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Foreword

The last years of the first decade of the twenty first century promise interesting times with major challenges to be faced. For twenty five years ECOTEC, Ecorys in the UK, has been researching, analysing and promulgating ideas to help understand how to act in the face of change and challenge. Effective response to global trends and strategic imperatives is ultimately delivered by individual institutions and actors, working in particular places with distinct characteristics.

Increasing global competitive pressures, higher expectations for greater productivity and quality improvements, and recurring institutional, structural and policy adjustments in the UK are each testimony too, and are the key drivers behind increasing demand for the efficient management of change. Whether it be at the national, regional or local level, robust evidence and imaginative interpretation are essential to underpin policy making and strategy formulation. The volatility and uncertainty that comes with change can be overwhelming, and informing debate is often the key to meeting the challenge.

It is therefore important that we understand through solid quantitative analysis how to interpret and measure change in highly complex and rapidly evolving environments. I am delighted to have this opportunity to share freely the fruits of our thinking, intuition and experience, and to invite our readers to contribute their own thoughts on the important topics covered by visiting www.ecotec.com/redreview.

John Bell
Chair
ECOTEC
Spring 2008


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Editorial Comment

RedReview is driven by the need to illustrate the type of robust analysis needed in an economic environment where there is on-going actual and potential change. The recent HM Treasury Review of sub-national economic development and regeneration[1], for example, has implications in respect of the continued support that the Government gives to the delivery of sub national economic development and regeneration. It views this as a key mechanism for achieving sustainable economic growth and a narrowing of regional and local disparities and thus reaffirms the key position that economic development and regeneration hold in public policy. It raises the profile of economic development and neighbourhood renewal in local authority areas in England as well as the importance of sub-regions, amalgamations of local authorities and city regions. The review thus suggests the need for evidence based research and visioning support.

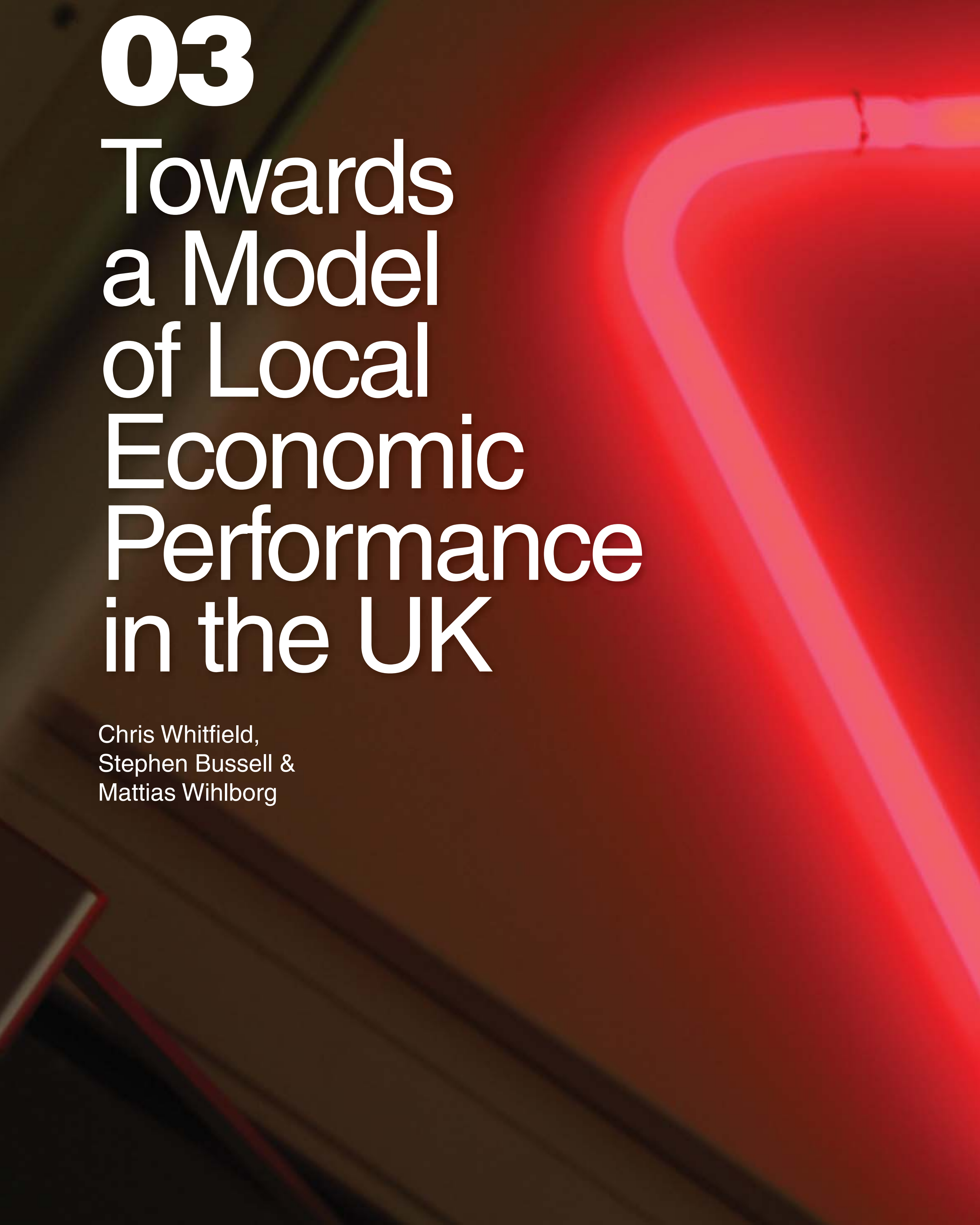
I am pleased to present this first **RedReview** with its authoritative articles. **Chris Whitfield, Stephen Bussell** and **Mattias Wihlborg** present an article *'Developing a Model of Local Economic Performance in the UK'* where they observe the need to apply more rigour to the analysis of factors underpinning economic success at a local level. One of their key conclusions is that a 'one-size-fits all' approach to economic development at the local level is inherently flawed; **Adrian Healy** in his article *'Near and Far Horizons: towards an understanding of the geography of university knowledge transfer activity in the UK',* explores the extent to which knowledge transfer activities reflect a geographical proximity versus relationship proximity. Through the analysis of university knowledge transfer activities in the UK he concludes that simply enhancing the capacity of universities to engage in knowledge transfer activities will not necessarily lead to any change in the geography of these activities.

Rob Huggins and **Will Davies** provide an article *'Conceptualising and Measuring the Competitiveness of Regions: A Review of the European Competitiveness Index',* assessing the relative competitiveness of regions in Europe by constructing a singe index that reflects, as fully as possible, the measurable criteria constituting 'area competitiveness'. As well as developing a comprehensive composite index, they provide some thoughts on the link between the concept and measurement of regional competitiveness. Their conclusion is that initiatives such as the index aim to provide analysis that can feed into current and future strategies to develop a more cohesive approach to technology, innovation and regional knowledge economy development. **Rupert Waters** provides an article *'Global Circuits of Labour and High Technology Local Economies*'. This provides evidence on the extent to which local labour market movements are predominant in globally important centres (Cambridgeshire and Oxfordshire high technology local economies) and considers the implications for the learning regions concept, thus attempting to bridge the gap between academic research and policy-making discourses.

Gary Lawson
Review Editor
ECOTEC
Spring 2008

[1] HM Treasury Review of sub-national economic development and regeneration July 2007


O N E



03

Towards a Model of Local Economic Performance in the UK

Chris Whitfield,
Stephen Bussell &
Mattias Wihlborg

The practice of economic development, both at a local and regional level, is increasingly susceptible to the latest fashionable thinking within the 'competitiveness' realm[1].

Recently we have seen the near ubiquitous promotion of priority business 'clusters', formulaic adoption of 'innovation' strategies and standard support for 'iconic' civic developments, applied as generic responses to the challenge of enhancing local or regional competitive performance. At a national level, similar 'formulae' are frequently projected as the required determinants of local economic success – the creation of a 'knowledge economy', building an 'entrepreneurial culture', and so on.

While these directions may be helpful in a general sense, more often than not such approaches fail to adequately reflect the particular circumstances and requirements of individual localities: the specifics of 'place'. Rather, there is a real danger that every strategy contains the same increasingly fashionable elements.

It may be asserted that, fundamentally, there exist a set of core elements required of any competitive location. However, and in order to inform successful local economic development processes, we need not only to understand what these individual elements might be, but also, critically, how they might best be combined when present in different variations. Put another way, we may know something of the basic ingredients of success, but we do not know the recipe as to how those ingredients may best be combined, in different ways, for different locations.

The Research

Our research has been driven by a pressing requirement for greater rigour in the analysis of factors underpinning economic success at a local level. In seeking to address this shortcoming we have sought to empirically test the contribution and hence relative importance of different underlying competitiveness factors on resulting economic performance. Moreover, and in order to better establish the statistical reliability of a range of theoretical (or anecdotal) propositions, we have attempted to construct a multivariate model of local economic performance.

Of course, in developing any model of local economic performance it should be borne in mind that each and every locality is necessarily unique. Yet in offering a more robust empirical basis from which to assess the different factors influencing local competitiveness the model provides the requisite theoretical platform from which to advance a typological approach to better understanding and directing local economic development.

Factors of Economic Performance

It is clear that there exist very significant variations in local economic performance within the UK. Income per head in the poorest local (NUTS 3) area, Isle of Anglesey (£9,036), represents barely 12% of that recorded in the richest, Inner London West (£72,485).

Explanatory variables comprise the potential 'factors' (or determinants) of local economic performance, with such factors forming the subject of empirical scrutiny for our research. Reflecting academic and policy debates connected to economic development, we have grouped explanatory variables under a number of broad factor headings: Business Structure, Enterprise, Education and Skills, Innovation and Knowledge Intensity, and Economic Geography (Spatial Factors).

[1] This article is based on new research undertaken into local competitiveness drivers and the principal determinants of economic performance at a local level in the UK. The research was funded through the ECORYS Research Programme.

Table 1: Explanatory Variables

Factor Grouping	Variable	Description
Business Structure	Employment in High Technology Manufacturing	Percentage of total employment engaged in high technology manufacturing sectors as defined by Eurostat.
	Employment in High and Medium Technology Manufacturing	Percentage of total employment engaged in high and medium technology manufacturing sectors as defined by Eurostat.
	Employment in Knowledge Intensive Services	Percentage of total employment engaged in knowledge intensive services sectors as defined by Eurostat.
	Employment in High/Medium Technology Manufacturing & Knowledge Intensive Services	Percentage of total employment in high/medium technology manufacturing and knowledge intensive services combined.
	Employment in Graduate Dense Sectors	Percentage of total employment engaged in those sectors identified to have 25% or more graduates.
	Index of Specialisation	A measure of the degree of sector specialisation of a local economy in relation to sector shares for the UK as a whole. Where 1 would represent a completely specialised economy with all of its employment in a single sector, and 0 would reflect a business structure identical to that of the UK.
Enterprise	Business Density	The stock of VAT registered companies per 10,000 of the adult population.
	Business Formation Rate	The number of newly registered companies as a percentage of business stock (average for two years).
	Business Population Rate	The number of start-ups (newly registered firms) per 10,000 of the adult population.
	Self-Employment Rate	Self-employed individuals as a proportion of the labour force.
Education and Skills	Knowledge Workers	The proportion of the employed workforce engaged in managerial, professional or technical occupations.
	NVQ 4/5+ Qualified Workers	Percentage of all working age population with NVQ level 4 or above qualifications.
	Workers with NVQ1 or No Qualifications	Percentage of the working age population with NVQ 1 or no qualifications.
	Achievement of 5+ Grade A-C GCSE	Percentage of school leavers achieving 5+ Grade A-C GCSE.
	Creative Class	Percentage of the skilled workforce (all aged 16-64 with NVQ4/5+) who are aged 20-29.
Innovation and Knowledge Intensity	Higher Education Student Population	Students enrolled in HE institutions as a percentage of total population.
	Quality of Research	The number of academic staff from a department rated 5 or 5* (HEI Research Assessment Exercise 2001) per 10,000 work-age population.
	Innovation Employment	The number of people employed in higher education institution and in research and development in the natural sciences and technology combined, per 10,000 jobs in the economy.
Spatial Considerations – Economic Geography	GVA Spillovers	A weighted measure of the GVA per capita of neighbouring areas based on commuting flows between the local area and the three neighbouring areas.
	Skills Adjacency	A weighted measure of the skills of the workforce (measured as % of NVQ 4+ qualified workforce) based on the shares of the workforce drawn from the three most dominant neighbouring commuter areas.
	Accessibility	Average time taken to travel to the nearest larger city or urban centre.

Determinants of Economic Performance

Correlations have been derived for explanatory variables in respect of GVA per head, with Table 2 highlighting a number which exhibit either strong or significant relationships with overall economic performance.

Selected variables from each of the five factor groupings are characterised by strong or else significant (positive or negative) correlation with GVA per capita. Notably, components of Education and Skills are strongly related to GVA per head - both at the top end (higher levels skills: positive correlation) and, conversely, at the bottom end (unskilled/ NVQ1 or no qualifications: negative correlation). Further, the quality of the labour force as measured by the proportion of professional and managerial staff (knowledge workers) also correlates strongly with recorded levels of GVA. Business Structure, as perhaps might be expected, also tends to be strongly correlated with economic performance. However, while knowledge intensive services correlate very strongly with GVA per head, the predominance of high technology manufacturing would appear somewhat less important.

Correlation analyses also reveal a number of insights in relation to the Enterprise variables. Creation of new businesses – business population and business formation rates – is positively correlated with GVA, though levels of business density exhibit only a weak relationship with GVA. The quality of the higher education sector, as measured in terms of HEI research active staff, is also strongly correlated with economic performance. Similarly, the proportion of the local workforce employed in HE and R&D activities – a proxy for innovation capacity - is also positively correlated with GVA.

Interestingly, spatial factors would also appear to exert considerable influence. Higher GVA areas are associated with net in-commuting, with GVA 'spillover' effects also correlated to a significant degree with GVA - i.e. there is a positive relationship between GVA performance and proximity to high GVA areas. Notably, a modified skills measure capturing both local skills attainment and the skills levels of adjacent areas (based on inward commuter flows) is marginally more strongly correlated with GVA than a conventional resident-based measure of NVQ4+ skills, suggesting that local skills base assessments should also take account of commuting patterns.

Relationships between explanatory variables are also relevant here: clearly, factors of economic performance do not act in 'splendid isolation'. Perhaps unsurprisingly, there is evidence of some strong interdependencies among independent variables drawn from within the same factor groupings, with, for example, high skills levels and occupational structure (knowledge workers) revealing a strong positive correlation. Further, areas with a higher proportion of knowledge workers also have a tendency to be among those with higher rates of new business formation.

Skills levels are also related to an appreciable degree with particular elements of Business Structure. Thus the presence of a large knowledge intensive service sector locally has a clear tendency to be linked with high skills levels. With regard to manufacturing activities, high technology manufacturing is associated with high skills levels, while, conversely, low technology manufacturing is associated with a lower skill base. Evidence of a strong HE sector and/ or an employment concentration in R&D is also related strongly with aspects of sector structure.

Table 2: Relationship with GVA per head

Strong positive association (correlation coefficient)	Positive association (correlation coefficient)	Negative association (correlation coefficient)	Strong negative association (correlation coefficient)
Knowledge Intensive Service employment (.804**)	Business Density (.041)	NVQ1 or no qualification (-.089)	Unskilled workers (-.318**)
Net Commuting Ratio (.569**)	High and Medium High Technology employment (0.008)		
Skills adjacency (.518**)			
Knowledge Workers (.491**)			
Business Population Rate (.487**)			
NVQ4+ qualifications (.472**)			
Innovation employment (.429**)			
Business Formation Rate (.407**)			
HEI Research Active Staff (.360**)			
GVA spillover effect (.352**)			

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

A Spatial Approach

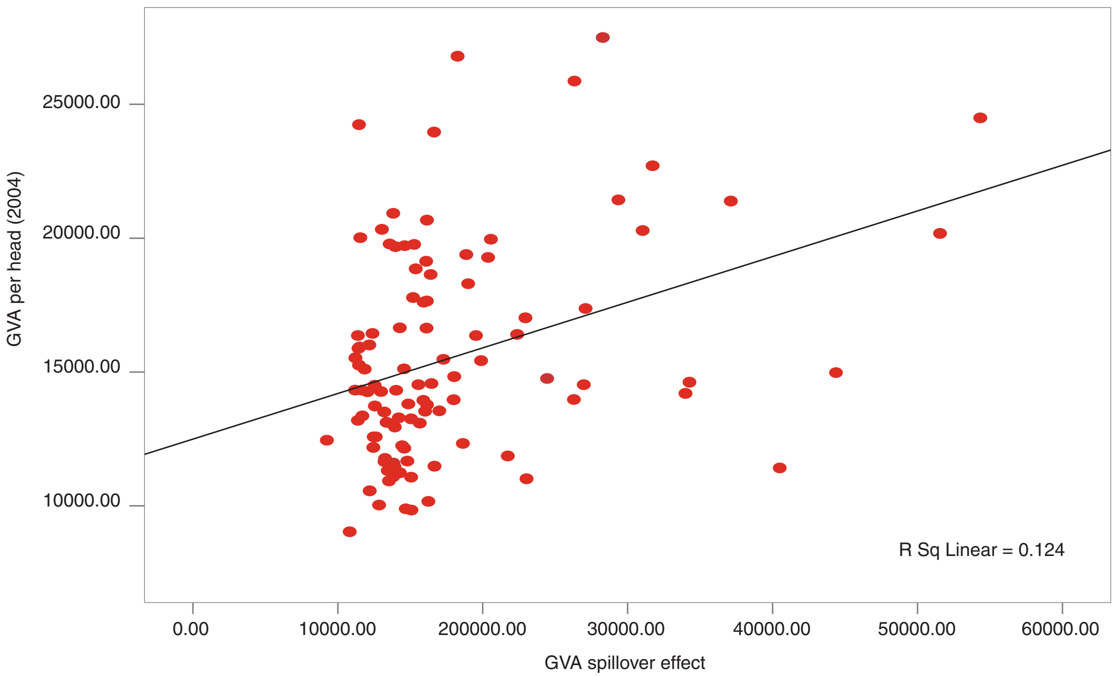
The local economies in our sample do not exist in spatial isolation. Movements of both labour and capital (goods and services) take place to a very considerable degree between different localities. It follows therefore, that the performance of any single local economy cannot be explained purely in terms of reference to those assets which lie within its immediate geographical boundary. Probably the starkest illustration of this relates to patterns of commuting, with a large proportion of the workforce in the UK commuting daily across local administrative boundaries. As a consequence some local areas are being characterised by net in-commuting while others by net out-commuting. It follows therefore that local competitiveness, and hence economic performance, will likely be dependent not only on the skills base of a local resident population, but also the skills of that labour which can be accessed from neighbouring areas.

A cursory scan of the available data suggests that those areas which lie adjacent to high performing (predominantly urban) areas also tend to be associated with comparatively high levels of GVA per capita – indicating the potential influence of positive 'spillover' effects. This in turn gives rise to an important theoretical question: are such spatial patterns simply the result of particular geographical endowments of other economic assets (for example, skills levels in the South East may be higher than those in Wales), or do agglomeration economies (i.e. returns to proximity) also represent an important explanatory factor?

It may be asserted that spatially determined patterns of economic activity occur because there are often distinct benefits (increasing returns) accruing from agglomeration. In the case of a firm, external economies of scale may arise from locating near other similar firms or else concentrations of related economic activity. According to cluster theory, external economies of scale and scope may include, for example, access to specialised labour and capital inputs, increased networking opportunities, and improved access to customers and markets.

Testing this assertion requires the development of a suitable potential 'spillover' effects between spatially proximate areas. The indicator developed for this study uses travel to work (commuting flow) data as a proxy measure of economic interaction between individual local areas . The adjacency measure has been applied to develop a weighted GVA measure based on the level of GVA per capita of neighbouring regions and the strengths of flows between them. An initial analysis of the relationship between headline economic performance and the GVA spillover measure shows that there is a weak (but positive) relationship between the two variables, suggesting that proximity to high performing local economies may have some affect on levels of recorded economic performance.

Figure 1 **Spillover Effects and Economic Performance**[2]



[2] Derived in each case on the basis of commuting flows between the local (NUTS3) area in question and the three local areas that are the greater source of workers

Figure 2 **Skills Adjacency and Economic Performance**

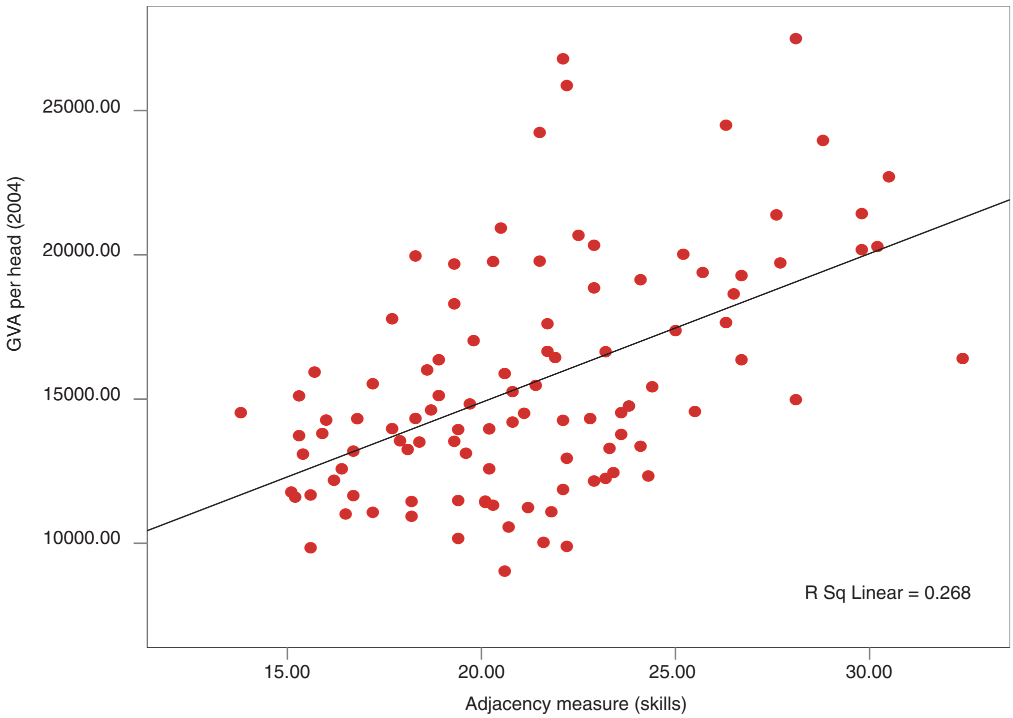
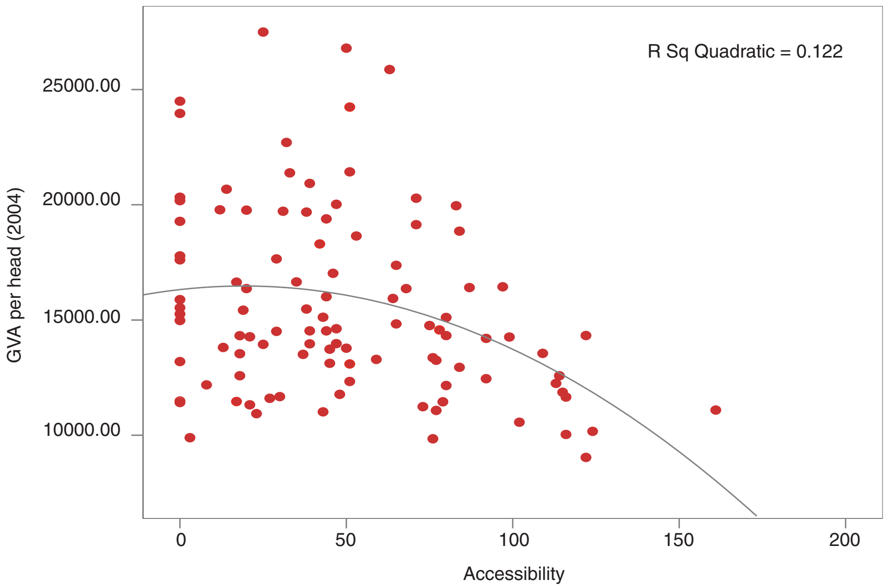


Figure 3 **Accessibility and Economic Performance**



The same approach has been used to produce an adjusted measure in respect of skills levels, with the resultant indicator measuring the skills of the workforce based on commuter flows as well as that of the resident population. Notably, there would appear to be a strong positive correlation between skills adjacency and overall economic performance.

Significantly, the skills adjacency measure would appear more effective in predicting GVA levels than a traditional resident-based skills measure, further supporting the view that local areas need to assess their available skills base with reference to the skills of commuters as well as local residents.

Finally, the analysis incorporates a measure of access to metropolitan or urban centres, with it being hypothesised that access to specialised markets, inputs and skills may impact positively on the productivity of a local economy. Our accessibility measure (based on OECD data) reflects average travel times, or 'effective distance', to nearest urban centres. Our results are illustrated in Figure 3 with the downward slope of the line indicating a negative relationship between accessibility and economic performance - in other words, the stronger the relative access to an urban centre, the stronger the expected economic performance.

A Typological Approach

As we have asserted, a 'one-size fits all' approach to local economic development is inherently flawed. The varying character of different economies at the local level determines that the growth drivers for one area are likely to vary from that of another. While certain factor endowments (e.g. skills) would appear to be of general overall importance, the subtle mix and relative importance of various factors are likely to vary from one local economy to another. Thus, any attempt to account for differentials in local economic performance without making a distinction between different types or categories of local economy is likely to be substantially flawed.

Certainly when considered at the NUTS 3 level the economic character of local areas in the UK is quite distinct, comprising highly urbanised metropolitan centres (central London, Birmingham, Manchester etc), and areas which are rather more rural and/ or dormitory in character and function (such as, say, the county areas of Lincolnshire, Shropshire and Norfolk). Through the categorisation of local areas to different types it is possible to test the presumption that the factors underpinning local economic performance differ in nature and magnitude from one type of area to another.

Through the use of cluster analysis we have sought to group local areas into 'types' or categories (clusters) in such a way as to maximise statistical differences between clusters and minimise any differences within clusters, testing the assertion that that there are at least two distinct typological groupings of areas i.e. those areas that are predominantly metropolitan/ urban, and those which are primarily rural and/ or hinterland areas.

Specifically, analysis of two key variables has provided the necessary framework basis for the cluster analysis:

- Population density – used as a basis for separating predominately urban areas (i.e. areas with a relatively high population density) from less urban, hinterland areas
- Commuting ratio – used as a proxy for determining functional status of local areas (i.e. importer or exporter of labour).

Two principal clusters or area typologies were identified:

- **Cluster 1 – Rural Hinterland and Commuter** - areas characterised either as predominately rural areas with a relatively low population density, or else as commuter settlements (i.e. lacking a dense urban or metropolitan centre). The primary economic role of such areas is that of a 'dormitory' and they are characterised as net exporters of labour. Typically, the scale of economic activity is limited, which is reflected in a low to medium level of GVA per head
- **Cluster 2 – Urban and Metropolitan** – predominantly urban or metropolitan areas with a relatively high population density. Such areas are characteristically net importers of labour and generally include one or more major centres of economic activity.

Cluster membership for our sample of local areas is summarised in Table 3:

Table 3

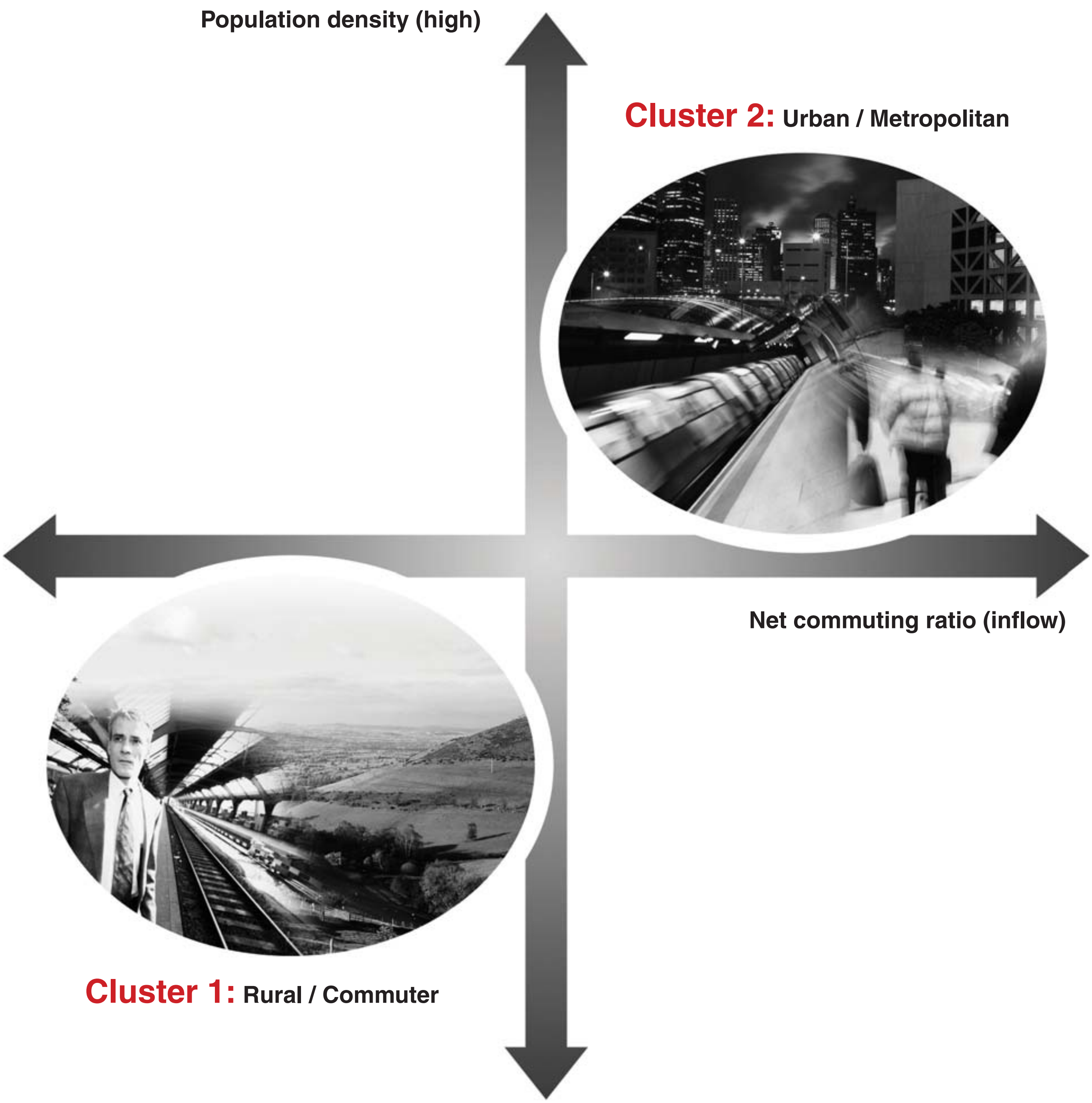

Population density (high)
Cluster 2: Urban / Metropolitan
Net commuting ratio (inflow)
Cluster 1: Rural / Commuter

Table 3: Cluster Membership

CLUSTER 1 – RURAL/COMMUTER		CLUSTER 2 – URBAN & METROPOLITAN		
Bedfordshire	Leicestershire CC and Rutland	Barnsley, Doncaster and Rotherham	Halton and Warrington	Solihull
Bridgend and Neath Port Talbot	Lincolnshire	Berkshire	Hartlepool and Stockton-on-Tees	South Nottinghamshire
Buckinghamshire	Monmouthshire and Newport	Birmingham	Hertfordshire	South Teeside
Cambridgeshire CC	Norfolk	Blackburn with Darwen	Inner London - East	Southampton
Cheshire CC	North and North East Lincolnshire	Blackpool	Inner London - West	Southend-on-sea
Conwy and Denbighshire	North Nottinghamshire	Bournemouth	Kingston Upon Hull	Stoke on Trent
Cornwall	North Yorkshire CC	Bradford	Leeds	Sunderland
Devon	Northamptonshire	Brighton	Leicester	Surrey
Dorset CC	Northumberland	Bristol	Liverpool	Swansea
Durham CC	Oxfordshire	Calderdale, Kirkless and Wakefield	Luton	Swindon
East Cumbria	Powys	Cardiff and Vale of Glamorgan	Medway	Telford and Wrekin
East Riding of Yorkshire	Shropshire CC	Central Valleys	Milton Keynes	Thurrock
East Sussex CC	Somerset	Coventry	North and North East Somerset	Torbay
Flintshire and Wrexham	South and West Derbyshire	Darlington	Nottingham	Tyneside
Gloustershire	South West Wales	Derby	Outer London - East and North East	Walsall and Wolverhampton
Gwyneed	Staffordshire	Dudley and Sandwell	Outer London - South	Wirral
Hampshire	Suffolk	East Derbyshire	Outer London -West and North West	York
Herefordshire	Warwickshire	East Merseyside	Peterborough	
Isle of Anglesey	West Cumbria	Essex	Plymouth	
Isle of Wight	West Sussex	Greater Manchester North	Portsmouth	
Kent	Wiltshire CC	Greater Manchester South	Sefton	
Lancashire CC	Worcestershire	Gwent Valleys	Sheffield	

A Model of Local Economic Performance in the UK

From further analysis of underlying data for the two local area clusters we have derived two (complementary) multivariate models of local economic performance. Such models are helpful in making more explicit the causal relationships between explanatory variables and headline economic performance (as measured by GVA per head). Importantly, multivariate models go beyond simple correlation analysis by allowing us to examine the relationship between a number of separate indicators and GVA per head concurrently. Given that in reality we know that economic performance is dependent on a number of contributory factors acting together, intuitively, this would seem a rational approach.

For practical data reasons our approach to multivariate analysis is necessarily a simplification of a complex reality and is based on a limited number of explanatory variables – with these intended to reflect the most crucial local performance drivers. Therefore, the purpose of the analysis is not to explain local economic performance in its entirety, but rather to explain a measure of variance in respect of local economic performance. Our suite of indicators reflects five principal factors of economic performance and we have sought to identify and isolate one indicator from each of the five groupings to include in the model.

Commuter/Hinterland Economies

A two variable model has been constructed as a basis for better explaining variations in local economic performance within this cluster group. Under this explanatory model variations in GVA per head at the local level are most dependent on differences in business structure together with the affect of spatial factors:

- Employment in Knowledge Intensive Service Sectors (%)
- Accessibility (average time taken to travel to the nearest urban centre).

The regression coefficients for this explanatory model are summarised on page 21.

Urban & Metropolitan Economies

A four variable model has been constructed as a basis for better explaining variations in local economic performance within this cluster group. Under this explanatory model variations in GVA per head at the local level are most dependent on differences in the following four measures:

- Net Commuting Ratio (No. of inward commuters/No. of outward commuters)
- Business Population Rate (new business starts per 10,000 inhabitants)
- Employment in Knowledge Intensive Service Sectors (%)
- Skills Adjacency – weighted measure of skills based on the qualifications of the resident population and the population of proximate commuter areas.

The regression coefficients for this explanatory model are set out on the opposite page.

Conclusions and Policy Implications

A key outcome of the modelling exercise is the notion that the central drivers of economic performance for each of the two clusters are significantly different. Moreover, the role that spatial factors play in relation to the two models has important implications for our understanding of the 'functional' role of urban/metropolitan and rural/commuter areas.

The two multivariate models that have been established are distinct - yet complementary - models of local economic performance. Urban areas, as dominant concentrations of economic activities, are the primary drivers of economic growth in the UK, exhibiting higher levels of GVA per head than other areas of the UK. This is, in part, a product of output being concentrated in urban areas while workforce is more widely dispersed: urban areas tend to draw a high proportion of the workforce from outside the local area itself. Perhaps also, urban areas outperform other areas because there are particular competitiveness gains to be made on account of spatial concentration itself. Hence, the urban/metropolitan model suggests that those areas with a higher net 'commuting ratio' (a higher level of inward commuting relative to outward commuting) would also be expected to have a higher level of GVA per capita.

It is not just the size of the labour influx that matters, but also its quality. The model confirms that skills levels - as might be anticipated – are a key determinant of local economic performance. More pointedly, and on account of the skills adjacency measure being included in the model, local economic performance is not only dependent on the skills level of the resident population, but also of the population of adjacent areas. Successful urban economies tend to be spatially linked to an appreciable degree through skilled labour to surrounding, rural/commuter areas.

It should be recognised however that relationships between urban/metropolitan and rural/commuter are bi-directional (Figure 4). While skilled labour typically flows from rural to urban, conversely, flows of disposable income flows in the opposite direction. Further, it is the case that many rural and commuter economies benefit from proximity of accessibility to urban centres, with links to urban centres providing businesses in rural areas with enhanced access to markets, labour, and intermediary inputs. Hence, a one minute improvement in average travel time to the nearest urban centre is associated empirically with a GVA increase of £24 per head.

Sector structure also plays a central role in accounting for economic performance within both typologies. Higher value added employment is associated with better overall performance, and in both cases it is the proportion of employment in knowledge intensive services which is particularly strongly correlated with GVA performance. In urban areas - in contrast to rural/commuter areas - the rate of new business creation (or the business population rate) is also an apparent determinant of economic performance.

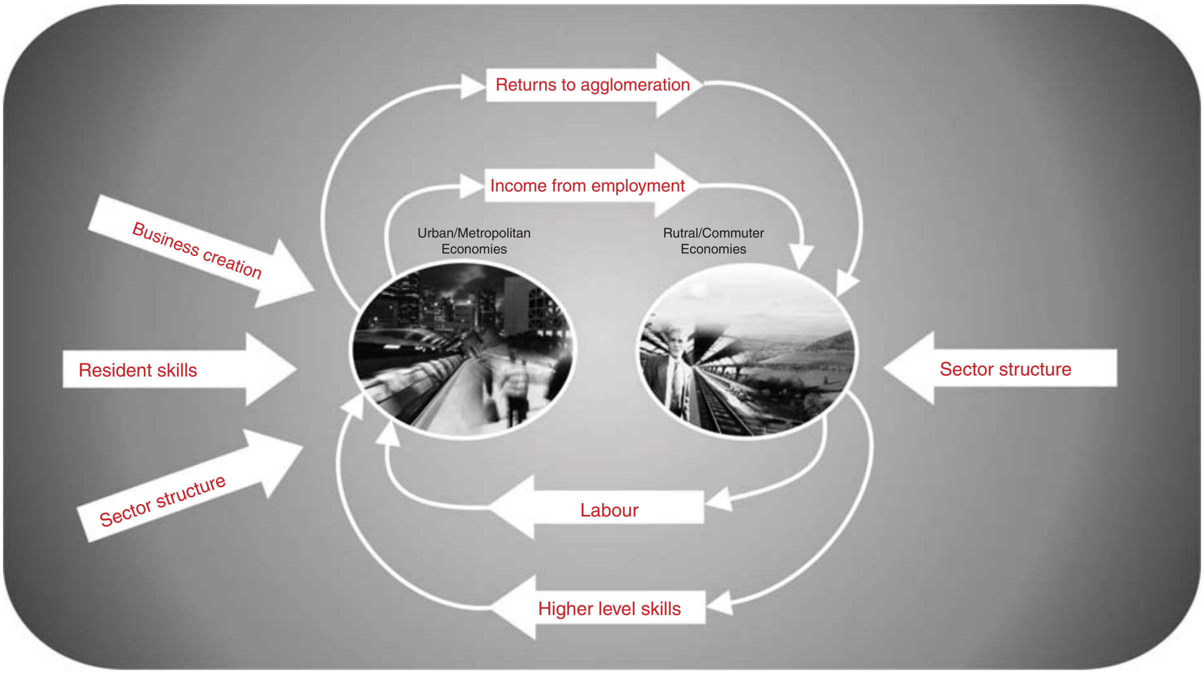
Coefficients[a]								
			Unstandardized Coefficients	Standardized Coefficients			Colinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	9615.001	987.109		9.741	.000		
	Knowledge Intensive Services (2004)	398.949	45.488	.726	8.770	.000	.918	1.089
	Accessibility	-24.493	6.747	-.300	-3.630	.001	.918	1.089

[a] Dependent Variable: GVA per head (2004)

Coefficients[a]								
			Unstandardized Coefficients	Standardized Coefficients			Colinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-8285.861	2206.237		-3.756	.000		
	Net commuting ratio	11940.827	1674.350	.475	7.132	.000	.823	1.215
	Business Population Rate (2001-2003)	96.006	45.984	.195	2.088	.041	.419	2.386
	Knowledge Intensive Services (2004)	250.604	66.678	.383	3.758	.000	.350	2.854
	Adjacency measure (skills)	202.734	87.494	.200	2.317	.024	.487	2.052

[a] Dependent Variable: GVA per head (2004)

Figure 4: Model Representation



The multivariate models developed under this research go some way towards further explaining variations in local economic performance, with the models collectively accounting for some three-quarters of all local variations in GVA per head. Outstanding variance (residual) suggests a requirement for additional, case-by-case, research into the individual circumstances of local economic performance.

By way of summary our research would tend to strongly underline the notion that a 'one-size fits all' approach to local economic development is inherently flawed. Specifically, our analysis empirically supports the assertion that there are broadly two distinct types of – highly interconnected - local economy: urban/metropolitan regions characterised by high population density and net inward commuting; and rural/commuter economies characterised by low population density and net outward commuting. The degree of interconnectedness of these two principal economy types is borne out by the structure of the derived multivariate models. Urban economies are dependent both on the skills of the local resident population together with the commuter workforce attracted from neighbouring areas, with those urban economies characterised by high levels of inward commuting tending to be the highest performers. Conversely, many rural/ commuter areas may also be expected to benefit economically from their proximity to major urban areas.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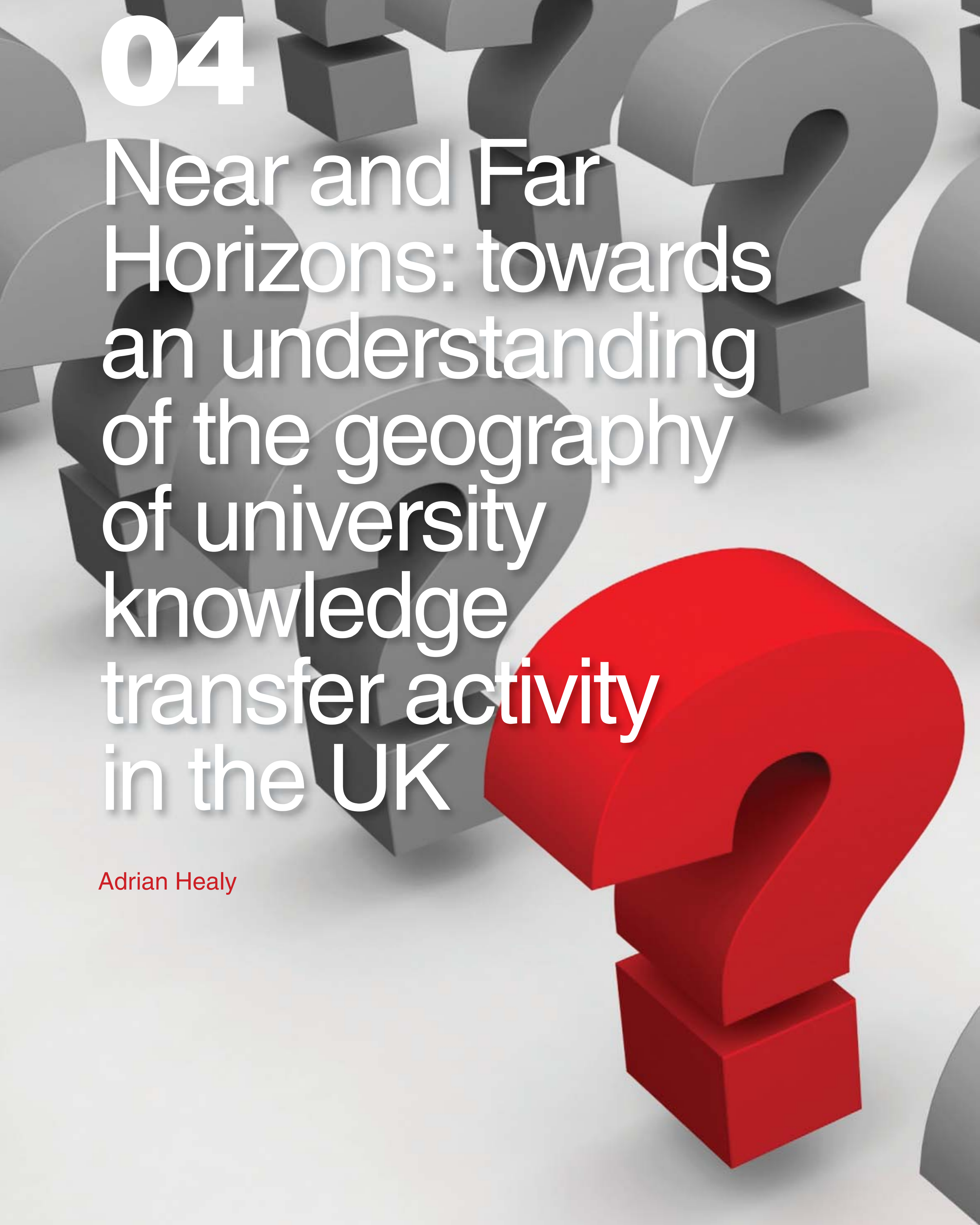


04

Near and Far Horizons: towards an understanding of the geography of university knowledge transfer activity in the UK

Adrian Healy

04

Public sector interventions supporting R&D are increasingly justified by reference to the economic benefits that this can bring to the local and regional economy, rather than the more traditional justification centring on public good.

New endogenous models of economic growth which allow for positive externalities and increasing returns to investment provide powerful arguments in favour of such an approach. Married to this shift in rationale is a concomitant decentralisation of responsibility for such interventions from the national to the regional scale. A new 'regional turn' is apparent which is reflected in concepts such as regional systems of innovation.

Yet the emphasis on a regional dimension and the role of R&D investment in promoting regional economic development relies on many assumptions, not least the importance of geographical proximity in the appropriation of the potential economic benefits. It also makes some strong assumptions about the nature of the linkages between places and organisations and how learning and innovation occur. This paper examines the geographical dimension to university-business knowledge transfer relationships and considers the importance of geographical proximity in practice.

The transfer of knowledge and ideas between firms and individuals has long been acknowledged as an important influence on levels of innovation and economic development. As far back as 1890 Marshall[2] identified the fact that "if one man starts a new idea it is taken up by others and combined with suggestions of their own, and this becomes the source of yet more ideas" (1890/1920 p271). This exchange of knowledge may be formal or informal, and may not be fully compensated for by market mechanisms.

Despite the difficulties of measuring spillover effects in practice (Krugman[3] 1991), a raft of studies have identified the positive effects emanating from flows of knowledge and information (Audretsch and Feldmann[4] (1996), Feldmann[5] (1999), Harhoff[6], (1999), Lissoni[7] (2001), Co[8] (2004)). Universities, as an important source of new ideas and knowledge, are perceived to have a major role to play in stimulating knowledge exchange and promoting positive spillover effects (Freel[9] 2003,Lambert[10] 2003). So much so that stimulating the exchange, or transfer, of knowledge between businesses and universities is now regarded as an important component of public policy approaches to stimulating innovation.

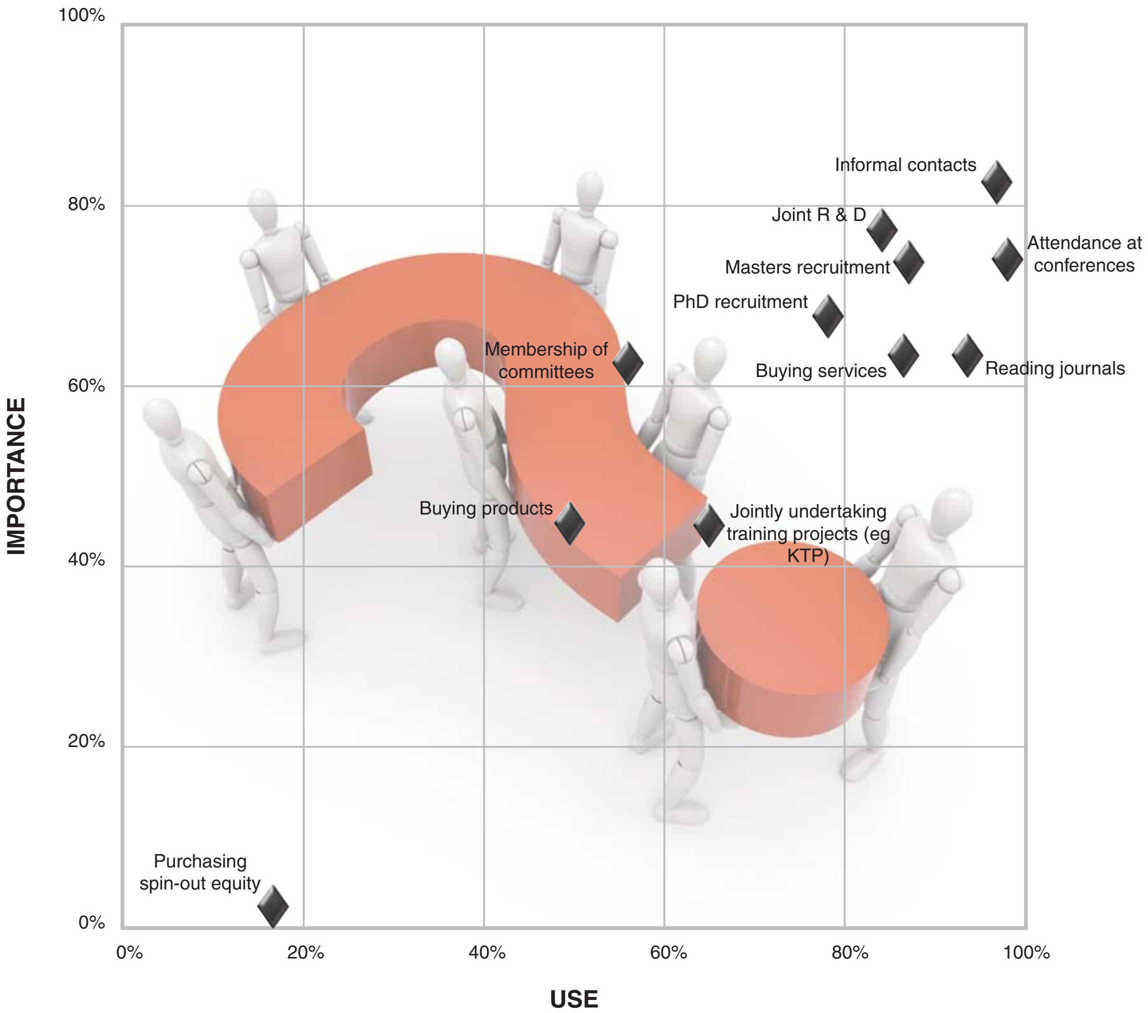
Five primary routes for knowledge transfer are commonly identified. This does not include the internal routes from in-house R&D activities to production although many of the routes remain pertinent:

- Co-operation in education and training (such as academic training or, increasingly, provision of courses for employees of firms)
- People and knowledge flows (through the exchange of staff for example)
- Collaborative research projects
- Commercialisation of R&D outputs (through licensing or spin-out enterprises for example)
- Publication of scientific papers and the training of scientists.

As Figure 1 demonstrates, it is not always the most tangible forms of knowledge transfer, such as licensing or establishing start-up companies exploting intellectual property generated by R&D, that are regarded by users as the most important. Less tangible forms of knowledge exchange, particularly informal contacts and the attendance of conferences can be as important as joint R&D activities.

[1] This paper is based upon research undertaken in 2005 for a consortium of clients led by the South East England Development Agency. We thank them for permission to publish extracts of this work in the following paper. The opinions expressed throughout are those of the author.

Figure 1: **Correlation between use and importance of KT mechanisms**



Source: Internal NERC paper

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It has generally been held that the effect of knowledge spillovers declines with distance (Anselin, Varga and Acs[11], 1997). Examination of variables such as patent registrations (Jaffe[12], 1989), bibliographic referencing techniques (Acs[13], 1994), and patent citation rates (Jaffe, Trajtenberg and Henderson[14] 1993) all demonstrate that levels of innovation tend to be higher in the vicinity of R&D activity. Such evidence, alongside powerful arguments regarding the importance of tacit knowledge in the innovation process, have provided a strong foundation for policymakers seeking to stimulate regionally-focused knowledge transfer systems.

However, several studies have identified strong evidence for the existence of positive knowledge spillovers between regions (Caniëls[15], 2000; Verspagen and Schoenmakers[16], 2004; Cantwell and Piscitello[17], 2005), suggesting that the relationships are more complex than previously assumed. With the easing of communications and increasing levels of regular dispersed contacts it has been argued that spatial proximity is now less relevant than it was in the past (Thrift 2000, Cairncross[18], 1997).

Building on the work of Nonaka and Konno, among others, Amin and Cohendet[19] echo this view arguing that there has been "an explosion of virtual communities, communities that can no longer be seen as somehow less able than physically proximate communities" (2004 p.107). Concluding that 'nodal knowledge' is not a local affair but is shaped by a range of extra-local interactions and linkages, they argue that relational proximity involves more than 'being there' in terms of physical proximity. They cite Allen[20] (2000) who states that "what matters... is not the fact of local embeddedness but the existence of relationships in which people are able to internalise shared understandings or are able to translate particular performances of their own tacit and codified communities" (p.28). Morgan[21] for one does not disagree with this but argues that "something gets lost, or degraded, when individuals or organisations communicate at a distance even when they know each other well" (2004 p8). Spatial proximity remains a powerful force in shaping patterns of innovation and learning, with the home base forming the heart of a knowledge network whose outer reaches might "straddle multiple spatial scales" (Morgan 2004 p.12).

The spatial dimension to knowledge transfer activity thus remains a contested consideration, but one which is of supreme importance considering the focus of much current public policy.

Approach

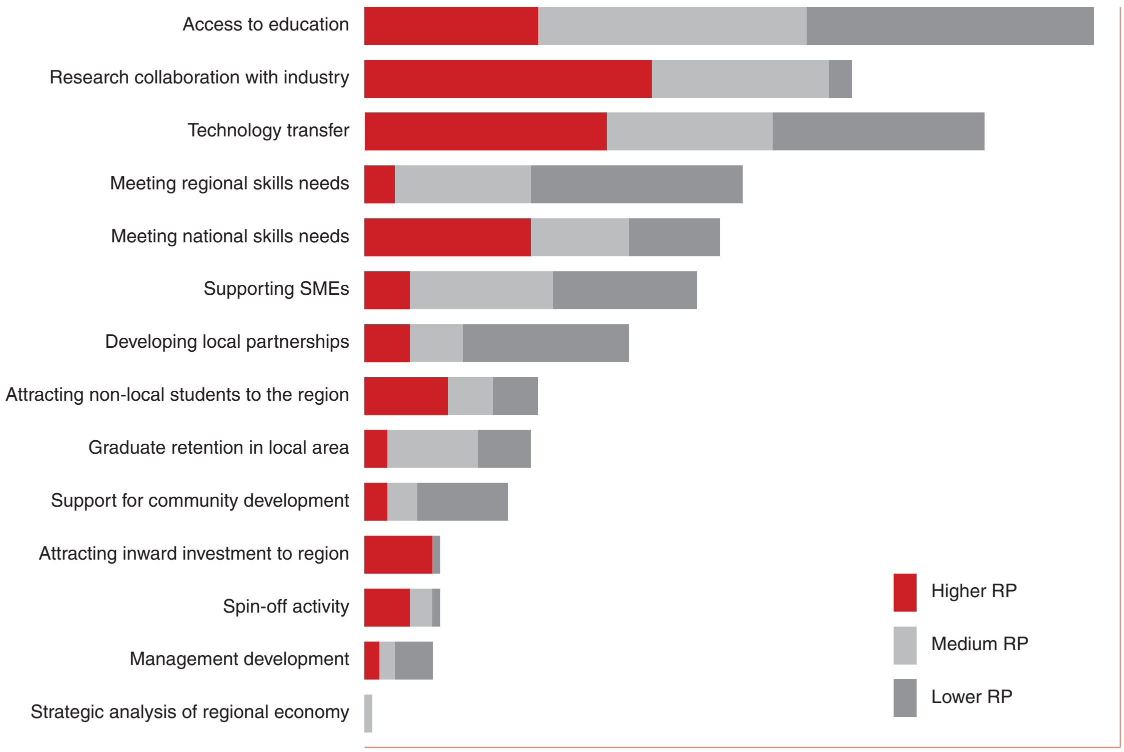
In order to examine the patterns of knowledge transfer from Universities and other Higher Education Institutions (known collectively as HEIs) this study examined patterns of activity in the Greater South East of England (GSE). The GSE is an informal grouping of three English regions: London; East of England and South East England. The study on which this work is based began in July 2004 and was completed in March 2005. Throughout this piece the terms university and HEI are used interchangeably.

A multidimensional approach combined qualitative interviews with a sample of universities and university departments, coupled with a small-scale survey of businesses linked through knowledge transfer activities to these departments, with a more quantitative assessment of secondary data sources.

The sample of University departments was created using a multistage dimensional sampling approach. In the first instance the focus was on those universities located in the Greater South East of England. Five broad subject areas were identified as being particularly related to commercial knowledge transfer activity and were selected as the focus for this study.

Universities increasingly acknowledge the contribution that their activities can make to economic development. While training and skills top the list, it is notable that universities, particularly those with a strong research profile, attach a high importance to knowledge transfer activities more generally (Figure 2).

Figure 2: **Economic development priorities by university research profile (RP)**



Source: HEBIS 2003

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These subject areas are:

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

This provided the basis for constructing an initial sample of universities located in the Greater South East which had a Department, or Departments, covering at least one of these subject areas. From this base a sub-sample of 15 Universities was selected, based upon research profile, the level of formal interaction with business and the range of third mission type activities, from 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 (PSREs)[22]. 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
- 12 interviews were also undertaken with a mixture of SMEs and MNCs to assess the factors that influence the use of different knowledge transfer mechanisms and why they chose to make links with the identified University.

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.
To overcome this problem a quantified assessment of the broader pattern of knowledge transfer activity in the UK was undertaken using secondary data sources published by public sector knowledge transfer programmes. Data was available for Knowledge Transfer Partnerships (KTP), Faraday Partnerships and the LINK programme and the spatial distribution of this activity was identified, based on some 248 identified individual partnerships.

Further quantified data was obtained from the Higher Education Business Interaction Survey. This is undertaken in the UK approximately every two years. It is a survey of all Higher Education Institutes in the UK and provides an indication of the nature, scope and extent of University interactions with businesses. Data from the surveys published in 2003 and 2005 was analysed to examine the overall pattern of business-university linkages in the UK. This data also provided the baseline of activity in individual Universities that was used to undertake the sampling exercise set out above.

Finally, a series of interviews were undertaken with key individuals to assess the broader context in which knowledge transfer activities were set. 20 semi-structured interviews with representatives from public and private sector stakeholders, at a national and regional level were also undertaken to gain a wider perspective on innovation, university knowledge transfer and the factors influencing this.

HEIs in the GSE

There are some 169 HEIs in the UK, of which two-fifths are located in the Greater South East of England (Table 1)[23]. Each year some 33% of all graduates in the UK emanate from HEIs located in the Greater South East. The following section briefly details levels of research, consultancy and other knowledge transfer activities undertaken.

Public funding for the HEI sector in the UK primarily emanates from one of the four Funding Councils[24] and the various Research Councils[25]. In 2003-4 research income accounted for almost a quarter (24%) of the total income for HEIs in the UK[26]. As Figure 3 illustrates, most of the £3.77m received came from UK Government sources, either the HE funding bodies or the Research Councils.

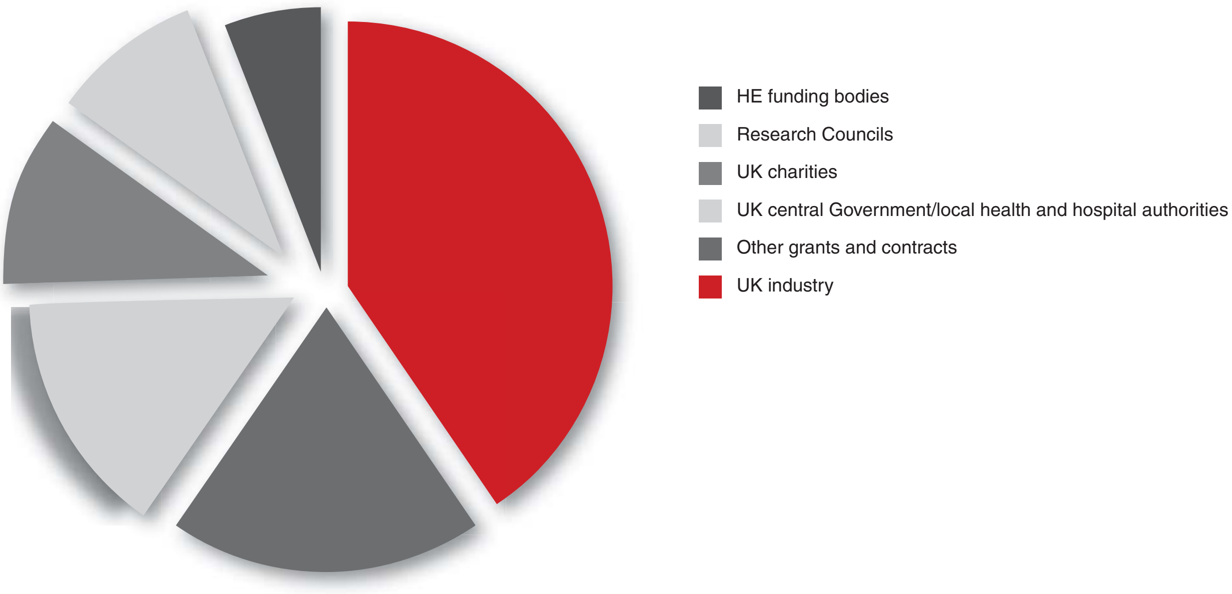
Table 1: Number of HEIs in the UK and student numbers

	IEE	IOP	RSC	% of UK
Greater South East	67*	40%	870,615	33%
England	132*	78%	2,296,265	86%
UK	169*		2,671,675	

* 19 schools and institutes included together as the University of London Source: adapted from HEFCE 2005 and HESA statistics

A small proportion (7%) is directly funded by UK industry, although the £250m spent by industry on research activities with HEIs constitutes a very minor part of the £16.6bn spent annually by the UK's 700 largest private R&D investors [27].

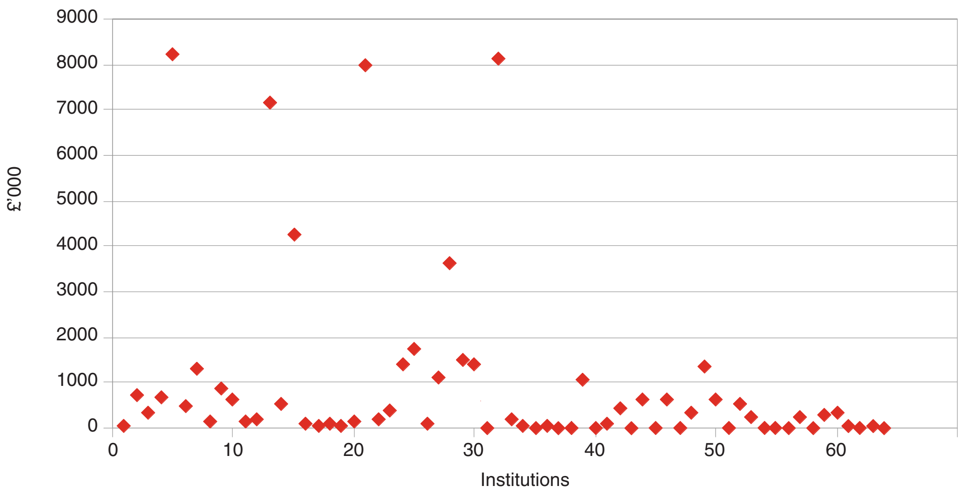
Table 2: Sources of research income for UK HEIs (2003-4)



Source: HEFCE 2005

On average, HEIs in the Greater South East are slightly more likely to engage in research activities than universities elsewhere in the UK, receiving 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[28]. 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 4.

Figure 4: **Distribution of HEFCE research funds in the Greater South East**



Source: data from HEFCE 2004

Overall, HEIs in the Greater South East have a similar propensity to engage in research activities with businesses as HEIs across the UK (Table 2) but are relatively less likely to engage in consultancy work. There is, though, strong variation between the individual regions of the Greater South East demonstrating that there is little or no consistent spatial pattern in terms of the propensity of individual HEIs to engage with businesses.

Table 3: **Sources of research income for UK HEIs (2003-4)**

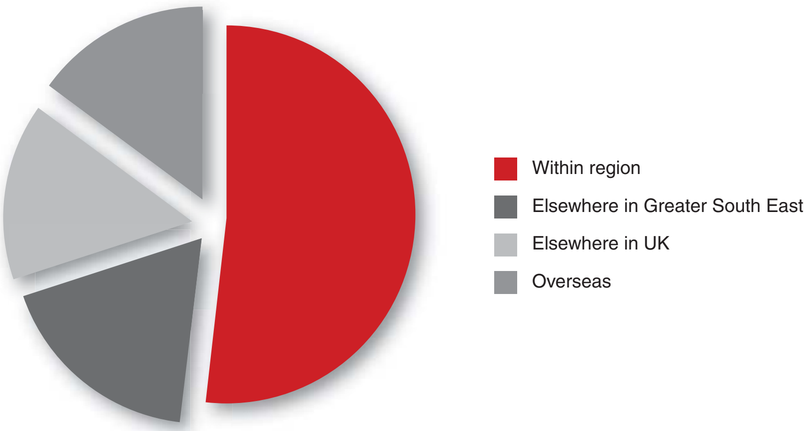
	Total		SMEs		Commercial non-SME	
	Consultancy	Research	Consultancy	Research	Consultancy	Research
East of England	134	97	84	19	34	78
London	76	37	23	4	40	33
South East England	66	158	14	86	44	71
Greater South East	81	78	29	28	40	49
UK	118	78	48	26	27	52

Source: adapted from HEBIS 2005

There is some variation in the propensity to work with large firms compared to SMEs, particularly with respect to consultancy work. In comparison to HEIs elsewhere in the UK, HEIs in the Greater South East are more likely to undertake consultancy work with large firms than SMEs.

A third area where HEIs may contribute to knowledge exchange is through projects in which students engage with non-academic partners. Two strong national schemes exist in this area. The first involves CASE studentships, whereby doctoral students are engaged on a joint research project with an academic and non-academic partner. The second involves Knowledge Transfer Partnerships (previously known as the Teaching Company Scheme) where 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. It appears that the former are largely utilised by larger organisations and the latter by SMEs. 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. HEIs in the Greater South East have a higher propensity to engage with the Knowledge Transfer Partnerships than the UK average, although in proportionate terms partner firms tend to be more likely to be based within the region.

Figure 5: **Spatial distribution of business contacts**



The spatial distribution of knowledge transfer activity

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. That finding is corroborated by this study in which around half of all business contacts were within the same region as the Department concerned (Figure 5). Of the remainder, around a fifth are located elsewhere in the Greater South East demonstrating the strength of the proximity effect. 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.

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. One third had no links outside of the Greater South East and two-fifths had no overseas links, demonstrating that links within the region are the most prevalent. 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.

A similar pattern emerges when the links between HEIs and businesses funded by the three formal knowledge transfer programmes - Link, Faraday Partnerships and KTP - are examined, although in this case the proportion of overseas links are much reduced owing to the nature of the programmes. More than three-quarters of the projects involving HEIs in the Greater South East are focused on links with businesses within the area (Table 3), with a half of these businesses located in the South East.

Table 3: Geographic spread of businesses linked to all South-East Universities via formal research programmes

Region	Total number	% of UK
Greater South East	187	38.3%
England	125	25.6%
UK	63	12.9%
GSE	375	76.8%
Rest of UK	104	21.4%
Abroad	9	1.8%
Total	488	100%

Source: Adapted from LINK, KTP, FARADAY

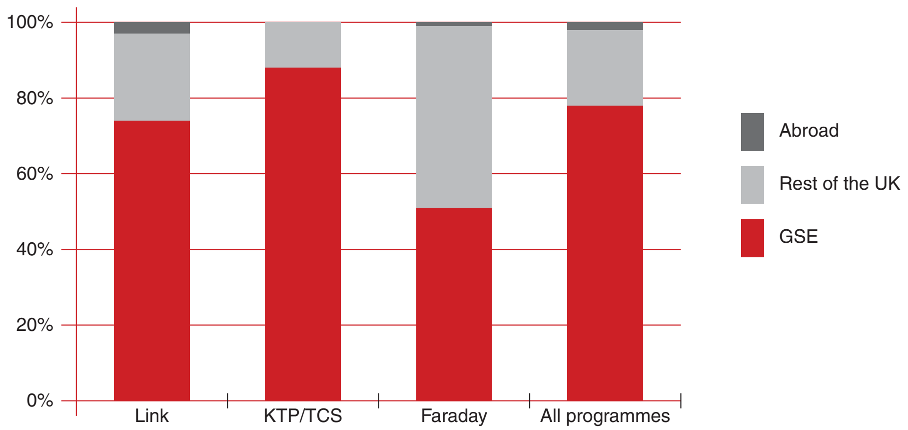
One of the results of our study was to highlight the important differences in spatial reach of different types of institution (Table 4). PSREs are more likely to have links with companies based outside of the Greater South East, both overseas and in the UK; followed by the four universities with the highest amounts of research funding. The remaining universities tend to have a stronger local focus.

Table 4: 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%

Similarly, different knowledge transfer programme also exhibit different spatial distributions. (Figure 6). 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[29].

Figure 6: Spatial distribution of businesses by Knowledge Transfer programme



A comparison of the different knowledge transfer routes (Table 5) also suggests the presence of differential geographies. In the case of collaborative research and consultancy activity (contract research) there is a strong similarity with around two-fifths of businesses contacts occurring 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 5: 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%

Table 6: Estimated strength of links with different areas

	Regional	GSE	UK	Overseas
Low	24%	41%	59%	47%
Medium	35%	38%	26%	29%
High	40%	21%	15%	24%

Source: HEI survey

An important finding of the study was that the strength of the respective contacts can also vary. Intuitively this is not surprising but is an important consideration in any study of knowledge transfer activity. It is not just the fact of a relationship being in place, the strength of that relationship is also important. Most contacts within the region are regarded by respondents to the study as high or medium in strength. In contrast almost two-fifths of respondents regarded contacts elsewhere in the UK as of low strength (Table 6), with contacts overseas generally being regarded as stronger.

Outside of the Greater South East there does not appear to be any significant pattern to the geographical distribution of activity (Figure 7). The Departmental survey suggests that the single most important region was the North West followed by the East Midlands, although a strong proportion of respondents identified links in all regions of the UK. The result does seem to suggest however that there is no significant 'gravity' effect that increases the prevalence of links with nearby regions.

Table 7: Regional distribution of UK contacts

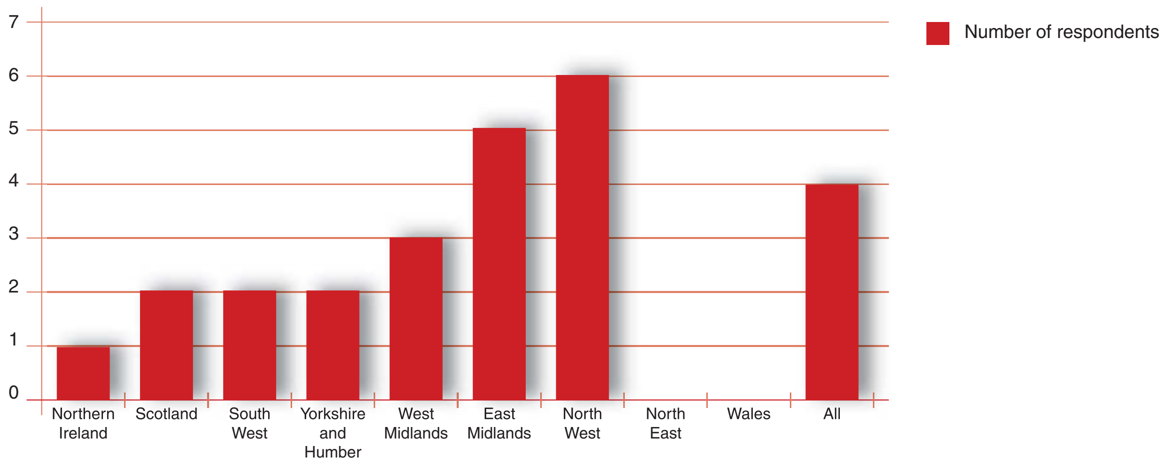
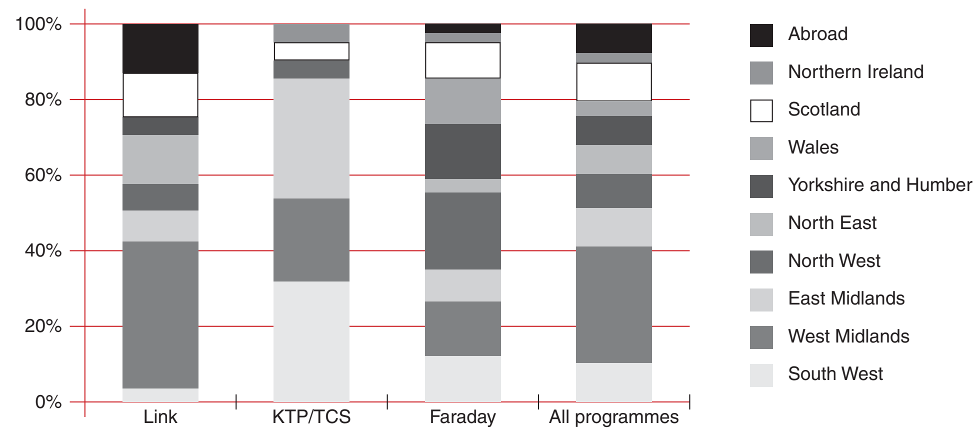


Figure 7: **Distribution of programme partners outside the GSE**



Similarly, as illustrated in Figure 8, in the case of the Knowledge Transfer Programmes identified, most partners outside of the GSE 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.

Factors influencing the spatial distribution of knowledge exchange

Understanding the geography of knowledge transfer activity involves an appreciation of the factors that influence its spatial distribution and bring about the patterns identified above. One of the main outcomes of this study was to identify the factors that typically influence the spatial distribution of knowledge exchange activities.

One of the major spatial influences is, not surprisingly, the pattern of demand. Where clusters or other concentrations of economic activity occur, knowledge transfer activities are pulled towards them. For example, 80% of the work of the Institute of Manufacturing at the University of Cambridge is reported to be located outside of the Greater South East of England, owing to the location of most of the potential users of its research. Art and Design Schools reported that they had strong links with London, where many of the design houses they worked with were located. Similarly, some 60% of all business R&D expenditure in the UK occurs in the Greater South East (Adams and Smith[30], 2005), increasing the likelihood that universities will work with companies located in the South East.

The size of the firm can also affect the spatial distribution of knowledge exchange activities. Relationships with SMEs appear more likely to localised, whereas those with larger firms 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 a university’s corporate liaison unit felt that the main impacts beyond the Greater South East were through relationships with large global businesses. In practice, individual academics tended to work with both large firms and SMEs, as each offers benefits (Box 1).

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

Box 1 The relative merits of working with SMEs and large firms

Few Departments focus on working with just one type, or size, of firm. There are some common perceptions of the relative merits of working with SMEs or large firms.

SMEs can be preferred because:

- They represent the industrial landscape and since the amount of their activity is increasing
- They are more likely to do DTI-funded research
- Smaller research projects are very useful, and it is possible to have a lot more influence
- They do not have the resources to undertake research in-house
- They offer niche research opportunities
- It is quicker to establish relationships with SMEs than with a large 'blue-chip' company

Large firms can be preferred because:

- They have the resources to engage in research orientated activities
- They are the source of the most income
- They are more likely to get involved in course development and add value
- They are more realistic, than SMEs, about operational timescales
- 7 Longer-term relationships can be established

with a particular stage of business development or size of company."

The capacity to develop linkages with firms emerges as a significant influence on the geography of knowledge transfer activity. Teaching loads, staff-student ratios and other commitments, particularly publishing research in academic journals, were all reported as impacting on the time available to work with business. Researchers reported that business related knowledge transfer activity was generally undertaken in the 'spare' time left over after these commitments were met. The real effect of this is in terms of the amount of time staff have to spend on developing contacts and relationships with businesses, with financial costs to the individual or the department also playing a part in limiting the number of contacts acted upon, or the travel distance considered. 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. The result of these constraints is that researchers tend to build contacts with those businesses that are the easiest to access, or where the returns are likely to be greatest. For some this will be locally-based businesses, for others it will be large multi-national companies met on the international conference circuit, or who have approached the academic themselves.

Making the initial contact with business recurs as one of the most 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.

An important source of contacts are personal and professional networks. These can 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". The geography of the networks memberships' thus play a crucial role in determining the overall geography of knowledge transfer activity more widely, in some cases broadening the reach of a university, in others limiting it.

Universities and academics also respond to requests for support from businesses. Here, reputation – either of the individual or the institution - 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. This knowledge can be transmitted in different ways. Often it is based upon publications and conference activity, at times it is held in databases, sometimes it is based upon student and graduate links, sometimes it is linked to sectoral networks and at other times it is about being known in a region. Awareness of who is doing what in a field, coupled with issues of trust, can play an important part in influencing the geography of knowledge transfer activity. A lot of effort has been expended 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 with. Clearly the focus of efforts to build awareness and bring potential partners together has a significant influence on the spatial distribution of knowledge transfer activities.

One clear influence on the geography of knowledge transfer is the strategy adopted by a university towards the links that it seeks to nurture. It is fair to say that no University 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 London-based commentator reported: “the CLU (Corporate Liaison Unit) 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 - it is immaterial where these are”. However, it is also clear that for at least some universities the spatial geography of business contacts is becoming a stronger consideration. 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 and the development of stronger working links with the RDAs reinforces this and 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. Similarly, all three universities that have identifiable spatial targets for knowledge transfer activity in their corporate plans aim to increase the proportion of activity they undertake within the region. If carried through, these effectively work against the development of a wider spatial focus. At a practical level a similar message emerges, for example one university informed this study that there are no real barriers to working outside the Greater South East as they work mainly with manufacturing businesses. However, the increased working links with the region’s economic development agency means they are focusing more on the region 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 that, for some, this is becoming a stronger consideration. There is also some hesitation among some universities as to where the regional turn is leading. As one university interviewee reported, geography is irrelevant as (the university) just wants to work with the best, wherever they are. Pushing the regional agenda does not necessarily sit well with this.

So how important is proximity?

One of the great debates in the field of knowledge transfer activity is the importance of co-location, or geographical proximity. As noted previously, much research highlights the fact that knowledge spillovers tend to decline with distance, with other research stressing the importance of a rich local ’learning’ environment. However, whether this remains valid in the context of new communications technologies is a moot point.

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 (Box 2). 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

Box 2 Proximity is not seen as a key driver:

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- it's 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.”

science is at its best". Finally one PSRE noted that they do world class research and local and regional networks have not been good business opportunities. However, they have been good for enterprises, allowing them to stay up to date with latest developments.

Proximity does have an influence in initiating contacts, as hinted at in the last comment in Box 2. 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.

Geographical proximity is also important in the placement of students with firms, such as in the case of Knowledge Transfer Partnerships. The vast majority of placements are proximate to the University. In these instances depth and frequency of contact, coupled with residential preferences appear to be important influencing factors. In some cases this is due to the requirements of the university. For some courses, for example, it is a requirement that the student lives locally, 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 towards more localised ones within the UK and a greater proportion overseas, reflecting the increasing numbers of overseas students.

This pattern of near and far links, with relatively fewer connections in between, appears to be quite strong for all knowledge transfer linkages, at least in the UK, and particularly with respect to the intensity of the connections made. There is a preference for local/regional linkages with links beyond the region bearing few signs of prevalent gravity effects, in that universities are as likely to engage with collaborators elsewhere in the world as they are with those located elsewhere in the UK.

A role for public sector intervention?

There has been a lot of public sector consideration on how to promote greater levels of knowledge transfer activity. In the UK this has focused, at a national level, around building capacity within HEIs to engage with businesses; stimulating spin-outs and licensing, and making direct connections with individual businesses through collaborative research and through placement and sponsorship schemes. These policies are, broadly, aspatial. The spatial effects of their implementation rely upon the focus of participating universities, PSRE and businesses as well as the nature of the activity itself. For example, spinouts tend to have strong local impacts, at least in the short-term, while licensing effects tend to be more global. As we have seen, this is presently leading to a mixed geography of knowledge transfer activity.

At a regional level there is an equal, and increasing, interest in stimulating knowledge transfer within the region, particularly in terms of capitalising on a region's knowledge base of universities and research centres. In part this relies upon a regionalisation of national policy initiatives but commonly also includes brokering contacts and fostering networks of business people and academics. Here there is a much stronger, albeit often implicit, emphasis on the spatial dimension to knowledge transfer activities. This is certainly the perception of the HEIs involved in this study and of many of the public bodies interviewed. Where spatial targets exist they tend to be regional rather than inter-regional. This paper does not question whether this increasingly regional turn to knowledge transfer policies is appropriate. Rather, it offers some pointers to effective mechanisms for stimulating regional knowledge transfer activities, based upon the lessons of the research undertaken.

Firstly, public policy makers can support awareness of available skills and knowledge as well interest in engaging in knowledge transfer activities. A recurring criticism of efforts to bring academics and businesses together is the current lack of knowledge of what expertise resides where. The costs of acquiring this knowledge are a barrier for many companies, and academics. Efforts to make such knowledge acquisition simpler and more straightforward, such as mapping of key areas of expertise and knowledge strengths within a region can 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.

While effective databases can be an important start they are not enough on their own. Evidence taken by the UK's Small Business Service 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 and Jumpstart, also in London, 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.

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. While 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 and digest new knowledge is a key question for public policy.

The challenge facing public agencies is, then, how to assist the dissemination and assimilation of knowledge. At one level this may involve generating a stronger innovation culture among firms more generally, reaching to both managers and employees. At another level public agencies, such as the Manufacturing Advisory Service in the UK, can 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. It can ensure that publicly funded research benefits companies and organisations across the UK by helping to draw externally generated knowledge into a region to the benefit of the firms located there. It can also benenfit those that do not necessarily wish to undertake collaborative work with HEIs on an individual basis.

Conclusions

Knowledge transfer activity is dominated by local contacts. Between a half and two-fifths of all activities are undertaken within the respective region. However, this is not a consistent picture. More research active organisations tend to have fewer local links, while different types of knowledge transfer activity also have differential spatial geographies, with those relating to student placements tending to be the most localised.

The strength of the contacts also vary by location. Local contacts tend to be the strongest followed by those that are overseas. Contacts with organisations located elsewhere in the UK – the medium-horizon - were, in this study, the least strong. There is also no consistent 'distance-decay' pattern observable in terms of research contacts within different regions elsewhere in the UK.

A range of factors, both external and internal to individual universities and departments, influence the geography of knowledge transfer activity revealed in this study. One of the recurring messages is that geographical proximity is not regarded as a key criterion by most academics, despite the finding that local contacts dominate knowledge transfer activity patterns. Rather the revealed geography is a function of the complex interplay of many different factors.

The study has provided further support to the contention that strong local spillovers emanate from universities located within a region but has also highlighted the importance of inter-regional spillovers. The latter do not appear to have an observable spatial geography. This supports Morgan's observation, from earlier in this chapter, that the home base forms the heart of a knowledge network which straddles multiple spatial scales.

This finding has important ramifications for those interested in the development of regional innovation systems. While the local remains important the relationship, between the local and wider scales must also be considered. In practice, many of these relationships are mediated by individuals operating in different networks, or communities of practice. In this respect it is the relational geography which is critical to the geography of knowledge transfer activities. The choice, it appears, is not between spatial proximity and relational proximity but rather about the mix between the two.

An important message is that simply enhancing the capacity of universities to engage in knowledge transfer activities will not necessarily lead to any change in the geography of these activities. It is a well-known truism that not all knowledge transfer routes are the same. Different types of route, whether this is contract relationships, collaborative research or student placements, exhibit a different geography. This is an important message for public policy makers who are seeking to build stronger regional knowledge transfer networks. The focus to date has been on developing HEI-business interactions per se regardless of geography, as a stronger regional turn to this policy emerges a more nuanced approach will be needed. In some cases this should focus on strengthening intra-regional knowledge transfer activities but in others policy–makers will do well to consider how to encourage inter-regional knowledge exchange to the benefit of local firms and universities.

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24 There are 7 Research Councils in the UK which are responsible for investing public money in science and research

25 HEFCE 2005 ibid

26 DTI R&D scorecard

27 In the UK the most research intensive universities form a group known as the Russell Group. 7 of the 19 members of the Russell Group (37%) are located in the Greater South East of England

28 This analysis is based on a sample of 7 current Faraday partnerships

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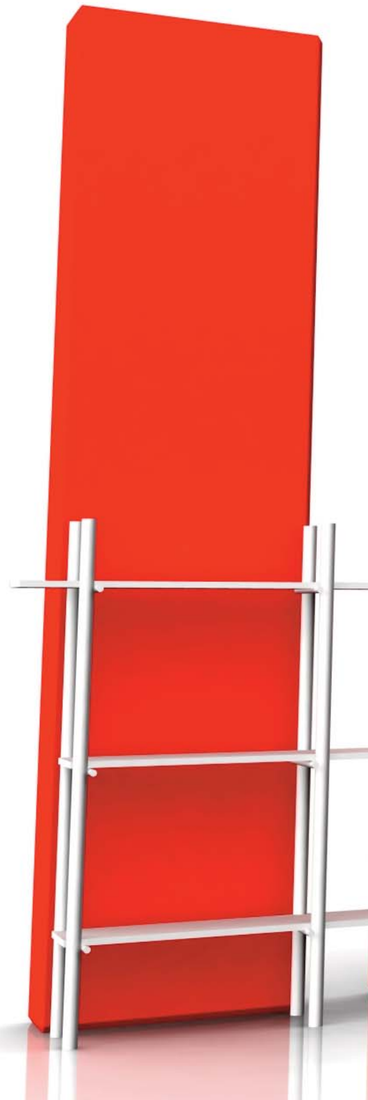
30 This might be the University or the PSRE as a whole or a particular Department, School or College

05

Conceptualising and Measuring the Competitiveness of Regions: a Review of the European Competitiveness Index

Robert Huggins & Will Davies



The relative competitiveness of regions in Europe can be measured by constructing a single index that reflects, as fully as possible, the measurable criteria constituting 'area competitiveness'.

This paper is based on the European Competitiveness Index (ECI), which was first published in 2004 (Huggins et al., 2004[2]) and updated in 2006 to include the ten new Member States. As well as developing a comprehensive composite index, the paper provides some thoughts on the link between the concept and measurement of regional competitiveness.

By providing visible yardsticks of strengths and weaknesses that go beyond a focus purely on GDP and GVA, it is our contention that regional benchmarking studies can make an important contribution to regional policymaking and inter-regional learning processes; much needed at a time when the European Union is both expanding and decentralizing.

Conceptualising the Competitiveness of Regions

The global importance of the concept of competitiveness has increased rapidly in recent years, with the issues surrounding it becoming, at the same time, both more empirically refined and theoretically complex. It was the research of Porter[3] (1990) that first defined national competitiveness as an outcome of a nation's ability to innovate in order to achieve, or maintain, an advantageous position over other nations in a number of key industrial sectors. From the spatial perspective, Porter's[4] (2006) major contribution was to take a micro-level understanding of the conditions determining firm competitiveness, such as the capacity to innovate, and apply it to the territorial unit, be it city, region, or nation.

Following Storper[5] (1997), we define regional competitiveness as referring to the capability of an economy to attract and maintain firms with stable or rising market shares in an activity, while maintaining stable or increasing standards of living for those who participate in it.

Particular criticism has been directed at the blunt, and often misleading, ways in which direct analogies have been made between competitiveness at the firm and territorial level; mostly famously by Krugman[6] (1994), who attacked what the he felt was becoming a 'dangerous' obsession with national competitiveness. The points raised by Krugman and others have, in general, led to a more rigorous economic application of the concept of competitiveness. Yet, the expression continues to be applied in a wide variety of different contexts and its usage continues to attract much criticism. According to Budd and Hermis[7] (2004), the term still 'sheds much heat but little light'. What is agreed, however, is that the notion of competitiveness has had an enormous influence on policy, and thus, although elusive, it remains a key concept requiring informed debate (Kitson et al[8], 2004).

In conceptualising competitiveness it is crucial to distinguish it from the concept of 'competition'. Certainly, by writing in terms of competitiveness one inevitably invites the reader to think in terms of competition, of head-to-head conflict. Yet, as used in the majority of cases, the use of competitiveness at the national or regional level is only 'competitive' in the sense that it refers to the presence of conditions that will enable firms to compete in local, national and international markets.

Territories may 'compete' in trying to provide the best platform for operating at high levels of productivity, but this is very different from the kind of direct competition undertaken by firms. It is the zero-sum conceptualisation of regional competitiveness which often leads to the premise that there must inevitably be both winners and losers (e.g. Bristow[9], 2005). Nevertheless, despite efforts to understand the processes driving firm competitiveness and economic development at the regional level, it would not be controversial to conclude that the concept of regional competitiveness requires considerable further development.

Measuring Regional Competitiveness

Most existing approaches to measuring regional competitiveness attempt to identify a set of 'indicators', which capture a broad range of the different assets thought to underpin relative economic performance within a fixed spatial context. However, as Deas and Giordano[10] (2001) emphasise, embodying the conceptual subtleties concerning regional competitiveness within a quantitative model is far from straightforward. The challenge for benchmarkers of regional competitiveness is to identify the indicators that best reveal the sources of competitiveness within the spatial units in question, and to explain those choices in the context of the relevant theories. Attempts to do so have ranged from very narrow analyses of individual indicators, to broad approaches that attempt to capture almost every measurable factor influencing economic performance (e.g. Zinnes et al[11] 2001).

Inevitably, some sources of competitiveness will be more readily 'revealed' than others (Martin[12], 2005). For instance, a range of indicators are available that can be considered to reveal innovative capacity, and as such "innovation indices" are quite common in the literature. A particularly good example is Crescenzi[13] (2005) whose index, aimed at an analysis of European regions, includes financial inputs (R&D expenditure), human resource inputs (R&D personnel) and outputs (patents). Other 'sources' of competitiveness are inevitably much harder to directly measure. For example, Iyer et al[14]. (2005), argue that 'social capital' – which will affect competitiveness through its impact on the manner in which technology is used – is especially overlooked, due to the inevitable difficulty in quantifying social characteristics.

A number of organisations have produced composite indices that attempt to capture the various sources and outputs of competitiveness at the national level (IMD[15], 2006; Lopez-Claros et al.[16], 2006). Despite growth in the development and sophistication of composite competitiveness indices it is recognised that composite indices have their flaws, with the most common criticism being the supposed 'universality' of the approach, which, it is claimed, leads to a 'one size fits all' approach to regional economic development (Bristow, 2005). Indeed, there is a danger of overemphasising those economic features for which statistics are readily available, while downplaying other, more intangible factors, which are more difficult to quantify. This universalism has also been criticised in a developmental context (e.g. Lall[17], 2001), since the constraints in low-income areas are likely to relate less to factors like knowledge and innovation, and more to assets such as infrastructure and capital. Yet this does not detract from the argument that, in a context of advanced economic development, there are factors that might be identified as being *universally* beneficial.

For others the criticism of competitiveness rankings systems appears to be based on the semantic confusion between 'competitiveness' and 'competition' discussed earlier. Bristow (2005) claims that composite rankings, fall into the trap of trying to make comparisons across very different but notionally similar 'regional' entities, without exploring the extent to which these places are indeed competing with each other. While it may be debated if and how regions 'compete', it is clear that their competitiveness varies in terms of their capacity and capability to support and attract productive activity (Porter, 2006).

Constructing the European Competitiveness Index

To create a single composite measure of competitiveness for European regions a number of different modes of designing the index and the variables to be included, were considered. This consideration focused on how to best reflect the link between macroeconomic performance and the underlying sources of competitiveness, be it knowledge, innovative capacity, infrastructure, or so on. The selected variables can be usefully divided into five categories: innovation, economic performance, infrastructure and accessibility, knowledge employment and education (for a list of indicators see: Huggins and Davies[18], 2006).

- The Normalisation of all data to ensure that no single variable has an overriding influence on the final results.
- Factor analysis of indicators in order to simplify the diverse relationships that exist among a set of observed variables by uncovering common dimensions or factors that link together the seemingly unrelated values.
- The composite index is calculated by Data Envelopment Analysis (DEA), which is a technique that assigns a weight for each factor and each region that will seek to maximise a weighted sum of the factor scores. The process is repeated for all regions, and a geometric mean of all the scores is taken to provide an overall score.

Results of the European Competitiveness Index 2006

Brussels in Belgium tops the European Competitiveness Index 2006, moving up two places from 2004 and knocking the previous leader, Uusimaa (Greater Helsinki), down into second place. In terms of economic performance, Brussels is clearly one of the wealthiest areas in Europe, with the highest GDP per capita of any region in the ECI, and second only to Île de France in terms of earnings and labour productivity. The unparalleled economic well-being of the region is obviously, in part, a result of the unique level of public sector investment in the home of the European Commission. However, our findings show that the region is also a dynamic, knowledge-intensive hub. Looking at specific indicators, Brussels ranks among the top regions in Europe by both per capita R&D expenditure and high-tech service employment, while added to this very strong knowledge base Brussels is also among the most accessible cities in Europe.

Although losing the top spot from 2004, Uusimaa in Finland continues to perform very strongly in the ECI. Our data shows that the region clearly contributes a huge amount to the competitive dynamism of the Finnish economy, arguably epitomising the creative, ‘knowledge-intensive’ development that has proved to be such a success in many parts of north-western Europe. In third and fourth positions we find two more knowledge-intensive centres, Île de France and Stockholm, while of the new regions two notably high new entries are Prague of the Czech Republic, in seventh place, and Bratislavský of Slovakia, in tenth place. Turning our attention to the bottom of the index we see that, unsurprisingly, the regions from the new Member States dominate the lower end of the rankings. The Baltic state-regions of Lithuania, Latvia and Estonia all fall in the bottom ten (although each has recorded very strong economic growth of late), while the regions from Poland and Hungary also tend to be concentrated towards the bottom of the index.

The enormity of the intra-national differences between regional competitiveness in parts of Eastern Europe is also highlighted by the fact that the Czech Republic and Slovakia, the homes to top ten entrants Prague and Bratislavský respectively, are also represented by regions in the bottom ten. Of the original EU-15, the lowest rankings are dominated by island regions, such as Acores (Portugal) and Sicilia (Italy), suggesting that inaccessibility resulting from geographic handicaps is one of the primary binding constraints in the knowledge economy. The same is true for the new regions – those at the bottom of the rankings tend to be remotely situated at the eastern edge of Europe, and lack the infrastructure necessary to connect themselves with the major European markets.

Table 1: **Regional European Competitiveness Index 2006**

		Regional European Competitiveness 2006	Rank 2004	Change in Rank
1	Brussels, Belgium	193.5	3	2
2	Uusimaa, Finland	188.3	1	-1
3	Île de France, France	185.2	4	1
4	Stockholm, Sweden	177.8	2	-2
5	Etelä-Suomi, Finland	175.4	28*	23*
6	Luxembourg	165.9	6	0
7	Prague, Czech Republic	165.7	-	-
8	Hamburg, Germany	163.5	7	-1
9	London, UK	162.6	8	-1
10	Bratislavský kraj, Slovakia	159.6	-	-
11	Bremen, Germany	155.8	10	-1
12	Pohjois-Suomi, Finland	143.6	23	11
13	Baden-Württemberg, Germany	138.4	11	-2
14	Switzerland	135.9	5	-9
15	Norway	135.6	9	-6
16	South East, UK	134.1	12	-4
17	Denmark	133.9	18	1
18	West-Nederland, Netherlands	133.6	14	-4
19	Comunidad de Madrid, Spain	132.9	30	11
20	Ostösterreich, Austria	132.8	21	1
21	Länsi-Suomi, Finland	132.4	54**	33**
22	Västsverige, Sweden	130.4	19	-3
23	Östra Mellansverige, Sweden	130.2	22	-1
24	Bayern, Germany	129.7	15	-9
25	Hessen, Germany	129.7	13	-12
26	Eastern, UK	128.4	17	-9
27	Sydsverige, Sweden	126.4	24	-3
28	Lazio, Italy	123.7	25	-3
29	Southern and Eastern, Ireland	122.1	36	7
30	Övre Norrland, Sweden	121.4	35	5
31	Zuid-Nederland, Netherlands	119.3	20	-11
32	Centre-Est, France	119.0	31	-1
33	Emilia-Romagna, Italy	118.8	37	4

34	Berlin, Germany	116.7	16	-18
35	Scotland, UK	116.7	42	7
36	Noreste, Spain	114.9	71	35
37	Lombardia, Italy	114.4	34	-3
38	Vlaams Gewest, Belgium	114.0	41	3
39	Centro, Italy	114.0	61	22
40	Nord Ovest, Italy	112.2	45	5
41	Oost-Nederland, Netherlands	112.1	29	-12
42	Nord Est, Italy	109.0	55	13
43	Nordrhein-Westfalen, Germany	108.9	26	-17
44	Sud-Ouest, France	107.9	47	3
45	Este, Spain	107.7	70	25
46	Westösterreich, Austria	107.5	44	-2
47	Közép-Magyarország, Hungary	107.4	-	-
48	South West, UK	106.5	32	-16
49	Südösterreich, Austria	105.5	52	3
50	East Midlands, UK	105.3	43	-7
51	Niedersachsen, Germany	103.9	39	-12
52	Itä-Suomi, Finland	103.6	65	13
53	North West, UK	103.0	46	-7
54	Noord-Nederland, Netherlands	102.4	50	-4
55	Est, France	102.4	51	-4
56	Méditerranée, France	102.4	53	-3
57	Yorkshire and The Humber, UK	102.3	60	3
58	Saarland, Germany	99.6	38	-20
59	Attiki, Greece	97.8	78	19
60	Rheinland-Pfalz, Germany	97.3	33	-27
61	West Midlands, UK	96.7	40	-21
62	Ouest, France	95.8	62	0
63	North East, UK	94.2	69	6
64	Northern Ireland, UK	94.2	63	-1
65	Schleswig-Holstein, Germany	93.1	48	-17
66	Norra Mellansverige, Sweden	92.7	56	-10
67	Bassin Parisien, France	92.6	57	-10
68	Wales, UK	92.1	64	-4

69	Abruzzo, Italy	90.7	76***	7
70	Sachsen, Germany	90.5	59	-11
71	Småland med öarna, Sweden	90.1	58	-13
72	Région Wallonne, Belgium	90.0	72	0
73	Canarias, Spain	87.6	79	6
74	Border, Midlands and Western, Ireland	86.9	74	0
75	Mellersta Norrland, Sweden	86.4	49	-26
76	Slovenia	86.2	-	-
77	Thüringen, Germany	85.2	68	-9
78	Noroeste, Spain	84.2	85	7
79	Nord - Pas-de-Calais, France	82.9	67	-12
80	Mecklenburg-Vorpommern, Germany	81.0	75	-5
81	Centralny, Poland	80.8	-	-
82	Continente, Portugal	80.6	77	-5
83	Sachsen-Anhalt, Germany	80.3	73	-10
84	Sardegna, Italy	80.2	80	-4
85	Centro, Spain	78.5	88	3
86	Brandenburg, Germany	78.1	66	-20
87	Nisia Aigaiou, Kriti, Greece	76.9	81	-6
88	Sur, Spain	76.5	90	2
89	Kentriki Ellada, Greece	75.8	91	2
90	Molise, Italy	75.8	76***	-14
91	Madeira, Portugal	75.8	82	-9
92	Cyprus	75.5	-	-
93	Voreia Ellada, Greece	74.3	89	-4
94	Campania, Italy	69.7	84	-10
95	Malta	69.6	-	-
96	Sud, Italy	68.9	87	-9
97	Sicilia, Italy	68.8	86	-11
98	Açores, Portugal	64.7	83	-15
99	Poludniowo-Zachodni, Poland	62.2	-	-
100	Poludniowy, Poland	62.1	-	-
101	Moravskoslezko, Czech Republic	61.5	-	-
102	Jihovýchod, Czech Republic	61.4	-	-
103	Pólnocno-Zachodni, Poland	60.3	-	-

104	Dunántúl, Hungary	58.3	-	-
105	Jihozápad, Czech Republic	57.8	-	-
106	Pólnocny, Poland	57.8	-	-
107	Západné Slovensko, Slovakia	56.5	-	-
108	Východné Slovensko, Slovakia	51.9	-	-
109	Estonia	49.4	-	-
110	Lithuania	45.7	-	-
111	Severozápad, Czech Republic	44.2	-	-
112	Stredni Morava, Czech Republic	44.1	-	-
113	Latvia	42.7	-	-
114	Stredné Slovensko, Slovakia	42.4	-	-
115	Alföld és Észak, Hungary	41.2	-	-
116	Severovýchod, Czech Republic	39.7	-	-
117	Stredni Cechy, Czech Republic	38.3	-	-
118	Wschodni, Poland	37.6	-	-

*fi18 Etelä-Suomi 2006 classified as whole region (in 2004 separated from Uusimaa)
**fi19 Länsi-Suomi named Väli-Suomi in 2004
***itf1 Abruzzo and itf2 Molise grouped as Abruzzo-Molise in 2004

Source: Huggins and Davies (2006)

Conclusion

Initiatives such as the European Competitiveness Index aim to provide analysis that can feed into current and future strategies to develop a more cohesive approach to technology, innovation and regional knowledge economy development. In particular, the hope is to contribute to regional policymaking and inter-regional learning processes through visible yardsticks of economic strengths and weaknesses that go beyond a focus purely on narrow measures of GDP, and in doing so to promote a more cohesive, knowledge-intensive Europe, within which peripheral and less favoured regions are able to develop the capacity building tools that will allow them to meet the Lisbon and Barcelona objectives. Also, in an age of increasing cross border regional cooperation, competitiveness benchmarking provides valuable intelligence to policymakers engaged in establishing cooperative initiatives.

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Global circuits of Labour and High Technology Local Economies

Rupert Waters

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‘Economic growth will increasingly depend on enterprise and innovation and the ability of places to build on their indigenous assets. It will be critical that places can develop, attract and retain a skilled workforce which is able to be successful in the globalised economy.’ **HM Government, 2007**[1]

The globalisation of labour markets and its effect on the UK economy has attracted much recent academic and policy attention. The focus has not typically been on the highly skilled knowledge workers that are the central concern of this paper. Rather, it has been on maintaining levels of service in the UK rather than driving productivity forward, for example McDowell et al (2007) on hotel workers in London, or Hardill & MacDonald (2000) on the in-migration of nurses.

Drawing on the globalisation, clusters and spatial labour market literatures this paper analyses the careers of one thousand highly skilled workers from the high-technology local clusters of Oxfordshire and Cambridgeshire draw on the global labour market for scientists.

Clusters

Despite continued globalisation ’the economic geography of the modern world is being reconstituted as a loose congeries of regional production complexes joined together in dense transactional webs’ (Scott, 1999, 78). As particular clusters emerge, they develop their own status in the labour market, so that the ‘geographic concentration of an industry acts as a strong magnet to attract talented people and other factors to it’ (Porter, 1990, 157) as its firms ’develop the power and resources to select the best students and workers from all over the globe’ (Perrons, 2004, 215).

That the movement of people is the only mechanism through which tacit knowledge can be transmitted between, within and across the boundaries of firms and territories (Hudson, 2005) is acknowledged by the UK Government’s assertion that ’the highly skilled will tend to be more concentrated in those areas where knowledge-intensive industries cluster’ (HM Government, 2007, 20). However, it has been argued that these clusters must be open to external energy in order to avoid ‘entropic death’ and a decline in their own innovative capability (Camagni, 1991).

In specifically considering the labour market for the highly skilled, Henry and Pinch (2000, 128) observed that the UK’s motorsport valley is the world’s leading motorsport cluster and that for engineers working beyond the cluster erodes the currency of knowledge, so that ’few stay away from the Valley for long, returning once more to refigure their position within the community of knowledge’ (2000, 128).

This is however a ’very individualistic labour market’ (Massey, 1995, 138), in which particular people are sought due to their possession of knowledge, and despite the international competitiveness of certain high-technology regional economies and skilled labour’s operation within national and international labour markets (Keeble et al, 1999) alternative analyses have found that the highly skilled appear to be highly mobile within local labour markets and quasi-immobile beyond that (Camagni, 1991).

Policy

As one of the Treasury’s five drivers of productivity, the importance of skills in economic policy is well established. However, the Leitch Review concluded that ’where skills were once a key driver of prosperity and fairness, they are now the key driver’ (HM Treasury, 2006, 9) and as noted in the quote introducing the paper economic growth can be expected to be dependent on developing, attracting and retaining skilled labour (HM Government, 2007).

The recent Sainsbury Report endorses the prevailing policy approach advanced in successive Skills Strategy White Papers (DfES, 2003a HM Government, 2005), arguing that ‘skilled labour is probably the least mobile factor of production, making the domestic system of education and training a key part of any innovation ecosystem and of crucial importance to policy makers’ (Lord Sainsbury, 2007, 24).

The skills development approach is complemented by a number of central Government initiatives to encourage international migration, most notably the Highly-Skilled Migrants Programme intended to ‘attract migrants likely to make a highly positive contribution to average skill levels and productivity growth’ (HM Government, 2004, 29). The DfES (2003b 14) has identified a

[1] HM Government, 2007, 71.

need 'to attract and retain the best researchers internationally', while the House of Commons Select Committee on Science and Technology are currently considering the impact of the Research Councils' policies on the international mobility of scientists and engineers[1]. The Home Office has also recently convened a Migration Advisory Committee as a time-limited Non-Departmental Body. Despite this recent interest in the migration of the highly skilled as an economic driver, UK skills policy remains dominated by the development of a demand-led labour market in which the labour market needs of employers are reflected in the curricula development of local FE and HE institutes (see for example HM Government, 2005).

At the regional level, skills development has long been a key feature of economic strategies. Both the South East England Development Agency (SEEDA) and the East of England Development Agency (EEDA), the Regional Development Agencies covering Oxfordshire and Cambridgeshire respectively, have explicitly acknowledged the role of in-migration of the highly skilled in economic development. The South East's Regional Economic Strategy (RES) notes that 'the current skills profile in the UK and the South East is inadequate [...] to compete in international markets and to meet domestic demand effectively and efficiently' before identifying that in-migration from the EU and beyond offers 'a unique opportunity to support the transfer of existing skills as well as bring global perspectives to the business environment' SEEDA (2006, 71).

Methodology

The paper reports on data collected through a postal survey of the highly skilled. A total of 6,099 questionnaires were sent to the members of the Institute of Electrical Engineers, the Institute of Physics and the Royal Society of Chemistry in Oxfordshire and Cambridgeshire. The response rate of 14 percent is typical for this type of survey, providing sufficiently large samples for both case-study areas and institute membership to allow analysis by both place and branch of science, comparing favourably against previous studies of high-technology local economies.

National datasets show that with 28 and 25 per cent of residents holding degree level qualifications, Oxfordshire and Cambridgeshire respectively rank as the 2nd and 6th most highly qualified sub-regions, while Oxford City (36.8 per cent) and Cambridge City (41.2 per cent) rank 8th and 12th of the 376 local authority areas in England and Wales. Table 1 presents the educational attainment of the survey population, showing 90 per cent of Oxfordshire residents and 86 of Cambridgeshire residents hold degrees (48.5 per cent and 47.0 per cent respectively holding PhDs), demonstrating the highly skilled nature of the sample.

[1] See http://www.parliament.uk/parliamentary_committees/science_and_technology_committee/ipa.cfm#terms

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Table 1: Respondents' Educational Attainment

	IEE		IOP		RSC	
	Oxon	Cambs	Oxon	Cambs	Oxon	Cambs
Degree	56.7	43.9	17.4	9.9	15.8	19.1
Masters	20.0	26.2	15.3	23.8	7.9	13.9
PhD	15.0	20.6	59.8	49.7	61.8	57.4
Total	91.7	90.7	92.5	83.4	85.5	90.4

Table 2: Percentage of respondents to have worked abroad

	IEE	IOP	RSC
Cambridgeshire	14.0	15.9	14.8
Oxfordshire	8.1	23.0	16.7

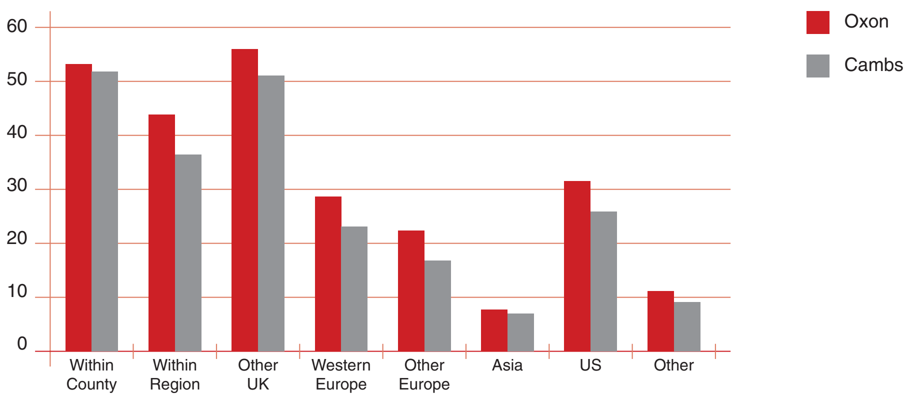
Table 3: Respondents to have worked abroad with PhDs (%)

	IEE	IOP	RSC
Cambridgeshire	22.7	25.6	22.7
Oxfordshire	22.2	30.1	23.4

Table 4: Proportion of those who have worked abroad currently in academic posts

	IEE	IOP	RSC
Cambridgeshire	50.0	23.4	50.0
Oxfordshire	0.0	25.0	10.0

Figure 1: **Respondents next job search location (percent)**



Oxfordshire and Cambridgeshire as Global Centres

Oxfordshire and Cambridgeshire are two of the most important centres of the knowledge economy in Britain. The two counties, although not the largest concentrations of high-technology activity in the UK, are among the fastest growing centres and have dense populations of research activity and highly skilled people (see Lawton, Smith et al., 2003). Their importance in the UK's knowledge economy as a whole, and in particular clusters has been widely acknowledged (see for example Sainsbury Report, 1999; Trends Business Research, 2001 for the Department of Trade and Industry; and the H.M. Treasury's Lambert Review, 2003).

Analysis

This section presents the empirical findings of the paper. There is no reliable national dataset to compare to the survey findings. However by way of comparison, in 2001 the South East region received 65,000 international migrants (0.8 per cent of total resident population) and the East of England 27,000 (0.5 per cent). The proportion of survey respondents to have worked abroad are presented in Table 2, which shows that over the course of their careers 17.4 per cent of scientists and engineers in the case studies had previously worked abroad, ranging from 8 per cent of electrical engineers in Oxfordshire to 23 per cent for the same county's physicists.

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The likelihood of having worked abroad increases markedly with educational attainment. When only those with PhDs are considered, the rates are higher for each segment, with the exception of Oxfordshire's electrical engineers. The overall figure rises to 25.9 per cent. The full results are presented in Table 3.

Where employment is in academic posts, the results are markedly different. Across the sample, 26 per cent of academics had held posts abroad (21 per cent for Oxfordshire and 30 per cent in Cambridgeshire). The Cambridgeshire experience in particular demonstrates that an academic career can be a strong driver of migration among the highly skilled. The full proportions are shown in Table 4.

Future job search locations for the respondents to the survey of the highly skilled provide validation of the findings, with respondents showing levels of interest in working abroad comparable with numbers to have employment histories that include overseas positions. The US is the most commonly cited possible overseas destination, ahead of Western Europe in both case studies.

Conclusion

This research has provided detailed data on the characteristics of the individuals that comprise world class skils. By analysing the work history and aspirations of the highly skilled it provides vital insights for policy makers and a valuable empirical source for the continuing refinement of migration policy for the highly skiled. The findings show that in advance of the new measures to increase rates of highly skilled in-migration to the UK, almost a fifth of scientific professionals working in two of the country's most important centres of the knowledge economically already have experience of working abroad. The academic labour market provides considerable impetus, adding support to suggestions in the literature that such migration is driven by status and performance of the local economy and individual institutions.

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