

Fourth report

The impact of universities on the UK economy



Universities UK

The impact of universities on the UK economy: fourth report

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This is the fourth study of the impact of the higher education sector on the UK economy which has been published by Universities UK. It updates earlier studies published from 1997. Since the first report appeared the economic importance of higher education has been much more widely recognised and its contribution to national and regional economic development is an important influence on policymaking. Higher education is seen in the UK as being of key importance in the creation and transfer of knowledge to the economy through its teaching, research and other activities.

The latest report provides new evidence of the impact of universities as independent businesses (additional to their role in increasing the stock of human capital). The economic activity generated by university expenditure (the aspect of the sector's economic contribution which is most readily quantifiable) is substantial. The scale of university activity across the UK also means that this can be very important at the macroeconomic level. The higher education sector is comparable to the printing and publishing and legal activities industries and larger than the pharmaceutical, aircraft and spacecraft and advertising industries in the UK.

The report confirms the growing economic importance of the sector, which had an income of £23.4 billion a year in 2007/08 (compared with £16.9 billion in 2003/04), gross export earnings of £5.3 billion and employed more than 1 per cent of the UK's total workforce. In terms of its wider economic impact the sector generated over £59 billion of output. The equivalent figure five years ago was nearly £45 billion, confirming a rapid growth in economic impact. The study demonstrates that the effectiveness of the higher education sector in generating impact is relatively high compared to other sectors of the economy.

The report also confirms the substantial employment effect of higher education activity, with around 670,000 jobs being created throughout the economy in 2007/08. Of these some 372,000 people were directly employed by universities and colleges. It provides further evidence of the importance of international students to the sector and the wider economy. One significant impact is the volume of personal off-campus expenditure of these students, which amounted to £2.3 billion in 2007/08.

Such activity depends on a continuing mix of public and private investment in the sector. Income from private sources amounts to 26 per cent of all higher education income – with considerable variations between institutions – but public investment (61 per cent of the total) will continue to play a vital role in the development of the sector. It is evident from the findings of this report that such investment has a direct impact on the UK economy and employment levels as well as maintaining the health of the sector.

Professor Steve Smith

President

Universities UK

Introduction

The role of higher education in the economy is attracting growing attention in all developed countries. In particular its potential contribution to economic prosperity, through innovation and knowledge exchange to the wider society, is regarded as vitally important for economic development and growth. At a time of global economic crisis governments across the world are looking to their universities to support national and regional economies, through the development of new ideas, products and services from research as well as through continuing to raise the education levels of citizens and increase the national capacity to innovate and adapt. In the UK it is increasingly recognised that the higher education sector forms a core part of the economic infrastructure, generating employment and output, attracting export earnings and contributing to the gross domestic product (GDP). The strength of the sector and its effectiveness in generating economic activity has become all the more important in a severe recession when other sectors of the economy are contracting.

This study presents key economic features of UK higher education in the academic year 2007/08 and those aspects of its contribution to the UK economy that can be readily measured. It does not, therefore, include any assessment of the value of the sector's collaboration with business or the impact of new ideas generated by universities or their graduates. The sector is analysed as a conventional industry, highlighting the major economic characteristics of UK universities, including their sources of revenue, employment created, output generated and export earnings attracted. Modelled estimates are made of the economic activity generated in other sectors of the economy through the secondary or 'knock-on' multiplier effects of expenditure by universities and their staff, as well as by international students and visitors. Additional analysis is undertaken of the overall contribution of the higher education sector to Gross Domestic Product (GDP) and its efficiency in generating impact is compared with a range of other sectors of the economy.

The study calculates that through both direct and secondary effects the higher education sector generated over £59 billion of output and over 668,500 full time equivalent jobs throughout the UK economy in 2007/08.

Methodology and data sources

The study is based on the 166 universities and colleges included in Higher Education Statistics Agency (HESA) data for the academic year 2007/08. (These institutions are referred to as universities throughout this report.) The study examined the key economic characteristics of universities and the impact generated by their activity. It also considered the impact of the off-campus expenditure of EU and international students (that is, all non-UK domiciled students) studying at UK universities. Modelled estimates were also made of the impact of the off-campus expenditure of international visitors attracted to the UK by the universities. The off-campus expenditure of UK domiciled students was excluded as this may not be regarded as additional to the UK economy as a whole.

The model used was a purpose designed and specially constructed 'type II' input-output model based on actual UK data derived from the Office of National Statistics' input-output tables (2006) together with data from its 'Blue Book' (2008)¹.

Data on university finance, staffing and students were obtained from HESA. Other data sources included *Travel trends* (Office of National Statistics) and a student expenditure survey (2009), published by the former Department for Innovation, Universities and Skills, as well as the Labour Force Survey and Annual Business Inquiry.

Key findings

The overall impact of the higher education sector

- Higher education sector impact is defined in this study to be that of the universities together with that of their international students and visitors.
- Through both direct and secondary or multiplier effects, this generated over £59 billion of output and over 668,500 full time equivalent jobs throughout the economy. The total employment generated was equivalent to around 2.6 per cent of all full time equivalent employment in 2007.

Universities: direct income, expenditure and employment

- In 2007/08, the total revenue earned by UK universities amounted to £23.4 billion. This was comparable in sectoral gross output terms to the printing and publishing industry and considerably larger than the pharmaceuticals industry in the UK.
- Revenue from 'core' public sources (defined as funding council grants and tuition fee payments) accounted for 48 per cent of all university income.
- Total revenue from all UK public sources amounted to £14.3 billion or 61 per cent of all income.
- International revenues (institutional gross export earnings) amounted to over £2.9 billion, representing nearly 13 per cent of all university income.
- In 2007/08, universities spent £22.9 billion, with the single largest component of expenditure being labour costs.
- Universities *directly* employed over 372,400 people, which equated to approximately 314,600 full time equivalent jobs. This was equivalent to 1.2 per cent of all full time UK employment in 2007.

Universities: secondary or 'knock-on' multiplier effects

- The expenditure of universities and their staff generated additional output and employment across the economy.
- For every 100 full time jobs within the universities themselves, more than 100 other full time equivalent jobs were generated through knock-on effects. Over 324,400 full time equivalent jobs in other sectors of the UK economy were dependent on the expenditure of the universities.
- For every £1 million of university output a further £1.38 million of output was generated in other sectors of the economy. This meant that an additional £32.4 billion of output was generated outside the universities as a result of their expenditure.

International students and visitors

- Personal (off-campus) expenditure of EU and international students attending UK universities in 2007/08 was estimated to be £2.3 billion. This was equivalent to over 14 per cent of all receipts from overseas visitors to the UK for the year 2007².
- Higher education makes a key contribution to UK business tourism. Personal (off-campus) expenditure of international business and recreational visitors to UK universities was estimated to be just over £135 million.
- The expenditure of international students and visitors also generated output and employment throughout the UK.
- International student expenditure generated £3.3 billion of output across the economy and over 27,800 jobs.
- International visitor expenditure generated around £189 million of output and over 1,600 jobs.

Higher education's contribution to GDP

The importance of higher education to the economy can be seen through the generation of significant levels of output and employment. However a key measure of its contribution to the national economy is its impact on GDP. GDP is used by all countries as an annual measure of the total value of all goods and services produced by an economy.

In the year 2007/08, universities contributed over £31 billion to UK GDP. The off-campus expenditure of their international students and visitors made a further £2.4 billion contribution to GDP. Taken together this contribution came to over £33.4 billion – equivalent to 2.3 per cent of UK GDP in 2008³.

Table 1

Overall impact of the higher education sector on the UK economy, 2007/08⁴

	Universities	International students	International visitors	Higher education sector
OUTPUT				
Direct output	£23.44 billion	0	0	£23.44 billion
Secondary output	£32.36 billion	£3.26 billion	£0.19 billion	£35.81 billion
Total output generated (direct plus secondary)	£55.80 billion	£3.26 billion	£0.19 billion	£59.25 billion
GDP(0)				
Direct GDP(0)	£15.16 billion	0	0	£15.16 billion
Secondary GDP(0)	£15.86 billion	£1.51 billion	£0.88 billion	£18.25 billion
Total GDP(0)	£31.02 billion	£1.51 billion	£0.88 billion	£33.41 billion
EMPLOYMENT				
Direct employment	314,632	0	0	314,632
Secondary employment	324,456	27,868	1,163	353,937
Total employment generated (direct plus secondary)	639,088	27,868	1,613	668,569
EXPORT EARNINGS				
Export earnings	£2.9 billion	£2.3 billion	£0.14 billion	£5.3 billion

Source: Universities UK economic impact modelling system (2009) constructed for this study

Note: All employment figures are full time equivalents

The role of higher education in the economy is attracting growing attention in all developed countries. In particular its potential contribution to economic prosperity through innovation and knowledge exchange to wider society is regarded as vitally important for economic development and growth. At a time of global economic crisis governments across the world are looking to their universities to provide ways to support national and regional economies, through the development of new ideas, products, and services from research as well as through continuing to raise the education levels of citizens and increase the nation's capacity to innovate and adapt. It is increasingly recognised in the UK that the sector has become a core part of the economic infrastructure of the country and its regions, generating employment and output, attracting export earnings and contributing to gross domestic product (GDP). The strength of the sector and its effectiveness in generating economic activity become all the more important in an economic recession when other sectors are contracting.

This report provides an up-to-date analysis of key economic aspects of UK universities in the academic year 2007/08. Analysis is made of the impact of the sector as a conventional industry, highlighting the major economic characteristics of UK universities, including their sources of revenue, employment created, output generated and export earnings attracted. Modelled estimates are made of the economic activity generated in other sectors of the economy through the secondary or 'knock-on' multiplier effects of the expenditure of the universities, their staff and that of their international students and visitors⁵. In this study, for the first time, estimates are also made of the sector's contribution to GDP.

For the purposes of this study the sector is defined as the 166 universities and colleges included in the Higher Education Statistics Agency (HESA) data for the study year (2007/08) together with the personal off-campus expenditure of their international (non-UK domiciled) students and visitors. The personal expenditure of UK-domiciled students is excluded since such expenditure is not additional to the UK economy but may take place anyway, irrespective of student status.

The institutions covered in this analysis are diverse in origin, mission and size. They include universities (six of which are 'ancient', with origins going back to medieval times), art colleges, conservatoires, colleges of higher education, university colleges, agricultural colleges and research institutes. Their student numbers range in size from fewer than 500 students to over 30,000, with an annual turnover ranging from less than £9 million to over £600 million; 131 are located in England, with 19 in Scotland, 12 in Wales and four in Northern Ireland.

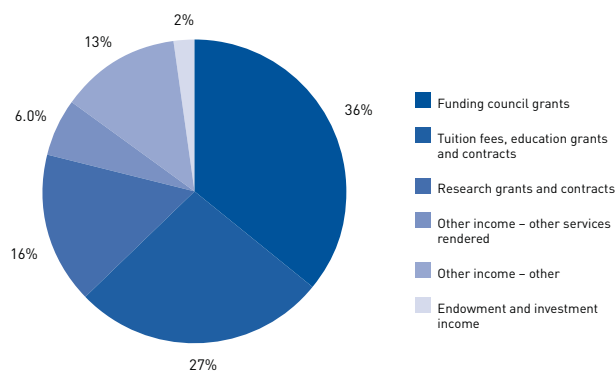
While the institutions under examination are the major suppliers of higher education in the UK, some further education colleges also offer courses at this level. There are significant numbers of higher education students registered at further education colleges and private institutions but relevant data on these are not included in HESA publications and are not available in a comparable format from other sources. While this report will therefore capture most of the economic impact of higher education as an activity, its overall impact will be somewhat greater.

This study follows on from, and updates, earlier analyses of the economic impact of higher education, which have been published since 1997⁶. The study follows essentially the same methodological approach as the earlier reports. Direct comparisons with previous results are not appropriate, however, as a new input-output model, with a different specification, has been developed and there are also a number of definitional differences in the data sources.

The 166 universities and colleges included in this study cover a wide range of types. As individual enterprises they vary in mission, size and scale of operations. All are legally independent entities and are classified as non-profit institutions serving households in the UK national accounts. Taken together they represent a significant sector of the national economy. Their total financial turnover in 2007/08 amounted to £23.4 billion.

Chart 1

University revenue, 2007/08
(£23.4 billion)



Source: HESA, *Resources of higher education institutions, 2007/08*

Chart 1 presents an overall picture of university income sources as classified by HESA. Most revenue is directly associated with teaching and research activity (with income from funding council grants, tuition fees and research grants and contracts amounting to 79 per cent of the total); however, 19 per cent of university revenue was earned from the delivery of other services. Further examination of the HESA data provides some additional insight into the sources of other income earned by universities. For example, a significant amount of other income comes from residence and catering operations (which amounted to £1.3 billion in 2007/08). Residence and catering income is not only derived from individual students and staff but is also secured by providing conference and seminar facilities to other organisations. Universities play an important role in promoting and supporting business tourism – a small proportion of their contribution is reflected in the income directly generated from conferences, although many of their large events provide a wider benefit by generating income to their host regions since most of the relevant business will go to local hotels. This is discussed in more detail in Section 5.

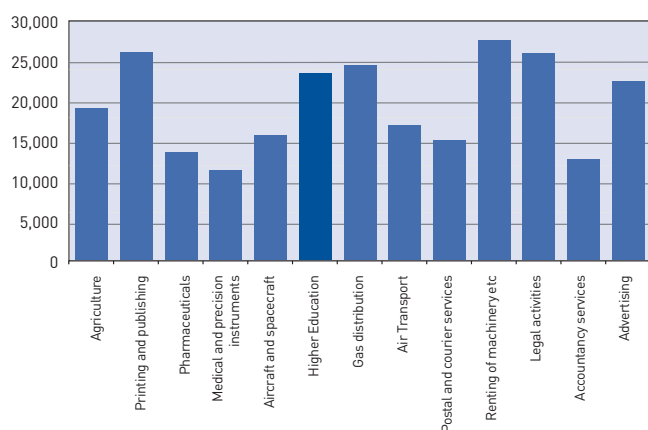
Other sources of revenue for universities can include consultancy and intellectual property income, such as that from royalties. There is a current drive by government to encourage universities to exploit intellectual property through patents, licensing and spin-outs. However, at the moment the income formally attributable to the exploitation of intellectual property rights in the form of royalties represents a relatively small proportion of overall university revenue (£37 million) and is concentrated in a minority of institutions. In total only 54 institutions reported income from this source in 2007/08 and only nine reported such income exceeding £1 million. While HESA does not disaggregate consultancy income, the higher education-business and community interaction survey for 2007/08 reported nearly £335 million income from consultancy, which was considerably higher than that from licensing and royalties.⁷

The report on intellectual property by Professor Paul Wellings for the former Secretary of State for Innovation, Universities and Skills in 2008 highlighted the fact that the most important benefits arising from university inventions and innovations may be the social and economic benefits accruing to society at large. These economic benefits will not always be captured by an analysis of the income streams from intellectual property as their value to society is likely to be greater than the direct financial returns to universities⁸. This suggests that university success in making an impact through innovation can go beyond that reflected in terms of the intellectual property income they receive. Studies of the wider social and economic benefits of universities, including the benefits of knowledge transfer, are currently being undertaken in a major research initiative on the impact of higher education institutions on regional economies, which is funded by the Economic and Social Research Council (ESRC) and the higher education funding councils.⁹

In national accounting terms, university annual turnover is equivalent to *sectoral gross output* as defined for all firms and industries. With revenues of £ 23.4 billion, the higher education sector is a significant UK industry. To put this into context, chart 2 gives examples of similarly sized industries¹⁰. It shows that the higher education sector was comparable in size to the printing and publishing and legal activities industries, slightly larger than the advertising industry and considerably larger than the pharmaceutical and aircraft and spacecraft industries.

Chart 2

Industry comparisons: sectoral gross outputs, 2007/08 (£ million)



Source: Industry comparisons from ONS UK Input-Output Supply Table (2007)

With an industry of the comparative significance of higher education (as highlighted in chart 2), it is important to analyse who pays for its services. Further analysis of university income data gives an insight into its wide client base. HESA records the sources of revenue for research grants and contracts as well as for some elements of other income generated. It also records tuition fee revenue from non-EU sources and provides some information on the sources of other tuition fees (for example, where they are paid by public sector agencies such as the Scottish Student Awards Agency), which enables estimates to be made of private fee payments. Information was also sought from other sources including the Association of College and University Business Officers' (CUBO) annual reports, which were used to inform estimates of the sources of other income generated, such as that from residence and catering operations. The outcome of this analysis is shown in table 2 below.

Table 2

Estimated sources of university income, 2007/08

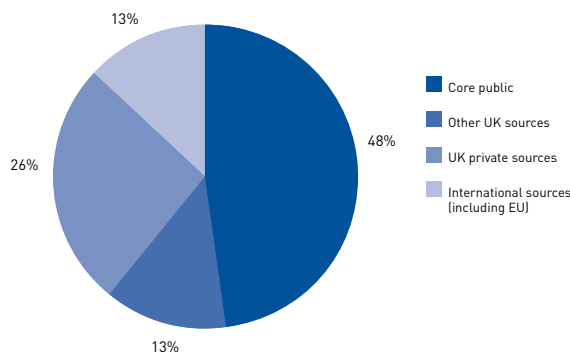
Source of income Type of income	(£ million)			Totals
	UK public sources	UK private sources	International sources (public and private including EU)	
Funding council grants	8,508	0	0	8,508
Tuition fees and education grants	2,636	1,731	1,887	6,254
Research grants and contracts	1,997	1,176	548	3,722
Other services rendered	492	734	245	1,471
Other general income	681	2,037	259	2,977
Endowment and interest	0	508	0	508
Totals	14,314	6,186	2,939	23,440

Sources: Analysis derived from HESA

The majority of university income is from the public sector (making up 61 per cent of total revenue) but it is worth noting that institutions also attract income from a wide range of other clients. Sources of income are summarised in chart 3 below.

Chart 3

Sources of university revenue, 2007/8 (£23.4 billion)



Source: Analysis of HESA data

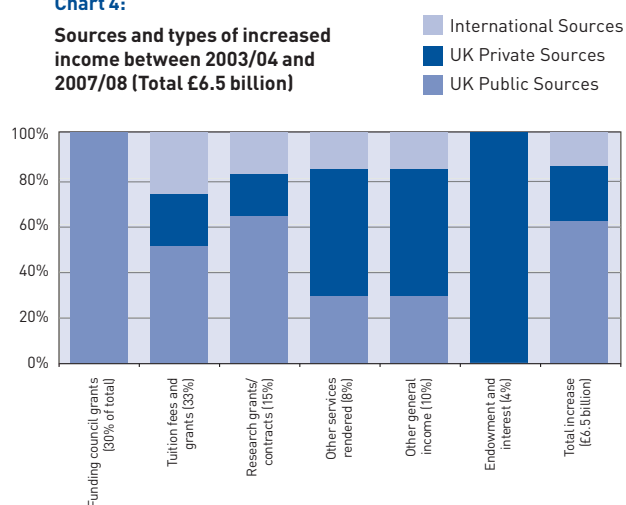
Chart 3 shows that 39 per cent of university revenue derives from private sector and international sources. 'Core' public sector income (defined as all funding council grants together with tuition fee payments from public sources) accounted for 48 per cent of all university income in 2007/08. Universities attracted a further 13 per cent of revenue from other public sources – these monies are usually won on a competitive basis for a range of services, including some research contracts.

In a general sense universities compete for all public monies in one way or another. However, competition for 'core' public sector funding tends to be 'intra-sectoral' – with institutions mainly competing against each other for domestic students and with funding council monies being tied to student numbers, research assessment exercise outcomes and progress in meeting other government targets. 'Other' public funding reflects more 'inter-sectoral competition', and to attract this revenue UK universities will have been in competition with government research institutes, private consultancy firms and other bodies within the UK and internationally.

Revenue from international sources (that is, *all* non-UK sources) represents export earnings for the UK. In 2007/08, the sector attracted nearly £3 billion of international revenue, which equates to universities' gross export earnings. This estimate was achieved by analysing the income sources within the classifications reported in HESA. The outcome figure of £3 billion is likely to be an underestimate of the amount of institutions' export earnings as, for example, HESA does not entirely differentiate between UK income and that from other EU countries (a distinction is made in some income categories but not all).

While the sector's revenue has risen substantially since we published our last study in 2006 (by 39 per cent: from £16.9 billion in 2003/04 to £23.4 billion in 2007/08), the overall balance of revenue sources remains similar. This suggests that universities continue to be able to leverage significant levels of private and international revenue to match increases in public sector income. The underlying trends in the increase in revenue between 2003/04 and 2007/08 were compared. Chart 4 illustrates from where the additional £6.5 billion of revenue has come and the broad types of income involved.

Chart 4:
Sources and types of increased income between 2003/04 and 2007/08 (Total £6.5 billion)



Source: Analysis of HESA data

Of the total increase of £6.5 billion, 30 per cent came in the form of funding council grants and 33 per cent was made up of additional tuition fees from public, private and international sources. 15 per cent of the increase came from research grants and contracts while other services rendered and general income (which includes, for example, residence and catering and consultancy income) rose by 18 per cent. The universities also increased the income they received from endowments and interest payments. Income from these sources more than doubled (a 115 per cent increase) between 2003/04 and 2007/08.

Chart 4 shows the underlying balance in terms of income from the UK public sector, the private sector and international sources. Overall 61.7 per cent of the additional £6.5 billion came from the public sector, with 23.8 per cent from the private sector and 14.5 per cent from international sources. This is very similar to universities' overall income profile and is evidence that they can leverage additional funds from the private sector and from international clients to keep pace with increased public sector support.

3 Employment profiles of UK universities

One of the most important roles that universities play in the economy relates to how many staff they employ. They tend to be labour-intensive enterprises and can be very large employers. Their importance as employers is well recognised at the regional level, since they are frequently among the largest employers in their regions. Universities are recognised for providing skilled and relatively high paid employment and attracting highly qualified people to an area (which in itself can contribute to increasing a region's capacity to absorb new ideas and innovations, making it more competitive). However, they are also important in providing employment in occupations across the entire skills spectrum.

HESA first published comprehensive data on higher education staffing in 2005 and this is now regularly collected; staff roles have also been identified and mapped to standard occupational classifications¹¹. This means that the full range and diversity of university employment can now be observed and compared with the employment profiles of other industries. In 2007/08, over 372,000 people were employed in universities and colleges across the UK. Table 3 below shows the range of employment within institutions.

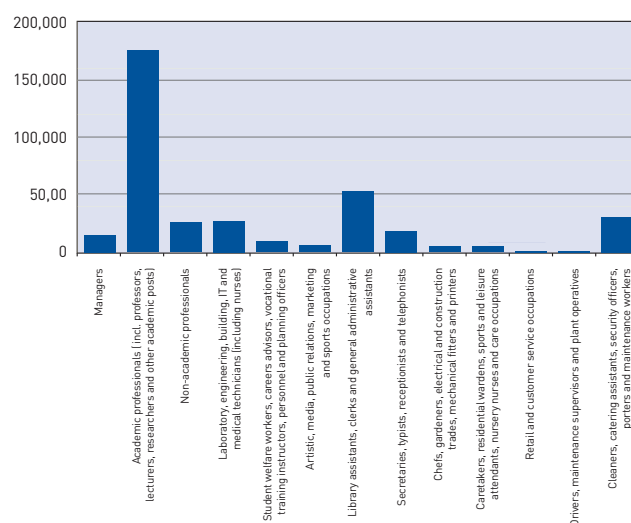
Table 3:
Employment in UK universities, 2007/08

Employment in UK universities ('headcount')	Total	Percentage of total
Managers	14,910	4.0
Academic professionals (including professors, lecturers, researchers and other academic posts)	174,930	47.0
Non-academic professionals	25,820	6.9
Laboratory, engineering, building, IT and medical technicians (including nurses)	27,125	7.3
Student welfare workers, careers advisers, vocational training instructors, personnel and planning officers	9,360	2.5
Artistic, media, public relations, marketing and sports occupations	5,795	1.6
Library assistants, clerks and general administrative assistants	52,575	14.1
Secretaries, typists, receptionists and telephonists	18,200	4.9
Chefs, gardeners, electrical and construction trades, mechanical fitters and printers	5,105	1.4
Caretakers, residential wardens, sports and leisure attendants, nursery nurses and care occupations	5,155	1.4
Retail and customer service occupations	1,225	0.3
Drivers, maintenance supervisors and plant operatives	1,435	0.4
Cleaners, catering assistants, security officers, porters and maintenance workers	30,780	8.3
Totals	372,415	100.0

Source: HESA

The total 'headcount' number of staff includes both full time and part time employment. According to HESA, this equates to 314,632 full time equivalent jobs, which is equivalent to 1.2 per cent of 2007 UK full-time equivalent employment¹². The full time equivalent employment profile of universities in 2007/08 is shown in chart 5 below.

Chart 5
University full-time-equivalent employment profile, 2007/08



Source: HESA

Chart 5 illustrates the broad range of higher education employment, which reflects the multi-faceted nature of activities in which universities engage. The overall ratio of academic to other support staff (45 per cent academic, 55 per cent other support staff) remains broadly similar to that observed in previous studies.

The university employment profile reflects the many inputs required to support the delivery of higher education services. Institutions need to manage a substantial infrastructure, including the maintenance of estate and buildings. Apart from laboratories, lecture theatres and offices, this includes residential accommodation, catering facilities, sports and recreation centres. The competitive environment in which universities operate also requires a diverse range of support professionals – for marketing and student recruitment as well as for business development and research management. A growing emphasis on enhancing the 'student experience' (coupled with students paying a larger proportion of the cost than previously and harbouring greater expectations of the services provided) requires additional support staff, such as welfare officers and careers advisers.

Moreover, a proportion of university activity (particularly commercial operations such as residence and catering or conference business) aims to generate revenue not only to cross-subsidise the 'core' teaching and research portfolio, but also to enable the institution to support other, less financially rewarding, activities that are in keeping with their particular institutional mission. This can include summer schools for young people or maintaining museums and galleries or artistic and scientific collections of historical importance. Such activities also require a range of specialist staff. The complex nature of the higher education business is reflected in the sector's non-academic staff profile with, for example, over 5,700 people being employed in 'artistic, media, public relations, marketing and sports occupations' and over 1,200 staff in 'retail and customer service occupations' as well as more traditional support staff roles (such as library assistants, laboratory technicians, cleaners and security staff).

As can be seen from the previous sections, universities make up a substantial UK industry, with an annual turnover of £23.4 billion and providing over one per cent of full time equivalent employment in the UK. In 2007/08, university expenditure amounted to £22.9 billion, which was almost the same amount as they earned (which is to be expected for non-profit-making organisations). In addition to their own output and employment, universities' expenditure generated additional output and employment in other sectors of the economy through secondary or 'knock-on' multiplier effects.

These 'knock-on' or multiplier effects are generally recognised as comprising two types of economic interaction:

- **indirect effects:** universities purchase goods and services from other sectors in order to support their own activity, thereby stimulating activity within those industries. The supplying industries also buy from other suppliers in order to fulfil university orders, and those suppliers in turn buy, so that there is a rippling-out effect.
- **induced effects:** universities pay wages and salaries to employees, who in turn spend this income on consumer goods and services. This creates wage income for employees in other sectors, who also spend their income and so on, creating a ripple effect throughout the economy as a whole.

In order to produce estimates of these 'knock-on effects', it is necessary to develop an operational model of the national economy. For the purposes of this study a complete type II input-output model was constructed, based on Office of National Statistics' UK input-output tables (2006). The model also included a labour market extension, derived from official Labour Force Survey data. The model enabled the impact generated by university expenditure to be traced through the economy. The specification of the model is described in the appendix.

Details of the major components of university expenditure were available from HESA and these provided the basic initial expenditure data required. However, this data alone is insufficient for modelling purposes, because the pattern of university expenditure (which types of goods and services they buy, and the proportion of expenditure on UK, rather than imported, goods and services) will determine the pattern of demand arising in different industries. The team made detailed estimates of university expenditure types, using data from a range of sources. These included data from a sector wide survey conducted for previous studies, together with observations of detailed patterns of expenditure from a number of individual universities studied by the team, and information obtained from higher education purchasing consortia. This facilitated the construction of a disaggregated university expenditure vector for incorporation into the model, which enabled the calculation of the economic activity generated in other industries in terms of:

- **sectoral gross output:** this is measured in monetary units and for most industries it is approximately equivalent to the level of turnover or gross receipts. For the distribution and transport industries it is a measure reflective of gross margins.
- **employment:** measured in terms of full time equivalent jobs (physical units) where one part time job = 0.5 of a full time job.¹³

Analysis was also undertaken of the contribution to GDP, which is discussed in Section 6. The results for the impact of university expenditure are summarised below in table 4.

Table 4
Output generated in the economy by universities, 2007/08 (£000)

University gross output (definitionally equivalent to university revenue)	£23.44 billion
University expenditure	£22.88 billion
Secondary or knock-on output generated in other UK sectors	£32.36 billion
Total output generated by universities (university output plus knock-on output)	£55.80 billion

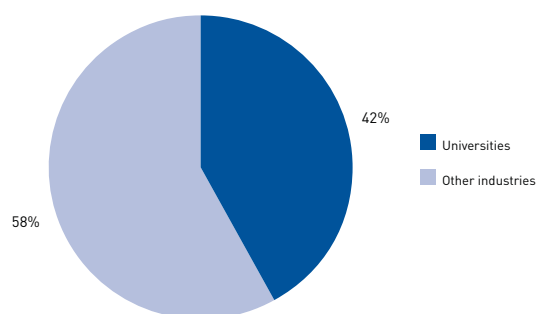
Source: HESA and the Universities UK economic impact modelling system (2009)

As table 4 shows, universities spent £22.88 billion in 2007/08 (of which some £19.5 billion was estimated to have been spent on UK, rather than imported, goods and services) and this expenditure generated £32.36 billion of output in other UK industries.

As has been highlighted earlier, the universities' own direct output (equivalent to annual turnover) amounted to £23.44 billion. Therefore the total output generated by universities (their own direct output combined with the secondary output in other industries) came to £55.80 billion. This is illustrated in chart 6.

Chart 6

Total output generated by UK universities, 2007/08 (£55.80 billion)

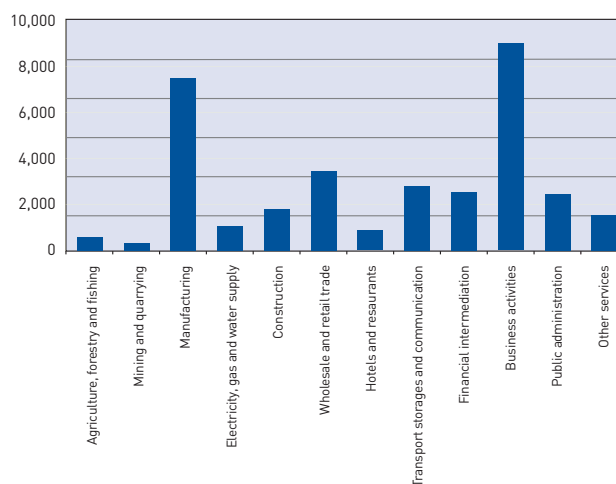


Source: Universities UK economic impact modelling system (2009)

The ratio of total output to direct output is defined as the *sectoral gross output multiplier*, with a calculated value for UK universities of **2.38**. Therefore, for every £1 million of direct university output a further £1.38 million was generated in other sectors of the economy. Chart 7 illustrates the pattern of total output generated by universities across the UK economy. It shows that the secondary output was spread across a range of other sectors, particularly manufacturing, wholesale and retail trade, and business activities. Although the institutions themselves had a very high propensity to purchase UK goods and services (including labour services), the overall impact was moderated by the fact that significant fractions of their labour payments were 'leaked' from the economy in the form of staff import purchases and tax payments.

Chart 7

Secondary output generated by UK universities by sector, 2007/08 (£32.36 billion)



Source: Universities UK economic impact modelling system (2009)

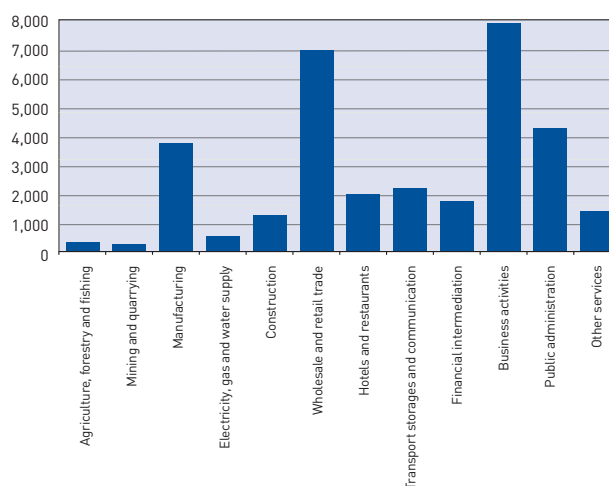
Employment generated by universities

As well as universities being large employers in their own right, their expenditure leads to jobs being generated in other industries. The team was able to analyse the impact on employment across the economy arising through secondary or 'knock-on' effects of expenditure by universities and their employees.

Analysis showed that an estimated 324,456 full-time-equivalent jobs were generated in other industries outside the higher education sector. The pattern of employment across other industries is shown in chart 8 below.

Chart 8

Secondary employment generated by university expenditure, 2007/08 (324,456 full time equivalent)



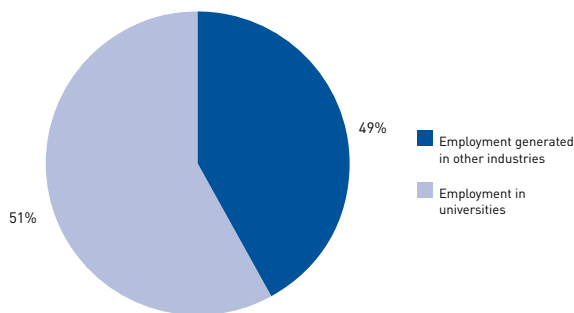
Source: Universities UK economic impact modelling system (2009)

As chart 8 shows, employment was generated across all sectors of the economy, with particularly notable impacts on manufacturing, the wholesale and retail trade as well as business activities. The employment impact is a reflection of the types of purchases made by universities and their staff as well as the process through which they were made. For instance, universities make major capital and equipment purchases as well as relying on a range of business services. Staff expenditure will be more oriented towards individual consumer purchases - food, clothes, and other general consumer goods - buying from shops and other retail outlets. Wholesale and retail distributors of consumer goods will benefit from this (as they attract a retail margin even when the goods themselves are imported).

As discussed earlier, the HESA data shows that universities directly employed over 372,400 people in 2007/08, which equates to 314,632 full time equivalent jobs. This means that in total, both through employing staff directly and through generating jobs in other industries through secondary effects, universities generated an estimated 639,088 full time equivalent jobs in the UK economy in 2007/08.

This gives an *employment multiplier* (defined as total employment divided by direct employment) for universities of 2.03, indicating that for every 100 jobs created directly within an institution, another 103 jobs are generated elsewhere in the economy.

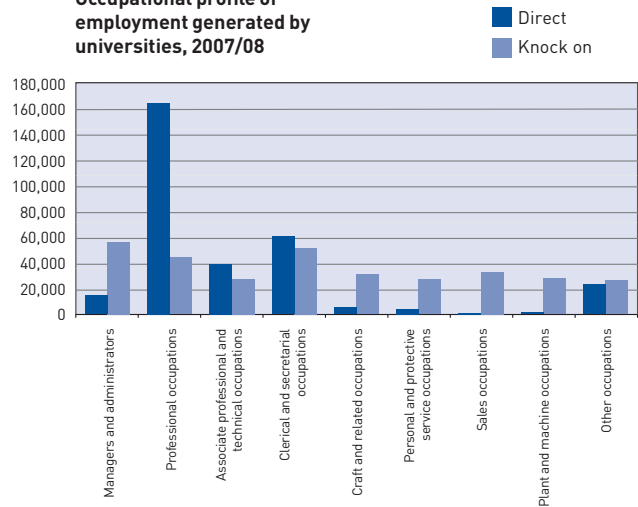
Chart 9
Employment generated by UK universities, 2007/08 (639,088 full time equivalent)



Source: Universities UK economic impact modelling system (2009)

Section 3 discussed the diverse pattern of employment within universities. However, the occupational profile of the secondary employment generated is more similar to that of the UK as a whole. It is also possible to compare the occupational profile of university direct employment with that of the jobs generated by the universities elsewhere in the economy. This is shown in chart 10.

Chart 10
Occupational profile of employment generated by universities, 2007/08



Source: HESA and the Universities UK economic impact modelling system (2009)

Chart 10 compares the occupational profile of university employment with that generated elsewhere in the economy by university expenditure. This highlights the specialised nature of some of the employment within universities (with a high concentration in professional occupations and a greater proportion in associate professional and clerical occupations compared to that generated through secondary effects). It is clear that direct employment in higher education shows a lower proportion of management occupations compared to those in the secondary employment generated. However, this is predominantly an issue of classification, as many people who might be classified as managers in other sectors are included in the professional or associate professional occupations in university statistics (for instance, academic managers such as heads of academic departments may be classified as academic professionals).

International students

Universities attract a substantial number of EU and international students, studying at institutions throughout the UK. In 2007/08, there were 341,810 students from outside the UK registered at UK institutions. These made up nearly 15 per cent of the total student population¹⁴. These students all make payments directly to universities for their fees, accommodation and other costs and the impact of these monies is captured within the calculation of university impact (income from residence and catering operations is covered in section 2). However, students also buy a wide range of goods and services off-campus. For example, the private rented sector benefits from students' need for accommodation (while many institutions have a stock of student accommodation, few – if any – can accommodate all their students), local supermarkets provide food and drink and local pubs and clubs frequently rely heavily on student trade. Even a casual observer will note that around any university or college there is a proliferation of cafes, snack bars, pubs and shops that seem to draw a large proportion of their business from students. The contribution of students to the prosperity of university cities is a subject of increasing interest and is also currently being studied as part of the research looking at the impact of higher education institutions on regional economies, supported by ESRC and the higher education funding councils¹⁵.

Expenditure by international students from outside the UK makes an injection into the national economy, as well as representing export earnings. It is important to note that the expenditure of *all* non-UK domiciled students is relevant, whether they are from the rest of the EU or from further afield. While EU students pay the lower domestic fee they spend money off-campus in the same way as students from other countries.

There are regular surveys of UK student expenditure: the most recent was published by the former Department of Innovation, Universities and Skills (DIUS) in April 2009¹⁶. This survey data – about English-domiciled students – was used to estimate student expenditure and in the absence of survey data on international student expenditure, it was assumed that such expenditure would be similar to that of domestic students.

To avoid any double-counting, the overall estimate of expenditure was reduced to allow for payments made to institutions for catering, residence charges and other items¹⁷. This gave a final total estimated off-campus expenditure figure for international students studying in the UK of £2.3 billion in 2007/08.

International visitors

There is another area of university activity that should be noted, which is the role that institutions can play in attracting visitors to the UK, which in turn is a significant contribution to national business tourism. The expenditure of university business and leisure visitors contributes to the UK economy in the same way as that of students.

The part that universities play in business tourism is beginning to be more widely recognised. For example, many cities have established 'conference ambassador programmes' to support senior academics and other professionals in attracting major international conferences to a region¹⁸. University staff can be pivotal to the success of local conference business as internationally renowned academics are in a position to influence major learned societies and research associations in their choice of conference location. Universities also frequently provide holiday accommodation for leisure visitors, group tours and summer school participants, as well as for individual visiting scholars. The annual report of the Association of College and University Business Officers for 2008 indicates that there are 134,000 bed spaces in its member institutions (which include 90 of the 166 institutions on which this study is based). Virtually all universities let out accommodation to visitors during the vacations.

In order to make an estimate of international visitor expenditure, the study team drew on previous survey based information (a previous study had collected data on university visitor numbers). These numbers were adjusted in line with the overall trend in visitors to the UK¹⁹. This gave an estimate of 1,148,695 business and 468,384 leisure visitor bednights in 2007/08. Per diem expenditure rates were sourced from the Office for National Statistics' *Travel trends*. It was therefore possible to derive an estimate of total international visitor expenditure in 2007/08. This total figure was also reduced in order to take account of monies paid directly to universities (for example, for residence and catering operations) and a final estimate of personal off-campus expenditure for international visitors amounted to £135 million. This also represents export earnings for the UK.

Expenditure figures for international students and international visitors were disaggregated into the format required for the model (with expenditure vectors constructed that reflected the ‘individual consumer’ oriented nature of student and visitor spend). The resulting impact on the UK economy is shown in table 5.

Table 5

Impact of international student and international visitor expenditure, 2007/08

	Overseas students	Overseas visitors
Total personal expenditure (off campus)	£2.3 billion	£135 million
Knock-on output generated throughout UK economy	£3.26 billion	£189 million
Knock-on employment generated	27,868 full time equivalent jobs	1,613 full time equivalent jobs

Source: Universities UK economic impact modelling system (2009)

It is clear that while the mainstream activity of universities has the most significant impact on the economy, the economic activity generated by the off-campus expenditure of international students and visitors is also important and adds an additional dimension to the role of higher education within the economy.

The importance of higher education to the economy can be seen through the generation of significant levels of gross output and employment. However, a key measure of higher education's contribution to the national economy is its contribution to gross domestic product (GDP), which is a net measure. While measures of industry output can give a clear indication of the contribution of an industry in terms of its magnitude and the scale of its generation of economic activity, when looking at the economy as a whole gross output measures inevitably involve an element of double counting, since some of one industry's output also forms part of another industry's output.

GDP is used by all countries as a measure of the net change in their wealth or prosperity as a whole over a year. There are three measures of GDP:

- GDP (I), where the measure is taken of national income;
- GDP (E) where GDP is measured through analysis of certain groups of expenditures;
- GDP (O) which is measured through analysis of industry outputs²⁰.

Gross value added (GVA) is the industry measure of GDP (O). It is a net measure and its principal components are: employment income, rents and gross profits. It is a production measure of the net change in wealth or prosperity in the UK economy as a whole over the year. Therefore an analysis of higher education gross value added can provide policy relevant information and this was undertaken as part of this study. The results are shown in table 6.

Table 6

The contribution of the higher education sector to UK GDP, 2007/08 (£ billion)

	Universities	Inter-national students	Inter-national Visitors	Higher education sector
Direct GDP (O)	£15.16	0	0	£15.16
Secondary GDP(O)	£15.86	£1.51	£0.88	£18.25
Total GDP (O)	£31.02	£1.51	£0.88	£33.41

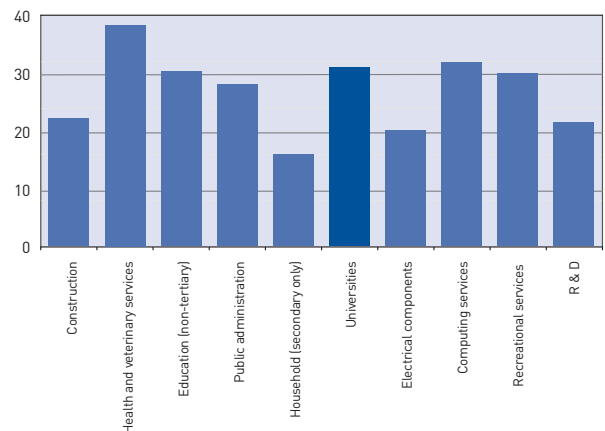
Source: Universities UK economic impact modelling system (2009)

The analysis of higher education gross value added revealed that in the year 2007/08 universities contributed over £31 billion to national GDP through both direct and secondary effects. The off-campus expenditure of international students and visitors made a further £2.4 billion contribution to GDP. Therefore taken together the contribution to GDP came to over £33.4 billion – equivalent to 2.3 per cent of GDP in 2008. This figure excludes any contribution to GDP of the off-campus expenditure of the UK's domestic higher education students (nearly 2 million) since it is assumed that they may have incurred their expenditure in any event.

Higher education's contribution to GDP (O) is clearly significant. Further analysis was undertaken to assess the impact of universities on GDP compared with a number of other UK sectors.

Chart 11

Higher education's contribution to GDP (O) compared to other sectors, 2007/08



Source: Universities UK economic impact modelling system (2009)

As chart 11 shows, the sector's contribution to GDP (O) in 2007/08 was comparable to that made by computing services and recreational services and greater than that of public administration and industry research and development.

This study focuses on the economic impact generated by higher education expenditure. The policy interest in its impact is primarily driven by value for money considerations and the desire on the part of funding agencies, research councils and government itself to see a wider social and economic return on their investment in higher education. To inform this discussion further the authors therefore considered ways in which to assess the *effectiveness* of higher education in generating impact. Analysis was undertaken to examine the impact generated per £1 million expenditure by universities compared to that generated by a number of other UK industry sectors.²¹ The results are shown in table 7.

Table 7

Total impact per £1 million expenditure, 2007/08

	Total output (£1m)	Total employment (FTE)	GDP(0) £1m	Per capita GDP (£1000)
Universities	2.44	27.9	1.35	48.39
Electronic components	1.97	17.0	0.87	51.18
Construction	1.90	20.27	0.96	47.36
Health	3.18	37.49	1.24	33.08
Education (non-tertiary)	2.60	41.58	1.32	31.75
Public administration	2.64	33.82	1.22	36.07
Household final income	1.37	15.56	0.69	44.34
R & D	1.88	24.31	0.93	38.26
Computing services	2.39	33.20	1.39	41.87
Recreational services	2.58	30.46	1.31	43.48

Source: Derived from the Universities UK economic impact modelling system (2009)

In considering the different types of impact created per £1 million of expenditure it may be observed that the measures reflect a range of different characteristics:

- output generated per unit of expenditure tends to reflect the purchasing patterns of the industry in question. Output generated per unit of expenditure tends to be higher in sectors with a relatively high concentration of expenditure on UK (rather than imported) goods and services. (Table 7 shows that universities generate a relatively high output per unit of expenditure, exceeded in these selected comparators only by the health and public administration sectors.)

- sectors generating higher numbers of jobs per £1 million unit of expenditure tend to be those with relatively low output per employees and they also tend to purchase from other sectors with low output per employee.
- high GDP (0) generated per unit of expenditure tends to be in sectors which in themselves have high value added per unit of output and which also tend to purchase from sectors which have high value added per unit of output.
- sectors which generate high GDP per capita are those which tend to be have a high income per employee and high productivity per employee – in other words sectors that tend to have higher paid and highly productive employees.

Household final income tends to be low across all categories both because of leakage through tax payments made together with a trend towards more import purchases.

The selected comparators were ranked according to their effectiveness in generating GDP per £1 million of expenditure and GDP (0) generated per capita (that is, per full time equivalent) and the results are shown in table 8.

Table 8

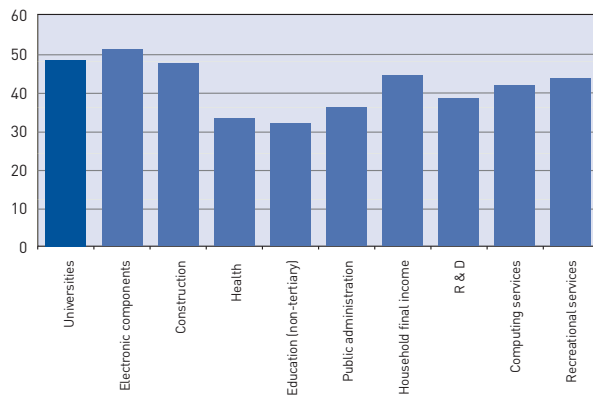
Impact efficiency rankings, 2007/08

	GDP (0) per £1m	Per capita GDP
Computing services	1	6
Universities	2	2
Education (non-tertiary)	3	10
Recreational services	4	5
Health	5	9
Public administration	6	8
Construction	7	3
Research and Development	8	7
Electronic components	9	1
Household final income	10	4

Source: Derived from the Universities UK economic impact modelling system (2009)

Table 8 shows that among the selected comparators higher education was one of the most effective sectors in generating GDP per £1 million unit of expenditure and per capita GDP (that is per full time equivalent) This calculation is shown in chart form below.

Chart 12
GDP impact comparisons,
2007/08



Source: Derived from the Universities UK economic impact modelling system (2009)

This study presents an analysis of key economic characteristics of UK universities and colleges in the academic year 2007/08. It also presents modelled analyses of the impact of university expenditure in generating additional output and employment in other parts of the national economy. It highlights the additional injection to the economy made by international students and visitors and analyses the overall contribution of the sector to UK GDP. The study focuses on universities as business entities and the impact of their expenditure on the economy, which is the aspect of the sector's contribution to the economy that is most readily quantifiable.

The evidence confirms that higher education (defined as the universities together with the expenditure of their staff, international students and international visitors) is a substantial industry, with a significant impact on the national economy. It also reveals that higher education is particularly effective in generating GDP per capita, compared to several other sectors of the economy.

The higher education sector generated £59.3 billion of industry output in the national economy. Universities directly provided over 314,600 full time equivalent jobs, representing more than one per cent of the workforce in employment. Over 353,900 additional jobs were generated throughout the economy through secondary effects, taking the total employment dependent on higher education expenditure to more than 668,000 full time equivalent jobs – or around 2.6 per cent of full time employment in the UK in 2007.

Higher education was also a major service sector export earner, attracting £5.3 billion of international revenue, £2.9 billion of which was paid directly to universities for their services.

Analysis of the revenue base shows that while the public sector remains the largest single client of universities, 39 per cent of their revenue was derived from private sector and international sources.

Overall the higher education sector contributed £33.4 billion to GDP in 2007/08.

The study did not set out to examine higher education's broader social and economic impact, such as that achieved through knowledge transfer and innovation or cultural and community engagement. Neither did it seek to place a value on the work undertaken by higher education²². It is nevertheless clear that higher education is a core part of the national economic infrastructure, generating significant employment and export earnings and making a substantial contribution to GDP.

The overall impact of the higher education sector (taking the impact of institutions together with that of the off-campus expenditure of international students and visitors) is presented in table 9.

Table 9
Overall impact of the higher education sector on the UK economy, 2007/08²³

	Universities	International students	International visitors	Higher education sector
OUTPUT				
Direct output	£23.44 billion	0	0	£23.44 billion
Secondary output	£32.36 billion	£3.26 billion	£0.19 billion	£35.81 billion
Total output generated (direct plus secondary)	£55.80 billion	£3.26 billion	£0.19 billion	£59.25 billion
GDP(O)				
Direct GDP(O)	15.16 billion	0	0	15.16 billion
Secondary GDP(O)	15.86 billion	1.51 billion	0.88 billion	18.25 billion
Total GDP(O)	31.02 billion	1.51 billion	0.88 billion	33.41 billion
EMPLOYMENT				
Direct employment	314,632	0	0	314,632
Secondary employment	324,456	27,868	1,613	353,937
Total employment generated (direct plus secondary)	639,088	27,868	1,613	668,569
EXPORT EARNINGS				
Export earnings	£2.9 billion	£2.3 billion	£0.14 billion	£5.3 billion

Source: Universities UK economic impact modelling system (2009)
Note: All employment figures are full time equivalents.

The model used was a purpose designed and specially constructed 'type II' input-output model of the UK economy, based on actual data derived from the Office of National Statistics' input-output tables (2006) together with Labour Force Survey data²⁴.

Methodology and model specification

Creating the Leontief matrix

The Leontief matrix is a vital starting point within the economic model. The team used the Office for National Statistics' (ONS) input – output tables (2006) and it proved possible to create a type I and then a type II model from this data source. One additional source used was the national accounts data (Blue Book, 2008) in order to estimate wages (compensation of employment in national accounts terminology) as a proportion of the total household income from all sources. If non-wage income was not included in the denominator then the type II model would overestimate the impact of knock-on effects throughout the economy. The C-Map program was used in order to invert the 124 x 124 matrix.

First, we estimated a domestic money flows intermediate matrix, X^{DD} , and a domestic money flows final demand vector (excluding exports), Y^{DD} . We also extracted the vector of exports, E , from the input-output tables. Following this we used the matrices from above to *calculate* the vector of domestic gross outputs, X^D , to be used as control totals and for the estimation of coefficients; i.e.

$$(1) X^D = X^{DD} + Y^{DD} + E.$$

Following this we calculated the domestic flows coefficient matrix,

$$(2) A^{DD} = \frac{X^{DD}}{X^D}$$

We then calculated the type I Leontief inverse as:

$$(3) \{I - A^{DD}\}^{-1}$$

This was then validated by calculating the following: (this is known as a recreate base or a base year test)

$$(4) X^* = \{I - A^{DD}\}^{-1} \{Y^{DD} + E\}$$

As calculated X^* was found to equal actual X^D , then the type I Leontief inverse was correct since it replicates the 'model' base year outcomes.

For the type II Leontief we needed to add a row of employment income coefficients and a column of household consumption coefficients to the A^{DD} matrix. For the income coefficients we then calculated for all industries:

$$(5) Y_i^E / X_i^D$$

Where Y_i^E is compensation of employees in industry I and X_i^D is domestic output of industry I from above. Total household income Y^T was estimated as employment income Y^E (estimated from the input-output tables), plus other income Y^O from the Treasury Blue Book (2008.)

From the simulated domestic final demand matrix Y^{DD} estimated earlier, we used the column vector of domestic household consumption C^{DD} . From this the column vector of consumption coefficients is calculated as:

$$(6) C^{DD} / Y^T$$

The type II Leontief inverse was now calculated. As above, validation involved ensuring that the expanded model was able to replicate actual base year outputs, including in this case total household income.

Extensions to model framework

UK employment figures by industry were created, using the Labour Force Survey where possible. Using this and the type II Leontief, the employment/output ratios can be calculated. This allows the creation of the employment sub-matrix.

The UK occupation-by-industry submatrix was formed using primary data. The occupation by industry data was compiled from previous Tourism Satellite Accounts, compiled by the authors for the former Department for Culture, Media and Sport,²⁵ which used the Labour Force Survey.

The extended labour market input-output model

The following describes both the use of the data already described in the creation of the model and the nature of the extended input-output model used as the main engine of analysis.

The basic UK input-output equation here is:

$$(7) X^{JK} = \sum_{i=1}^j X_{ij}^{JK} + Y^{JK}$$

where:

i, j = industrial sectors 1 to 124 including households

X^{JK} = vector of gross outputs

X_h^{JK} = total household income

X_{ij}^{UK} = matrix of volumes of sales from UK sector i to UK sector j

X_{hi}^{UK} = employment income paid by sector i

Y^{UK} = matrix of UK sectoral sales to final markets

Y_h^{UK} = UK household non-employment income

Taking the conventional input-output assumption that:

$$(8) X_{ij}^{UK} = a_{ij}^{UK} X_j^{UK} \quad \forall_{ij}$$

or, in matrix form:

$$(8a) X_{ij}^{UK} = A^{UK} X^{UK}$$

where: A^{UK} is a matrix of parametric constants, whose typical element a_{ij}^{UK} gives the inputs required from UK industry i per unit of output of UK industry j.

Substituting (8a) into (7):

$$(9) X^{UK} = A^{UK} X^{UK} + Y^{UK}$$

and solving (9) for X^{UK} :

$$(10) X^{UK} = [I - A^{UK}]^{-1} Y^{UK}$$

where $[I - A^{UK}]^{-1}$ is the UK Type II Leontief Inverse

In the extended input-output model we define a vector of aggregate industry employment-output coefficients, e , with elements given by:

$$(11) e^i = E_i^{UK} / X_i^{UK} \quad i = 1 \text{ to } 123 \text{ sectors}$$

where: E_i^{UK} is total full time equivalent employment in UK industry i. Then, the vector E^{UK} of total UK sectoral employments is:

$$(12) E^{UK} = \hat{e} X^{UK}$$

Or alternatively,

$$(12a) E^{UK} = \hat{e} [I - A^{UK}]^{-1} Y^{UK} \text{ (by substitution from (10))}$$

For the creation of the occupation by industry matrix²⁶ we define a matrix, o^{UK} , of UK occupational employment shares coefficients with elements given by:

$$(13) o_{oj}^{UK} = O_{oj}^{UK} / E_j^{UK} \quad o = 1 \dots\dots 371 \text{ occupations} \\ j = 1 \dots\dots 123 \text{ sectors}$$

where: O_{oj}^{UK} is full time equivalent employment in occupation o in industry j.

Then a vector, O^{UK} , of total UK employment in each occupation is obtained as:

$$(14) O^{UK} = o^{UK} \hat{E}^{UK}$$

and from (12a):

$$(15) O^{UK} = o^{UK} \hat{e} [I - A^{UK}]^{-1} Y^{UK}$$

Which is occupation by industry equating with overall full time equivalent employment across the UK. This will operate through the impact of expenditure within the economy in a consistent manner.

Overall the key results of the UK extended input-output labour market model are derived from the following equations:

Sectoral gross outputs

$$X^{UK} = [I - A^{UK}]^{-1} Y^{UK}$$

Sectoral total employment

$$E^{UK} = \hat{e} [I - A^{UK}]^{-1} Y^{UK}$$

Employment by occupation

$$O^{UK} = o^{UK} \hat{e} [I - A^{UK}]^{-1} Y^{UK}$$

Model Gross Value Added (GVA) is calculated by deriving the matrix, g^{UK} , of UK GVA shares coefficients with elements given by:

$$(16) g_{oj}^{UK} = G_{oj}^{UK} / X_j^{UK} \quad G = 1 \dots\dots 123 \text{ GVA} \\ j = 1 \dots\dots 123 \text{ sectors}$$

Where: G_{oj}^{UK} is actual GVA within industry j.

Then a vector, G^{UK} , of total UK GVA for a given input-output is obtained as:

$$(17) G^{UK} = g^{UK} [I - A^{UK}]^{-1} Y^{UK}$$

- 1 The input-output tables issued in 2006 were the most recent available during model construction.
- 2 Office of National Statistics (2007) Labour Force Survey August-October 2007. 668,569 full time equivalent jobs were equivalent to 2.6 per cent of all full time equivalent employment (all persons in employment, including self-employed and government trainees) in 2007 (taking 1 part time job as equal to 1 full time job.)
- 3 Office for National Statistics (2009) *Travel trends 2007* Cardiff: Office for National Statistics. Online at www.statistics.gov.uk/downloads/theme_transport/Travel_Trends_2007.pdf
- 4 From Office for National Statistics data for 2008 nominal GDP in current prices
- 4 Summary figures are rounded
- 5 A type II UK input-output model was constructed specifically for this study; in addition 12 regional extensions to the model were further developed, covering every part of the UK. The model and the 12 regional extensions are designed to model the impact on both the regional and national economies. Details of the UK input-out model specification are included in the appendix.
- 6 McNicoll I H, McCluskey K, Kelly U (1997) *The impact of universities and colleges on the UK economy: A report for CVCP* London: Committee of Vice Chancellors and Principals; Universities UK (2006); *The economic impact of UK higher education institutions* [authors U Kelly, I McNicoll and D McLellan]; Universities UK (2002) *The impact of higher education institutions on the UK economy*. [authors: U Kelly, R Marsh and I McNicoll] London: Universities UK
- 7 *The higher education business and community interaction survey* figure for total intellectual property rights income in 2007/08 was £66 million, which differs from the HESA figure for definitional reasons (for example, it includes the sale of shares). Online at: <http://www.hefce.ac.uk/econsoc/buscom/hebci/>
- 8 'A policy framework pushing universities to maximise financial returns to the university rather than social and economic benefits for society, government and industry is, on the balance of probabilities, doomed to fail in the long run'. From Wellings P (2008) *Intellectual property and research benefits*.
- 9 See www.impact-hei.ac.uk for more information about this research initiative
- 10 Comparator sectoral gross outputs are taken from the Office for National Statistics (2007) UK input-output tables online at http://www.statistics.gov.uk/about/methodology_by_theme/inputoutput/latestdata.asp
- 11 Further details of the staff classifications are given by HESA. See <http://www.hesa.ac.uk/index.php/content/view/291/161/1/1/>
- 12 Office of National Statistics (2007) Labour Force Survey August-October 2007. 314,632 full time equivalent jobs were equivalent to 1.2 per cent of all full time equivalent employment (all persons in employment, including self-employed and government trainees) in 2007 (taking 1 part time job as equal to 1 full time job).
- 13 This is the standard conversion rate used by the Office for National Statistics.
- 14 Total student population in 2007/08 was 2,306,130 (HESA)
- 15 'Students as catalysts for city and regional growth': see website of *Impact of higher education institutions on regional economies initiative*, at www.impact-hei.ac.uk/Projects/Studentsascatalysts.aspx
- 16 The most recent is Johnson, et al (2009) *Student income and expenditure survey 2007/08* Research report 09/05, published for Department of Innovation, Universities and Skills (DIUS). Accessed at www.dius.gov.uk/research_and_analysis/research_reports
- 17 The final per capita estimate used for international student off-campus expenditure came to £6801
- 18 For example, the Newcastle Gateshead Ambassador Programme www.newcastlegateshead.com/243/Conference_Ambassador_Programme.html
- 19 From Office for National Statistics (2009) *Travel trends 2007*. Cardiff: Office for National Statistics. Online at www.statistics.gov.uk/downloads/theme_transport/Travel_Trends_2007.pdf
- 20 All three measures share the same accounting identity. In other words they are three different ways to measure the same thing and the final outcome measurement should be identical. If there are observed differences between the measures this is a result of data discrepancies.
- 21 These are a small group of sectors selected on the basis of interest and for illustrative purposes. It is not a full ranking of all 123 industries within the model.
- 22 In other studies the authors have constructed a framework to enable economic valuation of higher education outputs – for more information see: <http://strathprints.strath.ac.uk/7179/>
- 23 Summary figures are rounded
- 24 This UK model was constructed specifically for this study; in addition 12 regional extensions to the model have been developed, covering every part of the UK. The UK model and the 12 regional extensions form part of the system known as the Universities UK economic impact modelling system, which is purpose designed to model the impact of universities on both the regional and national economies.
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© Universities UK
ISBN 978 1 84036 219 0
November 2009



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