Innovation and Knowledge Exchange: the national role of universities and research establishments based in the Greater South East of England

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EXECUTIVE SUMMARY

ECOTEC Research and Consulting Ltd was commissioned by the South East of England Development Agency (SEEDA) to undertake a study examining the impact of the Higher Education system in the Greater South East of England upon innovation and knowledge transfer across the UK as a whole. For the purposes of this study the Greater South East of England was defined as comprising the following 3 administrative regions: the South East of England, the East of England and London. The study was also asked to examine the influence of two public sector research establishments.

The study had four principal objectives: to identify the contribution made by universities and research establishments located in the Greater South East to knowledge transfer, to identify the spatial distribution of this contribution, the factors that affect this distribution and the implications of this for public sector policies.

Overall, some two-fifths of universities in the UK are located in the Greater South East of England, supplying some 33% of all graduates per annum. Universities located in the Greater South East of England are less likely to be engaged in consultancy work with SMEs than other universities in England, but their propensity to engage in collaborative research and to work with large firms is approximately the same. There are, though, strong differences between the three regions comprising the Greater South East.

Universities located in the Greater South East of England are more likely than other English universities to engage in Knowledge Transfer Partnerships and have significantly more CASE studentships. In both cases these schemes support the engagement of graduates on industry-relevant projects and the consequent exchange of knowledge.

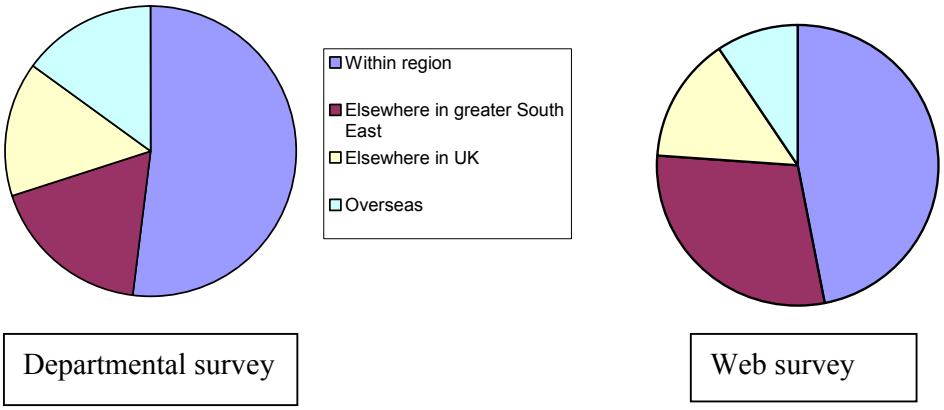
Universities in the GSE are slightly less likely to generate spin off businesses than universities in other parts of the UK, but the survival rates of those established are better than the UK average. Overall, some 191 spin-offs were established from universities located in the Greater South East of England in 2001-2, some 33% of all established in the UK that year. The most common form of spin-off is a company started by a graduate of the university, followed by a company with some HEI ownership. There are few known cases of spin-offs which have no HEI ownership or investment.

Two-thirds of graduates from universities located in the Greater South East of England remain in the area to find their first employment. Some 10% find work

elsewhere in the UK and 8% overseas. The destination of the remainder is not known.

There is remarkably little information available from universities or departments as to the spatial distribution of their contacts with businesses, despite this being recorded in the biennial Higher Education Business Interactions Survey. On the basis of our study it appears that between one-third and a quarter of all collaborative research and consultancy is with businesses located outside of the Greater South East, split evenly between the UK and overseas (Figure E1).

Figure E1 Spatial distribution of business contacts



There are differences between the public sector research establishments, the leading research funded universities and the rest of the university sector (Table E1). The four universities that received the most funds were more nationally and internationally orientated than other universities, as were the PSREs.

Table E1 Spatial distribution by sub-group

	Regional	***GSE***	***Rest of UK***	***Overseas***
PSRE	27%	14%	29%	31%
Leading 4 research universities	36%	20%	21%	23%
Remaining universities	59%	18%	12%	11%

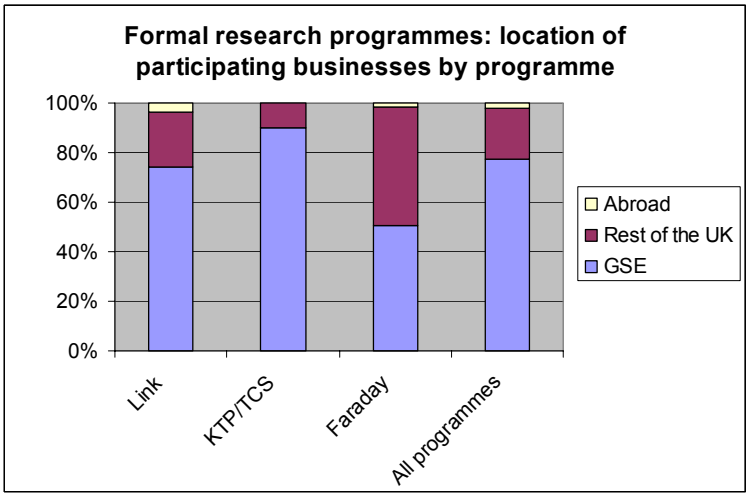
The spatial distribution of knowledge exchange and innovation-related activities also varies by knowledge transfer mechanism. Programmes such as the Faraday Partnerships were found to have a wider spatial distribution than Knowledge Transfer Partnerships for example (Figure E2). Similarly, programmes such as

the EU Framework Programmes have an international component by definition, although in this case the study was unable to ascertain the spatial pattern of participating partners.

Of the various factors influencing the national role of universities and research establishments located in the Greater South East of England the following were found to be significant:

- Most HEIs in the Greater South East do not see proximity as the critical factor influencing the spatial pattern of their business linkages. It has an influence when contacts are being initiated but thereafter it is not seen as significant by either businesses or researchers in terms of their working relationship. Where it is more influential is in terms of student placements and for programmes such as KTP, whereby closer proximity is regarded as desirable by all parties to stimulate regular personal contacts between the business, academic partner and student. Collaborative research programmes, particularly those stimulating leading edge research, appear to be least influenced by considerations of proximity. This is ascribed to the fact that researchers in these fields have well-developed networks that are widely dispersed.

Figure E2 Spatial distribution of businesses by Knowledge Transfer programme



- The location of particular industrial sectors, or concentrations of research-orientated organisations, is a more significant influence on the geography of knowledge exchange and innovation-related activities. In this respect universities and research establishments 'follow the market'.

- The limited capacity and resources available in universities and research establishments for developing business linkages also has an influence on the contribution made. All other things being equal individuals seek out new contacts in places where they have the greatest expectations of success and costs of acquisition are least. This tends to work against developing linkages in more distant regions where they have little or no existing knowledge.

- Networks perform a valuable role in bringing academics, researchers and businesses together, raising mutual awareness of opportunities and overcoming some of the capacity constraints identified. Most networks take a regional focus, although there are some important national sectoral networks. Regional networks tend to work against desires to develop a wider geography of knowledge exchange and innovation. Networks, such as the London Technology Network, that are starting to bring in businesses from outside of the region are to be encouraged.

- Efforts to stimulate knowledge transfer activity tend to be blind to the geography of this activity. This means that the national contribution is perceived in terms of the firms worked with, rather than their location. There are signs that where geography is taken into account this tends to emphasise development within the region in which a university is located. This was the case for all universities that had a geographical component to their targets for knowledge transfer activities.

- Demand for co-operation and collaboration by firms influences the national contribution made by universities and research establishments to knowledge exchange and innovation. Whilst large firms tend to argue that geographical location is not a factor in their decision-making, for SMEs this was seen as a more significant factor.

There is no strong spatial element to public policy interventions at present. The principle focus is on building the capacity of universities and research establishments to engage with businesses, wherever they are located, and on stimulating demand by business to engage in collaborative relationships. Where a spatial dimension to policy emerges, the emphasis is on the development of the region. In some cases performance measurement systems reinforce this message. This can lead to the region being favoured in the development of new business contacts. If the intention is to increase the contribution that universities and research establishments located in the Greater South East of England to knowledge exchange and innovation across the UK, then the spatial dimension will need to become a more explicit element to policy initiatives.

In developing policies for knowledge exchange and innovation, public policy makers will do well to consider the influence that the size of a firm can have on the geography of the relationships established. To reach SMEs in more distant regions may require a different approach than to reach those located in closer vicinity or to reach large and multi-national companies. The different geographies of the various knowledge exchange initiatives is also worthy of regard. One of the challenges facing policy makers in this area is to find means to strengthen access to the knowledge generated by universities and research establishments more broadly.

Strengthening the capacity of organisations to act in the field of knowledge exchange and innovation is an important dimension to securing a strong national contribution by universities and research establishments. Good advances have been made in both universities and research establishments and these should be secured through continuing support. Actions should also be taken to strengthen the capacity of public bodies that are engaged in promoting this agenda, particularly with reference to the wider benefits that universities and research establishments can make to knowledge exchange and innovation.

In order to strengthen the national contribution made by universities and research establishments located in the Greater South East of England to knowledge exchange and innovation we recommend:

1. That a stronger, more explicit, focus on developing inter-regional knowledge exchange initiatives be implemented and that the emphasis of the regional development agenda is carefully considered
2. That a stronger focus on building relations outside of the region be encouraged through existing knowledge exchange initiatives, such as Business Fellows and networks, building on emerging good practice such as the approach of the London Technology Network
3. That the geography of different forms of knowledge exchange activity be considered in developing new initiatives for collaborative and co-operative working between universities, research establishments and businesses
4. That particular attention is given to stimulating the national contribution that universities that are not part of the Russell Group can make to knowledge exchange and innovation
5. That London, the South East and the East of England regions continue to work together to develop a global ‘science-based region’, building linkages to other parts of the UK in order to secure the long-term national contribution of knowledge exchange and innovation by their universities and research establishments
6. That better data provision and reporting be encouraged in order to improve our understanding of this important area.

7. That longer-term funding for 3rd stream activities be introduced to provide the base on which to build a strategic approach to this important area
8. That a stronger discourse is encouraged between researchers, academics, business leaders and employees to encourage knowledge exchange and innovation, rather than relying upon co-operative and collaborative bilateral arrangements.

1. INTRODUCTION

In June 2004 ECOTEC Research and Consulting Ltd was commissioned by the South East of England Development Agency (SEEDA) to undertake a study examining the impact of the Higher Education system in the Greater South East of England upon innovation and knowledge transfer across the UK as a whole. For the purposes of this study the Greater South East of England was defined as comprising the following 3 administrative regions: the South East of England, the East of England and London. In commissioning this work SEEDA was acting on behalf of a consortium of partners including: the Regional Development Agencies for London and East of England (LDA & EEDA), the Government Offices for the South East, London and East of England, the South East and East of England Regional Assemblies, the DTI and the Higher Education Funding Council for England (HEFCE).

Innovation has been identified as one of six drivers of growth in the UK[1]. One of the priorities identified for improving economic performance in this area is the strengthening of inter-regional knowledge transfer. Yet remarkably little is currently known as to the extent of inter-regional knowledge transfer, or the opportunities for furthering such exchanges.

The present study is set in the context of increasing interest in how disparities in regional growth rates can be reduced in order to overcome persistent disparities in regional prosperity. It should also be seen in the context of a national emphasis on the role of science and innovation in boosting economic performance of the UK economy[2] and at a European scale the emphasis on R&D and innovation in delivering the objectives of the Lisbon agenda, most notably to make Europe 'the most competitive knowledge-based economy in the world by 2010'. The potential offered by strengthening Business-University collaboration was highlighted in the Lambert Review, published in 2003[3].

The 2003 ODPM Select Committee inquiry into PSA2 "Reducing Regional Disparities in Prosperity"[4] highlighted a number of concerns with the current approach to reducing regional growth differentials. Most significantly they argued that this needed to be a focus across all public policy areas and not just those of the DTI and ODPM. In this respect they identified that current Government policy towards Higher Education might be reinforcing disparities rather than reducing them, through supporting a concentration of activity in the Greater South East of England. This may be, however, a relatively simplistic representation of a complex reality, in that the benefits of activity in the Greater South East may be felt across a wider geographical area. It has been one of the tasks of this study to explore this.

[1] HM Treasury 2001 Productivity in the UK: the regional dimension

[2] see for example DTi 2003 Competing in the Global Economy: the innovation challenge

[3] HM Treasury 2003 Lambert Review of Business-University Collaboration

[4] House of Commons 2003 Reducing Regional Disparities in Prosperity. 9th Report of Session 2002-03 ODPM: Housing, Planning, Local Government and the Regions Committee

The current study was commissioned in order to better understand the mechanisms through which knowledge transfer operates between HEIs and other sectors, in order to strengthen policy interventions to aid these mechanisms within the Greater South East and the UK. In particular the study was charged with understanding the factors which affect the spatial distribution of wealth creation associated with the Higher Education sector.

Putting to one side the direct employment effects of HE institutions, and the indirect employment stimulated by their procurement policies, the HE sector broadly contributes to three of the six drivers of productivity in the UK:

- Skills - through the educational remit of the HE sector, both to traditional students and increasingly through working with businesses,
- Enterprise - through the generation of new businesses by graduates and staff
- Innovation – through R&D and knowledge transfer

It is this latter function that is generating substantial policy interest, but is also an area where knowledge of the mechanisms through which it operates remains weak. In part, Government officials already recognise the potential role that the HE sector in the GSE can play in supporting wider economic activity in the UK insofar as they regard supporting inter-regional knowledge transfer as one of the priorities for further action under the innovation driver of economic growth.

This partly stems from an acceptance that R&D activity will be focused on those institutions that have an acknowledged expertise and that in a competitive allocation process the best projects should be funded regardless of location. It is not the job of the Government to simply redistribute such funding on the basis of some geographical balancing act. The challenge is to ensure that the economic benefits of this activity are maximized for the UK as a whole and to support growth in less prosperous regions of the UK.

The study had four principal objectives:

- To identify the contribution of HEIs in the Greater South East to the following aspects of knowledge transfer:
    - Innovation as a result of R&D undertaken in Higher Education
    - Spin-outs from Higher Education
    - Graduate recruitment
- To identify the spatial distribution of this activity
- To identify the factors which affect this spatial distribution
- To identify the implications for public sector policies/interventions

Despite the increasing interest and focus on HEI-business linkages, there is little work examining the spatial distribution of these links. The focus of this study is on developing an understanding of the pattern of linkages between institutions and firms (through graduate recruitment, enterprise development or innovation effects) and establishing useful policy recommendations. The study was not expected to look at the benefits that can accrue to an area through the presence of an HEI, such as through the provision of services to an institution by local providers. It was also agreed that the study would not attempt to quantify the economic effects of HEI-business interactions in terms of employment created; output generated or economic rent gained through higher wages.

2. APPROACH AND METHOD

2.1. Study approach

The study has been approached using desk research and case study analysis focused on a sample of subject groupings and a sub-sample of HEIs which offer these subjects. The case studies have been undertaken through a mixture of face to face and telephone interviews. An e-mail survey extended the case study sample to all departments in the selected subject groupings in the Greater South East of England. Face to face interviews were also carried out with a selection of intermediary bodies, representative organisations and public sector organisations. A number of face to face and telephone interviews were also carried out with businesses that engaged with identified departments. Not all means have proved successful and we also report on the difficulties here. The method can be divided into 3 elements:

- A background assessment
- An examination of the spatial distribution of HEI activities
- An exploration of the role and potential for public sector policies

The study was undertaken between July 2004 and March 2005 in 3 phases: i) inception, ii) pilot and iii) roll-out. This is illustrated in Figure 2.1. The study has been aided by three meetings of a Steering Group, comprising the consortium of client organisations and two meetings of a Reference Group, comprised of representatives from both the business and academic communities. We would like to thank all who gave of their time and expertise for the benefit of this study.

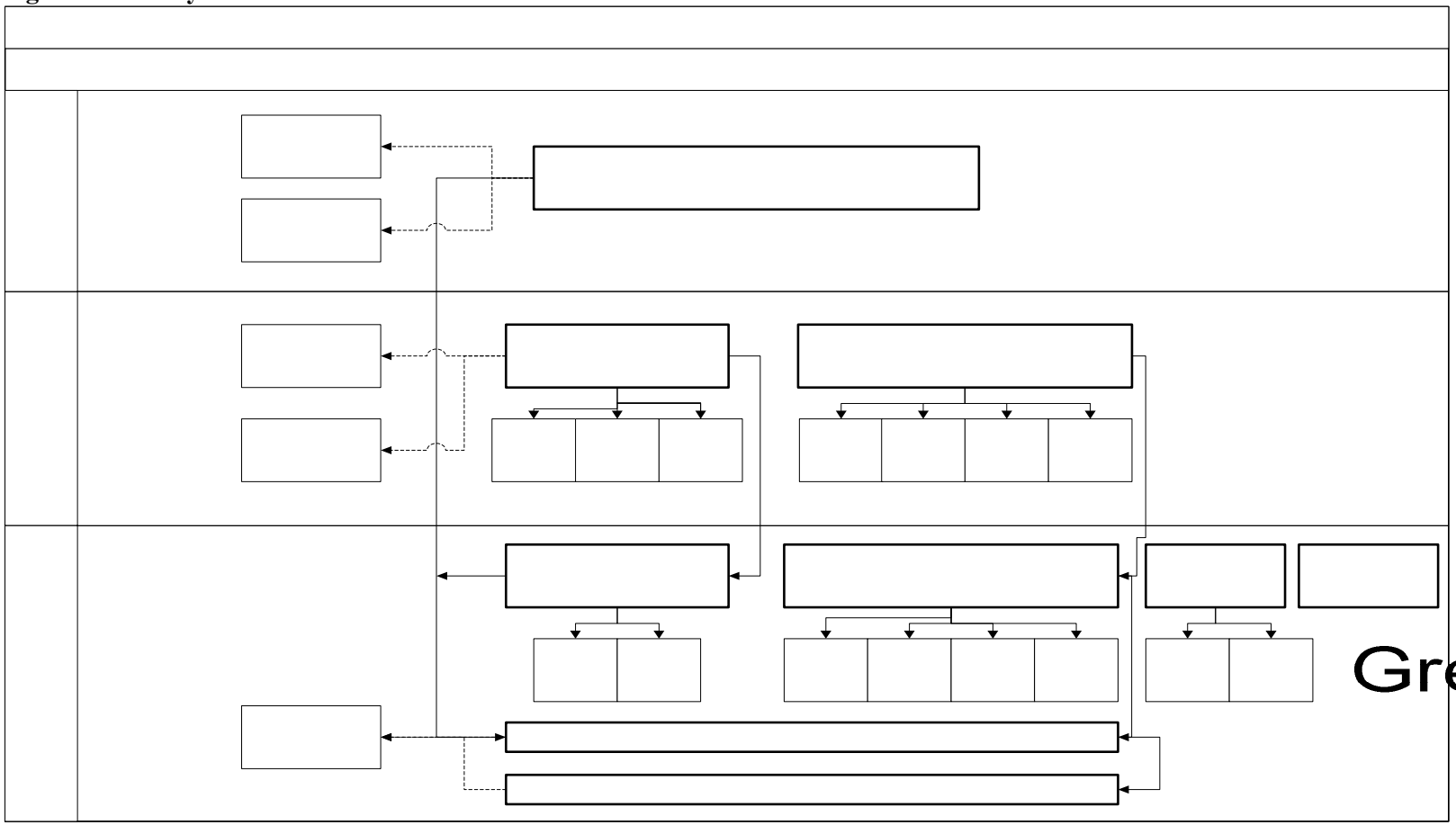
2.2. Method components

Details of the different components of the study are as follows:

Assessment of graduate destinations

Using data sourced from the Higher Education Statistics Agency (HESA) we mapped the first destinations of graduates from HEIs in the Greater South East of England. There are known difficulties with this data, not least the fact that is a snapshot taken six-months after graduation. We attempted to complement this through use of alumni data sourced from case study HEIs. In most cases we have been informed that data cannot be provided in a format that allows for spatial mapping. 8 institutions provided data, although not all was regionally distributed.

Figure 2.1 Study Framework



Assessment of spin-outs generated

Data from the 2003 and 2005 Higher Education Business Interactions Survey (HEBIS) was reviewed to provide a picture of overall levels of activity generated by HEIs in the Greater South East.

Assessment of HEIs contribution to innovation activity

Data from the 2003 and 2005 HEBIS was reviewed to provide a picture of overall levels of interaction between HEIs in the Greater South East and businesses.

The spatial distribution of business activity through the formal innovation and knowledge transfer programmes

A range of knowledge transfer programmes support HEI-business interactions. These formed the fullest source of data on spatial interactions, although only providing a partial sample. Data was accessed for Knowledge Transfer Partnerships (KTP), Faraday Partnerships and the LINK programme and the spatial distribution of this activity identified.

The spatial distribution of HEI-HEI collaborations funded through the Research Councils in the UK

During the study the team was asked whether it was possible to examine HEI-HEI collaborations using data from the UK Research Councils. A request was made to all the Research Councils. Most Councils do not hold their data in this format. Most are able to identify the location of the grant holder but not of collaborative partners. Where details could be provided these are reported on. We are grateful to the EPSRC for a very full and detailed analysis.

Case study interviews

At the outset it was recognised that there was limited data on the spatial distribution of HEIs links with businesses. It was for this reason that the project adopted a case-study based approach, seeking information from a limited number of institutions and identified Departments or Schools based within these. Five broad subject areas were identified as the focus for this study:

- Business, Marketing, Management, Enterprise
- Computer Science and Computing
- Engineering and Technology
- Art and Design (not Fine Art)
- Biological Sciences (including biochemistry)

From this sample a sub-sample of 15 HEIs was selected, based upon research profile, the level of formal interaction with business and the range of third mission type activities, form which a total of 52 Departments were contacted. Three declined to participate leaving a final sample of 49 Departments. In addition the study was extended to consider two Public Sector Research Establishments, selected by the client[5]. Overall:

- 52 face to face interviews were carried out with Heads of Department or their equivalent in the PSREs.

- 16 face to face interviews with other officials responsible for liaison with the business sector. These tended to be based in central corporate or industry liaison offices.

- 89 interviews with individual academics. Focus Groups were initially planned but owing to great difficulties in bringing together groups of academics these were replaced by individual telephone surveys.

During the pilot stage of the research it became clear that data on the spatial distribution of contacts was not available from individual departments. It was also proving difficult to access such data at a corporate level. The principal reasons for data not being available were commercial confidentiality and data not held in a format capable of spatial disaggregation. Following requests for information four institutions provided aggregated data of businesses involved in contract research but in no case was this able to demonstrate spatial distribution. It is clear that HEIs and, more particularly Departments, are only just coming to grips with reporting on their relationship with businesses. They have not been asked for the spatial distribution of these links previously and their data capture mechanisms are not aligned to report on this. The limitations of the available data have proven to be a significant constraint on the development of the study.

E-survey:

The e-survey was designed to gain a broader picture than is possible from the more detailed case study work. Designed to be sent to all Heads of Department in the relevant industry areas selected, the e-survey was distributed electronically to 106 non-case Study Departments. 16 completed interviews were returned between January-February 2005.

Business Survey

12 interviews were undertaken with a mixture of SMEs and MNCs to assess the factors that influence the use of different knowledge transfer mechanisms and why

[5] CCLRC (South East) and the Institute for Food Research (East of England).

they chose to make links with the identified HEI. A number of difficulties in accessing business data from HEIs, particularly issues of commercial confidentiality, prevented a larger sample frame from being established.

Intermediary interviews

20 semi-structured interviews with representatives from public and private sector stakeholders, at a national and regional level, including the CBI, SBS, FSB, DTI, OST, HEFCE, RDAs and intermediary bodies such as Oxford Innovations were conducted to gain a wider perspective on innovation and knowledge transfer through the HEI and the factors influencing this.

3. THE CONTRIBUTION OF THE HE SECTOR IN THE GREATER SOUTH EAST TO KNOWLEDGE EXCHANGE AND INNOVATION

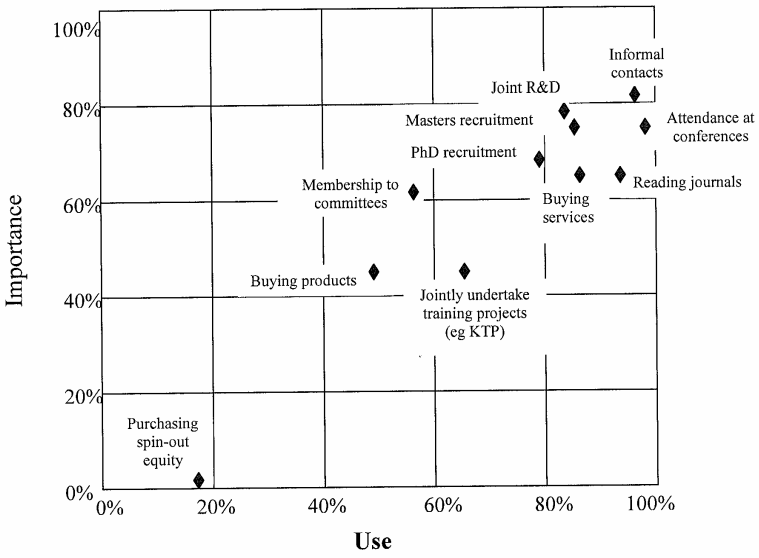
3.1. Knowledge transfer routes

The Research Councils UK recognise five primary routes through which knowledge transfer can occur from HEIs:

- Co-operation in education and training (such as CASE awards)
- People and knowledge flows (the exchange of staff, such as Marie Curie awards within the HE sector)
- Collaborative research with users (such as LINK or EU RTD Framework Programmes)
- Commercialisation of R&D (such as through patents and licensing and also including spin-outs)
- Publication of scientific papers and the training of scientists

The Research Councils UK claim that the most tangible forms of knowledge transfer are licensing and the establishment of start-up companies around intellectual property generated by Research Council-funded work[6]. Whilst this may be true, a survey of users undertaken by NERC suggests that this forms a very small part of the real benefits of knowledge transfer, demonstrating the significant intangible element to this (Figure 3.1).

Figure 3.1: Comparing the use and importance of KT mechanisms



Source: internal NERC paper

[6] Research Councils UK (n.d) Material World: knowledge economy

Effective knowledge transfer is reliant both on the supply of knowledge and a demand. Without firms actively engaged in making use of knowledge that is available then established knowledge transfer mechanisms are unlikely to be successful and the economic impact of the HEI sector will be reduced. Not all firms are active in making connections and the role of those that are needs to be recognised. These connections may be made locally, nationally or internationally and will often be based at least initially on personal contacts and existing networks. The London Technology Network is a good example of efforts to facilitate connections in this regard.

Work undertaken for the NERC (Technopolis, unpublished) has identified the following aspects of the use of knowledge generated within HEIs:

- Intermittent use of science base, and only where there is a clear need to do so
- Relied heavily on personal networks, built up through respondents' own higher education and professional careers
- Engaged with science and scientists through multiple knowledge-transfer routes
- Gave great weight to the movement of well-trained people from science to industry
- Have greatest knowledge of national knowledge transfer schemes such as LINK
- Do not make a great use of such knowledge transfer schemes
- Expect interaction with the science base to increase in the future

From the same work those firms that were most active in their interactions tended to:

- Recruit large numbers of science post-graduates
- Be regular sponsors of industrial studentships and fellowships
- Maintain strategic partnerships with university departments or research centres
- Stress the importance of codified knowledge as a means of diffusion of knowledge as this has credibility, repeatability and consistency)
- Be well-integrated into the supervisory structures of research councils and major research institutions.

These findings are unsurprising given that it is generally accepted now that it is those firms with an innovation and R&D culture and capacity that are most likely to engage in collaborative R&D and innovation activity. This is not simply a truism but reflects a view that to understand the value of knowledge transfer you have to be an active user of knowledge in the first place, and understand the language and symbols of that knowledge community.

It is important to realise the scale of knowledge exchange between HEIs and businesses. Results from the Community Innovation Survey suggest that whilst around half of businesses are actively engaged in innovation, just 8% do so in co-operation with another party and less than a third of these were likely to involve the HE sector.

3.2. HEIs' role in economic development

The most complete set of data on HEI-business interactions is set out in the biennial Higher Education Business Interactions Survey (HEBIS). The most recent results were published in January 2005, with the previous edition published 2 years earlier. There are some variations in the presentation of the results from the two surveys and whilst we have used the most recent figures in most cases we have also made use of earlier results where this are informative. In addition to the HEBIS we have made use of data purchased from the Higher Education Statistics Agency (HESA) to examine the destination of graduates of HEIs in the Greater South East of England.

As Table 3.1 demonstrates HEIs across the UK regard access to education as their most significant contribution to economic development, followed – at some distance - by research collaboration with industry. Technology transfer and supporting SMEs receive a similar degree of prioritisation, significantly above spin-off activity.

Table 3.1 Economic development priorities (% of HEIs)

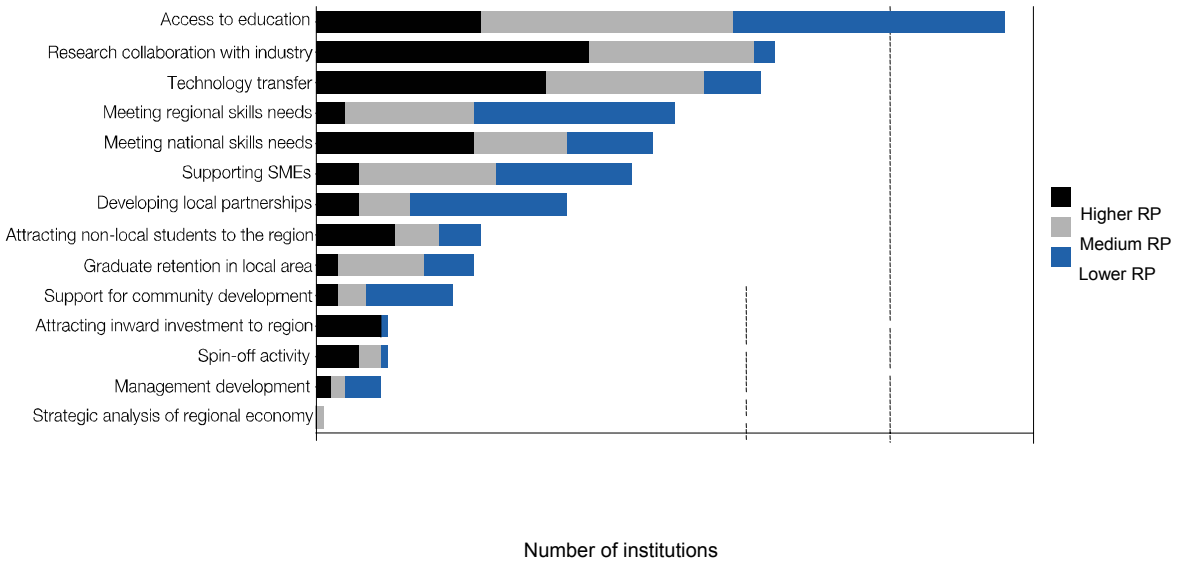
Areas of activity	England	Northern Ireland	Scotland	Wales	UK
Access to education	55%	50%	84%	69%	**59%**
Research collaboration with industry	38%	0%	37%	38%	**38%**
Meeting regional skills needs	38%	50%	16%	46%	**36%**
Technology transfer	29%	100%	53%	31%	**33%**
Supporting SMEs	34%	50%	11%	38%	**32%**
Meeting national skills needs	28%	0%	16%	15%	**26%**
Developing local partnerships	23%	0%	21%	8%	**21%**
Attracting non-local students to the region	17%	0%	11%	8%	**15%**
Graduate retention in local region	12%	0%	16%	15%	**13%**
Support for community development	11%	0%	11%	23%	**12%**
Spin-off activity	5%	50%	11%	8%	**6%**
Attracting inward investment to region	6%	0%	5%	0%	**5%**
Management development	4%	0%	0%	0%	**3%**
Strategic analysis of regional economy	0%	0%	5%	0%	**1%**

Source: HEBIS 2005

In the 2003 publication the HEBIS differentiated between those universities that had a high research profile (ie those that undertake the most research) and those with medium or low research profiles. In Figure 3.2 we illustrate the difference in economic development priorities espoused by high, medium and low research orientated universities. Differences in relative weights attached to access to education, technology transfer, supporting SMEs and spin-off activity are all noticeable, as is the far greater weight research-orientated universities attach to their

role in attracting inward investment into the region. Examination of the differences between meeting regional and national skills needs also demonstrates that research orientated universities appear to have a stronger national focus than other universities.

Figure 3.2 Economic development priorities by university research profile



Source: HEBIS 2003

3.3. The HEI sector in the Greater South East of England

There are some 169 HEIs in the UK, of which two-fifths are located in the Greater South East of England (40%)[7]. If looking just at England then HEIs in the Greater South East constitute some 51% of the total. Each year some 33% of all graduates in the UK emanate from HEIs located in the Greater South East.

Table 3.2 Number of HEIs in the UK and student numbers

	No of HEIs	*% of UK*	*Student numbers 2002/03*	*% of UK*
Greater South East	67*	40%	870615	33%
England	132*	78%	2296265	86%
Northern Ireland	4	2%	50555	2%
Scotland	20	12%	197820	7%
Wales	13	8%	127035	5%

* 19 schools and institutes included as the University of London

Source: adapted from HEFCE 2005 and HESA statistics

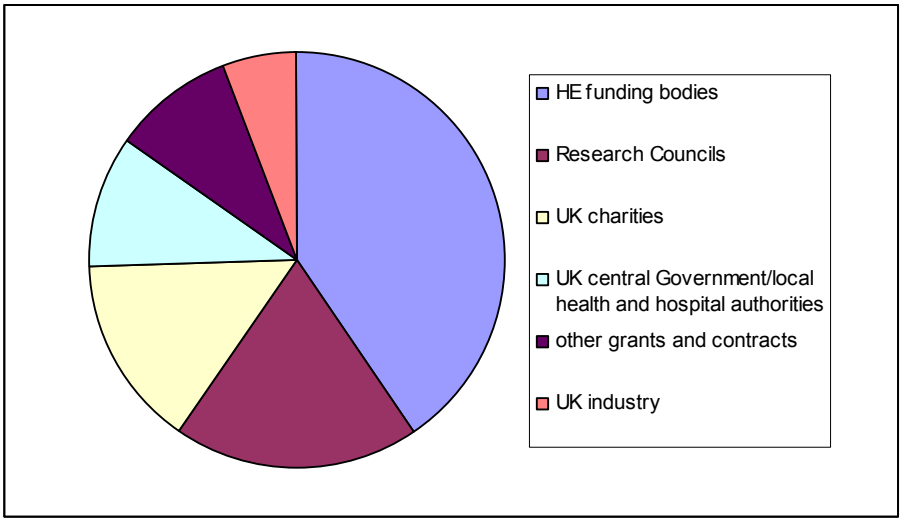
In the Greater South East the greatest number of HEIs is located in London, followed by the South East. Their scope varies from those offering a broad range of

[7] HEFCE 2005 Guide: Higher Education in the United Kingdom February

undergraduate and postgraduate courses with associated research facilities to those that have a more specialised focus. Specialisms range from science and engineering through to arts and drama.

Funding for the HEI sector in the UK comes from both the public and private sector. Public funding primarily emanates from one of the four Funding Councils and the various Research Councils. In 2003-4 research income accounted for almost a quarter (24%) of the total income for HEIs in the UK[8]. As Figure 3.3 illustrates, most of the £3.77m received came from UK Government sources, either the HE funding bodies or the Research Councils. A small proportion (7%) is directly funded by UK industry. The £250m spent by industry on research activities with HEIs constitutes a very minor part of the £16.6bn spent annually by the UKs 700 largest private R&D investors[9].

Figure 3.3 Sources of research income for UK HEIs (2003-4)



Source: HEFCE 2005

The importance of public funding, particularly through the Research Councils and the Funding Councils are clearly apparent from Figure 3.3. The potential of this to favour some parts of the UK over others was remarked upon by the ODPM Select Committee inquiry into Reducing Regional Disparities in Prosperity[10]. HEIs in the Greater South East do receive a slightly disproportionate share of recurrent research funds from the Funding Councils. On average, HEIs in the Greater South East receive some £9,555m each year in research funds from HEFCE, compared to an English average of £8,298m per annum. However, closer inspection reveals that this is primarily due to the presence of a small number of highly research intensive HEIs in the Greater South East; all of which are members of the Russell Group (Box 3.1).

[8] HEFCE 2005 ibid

[9] DTI R&D scorecard

[10] House of Commons 2003 Reducing Regional Disparities in Prosperity

The HEI sector in the UK is not homogenous. Some Universities have a very strong focus on research activities, others do not. Naturally, the contribution the HEIs in the Greater South East of England make to knowledge transfer and innovation can be influenced by differences in this focus.

Box 3.1 The Russell Group

In the UK the most research intensive universities form a group known as the Russell Group. In their own words:

In 2002/3, Russell Group Universities accounted for over 60% (£1.6billion) of UK Universities' research grant and contract income, approximately 55% of all doctorates awarded in the United Kingdom, and approximately 35% of all students studying in the UK from outside the EU. In the 2001 national Research Assessment Exercise, 78% of the staff in grade 5 departments and 57% of the staff in grade 5 departments were located within Russell Group Universities.*

7 of the 19 members of the Russell Group (37%) are located in the Greater South East of England.

Of the 12 HEIs in England that receive more than £25m per annum in research funding from HEFCE, 6 are based in the Greater South East and, as we can see from Table 3.3 all are at the head of the table.

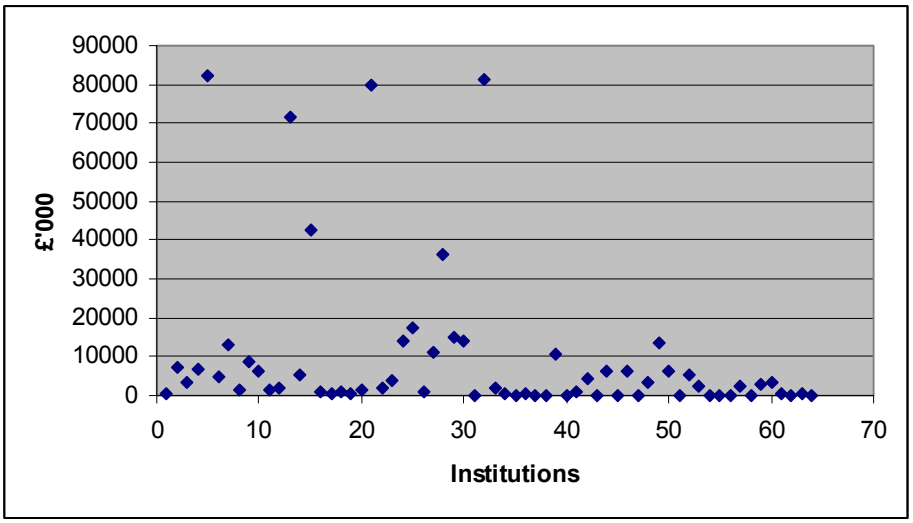
Table 3.3 HEIs in receipt of more than £25m research funds from HEFCE

Institute	***£m***
University of Cambridge	82,028
University College London	81,455
University of Oxford	79,649
Imperial College	71,637
University of Manchester	60,609
Kings College London	42,526
University of Southampton	36,458
University of Leeds	36,321
University of Sheffield	35,912
University of Birmingham	34,153
University of Bristol	32,542
University of Nottingham	30,373
University of Newcastle Upon Tyne	27,524

Source: HEFCE 2005

The contrast between the high research incomes of a small number of research intensive HEIs in the Greater South East is clearly illustrated in Figure 3.4.

Figure 3.4 Distribution of HEFCE research funds in the Greater South East



Source: data from HEFCE 2004

3.4. Greater SE HEIs and business contacts

Universities can contribute to innovation and knowledge exchange with businesses through numerous mechanisms, as we identified earlier. Of particular importance are relationships based on consultancy/contract research; collaborative research and student or graduate placements. The propensity to engage in these relationships, with SMEs or larger companies, is identified in the HEBI survey.

HEIs in the Greater South East of England are, on average, more likely to be involved in consultancy work with large companies than are HEIs elsewhere in the UK. As Table 3.4 demonstrates, this applies in all 3 regions of the Greater South East. However, overall they are less likely to engage with SMEs, apart from in the East of England where the situation is much stronger than the national average. The same picture holds true for consultancy contracts in general, including those with non-commercial and public sector bodies.

Table 3.4 Average number of contacts with business for each HEI

	Total		***SMEs***		***Commercial non-SME***	
	Consultancy	*Research*	*Consultancy*	*Research*	*Consultancy*	*Research*
East of England	134	97	84	19	34	78
London	76	37	23	4	40	33
South East England	66	158	14	86	44	71
Greater South East	81	78	29	28	40	49
UK	118	78	48	26	27	52

Source: adapted from HEBIS 2005

Overall, HEIs in the Greater South East perform broadly in line with national averages in terms of the number of research contracts they have with SMEs and with

large firms. However, as Table 3.4 also illustrates, there are clear differences between London and the East and South East of England.

Based on the findings of the 2001-02 HEBI survey, around 60% of HEI consultancy contacts are within the region in which the HEI is located, with two-fifths undertaken elsewhere in the UK or abroad. From the data available it is not possible to identify what the proportion of work is that is undertaken within the Greater South East but we can certainly assume that a proportion of contacts by HEIs in one of these three regions are with firms located in one of the other two regions.

A third area where HEIs may contribute to knowledge exchange is through projects whereby students are engaged with non-academic partners. Two strong schemes exist in this area. The first involves CASE[11] studentships, whereby doctoral students are engaged on a joint research project with an academic and non-academic partner. The second Knowledge Transfer Partnerships (previously known as Teaching Company Scheme). It appears that the former are largely utilised by larger organisations and the latter by SMEs.

Based on results from the 2003 HEBIS it appears that the Greater South East significantly outperforms the UK average in terms of the proportion of CASE awards per institution. In the East of England, HEIs held an average of an average of 15 CASE awards per institutions, of which 20% were with partners in the same region. Each London HEI held an average of 4 CASE awards, 1 of which would be with a partner in the same region. HEIs in the South East held 11 CASE awards per institution, 45% of which were with partners within the region. We are not able to differentiate whether partners based outside of the region were still within the Greater South East. HEIs in the Greater South East also had a higher propensity to engage with the Knowledge Transfer Partnerships[12] than the UK average, although in proportionate terms partner firms tended to be more likely to be based within the region.

From the HEBI surveys a complex picture emerges. In some cases HEIs located in the Greater South East are making a greater contribution to knowledge transfer and innovation than might be expected, in others the picture is less strong. One year snapshots are useful to illustrate the overall contribution that HEIs make to knowledge exchange and innovation across the UK as a whole, although we should recognise that the observed patterns can vary significantly over a small space of time. However, although the surveys provide a useful indication of the propensity of HEIs to engage in knowledge transfer activities they tell us little of the spatial geography of these relationships.

[11] Please see Glossary for further details

[12] A brief explanation of the scheme is included in the Glossary

3.5. Greater SE HEIs and spinoffs

Where graduates or employees of HEIs establish companies based upon research and activities undertaken whilst based at the HEI the resultant company is generally known as a 'spinoff'. There are four types of spinoff that are commonly recognised[13]:

- Spin-off companies established using HEI intellectual property (IP) and in which there is some element of HEI ownership
- Spin-off companies to which the HEI has assigned or licensed IP, but in which it has no equity
- Start-up companies involving current or former HEI staff as founders where the HEI has neither ownership nor an IP agreement. (In this case the HEI staff must be connected to the HEI immediately prior to formation of the company)
- Graduate start-up companies that have originated through the direct involvement of the HEI or through a dedicated graduate start-up programme

Spin-off or start-up businesses related to HEIs in the UK were estimated to have a combined turnover of some £384.5m per annum in 2001-02, with a full time equivalent staff of around 15,900 employees[14]. As Table 3.5 demonstrates, the most common type of spin-off across the UK were 'graduate start-ups' (337 established during 2001-02). This was followed by 'spin-offs with some HEI ownership' (199). Some 34% of all graduate start-ups emanated from the Greater South East, and 30% of all spin-offs with some HEI ownership. Whilst it is difficult to draw conclusions from simple aggregates this suggests that, on average, HEIs in the Greater South East are slightly less likely to generate spin-off businesses than HEIs across the UK as a whole, but that survival rates are broadly the same. Unfortunately we were unable to access data of sufficient detail to determine whether the particular mix of specialisms present amongst HEIs in the Greater South East might have some influence on this picture.

Table 3.5 Spin-off company formation in the GSE and the UK

	Formed in 2001-2		***Active in 2001-02 and survived for at least 3 years***	
	Greater SE	***UK***	***Greater SE***	***UK***
Spin-offs with some HEI ownership	60	199	140	434
Spin-offs with no ownership but some IP input	1	14	17	57
Staff start-ups with no HEI investment	15	35	87	152
Graduate start-up companies	115	337	142	278
Total	**191**	**585**	**386**	**921**

Source: adapted from HEBIS 2005

[13] See for example Annex A of HEBI survey 2005

[14] Its not possible to break this down further ie by region owing to data gaps.

Looking at the data in more detail, the East of England and the South East were in line with the UK profile (33 'graduate start-ups' in the East of England and 51 in the South East, followed up by 'spin-offs with some HEI ownership', 10 in the East of England and 12 in the South East). London displayed a slightly different picture, with 38 'spin-offs with some HEI ownership', and 31 'graduate start-ups' established over the course of the year. The East of England performs very well in terms of staff and graduate start-ups and London performs particularly poorly in terms of graduate start-ups.

3.6. Greater SE HEIs and graduate placement

Access to education is one of the main contributions by HEIs to knowledge transfer. The destination of graduates from HEIs in the Greater South East determines the spatial distribution of that contribution. The information presented below is drawn from the First Destinations Survey conducted by the Higher Education Statistics Agency, based on a self completion survey of graduates six months after graduation. We examine this on three counts: the influence of original residence, the contribution made to the wider UK labour supply and the relationship between these. We also consider the longer-term spatial distribution of graduates using a small sample of alumni data.

3.6.1. Influence of Region of Domicile on Region of Study

Table 3.6 shows the proportion of graduates educated in the wider South East by their home region, ie where graduates lived prior to attending university. The majority of graduates studying in the Greater South East from 1997/98 to 2001/02 came from within the area, with the remainder spread relatively evenly across the rest of the country.

Table 3.6 – Origin of students by Region of Study (1997/98 to 2001/02)

Domicile Region	Greater South East	Rest of UK	% of all graduates studying in Greater South East	% of graduates in studying in Rest of UK	% of graduates from region studying in Greater SE
North East	2,695	39,588	1%	5%	6%
North West	8,017	91,953	2%	11%	8%
Merseyside	1,590	23,483	0%	3%	6%
Yorkshire & Humberside	7,002	72,162	2%	9%	9%
East Midlands	11,120	60,747	3%	7%	15%
West Midlands	12,483	80,660	3%	10%	13%
Eastern	52,090	43,007	13%	5%	55%
London	109,871	32,290	27%	4%	77%
South East	93,567	65,745	23%	8%	59%
South West	25,809	67,026	6%	8%	28%
England unknown	9,662	12,771	2%	2%	43%
Wales	6,616	53,395	2%	6%	11%

Scotland	3,014	94,818	1%	11%	3%
Northern Ireland	2,145	40,405	1%	5%	5%
United Kingdom unknown (including the Channel Islands and IoM)	1,635	3,120	0%	0%	34%
Non-UK	52,609	59,682	13%	7%	47%
Total	399,925	840,852	100%	100%	32%

Source: HESA 1997/98 to 2001/02

3.6.2. Contribution of HEIs in the Greater South East to Labour Supply in Other Regions

Graduates from HEIs in the Greater South East have a tendency to remain within the region (Table 3.7). 65% of the 259,000 graduates known to have entered employment from HEIs within the Greater South East from 1997/98 to 2001/02 remained within the area 6 months after graduation. There tended to be small leakage to regions outside, with a total of 10% (25,900 over five years) finding employment in other regions. Overseas leakage stood at 8% over the five years in question.

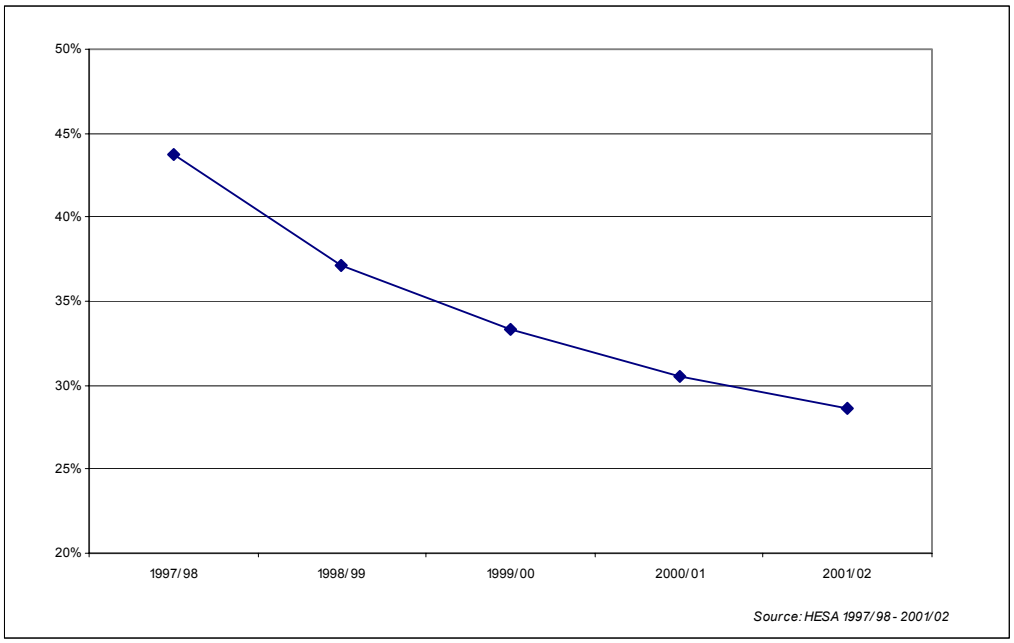
Table 3.7 –Employment Destination of Graduates from HEIs in the Greater South East (average from 1997/98 to 2001/02)

Region of Employment	**% of Graduates from HEIs in Greater South East**
North East	0%
North West	1%
Merseyside	0%
Yorkshire & Humberside	1%
East Midlands	1%
West Midlands	2%
Eastern	11%
London	33%
South East	22%
South West	4%
England Region unknown	17%
Wales	1%
Scotland	0%
Northern Ireland	0%
United Kingdom unknown (including the Channel Islands and IoM)	0%
Non UK	8%

Source: First Destinations Survey, HESA, 1997/98 to 2001/02, graduates known to enter employment

The proportion of graduates educated in the Greater South East entering employment outside of the area fell from 44% in 1997/98 to 27% in 2001/02, as illustrated in Figure 3.5.

Figure 3.5 - % of graduates from HEIs in the wider South East entering employment in external regions



Nevertheless, HEIs in the Greater South East make an important contribution to the flows of graduates into employment outside of the area, particularly in the Midlands and the South West. 17%, 15% and 37% of new graduates entering employment in the East Midlands, West Midlands, and South West respectively were educated at HEIs in the Greater South East from 1997/98 to 2001/02.

Particular institutions have a higher tendency to contribute more to graduate recruitment outside of the Greater South East than others. Table 3.8 highlights those institutions which contribute most to the wider labour market. Graduates of Canterbury Christchurch University had the highest propensity to leave the Greater South East in search of work over the 5 years to 2001/02, with just 16% of its graduates (1,000) finding employment within the area. Low retention rates tend to be found more often at smaller specialist institutions, such as those focusing on art, design, and performing arts, medicine, and business, although some large universities, such as Cambridge, Middlesex and Brunel all showed high rates of students leaving the region after graduation. Overseas moves were higher among specialist institutions, particularly those in London, such as the London Business School, London School of Hygiene and Tropical Medicine, and (not shown in the table below) the London School of Economic and Political Science.

Table 3.8 – Top 15 HEIs with lowest graduate retention rates within the Greater South East from 1997/98 to 2001/02

	Institution	Region of Employment		
		Greater South East	Rest of UK	Overseas
1	Canterbury Christ Church University College	16%	82%	2%
2	Cranfield University	30%	48%	22%
3	Royal College of Music	34%	59%	6%
4	Kent Institute of Art & Design	37%	47%	16%
5	Central School of Speech and Drama	37%	59%	4%
6	The Institute of Cancer Research	38%	31%	31%
7	The University of Cambridge	40%	45%	15%
8	London School of Hygiene & Tropical Medicine	41%	11%	48%
9	The Royal Veterinary College	44%	48%	8%
10	London Business School	45%	18%	37%
11	The School of Oriental and African Studies	49%	26%	25%
12	Thames Valley University	49%	48%	3%
13	Brunel University	49%	47%	4%
14	Middlesex University	50%	47%	4%
15	University of London (Institutes and activities)	50%	34%	17%

Source: HESA, 1997/98 – 2001/02

3.6.3. Links between original domicile, study region, and region of employment

Table 3.9 below shows that the original domicile of graduates has an influence over their later employment destination. Graduates domiciled outside the Greater South East are more likely to move out of the Greater South East than those domiciled within the region – with a total of 58% from 1997/98 to 2001/02 moving either to their original domicile or to other regions outside the Greater South East, compared to just 25% of those domiciled originally in the Greater South East.

However, those domiciled outside the South East but educated at HEIs within the area are less likely to return to their original domicile than graduates from institutions elsewhere in the UK.

Table 3.9 – Employment Destinations of graduates, by domicile region, and by region of study, 1997/98 to 2001/02

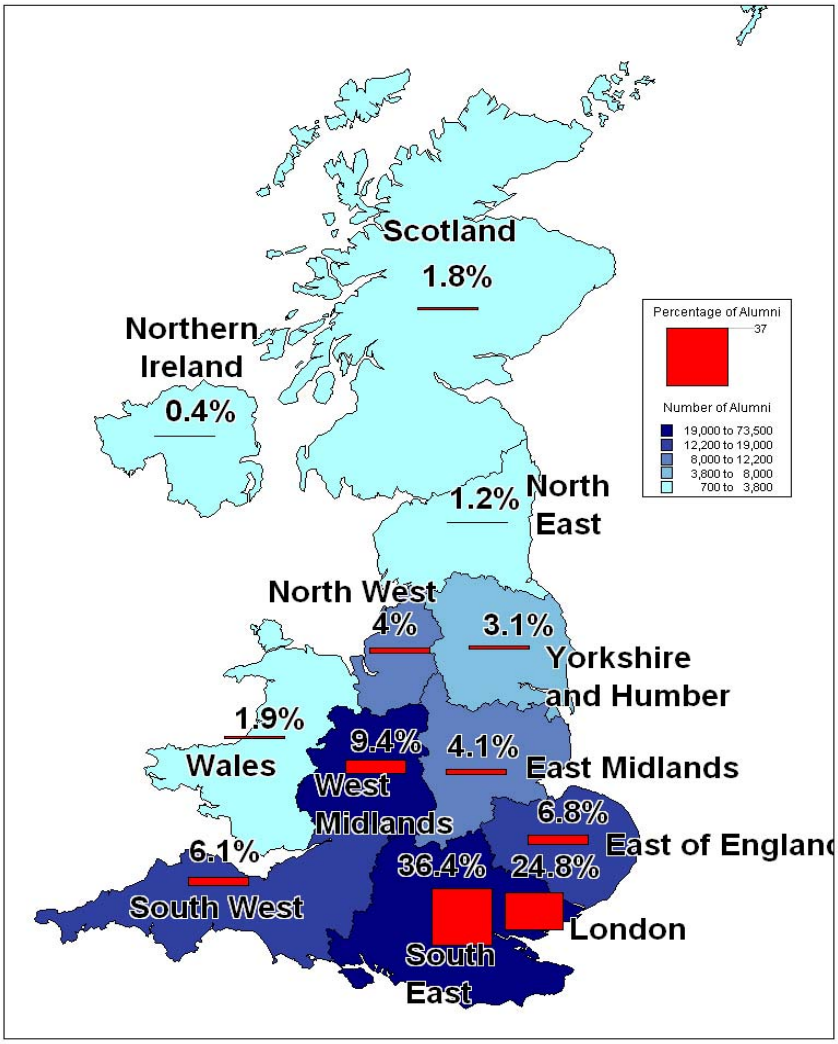
Employment destination after graduation	Numbers of graduates		% of total	
	Domiciled in Rest of UK	Domiciled in Greater South East	Domiciled in Rest of UK	Domiciled in Greater South East
Graduates from HEIs in the Greater South East				
Moved out of Greater South East	29,406	43,821	35%	25%
Remained in Greater South East	35,522	33,272	42%	19%
Returned to Original Domicile	19,299	99,798	23%	56%
Graduates from HEIs in the Rest of the UK				
Moved / Returned to Greater	43,025	17,291	9%	18%

South East				
No connection with Greater South East	147,154	0	32%	0%
Returned to Original Domicile	275,745	41,562	59%	42%
Remained outside Greater South East	0	39,109	0%	40%

3.6.4. Distribution of alumni

In order to examine the longer-term distribution of graduates of HEIs located in the Greater South East, 8 HEIs provided the study with alumni data in a format that could be spatially disaggregated. This demonstrates a similar locational pattern of past graduates as derived from the graduate destinations survey. Around three quarters of past graduates, whose location is known, remain in the Greater South East (Figure 3.6).

Figure 3.6 Location of alumni from selected HEIs



3.7. HEI-HEI collaborations

The final contribution to knowledge exchange considered by this study has been the pattern of collaborative relationships between HEIs in the Greater South East and elsewhere in the UK. Collaborations can occur through many routes and in many guises. In the field of knowledge transfer the 2nd round of the Higher Education Innovation Fund (HEIF 2) has funded a number of inter-regional collaborations, some of which are between HEIs in the Greater South East and those located elsewhere in the UK. Many individual academics collaborate routinely with colleagues in other HEIs whilst at a corporate level there are high level collaborations, such as between Cambridge and MIT in the USA, and Imperial College and the University of Wales. In order to examine the pattern of collaborations more closely we sought to review the extent to which inter-regional collaborations were being supported through research grants administered by the UK Research Councils. Three Research Councils were able to provide some details in this regard.

The Arts and Humanities Research Board (AHRB) funds 19 Research Centres that act as hubs of collaborative research. 5 of these have lead partners located in the Greater South East with other named partners located elsewhere in the UK. 1 Centre with a lead partner located outside of the Greater South East has a collaborative partner based within the region.

The Biotechnology and Biological Sciences Research Council (BBSRC) was able to provide details of its grant awards with information on the institutions funded. Of 427 awards 17 (4%) had a lead partner based in the Greater South East with one or more external partners located elsewhere in the UK. There were a corresponding 24 grants (6%) led by HEIs located outside of the Greater South East which had partners located within the region.

The greatest detail on the matter of inter- and intra- regional collaboration was provided by the Engineering and Physical Sciences Research Council (EPSRC). It found that around 13.5% of research projects have investigators drawn from more than one research organisation. The South East, London, Scotland and the North West have the highest total levels of collaborative grants. On a proportional basis there appears to be a small preference for intra-regional collaboration in all regions, with London and Yorkshire and the Humber demonstrating this most strongly. All regions have a strong number of external collaborations. Significantly, the South East and London are found to be the strongest collaboration partners for all regions, demonstrating the contribution that these regions are making to knowledge exchange across the UK in this research area.

4. THE SPATIAL DISTRIBUTION OF ACTIVITY

4.1. Context

4.1.1. The spatial dimension

As we have suggested previously there is a strong spatial dimension to the debate on knowledge transfer and innovation. There are those that hold that geography is dead and that geographical proximity is no longer an issue for the transfer of knowledge. Such a situation would suggest that the benefits of activity undertaken by HEIs and PSREs within the Greater South East should know no bounds. In contrast there are those who suggest that the death of geography has been exaggerated and that proximity does still matter. If so, then the potential benefits of universities and research establishments located in the Greater South East on the rest of the UK are likely to be much reduced.

The reality is, as always, probably somewhere in between the two as far as technology transfer and innovation are concerned. The Lambert Review of business-university collaboration acknowledges that proximity is important, particularly for locally-focused SMEs. As a firm's market-focus increases in size so the location of university collaborations becomes less significant, as illustrated in Table 4.1.

Table 4.1 Influence of market focus on patterns of collaboration

	Location of University		
Type of firms' largest market	***Local***	***National***	***Overseas***
Local	88%	12%	0%
Regional	47%	53%	0%
National	37%	47%	16%
International	26%	48%	26%
All	**36%**	**46%**	**18%**

Source: CIS UK - quoted in Lambert Review (2003: p.71 Fig 5.2)

This supports many of those in private industry who assert that it is not the location of the research that is important but rather its quality. It also demonstrates clearly that larger firms are able to draw upon a wider range of potential sources of knowledge transfer. In the following section we examine the spatial distribution of knowledge transfer activities based upon a sample of HEIs and PSREs based across the Greater South East.

4.1.2. Knowledge transfer mechanisms

Overall, the most common links between businesses and academic departments in our survey were around collaborative and contract research, consultancy advice, vocational training activities and the informal and personal networks of individual academics (Table 4.2). Staff mobility, licensing of intellectual property and business spin-offs/start-ups were all less common. Although there were variations in the responses derived from different survey methods the broad pattern is consistent.

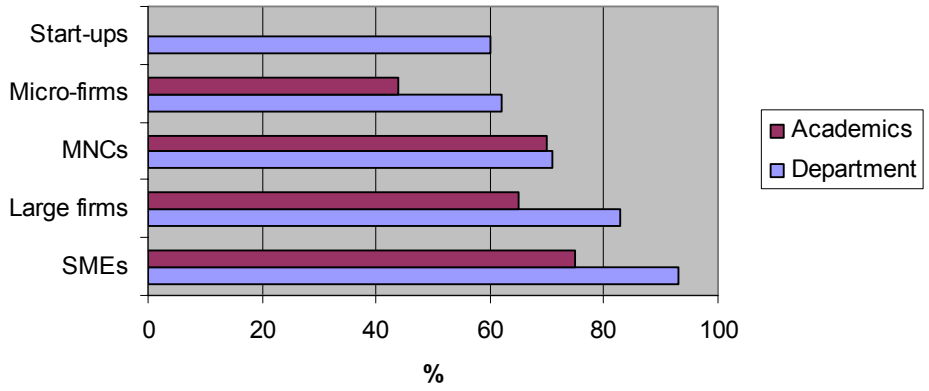
Table 4.2 Academic linkages with the business sector

	Department survey	***Academic survey***	***Web survey***
Collaborative research with business	67%	63%	75%
Contract research for business	69%	42%	63%
Consultancy advice/support to business	77%	63%	94%
Staff mobility/engagement between HEIs and business	40%	17%	25%
Cooperation in graduate student education	58%	67%	56%
Vocational training activities for business employees	73%	39%	69%
Licensing of Intellectual Property	25%	14%	50%
Spin-offs and start-ups of enterprises	46%	14%	31%
Informal contacts and personal networks with business.	81%	83%	94%

4.1.3. Size of firm

The majority of links identified by Heads of Department were with small and medium sized enterprises, followed by large firms and multinational corporations (MNCs), as demonstrated in Figure 4.1. Micro-firms and spin-offs featured less strongly, although were engaged with more than half of all the Departments interviewed. Academics interviewed were less likely to be involved with start-ups but otherwise the propensity to be involved with other types of firm broadly reflected the departmental pattern, with a slightly disproportionate emphasis on MNCs.

Figure 4.1 Extent of links with different types of firm (% of respondents)



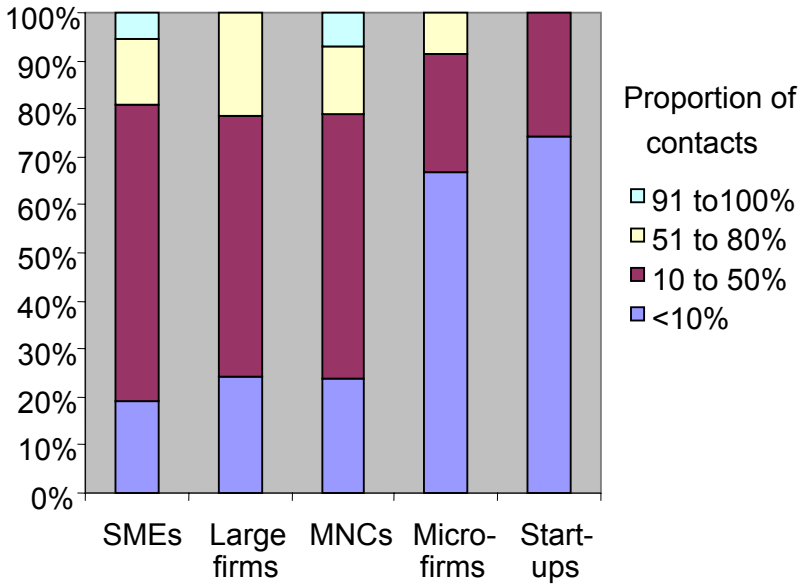
There is no consistent pattern in the relationships recorded by those universities with the highest levels of research funding compared to the PSREs or those universities with lower levels of research funding. On balance the four leading research based universities in our sample (University College London; University of Cambridge; University of Oxford and Imperial College) have a stronger focus on start-up/spin-off companies (Table 4.3); whilst the PSREs have a stronger focus on larger companies. Contrary to what is often perceived, links to MNCs are strongest amongst those universities located in the Greater South East that do not receive the greatest levels of research funding. These universities also have the strongest links to SMEs.

Table 4.3 Balance of activity by different sample sub-groups

	Start-ups	Micro firms	SMEs	Large firms	MNCs
PSREs	4%	11%	26%	43%	13%
Leading 4 research Universities	15%	12%	22%	33%	18%
Remaining Universities	3%	10%	37%	25%	26%

As a proportion of all their contacts, universities tend to work most strongly with SMEs, large firms and MNCs. As Figure 4.2 illustrates, in more than three fifths of all cases start-ups and micro-firms constituted less than 10% of all contacts. Conversely, in only around a fifth of cases did MNCs, large firms and SMEs form fewer than 10% of a Department's contact base.

Figure 4.2 Propensity to work with firms of different sizes



Overall, there was no preference for one type of firm over another. As one Head of Department commented: "You will find people here who are familiar with start-ups and you will find people who are familiar with large MNCs. We do not want to be pigeon-holed as a department dealing with a particular stage of business development or size of company." However, in some cases links with larger firms were preferred owing to the ability to make use of their greater resources, which are aligned to research areas. Their ability to take a long-term outlook and their strategic needs was also cited. It was also mentioned that are more likely to contribute to the development of courses, produce development opportunities and sponsorship of PhD students and that they can bring "kudos" in terms of grant applications. In addition, it was emphasized that contacts are assured/ long-standing and are easier to access.

Conversely, whereas it was cited that large enterprises are more likely to get involved in course development and add value, small companies are - it is suggested - more likely to do DTI-funded research. It was mentioned that these small amounts of money are very useful, as working with small businesses means that it is possible to have a lot more influence. For some Departments, SMEs are the most important because they represent the industrial landscape and since the amount of their activity is increasing.

4.2. Spatial distribution

Whilst the lack of data held on the location of businesses with which HEIs have relationships has meant that it has not been possible to accurately identify the precise distribution of links between them and businesses we have been able to derive some broad estimates based upon sample interviews. Overall Heads of Department generally felt that activity within their own region was strongest, followed by the rest of the Greater South East and overseas (Table 4.4). Activity elsewhere in the UK was perceived to be the least strongly represented. The wider web-based survey of academics demonstrates a slightly different picture but with a similar emphasis on links with the Greater South East compared to elsewhere in the UK or overseas.

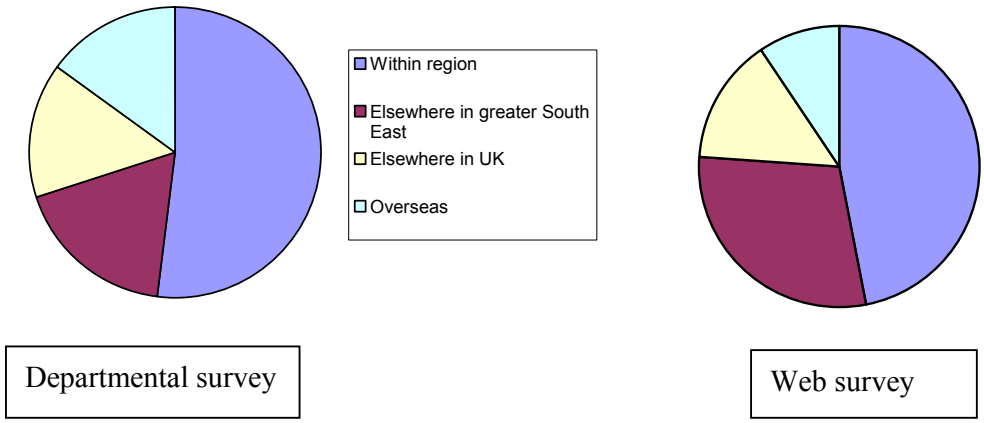
Table 4.4 Estimated strength of links with different areas

	Region		***GSE***		***UK***		***Overseas***	
	HoD	*Web*	*HoD*	*Web*	*HoD*	*Web*	*HoD*	*Web*
Low	24%	33%	41%	33%	59%	60%	47%	80%
Medium	35%	53%	38%	60%	26%	33%	29%	13%
High	40%	13%	21%	7%	15%	7%	24%	7%

As Figure 4.3 illustrates, around half of all business contacts appear to be within the same region as the Department concerned, with a further 18 to 28% located elsewhere in the Greater South East. On this basis, the proportion of business contacts located

outside of the Greater South East lies somewhere between a quarter and a third of all contacts.

Figure 4.3 Spatial distribution of business contacts



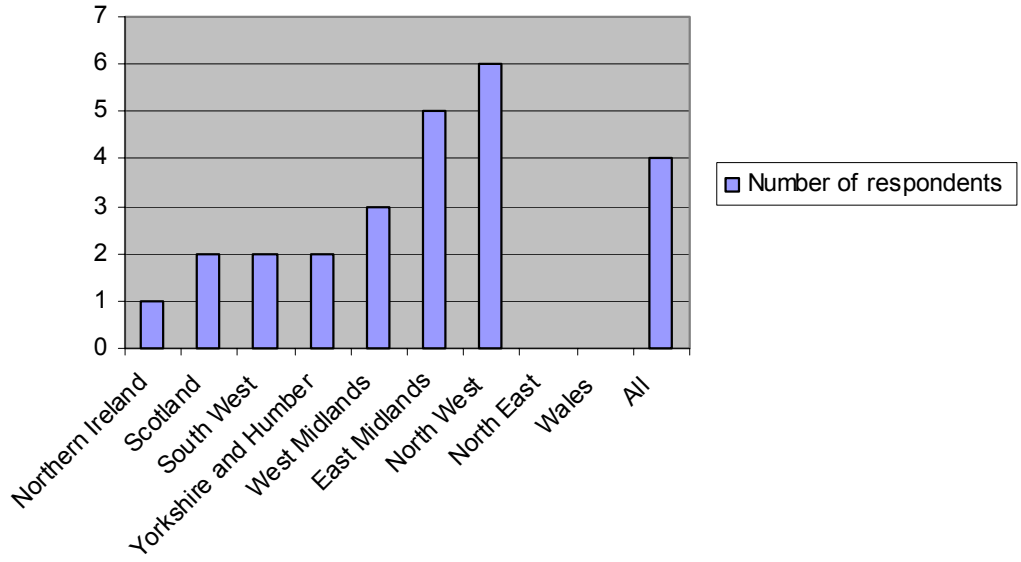
Breaking these figures down to take into account the three sub-groups of our sample demonstrates differences between them (Table 4.5). PSREs are more likely to have links with companies based outside of the Greater South East, both overseas and in the UK; followed by the four universities with the highest amounts of research funding. The remaining universities tend to have a stronger local focus. However, this aggregate picture the significant links outside of the Greater South East reported by individual departments in these universities, particularly in the University of the Arts, Westminster University, Brunel University and Portsmouth University.

Table 4.5 Spatial distribution by sub-group

	Regional	***GSE***	***Rest of UK***	***Overseas***
PSRE	27%	14%	29%	31%
Leading 4 research universities	36%	20%	21%	23%
Remaining universities	59%	18%	12%	11%

Few respondents were able to break these proportions down further to provide an indication of in what regions outside of the Greater South East their contacts were located in. Where they were able to do so there was no significant spatial pattern emerging (Figure 4.4). The single most important region was the North West followed by the East Midlands. A strong proportion of respondents identified links in all regions of the UK. The low response rate to this query means that the results should be treated with caution. The result does seem to suggest however that there is no significant 'gravity' effect occurring whereby links with nearby regions are more prevalent.

Figure 4.4 Regional distribution of UK contacts



4.3. The strength of the relationships

Nine out of ten departments identified links within their own region, with two-fifths of departments identifying that such local linkages constituted more than half of all their contacts with businesses (Table 4.6). One third had no links outside of the Greater South East and two-fifths no overseas links. Overall, the number of departments with strong links outside of the Greater South East appears relatively limited, although there are no benchmarks against which to compare this. For less than half of the departments interviewed did links elsewhere in the UK constitute more than 10% of their total contacts, and for only just over a third could the same be said for overseas contacts.

Table 4.6 Propensity to work with companies located in different areas

	Located within the region		**Located elsewhere within the GSE**		**Located elsewhere in the UK**		**Located overseas**	
	Depart.	Academic	Depart.	Academic	Depart.	Academic	Depart.	Academic
0%	10%	42%	24%	40%	35%	37%	41%	39%
1 -10%	8%	16%	20%	25%	18%	18%	22%	28%
11 – 50%	42%	21%	51%	27%	45%	34%	33%	28%
51 – 89%	22%	16%	4%	4%	2%	7%	4%	5%
90 – 100%	18%	5%		2%		5%		

On the whole where individual academics had links to businesses these were more likely to be broadly distributed. For a small proportion links elsewhere in the UK and overseas constituted more than half of all their contacts.

4.4. Does geography differ depending on type of relationship?

Not all knowledge transfer routes are the same. We sought to identify whether different types of route exhibit a different geography, examining contract relationships, collaborative research and undergraduate placements. Very few departments monitor the spatial distribution of contracts or collaborative research. In terms of contract research only 9 departments were able to give any sense of spatial distribution as was the case for publicly funded collaborative research, although these were not the same departments. Whilst more university departments (25 in total) were able to estimate the proportion of their students placed with businesses in different locations, this remains a broad estimate rather than a robust figure. A comparison of the different elements (Table 4.7) suggests that more than half of all research activity undertaken with businesses occurs within the Greater South East, with the balance split relatively evenly between the rest of the UK and overseas. Graduate placements however tend to be predominantly local, with overseas placements partly related to the prevalence of overseas students on some courses.

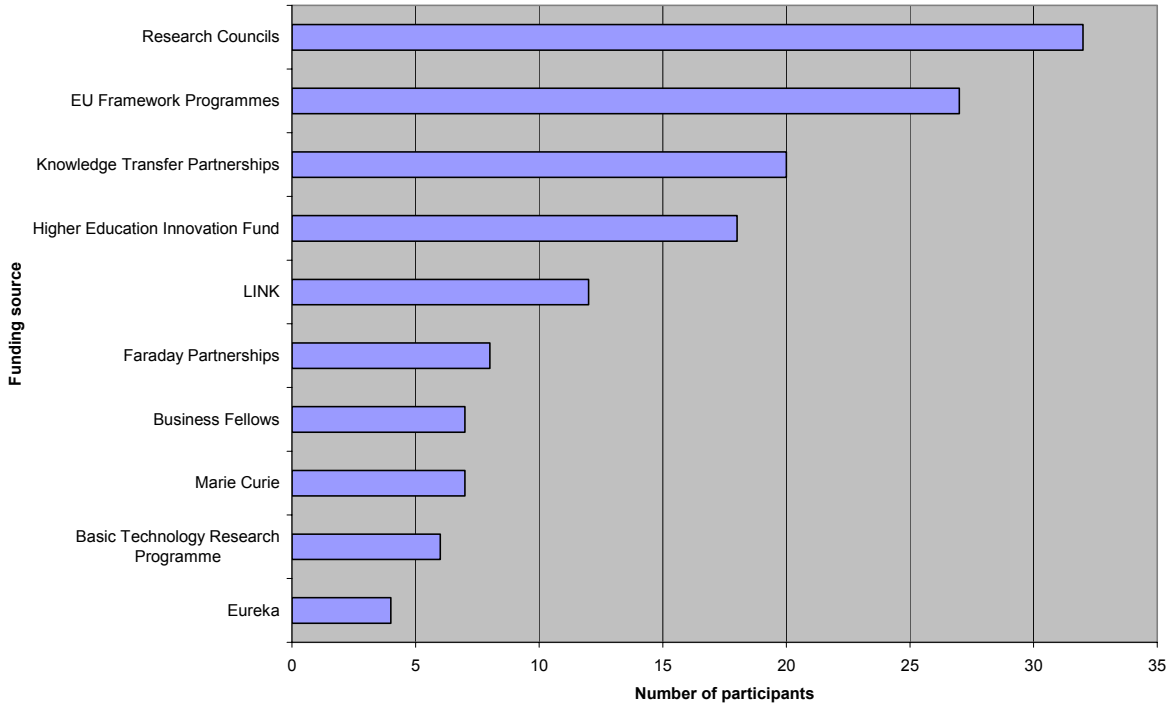
Table 4.7 Spatial distribution of different knowledge transfer routes

	Within GSE	Within rest of UK	Overseas
Contract research	58%	20%	22%
Collaborative research	58%	23%	19%
Undergraduate placements	86%	9%	5%

4.5. Links between Universities and businesses through formal research and collaboration programmes

In order to explore the spatial distribution of different knowledge transfer routes further we focused on formal funding programmes. University departments proved to have a good knowledge of their participation in these activities, but again the information on spatial distribution of partner organisations was limited. Participation in projects funded by the Research Councils was most common, followed by the EU Framework Programmes (Figure 4.5). There was also strong engagement in projects supported by the Higher Education Innovation Fund and Knowledge Transfer Partnerships.

Figure 4.5 Participation in research and collaboration programmes



Owing to the difficulties in determining the spatial distribution of links between Universities in the Greater South East and businesses using data from the universities themselves the study turned to the data records of the research programmes themselves. Three formal programmes have been considered for this analysis: LINK, Knowledge Transfer Partnerships (KTPs) - together with its predecessor the Teaching Company Scheme (TCS) - and 7 Faraday Partnerships. The choice was determined by those programmes for which information on the location of individual firms could be identified. A total of 248 individual partnerships have been considered.

4.5.1. Spatial distribution of HEI-business links

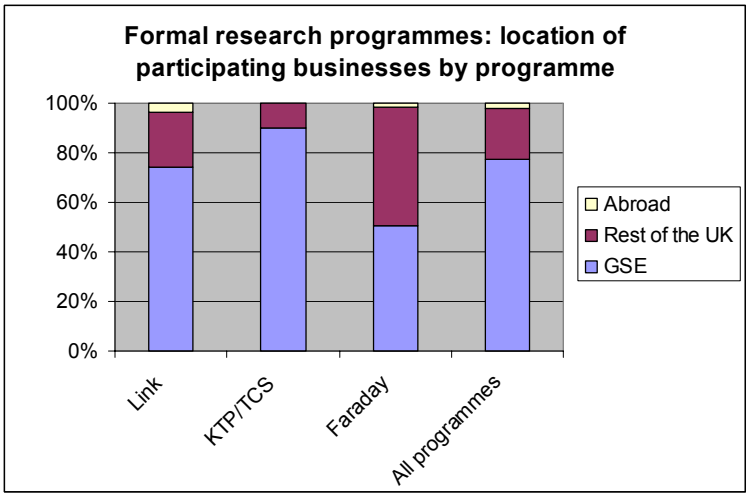
Looking at the three programmes as a whole (Table 4.8), more than three-quarters are focused on links between HEIs and businesses in the Greater South East. Breaking down the Greater South East into its component regions, the South East and London are the areas in which most of the businesses linked to HEIs in the Greater South East are based. Only 12.9% of businesses linked to universities through these three programmes are based in the East of England.

Table 4.8 Geographic spread of businesses linked to all South-East Universities via formal research programmes (LINK, KTP, Faraday)

Region	*Total number of businesses*	*%*
South East	187	38.3
London	125	25.6
East of England	63	12.9
GSE	375	77
South West	12	2.5
West Midlands	32	6.6
East Midlands	14	2.9
North West	12	2.5
North East	9	1.8
Yorkshire and Humber	8	1.6
Wales	4	0.8
Scotland	11	2.3
Northern Ireland	2	0.4
Abroad	9	1.8
Total	488	100

It is noteworthy that there are some differences in the weight of the GSE as a business location between the three programmes (Figure 4.5). The KTP/TCS has the strongest regional focus: 90% of businesses collaborating with universities located in the Greater South East are also based in the Greater South East themselves. The Faraday Partnerships, by contrast, appear to have the greatest geographical spread of business locations and the lowest share of businesses in the GSE, although 51% of businesses collaborating with universities in the Greater South East are still based in this area themselves.[15]

Figure 4.6 Spatial distribution of businesses by Knowledge Transfer programme

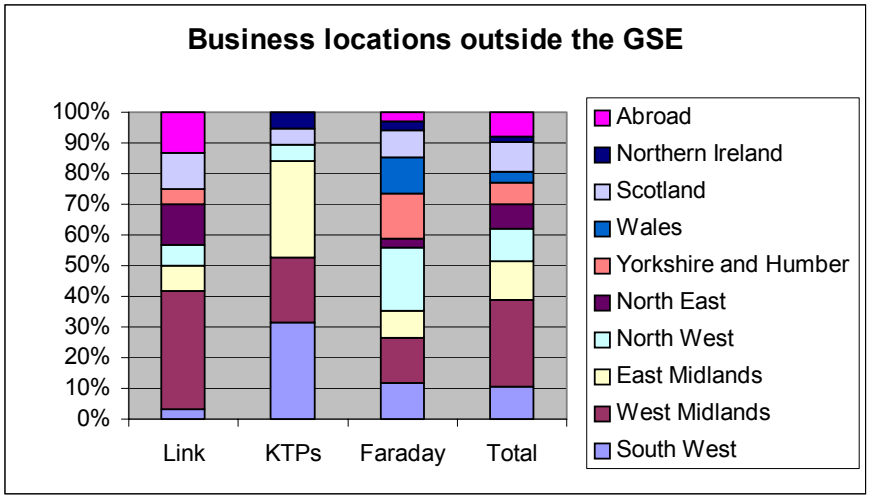


[15] This analysis is based on a sample of 7 current Faraday partnerships.

4.5.2. Spatial distribution outside of the Greater South East

Looking at all three formal research programmes together, 23% of businesses linked to Universities in the GSE are based outside London, the South East and the East of England. Figure 4.7 below shows more clearly where these businesses are based. Most are located in the West Midlands (6.6%) and the East Midlands (2.9%) followed by the South West (2.5%) and the North West (2.5%) as well as Scotland (2.3%). KTPs are most likely to be 'near-local' in the sense that most of the partners outside of the Greater South East are located in bordering regions. There are few links with businesses abroad, and these are primarily through the LINK programme. Of the 1.8% of overseas businesses linked to HEIs in the GSE most are located in the USA and Switzerland.

Figure 4.7 Distribution of programme partners outside the GSE



4.6. Future developments

HEI-business interactions are increasing. Significant resources are being brought to bear to stimulate these links. It is useful to examine where different people feel that growth will take place, as an indicator of the spatial focus of future efforts at stimulating co-operative and collaborative relationships. The differences between the perspectives of Heads of Department and the corporate offices responsible for industrial liaison (Table 4.9) is quite marked. Overall, nearly all Heads of Department (both those surveyed by e-mail and face to face) identify a strong increase in activity within the Greater South East, with around half feeling that activity elsewhere in the UK and overseas will also increase. The corporate liaison units on the other hand are more ambitious in their expectations.

Table 4.9 Expectations of future business contacts over the next 3 years

	Within Greater South East			***Within rest of UK***			***Overseas***		
	Dept	*Web*	*CLU*	*Dept*	*Web*	*CLU*	*Dept*	*Web*	*CLU*
Contacts will increase	81%	80%	90%	35%	53%	78%	46%	47%	90%
Contacts will stay the same	16%	13%	10%	62%	40%	22%	54%	47%	10%
Contacts will decrease	3%	7%	-	4%	7%	-	-	7%	-

5. FACTORS INFLUENCING THE SPATIAL DISTRIBUTION OF KNOWLEDGE EXCHANGE

5.1. Introduction

There is no single factor that substantially influences the propensity of universities and research establishments in the Greater South East to collaborate with businesses located elsewhere in the UK. Rather a variety of different factors are found to have an effect. Many of these are recognisable as influencing HEI-business collaborations more generally. In the web survey two-thirds of respondents reported that the barriers to working with businesses outside of the Greater South East of England were no greater than those facing academics wanting to work with businesses more locally. Only one-third thought that the barriers were greater. In no particular order of priority, seven dimensions influencing the spatial distribution of knowledge exchange have been identified through this study. They are:

- Proximity
- Industrial geography
- Capacity and resources
- Awareness and networks
- Willingness to engage
- Focus of activities
- Demand by firms

We deal with each in turn.

5.2. Proximity

Proximity has long been seen as an important feature in the development of HEI-business links. The value of nurturing a local R&D base is seen as an important feature of successful economic development, and lies at the heart of many economic development strategies. The data derived through this study appears to support the suggestion that proximity is an important factor influencing the spatial distribution of knowledge exchange and innovation. Yet, academics repeatedly report that proximity is not an important factor influencing the spatial geography of their linkages with business. A selection of comments regarding proximity are set out in Box 5.1. This view is supported by R&D intensive firms themselves. For multinational corporations relationships are forged on the basis of expertise rather than the geographic location of the HEI. For one firm, based in the North East, Southampton University was its favoured partner because - in this case - it was “where the science is at its best”.

Box 5.1 Proximity is not seen as a key driver:

In general proximity was not seen as a critical factor influencing the spatial pattern of university-business linkages. Typical comments included:

"Strategy is driven by industry needs/ sectoral opportunities - it doesn't matter where they are."
"Geography is not the point- its industry. Certain areas are better for certain industries."
"Spatial location is irrelevant to academics. (The HEI) undertakes research in locations where there are research units."
"Communications are such nowadays that distance is not as important after initial contact."

Where proximity does have an influence is in terms of initiating contacts, as hinted at in the last comment in Box 5.1. Universities and academics can have a better awareness of their local market and travel costs (in terms of money and time) tend to be lower. As one academic reported, it is more difficult to gain access to businesses outside the GSE as they are further away. This makes it more difficult to engage with them. These two factors appear to favour the development of local links all other things being equal. We come back to these points later.

In other cases, such as Knowledge Transfer Partnerships and student placements proximity is a much more important influence. In these instances depth and frequency of contact, coupled with residential preferences appear to be important influencing factors. The vast majority of placements are proximate to the HEI. In some cases this is due to the requirements of the HEI, for example, for some courses it is a requirement that the student lives locally, so restricting the opportunities to undertake placements further afield. In others it is due to the preference of the students, and in others it is due to the contacts base of the HEI/academic arranging the placements. Where placements are more widely distributed they tend to be with companies with which the department has a long standing arrangement. It appears that the tendency for placements is tending towards more localised ones in the UK and a greater proportion of overseas placements, reflecting the increasing numbers of overseas students.

This supports recent work by Adams and Smith[16] who assert that not all knowledge transfer activity is the same. They suggest that for R&D intensive collaboration proximity is not a factor but raise the question as to whether it might be more important for other types of knowledge transfer activity. Our work suggests that this is indeed the case.

[16] Adams J and Smith D (2005) Research and Regions: An overview of the distribution of research in UK regions, regional research capacity and links between strategic research partners. HEPI

5.3. Industrial geography

Industrial geography has a significant influence on the spatial distribution of links between universities, PSREs and business. This is either in terms of where concentrations of industrial activity are located, or particular clusters, or types of firms. For example, 80% of the work of the Institute of Manufacturing (University of Cambridge) is reported to be located outside of the Greater South East of England, whilst Art and Design Schools reported that they had strong links with London as this was where many of the design houses they worked with were located. The largest research intensive firms are also generally located in the Greater South East of England. Data reported in this report and in Adams and Smith (2005) amongst others demonstrates that the three regions in the Greater South East account for 60% of company R&D spend and 75% of company research publications. There is thus a strong coincidence of location, increasing the apparent focus on intra-regional activity.

Market pressure has also been suggested to be a significant factor influencing the spatial distribution of graduates from HEIs in the Greater South East. As the market for graduate labour has strengthened in the Greater South East the proportion of graduates remaining in the region has increased.

5.4. Capacity and resources

A fundamental constraint on the development of links between businesses and individual researchers is the capacity of the institution or the individual to develop available opportunities. Time and money is the most often cited barrier to developing more links with business in general. Teaching loads, staff-student ratios and other commitments were all reported as impacting on the time available to work with business. The real effect of this seems to be in terms of the amount of time staff have to spend on developing contacts and relationships with businesses. In terms of priority ranking it appears that the Research Assessment Exercise (RAE) comes first, teaching second and developing business links third. At least one respondent reported that making contacts with business was fitted around whatever spare time was available. In other cases where there is no RAE related funding, teaching took priority, with business related activity still undertaken in 'spare' time.

Financial costs to the individual or the department were also acknowledged to play a part in limiting the number of contacts acted upon, or the distance over which these would be acted upon. As one respondent reported: there are no barriers distance-wise if you have knowledge of the latest technology. However, where there are limited resources you need to be selective.

Together these two factors can effectively limit the range over which HEIs are able to operate. Where resources are scarce then more distant links are less likely to be developed, at least initially. Although the comment related to links within the Greater South East one Head of Department from the East of England noted that academics

tended to develop links with firms based in London rather than the north of the region because the public transport links were better.

The capacity of central resources, such as technology transfer offices or corporate liaison units is an increasingly important resource and one that influence the spatial distribution of links with business. For many HEIs corporate units have only recently become significant agents and they are still finding their feet. There is then a strong learning curve. It is also reported that in some cases staff turnover and a difficulty in attracting staff with sufficient experience has impacted on the effectiveness of their work. This issue is exacerbated by the number of fixed-term contracts owing to the short-term nature of much of the funding in this area to date. Resourcing of these units is rising, and rapidly so in many cases, suggesting that the capabilities and knowledge base of these units will be an increasingly significant factor influencing the spatial distribution of knowledge transfer activities in the future.

5.5. Awareness and networks

Making the initial contact with business recurs as one of the important factors underpinning the number and distribution of HEI-business linkages. A lack of contacts was reported as the second most common restriction on developing links with business. In this respect, one academic pointed out, awareness of those businesses that might be interested in academic collaboration is an important factor in developing contacts.

Successful relationships rely upon academics having a good understanding of the research needs of business. This is an area where at least some academics feel that their knowledge is lacking, a point reinforced in our discussions with businesses. The engagement of a central resource to make these contacts is not always a solution to this difficulty.

Networks are an important source of contacts, they act as a filtering mechanism – screening out those that are not interested or do not have something to offer – and reduce the potential transaction costs of contact development. The membership of such networks clearly influences the geography of relationships. Some networks are national industry bodies, the national composites network for example, others are more regional. Some, such as the London Technology Network, have started regionally but are now serving as a wider contact point and, in the words of one academic, “help to bring in businesses from further away”.

Collaborative networks can of course act to restrict linkages as well as to expand them. In a paper produced for this study the EPSRC observes that HEIs in both Yorkshire and London tend to rely more on intra-regional collaborations with other HEIs than might be expected. They put this down to the strength of intra-regional ties, such as between Imperial College and University College London in London and the White Rose partnership between the Universities of York, Leeds and Sheffield.

Awareness is also a factor in influencing collaborative choices by business. Box 5.2 illustrates some of the comments made on this point. Reputation – either of the individual or the institution[17] - is seen as a fundamental influence on the choice of who to approach. Those with wider reputations will, all things being equal, receive greater numbers of request to collaborate.

Of course, awareness is not just about reputation. It is also about knowledge of who works in a certain field. This knowledge can be transmitted in different ways. At times it is held in databases, sometimes it is based upon student and graduate links, other times it is linked to sectoral networks and at other times it is about being known in a region.

Box 5.2 The importance of reputation

Awareness of what an institution has to offer, its reputation and that of its staff are strong components influencing the extent to which businesses will contact university departments and PSREs. This can also influence the spatial geography of linkages, although - as the comments below demonstrate - not always in the ways we might expect.

Awareness of institution – "people are not aware of us as a resource and our skills"; "We are not good at promoting ourselves"; "marketing /communication is a weakness"; "we need to be more creative"
Image and perceptions – "sometimes it is easier for the University to work with businesses abroad as issues of reputation do not apply"

A lot of effort has been expanded on overcoming the knowledge deficit and bringing businesses and academics together. Formal innovation programmes, such as KTP and the Faraday Partnerships operate alongside broader 3rd stream funding through the Higher Education Innovation Fund (HEIF). Yet despite all these resources businesses still reportedly find it difficult to know who to work. Clearly the focus of efforts to build awareness and bring potential partners together will have a significant influence on the spatial distribution of knowledge transfer activities. We address this point further when we look at the focus of activities.

5.6. Willingness to engage

It should not be assumed that all researchers and academics wish to work with businesses. Many do not see this as part of their job. For others it is a key component. Several of those spoken to as part of this research reported that the average academic is mainly concerned with developing links to support research activity. The success of this is largely measured in terms of the level of funding received from the research councils. There is therefore a natural pull towards pure as opposed to applied research, although this also depends on the individual. The lack of tradition for this type of activity, the inertia, cultural barriers and the fact that linkages with business are not seen as part of the academics job were all seen as potentially

[17] HEI, Department, School, College or PSRE

reducing the willingness of individuals to engage with this debate. There are though signs that this is changing.

The willingness of individuals to work with business is, in part, influenced by the reward structures in place. It is argued that current reward structures do not encourage high levels of collaboration with business. As one commentator put it: "Industrial research seems to be lower value than government and academic research activities, which is very unfair as industrial research is just as important." Some HEIs have recognised this and are now starting to recognise practical applied research as part of their promotions criteria.

The willingness to engage with business is only likely to indirectly influence the spatial distribution of knowledge transfer activities - in so far as academics favour some types of firm, knowledge transfer activity or industrial sector over another.

5.7. Focus of activities

The focus of efforts to stimulate knowledge transfer activities is perhaps the single most important factor currently influencing the spatial distribution of these activities. It is fair to say that no HEI or Department interviewed adopts an overtly spatial focus to their activities. In nearly all cases the emphasis is on developing links with businesses wherever those might be located. Any spatial dimension is an unintended outcome of those decisions. As one commentator reported: "the CLU don't think in 'geographical' terms. Although London is important and will remain so, the strategy is driven by sectoral considerations and knowledge transfer opportunities - where these are is immaterial"

However, it is also clear that for at least some HEIs the spatial geography of their business contacts is becoming a stronger consideration. Two competing pressures appear to be emerging. One is to adopt a stronger intra-regional focus and the second is to adopt a stronger inter-regional focus. Needless to say, this may lead to some confusion.

HEIs certainly perceive that there is a strong pressure to focus on generating intra-regional benefits. The decentralisation of policy and resources to the regional level reinforces this perception. This is influencing behaviour. One leading HEI reported that it is not a regional HEI but it is happy to 'do' this and tick the regional box. The increasing regional emphasis of HEIs in the Greater South East is reflected in the few spatial targets that can be identified for business development by corporate liaison units, as can be seen in Box 5.3. If carried through these effectively work against the development of a wider spatial focus.

Box 5.3 Spatially relevant targets at 3 HEIs

- Increase the number of KTPs (currently 10), of which 30% are regionally based in LDA/SEEDA, to 20 by 2006 of which 50% will be regionally based.
- By 2007 25 business partnerships with regional corporations will be established
- For a third no targets are stated but its 5 year Strategic Plan emphasizes the regional role of the University

This perception of regional prioritisation is a powerful message which may impact on the spatial distribution of business-HEI links through influencing the promotion and marketing of HEI activities. The development of stronger working links with the RDAs is also beginning to have an influence on the focus of activities of, at least, some HEIs. For example one informed this study that in terms of working outside the Greater South East there are no real barriers as they work mainly with manufacturing businesses. However the increased working links with SEEDA means they are focusing more on the SE itself and therefore have reduced capacity to work elsewhere.

There is as yet no countervailing pressure to adopt an inter-regional approach, although there are signs – of which this study is one - that this is becoming a stronger consideration. There is also some hesitation amongst some HEIs as where this is leading. As one university interviewee reported, geography is irrelevant as (the HEI) just wants to work with the best, wherever they are, so pushing the regional agenda does not necessarily sit well against this.

A second force limiting the spatial distribution of business-HEI links is a reported reluctance for HEIs to enter into direct competition with each other in developing business contacts elsewhere in the country. It is argued that HEIs seek to complement each other, rather than compete. For example one commented that in order to expand work at the national level they would have to compete with other universities and they currently feel that they would rather complement the work of others rather than compete. Another observed that they might transfer knowledge beyond the GSE by working with other universities. From the data available from the research councils this is clearly happening, although it has not been possible to test these assertions further.

A final factor influencing the focus of HEI activity relates to responsibility for developing contacts with businesses. At present responsibility is generally shared between HEI corporate functions, individual departments and individual academics. Each has their own priorities. In only limited cases do these have an explicit spatial dimension, and, as we have highlighted, this tends to be intra-regional. The wider spatial distribution of knowledge transfer activities is nobody's responsibility and arguably is not in anybody's interest. Consequently there is little or no focus on this dimension of knowledge transfer and innovation.

5.8. Demand for knowledge transfer activities

The final factor that influences the spatial distribution of knowledge transfer activities is the demand for such activity. This is a function of firm type as well as the nature of the knowledge transfer activity being considered.

Relationships with SMEs appear to be more likely to be localised whereas those with firms which are larger are less constrained by distance. As one Head of Department commented: "We probably wouldn't be involved in start-ups in Birmingham or Newcastle and medium sized companies beyond a 50-60 mile radius". In another case the corporate liaison unit felt that the main impacts beyond the Greater South East were through relationships with large global businesses.

There is though no single preference for working with larger firms or SMEs. Each has its advantages. The contrasting views are illustrated in Box 5.4. For some Departments, SMEs are the most important because they represent the industrial landscape and since the amount of their activity is increasing. Small companies it was said might do DTI-funded research and these smaller research projects are very useful, as working with small businesses means that it is possible to have a lot more influence. However, in some industries it is only the large companies that have the resources to engage in research orientated activities. Large enterprises are also seen as important because they are more likely to get involved in course development and add value

The general tenor was summed up one Head of Department who stated "You will find people here who are familiar with start-ups and you will find people who are familiar with large MNCs. We do not want to be pigeon-holed as a department dealing with a particular stage of business development or size of company."

Box 5.4 Divergent views on the importance of working with SMEs vs larger firms.

There is no clear pattern relating to the attractiveness of working with SMEs versus larger firms. As the following comments demonstrate opinion is divided and each has perceived advantages:

"Larger firms generally, because they can afford contract research. However, the knowledge networks is a way of reaching out to SMEs."
"Most income generated from work with large/multi-national firms and public sector."
"More focused on national firms or MNCs. Difficult to work with SMEs because of operational timescales."
"Strategically SMEs are more important as they require other organisations to carry out research for them."
"SMEs because they offer niche opportunities. Takes a long time to develop relations with blue-chip companies."

Finally one PSRE noted that they do world class research and that local and regional networks have not been good in terms of business for them but have been good for the businesses themselves because it allows them to stay up to date with latest developments. Whilst the comment is signaling the importance of wider spatial links to this PSRE it serves to remind us that in encouraging knowledge transfer activities we must ensure that all parties stand to benefit in some way.

6. THE ROLE OF PUBLIC SECTOR POLICIES/INTERVENTIONS

Having examined the spatial distribution of HEI activity, in so far as this has been possible, and the factors influencing this we now turn to the implications of this for public sector policies and interventions. We do not prescribe detailed policy recommendations but highlight the principal issues facing public policy makers. We focus on those factors influencing spatial distribution rather than HEIs' contribution to innovation, spin-outs and graduate recruitment *per se*.

6.1. The current policy focus

The current emphasis of public sector policies and interventions supporting knowledge transfer appears to be focused at two levels. Firstly it focuses on building capacity within HEIs to engage with businesses. These efforts have been successful at building capacity but the results of this are yet to be seen[18]. The most visible results of HEIF for example have been in terms of building collaborations between universities, generally at a regional level, and stimulating their engagement with regional business support organisations[19]. Secondly policy has focused on stimulating spin-outs and licensing, such as through the University Challenge Fund and Public Sector Research Exploitation Fund. Publications by the Lambert Working Group to assist HEIs grappling with such things as IPR agreements reinforce this message. The attraction to HEIs of gaining a commercial return from the outputs of research should not be under-estimated either. However, licensing and spin-outs are a very small part of knowledge transfer activity, one multinational described licences "as a sprat to catch a mackerel". Spatially, spin-outs have been described as local whilst licences are seen as global.

These policies are, broadly, aspatial. The spatial effects of their implantation rely upon the focus of university, PSRE and businesses. If policy makers wish to see a stronger more explicit inter-regional dimension to HEI activities then public policy interventions may need to recognise this, rather than to rely on the unintended outcomes of aspatial policies.

In contrast there appears to be an implicit spatial emphasis on strengthening the intra-regional benefits of HEI activity underlying public policy at present. This is certainly the perception of the HEIs involved in this study and of many of the public bodies we spoke to. Where spatial targets exist these are regional rather than inter-regional. We cover this dimension more strongly in the following sections. There is thus a strong regional push to developing relationships between businesses and universities within the Greater South East.

[18] SQW 2005 Interim Evaluation of Knowledge Transfer Programmes Funded Through the Science Budget

[19] SQW *ibid* Executive Summary and pp20-21.

Businesses are encouraged to engage with academia through a range of initiatives, primarily managed by the DTI, although there are some regional examples – such as Jumpstart in London. The regional dimension is gaining importance with recent initiatives such as the decentralisation of R&D grant to the RDAs. These initiatives rely upon partners successfully seeking each other out, or some form of facilitation to help achieve this. There is no wider spatial element to these policies. Schemes such as KTP have a strongly local focus, owing to the fact that participants feel that proximity is important to enable the value of personal contacts to be realised. In some cases, such as Jumpstart, businesses are encouraged to work with HEIs regardless of location. This is right and proper. However, we were unable to find evidence of similar schemes in the Greater South East encouraging HEIs to work with businesses regardless of where they were located.

Interviewees acknowledged the real benefits that emerge from regional activity but also stressed that too strong an emphasis on the regional dimension can reduce the aggregate effects at the UK scale. The question facing businesses is how to access the most appropriate knowledge, regardless of location.

If a wider spatial distribution of HEIs' activities is truly desirable then positive policy messages are required to encourage this to occur. Developing a stronger inter-regional dimension to HEIF 3 may be one means of developing this. However, this would require positive guidance to potential member institutions. Whilst it is beyond the remit of this study to make recommendations in this field, a stronger sectoral focus at this level would appear to be valuable. Interesting lessons might perhaps be taken from approaches adopted by multinational corporations in developing networks of expertise.

6.2. Brokering connections

A recurring criticism of efforts to bring academics and businesses together is the current lack of knowledge of what expertise resides where. As one business leader reported to a workshop organised by the SBS in 2003: "In a particular technology area you need to know which university/professor is active in the area". The costs of acquiring this knowledge are a barrier for many companies, and academics. Efforts to make such knowledge acquisition simpler and more straightforward are required.

Mapping of key areas of expertise and knowledge strengths within each region and the development of a common database would go some way towards improving levels of information here. This is already occurring within regions, for example i10 in the East of England now has a database of more than 10,000 academics. At a national level a basic framework is also in place, for example on the UK INVEST website. Bringing some order to the various initiatives underway in this field can only assist efforts to overcome information asymmetries and support efforts to stimulate effective inter-regional relationships.

Whilst effective databases can be an important start they are not enough on their own. Evidence taken by the SBS suggests that businesses are looking for a 'human face'. Stimulating effective relationships between businesses and HEIs requires a more active brokerage role, by facilitators that have a strong specialist knowledge of where expertise lies. Networks, such as the London Technology Network, can play an important role in this regard. One of the success factors behind networks is that they improve the participants' knowledge of what expertise exists where and which businesses are potentially interested in academic expertise. Specialist business advisors, acting in a trans-regional capacity can also prove valuable brokers.

6.3. Performance measurement systems

Performance measurement systems influence actions in ways that deliver those things that are being measured. Current performance measurement systems are criticised for failing to reward academic-business collaborations focusing instead on research and teaching. There are signs that this is changing. This is a positive move and performance measurement systems that reward academic-business collaboration are to be welcomed. There is no certainty that such systems will promote inter-regional collaborations. Indeed, they may reinforce the regional focus identified above, either explicitly or implicitly.

If policy makers desire a stronger focus on inter-regional collaborations then performance measurement systems must be designed that reflect these objectives in meaningful ways.

6.4. No clear lines of responsibility

Stimulating HEI-business interactions are still at an early stage and roles and responsibilities are poorly articulated. Currently, all parties are working towards their own agendas within an overall framework of encouraging HEI-business interactions. This is reflected in the policies and the actions of the different actors. Some dimensions, such as inter-regional distribution of these linkages, are not part of the picture and form an unintended outcome of a broader agenda.

The recognition that a stronger interface between business and HEIs is needed is not a surprise. As recently as 2003 the SBS was reporting that there was a poor interface between HEIs and the then Business Links was very poor. As part of the current study we have been told by a Government official that it is "the responsibility of businesses to approach HEIs" and by an employers representative that "it is for the HEIs to approach business". In reality only rarely does either have the time or the knowledge to do so effectively. In practice this knowledge is held by the larger research-orientated companies or is mediated by academic departments or corporate units based within HEIs. Their knowledge tends to be regionally biased or focused on leading players within the industry.

Networks can and do play an important role in facilitating more effective interactions between businesses and HEIs. They act as a neutral meeting space and also provide a valuable filtering mechanism, ensuring that participants meet those that have something to offer, reducing the likelihood that time will be wasted. Networks that bring in businesses from outside of the region can stimulate inter-regional activities. Those that focus internally will naturally favour intra-regional linkages. Where academic time is limited this may lead to local linkages being progressed over national ones, all other things being equal. Where we are interested in stimulating wider spatial impacts then extra-regional networks should be encouraged.

6.5. Recognising the importance of firm-size

A strong message that has emerged from this study is the influence of firm size on the spatial distribution of business-HEI interactions. It has been put to us that whilst smaller firms tend to engage with KTPs and large firms are able to resource collaborative projects and develop links with universities, larger medium-sized firms are being overlooked in efforts to stimulate business-HEI interactions.

The size of the firm also influences the spatial geography of knowledge exchange and innovation between universities, PSREs and businesses. In general, and there are exceptions, smaller firms tend to look within a narrower search area when searching for academic links. Academics also tend to look more locally when seeking small and medium sized firms as partners. Large firms, multi-nationals and those that are research intensive do not regard geography as important. They work with the best, wherever those might be located. Equally, academics seeking to work with these firms are not constrained by geography. The question is how such contacts are initiated.

6.6. Strengthening access to knowledge

Stimulating the demand for knowledge is now a key component of public sector efforts to stimulate innovation. As we have seen though efforts in this direction tend to be aspatial or regionally focused, by default if not be design. Whilst there are some good examples of initiatives designed to access knowledge generated outside of the region these tend to be the exception rather than the rule. In the case of i10 for example, inter-regional connections are made on an informal basis through connections with similar initiatives in other regions.

However, stimulating demand for business-HEI collaborations may be missing a key dimension of knowledge exchange. The greatest contribution that HEIs make to knowledge transfer tends to be through the contributions made to published papers, conference presentations and informal advice. Whilst collaborative research and consultancy activity can benefit individual companies or organisations the development and publication of new knowledge has the ability to reach a wider audience.

How to help small and medium-sized firms access knowledge generated from outside of their region is a key question for public policy. Related to this is the question as to whether it is feasible (or even desirable) to encourage direct links between SMEs in one region and an HEI in another on a significant scale. The challenge facing public agencies is, perhaps, how to assist the dissemination of knowledge. At one level this may involve generating a stronger innovation culture amongst firms more generally, reaching to both managers and employees. HEIs can assist with this but this is outside of the remit of this study. At another level public agencies such as the Manufacturing Advisory Service provide a valuable service informing companies of new developments. Strengthening linkages of bodies such as these with new developments emanating from academia is an important dimension to spreading the knowledge generated in HEIs more widely, and can ensure that publicly funded research benefits companies and organisations across the UK.

At a regional level there is, potentially, a strong role for the regional Science and Industry councils to consider how to draw externally generated knowledge into a region to the benefit of the firms located there and which do not necessarily wish to undertaken collaborative work with HEIs on an individual basis. Developing joint action-research projects may be a means of developing capacity in this area. Another may involve the stimulation of networks and targeted seminar events. RDAs also clearly have a significant role to play here.

'Selling' the results of research undertaken in HEIs in the Greater South East to other regions in order to broaden the spatial reach of this work is not regarded as helpful though. HEIs for one have expressed a view that they prefer to collaborate in their relations with HEIs located elsewhere rather than compete. The challenge for public policy is to develop mechanisms which tap into expertise wherever that is located in ways that deliver that knowledge to firms across the UK in appropriate and accessible ways.

6.7. Student placements

Student placements are a very effective means of knowledge exchange, both into firms and into academia. They can also be a good starting point for developing longer-term and wider collaborations. However, the majority of placements tend to be local owing to preferences on both the academic and the business side. Where placements are not local these tend to be with large companies that have strong relationships with particular departments or academics. Whilst student placements should be encouraged there is little evidence suggesting that the spatial distribution of placements should be a focus for public policy interventions.

6.8. Building capacity (and skills)

Stimulating HEI-business interactions is rapidly developing as a key area for economic development. Some HEIs have a long track record of working in this area, others are less advanced. RDAs and regional Science and Industry Councils are

recent entrants to this area and their role is still developing. Business intermediaries, such as Business Link, are not yet fully engaged with this process.

Strengthening the capacity of actors to operate in this area is an important facet of public policy. This is beginning to occur within HEIs and PSREs through the resources made available by HEIF and PSREF. The short-term nature of these funding streams though is causing its own difficulties, partly in terms of developing consistent longer-term strategies but also for the recruitment and retention of staff with the requisite contacts and expertise. The support for Business Fellows within departments is making a substantial contribution to the ability of HEIs to interact with businesses and further support should be provided to expand their effective reach.

Developing the capacity of RDAs and Science and Industry Councils to engage in this important policy area has also been identified by the OST as a priority area. We would endorse efforts to support actions in this area, particularly in terms of co-ordinating and rationalising the range of actions that are already present. One recurring plea from all sides in the debate has been not to increase the number of initiatives and organisations already involved in this area. As one commentator put it 'don't set up new bodies or forums' make better use of those that are already engaged.

Simply enhancing capacity will not necessarily lead to any change in the present geography of course. The focus to date has been on developing HEI-business interactions *per se* regardless of geography. More recent efforts have tended to strengthen the regional dimension. Efforts to develop capacity should take into consideration the wider benefits that HEIs can provide to knowledge exchange and innovation and not focus too narrowly on a limited range of interactions. Only by doing so will the spatial dimension of HEI-business interactions be potentially influenced.

7. CONCLUSIONS AND RECOMMENDATIONS

The study set out to identify the contribution that universities and research establishments located in the Greater South East of England make to knowledge transfer and innovation in the UK, particularly those regions lying outside of the Greater South East. It has struggled to do so in any definitive manner owing to the paucity of information available on a spatial basis.

From the information available we are able to suggest that of the total sum of knowledge transfer activity undertaken in the Greater South East, **somewhere between one third and a quarter occurs with partners outside of the area**, evenly split between elsewhere in the UK and overseas. **Approximately 25% of all graduates educated in the Greater South East are in employment outside of the area six months after graduating**. At least some of these graduates will be supporting knowledge transfer.

It is difficult to identify whether the contribution made by universities and research establishments in the Greater South East to knowledge transfer and innovation in the rest of the UK is greater or less than might be expected. There are no benchmarks here. Comparative analysis of HEI-HEI linkages involving EPSRC funded programmes suggests that the universities of the Greater South East are amongst the most open in their collaborative relationships.

What emerges strongly from the study is that **not all knowledge transfer activity has the same geography**. Some is inherently more localised than others, this study has identified the different geographies appertaining to KTP, LINK and Faraday Partnerships. Participation in EU Framework Programmes, which is substantial, will also – by definition – involve overseas partners, although the respondents to this study were unable to identify their location. Activities involving smaller firms and student placements tend to be more localised than collaborative research and consultancy work with larger firms. Where the latter occurs within the Greater South East this is less a feature of the power of proximity but more reflective of the concentration of such firms within the Greater South East of England.

Similarly, **the spatial reach of the universities and research establishments studied varies.** Put simply, research establishments and the leading four research universities tend to have a stronger national and international focus than universities that receive less research funding. Not all Departments are the same though and several departments in universities that receive lower levels of research funding have a very strong national and international orientation. . This is a consequence of a complex interplay of factors which influence the outlook of individual Departments.

In considering the spatial outlook of different departments it seems that five ‘types’ can be broadly identified:

- Type A – these are the universities and research establishments where the links with business are predominately localised in the region. The clearest examples are the departments within Anglia Polytechnic University and London South Bank, where the majority of departmental links with industry are within the region.

- Type B - these are the universities and research establishments that extend their links beyond the region but generally establish their business linkages to neighbouring regions, although not exclusively. The clearest example of these, in the study, is the departments within the University of Reading which has established a focus beyond its region to establish links with business in the Greater South East.

- Type C - these are the universities and research establishments where the links with overseas businesses are more extensive than the links in the region and UK. The department in the study where this applies is Medical Physics and Bio-Engineering at UCL, space science at CCLRC and to a lesser extent to the School of Fashion at Central St Martin's, University of the Arts.

- Type D - these are the universities and research establishments which have established links with businesses at the local, regional, extra-regional and international level. The departments in the study where this applies are those within Institute of Food, Brunel, UCL, Oxford (SAID) and Cambridge. Like most global brands, these organisations recognise their unique and distinct role in local markets but also adapt to ensure effective national and international positioning.

- Type E - these are the universities and research establishments where the links with businesses across the nation are more extensive and significant than any other spatial level, including those overseas and the region. The departments in the study that this applies to includes a few from Cranfield University and Engineering at CCLRC.

Inter alia, the factors which influence the spatial geography of universities' and research establishments' contribution to knowledge exchange and innovation include the focus of current public policy interventions, the influence of performance measurement systems and unclear lines of responsibility.

On the whole **public policy interventions are presently designed either as aspatial policies** seeking to stimulate knowledge exchange and intervention between researchers and the business community, **or to strengthen the role such actions play in the regional economy**. Arguably, the focus to date has been on developing university-business interactions *per se* regardless of geography. More recently a stronger regional emphasis has become apparent. HEIs and research establishments have reacted positively to these messages and the related incentives. This has had an influence on the geography of knowledge exchange initiatives practiced by universities and research establishments located in the Greater South East of England.

Assessing the contribution of universities and research establishments located in the Greater South East **to knowledge transfer and innovation activities benefiting the rest of the UK is a new dimension;** and one that has not previously been emphasised strongly. **It is also, potentially, at odds with the stronger regional orientation that has, at least implicitly, been promoted in recent years**. A message emerging from the study is the potential ambiguity in the policy objectives surrounding knowledge transfer and innovation activities and the risk of unintended side-effects emanating from unclear policy messages.

Performance measurement systems and reward structures are reported to undervalue efforts made in developing 3rd stream activity. This in itself leads to a reduction of efforts in this direction but does not - directly - influence the spatial geography of knowledge exchange activities. However, evidence has been found that where spatial targets are included in the performance measurement systems of some corporate liaison units (or industrial development offices) they have been focused on strengthening the regional dimension of the universities activities. Where these targets influence action then the spatial reach of these universities will be reduced.

At present, **responsibility for developing the role of universities in knowledge exchange and innovation is divided**. Individual academics pursue their own agendas developing links with businesses for research or teaching purposes, or to develop more commercial arms to their activities. Departments engage in a similar range of activities, to a greater or lesser extent, with varying degrees of formal engagement. Increasingly universities are developing corporate resources that can act as intermediaries in stimulating knowledge exchange activities. Whilst each of these can have a different set of objectives and motivations it appears that in practice **the principle motivating factors break down into 3 parts: to work with the best, to work with those representing the industry wherever they be located and to work with those easiest to reach.**

The value of **networks and 'active brokerage' arrangements appears to be commonly accepted**. Knowing who to contact - whether in a university/research establishment or in a business area - is one of the principal constraints on effective knowledge exchange. Developing such networks and supporting resources (such as databases) underpins much of the work promoted by the Higher Education Innovation Fund. Few of these networks take a strong approach to engaging with businesses located outside of the region in which they are located.

There is a value in strengthening local networks and promoting local and regional cluster development. **However, too strong a focus in this area may be overlooking the important inter-regional dimension to knowledge transfer** and the benefits of extra-local connections both in terms of economic stimulation and preventing lock-in[20]. As Malecki and Oinas identify, the theme of extra-local

[20] DTI 2003 A Practical Guide to Cluster Development

relations which is recurrent in concepts such as innovative milieu, industrial districts and clusters is "mainly paid lip service rather than fully discussed"[21].

Recommendations:

Universities and research establishments are increasingly contributing to knowledge exchange and innovation. Their engagement with business is being stimulated by changing market conditions as well as policy interventions encouraging such actions. Universities and research establishments are actively engaged in seeking to further develop their links with businesses and to make more of the knowledge that is generated by and contained within their organisations. In the course of the study we have identified a number of elements that influence the effectiveness of existing efforts to stimulate interactions between businesses and universities and research establishments.

These include the fact that – in contrast to research and teaching resources – funding for initiatives designed to increase university-businesses linkages tends to be of a short-term nature. This reduces the ability of institutions to engage in longer-term strategy development. It also hinders the ability of institutions to build up sufficient experience and capacity to effectively develop 3rd stream activities. It also sends an unfortunate message in terms of the relative importance of working with business. **We recommend that funding for 3rd stream actions is based on a more long-term approach, providing a level of certainty around which strong strategies can be formed.**

It is also apparent that in seeking to promote interactions between businesses and universities and research establishments a lot of attention has been placed upon stimulating the commercialisation of new discoveries or promoting bi-lateral arrangements through co-operation and collaboration. Whilst these play a substantial role in stimulating knowledge exchange and innovation they overlook the importance of strengthening access to knowledge generated within the research sector more generally. **We recommend that RDAs encourage a stronger discourse between researchers and businesses** in ways that encourages a sharing of ideas rather than seeking to develop specific collaborative or co-operative relationships. This may be facilitated through expert intermediaries.

The study has been concerned with assessing the contribution that universities and research establishments make to knowledge exchange and innovation across the UK as a whole and overseas. The lack of available data detailing the spatial dispersion of activities undertaken by universities and research establishments has hindered our assessment of this contribution. This is unfortunate if the spatial agenda is regarded as an important dimension to understanding patterns of knowledge exchange and

[21] Malecki EJ and Oinas P 1999 Making Connections: Technological learning and regional economic change p.11

innovation in the UK. **We recommend that universities and research establishments are encouraged to make available the information that they report to the biennial HEBIS in order to further our understanding of this important topic and to improve policy making in this area.**

Public policy objectives are currently influencing the spatial distribution of knowledge exchange and innovation activities. At present these are strongly focused on stimulating intra-regional initiatives. At least some universities also perceive that they are being encouraged to adopt a more 'regional' focus. **We recommend that a stronger emphasis on developing inter-regional initiatives is adopted if the objective is to maximise the contribution that the UK's universities and research establishments make to the UK economy as a whole**. Such positive policy actions are required if the geography of knowledge transfer activities is not to be the *de facto* consequences of a series of aspatial interventions. **We also recommend that universities, RDAs and other agencies review their performance measurement systems to ensure that these reflect their true spatial aspirations.**

In taking positive action **the differential geography of different knowledge transfer mechanisms should be taken into consideration**. Schemes such as KTP tend to be more locally orientated than Faraday Partnerships for example. In seeking to stimulate inter-regional knowledge exchange and innovation universities, research establishments and other agencies should identify what they are seeking to achieve in each of these areas and tailor their actions accordingly.

Establishing an outward looking dimension to existing efforts to stimulate knowledge exchange and innovations by universities and research establishments in the Greater South East will assist in strengthening their national contribution. **Business Fellows have proved a successful means of raising levels of knowledge exchange activity** within university departments and **we recommend that they play a key role in efforts to broaden the spatial reach of these activities**. In order to provide the extra-regional perspective and bring together relevant potential partners we suggest that these are linked to **support for specialist advisors working with the business sector**, through a national network of contact points, with links to other advisory agencies such as the Manufacturing Advisory Service.

The **public sector research establishments and leading research funded universities have a stronger relationship with businesses located outside of the Greater South East** than those universities which receive less research funding. Actions with these universities and other centres of excellence with strong national and international connections will make a strong national contribution to knowledge exchange and innovation and **we recommend continuing support for their research and development activities. We also recommend that greater attention is focused on promoting activities in the universities that are not part of the Russell Group** in efforts to strengthen their national contribution to knowledge exchange and innovation, as this is an area where strong gains can be made.

The Greater South East is a science-based region. It contains the majority of private-sector R&D activity in the UK and a strong public sector research base, including 6 of the leading research-based universities in the UK and a plethora of globally renowned Departments and research units located in other universities. The advantages of the three regions that comprise the Greater South East working together to stimulate knowledge generation, knowledge exchange, innovation and economic development are substantial and recognised. The value of working together with other regions is equally significant. Regional innovation systems are set within national systems.

Integrating the national-regional interface is the challenge that lies in front of us. **We recommend that the three regions work together with other regions and the UK Government in order to explore how the benefits of this critical mass can effectively add value to the wider UK economy, whilst strengthening the research and innovation base across the UK as a whole**. At present the relationships are based upon the individual strategies and preferences of particular companies, universities, research establishments and individuals. There is room for a more strategic approach. One model demonstrated to us was the establishment of several networks of leading research units – in this instance located across the globe – led by one identified centre to provide specialist advice and expertise to a particular multi-national company. **We recommend that similar models be considered in efforts to stimulate the national contribution that universities and research establishments make to knowledge exchange and innovation.**

GLOSSARY AND ABBREVIATIONS

Glossary

CASE (Cooperative Awards in Sciences of the Environment)	Research study (usually PhD) involving joint supervision of the student by a member of staff from an academic institution and a scientist from business, commerce or the public sector
EU Framework Programmes	The main instrument of the EU's research policy. Funds collaborative research projects in specified thematic areas
Faraday Partnerships	An alliance of organisations and institutions that promotes improved interaction between the UK science, technology and engineering research base and industry. There are currently 24 Faraday Partnerships in the UK. Each partnership employs technology 'translators'.
HEFCE (Higher Education Funding Council for England).	One of four Funding Councils in the UK. Funds higher education at universities and colleges in England
HEBIS (Higher Education Business Interactions Survey).	Biennial survey of universities setting out their interactions with businesses and commercial activities
HEIF (Higher Education Innovation Fund).	Competitive programme to increase capacity of HEIs to provide industry with technical expertise and business aware science and technology graduates. There have been two rounds to date
KTP (Knowledge Transfer Partnerships)	Scheme to assist SMEs - and industry generally - innovate through collaborative working with HEIs and research organisations. Businesses work with a university partner on a common project. The university provides staff expertise plus a Knowledge Transfer Associate -normally a recent graduate – who is located within the company and dedicated to the particular project.
LINK	Government funded scheme to support collaborative R&D projects between business and the research base
Marie Curie Fellowships	European placements for pre and post doctoral researchers and for experienced researchers. The host organization can be academia or industry
TSC (Teaching Company Scheme).	Forerunner of the Knowledge Transfer Partnerships

Other Abbreviations

AHRB	Arts and Humanities Research Board
BBRSC	Biotechnology and Biological Sciences Research Council
EEDA	East of England Development Agency
EPSRC	Engineering and Physical Sciences Research Council
LDA	London Development Agency
HEI	Higher Education Institute
HESA	Higher Education Statistics Agency
NERC	Natural Environment Research Council
PSRE	Public Sector Research Establishment
PSREF	Public Sector Research Exploitation Fund
RAE	Research Assessment Exercise
SEEDA	South East of England Development Agency

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