September 2011/24

**Policy development**

**Report**

This report sets out the advice and conclusions of the third HEFCE Chief Executive's advisory group on Strategically Important and Vulnerable Subjects.

No action is required

# Strategically Important and Vulnerable Subjects

## The HEFCE advisory group's 2010-11 report



HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND

**Contents**

## Strategically Important and Vulnerable Subjects: the HEFCE advisory group's 2010-11 report

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|---|---|
| To | Heads of HEFCE-funded higher education institutions<br>Heads of further education colleges directly funded by HEFCE<br><br>Other relevant stakeholders |
| Of interest to those responsible for | Senior management, Finance, Governance, Planning |
| Reference | 2011/**24** |
| Publication date | September 2011 |
| Enquiries to | Linda Allebon, tel 0117 931 7237, e-mail l.allebon@hefce.ac.uk |

# Executive summary

i. This is the second report from the third[1] HEFCE Chief Executive's advisory group on Strategically Important and Vulnerable Subjects (SIVS – broadly, these are science, technology, engineering and maths (STEM), modern foreign languages and quantitative social science).

ii. This report:

- sets out the group's advice and conclusions;
- analyses the predicted future demand for all SIVS qualifications;
- notes key developments since the third advisory group's first report, in 2009[2]
- sets out the evidence on the current and future supply of graduates and postgraduates in SIVS subjects.

iii. The SIVS advisory group, via this report, seeks to: influence policy across HEFCE, government and other stakeholders; inform 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.

iv. Looking forward, the group will work with HEFCE and the Department for Business, Innovation and Skills (BIS) to consider during 2011-12 the activities that may be within

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[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 www.hefce.ac.uk/aboutus/sis

[2] 'Strategically Important and Vulnerable Subjects: The HEFCE advisory group's 2009 report' (HEFCE 2010/09)

scope for HEFCE's policy on SIVS, with a view to reviewing and aligning SIVS policy in light of the government's higher education reforms.

## Key conclusions and recommendations

v. HEFCE has continued since 2009 to invest in measures to increase and diversify demand for, and sustain and re-shape the supply of, strategically important subjects: chemistry, engineering, mathematics and physics within STEM; quantitative social science; and modern foreign languages and related area studies. An evaluation of these interventions confirms it has provided value for money and made a positive contribution to the sustainability of these disciplines.

vi. As a result of the reforms set out in the government's 2011 White Paper *Higher education: Students at the heart of the system*[3], HEFCE has two new challenges with regard to subject provision: firstly, to establish an approach to supporting high cost subjects that mitigates the impact of costs on the demand for and supply of the highest cost provision; secondly, to identify those subjects where there is evidence that the student-led system – operating alongside the dual support system for research, and activities such as business engagement and international student recruitment – may not sustain the flow of graduates, supply of programmes and expertise, and level of research activity necessary to secure the national interest.

vii. Analysis of the latest data on the flow of undergraduates suggests that at a time of wider expansion in undergraduate numbers, those in SIVS have seen a continued expansion, and at a rate higher than other subjects during recent years. However, some concerns remain, for example among the engineering and modern language disciplines, and with regard to the accessibility of SIVS provision via part-time programmes and at post-1992 institutions.

viii. There has been sustained growth in the flow of postgraduate taught and postgraduate research students during the last decade, and in the SIVS areas the flow of taught students has been higher than the average overall. A significant proportion of this growth is, however, attributable to international students. The growth in international numbers has been so marked that any decrease in overseas postgraduate students could lead to concerns about the future viability of courses and the overall sustainability of these disciplines, given the impact of the reduction in associated income streams. There may also be a risk in relation to the UK's future workforce, given that many postgraduate students enter positions requiring advanced skills and expertise following their studies, including studies in universities and research organisations.

ix. Evidence suggests that employers signal the greater value they place on postgraduate study in preference to undergraduate study through higher salary levels, higher employment rates and sponsorship of postgraduate students. There is, however, only limited information available on the courses employers particularly value. This

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[3] Department for Business, Innovation and Skills White Paper available at www.bis.gov.uk/assets/biscore/higher-education/docs/h/11-944-higher-education-students-at-heart-of-system

should be a focus for the work, proposed in the recent Higher Education White Paper, on a Key Information Set (KIS) for postgraduate students.

x. A new policy approach is now in development. It starts from the assumption that the new student-led system for financing teaching, operating alongside HEFCE teaching funding and the dual-support system for research, will for the most part achieve the government's aspirations with regard to subject provision. HEFCE's future policy must be concerned with identifying the minority of areas in which this may not be the case and determining any mitigating action that might be taken. HEFCE will consult on the details of this approach alongside the second stage of the consultation on teaching funding arrangements from 2013-14, which will take place in the coming winter[4].

[4] For more information on the teaching funding consultation see www.hefce.ac.uk/learning/funding/201213/

# Background

1. HEFCE has a long history of engagement with subjects[5], but has only had an explicit programme to sustain the future of strategically important and vulnerable subjects (SIVS) since 2005. SIVS are subjects identified by the government as strategically important, where there is compelling evidence of a requirement for action to enable them to continue to be available at a level and in a manner that meets the national interest.

2. HEFCE's policy in this area has been developed by successive advisory groups, the first of which was chaired by the late Sir Gareth Roberts. The key elements of the policy are that the English HE system's success is founded on the ability of autonomous institutions dynamically to respond to changing circumstances, that HEFCE should 'guard against an overly interventionist role'[6], but that action should selectively be taken to sustain the minority of subjects that can be identified as both strategically important and vulnerable.

3. During recent years, attention has primarily focused on two broad areas: chemistry, engineering, mathematics and physics within the STEM subjects, and modern foreign languages. There is also a strand of activity in quantitative social sciences, which is led by the Economic and Social Research Council. The activities supported by HEFCE have focused on promoting demand and attainment among potential students, securing the supply of teaching and research provision and promoting the flow of graduates into employment[7]. The findings of an independent evaluation of this activity are provided in the Annexes to this report.

4. This report, which has been overseen by an advisory group[8] chaired by Peter Saraga, former Director of Philips Research Laboratories, aims to:

  a. describe the key developments since the 2009 SIVS advisory group report[9], including the action taken by HEFCE in response to the report and the implications for SIVS of the English HE finance reforms (from page 7);

  b. provide the latest data and analysis on the flow of undergraduates and, for the first time postgraduates, in SIVS (from page 11 and Annexes);

  c. draw upon the two elements above, the evaluation of HEFCE's SIVS activities and the available evidence on the demand for graduates and

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[5] For example, 'Minority subjects' funding and the Chinese studies initiative: www.hefce.ac.uk/pubs/rdreports/2005/rd03_05/

[6] HEFCE 2005, *Strategically Important Subjects – Final Report of the advisory group*, p1 www.hefce.ac.uk/pubs/hefce/2005/05_24/

[7] A full list of SIVS investments is available at www.hefce.ac.uk/aboutus/sis

[8] The Group's Terms of Reference are in Appendix D

[9] The Group's last report was put together in 2009 and published early in 2010. It is referred to throughout this document as 'the 2009 report' and can be found via the HEFCE website at www.hefce.ac.uk/pubs/hefce/2010/10_09/

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postgraduates, to make recommendations on a future approach to SIVS (from page 24).

5. The information in this report will inform the HEFCE Board's response to the priority assigned to SIVS in its 2011-12 grant letter – which includes a request for it to consider 'the subjects, including arts, humanities and social sciences subjects, that should in future be within scope'[10] – and also to the June 2011 White Paper, which requests that HEFCE consult on future grant funding to support those subjects that require support to avoid undesirable reductions in the scale of provision.

[10] www.bis.gov.uk/assets/biscore/higher-education/docs/h/10-1359-hefce-grant-letter-20-dec-2010.pdf, paragraph 17

## Key developments since the 2009 report

6. The 2009 report highlighted a generally positive trend in the flow of graduates in SIVS, reversing a decline in the early part of the decade. It also suggested that employers consistently identify a demand for STEM graduates and a broad set of attributes associated with employability. In the small number of cases where specific and immediate concerns could be identified, the report suggested that these could be addressed through collaboration and co-financing with employers.

7. The key actions for HEFCE as a result of these findings were to:

a. continue to invest in measures to promote the demand for and sustain the supply of SIVS, responding in particular to the recommendations in Professor Michael Worton's review of modern foreign languages[11], the variable landscape in engineering and the decline in part-time and post-1992 SIVS provision, which may be considered to be the most accessible;

b. establish a means for ensuring that the upturn in STEM student demand could be accommodated by an increase in provision, notwithstanding the government's control on the student intake;

c. engage with universities, colleges and employers on the signalling of employer preferences, the provision of placements and internships, and any specific and immediate skills concerns;

d. continue to analyse the flow of SIVS graduates and the sustainability of provision, and extend this to postgraduate studies.

8. In response, HEFCE has:

a. continued to invest in demand-raising programmes in STEM[12] and modern foreign languages[13], both of which will now run until the HE finance reforms are implemented in autumn 2012, and include strands on employability and collaboration with employers;

b. supported a project led by the University Council for Modern Languages to address leadership in modern foreign languages and promote their contribution to the internationalisation of universities and their socio-economic impact;

c. introduced a scheme to support institutions moving student places into SIVS, which will operate for a second intake in 2011-12. In its first year, the scheme provided £4m to support the movement of 1,700 places, supplementing an allocation to SIVS within the additional 10,000 places made possible by the University Modernisation Fund[14];

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[11] www.hefce.ac.uk/news/hefce/2009/worton.htm

[12] National HE STEM Programme: www.hestem.ac.uk

[13] Routes into Languages: www.routesintolanguages.ac.uk

[14] www.hefce.ac.uk/news/hefce/2010/umf.htm

d. consulted on a Key Information Set[15] for implementation alongside the HE finance reforms in 2012, within which employment outcomes are signalled through salary levels, job characteristics and professional accreditation. A pilot exercise has also been undertaken to enable universities to highlight their provision for enhancing the employability of their graduates[16];

e. worked with the Office for Fair Access (OFFA) to embed the provision of placements and internships within the outreach activities eligible to be undertaken by higher fee-charging universities from 2012[17] as a contribution to their access obligations, and commissioned research on the way in which this might further be promoted within the new HE finance system, drawing on pilot undergraduate and graduate internship schemes[18];

f. co-financed with employers a new MSci led by King's College London, which responds to an immediate requirement for graduates with in-vivo expertise;

g. provided advice to the Independent Review of Higher Education Funding and Student Finance[19] on the position of and future approach to SIVS, drawing on the 2009 report.

9. HEFCE has also commissioned an evaluation of its SIVS activities between 2005 and 2010.[20] This suggests that the programme has enabled HEFCE to exercise leadership in this area without heavy-handed market interference. Individual projects have provided value for money and those on the supply side appear to have been particularly effective. It is, however, difficult to disaggregate the impact of investments on the demand side and to establish whether the root causes of vulnerability have been addressed.

10. As is clear from the references above, the key development in terms of the future sustainability of subjects and HEFCE's SIVS policy has been Lord Browne's review, and the government's response to it in the form of student finance reforms and, most recently, the White Paper 'Students at the Heart of the System'.

11. The White Paper proposes a student-led system, made possible by substituting a large proportion of the teaching funding currently routed through HEFCE for loans and grants to students. Within this system, the expectations of informed fee payers and higher salary-paying employers, coupled with greater competition, are intended to drive improvements in quality and efficiency. The key features are better advice and information (including on employment prospects), student support to cover fees and living costs (extended to most part-timers), variable fees and increased competition, employers

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[15] www.hefce.ac.uk/learning/qual/public/infoset.htm

[16] www.hefce.ac.uk/econsoc/employer/employstate/

[17] www.offa.org.uk

[18] www.hefce.ac.uk/econsoc/challenge/

[19] www.independent.gov.uk/hereview/

[20] www.hefce.ac.uk/pubs/rdreports/2011/rd05_11/

paying a graduate salary premium (enabling loans to be re-paid), and a regulatory regime embracing quality, access and financial health.

12. In theory, if a subject is valuable to employers this will be reflected in their recruitment of graduates, which will be included in the information provided to inform student choice, which will in turn drive up the demand for and supply of the subject. The same approach could be applied at the level of programmes and institutions, thereby responding to a trend highlighted in the Group's 2009 report, whereby employers target specific programmes and institutions they perceive to be delivering the attributes they value. If, as the 2009 report suggests, employers consistently report a demand for more STEM graduates from what they perceive to be the highest quality programmes, the system should in theory respond to this through labour market signals directing students towards these programmes and, given the returns that should result, providers growing or emulating them. The subjects, programmes and institutions most valued by employers should thereby be the ones that are sustained.

13. There are, however, barriers to the functioning of this system. There may, for example, be imperfect information on the employment prospects arising from different courses, and on the nature and benefits of different courses. There may be time lags between course choice and employment, and between the identification of a course need and its implementation. The supply of courses may reflect academic expertise, rather than student and employer demand, and there may be barriers to the price that can be charged, the wage that can be accrued and the entry of new providers.

14. For these reasons, the government will maintain some public funding for teaching, 'to fund additional costs and public policy priorities that cannot be met by a student-led funding system alone'.[21] The White Paper identifies a number of priorities for the use of teaching funding, which include meeting 'the additional costs of higher-cost subjects at undergraduate and postgraduate levels such as medicine, science and engineering, that cannot be recovered through income from graduate contributions' and support for 'those subjects which are strategically important and vulnerable and require support to avoid undesirable reductions in the scale of provision'.[22]

15. With regard to subjects, the government is concerned to address costs beyond the level that may be addressed through fees, given the restrictions on the level of fees that can be charged. It is then, as it indicates in both its grant letter to HEFCE and in the White Paper, concerned to identify and support subjects that may be strategically important and vulnerable. This provides HEFCE with two key challenges: firstly, to establish an approach to support high cost subjects that mitigates the impact of costs on the demand for and supply of the highest cost provision; secondly, to identify those subjects where there is evidence that the student-led system – operating alongside the dual support system for research, and activities such as business engagement and international student recruitment – may not sustain the flow of graduates, supply of

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[21] White Paper, paragraph 1.25

[22] *Ibid*, paragraph 1.26

programmes and expertise, and level of research activity necessary to secure the national interest.

16. At this point, it is difficult to predict how the reforms will influence student choices about whether and what to study and to what level, and how their choices will in turn influence the decisions of universities and colleges with regard to subject provision. Both sets of decisions may be influenced by employers, although this will depend on the effectiveness of the information made available on employment outcomes, and the extent to which employers seek influence by, for example, sponsoring students and providing placements. As ever, decisions on subject provision will also be significantly influenced by research performance and funding, which is being sustained overall, but increasingly distributed on a more selective basis[23]. It may also be affected by knowledge exchange factors, which may be influenced by economic conditions and a changing regional and business support landscape[24].

17. The third section of this report sets out a way forward for HEFCE's SIVS policy, taking these developments, an evaluation of SIVS activity and an updated analysis of employer demand-side indicators into account.

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[23] See www.hefce.ac.uk/news/hefce/2011/funding.htm

[24] See www.hefce.ac.uk/pubs/circlets/2011/cl06_11/

# Updating the Group's 2009 report: supply and demand issues

## Undergraduate provision

18. This section provides an additional two years' data to update the analysis on the supply of SIVS subjects provided in the 2009 report[25]. In line with the analysis in the last report, trends across the period from 1999-2000 to 2009-10 are considered, as are those across the last three years of data now available. The approach is intended to capture the different stages of the graduate supply chain: it considers the number of entries to A levels and the numbers of acceptances via UCAS of a place to study a full-time HE course, alongside numbers of FTE undergraduate student numbers in SIVS, thereby showing potential flows of graduates in subsequent years.

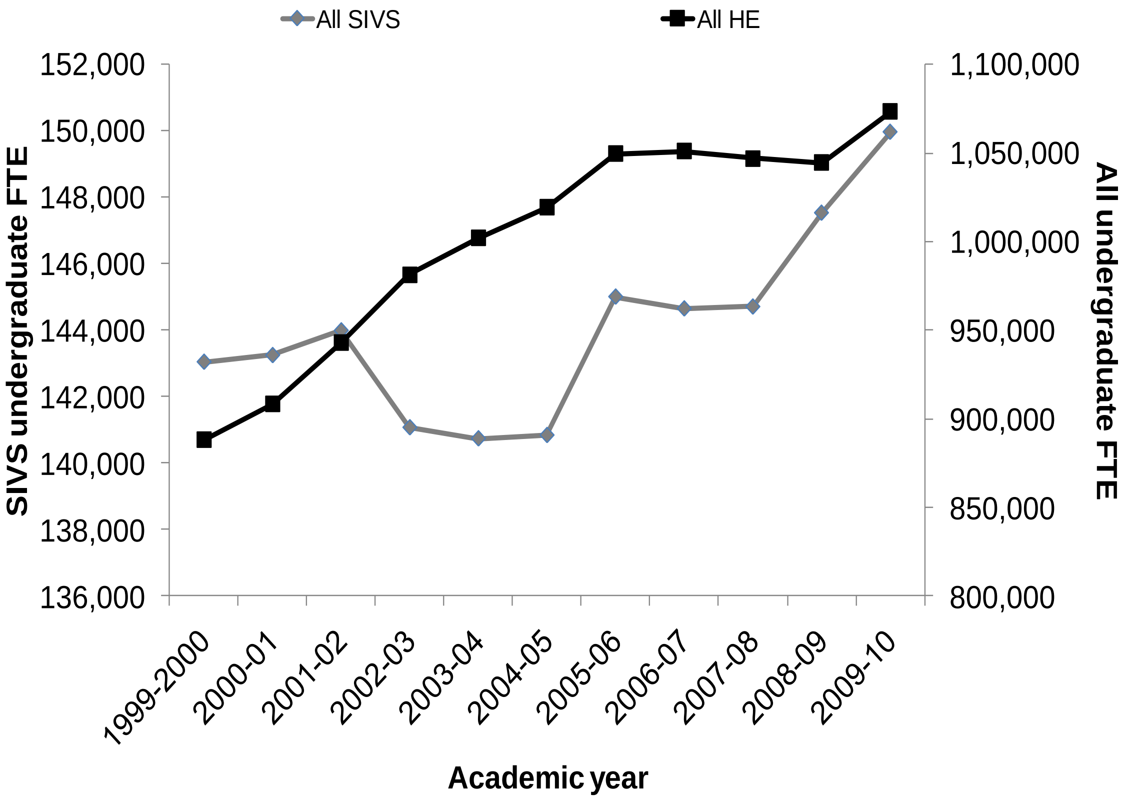
19. The data underpinning the analysis presented here is summarised in the Annexes to this document (which are published alongside this report at www.hefce.ac.uk/pubs), along with data definitions and a commentary highlighting noteworthy trends. The Annexes to this report include a number of charts and tables referenced by the discussion below.

*Trends across 1999-2000 to 2009-10*

20. As identified in the 2009 report, across the decade SIVS growth has not kept pace with the growth in undergraduate numbers. Numbers of undergraduate student FTE increased by 21 per cent overall across this period, compared to 5 per cent across SIVS areas. SIVS numbers have, however, increased since 2006-07 and at a rate exceeding that in other subjects.

[25] In respect of data sources, definitions and coverage the updated analysis is consistent with that described at Paragraphs 23 to 26, and 37 to 38 of the 2009 report. For further details, please see HEFCE 2010/09

**Figure 1 Numbers of undergraduate student FTE, 1999-2000 to 2009-10[26]**




21. Undergraduate student FTE in mathematics increased by 16 per cent over the eleven years from 1999-2000 to 2009-10. Table A.1 shows that the equivalent increase was 11 per cent in chemistry, 13 per cent in physics and 9 per cent in modern languages. Numbers in engineering and technology declined by 2 per cent over the period.

22. The trends identified in 2009 with regard to part-time students continue in the latest years of data available. The numbers of part-time undergraduate student FTE in chemistry and in engineering and technology decreased to a greater extent over the period from 1999-2000 to 2009-10 than was observed across all subject areas, while physics also showed a decline in numbers. Mathematics and modern languages saw an increase in the numbers of part-time student FTE, though such numbers in modern languages were variable and showed a substantial decrease in more recent years. Activity registered at pre- and post-1992 institutions again showed varied patterns across the different SIVS cost centres: numbers registered at pre-1992 institutions increased across each area, while only those in chemistry increased in regard to activity registered at post-1992 institutions. Numbers of EU and international student FTE in engineering and technology in particular continued to increase over the time series considered.

[26] It should be noted that the majority of the graphs in this section have two different scales on the vertical axes. This means that the shapes of the lines shown are not directly comparable. They are included on the same graph for ease of reference

**Trends across the last three years**

23. The last three years of available data[27] show a 3 per cent increase in the total number of undergraduate student FTE. A level entries increased by 6 per cent over the same period, while numbers of UCAS acceptances increased by 7 per cent.

24. Physics, chemistry and mathematics all saw a continuation of the trends identified in 2009, with growth across all three measures: undergraduate FTE, UCAS acceptances and A level entries for each of the subjects show an increase of at least 6 per cent over the three years. Trends in modern languages and engineering and technology continued to show variability across these measures.

**Summary**

25. The 2009 report of the SIVS advisory group identified a positive trend in the supply of graduates in SIVS subject areas, with some variation in respect of engineering and technology and modern languages, and a decline among part-time students and post-1992 institutions. Analysis of the additional years' data provided here shows that this pattern has for the most part continued. At a time of a wider expansion in undergraduate numbers overall, undergraduate numbers in SIVS have seen a continued expansion, and at a rate higher than other subjects during recent years. However, some concerns remain, for example among the engineering and modern language disciplines, and with regard to the accessibility of SIVS provision via part-time programmes and at post-1992 institutions. As noted in the Group's 2009 report, students at post-1992 institutions are more likely than others to be mature, in work, studying locally and from neighbourhoods with a record of low HE participation. Such institutions therefore have an important role in making HE accessible in all subject areas, including SIVS.

26. These trends support the conclusions in the evaluation of HEFCE's SIVS programme[28], which notes the general upturn in SIVS and suggests that the programme has been 'effective in providing support for these subjects' whilst 'avoiding heavy-handed market interference'. Its influence, however, may largely have been through the leadership that has encouraged universities and colleges to sustain provision in a period of growth. It is not yet clear, the report suggests, that lasting solutions have been found for the 'root causes of vulnerability', which in the last decade have been student demand and attainment, institutional strategies and priorities, and public funding. The new environment, being brought about by the government's HE reforms, will shift influence further towards students and institutions, and will require a new approach to this agenda.

## Postgraduate provision

27. The Group's 2009 report provided a detailed analysis of data relating to undergraduate student numbers, and signalled a need to undertake the same level of analysis for postgraduate data. Postgraduate provision is as subject to vulnerabilities as undergraduate provision, so an understanding of patterns of provision at this level is

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[27] 2007-08 to 2009-10 for A level entries and student FTE; 2008-09 to 2010-11 for UCAS acceptances

[28] www.hefce.ac.uk/pubs/rdreports/2011/rd05_11/

needed to identify trends and possibilities for future policy. A full analysis of data and of other reports, along the same lines as that undertaken for undergraduate provision, is available at Annex A. This section sets out the characteristics of postgraduate provision, followed by key trends identified in the data analysis, and a discussion about the demand for postgraduate skills.

### The shape of the postgraduate sector

28. Detailed descriptions of the postgraduate sector can be found in Sir Adrian Smith's review of postgraduate education, from April 2010,[29] and in reports from the Higher Education Policy Institute.[30] An examination of this highly differentiated sector shows that:

- Postgraduate study can refer to level of study attained or aimed for, or to volume of study additional to undergraduate level – such as continuing professional development (CPD) undertaken to achieve, maintain or advance professional standing, develop additional skills or to maintain licence-to-practise status. Individual interest and the development of artistic practice are also important motivations for advanced levels of study.

- Postgraduate taught (PGT) courses offer employees and students an advantage in the labour market alongside progression to advanced levels of study such as doctoral level study or other postgraduate research programmes.

- Postgraduate research (PGR) courses can act as a gateway to academic careers and work that requires skills and training at very advanced levels.

- In terms of funding:

  a. The Research Councils fund around 25 per cent of all PhD graduates. In 2008-09 this equated to 19,202 doctoral studentships at a cost of £375.9m[31]. HEFCE has also provided around £200m each year to support research students through its quality-related (QR) funding.

  b. In 2007-08 the Research Councils supported approximately 800 students on 136 taught/vocational Masters courses, at a cost of roughly £10.7m. There were also 340 students on the AHRC Research Preparation Masters, at a cost of £4.3m. HEFCE provided more than £217m through its 2007-08 teaching grant to support students on PGT courses, although this will reduce from 2012 and focus on high-cost subjects, in line with the government's HE funding reforms.

[29] http://webarchive.nationalarchives.gov.uk/+/http://www.bis.gov.uk/postgraduate-review

[30] www.hepi.ac.uk/466-1764/Postgraduate-education-in-the-UK.html

[31] Unpublished correspondence from RCUK to HEFCE

c. HEFCE has been asked to take forward support for the next generation of researchers by selectively funding on the basis of internationally excellent research.[32]

29. Postgraduate students operate in a global marketplace for academic and student talent. The reforms to undergraduate student funding may have a consequential impact on the PG sector, as might other factors such as visa restrictions on academic staff and students, and the future funding arrangements of the PG sector itself. The Browne review suggested that continued public funding should be made available for postgraduate taught provision, targeted at priority courses, but that student finance provision was not necessary as the private benefits to individuals would be sufficient to generate investment.[33] The recent White Paper indicates that HEFCE will be asked to review participation in postgraduate study, and to consider whether additional data on postgraduate participation needs to be collected in order to help evaluate the longer term impact of the undergraduate student finance reforms.[34]

## Data and analysis: supply

30. Data relating to postgraduate study patterns has been analysed to provide a picture of the shape of the postgraduate sector over the period 2002-03 to 2009-10. The approach to this analysis differs to that undertaken for activity at undergraduate level, largely due to changes in reporting practice during the time series considered here. A more detailed explanation of the reasons behind this different approach is given at Annex B. The data underpinning the analysis presented here is summarised at Annex A, along with data definitions and a commentary highlighting further key trends. Annex A includes a number of charts and tables referred to in the discussion below.

31. Trends and characteristics associated with those studying PGT qualifications differ from those of students undertaking PGR qualifications: our analysis of full-person equivalent (FPE) student numbers at postgraduate level therefore considers these separately. In particular, it is noteworthy that in 2009-10, 24 per cent of all PGR students were studying in SIVS areas. This proportion is three times higher than at PGT level, where just 8 per cent of all students were studying in SIVS areas in the same year. As a comparison, at UG level, 14 per cent of all students in 2009-10 were active in SIVS.

32. Figure 2 and Figure 3 demonstrate the sustained growth in overall postgraduate student numbers over the period from 2002-03 to 2009-10, both in PGT and PGR. Overall numbers in SIVS areas increased, although the levels of growth differ between PGT and PGR. Table A.2 at Annex A shows that the increase of 36 per cent in PGT SIVS numbers was in excess of the growth across all PGT subject areas (31 per cent). Conversely, Table A.3 at Annex A shows that the 8 per cent increase observed in PGR SIVS areas was lower than the overall growth in PGR (12 per cent).

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[32] HEFCE grant letter from BIS, paragraph 10, available at www.hefce.ac.uk/news/hefce/2010/grant1112/

[33] Independent Review of Higher Education Funding and Student Finance, page 55

[34] BIS White Paper, paragraph 1.33

**Figure 2 Numbers of postgraduate taught student FPE, 2002-03 to 2009-10**

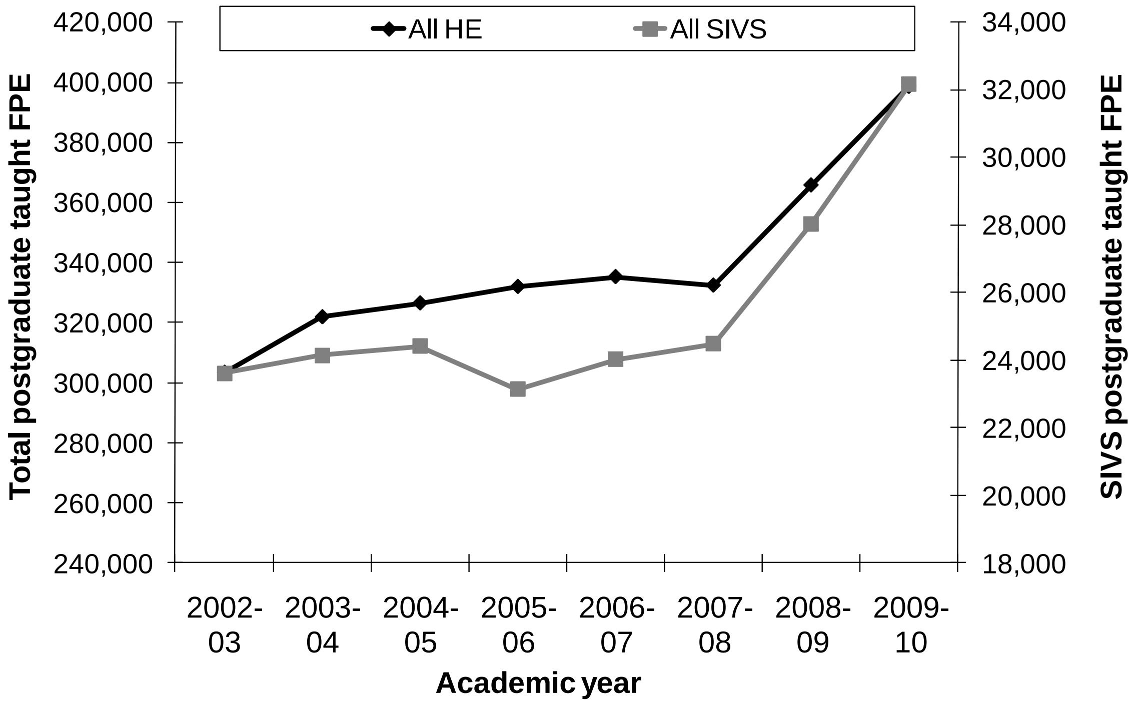
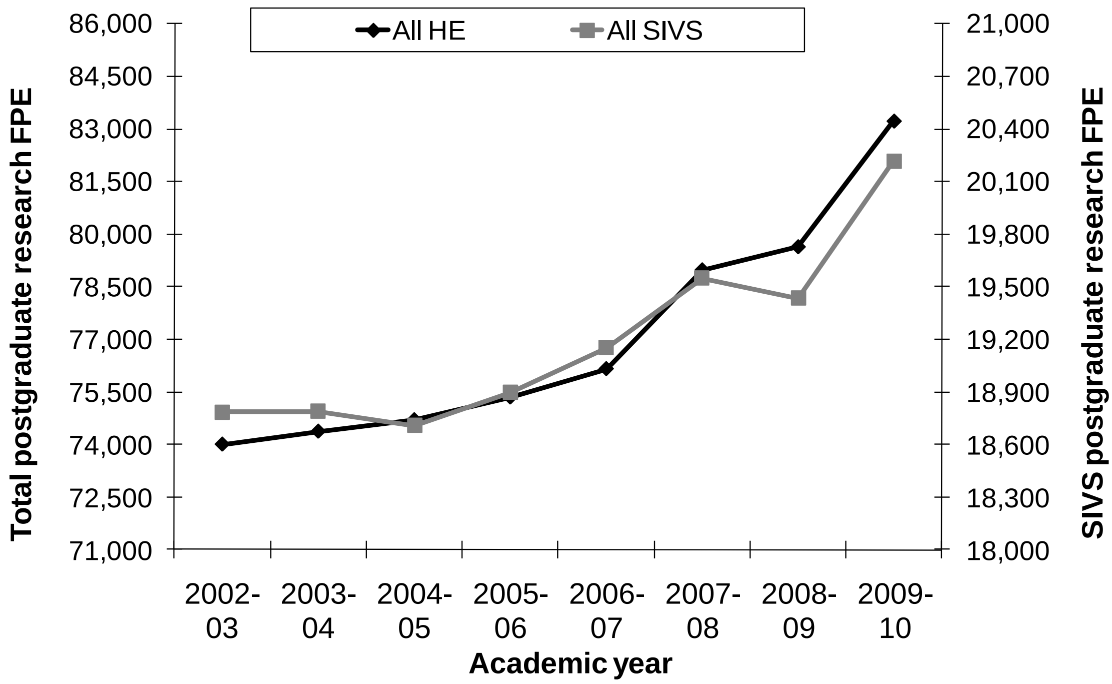
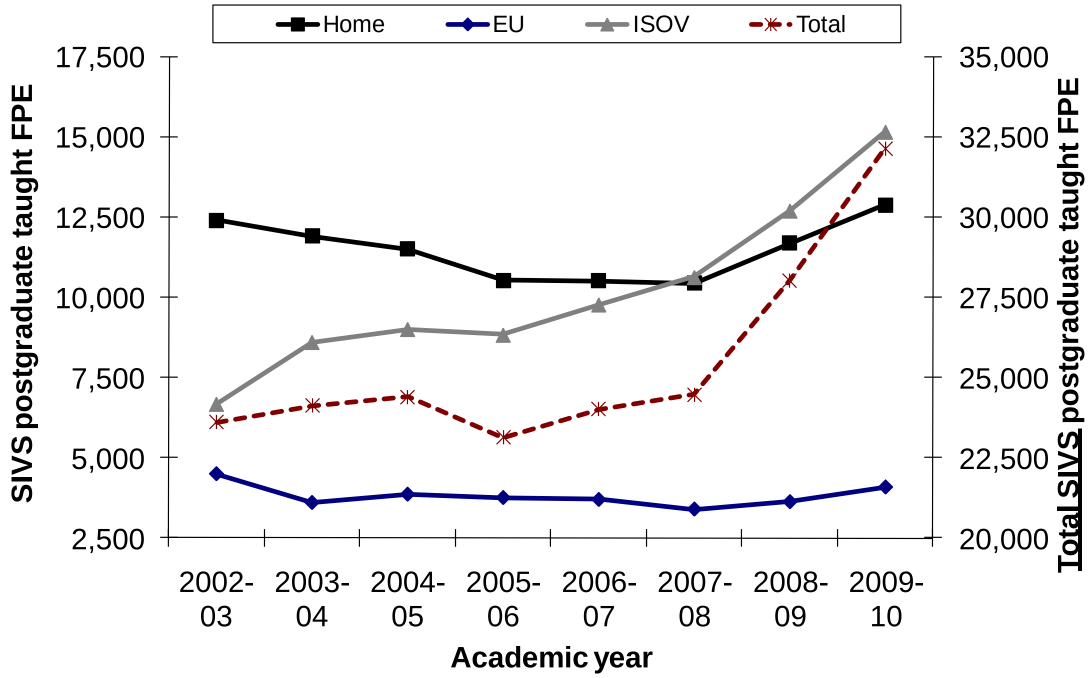



**Figure 3 Numbers of postgraduate research student FPE, 2002-03 to 2009-10**




33. A significant proportion of the SIVS growth in both PGT and PGR results from an increase in international students. For PGT, this is demonstrated in Figure 4, which shows a 22 per cent increase in international student numbers in SIVS subjects over the eight-year period.

**Figure 4 Numbers of postgraduate taught student FPE in SIVS, by student domicile, 2002-03 to 2009-10**




34. Table A.4 at Annex A shows that in STEM disciplines of SIVS, the PGT international population more than doubled over the last eight years, while the home student population grew by only 1 per cent. Table A.5 at Annex A shows that in the same subject areas the PGR international population grew by 23 per cent while the home student population fell by 2 per cent. This pattern is different in language-based SIVS disciplines, where the biggest increase in PGT was in the home student population (up 53 per cent), although international student numbers increased in this area as well, by 28 per cent. At PGR level, the pattern in language-based SIVS was more consistent with those in other areas: international student numbers increased by 17 per cent while home student numbers fell by 8 per cent.

35. The growth in international numbers during this period has been so marked, both for SIVS and across all subjects, that any decrease in overseas postgraduate students could lead to concerns about the future viability of courses and the overall sustainability of these disciplines, given the impact of the reduction in associated income streams. There may be a risk in relation to the UK's future workforce, given that many postgraduate students enter positions requiring advanced skills and expertise following their studies, including in universities and research organisations.

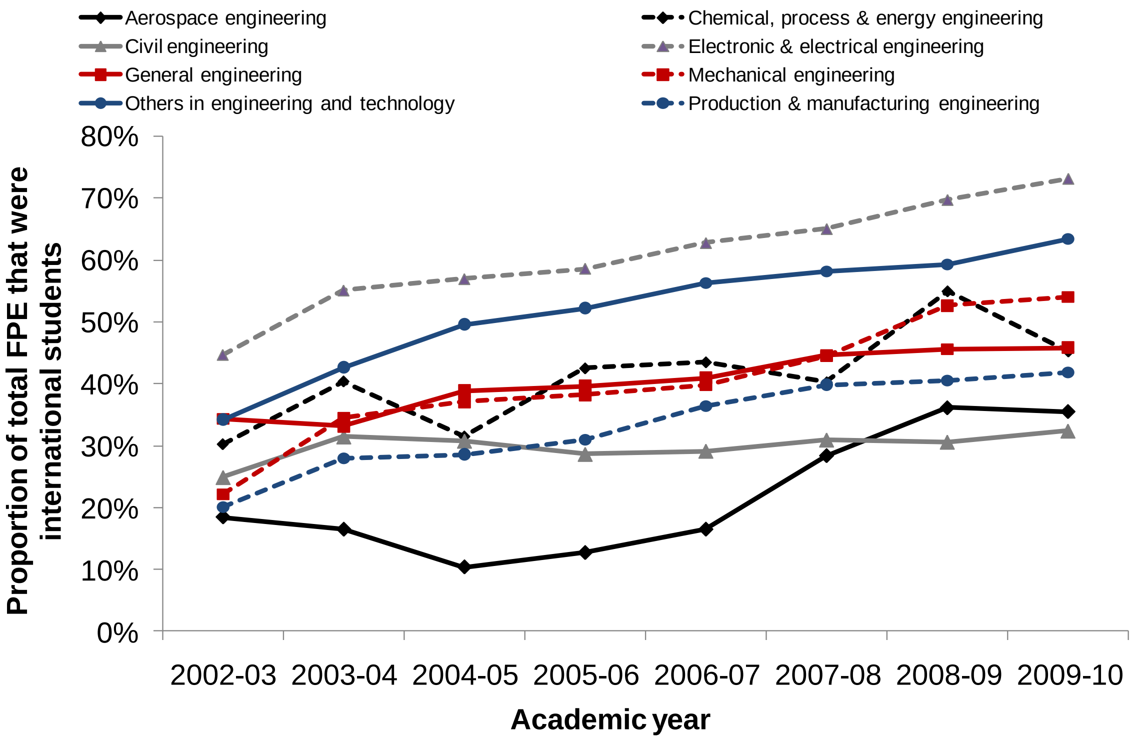
36. Detailed subject-by-subject analysis is set out at Annex A. The analysis of data relating to engineering is worthy of note here. Table A.6 and Table A.7 at Annex A show student numbers for PGT and PGR respectively, broken down by engineering discipline. At PGT level, some disciplines were relatively small in terms of overall FPE numbers, and smaller still at PGR level. This may be explained, at least in part, by the professional routes taken by engineers, which may vary by the branch of engineering. For example, while many study an extended undergraduate programme, it may also be that particular

engineers progress in their careers through experience and chartership, as opposed to a postgraduate study route.

37. Using the data from Table A.6 at Annex A, Figure 5 shows the growth in the proportion of international students in each of the PGT engineering disciplines. The largest change over the eight-year period was in mechanical engineering, where international student numbers grew from 22 per cent of the total PGT FPE in that discipline in 2002-03 to 54 per cent in 2009-10. One question arising from this, which may be an issue for the engineering professional bodies to explore, is the relationship between the trends in UK and overseas students across the different engineering disciplines and the areas of relative industrial strength within UK.

38. Further analysis has shown that for PGT, the numbers of international students were fairly evenly distributed between pre- and post-1992 institutions. For PGR, numbers of international students were more concentrated in pre-1992 institutions.

**Figure 5 Proportion of postgraduate taught student FPE in engineering and technology who were international, by engineering and technology subject area defined using JACS, 2002-03 to 2009-10**




## Postgraduate data and analysis: relationship between supply and demand

39. In its 2009 report, the Group identified that demand from employers can be articulated at a number of levels, and that employers are as concerned about institutions and broad graduate attributes as they are about subjects. Employers do, however, consistently identify a demand for STEM graduates, arising from a broad requirement for

numeracy aligned with specific technical skills, and these graduates are employed across a wide variety of jobs.[35]

40. This section updates the analysis of employer demand in the 2009 report by considering whether the broad conclusions reached with regard to undergraduates apply equally to postgraduates. It also considers the implications of the HE reforms for any measures that may be taken with regard to graduate and postgraduate supply and demand.

41. To a certain extent the supply of undergraduate students entering HE can be predicted because there are robust leading indicators (from A levels, through to UCAS acceptances and on to HE entrants) and recognised patterns of progression into these levels of HE. This trajectory does not apply to postgraduate levels of study, where the market is so highly differentiated that it is difficult to identify patterns of progression. Postgraduate study is more likely to be undertaken at differing times of life and careers, and for a wider variety of motives. More than a third of PGR entrants, for example, commence their study after 30 years of age. Postgraduate also differs from undergraduate study in terms of the more limited propensity and ability to study at higher levels, and the requirement in many cases for private rather than public finance. Patterns of supply are, therefore, harder to identify and harder for policy-makers to influence.

42. A key indicator of demand for postgraduates is the nature of the job undertaken following postgraduate study and the salary earned. The data available on this[36] shows that, 40 months after graduation, full-time postgraduate qualifiers (PGT and PGR) had a median salary of £27k: £3k higher than the median salary of full-time first degree qualifiers. Part-time postgraduate qualifiers (PGT and PGR) at the same point in their careers (40 months after graduation) reported an even higher median salary of £38k. These figures are likely to reflect the mid-career focus of a great deal of part-time postgraduate studies: the median age of part-time postgraduate students (PGT and PGR) in their first year of study is 35 years.

43. A higher percentage of postgraduate qualifiers reported that they were in 'graduate' occupations than those at undergraduate level.[37] At 40 months after graduation, 77 per

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[35] This is confirmed by recent research conducted on behalf of BIS: STEM graduates in non-STEM jobs', March 2011, available at www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf. While suggesting that there is a need to raise STEM students' awareness of the range of career opportunities available to them, to enable them to make informed career choices, the BIS report also notes that almost all STEM graduates surveyed are making good use of the skills learned as part of their STEM degree (particularly analytical and problem-solving skills), regardless of occupation

[36] Data are drawn from analysis of the Longitudinal Destination of Leavers from Higher Education (DLHE Longitudinal) survey. For further information, please see www.hesa.ac.uk under DLHE Longitudinal Survey, and 2004/05 cohort

[37] The occupations that HE leavers work in are classified by the Standard Occupational Classification (SOC2000), where each occupation can be classified as being a 'graduate' or 'non-graduate' occupation according to a classification scheme devised by Elias & Purcell (2004)

cent of full-time first degree qualifiers reported working in a 'graduate' occupation, compared to 93 per cent of full-time postgraduate qualifiers. These figures were 82 per cent and 93 per cent respectively for equivalent part-time qualifiers. Related to this, 20 per cent of part-time postgraduate taught students registered at English HEIs in 2009-10 (equivalent to some 40,000 student headcounts) had their fees paid by their employer or UK industry/commerce. This compares to 13 per cent of equivalent undergraduate students. Again, the difference in age and therefore likely career stage is of relevance here.

44. Collectively, this data suggests high levels of employer engagement and funding for PGT students, alongside a wage premium, and it is backed up by qualitative evidence such as CIHE's 'Talent Fishing' report[38] which surveyed employers and found strong satisfaction with postgraduate students, albeit with a need for more leadership development and work experience.[39]

45. The Association of the British Pharmaceutical Industry (ABPI) is distinctive in surveying employers' postgraduate-specific skills needs.[40] Across relevant discipline areas, its 2008 report assesses the quality and quantity of applicants, and the level of need (e.g. graduate, doctoral, post-doctoral) by relevant discipline. Reports such as this, backed up by accreditation such as that from the new Society for Biology,[41] can be significant in identifying specific and immediate requirements, to inform the decisions by individuals about the courses to study and by institutions about their offer.

46. As suggested in the Group's 2009 work, reports on employer requirements can also inform tailored responses by employers, institutions and government, such as the new MSci led by King's College London, which is being co-financed by HEFCE and employers in the pharmaceutical industry. Following the HE finance reforms, however, such responses will need primarily to be driven by employers and institutions, with publicly supplied information and loans to individuals in support.

47. Other important sources of labour market information and analysis (for demand for both undergraduates and postgraduates) include UKCES' work with the Migration Advisory Committee (MAC) to review the evidence around skills shortages and skills needs, and thereby inform the MAC's recommendations on jobs that may be filled

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[38] www.cihe.co.uk/talent-fishing-what-businesses-want-from-postgraduates/

[39] Since 2003, approximately £20m per year has been invested via RCUK for career development and transferable skills training for the benefit of PhD students and research staff. This funding (often referred to as 'Roberts' money') has been allocated not only to HEIs but also to other research organisations. A recent evaluation (www.rcuk.ac.uk/documents/researchcareers/Robertreport2011.pdf) noted limited interaction between those organisations training researchers and employers, and a very specific need for a greater focus on employment needs as the driver for future developments of transferable skills training

[40] www.abpi.org.uk/our-work/mandi/Documents/2008-10 STEM Skills Review Report FINAL amended2.pdf

[41] www.societyofbiology.org/education/hei/accreditation

through immigration[42]; its National Strategic Skills Audit[43] and NESTA's review of the video games and visual effects industries[44]. This is all important evidence to inform decisions by students and employers.

48. Employers signal the value they place on postgraduate study primarily through the additional salary they pay for postgraduates and their greater willingness to sponsor postgraduate students. Other evidence from graduate and employer surveys and reports may be used by individuals and employers to inform their specific investments, and by institutions to inform the development of their provision. The labour market is, however, complex and fast-moving, and such evidence not only dates quickly, it is also often open to varied interpretation, and only covers some employment areas. The priority for government, in this context, should be to enhance the information made publicly available to students and employers, and thereby to inform their choices; to continue to gather evidence to understand patterns in the supply of and demand for postgraduates, as set out in the White Paper[45]; and to work with institutions and employers to take action in those cases where there is compelling evidence that these outcomes are not in the national interest.

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[42] www.ukces.org.uk/publications/er20-skills-shortage-and-needs

[43] www.ukces.org.uk/publications/nssa-vol-1

[44] www.nesta.org.uk/publications/assets/features/next_gen

[45] White Paper, paragraph 1.33

## The future direction for HEFCE's SIVS policy

49. The first section of this report set out the forthcoming changes to the student fees and finance system, noting that it is difficult, at this stage, to predict how these changes will impact on subject provision. What is clear, however, is that HEFCE's SIVS policy must change to be brought in line with the broad objective of the new system, which is that student choice should drive innovation, efficiency and quality in teaching. HEFCE has been charged specifically with ensuring that undesirable reductions in the scale of provision are avoided. To do this, there is a need to consider more than just undergraduate provision: postgraduate provision, research, business engagement and international recruitment will all contribute to the picture of the health of SIVS provision. There is also a need to look again at the subjects and areas of concern.

50. A new policy approach is now in development. It starts from the assumption that the new student-led system for financing teaching, operating alongside the HEFCE teaching funding and the dual-support system for research, will for the most part achieve the government's aspirations with regard to subject provision. HEFCE's future policy must be concerned with identifying the minority of areas in which this may not be the case and determining any mitigating action that might be taken. It will need to identify areas where there may be a risk of an insufficient or inappropriate flow of graduates from undergraduate or postgraduate programmes, and/or an insufficient level and range of the expertise necessary to sustain the nation's research capacity and capabilities. Given the government's desire to promote dynamism and excellence, HEFCE will also be seeking to establish why any such areas may be considered strategically important and whether the risks may satisfactorily be resolved in the medium term through the normal working of the teaching and research systems.

51. Data analysis will be invaluable in gaining an overview of any changes in the scale of SIVS provision. Engagement with other organisations, such as the Research Councils, learned societies, subject associations and employer-representative bodies will also play an important part in HEFCE's understanding of the sufficiency of the scale of provision. Given that HEFCE's funding will be limited, it is expected that any such mitigating actions would normally be taken in collaboration with other funders and agencies such as these, and would explore interventions other than funding alone.

52. HEFCE will consult on the details of this approach as part of the second stage of the teaching funding consultation, which will take place in the winter.

# Annex A Tables to demonstrate headline trends in SIVS activity at undergraduate and postgraduate levels

An evidence base to show the flows of SIVS graduates into higher education has been established for some time, and was drawn upon by successive SIVS advisory groups. In 2010 it was extended to demonstrate the flows of SIVS postgraduates into higher education. This Annex provides a summary of the headline trends in SIVS activity at undergraduate and postgraduate level, identified from analysis of the current version of that evidence base. Where appropriate, references to tables within this Annex detail the equivalent tables published by the 2009 report of the SIVS advisory group.

**Table A.1 Numbers of undergraduate student FTE in SIVS, by HESA cost centre, 1999-2000 to 2009-10**

| Group | HESA cost centre | 1999-2000 | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 1999-2000 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIVS | Chemistry | 12,895 | 11,817 | 11,556 | 10,751 | 10,350 | 10,458 | 12,027 | 12,888 | 13,505 | 14,134 | 14,283 | 11% |
| | Physics | 9,341 | 8,956 | 8,957 | 9,153 | 9,426 | 9,337 | 9,534 | 9,540 | 9,932 | 10,225 | 10,515 | 13% |
| | Engineering and technology | 74,176 | 74,790 | 74,524 | 73,298 | 73,999 | 72,830 | 72,764 | 71,411 | 70,629 | 71,157 | 72,748 | -2% |
| | Mathematics | 21,782 | 21,290 | 21,209 | 20,435 | 20,252 | 21,329 | 22,678 | 22,845 | 23,786 | 24,574 | 25,236 | 16% |
| | **Subtotal: STEM within SIVS** | **118,193** | **116,854** | **116,246** | **113,637** | **114,027** | **113,954** | **117,004** | **116,684** | **117,852** | **120,091** | **122,782** | **4%** |
| | Modern languages | 24,853 | 26,392 | 27,743 | 27,436 | 26,714 | 26,886 | 28,004 | 27,967 | 26,856 | 27,441 | 27,185 | 9% |
| **All SIVS** | | **143,046** | **143,246** | **143,989** | **141,073** | **140,741** | **140,841** | **145,008** | **144,651** | **144,707** | **147,531** | **149,967** | **5%** |
| **All STEM (including STEM within SIVS)** | | **264,627** | **269,471** | **277,085** | **282,459** | **280,545** | **277,603** | **280,339** | **277,309** | **277,183** | **279,002** | **285,978** | **8%** |
| Non-SIVS, non-STEM | | 480,362 | 495,668 | 521,909 | 557,815 | 580,759 | 601,014 | 624,273 | 629,033 | 625,135 | 618,123 | 637,531 | 33% |
| **All HE** | | **888,034** | **908,385** | **942,983** | **981,347** | **1,002,044** | **1,019,458** | **1,049,619** | **1,050,993** | **1,047,026** | **1,044,657** | **1,073,476** | **21%** |

Note: Relates to Tables 2.1 and 2.2 published at Appendix 2 of HEFCE 2010/09.

Tables A.2 to A.6 consider activity in SIVS at postgraduate level in terms of full-person equivalent (FPE) numbers of students, with subject areas defined through the use of the Joint Academic Coding System (JACS) classification. Being a headcount measure, figures in the tables that follow are rounded to the nearest five.

**Table A.2 Numbers of postgraduate taught student FPE in SIVS, by subject areas defined using JACS, 2002-03 to 2009-10**

| Group | JACS subject area | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| SIVS | Physics and astronomy | 505 | 530 | 565 | 575 | 630 | 585 | 640 | 815 | 61% |
| | Chemistry and materials science | 665 | 680 | 595 | 560 | 605 | 645 | 690 | 820 | 24% |
| | Engineering and technology | 18,095 | 18,475 | 19,080 | 17,935 | 18,545 | 19,400 | 22,330 | 25,630 | 42% |
| | Mathematical sciences | 2,540 | 2,555 | 2,170 | 2,160 | 2,200 | 2,140 | 1,985 | 2,515 | -1% |
| | **Subtotal: STEM within SIVS** | **21,805** | **22,245** | **22,405** | **21,235** | **21,980** | **22,780** | **25,645** | **29,780** | **37%** |
| | Modern languages: Eastern, Asiatic and African | 750 | 765 | 835 | 775 | 820 | 695 | 790 | 800 | 7% |
| | Modern languages: European | 1,055 | 1,125 | 1,160 | 1,125 | 1,215 | 1,010 | 1,610 | 1,575 | 49% |
| **All SIVS** | | **23,610** | **24,135** | **24,405** | **23,135** | **24,015** | **24,485** | **28,050** | **32,160** | **36%** |
| **All STEM (including STEM within SIVS)** | | **53,330** | **55,515** | **56,310** | **54,805** | **57,270** | **57,320** | **65,150** | **73,135** | **37%** |
| Non-SIVS, non-STEM | | 248,190 | 264,470 | 268,195 | 275,310 | 276,005 | 273,435 | 298,380 | 323,320 | 30% |
| **Total PGT student FPE** | | **303,325** | **321,880** | **326,505** | **332,015** | **335,310** | **332,465** | **365,930** | **398,830** | **31%** |

**Table A.3 Numbers of postgraduate research student FPE in SIVS, by subject areas defined using JACS, 2002-03 to 2009-10**

| Group | JACS subject area | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| SIVS | Physics and astronomy | 2,310 | 2,325 | 2,325 | 2,400 | 2,395 | 2,575 | 2,660 | 2,770 | 20% |
| | Chemistry and materials science | 3,505 | 3,345 | 3,280 | 3,275 | 3,265 | 3,425 | 3,345 | 3,340 | -5% |
| | Engineering and technology | 9,735 | 9,895 | 9,880 | 9,945 | 10,020 | 10,090 | 10,080 | 10,685 | 10% |
| | Mathematical sciences | 1,775 | 1,760 | 1,855 | 1,890 | 2,065 | 1,990 | 1,900 | 1,920 | 8% |
| | **Subtotal: STEM within SIVS** | **17,325** | **17,320** | **17,335** | **17,510** | **17,745** | **18,080** | **17,985** | **18,715** | **8%** |
| | Modern languages: Eastern, Asiatic and African | 410 | 435 | 410 | 405 | 410 | 465 | 450 | 470 | 15% |
| | Modern languages: European | 1,050 | 1,030 | 960 | 980 | 995 | 1,005 | 1,000 | 1,030 | -2% |
| **All SIVS** | | **18,785** | **18,785** | **18,705** | **18,895** | **19,150** | **19,550** | **19,435** | **20,220** | **8%** |
| **All STEM (including STEM within SIVS)** | | **35,405** | **35,790** | **35,760** | **36,200** | **36,765** | **38,030** | **37,710** | **39,010** | **10%** |
| Non-SIVS, non-STEM | | 37,130 | 37,110 | 37,560 | 37,755 | 37,985 | 39,475 | 40,475 | 42,720 | 15% |
| **Total PGR student FPE** | | **73,995** | **74,365** | **74,690** | **75,340** | **76,155** | **78,975** | **79,635** | **83,230** | **12%** |

**Table A.4 Numbers of postgraduate taught student FPE in SIVS, by domicile and subject area defined using JACS, 2002-03 to 2009-10**

| JACS subject area | Student domicile | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Physics and astronomy | Home | 365 | 365 | 375 | 405 | 435 | 385 | 435 | 515 | 42% |
| | EU | 65 | 70 | 85 | 80 | 75 | 80 | 90 | 100 | 47% |
| | International | 75 | 100 | 105 | 95 | 120 | 120 | 115 | 200 | 158% |
| | **Total** | **505** | **530** | **565** | **575** | **630** | **585** | **640** | **815** | **61%** |
| Chemistry and materials science | Home | 425 | 430 | 370 | 325 | 340 | 360 | 390 | 390 | -8% |
| | EU | 85 | 60 | 55 | 55 | 60 | 60 | 45 | 55 | -37% |
| | International | 155 | 195 | 165 | 180 | 200 | 225 | 260 | 380 | 144% |
| | **Total** | **665** | **680** | **595** | **560** | **605** | **645** | **690** | **820** | **24%** |
| Mathematical sciences | Home | 1,360 | 1,715 | 1,275 | 1,220 | 1,130 | 1,040 | 985 | 1,325 | -2% |
| | EU | 800 | 255 | 330 | 340 | 340 | 330 | 310 | 330 | -59% |
| | International | 380 | 590 | 565 | 605 | 730 | 770 | 690 | 860 | 126% |
| | **Total** | **2,540** | **2,555** | **2,170** | **2,160** | **2,200** | **2,140** | **1,985** | **2,515** | **-1%** |
| Engineering and technology | Home | 9,255 | 8,360 | 8,440 | 7,685 | 7,640 | 7,840 | 8,515 | 9,265 | 0% |
| | EU | 3,255 | 2,920 | 3,035 | 2,895 | 2,750 | 2,600 | 2,765 | 3,180 | -2% |
| | International | 5,580 | 7,195 | 7,605 | 7,355 | 8,155 | 8,965 | 11,055 | 13,185 | 136% |
| | **Total** | **18,095** | **18,475** | **19,080** | **17,935** | **18,545** | **19,400** | **22,330** | **25,630** | **42%** |
| **Subtotal: STEM within SIVS** | Home | 11,405 | 10,865 | 10,460 | 9,630 | 9,545 | 9,625 | 10,315 | 11,500 | 1% |
| | EU | 4,205 | 3,300 | 3,510 | 3,370 | 3,230 | 3,070 | 3,210 | 3,660 | -13% |

| JACS subject area | Student domicile | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | International | 6,195 | 8,075 | 8,435 | 8,235 | 9,205 | 10,085 | 12,120 | 14,625 | 136% |
| | **Total** | **21,805** | **22,245** | **22,405** | **21,235** | **21,980** | **22,780** | **25,645** | **29,780** | **37%** |
| Eastern, Asiatic and African languages, literature and related subjects | Home | 380 | 370 | 390 | 350 | 355 | 290 | 335 | 365 | -4% |
| | EU | 70 | 65 | 80 | 70 | 105 | 70 | 95 | 125 | 78% |
| | International | 300 | 330 | 370 | 355 | 360 | 335 | 360 | 310 | 4% |
| | **Total** | **750** | **765** | **835** | **775** | **820** | **695** | **790** | **800** | **7%** |
| European languages, literature and related subjects | Home | 635 | 685 | 665 | 555 | 630 | 530 | 1,050 | 1,025 | 62% |
| | EU | 225 | 230 | 275 | 315 | 360 | 255 | 320 | 300 | 33% |
| | International | 195 | 210 | 220 | 255 | 225 | 225 | 240 | 250 | 26% |
| | **Total** | **1,055** | **1,125** | **1,160** | **1,125** | **1,215** | **1,010** | **1,610** | **1,575** | **49%** |
| **Subtotal: SIVS** | **Home** | **12,420** | **11,920** | **11,515** | **10,535** | **10,525** | **10,445** | **11,705** | **12,890** | **4%** |
| | **EU** | **4,500** | **3,600** | **3,860** | **3,755** | **3,695** | **3,395** | **3,625** | **4,085** | **-9%** |
| | **International** | **6,690** | **8,620** | **9,025** | **8,845** | **9,790** | **10,645** | **12,720** | **15,180** | **127%** |
| | **Total** | **23,610** | **24,135** | **24,405** | **23,135** | **24,015** | **24,485** | **28,050** | **32,160** | **36%** |
| **Total PGT FPE (SIVS and non-SIVS)** | **Home** | **223,395** | **231,000** | **231,465** | **235,210** | **233,605** | **225,245** | **245,655** | **261,775** | **17%** |
| | **EU** | **22,940** | **22,800** | **25,435** | **26,025** | **25,445** | **25,755** | **27,560** | **29,960** | **31%** |
| | **International** | **56,995** | **68,075** | **69,605** | **70,780** | **76,260** | **81,460** | **92,715** | **107,095** | **88%** |
| | **Total** | **303,325** | **321,880** | **326,505** | **332,015** | **335,310** | **332,465** | **365,930** | **398,830** | **31%** |

**Table A.5 Numbers of postgraduate research student FPE in SIVS, by domicile and subject area defined using JACS, 2002-03 to 2009-10**

| JACS subject | Student domicile | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Physics and astronomy | Home | 1,595 | 1,615 | 1,585 | 1,625 | 1,560 | 1,685 | 1,710 | 1,760 | 10% |
| | EU | 290 | 285 | 315 | 335 | 370 | 410 | 455 | 480 | 65% |
| | International | 425 | 425 | 425 | 440 | 465 | 475 | 495 | 530 | 24% |
| | **Total** | **2,310** | **2,325** | **2,325** | **2,400** | **2,395** | **2,575** | **2,660** | **2,770** | **20%** |
| Chemistry and materials science | Home | 2,385 | 2,245 | 2,175 | 2,095 | 2,010 | 2,075 | 2,070 | 2,165 | -9% |
| | EU | 585 | 505 | 480 | 525 | 545 | 570 | 485 | 420 | -28% |
| | International | 535 | 595 | 620 | 650 | 715 | 780 | 790 | 760 | 42% |
| | **Total** | **3,505** | **3,345** | **3,280** | **3,275** | **3,265** | **3,425** | **3,345** | **3,340** | **-5%** |
| Mathematical sciences | Home | 1,040 | 1,025 | 1,060 | 1,030 | 1,085 | 995 | 980 | 965 | -7% |
| | EU | 265 | 235 | 280 | 305 | 345 | 365 | 315 | 335 | 27% |
| | International | 470 | 495 | 515 | 560 | 635 | 630 | 605 | 620 | 32% |
| | **Total** | **1,775** | **1,760** | **1,855** | **1,890** | **2,065** | **1,990** | **1,900** | **1,920** | **8%** |
| Engineering and technology | Home | 4,465 | 4,370 | 4,185 | 4,140 | 4,150 | 4,065 | 4,060 | 4,435 | -1% |
| | EU | 1,260 | 1,250 | 1,375 | 1,425 | 1,450 | 1,450 | 1,435 | 1,485 | 18% |
| | International | 4,015 | 4,275 | 4,315 | 4,380 | 4,420 | 4,580 | 4,580 | 4,765 | 19% |
| | **Total** | **9,735** | **9,895** | **9,880** | **9,945** | **10,020** | **10,090** | **10,080** | **10,685** | **10%** |
| **Subtotal: STEM within SIVS** | Home | 9,485 | 9,255 | 9,010 | 8,890 | 8,805 | 8,815 | 8,820 | 9,325 | -2% |
| | EU | 2,400 | 2,275 | 2,450 | 2,590 | 2,705 | 2,795 | 2,695 | 2,720 | 13% |

| JACS subject | Student domicile | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| | International | 5,445 | 5,790 | 5,875 | 6,030 | 6,235 | 6,465 | 6,470 | 6,670 | 23% |
| | **Total** | **17,325** | **17,320** | **17,335** | **17,510** | **17,745** | **18,080** | **17,985** | **18,715** | **8%** |
| Eastern, Asiatic and African languages, literature and related subjects | Home | 150 | 130 | 125 | 130 | 135 | 170 | 160 | 190 | 28% |
| | EU | 50 | 55 | 65 | 65 | 60 | 65 | 60 | 55 | 13% |
| | International | 215 | 250 | 220 | 210 | 215 | 230 | 230 | 230 | 6% |
| | **Total** | **410** | **435** | **410** | **405** | **410** | **465** | **450** | **470** | **15%** |
| European languages, literature and related subjects | Home | 665 | 645 | 585 | 600 | 585 | 575 | 570 | 560 | -16% |
| | EU | 240 | 240 | 245 | 250 | 255 | 275 | 255 | 280 | 17% |
| | International | 145 | 145 | 135 | 130 | 160 | 155 | 175 | 190 | 33% |
| | **Total** | **1,050** | **1,030** | **960** | **980** | **995** | **1,005** | **1,000** | **1,030** | **-2%** |
| **Subtotal: SIVS** | **Home** | **10,295** | **10,030** | **9,720** | **9,620** | **9,520** | **9,560** | **9,555** | **10,070** | **-2%** |
| | **EU** | **2,685** | **2,570** | **2,765** | **2,905** | **3,020** | **3,135** | **3,005** | **3,055** | **14%** |
| | **International** | **5,805** | **6,185** | **6,225** | **6,370** | **6,610** | **6,855** | **6,875** | **7,090** | **22%** |
| | **Total** | **18,785** | **18,785** | **18,705** | **18,895** | **19,150** | **19,550** | **19,435** | **20,220** | **8%** |
| **Total PGR FPE (SIVS and non-SIVS)** | **Home** | **45,400** | **44,540** | **43,605** | **43,870** | **43,510** | **44,610** | **45,190** | **47,945** | **6%** |
| | **EU** | **8,395** | **8,385** | **9,445** | **9,805** | **10,200** | **10,950** | **10,815** | **11,000** | **31%** |
| | **International** | **20,200** | **21,440** | **21,645** | **21,660** | **22,445** | **23,415** | **23,630** | **24,285** | **20%** |
| | **Total** | **73,995** | **74,365** | **74,690** | **75,340** | **76,155** | **78,975** | **79,635** | **83,230** | **12%** |

**Table A.6 Numbers of international postgraduate taught student FPE in engineering and technology, by engineering and technology subject area defined using JACS, 2002-03 to 2009-10**

| Discipline of engineering and technology | | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Aerospace engineering | Total FPE | 890 | 779 | 996 | 920 | 937 | 1,165 | 1,392 | 1,461 | 64% |
| | International FPE | 164 | 128 | 103 | 117 | 154 | 331 | 503 | 519 | 216% |
| | **% international** | **18%** | **16%** | **10%** | **13%** | **16%** | **28%** | **36%** | **36%** | |
| Chemical, process & energy engineering | Total FPE | 818 | 836 | 924 | 801 | 831 | 980 | 960 | 1,731 | 112% |
| | International FPE | 248 | 338 | 291 | 341 | 361 | 395 | 528 | 783 | 216% |
| | **% international** | **30%** | **40%** | **32%** | **43%** | **43%** | **40%** | **55%** | **45%** | |
| Civil engineering | Total FPE | 2,844 | 3,133 | 3,410 | 3,274 | 3,585 | 3,855 | 4,790 | 4,892 | 72% |
| | International FPE | 708 | 985 | 1,049 | 937 | 1,044 | 1,192 | 1,465 | 1,584 | 124% |
| | **% international** | **25%** | **31%** | **31%** | **29%** | **29%** | **31%** | **31%** | **32%** | |
| Electronic & electrical engineering | Total FPE | 4,550 | 5,102 | 5,078 | 4,620 | 4,866 | 4,957 | 5,724 | 6,620 | 46% |
| | International FPE | 2,033 | 2,811 | 2,891 | 2,708 | 3,055 | 3,224 | 3,992 | 4,844 | 138% |
| | **% international** | **45%** | **55%** | **57%** | **59%** | **63%** | **65%** | **70%** | **73%** | |
| General engineering | Total FPE | 2,518 | 2,109 | 2,539 | 2,592 | 2,821 | 2,469 | 2,532 | 2,849 | 13% |
| | International FPE | 865 | 699 | 988 | 1,028 | 1,156 | 1,102 | 1,153 | 1,306 | 51% |
| | **% international** | **34%** | **33%** | **39%** | **40%** | **41%** | **45%** | **46%** | **46%** | |

| Discipline of engineering and technology | | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mechanical engineering | Total FPE | 1,727 | 1,740 | 1,726 | 1,700 | 1,806 | 2,243 | 2,651 | 3,002 | 74% |
| | International FPE | 381 | 601 | 640 | 649 | 717 | 997 | 1,395 | 1,623 | 326% |
| | **% international** | **22%** | **35%** | **37%** | **38%** | **40%** | **44%** | **53%** | **54%** | |
| Production & manufacturing engineering | Total FPE | 1,643 | 2,028 | 1,817 | 1,562 | 1,612 | 1,297 | 1,512 | 1,883 | 15% |
| | International FPE | 562 | 865 | 901 | 816 | 907 | 755 | 896 | 1,193 | 112% |
| | **% international** | **34%** | **43%** | **50%** | **52%** | **56%** | **58%** | **59%** | **63%** | |
| Others in engineering and technology | Total FPE | 3,105 | 2,748 | 2,589 | 2,464 | 2,089 | 2,436 | 2,772 | 3,191 | 3% |
| | International FPE | 623 | 769 | 740 | 762 | 761 | 970 | 1,123 | 1,334 | 114% |
| | **% international** | **20%** | **28%** | **29%** | **31%** | **36%** | **40%** | **41%** | **42%** | |
| **Total engineering and technology PGT FPE** | **Total FPE** | **18,094** | **18,474** | **19,080** | **17,934** | **18,547** | **19,402** | **22,332** | **25,630** | **42%** |
| | **International FPE** | **5,582** | **7,195** | **7,603** | **7,357** | **8,155** | **8,965** | **11,055** | **13,185** | **136%** |
| | **% international** | **31%** | **39%** | **40%** | **41%** | **44%** | **46%** | **50%** | **51%** | |

**Table A.7 Numbers of international postgraduate research student FPE in engineering and technology, by engineering and technology subject area defined using JACS, 2002-03 to 2009-10**

| Discipline of engineering and technology | | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Aerospace engineering | Total FPE | 206 | 225 | 225 | 227 | 520 | 463 | 495 | 394 | 91% |
| | International FPE | 59 | 60 | 65 | 66 | 162 | 147 | 158 | 102 | 74% |
| | **% international** | **28%** | **27%** | **29%** | **29%** | **31%** | **32%** | **32%** | **26%** | |
| Chemical, process & energy engineering | Total FPE | 843 | 866 | 878 | 848 | 881 | 936 | 957 | 1,024 | 22% |
| | International FPE | 405 | 421 | 417 | 387 | 404 | 407 | 409 | 436 | 8% |
| | **% international** | **48%** | **49%** | **47%** | **46%** | **46%** | **43%** | **43%** | **43%** | |
| Civil engineering | Total FPE | 1,048 | 1,032 | 1,017 | 1,038 | 1,049 | 1,091 | 1,050 | 1,187 | 13% |
| | International FPE | 459 | 493 | 468 | 482 | 481 | 518 | 524 | 549 | 20% |
| | **% international** | **44%** | **48%** | **46%** | **46%** | **46%** | **47%** | **50%** | **46%** | |
| Electronic & electrical engineering | Total FPE | 2,412 | 2,487 | 2,529 | 2,478 | 2,580 | 2,615 | 2,488 | 2,644 | 10% |
| | International FPE | 1,156 | 1,278 | 1,297 | 1,294 | 1,353 | 1,385 | 1,354 | 1,434 | 24% |
| | **% international** | **48%** | **51%** | **51%** | **52%** | **52%** | **53%** | **54%** | **54%** | |
| General engineering | Total FPE | 1,871 | 1,955 | 2,050 | 2,139 | 1,738 | 1,920 | 2,000 | 2,091 | 12% |
| | International FPE | 728 | 797 | 858 | 883 | 743 | 835 | 885 | 906 | 24% |
| | **% international** | **39%** | **41%** | **42%** | **41%** | **43%** | **43%** | **44%** | **43%** | |

| Discipline of engineering and technology | | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | % change 2002-03 to 2009-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mechanical engineering | Total FPE | 1,645 | 1,471 | 1,417 | 1,402 | 1,504 | 1,419 | 1,466 | 1,591 | -3% |
| | International FPE | 662 | 574 | 572 | 586 | 648 | 642 | 658 | 707 | 7% |
| | **% international** | **40%** | **39%** | **40%** | **42%** | **43%** | **45%** | **45%** | **44%** | |
| Production & manufacturing engineering | Total FPE | 531 | 479 | 450 | 442 | 495 | 452 | 440 | 421 | -21% |
| | International FPE | 122 | 132 | 129 | 140 | 147 | 162 | 124 | 124 | 2% |
| | **% international** | **23%** | **28%** | **29%** | **32%** | **30%** | **36%** | **28%** | **30%** | |
| Others in engineering and technology | Total FPE | 1,183 | 1,380 | 1,314 | 1,372 | 1,253 | 1,196 | 1,184 | 1,335 | 13% |
| | International FPE | 425 | 519 | 511 | 541 | 484 | 482 | 470 | 506 | 19% |
| | **% international** | **36%** | **38%** | **39%** | **39%** | **39%** | **40%** | **40%** | **38%** | |
| **Total engineering and technology PGR FPE** | **Total FPE** | **9,737** | **9,893** | **9,879** | **9,946** | **10,020** | **10,092** | **10,079** | **10,685** | **10%** |
| | **International FPE** | **4,013** | **4,274** | **4,317** | **4,379** | **4,421** | **4,579** | **4,582** | **4,763** | **19%** |
| | **% international** | **41%** | **43%** | **44%** | **44%** | **44%** | **45%** | **45%** | **45%** | |

# Annex B Narrative to accompany web-based tables

1. An evidence base to show the flows of SIVS graduates into higher education has been established for some time, and was drawn upon by successive SIVS advisory groups. In 2010 it was extended to demonstrate the flows of SIVS postgraduates into higher education. This report considers a summary of the current version of that evidence base.

2. In respect of activity in SIVS at undergraduate level, the tables provided alongside this report at www.hefce.ac.uk/pubs are an updated version of those provided at Appendix 2 of the 2009 report of the SIVS advisory group. Our approach to the data sources remains consistent with that discussed further at Paragraphs 23 to 26 and 37 to 38 of the 2009 report, as do all definitions and coverage. For ease of use, references to tables and figures within this discussion retain the numbering conventions used by that report, unless otherwise indicated.

3. The approach of our analysis of activity at postgraduate level differs to that for activity at undergraduate level:

a. at undergraduate level, as the previous SIVS advisory groups and the 2008 Review of UK Physics[46] observed, it may be that a great deal of activity in a specific subject is undertaken beyond the department, course and cost centre of that name. As a result, a measure of the full-time equivalent (FTE) student numbers in academic cost centres enables us to better capture overall volumes of activity in SIVS. Over a given time series, FTE undergraduate student numbers in cost centres as returned to the Higher Education Statistics Agency (HESA) in their annual data collections, have been examined;

b. in respect of activity at postgraduate level, the analysis discussed here considers the numbers of full-person equivalent (FPE) postgraduate students returned to the annual HESA data collections. FPE student numbers in subject areas defined by the Joint Academic Coding System (JACS) are considered. The JACS codes used to define SIVS for the purposes of this analysis are shown and discussed at Table B1;

c. the differing approach described here largely results from changes to reporting practice in terms of HESA data. In particular, a change to the manner in which institutions were required to return FTE student numbers for those on non-standard academic years appears to drive inconsistency in the time series of cost centre FTE activity at postgraduate level. In PGT study especially, one-year programmes and those that span non-standard academic years are prominent and this causes turbulence in a cost centre analysis of such activity[47]. Such inconsistency is not encountered in an analysis of FPE student numbers. However, use of the JACS classifications of subject areas restricts the time series available for analysis to 2002-03 to 2009-10;

d. as described at Paragraph 23 of the 2009 report, analysis of the trends in the supply of SIVS graduates has considered data intended to represent the different stages of the graduate supply chain. The numbers of entries to A levels and the numbers of

46 www.rcuk.ac.uk/documents/reviews/physics/review.pdf

47 The effect of the FTE reporting change is minimal among the undergraduate population where non-standard academic years are fewer in number and programmes are more likely to extend beyond one year in length

acceptances via UCAS of a place to study a full-time HE course have both been considered alongside numbers of FTE undergraduate student numbers in SIVS cost centres to show potential flows of graduates in subsequent years;

e. it is difficult to consider the supply of postgraduates in a similar fashion: while a range of data is available, no one source is complete, comparable or readily available at a sector-wide level[48]. To gauge an indication of the potential pool of entrants to postgraduate study, we consider the numbers qualifying from an undergraduate qualification aim with a first degree. In particular we focus on those qualifying with a first or upper second class first degree, which is often a pre-requisite for postgraduate study. It is inevitable that a proportion of this pool will have little or no intention to pursue such study, instead opting to move directly into employment. To this end we consider those responding to the destination of leavers from higher education (DLHE) survey and the proportions who report that they were undertaking further study six months after qualifying with a first or upper second class first degree.

4. Trends and characteristics of those studying postgraduate taught (PGT) qualifications differ from those of students undertaking postgraduate research (PGR) qualifications. It follows that our analysis considers the PGT and PGR populations separately.

[48] UCAS provides an applications service for postgraduate study similar to that used for full-time first degree applicants: it is used by 21 HEIs in the UK. Research Councils collect information on postgraduate students applying to them for funding: alternative sources of funding are also available to postgraduate students. Individual institutions collect information on applicants (direct and otherwise) to their own postgraduate programmes

**Table B1 JACS codes**

| JACS principle subject group | JACS subject line (at level 2 of 4) | JACS subject group to be used in our reporting |
|---|---|---|
| A - Medicine & dentistry | Clinical dentistry<br>Clinical medicine<br>Others in medicine & dentistry<br>Pre-clinical dentistry<br>Pre-clinical medicine | Medicine and dentistry (CLINICAL STEM) |
| B - Subjects allied to medicine | Anatomy, physiology & pathology | Anatomy, physiology & pathology (OTHER STEM) |
| | Medical technology | Medical technology (OTHER STEM) |
| | Pharmacology, toxicology & pharmacy | Pharmacology, toxicology & pharmacy (OTHER STEM) |
| | Aural & oral sciences<br>Broadly-based programmes within subjects allied to medicine<br>Complementary medicine<br>Nursing<br>Nutrition<br>Opthalmics<br>Others in subjects allied to medicine | Subjects allied to medicine (Non-SIVS, non-STEM) |
| C - Biological sciences | Psychology | Psychology (Non-SIVS, non-STEM) |
| | Sports science | Sports science (Non-SIVS, non-STEM) |
| | Biology<br>Botany<br>Broadly-based programmes within biological sciences<br>Genetics<br>Microbiology<br>Molecular biology, biophysics & biochemistry<br>Others in biological sciences<br>Zoology | Biological sciences (OTHER STEM) |
| D - Veterinary science | Clinical veterinary medicine & dentistry<br>Pre-clinical veterinary medicine | Veterinary sciences (CLINICAL STEM) |
| D - Agriculture & related subjects | Agricultural sciences | Agricultural sciences (OTHER STEM) |
| | Agriculture<br>Animal science<br>Food & beverage studies<br>Forestry<br>Others in veterinary sciences, agriculture & related subjects | Agriculture and related subjects (Non-SIVS, non-STEM) |
| F - Physical sciences | Astronomy<br>Physics | Physics and astronomy (SIVS) |
| | Chemistry<br>Materials science | Chemistry and materials science (SIVS) |

| | | |
|---|---|---|
| | Geology<br>Science of aquatic and terrestrial environments | Earth, marine and environmental sciences (OTHER STEM) |
| | Forensic & archaeological science | Forensic & archaeological science (OTHER STEM) |
| | Physical geographical sciences<br>Broadly-based programmes within physical sciences<br>Others in physical sciences | Physical sciences (Non-SIVS, non-STEM) |
| G - Mathematical sciences | Broadly based programmes in mathematical science<br>Broadly-based programmes within mathematical & computer sciences<br>Mathematics<br>Operational research<br>Others in mathematical & computer sciences<br>Others in mathematical sciences<br>Statistics | Mathematical sciences (SIVS) |
| G - Computer science | Artificial intelligence<br>Broadly based programmes in computer science<br>Computer science<br>Information systems<br>Others in computer sciences<br>Software engineering | Computer sciences (OTHER STEM) |
| H and J - Engineering & technology | Aerospace engineering<br>Biotechnology<br>Broadly-based programmes within engineering & technology<br>Ceramics & glasses<br>Chemical, process & energy engineering<br>Civil engineering<br>Electronic & electrical engineering<br>General engineering<br>Maritime technology<br>Materials technology not otherwise specified<br>Mechanical engineering<br>Metallurgy<br>Minerals technology<br>Naval architecture<br>Others in engineering<br>Others in technology<br>Polymers & textiles<br>Production & manufacturing engineering | Engineering and technology (SIVS) |

| | | |
|---|---|---|
| K - Architecture, building & planning | Architecture<br>Broadly-based programmes within architecture, building & planning<br>Building<br>Landscape design<br>Others in architecture, building & planning<br>Planning (urban, rural & regional) | Architecture, building and planning (Non-SIVS, non-STEM) |
| L - Social, economic & political studies | Anthropology<br>Broadly-based programmes within social studies<br>Economics<br>Human & social geography<br>Others in social studies<br>Politics<br>Social policy<br>Social work<br>Sociology | Social, economic and political studies (Non-SIVS, non-STEM) |
| M - Law | Broadly-based programmes within law<br>Law by area<br>Law by topic<br>Others in law | Law (Non-SIVS, non-STEM) |
| N - Business & administrative studies | Accounting<br>Broadly-based programmes within business & administrative studies<br>Business studies<br>Finance<br>Hospitality, leisure, tourism and transport<br>Human resource management<br>Management studies<br>Marketing<br>Office skills<br>Others in business & administrative studies | Business and administrative studies (Non-SIVS, non-STEM) |
| P - Mass communication and documentation | Broadly-based programmes within mass communications and documentation<br>Information services<br>Journalism<br>Media studies<br>Others in mass communications & documentation<br>Publicity studies<br>Publishing | Mass communication and documentation (Non-SIVS, non-STEM) |

| | | |
|---|---|---|
| Q, R and T - Languages | African studies<br>Chinese studies<br>Japanese studies<br>Modern Middle Eastern studies<br>Other Asian studies<br>Others in Eastern, Asiatic, African, American & Australasian languages, literature & related subjects<br>South Asian studies | Eastern, Asiatic and African languages, literature and related subjects (SIVS) |
| | European Studies<br>French studies<br>German studies<br>Italian studies<br>Others in European languages, literature & related subjects<br>Portuguese studies<br>Russian & East European studies<br>Scandinavian studies<br>Spanish studies | European languages, literature and related subjects (SIVS) |
| | American studies<br>Australasian studies | American and Australasian studies (Non-SIVS, non-STEM) |
| | Broadly -based programmes within languages | Broadly-based programmes within languages (Non-SIVS, non-STEM) |
| | Ancient language studies<br>Celtic studies<br>Classical Greek studies<br>Classical studies<br>Comparative literary studies<br>English studies<br>Latin studies<br>Linguistics<br>Others in linguistics, classics & related subjects | Linguistics, classics and related subjects (Non-SIVS, non-STEM) |
| V - Historical and philosophical studies | Archaeology<br>Broadly-based programmes within historical and philosophical studies<br>History by area<br>History by period<br>History by topic<br>Others in historical & philosophical studies<br>Philosophy<br>Theology & religious studies | Historical and philosophical studies (Non-SIVS, non-STEM) |

| | | |
|---|---|---|
| W - Creative arts & design | Broadly-based programmes within creative arts & design<br>Cinematics & photography<br>Crafts<br>Dance<br>Design studies<br>Drama<br>Fine art<br>Imaginative writing<br>Music<br>Others in creative arts & design | Creative arts and design (Non-SIVS, non-STEM) |
| X - Education | Academic studies in education<br>Broadly-based programmes within education<br>Others in education<br>Research & study skills in education<br>Training teachers | Education (Non-SIVS, non-STEM) |
| Z - Combined subjects | Combined | Combined (Non-SIVS, non-STEM) |

# Trends in the supply of SIVS graduates: Updated analysis of undergraduate activity in SIVS

## Trends across 1999-2000 to 2009-10

5. As previously identified, SIVS growth has not kept pace with the growth in undergraduates overall. Numbers of undergraduate student FTE increased by 21 per cent overall across this period, compared to 5 per cent across SIVS areas. However, SIVS numbers have been continually increasing since 2006-07.

6. Undergraduate student FTE in mathematics increased by 16 per cent over the eleven years from 1999-2000 to 2009-10. The equivalent increase was 11 per cent in chemistry, 13 per cent in physics and 9 per cent in modern languages. Numbers in engineering and technology cost centres declined by 2 per cent over the period.

7. Across a wider definition of STEM an overall increase of 8 per cent was observed. As previously reported, clinical STEM subjects continued to see substantial increases. Clinical medicine increased by 97 per cent, clinical dentistry by 71 per cent, and veterinary science by 98 per cent. Numbers in computer science continued to decline (by 25 per cent from 1999-2000 to 2009-10) as did those in earth, marine and environmental sciences (by 16 per cent).

Relates to Tables 2.1 and 2.2, and Figures 2.4 through to 2.7

## Trends across the last three years

<u>All subjects</u>

8. A 3 per cent increase was observed in the total number of undergraduate student FTE between 2007-08 and 2009-10. A level entries increased by 6 per cent over the same period, while numbers of UCAS acceptances increased by 7 per cent between 2008-09 and 2010-11.

Relates to Table 2.3

<u>Physics</u>

9. Growth of 6 per cent in the number of undergraduate student FTE studying physics was more than double the overall growth across all subjects. Over the same period, the number of A level entries to physics increased by 12 per cent. The number of UCAS acceptances increased by 10 per cent.

Relates to Table 2.3

<u>Chemistry</u>

10. Similar growth patterns to physics. The number of undergraduate student FTE increased by 6 per cent, A level entries to chemistry saw growth of 11 per cent, and UCAS acceptances increased by 8 per cent.

Relates to Table 2.3

<u>Engineering and technology</u>

11. Growth was observed year on year across the last three years, and the number of undergraduate student FTE increased by 3 per cent. However, the patterns of growth varied across different engineering and technology disciplines. While chemical engineering saw

numbers of undergraduate student FTE increase by 20 per cent, a 5 per cent decline was observed in the general engineering cost centre.

12. Between 2008-09 and 2010-11 UCAS acceptances to engineering and technology disciplines increased by 10 per cent overall. Here, mechanical, aerospace and production engineering saw the largest growth (18 per cent), while mineral, metallurgy and materials engineering saw a decline of the equivalent magnitude.

Relates to Tables 2.3 and 2.4

Mathematical sciences

13. Over the last three years, numbers of undergraduate student FTE increased at the same rate as those in chemistry and physics (by 6 per cent). The number of A level entries to mathematics increased by 21 per cent over the same period, and a 28 per cent increase was observed in A level entries to further mathematics. A 13 per cent increase in the number of UCAS acceptances was observed between 2008-09 and 2010-11.

Relates to Table 2.3

Modern languages

14. Between 2007-08 and 2009-10 the numbers of undergraduate student FTE increased by 1 per cent. A level entries to modern languages also increased by 1 per cent overall. In particular, Spanish studies continued to increase (by 15 per cent between 2008-09 and 2010-11), and entries to German continued to decline (by 9 per cent). A level entries to French declined by 2 per cent and other modern languages increased by 7 per cent.

15. In respect of UCAS acceptances, those to European languages, literature and related subjects increased by 1 per cent, while those to non-European languages, literature and related subjects decreased by 6 per cent.

Relates to Tables 2.3 and 2.5

Student domicile

16. Growth is observed in UK-domiciled undergraduate student FTE across both all subject areas and each of the SIVS subject areas. This is with the exception of modern languages where a decline of 2 per cent was seen in UK students.

17. In contrast to trends previously identified, UK-domiciled students in engineering and technology increased by 1 per cent from 2007-08 to 2009-10. At the same time EU numbers increased by 6 per cent, and international students increased by 11 per cent.

18. International student FTEs in mathematics and modern languages saw particular growth over the three years: numbers increased by 14 per cent and 51 per cent respectively. This was coupled with slower rates of growth in EU numbers than previously reported for these subject areas: EU-domiciled undergraduate student FTE increased by 7 per cent in mathematics from 2007-08 to 2009-10, and by 4 per cent in modern languages.

Relates to Table 2.6 and Figure 2.3

Mode of study

19. Across all subject areas, and each of the SIVS subject areas, full-time FTE accounted for more than 90 per cent of the total undergraduate student FTE in 2009-10. In modern languages this proportion continued to grow: from 89 per cent in 2007-08 to 93 per cent in 2009-10.

20. Across all subject areas the number of undergraduate student FTE who studied full-time increased by 3 per cent over the last three years, while those studying part-time decreased by 6 per cent. Mathematics and physics both continued to counter the decreasing trend in part-time study with increases of 1 per cent and 10 per cent respectively from 2007-08 to 2009-10. This accompanied growth of 6 per cent in the number of full-time FTE in each of these subject areas.

21. The number of part-time undergraduate student FTE in chemistry and modern languages decreased to a greater extent than was observed across all subject areas: by 16 per cent and 30 per cent respectively. Full-time FTE increased by 7 per cent in chemistry and by 5 per cent in modern languages.

Relates to Table 2.7

Institution type

22. Across all subject areas the number of undergraduate student FTE increased by 3 per cent at both pre- and post-1992 HEIs. In mathematics, the last three years saw an increase of 9 per cent in the numbers registered at post-1992 institutions, alongside a continued increase in the numbers at pre-1992 institutions (of 6 per cent).

23. In engineering and technology and modern languages numbers of undergraduate student FTE registered at post-1992 HEIs continued to decline, though at a lesser rate than previously reported. While numbers registered at pre-1992 institutions increased by 7 per cent for engineering and technology, those at post-1992 institutions declined by 1 per cent over the last three years. For modern languages these changes were an increase of 4 per cent and a decrease of 6 per cent respectively.

Relates to Table 2.8

## Conclusion

24. The 2009 report of the SIVS advisory group identified a positive trend in the supply of graduates in SIVS subject areas, with some variation in respect of engineering and technology and modern languages, as well as part-time students and post-1992 institutions. Analysis of the additional years' data provided here shows that many of these trends have continued. Undergraduates in SIVS have seen a continued expansion at a time of a wider expansion in undergraduate numbers overall and a range of interventions made by HEFCE and others to promote SIVS.

25. These positive trends suggest that the approach adopted by HEFCE since 2005 has been appropriate to the HE landscape and funding model to date.

## Trends in the supply of SIVS postgraduates

### Summary observations: 2002-03 to 2009-10

26. There was sustained growth in postgraduate student numbers over this period, both in PGT (which saw an increase in numbers of 31 per cent) and PGR (up 12 per cent). Overall numbers in SIVS areas increased, although the levels of growth differ between PGT and PGR: the increase of 36 per cent in PGT numbers was in excess of the growth across all PGT subject areas, while the 8 per cent increase observed in PGR SIVS areas was lower than the overall growth in PGR.

27. Across both PGT and PGR student FPE numbers, growth in STEM disciplines of SIVS was larger than that in language-based SIVS[49]. At PGT level, student numbers in STEM disciplines of SIVS increased by 37 per cent compared to 32 per cent in language-based SIVS. At PGR level the figures were 8 per cent and 3 per cent respectively.

28. A substantial proportion of the growth in both PGT and PGR resulted from an increase in international student numbers. In STEM disciplines of SIVS, the PGT international population more than doubled over the last eight years, while the home student population grew by only 1 per cent. In the same subject areas the PGR international population grew by 23 per cent while the home student population fell by 2 per cent. This pattern is less consistent in vulnerable languages, where the biggest increase in PGT was in the home student population (up 53 per cent), though this accompanied an increase of 28 per cent in numbers of international student FPE. In vulnerable languages at PGR level, the biggest increase was in international numbers, which grew by 17 per cent while home student numbers fell by 8 per cent.

Relates to Tables 3.1, 3.2 and 3.5 and Figures 3.1, 3.2 and 3.3

### Postgraduate taught provision (PGT)

29. At PGT level, growth in student numbers between 2002-03 and 2009-10 was particularly large for physics and astronomy (61 per cent), European languages, literature and related subjects (49 per cent) and engineering and technology (41 per cent). Across a wider definition of STEM, even more significant growth was seen in clinical STEM subjects (up 80 per cent, with the majority of this growth in veterinary sciences), mirroring the overall growth of clinical STEM subjects at undergraduate level over a similar period. Other STEM subjects (those that were neither SIVS nor clinical subjects) saw an increase of 29 per cent in PGT FPE student numbers, though there was variability among individual subjects within this.

Relates to Tables 3.1 and 3.2, and Figures 3.2 and 3.3

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[49] The terms 'STEM SIVS' and 'language-based SIVS' are used for convenience throughout this analysis. STEM SIVS covers physics and astronomy, chemistry and materials science, mathematical sciences, engineering and technology. Language-based SIVS includes Eastern, Asiatic and African languages, literature and related subjects, and European languages, literature and related subjects

All subjects

30. Across all subject areas, FPE student numbers studying at PGT level increased by 31 per cent from 2002-03 to 2009-10. This increase included consistent year-on-year increases with the exception of a slight drop in numbers between 2006-07 and 2007-08.

Relates to Table 3.2 and Figure 3.1

Clinical STEM

31. A large increase was observed in FPE student numbers over last eight years, significantly in excess of that shown in the overall PGT population. Medicine and dentistry saw numbers increase by 75 per cent while those in veterinary sciences increased more than three-fold.

Relates to Table 3.2

Other STEM

32. STEM disciplines that were neither SIVS nor clinical subjects saw an overall increase of 29 per cent from 2002-03 to 2009-10, slightly lower than the increase at PGT population level. The largest growth was seen in anatomy, physiology and pathology where FPE student numbers more than doubled. Medical technology and computer sciences saw the smallest growth across the eight-year period (each increased by 7 per cent), though both showed increased growth more recently: numbers in medical technology increased by 28 per cent from 2006-07 to 2009-10, while those in computer sciences increased by 32 per cent.

Relates to Table 3.2

Physics and astronomy

33. Overall growth over the last eight years was considerably in excess of the growth in the overall PGT population: though FPE student numbers in physics and astronomy were relatively small, an increase of 61 per cent was observed. A particular increase in numbers was seen between 2008-09 and 2009-10.

Relates to Table 3.1 and Figure 3.2

Chemistry and materials science

34. FPE student numbers in chemistry and materials science were relatively small, but showed an increase of 24 per cent over the eight-year period considered. Following a slight decline between 2003-04 and 2005-06, numbers then increased each year since then.

Relates to Table 3.1 and Figure 3.2

Engineering and technology

35. Apart from a slight decline in 2005-06, the last eight years saw a steady year-on-year increase in PGT numbers studying engineering and technology. At 42 per cent, the increase was 11 percentage points larger than that in the overall PGT population.

Relates to Table 3.1 and Figure 3.2

Mathematical sciences

36. Numbers of PGT students in mathematical sciences showed some turbulence over the time series considered. From a peak in 2003-04 numbers were broadly in decline up to 2008-09, with a slight increase in 2006-07. A substantial increase in 2009-10 saw numbers return to a similar level as observed in 2002-03 and 2003-04.

Relates to Table 3.1 and Figure 3.2

Modern languages – Eastern, Asiatic and African languages, literature and related subjects

37. Though FPE student numbers increased by 7 per cent across the eight-year period considered, a base population of around 700 to 800 was maintained with year-on-year variation between and around these figures in no distinct pattern.

Relates to Table 3.1 and Figure 3.2

Modern languages – European languages, literature and related subjects

38. The overall rate of growth over the last eight years was, at 49 per cent, notably greater than that of the overall PGT population. As with non-European languages, a base population (of around 1,000 to 1,200) was maintained with year-on-year variation across the period from 2002-03 to 2007-08. Numbers were then seen to increase in 2008-09 and 2009-10 (to around 1,600).

Relates to Table 3.1 and Figure 3.2

Student domicile

39. Across all PGT subjects home students made up 66 per cent of the 2009-10 population. Though home numbers increased by 17 per cent over the eight-year period considered, these students accounted for a decreasing proportion of activity year-on-year since 2002-03 when 74 per cent of PGT students were UK-domiciled. The international student population in PGT increased by 88 per cent over the period.

40. Among PGT students studying SIVS disciplines the proportion of home students was noticeably lower: 40 per cent of the 2009-10 population were UK-domiciled, though this varied by subject area. Engineering and technology saw home students account for the smallest proportion of the PGT population (36 per cent in 2009-10) and, following a period of decline, home FPE student numbers in the most recent year returned to the same level as those at the beginning of the time series. The proportion of home students was highest among those studying European languages (65 per cent): along with physics and astronomy, this was one of the only SIVS subject areas that saw growth in the numbers of home students across the period considered. Increases were also observed in EU and international student numbers in both of these subject areas.

41. Home and EU FPE student numbers both fell in chemistry and materials science and mathematical sciences over the last eight years, while international student numbers in these subject areas more than doubled. Home students in non-European languages fell by 4 per cent, while EU and international students both grew (EU more substantially than international).

Relates to Tables 3.5 and 3.8, and Figure 3.3

Mode of study

42. Numbers of both full- and part-time students studying PGT overall and in the different SIVS areas increased over the eight-year period considered, with the exception of part-time students in

mathematical sciences and non-European languages. However, while 57 per cent of the 2002-03 PGT population studied part-time, this proportion declined year-on-year to 51 per cent in 2009-10. A similar trend is observed across the SIVS disciplines, where the proportion studying part-time was smaller and declined by ten percentage points: from 44 per in 2002-03 to 34 per cent in 2009-10.

43. Restricting the analysis to home students we find that a similar trend is observed among those studying part-time in SIVS disciplines. The proportion of home students studying part-time is higher than among students from all domiciles but also declines consistently, from 66 per cent to 62 per cent. Variability is observed among the proportion of home students across the whole PGT population who studied part-time, from 68 per cent to 70 per cent in no distinct pattern.

Relates to Table 3.6

Institution type

44. In each of the eight years considered, more than half of all PGT FPE student numbers were registered at post-1992 institutions. Activity in SIVS disciplines countered this trend, with more than half of students registered at pre-1992 institutions. Non-European languages in particular see more than 90 per cent of students registered at pre-1992 institutions.

45. Growth in SIVS numbers registered at post-1992 institutions was evident across all disciplines except physics and astronomy and non-European languages. Engineering and technology had the largest proportion of students registered at post-1992 institutions (46 per cent in 2009-10) as well as the largest growth in such students (56 per cent over the eight-year period considered).

Relates to Table 3.7

### Postgraduate research provision (PGR)

46. At PGR level, growth in student numbers between 2002-03 and 2009-10 was particularly large for physics and astronomy (20 per cent) and Eastern, Asiatic and African languages, literature and related subjects (15 per cent). However, two SIVS areas saw an overall decline in numbers over this period: chemistry and materials science (decrease of 5 per cent) and European languages, literature and related subjects (decrease of 2 per cent, contrasting with the 49 per cent rise in PGT numbers in this area). Across a wider definition of STEM, growth of 13 per cent in the number of PGR FPE student numbers in clinical STEM subjects was in line with the growth in the PGR population overall (12 per cent), as was the growth in other STEM subjects (neither SIVS nor clinical subjects).

Relates to Tables 3.4 and 4.2, and Figures 4.2 and 4.3

All subjects

47. Across all subject areas, FPE student numbers studying at PGR level increased by 12 per cent from 2002-03 to 2009-10. The overall increase included consistent year-on-year increases.

Relates to Table 4.2 and Figure 4.1

Clinical STEM

48. The 13 per cent increase in numbers studying each of veterinary science and medicine and dentistry was in line with the overall increase in the overall PGR population (also 13 per cent). Though the population remained small, numbers studying veterinary science reached a

peak in 2007-08 having increased year-on-year since 2003-04, before falling consecutively in 2008-09 and 2009-10. In medicine and dentistry numbers increased year-on-year with the exception of a dip between 2007-08 and 2008-09.

Relates to Table 4.2

Other STEM

49. STEM disciplines that were neither SIVS nor clinical subjects saw an overall increase of 12 per cent in student numbers over the eight-year period considered, in line with the increase across the overall PGR population. The largest growth was seen in medical technology, where FPE student numbers more than doubled, though the population was small in size. Biological sciences saw the smallest growth (of 4 per cent), while the very small numbers studying agricultural sciences decreased consistently from 2003-04.

Relates to Table 4.2

Physics and astronomy

50. Growth over the last eight years was larger than across the PGR population overall, and largely consistent year-on-year. FPE student numbers in physics and astronomy increased by 20 per cent.

Relates to Table 4.1 and Figure 4.2

Chemistry and materials science

51. Chemistry and materials science was the only SIVS area to see a decline in PGR numbers across the period considered. FPE student numbers declined steadily between 2002-03 and 2006-07, following an increase in 2007-08 the decreasing trend continued across the last two academic years.

Relates to Table 4.1 and Figure 4.2

Engineering and technology

52. Growth of 10 per cent among those studying engineering and technology was only slightly lower than the rate of growth across the PGR population overall. A particular increase in numbers was seen between 2008-09 and 2009-10.

Relates to Table 4.1 and Figure 4.2

Mathematical sciences

53. Despite an increase of 8 per cent in the numbers of PGR students in mathematical sciences across the eight-year period considered, some turbulence was observed. Reaching a peak in 2006-07 following a broadly increasing trend across early years of the time series, numbers decreased in 2007-08 and 2008-09 before appearing to stabilise in 2009-10.

Relates to Table 4.1 and Figure 4.2

Modern languages – Eastern, Asiatic and African languages, literature and related subjects

54. Though FPE student numbers increased by 15 per cent across the eight-year period considered, a base population of around 400 was maintained up to 2006-07 with year-on-year variation in no distinct pattern. Numbers rose to be above 450 in each of the last three years of the time series.

Relates to Table 4.1 and Figure 4.2

Modern languages – European languages, literature and related subjects

55. In contrast to the substantial growth found in European languages at PGT level, numbers of PGR students remained broadly static across the time series considered. A base population of around 1,000 FPE was maintained in each year.

Relates to Table 4.1 and Figure 4.2

Student domicile

56. Across all PGR subjects home students made up 58 per cent of the 2009-10 population. Though home numbers increased by 6 per cent over the eight-year period considered compared to larger increases among the EU and international populations, these students accounted for between 56 per cent and 58 per cent of the overall population in each year since 2004-05. While international student numbers increased by 20 per cent over the time series, EU numbers increased by 31 per cent.

57. Among PGR students studying SIVS disciplines the proportion of home students was lower: 50 per cent of the 2009-10 population were UK-domiciled, though this varied by subject area. Non-European languages saw home students account for the smallest proportion of the PGR population (40 per cent in 2009-10, though numbers were small) and, following a period of decline, home FPE student numbers in the most recent years were higher than those at the beginning of the time series. Physics and astronomy was the only other SIVS area to see an increase in the numbers of home students (of 10 per cent). The largest decline was among those studying European languages, where home student numbers fell by 16 per cent.

58. Chemistry and materials science was the only SIVS area to see a decline in numbers of EU students (of 28 per cent), though international student numbers in this subject increased by 42 per cent: the largest increase across the SIVS disciplines. International student numbers increased in each of the SIVS disciplines, largely at a rate higher than the increase in such students across all of PGR.

Relates to Tables 4.5 and 4.8, and Figure 4.3

Mode of study

59. Numbers of full-time students studying PGR overall and in the different SIVS areas increased over the eight-year period considered. This is with the exception of those full-time students in chemistry and materials science, where such numbers showed some turbulence across the time series and a 1 per cent decline overall. Numbers of part-time students decreased (by 10 per cent across all of PGR), with the largest decline in SIVS seen in physics and astronomy, where, though small, part-time numbers declined by 56 per cent.

60. In each of the STEM disciplines within SIVS and in non-European languages, more than 80 per cent of PGR students in 2009-10 studied full-time. The proportion was highest among those studying chemistry and material science (at 97 per cent), and had increased across the eight-year period for each of the disciplines (by up to 10 per cent). European languages had the largest proportion of part-time students, though this declined steadily across the time series from 41 per cent in 2002-03 to 29 per cent in 2009-10.

61. Restricting the analysis to home students we find that similar trends are observed among those studying full- and part-time in SIVS disciplines. The proportions of home students studying

full-time are lower than among students from all domiciles and increased consistently across the eight-year period considered.

Relates to Table 4.6

Institution type

62. By comparison with PGT, a much smaller proportion of PGR students studied at post-1992 institutions: 19 per cent in 2009-10. Over the eight-year period considered, PGR FPE student numbers at both pre- and post-1992 institutions increased, though at a greater rate among those registered at post-1992 institutions (19 per cent, compared to 11 per cent among those registered at pre-1992 institutions).

63. PGR activity in SIVS disciplines was further concentrated at pre-1992 institutions, with 12 per cent of SIVS students having been registered at post-1992 institutions in 2009-10. Chemistry and materials science was the only SIVS discipline that did not see an increase in the numbers of PGR students registered at pre-1992 institutions. While student numbers registered at pre-1992 institutions across other SIVS disciplines increased by between 6 per cent and 25 per cent, those in chemistry and materials science declined by 4 per cent. In respect to PGR students registered at post-1992 institutions, a decrease was observed across each of the SIVS disciplines with the exception of physics and astronomy where such numbers increased by 10 per cent, though numbers were small.

Relates to Table 4.7

## Conclusions

64. Overall, student numbers in SIVS subjects look healthy in both PGT and PGR, with most subjects having grown in numbers over the last eight years. However, a considerable proportion of this growth has been in overseas (or EU) student numbers, which may lead to concerns about the viability and sustainability of particular disciplines if these numbers were to decline for any reason. There may also be concerns that the volume of home students wishing to undertake postgraduate study could be affected by the increase in tuition fees at undergraduate level, depending on an individual’s willingness to incur further costs for further study. These issues are discussed further in the next section of this report, but are mentioned here to demonstrate the need for ongoing monitoring of the health of these areas at postgraduate level.

# Annex C Overview of demand for STEM skills reports

## General reports on STEM

| Source | Date of publication | Definition of STEM | Headline messages on demand for STEM |
|---|---|---|---|
| Smallpiece Trust<br>*‘**Securing Tomorrow’s Workforce:** The rise of low carbon industries and the future of STEM careers’* | 2011 | The sciences, technology, engineering and maths | This report claims that over 640,000 STEM-related jobs must be filled by 2017, of which at least 400,000 of these will have a focus on low carbon technologies and practices.<br>The report claims it is crucial that young people be introduced to STEM careers if the UK is to become a true leader in the global low carbon economy. With new industries recruiting and an ageing workforce retiring, the report claims he country is facing a deficit of qualified, educated professionals in STEM-related jobs. |
| CBI<br>*‘Building for growth: business priorities for education and skills’* | 2011 | The sciences, technology, engineering and maths | This report finds that STEM skills are in demand at every level, but employers face difficulty in finding staff<br>• STEM applicants are not meeting business needs<br>• science and maths hold the key to STEM progression<br>• business can do more to support STEM in schools. |
| SEMTA<br>*‘Skills and the future of UK Science, Engineering and Manufacturing Technologies 2011’* | 2011 | Broad definition of engineering and science, including engineering industries, leading-edge technology industries and science industries | This report sets out a detailed skill needs and current provision analysis for engineering and science industries. The report concludes that new process and material technologies, advanced manufacturing and efforts to make carbon reductions are being utilised by employers across many sectors to gain competitive advantage through new products, cost and energy savings and to improve and maintain a competitive edge in a challenging market.<br>In the supply chain, traditional products, established technologies and manufacturing processes are still essential to the successful manufacture of final goods. |
| BIS research paper 30<br>*‘STEM graduates in non-STEM jobs’* | 2011 | Broad definition, including psychology, geography and archaeological/ forensic science | This paper investigates why some STEM graduates do not work in occupations related to their degree. While there is evidence of high demand from employers (of whom many report difficulties recruiting STEM graduates) and an apparent salary premium for many STEM qualified graduates who work in ‘scientific‘ occupations, the report concludes that<br>• students and graduates find other (non-STEM) work potentially to be more interesting, and/or that their chosen STEM degree turns out less interesting or enjoyable than expected<br>• few students appear to be primarily motivated by pay in choosing a STEM or non-STEM career (despite the economic evidence that financial returns in STEM are better)<br>limitations need to be put on an expectation that choosing to study a STEM subject leads to entering a STEM job. This link has been an important part of the STEM pipeline model which has formed part of the government’s STEM skills strategy, and may require some rethinking<br>• many STEM graduates are attracted to other areas, often because of a lack of knowledge of what STEM work and careers look like, but also because the graduates perceive other areas to be of more interest. |
| National Audit Office<br>*‘Educating the next generation of scientists’* | 2010 | Does not look at STEM as a whole, but at take-up and achievement of science and maths at school | This report evaluates progress by the DfE in increasing take-up and achievement in maths and science up to age 18, and the extent to which specific programmes to raise the quality of school science facilities, recruit and retain science and maths teachers, and improve the appeal of science to young people have contributed to any increase. The report concludes<br>• careers information and guidance, quality and quantity of school science facilities, quality and quantity of science teachers, image and interest and availability of separate GCSE sciences (‘Triple Science’) are all critical success factors in improving take-up and achievement in science and maths. |

| Source | Date of publication | Definition of STEM | Headline messages on demand for STEM |
|---|---|---|---|
| UK government<br>*'Ingenious Britain – making the UK the leading high tech exporter in Europe'* | 2010 | Does not look at STEM as a whole, but how to inspire a future generation of scientists, engineers and technicians | This report considers issues including culture, education, universities and research and development – targeted at<br>• bringing about a step change in both public and political attitudes to science and engineering<br>• inspiring a future generation of scientists, engineers and technicians to pursue STEM subjects in higher education. |
| Department for Education and Department for Employment and Learning<br>*'Report of the STEM review'* | 2009 | The sciences, technology, engineering and maths | This report examines the issues related to STEM in schools, further and higher education, and makes four key recommendations to ensure the future success of STEM education in growing a dynamic, innovative economy:<br>1. business must take the lead in promoting STEM<br>2. need to alleviate key constraints in the STEM supply chain<br>3. there needs to be increased flexibility in the provision of STEM education<br>4. government must better co-ordinate its support for STEM. |
| Policy Exchange<br>*'Science Fiction? Uncovering the real level of science skills at school and university'* | 2009 | The sciences, technology, engineering and maths | The report claims Britain will need more science skills if it is to prosper, and that<br>• 92% of firms across all sectors require people with STEM skills, but more than 59% are experiencing problems finding them<br>• the government's claim the numbers of pupils studying STEM subjects is going up is misleading as the school population has also increased considerably since 1997<br>• claims misleading figures and lowered standards were found to be behind many of the apparent 'improvements' to the performance and take up of science subjects at every level, with the result that British businesses now face a critical skills shortage. |
| UK Commission for Employment and Skills<br>'*Ambition 2020: World class skills and jobs for the UK'* | 2009 | Is not STEM specific. Provides the first <u>annual</u> assessment of the progress towards making the UK a world leader in employment and skills by 2020.<br>Monitors progress against the UK's 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.<br>This first report provides a baseline from which to assess future progress. | The report makes projections of the following:<br>The 2020 qualifications profile for the UK and for individual UK nations<br>The UK 2020 basic skills position for literacy and numeracy<br>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.<br>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.<br>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 its Working Futures work to look specifically at STEM; the results are given in its 'The demand for STEM graduates: some benchmark projections' report, the third entry in this table).<br>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'. |

| Source | Date of publication | Definition of STEM | Headline messages on demand for STEM |
| --- | --- | --- | --- |
| Department for Innovation, Universities and Skills:<br>*The 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.<br>However, shortages relate to specific STEM knowledge as well as broader competencies and practical work experience.<br>STEM graduates tend to have higher earnings than non-STEM graduates, but employment rates are relatively similar.<br>There could be a skills mismatch with some STEM graduates not working in STEM-related occupations even though employers are offering relatively higher wages.<br>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 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:<br>*'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.<br>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'.<br>The report makes projections of employment of those qualified in STEM subjects to 2017. It points out that the projections are based on a macroeconomic scenario developed in the first half of 2008, a time of considerable economic uncertainty. It 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:<br>*'Skilled, shortage, sensible: 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 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.<br>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.<br>The report does not make projections itself, but quotes relevant reports that make projections or forecasts of employment. |
| CBI:<br>*'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.<br>40% of companies prefer STEM when recruiting graduates.<br>Two thirds of businesses had difficulties recruiting STEM-skilled people at some level.<br>Two thirds of science, hi-tech and IT employers found the content of STEM degrees not relevant to their business.<br>The report does not make projections. |

| Source | Date of publication | Definition of STEM | Headline messages on demand for STEM |
| --- | --- | --- | --- |
| CBI:<br>*'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.<br>Six out of ten employers are having difficulty recruiting STEM-skilled individuals.<br>Large firms are thinking internationally when recruiting STEM-skilled employees – over a third are recruiting from India and a quarter from China.<br>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):<br>*'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.<br>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.<br>A pilot survey of 35 CIHE member companies and three 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.<br>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:<br>Chemistry: salary data suggest weak demand from employers, graduate salary is £22,500 (3.5 years after graduation).<br>Physics: average salary (3.5 years after graduation) is £24,760.<br>Engineering: Mixed picture of demand with employer demand stronger for some sub disciplines than others.<br>Mathematics: Graduate salary is £25,800 (3.5 years after graduation)<br>Medicine: Graduate salary is £42,000 (3.5 years after graduation), but higher salary does not mean a shortage.<br>The report does not make projections. |
| HEFCE:<br>*'Graduates and their early careers'* | 2008 | Focuses on strategically important STEM subjects of chemistry, physics, astronomy, engineering and mathematical sciences | Provides an analysis of graduate destinations (employment rates and salaries by subject area), and the role of a subject area in achieving employment.<br>Finds that strategically important subjects have a lower percentage of graduates in employment or in further study six months after graduation. Engineering had the highest mean salary of the subjects.<br>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.<br>The report does not make projections. |

| Source | Date of publication | Definition of STEM | Headline messages on demand for STEM |
|---|---|---|---|
| Research Councils UK:<br>*'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:<br>• Chemistry – lack of replacement academic staff<br>• Clinical and translational research – shortage of statisticians and health economists<br>• Engineering and technology – overall academic staff numbers falling<br>• Whole animal physiology and veterinary sciences – shortage of graduates<br>• Mathematics – high demand for skills from academic sector and beyond<br>• Physics – acute lack of academic staff<br>• Shortage of public health and health service researchers<br>The report does not make quantitative projections, but quotes other sources of information in developing its own assessment of future shortages. |
| Regular monitoring of Ten 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.<br>Reproduces data from the Destinations of Leavers from Higher Education Surveys.<br>Does not make projections. |
| Royal Society :<br>*'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.<br>Mentions engineering and technology, and teaching as specific areas of shortage.<br>Calls for a large-scale study of the changing needs of employers.<br>Does not make projections. |
| Universities UK (PWC):<br>*'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:<br>• Medicine: £340,315<br>• Engineering: £243,730<br>• Physical/environmental sciences: £237,935<br>• Math/comp sciences: £241,749<br>• Subjects allied to medicine: £166,017<br>• Technology: £119,484<br>• Biosciences: £111,269<br>Does not make projections. |

| Source | Date of publication | Definition of STEM | Headline messages on demand for STEM |
|---|---|---|---|
| Department of Trade and Industry:<br>*'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.<br>Employment, unemployment and inactivity rates of SET degree holders have not changed significantly – suggesting no imbalance between demand and supply.<br>Almost half of SET graduates work in occupations that have the greatest requirement for SET skills, and particularly work in health and education sectors.<br>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.<br>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.<br>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:<br>'*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:<br>Currently there are skills shortages and gaps prevalent in engineering and health associate professions and for draughtspersons and building Inspectors.<br>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.<br>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:<br>*'SET for success'* | 2002 | Focuses on biological sciences, physical sciences, engineering, mathematics and computer science. Excludes medicine, agriculture, social sciences and psychology. | 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 difficulties.<br>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.<br>Does not make projections. |

## Sector-specific reports

| Source | Date of publica tion | Sector | Headline messages on demand for STEM skills or ability to fill vacancies |
|---|---|---|---|
| Institution of Engineering and Technology<br>'*IET Skills and Demand in Industry Report'* | 2011 | Engineering | This report claims that just 3 per cent of technicians and 6 per cent of engineers employed by surveyed organisations were women, and while the overall female workforce has increased to 24 per cent of all UK staff in 2011 (from 20 per cent in 2010) the proportion of women in engineering roles has remained around the same since 2008.<br>It also claims 'there are actions that the government can take in terms of support, the profession can do more to co-ordinate its activities and organisations can do more to provide an attractive working environment.'<br>The report notes that IET and others do a lot of work trying to address skills shortages in the engineering sector, either through going to the government and trying to encourage them to design the education system in such a way as to encourage more people to take engineering and engineering-related subjects. The Shadow Minister for Innovation and Science, Chi Onwurah MP pointed out that in 25 years the percentage of female engineering students had not changed, and that to compete globally we need more engineers and scientists and we need to be drawing them from a larger pool. He calls on the government to do more to encourage more girls into science and engineering, and improve the availability of quality STEM teaching. |
| Engineering UK<br>*'2011 Report'* | 2011 | Engineering | This report centres on the importance of the engineering sector in rebalancing the UK economy and meeting climate change and renewable energy targets.<br>The report highlights the need both for investment, on a scale not known since reconstruction after World War II, and for significantly boosting the skill levels of UK workers, as crucial steps to success. |
| NESTA<br>*'Next Gen.'* | 2011 | Creative industries and video games | This report highlights a shortage in computing and artistic skills that are vital to the UK's high-tech creative industries as the video games industry. The report claims:<br>• there is a need for a greater awareness of the job prospects in these industries and the qualifications that can take them there – STEM subjects and art being the key to success<br>• while awareness-raising will make these subjects more attractive to young people<br>• schools are recognising that video games can be used to improve maths, physics and computer science outcomes in the classroom itself. |

| Source | Date of publication | Sector | Headline messages on demand for STEM skills or ability to fill vacancies |
|---|---|---|---|
| The Royal Society<br>*'Hidden Wealth: the contribution of science to service sector innovation'* | 2009 | Service | The report highlights the wider significance of STEM to the UK services sector and concludes that STEM is deeply embedded within the UK service sectors and has an extensive impact on service innovation processes. It claims STEM is also likely to play an important part in the future of services, as many services are on the cusp of a transition to more personalised and interconnected systems, which will require significant advances in STEM.<br>The report makes the following key recommendations:<br>• a need for greater engagement between the academic services community and services forms, in order to ensure that opportunities to exploit STEM in services are properly recognised<br>• the Sector Skills Councils should undertake a large-scale exploration of STEM skill needs in services sectors to inform the development of more suitable undergraduate and postgraduate courses that better meet the needs of service sectors<br>• an increase in the scale of knowledge exchange between services organisations and the academic STEM community<br>• the Funding Councils should review the contents of financial engineering and related courses in the UK and, in association with Higher Education Institutions, ensure the provision of appropriate curriculum elements such as considerations of risk, safety tolerances, testing, adherence to published standards, wider understanding of economic contexts, and also any ethical considerations<br>• improving the understanding of services and service innovation models supported by STEM by policymakers, researchers and funders through the development of a greater body of academic research into services innovation<br>• with regards to public sector innovation, the Cabinet Office and the Department for Business, Innovation, and Skills (BIS) should establish a team to undertake detailed work on how STEM can be exploited more successfully to foster public sector innovation. |
| ABPI<br>*'Skills needs for biomedical research'* | 2008 | Pharmaceutical | 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.<br>Does not give projections but rates each discipline on its future as low, medium or high priority. |
| ABPI and Biosciences Federation<br>*'In vivo sciences in the UK: sustaining the supply of skills in the 21st century'* | 2008 | Pharmaceutical | Reports that over the next five to ten years industrial employers of *in vivo* skills expect to need to recruit annually:<br>100-320 BSc or MSc qualified people<br>20-50 with PhDs<br>30-60 with relevant post doctoral experience<br>140-280 animal technologists<br>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<br>'*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.<br>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. |

| Source | Date of publication | Sector | Headline messages on demand for STEM skills or ability to fill vacancies |
|---|---|---|---|
| Institution of Civil Engineers<br>*'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.<br>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<br>*'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<br>*'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.<br>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 current situation, and an ability to anticipate the effects of new and disruptive technologies.'<br>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<br>*'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:<br>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.<br>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.<br>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<br>*'Labour Market Survey of the GB Engineering Sectors'* | 2007 | Engineering | 11% of employers had experienced hard to fill vacancies within the last 12 months.<br>Does not make projections. |
| Cogent<br>*'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. |

| Source | Date of publication | Sector | Headline messages on demand for STEM skills or ability to fill vacancies |
|---|---|---|---|
| SEMTA<br>*'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.<br>Does not make projections. |
| Skills for Health<br>*'Sector skills agreement for health: Delivering a Flexible Workforce to Support Better Health and Health Services – The Case for Change'* | 2006 | Health | Demand for skills is considered to exceed supply, 7% of establishments experienced skill shortage vacancies.<br>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.' |
| SEMTA, as quoted in DIUS's<br>'*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<br>'*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. |

## Annex D Strategically Important and Vulnerable Subjects: Terms of Reference of the HEFCE advisory group

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.

2. 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 fulfil 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.