aged between 14 and 19 from a wide geographical area.

Brunel University London will work with partners including the nearby Heathrow Airport, British Airways, Virgin Atlantic and other major businesses to provide practical assistance in the form of input to curriculum development and delivery as well as widening participation and schools liaison activities.

The UTC will fill an important gap in the local provision of high quality technical education and will make an important impact on the socio-economic challenges of the area by contributing to regional skills and employability targets.

Further investment in local skills is also underway, with a £5 million investment by the University (funded by a HEFCE grant) to re-balance the gender gap in science, engineering, technology and maths-based careers. Brunel University London will refurbish its facilities to grow its engineering undergraduate programmes 5% a year for the next five years and further increase those taking

the apprenticeship route through the Aviation UTC. Key to the growth plans is working with schools and other stakeholders to create a step-change in the number of girls studying engineering and science subjects.

The new facilities will be the springboard for a large increase in STEM subject graduates but importantly, it will take an integrated approach to attracting many more girls into studying maths, physics and computing to A-level and beyond. At the heart of the new facilities will be a STEM Outreach Lab which will reach 30,000 school pupils a year on and off campus.

8.2.3 Widening Participation and Improving Life Chances

Widening participation (WP) activities in 2014/15 were targeted at students from under-represented groups with particular emphasis on students with disabilities and care-leavers. The aim is to ensure that Brunel University London continues to exceed its WP benchmarks in key areas, as recorded by the Office for Fair Access (OFFA).²³

The University's performance is currently very good, and it is on target to meet its targets in 7 of the 9 target areas considered by OFFA:

- the number of young full time first degree students from Low Partition Neighbourhoods (LPNs) has increased from the baseline of 6.0% set in 2009 to 7.4% in 2013/14;
- the number of full time first degree students in receipt of the Disabled Students Allowance has increased from a baseline of 5.4% set in 2009 to 8.7% in 2013/14; and
- evidence of activity to support the transition, progression, retention and employability of all WP students during 2014/15 includes the introduction of a WP Internship project to support the employability of under-represented undergraduates.

The WP Office has also continued to operate two strands of Professional Mentoring for UK second year undergraduates from widening participation backgrounds and under-represented ethnic minorities. The Ethnic Minority Undergraduate Scheme (EMUS) targets undergraduates from ethnic minority backgrounds and is managed in collaboration with the National Mentoring Consortium (NMC). Both programmes draw on experienced individuals from employers in the private and public sectors. Mentors receive full training and give their time voluntarily over a period of seven months. The scheme was cited by Government's Office for Fair Access (OFFA) and HEFCE in April 2014 as an example of good practice.

Brunel University London's WP Programme was cited as an example of best practice by OFFA, which stated:

"Brunel University's approach to access encompasses not only outreach and financial support but also activity to improve retention and success. It focuses on employer engagement to improve job prospects, including a programme of mentoring for undergraduates by professionals who work in a sector or industry related to the student's subject or career aspiration".

²³ Office for Fair Access (2016), Outcomes of access agreement monitoring for 2014-15 - Spreadsheets of all institutional targets

9 SUMMARY

9.1 Summary of Quantitative Impacts

The tables below show that in 2014/15, as an integrated package of teaching, research, and business collaboration, Brunel University London had an estimated impact of:

- £227.0 million GVA and 4,305 jobs in the Borough of Hillingdon;
- £510.1 million GVA and 7,564 jobs in London; and
- £787.9million GVA and 10,246 jobs in the United Kingdom.

Table 9.1 – Brunel University London GVA Impact 2014/15 (£m)

	Borough of Hillingdon	London	UK
Direct	125.5	125.5	125.5
Supplier Spending	5.6	36.0	64.6
Staff Spending	6.4	43.1	82.1
Capital Spending	1.3	12.0	34.1
Core Impact	138.8	216.7	306.4
Student Spending	35.5	70.0	81.8
Student Employment	22.5	37.0	41.8
Student Volunteering	0.2	0.5	0.6
Student Impact	58.2	107.5	124.1
Business Collaboration	0.4	14.4	37.7
KTPs	-	0.3	1.1
Student Placements	2.0	14.1	25.9
Spin-Outs	-	-	0.3
Science Park	5.8	4.6	3.2
Diffusion of Knowledge	8.2	33.3	68.1
Visits from Friends & Relatives	1.2	2.5	3.0
Conferences and Events	0.4	0.2	0.3
Summer Schools	1.4	0.7	0.7
Tourism Impact	3.0	3.4	4.0
Annual GVA Impact	208.3	360.8	502.6
Graduate Premium	18.6	145.6	264.0
Health Impact	0.1	2.5	19.1
Placement Premium	0.1	1.1	2.3
Total GVA Impact	227.0	510.1	787.9

Source: BiGGAR Economics Calculations. Note: Totals may not sum due to rounding.

Table 9.2– Brunel University London Employment Impact 2014/15 (Jobs)

	Borough of Hillingdon	London	UK
Direct	2,128	2,128	2,128
Supplier Spending	171	1,093	1,961
Staff Spending	123	791	1,495
Capital Spending	14	126	359
Core Impact	2,435	4,138	5,943
Student Spending	756	1,391	1,603
Student Employment	874	1,381	1,546
Student Volunteering	3	14	18
Student Impact	1,633	2,785	3,167
Business Collaboration	6	221	504
KTPs	-	6	21
Student Placements	32	222	409
Spin-Outs	-	-	10
Science Park	75	66	47
Diffusion of Knowledge	112	515	991
Visits from Friends & Relatives	51	93	110
Conferences and Events	15	7	7
Summer Schools	58	25	27
Tourism Impact	125	125	144
Total Employment	4,305	7,564	10,246

Source: BiGGAR Economics Calculations. Note: Totals may not sum due to rounding.

9.2 Value for Money

In 2014/15 Brunel University London directly contributed £125.5 million GVA to the UK economy and generated a total quantifiable economic impact of £787.9 million GVA. This implies that for every £1 GVA directly contributed by the University, it generates a total impact of £6.30 in the UK economy.

In 2014/15 Brunel University London supported 10,246 jobs throughout the UK economy. This included 2,128 people who were directly employed by the University, which means that every job created by the University supported 4.8 jobs throughout the UK economy.

These multipliers are summarised in Table 9.3.

Table 9.3 – Brunel University London Impact Multipliers

	Including Graduate Premium and Returns to Medical Research	Excluding Graduate Premium and Returns to Medical Research
Direct GVA : Total GVA	6.3	4.0
Direct Jobs : Total Jobs	4.8	4.8

Source: BiGGAR Economics Calculations

9.3 Comparison with 2013/14

The overall GVA impact of Brunel University at the UK level has remained broadly the same. This is because although the University's income and direct employment has increased and the number of students living in Hillingdon has increased, the graduate premium has fallen by 8.3%. This is in large part due to a reduction in UK graduates of over 300. Although the number of non-UK graduates increased, they are less likely to stay in the country and contribute economically.

Table 9.4 – Overall Change in GVA (£m)

	Borough of Hillingdon	London	UK
2013/14	212.6	504.5	785.4
2014/15	227.0	510.1	787.9
Change	6.7%	0.8%	0.3%

Source: BiGGAR Economics Calculations