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Universities UK

# The economic impact of UK higher education institutions







# Foreword

This is the third UK-wide study of the impact of the higher education sector on the national economy published by Universities UK. It updates earlier studies published in 1997 and 2002. Since the first report appeared the economic importance of higher education has been much more generally recognised and its contribution to national and regional economic development is attracting the attention of policy-makers. In the UK higher education is seen 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 higher education institutions as independent business entities (which is additional to their role in increasing the stock of human capital). The economic activity generated by institutional expenditure (the aspect of the sector's economic contribution which is most readily quantifiable – because of the difficulty in finding a commonly agreed metric, the economic impact of third stream activity is not included in this study) is substantial. The extensive scale of higher education institutional activity across the UK also means that this can be of significant importance at the macroeconomic level.

The report confirms the growing economic importance of the sector which had an income of £16.87 billion a year in 2003/04 (compared with £12.8 billion in 1999/2000), gross export earnings of £3.6 billion and employed 1.2% of the total workforce. In terms of its wider economic impact the sector generated over £45 billion of output (it has a higher than average output multiplier). The equivalent figure five years ago was nearly £35 billion, confirming a rapid growth in economic impact. The report also confirms the substantial employment effect of higher education activity with around 600,000 jobs being created throughout the economy in 2003/04. Of these some 330,000 people were directly employed by higher education institutions. The report 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 £1.5 billion in 2003/04.

All the evidence suggests that the direct economic importance of higher education will continue to grow in the future. The future expansion of student numbers, domestic and international, the development of knowledge transfer activities as well as a substantial volume of research all point in the same direction. Such activity depends on a continuing mix of public and private investment in the sector. Income from private sources now amounts to 27% of all higher education income and this figure will increase significantly with the introduction of variable tuition fees. It is equally clear that public investment 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 economic impact on the UK economy as well as maintaining the health of the sector.

**Professor Drummond Bone**  
President, Universities UK



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# Executive summary

## Introduction

The economic importance of higher education is now well recognised and the contribution that it can make to the development of both national and regional economies is attracting significant policy attention in the UK. Higher education is seen as being of key importance in the creation and transfer of knowledge to the UK economy through its teaching, research and other activities. Both the White Paper on 'The Future of Higher Education' (2003) and the Lambert Review of University-Business Collaboration (2003) envisaged the sector as playing a pivotal role in ensuring the country's economic competitiveness.

Higher education can impact on the economy in a very wide range of ways. Increasing attention is being paid to the contribution of higher education to the stock of human capital, with continuing analysis of both private and social rates of return to graduates. Higher education is also considered to have an important impact on the social and cultural environment, and this in turn has an impact on the economic environment within which business operates. However higher education institutions are also independent business entities and the economic activity generated by institutional expenditure (the aspect of sector's economic contribution which is most readily quantifiable) is substantial. The extensive scale of higher education institutional activity across the UK also means that this can be of significant importance at the macroeconomic level.

This study presents key economic features of UK higher education in the academic and financial year 2003/04 and those aspects of its contribution to the economy that can be readily measured. Analysis is made of the sector as a conventional industry, highlighting major economic characteristics of higher education institutions 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 higher education institutions, their staff and that of international students and visitors attracted to the UK by the higher education institutions.

## Methodology and data sources

The higher education institutions (HEIs) included in this study are the 171 institutions included in Higher Education Statistics Agency (HESA) data for the academic and financial year 2003-2004. The study focused on the examination of key economic characteristics of the HEIs and the impact generated by their activity. The study also examined the impact of the off-campus expenditure of international students (i.e. all non-UK domiciled students) studying at the UK HEIs. Modelled estimates were also made of the impact of the off-campus expenditure of international visitors attracted to the UK by the HEIs. 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 2001 Office of National Statistics input-output tables together with labour force survey data.

Data on higher education institutional finance, staffing and students were obtained from HESA. Other data sources included *Travel Trends* (Office of National Statistics) and Department for Employment and Skills student expenditure surveys.

## Key findings

### Higher education institutions: direct income, expenditure and employment

- In 2003-2004, the total revenue earned by **UK HEIs** amounted to £16.87 billion. In terms of sectoral gross output this was greater than the UK pharmaceutical industry and only slightly smaller than UK legal activities and auxiliary financial services.
- **HEI** revenue from 'core' public sector sources (defined as funding council grants and academic fee payments from the public sector) accounted for just under 48% of all **HEI** income
- Total revenue from all public sector sources amounted to £10.3 billion or 61% of all income.
- Income from private sector sources accounted for £4.6 billion or 27% of all **HEI** income.
- **HEI** international revenues (institutional *gross export earnings*) amounted to nearly £2 billion representing nearly 12% of all **HEI** income.
- In 2003-2004 **UK HEIs** spent £16.6 billion, with the single largest component of expenditure being labour costs, which accounted for 59% of all costs.
- **HEIs** *directly* employed over 330,000 people, which equated to approximately 280,000 full time equivalent (FTE) jobs. This was equivalent to 1.2% of total UK employment.

### Higher education institutions: secondary or 'knock-on' multiplier effects

- The expenditure of HEIs and their staff generated additional output and employment across the economy.
- For every 100 full time jobs within the **HEIs** themselves, a further 99 FTE jobs were generated through knock – on effects. Over 276,400 jobs in other sectors of the economy were dependent on the HEIs.
- For every £1 million of **HEI** output a further £1.52 million of output was generated in other sectors of the economy. This meant that an additional £25.6 billion of output was generated outside the HEIs as a result of their expenditure.

### International students and visitors

- Personal (off-campus) expenditure of **international students** attending UK HEIs in 2003-2004 was estimated to be £1.5 billion. This was equivalent to 9% of all UK receipts from overseas visitors to the UK for the year 2004.
- Higher education makes a key contribution to business tourism. Personal (off-campus) expenditure of **international business and recreational visitors** to UK HEIs was estimated

to be just over £106 million or around 1% of all UK receipts from overseas visitors to the UK for the year 2004.

- The expenditure of international students and visitors also generated output and employment throughout the country. .
- International student expenditure generated £2.4 billion of output across the economy and over 21,900 jobs.
- International visitor expenditure generated nearly £200 million of output and over 2700 jobs.

### **The overall impact of the higher education sector**

- “Higher education sector” impact is defined in this study to be that of the higher education institutions together with that of international students and visitors to the HEIs.
- Gross export earnings for the **HE sector** in 2003-2004 were estimated to be over £3.6 billion. This includes the international revenue earned directly by the HEIs together with the additional personal expenditure of international students and visitors.
- In 2003-2004 the HE sector spent some £15.4 billion on goods and services produced in the UK.
- Through both direct and secondary or multiplier effects this **generated** over £45 billion of output and over 581,000 full time equivalent jobs throughout the economy. The total employment generated was equivalent to around 2.5% of the workforce in employment.

# I. Introduction

The economic importance of higher education is now well recognised and the contribution that higher education can make to the development of both national and regional economies is attracting significant policy attention. Higher education is seen as being of key importance in the creation and transfer of knowledge to the economy through its teaching, research and other activities. Both the White Paper on *The Future of Higher Education* (2003) and the Lambert *Review on University-Business Collaboration* (2003) envisaged the sector as playing a pivotal role in ensuring the UK's economic competitiveness.

Higher education can impact on the economy in a very wide range of ways. Increasing attention is being paid to its contribution to the stock of human capital, with continuing analysis of both private and social rates of return to graduation. Higher education is also considered to have an important impact on the social and cultural environment and this in turn has an impact on the economic environment within which business operates. However higher education institutions are also independent business entities and the economic activity generated by institutional expenditure (the aspect of higher education's economic contribution which is most readily quantifiable) is substantial. The extensive scale of higher education institutional activity across the UK means that its impact can have macroeconomic significance.

This report provides an up-to-date analysis of key economic aspects of UK higher education institutions (HEIs) in the academic and financial year 2003/04. The study focuses on the 171 HEIs on which the Higher Education Statistics Agency (HESA) collects data.<sup>1</sup> Analysis is made of the impact of the sector as a conventional industry, highlighting major economic characteristics of UK HEIs 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 higher education institutions, their staff and that of international students and visitors attracted to the UK by the HEIs.<sup>2</sup>

For the purposes of this study the higher education sector is defined as the 171 HEIs included in HESA data for the study year of 2003/04 together with the personal off-campus expenditure of international (non-UK domiciled) students and visitors attracted to the UK by the HEIs. The personal expenditure of domestic UK domiciled students is excluded since such expenditure by this group is not additional to the UK economy but may take place anyway, irrespective of student status.

The HEIs covered in this analysis are diverse in origin, type 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. They range in size from institutions with less than 500 students to ones with over 30,000 students, with annual turnover

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<sup>1</sup> These are the HEIs in direct receipt of higher education funding council grants.

<sup>2</sup> A type II UK input-output 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 for use by HEIs to model their impact on both the regional and national economies. Details of the input-output model specification are included in Appendix A.

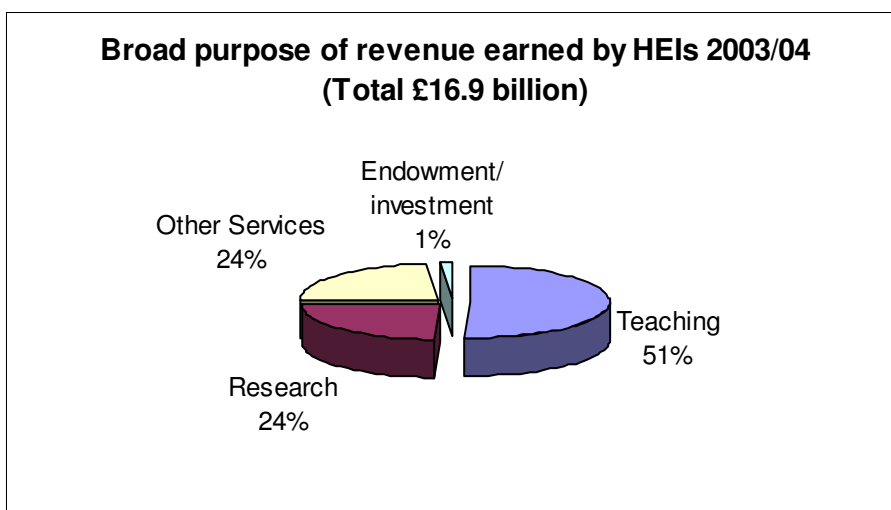
ranging from less than £10 million to over £400 million. 133 are located in England, with 20 in Scotland, 14 in Wales and four in Northern Ireland.

It is worth pointing out that while the HEIs under examination are the major suppliers of higher education in the UK, higher education level courses are also offered at a range of further education colleges and there are significant numbers of higher education students registered at further education colleges. Relevant data on these are not included in HESA publications. The University of Buckingham is an additional privately funded university not included in HESA data. While this report will therefore capture the majority of the economic impact of higher education as an activity, the overall impact of higher education in the UK will be somewhat greater.

This study follows on from, and updates, earlier analyses of higher education (*The impact of universities and colleges on the UK economy*, McNicoll, McCluskey & Kelly, CVCP 1997 and *The impact of higher education institutions on the UK economy*, Kelly, Marsh & McNicoll, Universities UK 2002). The study follows the same fundamental methodological approach as the earlier reports. However, detailed direct comparisons with the results of the previous studies are not appropriate as a new and different input-output model, with a different specification, has been developed for this study and there are also a number of definitional differences in the data sources used.

# II. Revenue base of UK higher education institutions

As discussed in the introduction, the 171 HEIs included in this study cover a wide range of types. As individual enterprises they vary in size and scale of operations. All of the institutions are legally independent entities and are classified as non profit institutions serving households (NPISH) in the UK national accounts. Taken together they represent a significant sector of the UK economy. Total financial turnover in the study year amounted to £16.9 billion.



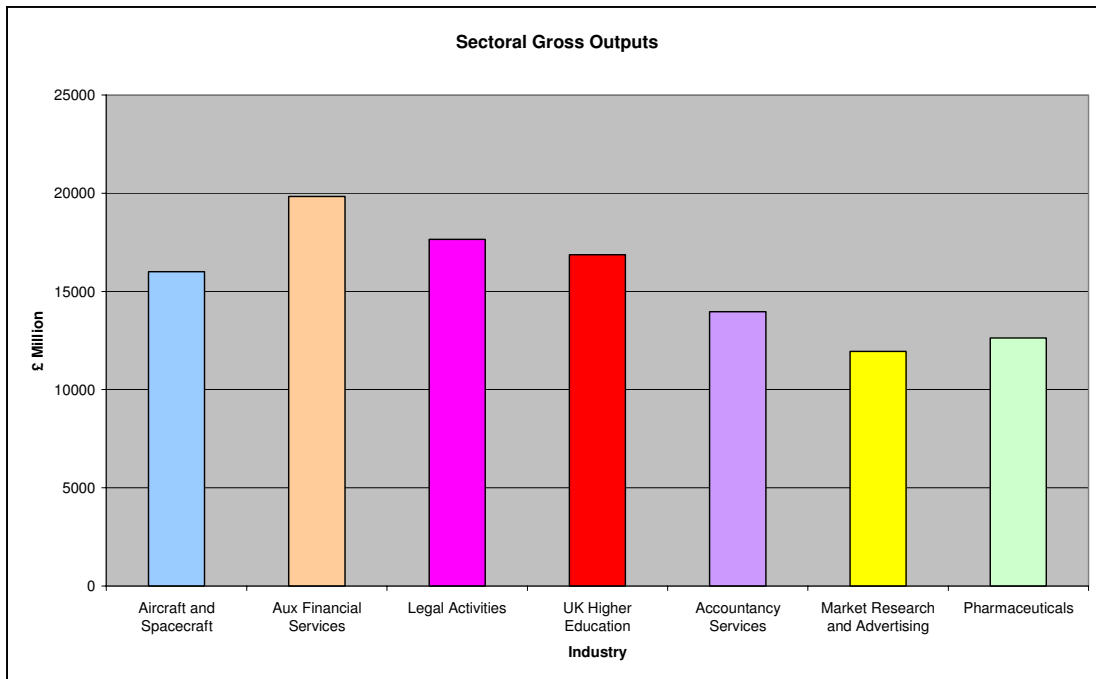
Source: Analysis derived from HESA Resources of Higher Education Institutions 2003/04

**Figure 1: Broad purpose of revenue earned by HEIs 2003/04**

Figure 1 above presents the broad purposes for which HEIs earned revenue. With teaching and research being the major components of HEI activity portfolios, it is not surprising to observe that the majority of revenue was associated with teaching and research activity. However it can be noted that 25% of revenue was earned from the delivery of other services and for other general purposes. A large proportion of this relates to commercial services such as residence and catering operations (which represented over 6% of total HEI earnings, and making up 26% of the 'other services' in figure 1 above). Other sources of revenue included knowledge transfer related activities such as consultancy and intellectual property income.

In national accounting terms, HEI annual turnover is equivalent to **sectoral gross output** as defined for all firms and industries. With HEI revenue of £16.9 billion, the higher education sector is a significant UK industry. To put this into context, Figure 2 gives examples of similarly sized UK

industries.<sup>3</sup> It can be seen that higher education was slightly larger than the aircraft and spacecraft industry, pharmaceutical industry, but smaller than legal activities and the auxiliary financial services industry.



Source: Universities UK economic impact model

**Figure 2: Sectoral gross outputs**

With such a significant industry it is useful to examine who purchases HEI services. Further analysis of HEI revenue data gave information regarding the HEI client base. HESA records the sources (public/private/EU/other overseas) of revenue for research grants and contracts as well as for other services rendered. HESA also records tuition fee revenue from non-EU sources. However HESA does not separately identify tuition fee income paid by private UK or other EU individuals or companies (for example the fee contribution paid by UK and other EU students). Neither does HESA record the source of some other operating income (such as that earned by residence and catering operations). Therefore further analysis had to be made of these elements of HEI revenue, drawing on previous survey data combined with estimates of the proportion of tuition fees paid from private UK and EU sources.<sup>4</sup>

The outcome of this analysis is shown in Figure 3 below.

<sup>3</sup> Comparator sectoral gross outputs are taken from the same UK input-output model used for this study, the base year for which is 2001. Therefore it should be noted that as the HEI output is for 2003/04, the output for the other sectors may be higher in 2003/04, although they are unlikely to be significantly so.

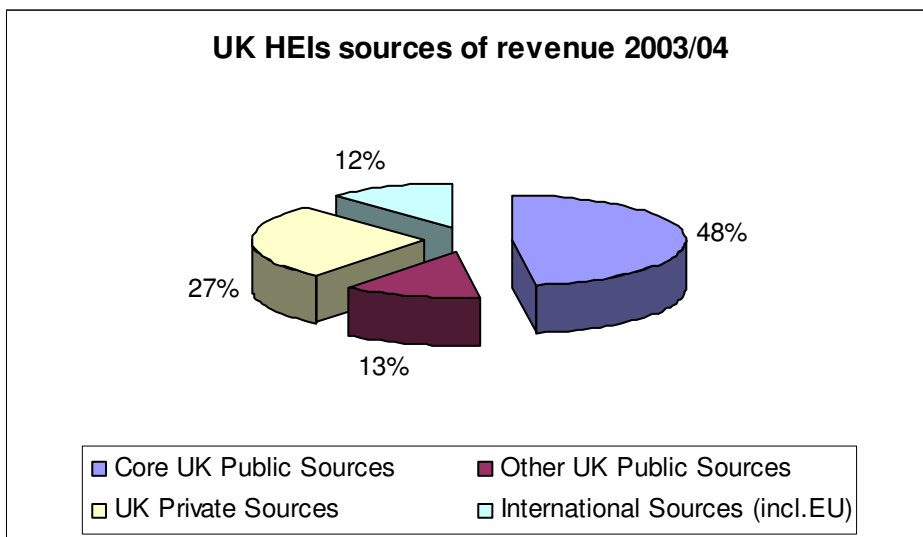
<sup>4</sup> See Bahram Bekhradnia *Demand for HE to 2010* Higher Education Policy Institute Paper (2003)

SOURCE OF INCOME ↓	( £M)			
	UK Public sources	UK Private sources	International sources (incl. EU)	TOTALS
Funding council grants	6516.6	0	0	6516.6
Tuition fees & education grants	1538.5	1238.6	1301.8	4079
Research grants & contracts	1355.2	994.6	364.8	2714.6
Other services rendered	349.7	462.3	165.9	978
Other general income	497.8	1687.7	157	2342.5
Endowment & interest	0	236.4	0	236.43
Totals	10257.8	4619.7	1989.5	16867

Sources: Analysis derived from HESA and previous HEI survey data

**Figure 3: Estimated sources and purpose of income to UK HEIs**

This analysis showed that while the public sector was the most significant source of revenue for HEIs (61% of the total), it was not the only source. Sources of revenue are summarised in Figure 4 below.



Source: Analysis of HESA data

**Figure 4: HEI revenue by source 2003-2004**

Figure 4 shows that 39% of HEI revenue derives from private sector and international sources. 'Core' public sector income (defined as all funding council grants together with tuition fee payments from the public sector) accounted for only 48% of all HEI income in 2003-2004. HEIs attracted a further 13% of revenue from other public sector sources – these monies are usually won on a competitive basis for a range of services, including some research contracts.

Broadly speaking, HEIs compete for all public monies in one way or another. However competition for 'core' public sector funding tends to be 'intra-sectoral' – with HEIs mainly competing against each other

for domestic students and with funding council monies being tied to student numbers, research assessment exercise outcomes and the achievements of other government targets. 'Other' public funding reflects more 'inter-sectoral competition', and to attract this revenue HEIs will have been in competition with government research institutes, private consultancy firms and other bodies within the UK and internationally.

Revenue from international sources (i.e. *all* non UK sources) represents export earnings for the UK. The analysis of HEI income sources showed that in 2003/04 they attracted nearly £2 billion of international revenue, which equates to HEI gross export earnings.



# III. Employment profile of UK higher education institutions

An important element of the role that HEIs play in the economy is related to how many staff they employ. They tend to be labour intensive enterprises and can be very large employers. Indeed they are frequently among the largest employers in their regions.<sup>5</sup> What is more, HEIs do not only employ academics but provide jobs for a very wide range of staff across a number of occupations. This is an aspect of higher education that has only begun to be recognised in recent years. Until very recently, data on total HEI employment could only be obtained through purpose-designed surveys of all HEIs, a resource intensive exercise .

However HESA data for 2003/04 now include, for the very first time, comprehensive data on total HEI staffing, with staff roles being identified and mapped to standard occupational classifications.<sup>6</sup> This means that the full range and diversity of HEI employment can now be observed. In 2003/04 over 338,000 people were employed in HEIs across the UK. Figure 5 below shows the range of employment within HEIs.

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<sup>5</sup> The University of Strathclyde, for example, is one of the top ten employers in the City of Glasgow.

<sup>6</sup> Full details of the mapping procedures are contained in 'Occupational coding of HEI staff', Institute for Employment Research, University of Warwick 2002

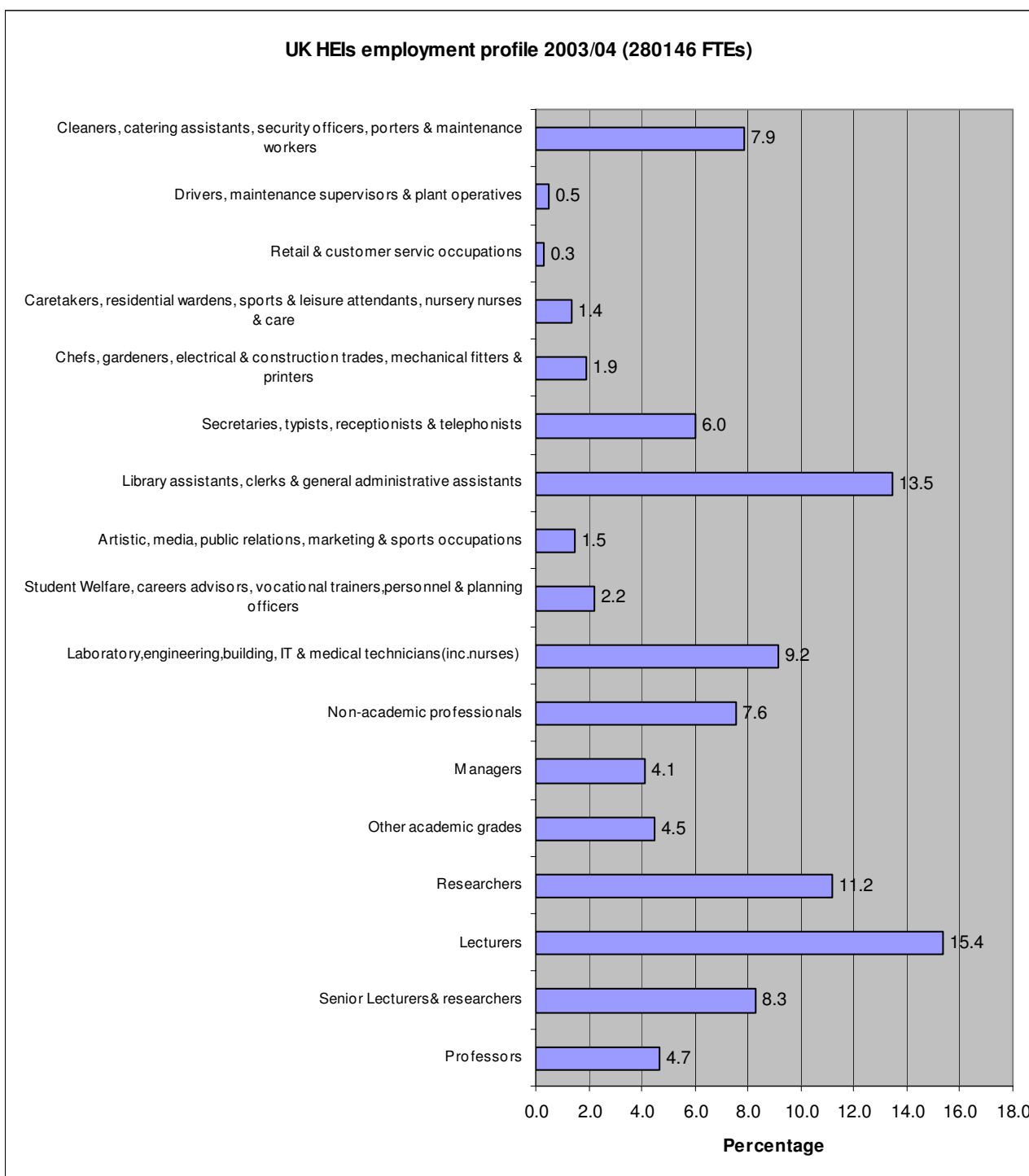
Employment in UK HEIs ( 'headcount')	Total	% of Total
Managers	11660	3.4%
Academic professionals ( including professors , lecturers, researchers and other academic posts)	150230	44.4%
Non-academic professionals	27170	8.0%
Laboratory, engineering, building, IT & medical technicians (including nurses)	27245	8.1%
Student welfare workers, careers advisors, vocational training instructors, personnel & planning officers	7275	2.2%
Artistic, media, public relations, marketing & sports occupations	4705	1.4%
Library assistants, clerks & general administrative assistants	44520	13.2%
Secretaries, typists, receptionists & telephonists	19600	5.8%
Chefs, gardeners, electrical & construction trades, mechanical fitters & printers	5520	1.6%
Caretakers, residential wardens, sports & leisure attendants, nursery nurses & care occupations	4910	1.5%
Retail & customer service occupations	1125	0.3%
Drivers, maintenance supervisors & plant operatives	1540	0.5%
Cleaners, catering assistants, security officers, porters & maintenance workers	32635	9.7%
<b>TOTALS</b>	<b>338135</b>	<b>100.0%</b>

Source: HESA

### Figure 5: Employment in UK HEIs

The total 'headcount' number of jobs includes both full time and part-time employment. According to HESA, this equates to 280,146 FTE jobs, which is equivalent to 1.2% of the UK workforce in employment.<sup>7</sup> The FTE employment profile of HEIs in 2003/04 is shown in Figure 6 below.

<sup>7</sup> Derived from labour force survey data within the modelling system



Source: HESA

**Figure 6: UK HEI employment profile (FTE)**

The above chart gives for the first time a real flavour of the diverse nature of higher education employment which reflects the wide range of activity in which HEIs engage. The overall ratio of

academic to other support staff (44% academic, 56% other support staff)<sup>8</sup> remains broadly similar to that observed in previous studies, however the full range of support staff employment is revealed.

The employment profile of UK HEIs reflects the fact that in order to deliver their core teaching and research mission, HEIs need to main a substantial infrastructure. This often includes an extensive estate and buildings – not only laboratories, lecture theatres and offices but also residential accommodation, catering facilities, sports and recreation centres. Of course the actual business of a modern HEI in a competitive environment is also more than simply maintaining an infrastructure. Students have to be recruited and research business has to be won. This requires marketing and finance professionals. With an increasingly diverse student population, there are also requirements for additional student support services, such as student welfare officers, careers advisors and medical support staff.

Previous analysis of HEI revenue has also shown that while their primary mission is ‘teaching and research’, HEIs raise 25% of their revenue from other business. This fact, combined with the revealed employment profile, may shed some light on areas of HEI activity which are sometimes overlooked. A proportion of HEI activity (particularly commercial operations such as residence and catering or conference business) aims to generate revenue not only to cross-subsidise their ‘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 community outreach activities such as summer schools for young people or cultural heritage work such as maintaining museums and galleries or artistic and scientific collections of historical importance.<sup>9</sup>

The multifaceted nature of HEI business is reflected in its non-academic staff profile with, for example, UK HEIs employing over 4,700 people in “artistic, media, public relations, marketing & sports occupations” and over 1,100 staff in “retail & customer service occupations “ as well as more traditional support staff roles (such as library assistants, laboratory technicians or cleaners and security staff).

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<sup>8</sup> In the *Impact of higher education institutions on the UK economy* (Kelly, Marsh & McNicoll, Universities UK 2002) the ratio was estimated to be 40:60, based on grossing up sample HEI survey data. However HESA data are based on statutory returns from HEIs and hence will have a 100% response rate and more of the characteristics of a census.

<sup>9</sup> As non-profit organisations that are not subject to the constraints of paying dividends to shareholders, HEIs can, and frequently do, interpret their institutional mission as including elements of ‘public good’ activity which by its nature is rarely revenue generating.

# IV. Higher education institutional expenditure and the knock-on impact on the UK economy

As can be seen from the previous sections, HEIs make up a substantial UK industry, with significant annual turnover of £16.9 billion and providing over 1.2% of full time equivalent employment in the UK. In 2003/04 HEIs also spent a significant sum; expenditure amounted to £16.6 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, HEI 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: HEIs purchase goods and services from other sectors in order to support their own activity, thereby stimulating activity within those industries. The supplying industries also make purchases from other suppliers in order to fulfil the orders from HEIs, and those suppliers in turn make purchases, so that there is a rippling-out effect.
- induced effects: HEIs 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 UK economy. For the purposes of this study a complete type II input-output model was constructed, based on Office of National Statistics input-output tables. The model also included a labour market extension derived from official labour force survey data. The model enabled the impact generated by HEI expenditure to be traced through the economy. The specification of the model is included in Appendix A.

Details of the major components of HEI expenditure were available from HESA and these provided the basic initial expenditure data required. However these data alone are insufficient for modelling purposes since the pattern of HEI 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 was able to derive detailed estimates of HEI expenditure types from a range of sources; these included data from an UK-wide survey conducted for previous studies, together with observations of detailed patterns of expenditure from a number of individual HEIs studied by the team, and information obtained from sector purchasing consortia. This enabled the construction of a disaggregated HEI expenditure vector for incorporation into the model.

Incorporation of the disaggregated expenditure estimates into the input-output model 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 distribution and transport industries it is a measure reflective of gross margins.
- **Employment:** Measured in terms of full time equivalent jobs (physical units) where 1 part-time job = 0.5 of a full time job.<sup>10</sup>

The results for the impact of HEI expenditure are summarised below:

#### Output generated by the HEIs

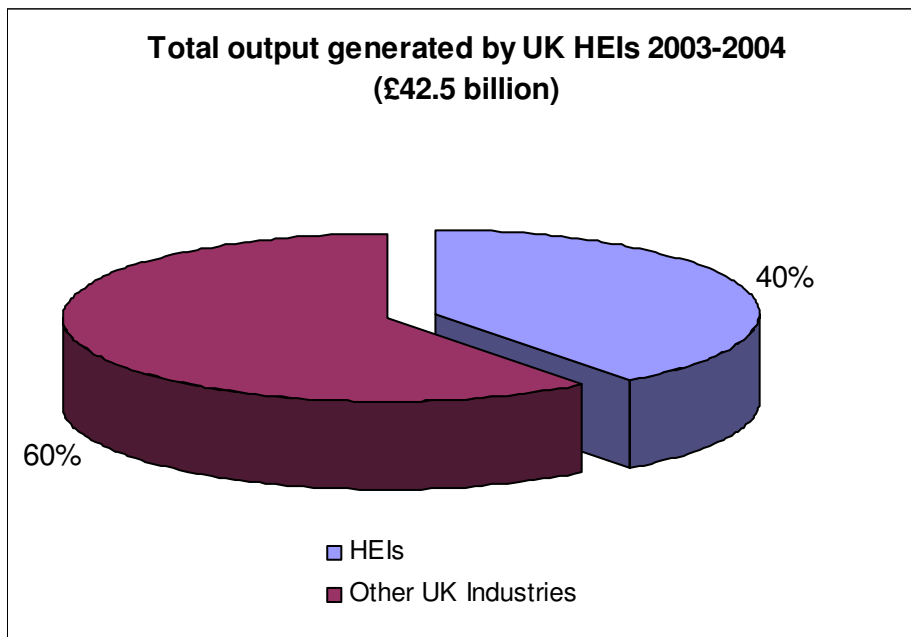
<b>Total UK HEI expenditure</b>	<b>16625.7</b>
UK HEI expenditure on UK goods and services	14277.7
Secondary or knock-on output generated in other UK sectors	25629.5
Total output generated by UK HEIs (Direct plus knock-on)	42496.51

**Figure 7: Secondary output generated in the economy by HEIs 2003-2004 (£000)**

As Figure 7 shows, in 2003-2004 HEIs spent some £16.6 billion of which some £14.3 billion was estimated to have been expended on UK goods and services. This expenditure generated £25.6 billion of output in other UK industries.

As has been highlighted earlier, the HEIs own direct output (equivalent to annual turnover) amounted to £16.9 billion. Therefore the total output generated by HEIs (their own direct output combined with the secondary output in other industries) came to £42.5 billion. This is illustrated in Figure 8.

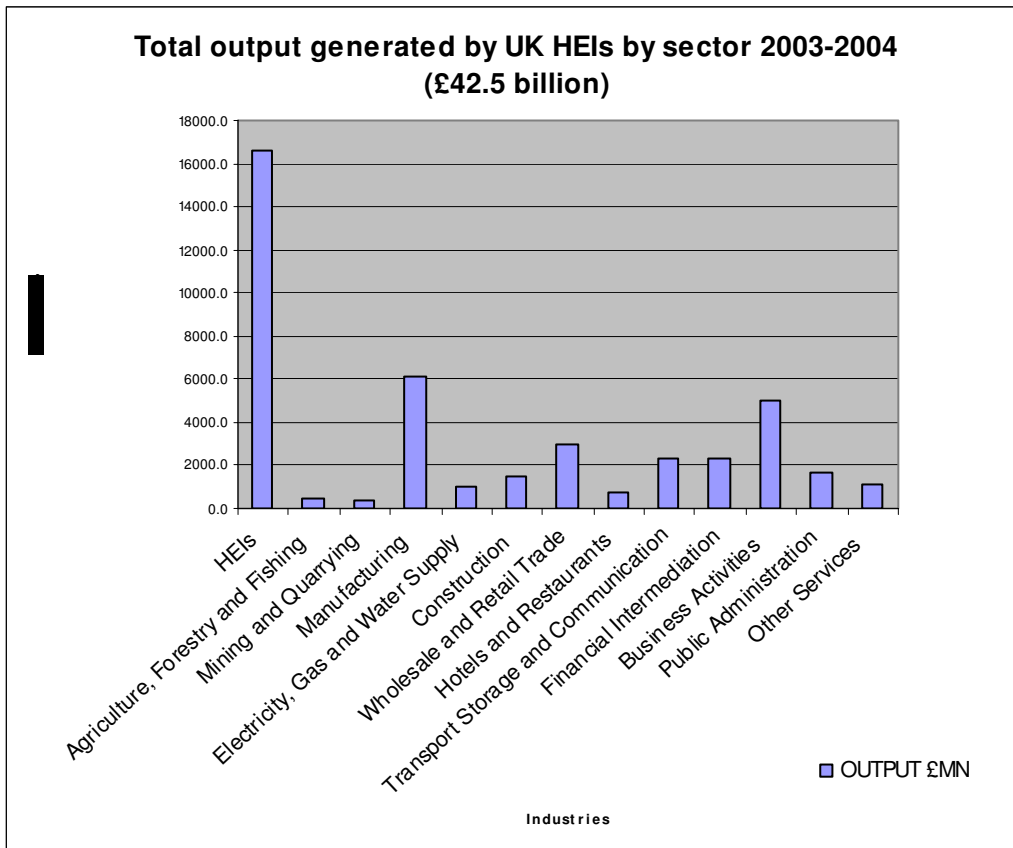
<sup>10</sup> This is the standard conversion rate used by the Office of National Statistics.



**Figure 8: Total output generated by UK HEIs 2003-2004 (£42.5 billion)**

The ratio of total output to direct output is defined as the **sectoral gross output** multiplier, with a calculated value for the HEIs of **2.52**. Therefore, for every £1 million of HEI direct output a further £1.52 million was generated in other sectors of the economy. It can be noted (see Figure 9) that the secondary output was spread across a range of other sectors with an emphasis on manufacturing, wholesale and retail trade and business activities. The output multiplier for HEIs ranked 51st out of the 123 input – output industries in the model constructed for this study, suggesting that the purchasing “linkages” of the HEIs with the rest of the economy were somewhat higher than average. 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.

Figure 9 below illustrates the pattern of total output generated by HEIs economy-wide.



**Figure 9: Pattern of total output generated by UK HEIs**

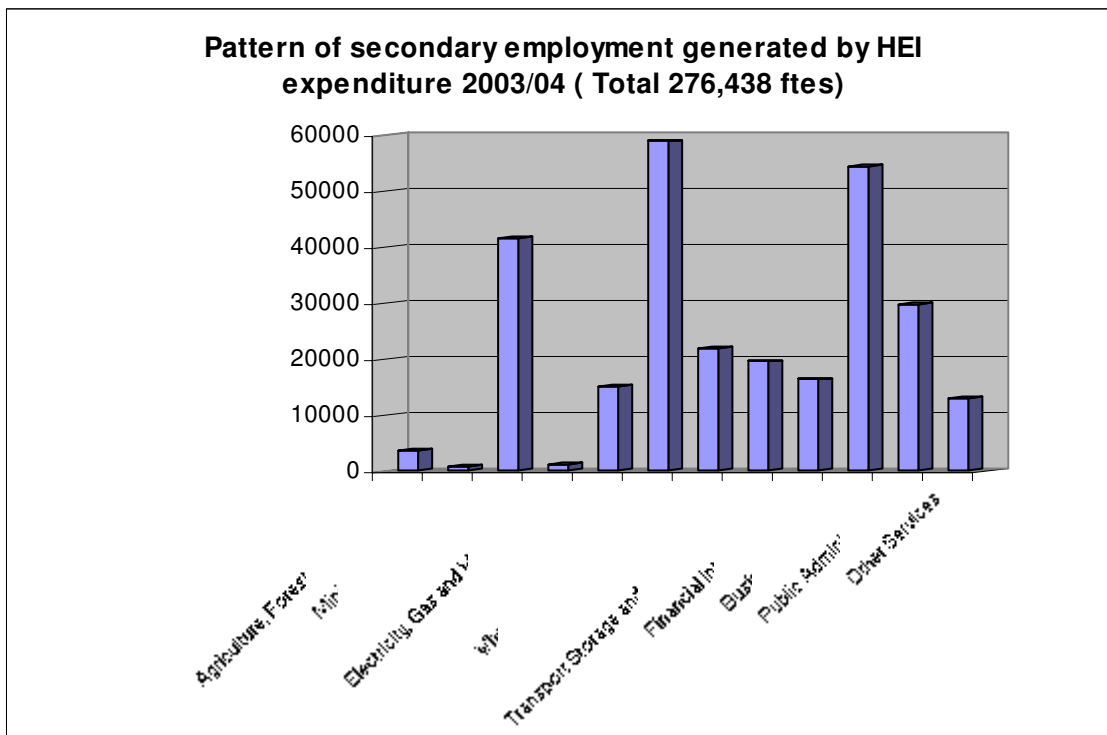
### **Employment generated by the HEIs**

HEI 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 the expenditure of HEIs and their employees.

Analysis showed that an estimated 276,438 full time equivalent jobs were generated outside the HEIs in other industries.

The pattern of employment across other industries is shown in Figure 10 below.





**Figure 10: Pattern of secondary employment generated by HEI expenditure 2003/04**

As Figure 10 illustrates, employment was generated across all sectors of the economy, with particularly notable impacts on manufacturing, wholesale and retail trade as well as business activities. The impact reflects both the nature of the purchases made and the process through which they were made. In this way it is not surprising that the wholesale and retail sectors feature strongly, since these are highly labour-intensive, and since the majority of producer and consumer goods purchases attract distributive margins.

As earlier discussed, HESA data show that HEIs directly employed over 330,000 people in 2003-2004, which HESA also expresses as equating to full time equivalent employment of 280,146<sup>11</sup>.

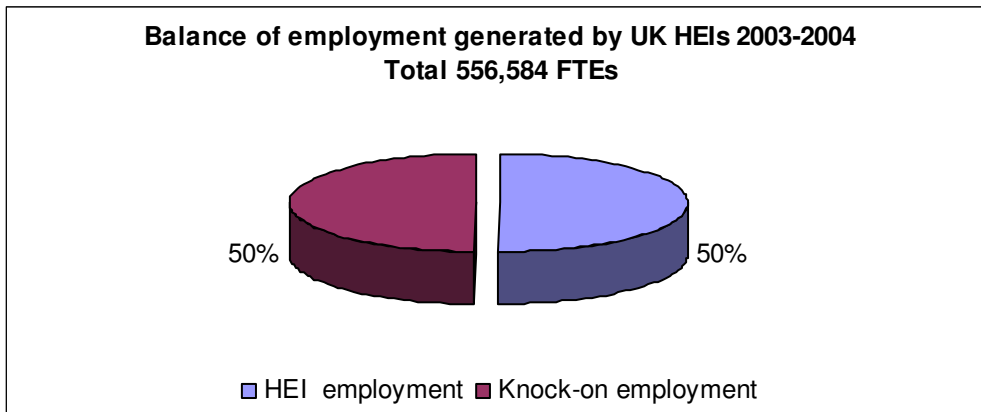
This means that in total, both through employing staff directly and through generating jobs in other industries through secondary effects, HEIs generated an estimated 556, 584 jobs in the UK in 2003/04. This was equivalent to 2.4% of the total workforce in employment.<sup>12</sup>

This shows an **employment multiplier** (defined as total employment divided by direct) for HEIs of **1.99**, indicating that for every 100 jobs created directly within an HEI, another 99 are generated elsewhere within the economy<sup>13</sup>.

<sup>11</sup> It may be noted that HESA methodology for full time equivalence 'measures the equivalence to full-time over the course of the reporting period 1 August to 31 July. The FTE is therefore counted using a population of staff who were active during the reporting period'. It also allocates staff to 'activities in proportion to 'the declared FTE for that activity'. (*Resources in higher education institutions: staff definitions*)

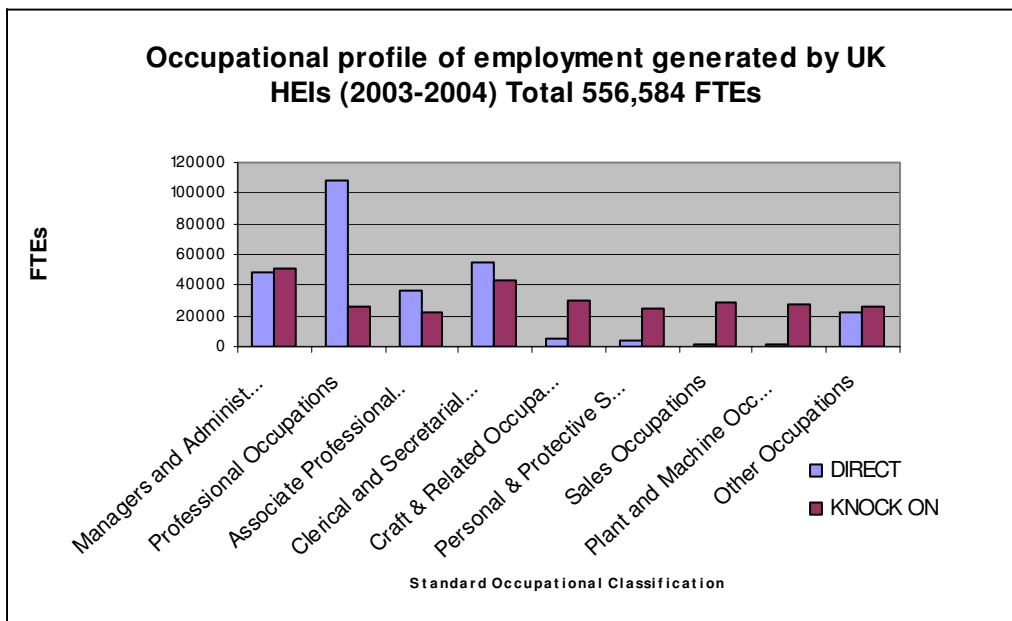
<sup>12</sup> Derived from labour force survey data within the modelling system

<sup>13</sup> The full time equivalent figure (FTE) for HEI direct employment is that given by HESA and which is derived through HESA's own methodology. The FTE figure for employment elsewhere is that generated by the model and conforms to ONS practice where 1 part time job = 0.5 FTE. This means that the multiplier for UK HEIs is very slightly higher than it would be if Office of National Statistics (ONS) definitions were applied to HEI direct employment. However the difference is not at all significant (if ONS definitions had been used to derive FTEs from HESA's head count figures the multiplier arising would have been 1.98).



**Figure 11: Employment generated by UK HEIs 2003-2004. Total 556,584 FTEs.**

Section III discussed the diverse pattern of employment within HEIs. It is also possible to compare the occupational profile of HEI direct employment with that of the jobs generated by the HEIs elsewhere in the economy. This is shown in Figure 12.



**Figure 12: Occupational profile of employment generated by UK HEIs (2003-2004). Total 556,584**

It can be noted that where employment directly within HEIs is relatively specialised in standard occupational classifications 2 and 4 (that is professional and clerical occupations), the pattern of secondary employment tends to be more similar to that of the UK taken as a whole.

## Comparisons of multiplier values for HEIs with other sectors

Two key multiplier values for a sector are those of output and employment:

### Output multiplier:

The output multiplier is a reflection of the domestic purchasing linkages of the sector in question; i.e. a sector which purchases a higher than average proportion of its operating requirements (including labour) domestically, will tend to have a higher type II output multiplier.

### Employment multiplier:

An industry that tends to have higher than average direct labour inputs per unit of output (labour intensive) will tend to have a smaller type II multiplier.

It is possible to compare the multipliers for HEIs with those from other sectors within the input – output model. Some examples are given below in Figure 13 below.

Industry	Type II multiplier output	Type II multiplier employment
HEIs	2.52	1.99
Aircraft and spacecraft	2.44	2.37
Medical and precision instruments	2.53	1.13
Office machinery	2.12	2.98
Air transport	1.55	2.17
Telecommunications	2.33	2.93
Research and development	1.44	1.23
Computing services	1.59	1.39
Legal Activities	1.34	1.03
Oil processing and nuclear fuel	1.13	1.58
Marketing and advertising activities	1.14	1.24

**Figure 13: Comparator multipliers for HEIs with selected other UK industries**

**2.12** We can see that HEIs have a relatively high output multiplier in comparison with the selected industries, which suggests that they tended to make a larger proportion of purchases on UK goods and services than the comparator industries.

The relatively high employment multiplier for office machinery reflects its capital intensive nature. It can also be seen from Figure 13 that the HEIs have a higher employment multiplier than most of the other included *service* industries. This is because, while the HEIs are themselves labour-intensive like other specialised services, their knock-on effects are relatively concentrated in sectors which are *also* labour-intensive (such as distributive trades and business services).

# V. Additional impact of international students and visitors

## International students

HEIs attract a substantial number of international students, studying at institutions throughout the country. In 2003/04 there were 300,050 students from outside the UK registered at UK institutions. These made up around 13% of the total student population. These students all make payments directly to HEIs for fees, accommodation etc, and the impact of these monies is captured within the HEI impact. However students do not confine their expenditure solely to the HEI precincts but 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 the totality of their student population), local retail outlets provide catering supplies and local pubs and other entertainment venues frequently rely on student trade. Even a casual observer will note that around any HEI there is a proliferation of cafes, snack bars, pubs and shops that seem to draw a large proportion of their business from students.

The expenditure of students from outside the UK makes an injection into the UK economy, as well as representing export earnings. It is important to note at this point 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 rates to the HEI, EU students spend money off-campus in the same way as students from other countries. Their spending is just as important to the economy, generating employment and output within the UK, as the expenditure of an American, African or Malaysian student.

The Department for Employment and Skills regularly publishes reports on UK student expenditure.<sup>14</sup> In the absence of survey data on international student expenditure, it was assumed that international student expenditure would be similar to that of domestic students.

The per capita figure for annual student expenditure chosen was that which equated to the median expenditure (excluding fees) of a student during the academic year, applying 'London' and 'outside London' rates to the relevant groups of students. The academic year in this case includes the short Christmas and Easter vacations but not the summer vacation and hence relates to around nine months

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<sup>14</sup> The most recent is: Callender, C., Wilkinson, D.(2003), *2002/03 Student income and expenditure survey: students' income, expenditure, and debt in 2002/03 and changes since 1998/99*

of expenditure. To the extent that many postgraduates will be studying and incurring expenditure over 12 months rather than nine months, this per capita figure can be regarded as conservative.

To avoid any double-counting, the overall estimate of expenditure was reduced to allow for payments made to the institutions for catering, residence charges etc. This gave total estimated off-campus expenditure figure for international students studying in the UK of £1.54 billion.

## International visitors

There is another area of HEI activity that should be noted, which is the role that HEIs can play in the attraction of visitors to the UK. The expenditure of HEI business and leisure visitors contributes to the UK economy in the same way as that of students.

The part that HEIs play in business tourism is beginning to be recognised. For example, many regional tourist boards have been aware for quite some time that HEIs (frequently through the standing and reputation of their senior academic staff) can play an extremely important part in the attraction of major international conferences. For example, the Greater Glasgow & Clyde Tourist Board has estimated that 50% of its convention sales are linked to the 'Ambassadors Programme', which is a programme designed to encourage and support prominent professionals, particularly academics, in persuading international learned societies to bring their conferences to Glasgow.<sup>15</sup> HEIs also frequently provide holiday accommodation for leisure visitors, group tours and summer school participants as well as individual visiting scholars.

In order to make an estimate of HEI international visitor expenditure, the study team drew on previous survey based information (a previous study of higher education had collected data on HEI visitor numbers). These numbers were adjusted in line with the overall trend in visitors to the UK<sup>16</sup>. This gave an estimate of 904,800 business and 347,130 leisure visitor bednights in 2003/04. Per diem expenditure rates were sourced from *Travel Trends*. It was therefore possible to derive an estimate of total international visitor expenditure in 2003-2004. This total figure was also reduced to take account of monies paid directly to the HEIs (e.g. for residence and catering operations) and a final estimate of personal off-campus expenditure for international visitors amounted to just over £106 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 the Figure 14 below:

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<sup>15</sup> These can be very large conferences, such as the upcoming 2006 International Congress of Parisitology (likely to be c.2,500 delegates).

<sup>16</sup> From *Travel Trends* 2003-04 Office of National Statistics. The overall trend in visitors to the UK is slightly downwards and so numbers of HEI visitors were adjusted downwards also.

	<b>Overseas students</b>	<b>Overseas visitors</b>
<b>Total personal expenditure (off campus)</b>	£1.54 billion	£106.15 million
<b>Expenditure on UK Goods and services</b>	£1.01 billion	£79.83 million
<b>Knock – on output generated throughout UK economy</b>	£ 2.4 billion	£199.56 million
<b>Knock on employment generated</b>	21,924 full time equivalent jobs	2715 full time equivalent jobs

**Figure 14: Impact of international student and international visitor expenditure 2003-2004**

It is clear that while the activity of HEIs 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 HEIs within the economy.

# VI. Conclusions

This study presents an up-to-date analysis of key economic characteristics of UK HEIs. It also presents modelled analyses of the impact of HEI expenditure in generating additional output and employment in other parts of the economy. It highlights the additional injection into the UK economy made by international students and visitors attracted to the UK by the HEIs.

The evidence shows higher education sector to be a substantial industry with a significant impact on the UK economy. The overall impact of the sector (taking UK HEI impact together with that of the off-campus expenditure of international students and visitors) is presented in Figure 15 below.

	HEIs	International students	International visitors	The HE sector
<b>Direct output</b>	£16.9 billion	0	0	£16.9 billion
<b>Secondary output</b>	£25.6 billion	£2.4 billion	£0.2 billion	£28.2 billion
<b>Total output generated ( direct plus secondary)</b>	£42.5 billion	£2.4 billion	£0.2 billion	<b>£45.1 billion</b>
<b>Direct employment</b>	280,146 FTEs	0	0	280,146 FTEs
<b>Secondary employment</b>	276,438 FTEs	21,924 FTEs	2715 FTEs	301,077 FTEs
<b>Total employment generated ( direct plus secondary)</b>	556,584 FTEs	21,924 FTEs	2715 FTEs	<b>581,223 FTEs</b>
<b>Export earnings<sup>17</sup></b>				
	£2.0 billion	£1.5 billion	£0.1 billion	<b>£3.6 billion</b>

**Figure 15: Overall impact of the UK higher education sector on the UK economy.**

The higher education sector generated £45.1 billion of UK industry output. HEIs directly provided over 280,000 FTE jobs, equivalent to 1.2% of the workforce in employment. Over 301,000 additional jobs were generated throughout the economy through secondary effects, taking the total employment dependent on UK higher education to over 581,000 FTE jobs – or around 2.5%<sup>18</sup> of the workforce.

UK higher education was also a major service sector export earner, attracting £3.6 billion of international revenue, £2 billion of which was paid directly to UK HEIs for their services. Analysis of the HEI revenue base shows that while the public sector remains the largest single client of HEIs, 39% of revenue was derived from private sector and international sources.

<sup>17</sup> These represent all international revenue earned directly by the HEIs as well as the personal (off-campus) expenditure of international students and visitors attracted to the UK by the HEIs.

<sup>18</sup> Derived from labour force survey data within the modelling system.



This study focused on UK HEIs as business entities and the impact of their expenditure on the economy, which is the aspect of higher education's contribution to the economy that is most readily quantifiable. The study did not set out to examine the contribution higher education may make in other ways to economic development, such as that through knowledge transfer and innovation activities. However the revealed HEI employment profile provides an initial insight into the wide-ranging ways through which their work may be contributing to economic, social and cultural development. The diversity of occupations within HEIs reflects the multifaceted nature of their operations, with not only academics and support staff more traditionally associated with higher education (such as laboratory technicians) but also an array of other occupations including marketing and retail, as well as welfare advisers, artistic and media occupations.

# Appendix A:

## Notes on modelling methodology

The model used was a purpose designed and specially constructed 'type II' input-output model of the UK economy based on actual UK data derived from the 2001 Office of National Statistics input-output tables together with labour force survey data.<sup>19</sup>

### Methodology and model specification

#### Creating the Leontief matrix

The Leontief matrix is a vital starting point within the economic model. Use was made of the 2001 Office of National Statistics (ONS) input – output table and it proved possible to create a Type I and then a Type II from this data source. An additional source utilised was national accounts data (Blue Book, 2002) in order to estimate wages (compensation of employment in national accounts terminology) as a proportion of 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 utilised in order to invert the 124 x 124 matrix.

Firstly 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 utilised 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.

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

Following this we calculated the domestic flows coefficient matrix,

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

We then calculated the type I Leontief inverse as:

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

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

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

As calculated  $\mathbf{X}^*$  was found to equal actual  $\mathbf{X}^D$ , then the type I Leontief inverse was correct since it replicates the "model" base year outcomes.

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<sup>19</sup> 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 for use by UK HEIs to model their impact on both the regional and national economies.

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:

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

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 (Treasury Blue Book, 2002)

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:

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

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 creation of the employment sub-matrix.

The UK occupation- by- industry submatrix was formed using primary data. The data were compiled from previous TSA<sup>20</sup> work on occupation by industry (using the aggregate figures for region of work), which itself is from the LFS.

#### **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:

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

where:

$i, j$  = industrial sectors 1 to 124 *including households*

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<sup>20</sup> Tourism satellite accounts. UK tourism satellite account -first steps project, Calvin Jones, Max Munday, Jane Bryan, Annette Roberts, Iain H. McNicoll and Donald McLellan. Cardiff Business School, Report for DCMS, September 2004. <http://www.culture.gov.uk>

$X^{UK}$  = vector of gross outputs

$\chi_h^{UK}$  = total household income

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

$\chi_{hi}^{UK}$  = 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:

$$(8) X_{ij}^{UK} = a_{ij}^{UK} X_j^{UK} \quad \forall i,j$$

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 FTE 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,

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

For the creation of the occupation by industry matrix<sup>21</sup> we define a matrix,  $o^{UK}$ , of UK occupational employment shares coefficients with elements given by:

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

$j = 1 \dots\dots 123 \text{ sectors}$

where:  $O_{oj}^{UK}$  is FTE employment in occupation  $o$  in industry  $j$ .

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

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

and from (12a):

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

Which is occupation by industry equating with overall FTE employment across the UK. This will operate through the impact of expenditure within the UK 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**

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

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<sup>21</sup> From labour force survey data

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