March 2010/09

Policy development

Report

No action is required.

This report sets out the advice and conclusions of the third HEFCE chief executive's Advisory Group on Strategically Important and Vulnerable Subjects.

Strategically Important and Vulnerable Subjects

The HEFCE advisory group's 2009 report

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND

Strategically Important and Vulnerable Subjects: the HEFCE advisory group's 2009 report

Executive summary

This report sets out the advice and conclusions of the third[1] HEFCE chief executive's Advisory Group on Strategically Important and Vulnerable Subjects (SIVS). With this new group, the remit has been expanded beyond that of earlier groups in response to Lord Sainsbury's Review of Science and Innovation, 'Race to the Top', which asked it to produce an annual report that would identify shortages of Science, Technology, Engineering and Mathematics (STEM) graduates.

This is the new group's first annual report. It outlines HEFCE's policy and approach towards SIVS (broadly, these are STEM plus Modern Foreign Languages and quantitative social science), alongside an analysis of the predicted future demand for STEM. In line with its predecessors, it also sets out the evidence on the current and future supply of graduates in SIVS subjects.

The SIVS advisory group, via this report, seeks to do three things: influence policy across HEFCE, government and other stakeholders; influence student choice by communicating its work on the supply of and demand for different subjects; and provide an authoritative voice on subjects of strategic importance to the nation.

Looking forward, the group will work with HEFCE and the Department for Business, Innovation and Skills (BIS) to review and align SIVS policy in light of the government's *New Industry, New Jobs*; *Higher Ambitions*; and *Skills for Growth* agendas.

[1] Previous advisory groups, chaired by Professor Sir Gareth Roberts and Professor Sir Brian Follett respectively, established and reviewed HEFCE policy towards strategically important and vulnerable subjects, and provided information on the flow of students in these subjects. Their reports are at http://www.hefce.ac.uk/aboutus/sis.

Key conclusions and recommendations

1 – The dynamism of English higher education (HE) is a great strength and interventions should continue to be kept to a minimum. The sustainability of subjects deemed strategic by government and vulnerable by HEFCE should continue to be addressed by measures that raise student demand and attainment, and that sustain and re-shape provision whilst this takes effect.

2 – The policy adopted by HEFCE to date is supported by the latest data on admissions to HE. A decline across SIVS in the first part of the decade, influenced to a degree by the growth of competing disciplines such as Medicine and related studies, has been reversed during the last three years. The latest data on A levels and entrants to HE suggests that this will continue. Given current and anticipated pressure on HE finances, however, universities and colleges can be expected to focus their investment on their areas of greatest strength, which may require HEFCE to continue to take action to secure the sustainability of provision.

3 – The position within individual SIVS is as follows:

- During the last three years, the number of students in Chemistry, Physics and Mathematics programmes in HE has increased at a greater rate than the average across all subjects and to a level beyond that at the beginning of the decade. The latest data on A levels and entrants to HE suggests that this trend will continue. A significant increase in students taking Mathematics A level can be expected to have a positive impact on HE admissions throughout science and engineering.

- In Engineering, the number of students in HE programmes has been declining for some time, but the pattern varies between sub-disciplines. During the last three years, the number of Electrical Engineering students has declined, albeit from a large base, whereas Civil Engineering and Chemical Engineering numbers have increased at a rate well beyond the average for all subjects. Other areas of engineering appear to be more stable, although a significant decline in entrants to Minerals, Metallurgy and Materials Engineering programmes suggests that numbers in this area will decline during the coming years. In collaboration with the relevant professional institutions, the Advisory Group will seek to develop a better understanding of the causes of these trends, and any actions that may be needed in response to them, during 2010.

- In Modern Foreign Languages (MFL), there has been consistent growth in the number of students in Iberian and Asian languages programmes, and consistent decline in German. Most language disciplines have experienced growth at A level, but overall numbers in HE have declined during the last three years and can be expected to remain variable during the coming years. As Professor Michael Worton's recent review of MFL makes clear, there is a need for continued strategic intervention to increase student demand and sustain provision, but also for language departments and centres to develop and communicate a compelling identity to students, employers and government, and within their own institutions. The Forum proposed in the review report, to be chaired by the Minister for Higher Education, will provide a platform on which this can be developed.

4 – Across SIVS, and particularly in Engineering and MFL, the number of part-time students and the number in post-1992 institutions has declined. Students in these categories are more likely than others to be mature, in work, studying locally and from neighbourhoods with a record of low HE participation. This suggests a limit on the diversity, and in some locations the availability, of graduates in these subjects. This should be a concern for HEFCE's student demand raising programme in STEM and in MFL, and also for the *Review of Higher Education Funding and Student Finance*, which will be undertaken during 2010.

5 – Demand from employers can be articulated in terms of broad graduate attributes, individual or groups of subjects, or specific skills acquired within subjects and programmes. These requirements may be associated with graduates in identified subjects or programmes, levels of performance or qualification, with highly selective institutions or aspects of the HE experience such as work placement and time abroad.

6 – There are two areas in which the views of employers are consistent enough to inform national policy on the level and nature of HE provision. Firstly, evidence commissioned by the group and in numerous other reports suggests that employers consistently identify a demand for STEM graduates, which arises from a broad requirement for numeracy aligned with specific technical skills. Secondly, employers are concerned about broad employability skills. In both cases, this perception derives from an expectation that there will be a particular premium on these skills in the advanced and rapidly changing labour market of the future.

7 – Evidence from employers suggests that concerns about graduate unemployment arising from the current economic climate will be short-term. Given the consistent message from employers about STEM and changing student aspirations in this area, it will be essential for government and HEFCE to establish a means for ensuring that the upturn in student demand can be accommodated by an increase in provision. Employers will also need to provide clear signals of the subjects, skills and attributes they particularly value, and that will position graduates most effectively in the labour market, and to engage in the development and delivery of provision, for example through staff and student placements.

8 - There are some immediate areas of shortage, which can be identified at the level of skills required by specific employers and attributable to specific programmes in HE, such as *in-vivo* techniques in the pharmaceutical industries and engineering skills required for the nuclear industry. It should be possible for immediate skills requirements to be addressed through close working between individual and groups of employers, universities and colleges. This will, however, require responsiveness from HE providers,

underpinned by public funding incentives, and employer funding at a level appropriate to the specificity of their requirements.

Background

1. HEFCE's approach to strategically important and vulnerable subjects (SIVS) derives from an intervention in 2004 by the then Secretary of State for Education and Skills, Charles Clarke[2]. HEFCE was asked in a letter from the Secretary of State to advise on 'whether there are any higher education (HE) subjects or courses that are of national strategic importance, where intervention might be appropriate to enable them to be available... and the types of intervention which it believes could be considered'. The letter included a list of subjects the government considered to be strategically important[3].

2. In response to this HEFCE appointed a Board level Advisory Group. The group's report, published in June 2005, established a policy framework to secure the national interest with regard to strategically important subjects. A key plank of the policy is that the English HE system's success is founded on the ability of autonomous institutions dynamically to respond to changing circumstances. The report suggests that 'HEFCE should guard against an overly interventionist role' and focus on 'subjects which are both strategically important and vulnerable'[4]. Government, importantly, should define strategically important subjects, and HEFCE's role should be to identify whether they are vulnerable.

3. Drawing upon the subjects highlighted by the Secretary of State, the report identified five subject areas which should be considered both strategically important and vulnerable, and to which HEFCE's attention should be focused: science, technology, engineering and mathematics (STEM)[5]; area studies and related minority languages; Modern Foreign Languages (MFL); land-based studies; and quantitative social science (QSS).

4. This has provided the basis for HEFCE's interventions in this area during the last five years, each addressing the specific aspects of vulnerability in different strategically important subjects[6] by:

- promoting demand and attainment among potential students, for example STEM and QSS demand-raising programmes, and the Routes into Languages programme, which bring universities and schools together to work on demand-raising and curricula activities

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[2] There is a long history prior to 2004 of government interest in promoting science and technology in particular. See, for example, R.D. Anderson, *British Universities Past and Present* (London 2006), p66, p133, p150 and p158.

[3] http://www.dcsf.gov.uk/pns/DisplayPN.cgi?pn_id=2004_0209

[4] HEFCE 2005, *Strategically Important Subjects – Final Report of the Advisory Group*, p1 http://www.hefce.ac.uk/pubs/hefce/2005/05_24/

[5] The focus of SIVS activity within STEM is explained in paragraph 5 below.

[6] The activities are summarised in *HEFCE's Programme of Work 2005-06 to 2011-12* and the *Sustaining Science and Other Key Vulnerable Subjects in Higher Education* publication, which are at http://www.hefce.ac.uk/aboutus/sis/

- securing the supply of provision, for example through additional funding for very high cost and vulnerable science subjects, and the enhancement of regional and national research capacity in SIVS
- promoting the flow of graduates into employment, for example by supporting the development of new programmes with employers and Sector Skills Councils in specific areas of STEM.

5. A group chaired by Professor Sir Brian Follett reviewed HEFCE's SIVS policy and investments in 2008. It considered HEFCE's policy and its investments in this area to be appropriate, whilst highlighting the importance of working closely with employers in the next phase of work. In line with a request in Lord Sainsbury's review of science and innovation, it recommended that the next SIVS group should report annually on the relationship between the supply of graduates and demand from employers[7]. Informed by a review of land-based studies[8] and by evidence on admissions, it also recommended that land-based studies should no longer be considered vulnerable, and that chemistry, engineering, mathematics and physics should be the focus of actions to address vulnerability within STEM.

6. This is the first report of the new Advisory Group which is chaired by Peter Saraga, former Director of Philips Research Laboratories and a former HEFCE Board member. The group's membership – which includes leaders in higher education, business and government – and terms of reference are set out in Appendix 1.

7. This report covers a number of areas: the Advisory Group's approach to its remit and to reporting; developments since the Follett and Sainsbury reports; an update on the flow of graduates in SIVS; and an analysis of the evidence on employer demand. It also signals some wider policy questions to be addressed in the next annual report, which is likely to be published early in 2011. The aim will be to update and improve the analysis each year, and to refine the approach in light of new imperatives such as the changing economic conditions and government initiatives.

[7] H M Treasury 2007, *The Race to the Top: A Review of Government's Science and Innovation Policies,* Recommendation 7.1.5 - http://www.hm-treasury.gov.uk/sainsbury_index.htm

[8] Available at http://www.hefce.ac.uk/aboutus/sis/land.htm

The Group's Approach

8. The group's key aims are to produce an annual report on the supply of and demand for SIVS and to review HEFCE's policy and approach towards SIVS (including the list of vulnerable subjects) in 2011. The group has analysed patterns over the last decade, as well as the latest information on the supply of and demand for graduates in SIVS. In doing so, it has sought to understand three elements to the flow of graduates in SIVS:

- entry to higher education courses in SIVS, which is influenced by student aspiration, choice and attainment, and the availability and nature of provision in universities and colleges
- supply of graduates in SIVS, which lags behind entry and is influenced by student choice, retention and performance during their period in higher education, and the nature of provision
- demand for SIVS graduates by employers, which is influenced by a range of socio-economic factors, and may itself influence entry, supply and provision.

9. By analysing these elements, which are inter-related, the group aims to develop and communicate an understanding of the way in which the flow of graduates is evolving, the areas in which there may be current or future concerns and the action that may be taken to address this.

10. There is an established evidence base to demonstrate the flow of SIVS students into and out of HE, the latest version of which is summarised in the next section of this report and detailed in Appendix 2. It views the flow of graduates through the lens of their supply, rather than employer demand, and thereby focuses on subjects as the building blocks of HE. The analysis covers STEM and MFL. The group has not provided a commentary on quantitative social science as the reporting of provision in this area is embedded within a range of subjects; this will, however, be addressed at the end of the pilot activity currently being supported by HEFCE and the Economic & Social Research Council[9], and will thereby inform the proposed review of vulnerable subjects in 2011.

11. The evidence on employer demand is more subjective and wide-ranging. With this background, the group's early work has focused on establishing its approach to understanding employer demand and commissioning the work necessary to address this. This included analysis of published evidence, and interviews undertaken with employers to go into further detail about their requirements and understand how this may influence their behaviour (the early findings from this work are provided in the third section of this report). The evidence base almost entirely focuses on STEM subjects, so the group has focused on this in its first report. It has done so, however, in the expectation that the forum proposed as a result of the Worton Review will address the shortage of evidence on employer demand for MFL graduates.

[9] Further detail is available at http://www.hefce.ac.uk/aboutus/sis/socialsci/

Developments since the 2008 Report

12. The most significant development since the last report has been the global economic downturn, which has affected recruitment by employers, public spending, student preferences and HE provision. The current conditions should, however, be considered in a longer run context. Firstly, of sustained growth in jobs (some 3 million over the last 10 years[10], according to the UK Commission for Employment and Skills (UKCES)), the majority of which have been higher skilled, reflected in the growth of professional, associate professional, technical and managerial jobs. Secondly, the growth and impact of the so called BRIC nations (Brazil, Russia, India and China) within the global economy has created renewed competition for talent and skills, and new possibilities for employers requiring STEM graduates. Thirdly, and more recently, the government's *New Industry, New Jobs* agenda provides a vision of renewed industrial activism and a list of sectors for targeted action[11], and related strategies for further and higher education are given in *Skills for Growth* and *Higher Ambitions*[12].

13. Attention over the last year has shifted towards addressing graduate unemployment, in tandem with supporting sectors that will provide comparative advantage for the UK in the post-recessionary world. A downturn in graduate vacancies[13] has also yielded an increase in postgraduate study, combined with steps by government and universities to support study and internships for graduates who would otherwise be unemployed[14]. Demand for HE appears to have a significant counter-cyclical element and a recession may have the further effect of directing students towards subjects such as those identified as SIVS, which may be perceived to position them more effectively in a challenging labour market. As is clear in the next section, the current level of demand for entry to universities and colleges, and for mathematics and science teacher training, is unparalleled[15].

14. **Given the current level of competition for admission to universities and colleges, and for graduate jobs, it is more than ever important that clear signals are provided about the subjects, skills and attributes employers particularly value, and that will position graduates most effectively in the labour market.**

15. As the recent CBI Higher Education Taskforce recommends, graduates should be able to make choices based on the best possible information on teaching quality,

[10] The UK Commission for Employment and Skills, *Ambition 2020: World Class Skills and Jobs for the UK*, 2009 report p8.

[11] H M Government 2009, *New Industry New Jobs: Building Britain's Future*, pp30-31 – http://www.berr.gov.uk/files/file51023.pdf

[12] Available at http://www.bis.gov.uk/policies/skills-for-growth and http://www.bis.gov.uk/policies/higher-ambitions

[13] HECSU 2009 *How are Higher Education Careers Services Experiencing the Recession* – http://www.hecsu.ac.uk/hecsu.rd/research_reports_355.htm.

[14] See http://www.hefce.ac.uk/econson/challenge/ for details of HEFCE and government funding for skills training and internships responding to the recession.

[15] http://www.tda.gov.uk/about/mediarelations/2009/181109.aspx

employment outcomes and economic returns[16]. In order for SIVS provision and the flow of graduates in these areas to continue to strengthen, it will be essential for these market signals to be sustained and enhanced. This will be a task for HEFCE, working with universities and colleges through its Teaching Quality Information (TQI) Steering Group and with key partners such as UKCES[17].

16. One manifestation of the positive trend in HE admissions has been the pressure it has placed on the funding available for student support, which required a cap to be placed on the intake of full-time students in 2009-10. Although the impact was mitigated by the accommodation of 10,000 additional entrants in subjects identified as contributing to the *New Industry, New Jobs* agenda[18], it is clear that this has prevented a number of universities from expanding their SIVS provision to respond to the growth in student demand. If the flow of students at lower levels of the education system continues to be constrained by restrictions on the intake to HE this year, there may be a longer-term impact on aspirations.

17. **Given the consistent message highlighted later in this report that employers particularly value STEM graduates, it will be essential for government and HEFCE to establish a means for ensuring that the upturn in student demand in this area can be accommodated by an increase in provision.**

18. Institutions throughout the sector are reviewing the range of their provision in light of factors such as their own student recruitment, the outcome of the 2008 Research Assessment Exercise (RAE), increasing pay and energy costs and – perhaps most importantly – current and anticipated constraints on public, private, charitable and endowment income. **Universities and colleges can be expected to focus their investment on their areas of greatest strength and viability, which may require HEFCE to continue to take action to secure the availability of SIVS provision.**

19. HEFCE's £25m per year additional support for high cost STEM subjects[19], coupled with the ring-fence requested by the government for research funding in STEM subjects[20], will act as disincentives against closure of these areas, but the group will need to continue to monitor the availability of strategically important provision across the country.

20. **Professor Michael Worton's *Review of Modern Foreign Languages*[21] addresses the particular issues threatening the sustainability of provision in this area within SIVS. The report suggests a need for continued strategic intervention to increase student demand and sustain provision, but also for language departments and centres to develop and communicate a compelling identity to**

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[16] CBI 2009, *Stronger Together: Businesses and Universities in Turbulent Times*, p48 – http://www.cbi.org.uk

[17] See http://www.hefce.ac.uk/learning/qual/tqi.asp

[18] See http://www.hefce.ac.uk/news/2008/advice.htm and http://www.hefce.ac.uk/news/hefce/2009/studentplaces/confirmed.htm

[19] See http://www.hefce.ac.uk/news/HEFCE/2006/science.htm

[20] See http://www.hefce.ac.uk/news/HEFCE/2009/grant/letter.htm

[21] Available at http://www.hefce.ac.uk/news/hefce/2009/worton.htm

students, employers and government, and within their own institutions. The forum proposed in the review report, to be chaired by the Minister for Higher Education, will provide a platform on which this can be developed.

21. HEFCE continues to invest in activities to promote demand among students for SIVS, to secure the supply of SIVS provision and to enhance the flow of employable graduates. Notable developments since 2008 include the integration of four STEM demand-raising programmes into a single National HE STEM programme, which will co-ordinate activity throughout England and Wales[22], new industry standard Foundation Degrees in the Nuclear, Chemical and Bioscience industries co-funded with employers[23], and a series of SIVS activities within the Economic Challenge Investment Fund to support individuals and businesses through the downturn[24]. The implementation of a single demand-raising programme arises from an interim evaluation of HEFCE's SIVS policy and investments, which was conducted in 2008. A full list of activities and investments is available at: http://www.hefce.ac.uk/aboutus/sis/. The group will commission a further evaluation of this work this year.

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[22] See http://www.hefce.ac.uk/news/hefce/2008/stem.htm

[23] See http://www.hefce.ac.uk/econsoc/employer/projects/show.asp?id=43

[24] See http://www.hefce.ac.uk/econsoc/challenge/

Trends in the supply of SIVS graduates

22. This section of the report provides the latest information on entry to SIVS in HE and the supply of new SIVS graduates. The data underpinning this is summarised in Appendix 2. Given the amount of information presented in this section, summary conclusions have been highlighted in bold below.

Data sources

23. The information covers:

- The number of **entries to A levels** in SIVS disciplines. This demonstrates student choice prior to HE, which influences entry to universities and colleges. An increase in the number of students choosing to study Mathematics A level, for example, is likely to be needed to underpin any increase in STEM entry to HE[25]. An increase in A level entries in relevant subjects may, therefore, signal an increase in the supply of SIVS graduates in later years. The translation of A level entries into HE is, however, not direct[26].
- The number of **acceptances via UCAS** of a place to study full-time HE courses in SIVS disciplines[27]. Acceptance of a place in HE is a better indicator of full-time supply of SIVS graduates than an application as, subject to some movement and non-completion at the margins, any increase in this figure is likely to flow directly through to an increase in the number of graduates in subsequent years. Part-time students apply direct to universities and colleges and are not therefore recorded via UCAS.
- The number of **full-time equivalent (FTE) students** returned to the Higher Education Statistics Agency (HESA) in their annual data collections as being active in SIVS cost centres at undergraduate level. The HESA cost centres[28] used to define

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[25] Note that Engineering is not an A level subject – progression is most likely via cognate A levels or vocational training.

[26] It is likely that an entrant to higher education through this route will have studied three or more subjects at A level. These multiple A level subject areas correlate to only one or two subject areas studied in HE. There are also qualifications other than A level that secure entry to higher education and entry is also constrained by the availability and accessibility of provision in SIVS.

[27] UCAS is an entry route to higher education for full-time students only. Part-time students may apply directly to a higher education institution (HEI). Part-time undergraduate FTE registered at HEFCE-funded HEIs (not including the Open University, on which there is a separate analysis later) accounts for 10 per cent of all such undergraduate FTE in 2007-08.

[28] Note that HESA cost centre data is not directly comparable to HESA data considering the subject of the course, identified using the Joint Academic Coding System (JACS) classifications of subject areas. The JACS coding system was introduced in 2002-03 and subject area definitions can be inconsistent with those in earlier years. Cost centres indicate where resources deployed to teach the student are located, and enable a longer time period to be considered: they were unaffected by the introduction of the JACS coding system.

SIVS for the purposes of this analysis are: Chemistry; Physics; Mathematics; MFL; Chemical Engineering; Civil Engineering; Electrical, Electronic and Computer Engineering; General Engineering; Mechanical, Aero and Production Engineering; and Mineral, Metallurgy and Materials Engineering. Quantitative Social Science is not captured as this activity is spread across a range of cost centres.

The HESA data includes all undergraduates[29] registered at HEFCE-funded higher education institutions (HEIs); across all modes of study (full- and part-time); from all domiciles (UK, EU and other international); and in all years of study. The inclusion of students in all years of study means that an increase in UCAS acceptances will only gradually impact on HESA numbers, and any HESA increase will in turn only gradually flow through to an increase in the number of SIVS graduates entering the labour market. It should also be remembered that, as the previous SIVS Advisory Group and the more recent Wakeham Review of Physics have noted[30], a great deal of activity in a specific subject can be undertaken beyond the department, course and cost centre of that name. This means that the overall activity in Physics, for example, will be greater than that recorded in the Physics cost centre.

24. **Together, these indicators represent different stages of the graduate supply chain. Given a traditional full-time model, it will take five years for a change in A level entries and three years for a change in UCAS acceptances to influence the number of new graduates. Changes in HESA numbers will have a more immediate effect and will predominantly influence new graduate numbers over the immediate three year period.**

25. The population used to inform this analysis is consistent with the evidence that informed the reports of the 2005 and 2008 SIVS Advisory Groups. Background to the definition of these populations, and an explanation of the areas of STEM considered to be vulnerable, is available at paragraphs 30 to 37 of the 2008 report[31].

26. The analysis addresses separately the trends apparent from data since the beginning of the decade[32] and during the last three years[33]. The focus is primarily on the number of students flowing into courses in HEIs, but consideration is also given to the domicile of the student, mode of study and type of institution, in order to understand issues such as the accessibility of provision and the diversity of SIVS graduates.

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[29] The undergraduate population includes not only those studying towards first degrees, but also HNCs, HNDs, institutional credits, foundation degrees and other undergraduate-level qualifications. As in the 2005 and 2008 reports of the SIVS Advisory Groups, it does not include students at the Open University (OU), but a separate analysis has been provided on this later in this section. This exclusion results from neither subject area of study nor qualification aim having been recorded by the OU prior to 2002-03.

[30] The Wakeham review of Physics can be viewed at http://www.rcuk.ac.uk under Research Councils UK Reviews, and RCUK Review of Physics.

[31] HEFCE 2008/38 is available at www.hefce.ac.uk under Publications, and HEFCE publications issued in 2008.

[32] HESA data between 1999-2000 and 2007-08

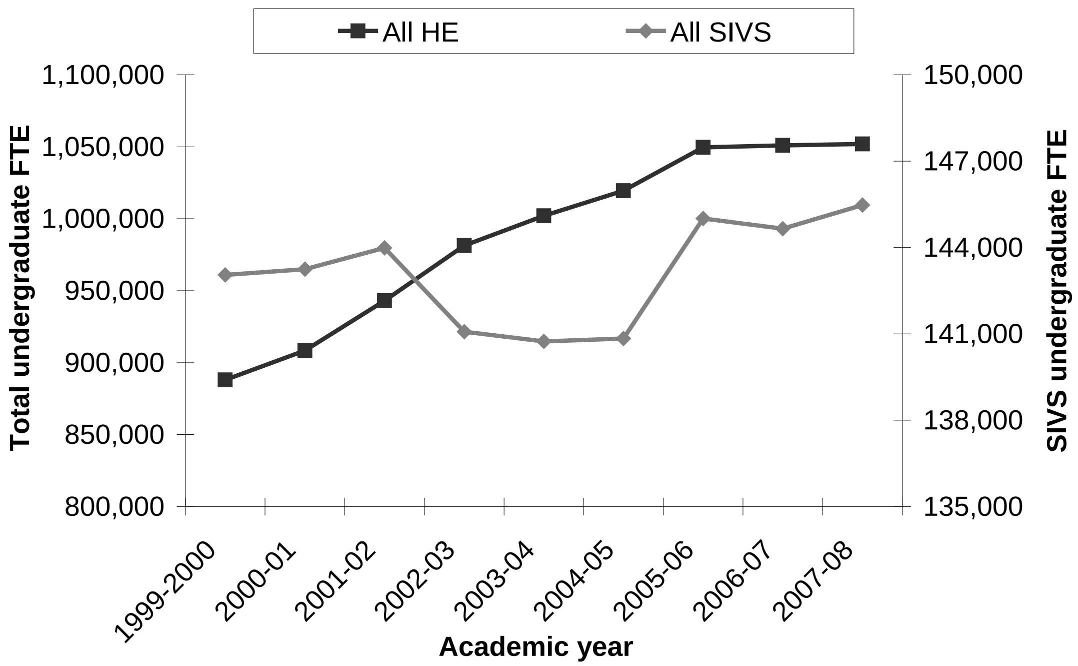
[33] A Level, HESA and UCAS data for the last three available years of data.

27. The focus at this point is on undergraduates, but the group aims to consider the position for postgraduates – taking into account the government's planned postgraduate review[34] – in 2010.

Trends across the decade

28. As Figure 1 below makes clear, between 1999-2000 and 2007-08 the number of FTE undergraduate students increased by 18 per cent, but in SIVS the increase was only 2 per cent. There was also a substantial dip in SIVS numbers between 2002 and 2005, at which point the first SIVS Advisory Group report was published and HEFCE's interventions commenced.

Figure 1 Numbers of FTE undergraduate students, 1999-2000 to 2007-08



29. Figure 2 below disaggregates SIVS and shows the numbers in each subject. This shows a 9 per cent increase in Mathematics, 8 per cent in MFL, 5 per cent in Physics and Chemistry. In all cases, this is less than half the increase observed across all subject areas. In Engineering and Technology, there was a decline during the decade, totaling 4 per cent overall.

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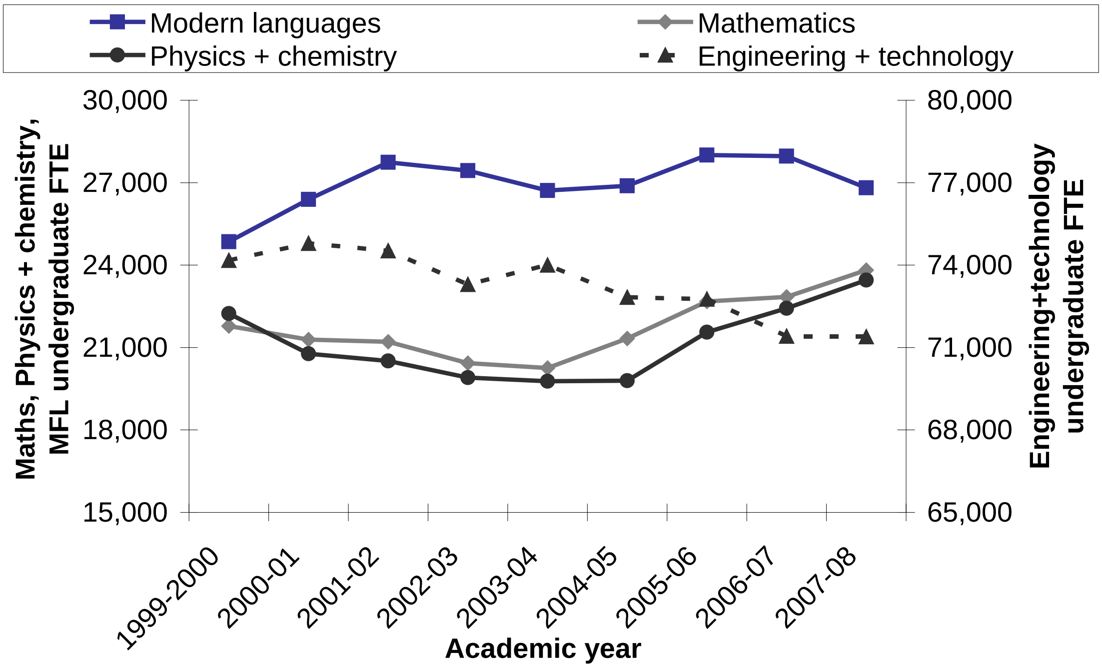
[34] See www.bis.gov.uk/postgraduate-review

Figure 2 Numbers of FTE undergraduate students by individual SIVS, 1999-2000 to 2007-08



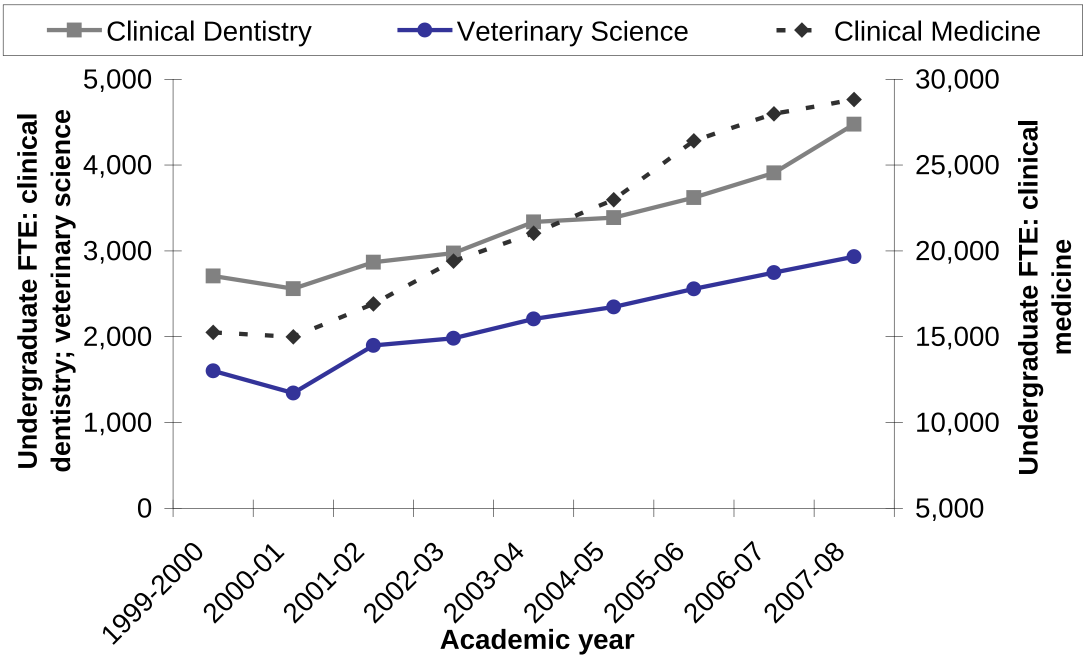
30. Table 2.1, and Figures 2.1 and 2.2, at Appendix 2 provide more detail on this[35].

31. The pattern across STEM as a whole is more positive if those disciplines not identified as vulnerable in the previous SIVS Advisory Group's report are taken into account.

32. For example, Figure 3 below shows the patterns in the clinical STEM subjects of medicine, dentistry and veterinary sciences, which experienced prolonged and substantial growth throughout the decade; growth was almost 90 per cent in clinical medicine. Although the disciplines were smaller in terms of absolute student numbers, increases of 83 per cent were observed in veterinary science and 65 per cent in clinical dentistry.

[35] Figure 2.1 considers the number of undergraduate student FTE studying physics and chemistry, by discipline, between 1999-2000 and 2007-08. Figure 2.2 shows equivalent information for engineering and technology disciplines. In HESA cost centre data, languages activity is captured within one Modern Foreign Languages cost centre: sub-disciplines cannot be extracted. Professor Michael Worton's 'Review of Modern Foreign Languages provision in higher education in England' (HEFCE 2009/41, available at www.hefce.ac.uk under Publications, and HEFCE publications issued in 2009) provides information on students studying sub-disciplines of Modern Foreign Languages, by considering subject areas of study identified using the JACS coding system.

Figure 3 Numbers of FTE undergraduate students by clinical STEM subject area, 1999-2000 to 2007-08



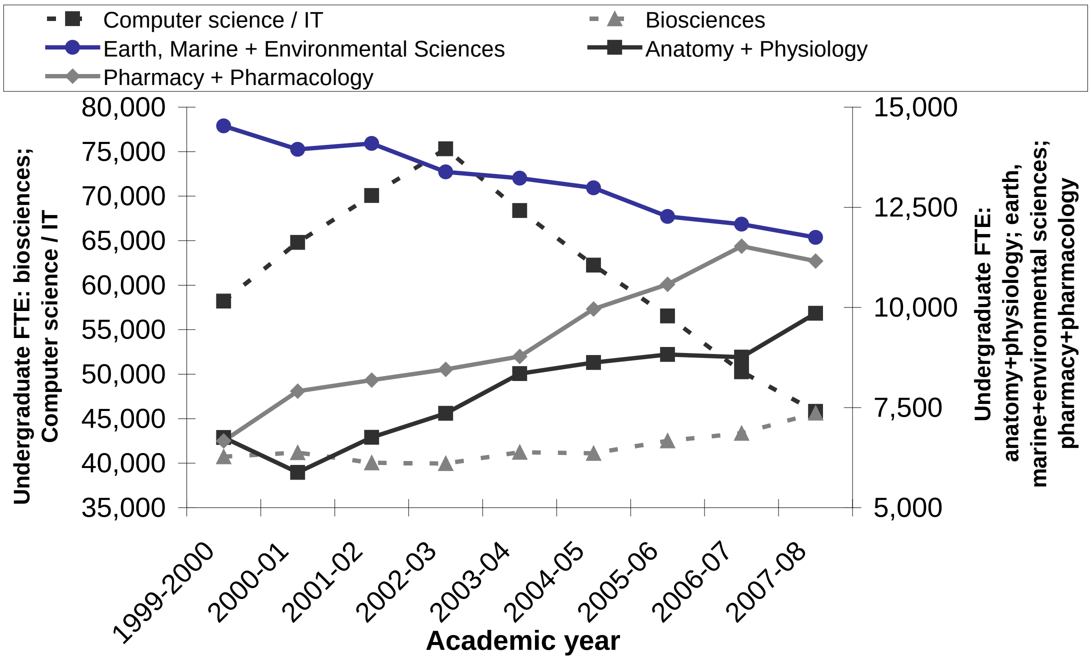
33. As Figure 4 below shows, in the non-clinical STEM subjects that fall outside of the SIVS remit, the patterns are more variable. At 45,640 FTEs, the volume in Biosciences is almost equivalent to that in Chemistry, Mathematics and Physics combined and increased throughout the decade. At lower levels of volume, Anatomy and Physiology increased by almost 50 per cent, and Pharmacy and Pharmacology by 67 per cent.

34. Figure 4 also demonstrates the potential vulnerability of other STEM disciplines. Numbers studying Earth, Marine and Environmental sciences have declined steadily throughout the decade, whereas those in Computer Science/IT[36] increased between 1999-2000 and 2002-03, then declined rapidly during the remainder of the period. This decline is, however, from a large base and volume overall remains comparable to Biosciences. The vulnerability of individual strategically important subjects will be considered further by the advisory group in 2011.

35. The data underpinning this analysis is summarised in Table 2.2 in Appendix 2.

[36] Full name of cost centre is 'IT and systems sciences, Computer software engineering'.

Figure 4 Numbers of FTE undergraduate students by non-SIVS, non-clinical STEM subject area, 1999-2000 to 2007-08



36. **As the previous SIVS Advisory Group's report notes, the dramatic growth in medicine and related subject areas may have had an impact on participation in other STEM disciplines, including those falling within the SIVS remit. These disciplines compete for entrants with similar STEM backgrounds in terms of A level or equivalent study. Growth in medicine and related subjects may, therefore, have reduced the pool of potential entrants to other STEM disciplines and contributed to their vulnerability.**

Trends in SIVS data: the last three years of available data

37. The last three years of available data, referred to for simplicity as the last three years, confirms the largely positive trend in the supply of SIVS graduates identified in the previous SIVS Advisory Group's report. This cannot directly be attributed to any specific factor such as HEFCE's SIVS investments. It is most likely to result from the weight of efforts to promote SIVS (particularly STEM) within schools, allied to the influence of student debt, and more recently a constrained graduate labour market, on student choices. It does, however, suggest that HEFCE's selective approach to intervention since 2005 has been appropriate.

38. In order to provide the most recent data, it has been necessary to use periods that are not precisely identical: HESA data – FTEs for 2005-06 to 2007-08; UCAS accepted applicants – headcount for 2007-08 to 2009-10; A level entries[37] by subject area – headcount for 2006-07 to 2008-09.

[37] A level entries relate to all entries, regardless of outcome. In SIVS disciplines, a minimum of 95 per cent of A level entries were awarded a pass (grades A to E); for further information ,

All Subjects

39. In order to provide a benchmark for comparison, it is helpful to begin the analysis of the last three years with a picture of the trend across all subjects. The total number of undergraduate FTEs, UCAS acceptances and A level entrants increased, but the increase in the overall undergraduate population was 0.2 per cent, or less than 2,500 FTEs, to 1,051,911. This follows a substantial increase in 2005-06, which is thought to relate to the introduction of variable tuition fees during the following year. UCAS acceptances increased by 15 per cent over the period considered and A level entries by 5 per cent[38]. Further details are provided in Table 2.3 in Appendix 2.

Physics and Chemistry

40. **The number of Chemistry and Physics students in HE increased at a greater rate during the last three years than the average across all subjects, and is now at a level higher than at the beginning of the decade. A level and UCAS data suggest that the supply of new graduates in these subjects will continue to increase during the coming years.**

41. In Chemistry, undergraduate FTEs increased by 12 per cent, UCAS acceptances by 1 per cent and A level entries by 6 per cent during the period. In Physics, the comparable increases were 5 per cent, 11 per cent and 7 per cent. Further details are provided in Table 2.3 in Appendix 2.

Mathematics

42. **Following a period of decline, the number of Mathematics students in HE is growing at a greater rate than the average for all subjects, and is now at a level higher than at the beginning of the decade. Given A level and UCAS data, continued increases in the supply of new Mathematics graduates can be anticipated during the coming years. The increase in A level entries should also have a wider positive effect, due to the underpinning significance of mathematics throughout science and engineering.**

43. There was a 5 per cent increase in the number of undergraduate FTEs in Mathematics during the period. UCAS acceptances increased by 17 per cent and the increases in A level entries were even greater: 21 per cent in A level Mathematics and 30 per cent in Further Mathematics. Further details are provided in Table 2.3 in Appendix 2.

Engineering and Technology

44. **The trend across Engineering is less positive than Physics, Chemistry and Mathematics, but it varies between engineering disciplines. The number of Electrical Engineering students is declining, albeit from a large base, whereas Civil and Chemical Engineering numbers are increasing at a rate well beyond the**

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see ‘GCE/VCE/Applied A/AS and Equivalent Results in England’: www.dcsf.gov.uk under Research and Statistics.

[38] The 2008-09 UCAS acceptances data included ex-NMAS (Nursing and Midwifery Admissions Service) applicants for the first time: UCAS indicate that there were around 14,000 such applicants accepted in 2008-09.

average for all subjects. Other areas of Engineering appear to be more stable, although a significant decline in UCAS acceptances to Minerals, Metallurgy and Materials Engineering suggests that numbers in this area will decline during the coming years.

45. Across all of the Engineering and Technology disciplines, undergraduate FTEs declined by 2 per cent during the period. Whereas Chemical Engineering numbers increased by 30 per cent and Civil Engineering by 9 per cent, those in Electrical, Electronic and Computer Engineering fell by 13 per cent and those in General Engineering by 3 per cent.

46. UCAS acceptances to Engineering and Technology disciplines increased by 12 per cent during the period. The only decrease was a reduction of 32 per cent in Minerals, Metallurgy and Materials, although volume in this discipline was small throughout the period. The largest increases were in Civil Engineering (28 per cent) and Chemical Engineering (26 per cent). Electrical, Electronic and Computer Engineering increased by 1 per cent.

47. Further details are provided in Tables 2.3 and 2.4 in Appendix 2.

Modern foreign languages

48. **Within MFL, there has been consistent growth in the number of students in Iberian and Asian languages programmes, and consistent decline in German. Most language disciplines have also experienced growth at A level. Overall numbers have, however, declined during the last three years and can be expected to remain variable during the coming years.**

49. Undergraduate FTEs in MFL decreased by 4 per cent during the three year period. Following a peak in 2005-06, the latest year shows numbers falling back to 2003-04 levels.

50. UCAS acceptances varied between the categories recorded: in ‘European language, literature and related courses’, numbers increased by 10 per cent, but there was a 21 per cent decrease in ‘non-European language, literature and related courses[39]’. Within these headings, however, there were increases in French (15 per cent), Iberian (10 per cent), Russian and East European (35 per cent), and Asian Studies (26 per cent), but reduction in German and Scandinavian (6 per cent), Italian (12 per cent), African and Modern Middle Eastern Studies (11 per cent).

51. A more narrow range of language studies is available at A level. During the three year period, numbers in French increased by 1 per cent, those in Spanish by 11 per cent and those in other available languages by 19 per cent. German, however, declined by 9 per cent.

52. Further details are provided in Tables 2.3 and 2.5 in Appendix 2.

Domicile: where students come from

53. Across all subjects during the three year period, UK-domiciled (home) FTEs accounted for around 9 out of every 10 undergraduates. This was also broadly the

[39] Not including acceptances to ‘American studies’.

position within each SIVS area[40], although in Engineering and Technology the proportion of students from outside UK in 2007-08 was 25 per cent.

54. Analysis of student domicile confirms that the decline in Engineering and Technology is more pronounced among UK students. While total numbers declined by 2 per cent during the three year period, home numbers declined by 5 per cent. EU numbers, in contrast, increased by 7 per cent and international students by 9 per cent. This suggests that HEIs may be recruiting more Engineering students from outside the UK to sustain their provision in the face of the decline in home numbers.

55. **As graduates from outside UK may be allowed to stay on to work after their studies, they represent a significant, although potentially less secure, contribution to the supply of graduates. In Engineering, the actions of universities and colleges substantially to increase recruitment from overseas may mitigate the effect of declining UK numbers, but this creates particular challenges for employers in sectors such as defence, which are reliant on UK nationals for graduate labour.**

56. Further details are provided in Table 2.6 and Figure 2.3 in Appendix 2.

Mode of Study: full and part-time students

57. Part-time undergraduate FTEs account for around one in ten of all undergraduate students. Across all subjects, full-time numbers increased by 1 per cent during the last three years, whilst part-time numbers declined by 9 per cent. This pattern is generally reflected in the SIVS subjects[41] and in those subjects countering the overall trend – Physics and Mathematics – the numbers involved are small. The decline in part-time numbers is particularly apparent in MFL (17 per cent). Although HEFCE has provided funding to mitigate the impact of the recent withdrawal of funding for students with equivalent and lower qualifications in SIVS subjects, the continued absence of student support for part-time students is likely to be a key contributing factor.

58. **The decline in part-time numbers in the SIVS subjects suggests that provision is becoming less accessible to adults and those already in employment. This implies a diminishing diversity of SIVS graduates entering the labour market, and particular concerns for employers seeking SIVS qualifications for members of their workforce.**

59. Further details are provided in Table 2.7 of Appendix 2.

The Open University (OU)

60. The OU is not included in this section's analysis of HESA data, but it is a major provider of part time study. Overall OU numbers declined by 22 per cent during the period since 1999-2000 and the decline was more pronounced in SIVS disciplines. Although numbers in Chemistry increased by 16 per cent, those in Physics declined by 32 per cent, those in Mathematics numbers by 22 per cent, and those in MFL by 19 per cent. Across Engineering and Technology, there were declines of 17 per cent in General

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[40] Table 2.6 at Appendix 2 considers numbers of undergraduate FTE across the SIVS subjects areas by student domicile.

[41] Table 2.7 at Appendix 2 considers numbers of undergraduate FTE across the SIVS subjects areas by mode of study.

Engineering, 45 per cent in Electrical, Electronic and Computer Engineering, and 19 per cent in Mineral, Metallurgy and Materials Engineering.

61. **Discussions with the OU suggest that the decline in SIVS registrations is beginning to reverse. Overall, however, these data provide further evidence of the decline in part-time activity across SIVS, and the impact this may have on the accessibility of provision and the diversity of the graduate workforce in these subjects.**

62. Further details are provided in Table 2.8 of Appendix 2.

Institution type: pre and post-1992 universities

63. Across all SIVS subjects[42], undergraduate FTE at pre-1992 institutions[43] increased by 3 per cent over the three-year period, while the equivalent number at post-1992 HEIs declined by 2 per cent. In Physics and Chemistry, there were increases in both post-1992 and pre-1992 institutions, but patterns varied considerably between the two categories in Mathematics, Engineering and Technology, and particularly in MFL.

64. In Mathematics, there was a 6 per cent decrease in numbers at post-1992 institutions and an 8 per cent increase in pre-1992 institutions. In Engineering and Technology, the comparable figures were a 4 per cent decrease and a 2 per cent increase, and the last two years of the period were the first during the decade in which numbers in pre-1992 institutions outnumbered those in the post-1992 sector. In MFL, numbers at pre-1992 institutions remained stable over the three-year period, but there was a decline of 18 per cent in post-92 institutions.

65. **The decline in Engineering, Mathematics and MFL provision in post-1992 HEIs suggests that SIVS provision is becoming less accessible. Students in these institutions are more likely than others to be mature, in work, studying locally and from neighbourhoods with a record of low HE participation. Programmes in these institutions also have a strong tradition of vocational orientation. This suggests a limit on the diversity, and in some locations the availability, of graduates in these subjects.**

66. Further details are provided in Table 2.9 of Appendix 2.

Conclusion

67. Overall, the trend in the supply of graduates in SIVS subjects is positive and can be expected to continue to improve. This suggests that the selective approach adopted by HEFCE since 2005 has been appropriate, but that further strategic interventions will be required. The group's findings in relation to Engineering, MFL, part-time students and post-1992 institutions provide a particular steer for the targeting of such interventions during the coming years.

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[42] Table 2.9 at Appendix 2 considers numbers of undergraduate FTE across the SIVS subjects areas by type of institution.

[43] Those with degree awarding powers and the right to use the University title before 1992.

Demand for STEM Graduates

68. As discussed earlier, Lord Sainsbury's review of Science and Engineering recommended that the group should produce an annual report identifying the supply of and demand for STEM graduates [44]. This extension to HEFCE's SIVS remit has been approached by compiling and synthesising the existing evidence on employer demand; analysing HESA data on salaries and employment; and commissioning research on employers' views of their requirements for STEM graduates. The group has, in line with the Sainsbury recommendation, focused on demand for STEM subjects at undergraduate level. Postgraduate demand will be considered next year, taking into account the government's postgraduate review.

69. Employer demand, for the purpose of this work, is defined as the labour and skills required by employers, including business, academia, government and other sectors. **Demand can be identified from employer surveys, labour market forecasts, or quantitative indicators such as salary or earnings data. Demand can be expressed in terms of a predicted shortage at some point in the future or an immediate and unfulfilled demand. It can be identified at national or regional levels, and framed in terms of sectors or occupations, rather than subjects in HE; demand may relate to specific courses and levels of study, or to skills attributable to one aspect of these. The link between an identified employer need and a subject or course within HE is rarely straightforward.**

70. Importantly, employers are not a homogenous group. Research tends to capture the views of larger employers (or their representative bodies), which are able to respond to questionnaires and find the time to be interviewed. Employers' views on what they need from HE varies by size of business and which level and type of manager is questioned[45].

71. The commentary and conclusions below are intended to provide a better basis for government, HEFCE and others, including potential students, to understand and respond to the needs of employers in the areas identified. This section addresses in turn: what employers say they value; what they mean when they identify subjects or attributes they value; and what conclusions can be reached from this.

What employers say

72. Consultants commissioned by the group assessed the robustness of the underlying methodology behind forecasts of shortage[46], and collated a number of recent demand studies. The research notes that a number of indicators or proxies for demand are typically used to forecast future demand. These include employer-based indicators (e.g. reports of shortage); price-based indicators (e.g. earnings growth); volume-based

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[44] HM Treasury, 2007, *The Race to the Top,* Executive summary http://www.hm-treasury.gov.uk/sainsbury_index.htm

[45] Ewart Keep, *Higher Education and a Skills Agenda More Broadly Conceived*, in IPPR 2009, *First Class? Challenges and Opportunities for the UK's University Sector.*

[46] SQW Consulting, 2009, *Demand for subjects and skills in English HE,* available from HEFCE publications (http://www.hefce.ac.uk/pubs/) in early 2010.

indicators (e.g. employment or unemployment); and other indicators of imbalance based on administrative data (e.g. vacancies or vacancy/unemployment ratios).

73. The research finds that evidence of demand can be articulated in terms of: sectors or occupations, with limited definition of the attributes or skills required; broad graduate attributes e.g. leadership and communication skills, teamwork, business awareness; specific subjects e.g. Physics or STEM; and specific skills that can be acquired as part of a broader academic subjects at university e.g. specific experimental techniques. A combination of these factors may often be identified, and may also be overlaid with a broader concern about the 'quality' of graduates and their fitness for employment. For example[47]:

- the CBI's 2009 'Education and Skills survey' suggests that two thirds of businesses had difficulty recruiting STEM-skilled people at some level
- the Department for Business Innovation and Skills' 'UK Low Carbon Industrial Strategy' forecasts that jobs in low carbon and environmental goods and services could increase by 400,000 by 2015[48]
- the Association of the British Pharmaceutical Industry and Biosciences Federation's '*In vivo* sciences in the UK: sustaining the supply of skills in the 21st century' calculated in 2008 that 60-120 extra graduates are needed with experience of in-vivo techniques above existing numbers
- the Council for Industry and Higher Education's study on 'The demand for STEM graduates and postgraduates' finds that the level of applications from STEM graduates for jobs was adequate, but employers were concerned about the standard and abilities of the graduates applying
- engineeringUK's 2009-10 report suggests that by 2017 587,000 new workers will need to be recruited into the manufacturing sector[49]
- the Migration Advisory Committee identifies civil engineers, geophysicists, chemical engineers, and science and engineering technicians among its list of shortage occupations, where inclusion indicates the occupation is skilled, suffering from an *immediate* labour shortage and it is sensible to fill the shortage using labour from outside the European Economic Area[50].
- pre-recession analysis by the Institute of Employment Research at the University of Warwick finds a shift from traditional manufacturing to a wider demand for STEM graduates in areas such as medicine, business services, transport and distribution, and in occupations at managerial, professional and associate professional levels.

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[47] Ibid SQW.

[48] HM Government 2009, *The UK Low Carbon Industrial Strategy*, http://www.berr.gov.uk/files/file52002.pdf

[49] EngineeringUK 2009, *2009/10 report*, http://www.engineeringuk.com/what_we_do/education_&_research/engineering_uk_2009/10.cfm

[50] Migration Advisory Committee April 2009, *First Review of Recommended shortage Occupation Lists,* http://www.ukba.homeoffice.gov.uk/aboutus/workingwithus/indbodies/mac/

- the UK Commission for Employment and Skills' 'Ambition 2020: World class skills and jobs for the UK' concludes that there are limited skills shortages and the key issue for the UK economy is to address the relatively low demand for skills among employers relative to their supply
- REFLEX – an international survey of graduates five years after graduation – suggests that UK graduates are well prepared for their longer-term career, but poorly prepared for their first job, reflecting the historically looser relationship between HE and employment in the UK than some other countries. The key issue identified here, therefore, is the transition from HE into employment[51].

As this list makes clear, there is a wide range of forecasts about the current and future demand for skills, occupations and subjects, and the priorities for addressing them; Appendix 3 gives a fuller picture.

74. Any forecast of future demand also faces a number of definitional and methodological problems. Research for the Department of Trade and Industry in 2006 found that 'most forecasting models are based on the assumption that, to a large extent, current trends in demand and supply will continue. The validity of this assumption is clearly questionable in an economy subject to both internal and external shocks'[52]. Similarly, employers consulted for a Department of Innovation, Universities and Skills project[53] said it was not possible to make sensible forecasts about their likely recruitment over a 5-10 year period because there were too many uncertainties. While forecasts at a sector level were more plausible the employers suggested that even these would be highly uncertain. **With the exception of those areas like medicine and teaching, where demographic and workforce development models can inform both the supply of and demand for trained graduates, it is very difficult to identify shortages that will be meaningful in early careers, let alone a full working lifetime.**

75. This does not mean that action should not be taken to address areas identified as experiencing immediate shortages, such as the *in-vivo* example above. Recent collaborations on nuclear and chemical industry standard Foundation Degrees suggest that shortages such as these can successfully be addressed by employers, funders and universities and colleges working together to develop tailored and co-funded provision. It does, however, suggest that **the policies, funding and approaches needed to address particular and immediate shortages should be quite different to those informing the level and nature of HE provision, and thereby the broad flow of graduates into the labour market.**

76. **There are two areas in which the views of employers are consistent enough to inform national HE policy. Firstly, evidence commissioned by the group and in numerous other reports suggests that employers consistently identify a demand for STEM graduates, which arises from a broad requirement for numeracy aligned**

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[51] Available at www.hefce.ac.uk/pubs/rdreports/2008/rd22_08/

[52] DTI 2006, *Science Engineering and Technology Skills in the UK*, http://www.berr.gov.uk/files/file28174.pdf

[53] DfES 2009, *The Demand for Science, Technology, Engineering and Mathematics (STEM) skills* http://www.dius.gov.uk/~/media/publications/D/Demand_for_STEM_Skills

with specific technical skills. Secondly, employers are consistently concerned about the quality of graduates emerging from HE, and they associate this both with broad employability and specific technical skills.

What employers mean when they say they value high quality STEM graduates

77. In order to move beyond labour market forecasts and employer surveys, researchers commissioned by the group were tasked with understanding what employers mean when they express a desire to recruit STEM graduates, how they do so, and what happens when they are unable to recruit the people they want. Interviews were conducted with key senior decision makers among large companies and their representative bodies including MW Kellog, Barclays, the Association of the British Pharmaceutical Industry and Procter and Gamble.

78. The research finds, firstly, that employers typically expect more from STEM graduates than they did in the past. More advanced technology means that UK based industries are addressing more complex scientific and business challenges. STEM graduates are increasingly required to draw upon disciplines such as design and social sciences to solve real world problems. The globalisation of production and research can require employees to work in teams that rarely meet face to face or work together at the same time, and may include people from different cultures speaking different languages. For some employers, the UK may be a small part of worldwide business in companies that are located in and directed from locations worldwide (and vice versa). Where the workforce comes from may, therefore, be immaterial to the company, if not its local managers and national governments. This dynamic raises the importance of employees' 'soft' skills and their adaptability.

79. The notion of 'quality', to unpack this idea further, may vary depending on the employer questioned. R&D intensive employers, for example, may express a need to recruit STEM graduates, post graduates and post doctoral students of the highest intellectual calibre. The numbers required here may be small, but they are vitally important to these businesses. For others, a concern about 'quality' may be associated with aspects of the modern STEM curriculum, such as the move to more flexible or modular learning, or a limited focus on practical experimentation. Others again may identify 'quality' with the social or cultural capital apparent in candidates who demonstrate team work, communication skills, leadership potential and business acumen. Some employers may associate these attributes with a particular set of universities, typically with high entrance requirements or a track record of working with business, and so may restrict their recruitment efforts to a very narrow field.

80. Employers may selectively use internships and placements[54] to ensure candidates meet their quality profile ahead of formal recruitment. In this context, it is noteworthy that the numbers of students undertaking sandwich placements – which are strongly correlated to positive employment outcomes[55] – have been decreasing (10.5 per cent of undergraduates in 1994-95 were registered as sandwich in comparison with to 6.5 per

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[54] The Panel on Fair Access to the Professions 2009, *Unleashing Aspiration: The Final Report,* Section 4.4 http://www.cabinetoffice.gov.uk/media/227102/fair-access.pdf
[55] Ibid chapter 7 figure 7a.

cent in 2006-07)[56]. Discussions with employers suggest that cost is a key factor, both to host employers and to students, who are unable to afford placements if they are unpaid, if they have to give up part-time employment to undertake them, or need to travel or live near to the placement.

81. Beyond the theme of quality, it appears that business location may restrict the pool of potential candidates for some employers[57]. Businesses, like some universities, observe that certain regions or areas have a greater 'pull' to potential employees (or students) than others and, in some areas, there can be a 'clustering' effect between HE and business. Research for the HEFCE funded 'Chemistry for Our Future' programme, for example, found that business location was the most common reason for hard-to-fill vacancies in the chemical sciences[58]. In situations such as this, the accessibility of STEM provision in a specific locality may be a legitimate concern – particularly given the earlier data showing a decline in Engineering and Mathematics provision in post-1992 institutions.

82. There may also be differences in approach due to the size of business. Larger employers may have a ball park figure of graduates or post graduates they wish to recruit, and a failure to recruit one or two either side of this may not materially affect business performance. Work and projects may be moved elsewhere within companies or can be reprioritised without significant impact; skilled and experienced manpower recruited from elsewhere; flexible working practices encouraged; relationships developed with particular universities, perhaps via placements/internships or contract/collaborative research; or employers may train in house, or recruit at apprenticeship/foundation degree level. This degree of flexibility, of course, is not open to all employers.

Other factors influencing supply and demand

83. Approximately half of all STEM graduates enter occupations or sectors not directly relevant to their qualification. This may restrict the supply of skilled manpower for those employers that require STEM graduates for their subject expertise[59], but whether this is a matter of concern is debatable. As the Royal Society has identified in its report on 'Hidden Wealth: the contribution of science to service sector innovation', science has played a key role in the expansion of and innovation within the service sector, which accounts for 80 per cent of UK employment[60].

84. Employers pay STEM graduates high salaries relative to those in other subjects, which suggests that effective market signals are in place. The Longitudinal Destinations of Leavers from HE (LDLHE) survey provides evidence in relation to the salaries of

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[56] The CBI 2009, *Future Fit Preparing Graduates for the World of Work*, http://www.cbi.org.uk/pdf/20090326-CBI-FutureFit-Preparing-graduates-for-the-world-of-work.pdf

[57] WM Enterprise 2009, *Demand for Skills and Subjects in English Higher Education*, available from HEFCE publications (http://www.hefce.ac.uk/pubs/) in early 2010.

[58] Reported in HECSU's, *Graduate Market Trends Summer 09,* http://www.prospects.ac.uk

[59] Ibid DIUS.

[60] The Royal Society 2009, *Hidden Wealth*, http://royalsociety.org/page.asp?id=8691

graduates 40 months after graduation. These data[61] show that the mean salary of UK and EU domiciled graduates from a full-time first degree in Engineering, for example, was £29,535 compared to a mean salary of £25,680 for equivalent graduates across all subject areas. Employment rates for STEM disciplines are at or above the average for all disciplines three and half years after graduation.

85. Research for Universities UK in 2007[62], furthermore, calculated the economic benefits to the individual of specific higher education subjects. Findings for specific subjects include Engineering, £243,730; Physical/Environmental sciences, £237,935; Mathematical and Computer sciences, £241,749. This compares to the average return of £160,000. Recent estimates have been more conservative[63], but the subject differential and potential market signal remains.

Conclusions

86. In conclusion, forecasts about future demand for STEM graduates should only be used to inform policy on the supply of HE in the broadest terms. There are many forecasts, but the landscape is simply too complex and fast moving for shortages in specific sectors or occupations to be translated into numerical changes to provision in specific subjects. Employers value STEM graduates for their numeracy and scientific skills, particularly when these are aligned with the transferable skills they associate with the highest calibre graduates. These graduates will, however, increasingly draw on other disciplines, such as design and social science, to solve problems associated with the industries and jobs of tomorrow.

87. It should be possible for specific skill requirements to be addressed through close working between individual and groups of employers, universities and colleges. This will, however, require responsiveness from HE providers, underpinned by public funding incentives, and employer funding at a level appropriate to the specificity of their requirements. Employers will also need to provide clear signals of the subjects, skills and attributes they particularly value, and that will position graduates most effectively in the labour market; and to engage in the development and delivery of provision, for example through staff and student placements.

[61] Updated version of analysis presented in 'Graduates and their early careers' (HEFCE 2008/39), based on the more recent 2004-05 LDLHE population. See Appendix 4 for further detail.

[62] Universities UK 2007, *The economic benefits of a degree.*

[63] A full discussion is available on the Prospects website, http://www.prospects.ac.uk, 'Financial benefits of a degree and the impact of variable fees'

Appendix 1

Terms of reference

1. On behalf of the government and the HEFCE Board, to keep under review the contribution that higher education makes to strategically important and vulnerable subjects (SIVS), focusing in particular on the contribution that higher education makes, through its teaching, research and knowledge transfer activities in science, technology, engineering and mathematics, to the science and innovation system.

To focus on the sustainability of provision in SIVS within the higher education system, noting that:

a. It is for the government to make judgements on which subjects are strategically important at any given time, including those that may become strategically important in the future.

b. The government has asked HEFCE to focus on the sustainability of SIVS provision and to identify areas where current provision is out of step with national need and action is needed.

c. Lord Sainsbury's review of Science and Innovation policy has tasked the group with publishing an annual report describing the subjects where there are, or are likely shortly to be, shortages of students with key skills. To include gathering and commissioning new evidence to fulfill this role.

d. To keep under review HEFCE's rationale, process and criteria for identifying academic subjects as being vulnerable – including HEFCE's general approach towards vulnerability – taking into account all available evidence.

e. To oversee HEFCE's monitoring of provision in SIVS (so called 'horizon scanning') in 2011.

f. To oversee HEFCE's programme of work to support SIVS and to commission research evidence for the effectiveness and impact of HEFCE's interventions.

g. In advising on SIVS, to take account of the needs of the economy and society in relation to both knowledge and skills.

h. To advise on research and information requirements to underpin HEFCE's approach to this issue in the longer term.

i. To review, by 2011, HEFCE's SIVS policy and the list of vulnerable subjects

Strategically important subjects Advisory Group members

Peter Saraga (Chair)	Former Managing Director, Philips Research Labs UK; former HEFCE Board member
Susan Anderson	Director of Public Affairs, CBI
Stephen Axford	Head of Science and Society team, Department for Business, Innovation and Skills
John Craven	Vice-Chancellor, University of Portsmouth
Julia Goodfellow	Vice-Chancellor, The University of Kent
Victoria Pryce	Chief Economic Adviser and Director-General, Economics Department for Business, Innovation and Skills
Colin Riordan	Vice-Chancellor, University of Essex
David Sweeney	Director, Research, Innovation and Skills, HEFCE
Philip Whiteman	Chief Executive, SEMTA
Officers	
Paul Hazell	HEFCE
Chris Millward	HEFCE

Appendix 2

Additional figures and tables to show supply of graduates to SIVS disciplines

An evidence base to show the flows of SIVS graduates into higher education has been established for some time, and was drawn upon by previous advisory groups. The figures and tables that follow provide a summary of the current version of this evidence base.

Data regarding numbers of undergraduate student FTEs are drawn from HESA cost centre data. This data includes all undergraduates registered at HEFCE-funded HEIs (not including the Open University[64]): across all modes of study (full- and part-time); from all domiciles (UK, EU and other international); and in all years of study. The data sources are discussed further at Paragraph 23 of the main report.

Table 2.1 Numbers of undergraduate student FTEs in SIVS, by HESA cost centre, 1999-2000 to 2007-08

Group	HESA cost centre	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08
SIVS	Chemistry	12,895	11,817	11,556	10,751	10,350	10,458	12,027	12,888	13,442	4%
	Physics	9,341	8,956	8,957	9,153	9,426	9,337	9,534	9,540	10,011	7%
	Mathematics	21,782	21,290	21,209	20,435	20,252	21,329	22,678	22,845	23,816	9%
	Engineering and technology	74,176	74,790	74,524	73,298	73,999	72,830	72,764	71,411	71,396	-4%
	Modern foreign languages	24,853	26,392	27,743	27,436	26,714	26,886	28,004	27,967	26,812	8%
All SIVS		**143,046**	**143,246**	**143,989**	**141,073**	**140,741**	**140,841**	**145,008**	**144,651**	**145,477**	**2%**

Table 2.1 notes: This table aggregates undergraduate student FTEs in the cost centres of chemical engineering; civil engineering; electrical, electronic and computer engineering, general engineering; mechanical, aero and production engineering; and mineral, metallurgy and materials engineering, to provide information on the total FTEs active across all engineering and technology cost centres.

[64]Prior to 2002-03, neither subject area of study nor qualification aim was recorded by the OU (all students were returned as studying towards institutional credits). It is therefore difficult to include the OU in trend analysis that looks further back than 2002-03. Analysis of HESA data at cost centre level reported in the 2005 and 2008 reports does not consider activity registered at the OU primarily for this reason.

Figure 2.1 Numbers of undergraduate student FTEs studying 'physics and chemistry', by discipline, 1999-2000 to 2007-08

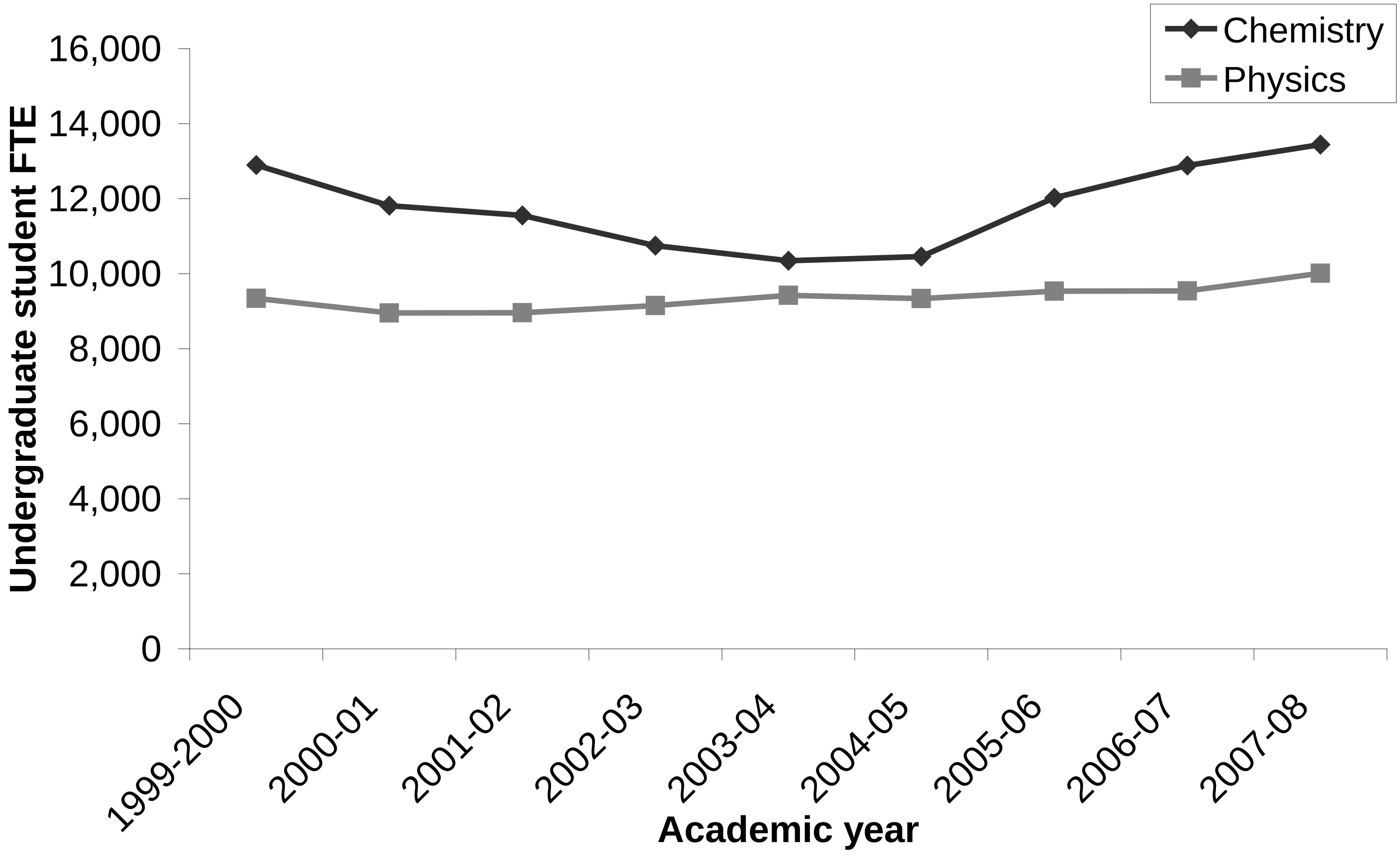

Figure 2.2 Numbers of undergraduate student FTEs studying ‘engineering and technology’, by discipline, 1999-2000 to 2007-08

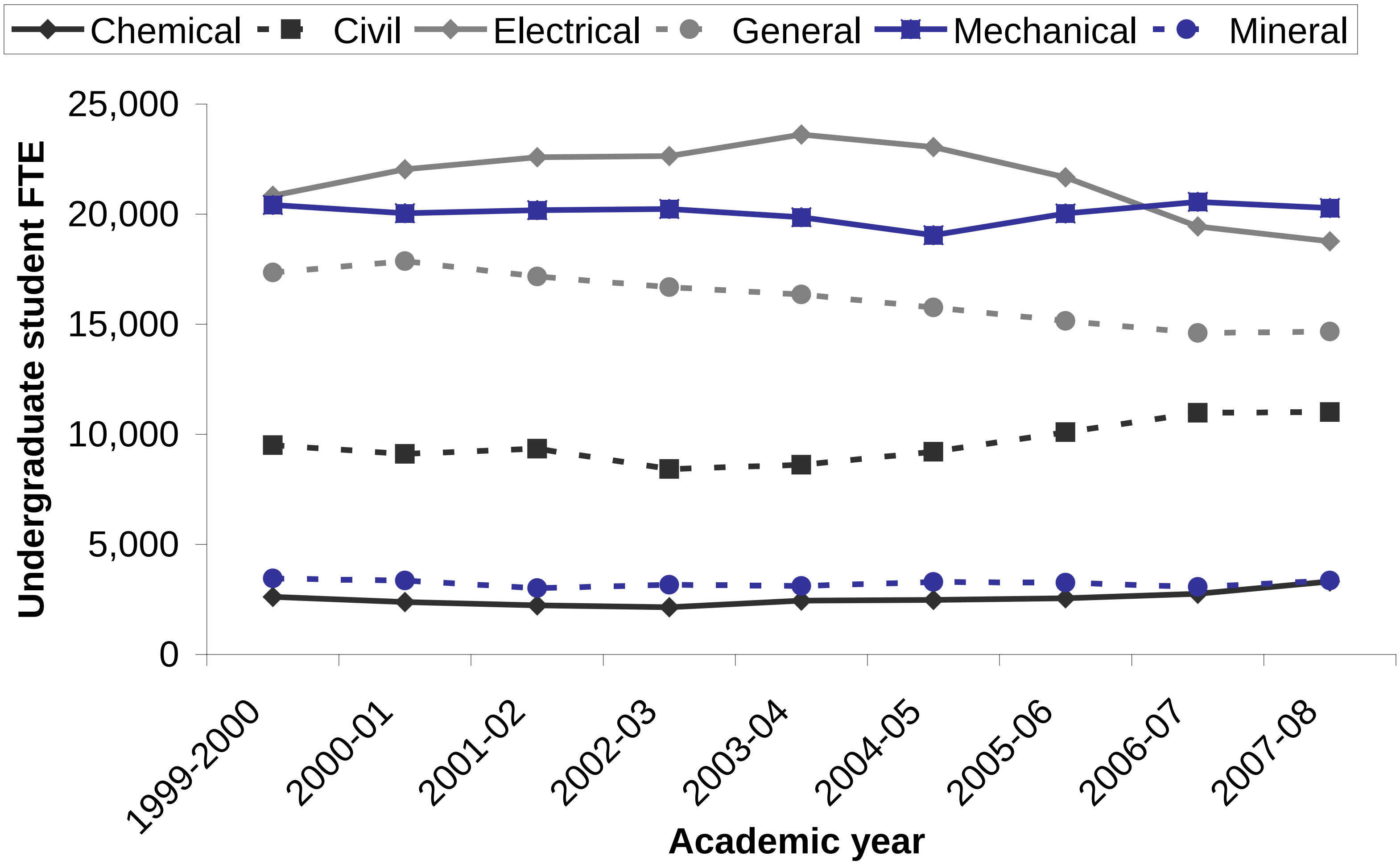

Table 2.2 Numbers of undergraduate student FTEs, by HESA cost centre, 1999-2000 to 2007-08

Group	HESA cost centre	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08
All SIVS		143,046	143,246	143,989	141,073	140,741	140,841	145,008	144,651	145,477	2%
Clinical STEM	Clinical Dentistry	2,707	2,559	2,868	2,974	3,337	3,387	3,621	3,909	4,477	65%
	Clinical Medicine	15,249	14,992	16,911	19,403	21,026	22,984	26,417	27,987	28,822	89%
	Veterinary Science	1,603	1,342	1,898	1,983	2,207	2,347	2,557	2,748	2,933	83%
Other STEM	Anatomy and Physiology	6,754	5,878	6,754	7,355	8,348	8,625	8,826	8,757	9,854	46%
	Biosciences	40,723	41,197	40,056	39,958	41,228	41,116	42,526	43,355	45,640	12%
	Computer Science / IT	58,201	64,795	70,075	75,311	68,371	62,245	56,545	50,261	45,825	-21%
	Earth, Marine and Environmental Sciences	14,529	13,947	14,093	13,384	13,227	12,986	12,269	12,077	11,746	-19%
	Pharmacy and Pharmacology	6,668	7,908	8,185	8,455	8,776	9,960	10,575	11,529	11,156	67%
All other subject areas		598,555	612,522	638,155	671,451	694,785	714,968	741,276	745,719	745,981	25%
All HE		**888,034**	**908,385**	**942,983**	**981,347**	**1,002,044**	**1,019,458**	**1,049,619**	**1,050,994**	**1,051,911**	**18%**

Table 2.3 Summary of undergraduates in SIVS over the last three academic years, by discipline and measure of supply

<table>
<tr><th rowspan="2">Area of SIVS</th><th rowspan="2">Discipline</th><th colspan="2">Undergraduate FTEs</th><th colspan="2">UCAS acceptances</th><th colspan="2">A level entries</th></tr>
<tr><th>2005-06
2007-08</th><th>% change 2005-06 to 2007-08</th><th>2007-08
2009-10</th><th>% change 2007-08 to 2009-10</th><th>2006-07
2008-09</th><th>% change 2006-07 to 2008-09</th></tr>
<tr><td rowspan="2">Science</td><td>Chemistry</td><td>12,027
13,442</td><td>12%</td><td>3,907
3,956</td><td>1%</td><td>35,077
37,174</td><td>6%</td></tr>
<tr><td>Physics</td><td>9,534
10,011</td><td>5%</td><td>3,228
3,573</td><td>11%</td><td>23,887
25,643</td><td>7%</td></tr>
<tr><td>Engineering and Technology</td><td>Engineering and technology</td><td>72,764
71,396</td><td>-2%</td><td>21,807
24,491</td><td>12%</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Mathematics</td><td>Mathematics</td><td>22,678
23,816</td><td>5%</td><td>5,915
6,908</td><td>17%</td><td>53,331
64,553</td><td>21%</td></tr>
<tr><td>Further mathematics (A level entries only)</td><td colspan="2"></td><td colspan="2"></td><td>7,241
9,449</td><td>30%</td></tr>
<tr><td rowspan="2">Modern foreign languages</td><td>European languages, literature and related courses</td><td rowspan="2">28,004
26,812</td><td rowspan="2">-4%</td><td>4,214
4,631</td><td>10%</td><td rowspan="2">28,377
29,542</td><td rowspan="2">4%</td></tr>
<tr><td>Non-European languages, literature and related courses</td><td>1,261
1,002</td><td>-21%</td></tr>
<tr><td colspan="2">All subjects (SIVS and non-SIVS)</td><td>1,049,619
1,051,911</td><td>0%</td><td>413,430
477,277</td><td>15%</td><td>718,756
757,761</td><td>5%</td></tr>
</table>

Table 2.3 notes: This table aggregates the sub-disciplines within engineering and technology, and modern languages: further information on these sub-disciplines is provided in Tables 2.4 and 2.5, respectively. Note that engineering is not an A level subject.

Table 2.4 Summary of undergraduates in 'engineering and technology' over the last three academic years, by discipline and measure of supply

Discipline	Undergraduate FTEs		UCAS acceptances	
	2005-06 2007-08	% change 2005-06 to 2007-08	2007-08 2009-10	% change 2007-08 to 2009-10
Chemical engineering	2,549 3,311	30%	1,465 1,838	25%
Civil engineering	10,097 11,010	9%	3,946 4,663	18%
Electrical, electronic and computer engineering	21,672 18,765	-13%	4,898 4,951	1%
General engineering	15,153 14,665	-3%	3,082 3,359	9%
Mechanical, aero and production engineering	20,027 20,284	1%	7,580 9,110	20%
Minerals, metallurgy and materials engineering	3,266 3,361	3%	836 570	-32%

Table 2.5 Summary of undergraduates in Modern Foreign Languages over the last three academic years, by discipline and measure of supply

Discipline	Undergraduate FTEs		UCAS acceptances		A level entries	
	2005-06 2007-08	**% change 2005-06 to 2007-08**	**2007-08 2009-10**	**% change 2007-08 to 2009-10**	**2006-07 2008-09**	**% change 2006-07 to 2008-09**
French studies	28,004 26,812	-4%	696 797	15%	12,152 12,238	1%
German and Scandinavian studies (A level entries to German)			315 297	-6%	5,615 5,122	-9%
Iberian studies (A level entries to Spanish)			357 393	10%	5,491 6,092	11%
Italian studies			89 78	-12%	5,119 6,090	19%
Russian and East European studies			81 109	35%		
Others in European languages, literature and related subjects			2,676 2,957	11%		
Asian studies			344 435	26%		
African and modern Middle Eastern studies			176 156	-11%		
Others in non-European languages, literature and related subjects			741 411	-45%		

Domicile: where students come from

Table 2.6 Numbers of undergraduates, by student domicile and SIVS area, 1999-2000 to 2007-08

SIVS area	Student domicile	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08	% change 2005-06 to 2007-08
Chemistry	UK	11,933	10,959	10,731	9,985	9,531	9,539	10,912	11,532	12,083	1%	11%
	EU	586	488	374	299	266	287	381	433	480	-18%	26%
	Other International	376	370	451	467	553	632	734	924	879	134%	20%
	Sub-total	**12,895**	**11,817**	**11,556**	**10,751**	**10,350**	**10,458**	**12,027**	**12,888**	**13,442**	**4%**	**12%**
Physics	UK	8,581	8,257	8,328	8,463	8,666	8,566	8,690	8,557	8,932	4%	3%
	EU	462	416	325	322	328	368	390	465	533	15%	37%
	Other International	297	283	305	368	432	403	454	518	547	84%	20%
	Sub-total	**9,341**	**8,956**	**8,957**	**9,153**	**9,426**	**9,337**	**9,534**	**9,540**	**10,011**	**7%**	**5%**
Engineering and Technology	UK	58,782	60,046	60,034	58,597	58,970	56,957	56,600	54,956	53,868	-8%	-5%
	EU	7,332	7,228	5,590	5,055	4,403	4,375	4,440	4,746	4,748	-35%	7%
	Other International	8,062	7,516	8,899	9,645	10,626	11,497	11,725	11,708	12,779	59%	9%
	Sub-total	**74,176**	**74,790**	**74,524**	**73,298**	**73,999**	**72,830**	**72,764**	**71,411**	**71,396**	**-4%**	**-2%**

SIVS area	Student domicile	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08	% change 2005-06 to 2007-08
Mathematics	UK	19,161	18,625	18,442	17,314	16,611	17,030	17,918	17,991	18,701	-2%	4%
	EU	1,054	1,042	810	729	653	897	1,028	1,177	1,323	26%	29%
	Other International	1,567	1,622	1,957	2,392	2,987	3,403	3,733	3,677	3,792	142%	2%
	Sub-total	**21,782**	**21,290**	**21,209**	**20,435**	**20,252**	**21,329**	**22,678**	**22,845**	**23,816**	**9%**	**5%**
Modern Foreign Languages	UK	21,754	23,042	24,273	23,910	22,890	23,362	24,489	24,185	23,035	6%	-6%
	EU	2,279	2,440	2,416	2,204	2,158	2,238	2,278	2,543	2,539	11%	11%
	Other International	820	910	1,054	1,322	1,666	1,287	1,237	1,240	1,239	51%	0%
	Sub-total	**24,853**	**26,392**	**27,743**	**27,436**	**26,714**	**26,886**	**28,004**	**27,967**	**26,812**	**8%**	**-4%**
All subjects (SIVS and non-SIVS)	UK	793,554	812,215	843,646	873,392	889,298	901,198	925,907	924,160	920,705	16%	-1%
	EU	49,223	49,413	44,265	41,690	39,902	42,853	46,374	50,131	52,595	7%	13%
	Other International	45,257	46,757	55,072	66,265	72,845	75,407	77,337	76,703	78,612	74%	2%
	Total	**888,034**	**908,385**	**942,983**	**981,347**	**1,002,044**	**1,019,458**	**1,049,619**	**1,050,994**	**1,051,911**	**18%**	**0%**

Table 2.6 notes: This table aggregates the sub-disciplines within engineering and technology, and Modern Foreign Languages.

Figure 2.3 Numbers of UK-domiciled undergraduate student FTEs by broad SIVS area, 1999-2000 to 2007-08

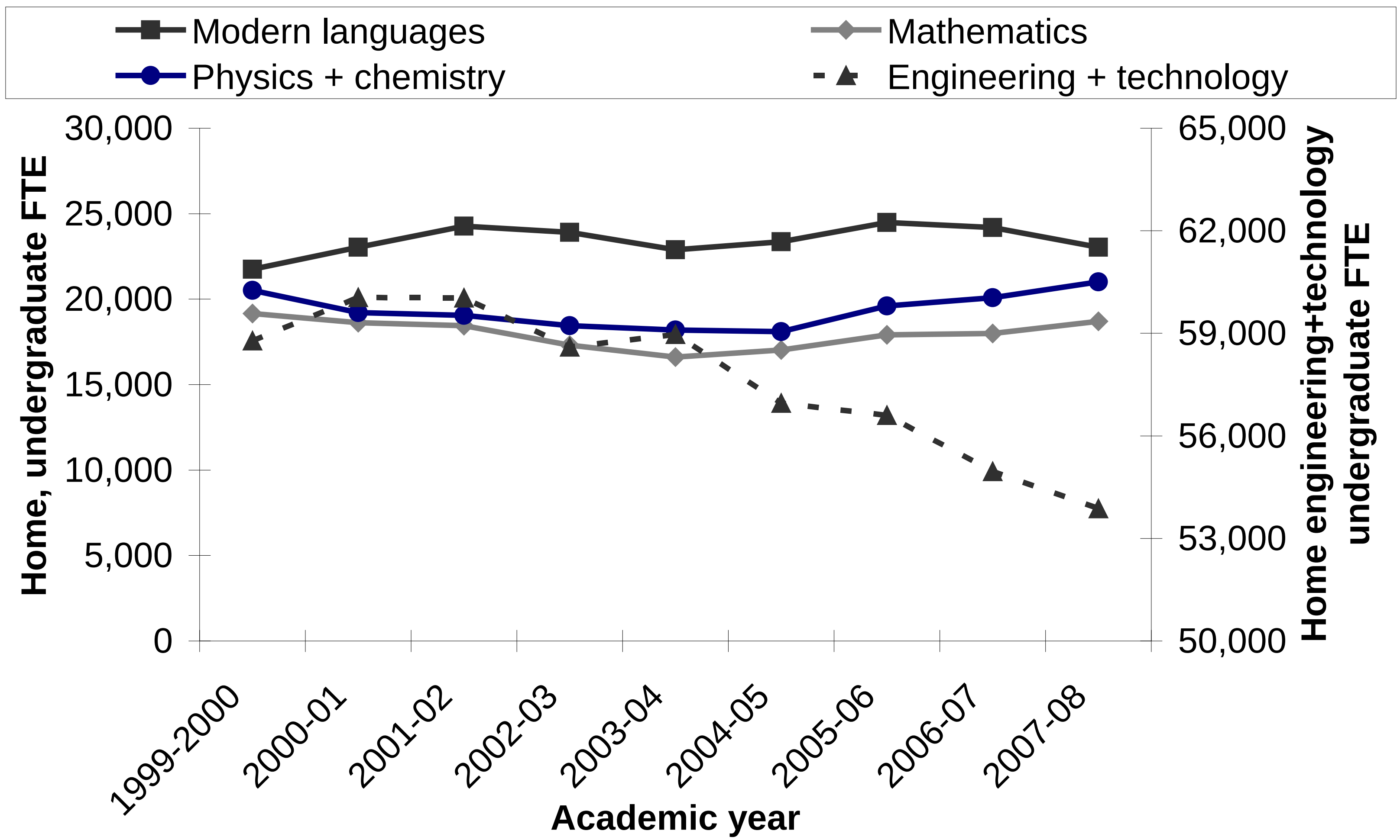

Figure 2.3 notes: This figure aggregates the sub-disciplines within engineering and technology, and Modern Foreign Languages, as well as physics and chemistry. UK-domiciled undergraduates only.

Mode of Study: full- and part-time students

Table 2.7 Numbers of undergraduates, by mode of study and SIVS area, 1999-2000 to 2007-08

SIVS area	Mode of study	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08	% change 2005-06 to 2007-08
Chemistry	Full-time	11,957	11,038	10,809	10,082	9,761	9,881	11,446	12,308	12,869	8%	12%
	Part-time	938	780	746	669	588	577	581	581	573	-39%	-1%
	Sub-total	**12,895**	**11,817**	**11,556**	**10,751**	**10,350**	**10,458**	**12,027**	**12,888**	**13,442**	**4%**	**12%**
Physics	Full-time	9,104	8,771	8,771	8,953	9,253	9,156	9,324	9,356	9,747	7%	5%
	Part-time	238	185	186	200	173	180	210	184	264	11%	26%
	Sub-total	**9,341**	**8,956**	**8,957**	**9,153**	**9,426**	**9,337**	**9,534**	**9,540**	**10,011**	**7%**	**5%**
Engineering and Technology	Full-time	66,838	66,607	66,797	65,359	66,484	65,616	65,834	64,404	64,676	-3%	-2%
	Part-time	7,338	8,183	7,727	7,939	7,515	7,215	6,930	7,007	6,720	-8%	-3%
	Sub-total	**74,176**	**74,790**	**74,524**	**73,298**	**73,999**	**72,830**	**72,764**	**71,411**	**71,396**	**-4%**	**-2%**
Mathematics	Full-time	21,170	20,644	20,615	19,915	19,644	20,732	22,107	22,245	23,122	9%	5%
	Part-time	612	646	594	520	608	597	571	600	694	13%	21%
	Sub-total	**21,782**	**21,290**	**21,209**	**20,435**	**20,252**	**21,329**	**22,678**	**22,845**	**23,816**	**9%**	**5%**
Modern Foreign Languages	Full-time	23,003	24,024	25,218	24,132	23,495	23,967	24,557	24,555	23,961	4%	-2%
	Part-time	1,850	2,368	2,525	3,304	3,219	2,920	3,447	3,412	2,852	54%	-17%
	Sub-total	**24,853**	**26,392**	**27,743**	**27,436**	**26,714**	**26,886**	**28,004**	**27,967**	**26,812**	**8%**	**-4%**
All subjects (SIVS and non-SIVS)	Full-time	783,275	798,939	830,600	863,710	884,504	905,833	936,993	941,474	949,471	21%	1%
	Part-time	104,759	109,446	112,383	117,637	117,540	113,625	112,626	109,520	102,440	-2%	-9%
	Total	**888,034**	**908,385**	**942,983**	**981,347**	**1,002,044**	**1,019,458**	**1,049,619**	**1,050,994**	**1,051,911**	**18%**	**0%**

Table 2.7 notes: This table aggregates the sub-disciplines within engineering and technology, and Modern Foreign Languages.

The Open University (OU)

Table 2.8 Summary of undergraduate activity registered at the Open University, by SIVS discipline

HESA cost centre	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08	% change 2005-06 to 2007-08
Chemistry	377	353	891	375	388	396	261	344	302	-20%	16%
Physics	460	352	269	424	825	742	740	707	502	9%	-32%
Total chemistry and physics	**837**	**705**	**1,160**	**800**	**1,213**	**1,137**	**1,000**	**1,051**	**805**	**-4%**	**-20%**
Electrical, Electronic and Computer Engineering	2,360	2,255	1,286	980	810	554	341	190	187	-92%	-45%
General Engineering	4,463	4,771	3,451	4,051	3,966	3,650	3,593	3,677	2,988	-33%	-17%
Mechanical, Aero and Production Engineering	310	289	101	0	0	0	0	0	0	-100%	n/a
Mineral, Metallurgy and Materials Engineering	226	192	121	138	227	301	119	177	169	-25%	43%
Total engineering and technology	**7,359**	**7,507**	**4,958**	**5,168**	**5,003**	**4,504**	**4,052**	**4,044**	**3,345**	**-55%**	**-17%**
Mathematics	**4,120**	**3,739**	**2,720**	**2,865**	**3,059**	**3,482**	**3,287**	**3,297**	**2,557**	**-38%**	**-22%**
Modern Foreign Languages	**1,697**	**1,571**	**1,124**	**1,392**	**2,202**	**2,217**	**1,854**	**1,972**	**1,500**	**-12%**	**-19%**
All OU activity	**55,326**	**56,414**	**44,790**	**49,290**	**58,269**	**55,154**	**49,504**	**51,627**	**43,202**	**-22%**	**-13%**

Institution type: pre- and post-1992 universities

Table 2.9 Numbers of undergraduates registered at English HEIs, by mode of study and SIVS area, 1999-2000 to 2007-08

SIVS area	Institution type	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	% change 1999-2000 to 2007-08	% change 2005-06 to 2007-08
Chemistry	Post-1992	4,171	3,328	3,100	2,536	2,432	2,588	3,519	4,199	4,212	1%	20%
	Pre-1992	8,588	8,345	8,314	8,078	7,789	7,723	8,335	8,426	8,965	4%	8%
	Sub-total	**12,759**	**11,672**	**11,414**	**10,614**	**10,221**	**10,311**	**11,854**	**12,625**	**13,176**	**3%**	**11%**
Physics	Post-1992	910	722	626	416	314	242	267	237	555	-39%	108%
	Pre-1992	8,100	7,938	8,031	8,424	8,791	8,785	8,933	8,999	9,155	13%	2%
	Sub-total	**9,010**	**8,660**	**8,657**	**8,839**	**9,105**	**9,027**	**9,200**	**9,236**	**9,711**	**8%**	**6%**
Engineering and Technology	Post-1992	39,025	39,999	38,496	36,862	36,099	35,074	35,623	34,011	34,090	-13%	-4%
	Pre-1992	32,443	31,968	33,046	33,449	34,797	34,543	33,867	34,250	34,399	6%	2%
	Sub-total	**71,467**	**71,967**	**71,542**	**70,311**	**70,896**	**69,616**	**69,490**	**68,260**	**68,488**	**-4%**	**-1%**
Mathematics	Post-1992	6,526	6,087	5,727	4,777	4,403	4,457	4,773	4,648	4,493	-31%	-6%
	Pre-1992	14,765	14,780	15,097	15,330	15,546	16,554	17,567	17,893	19,026	29%	8%
	Sub-total	**21,291**	**20,867**	**20,823**	**20,107**	**19,949**	**21,011**	**22,340**	**22,541**	**23,519**	**10%**	**5%**
Modern Foreign Languages	Post-1992	6,348	7,040	7,448	7,579	6,947	6,534	7,038	6,776	5,780	-9%	-18%
	Pre-1992	17,719	18,448	19,569	19,172	19,037	19,654	20,280	20,589	20,372	15%	0%
	Sub-total	**24,067**	**25,489**	**27,017**	**26,751**	**25,984**	**26,188**	**27,319**	**27,365**	**26,152**	**9%**	**-4%**
All subjects (SIVS and non-SIVS)	Post-1992	521,372	535,002	540,365	558,894	567,354	576,894	598,565	595,441	587,863	13%	-2%
	Pre-1992	342,023	347,635	375,935	394,289	405,599	412,904	420,930	426,212	434,759	27%	3%
	Total	**863,395**	**882,637**	**916,299**	**953,184**	**972,954**	**989,799**	**1,019,495**	**1,021,653**	**1,022,622**	**18%**	**0%**

Table 2.9 notes: This table aggregates the sub-disciplines within engineering and technology, and Modern Foreign Languages. English HEIs only.

Appendix 3

Overview of demand for STEM skills reports

General reports on STEM

Source	Date of publication	Definition of STEM	Headline messages on demand for STEM
UK Commission for Employment and Skills '*Ambition 2020: World class skills and jobs for the UK*'	2009	Is not STEM specific. Provides the first annual assessment of the progress towards making the UK a world leader in employment and skills by 2020. Monitors progress against our international competitors in the context of (i) the 'Leitch' Ambition for 2020; and (ii) the aims and priorities for the four nations of England, Scotland, Wales and Northern Ireland. This first report provides a baseline from which to assess future progress.	The report makes projections of the following: • The 2020 qualifications profile for the UK and for individual UK nations • The UK 2020 basic skills position for literacy and numeracy • The UK's 2020 international ranking vis-à-vis OECD countries for (i) below upper secondary ('low skills'), (ii) upper secondary ('intermediate skills') and (iii) tertiary ('high skills') levels of education. The technical annex to the report highlights the limitations to the models used to make the projections, and how the models could be improved in future including: taking into account data developments, investigating and improving model robustness, improving model coverage, and new reporting based upon extending the existing methods. Chapter 6 of the report assesses the demand for labour, employers' requirements in terms of jobs and skills needed. The chapter looks at recent changes in employer demand as well as looking to the future. Projected employment changes by sector are given up to 2017, drawing on the IER's Working Futures Projections work. (Note that the IER extended their Working Futures work to look specifically at STEM; the results are given in their 'The demand for STEM graduates: some benchmark projections' report, the third entry in this table). Chapter 7 of the report assesses how far the changes in supply meet changing demands and how far the market effectively matches supply and demand. The analysis considers skill shortages and skill gaps, and summarises existing work in this area including the National Employers Skills Survey, work by Sector Skills Councils and the Migration Advisory Committee. It concludes that there is a relatively low level of skills in the UK, a limited extent of skill shortages and *relatively low demand for skills relative to their supply*. Taken together, the report argues, these findings imply a demand-side weakness, with the UK having 'too few employers producing high quality goods and services, too few businesses in high value added sectors'.
Department for Innovation, Universities and Skills: '*Demand for Science, Technology, Engineering and Mathematics Skills*'	2009	Broad definition, including medicine, computer science and biosciences	• Employers report specific recruitment difficulties in some STEM-related sectors: biosciences, engineering and IT. • But shortages relate to specific STEM knowledge as well as broader competencies and practical work experience. • STEM graduates tend to have higher earnings than non-STEM graduates but employment rates are relatively similar. • There could be a skills mismatch with some STEM graduates not working in STEM-related occupations even though employers are offering relatively higher wages. • Report draws on IER 2009 report, which projects that the share of the workforce with a Level 4 STEM qualification will increase from 8.2% in

Source	Date of publication	Definition of STEM	Headline messages on demand for STEM
			2007 to 9.8% by 2017. However, the report regards projections of future employment trends as highly speculative. Employers consulted said it was not possible to make sensible forecasts over a period of 5-10 years.
Institute for Employment Research: *'The demand for STEM graduates: some benchmark projections'*	2009	Includes medicine, computer science and biosciences	• Given continuation of past trends in employment patterns, and using a model incorporating longer-term prospects for the economy, results suggest that apart from medicine, the demand for most STEM subjects is likely to grow faster than for other disciplines over the coming decade. • If shares of young people choosing to study STEM subjects continue to fall, then 'companies and organisations dependent on high quality STEM personnel will find it increasingly difficult to find the skills that they will need to operate and compete successfully.' • The report makes projections of employment of those qualified in STEM subjects to 2017. Points out that the projections are based on a macroeconomic scenario developed in the first half of 2008, a time of considerable economic uncertainty. Highlights that the projections are only indicative, representing what might happen if past trends and current patterns of behaviour continue over the next decade.
Migration Advisory Committee (MAC): *'First review of the recommended shortage occupation lists for the UK and for Scotland'*	2009	Does not look at STEM as a whole, but considers selected occupations that employ STEM graduates	• The MAC compile a list of shortage occupations, where inclusion on the list indicates the occupation is skilled, suffering from a labour shortage and it is sensible to fill the shortage using labour from outside the European Economic Area. • STEM related occupations on the shortage list and which will be reviewed in six months include: civil engineers, physicists, geologists and meteorologists, chemical engineers, medical practitioners, dental practitioners, veterinarians, secondary education teaching professionals for maths and science, engineering technicians, biological scientists and biochemists, psychologists, pharmacists, medical radiographers, medical and dental technicians, nurses. • The report does not make projections itself, but quotes relevant reports that make projections or forecasts of employment.
Migration Advisory Committee: *'Skilled, shortage, sensible: the recommended shortage occupation lists for the UK and for Scotland'*	2008	Does not look at STEM as a whole, but considers selected occupations that employ STEM graduates	• The following STEM related occupations appear on the UK's shortage occupation list: civil engineers, physicists, geologists and meteorologists, chemical engineers, secondary education teaching professionals for maths and science, engineering technicians. • Occupations on the list and to be reviewed in six months include: medical practitioners, dental practitioners, veterinarians, biological scientists and biochemists, psychologists, pharmacists, medical radiographers, pharmaceutical dispensers, medical and dental technicians, occupational therapists, nurses. • The report does not make projections itself, but quotes relevant reports that make projections or forecasts of employment.
CBI: *'Education and Skills' survey*	2009	Defined broadly, does not specify individual subjects	• Survey of 581 businesses. Argues that businesses from all sectors require STEM skills, but are particularly relevant to energy and hi-tech manufacturing, areas both predicted to grow and provide employment opportunities in future. • 40% of companies prefer STEM when recruiting graduates. • Two thirds of businesses had difficulties recruiting STEM-skilled people at

Source	Date of publicat ion	Definition of STEM	Headline messages on demand for STEM
			some level. • Two thirds of science, hi-tech and IT employers found the content of STEM degrees not relevant to their business. • The report does not make projections.
CBI: *'Education and Skills' survey*	2008	Defined broadly, does not specify individual subjects	• Survey of 735 businesses. Argues that STEM skills are in short supply, relative to meeting demand. • Six out of ten employers are having difficulty recruiting STEM-skilled individuals. • Large firms are thinking internationally when recruiting STEM-skilled employees – over a third are recruiting from India and a quarter from China. • The report does not make projections itself, but quotes the finding that "by 2014 demand for science, engineering and technology-related occupations is expected to have expanded by 730,000 and net requirement for these jobs… is predicted to rise to 2.4 million." (From IER Working Futures 2004-14 report).
Council for Industry and Higher Education (CIHE): *'The demand for STEM graduates and postgraduates'*	2009	Includes medicine, psychology, computer science, sports science	• Reports that a meeting of HR Directors from CIHE member companies gave the view that UK businesses are seriously concerned about the shortages of graduates and post-graduates. • Considers there is little robust information about demand for STEM graduates and post-graduates, and why the pipeline of UK students needs to be increased. • A pilot survey of 35 CIHE member companies and 3 Sector Skills Councils showed that STEM applications to jobs were adequate, but finding those with the ability to meet the required standards was getting harder. • Refers to the IER 2009 report on projections.
HEFCE: *Follett report*	2008	*Excludes* biosciences, computer science, medicine and related subjects	Looks at supply issues, but also demand aspects through data on early careers of graduates. Finds that medical degrees earn higher salaries than other subjects. But on examination of the data this does not necessarily mean medicine is a 'vulnerable' subject. Other findings are: • Chemistry: salary data suggest weak demand from employers, graduate salary is £22,500 (3.5 years after graduation) • Physics: average salary (3.5 years after graduation) is £24,760 • Engineering: Mixed picture of demand with employer demand stronger for some sub disciplines than others. • Mathematics: Graduate salary is £25,800 (3.5 years after graduation) • Medicine: Graduate salary is £42,000 (3.5 years after graduation), but higher salary does not mean a shortage. The report does not make projections.
HEFCE: *'Graduates and their early careers'*	2008	Focuses on strategically important STEM subjects of	• Provides an analysis of graduate destinations (employment rates and salaries by subject area), and the role of a subject area in achieving employment. • Finds that strategically important subjects have a lower percentage of

Source	Date of publication	Definition of STEM	Headline messages on demand for STEM
		chemistry, physics, astronomy, engineering and mathematical sciences	graduates in employment or in further study six months after graduation. Engineering had the highest mean salary of the subjects. • Subjects (such as medicine) that are directed towards a specific career have a higher proportion of graduates in employment or further study six months after graduation. • The report does not make projections.
Research Councils UK: *'Health of Disciplines' report*	2008	Does not focus specifically on STEM, but considers individual disciplines	Identifies areas of specific concern, taking into account supply/demand mismatches, mainly relating to employment of staff by the higher education sector. Highlights the following STEM related shortages: • Chemistry – lack of replacement academic staff • Clinical and translational research – shortage of statisticians and health economists • Engineering and technology – overall academic staff numbers falling • Whole animal physiology and veterinary sciences – shortage of graduates • Mathematics – high demand for skills from academic sector and beyond • Physics – acute lack of academic staff • Shortage of public health and health service researchers The report does not make quantitative projections, but quotes other sources of information in developing its own assessment of future shortages.
Regular monitoring of 10 Year Science and Innovation Investment Framework	2008	Broad definition, including medicine, computer science and biosciences	Mainly reports on the supply side, rather than demand side. Reproduces data from the Destinations of Leavers from Higher Education Surveys. Does not make projections.
Royal Society : *'A higher degree of concern'*	2008	Defines STEM broadly, including medicine, engineering. Previous report only focused on STM (not engineering)	• A follow up to their earlier report, which concluded there is a broad balance between supply and demand. This report continues to believe this is the case, but specific industries/sectors experience shortages of graduates/workers. • Mentions engineering and technology, and teaching as specific areas of shortage. • Calls for a large-scale study of the changing needs of employers. • Does not make projections.
Universities UK (PWC): *'The economic benefits of a degree'*	2007	Does not focus specifically on STEM, but analysis covers individual subject areas, including sciences, medicine and maths	Calculates the economic benefits of specific higher education subjects, including gross additional lifetime earnings compared to 2 or more GCE A levels. Findings for specific subjects include: • Medicine: £340,315 • Engineering: £243,730 • Physical/Env sciences: £237,935 • Math/Comp sciences: £241,749

Source	**Date of publication**	**Definition of STEM**	**Headline messages on demand for STEM**
			• Subjects allied to medicine: £166,017 • Technology: £119,484 • Biosciences: £111,269 Does not make projections.
Department of Trade and Industry: *'Science, Engineering and Technology Skills in the UK'*	2006	Broad definition, including medicine, computer science and biosciences.	• Uses labour market indicators such as wage returns, employment rates and vacancy data to assess demand. Finds that wage gains have remained fairly constant over the last 10 years. • Employment, unemployment and inactivity rates of SET degree holders have not changed significantly – suggesting no imbalance between demand and supply. • Almost half of SET graduates work in occupations that have the greatest requirement for SET skills, and particularly work in health and education sectors. • Makes the judgment that if current trends continue, the supply of SET graduates is on course to maintain existing levels of workers in SET occupations, but additional increases in supply are needed to achieve more ambitious growth. • Projects total employment in each SET occupation and then assesses whether the current trends in SET graduations would generate an increasing or decreasing share of this employment being taken by graduates. Concludes that supply and demand pressures are broadly in balance. Provides estimates of the demand for degree-level qualifications for four SET occupations. • Is cautionary on the use of projections: "Robust projections of future employment levels are difficult to derive. Most forecasting models are based on the assumption that, to a large extent, current trends in demand and supply will continue. The validity of this assumption is clearly questionable in an economy subject to both internal and external shocks."
Department for Education and Skills: '*The Supply and Demand for Science, Technology, Engineering and Mathematics Skills in the UK Economy'*	2006	Broad definition, including medicine, computer science and biosciences. Highlights differences between including psychology and excluding it.	Comments on the balance between supply and demand, with the following findings: • Currently there are skills shortages and gaps prevalent in Engineering and Health associate professions and for Draughtspersons & Building Inspectors. • Most STEM graduates are using their 'knowledge' and 'skills' in their employment though those in Natural Sciences make relatively less use, at least in the first two years after graduation. Reproduces projections from the Department for Trade and Industry's paper, with the caveat: "These employment projections must be treated with a certain amount of caution. They indicate the most likely future, given a continuation of past patterns of behaviour and performance and include assumptions about what will happen to supply. They are not necessarily therefore a true projection of what demand for STEM skills might be."
Roberts Review: *'SET for success'*	2002	Focuses on biological sciences, physical	• Argues that there is a disconnect between strengthening demand for graduates and declining numbers of maths, engineering and physical science graduates, which is starting to result in skills shortages. Draws on employment rates, salary data and surveys of employers' recruitment

Source	Date of publication	Definition of STEM	Headline messages on demand for STEM
		sciences, engineering, mathematics and computer science. Excludes medicine, agriculture, social sciences and psychology.	difficulties. • Finds a number of issues lie behind the disconnect, including shortage of women studying these subjects, poor experiences of education, negative image, insufficiently attractive career opportunities, and education's failure to develop transferable skills and knowledge required by employers. • Does not make projections.

Sector-specific reports

Source	**Date of publicat ion**	**Sector**	**Headline messages on demand for STEM skills or ability to fill vacancies**
ABPI *'Skills needs for biomedical research'*	2008	Pharmaceutic al	40 out of 46 responses from pharmaceutical sites reported skills gaps as a major concern and 41 out of 46 respondents cited the application of science and maths knowledge as a concern or major concern. Does not give projections but rates each discipline on its future as low, medium or high priority.
ABPI and Biosciences Federation *'In vivo sciences in the UK: sustaining the supply of skills in the 21st century'*	2008	Pharmaceutic al	Reports that over the next five to ten years industrial employers of *in vivo* skills expect to need to recruit annually: 100-320 BSc or MSc qualified people 20-50 with PhDs 30-60 with relevant post doctoral experience 140-280 animal technologists The report considers the annual supply of graduates with some exposure to *in vivo* techniques and who are likely to join industrial employers, and uses these numbers to calculate the number of graduates industrial employers need above existing numbers. Calculates that 60-120 extra graduates are needed, but takes the view that 120 extra graduates is a more likely figure.
Institution of Engineering and Technology '*Engineering and technology skills and demand in industry 2008' survey*	2008	Engineering	33% of companies found to be experiencing problems recruiting graduate engineers, 49% in recruiting senior engineers, 31% in recruiting technicians. Does not make projections, but asks employers whether they expect to recruit sufficient numbers of engineers, technicians and technologists over a time span of the next four years.
Institution of Civil Engineers *'State of the Nation: capacity and skills'*	2008	Engineering	Questions whether, in the long term, gaps in capacity can be met with imported labour. Their salary survey notes that civil engineering salaries are rising at above average levels. Refers to Construction Skills Network (CSN) forecasts that estimate an average need for some 12,300 new industry professionals each year until at least 2011.
e-Skills UK *'IT and Telecoms Insights'*	2008	IT and Telecoms	Projections to 2012 estimate that 141,300 new entrants to the workforce will be required each year to replace existing workers and meet needs for expansion. 50% is expected to be met through recruitment of individuals already employed in other occupations.
Institute of Physics *'Response to DIUS consultation'*	2008	Physics	Main private sector 'users' of highly trained physicists often employ them in non-physics specific roles such as analysts, actuaries and commercial managers. On the feasibility of projections, argues that "the wide range of occupations held by people with physics degrees, together with the lack of reliable data on the graduate first destinations of those with physics degrees, precludes a rigorous assessment of the demand for existing, let alone future, physics graduates and by extension STEM graduates…. to predict the demand for physics graduates 20 years in the future will require both a comprehensive understanding of the

Source	Date of publicat ion	Sector	Headline messages on demand for STEM skills or ability to fill vacancies
			current situation, and an ability to anticipate the effects of new and disruptive technologies." However, the report also argues that "where future developments are planned on a sufficiently long timescale, or where there are known demographic problems amongst the existing workforce then limited projections for demand may be possible. Perhaps the most pertinent of these examples is within the nuclear power sector. With the commitments to build several new power stations over the next decades and the requirement to decommission numerous others there is an evident need for nuclear physics and trained engineers."
SEMTA *'Skill Needs Assessment for the Metals, Mechanical Equipment and Electrical Equipment Sectors'*	2008	Metals, mechanical equipment and electrical equipment	Makes future projections based on commissioned report by the IER: • The projections indicate that although a net decline in employment is likely in all MME sectors significant numbers of staff will be needed in all MME sectors in order to replace those who leave their jobs because of retirement or other reasons. • The projections point to the need for over 296,000 employees within the MME sectors as a whole to replace employees leaving, implying a net requirement for labour over this period of over 235,000 or just over 26,000 employees per annum. • In relation to each individual MME sector the projections point to a net requirement for labour of nearly 132,000 within the metals sector, 67,000 within mechanical equipment and nearly 37,000 within electrical equipment.
SEMTA *'Labour Market Survey of the GB Engineering Sectors'*	2007	Engineering	11% of employers had experienced hard to fill vacancies within the last 12 months. Does not make projections.
Cogent *'A skill needs assessment of the Cogent sector'*	2006	Chemicals, pharma-ceuticals, oil and gas	Uses IER data (Working Futures) to look at skills needs in the sectors Cogent covers up to 2014. Reports expansion and replacement demand figures for occupations in Cogent sectors.
SEMTA *'Labour market survey of the pharmaceutical and bioscience sectors'*	2006	Pharmaceutical and biosciences	39% of sites reported vacancies that were hard to fill during the last 12 months. Does not make projections.
Skills for Health *'Sector skills agreement for health: Delivering a Flexible Workforce to Support Better Health and Health Services – The*	2006	Health	Demand for skills is considered to exceed supply, 7% of establishments experienced skill shortage vacancies. Does not make projections, but asks employers about the future – vocational qualifications are regarded as becoming more important. Expresses the view on planning: "it is important to recognise that, given the size and complexity of the sector and the significant variations between the four UK countries and nine English regions, between the three health sub-sectors, and between the 26 main occupations in the sector, 'one-size-fits-all' workforce planning and education commissioning solutions for the health sector are unlikely to succeed."

Source	Date of publication	Sector	Headline messages on demand for STEM skills or ability to fill vacancies
Case for Change'			
SEMTA, as quoted in DIUS's '*Demand for Science, Technology, Engineering and Mathematics Skills*'	2002	Electronics	29% of firms reported hard-to-fill vacancies. 72% of those with skills gaps reported technical engineering skills gaps. General engineering skills, electrical engineering and computer-aided design were highlighted in particular.
SEMTA as quoted in DIUS's '*Demand for Science, Technology, Engineering and Mathematics Skills*'	2002	Aerospace	33% of sites experienced hard to fill vacancies. Projections (dating from 2002) highlight the move towards higher grade technicians and graduates, particularly professional engineers, as a larger proportion of the workforce.

Appendix 4

Salaries of graduates three-and-a-half years after graduation

The HEFCE issues paper ‘Graduates and their early careers’ (HEFCE 2008/39) considered the salaries of UK and EU domiciled graduates three-and-a-half years after their graduation from a full-time first degree in 2002-03.

In that report, salaries at three-and-a-half years were derived through a modeling approach to account for potential biases caused by different response rates (particularly by subject area of study). The modeling approach adopted is explained at Annex B of HEFCE 2008/39. Essentially it uses instances where salaries are provided to impute salary information in instances where it is not provided, taking account of a range of factors that may influence the salary.

The analysis and modeling undertaken with regard to salaries and reported in HEFCE 2008/39 has been repeated for the equivalent cohort of graduates from 2004-05, based on the second Longitudinal Destinations of Leavers from HE (LDLHE) survey. In the table that follows, data regarding the SIVS subject areas are highlighted in bold.

Table 4.1 Imputed salary of graduates three-and-a-half years after graduation

Subject area of study	Mean reported salary	Mean imputed salary	Rank of reported salary	Rank of imputed salary
Clinical dentistry	£41,560	£40,785	30	30
Medicine	£32,740	£36,755	29	29
Pharmacy and pharmacology	£32,125	£32,115	28	28
Engineering	**£29,260**	**£29,535**	**26**	**27**
Mathematical sciences	**£28,955**	**£29,370**	**25**	**26**
Finance and accounting	£27,425	£28,790	23	25
Architecture, building and planning	£27,160	£28,730	21	24
Physics, astronomy	**£27,500**	**£27,920**	**24**	**23**
Veterinary science	£30,620	£27,505	27	22
ITS and computer software engineering	£27,255	£27,240	22	21
Business and management	£26,145	£26,570	19	20
Catering and hospitality management	£24,800	£26,335	14	19
Health studies	£25,520	£25,735	18	18

Subject area of study	Mean reported salary	Mean imputed salary	Rank of reported salary	Rank of imputed salary
Geography	£25,175	£25,610	16	17
Humanities and language based studies	£24,870	£25,550	15	16
Modern foreign languages	**£24,540**	**£25,500**	**11**	**15**
Earth, marine and environmental sciences	£26,245	£25,355	20	14
Chemistry	**£24,645**	**£25,320**	**12**	**13**
Anatomy and physiology	£24,670	£25,075	13	12
Combined	£25,395	£25,035	17	11
Nursing	£24,015	£24,575	10	10
Biosciences	£23,125	£24,440	9	9
Sociology, social policy, and anthropology	£22,660	£23,405	7	8
Education	£22,855	£23,290	8	7
Sports science	£22,010	£22,530	6	6
Psychology	£21,630	£22,420	4	5
Media studies	£21,020	£22,140	3	4
Archaeology	£20,685	£22,100	1	3
Design and creative arts	£20,935	£22,060	2	2
Agriculture	£21,685	£21,810	5	1
All subject areas of study	**£25,270**	**£25,680**	**n/a**	**n/a**

Table 4.1 notes:

- Salaries of UK and EU domiciled graduates from full-time first degrees at UK HEIs in 2004-05, who were in employment at the time of the second LDLHE survey.
- Equivalent to Table E13, at Annex E of HEFCE 2008/39
- Salaries imputed using the modeling approach described at Annex B of HEFCE 2008/39.
- SIVS subject areas highlighted in bold.

The salaries reported by those who responded to the LDLHE and provided their salary information are shown in the table that follows. Note that this table makes no attempt to account for instances where a graduate is known to be employed, but salary information was not provided. Such students were excluded from the analysis from which Table 4.2 is derived.

Table 4.2 Salary of graduates three-and-a-half years after graduation

Subject area of study	Minimum	Maximum	Mean	Median	Standard deviation	Number of graduates reporting salary information
Clinical dentistry	£4,200	£150,000	£41,560	£42,000	13,405	485
Medicine	£14,500	£63,000	£32,740	£30,875	9,085	65
Pharmacy and pharmacology	£5,000	£76,805	£32,125	£30,000	12,260	265
Engineering	**£2,450**	**£302,400**	**£29,260**	**£27,695**	**13,495**	**1,270**
Mathematical sciences	**£4,995**	**£133,955**	**£28,955**	**£27,000**	**11,430**	**505**
Finance and accounting	£4,750	£160,745	£27,425	£25,000	14,575	545
Architecture, building and planning	£4,045	£100,000	£27,160	£25,500	10,535	275
Physics, astronomy	**£3,175**	**£60,000**	**£27,500**	**£26,000**	**9,360**	**275**
Veterinary science	£15,000	£50,600	£30,620	£30,000	7,390	70
ITS and computer software engineering	£3,050	£110,000	£27,255	£25,000	11,205	1,365
Business and management	£1,560	£336,000	£26,145	£24,000	16,390	1,430
Catering and hospitality management	£2,810	£338,000	£24,800	£23,500	15,400	655
Health studies	£1,500	£316,135	£25,520	£24,000	16,110	460
Geography	£1,560	£318,000	£25,175	£24,000	19,120	655
Humanities and language based studies	£1,560	£210,000	£24,870	£23,000	12,195	4,230
Modern foreign languages	**£1,560**	**£120,560**	**£24,540**	**£23,400**	**11,175**	**890**
Earth, marine and environmental sciences	£9,000	£80,000	£26,245	£24,000	10,600	165
Chemistry	**£1,915**	**£60,000**	**£24,645**	**£24,000**	**7,650**	**210**
Anatomy and physiology	£4,200	£60,000	£24,670	£24,100	7,210	295
Combined	£10,000	£65,730	£25,395	£23,000	10,190	85

Subject area of study	Minimum	Maximum	Mean	Median	Standard deviation	Number of graduates reporting salary information
Nursing	£8,500	£48,000	£24,015	£23,000	5,760	410
Biosciences	£1,200	£92,735	£23,125	£22,175	8,945	740
Sociology, social policy, and anthropology	£2,650	£275,040	£22,660	£22,000	11,250	990
Education	£2,600	£74,500	£22,855	£24,000	7,045	605
Sports science	£2,810	£54,600	£22,010	£22,000	7,340	370
Psychology	£2,440	£288,000	£21,630	£21,000	12,040	885
Media studies	£1,745	£76,715	£21,020	£20,000	7,850	620
Archaeology	£5,410	£45,540	£20,685	£20,000	7,235	150
Design and creative arts	£2,400	£338,000	£20,935	£20,000	14,965	1,520
Agriculture	£5,000	£55,000	£21,685	£20,100	9,565	150
All subject areas of study	**£1,200**	**£338,000**	**£25,270**	**£24,000**	**13,030**	**20,635**

Table 4.2 notes:

- Reported salaries of UK and EU domiciled graduates from full-time first degrees at UK HEIs in 2004-05, who were in employment at the time of the second LDLHE survey and responded to that survey.
- Equivalent to Table E12, at Annex E of HEFCE 2008/39
- SIVS subject areas highlighted in bold.

Appendix 5

Abbreviations

BIS	Department for Business Innovation and Skills
CIHE	Council for Industry and Higher Education
FTE	Full-time equivalent
HE	Higher education
HEI	Higher education institution
HESA	Higher Education Statistics Agency
IER	Institute for Employment Research
LDLHE	Longitudinal Destinations of Leavers from Higher Education survey
MAC	Migration Advisory Committee
MFL	Modern Foreign Languages
OU	Open University
QSS	Quantitative social science
RAE	Research Assessment Exercise
SEMTA	Sector Skills Council for science, engineering and manufacturing technologies
SIVS	Strategically Important and Vulnerable Subjects (SIVS)
STEM	Science, Technology, Engineering and Mathematics
TQI	Teaching Quality Information
UKCES	UK Commission for Employment and Skills