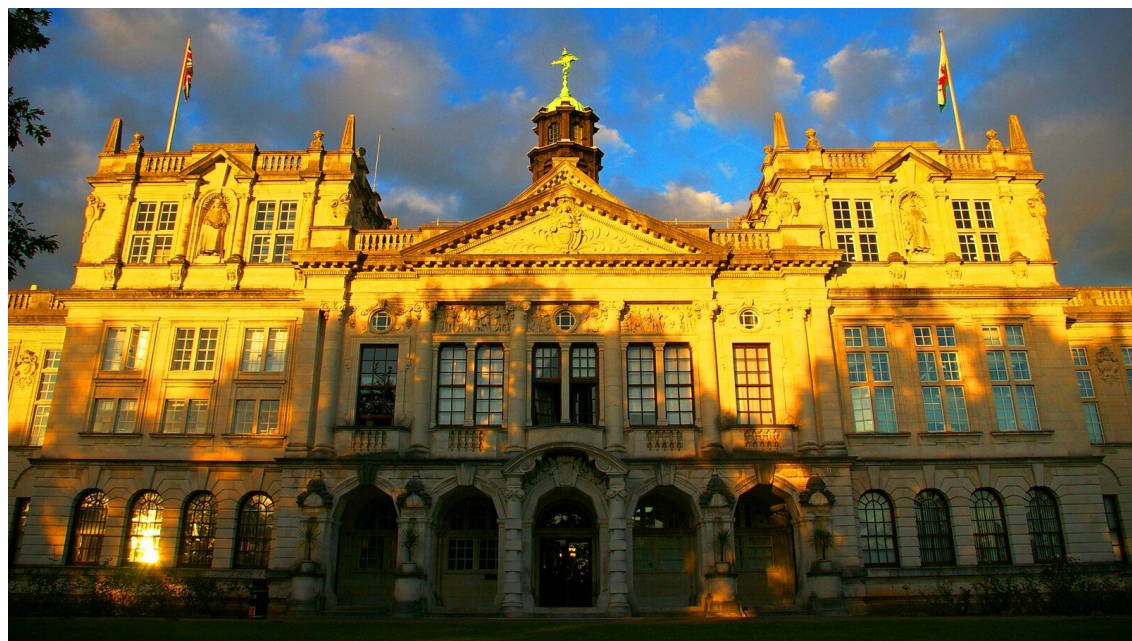
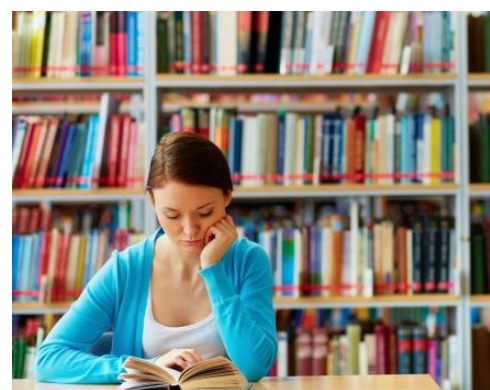
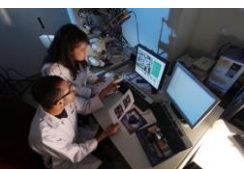


The economic and social impact of Cardiff University: 2014-15 update

Final Report for Cardiff University



LE
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Economics

November 2016




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Executive Summary

London Economics were commissioned to update the estimates of the economic and social impact of Cardiff University on the Welsh and UK economies in 2014-15.



Teaching and Learning

In terms of the components of economic impact, the value of the **teaching and learning** activities was estimated to be approximately **£966.2m** in 2014-15 (corresponding to **33%** of the total economic impact). The economic impact associated with teaching and learning was essentially unchanged from the previous analysis in 2012-13 (£967.9 million), with the **12%** increase in student numbers between 2012-13 and 2014-15 offsetting the reduction in the net graduate premium.



Research

Building on the University's top 5 ranking in the 2014 Research Excellence Framework, the analysis estimated that **research** activity added **£664.1m** to the university's contribution to the UK economy (equivalent to **23%**). This represents a **£55m** increase (or **9%**) increase from the previous analysis.



Exports

With more than **5,000** overseas students starting a qualification at Cardiff University in 2014-15, **£217.2m** of economic activity (corresponding to **7%** of the total) is generated through **educational exports**. Illustrating Cardiff University's international status, the contribution of educational exports in 2014-14 represents a **60%** increase on the previous estimate of £135.9 million in 2012-13.

Table 1 Aggregate economic impact of Cardiff University in the UK (£m and % of total)

Type of impact (£m in 2014-15)	£m	%
Impact of teaching and learning	966.2	33%
Students	468.1	16%
Public purse	498.1	17%
Impact of research	664.1	23%
Net direct research income	74.2	3%
Spillover impact	589.9	20%
Impact on exports	217.2	7%
Net tuition fee income	102.5	3%
Non-tuition fee income	114.7	4%
Direct, indirect and induced impacts	1,071.0	37%
Impact of CU expenditure	778.8	27%
Impact of CU student expenditure	292.2	10%
Total economic impact	2,918.5	100%

Note: All monetary values are presented in 2014-15 prices, and rounded to the nearest £0.1m. Note that the analyses between 2012-13 and 2014-15 do not present an exactly comparable methodological approach. In particular, there are a number of items that were included in the 2012-13 analysis but removed (because of double counting) in 2014-15. If the comparable analysis was undertaken in 2012-13, the total economic benefit of the University would be **£70.3m** lower (concentrated in the contribution of direct, indirect and induced effects), and thus standing at **£2,670.1m** in total. **Source: London Economics' analysis**



Cardiff University's physical footprint

Cardiff University's physical footprint supports jobs and promotes economic growth throughout the region. With **5,516** full time equivalent employees, Cardiff University spent a total of **£262.8m** in 2014-15 on staff related costs, as well as **£173.1m** on non-staff related costs. Through a far reaching supply chain, the University generated a further **£342.9m** of indirect and induced impact, which combined with the economic impact of Cardiff University's student expenditure of **£292.2m**, supported a further **5,795** jobs across the United Kingdom.

The economic impact resulting from Cardiff University's physical footprint constituted the largest source of impact, standing at **£1,071m** (37% of total). This represented a **12%** increase from 2012-13 on a like-for-like basis

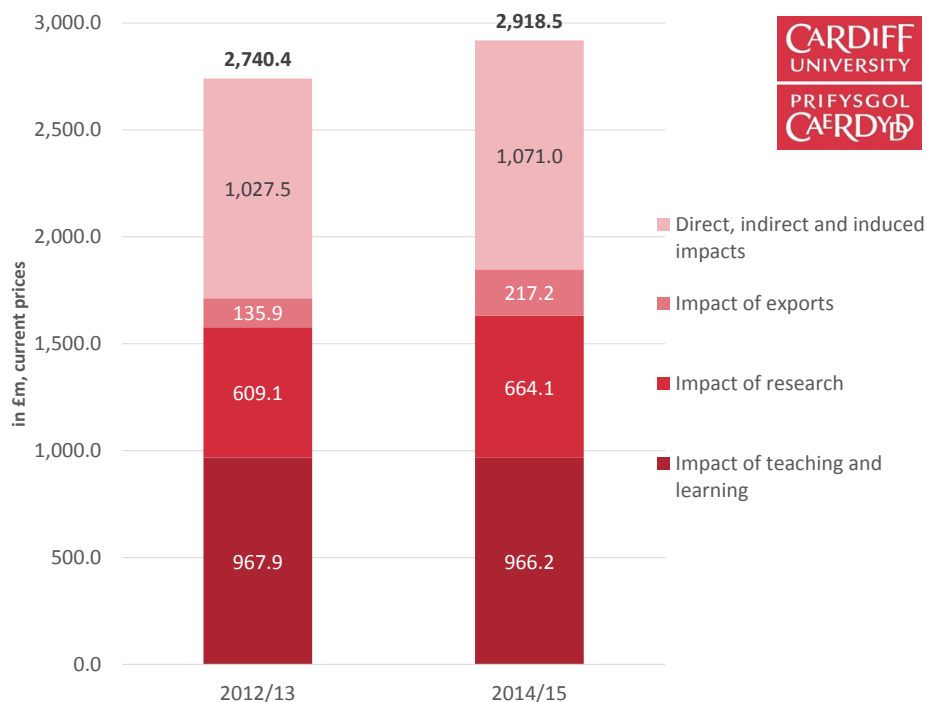
Aggregate economic impact

Combining these individual strands of impact, the total economic impact associated with the activities of Cardiff University were estimated to be **£2,918.5m** across the United Kingdom in 2014-15. This compares to the estimate of **£2,670.1m** from 2012-13 (9.3% increase on 2012-13)¹.

Based on a number of assumptions on the location of the different strands of impact, we estimated that the total economic impact of Cardiff University on the Welsh economy stood at approximately **£2,204.8m** (£2,036.7m in 2012-13), corresponding to approximately **76%** of the total attributable economic benefit generated by the University. The remaining **£713.7m** (24%) was accrued elsewhere across the United Kingdom.

To place these estimates in context, the analysis suggests that compared to Cardiff University's total operational cost of **£458.7m** in 2014-15, the total economic contribution to the UK economy associated with this 2014-15 cohort of students was estimated to be **£2,919m** in 2014-15 money terms. This represents a benefit to cost ratio of **6.36:1** (compared to **6.26:1** in 2012-13 on a like-for-like basis).

Figure 1 Total economic impact associated with Cardiff University, 2012-13 and 2014-15



Note: All values are presented in current prices, and rounded to the nearest £0.1m.

Note that the analyses between 2012-13 and 2014-15 do not have an exactly comparable methodological approach. In particular, there are a number of items that were included in the 2012-13 analysis but removed (because of double counting) in 2014-15. If the comparable analysis was undertaken in 2012-13, the total economic benefit of the University would have been estimated to be **£70.3m** less than presented, standing at **£2,670.1m** in total. The change in methodological approach is concentrated in the contribution of direct, indirect and induced effects)/

London Economics' analysis

¹ Again, this is based on methodological improvements applied to the analysis of direct, indirect and induced impacts of Cardiff University's footprint (see Section 5) for more information.

1 Introduction

London Economics were commissioned to update previous estimates from 2012-13 of the economic impact of Cardiff University in Wales and across the UK as a whole. Cardiff University's **physical and digital footprints** play a significant role in the Welsh economy, in addition to being a significant employer in the South Wales region. Through its extensive supply chain and by **attracting students to the region** – from every region of the UK and internationally - the University also supports a substantial number of jobs indirectly across Wales and the rest of the United Kingdom. However, more importantly from the perspective of long term economic growth, the impact of Cardiff University is even more substantial, given that its primary 'products' include undertaking world-class **research**, as well as the successful delivery of **teaching and learning**.

Our general approach to addressing these many impacts is as follows. In the first substantive section of this report (**Section 2**), we assess the improved labour market earnings and employment outcomes associated with higher education attainment through a detailed analysis of the Labour Force Survey². Through an assessment of the lifetime benefits and costs associated with education attainment, we estimate the economic impact of Cardiff University's teaching and learning activity for its **11,578** UK-domiciled students starting qualifications or standalone modules in 2014-15, but also the impact on the public purse (through enhanced taxation receipts).

In **Section 3**, we combine information on the research-related income accrued by Cardiff University in 2014-15 (by income source) with estimates from the wider economic literature on the extent to which public investment in research activity results in additional or subsequent private sector productivity (i.e. positive 'productivity spillovers'). This analytical approach results in an estimate the impact of Cardiff University's **research** activities.

In addition to the **11,578** UK-domiciled students starting qualifications or modules with Cardiff University in the 2014-15 academic year, a further **5,061** international students commenced their studies with the University in that year. As such, Cardiff University contributes to the value of UK **educational exports** through the receipt of income from overseas. **Section 4** assesses the monetary value of the tuition fee and non-tuition fee income associated with non-UK domiciled students, and estimates the contribution of these activities to the UK economy³.

With more than **6,800** contractual staff and almost **2,000** atypical staff in 2014- 15 (headcount), through the employment and earnings received by this workforce, the **direct economic impact** of Cardiff University is substantial. In addition to these direct effects, Cardiff University also **indirectly** supports the employment and earnings outcomes of many individuals that provide services throughout the University's extensive supply chain, and results in **induced** economic benefits through the expenditures of its staff. The spending of the University's students within the local economy results in similar direct, indirect and induced economic benefits to local businesses and throughout their supply chains. In **Section 5**, using information from the University's financial accounts, the Student Income and Expenditure Survey, as well as the wider economic literature, we estimate both the direct impact of Cardiff University's expenditure and the spending of its students, as well as the indirect and induced impact across Wales and the United Kingdom.

Section 6 of this report summarises our main findings.

² Focusing on Labour Force Survey data from 2000 to 2015.

³ Note that the estimated aggregate impact on exports does not take account of export revenues associated with the off-campus expenditures generated by international visitors to Cardiff (due to data limitations, particularly a lack of information on the number of such visitors attracted by universities).

2 The impact of Cardiff University's teaching and learning

2.1 The 2014-15 cohort of Cardiff University students

The analysis of the economic impact of Cardiff University's teaching and learning activities is based on the **2014-15 cohort** of students. Hence, instead of considering the University's entire student body (irrespective of when these students commenced their studies), the analysis focuses on the economic impact associated with students **undertaking a new standalone credit-bearing module** or **starting a formally recognised qualification in the 2014-15 academic year**. This component of the analysis is further restricted to **UK domiciled students** in the 2014-15 cohort, focusing only on those students with a known domicile in any of the UK's Home Nations⁴.

Out of the total of **30,480** (new and continuing) students enrolled with Cardiff University in 2014-15⁵, based on our definition of the relevant cohort, **16,639** students (both UK and non-UK domiciled) **started** higher education qualifications or credit-bearing modules. Excluding non-UK domiciled students, the analysis of the University's teaching and learning activities focuses on a total of **11,578** UK domiciled students in the 2014-15 cohort. Figure 2 presents the distribution of these students by study level (compared to the 2012-13 cohort considered in the previous analysis). Figure 3 and Figure 4 present a more detailed breakdown by study mode and Home Nation domicile⁶.

The analysis indicates that overall, there has been an increase in the number of students commencing their studies at Cardiff University between 2012-13 and 2014-15 (from **10,310** to **11,578** (equivalent to **12.3%**)). By qualification level, the increase in student numbers has been concentrated amongst postgraduate Masters students (from **2,153** to **3,088**), and Doctoral students (from **326** to **984**), while there has also been a significant increase at undergraduate level (from **4,586** to **5,005**).

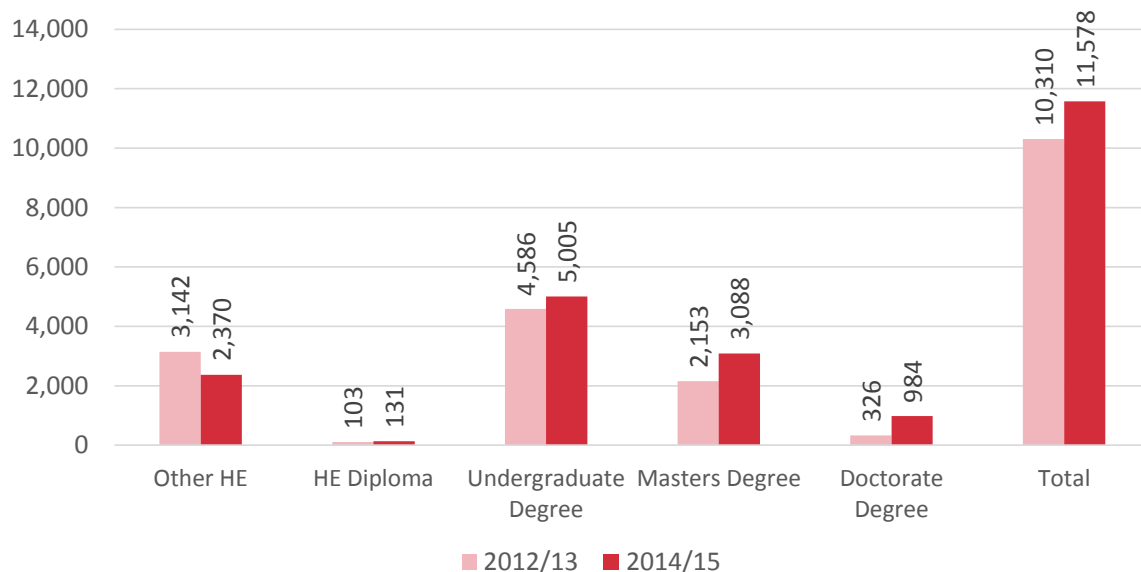
By Home Nation, the increase has been generated through an increase in the number of students domiciled in Wales (from **6,291** to **6,895**), with a similarly sized increase amongst students domiciled in England (from **3,898** to **4,546**).

In terms of study mode, Figure 4 demonstrates that the increase in student numbers has been concentrated within the full-time student population, where there has been an increase of **983** starters over the two years (from **5,702** to **6,685**).

⁴ It is likely that a proportion of EU and non-EU domiciled students undertaking their studies at Cardiff University will remain in the UK to work following completion of their studies; similarly, UK-domiciled students might decide to leave the UK to pursue their careers in other countries. Given the uncertainty in predicting the extent to which this is the case, and the difficulty in assessing the net labour market returns for non-UK students, the analysis of teaching and learning focuses on UK-domiciled students only. In other words, we assume that all UK students studying with Cardiff University will enter the UK labour market upon graduation, and that non-UK students will leave the UK upon qualification completion.

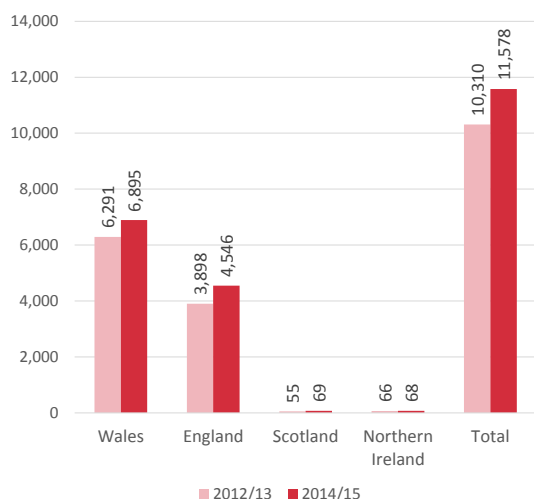
⁵ See Higher Education Statistics Agency (2015).

⁶ For further information on the 2014-15 cohort of UK domiciled Cardiff University students, please refer to A2.1.1.

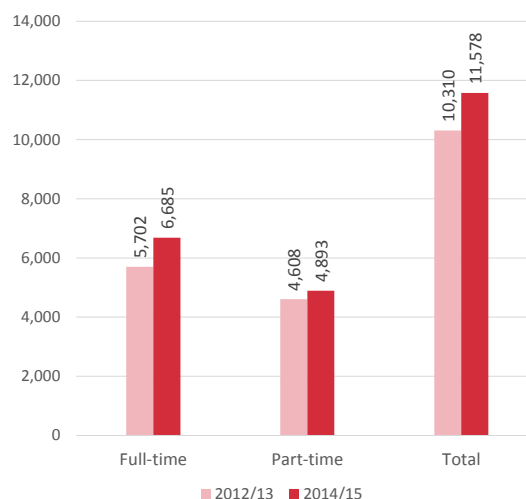
Figure 2 UK domiciled Cardiff University 2014-15 cohort by qualification aim

Note: 'Other HE' includes Certificates of Higher Education, taught work for institutional credits or with an unspecified qualification aim, and credits at HE level. We received HESA data on a total of **19,183** students from CU Registry & Academic Services. From those, we excluded a total of **5,168** students who were not UK-domiciled, domiciled in Guernsey, Jersey or the Isle of Man, or with an unknown domicile within the UK or generally; **120** students whose age was indicated as 99 (the default HESA age for students whose birth date is not known); and **2,317** students who were following courses at Further Education level. As with the analysis for 2012-13, the definition of a new student instance was based on HESA variable YEARSTU (including students with a YEARSTU value of 1). For a total of **495** students out of the resulting UK cohort, previous attainment levels were specified as either 'Mature student admitted on basis of previous experience and/or admissions test', 'Other qualification level not known' or 'Not known'. For those students, we imputed their prior attainment level per student using a group-wise imputation approach based on students undertaking similar qualifications, separately by study mode.

Source: London Economics' analysis of based on Cardiff University data

Figure 3 UK domiciled CU 2014-15 cohort by domicile

Source: London Economics' analysis of based on Cardiff University data

Figure 4 UK domiciled CU 2014-15 cohort by mode

Source: London Economics' analysis of based on Cardiff University data

The above information provided an overview of the number of students *starting* qualifications or modules at Cardiff University in the 2014-15 academic year⁷. However, to aggregate individual-level

⁷ Further information on the composition of the cohort for analysis is presented in A2.1.1.1.

impacts of the University's teaching and learning activity, it is necessary to adjust the number of 'starters' to account for **completion rates**.

Table 2 presents the completion rates assumed throughout the analysis⁸, based on information on progression outcomes for Cardiff University students in 2014-15. The information suggests that of those individuals starting an undergraduate degree at Cardiff University in 2014-15, approximately **95.5%** will complete the qualification as intended. The remaining **4.5%** either complete a different (usually lower) qualification (e.g. students intending to undertake a full undergraduate degree might instead complete a HE Diploma), or only undertake one or more of the modules associated with their degree before discontinuing their studies. In all of these cases, the analysis calculates the estimated returns associated with the *completed* qualification or standalone credit-bearing module(s).

Table 2 Completion rates of Cardiff University students by level of intended attainment

Completion outcome	Qualification level /study intention				
	Other HE	HE Diploma	UG Degree	Masters	Doctorate
Complete as intended	100.0%	93.3%	95.5%	89.5%	93.1%
Other outcome	0.0%	6.7%	4.5%	10.5%	6.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Students are included in the 'other outcome' category if they do not complete the qualification which they started, but instead either complete a different (usually lower) qualification, or only undertake one or more modules required as part of their programme before discontinuing their studies.

Source: London Economics' analysis based on Cardiff University data on progression outcomes for the 2014-15 academic year

2.2 Defining the returns to qualifications

The fundamental objective of this element of the analysis is to generate the **net graduate premium** to the individual associated with higher education qualification attainment and the **net public purse benefit**. These are defined in Box 1.

Box 1 Definition of gross and net graduate premiums and benefits to the public purse

The **gross graduate premium** associated with qualification attainment is defined as the **present value of enhanced after-tax earnings** (i.e. after income tax, National Insurance and VAT are removed, and following the deduction of any foregone earnings) relative to an individual in possession of the counterfactual qualification.

The **gross benefit to the public purse** associated with qualification attainment is defined as the **present value of enhanced taxation** (i.e. income tax, National Insurance and VAT, following the deduction of the costs of foregone tax earnings) relative to an individual in possession of the counterfactual qualification.

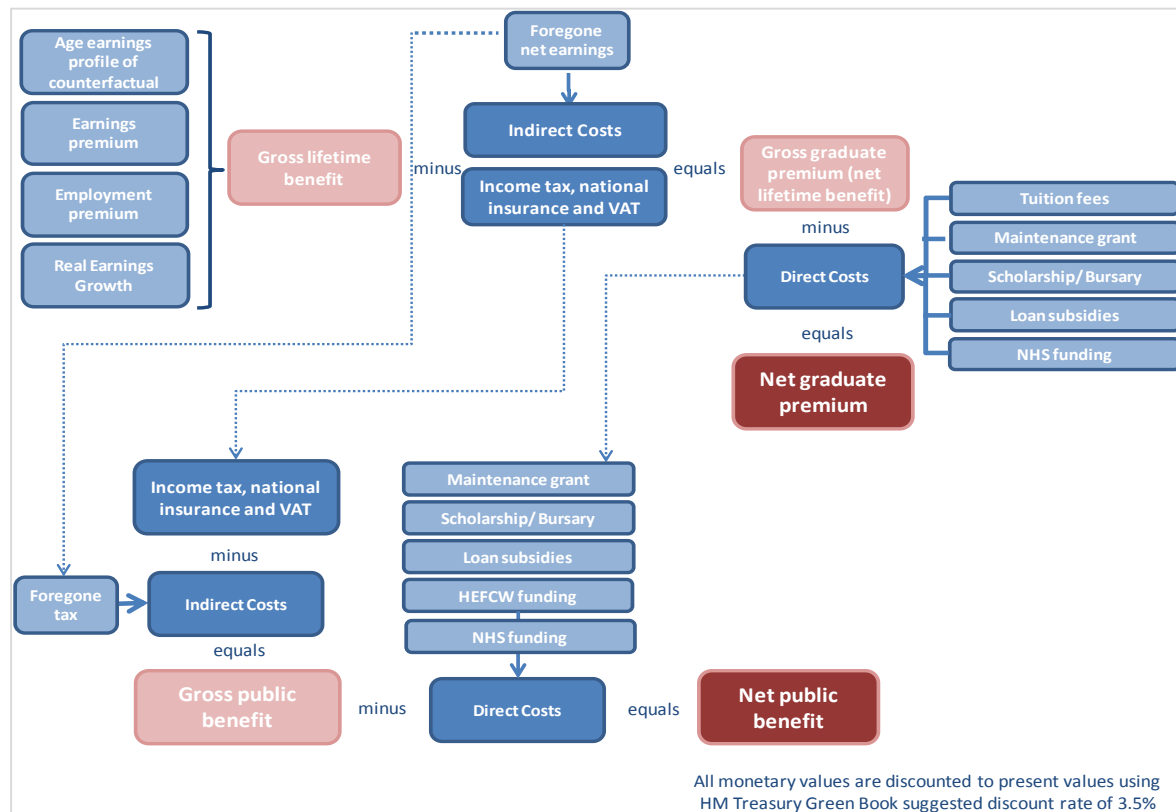
The **net graduate premium** is defined as the gross graduate premium *minus* the present value of the direct costs associated with qualification attainment. Similarly, the **net benefit to the public purse** is defined as the gross benefit minus the direct costs of provision during the period of attainment.

In Figure 5, we provide an illustration of some of these concepts, as well as how the various components feeding into the costs and benefits associated with qualification provision and

⁸ The same completion rates are applied to estimate the impact of Cardiff University on exports (Section 4) and the direct, indirect and induced impact of the University's activities (see Section 5).

acquisition, tie together. We discuss the approach for establishing the **net graduate premium** and the **net public purse benefit** in the next sections.

Figure 5 Generating the gross and net costs and benefits to the individual and the public purse



Source: London Economics' analysis of Department for Business Innovation and Skills (2011)

2.3 Estimating the benefits to higher education qualifications

2.3.1 Assessing the gross graduate premium

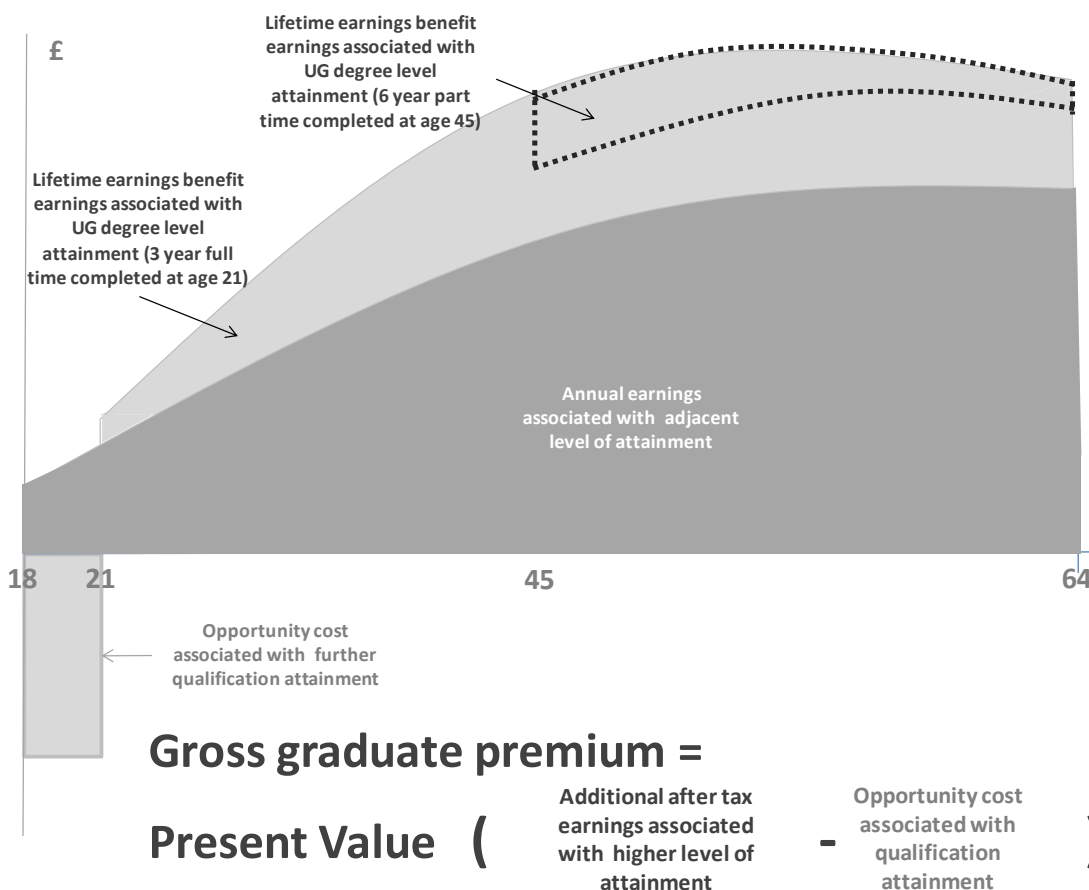
To measure the **economic benefits to higher education qualifications**, we estimate the labour market value associated with particular education qualifications, rather than simply assessing the labour market outcomes achieved by individuals *in possession* of a higher education qualification. To achieve this, the standard approach is to undertake a standard **econometric analysis** where the 'treatment' group consists of those individuals in possession of the qualification of interest, and the 'counterfactual' group consists of those individuals with comparable personal and socioeconomic characteristics but with the next highest or 'adjacent' level of qualification⁹.

Comparing the earnings and employment outcomes of the treatment group and the counterfactual groups 'strips away' those other personal and socioeconomic characteristics that might affect the labour market earnings and employment (such as gender, sector or region of employment), leaving just the labour market gains attributable to the qualification itself. This is presented in Figure 6.

⁹ For a more detailed discussion of the 'treatment' and 'counterfactual' groups used throughout the econometric analysis, please refer to London Economics (2015a).

Throughout the analysis, the assessment of earnings and employment outcomes associated with higher education qualification attainment (at all levels) is undertaken separately by gender (reflecting the different labour market outcomes between men and women), study mode, prior attainment, and qualification level at Cardiff University. In addition, the analysis is adjusted to reflect the relatively higher age at which some students (particularly part-time students) typically complete their qualifications at Cardiff University¹⁰. To take account of these characteristics of the cohort, we apply a 'decay function' to the returns associated with qualification attainment, reflecting the shorter period of time spent in the labour market after graduation.

Figure 6 Illustrating the graduate premium



Note: The analysis assumes that the opportunity costs of foregone earnings associated with further qualification attainment are applicable to full-time students only. For part-time students, we have assumed that these students are able to combine work with their academic studies and as such, do not incur any opportunity costs in the form of foregone earnings. Note that this illustration assumes that the period of qualification occurs between the ages of 18 and 21. In reality, this is not always the case, and the analysis presented in the remainder of the report is based on the actual average starting age and average duration of qualification attainment. In the case of full time undergraduate degrees, the average age at commencement was 20, with the average age at completion being 23.

Source: London Economics' analysis

2.3.2 Gross benefits to the public purse

The potential benefits accruing to the public purse from the provision of higher education qualification attainment are derived from the enhanced taxation receipts that are associated with a higher likelihood of being employed, as well as the enhanced earnings associated with more highly skilled and productive employees. Based on the analysis of the lifetime earnings and employment

¹⁰ For an overview of the assumptions underlying the 'age decay function', and the average age at enrolment and at completion for students in the 2014-15 cohort, please refer to A2.1.3.

benefits associated with higher education qualification attainment (generated through an econometric analysis of the Labour Force Survey), and combined with administrative information on the relevant taxation rates and bands (from HM Revenue and Customs), we estimated the present value of the additional income tax, National Insurance and VAT associated with higher education qualification attainment (by gender, level of study, mode of study, and prior attainment)¹¹.

2.3.3 Costs to the individual

As outlined above, the *gross* graduate premium associated with higher education attainment already takes account of the indirect costs of foregone earnings during the period of study (applicable to full-time students only). To assess the *net* graduate premium, it is necessary to further consider the **direct costs** which students incur to attend university.

These direct costs refer to the **proportion of the tuition fee paid by the student**¹² net of any **fee support** or **maintenance support** provided by the Student Loans Company (SLC)^{13 14} or the National Health Service (NHS) (for particular medicine and dentistry study programmes¹⁵), and minus any **bursaries** provided by Cardiff University. Note that the student benefit associated with tuition fee loans or maintenance loan support equals the **Resource Accounting and Budgeting Charge** (RAB charge, or interest rate subsidy), capturing the proportion of the loan that is not repaid¹⁶. Given the differing approach to the funding of students from each of the UK Home Nations, the total direct costs incurred by students were assessed separately for students from Wales, England, Scotland and Northern Ireland.

2.3.4 Costs to the public purse

The direct costs to the public purse include the level of **teaching funding (administered through HEFCW)**, the above-described **student support** from the SLC in the form of maintenance/fee grants and the subsidies associated with maintenance and tuition fee loans (i.e. the **RAB charge**), as well as the **student support and teaching funding provided by the NHS**. Again, due to the difference in student support funding regimes, the direct public costs were assessed separately for students from different Home Nations.

¹¹ More detail on the calculation of gross graduate premiums and gross public purse benefits is provided in the annex.

¹² For this, we made use of Cardiff University information on minimum fee levels, provided separately for undergraduate, postgraduate Masters and postgraduate Doctorate students. Where fee levels were broken down by programme subject, we took a simple average of fees across the different subject areas. To derive fee levels associated with students undertaking HE Diplomas or 'other' HE qualifications (including modules), we multiplied minimum fee levels for undergraduate degree students by the ratio of average study load (i.e. course intensity) for other HE / HE Diploma students in the cohort divided by the average study intensity for undergraduate degree students. This was calculated separately for students undertaking qualifications on a full-time or part-time basis, and for EU and non-EU students.

¹³ Or the Student Awards Agency for Scotland (applicable to Scottish domiciled students).

¹⁴ The analysis makes use of *average* levels of support (including Disabled Students' Allowance and other targeted support) per new student attending a Higher Education Institution in Wales in 2013-14, by study mode, study level and domicile. The information is based on the approach applied in London Economics (2015b), and the estimates have been inflated to reflect 2014-15 prices. The student support estimates were further adjusted to reflect the particular changes to student support for Welsh part-time students in 2014-15 (based on modelling undertaken by the Welsh Government as part of the Diamond Review of Higher Education).

The resulting estimates were further adjusted for any fee or maintenance support received by the National Health Service. In addition, the estimated level of tuition fee loan support was adjusted for bursaries provided by Cardiff University, where it is assumed that students will only take out loans for the remainder of the fee cost that is not already covered by a bursary.

¹⁵ This includes the provision of maintenance and tuition fee support to students undertaking certain healthcare and nursing programmes, as well as teaching funding (in the form of Service Increment for Teaching funding) to compensate for the higher costs of clinical training for students undertaking Bachelors in Dental Surgery. Note that the NHS student support excludes any salary paid to some students by the NHS during their programme, as well as any other types of special support (e.g. Childcare Allowance payments). For simplicity, it is assumed that all of these types of NHS funding are applicable to UK domiciled full-time undergraduate level students only.

¹⁶ Where the assumptions on the underlying RAB charge were based on London Economics (2015b).

The above-described costs associated with qualification attainment to both students and the public purse were calculated from start to completion of a student's learning aim. Throughout the analysis, to ensure that the values of the economic benefits and costs presented were done so in **present value** terms (i.e. in 2014-15 money terms), all benefits and costs occurring at points in the future were discounted using the standard HM Treasury Green Book discount rate of **3.5%**¹⁷. Deducting the resulting costs from the estimated gross graduate premium and net public purse benefit, we arrive at the estimated **net graduate premium** and **net public purse benefit** per student (separately by Home Nation, study mode, study level, prior attainment and gender).

2.4 Estimates of the net graduate premium for full-time students?

The net graduate premiums achieved by students undertaking undergraduate degrees in 2014-15 (depending on student domicile and gender) are presented in Table 3¹⁸. The analysis indicates that the **net graduate premium** achieved by a representative¹⁹ male student from Wales in 2014-15 completing a full-time undergraduate degree at Cardiff University with GCE 'A' Levels as their highest level of prior attainment was **£109,000** in today's money terms (compared to **£121,000** in 2012-13). The comparable estimate for a female undergraduate student in 2014-15 was estimated to be approximately **£78,000** (compared to **£89,000** in 2012-13)²⁰.

The net graduate premium associated with a full-time undergraduate degree for a representative student from Wales stands at approximately **£109,000** for men and **£78,000** for women.

Table 3 Net graduate premium and net public purse benefit to a full-time undergraduate degree (relative to GCE 'A' Levels) in 2014-15

Domicile	Men		Women	
	Net graduate premium	Net public purse benefit	Net graduate premium	Net public purse benefit
Wales	£108,578	£112,776	£77,537	£61,664
England	£104,055	£117,299	£73,014	£66,187
Scotland	£94,503	£126,851	£63,463	£75,739
Northern Ireland	£101,751	£119,602	£70,711	£68,491

Note: Estimates are based on an average age at graduation of 23 for students undertaking undergraduate degrees at Cardiff University on a full-time basis.

Source: *London Economics' analysis*

The decline in the graduate premium between 2012-13 and 2014-15 is as a result of the fact that the **average age of completion** amongst full time undergraduates increased from 22 to 23; the

¹⁷ See HM Treasury (2011).

¹⁸ The results for the previous analysis for the 2012-13 cohort are presented in A2.1.4.

¹⁹ The analysis is based on an average age at graduation of **23** for full-time students undertaking undergraduate degrees at Cardiff University (based on the characteristics of the 2014-15 cohort).

²⁰ It is important to note that the economic benefits associated with higher education qualification - expressed in monetary terms - are generally lower for women than men - predominantly as a result of the increased likelihood of spending time out of the active labour force. However, as with the majority of the wider economic literature, it is often the case that the benefit associated with higher education qualification attainment - expressed as either the percentage increase in hourly earnings or enhanced probability of employment - are greater for women than for men.

relatively **lower earnings and employment returns** amongst graduates; and an **increase in the taxation paid** by graduates (as a result of changing tax thresholds)²¹.

As in previous analyses, and reflecting the different tuition fee and student support arrangements across the Home Nations, the respective net graduate premiums for undergraduates in **England, Scotland and Northern Ireland** are noticeably **lower** than in Wales, ranging between approximately **£94,000** and **£104,000** for men, and between **£63,000** and **£73,000** for female undergraduate students.

2.5 What are the estimates of the net benefit to the public purse?

Also presented in Table 3, the **net benefit to the public purse** for a representative full-time male undergraduate student from **Wales** with GCE 'A' levels as their highest level of prior attainment stands at approximately **£113,000** in 2014-15 money terms (compared to **£114,000** in 2012-13). The comparable estimate for a female undergraduate in 2014-15 stands at approximately **£62,000** (**£60,000** in 2012-13). In comparison, and again reflecting the lower levels of support provided to students from other Home Nations, the respective net public benefits for undergraduates from **England, Scotland and Northern Ireland** are **higher**, ranging between approximately **£117,000** and **£127,000** for men and between approximately **£66,000** and **£76,000** for women.

The net public purse benefit associated with a full-time undergraduate degree for a representative CU student from Wales stands at approximately **£113,000** for men and **£62,000** for women.

2.6 Differences by study mode

Despite the fact that students undertaking qualifications at Cardiff University on a part-time basis generally complete their qualifications later in life, there are also substantial benefits to both the individual and the public purse associated with the acquisition of higher education qualification attainment on a part-time basis. The results of the analysis presented in Table 4 illustrate that the average net graduate premium achieved by a representative²² male student domiciled in Wales undertaking an undergraduate degree (relative to the possession of GCE 'A' Levels) stands at approximately **£25,000**, while the corresponding estimate for a woman stands at approximately **£7,000** (compared to **£45,000** and **£26,000** respectively in 2012-13).

In spite of the late attainment of qualifications and the 'age decay' function applied to part-time students, the relatively small amount of funding available to part-time students implies positive returns to the public purse associated with part-time undergraduate level qualifications. In particular, the net public purse benefit associated with a representative male student undertaking a part-time undergraduate degree stands at approximately **£34,000**, while the corresponding public

²¹ In addition, in improving the methodological approach, there has been a change in the way in which student support is distributed in the model. In the previous report, the total value of student support was allocated to only those students eligible for funding; in contrast, following the methodology used as part of a recent in-depth analysis of student support arrangements across the Home Nations (see London Economics, 2015b), the approach for 2014-15 allocates student support across *all* students in the relevant cohort, thereby reducing the level of student support per capita.

²² The analysis is based on an average age at graduation of **45** for part-time students undertaking undergraduate degrees at Cardiff University

purse benefit generated by women stands at **£13,000** (compared to **£26,000** and **£3,500** in 2012-13).

Table 4 Net graduate premium and net public purse benefit to a part-time undergraduate degree (relative to GCE 'A' Levels) in 2014-15

Domicile	Men		Women	
	Net graduate premium	Net public purse benefit	Net graduate premium	Net public purse benefit
Wales	£24,668	£34,003	£6,967	£12,672
England	£21,336	£37,335	£3,635	£16,004
Scotland	-	-	-	-
Northern Ireland	-	-	-	-

Note: Estimates are based on an average age at graduation of 45 for students undertaking undergraduate degrees at Cardiff University on a part-time basis. There are no students from Scotland and Northern Ireland recorded as having an intention to complete an undergraduate degree on a part-time basis in the 2014-15 cohort of Cardiff University students. *Source: London Economics' analysis*

2.7 Other qualification levels

Although the focus has been on undergraduate degrees, the analysis was replicated for the full range of different qualifications offered by Cardiff University. In particular, focusing on just those net graduate premiums and net public benefits generated by students/graduates who were Welsh domiciled prior to commencing their course of study, the analysis indicates that the **net (post)graduate premium** associated with a representative²³ Welsh-domiciled Cardiff University **Doctoral** student (relative to an undergraduate degree) stands at approximately **£43,000** for men and **£30,000** for women (compared to **£54,000** and **£40,000** respectively in 2012-13). Reflecting the limited public funding associated with these degrees, the **net public purse benefit** associated with these Doctorate degree students stands at approximately **£98,000** for a man and **£54,000** for a woman (compared to **£108,000** and **£64,000** respectively in 2012-13).

Table 5 Estimates of the net graduate premium and net public purse benefit associated with qualifications offered by Cardiff University (full-time students from Wales only) in 2014-15

Level of study at CU	Men		Women	
	Net graduate premium	Net public purse benefit	Net graduate premium	Net public purse benefit
Other HE ¹	£12,232	£14,280	£3,380	£580
UG Degree	£108,578	£112,776	£77,537	£61,664
Masters Degree ²	£60,058	£77,844	£50,096	£48,566
Doctorate Degree ³	£43,113	£97,869	£29,545	£54,132

Note: ¹ Net graduate premiums and net public purse benefits associated with qualifications at Other HE level, and undergraduate degree level are estimated relative to possession of GCE 'A' Levels. Given the relatively low incidence of students undertaking HE Diplomas at Cardiff University, these have not been presented here.

² Net graduate premiums and net public purse benefits associated with qualifications at Masters degree level are estimated relative to possession of an undergraduate degree.

³ Net graduate premiums and net public purse benefits associated with qualifications at Doctorate degree level are estimated relative to possession of an undergraduate degree.

Source: London Economics' analysis

A similar impact is identified for individuals undertaking postgraduate Masters qualifications. Specifically, the analysis suggests that the **net (post)graduate premium** associated with a

²³ This is based on an average age at enrolment of **28** (based on the characteristics of the 2014-15 cohort), and an average study duration for full-time Doctorate students of 3 years.

representative Welsh-domiciled²⁴ Cardiff University Masters student stands at approximately **£60,000** for a man and **£50,000** for a woman (relative to an undergraduate degree). This compares to **£53,000** and **£47,000** respectively in 2012-13. The corresponding **net public purse benefits** stand at approximately **£78,000** and **£49,000** respectively (compared to **£76,000** and **£50,000** in 2012-13).

In relation to sub-degree higher education qualifications, the modelling suggests that there is a small net graduate premium associated with undertaking 'other' forms of higher education (i.e. stand-alone credit-bearing modules and Certificates of Higher Education²⁵). For representative²⁶ male students from Wales at Cardiff University, the net benefit stands at approximately **£12,000** compared to **£3,000** for a woman (relative to 2 or more GCE A Levels). The corresponding net public purse benefits stand at approximately **£14,000** and **£600** for men and women, respectively.

Box 2 The National Software Academy

Skilled software engineering and programming graduates are in high demand both in Wales and nationally. However, in general, supply from universities is low, and current software engineering graduates often lack essential skills demanded by the industry. As a result, there is a significant skills gap in the IT and software engineering industry in Wales.²⁷



Credit: Cardiff University

In light of this, Cardiff University, in partnership with the Welsh Government and industry leaders, established the **National Software Academy (NSA)**. Based in Newport, the NSA aims to tackle the shortage of skilled software engineering and programming graduates.

The NSA's three year **BSc in Applied Software Engineering** is an innovative programme that provides teaching and learning through real-world software development projects and close industrial partnerships. The programme provides students with mentoring from industry experts as well as "real-life" software development experience. In recognition of their close industrial collaboration, the NSA has been awarded the '**Collaborative Partnership of the Year**' award at the **2016 ESTnet Awards**, recognising excellence in the Welsh electronics, software and technologies sectors.

The close industry collaboration and the hands-on teaching approach will help the NSA to produce highly skilled software engineers with industrial experience, who possess the crucial skills and knowledge demanded by industry.

Source: Cardiff University

2.8 Aggregating the individual-level returns to teaching and learning

Combining the information on completion rates with the number of students in the 2014-15 Cardiff University cohort and the net graduate and public purse benefits per student associated with the different qualification levels (relative to students' specific prior attainment), the analysis estimates

²⁴ This is based on an average age at enrolment of **25**, and an average study duration for full-time Masters students of one year.

²⁵ For further detail on the qualification categorisations employed throughout the analysis, please refer to London Economics (2015a).

²⁶ This is based on an average age at enrolment of **30**, and an average study duration for full-time Other HE students of one year.

²⁷ For example, see e-skills UK (2012).

the **aggregate economic impact of Cardiff University's teaching and learning activities**. The main results for 2014-15 are presented in Table 6.

The total economic impact associated with Cardiff's University's teaching and learning activities stands at **£966.2 million** (**£967.9 million** in 2012-13). Of this amount, approximately **£468.1 million** is accrued by graduates compared to **£498.1 million** accrued by the public purse.

The analysis illustrates that the increase in the number of students commencing their studies in Cardiff University has offset the decline in the net graduate premium that has occurred since the previous analysis.

In terms of the contribution by student domicile, the analysis indicates that the contribution from students domiciled in Wales was **£395.9 million** (a marginal decline from **£405.9 million** in 2012-13), whilst the contribution from students domiciled in England has increased to **£559.1 million** (from **£549.6 million** in 2012-13).

The economic impact generated by Cardiff University's teaching and learning activities was £966.2 million in 2014-15.

Table 6 Aggregate economic impact of CU teaching and learning (£m), by students' domicile and type of impact in 2014-15

Type of impact	Wales	England	Scotland	N. Ireland	UK
Students/Graduates	194.2	269.0	1.2	3.7	468.1
Full-time	163.2	255.9	0.8	3.4	423.3
Part-time	31.0	13.1	0.4	0.3	44.8
Public purse	201.7	290.1	2.1	4.2	498.1
Full-time	164.4	272.8	1.5	3.8	442.5
Part-time	37.3	17.3	0.6	0.4	55.6
Total	395.9	559.1	3.3	7.9	966.2
Full-time	327.6	528.7	2.3	7.2	788.8
Part-time	68.3	30.4	1.0	0.7	292.2

Note: All values are presented in 2014-15 prices, and rounded to the nearest £0.1m.

Source: *London Economics' analysis*

Box 3 IAMP Media: A graduate start-up success

While the new innovation campus (see Box 4) will greatly benefit student start-ups, Cardiff University already actively supports young entrepreneurs. For example, through its enterprise team, the University provides one-to-one business advice, workshops, network opportunities and other events, and free office space to alumni wishing to start their own business.

One such alumnus is George Pearce, founder and managing director of IAMP Media. From 2010 to 2013, George studied physics at Cardiff University. To support his studies, he created websites and software alongside his degree.



Credit: Cardiff University

“Running a small business has been (and continues to be) a huge challenge but is also one of the most enjoyable and rewarding things I've ever done - and with support available from Cardiff University and the Welsh Government, there's never been a better time to start.”

George Pearce,
Founder and Managing Director, IAMP Media

In his final year, George decided to build a business around this knowledge, and founded IAMP Media in his spare bedroom. IAMP Media offers bespoke web-design services and software solutions to customers around the world, and is now a successful web-design and software company featuring 6 staff including one trainee web developer.

Entrepreneurial support from Cardiff University was instrumental to the businesses' success, with Cardiff providing the young entrepreneur with advice, mentorship, and free shared office space in the Cardiff Business Technology Centre into which IAMP

Media moved in April 2014 with the aim to further advance the business. Within six months, the business outgrew this space and now occupy their own paid unit in the centre.

Source: Cardiff University

3 The impact of research and knowledge transfer activities

3.1 Direct research impact

The direct economic impact of the research undertaken by Cardiff University was based on the total research-related income accrued by the University in the 2014-15 academic year, in terms of:

- **Research grants and contracts**, funded by:
 - The UK Research Councils and charities;
 - Public corporations, Local Authorities and UK Government;
 - UK Industry and Commerce;
 - EU and overseas sources;
 - Other sources;
- Research-related **funding body grants**, in terms of Quality Research Funding allocated by the Higher Education Funding Council for Wales (HEFCW); and
- **Other research-related income**, in terms of income from intellectual property rights.

Table 7 presents information on the level of income from these sources accrued by Cardiff University in the 2014-15 academic year, indicating that the total research-related income accrued by the University in that year amounted to **£140.1m**²⁸. Looking at the breakdown by source, the majority of this income was provided by the UK Research Councils and charities (**£44.9m** or **32%** of the total) and the recurrent Quality Research grant allocated by HEFCW (**£40.4m** or **29%**).

Table 7 Cardiff University research-related income, £m in 2014-15

Type of income	Income, £m in 2014-15	% of total
Research grants and contracts *		
Research Councils and charities	44.9	32%
Public corporations, Local Authorities, UK Government	31.6	23%
Industry and commerce	4.3	3%
EU and overseas	15.2	11%
Other	2.1	1%
Funding body grants		
HEFCW Quality Research Funding	40.4	29%
Other income		
Income from intellectual property rights	1.6	1%
Total	140.1	100%

Note: All values are presented in 2014-15 prices, and rounded to the nearest £0.1m. * Note that the income from research grants and contracts excludes a total of £9.8 million of income in 2014-15 associated with Research and Development Expenditure Credits, as this was provided to CU as part of a UK tax incentive scheme, and was reived as a one-off source of income for the three financial years ending 31 July 2015. Source: London Economics' analysis of Cardiff University data

To arrive at the net direct impact of Cardiff University's research activities on the economy, we deducted from this income the costs to the public purse of funding the research activities undertaken by the University (i.e. the public costs of providing HEFCW Quality Research funding, as well as the funding supplied by the Research Councils). Together, these public costs amount to **£65.9m**. Deducting these costs from total research-related income (**£140.1m**), the analysis thus suggests that the total **direct impact** associated with Cardiff University's research in 2014-15 stands at **£74.2m** (compared to **£66.9m** in 2012-13).

²⁸ Note that the income from research grants and contracts excludes a total of £9.8 million of income in 2014-15 associated with Research and Development Expenditure Credits, as this was provided to CU as part of a UK tax incentive scheme, and was reived as a one-off source of income for the three financial years ending 31 July 2015.

Box 4 Innovation Campus investments

Cardiff University actively invests in innovation. Highlighted by its **£300m investment** in the development of a new **Innovation Campus** based on Maindy Park in the centre of Cardiff, the University is aiming to transform a disused former industrial space into a state-of-the-art campus.

The current phase of investment in the **Innovation Campus** consists of two main elements: the **Innovation Central** building that houses the **Innovation Centre** and the **Social Science Research Park (SPARK)**; and the **Translational Research Facility (TRF)**, which is the home of the **Institute for Compound Semiconductors (ICS)** and the **Cardiff Catalysis Institute (CCI)**. A new bridge over the railway will also connect the innovation campus to the Cardiff Business School.



Credit: Cardiff University

The **Innovation Centre**, based in the new campus' Innovation Central building, will provide space and support for organisations involved in translational collaborations with the University, as well as innovative start-ups and spin-outs, and student and graduate entrepreneurs.

Business development staff at the Innovation Centre will offer advice on how to access Cardiff University's research and facilities. Moreover, the centre's creative and networking spaces, and events and activities will foster collaboration and the sharing of knowledge by bringing together students, researchers and businesses. This will **allow students and entrepreneurs to turn their innovative ideas into practice, thus fostering economic growth in Wales**.

The **Social Science Research Park (SPARK)** is also based in the Innovation Central building. Building on existing research expertise across the University and working with key partners, SPARK seeks to attract international research leaders from various disciplines to the campus, and bring them together in a collaborative environment that fosters innovative and impactful social science research. This is intended to help **turn world-leading research into innovative real world solutions to the pressing problems of society**, as well as provide increased postgraduate research capacity.

The **Institute for Compound Semiconductors (ICS)** is a unique UK-based, large-scale translational research centre in compound semiconductors. It aims to position Cardiff as the European leader in compound semiconductors, providing cutting-edge facilities that help researchers and industry work together (see Box 5 for additional detail)

The **Cardiff Catalysis Institute (CCI)** is already established as one of the world's top five catalysis research centres, and the leading UK facility in this area. The CCI is improving the understanding of catalysis, developing new catalytic processes with industry and promoting the use of catalysis as a sustainable 21st century technology.

Elsewhere on the Innovation Campus, the new **Cardiff University Brain Research Imaging Centre (CUBRIC)** will provide researchers with modern high speed computing technology in imaging and simulation across a wide range of cutting-edge laboratories. Together with the centre's world-leading expertise in brain imaging techniques, this will **allow researchers to gain a better understanding of the causes of neurological and psychiatric conditions** (e.g. dementia, schizophrenia, or multiple sclerosis) and hence **develop better treatments**. CUBRIC follows the development of the **Hadyn Ellis Building**, which brings Alzheimer's disease, schizophrenia, and stem cell cancer research experts together.

Source: Cardiff University

3.2 Productivity spillovers

In addition to the direct economic value of the innovations and knowledge generated by Cardiff University for the organisations funding these research activities, wider academic literature indicates that investments in intangible assets such as R&D may induce **positive productivity and knowledge spillovers**, where knowledge generated through the research activities of one agent enhances the productivity of other firms. For example, positive spillovers might arise if firms can benefit from technologies developed at Cardiff University by employing them in their own production processes, thus reducing costs²⁹.

Following the approach used throughout the previous assessment of the economic impact of Cardiff University in 2012-13³⁰, the analysis makes use of existing estimates of the productivity spillovers from university research in the academic literature. In particular, the analysis employs estimates by Haskel and Wallis (2010) and Haskel et al. (2014), whose research indicates that:

- The marginal spillover effect of public spending on research **through the UK Research Councils** amounts to **12.7** (Haskel and Wallis, 2010), **i.e. every £1 million spent on university research through the Research Councils results in an additional annual output of £12.7 million in UK companies**; and
- The total rate of return on **public sector** research³¹ amounts to **0.2** (Haskel et al., 2014), **i.e. every £1 million spent on public R&D results in an additional annual output of £0.2 million within the UK private sector**³².

Table 8 Productivity spillover multipliers, by research income category

Type of income	Income, £m in 2014-15	Multiplier
Research grants and contracts		
Research Councils and charities	44.9	12.7
Public corporations, Local Authorities, UK Government	31.6	0.2
Industry and commerce	4.3	0.2
EU and overseas	15.2	0.2
Other	2.1	0.2
Funding body grants		
HEFCW Quality Research Funding	40.4	0.2
Other income		
Income from intellectual property rights	1.6	0.2
Weighted average productivity spillovers	4.2	

Source: London Economics' analysis based on Cardiff University data, Haskel and Wallis (2010) and Haskel et al. (2014)

Assigning the multiplier of **12.7** to the research funding that Cardiff University received from the Research Councils and UK-based charities in 2014-15 (amounting to **£44.9 million**), and using the multiplier of **0.2** for all other research funding received by the University in that academic year (amounting to **£95.2 million**), we infer a weighted average spillover multiplier of approximately **4.2** associated with Cardiff University's research activities. This implies that **every £1m invested in**

²⁹ Box 6 presents information on Cardiff University's new Innovation Campus, and provides examples of how the University promotes the sharing of its research and knowledge with other organisations.

³⁰ See London Economics (2015a).

³¹ Where public sector research includes the combined research conducted by the Research Councils, the higher education sector, and central Government itself.

³² In terms of the large difference in magnitude between these multipliers, explaining the size of the 12.7 multiplier in particular, Haskel and Wallis (2010) argue that they would expect the productivity spillovers from Research Council funding to be large, 'given that the support provided by Research Councils is freely available and likely to be basic science'. To the best knowledge of the authors, there exists no further and recent empirical evidence to support this. As a result, we apply the separate multipliers to the different income strands.

research at Cardiff University results in an additional economic output of £4.2 million for UK companies. Applying the average multiplier to the total research-related income accrued by Cardiff University, we estimate that the market sector productivity spillovers associated with research conducted by Cardiff University in 2014-15 amount to **£589.9 million** (compared to **£542.2 million** in 2012-13).

Box 5 Driving innovation in Compound Semiconductors

Compound semiconductor technologies are vital components in many devices including smartphones, tablets, electric vehicles, and satellite communication systems. As part of its **partnership with IQE plc**, a leading supplier of compound semiconductor wafer products, Cardiff University has been at the forefront of driving research and innovation in these technologies.



Credit: Cardiff University

The **Institute for Compound Semiconductors (ICS)**, based in the **Translational Research Facility (TRF)** features state-of-the-art equipment and facilities allowing researchers to provide world-class research and work closely with industry partners. It is part of the University's wider **£300m Innovation Campus** capital development plan (see Box 4), and received funding from the Welsh Government, the UK Research Partnership Investment Fund and Welsh European Funding Office (WEFO). Research at the Institute will build on Cardiff's expertise in compound semiconductor technologies and it will focus on device fabrication and the development of innovative growth methods and materials technologies. The Institute also aims to create a small scale pilot production as well as to provide specialised training.

As part of the ICS, Cardiff University and IQE have established a **Knowledge Transfer Partnership (KTP)**, placing the research associate Dr Lewis Kastein within IQE's developing eco-system. Using knowledge and techniques developed at Cardiff University, Dr Kastein will help IQE develop and embed new characterisation capabilities, to continue to strengthen their leading role in manufacturing compound semiconductor materials.

Cardiff University and IQE recently jointly established the Compound Semiconductor Centre (CSC) Ltd. The establishment of the **CSC** will further strengthen Cardiff University's close industry connections, and allow its research to be translated into new real-world applications and large-scale mass production, to **bridge the gap from early research to commercialisation**. The CSC will build on fundamental research undertaken at the ICS, to develop innovative new products, services and skills and bring them to market to enable a wide range of new and emerging applications. The CSC will thus create a complete value chain from research over the development of new materials technologies to the translation of these technologies into new applications as well as the large-scale manufacturing of these.

Building on the ICS and the CSC, earlier this year, then-chancellor George Osborne announced a £50m national **Compound Semiconductor Applications Catapult for South Wales**. Complementing the activities of the ICS and the CSC, the Catapult aims to help establish the **world's first compound semiconductor cluster in South Wales**. The Catapult will accelerate the use of compound semiconductor devices within the areas of healthcare, the digital economy, energy, transport, and defence and security

Source: Cardiff University, Catapult

3.3 Aggregate impact of Cardiff University's research activities

Combining the direct economic impact of the University's research activities (£74.2 million) with the estimated productivity spillovers of this research (£589.9 million), the total economic impact of research conducted by Cardiff University in the 2014-15 academic year was estimated at **£664.1 million** (see Table 9). This represents an increase of **£55 million** (or **9.2%**) compared to the 2012-13 estimates.

Table 9 Total impact of Cardiff University's research activities, in £m

Type of impact	£m in 2014-15
Direct research impact	74.2
Productivity spillovers	589.9
Total	664.1

Note: All values are presented in 2014-15 prices, and rounded to the nearest £0.1m. *Source: London Economics' analysis*

Box 6 Cardiff Medicentre

Cardiff Medicentre is a dedicated business incubator that provides space for bioscience and medical technology start-ups to develop innovative ideas that improve patients' lives. The Medicentre is at the heart of a wider clinical innovation partnership underpinning closer collaboration between the University and Cardiff and Vale University Health Board on a number of important challenges such as tackling dementia. Run jointly, the Medicentre **provides start-ups with a range of services to accelerate their growth**. These include legal, financial, marketing and strategy support, as well as contacts in Welsh Government, commercial organisations and connections to venture capital companies.



Credit: Cardiff Medicentre

The Medicentre has been home to a number of businesses and start-ups, some of which are spin-outs from the University, and many that have become **success stories**. Examples include:

- **BioDynamics Research** was founded at Cardiff Medicentre and developed into a leading provider of specialist metabolic, bioanalytical and radiochemistry services with 100 employees and annual revenues of over £7 million.
- **Q Chip**, is a biopharmaceutical company that was founded as a biotech spin-out from Cardiff University's School of Engineering. The company now runs its own laboratory in Cardiff, and has developed into an international business with an overseas facility in the Netherlands.
- **onExamination Ltd** was founded by two Cardiff University medics to help doctors prepare for medical examinations online. Since its foundation, onExamination has expanded to provide help for a variety of exams for medical students, doctors and nurses, as well as resources for school leavers wishing to start a career in medicine. The company was acquired by BMJ group in late 2007 and is now a leading provider of medical exam preparation.

"Our time at Cardiff Medicentre played an important part in our growth. As a small company in the health sector, we could interact with other tenants and share ideas and experiences. Cardiff Medicentre describes itself as a business incubator, and it was an ideal one for us."

Dr Dan Palmer, Chief Scientific Officer at Q Chip Ltd

Source: Cardiff University Medicentre

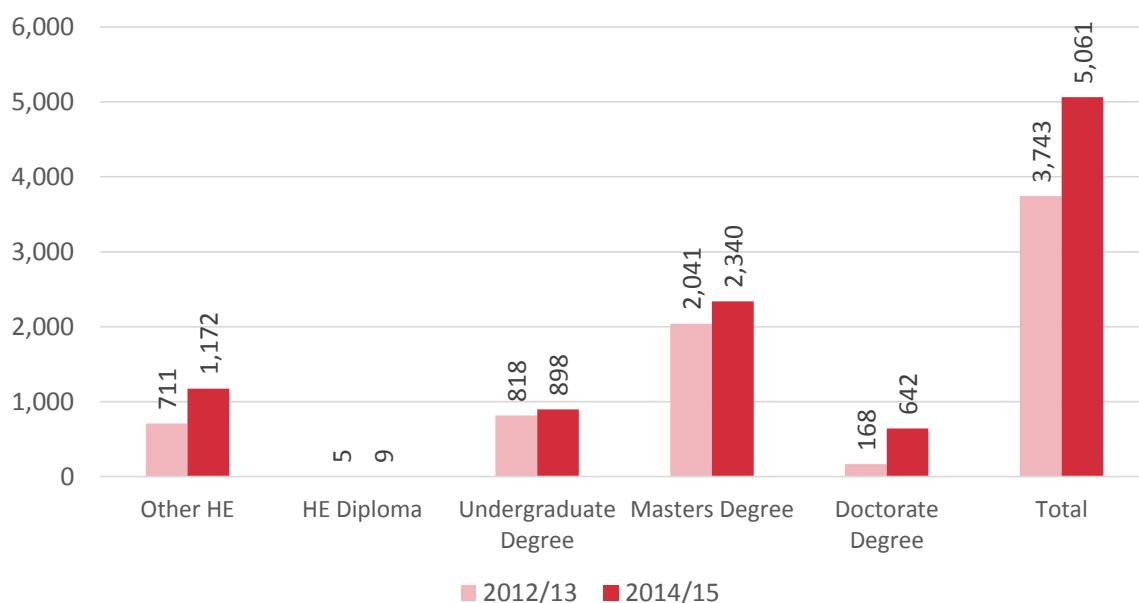
4 Impact on exports

Overseas trade (or international trade) is the sale of goods and/or services across international borders. With the United Kingdom currently being a destination for many overseas students wishing to undertake their advanced studies, higher education generates significant **educational exports** that contribute to the UK economy as an injection of income from an overseas source (i.e. non-UK origin). The guiding definition for export income in our valuation is that the income is derived from an overseas source³³. In particular, we focus on export income in terms of the tuition fee income from overseas students (net of any public purse costs of provision), as well as the income associated with the non-tuition fee (off-campus) expenditure of overseas students during their studies at Cardiff University³⁴.

4.1 The 2014-15 cohort of non-UK domiciled students

In the 2014-15 academic year, out of a total of **16,639** students starting new qualifications or standalone modules with Cardiff University, **5,061** (i.e. **30%** of the total), were non-UK domiciled prior to starting their qualification.

Figure 7 Non UK-domiciled Cardiff University 2014-15 cohort by qualification aim



Note: 'Other HE' includes Certificates of Higher Education, taught work for institutional credits or with an unspecified qualification aim, and credits at HE level. We received HESA data on a total of **19,183** students from CU Registry & Academic Services. From those, we excluded **14,015** students with a known UK domicile; **103** students from Guernsey, Jersey and the Isle of Man or with an unspecified unknown domicile in the UK or generally; and **4** students who were following courses at Further Education level. As with the analysis for 2012-13, the definition of a new student instance was based on HESA variable YEARSTU (including students with a YEARSTU value of 1). For a total of **513** students out of the resulting non-UK cohort, previous attainment levels were specified as either 'Mature student admitted on basis of previous experience and/or admissions test', 'Other qualification level not known' or 'Not known'. For those students, we imputed their prior attainment level per student using a group-wise imputation approach based on students undertaking similar qualifications, separately by study mode.

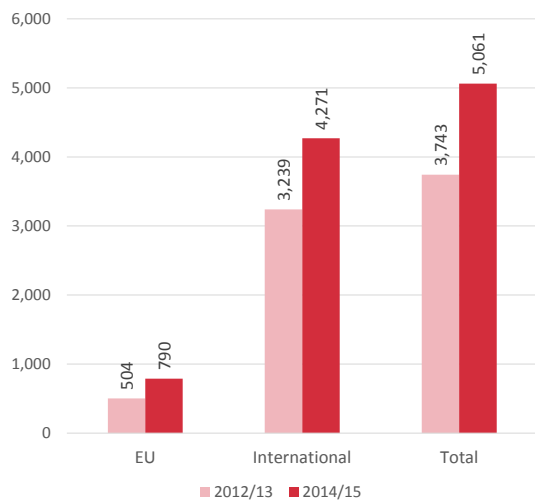
Source: London Economics' analysis of based on Cardiff University data

³³ See Department for Business, Innovation and Skills (2011).

³⁴ Note that other types of export income accrued directly by Cardiff University (such as research income from international sources, or any other income received from non-UK sources) are taken account of in our analysis of the impact of CU's research activity (Section 3) and the direct, indirect and induced impacts (Section 5), and are thus excluded from the analysis of exports to avoid double-counting.

Reflecting the calibre and popularity of the institution, there has been an increase in the number of non-UK students commencing their studies at Cardiff University between 2012-13 and 2014-15 (from **3,743** to **5,061**). Considering the distribution of non-UK students by qualification level (Figure 7), the increase in student numbers has been concentrated amongst postgraduate students (an increase from **2,041** to **2,340** Masters students and **168** to **642** Doctoral students), while the number of undergraduate degree level students has increased from **818** to **898**. In relation to student origin (Figure 8), the increase in the number of students domiciled in the European Union has increased from **504** to **790**, while the number of international (i.e. non-EU) students has increased by more than 1,000, from **3,229** to **4,271**³⁵.

Figure 8 Non-UK domiciled CU 2014-15 cohort by domicile



Source: London Economics' analysis of based on Cardiff University data

Figure 9 Non-UK domiciled CU 2014-15 cohort by mode



Source: London Economics' analysis of based on Cardiff University data

4.2 Net tuition fee income associated with non-UK cohort

As in the previous analysis, to assess the level of tuition fee income associated with EU and non-EU students starting qualifications at Cardiff University, we made use of data on fee levels per year for CU students in the 2014-15 academic year (by qualification level and domicile³⁶). This provided an estimate of the **gross tuition fee income per student** associated with non-UK students starting qualifications at Cardiff University in 2014-15. To estimate the **net tuition fee income** associated with these students, it is necessary to deduct the direct public costs associated with funding this education provision. These public purse costs include the subsidies associated with the **tuition fee support** (in terms of non-repayable tuition fee grants and the RAB charge on tuition fee loan support provided to eligible EU domiciled students), as well as the **teaching funding costs** (administered through HEFCW) associated with EU domiciled students studying in Wales. Note that no such public

³⁵ For more detailed information on the non-UK cohort of students, please refer to A2.3.

³⁶ As in the analysis of teaching and learning, minimum fee levels were provided separately for undergraduate, postgraduate Masters and postgraduate Doctorate students. Where fee levels were broken down by programme subject, we took a simple average of fees across the different subject areas. To derive fee levels associated with students undertaking HE Diplomas or 'other' HE qualifications (including modules), we multiplied minimum fee levels for undergraduate degree students by the ratio of average study load (i.e. course intensity) for other HE / HE Diploma students in the cohort divided by the average study intensity for undergraduate degree students. This was calculated separately for students undertaking qualifications on a full-time or part-time basis, and for EU and non-EU students.

purse costs apply to students from non-EU countries attending Welsh higher education institutions, so that gross tuition fee income equals net tuition fee income for this group of students.

Using similar assumptions on average study duration as in the analysis of teaching and learning, the resulting estimates of net tuition fee export income per student (by domicile, study mode and qualification level) were calculated from start to completion of a student's learning aim. Again, any net benefits per student occurring in future years were discounted using the standard HM Treasury Green Book discount rate of **3.5%**.

Taking the most common example, the analysis indicates that the net average tuition fee income associated with a representative Cardiff University student from the European Union undertaking a full-time Masters Degree stood at approximately **£5,767** *over the duration of their studies*, while the average tuition fee income associated with a corresponding non-EU international student stood at approximately **£15,250**. The difference between these estimates is driven by the fact that (non-EU) international students incur higher tuition fee costs, and that there are no public purse subsidies (either in terms of any student support or teaching grants) associated with non-EU students.

4.3 Non-tuition fee income associate with non-UK cohort

Additional export income from overseas students originates from students' expenditures on other **non-tuition fee** related activities incurred during their studies at Cardiff University, including:

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

To analyse the level of non-tuition fee income associated with overseas students in the 2014-15 Cardiff University cohort, we make use of estimates provided by the most recent wave of the **Student Income and Expenditure Survey (SIES)**, undertaken for Welsh domiciled students during the 2011-12 academic year³⁷. The survey provides estimates of the average spending on living costs, housing costs, participation costs (*including* tuition fees) and spending on children by Welsh undergraduate students, separately by mode of learning. For the purpose of this analysis, we undertook a number of adjustments to the 2011-12 SIES expenditure estimates:

- To avoid double-counting with the analysis of net tuition fee income (outlined above), we **exclude tuition fee costs** from the SIES average expenditure estimates.
- Similarly, to avoid any double-counting with the impact of institutional expenditure (as analysed in Section 5.1.1), it is necessary to exclude any amounts that students might spend *on campus* (i.e. any amounts that would be counted as income by the University itself), thus focusing on international students' **off-campus expenditures only**³⁸.
- Since the SIES does not cover non-UK domiciled students, our analysis assumes that the level and pattern of expenditure of non-UK domiciled students in Wales is not significantly

³⁷ For further details, please refer to Welsh Government (2014).

³⁸ Following the approach undertaken by Kelly et al. (2015), who analyse the collective economic impact of Higher Education Institutions in Wales, we assume that **13%** of students' non-tuition fee expenditures are spent on campus (i.e. are accrued as income by Cardiff University itself).

different to that of Welsh domiciled students. We do, however, **adjust expenditure levels to reflect assumed longer average stay durations in the UK for non-UK students**³⁹.

The resulting estimates were then adjusted for inflation⁴⁰ to provide total (off-campus) non-tuition fee expenditure per student in 2014-15 prices, by domicile (i.e. EU versus non-EU), study mode and level of study. As with the net tuition fee income associated with non-UK students, all estimates per student were calculated over the total study duration and discounted to reflect present values.

Again taking an example, the analysis indicates that the average non-tuition fee income associated with a representative Cardiff University full-time Masters student stood at **£13,151** over their study duration. Since we use the same assumption regarding average UK stay duration for all non-UK domiciled Masters students, this estimate applies to both EU and non-EU Masters students in the 2014-15 cohort.

Box 7 The Welsh Wound Innovation Centre

The **Welsh Wound Innovation Centre (WWIC)** is a Centre of Excellence in wound prevention and treatment, wholly owned by Cardiff University. It forms part of the Welsh Wound Innovation Initiative, which aims to tackle challenges in wound care such as the treatment and prevention of non-healing wounds. The Centre was set up with **£2.5m** funding from the Welsh Government, local health boards and the private sector.

By finding new ways of treatment and prevention through research, and by providing clinical services, the WWIC aims to **improve wound care and the quality of life of people suffering from wounds**, and to **lower the cost of wound care** to the NHS by reducing hospital admissions and stays.

Alongside its research role, the WWIC also plays a coordinating role to direct funds and services, and provides strategic guidance. The WWIC already supports a range of start-ups and existing businesses in the clinical innovation and development of products and services in Wales and abroad. The Centre also conducts clinical trials ranging from simple case studies to randomised clinical trials. Moreover, WWIC has created a national wound registry which can be used for studies and evaluation. The centre further provides clinically and patient focused training and education in wound healing for medical professionals, as well as consultancy services on a wide range of topics within wound care.



Credit: Welsh Wound Innovation Centre

Source: Cardiff University

4.4 Aggregate impact on exports

To estimate the aggregate export income associated with Cardiff University's 2014-15 cohort of non-UK students, using the same assumptions as in the analysis of the impact of teaching and learning (see Section 2.1), we again assessed the number of non-UK students in the cohort expected to

³⁹ Our adjustments are based on the approach outlined by the Department for Business, Innovation and Skills (2011) in estimating the value of education exports to the UK economy. Further information on the adjustments for average stay durations is provided in London Economics (2015a).

⁴⁰ Inflation estimates are based on data provided by the Office for National Statistics (2016).

complete qualifications (and modules) at Cardiff University (by gender, domicile, study mode, prior attainment and level of study).

Combining the resulting number of students completing qualifications with our estimates of net tuition fee income and non-tuition fee income, the analysis indicates that the aggregate export income associated with Cardiff University's 2014-15 cohort of non-UK students stands at **£217.2 million** (see Table 10). Of this, approximately **£28.8 million (13%)** is generated by EU domiciled students, while the remaining **£188.4 million (87%)** of impact is associated with non-EU international students attending the University. This is predominantly driven by the composition of the cohort of non-UK students (see Figure 8), as well as the fact that non-EU students pay higher tuition fees than their EU domiciled counterparts.

The impact of Cardiff University on UK exports, based on the 2014-15 academic year, stands at £217.2 million – an increase of 60% over the last two years.

Table 10 Aggregate economic impact on exports in 2014-15 (£m), by domicile and type of impact

Type of impact	Domicile		
	EU	Non-EU	Total
Net tuition fee income	6.5	96.0	102.5
Non-tuition fee income	22.3	92.4	114.7
Total	28.8	188.4	217.2

Note: All values are presented in 2014-15 prices, and rounded to the nearest £0.1m. *Source: London Economics' analysis*

Compared to the analysis relating to 2012-13, the value of educational exports has increased significantly. In particular, the value of exports in 2012-13 was estimated to be **£135.9 million**, comprised of export income of **£12.9 million** from EU domiciled students and **£123.0 million** from non-EU students. The analysis for 2014-15 indicates that the value of exports from EU students has increased by **£15.9 million (123%)**, while the **£65.4 million** increase in exports generated from non-EU students represents a **53%** increase between the two cohorts. Overall, the aggregate value of Cardiff University's educational exports has increased by **£81.3 million (60%)**.

5 Direct, indirect and induced impacts

Traditional analyses of the economic impact of universities focus (almost exclusively) on the **direct, indirect and induced** impact of higher education institutions on their local, regional or national economies. An assessment of such effects considers a university as an economic unit creating output within its local economy, through the purchasing of products and services from different suppliers and hiring employees. In addition, a number of analyses also consider the impact of the non-tuition fee expenditures of students on the businesses within the local communities in which universities are located.

5.1 Economic impact associated with CU institutional expenditure

The direct, indirect and induced impacts of a university's output are defined as follows:

- The **direct effect** considers the economic output generated by a university itself, by purchasing goods and services, including labour, from the economy in which it operates.
- The **indirect effect** arises from a university's purchases of goods and services from other sectors in the economy to support its activities. These purchases generate income for the supplying industries, which are in turn spent on purchases from their own suppliers to meet the university's demands. This results in a chain of reaction of subsequent rounds of spending across industries, typically referred to as the 'ripple effect'⁴¹.
- The **induced effect** is based on a university's status as an employer: specifically, in return for their services, a university pays salaries to its employees, who use this income to purchase consumer goods and services within the economy. This generates wage income for employees within the industries producing these goods and services, who in turn spend their own wages on goods and services. Again, this leads to subsequent rounds of wage income spending throughout the economy as a whole, i.e. a 'ripple effect'⁴².

The total of these direct, indirect and induced impacts (net of any leakage and displacement effects, as applicable) of a university on the economy is commonly measured both in terms of **monetary output**⁴³ and **employment**.

5.1.1 Direct impact of CU expenditure and employment

To measure the direct economic impact of Cardiff University's purchases of labour, goods and services within the UK economy, we used data on total staff and non-staff expenditure, as well as the number of staff employed by Cardiff University itself (measured in terms of full-time equivalent employees), in the 2014-15 academic year.

Based on the above definitions, the total **direct impact** of Cardiff University (in terms of monetary output) is estimated at **£435.9 million**, based on approximately **£262.8 million** of staff costs and

⁴¹ E.g. Kelly et al. (2015).

⁴² An analysis of the net impact of these effects on a university's local, regional or national economy needs to consider two additional factors potentially reducing the size of any of the above effects: First, **leakage** into other geographical areas takes account of how much of the additional economic activity actually occurs in the area under consideration. For example, it might be the case that the university sources some of its inputs from areas outside of its local economy, thus reducing the economic impact which it has on its local surroundings. Second, **displacement** of economic activity within the region of analysis takes account of the possibility that the economic activity generated might result in the reduction of activity elsewhere within the region.

⁴³ In this respect, the monetary economic output associated with universities is typically measured either in terms of institutional revenue or institutional expenditure. As outlined in Kelly and McNicoll (2013), the use of different output measures should, in theory, not influence output multipliers to a large extent, since the status of universities as not-for-profit organisations implies that their expenditure is closely aligned with institutional revenue.

£173.1 million spent on other operating expenses in the 2014-15 academic year⁴⁴. In terms of employment, Cardiff University directly employed **5,516** full-time equivalent staff^{45 46}.

5.1.2 Indirect and induced impacts of CU expenditure

Across the existing literature, the indirect and induced effects of higher education institutions on the economy are (in general) estimated with the help of Input-Output models. Such models develop a series of **multipliers** to estimate the extent to which the direct output produced by a university generates additional activity throughout the rest of the economy. As with the direct impact presented above, these knock-on multipliers are commonly measured in terms of both economic output (e.g. total turnover or expenditure by the university) and employment. These multipliers are commonly calculated as:

$$\text{Output multiplier} = \frac{\text{Direct output} + \text{indirect output} + \text{induced output}}{\text{Direct output}}$$

$$\text{Employment multiplier} = \frac{\text{Direct employment} + \text{indirect employment} + \text{induced employment}}{\text{Direct employment}}$$

To interpret the resulting estimates, for example, an output multiplier of 1.5 implies that each £1 million of (direct) expenditure by a university on goods and services (including labour services) generates an additional £500,000 throughout the economy. Similarly, an employment multiplier of 1.25 implies that for every 1,000 employees hired directly by a university, another 250 jobs are created in other industries.

For the purpose of our analysis, we applied relevant output and employment multipliers to Cardiff University's total direct expenditure (i.e. both staff and non-staff costs) and employment, respectively. To arrive at best estimates, we made use of recent estimates provided by Kelly et al. (2015) in assessing the combined economic impact of HEIs in Wales on the Welsh and UK economies. These multipliers are presented in Table 11. Based on these estimates, we assume that every **£1 million** of Cardiff University expenditure will generate an *additional* **£1.02 million** of impact throughout the Welsh economy, and a further **£0.34 million** in other parts of the UK. In terms of employment, for every **1,000** (FTE) staff employed by Cardiff University itself, an *additional* **1,120** jobs will be generated throughout the whole of the UK, of which **870** are generated in Wales itself, and **250** will be created elsewhere in the UK.

Table 11 Economic multipliers applied to CU expenditure and employment

Multiplier type	Location of impact		
	Wales	Rest of UK	Total UK
Expenditure	2.02	0.34	2.36
Employment	1.87	0.25	2.12

Note: While we apply multiplier effects to CU's expenditure, the analysis by Kelly et al. (2015) instead focuses on institutional revenue as a measure of universities' output; as noted above, the use of different measures of output should, in theory, not influence output measures to a large extent, based on the assumption that institutional revenue roughly equals expenditure of universities.

Source: *London Economics' analysis of Kelly et al. (2015)*.

⁴⁴ Note that we exclude from aggregate expenditure a total of **£22.7 million** in depreciation costs, as it is assumed that these are not relevant from a procurement perspective (i.e. these costs are not accounted for as income by other organisations).

⁴⁵ Note that the full-time equivalent employment figure excludes atypical staff. While the analysis for 2012-13 included a full-time equivalent figure for atypical staff, this has not been generated for 2014-15.

⁴⁶ In terms of employee headcount, this is equivalent to a total of 6,832 contractual staff and 1,925 atypical staff. Again, note that the full-time equivalent figure excludes any atypical staff.

5.2 Economic impact of Cardiff University student expenditure

In addition to the direct, indirect and induced impacts of institutional expenditure by universities, traditional HEI impact analyses further consider the economic output associated with the personal expenditures of university students throughout their studies. This includes the (non-tuition fee) expenditure associated with *both* UK and non-UK domiciled students.

Our methodology behind estimating the non-tuition fee spending associated with *non-UK domicile* students is outlined in Section 4. We employed a similar methodological approach to estimate the level of non-fee spending of *UK domiciled* students starting qualifications or modules with Cardiff University in 2014-15.

As in the analysis of the impact on exports, we make use of the 2011-12 Student Income and Expenditure Survey for Welsh domiciled students, adjusting the Survey's estimates to exclude any tuition fee income and other *on-campus* expenditure that students might incur⁴⁷ (and inflating the estimates to reflect 2014-15 prices). Further, we assume that the level and pattern of expenditure by non-Welsh domiciled students is (in general) similar to that of Welsh domiciled students studying in Wales; we do however make an additional adjustment for part-time students from Wales.

While our estimates for *full-time students* from all Home Nations are based on all types of non-tuition fee off-campus expenditure (i.e. including the costs of living, housing, course participation, spending on children etc.), it is likely that *Welsh domiciled part-time students* would have lived (and worked) in Wales regardless of their study at Cardiff University. This implies that *only some* of these students' non-tuition fee spending should be considered *additional* to the Welsh economy. Our estimate of Welsh domiciled part-time students' additional non-tuition fee expenditure thus only includes the costs which these students incur directly in relation to their studies (such as course material costs or course-related travel costs), and excludes any other expenditures.

The resulting estimates of the off-campus non-tuition fee spending per student per year (by domicile, study mode and level of study) were calculated over the total study duration and discounted to reflect present values. We then aggregated the level of expenditure per student across the total 2014-15 cohort, combined with information on completion rates, to achieve the total (off-campus) non-tuition fee expenditure associated with students of all UK and non-UK domiciles⁴⁸. This was estimated to be **£323.7 million** in 2014-15 (compared to **£217.5 million** in 2012-13).

In line with Cardiff University's own institutional expenditure creating 'ripple effects' of spending through the economy, the personal expenditure of Cardiff University's students is expected to create similar knock-on impacts over and above the level of this expenditure. These knock-on effects again arise from indirect impacts of students' expenditure (generating revenue for businesses which these companies in turn use to purchase goods and services from suppliers), as well as induced effects (as businesses also use the additional revenue to pay wages to their staff).

Similar to the analysis of the indirect and induced effects associated with the expenditures of Cardiff University itself, we applied relevant multipliers to the total values of student expenditure, based on estimates provided by Kelly et al. (2015). Outlined in Table 12, their estimates indicate that every **£1 million** of expenditure by non-UK domiciled students attending university in Wales generates a total of **£1.12 million** impact throughout the Welsh economy, with a further **£0.38 million** impact

⁴⁷ This is again based on the assumption that **13%** of students' non-tuition fee expenditures are incurred on campus (see Kelly et al., 2015).

⁴⁸ Again, the aggregation is based on similar assumptions on total study duration, average wage growth, discount rates and completion information as the analyses of the impact of CU's teaching and learning activities, as well as the University's impact on exports.

across the rest of the UK. In terms of employment, the estimates suggest that every **£1 million** of international student expenditure supports a total of **12.70** full-time equivalent jobs in the UK, of which **9.41** are located in Wales. For UK-domiciled students, the respective multiplier effects for both the Welsh and UK economy stand at **1.12** in terms of output, and **9.41** in terms of employment⁴⁹.

Table 12 Economic multipliers applied to CU student expenditure

Domicile	Output multipliers (£m impact per £m expenditure)			Employment multipliers (FTE employees per £m expenditure)		
	Wales	Rest of UK	Total UK	Wales	Rest of UK	Total UK
UK	1.12	–*	1.12	9.41	–*	9.41
Non-UK	1.12	0.38	1.50	9.41	3.29	12.70

Note: These multipliers are based on London Economics' calculations derived from Kelly et al. (2015).

*As outlined by Kelly et al., 'because of the effects of displacement, the impact on UK output for both [Rest of UK] students and Welsh students is assumed to be equal to the impact on Welsh output'.

Source: London Economics' analysis of Kelly et al. (2015).

Box 8 Transforming Communities

Supporting Cardiff University's overall strategy to 'create knowledge exchange projects that help those who do not traditionally engage with the University'⁵⁰, Cardiff University's *Transforming Communities* programme consists of **five key projects**, with the common aim of bringing long lasting benefits to Welsh, national and international communities:

- **City Region Exchange** aims to shape the Cardiff Capital Region by boosting the economy and creating jobs through stronger engagement with businesses, local governments and policy makers in the region. Since the start of the **City Region Exchange** project, it has funded pilot projects aiming to increase the capacity for partnerships between the University, community and businesses in the region
- **Community Gateway** aims to develop a meaningful long-term relationship between the University and local communities for the benefit of these communities. An initial pilot project has been established in Grangetown, a large and culturally diverse electoral district of Cardiff, aiming to support existing community benefit initiatives and developing new projects focusing on health, sustainability and the environment. A total of 32 collaborative projects were running or completed in Grangetown in 2014/15, including the creation of a community social hub, the Grange Gardens Bowls Pavilion.
- **Community Journalism** aims to transform the landscape of local news by helping communities develop their own community news ventures, transferring skills, conducting



Credit: Cardiff University

⁴⁹ While Kelly et al. (2015) argue that the personal expenditure of non-UK domiciled students in Wales is an injection into the UK economy, their multipliers are adjusted to reflect different assumptions on *additionality* for UK domiciled students. In particular, it is argued that the personal expenditure of UK students from Home Nations *outside Wales*, while not additional to the UK economy, constitutes an injection into the Welsh economy. Further, they presume that the expenditures of *Welsh domiciled* students are not an injection into the Welsh or UK economies; however, they argue that HEIs in Wales ensure that this expenditure is instead *retained* within the Welsh region (assuming that students would otherwise leave Wales to study elsewhere within the UK). In consequence, this is reflected in the expenditure and employment multipliers for UK domiciled students, where the effects on the UK economy are identical to the effects on the Welsh economy, with no additional impact on the rest of the UK (due to displacement).

⁵⁰ Cardiff University (2014).

research, and providing networking, information and support. As part of the **Community Journalism** project, over 300 people across Wales have received digital and social media skills teaching, while 15,000 people from 130 countries worldwide have taken part in a community journalism Massive Open Online Course (MOOC). This resulted in many Welsh language business and community groups reporting positive impacts on communications and audience engagement, as well as the creation of new community news projects such as *Grimsby Spotlight* and *Star and Crescent Plymouth*.

- **Strong Communities, Healthier People** works together with local communities to increase confidence, skills, and community resilience; improving mental health and general wellbeing; and creating a sustainable engagement approach between the University and local communities.

The **Strong Communities, Healthier People** project has trained 40 community members and Communities First staff on research and evaluation, developed a sustainable engagement approach which contributed to the Welsh Government's anti-poverty agenda, and was appointed a leading role in the *Fusion Initiative: Tackling Poverty through Culture project* of the Welsh Government, which aims to eliminate barriers that prevent people from taking part in cultural activities.

- **The Phoenix Project** aims to strengthen the University of Namibia by building a long-lasting relationship between the two universities, and to raise awareness of the importance of education both in Namibia and Wales. Working in line with the Welsh Government's *Welsh for Africa* programme, the project aims to foster collaboration through training, sharing educational resources, supporting staff, making student exchanges and providing information technology support.



The **Phoenix Project** has provided 75 medical students and 11 medical officers with anaesthetics training, which led to the creation of university curricula enabling Namibia to provide anaesthesia training itself and saving lives in the process. The project also held an open-source software conference which provided training to over 100 students and staff and has resulted in the formation of *Pynam*, a national Namibian software association.

The Transforming Communities programme was shortlisted for this year's Times Higher Education *Knowledge Exchange Award*, and has had many identifiable positive impacts on local communities in Wales, the UK and internationally.

Source: Cardiff University

5.3 Adjusting for double counting with other strands of impact and transfers between different agents in the economy

Before arriving at a total direct, indirect and induced impact associated with Cardiff University's expenditure and the spending of its students, it is necessary to deduct a number of items to avoid double counting and to take account of the 'netting out' between the costs and benefits associated with the University and its students to different agents in the UK economy.

Specifically, we deducted from the impact of Cardiff University's expenditures:

- **£3.1 million** in Cardiff University bursary spending⁵¹ as included in the analysis of teaching and learning (Section 2).
- The public cost of research funding (**£65.9 million**) and research income (**£74.2 million** net of public costs) as included in the estimate of research impact (Section 3); and
- **£102.5 million** of net tuition fee expenditure incurred by international students, **£2.9 million** costs relating to student loan support for EU students, and **£1.4 million** in HEFCW teaching grant funding for EU students as included in the impact on exports (Section 4).

Similarly, **£114.7 million** of non-tuition fee expenditure incurred by non-UK students were removed from the total impact of the expenditure of Cardiff University's students, in order to avoid double-counting with the impact on exports (Section 4).

5.4 Aggregate direct, indirect and induced impact of Cardiff University

Following these adjustments, Table 13 presents the resulting aggregate estimates of the total direct, indirect and induced impacts associated with the expenditures incurred by Cardiff University and its students in 2014-15. The analysis suggests that the total direct, indirect and induced impacts stood at **£1,071.0 million** across the UK, of which **£927.6 million (87%)** was estimated to accrue within Wales. Of the total UK impact, **£778.8 million (73%)** is associated with the University's expenditures on goods and services, while **£292.2 million (27%)** is generated from the off-campus personal expenditures of students undertaking their studies at Cardiff University.

In addition to these measures of monetary impact, the analysis also estimates the direct, indirect and induced impact of Cardiff University in terms of employment. The analysis suggests that in addition to the **5,516** full-time equivalent jobs provided directly by the University, there are an additional **5,795** supported by the expenditure of Cardiff University through its supply chain and the expenditure of its students.

The total direct, indirect and induced impact of Cardiff University's staff and non-staff expenditure, and the personal expenditure of its students stands at **£1.071 billion** in the UK. Of this total, **£928 million** is accrued in Wales.

Cardiff University's activities support a total of **11,311 jobs** throughout the UK, of which almost **10,000** are in Wales.

Compared to the analysis undertaken in relation to the 2012-13 cohort where the total economic impact associated with Cardiff University's physical and digital footprint was estimated to be **£1,027.5 million**, the 2014-15 estimates represent a **4.2%** increase⁵².

⁵¹ Cardiff University bursary support to UK-domiciled students is considered as a benefit to the student in the analysis of the impact of teaching and learning activities. It is therefore necessary to deduct those support costs from the direct impact of Cardiff University, to correctly take account of the fact that these bursaries are merely a transfer from the University to its students, and not an additional benefit to the UK economy.

⁵² It is important to note that there have been a number of methodological improvements compared to the previous analysis. On a like-for-like basis, the economic impact of the University in 2012-13 stood at **£957.2 million**, implying that the impact has increased by approximately **12%** increase in reality.

Table 13 Direct, indirect and induced impact associated with CU expenditure and CU student expenditure (£m and number of FTE jobs supported) 2014-15

Type of impact	£m		# of FTE jobs	
	Wales	UK	Wales	UK
Impact of CU expenditure	666.6	778.8	7,808	8,852
Impact of CU student expenditure	261.0	292.2	2,187	2,459
Total	927.6	1,071.0	9,995	11,311

Note: Estimates have been adjusted to avoid double-counting with other sources of economic impact as analysed in previous sections. For each type of impact separately, the impacts which would be double-counted were deducted from the total UK impact in £m of expenditure. We then calculated the revised Welsh impact by multiplying the new UK total by the ratio of Welsh to UK impacts (in terms of expenditure) based on the 'raw' results before adjusting for double-counting. The revised expenditure impacts were then combined with the ratios of FTE employees per £m of expenditure impact (based on the 'raw' results before double-counting adjustments), separately for Wales and the UK and by type of impact. All values are presented in 2014-15 prices, and rounded to the nearest £0.1m.

Source: London Economics' analysis

Box 9 Creative Cardiff

Cardiff University's **Creative Cardiff** initiative aims to connect people working in creative organisations and businesses in the Cardiff region, and to encourage them to cross the boundaries of their sector and work together. Supported by the Wales Millennium Centre, BBC Cymru Wales and Cardiff Council, the project envisages **Cardiff as a 'capital city of creativity' with a vibrant and well connected creative community that benefits the city and helps it to thrive.**

Creative Cardiff aims to make this vision a reality through a variety of ways for people to engage in its network, which was launched publicly in October 2015.



During the first year Creative Cardiff showcased '52 Things' that highlight the creativity of the city. The activities ranged from presenting existing creative spaces in the capital and interviews and conversations with people working in the creative industry, to running and attending creative events and showcasing ideas aiming to make Cardiff the most creative place it can be. It was effective in growing the network to over 700 members and an active twitter following (6000+). Arts Council of Wales have also joined as a core member.



Credit: Cardiff University

Creative Cardiff has always placed importance on **the places that creative people work**, originally intending to create a physical *Creative Hub* in the city. A pilot 'pop-up' hub ran for a week in June 2016, attended by more than 30 creative professionals. Since then, an array of co-working spaces of different types have opened, with Creative Cardiff now focussing on what it can do to support and cross-pollinate these spaces and explore how they are animated to encourage the best collaboration.

Allied to this, they have developed the 300 member strong Creative Cardiff Research Network with its first subgroup – focussing on festivals in the city – creating a pop-up Museum with Swn festival. The interdisciplinary project received coverage on 6 Music, Wales Online, BBC and Made in Cardiff.

Source: Cardiff University

6 Total economic impact

Table 14 and Figure 10 present aggregate estimates of the economic impact of Cardiff University across the UK. In terms of the components of economic impact, the value of the teaching and learning activities stands at approximately **£966.2 million** (33% of total), while research activity contributes **£664.1 million** (23% of total). A further **£217.2 million** (7%) is associated with the University's contribution to educational exports. The economic impact resulting from Cardiff University's physical footprint, in terms of its own expenditure on goods and services, as well as its students' personal expenditures throughout their studies, constitutes the largest individual source of impact, standing at **£1,071 million** (37% of total).

The total economic impact associated with Cardiff University was estimated to be approximately £2,919 million in 2014-15.

Combining these strands of impact, we have estimated the total economic impact associated with the activities of Cardiff University to be approximately **£2,918.5 million** across the UK in 2014-15. This compares to **£2,740.4 million** in 2012-13 (and **£2,670.1 million** on a like-for-like basis⁵³).

Based on a number of assumptions on the location of the different strands of impact, we estimated that the total economic impact of Cardiff University on the Welsh economy stood at approximately **£2,204.8 million** (**£2,036.7 million** in 2012-13), corresponding to approximately **76%** of the total attributable economic benefit generated by the University. The remaining **£713.7 million** (24%) accrued elsewhere across the United Kingdom.

Table 14 Aggregate economic impact of Cardiff University in the UK (£m and % of total)

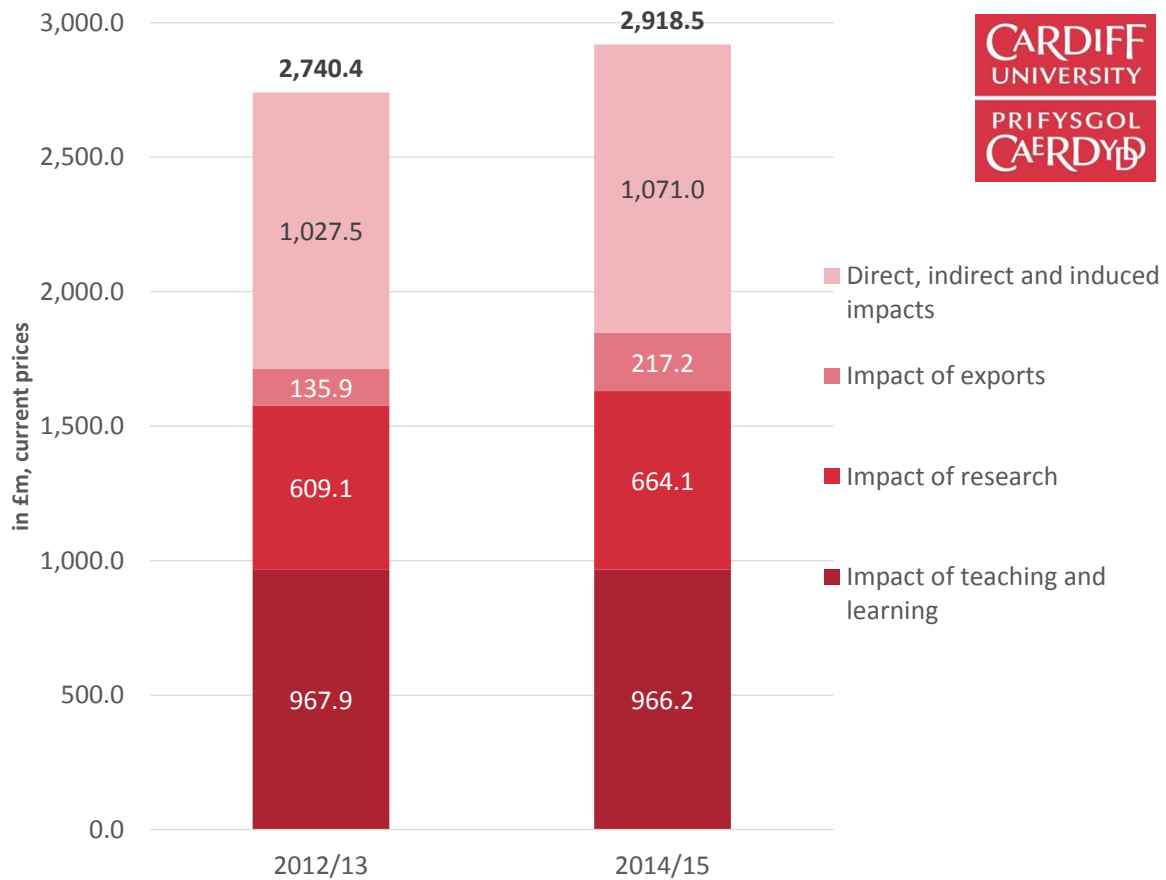
Type of impact (£m in 2014-15)	£m	%
Impact of teaching and learning	966.2	33%
Students	468.1	16%
Public purse	498.1	17%
Impact of research	664.1	23%
Net direct research income	74.2	3%
Spillover impact	589.9	20%
Impact on exports	217.2	7%
Net tuition fee income	102.5	3%
Non-tuition fee income	114.7	4%
Direct, indirect and induced impacts	1,071.0	37%
Impact of CU expenditure	778.8	27%
Impact of CU student expenditure	292.2	10%
Total economic impact	2,918.5	100%

Note: All monetary values are presented in 2014-15 prices, and rounded to the nearest £0.1m.

Note that the analyses between 2012-13 and 2014-15 do not present an exactly comparable methodological approach. In particular, there are a number of items that were included in the 2012-13 analysis but removed (because of double counting) in 2014-15. If the comparable analysis was undertaken in 2012-13, the total economic benefit of the University would be **£70.3 million** lower (concentrated in the contribution of direct, indirect and induced effects), and thus standing at **£2,670.1 million** in total.

Source: London Economics' analysis

⁵³ Again, this is based on methodological improvements applied to the analysis of direct, indirect and induced impacts of Cardiff University's footprint (see Section 5) for more information.

Figure 10 Total economic impact associated with Cardiff University, 2012-13 and 2014-15

Note: All values are presented in current prices, and rounded to the nearest £0.1m.

Note that the analyses between 2012-13 and 2014-15 do not present an exactly comparable methodological approach. In particular, there are a number of items that were included in the 2012-13 analysis but removed (because of double counting) in 2014-15. If the comparable analysis was undertaken in 2012-13, the total economic benefit of the University would be **£70.3 million** lower (concentrated in the contribution of direct, indirect and induced effects), and thus standing at **£2,670.1 million** in total.

London Economics' analysis

To place these estimates in context, the analysis suggests that compared to Cardiff University's total operational cost of **£458.7 million** in 2014-15, the total economic contribution or benefit to the UK economy associated with the 2014-15 cohort of students is estimated to be **£2,918.5 million** in 2014-15 money terms. This represents a benefit to cost ratio of **6.36:1** (compared to **6.26:1** in 2012-13 on a like-for-like basis).

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Annex 2 Technical Annex

A2.1 Impact of Cardiff University's teaching and learning activities

A2.1.1 Further information on the 2014-15 UK domiciled cohort of Cardiff University students

Table 15 UK domiciled students (headcount) in 2014-15 cohort, by domicile, study mode and level of study at Cardiff University

Level and mode of study at Cardiff University	Domicile				
	Wales	England	Scotland	Northern Ireland	Total UK
Full-time	2,831	3,769	33	52	6,685
Other HE	48	12	0	0	60
HE Diploma	47	25	0	0	72
Undergraduate Degree	1,796	3,083	7	42	4,928
Masters Degree	537	321	10	5	873
Doctorate Degree	403	328	16	5	752
Part-time	4,064	777	36	16	4,893
Other HE	2,159	141	7	3	2,310
HE Diploma	50	9	0	0	59
Undergraduate Degree	70	7	0	0	77
Masters Degree	1,618	555	29	13	2,215
Doctorate Degree	167	65	0	0	232
Total	6895	4546	69	68	11,578
Other HE	153	2,207	7	3	2,370
HE Diploma	34	97	0	0	131
Undergraduate Degree	3,090	1,866	7	42	5,005
Masters Degree	876	2,155	39	18	3,088
Doctorate Degree	393	570	16	5	984

Note: 'Other HE' includes Certificates of Higher Education, taught work for institutional credits or with an unspecified qualification aim, and credits at HE level. We received HESA data on a total of **19,183** students from CU Registry & Academic Services. From those, we excluded a total of **5,168** students who were not UK-domiciled, domiciled in Guernsey, Jersey or the Isle of Man, or with an unknown domicile within the UK or generally; **120** students whose age was indicated as 99 (the default HESA age for students whose birth date is not known); and **2,317** students who were following courses at Further Education level. As with the analysis for 2012-13, the definition of a new student instance was based on HESA variable YEARSTU (including students with a YEARSTU value of 1). For a total of **495** students out of the resulting UK cohort, previous attainment levels were specified as either 'Mature student admitted on basis of previous experience and/or admissions test', 'Other qualification level not known' or 'Not known'. For those students, we imputed their prior attainment level per student using a group-wise imputation approach based on students undertaking similar qualifications, separately by study mode.

Source: London Economics' analysis based on Cardiff University data

A2.1.2 Marginal earnings and employment returns

Box 10 Estimating the wage returns to higher education qualifications

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

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

where $\ln(\omega_i)$ represents the natural logarithm of hourly earnings, ε_i represents an error term, and X_i provides the independent variables included in the analysis as follows:

- Gender
- Age
- Age squared
- Ethnic origin
- Region of usual residence
- Qualifications
- Marital Status
- Number of dependent children under the age of 16
- Full-time/ part-time employment
- Temporary or permanent contract
- Public or private sector employment
- Workplace size
- Interaction terms, and
- Yearly Dummies

Using the above specification, we estimated earnings returns in aggregate and for men and women separately. Further, to analyse the benefits associated with different education qualifications over the lifetime of individuals holding these qualifications, the regressions were estimated separately across a range of specific age bands for the working age population, depending on the gender and qualification considered. The analysis of earnings premiums was undertaken at a national (UK-wide) level. However, to adjust for differences across the Home Nations, these UK-wide earnings premiums were then combined with the relevant differential direct costs facing the individual and/or the public purse for students domiciled in the different Home Nations.

To estimate the impact of higher education qualifications on labour market outcomes using this methodology, we used information from pooled Quarterly UK Labour Force Surveys between 2000 and 2015. The selection of information over this period is the longest time for which information on education and earnings is available on a relatively consistent basis. The resulting estimates of marginal wage returns to higher education qualifications are presented in Table 16.

Box 11 Estimating the employment returns to higher education qualifications

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

$$\text{probit}(\text{EMPNOT}_i) = \alpha + \gamma' Z_i + \varepsilon_i$$

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

- Gender
- Age
- Age squared
- Ethnic origin
- Region of usual residence
- Qualifications
- Marital Status
- Number of dependent children under the age of 16, and
- Yearly Dummies

Again, ε_i represents an error term. Similar to the methodology for estimating earnings returns, the described probit model was estimated in aggregate and separately for men and women, with the analysis split by respective age bands. Further, and again similar to the analysis of earnings returns, employment returns were estimated at the national (i.e. UK-wide) level. The resulting estimates of marginal employment returns to higher education qualifications are presented in Table 17.

Throughout the analysis, we present detailed findings of the **marginal earnings and employment returns** associated with different types of higher education qualifications^{54 55}. While the previous analysis (which was based on the 2012-13 academic year) made use of marginal earnings and employment returns estimated using Labour Force Survey data between 1996 and 2013, the analysis was updated based on comparable data from 2000 to 2015⁵⁶.

In the earnings regressions, the coefficients relating to the higher education qualifications provide an indication of the additional effect on hourly earnings associated with possession of the respective qualification in addition to those in the reference category. Table 16 presents the marginal percentage earnings returns estimated using the above methodology, separately for men and women and across a range of age bands. Taking an example, in the row labelled 'undergraduate degree', the analysis suggests that a male aged between 31 and 35 years old in possession of an undergraduate degree is estimated to achieve a **23.0%** hourly earnings premium compared to a comparable male holding only 2 or more GCSE 'A' levels as his highest level of attainment. The comparable estimate for a woman aged between 31 and 35 stands at **29.4%**.

In the employment regressions, the relevant coefficients (displayed in Table 17) provide similar estimates of the impact of the qualification on the probability of being in employment (expressed in percentage points). Again taking an example in relation to employment, a man aged between 36 and 40 in possession of an undergraduate degree is **2.9 percentage points** more likely to be in employment than a man of similar age holding only 2 or more GCE 'A' levels as his highest level of education.

⁵⁴ The coefficients in the model (represented by β) provide information on the extent to which a particular independent variable (e.g. qualification attainment) influences the dependent variable (earnings or employment outcomes). For the earnings returns, because the coefficients from the regression refer to the impact of qualification on the natural logarithm of hourly earnings, these coefficients need to be converted into percentages through exponentiation (using the transformation $e^{\beta} - 1$). In general terms, for small coefficients (less than 0.10), the coefficient in the regression model will give a reasonable approximation of the actual percentage change; however, for coefficients greater than this, the correction is necessary. This transformation is required only when considering earning returns, as we are estimating the impact of qualification attainment on the logarithm of hourly earnings. No exponential transformation is necessary when considering the employment outcomes of learners, as in the employment regressions, the relevant coefficient provides an automatic estimate of the impact of the qualification on the probability of being in employment, in percentage terms.

⁵⁵ Note that in cases where the estimated coefficients are not statistically significantly different from zero (at the 10% level), the coefficient is assumed to be zero.

⁵⁶ 2004 to 2015 for Foundation Degrees.

Table 16 Marginal earnings returns to higher education qualifications, in %, by gender and age band

Qualification level	Male										Female									
	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	
2 or more GCE A-levels ¹	3.0%	4.0%	12.4%	22.1%	26.0%	21.3%	24.6%	21.8%	20.7%	22.1%		5.9%	11.5%	17.2%	20.2%	22.8%	15.1%	14.6%	13.1%	
HNC/HND/Level 4 BTECS ²		5.2%	9.0%	5.3%	5.0%	8.1%	12.1%	12.7%				4.8%	6.0%		9.0%	12.2%	6.3%	7.1%	13.7%	
Other HE						23.9%	12.5%	14.9%						14.0%				17.7%		
HE Diploma						23.6%							7.8%	13.2%	30.1%	37.0%	26.6%	29.0%	20.9%	
Foundation Degree ³				13.9%	16.4%			23.6%					11.7%			38.8%				
Undergraduate Degree		8.9%	18.4%	23.0%	24.2%	27.3%	23.1%	27.8%	24.7%	25.6%		7.8%	20.9%	29.4%	40.2%	35.7%	37.0%	40.6%	32.4%	
Masters Degree ⁴		6.5%	11.5%	7.8%	10.8%	13.2%	12.5%	15.4%	7.7%				2.7%	9.5%	11.0%	17.6%	20.3%	12.3%	23.2%	
Doctorate Degree			16.4%	14.6%	18.3%	19.5%	17.5%	26.1%	22.0%	48.7%			12.7%	15.3%	30.3%	26.0%	29.3%	32.4%	26.4%	

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

¹ Returns to holding 2 or more GCE 'A' levels compared to 5 or more GCSEs at A*-C.

² Returns to HNCs/HNDs/Level 4 BTECs, 'other' higher education qualifications, higher education Diplomas, Foundation Degree and Undergraduate Degrees returns are estimated relative to individuals holding 2 or more GCE 'A' levels as their highest qualification.

³ Returns to Foundation Degrees were estimated over the period 2004 to 2015 (due to data availability in the Labour Force Survey).

⁴ Masters Degree and Doctorate Degree returns are estimated relative to Undergraduate Degrees.

Source: *London Economics' analysis of Labour Force Survey 2000-2015*

Table 17 Marginal employment returns to higher education qualifications, in percentage points, by gender and age band

Qualification level	Male											Female								
	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	
2 or more GCE A-levels ¹	-5.7%		1.9%	1.6%	2.6%		1.7%				-2.7%	2.1%	3.8%	2.4%			2.2%	3.8%		
HNC/HND/Level 4 BTECS ²				2.8%	1.7%	2.2%		3.9%	5.2%						4.5%					
Other HE														10.2%						
HE Diploma														6.9%						
Foundation Degree ³										20.7%				8.4%						
Undergraduate Degree		-3.5%	1.4%	2.7%	2.9%	3.2%	2.3%	5.6%				1.5%	3.1%	3.7%	4.4%	5.4%	3.8%	3.3%	8.0%	
Masters Degree ⁴		-5.3%					1.0%		4.9%	6.7%		-3.1%				4.1%	3.9%	4.7%	8.9%	
Doctorate Degree								3.9%	8.8%	10.5%			-4.1%	4.1%		7.2%	6.7%		9.1%	

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

¹ Returns to holding 2 or more GCE 'A' levels compared to 5 or more GCSEs at A*-C.

² Returns to HNCs/HNDs/Level 4 BTECs, 'other' higher education qualifications, higher education Diplomas, Foundation Degree and Undergraduate Degrees returns are estimated relative to individuals holding 2 or more GCE 'A' levels as their highest qualification.

³ Returns to Foundation Degrees were estimated over the period 2004 to 2015 (due to data availability in the Labour Force Survey).

⁴ Masters Degree and Doctorate Degree returns are estimated relative to Undergraduate Degrees.

Source: London Economics' analysis of Labour Force Survey 2000-2015

A2.1.3 ‘Age-decay’ function

As with the analysis for the 2012-13 academic year, the updated assessment of the economic and social impact of Cardiff University makes use of an ‘age-decay’ function. This approach assumes that possession of a particular higher education qualification is associated with a certain earnings or employment premium, and that this entire labour market benefit accrues to the individual *if* the qualification is attained before the age of 25.

However, we assume that, as the age of attainment increases, a declining proportion of the potential value of the estimated earnings and employment benefit accrues to the individual. This calibration ensures that those individuals completing qualifications at a relatively high age will see relatively low earnings and employment benefits associated with higher education qualification attainment (and perhaps reflect potentially different motivations amongst this group of learners). In contrast, those individuals attaining qualifications earlier in their working life will see a greater economic benefit (potentially reflecting the investment nature of qualification acquisition).

The age-decay function was introduced based on the fundamental differences between the attainment of higher education qualifications on a part-time basis as compared to a full-time basis. In particular, part-time students typically undertake higher education qualifications several years later than the ‘standard’ full-time undergraduate (the average age at enrolment amongst students undertaking undergraduate degrees with Cardiff University on a part-time basis is approximately 39); generally undertake their studies over an extended period of time (a Cardiff University part-time undergraduate degree normally lasts approximately 6 years); and often combine their studies with full-time employment. However, and similarly, note that some CU full-time students also tend to start their higher education qualifications later than ‘typical’ UK full-time students (e.g. the average age at enrolment amongst full-time HE Diploma students in the Cardiff University 2014-15 cohort stands at approximately 26, see Table 18⁵⁷).

To reflect these particular characteristics, as with the 2012-13 analysis, the age-decay function was applied to both *part-time and full-time students* in the 2014-15 cohort.

Table 18 Average age at enrolment, study duration, and age at completion for students undertaking higher education qualifications at Cardiff University, 2014-15 cohort

Qualification level	Full-time students			Part-time students		
	Age at enrolment	Duration (years)	Age at completion	Age at enrolment	Duration (years)	Age at completion
Other HE	30	1	31	43	2	45
HE Diploma	26	2	28	38	4	42
UG Degree	20	3	23	39	6	45
Masters Degree	25	1	26	31	2	33
Doctorate Degree	28	3	31	40	5	45

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

Source: London Economics' analysis based on Cardiff University data

In this respect, there were several key differences in the average age at enrolment between students starting qualifications at Cardiff University in 2012-13 as compared to 2014-15. As presented in

⁵⁷ The table presents the (rounded) average age at enrolment amongst the 2014-15 UK-domiciled cohort of Cardiff University students. The average duration of study (by qualification level and study mode) is based on separate information provided by Cardiff University; note that this assumption was the same for the 2014-15 cohort as for the 2012-13 cohort.

Table 19, some students in the 2014-15 CU cohort were (on average) relatively **older** than students in the comparable 2012-13 cohort. This applied to students undertaking other HE qualifications (where the average age at enrolment increased from approximately **23** in 2012-13 to **30** in 2014-15 for full-time students, and from **40** to **43** for part-time students), full-time undergraduate degrees (increasing from 19 to 20), and doctorate degrees (where the average age increased from **26** to **28** for full-time and from **39** to **40** for part-time students). For these types of students, the higher age at enrolment implies that these students are expected to spend fewer years in the labour market following the completion of their studies, resulting in lower earnings and employment benefits (and associated public purse benefits).

Table 19 Average age at enrolment, study duration, and age at completion for students undertaking higher education qualifications at Cardiff University, 2012-13 cohort

Qualification level	Full-time students			Part-time students		
	Age at enrolment	Duration (years)	Age at completion	Age at enrolment	Duration (years)	Age at completion
Other HE	23	1	24	40	2	42
HE Diploma	27	2	29	39	4	33
UG Degree	19	3	22	39	6	45
Masters Degree	25	1	26	32	2	34
Doctorate Degree	26	3	29	39	5	44

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

Source: London Economics' analysis based on Cardiff University data

A2.1.4 Net graduate premiums and public purse benefits (2012-13)

Table 20 Net graduate premium to a full-time undergraduate degree (relative to GCE 'A' Levels) in 2012-13

Domicile	Men		Women	
	Net graduate premium	Net public purse benefit	Net graduate premium	Net public purse benefit
Wales	£121,058	£113,692	£89,180	£60,377
England	£114,020	£120,729	£82,143	£67,414
Scotland	£111,937	£122,813	£80,059	£69,498
Northern Ireland	£111,641	£123,109	£79,763	£69,793

Note: Estimates are based on an average age at graduation of 22 for students undertaking undergraduate degrees at Cardiff University on a full-time basis (based on the 2012-13 cohort). Source: London Economics' analysis

Table 21 Net graduate premium to a part-time undergraduate degree (relative to GCE 'A' Levels) in 2012-13

Domicile	Men		Women	
	Net graduate premium	Net public purse benefit	Net graduate premium	Net public purse benefit
Wales	£44,546	£26,228	£26,062	£3,540
England	£31,464	£39,311	£12,980	£16,623
Scotland	-	-	-	-
Northern Ireland	-	-	-	-

Note: Estimates are based on an average age at graduation of 45 for students undertaking undergraduate degrees at Cardiff University on a part-time basis (based on the 2012-13 cohort). There were no students from Scotland and Northern Ireland recorded as having an

intention to complete an undergraduate degree on a part-time basis in the 2012-13 cohort of Cardiff University students. **Source:** *London Economics' analysis*

Table 22 Net graduate premium and net public purse benefit associated with qualifications offered by Cardiff University (full-time students from Wales only) in 2012-13

Level of study at CU	Men		Women	
	Net graduate premium	Net public purse benefit	Net graduate premium	Net public purse benefit
Other HE	£17,055	£14,708	£10,560	£672
UG Degree	£121,058	£113,692	£89,180	£60,377
Masters Degree	£53,403	£75,673	£46,742	£50,038
Doctorate Degree	£54,393	£107,915	£40,101	£64,001

Note: As per Table 5.

Source: *London Economics' analysis*

A2.1.5 2012-13 estimates of the impact of teaching and learning

Table 23 Aggregate economic impact of CU teaching and learning (£m) in 2012-13, by students' domicile and type of impact

Type of impact	Wales	England	Scotland	N. Ireland	UK
Students/Graduates	215.4	277.8	2.0	4.1	499.3
Full-time	188.3	260.3	0.8	3.6	453.0
Part-time	27.1	17.5	1.2	0.5	46.3
Public purse	190.5	271.8	2.3	4.0	468.6
Full-time	164.5	251.5	0.9	3.5	420.4
Part-time	26.0	20.3	1.4	0.5	48.2
Total	405.9	549.6	4.3	8.1	967.9
Full-time	352.8	511.8	1.7	7.1	873.4
Part-time	53.1	37.8	2.6	1.0	94.5

Note: All values are presented in 2012-13 prices, and rounded to the nearest £0.1m.

Source: *London Economics' analysis*

A2.2 Impact of Cardiff University's research activities

Table 24 Total impact of Cardiff University's research activities in 2012-13 (£m)

Type of impact	£m in 2012-13
Direct research impact	66.9
Productivity spillovers	542.2
Total	609.1

Note: Values are presented in 2012-13 prices, and rounded to the nearest £0.1 million. **Source:** *London Economics' analysis*

A2.3 Impact on exports

Table 25 Non-UK domiciled students (headcount) in 2014-15 cohort, by domicile, study mode and level of study at Cardiff University

Level of study at CU	Domicile		
	EU (outside UK)	Non-EU	Total
Full-time	650	3,767	4,417
Other HE	13	1,102	1,115
HE Diploma	2	7	9
UG Degree	249	647	896
Masters	237	1,570	1,807
Doctorate	149	441	590
Part-time	140	504	644
Other HE	36	21	57
HE Diploma	0	0	0
UG Degree	1	1	2
Masters	87	446	533
Doctorate	16	36	52
Total	790	4,271	5,061
Other HE	49	1,123	1,172
HE Diploma	2	7	9
UG Degree	250	648	898
Masters	324	2,016	2,340
Doctorate	165	477	642

Note: 'Other HE' includes Certificates of Higher Education, taught work for institutional credits or with an unspecified qualification aim, and credits at HE level. We received HESA data on a total of **19,183** students from CU Registry & Academic Services. From those, we excluded **14,015** students with a known UK domicile; **103** students from Guernsey, Jersey and the Isle of Man or with an unspecified unknown domicile in the UK or generally; and 4 students who were following courses at Further Education level. As with the analysis for 2012-13, the definition of a new student instance was based on HESA variable YEARSTU (including students with a YEARSTU value of 1). For a total of **513** students out of the resulting non-UK cohort, previous attainment levels were specified as either 'Mature student admitted on basis of previous experience and/or admissions test', 'Other qualification level not known' or 'Not known'. For those students, we imputed their prior attainment level per student using a group-wise imputation approach based on students undertaking similar qualifications, separately by study mode.

Source: *London Economics' analysis of based on Cardiff University data*

Table 26 Aggregate economic impact on exports (£m) in 2012-13, by domicile and type of impact

Type of impact	Domicile		
	EU	Non-EU	Total
Net tuition fee income	1.9	65.5	67.4
Non-tuition fee income	11.0	57.5	68.5
Total	12.9	123.0	135.9

Note: Values are presented in 2012-13 prices, and rounded to the nearest £0.1m. **Source:** *London Economics' analysis*

A2.4 Direct, indirect and induced impact of Cardiff University

Table 27 Direct, indirect and induced impact associated with CU expenditure and CU student expenditure (£m and number of FTE jobs supported) in 2012-13

Type of impact	£m		# of FTE jobs	
	Wales	UK	Wales	UK
Impact of CU expenditure	718.9	842.9	8,685	9,819
Impact of CU student expenditure	166.9	184.6	1,398	1,552
Total	885.8	1,027.5	10,083	11,371
Total (like-for-like)	825.9	957.2	9,360	10,552

Note: All values are presented in 2012-13 prices, and rounded to the nearest £0.1m.

Note that the analyses between 2012-13 and 2014-15 do not present an exactly comparable methodological approach. In particular, there are a number of items that were included in the 2012-13 analysis but removed (because of double counting) in 2014-15. If the comparable analysis was undertaken in 2012-13, the direct, indirect and induced economic benefit of the University would be **£70.3 million** lower, and thus standing at **£957.2 million** in total (instead of **£1,027.5 million**).

Source: London Economics' analysis

A2.5 Total economic impact of Cardiff University in 2012-13

Table 28 Aggregate economic impact of Cardiff University in the UK (£m and % of total) in 2012-13

Type of impact (£m in 2012-13)	£m	%
Impact of teaching and learning	967.9	35%
Students	499.3	18%
Public purse	468.6	17%
Impact of research	609.1	22%
Net direct research income	66.9	2%
Spillover impact	542.2	20%
Impact on exports	135.9	5%
Net tuition fee income	67.4	2%
Non-tuition fee income	68.5	3%
Direct, indirect and induced impacts	1,027.5	38%
Impact of CU expenditure	842.9	31%
Impact of CU student expenditure	184.6	7%
Total economic impact	2,740.4	100%

Note: Monetary values are presented in 2012-13 prices, and rounded to the nearest £0.1m.

Note that the analyses between 2012-13 and 2014-15 do not present an exactly comparable methodological approach. In particular, there are a number of items that were included in the 2012-13 analysis but removed (because of double counting) in 2014-15. If the comparable analysis was undertaken in 2012-13, the total economic benefit of the University would be **£70.3 million** lower (concentrated in the contribution of direct, indirect and induced effects), and thus standing at **£2,670.1 million** in total.

Source: London Economics' analysis



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