R&D in the Regions: The regional impact of EU technology programmes in the UK

Adrian Healy

April 2009

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

DECLARATION

This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.

Signed ..... Date: 14th April 2009

Adrian Healy

STATEMENT 1

This thesis is being submitted in partial fulfillment of the requirements for the degree of PhD.

Signed ..... Date: 14th April 2009

Adrian Healy

STATEMENT 2

This thesis is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by explicit references.

Signed ..... Date: 14th April 2009

Adrian Healy

STATEMENT 3

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed ..... Date: 14th April 2009

Adrian Healy

SUMMARY OF THESIS: POSTGRADUATE RESEARCH DEGREES

Student ID Number:	0433120
Title:	**Please circle appropriate value** **Mr/ Miss/ Ms/ Mrs/ Dr/ Rev/ Other, please specify** .....
Surname:	HEALY
First Names:	ADRIAN
School:	CITY AND REGIONAL PLANNING
Title of Degree:	**Please circle appropriate value** **EdD, EngD, DSW, DClinPsy, DHS, MCh, Md, MPhil, MPhil/PhD, MScD by Research, PhD/ Other, please specify** .....
Full Title of Thesis	R&D and the Regions: The regional impact of EU technology programmes in the UK

Summary of Thesis

Student ID Number:	0433120

Summary of Thesis:

This research explores the role and rising importance of EU R&D instruments in regional economic development in the UK since 1999. It poses the simple question of 'who gets what, and why?', and how this conforms to theories of innovation. The approach combines an analysis of both the EU's Structural Funds and Framework Programmes, two instruments which are rarely considered together at the regional level.

The research design is informed by a critical realist perspective which incorporates recent thinking on the role that relational geographies play in influencing social structures, the behaviour of groups and individuals and the complex interplay between these. The study centres on a qualitative, multiple case-study, approach using the UK's regions and Devolved Administrations as the unit of analysis. The study provides a robust empirical evidential base to the pattern of policy and practice running through the EU's R&D instruments in the UK and sheds new light on the 'territorial' debate which is prevalent both in EU policy circles and academic theorising.

The research highlights the tendency for regional policy-makers to fall back on narratives extolling local capacity, local knowledge spillovers and locally-orientated networks. The research demonstrates that in a world of flows spaces do matter, and that the boundaries of these spaces can exert power. Equally, however, to assume that the region forms a natural arena for collaboration is ill-advised.

The thesis finds that current thinking on patterns of spatial innovation underplays the importance of the territorial dialectic between the geographically proximate and the relational. It finds that the parallel worlds of practice revealed by the Structural Funds and the Framework Programmes epitomize the dialectical space of the region. The work illustrates the complex, divided, spaces forming administrative regions, and how policy-makers shape, and create, these spaces through their actions when seeking to construct the knowledge economy.

Contents

List of Figures, Tables, Boxes and Maps

List of Figures *Page*

List of Tables *Page*

List of Boxes *Page*

List of Maps

Acknowledgements

I owe a particular debt of gratitude to all those individuals who gave so freely of their time and their own knowledge during the course of this study. Without their support this study truly would not have been possible. Too many to name individually, I would particularly like to thank Vicki Brown for all her help and support whilst she was at the OSI. I hope each and all will recognise their thoughts in this work, and forgive me for any errors that I may have made.

I am also extremely grateful to Dr. Gillian Bristow, Prof. Phil Cooke and Prof. John Lovering who have all given me much support and encouragement during the duration of this study. My own understanding has benefited significantly from their insightful comments and I shall be forever grateful for their patience at what must, at times, have seemed very naïve questions. I hope that this work repays their trust. Thanks are also due to Stevie Upton, without whom coffee-times would have been much the poorer. I would also like to thank Roisin Willmott for volunteering to undertake the proof-reading of this thesis – your efforts are very much appreciated. Any errors in the work remain my responsibility alone.

My greatest thanks are reserved for Prof. Kevin Morgan. His unstinting support and guidance has been instrumental in the development of this work and provided the foundation on which I could begin to build. Without his generous provision of time, wisdom and knowledge I would have struggled to complete even this modest endeavour. Moreover, his enthusiasm, energy and good-humour have made the past four years an absolute pleasure.

Finally, I dedicate this work to my nephew Rohan, born on the 17th September as I was finalising this work. May you always be curious about the world around you.

Glossary

AMRC	Advanced Manufacturing Research Centre
AMRP	Advanced Manufacturing Research Park
BERD	Business Expenditure on R&D
BERR	Department for Business, Enterprise and Regulatory Reform
CEFAS	Centre for Fisheries and Aquaculture Science
CETIC	Centres of Excellence for Technology and Industrial Collaboration
CIC	Centre for Industrial Collaboration
CLG	Department for Communities and Local Government
CSL	Central Science Laboratory
CTI	Castings Technology International
DA	Devolved Administration
DIUS	Department for Innovation, Universities and Skills
DTI	Department of Trade and Industry
EC	European Commission
EEDA	East of England Development Agency
ERA	European Research Area
ERDF	European Regional Development Fund
ESF	European Social Fund
ESRC	Economic and Social Research Council
EU	European Union
FOI	Field of Intervention
FP	Framework Programme
FP4	4th Framework Programme
FP5	5th Framework Programme
FP6	6th Framework Programme
GDP	Gross Domestic Product
GERD	Gross Expenditure on R&D
GO	Government Office
GO-East	Government Office East of England
GO-Science	Government Office for Science
GOYH	Government Office Yorkshire and Humber
GVA	Gross Value Added
HE	Higher Education
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institute
HEIF	Higher Education Innovation Fund
HERD	Higher Education Expenditure on R&D
IGER	Institute of Grassland and Environmental Research
ILS	Institute for Life Sciences

IRC	Innovation Relay Centre
KEF	Knowledge Exploitation Fund
KTP	Knowledge Transfer Partnerships
MEC	Manufacturing Engineering Centre
NAMTEC	National Metals Technology Centre
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Cooperation and Development
OP	Operational Programme
OSI	Office of Science and Innovation
OST	Office of Science and Technology
PMC	Programme Monitoring Committee
PSRE	Public Sector Research Establishment
R&D	Research and Development
RDA	Regional Development Agency
RIS	Regional Innovation Strategy
RITTS	Regional Innovation and Technology Transfer Strategy
RTD	Research and Technological Development
RTDI	Research, Technological Development and Innovation
RTP	Regional Technology Plan
SHU	Sheffield Hallam University
SME	Small and medium sized enterprise
SPD	Single Programming Document
TWI	The Welding Institute
UK	United Kingdom
W:AVE	Wales: A Vibrant Economy
WAG	Welsh Assembly Government
WDA	Welsh Development Agency
WEFO	Welsh European Funding Office
WIRC	Wales Innovation Relay Centre
YF	Yorkshire Forward

1. INTRODUCTION

Public sector intervention in support of research and development (R&D) has traditionally been justified by the fact that the private rate of return to investment lies below the social rate of return (Arrow 1962). Without public-sector support, the argument runs, there would be an under-provision of socially-beneficial R&D. Increasingly, though, policy makers are looking to stimulate R&D activities for reasons of wider economic development, seeking to enhance economic growth rates and to overcome disparities in economic prosperity.

The argument that R&D activity can have a profound impact on overall levels of economic development stems from developments in thinking around economic growth theories, as well as a deeper understanding of the process by which the results of R&D are embedded in new products and processes through the innovation process. That knowledge creation (through R&D) might be seen as an endogenous process, the results of which are socially constructed and which can have substantial spillover benefits has been a powerful message for policy makers at different levels of government (see Landabasso and Mouton (2002) for example).

In consequence, public policies are increasingly targeting different facets of R&D in an effort to stimulate economic growth, from strengthening research infrastructures, through supporting research itself, to promoting the transmission of knowledge through animating networks and other avenues of dissemination. Policy-makers have also taken heed of the suggestion that the economic benefits of R&D will depend upon the efficacy of 'innovation systems' operating at different geographic scales, with a mounting emphasis being placed upon regional scales of activity. Recently, academics have suggested that through such actions regions might 'construct advantage' by actively encouraging the development of a knowledge-based economy (Cooke and Leydesdorf 2006).

The rising importance attached to R&D instruments as a means of stimulating economic development is exemplified by the European Commission. Over the past two decades

there has been a significant increase in the emphasis given to the role its instruments can play in stimulating research-led economic development in the European Union (EU). In the case of the Structural Funds, targeted at economic development and stimulating economic and social cohesion, emphasis has been placed on supporting the development of research capacity at the regional level. In the case of the Framework Programmes, targeted at stimulating high-level collaborative research of international significance, the emphasis has been on the commercial exploitation of the knowledge produced.

The increasing role granted to EU R&D instruments in stimulating levels of economic growth has inspired a range of academic literatures, both directly and indirectly. Yet, despite all of the research being undertaken there has been no combined analysis as yet of the activities of both the Structural Funds and the Framework Programmes in this field. This study seeks to close that gap. In recognition of the importance of this in the UK it has been partly financed by the DTI, through an ESRC-Case award.

The focus of the research is at the level of the region. This is for a number of reasons. Firstly, it is reported that some 80% of EU programmes are managed and implemented by local and regional authorities (Morgan 2004a). Secondly, the European Commission itself regards the regional scale as significant, in that it is the place where research actually occurs; the decisions of regional authorities influence the level of research undertaken and, thirdly, one of the overarching objectives of the European Commission is to promote the convergence of economic prosperity at the level of the region. Symbolic of the importance attached to the regional level is the 4th Cohesion Report entitled 'Growing Regions, Growing Europe' (EC 2007). Finally, the region has been the preferred geographical scale for writings about territorial innovation systems. Again, this tends to be because the region is regarded as the scale at which things 'happen', both in terms of public policy and where innovation is played out in practice.

Yet this regional focus is not without its tensions. There is a long-running, and often fraught, debate as to the balance between macro-economic growth and regional cohesion. This is typically expressed in terms of choosing between the geographic concentration of

research in a limited number of centres of 'excellence' and the distribution of that activity more broadly across the whole of the territory of the European Union. The concern, for those involved with regional cohesion, is that increased R&D expenditures in already prosperous regions will only exacerbate existing structural imbalances. Whilst those concerned with promoting research excellence and the overall performance of the EU economy worry about the inefficiencies of targeting investment at regions with lower levels of research capacity and capability.

For many years this tension has led to a parallel approach whereby investments are made to support excellent research wherever this may be located in the EU, and to promote a strengthening of research capacity in less prosperous regions. There have been strident calls in recent years, from the European Parliament, Member States and other bodies, for synergies between these two approaches to be realized. However, these calls have been made on the basis of a very limited evidential base. This study will contribute to overcoming that weakness in the UK. As such, this thesis makes a substantial empirical contribution to the policy implementation literature and provides a new insight into operation of EU R&D instruments in British regions. The relevance of this topic is further highlighted by the recent hearings held by the European Commission on 'Cohesion Policy and Innovation' (September 15th 2008) and chaired by the Director-General for Regional Policy.

As well as its practical policy value, the nature of the research offers a unique opportunity to explore a number of contemporary debates in the academic literature. These include the role of regionally-constituted innovation systems versus more relational geographies; the significance of multi-level models of governance in determining the pattern of activity of EU R&D instruments, and recent writings by authors such as Healey (2006, 2007) exploring the role of how particular constructs are 'imagined' or 'seen' in determining the outcomes of policy.

The different modes and scales of operation of the Structural Funds and the Framework Programmes offer a fascinating lens through which to explore these debates. They cast a

vivid light on the practice of research-led innovation within the UK and offer valuable insights into the nature of complex knowledge spaces and the determinants of policy making. In approaching this subject the remainder of the thesis is structured as follows:

Chapter 2 introduces the methodological approach taken by the study. After setting out the research question to be addressed by the study the chapter outlines how this has been approached. Building on a critical realist perspective, and using a technique of interpretive policy analysis, the chapter sets out why a qualitative case study approach was chosen and the details of the research design adopted.

Chapter 3 then considers the extant literatures which have a bearing on our understanding of this topic. Traditionally, the question of research-led economic development has been tackled from a number of different standpoints. These include models of economic growth; theories of innovation and learning within the firm and concepts of systems of innovation. More recently, there has been a burgeoning literature on the relative importance of geographic proximity versus distanciated learning. The chapter seeks to merge these disparate literatures into a coherent narrative through which to consider the activities of the EU's R&D instruments. As these are instruments of public policy the governance dimension is also a relevant consideration and the chapter concludes by reflecting on the insights provided by the literature on multi-level governance.

Chapter 4 provides an initial assessment of the distribution of activities financed by the EU's R&D instruments across the UK. This serves to set the context for the case study analysis set out in the following chapters. Prior to this assessment the chapter provides a description of each of the two EU R&D instruments considered by this research and the policy framework in which they are situated. This serves both to set out the broad narrative framework for the later analysis and also to provide a common baseline of policy knowledge. One of the strong findings of the research has been the partial knowledge of most actors in this policy area, who are familiar with one instrument but rarely both.

Chapter 5 continues the descriptive element of the work, setting out the stall for each of the three case study regions covered by this study. For each region a brief summary of the socio-economic context and existing R&D capacity is set out, followed by a description of the prevailing governance arrangements. Together these provide the setting in which the EU R&D instruments operate in each region. This is followed by an outline of the relevant EU programmes – Structural Fund and Framework Programmes – which operate within the three regions. At this stage the central themes of this study's findings begin to emerge.

Chapter 6 tackles the central research question of who gets what. This is examined in two ways: firstly, which regions benefit from the funds available and, secondly, which organizations benefit. The first part of the chapter contains a strong descriptive element as it sets the evidence base for later analysis. The second part of the chapter is more reflective and explores some of the contrasting experiences identified in the three regions. These demonstrate the relevance of certain themes which began to emerge in Chapter 5. In particular they highlight the role of policy spaces and imagined narratives in shaping behaviour, as well as the significance of regional innovation structures.

Chapter 7 builds on the findings set out in Chapter 6. It argues that in order to understand the pattern of activity funded by the EU R&D instruments it is necessary to consider the very different conceptions as to what the Structural Funds and the Framework Programmes are 'for', despite a common overarching framework. Equally, it highlights the powerful influence exerted by the different scales of operation of these two instruments and the role of individuals and institutions in shaping policy outcomes on the ground within the context of established structures. In doing so, the chapter reflects on the implications of this for existing innovation theory and suggests that a powerful relational geography is visible which has not been sufficiently acknowledged by the existing literature on spatial innovation.

Chapter 8 sets out the conclusions of the overall study. It considers the overall findings of the research and the implications of this for existing theories of spatial innovation,

particularly the standard literature on regional innovation systems. In addition to the relational geography identified in Chapter 7 it argues that the manner in which actors 'imagine' places and themes can be influential in shaping the activities undertaken. The chapter then briefly considers the policy implications of the research before concluding with reflections on the approach adopted for the study, in the light of the experience gained, and the identification of three principal areas where further research is merited.

2. RESEARCH METHOD AND DESIGN

2.1 Introduction

The purpose of this study is to provide an understanding of the role and rising importance of EU R&D instruments in regional economic development in the UK since 1999. In doing so it examines both the distribution of activity funded through these instruments and the factors influencing this. The principal research questions were agreed with the DTI and the ESRC at the outset of the study and formed a backbone from which broader theoretical considerations could then be examined.

The following Chapter sets out those research questions and details the approach taken to addressing these. The research design itself is informed by a critical realist perspective which incorporates recent thinking on the role that relational geographies play in influencing social structures, the behaviour of groups and individuals and the complex interplay between these. It is this relational perspective which lies at the heart of this study.

The study is unusual in that it involves two policy instruments which are seldom considered together despite addressing a common policy issue. This offers great advantages in terms of deepening our understanding of how policy issues are conceived but also offers challenges in terms of approaching the study as each has a different research tradition.

The study centres on a multiple case-study approach using the UK's regions and Devolved Administrations as the unit of analysis. This is a relatively traditional approach in the case of one of the policy instruments under consideration but has not been used previously in the case of the other. The broadly qualitative approach adopted was agreed with the DTI at the outset of the study and was proved to be highly appropriate as the study progresses. On the one hand it provided a depth of analysis and understanding that more quantitative approaches could not have achieved and on the other hand the research

highlighted flaws in the existing datasets that would have compromised any attempt at quantitative economic impact analysis.

2.2 The research question

The research set out to address the following basic question:

Who gets what and why? Addressing the quantitative dimension to the EU's R&D related activities in the UK this question examines the overall level of R&D-related activity financed by EU funding programmes, what has been funded and who receives this funding. Although apparently straightforward this question has not previously been addressed in the UK.

From this initial starting point the research then seeks to use the information gained to explore the following additional research questions:

- What explanations underpin the patterns identified and to what extent do these vary across different regions?

- What are the perceived benefits of the EU's R&D instruments, and what do these tell us about how research-led economic development is conceived?

- To what extent do the observed processes and patterns conform to existing innovation theory?

- What light do these patterns and processes shed on regional innovation structures within UK regions, particularly with respect to knowledge transfer networks?

It is worth stating at the outset that this is *not* a study designed to estimate the economic impacts of the activities financed through the EU's R&D instruments in the UK, or one which seeks to quantify the benefits that these instruments have secured. Such research

would be valuable but lies beyond the remit of the current study. In undertaking this research, serious methodological issues have been identified with existing data sets which would need to be addressed before any such economic assessment could be undertaken.

2.3 Defining the focus

2.3.1 Defining R&D

The definition of R&D adopted for the purpose of this study is that set out by the OECD and utilised by both the European Commission and the UK Government:

"Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications" (OECD 2002 p.30).

The definition goes on to identify three distinct forms of R&D activity:

- ***Basic research*** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- ***Applied research*** is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- ***Experimental development*** is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed (OECD 2002 p.30).

Adopting this definition ensures that this study is working within the same framework as the EU's R&D instruments, which are based on this definition. This ensures comparability and enables the drawing of robust conclusions.

2.3.2 EU R&D instruments

EU R&D instruments are defined for the purposes of this study as the EU's Framework Programmes and those aspects of the Structural Funds which are used to support investments in R&D-related activities.

In the case of the Framework Programmes all shared cost actions are considered apart from those actions financed through the EURATOM programme dedicated to supporting European atomic research. EURATOM is generally regarded as a special case subject to its own particular rules and structures. The Framework Programmes considered by the study are the 5th Framework Programme and the 6th Framework Programme. Further details on these are contained in Chapter 4.

In the case of the Structural Funds the study considers the use of the European Regional Development Fund (ERDF) for R&D-related investments, as channeled through Objectives 1 and 2 of the Structural Funds. Objective 1 and Objective 2 are both territorially targeted programmes which, along with the horizontal Objective 3 programme accounted for more than 90% of all expenditure under the Structural Funds between 2000 and 2006. The European Social Fund (ESF) wholly financed Objective 3 programmes, part-financed Objective 1 programmes and contributed to some Objective 2 programmes. ESF funds are generally used to support skills development, whilst the ERDF has traditionally co-financed: productive investment leading to the creation or maintenance of jobs; infrastructure, and local development initiatives and the business activities of small and medium-sized enterprises. The study concentrates on ERDF activity as this is where the bulk of R&D related investments have occurred. Further detail on the policy context is set out in Chapter 4.

2.4 Philosophical underpinnings

The philosophical stance of this study is very much centred on a critical realist perspective. In part this is because this offers an alternative approach to the polar cases of positivism and relativism (Sayer 2000). Whilst positivist, or empiricist, approaches seek to identify causation, through linking observation to general laws (Outhwaite 1987) there are strong doubts that this can apply in social science. One reason for this is Bhaskar's transformational model of social activity (Bhaskar 1989), where he argues that research findings may influence those who come into contact with these and so, themselves, lead to changes in behaviour. Indeed, as this study demonstrated at times, the research process itself can also influence behaviour simply by raising awareness of the issues under investigation and causing the subject to reflect on their behaviour, or that of others, towards available opportunities.

In contrast, a strongly relativist position which seeks to "document the unique" (Sayer 2000 p.3) appears to deny the possibility that there is an objective reality which can be known (Robson 2002). Whilst the proposition that reality is a social construct is an important consideration this seems to go too far in suggesting that structures cannot exist outside of the conception of individuals. In the words of Andrew Sayer, one "*accepts* 'epistemic relativism', that is the world can only be known in terms of available descriptions or discourses, but ... rejects 'judgemental relativism' – the view that one cannot judge between different discourses and decide that some accounts are better than others" (Sayer 2000 p.47, italics in original).

The role of structures in shaping the social world is an important dimension of critical realism. In this respect structures are conceptualised as a "set of internally related objects whose causal powers, when combined, are emergent from those of their constituents" (Sayer 2000 p.14). In other words structures are formed from individuals or organisations that interact in ways which are interdependent and which lead to the emergence of new phenomena. The role of institutions and rules is clearly apparent in the field of European policy, both in the development of policy approaches and the

delivery of these policies. The role of norms and accepted behaviour also becomes very apparent from any study of actions in this field, as we shall see in later Chapters. Structures then form an important factor influencing observed actions; structures which are reproduced through the actions of individuals and which influence the behaviour of individuals and of institutions.

It would be wrong to suggest that all activity is determined solely by social structures (Bhaskar 1978). Individuals, and groups, also have the power to choose their own actions, within certain constraints, in other words they have 'agency' (Giddens 1979). This can lead to differences in behaviour and to changes in those same structures, as the structures themselves are both the medium of social action and the outcome of social actions – referred to by Giddens as a 'duality' (Giddens 1979). One of the aspects that this study is particularly interested in is how certain ways of thinking and doing become 'embedded' (Granovetter 1985) into accepted practices and how these accepted notions change over time. Giddens (1979) argues that societies are increasingly reflexive, enhancing their capacity to adapt and change. This, he argues, is one particular attribute of the modern society.

The degree to which individuals act independently is strongly determined by the power exerted by accepted norms of behaviour, to the tacit knowledge of individuals (Giddens 1979) and their prevailing beliefs. As King (2005) explains, agents act within a fluid context of structure, marked by group expectations, norms of acceptable practice, sanctions and relations of power. These perceptions and dispositions which organise the way in which individuals perceive the surrounding world and act within it are captured by Bordieu in his notion of 'habitus'. Quoting Bordieu, King notes that "the cognitive structures which social agents implement in their practical knowledge of the social world are internalised, embodied social structures" (Bordieu 1979 p.468).

The framing structures which influence individual actions are not a given. They are the sum of competing discourses and priorities, the interplay of different concepts and ideas (Healey 2007). The relative emphasis can change over time and may differ between

places. As not all structures can be observed so the role of the researcher is to 'construe' the social world (Sayer 2000) and seek to explain how mechanisms produce events (Robson 2002). However, the difficulty of identifying causal responsibility in a complex, open, system with its many interacting structures and mechanisms is recognised by researchers operating within a critical realist tradition (Sayer 2000). One of the challenges for this study is to explore how these framing structures are 'seen' by policy makers and practitioners and how this influences their behaviour and that of others.

There is an increasing interest in the spatial dimension to social theory (Castells 1996, 1998, 2000; Harvey 1996, Soja 1989) and the concepts of space and geography lie at the heart of many of the theories which this work explores. In the past, institutions may have been largely shaped by the territories in which they were embedded. As the geography of social relations changes so a new relational geography is emerging to challenge this (Amin 2002, Massey 2005). Giddens also argues that the modern age is driven by the dynamics of time-space distanciation, disembedding mechanisms which lift social relations out of local contexts (Giddens 1998). This notion of relational geographies shaping "socially situated trajectories of experience and understanding" (Healey 2007 p.14) is one that emerged as being of significance during the course of the research process and underpins much of the analysis I return to later in this Chapter. As Sayer acknowledges there is "a need to be attentive to spatial form, or risk obscuring causality" (Sayer 2000 p.122).

However, not everything is spatially contingent and one of the elements of this work has been to seek to unpick this conundrum. This research is informed by the approach of Healey (2007) which seeks to address the, to-date, "limited intellectual interaction between 'sociological institutionalist' analysis of governance processes, interpretative policy analysis and the development of a relational understanding of the geographies through which places and the spatial patterning of phenomena are produced." (p.14-15).

In considering such relational geographies it is worth noting that these are seen as "relational webs that transect an urban region, each with its own scale, driving dynamics,

organisations into centres, nodal points and flows, and spatial patterning" (Healey 2007 p.29). Understanding these webs, flows and dynamics is crucial to understanding how norms and behaviour are shaped. It also raises questions as to the validity of traditional geographies based around physical proximity, suggesting that "the relations of an urban region are not ... necessarily 'integrated' with each other" (Healey 2007 p 29). Through examining the perceived role of EU R&D instruments in specific regional settings this work builds on Healey's approach through considering the interplay and interactions which occur in specific places and how these are embedded in past trajectories and wider contexts.

In addressing these notions of relational spaces and the structures and agency at work I have adopted an approach that is informed by the notion of what Healey describes as interpretative policy analysis. Drawing on Hajer (2003), Healey comments that "politics has expanded out of the formal areas of representative democracy into complex interactive worlds through which policy formulation and delivery are accomplished" (Healey 2007 p.17). This provides the setting for a relational form of governance whereby "governance activity (is) driven by and performed through a nexus of complex interactions, linking the spheres of the state, the economy and civil society in diverse, if typically highly uneven, ways" (Healey 2007 p. 17). Concepts of policy networks and policy communities are central to this notion and are considered more fully in the notion of multi-level governance introduced in Chapter 3.

2.5 Measuring comparative regional R&D and innovation performance

In both the UK and the EU more widely there has been an increasing interest in the comparative competitive performance of regions, in both policy-making and academic circles, over the past decade. One consequence of this has been an emphasis on seeking to measure comparative regional performance in terms of levels of innovation and, as a particular aspect of this, R&D activity We can see evidence for this in the annual series of Technical Papers on Regional Innovation published by the European Trend Chart on Innovation, beginning in 2002, and, in the UK, the annual report on Regional

Competitiveness and the State of the Regions (DTI 2008). This rising interest in comparative regional innovation performance does, however, highlight some significant methodological challenges which can imperil robust analysis. Before turning to these it is worth noting that the interest in comparative regional performance contains its own analytical dilemmas. Firstly, all regions based within better performing national economies tend to perform better than those which are located in less well-performing economies, suggesting that it is useful to identify 'local leaders' – those regions which perform well compared to their national economy. Secondly, scale effects can be a significant issue. A large region may appear to out-perform others on absolute measures of performance simply because it is larger, yet a small region may out-perform because of the impact of one large manufacturing plant or research centre located within its narrowly defined boundaries (for a fuller discussion of this topic see Trend Chart on European Innovation 2006).

Leaving aside the questions of scale, there are two principal challenges in the use of inter-regional comparative indicators. The first is that of the availability of suitable indicators at the regional level. This is particularly so for measures of innovation where there is a strong reliance on the use of proxy indicators. The challenge is that much stronger in that some indicator sets traditionally used to measure R&D and innovation are collected at a national level and then extrapolated down to the regional scale, based upon certain assumptions. The second challenge is one of comparison and of aggregation. Not all indicators are available across the European territory; of those that are not all are available at the same scale, and for those which are there may be differences in how they are collected or defined. For example, the proportion of the population engaged in tertiary education varies by country partly because of differences in the definition of what constitutes tertiary education. A good discussion of these and other challenges in developing comparative regional indicators of regional innovation performance is contained in Trend Chart on European Innovation (2002). The following section briefly identifies the main aspects of these challenges associated with this thesis, the indicators selected to set the context for the study in the light of this, and the sources from which these have been drawn.

Traditionally, the level of innovation within a territory has been measured through the use of measures of R&D performance and proxy measures for innovation. The most commonly used R&D indicators are based upon standardised international definitions such as the level of R&D expenditure, disaggregated between private, government, Higher Education and other sectors; the proportion of the workforce engaged in R&D occupations, and, as a measure of research output, the number of patent applications, although this assumes a linear commercially-orientated view of the research process (OECD 2002). R&D expenditure figures are, usually, divided by recorded levels of GVA to give a measure of R&D intensity for comparative purposes. Unfortunately, similar comparative data is difficult to obtain for measures of personnel engaged in R&D occupations as, in the case of the UK, these are not collated in a manner comparable to other EU economies.

In contrast, proxy measures of innovation performance have been more difficult to realise and tend to be more generalised, typically including indicators such as the proportion of the labour force aged 25-64 engaged in lifelong learning or the percentage of the workforce employed in high or medium-technology manufacturing (both used in the European Innovation Scoreboard). Such proxy measures have been supplemented by occasional qualitative survey data which seeks to assess the level of innovation which actually occurs within the economy through measuring indicators such as the proportion of enterprises with co-operation arrangements on technological innovation activities with other enterprises or institutions, and the proportion of turnover accounted for by new or improved products (as set out in the EU-wide Community Innovation Survey).

However, whilst indicator availability has been steadily improving at a national level, there remain challenges in transferring similar methodologies to the regional scale. In the UK, indicators of R&D expenditure are not recorded at a scale below the NUTS 1 administrative unit and, until 2004, the Community Innovation Survey was not of a scale which provided robust data at a regional level. Similarly, there are acknowledged difficulties in the use of patent data as an indicator for regional performance as, in many cases, patent registration does not occur at the same address as the research is undertaken,

an issue similar to that identified in this study relating to the categorisation of Framework Programme activity location.

In setting the regional R&D context for this study, issues of data availability and quality have led to a focus on R&D expenditure data, both due to its robust nature and direct relevance to the subject at hand. In essence, regions which have comparatively higher levels and intensities of R&D expenditure are assumed to have a stronger research base in practice (assuming constant levels of productivity). Use has also been made of qualitative data from other occasional surveys, particularly the firm-centred Community Innovation Survey (CIS), where appropriate to provide an indication of the level of innovation practice amongst firms within each region. This was believed to offer more value to this study than the use of typical proxy measures such as the number of patent applications or the proportion of population in tertiary education, for the reasons set out above. Other indicators used relate to commonly accepted measures of cohesion and economic performance, such as levels of GVA, employment, unemployment and new VAT registrations. These provide broad indicators of relative regional prosperity.

Data on all standardised indicators is readily available from sources such as the UK's Office for National Statistics, or its EU equivalent EUROSTAT. CIS data is published for the UK by the DTi and, at an EU level, by EUROSTAT. Use has also been made of occasional survey data published by other bodies, particularly that of the Higher Education- Business Interactions Survey published by the Higher Education Funding Councils in England, Wales, Scotland and Northern Ireland. This provides a partial view on one aspect of the innovation process and is a useful adjunct to official statistical datasets.

2.6 The approach

In order to explore the research questions an intensive, largely qualitative, research method was adopted. This was felt to be the most appropriate given the nature of the subject matter and the aims of the study. As Sayer identifies "Intensive research

focuses...on groups whose members may be either similar or different but which actually relate to each other either structurally or causally" (Sayer 1992 p.242). In particular the need to include a range of institutional actors which were involved with EU R&D instruments in different contexts suggested that a qualitative approach would be most relevant.

A quantitative survey-based approach was considered but was discounted both on methodological grounds and because of the focus of the study. The methodological difficulties of constructing a representative sample is significant, particularly as not all individuals or institutions in different taxonomic groups necessarily interact with the EU's R&D instruments. The downside of such an intensive approach, over a more extensive quantitative survey based approach is that the results cannot be seen as representative of a whole population. However, this is not the aim of the study. Rather, the results of the study help to illuminate our understanding of the processes at work and the approach taken by key actors. In essence the study is interested in explanation rather than correlation.

The qualitative approach was also suggested by the availability of datasets on the use of Framework Programmes and the Structural Funds. Although these were not without their flaws (see Section 2.7.4) they largely eliminated the need to construct a separate survey seeking to identify which organizations received such funds in each of the UK's regions. These datasets form a base on which the qualitative material elicited from the study is able to build in terms of understanding the role and rising importance of EU R&D instruments in approaches to regional economic development in the UK and, more particularly, the interface between the instruments targeted at stimulating research activity and those aimed primarily at regional economic development.

2.7 The research design

A case study approach was chosen in order to understand both the phenomena under investigation, the use of Structural Funds and Framework Programmes for R&D-related

activities, and, most importantly, the context in which this occurred. Within this framework the research design mixes both quantitative and qualitative elements in order to create a robust understanding of the focus of the research.

As this is an area where there has not been a significant amount of previous study a flexible research design was adopted in agreement with the DTI, the CASE partner for this study, whereby the purpose and approach was kept continuously under review. In practice, the research questions remained valid throughout the duration of the study but some anticipated data sources proved to be less valuable than initially anticipated, necessitating a shift in the balance of activities towards the collection of data at the case-study level.

2.8 The case study approach

2.8.1 A multiple-case design

A multiple case study approach was selected as the most appropriate method for exploring the identified research questions (Yin 2003). This was informed by the desire to test the robustness of the results generated through comparison across different regional contexts within the UK. Use of a single-case approach presents the risk that the results generated relate to the 'special case' of that particular case study rather than being representative of more generally prevailing phenomena. The use of a multiple case study design enables the researcher to consider the extent to which the results realized might be more widely representative of prevailing conditions and hence might be replicable in other cases which were not subject to study. Moreover, the nature of the research questions established for this study demand the use of multiple case studies for the purpose of identifying variation across the UK's regions.

One disadvantage of adopting a multiple-case approach is that, for a given level of resources, the study is not able to enter into the same depth of analysis as would be enabled by a single-case study approach. Consequently there is the risk that the data is

less rich than would be the case in a single-case design. Whilst this risk is present, for the purposes of the current study the ability to acquire a greater richness in the breadth of information available to the study and to explore the same issues in different contexts was felt to outweigh this disadvantage. A second risk is that the comparable cases chosen each fall within a 'special cases' category, nullifying the validity of the conclusions drawn. To reduce the likelihood of this occurring a three case approach was adopted, with additional case-studies 'nested' within each. Whilst there remains the risk that 'special cases' have been selected the approach is felt to limit the chances that this has occurred.

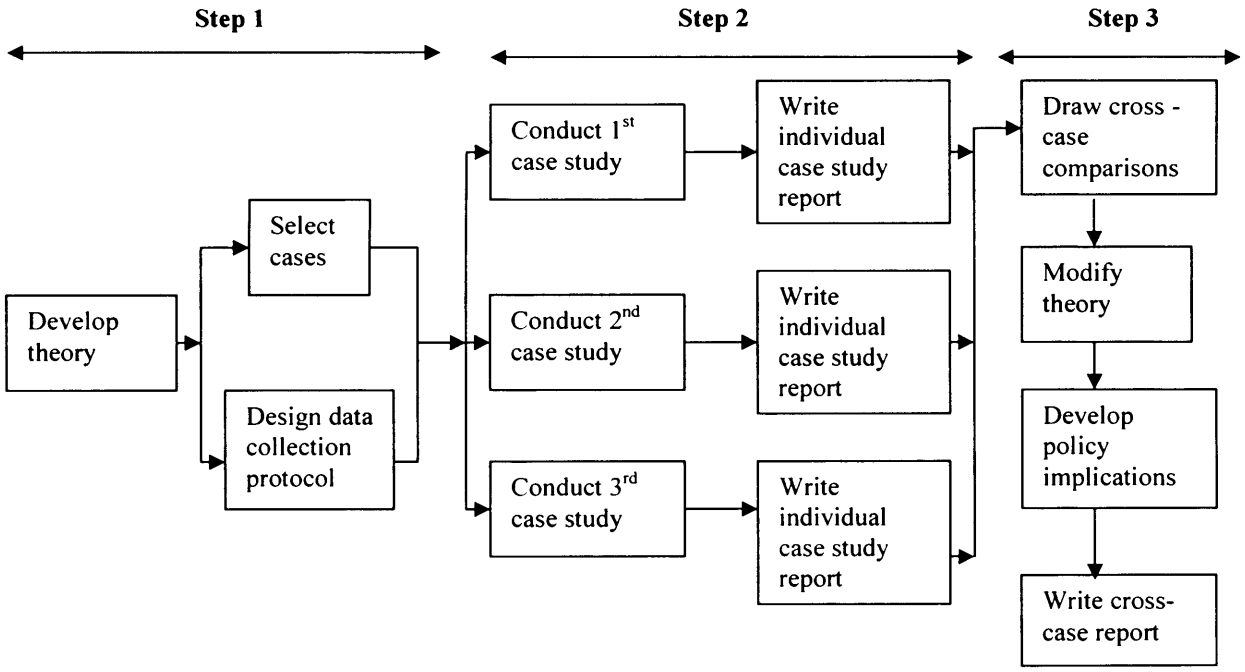
The three case approach was also deemed to be appropriate given the overall population of regions under consideration. There are 12 nations/regions in the UK, consisting of the nine English regions and the three Devolved Administrations of Wales, Scotland and Northern Ireland. The approach adopted means that a quarter of all valid cases have been studied. This provides a strong representation of all cases in the UK and allows the extrapolation of the results to generate robust conclusions that can be generalized to the UK as a whole. The results are also thus meaningful at a European level, although further work to assess whether the UK represents a special case in its own right would be required before generalising the results further. Consideration was given to including a case study from a region outside of the UK in order to test the wider applicability of the study findings. This was not pursued as it was felt that the findings from just one case from outside of the UK would not provide a sufficiently robust comparator to add significant value to the study.

2.8.2 The method of approach

Following Yin (2003) a three-step approach was adopted (Figure 2.1). The first step involved developing the theoretical underpinnings to the research through an extensive literature and policy review (reported in Sections 3 and 4 respectively). This provided the basis for the selection of the three cases to be studied and the data collection instruments to be used. The second step involved the preparation and collection of the

data for each case study through a mixture of interviews and desk-based research. This was then analysed for each case and an individual case study report was prepared for each region. The purpose of this was to enable the main finding for each region to be separately enunciated and for comparisons to then be drawn. The final step of the research approach was the analysis of the individual case study material to identify robust and consistent results which could inform the drawing of cross-case conclusions and be used to both inform theory development and develop policy recommendations. In line with good practice, the three case studies were undertaken sequentially, allowing the experience of the first to be used as a pilot for the following two studies. In practice, this resulted in a slight change to the phrasing of certain questions, which had proved to be ambiguous, and the omission of certain parts of the interview schedule which had proved to be unnecessary and led to overly long interviews.

Figure 2.1 Case study method



Source: COSMOS Corporation, reported in Yin (2003 p.50)

2.8.3 Selection of the three case studies

The unit of analysis selected for the case study approach was the regional level in the UK, defined on the basis of the standard statistical region. This equates to the NUTS 1 territorial level in the EU's classification of statistical units[1]. This unit was deemed to be the most appropriate following the development of stronger regional level administrations in the UK from 1999 with the attendant devolution of certain powers. Within EU policy debates the role of the regional level is also seen as central, particularly in terms of the social and economic cohesion of the Union. Within this policy environment the region is widely accepted as the principal sub-national territorial unit and so holds a central place in European policy-making. An alternative approach, based upon NUTS 2 programme areas, was felt to be less appropriate as it would fail to address the wider regional governance dimension and would restrict the ability to make comparisons between Objective 1 and Objective 2 programmes operating within the same region.

The primary period of analysis for the study are the years 1998-2007. This period was selected for two reasons. 1998-2007 covers two full periods of the Framework Programmes which, at this time, were multi-annual programmes with a four year duration. The 5th Framework Programme financed actions during 1998-2002, followed by the 6th Framework Programme in the period 2002-2006. For the Structural Funds, 1st January 2000 to 31st December 2006 constituted a full programme cycle for these multi-annual seven-year programmes. The programming data included in the study for the Structural Funds is always related to the activities financed by the ERDF for the period 2000-2006. Establishing a start-date for the study in 1998 allows consideration of the development of these programmes whilst the end-date of 2007 both acknowledges the fact that programme spend will not cease until 31st December 2009 and has allowed

[1] The Nomenclature of Territorial Units for Statistics (NUTS) was established by Eurostat to provide a single uniform breakdown of territorial units for the production of regional statistics for the EU. This territorial classification system is also used to determine areas eligible for certain forms of EU support. It is divided into a hierarchy of sub-divisional levels known ranging from NUTS 0 (the UK) through to NUTS 5 (a local ward). In the UK the Regions and Devolved Administrations form the NUTS 1 level, NUTS 2 areas are sub-regional groupings of local authority areas, and NUTS 3 areas are formed of individual local authority areas or, occasionally, two such areas.

consideration of the new programmes being developed in the regions for the period 2007-13.

The selection of the three regions to be included in the study was informed by a desire to capture three principal elements:

- Variations in the extent to which regions benefit from the Structural Funds, and the extent to which they have used these funds for R&D related activities
- Variations in the extent to which regions benefit from the Framework Programmes
- Variations in governance arrangements between regions

To inform this selection an initial analysis was undertaken of planned expenditure on R&D activities through the Structural Fund programmes (2000-2006) in all UK Structural Fund programmes using data provided by DG Regio of the European Commission. This was complemented by an initial analysis of the level of activity in each region (participation in projects and funds received) financed through the Framework Programmes. This utilized data provided by the then Office of Science and Innovation, of the UK Government. The results of this exercise are included in Chapter 4 and provided evidence of the extent to which EU R&D instruments were actively used in all UK regions.

This information was set in the context of the eligibility of the 12 regions for support under the EU's Structural Funds. Between 2000 and 2006 the Structural Funds included two geographically-targeted programmes: these were known as Objective 1 and Objective 2[2]. Regions eligible for support under Objective 1 of the Structural Funds receive the largest level of grant aid and are eligible for the highest level of support under EU regional aid guidelines and. In the UK, between 2000-2006, Objective 1 programmes operated in:

[2] For a fuller description of the policy context please see Chapter 4

- Cornwall and the Isles of Scilly
- West Wales and the Valleys
- South Yorkshire
- Highlands and Islands of Scotland
- Northern Ireland

All the UK regions, with the exception of Northern Ireland, included areas eligible for support under Objective 2 of the Structural Funds. The values of these programmes varied with the East of England and South East England having the smallest programmes.

The governance arrangements in the UK underwent a dramatic change in 1999. In that year Scotland, Wales and Northern Ireland were constituted as Devolved Administrations with certain powers of self-government. In the same year more modest regional governance arrangements were established in each of the English regions. This provides an opportunity to explore how new governance arrangements may have influenced the use of EU R&D instruments as an element to this study. Throughout this thesis the term 'region' shall be used to refer to both the English Regions and to the Devolved Administrations.

The regions selected for the case studies are set out in Figure 2.2 below, together with the key reasons for their selection. In practice the choice was based on a desire to achieve a balance across three primary criteria: the extent to which a region benefited from Structural Fund support; the level of Framework Programme activity in a region, and the nature of regional governance. The eventual choice of regions allows comparisons to be made as well as contrasts across each of these primary criteria.

Figure 2.2 Case study regions and key criteria for selection

	Structural Funds	*Framework Programmes*	*Governance Arrangements*
Wales	Eligible for Objective 1 of the Structural Funds Strongly rural Objective 1 programme area Eligible for Objective 2 of the Structural Funds Large programme value for Objective 1 Extensive levels of R&D activity planned	Very low level of activity	Devolved Administration
Yorkshire and Humber	Eligible for Objective 1 of the Structural Funds Highly industrial Objective 1 programme area Eligible for Objective 2 of the Structural Funds Moderate programme values Moderate levels of R&D activity planned	Moderate level of activity	Non-devolved regional governance with Regional Development Agency
East of England	Eligible for Objective 2 of the Structural Funds Small programme value No R&D activity planned	Significant level of activity	Non-devolved regional governance with Regional Development Agency

2.8.4 Main activities in each case study

In pursuing the case study approach, a mixture of quantitative and qualitative analysis was adopted in order to generate results, to explore explanations for these and to draw relevant conclusions. The main elements undertaken during each case study were:

- The gathering of contextual information appertaining to each region
- The review of documentary evidence
- The gathering of data on the use of the Structural Funds in the regions

- The gathering of data on the use of the Framework Programmes in the regions
- Interviews with key stakeholders with knowledge of the use of EU R&D instruments in each region

Further details on the approach adopted in each case are set out below.

2.8.4.1 Review of contextual data

The context for each case-study was gathered through the analysis of published statistics and regional documentation. The primary source for this data was material published by the Office of National Statistics (ONS). This ensured comparability in the statistics used for each region. Indicators were selected which provide a summary perspective on relevant key features of each regional economy. The principal indicators chosen relate to the scale of each region (area and population size); economic performance (employment, unemployment and Gross Value Added) and proxy measures for entrepreneurship and innovation. A short summary, drawn from regional documents, of the sectoral structure of each economy is included, together with a description of recent historical trends.

Of the range of indicators that can be used to measure levels of R&D activity in a region the most common is levels of R&D expenditure. Typically reported as Gross Expenditure on R&D (GERD) this is commonly disaggregated into expenditure by business (BERD), expenditure by the Higher Education Sector (HERD) and expenditure by Government (GovERD). Again all data used for the study has been obtained from the ONS. Data on regional expenditure levels should, the ONS notes, be treated with caution as "Higher Education Institutions (HEI) regional R&D estimates are obtained by allocating total R&D performed by HEIs to individual HEIs in proportion to their income from research grants and contracts" (ONS 2006 p.17).

The R&D statistics published by the ONS are consistent with the OECD's Frascati Manual (OECD 2002) which defines Research and Experimental Development. Statistical reporting occurs at two levels: the sector which makes the expenditure

(regardless of where the research takes place) and the sector in which the research takes place. The ONS data used for this study relates to the sector making the expenditure. The most recently available data disaggregated by all sectors was published in 2006 and relates to expenditure levels in 2003. More recent data on levels of business expenditure on R&D is available and this has been separately reported. Supplementary data on levels of R&D activity within the HE sector was obtained from the biennial Higher Education Business Interactions Survey (HEFCE 2007). Published by the Higher Education Funding Councils in the UK, this is based upon a survey of all HEIs which, *inter alia*, report on the levels of income received for R&D activity from different sources.

2.8.4.2 Review of documentary evidence

The primary documentary sources used for this study were regional economic strategies; regional innovation strategies and the programming documents relating to individual Structural Fund programmes in each region (2000-2006) and (2007-2013).

Each case-study region has published a number of economic strategies since 1999, supplemented in some cases with regional innovation strategies. Wales has also published "A Science Policy for Wales" (WAG 2006). These documents were sourced from regional web-sites or obtained in print versions from the publishing authority.

Structural Fund programme documents - known as Operational Programmes (OP) or Single Programming Documents (SPD) - are produced for each programme. For the period 2000-2006 the SPD was supplemented by a more detailed planning document known as the Programme Complement. Copies of each of these documents were obtained from the websites managed by each Programme Secretariat. In addition, mid-term evaluations have been published for each programme and these were also sourced from these websites. Consultation drafts and final drafts of each of the programmes developed for the period 2007-2013 were accessed from the websites of the Regional Development Agency (RDA) in the English regions and from the Wales European Funding Office (WEFO) in Wales.

All the strategies and programme documents were subject to a keyword analysis to determine their content and coverage. In the case of the regional strategies this focused on identifying the extent to which they prioritized R&D-related economic development initiatives and the emphasis given to EU R&D instruments within this. In the case of the Structural Fund programming documents it focused on identifying the emphasis given to R&D-related activities and the linkages drawn with the EU's Framework Programmes. A summary of the keywords used is contained in Box 2.1.

Box 2.1 Keyword Analysis

The following words and phrases were used to carry out the analysis of the content of:

- EU Structural Fund programmes in each of the case study regions
- Regional economic strategies and regional innovation strategies

There was some overlap between each of the categories.

<u>General R&D</u>
Research
R&D
R+D
RTD
Technological
Technology
Science
Scientific

<u>Framework Programmes</u>
EU
FP
Framework
European

<u>Structural Funds</u>
Structural
Cohesion
Convergence
Regional
Objective
ERDF

2.8.4.3 Gathering of data on the use of the Structural Funds in the regions

Data on the planned use of Structural Fund resources was sourced from material held by DG Regio. Their database contains the planned expenditure of each ERDF-financed Structural Fund programme in the Union across a range of variables including types of activity. The different types of activity are grouped into categories known as a Field of Intervention (FOI). There is one Field of Intervention Code specifically related to research, technological development and innovation (RTDI): FOI 18. FOI 18 is itself subdivided into 4 categories as set out below:

FOI 18: Research, Technological Development and Innovation

FOI 181.	Research projects based in universities and research institutes
FOI 182.	Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes
FOI 183.	RTDI Infrastructure
FOI 184.	Training for researchers

Data on planned expenditure levels was captured in 2005. This allowed the original planned levels of activity to be compared with that planned after the mid-term review of each programme, which occurred around the year 2004.

Although data on actual expenditure is also collected by DG Regio, on the basis of reports provided by each Structural Fund programme, examination of this data and the experience gained from the regional fieldwork suggested that it was less robust than the planned expenditure figures owing to poor reporting conventions. In consequence no use of this dataset has been made. Instead the study has relied on two primary sources.

In the first instance data on expenditure incurred under FOI 18, or otherwise categorized as RTDI, was obtained from each Secretariat. In the case of Wales this was drawn directly from WEFO's website which includes a searchable database with an RTDI search category; in the case of Yorkshire and Humber the programme secretariats provided

details of projects financed under the heading of FOI 18, and in the case of East of England it was confirmed by the programme secretariat that no funds had been directed towards RTDI projects, under FOI 18.

The second approach taken was to acquire a listing of all projects which had been financed by the ERDF under each programme. These were then examined to assess which projects were related to the RTDI categories, identified above, but were not, for whatever reasons, included by the programme secretariats in their reporting on RTDI activity. The data available was normally restricted to a title and, occasionally a line of activity description. Whilst this was not able to provide a definitive listing of all activity, it did identify a number of projects which merited inclusion in the study. Similarly, on closer examination of the data provided relating to projects classified under FOI 18 a small number of community-based ICT projects were felt to extend the definition of this category too far, particularly given that they do not conform to the accepted definitions of R&D activity, and so were excluded.

Data collection on actual levels of expenditure under each of the Structural Fund programmes was begun in 2005, using DG Regio data. Following the decision to make use of primary data sets, regional data collection took place in early 2007 and was updated in early 2008. This allowed the fullest assessment of activity to be undertaken, within the bounds of the information available.

2.8.4.4 Gathering of data on the use of the Framework Programmes in the regions

Initial data on levels of Framework Programme activity in each region was provided by the Office of Science and Innovation (OSI). This is based upon material provided to the OSI by DG Research. It includes data on the number of organizations in each region participating in the Framework Programmes and the overall level of Framework Programme receipts in each region. The data was provided separately for the 5th and 6th Framework Programmes and is disaggregated by the following four sectors based upon the self-reporting of project applicants:

- Higher Education (HES)
- Industrial (IND)
- Research Centre (REC)
- Other (OTH)

Data was initially provided in April 2006 with an update provided in March 2008. Again this allows for the most complete assessment of levels of programme activity within each region. One of the challenges of the data available from OSI is that it records the number of project participations. Thus, in their own words: "where a particular organisation takes part in six projects, they will be counted six times. If there are three participants from a particular region in a project, all three will be counted" (OSI personal communication). From the data available it is difficult to know which is the case.

To overcome this, and to provide a richer dataset, this study complemented the data supplied by OSI with a comprehensive analysis of the European Commission's CORDIS database. This includes data on all projects undertaken through the Framework Programmes and is accessible at www.CORDIS.europa.eu. The database can be searched according to a number of parameters, including the location of projects by Member State and which programme the project was funded under. Each project record then provides details of the participating organizations including their address. For most, but not all, records this includes the region as well as postal address. The approach taken, together with identified challenges is set out in Box 2.2. It is believed that this is the first time such an exhaustive analysis of the regional dimension of the Framework Programmes has been undertaken, certainly in the UK and probably in the EU.

Box 2.2 Searching the CORDIS Database

The following search parameters were used to identify Framework Programme projects undertaken in the UK:

- Search criteria: Advanced search function.
- Project status - all.
- Project Type - 5th or 6th Framework Programme
- Programme Acronym – identifier for each programme
- Contract Type - any.
- Subject Index - any.
- Country - UK.

Search 1: Prime Contractor. Search 2: Other Contractor.

This provided a list of all projects undertaken within the UK which could then be manually reviewed to identify which projects had partners located in Wales, Yorkshire and Humber or East of England. Where no geographical identifier for the UK has been included then projects will not show up. The manual search identified a number of consistent geographical miscoding issues within CORDIS:

- Peterborough and Huntingdon located in the East Midlands
- Bedfordshire and Hertfordshire identified as part of South East England
- Essex Located in South East England
- Hayes, Middlesex identified as part of East Anglia (East of England)

The data has been cleaned to allow for this in the data compiled specifically for this study but data provided by the OSI may remain subject to this miscoding.

It should also be noted that some partners are registered at an headquarters address, where research is not necessarily undertaken. This is a particular issue for London, especially with regard to Qinetiq and Shell, but also occurs in the case of the Central Science Laboratory which undertakes its research in York but some projects are registered in London.

The approach provides data on some 3,099 projects with one or more participants from each of the three case study regions, involving some 3,465 participants. Comparing this data with that provided by the OSI suggests a strong degree of consistency (Table 2.1). The lower figures for the 6th Framework Programme may relate to CORDIS not being fully updated when the data was accessed in Summer 2007. The slightly lower figures for Wales are interesting and more difficult to explain, although it may be the case that

applicants are entering Wales rather than UK into the country identifier – a category that cannot be searched for on CORDIS.

Table 2.1 Variation in number of participants between data accessed directly from CORDIS and that provided by OSI

	Wales	*Yorkshire and Humber*	*East of England*
FP5	93%	101%	98%
FP6	64%	68%	69%

The number of projects identified, and the proportion of the total population that these represent, suggest that the overall findings of the study are robust and comparable across the three case study regions. The data was examined to identify the number of partners in each project, the location of the lead partner (by region if in UK and by country if outside) and, where the lead partner was based in the case study region, the location of other partners (within region, within UK, outside of UK).

Finally, in seeking to identify the number of projects which individual participants were engaged in a separate search was undertaken of the CORDIS database using the names of key universities and research centres located in each region. Again, the resulting list of projects had to be examined carefully for return errors. For example a search for 'University of Sheffield' also returns results for Sheffield Hallam University.

2.8.4.5 Interviews with key stakeholders

The qualitative dimension to the study was undertaken through interviews with key stakeholders in each region. Amongst other things, this provided a stronger insight into how EU R&D instruments were being used in each region; their fit with regional strategies, and the perceived benefits of the actions undertaken. The interviews provided an opportunity to explore with knowledgeable parties explanations for the patterns observed through the initial quantitative analysis of data relating to the EU R&D instruments.

The focus of this study is on the strategic approach to the use of EU R&D instruments. This guided the selection of the key institutions to be approached to participate in the qualitative stage of the research. It was regarded as important to get a mix of perspectives pertaining to both the Structural Funds and the Framework Programmes, as well as from key institutional sectors engaged in research-led economic development activity within each region. As the research is not aimed at identifying the impact of the EU R&D programmes, either in aggregate or through individual projects, there was no attempt to approach individual managers of projects directly funded by either the Structural Funds or the Framework Programmes. Where such individuals were, occasionally, involved this was due to the wider strategic perspective they could also bring to bear.

The interview approach was based on seeking representation from five primary institutional sectors, regarded as the principal actors in this area of activity. These are set out in Table 2.2, together with the corresponding number of interviews carried out in each region. A full list of the individual institutions represented in the study is contained in Annex 1.

Table 2.2 Interviews by institutional sector

Identifier	*Institutions*	*Wales*	*Y&H*	*EE*	*Total*
HE	Higher Education and Research Institutes	5	6	3	14
PM	Structural Fund Programme Management	1	2	1	4
RG	Regional Governance (WAG, RDAs and Regional Assembly)	3	4	4	11
LA	Local Authorities	2	3	3	7
Int	Intermediary bodies (Innovation Relay Centres, Innovation Centres etc)	3	1	3	7
Ind	Independent individuals	2	1	-	3
DIUS	UK Government, Dept for Innovation, Universities and Skills				1
EU	European Commission				1
Oth	Other bodies (CBI)				1

Overall, a good balance has been achieved both institutionally and regionally. In total some 47 interviews with regional respondents were undertaken: 17 in Yorkshire and

Humber, 16 in Wales and 15 in East of England. The slightly lower number of respondents in East of England largely reflects the fact that there is only one Structural Fund programme operating in a very small part of the region. In addition three interviews were held with extra-regional bodies: the CBI to provide a wider business perspective; the Department for Innovation, University and Skills (DIUS), to explore their perception of the regional dimension to research and innovation and the role of EU policy instruments in this, and DG Regio of the European Commission to ascertain their perspective on the use of the Structural Funds for RTDI.

No discussions were held with stakeholders within DG Research as the author has a strong awareness of the different perspectives prevailing within this DG having acted as Rapporteur to two advisory groups reporting to the Commissioner of DG Research[3] during the course of this research. As part of that work evidence was also taken from officials responsible for RTDI topics within DG Regio, providing a wider perspective than could be gained from a limited number of interviews.

Potential interviewees were identified through a mixture of desk-research and personal recommendation using the common 'snowball' technique. An initial set of key individuals was identified, particularly those representing programme authorities and regional governance bodies. These were then asked to recommend others they regarded to have good knowledge of the research topic, who were in turn asked to recommend others. Potential interviewees were not restricted to the institutional categories identified in Table 2.2, leading to the inclusion of three other individuals. It was clear at an early stage in the research in each region that the number of individuals regarded as having a good strategic knowledge of both the Framework Programmes and the R&D-related elements of the Structural Funds was very limited.

Potential interviewees were contacted by email and by telephone to ask whether they were willing to participate in this study. Of those contacted one local authority and one

[3] "Stimulating the regional potential for research and innovation" (Reported November 2005) and "Energising Europe's Knowledge Triangle of Research, Education and Innovation through the Structural Funds" (Reported April 2007). Both undertaken by the EU Research Advisory Board (EURAB).

research institute failed to respond to the initial contact and one subsequent attempt. All others were willing to participate, either in the form of a face-to-face interview or, in three cases, by telephone. Interviewees were supplied with the interview schedule in advance of the meeting.

A standard semi-structured interview schedule was used in each case (Annex 2). An initial filter question was used to determine the level of knowledge of each participant of the EU R&D instruments. Those that had an awareness of one or both of the instruments under investigation were taken through the full schedule. In three cases - two local authorities and one intermediary body - this filter identified a lack of knowledge and led to the use of an alternative short interview guide to ascertain the reasons for this. The main categories covered by the full interview schedule dealt with:

- The importance of the EU's R&D instruments to the region
- The strategic role that these play within the region
- How the instruments are being used in practice within the region
- The benefits that this brings to the region
- The added value that this presents

Additional questions included at the request of the DTI considered the support available in the region for applicants to the Framework Programme and the extent to which evaluations of R&D-related actions had been undertaken or were planned.

The questions were predominantly open in format. In two cases a Likert scale approach was used. This was adopted in order to assess the perceived benefits of the EU-funded R&D activities in the region and the perceived focus of R&D activities in each of the Structural Funds programmes in each region. A Likert scale approach was adopted as the most suitable format for gathering collective perspectives on these matters. In each case interviewees were asked to identify their level of agreement to a series of statements. The statements were based upon the review of theory carried out in the initial literature analysis undertaken for this study (Step 1 in Figure 2.1 above) and specified,

respectively, all potential commonly-associated economic benefits of investments in R&D and potential forms of R&D investment activity. Interviewees who were met on a face to face basis were asked permission to record the interview and these records were then transcribed. In a small number of cases interviewees asked that the interview not be recorded and the transcription is based on notes taken during the interview. A commitment was made to protect the anonymity of all interviewees and so quotations used in this study are only identified by sector and numeric identifier.

All interviews were undertaken during a period from April 2006 through to March 2007. Broadly, an initial week would be spent in the region undertaking interviews with regional bodies and programme authorities. This would be followed by a return visit some 3-4 weeks later to interview those identified in the original set of interviews, followed by a final visit to follow up additional identified respondents in the region some 3-4 weeks after that.

2.9 Reflections on the role of the CASE partner

This study has been partly funded through an ESRC CASE award. The CASE partner was the UK's DTI. Initial involvement of the DTI in the study was limited owing to the departure of key individuals from the DTI and internal reorganization. A first full meeting was held with the DTI some 12 months into the study. This proved to be very positive with representation from different divisions of the DTI including the Office for Science and Technology (OST), European policy and regional directorates. One interesting comment during this meeting was that this was the first occasion these three groups had met together. The OST in particular proved to be very supportive following this meeting, providing data on the distribution of Framework Programme activity in the UK.

The DTI played a strong role in the development of the methodology and approach for the study. Through joint discussion it was agreed to focus on three case study regions in the UK, with the DTI contributing to the choice of the three regions selected. The merits

of including an overseas case study were debated but it was felt that this would not offer any benefits to the study as a whole. It was also agreed that the focus of the study should be a qualitative policy-based approach rather than a quantitative assessment of the economic impact of EU R&D instruments in the UK. One reason for this was that the DTI were very keen to understand how available funds were being used in the UK's regions. To this end two sets of questions were included in the interview questionnaire at the DTI's request: the extent to which EU-financed R&D interventions were subject to evaluation, and the level of support available at a regional level for applications to the Framework Programme. The DTI also commented on draft versions of the questionnaire to be used in the study.

During the progress of the study a second full meeting of all interested parties from the DTI was convened and the interim results of the initial two case studies were reported. This provided an input into the development of the UK's National Strategic Reference Framework – prepared as part of the process of developing new Structural Fund programmes in the UK for the period 2007-2013.

In the autumn following this meeting a major institutional change occurred with the DTI being divided into two Ministerial Departments: the Department for Business, Enterprise and Regulatory Reform (BERR) and the Department for Innovation, Universities and Skills (DIUS)[4]. The implications of this reform were far-reaching and the disruption caused led to a loss of formal contact with the CASE partner although day to day contacts with OSI (now GO-Science) were maintained.

On reflection, once fully involved, the DTI proved to be a very supportive partner of the study. Unfortunately, due to external circumstances, this support could not be maintained throughout the life of the study. It is believed that the DTI benefited from the initial results being reported to the panel of officials, there was certainly much rich discussion

[4] BERR took responsibility for enterprise development and business regulation and DIUS took responsibility for innovation and science policy in the UK. BERR retains the regional policy responsibility of the DTI, overseeing the RDAs in England and leading on negotiations with the European Commission for the UK. GO-Science is brigaded as part of DIUS.

on each occasion, with the suggestion that the research was opening up rich new avenues for consideration. Having the DTI on-board as a partner in the study was also useful for the credibility of the study in the eyes of some external contacts, and certainly assisted in terms of gaining access to some interviewees for the study.

2.10 A note on exchange rates

In the UK, EU programme values are typically denominated in euros[5] rather than in pounds sterling. This reflects the fact that grants are paid by the European Commission in euros. Grant payments and levels of programme expenditure are typically reported in pounds sterling as this is the currency in which payment is made to beneficiaries and expenditure claims received. In this study, values are reported in either euros or pounds sterling depending on the comparison being made and the source of the original material.

Where conversion between euros and pounds sterling, or vice versa, is required then the exchange rate used is €1.4 to £1. Any single rate can only be an approximation owing to currency fluctuations. This rate has been chosen as it is represents a reasonable approximation of the prevailing rate for most of the latter part of the programming period, particularly the close of the programming period at the end of 2006. The recent strengthening of the euro (broadly occurring in 2008, whereby the rate approximates to €1.25 to £1 in September 2008) would serve to depress the overall value of activity in the UK (financed in £) when converted back to euros but increase the Sterling value of receipts from the EU (financed in €).

2.11 Conclusions

The aims of this research are groundbreaking in two ways. Firstly, it is the first attempt, certainly in the UK and possibly in the EU, to consider the regional distribution of activity supported through the EU's Framework Programmes and R&D interventions

[5] The euro was introduced as an accounting currency in 1999, with physical coins and banknotes introduced on 1 January 2002. It replaced the former European Currency Unit (ECU) at a ratio of 1:1.

financed through the Structural Funds. There has been very little research examining these two instruments in combination. This was one of the reasons that the DTI was supportive of the study. Secondly, through the analysis of the factors which influence the take-up and use of these instruments, the research has been able to contribute to an emergent literature on relational geography and how these geographies themselves influence the way in which territories and policy concerns are imagined.

Overall, the approach adopted proved to be highly appropriate for the study objectives and few problems were encountered in its delivery. This was primarily due to the willingness of those contacted to give freely of their time but also related to the fact that the methodology was tried and tested and the researcher had long experience of undertaking similar research projects. The research design also offered the flexibility to overcome the challenge presented by the poor quality of data available for actual expenditure on R&D financed through the Structural Funds.

One of the issues for this study has been the need to construct data for both Structural Fund activity in the regions and the Framework Programmes. This is perhaps the most significant potential weakness with respect to the reported results. In neither case can the final reported figures be regarded as definitive in terms of their absolute values. However, in all cases the figures are robust estimates which provide a solid basis on which to draw comparisons across the different case-studies and to inform our understanding of the processes and patterns at work. For this reason it is felt that the method adopted provides a solid foundation for the analysis that follows.

3. R&D AND REGIONAL ECONOMIC DEVELOPMENT

"*The capacity of any space to generate innovation has long been considered as one of the keys – if not the main key – to economic success. Innovative regions and nations have always been at the forefront of economic progress and have been regarded as the model to be followed by less innovative spaces*" (Rodríguez-Pose 2001 p.277).

3.1 Introduction

With these words Rodríguez-Pose succinctly captures the reason innovation and its spatial attributes has captured the attention of policy-makers and academics alike. However, like so many apparently simple statements, constructing an understanding of how R&D interventions can lead to regional economic 'success' and how the regional environment can, in itself, exert influence on the outcomes of this process is not straightforward. Yet it lies at the heart of current policy debates in this field. This chapter seeks to identify the key strands in this complex problem, through which a number of crucial strands of inquiry are interwoven.

Traditionally, academic research has approached this topic through a number of distinct literatures, ranging from those embedded in mainstream economic research traditions, through those which take a more systems-based, or institutional perspective, to those rooted in studies of governance processes. Increasingly the spatial dimension and, more especially, the influential nature of different spatial relationships are also being considered. The two policy instruments which are the focus of this study are also, traditionally, treated differently conceptually. Research into the Structural Funds tends to be grounded in territorial and spatially-orientated literatures, whilst research into the Framework Programmes tends to be more sectorally-orientated and, broadly, aspatial.

This chapter draws upon each of these literatures to explore different facets of spatial innovation. The chapter begins by outlining the main components of existing innovation theory, highlighting the importance of knowledge acquisition by firms and the role of the wider innovation system in influencing levels of activity. In a move away from traditional neo-classical models of economic growth, the chapter then explores the spatial

processes underpinning this. It draws on theories of endogenous growth and evolutionary economics to suggest explanations for the observed persistent spatial disparities in levels of innovation and economic prosperity. Work from the corpus of literature on regional innovation systems, variations in the 'absorptive' capacity of local economies and the importance of geographic proximity form the core of this review.

To this point, the material considered is largely a review of traditional and broadly accepted thinking in the field of regional innovation studies. It provides a background for our later assessment of the extent to which observed patterns of activity conform to existing innovation theories. Yet, the research undertaken for the study opened up two new avenues for exploration with their own rich and emergent literatures. The first of these is the notion of spatial relationships. Much of the early literature on patterns of regional innovation stresses the role of geographical proximity. This notion is being challenged both by the rich literature on 'globalisation' and also from emergent thinking on the nature of relational geographies. The chapter considers this 'relational turn' as a basis for extending our understanding of the R&D and innovation process.

The second avenue is around the policy process itself. This study is very much about the role of EU R&D policies in regional economic development. The two instruments considered by the study have different governance structures and act at different spatial scales. This provides a rich, and as yet unstudied, resource to consider how regional policy makers conceive different instruments and combine them towards common objectives. This chapter draws on emerging literatures emphasising the role of different actors in shaping policy in practice, as opposed to the formal setting of policy, to build an understanding of how policy governance in this complex setting might be better understood in practice.

3.2 Linking R&D to economic growth

3.2.1 Economic growth through 'technological progress' and innovation

Traditionally economic growth has been associated with increases in the amount of land, labour or capital that is available to the production process. Given that the supply of land is generally seen as fixed within any single country or region attention has focused on the contribution that variations in the quantity of capital and labour make to increasing levels of output and, ultimately, incomes. Studies of economic growth have found that changes in the amounts of labour and capital account for only a small proportion of measured economic growth, leaving a large unexplained residual. This residual was explained by Solow (1957) as emanating from 'technical progress' and has come to be known as total factor productivity. It represents the level of growth that cannot be explained by increases in labour or capital inputs alone and rising levels of productivity are now seen to be a fundamental explanation of observed rates of economic growth (Baumol, Blackman and Wolff 1989; Malecki 1997, HM Treasury 2001).

The interest given by academics and policy makers to R&D stems from the persistently observed correlation between levels of investment in R&D and economic growth rates (Dosi 1988, Nelson and Winter 1982). Recent work focusing on the EU has reinforced this finding, suggesting that R&D investment as a whole, and higher education R&D investment in less prosperous regions of the EU in particular, are positively associated with levels of economic growth (Bilbao-Osorio and Rodriguez-Pose 2004). It is now believed that levels of R&D activity have a significant influence on long-term economic growth rates, and that differences in levels of R&D activity may account for spatial disparities in economic prosperity.

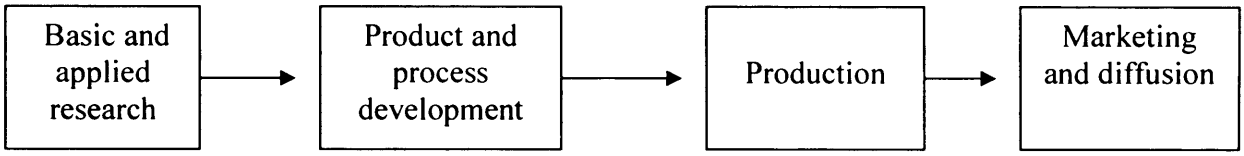
One reason for this may be the wider economic benefits of research (see for example, Bania et al. 1993; Brooks, 1994; Dasgupta and David, 1992; David et al., 1994; OECD 2000, Pavitt, 1991, 1997; Rosenberg and Nelson, 1994; Salter and Martin, 2001; Schartinger et al., 2001). These can be broadly summarised as follows:

- The dissemination of research results as codified knowledge through publications, conferences and patents produces a stock of knowledge which can be used by industry as an input into further research and innovation.
- The research process generates well-trained individuals, and contributes to the training of others through research-based educational materials.
- Researchers commercialise the knowledge generated from the results of their research through establishing 'spin-off' companies or licensing the products and techniques developed.
- Equipment, techniques and instrumentation developed in the course of undertaking research activity is made more widely available to the benefit of commercial enterprises.
- The mobility of researchers between science and industry (and vice versa) contributes both to the dissemination of codified knowledge and to the exchange of tacit knowledge.
- Universities and public research organisations engage in collaborative R&D projects with industry, providing for the exchange of tacit and codified knowledge and leading to new opportunities for innovation.

However, the primary link between R&D and economic growth is now generally accepted to be through the process of innovation, memorably described as a "groping, searching, uncertain process" (Freeman 1982) where the results are uncertain and the failure rate is high. Through a process of introducing new products, or upgrading those that already exist, firms stay ahead of the competition, whilst other firms seek to catch up through imitation (Grossman and Helpman 1991). Firms have an incentive to engage in innovative activities because of the expectation that new technologies will generate economic rent and R&D is one, crucial, input into this process. Equally, the process of investing in new production technologies and making more efficient use of those which are available will also improve productivity levels and so the competitive advantage of a firm (Baily and Chakrabarti 1988, Best 2001, Van Ark and Piatkowski 2004).

Although often described in linear terms, as illustrated in Figure 3.1, this model is largely a conceptual 'straw man' which, at best, only applies in a limited range of industries, such as chemicals and pharmaceuticals, and even then in rather special circumstances (Pavitt 1991, Frenz and Oughton 2005).

Figure 3.1 The stylised linear model of technological change



Source: Malecki (1997 p.51)

In practice the innovation process is highly iterative and interactive where the role of research is complemented by other influences as solutions are sought to production problems, as new products are developed to meet a customer's needs and as learning and process innovation take place during production (Shaw 1994, Kline and Rosenberg 1986; Von Hippel 1988). Numerous feedbacks occur as solutions are sought to production problems, as new products are developed to meet a customer's needs and as learning and process innovation take place during production (Shaw 1994). Consequently, researchers are increasingly seeking to understand the wider innovation process as a whole, and the role of R&D in this. In doing so two features stand out. The first is the means by which knowledge is acquired and used and the second is the influence of social and institutional characteristics in shaping the innovation process.

3.2.2 Acquiring and using knowledge

In doing so the focus has turned to the means by which firms acquire the knowledge required for innovation, including the various forms that knowledge can take and the nature of the innovation process itself (Amin and Cohendet 2004). R&D itself is just one source underpinning a number of different forms of knowledge which a firm can draw upon, some of which are more easily assimilated than others.

Amin and Cohendet (2004) draw upon the work of Spender; Lundvall and Blackler to highlight two distinctive characteristics of knowledge (Figure 3.2). Although the terminology varies they argue that the common features of the different types of knowledge are that they can either be tacit or codified (Polanyi 1967), and can either be held by an individual or by the community.

Figure 3.2 A typology of knowledge

	Individual	*Social (or collective)*
Explicit (or codified)	Conscious (Spender) Embrained (Blackler) Know-what (Lundvall)	Objectified (Spender) Encoded (Blackler) Know why (Lundvall)
Tacit	Automatic (Spender) Embodied (Blackler) Know how (Lundvall)	Collective (Spender) Embedded/encultured (Blackler) Know-who (Lundvall)

Source: Amin and Cohendet 2004 p.34[6], adapted from Spender (1997)

The importance of knowledge exchange in the innovation process is not a new argument, as far back as 1890 Marshall 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). What the knowledge-based literature adds to our understanding is a recognition of the different forms of knowledge which influence the process and the combining of these. As Cook and Brown (1999) suggest, the true spark of innovation lies in the 'generative dance' between the knowledge that we possess and that which we use; mimicking Nonaka and Takeuchi's (1995) view of knowledge conversion as an iterative and spiral-like process of collective learning. This exchange of knowledge may be formal or informal, and may not be fully compensated for by market mechanisms.

Knowledge formation then occurs not only through individuals or organisations but through communities (Brown and Duguid 1991). Or, as Amin and Cohendet put it, through "socially distributed activity systems" (Amin and Cohendet 2004 p.30) forming "spaces of knowledge and learning" (Amin and Cohendet 2004 p.86). It is the combination of generic knowledge held within a community with that held by firms and

[6] Note: typographic errors in original corrected here

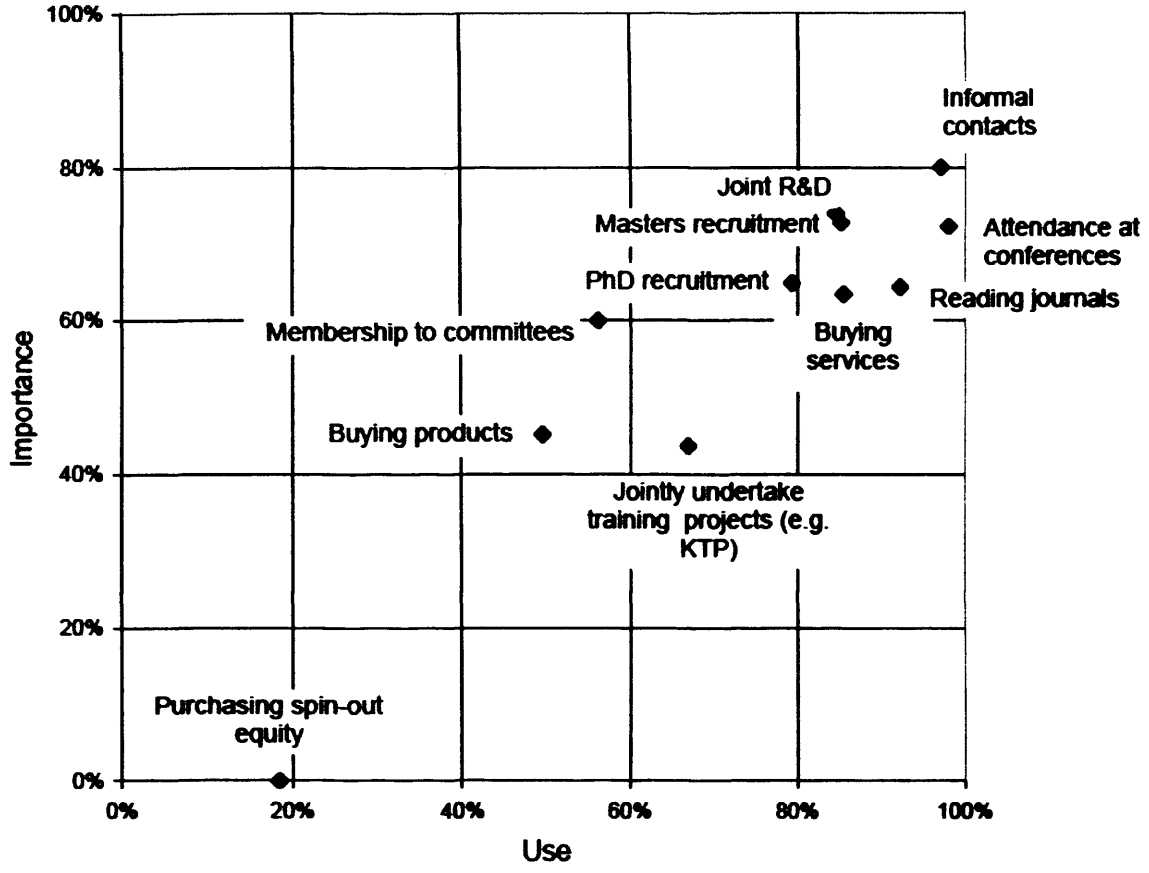
individuals that leads to successful innovation, and it is the interactions and practices of these communities that determine the extent to which knowledge is generated and disseminated; interactions which may be based upon strong or weak ties (Granovetter 1973, Lorenzen and Foss 2002), depending upon the frequency and depth of interaction. In this respect knowledge generation and, hopefully, innovation should be seen as an intensely social process; best described as a 2-way street and not unidirectional from researchers to producers. Innovation relies not just on the application of knowledge, but also learning from this process and reapplying the lessons learnt; the notion of single and double loop learning introduced by Argyris and Schon (1978).

Following Brown and Duguid (1991), Amin and Cohendet (2004) argue that a firm should be seen as a community of communities, with the role of management being to draw the various communities together in the pursuit of collective goals, such as innovation. The role of go-betweens, such as 'knowledge enablers' or translators (Ichigo, Krogh and Nonaka 1998, Brown and Duguid 1998, Nooteboom 1999), who can transcend the boundaries of different communities, is crucial in achieving these goals, as are measures for stimulating effective engagement. In this respect the firm is the 'processor of knowledge' generated from different sources both internally and externally (Amin and Cohendet 2004). The nature of the innovation system affects the ability of the firm to access and effectively process available knowledge.

The importance of communities in the exchange of knowledge is well-illustrated in work examining the sources of knowledge drawn upon by users of research commissioned by the UK's Natural and Environmental Research Council (NERC) and undertaken by Technopolis (2004)[7]. As Figure 3.3 clearly illustrates, informal contacts are amongst both the most important and the most used sources of knowledge, with attendance at conferences similarly well regarded. The importance of tacit knowledge is also emphasised in these results, with inter-personal interplay fundamental in each of the top five mechanisms in terms of rated importance.

[7] Survey based upon 'users' of NERC research. These tend to be large companies with an established R&D capacity of their own.

Figure 3.3 Correlation between use and importance of KE mechanisms



Source: Technopolis (2004 p. 22)

In summary, there are many routes to innovation aside from undertaking R&D within an organisation. Indeed, this is now seen as the exception rather than the norm and the question thus becomes one of how firms make use of knowledge (regardless of source) and how they access that knowledge. The focus of attention has, then, gradually shifted from the inputs into the R&D process and the flows of knowledge emanating from R&D activities; to the means by which firms process knowledge and to how that knowledge is harnessed (Amin and Cohendet 2004).

3.2.3 Systems of innovation

The shaping role of prevailing institutional, organisational, social and political factors on the innovation process has led many writers to suggest that levels of innovation are

affected by systemic processes (Kline and Rosenberg 1986; Von Hippel 1988; Christensen et al 1999). The performance and orientation of the system as a whole has a decisive effect on the propensity of firms within the system to innovate and so influences rates of economic growth. Differential levels of innovation and growth arise, it is argued (Dosi 1984), because different systems have:

- different abilities to generate and absorb new knowledge;
- different abilities to put new knowledge to a productive use and exploit it economically; and,
- different behavioural patterns with respect to innovation and market growth, even when facing notionally similar opportunities.

The concept of distinctive innovation systems has been supported by observed differences in levels of R&D activity and innovation performance between countries (Freeman 1987, Lundvall 1992, Nelson 1993), as well as within defined technology areas and industrial sectors (Carlsson and Jacobsson 1997). Variations in institutional capacity for example, including the degree of co-ordination, have been identified as an important influence on the performance of local industry (Amin and Thrift 1992, Sjostrand 1993), whilst firms and organisations themselves respond differently to the same signals (Howells 1999). It is argued that it is the interplay of these different abilities and behavioural patterns that determine the effectiveness with which knowledge is assimilated and innovation occurs (Lundvall and Johnson 1994, Amable 2000, Gertler, Wolfe and Garkut 2000, Hollingsworth 2000).

As to what elements actually constitute a system of innovation in practice, definitions remain broadly drawn. Systems generally can be described as "complexes of elements or components which mutually condition and constrain one another, so that the whole complex works together, with some reasonably clearly defined overall function" (Fleck 1992 p5). Equally, whilst some elements of an innovation system may be consciously designed by policy makers, most are not (Edquist 1997).

Nelson and Rosenberg stress that an innovation system consists of more than just those actors engaged in R&D: "The concept is of a set of institutions whose interactions determine the innovative performance... of national firms... The 'systems' concept is that of a set of institutional actors that, together, play the major role in influencing innovation performance" (1993 p.5). Freeman (1987 p.1) echoes this view stressing "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies". For Etzkowitz and Leydesdorff (1997, 2000 cited in Oughton et al 2002) innovation is best understood as a 'triple-helix model' of interacting interrelationships between government-university-industry. The nature of a particular innovation system will be determined by the extent to which industry and science interact in practice; the characteristics of the main actors representing demand and supply on the (national) knowledge markets; and the policy-related framework conditions which provide the setting for the 'knowledge market' (Polt et al 2001).

Despite (or maybe because of) the many pages written on innovation systems detailed identification of common components of innovation systems remain elusive. Indeed one of the challenges facing any researcher in this field is that all systems are subtly different and largely unique. Consequently, most studies are based upon case studies of individual regions providing descriptions of individual systems, whilst seeking to identify generic lessons and successful features of particular systems. Critics of work in this area argue that this has led to nothing more than a wide number of 'benchmarking' exercises - 'bad abstraction' in the words of Lovering (1999) - but little robust theorising (see also Moulaert and Sekia 2003).

For some researchers, this is as much as can be expected. Howells (1999), for example argues that innovation systems should simply display their own internal set of interactions and display qualities of operating as a system. Whilst Edquist (1997) suggests that the approach is a conceptual one offering a focusing device to help explain observed patterns, rather than a predictive tool.

Still, interest in identifying the various components of innovation systems has led to a broad consensus around the various elements involved, which involve both the 'hard' infrastructure of actual organisations and the 'softer' infrastructure of prevailing norms and social values (Dosi et al 1988, Lundvall 1992, Nelson 1993, Cooke and Morgan 1998, Amin and Cohendet 2004, Todtling and Trippl, 2005). Synthesising this work the following components appear to make up, and influence the behaviour of, systems of innovation:

- Organisations and institutions directly influencing R&D
- The collection and organisation of education and training institutions
- The organisation of financial services
- The complex of user-producer relations between firms
- The prevailing industrial structure
- The network of intermediate institutions (such as trade associations, chambers of commerce, trade unions etc)
- Social networks and interacting communities (including norms of trust, reciprocity and social behaviour)

In turn, each of these components also have their own dynamics, their own objectives, and are focused on supporting research and innovation to a greater or lesser degree suggesting that innovation systems are in fact complex combinations of different interacting systems. In a further extension to this thinking Cooke (2005) has recently suggested that there is a need to distinguish between knowledge-producing and knowledge-utilising dimensions of innovation systems. This is a useful recognition of the fact that these two dimensions often exist as separate circuits of knowledge activity, with occasional exchange between the circuits acting as interactive stimuli.

Whilst much of the literature has focused on the identification, and the efficacy, of particular innovation systems it is probable that any single firm or organisation is subject to the influence of a range of 'systems' operating at different spatial scales and across different sectors. There is no presumption that these will operate in harmony, or even towards a common end. Elements of any system may work towards different goals and

objectives or may even be in conflict (Nelson and Rosenberg 1993). In many respects innovation systems can be seen as coalitions of overlapping and interwoven networks with different interests and horizons. This can provide both a source of strength but also, potentially a weakness.

In practice an important feature of any innovation system is the "extent to which knowledge is exchanged and the conditions of exchange" (Foray 1997 p.65), with systems acting "as both carriers of demand impulses and technology flows" (Dosi 1999 p.39). The presumption that knowledge is socially constructed and distributed through appropriate institutions and conventions (David and Foray 1995, 1996) is one of the principal arguments for taking a systems approach. On this basis the system can be defined in terms of the formal and informal networks of actors or other entities that assume specific functions in the generation, transformation, transmission and storing of knowledge (Carlsson and Jacobsson 1997; Dosi et al 1988; Metcalfe 1992). The system is the result of market decisions by the various actors of this knowledge market (Polt et al 2001) with the system providing a search space for firms due to their bounded rationality and vision (Fransman 1990). The common message is that innovation is dependent upon a network of actors and the reach of their combined actions. In this respect there may be less to be gained from debating the components and scope of different innovation systems than from considering how different constellations of actors and their behaviour influence the generation and application of knowledge.

3.3 New models of economic growth

The notion that economic growth is not just a quantitative process but also a qualitative one is compelling and has called into question traditional neo-classical models of economic growth. As Frenz and Oughton contend a potential shortcoming of neo-classical models of economic growth is that "they put the focus on the firm and ignore wider system and infrastructure effects that are known to influence innovation" (Frenz and Oughton 2005 p. 21).

At the same time, observers of economic development patterns across the world are calling into question the traditional neo-classical view that technological change is an exogenous variable freely available to all (Nelson 1995). Rather, different channels are more or less effective at supporting the exchange of knowledge depending upon the types of knowledge concerned, the attributes of the organisations involved and prevailing social and market conditions (Foray 1997, Gibbons et al. 1994, Lundvall 1988, Saviotti 1998 Nelson and Winter 1982, Amit and Schoemaker 1993 Brown and Duguid 1991).

In questioning the orthodox neo-classical view of economic growth academics have begun to explore alternative, heterodox, theories based around notions of endogenous growth and evolutionary economics, which are, in turn, beginning to influence policy thinking in this area (see Chapter 4).

3.3.1 Theories of endogenous growth

Collectively known as the New Growth Theories, these new approaches emphasise the importance of spillover effects and positive externalities within an economy, which can lead to a situation of increasing returns from the accumulation of knowledge offsetting the tendency towards diminishing marginal returns on investment (Grossman and Helpman 1991, Romer 1994, Martin and Sunley 1998). How these localized returns develop and reinforce local economies is now regarded as an important component of local dynamic competitive advantage (Krugman, 2005).

That positive externalities might offset diminishing returns to scale has been considered plausible since the 1950s when persistent disparities appeared to lead to less convergence between economies rather than more. Initially attributed to Myrdal (1957), the proponents of cumulative causation argue that growth can be self-reinforcing as endogenous forces tend to increase regional differences in productivity growth (Dosi, Pavitt and Soete 1990, McCombie 1988). Essentially, increasing returns in faster developing regions can set in motion a process whereby production factors move away from the slower developing regions and so lead to increasing growth in the faster

developing regions, and depress the opportunities for growth further in the slower developing regions.

The new growth theories also assume that knowledge and know-how are not disseminated instantly (Fagerberg 1994). This is not only due to market inefficiencies where companies have an incentive to keep knowledge to themselves in order to gain monopoly rents but also because knowledge is an acquired commodity. New techniques are not available to all but have to be acquired and the propensity to make use of knowledge can vary between firms, sectors and regions. The differential uptake of knowledge can thus influence rates of growth and the propensity to grow.

In the case of R&D, regions with strong R&D endowments are likely to attract more of these factors. Conversely those regions that do not have existing endowments may continue to lag behind and may indeed see the gap widen. Dosi (1984) extends this relationship further by suggesting that it can also capture the effects of more innovative sectors being established in more advanced regions. Support for this thinking has been reinforced by the observation that geographical patterns of technological strengths and weaknesses exhibit a high degree of stability over time. Between 1960 and 1980 for example there was little change in the distribution of strengths and weaknesses amongst regions in OECD member countries (Patel and Pavitt 1994) and more recent publications do not demonstrate significant changes in established patterns (OECD 2005).

Whilst the centres of economic strength in the economy appear to be very robust this is not the case for economic agents. There is a strong 'churning' of leading firms with - often rapid - changes in fortunes over the space of a few years and, certainly, over a number of decades (Mowery 2005). The inference drawn from this is that institutional and organisational configurations are more important determinants of economic development and growth than the presence of particular firms (Saviotti 1998), a point that also underpins heterodox theories of evolutionary economic growth.

3.3.2 Evolutionary perspectives on economic growth and development

The observation that spatial disparities in economic prosperity are both deep-seated and often self-reinforcing has resulted in a questioning of traditional neo-classical economic models. Based on assumptions of market equilibrium and the rational allocation of scarce resources these models suggest that a process of convergence should occur, unless failures in market mechanisms inhibit this. In a seminal work, Nelson and Winter (1982) argue that this need not be the case. In their work they introduce the notion of evolutionary economics to seek to explain observed patterns of growth and development and to address some of the perceived weakness of neo-classical growth models. Their work has spawned a developing literature which explicitly incorporates the variety of products, processes, economic agents and institutions that exist within an economy in an effort to unravel the complex processes at work in regional development (Aghion and Howitt 1993, Brouwer 1991, Dosi et al 1995, Silverberg and Verspagen 1994).

Whilst there is limited empirical evidence to fully support the perspectives espoused in the emerging field of evolutionary economics – it is best described as 'appreciative theorising' (Malecki 1997) – there is an increasing body of work which substantiates the ideas promoted. Writers such as Metcalfe, Foster and Ramlogan (2005), and Martin and Sunley (2006) argue that the evolution of spatial economic disparities has much to do with spatial differences in 'adaptive growth', and how far and in what ways different regions, cities and localities adjust to constantly changing national and international market, technological and policy conditions. For these writers, the "growth of productivity, output and employment are determined mutually and endogenously, and their values depend on the variation in the primary causal influences in the system" (Metcalfe et al 2005 p.7). The challenge is that knowledge-driven economic systems are not only unpredictable but that knowledge is unevenly distributed.

The concept of economies 'evolving' is not a new one and it is important to understand the different way in which the evolutionary metaphor has been used. In an authoritative review of the field Hodgson (1993) identifies a taxonomy of evolutionary approaches

which, *inter alia*, vary in the extent to which they are based on our understanding of biological systems and their perspectives on equilibrium and disequilbria. The following paragraphs draw heavily on the work of Hodgson.

On the one hand we have those models that suggest that economies progress through different stages of economic development; such as Rostow's well-known Stages of Growth model or Marxist theories of development. Here evolution can be seen as a synonym for advancement, rather than describing an approach based upon biological theories of development. Models are described as unilinear or, alternatively, as multilinear if there are multiple possibilities present.

On the other hand are those strands of thinking that Hodgson describes as 'genetic'. In these models biological theories form, to a greater or lesser extent, the building blocks for understanding economic behaviour and the development of economies over time. In these genetic perspectives, habits; individuals; organisational routines, and social institutions are all seen as analogous to biological 'genes', with the economic system being the organism as a whole (Hodgson 1993 p.42). It is these models which form the basis of the work of writers such as Nelson and Winter, as well as Schumpeter, Marshall and Adam Smith.

For most of these authors evolution is seen as a continuous (or incremental) process but, where radical change occurs – as Hodgson identifies in some of Schumpeter's writings - the potential exists for a punctuated form of evolution. In a further development, and drawing on Lamarckian ideas of inherited behaviour, it is also possible that some form of selection process can occur whereby differential rates of change ('birth' and 'death') cause the population to change. Described as phylogenetic evolution this "involves the development of different genetic rules through some cumulative process of feedback, and the subsequent effects" (Hodgson 1993 p.44). This could involve "changes in the composition of the human population.... or changes in habits, routines, institutions or systems, or combinations of these" (Hodgson 1993 p.44). Crucially, in considering the dynamics of phylogenetic models of development there is no necessary tendency towards

a stable equilibrium. As Veblen puts it evolution "is a scheme of blindly cumulative causation, in which there is no trend, no final term, no consummation" (Veblen 1919 p. 436, quoted in Hodgson 1993 p. 44). Whilst some authors consider that a population will tend towards equilibrium (Lewontin 1982), for others such as Nelson and Winter (1982) the equilibrium is continuously shifting and, in practice, never reached.

The concept of evolutionary economics has profound implications for our thinking about patterns of regional economic development. Notions of diversity, selection, path dependency and the role of rules and institutions take on a far stronger importance than is the case in neo-classical theories (McKelvey 1997). These notions provide an important basis for our thinking about the process of spatially-bounded economic development over time and, to a greater or lesser degree, are increasingly influential in the thinking of economic development policy-makers.

The role of diversity in economic geography remains contentious. On the one hand regional industrial specialisation allows for Marshall-Arrow-Romer style economies. On the other hand a more diverse economic base allows for the cross-fertilisation of ideas, so-called Jacobs externalities, a benefit that Boschma and Frenken have stressed in their work on related variety (Boschma and Frenken 2003). The presence of diversity[8] and variety is also believed to provide positive economic consequences over the longer-term (Dosi et al 1988; Metcalfe 1992; Saviotti 1988). As Metcalfe (1988) points out, economies that are based on a more varied population of firms may stand a better chance of survival in the face of major changes in economic conditions – each will innovate in a slightly different way. Equally, as firms innovate they themselves are able to produce a more diverse range of products, so equipping themselves for longer term survival.

Survival is not just about the 'survival of the fittest' as common misconceptions of evolution would have it. The most efficient firm is not always the most successful over time and there is evidence of a variety of firm strategies which are not always profit

[8] Diversity can be regarded as the number of actors, activities and objects necessary to describe a system and will include: output diversity (ie number of distinguishable types of output); process diversity and institutional and organisational diversity (Saviotti 1997 p.186).

maximising. As with biological organisms, the ability of a firm to adapt to changing conditions can be as important in determining its survival as is its fitness for current conditions. Over time, circumstances can radically alter and long-term survival requires the flexibility to adapt. Firms that are well suited to particular market conditions may find that they are ill-equipped for a radically different world, such as different patterns of consumption; the introduction of radical innovations, or some external shock. Where change is incremental then more specialised economies are likely to reap rewards, whilst it is more diverse economies that are most likely to react positively to significant changes in prevailing economic conditions (Prigione and Stengers 1984).

Firms, and regions, are not free to choose their development paths. They are, to a certain extent, locked-in to paths determined by past investment decisions, existing economic structures and prevailing institutions (Kaldor 1934, Martin and Sunley 2006). Various reasons have been postulated for this including the legacy of a dominant industrial structure, as can be witnessed in areas tied to declining industries such as mining, and the influence of past investment decisions whereby the existing capital stock influences the ability of firms to implement known innovations. This notion of path-dependency, which has strong parallels in evolutionary biology (Hodgson 1993), highlights the significance of existing characteristics in influencing the direction of future direction; suggesting that only certain paths can actually be taken.

The notion of path-dependency provides public authorities with a powerful argument for intervention through seeking to speed up processes of change and overcome the inbuilt inertia of past investment decisions. Similarly, there are opportunities to create new paths rather than see the future as some predetermined destiny immutably shaped by the past. As Cohendet and Llerena put it "the local entity is not a passive source of competitive advantages but an active element of the overall competition process that can create and select technologies in a specific manner" (Cohendet and Llerena 1997 p.231). Or, in the words of Martin and Sunley: "possibilities of capabilities and competence building, expectation formation, and organizational and institutional creation, produce variety and heterogeneity into the economic landscape, and hence constant pressure for

path destruction and opportunities for new path creation" (Martin and Sunley 2006 p.424).

At the heart of Nelson and Winters' (1982) thinking in developing their ideas of evolutionary biology was the importance of routines and the role of institutions and rules in governing behaviour (Nelson 1981, 1994, 1995). As it is human actions that cause patterns of innovation, explanations of why change occurs must also be sought in the decisions and actions of different agents in relation to institutions and organisations (Saviotti 1997, McKelvey 1997, Hodgson 1991). The emphasis here is on understanding the cultural and social context in which decisions are taken and which result in innovative behaviour. This approach finds resonance in the work of authors such as Brown and Duguid (1991) who stress the sociology of learning in influencing innovation.

The diffusion and application of knowledge can be influenced by prevailing norms of activity and behaviour – the 'way things are done'. New ideas are not simply picked up by firms and brought into use. Old ideas must be 'unlearnt', production processes altered and new skills acquired (Lundvall and Johnson 1994). Inherited institutions and routines may influence the rate at which firms within an economy adapt to changing circumstances; as inertia forestalls adaptation. Habits and routines tend to be slow to change and patterns of behaviour are reproduced and replicated, with new ideas having to compete with previously accepted norms of behaviour and action (Nelson and Winter 1982). Where an economy is dominated by particular industrial forms and structures this inertia may be especially prevalent (Dosi 1984).

The institutional context of an economy can also influence the ability of firms to assimilate new ideas. To the extent that innovation is a shared, interactive and collective process it will involve different organisations and be governed by accepted norms of behaviour concerning the sharing of information (Cooke 1998, Braczyk and Heidendreich 1998, Cooke and Morgan 1998). Institutions, as social norms or regulatory structures, permit knowledge flows and synergies through encouraging co-operative behaviour, helping to produce new levels of innovation and the assimilation of

knowledge on which further development can be built (Oughton et al 2002; Howells 1999, Braczyk and Heidendreich 1998). In this respect Amin and Cohendet, amongst others, argue that weaker degrees of rational decision making must be considered particularly in the context of situational learning where "the respect for the social norms of the group and the practices of engagement are a more important guide to behaviour than a rational decision-making context" (2004 p.33).

Arguably, the ability of firms to respond to new ideas will also depend on the extent to which they are open to the influx of new ideas. Firms, and – by extension – economies, that are open to ideas from outside sources will be in a better position to grow and adapt to change than ones that are closed to these ideas. The acknowledgement of the role of a wider set of actors and institutions in the innovation process in stimulating economic change meshes with notions of associational, or networked governance (Grabher 1993, Cooke and Morgan 1998). It also reflects the interest in the role of innovation 'systems' in influencing the level and direction of technological change within an economy.

3.4 Explaining spatial disparities in levels of innovation - the territorial turn

The concern of policy-makers at the variations in the levels of innovation and R&D observed at a regional scale across the EU is one of the starting points for this research. Reasons for this concern, in terms of its implications for longer-term economic growth have been explored in the preceding sections. This variation is more than simply a function of the number of firms located within a given territory, the economic structure of that territory, the skills of the local labour force or the presence or otherwise of research institutions; although all of these offer partial explanations. Our understanding of what causes and maintains spatial disparities in innovation performance draws heavily on three principal ideas: the role of territorial innovation systems; the notion of absorptive capacity, and the localised nature of knowledge spillovers.

3.4.1 Territorial innovation systems

The early focus of research into innovation systems was at a national level, reflecting the importance attached to national political and administrative boundaries. These were seen to define the space in which specific learning processes and institutional building takes place (Gregerson et al 1994) and shape firm behaviour through cultural patterns of inter-firm relations and industrial relations (Gaffard et al 1993). The national level was also seen as the area where public policy activities were concentrated, "most public policies influencing the innovation system or the economy as a whole are still designed and implemented at the national level" (Edquist 1997 p12).

More recently the systems of innovation approach has been applied at sub-national levels as well. Again, geographical disparities in patterns of innovation activity are seen to suggest that regional variations in institutional, organisational, social and political factors influence innovation outcomes (Braczyk et al 1998, Cooke and Morgan 1998). That these disparities occur within broadly similar political and cultural contexts (as represented by the nation state) is put forward as a powerful argument for the role of regional institutions in effectively filtering national conditions (Howells 1999; Metcalfe 1995). The more distinctive the differences between regions within a national (or supra-national) entity then the more relevant will be the concept of distinctive regional innovation systems (Howells 1999).

A range of qualitative and quantitative studies undertaken at the regional level has confirmed the important role that regional variations in institutional capacity can play in shaping levels of innovation, with researchers arguing that the existence and strength of the association between R&D, innovation and economic growth is "contingent upon region-specific socio-economic characteristics, which affect the capacity of each region to transform R&D investment into innovation and, eventually, innovation into economic growth" (Bilbao-Osorio and Rodriguez-Pose 2004 p.434). With a heritage stretching back to research on Italian industrial districts, territorial innovation systems might be conceived as "an integrated and spatially concentrated network of institutions that

provide inputs to the innovation process" (Feldmann 1994 p.69). In considering what this might include Smith (1997) differentiates between economic, or physical, infrastructures, such as roads and telecommunication networks, and knowledge infrastructures, such as universities, research laboratories, libraries, training systems and organisations related to standards and intellectual property rights. For Storper (1995) soft-infrastructures, such as conventions and non-traded interdependencies, also form locally specific relational assets which positively influence levels of innovation in a region

Whilst few would argue that innovation systems can have territorial dimensions and that they are locally situated there is also a recognition that their territorial boundaries are inherently fuzzy (Narula 2003). As Simmie and colleagues identify knowledge flows and activity increasingly span regional and national borders (Simmie et al 2002) suggesting that regional innovation systems are open and porous, but to differential degrees (Howells 1999).

3.4.2 The absorptive capacity of an economy

Absorptive capacity refers to the propensity of firms, sectors and territories to make use of knowledge. This can vary between firms, sectors and regions (Rosenberg 1982), for although the results of research have some of the attributes of a public good they cannot be costlessly assimilated by any potential user (Pavitt 1991). To make use of knowledge, it is argued, firms and other organisations require an existing level of human capital and technological know-how in order to effectively utilise available knowledge spillovers (Cohen and Levinthal 1990; Glass and Saggi 1998; Keller 2001). For positive spillovers to occur the knowledge gap between industry leaders and the firms seeking to 'absorb' available spillovers must not be too wide, otherwise the opportunity to make use of that knowledge will be lost. Differences in absorptive capacity will lead to differential uptake of knowledge and can thus influence both rates of growth and the propensity to grow (Amin and Cohendet 2004).

The notion of the absorptive capacity of countries has a strong history in development economics. In the context of technological development this can be seen as "the ability to learn and implement the technologies and associated practices of already developed countries" (Dahlman and Nelson 1995). With the development of a more explicit regional focus, particularly notions of the 'Learning Region' (Lundvall 1992), it has not been a long step to extend this conception of absorptive capacity to regions.

Whilst the absorptive capacity of firms tends to be measured by proxy variables such as R&D expenditure (Cohen and Levinthal 1989), R&D intensity (Kinoshita 2001) and labour productivity (Kokko 1994) measurement of the absorptive capacity of regions has drawn on the burgeoning literature surrounding regional innovation systems, particularly taking advantage of case studies of successful regions. Amongst other things, levels of industry R&D, human capital and the quality of the institutional infrastructure in a region have been identified as particularly influential.

The importance of the institutional environment in stimulating innovation is well-rehearsed in the innovation systems literature, although Morgan (2004b) warns against the 'conceit' of assuming that the provision of a dense environment of institutional support structures is either necessary or sufficient to promote innovation on its own. It may also act as a 'training place' for collaboration, before firms enter into international knowledge networks (Drejer and Vinding 2005): an argument that is reminiscent of Linder's home market effects (1961).

The notion of absorptive capacity has become an important dimension in directing actions designed to build R&D and innovation capacity, in order to stimulate economic growth and development within EU regions. As an aside, it is important to differentiate between the use of the term absorptive capacity in the context of knowledge spillovers and its current common usage in the context of the EU's Structural Funds. In the latter case absorptive capacity is used to refer to the ability of a Member State (occasionally extended to a regional context) to 'absorb' EU funds. The principal considerations here are macro-economic (with EU funds 'capped' at 4% of GDP); financial (the ability to

provide the required levels of co-funding for programmes) and administrative (the presence of the necessary structures, skills, systems and tools to administer the agreed programmes efficiently, effectively and in accordance with EU rules and regulations).

3.4.3 The localised nature of knowledge spillovers

It has long been recognised that firms find it difficult to fully appropriate the results of their investments in R&D activities as some knowledge will 'spillover' to the benefit of others (Griliches 1992). Different approaches based on reviews of econometric studies and case-study approaches have concluded that on average private rates of return to an innovation are around half of the social rate of return (Nadiri 1993; Mansfield et al 1977). Rather than seeing the existence of different types of knowledge spillover (for example, see Klette et al 2000) as a negative, in that it leads to lower levels of R&D activity by the private sector, many academics now regard them as positive externalities, in that firms can also benefit from the access to knowledge which they did not commission.

Although there is strong evidence for a flow of knowledge and information between agents measuring the effects of this has been seen as difficult (Krugman 1991a). A raft of studies in the past 10 years has taken on board this challenge however and identified evidence of significant positive spillover effects (Audretsch and Feldmann 1996, Feldmann 1999, Harhoff 1999, Lissoni 2001, Co 2004, Acs, Fitzroy and Smith 1999 and Kelley and Helper 1999) emanating from R&D activity and that inter-firm and university-business collaboration can actively stimulate levels of innovation (Fritsch 2004, Frenz, Michie and Oughton 2005).

A significant fraction of knowledge spillovers tends to be localized (Acs and Varga 2002). Examination of variables such as patent registrations (Jaffe 1989), bibliographic referencing techniques (Acs et al 1994), and patent citation rates (Jaffe, Trajtenberg and Henderson 1993) all demonstrate that levels of innovation tend to be higher in the vicinity of R&D activity and that the effects of these knowledge spillovers declines with distance (Anselin, Varga and Acs 2000).

The general agreement on the local concentration of knowledge spillover effects, and the positive influence that this can have on total factor productivity of the local economy, provides a powerful message to regional, and national, policy makers. It is perhaps no surprise that suggestions that "a state that improves its university research system will increase local innovation both by attracting industrial R&D and augmenting its productivity" (Jaffe 1989 p.968) have proved attractive to these policy makers. Yet, given our state of appreciation of local knowledge spillovers such a strong statement is regarded as "daring" by Breschi and Lissoni, who go on to warn that this may "lead to naïve policy implications" (Breschi and Lissoni 2001 p.979) and suggest that the "notion of Local Knowledge Spillovers has been largely abused" (Breschi and Lissoni 2001 p.999).

As Breschi and Lissoni (2001) note, whilst there may be a correlation between local knowledge spillovers the causation is less well understood, partly because most of the evidence for their existence is indirect. Consequently, the role of geographical distance in the transmission of knowledge remains controversial (Rallet and Torre 1999, Amin and Cohendet 2004). To put it simply, whilst proximity does appear to matter, the reasons underlying this remain contested. Moreover, whilst there is evidence that the reach of spillovers declines with distance, there is no consensus on what their range is in practice (Breschi and Lissoni 2001).

Although there is some evidence to suggest that knowledge diffuses relatively faster in regions which already have a relatively higher productivity and a larger stock of existing knowledge it is not entirely clear why this should be so. Crucially perhaps, individuals must be aware of others work in order to make use of it and this may be facilitated by geographic proximity. However, even this is now being questioned: "Once relationships have been established individuals can remain socially close even when they become geographically separated" (Agrawal et al 2006 p. 589).

Equally, whilst the existence of localised knowledge spillovers is compelling, and underpins assumptions of both endogenous growth and evolutionary economics, no locality can be entirely self-sufficient for knowledge. This suggests that, over time, there must be a diffusion of knowledge which need not be based solely upon gravity models. A number of studies have now identified strong evidence for the existence of positive knowledge spillovers between regions (Caniëls 2000; Verspagen and Schoenmakers 2004; Cantwell and Piscitello 2005), suggesting that the relationships are more complex than previously assumed and opening up fruitful avenues for research. In an interesting development it has been suggested that inter-regional spillovers tend to be more important in regions with low R&D density compared to those regions with a higher R&D density (Bode 2004).

3.4.4 The spatiality of knowledge

It is now widely accepted that knowledge is neither universally available nor universally equivalent. Rather, the knowledge held by individuals or organisations tends to be partial and is rooted in a specific time and place. This is because knowledge is context dependent and strongly dependent upon the social and cultural practices in which it is located. From different perspectives it is argued that all knowledge needs to be situated in the perspective of the observer (Haraway 1988) and is embedded in the structures and relationships which exert influence on the individuals and organisations involved (Granovetter 1992). There is, then, a territorial specificity to knowledge.

The territorial specificity of knowledge, and the use of knowledge for innovation, has been strongly articulated in the notion of the Learning Region, which argues that it is the region which is the locus for knowledge generation; is the repository for knowledge, and provides the underlying environment shaping the flow of knowledge, ideas and learning (Florida 1995, Morgan 1997). Innovation, it is argued, is an interactive process which is shaped by a variety of institutional routines and social conventions. These routines and conventions vary, temporally and geographically, with some forms being more conducive to fostering innovation and learning than others (Morgan 1997). The capacity of a region

to support a collective process of learning and innovation through the absorption and diffusion of knowledge adapted to local needs is thus regarded as a key source of competitive advantage to firms within that region, and to the sustained economic prosperity of the region itself (Iammarino 2005, Lawson and Lorenz 1998, MacKinnon et al 2002).

However, the importance of the territorial space in knowledge formation remains contested. Whilst there is an acknowledgement that geographical proximity is an important factor in the take-up and spread of knowledge, writers such as Amin and Cohendet (2004) forcefully argue that relational forms of proximity are more significant. Powell (2007), similarly argues that knowledge circulates through two forms of scientific space – that of communities of practice and that of scientific architectures, for both semiotic and practical reasons. In this context it is noticeable that Powell makes no reference to the wider territory as a space of scientific knowledge.

Intuitively, as well as conceptually, there is a compelling argument that whilst knowledge may be spatially and relationally differential, gains are to be made through the combination of different sets of knowledge via processes of inter-regional learning. In just such an attempt to combine the importance of contextual practice and relational activity, Amin and Cohendet argue for a "geography of 'heterarchic novelty'" (2004, p.110) which combines face-to-face casual contacts with distanciated relationships, prompting ideas of inter-connected nodal points of rich knowledge generation, combination and recombination. Such a notion is supported by the work of Sole and Edmondson (2002) who illustrate how geographically dispersed teams are able to draw upon knowledge situated in the multiple physical locals they span and so leverage local competencies that would not be available to teams that were located in one place only. However, the inter-regional dimension of learning remains under-researched and under-theorised in the regional innovation literatures (Hassink and Lagendijk 2001).

3.4.5 The thorny issue of scale

But what area are we referring to when we speak of a region, or of 'local' spillovers? In a forceful critique of what has been termed 'the new regionalism' (Lovering 1999), the looseness with which researchers have tended to approach the question of the regional scale has strongly criticised (Lovering 1999, McLeod 2001). Whilst some refer to a region as a sub-national unit of governance (Scott 1988, Yeung 2002) for others it is a supra-national unit, such as Freeman's description of the continental economies (Freeman 1987). The picture is further muddied by an increasing tendency to speak of metropolitan-regions and city-regions (Brenner 2004). What is readily apparent is the lack of consistency in the use of common terms.

Drawing on Paasi (1996), McLeod (2001) identifies three main ways in which the concept of a region is commonly applied. Firstly there is the practical 'taken-as-read' choice of the researcher. This tends to make use of defined political or administrative units and is the principal approach adopted in studies of regional innovation systems. This takes administrative regions such as Baden-Würtemburg, in Germany or Wales in the UK as the unit of analysis. Secondly is the use of region to describe a perceptual unit of classification, such as the identification of industrial districts or industrial clusters. The description of Silicon Valley is perhaps the best known of these, Silicon Glen in Scotland could be a second example. The boundaries of such units can be relatively fuzzy and may not be commonly agreed. The third use of the term tends to be to describe the setting for social interactions and practice and is based upon collective interpretations of identity.

Many of the complications researchers encounter in seeking to describe the boundaries of regional innovation systems can at least partly be explained by the interplay of these three attributes. In most cases, each has a different overlapping geography making the identification of delimiting boundaries a complex, if not futile, task. It is perhaps for these reasons that it is difficult to find a consensus on the geographical boundaries of a regional innovation system (Doloreux and Parto 2004).

In the case of European policy the situation is not eased by the definition of regions across the EU. The common EU framework for territorial classification is multi-scalar and is based upon a hierarchical system from NUTS 0 through to NUTS 5. However, there is very little consistency in the application of this approach across the Union, as Figure 3.4 illustrates, and the term 'region' tends to be used interchangeably regardless of the NUTS classification referred to. It is apparent from Figure 3.4 that typical subjects of regional innovation studies, such as Wales, Baden-Würtemburg, Castilla-y-Leon and Emilia-Romagna, do not share a common classification in this system, providing some support to the criticisms raised by Lovering and others.

Figure 3.4 The NUTS classification with territorial examples

Country	*NUTS 0*	*NUTS 1*	*NUTS 2*
UK	UK	Wales Yorkshire and the Humber	West Wales and the Valleys York
Denmark	Denmark	Denmark	Denmark
Germany	Germany	Baden-Würtemburg	Stuttgart
Spain	Spain	Centro	Castilla-y-Leon
Sweden	Sweden	Sweden	Stockholm
Italy	Italy	Nord-Est	Emilia-Romagna

Source: adapted from EUROSTAT

Critics of the so-called 'new regionalism' also argue that it ignores the ideological component whereby the rise of the 'region' is a result of changing nation-state agendas rather than any logic of the regional scale itself (Lovering 1999, Jones 1998). Lovering describes this as an effect of changing nation-state agendas which are replacing "the 'imagined community' at the national level with an 'imagined unit of competition' at the urban/regional level" (Lovering 1999 p.392). In this respect it is well to remember the role of the state in shaping what a region is (McLeod 2001). Within the UK, the strength of the regional dimension was significantly increased following the creation of the Welsh Assembly Government and the introduction of RDAs in 1999 (Morgan 2007). Moreover, in the case of Wales the NUTS 2 boundaries were radically redrawn in 1999, clearly demonstrating the power of the nation state to change a regional geography to suit changing policy agendas.

3.5 The Relational Turn: Does Place Matter?

Many academics would agree with Varga and Schalk when they state that "geography matters in technological change" (Varga and Schalk 2004 p.984). The localized nature of knowledge spillovers, coupled with the acknowledged influence of the absorptive capacity of regions and the influence of regionally-situated innovation systems means that "space does matter in the sense that the range of knowledge spillovers may be limited and that regional differentials in the efficiency of utilizing knowledge spillovers can be expected" (Döring and Schnellenbach 2004 p. 11). However, there is an increasing range of literature which now questions the presumption that geography, particularly geographic proximity, matters. The following section explores this position.

One of the reasons traditionally given for the highly localized dimension of knowledge spillovers is that they are reliant on tacit knowledge. This is strongest where face-to-face relationships are present and suggests that a significant proportion of knowledge flows will be spatially bounded. However, some writers have suggested that whilst this was true in the past it need no longer be so (Thrift 2000, Cairncross 1997). Building on the work of Nonaka and Konno, amongst others, Amin and Cohendet (2004) 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" (Amin and Cohendet 2004 p.107). They cite Allen 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" (Allen 2000 p.28).

The emergence of epistemic communities, or communities of practice, which transcend borders is leading to connections through which knowledge spillovers occur in an aspatial manner. These spillovers are facilitated through the trust and reciprocal relationships imparted by membership of such communities; through the creation of temporary spaces, such as conferences, trade-fairs and meetings, and, as Breschi and Lissoni (2001) suggest,

partly because the shared language of such communities allows some portion of tacit knowledge to be transmitted across long distances.

Drawing on Castells' notion of the network society (Castells 1996, 1998, 2000), it is argued that what matters in the global economy is not so much physical proximity but the 'space of flows', that is the web of connections linking capital, information and power. Those that are present within such networks have significance whilst those that are excluded from the networks are left spatially invisible and knowledge-poor (Bauman 1998). The advent of new communications technologies, it is suggested, heralds the 'death of distance' (Cairncross 1997) as production processes are globalised and the codification, transmission, storage and retrieval of information can occur at any time and in any place. Distance is no longer an influence on the time that it takes for knowledge to diffuse from any given location, nor is it the determinant of personal connections. This notion of time-space compression (Giddens 1998, Harvey 1996) resonates in a field where the "introduction of knowledge spillovers by the new growth theory ... also implies an interest in processes that are unfolding in time *and* space" (Döring and Schnellenbach 2004 p. 2, emphasis in original).

The suggestion that distance no longer matters is powerful as it suggests that knowledge spillovers need not be locally concentrated, that what is important is that one is present within the networks, is a node within this space of flows. In this perspective 'nodal knowledge' is not a local affair but is shaped by a range of extra-local interactions and linkages, leading Amin and Cohendet (2004) to conclude that relational proximity involves more than 'being there' in terms of physical proximity. Morgan 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" (2004b p.8).

Audretsch (2003) sees the continuing importance of location, even though the geographic location should be irrelevant in the spillover of knowledge from the producer to the consumer, as a "spatial paradox" (Audretsch 2003 p.673). In seeking to account for this

apparent paradox in the importance place continues to play in the established concentration of knowledge transfer, writers have sought to unpack the 'black box' of knowledge spillovers (Gertler 2008, Boschma 2005). Proximity, it seems, remains an important component in facilitating knowledge spillovers and the 'death of distance' does not yet herald a 'death of geography'.

In a review of the literature, Boschma argues that geographical proximity- described as the spatial or physical distance between economic actors (Boschma 2005 p. 69) - is just one of five forms of proximity which influences the propensity of individuals, and by extension, the ability of firms and other organizations, to learn. The others are cognitive proximity, where a shared knowledge base enables learning to occur; organizational proximity, both across and within organizations, which influences the capacity to co-ordinate an effective exchange of knowledge; social proximity, where embedded social relations support trust and reciprocity in the sharing of knowledge, and institutional proximity, where common habits, rules and routines encourage a sharing of knowledge. Where these other, relational, forms of proximity are present it is argued that learning need not be spatially constrained and distanciated learning will occur (Allen 2000, Amin and Cohendet 2004).

Geographic proximity remains important partly because it is the setting where other relational forms of proximity occur and combine. In that sense it is a proxy for the different dimensions of social affinity that promote knowledge spillovers and innovation (Gertler 2008). As Breschi and Lissoni comment innovation processes are likely to differ across regions precisely because "different routines of interaction are established between the various parties involved in the process" (Breschi and Lissoni 2001 p.978). However, as Morgan points out, a recognition of the role of geographical proximity should not presume some automatic set of relationships but that the "social interactions which constitute 'local' action ... have to be actively constructed like any other relational asset" (Morgan 2004b p.11). It is merely that these relationships are more likely to occur, and to combine, within a local setting than at a distance. Drawing on the work of Brown and Duguid (2000), Morgan goes on to suggest that learning opportunities are enhanced

within a spatial setting owing to the existence of ecologies of knowledge. He suggests that whilst "the spatial *core* of these ecologies of knowledge may be a regional cluster... the outer *boundaries* may straddle multiple spatial scales" (Morgan 2004b p.12, emphasis in original).

What is emerging is an acknowledgement that the geography of knowledge spillovers is highly complex. Whilst the suggestion that communities of practice can support distanciated learning remains underdeveloped (Gertler 2008 p.1) it does contain a degree of substance. Similarly, whilst most knowledge spillovers remain localised the simple fact of geographical proximity "is neither a necessary nor a sufficient condition for learning to take place" (Boschma 2005 p.62) and it would be wrong to assume that simply 'being there' is sufficient for learning and knowledge exchange to occur. To do so is to fall into the trap of spatial fetishism (Morgan 2004a). As Paasi comments: "There is no doubt that networks do matter, but so do 'geography', boundaries and scales as expressions of social practice, discourse and power" (Paasi 2004 p. 541-542). This has important implications for policy and for practice as it suggests a need to search for a more sophisticated understanding of the process by which knowledge spillovers occur and learning within regions takes place.

In exploring this process it is useful to build upon Morgan's notion of networks with common spatial cores but multiple spatial boundaries (Morgan 2004b). This has strong similarities with those emergent writings on relational geographies which recognize that space can, simultaneously be both bounded and porous comprised as it is of "communities of relational connectivity that transcend territorial boundaries" (Morgan 2007 p.1248), and where individuals can be members of a multitude of different communities each one reflecting a facet of their multiple identities. In the words of Allen et al "An adequate understanding of the region and its future can only come through a conception of places as open, discontinuous, relational and internally diverse" (Allen et al 1998 p. 143). The interface between the local and the global then becomes paramount and a number of studies have recently begun to explore the means and mechanisms through which externally generated knowledge might be introduced into a region

(Barthelt et al 2004, Benneworth and Hospers 2007). These studies stress the potential role that local actors such as universities might play in straddling the spatial divide, particularly where appropriate intermediary structures exist (Benneworth and Hospers 2007).

In this perspective the geographically proximate and the geographically distant can be simultaneously present and territories, be they localities, regions or nations, derive their roles and identities from the mix of activities present within each (Lagendijk and Oinas 2005, Amin and Thrift 2002). This network perspective places a strong emphasis on the role of power-geometries in shaping the form that different territories take (Massey 1999). Places then are "spaces of complex 'layering' of multiple social relations, each with their own space-time dynamics and scalar reach" (Healey 2007 p.224). At the same time it is important to recognize the importance that place itself can play in shaping relationships and power-geometries, if only because places are political constructs (Morgan 2007, Lagendijk and Oinas 2005). Although spatial scales might be recast at a political whim, whilst they exist in an institutional form they have power and agency through the mechanisms of governance, and so exert influence.

Spatial proximity, it would seem, 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 2004b p.12). The spatial dimension to knowledge transfer activity though remains a contested consideration, but one which is of supreme importance considering the focus of much current public policy. Not least because Gertler's contention that "in this world of globally connected local innovation nodes 'being there' still provides its own rewards" (Gertler 2008 p.15) is reassuring for those that are there, but what of those that are not? What are the opportunities for those places that lie on the margins of these globally connected nodes?

Spaces can also be important as an imagined entity. The way in which a place, or a problem, is 'seen' or 'imagined' influences the actions taken to shape the territory in line

with those perceptions (Allen et al 1998, Healey 2006). Power then becomes the ability to impose ones own imaginations on others, as North identified in his seminal work on path dependency the difficulty in turning economies around is a "function of the nature of political markets and, underlying that, the belief systems of the actors" (North 1993). The challenge for those taking the lead in strategy making is to 'see' the relations in question (Healey 2006, Jensen and Richardson 2004). As Healey identifies in the context of planning practices "In this perspective of relational complexity, planning activity can be understood both as part of an effort of collective imagination about place qualities, and as a set of relational webs which, intersecting with other relations, can produce substantial resources and constraints on other relational dynamics" (Healey 2006 p.526). It is not difficult to extend this insight to that of the topic under consideration in this study. What is then important is how the relevant institutions, and other actors, perceive the political space in which they operate; the other actors at play, and the issues which they address. Governance processes and practices thus become a crucial consideration.

3.6 Governance, policy formation and practice

Concepts of multi-level governance (Marks 1993) lie at the heart of much of the literature on EU policy making. At its most basic level this refers to a "system of continuous negotiation among nested governments at several territorial tiers – supranational, national, regional and local" (Marks 1993 p.392). In practice, the process of policy development and delivery can be viewed as a collective endeavour shared between the European institutions, national and sub-national authorities and other actors. This description of governance processes in the EU is explicitly recognised by the European Commission (CEC 2001a), which goes so far as to describe the governance of EU R&D instruments as a "shared-responsibility" (CEC 1998 p.9).

In this model the budgets and long-term objectives of RTD, innovation and cohesion policies are agreed by the EU's institutions, which ensure that the various interventions are coherent and consistent. That this is a process of strong inter-governmental bargaining between the European Commission, the Member States (particularly the

Council of Ministers) and, increasingly, the European Parliament is a matter of record and is outside of the scope of this study. The responsibility to use these subventions in a manner appropriate to each region of the EU – that is the design and implementation of appropriate policies – often lies with the local and regional levels, particularly with respect to the Structural Funds, mediated as always by the institutional context set by individual Member States (Pollack 1995).

However these relationships are not necessarily hierarchical, sub-national authorities can have a direct engagement with the European Commission and vice versa, and they need not be consistent. Regional authorities in different Member States, for example, will have differing relationships with the European Commission owing to differences in national governance structures, but equally a particular regional authority can have a different relationship with the European Commission depending upon the policy area considered or the instrument involved. This is particularly so in the case of the Framework Programmes and the Structural Funds. It is apparent that governance in the EU "encompasses both interdependence and variation, with different actors wielding power in contrasting contexts" (John 1996 p.4) and, in practice, it involves "a large number of decision-making arenas ... differentiated along both functional and territorial lines, and ... interlinked in a non-hierarchical way" (Eberlein and Kerwer 2004). Multi-level governance relationships are, then, both complex and contextually defined as they are mediated by the particular circumstances of each case (Kohler-Koch 1996, Peters and Pierre 2002).

Hooghe and Marks describe this type of multi-faceted governance structure as 'Type II'. Where Type 1 models bundle competencies into hierarchical jurisdictions at a limited number of territorial levels, Type II models divide the provision of public goods between functionally-discrete jurisdictions which have no single hierarchy (Hooghe and Marks 2003). In their own words: "the constituencies of Type II jurisdictions are individuals who share some geographic or functional space and who have a common need for collective decision-making" (Hooghe and Marks 2003 p.16). Although, as Hooghe and Marks recognise, this is a very blunt typology they feel that it is useful characterisation of

the different forms of multi-level governance. It certainly forms a useful launchpad for this study as it poses the interesting question as to what happens when individuals inhabit both a functional space and a geographic space where these two aspects of their identity may be in conflict.

One of the strengths of the multi-level governance model is that it is able to accommodate the patent diversity of sub-national government forms within the EU, and offers an explanation for the apparent 'by-passing' of national governments by both the European Commission and sub-national authorities in the development and delivery of European policy, a process memorably described as the 'hollowing-out' of the nation state. It also accommodates changes in inter-governmental relations, such as introduced through the regional devolution of powers in the UK (Pierre and Stoker 2000, Morgan 2002). However, critics of the approach suggest that most governance systems exhibit some form of multi-level structure and that it is not clear what the theoretical standing of this work is (Bache and Flinders 2005).

Rather than trying to see multi-level governance as a system of governance it may, then, be more rewarding to regard it as an explanation of process, using the approach to explore the particular form of policy development and delivery in the EU. Certainly, the differential spatial geographies and policy communities of the EU's Structural Funds and Framework Programmes offers a fruitful context for such an interpretative policy analysis in order to better understand the spatial patterning of the realised phenomena (Healey 2007).

In doing so it is the power to shape policy as opposed to setting policy (Peterson 1995) that lies at the heart of this study. It is not enough to examine levels of policy influence in terms of resource allocation and decision-making, we must also consider how policies are implemented in practice on the ground. As Morgan observes: "we should not confuse the power to decide (ie the power to design policies) with the power to transform (ie the power to deliver)" (Morgan 2004a p. 872). As Morgan himself acknowledges there seems to be "a burgeoning gap between what is formally decided by national and supra-

national powers and what is actually delivered in the prosaic world of practice" (Morgan 2004a p. 879). Or, using his own emotive words, there is a "delivery deficit" (Morgan 2004a p. 879), particularly where, as in England, the devolution of economic responsibility did not bring with it a devolution of economic power (Morgan 2002).

In an adaptation and extension of the multi-level governance approach Peters and Pierre tackle this same point. They note that effective power and resources are likely to reside at any level in the system and, borrowing from March and Olsen, argue that what occurs in practice is best described as 'organised anarchy' (Peters and Pierre 2002). In this model the region becomes a locus for decisions in which actors pursue their own ends, building coalitions to suit their own purposes. They base their thinking on the work of Simon (1947), arguing that actors will pursue strategies based on bounded rationality, and on multi-player multi-level game theory. In their thinking the "relationship among institutions at different tiers of government ... are believed to be fluid, negotiated and contextually defined" (Peters and Pierre 2002 p.3), but they hold that the only way to impose order is to depend upon the strategies of the institutional actors as they seek to 'survive'. In their view, the "multi-level nature of policy only enhances the opportunities for segmented decision-making and limited co-ordination across policy sectors" (Peters and Pierre 2002 p.19).

In building an understanding of policy and governance this research shall also draw on the heritage of policy network thinking in an effort to build on the strongly pluralist tradition that this represents. Policy networks consist of public and private actors that interact around specific policies or projects and so are always bounded (Windhoff-Héritiér 1993, Cooke 1996, Lord 2004). They tend to be self-organising and can be conceived as both vertical and as horizontal (Heinelt and Smith 1996). Marsh and Rhodes (1992) argue that they can range from epistemic communities of scientific and professional experts as identified by Haas (1992), through to advocacy coalitions (Sabatier 1987), for Cooke, the important aspect is that members should always be "of consequence" (Cooke 1996 p.33).

Policy networks have also been described as social systems where "decision rules and the rules of the game" (Mazey and Richardson 1993) determine the opportunities that those involved actually have to exert any influence (or to actually get involved) in either policy setting or policy shaping activities. In this respect we return to the notion of rules and institutions as guiding structures. Power is exerted through the network effect, where the combination of actors provides more influence than could any single member working individually. Policy networks may range from a loose coupling of largely autonomous actors to those that are very tightly defined, where the potential for actors to be locked in to certain forms of thought or activity is strong. The entry of new groups into the policy process changes the dynamics at play by creating new webs of influence or even new issue networks.

Again, whilst there is a strong tradition of policy network analysis in the case of the Structural Funds (see for example Heinelt and Smith 1996) and regional policy (see for example Cooke and Morgan 1993) the involvement of regional actors in EU RTD policies is less strongly researched. Indeed, it is useful to note that in the context of the innovation systems literature referred to earlier, Cooke explicitly distinguishes between policy networks and innovation networks. Quoting Camagni (1991) he describes the latter as acting as an "incubator of innovation processes" (Cooke 1996 p.36), implicitly suggesting that they have no policy orbit. The interface between these three levels then – intergovernmental, policy networks and the innovation milieu – form one dimension to this study.

The very strengths of policy networks, their focus on particular areas of activity, are at the same time their weakness. Organisations can and will be members of multiple, often overlapping, networks, operating at many scales simultaneously. As Hooghe and Marks recognise in the context of their Type II model of multi-level governance "membership of such functional communities is extrinsic, it encompasses merely one aspect of an individual's identity" (Hooghe and Marks 2003 p.16). Yet in a world of bounded rationality due cognisance must be taken of all imagined identities. Equally, regions, as we saw earlier, cannot be considered as single integrated unities. As Healey rightly

identifies "they are instead complex constructions created by the interaction of actors in multiple networks who invest in material projects and who give meaning to the qualities of places. These webs of relations escape analytical attempts to 'bound them'" (Healey 2007 p.2). As Healey goes on to state, the search for policy integration involves "imaging what to link, integrate and 'join up'" (Healey 2007 p.5). It is the search for this narrative image which lies at the heart of this study.

Given that the multi-level governance approach was originally developed as an explanation for the practice of regional policy in the EU (Marks 1993, Hooghe 1996), it is no surprise that a vast corpus of literature has developed detailing the mobilisation of sub-national actors around European cohesion policies, as represented by the Structural Funds (see for example Hooghe and Keating 1994; Roberts 2003). In contrast, much of the literature on the EU's RTD Framework Programmes has focused on the 'high' politics of intergovernmental bargaining, budgetary negotiations and the influence of interest groups on the outcome of the objectives and themes of the various Programmes (Banchoff 2002; Muldur et al 2006). There has been significantly less on the involvement of sub-national actors, nor the 'low' politics of the policy shaping roles around how policy is implemented where the key actors are non-political (Peterson 1995). As this research demonstrates, there are incipient signs that regional actors are beginning to mobilise around the Framework Programmes suggesting that, certainly in the UK, this is a clear omission.

The role of sub-national authorities, particularly cities and regions, in the shaping and delivery of European Union policies is of increasing interest to academic writers. This is partly due to an interest in how policies are formulated in practice but also because of an interest in how policy is delivered on the ground. As Morgan identifies, our interest in the sub-national scale, particularly the regional realm, is growing precisely "because it is the governance scale where a wide range of policies are actually implemented and realised" (Morgan 2004a p. 872). Equally, studies of those regions in Europe with a stronger innovation performance have highlighted the fact that many enjoy a measure of political devolution. Given the strong engagement of regional actors in this policy area it

is perhaps no surprise that this was the ground in which the seeds of multi-level governance thinking first germinated. Yet there is a curious gap in the literature examining the interface between different, albeit closely related, European policy areas within a regional context. It is this gap which this research begins to tackle.

3.7 Conclusions

Aside from the basic question of who gets what funding through the EU's R&D instruments this research aims to explore why this is so, what this tells us about how such interventions are seen by policy-makers, the nature of regional innovation structures in the UK and how the observed patterns of activity conform to existing theories of regional innovation. From this review it is clear that there is a rich and wide literature addressing different dimensions of this subject area. The challenge, both for the researcher and the policy-maker, is to bring these diverse elements together into a coherent narrative. Doing so is not without conceptual difficulties.

At the outset of the research it was anticipated that a review of the standard literatures on the role of R&D in economic development and regional innovation systems, coupled with a strong grounding in governance models, particularly those of multi-level governance, would provide much of the background required for the project. As the research progressed it became clear that the subject of the research was opening up new and highly fruitful avenues of enquiry.

The observed correlations between R&D expenditures and economic growth have proved a powerful rationale for public sector efforts to stimulate levels of R&D activity within any given space. Theories of endogenous growth, evolutionary economics and the importance of absorptive capacity and geographical proximity in realising the economic benefits of R&D expenditure have all enhanced the level of interest in stimulating R&D activity, capacity and capabilities in those regions where this is judged to be lacking. As we shall see in Chapter 4, this is a powerful framing discourse for those charged with securing the economic development of European regions.

It is a discourse that is not without its tensions of course. For some, public R&D expenditure in economically prosperous regions merely maintains and exacerbates existing disparities in prosperity, whilst for others this is the most efficient use of resources. As Rodríguez-Pose (2001) identifies, the very mobility of technology and knowledge which is now fuelling economic growth suggests that it might be more efficient to concentrate R&D investment in particular geographic spaces and to focus on supporting the diffusion of resulting knowledge spillovers. Yet to do so suggests that engrained patterns of path dependence and technological dependency will not be broken, whilst the localised nature of most knowledge spillovers also casts doubt on the efficacy of such an approach if the policy goal is one of overcoming spatial disparities in prosperity.

In practice this creates a dilemma for policy-makers in a system of shared-responsibilities and with multiple and, seemingly, contrasting policy objectives. If the economic rationale for investment in R&D is given credence then how might the conflicting demands of stimulating overall economic growth be reconciled with a demand for greater distribution of that activity across any given space? The geography of R&D subventions thus becomes a matter of policy concern in its own right, not merely a residual of other policy objectives. Whilst the literature suggests a compelling narrative for investments in R&D activity and capacity at the regional level to support regional economic prosperity and to overcome spatial disparities in economic well-being, more recent literatures on globalisation and distanciated learning suggest that geographical proximity may no longer be a necessary condition. The research for this study will explore both the nature of the narrative, or framing discourse, adopted by policy makers and the role of geographical proximity in policy-thinking.

From the literature there is a strong emphasis on the regional scale both in terms of innovation processes but also in terms of governance, largely because this is "the governance scale where a wide range of policies are actually implemented and realised" (Morgan 2004a p.872). Whilst Hooghe and Marks' Type II model of multi-level

governance captures the complexities of the multiple geometries of EU R&D governance, the research undertaken for this study highlights the challenges this raises for policy-makers. In particular the EU's Structural Funds and Framework Programmes highlight the practical difficulty of co-ordinating policies with a different spatial reach and different immediate objectives. This led the research into newly emergent literatures around how problems and territories are seen or 'imagined'.

In her recent work on spatial planning practices, for example, Healey finds that although there is an understanding amongst practitioners of the 'relational complexity' of territorial dynamics and governance processes it is "weakly-developed and often displaced by more traditional ways of seeing place/space and governance process" (Healey 2006 p.525). In many strategies 'scale' is synonymous with defined governance boundaries (Healey 2006) and the focus of territorial policy makers is on the way relations 'pass through' the defined territory, how the identified relations interact within the territory and the issues that arise from this (Healey 2007). As Jones et al put it: "When performing their practical politics, agents often imagine and identify a discrete, bounded space characterized by a shared understanding of the opportunities and problems which are motivating the very nature of political action" (Jones et al 2006 p. 8). Equally though, for policy communities involved in sectoral, rather than territorial, polices, a territory is often conceived as little more than a 'container' within which certain activities are located.

Combining territorial and sectoral perspectives in a relational setting is then a challenge for the policy imagination which may involve the construction of new spaces of knowledge. The emergent 'relational' literature appears to offer a means of reconciling these paradoxes. It is a literature that is presently only weakly articulated, yet it appears to offer real opportunities to understand the complex interactions and interrelationships at work in the interplay between R&D, innovation and territorial development. Exploring the potential of relational thinking for appreciating the processes at work forms a central strand to the research set out in the remainder of this thesis.

In conclusion, the literature suggests two fruitful avenues for exploration. The first is the potential offered by the new relational literature to deepen our understanding of the process and the practice of regional innovation and, more especially, the implications of this for theory development in the field of regional innovation systems. The second is the manner in which places and policy issues are 'visualised' by policy actors and how this may act as an explanation for the practical realisation of actions on the ground, particularly in the context of multi-scalar and multi-instrument policy environments. These two avenues are closely linked and together form a central line of enquiry throughout this study.

4. EU POLICY CONTENT AND PRACTICE ACROSS THE UK

4.1 Introduction

EU policies seeking to stimulate R&D in the EU have various objectives which are increasingly aligned under the heading of improving the competitiveness of the EU economy. As the economic benefits of R&D activities receive greater emphasis there has been a corresponding increase in the importance attached by the EU to the role of the regions in stimulating R&D and the potential of R&D investments to stimulate regional economic development and so promote greater economic cohesion between the regions of the EU.

This Chapter outlines the basis on which the EU intervenes to boost levels of R&D activity within EU regions. It firstly outlines the legal basis for the interventions, which is fundamental to the shape of the actions undertaken, goes on to illustrate how the economic rationale has gained strength since the early 1990s, particularly since 2005, and introduces the importance of the regional dimension. The Chapter draws upon original analysis based upon secondary sources and a review of existing literature and EU policy documents. It does not consider the corresponding UK policy literature in detail, save to illustrate the consistency between this and EU thinking, as this is not at the forefront of the research being undertaken.

This is followed by a description of the EU's two main policy instruments and how these apply to the UK. One of the early findings of the research was that knowledge of individuals in this policy area tended to be limited to either the Structural Funds or to the Framework Programmes. Consequently some time has been spent providing background details on each policy instrument. This Chapter also begins to identify, for the first time, the regional distribution of EU R&D activities in the UK and so sets the scene for the more detailed analysis that follows in subsequent Chapters.

In setting out this wider context the Chapter has two aims. Firstly, to identify the policy frameworks and discourses, within which the regional approaches identified in the subsequent case-study analysis can be situated. Secondly, to assess the regional distribution of R&D interventions supported by the Structural Funds and Framework Programmes within the UK. This serves to both provide a wider UK context for the later analysis and to illustrate the position of the regions selected as case-studies in comparison to other regions in the UK.

4.2 The Treaty Base

The EU's role in the field of R&D is set out in Title XVIII, Articles 163-173 of the Treaty establishing the European Community[9]. This is strongly orientated towards the support of R&D activity itself in SMEs, research institutes and universities with the "objective of strengthening the scientific and technological bases of Community industry and encouraging it to become more competitive at international level, while promoting all the research activities deemed necessary by virtue of other chapters of this Treaty" (Art. 163). The Treaty makes provision for a multiannual Framework Programme to deliver the activities of the Community in this area; namely:

- implementation of research, technological development and demonstration programmes, by promoting cooperation with and between undertakings[10], research centres and universities;
- promotion of cooperation in the field of Community research, technological development and demonstration with third countries and international organisations;
- dissemination and optimisation of the results of activities in Community research, technological development and demonstration;
- stimulation of the training and mobility of researchers in the Community

[9] The full text of the Treaty of the European Union can be accessed at http://eur-lex.europa.eu/en/treaties/dat/12002E/htm/C_2002325EN.003301.html

[10] In this case 'Undertakings' is another term used for firms or businesses

In addition, Title XVII of the Treaty, tackling 'Economic and Social Cohesion', provides for the Community to "aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions or islands, including rural areas" (Article 158); objectives known collectively as cohesion policy. Although this does not refer to specific forms of intervention it provides for the ERDF to "help to redress the main regional imbalances in the Community through participation in the development and structural adjustment of regions whose development is lagging behind and in the conversion of declining industrial regions" (Art. 160). In practice, as we shall see in Section 4.3, the ERDF has increasingly embraced support for the development of R&D capacity within regions as a means to overcome regional imbalances in economic prosperity. In doing so it has embraced the ideas of the 'new economic geography' set out in Chapter 3.

4.3 Emphasising economic competitiveness and the role of R&D

The EU has moved from a traditional focus on economic and social cohesion towards seeking to boost the competitiveness of the EU's economies in comparison to the rest of the world (Sapir 2004). This shift in policy emphasis was most clearly stated in the oft-quoted ambition of the Lisbon Agenda to make the EU "the most dynamic and competitive knowledge-based economy in the world, capable of sustainable economic growth; with more and better jobs and greater social cohesion, and respect for the environment" (Lisbon European Council Presidency Conclusions March 2000).

Higher levels of research and innovation are seen as fundamental to improving the competitiveness of the EU - through the raising of productivity levels across the EU, increasing employment rates and shifting European economies towards higher-value added activities. R&D is now consistently identified as one of the principal driving forces of economic growth, competitiveness and employment (CEC 2005a, CEC 2005b). This economic turn is summed up well by the claim that: "A high level of R&D spending and a good innovation performance contribute to more and better jobs" (CEC 2005b p.4),

with the Commission advocating "a move towards innovation-based growth" (CEC 2007b p.2).

The fear is that the perceived poor R&D performance of the EU "could lead to a loss of growth and competitiveness in an increasingly global economy" (CEC 2000b p.4). Greater levels of investment in R&D, and a strengthening of related innovation activity through technology transfer and diffusion, is regarded as a means to overcome "the structures and expectations established in the post WW2 era which leave (the EU) living a moderately comfortable life on slowly declining capital" (EC 2006 p.4). This is a consistent theme over time, in the words of the European Commission: "In this new economic order, Europe cannot compete unless it becomes more inventive.... and innovates more" (CEC 2006 p.2).

The shift in emphasis towards R&D and innovation is memorably articulated by Alyn Smith MEP:

"Research and the upscaling of Europe's economy is Europe's new narrative. Europe used to be about coal and steel, then it was about agriculture and fisheries. For the future, Europe is going to be about research and development" (quoted in Muldur et al 2006 p. 79).

A series of policy ambitions has been announced seeking to encourage greater levels of R&D, ranging from the target of raising levels of investment in R&D to 3% of GDP across the EU, agreed at the European Council meeting in Barcelona in 2002, to the establishment of a European Research Area (ERA), announced at the Lisbon Council of 2000. Described as a "central pillar of EU research activities" (CEC 2002 p.3), it was seen as a "fully developed, functioning and interconnected research space" (CEC 2001b p.4). The ERA was intended to provide a mechanism to overcome the fragmentation and duplication of research efforts across the EU's Member States and so improve the overall efficiency and effectiveness of research in the EU (CEC 2000b). Tellingly, one of the aspirations of the ERA was that "it should stimulate innovation and economic growth and hence the creation of jobs" (CEC 2002 p.3).

The emphasis on R&D as a means to stimulate economic growth is closely aligned with UK policy thinking, which has developed in a similar direction during the same period. This is most clearly illustrated by the following statement drawn from the UK's White Paper on Science and Innovation published in 2004: "For the UK economy to succeed in generating growth through productivity and employment... it must invest more strongly in its knowledge base.... At the core of the UK's knowledge base is its research and development capacity, in the public and private sectors" (DTI 2004a p.5).

4.4 The regional dimension

The regional dimension is now seen as a crucial level within European policy making circles. However, this has not always been the case and the regional dimension to EU R&D programmes was for many years highly contested and subject to strong internal debate between rival directorates (see for example Cooke and Morgan 1998). It is now recognised that it is in the EU's regions that research activities occur and that the nature of these influences the overall level and structure of research and innovation across the EU as a whole "regional research and innovation activities have significant influence on the structuring of European research capacity as a whole" (CEC 2001b p. 6). Regions are also seen to provide a 'bridging role' between EU policies and local actions (CEC 2001b), as "the main competence to foster innovation often lies at regional level" (CEC 2006b p.16).

Moreover, one of the EU's primary concerns is to overcome the disparities in incomes between the various regions of the EU. The EU has long regarded the differentials in levels of R&D expenditure and other measures of R&D activity, often referred to as an 'innovation deficit', as a contributory factor in preserving these disparities (CEC1993, CEC 1998, CEC 2007a). As a consequence the EC stresses the need to strengthen the capacity of regions to integrate research and innovation into their economic development strategies and provides the means to support this (CEC 1998).

The thinking underpinning EU actions in this area is strongly rooted in the theories of new economic geography, stressing the importance of spillover effects, agglomeration economies, knowledge externalities and innovation (CEC 2003a). There is also a clear emphasis on the role of proximity. Regions are regarded as the places where collaboration and technology transfer will occur: "regions are important because they form the spatial basis of groupings of research and innovation operators" (EC 2001b p.8). Concerted action at the regional level, it is felt, will enhance the overall effectiveness of the actions taken: "to enlarge the positive effects of ... knowledge-supporting policies, clustering of knowledge-based and innovation activities should be encouraged to take advantage of spillover effects" (CEC 2003a p.13). However, there remains some debate as to the real importance of proximity with at least one Communication by the Commission emphasising that "geographical proximity is no longer the main basis for selecting a partner" in university business relationships (CEC 2003b p.8). It is apparent that the European Commission assumes the region to be an unproblematic entity, where networks exist and which accords with administrative definitions of territory.

The emphasis on the regional level, as the level at which activity occurs, has also led to a strong identification with the concept of regional innovation systems as a basis for European policy thinking: "the regional RTD and innovation system.... should be responsive to the local economic milieu" (CEC 1998 p.8), "RTD and innovation policies have to be integrated with the productive fabric of the region" (CEC 1998 p.14). Indeed, European policy documents have variously called for a 'region-conscious' model for the organisation of European research and innovation systems and a 'territorialisation' of research policy (CEC 2001b). Part of the latter is to direct policies towards building the research and innovation capacity of regions "enhancing their ability to act as drivers for economic and technological development" (CEC 2001b p.7).

As a result of these various forces the level of investment in RTDI forecast through the Structural Funds rose from some €11bn between 2000-2006 to more than €45bn between 2007-2013 (CEC 2007b); a positive response to the call for the Structural Funds to be "seen as a key means of supporting research and innovation capacity and in particular for

pursuing cohesion" (EC 2006). The focus on RTDI in less favoured regions also stems from a view that "some specific instruments chosen to preserve cohesion.... may have exerted too high a toll in terms of growth" (Sapir 2004 p.72). Although this is not officially accepted there is no doubt that the sentiment has contributed to a refocusing of efforts on actions that are felt to promote long-term economic growth and employment creation. Interestingly, the Commission, in 1998, argued that stronger emphasis needed to be placed on supporting investments in the private sector, rather than the public sector, in less favoured regions[11], owing to the lower economic returns to investment in the public sector in less favoured regions in comparison to similar investments in more developed regions.

Unlike the Structural Funds, the Framework Programmes have never had an explicit regional dimension. However, in practice the bulk of Framework Programme activity has been concentrated in a small number of relatively prosperous regions. This has led some to describe the Framework Programmes as the 'rich man's regional policy' with associated calls to target the funds in a manner that benefits less favoured regions more strongly, leading to a sometimes virulent debate over the balance to be struck between promoting research excellence and encouraging cohesion. In response to this debate Sapir emphasises that in seeking to boost investment in knowledge it is crucial that the emphasis should be on excellence, rather than other distributional criteria. He is dismissive of other 'dysfunctional' models such as those based upon a *juste retour*[12] or centrally-directed research programmes (Sapir 2004). These, he argues, will not promote economic growth.

National policy in the UK has not placed such a strong emphasis on the role of research and development as a driver of regional economic development. This has rather been seen as the responsibility of the Devolved Administrations and Regional Development

[11] A variety of terms are used to describe regions with low levels of GDP compared to the EU average including Less Favoured Region, Objective 1 region, Cohesion region and, most recently, Convergence region. Typically these all relate to regions with a GDP of less than 75% of the EU average.
[12] Whereby actors seek to achieve a just return on their investment in a programme. At a European level this is particularly the case where Member States seek to receive funds equivalent to their contribution to the EU's budget.

Agencies (see Chapter 5 for a description of the regional governance structures in the UK). However, like EU policy documents, national policy documents do draw upon concepts based upon territorial innovation systems. They emphasise the importance of what they term 'innovative places'; suggesting that the drivers of innovation come together in these places (DIUS 2008). The approach builds on notions of innovation eco-systems, which is heavily influenced by the notion of regional innovation systems, but does not specify the spatial scale which these places are construed to represent.

4.5 Excellence, efficiency and equity: Competing discourses?

Within the EU it is well-known that R&D activity is not evenly distributed across the territory but concentrated in a limited number of R&D 'hotspots', supported by an equally small number of core R&D regions in each Member State with the remaining regions of the EU lagging behind on measures of R&D performance (REF). Out of this spatial pattern of activity an inherent tension between the dual objectives of EU R&D policies has been established. On the one hand the EU seeks to stimulate the competitiveness of the EU economy as a whole through supporting 'frontier science'. On the other hand it seeks to overcome persistent disparities in economic performance through tackling the observed 'R&D deficit' which exists in economically lagging regions. The practical outcome of these two approaches is vividly illustrated by the distribution of EU funds for investment in scientific research (the RTD Framework Programmes) and for investment in regional innovation policies (through the Structural Funds). The former is heavily weighted towards the wealthiest regions of the EU, where research capacity is heavily concentrated, whilst the latter is weighted towards the poorest regions of the EU owing to its focus on promoting economic convergence between the regions of the EU.

The argument for focusing EU R&D investment in existing centres of excellence is based on the assumption that this is the most effective and efficient use of scarce resources. The existence of scale economies suggests that, for reasons of efficiency, significant investments aimed at underpinning the scientific base of the EU as a whole, should be

focused in those places with existing concentrations of expertise in order that the full benefits of such investments will be realised enabling the EU to compete on a global scale. A corresponding argument is also made in UK policy debates, such as in the intention announced in the 2008 White Paper: Innovation Nation to develop two national Science and Innovation 'campuses' in the UK (DIUS 2008). However, those concerned with the spatial distribution of economic activity across the EU fear that such an approach will exacerbate already existing disparities in levels of regional prosperity across the EU through reinforcing pre-existing competitive advantages and further stimulating forces of endogenous growth. This has led the EU's RTD Framework Programmes to be labelled as the 'rich man's regional policy'.

For those concerned with regional economic convergence the tendency towards agglomeration and the establishment of core-periphery relationships demonstrated by Krugman (1991b, 1998a) is self-evident in the distribution of R&D activity across the EU. Talent and resources are attracted to the existing concentrations of R&D excellence which improves the production function of local firms, through externalities and informational spillovers which, in turn, enhances the attractiveness of the locality and sets up a process of circular causation through the formation of forward and backward linkages. Where knowledge is not ubiquitous – owing to sunk costs, absorptive capacity and distance effects favouring locally-available tacit knowledge – then centripetal forces begin to predominate. Park (2004) goes as far as to suggest that "What we call the 'new age of regions' is a story of innovation centres, most usually the metropolitan region of advanced countries..... Peripheries have been completely excluded from innovation policies and strategies" (Park 2004 p.283).

In its 2009 World Development Report the World Bank also reflects on this challenge. It argues that development is lumpy, that prosperity does not come to every place at the same time, and that Governments cannot simultaneously foster economic production and spread it out smoothly. This is forcefully captured in the opening line of the report: "*Economic growth will be unbalanced, but development still can be inclusive*" (World Bank 2008 p.1, italics as in original). It goes on to present a challenging message, which

bears comparison with the inverted u-curves of widening and then diminishing disparities in comparative income levels originally postulated by international development theorists (Kuznets 1963):

> "A generation of economic research confirms this: there is no good reason to expect economic growth to spread smoothly across space. The experience of successful developers shows that production becomes more concentrated spatially. The most successful nations also institute policies that make basic living standards more uniform across space. Economic production concentrates, while living standards converge" (World Bank 2008 p.6).

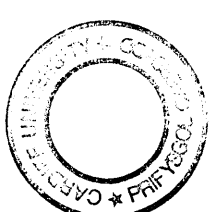
However, EU cohesion policy does not currently accept this standpoint. Instead it seeks to redress disparities in living conditions through enhancing regional innovation systems. This focuses on strengthening the capacity and capability for R&D activity within the EU's regions in order to offset the 'natural' advantages experienced by regions with existing endowments of a strong research base. In part this is through traditional approaches, focusing on human or fixed capital formation, but also turns on new evolutionary approaches which seek to promote networks and build social and institutional capacity favouring relational connections to support innovative activity within regions. In doing so the expectation is that regions will be better placed to undertake R&D and so promote innovation and research within regionally-located businesses.

Whilst models of territorial innovation provide a theoretical justification of such an approach it also appears to reflect a regionalisation of EU cohesion policies, whereby the EU provides a broad governing framework but makes financial allocations to individual regions which determine how these are to be used within that framework. As I argue later, this may be leading to an overly-strong intra-regional focus. This trend towards regionalisation can also be seen in the case of the Framework Programmes, with regions now often adding their voices to concerns over the pattern of EU-financed R&D activity. These arguments tend to be couched in terms of regions wishing to see a 'fair share' or '*juste retour*' of the available funds, either based upon existing levels of R&D activity or on a desire to secure additional funds to offset the innovation or R&D deficit reportedly

suffered by the region. In this, it also extends to seeking to 'capture' major EU-wide investments in science and technology, particularly where this relates to a new science and technology research facility. In an interesting twist on the efficiency debate some regions are now arguing that such investments can be more efficient in less favoured regions owing to cheaper factor costs.

The tension between the dual objectives of EU R&D policies is often labelled as a choice between supporting scientific 'excellence' and social and economic 'cohesion', terms which neatly summarise the debate albeit being debateable in themselves. At issue is the spatial distribution of growth and prosperity across the EU. Yet, the question is, can these two competing priorities be reconciled or is this a zero-sum game whereby the two policy priorities are forever in competition? Is it possible to find a policy approach which supports economic convergence between EU regions whilst still strengthening the EU's overall scientific and technological resource base? Certainly, emerging evidence suggests that there may be some potential 'middle-ground'. As Krugman himself points out "the tendency towards agglomeration is stronger in the models than it seems to be in the real economy" (1998b, p.15). Similarly, evidence from empirical studies is beginning to demonstrate that it is not the level of R&D activity and capacity within a region which is the most significant factor in economic growth, albeit remaining strongly important, but rather the absorptive capacity of a regional economy in so far as this signifies the ability of firms and institutions to access and exploit information which is available (Rodriguez Pose and Crescenzi 2008, Hauser et al 2007, Caragliu and Nijkamp 2008).

Caragliu and Nijkamp demonstrate that where regional absorptive capacity is lower, then knowledge is more likely to spillover outwards towards surrounding areas, whilst Rodriguez-Pose and Crescenzi demonstrate that "the economic potential of a region is maximised when an appropriate set of social conditions is *combined* with local investment in R&D" (Rodriguez-Pose and Crescenzi 2008, p.61, emphasis added). Rodriguez-Pose and Crescenzi also argue that where absorptive capacity is lacking in a region then investments in local R&D capacity are likely to be inefficient and that higher



returns can be realised through investing to connect innovative firms in less favoured regions with sources of knowledge generation located outside of the region. This point is also taken up by Cappellin who argues that the "issue of promoting cross-border and cross-regional knowledge flows has been only sparsely researched. However, it may have important implications for cohesion and enlargement in Europe and may enhance the economic development of industrial clusters in the less developed regions of Europe" (2004, p.207). Indeed, as the work by Sole and Edmondson(2002) on geographically-dispersed teams referred to earlier suggests, the ability to combine knowledge from varying geographical locations may confer benefits additional to that which could be developed through a single geographical territory.

At present, the debate between the two policy positions of competitiveness and cohesion continues to reverberate. The debate opens up significant philosophical questions relating to issues of inter-generational and inter-regional equity, as well as, potentially, political theory in the context of the EU's governance arrangements in order to confer legitimacy and credibility. These are beyond the particular remit of this study. Whilst, officially, the focus of EU regional innovation policies remains one of achieving complementarities between the Framework Programmes and the Structural Funds there is an increasing tendency for the argument to drift towards the regionalisation of EU R&D policies, and so sets up the battleground for the competing priorities of excellence and cohesion. There is a very real risk that this underplays the potential of inter-regional flows of knowledge to support levels of regional innovation and increase levels of economic prosperity across the EU. Although there is some emerging evidence of the potential to be gained through visualising the EU as a single space for research and innovation this remains under-researched and under-conceptualised and is in danger of being lost in the polarised debate as to the primacy of excellence vs cohesion.

4.6 Supporting instruments

The EU operates two principal financial instruments which provide support for R&D activities (CEC 2006b). The Framework Programme, which is primarily focused on

supporting research and the Structural Funds, notably the ERDF, which are designed to support structural economic change and promote a reduction in economic disparities between regions across the EU. Taking each in turn.

4.6.1 The Framework Programmes

The Framework Programmes are the primary means of the EU's funding for R&D activities. These multiannual programmes were established in 1984 with the launch of the 1st Framework Programme (1984-1987). Since then successive programmes, of varying durations, have run up until the present 7th Framework Programme (2006-2013). The current study is primarily concerned with the 5th Framework Programme (1998-2002) and the 6th Framework Programme (2002-2006).

Each Framework Programme is divided into a number of individual programmes which are targeted at specific objectives. Traditionally these have focused on supporting co-operative research efforts on a shared-cost basis and human mobility actions. Each programme also includes an allocation of funds in support of the EU's Joint Research Centre, based in Seville, and the EU's atomic research programme EURATOM. Neither is considered in the context of this study. Table 4.1 outlines the agreed programmes for both the 5th and 6th Framework Programmes, which are the focus of this study.

There are some distinctive differences between the 5th and 6th Framework Programmes. The 5th Framework Programme was based on four thematic research priorities and three horizontal priorities. In the case of the 6th Framework Programme the number of research themes was increased and a stronger emphasis on actions which would help to 'strengthen' and to 'structure' the ERA was also introduced. There was also a change in the nature of the projects to be supported with the introduction of new forms of cooperation: 'Networks of Excellence', which were large-scale projects, designed to strengthen scientific and technological excellence in a particular research field; and 'Integrated Projects', which were multi-partner projects supporting research aimed at producing knowledge relevant to new products, processes or services. Introduced in

order to increase the impact of the research projects the net result was to increase the average size of supported activities.

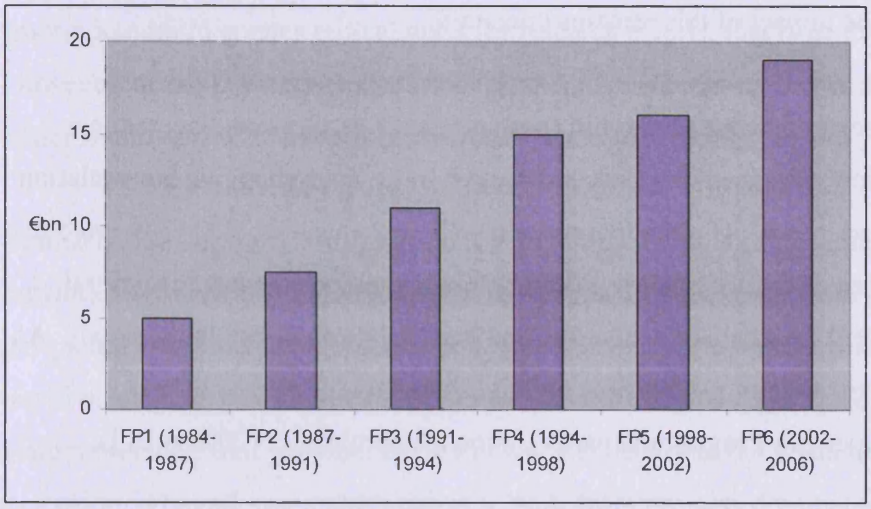
Table 4.1 The 5th and 6th Framework Programmes

FP5 (1998-2002)		*FP6 (2002-2006)*	
Structure	***Budget***	***Structure***	***Budget***
Thematic research priorities Quality of life and management of living resources User-friendly Information Society Competitive and Sustainable Growth Energy Environment and Sustainable Development	€ 10,843m	*Thematic Priorities* Life Sciences, genomics and biotechnology for health Information Society Technologies Nanotechnologies Aeronautics and Space Food quality and safety Sustainable Development, Global Change and Ecosystems Citizens and Governance in a Knowledge Based Society *Integrating Actions* Specific Activities covering a wider field of Research Policy support & anticipating S&T needs Horizontal research activities involving SMEs Specific Measures in support of international cooperation Non nuclear activities of JRC	€ 13,345m
Confirming the international role of Community research	€ 475m	*Structuring the European Research Area* Research and Innovation Human Resources Research Infrastructures Science and society	€ 2,605m
Promotion of Innovation and encouragement of SME participation	€ 363m	*Strengthening the Foundations of the ERA* Support for Coordination of activities Support for coherent development of policies	€ 320m
Improving human research potential and the socio-economic knowledge base	€ 1,280m		
Joint Research Centre (non nuclear)	€ 739m		
EURATOM Programme	€ 1,260m	EURATOM Framework Programme	€ 1,280m
TOTAL	**€ 14,960m**	**TOTAL**	**€ 17,500m**

Source: DG Research

The steady increase in the importance of the Framework Programmes is indicated by the increase in budget allocated to each Programme period (Figure 4.1) from around €5bn for FP1 (1984-1987) rising to around €19bn for FP6 (2002-2006). In December 2006, the European Council agreed a further significant increase in the budget of the 7th Framework Programme (2007-2013), taking the total to around €50bn at current prices, cementing the importance of the Framework Programmes in the development of the EU's activities.

Figure 4.1 Framework Programme budgets 1984-2006 (€bn, 2004 prices)



Source: adapted from Muldur et al (2006 p.97)

The UK is the second largest beneficiary of Framework Programme funding after Germany; both in terms of the number and value of participations. Under Framework Programme 5 UK participant secured almost 16% of total resources (DTI 2004b). This has been a consistent pattern since the beginning of the Framework Programmes and reflects the greater size of these countries both in terms of population and GVA (Healy and Roy 2006, Muldur et al 2006). When examined in terms of the intensity of R&D activity, as a proportion of GVA and as a proportion of total R&D expenditure, the picture changes somewhat, with smaller and less wealthy countries often participating more strongly per unit of GVA or research expenditure, suggesting that in these cases the Framework Programmes may have a more significant influence than absolute values suggest (Healy and Roy 2006).

Across the EU, businesses originally comprised the majority of participations in FP2 (Muldur et al 2006), but, in more recent programmes the Higher Education sector and, to a lesser extent, research centres have gradually assumed a greater importance. By FP6 businesses accounted for around a third of all participations, with the Higher Education sector accounting for around 40% of activity. The lack of participation by SMEs has been a recurrent criticism of the Framework Programmes, with some commentators seeing the Programmes as the domain of big business (Arnold 2005). In an attempt to overcome this a proportion of each Framework Programme since FP4 has been targeted on SMEs, although the impact of this remains uncertain.

In practice, there appears to be an 'oligarchic core' of regular participants, located in a limited set of, relatively advanced, regions, surrounded by an ever-changing constellation of institutions engaged in one-off participations (Breschi and Cusmano 2002 (reported in Muldur et al 2006), see also DTI 2004b). Whether this is problematical or the natural, and even beneficial, effect of capacity, 'lock-in' and the 'Matthews effect' is unknown. As Muldur et al recognize, it is not yet possible to judge "whether the degree of concentration of Framework Programme participation is appropriate" (2006 p.113).

The challenges of assessing the wider impacts of the EU's Framework Programmes, as with many R&D intervention programmes, are widely recognized (DTI 2004c, Arnold 2005). Typically, benefits attributed to Framework Programme activity are held to include improvements in the capabilities of firms and institutions to undertake research, particularly through the influence of the human resource actions; an improvement in scientific performance in the sector; improvements in technological and innovative performance and micro-economic benefits to individual firms (Muldur et al 2006).

Wider economic benefits have also been identified in some studies; with the DTI in the UK estimating that the Framework Programmes have made a significant contribution to total factor productivity in the UK (DTI 2004b). However, the same study also describes the wider impacts of Framework Programme activities in the UK as 'inconclusive' (DTI

2004c), with gains primarily realised by the individual participants: "most benefits arising from Framework accrue to participants" (DTI 2004b, p.ix), with benefits generally outweighing the costs. Projects appear to perform best on networking and knowledge creation and less well on more tangible and commercial objectives.

Perhaps the strongest claims to the benefits of the Framework Programmes lie in the integrating effect that European collaborative research is believed to provide, with positive effects on longer-term economic cohesion across the Union (Muldur et al 2006). As one of the justifications for the Framework Programmes is to pool resources across frontiers to build greater critical mass for research efforts, this is generally applauded. However, as the DTI recognized (2004c), there is no certainty that more is necessarily better in the case of collaborative research (see also Arnold 2005).

Similarly, the tendency for Framework Programme activity to generate collaborative networks, which are gradually integrating groups of researchers from intermediate and peripheral countries with researchers in more 'advanced' countries is also highlighted as a positive attribute (Muldur et al 2006). As Arnold (2005) suggests, the Framework Programme does not generate wholly new R&D networks but tends to encourage network extension. Overall, researchers detect a "shift from projects dominated by just a few core countries and relying on geographical proximity to projects with a more balanced national representation and detaching themselves from traditional ties" (Muldur et al 2006 p.115).

4.6.2 The European Regional Development Fund

The ERDF is one of the EU's Structural Funds, which are the EU's main instruments for tackling regional disparities and promoting social and economic cohesion across the Union. In the period 2000-2006 the Structural Funds also included the European Social Fund (ESF), European Agricultural Guidance and Guarantee Fund (EAGGF) and Financial Instrument for Fisheries Guidance (FIFG). This research focuses on the role of

the ERDF in supporting regional development, particularly through stimulating regional capacities for R&D activity.

Whilst the focus of the Framework Programmes on stimulating research has been clear since its introduction in 1984, the focus of the Structural Funds has evolved over time; with a steadily increasing emphasis by the European Commission on supporting research and innovation. Initial references to the importance of RTDI to regional development through the Structural Funds can be identified as early as 1993, complementing innovative pilot actions such as STRIDE and the Regional Innovation Strategies launched in 1990 and 1997 respectively, and funded through the ERDF. Under these actions the emphasis of interventions evolved to stress the importance of interactive processes and a move away from traditional supply-side initiatives (Cooke and Morgan 1998). From 1999 the focus of the mainstream Structural Funds (Objective 1 and Objective 2) took on a stronger RTDI dimension, and the attention given to this strengthened further following the publication of the Kok review of the Lisbon Agenda in 2004 (Kok 2004).

There is now a strong commitment to the use of Structural Fund resources for RTDI investments. Danuta Hübner, Commissioner for DG Regio, even went so far as to state that "I would like to see all Member States and regions dedicating a substantial share of their Structural Fund, particularly their ERDF, resources to research and innovation" (17th October 2005). Much of the rationale for this support relates to the belief that RTDI performance underpins future economic performance and a wish to overcome the innovation 'deficit' between regions: "reducing the innovation deficit is a key task for the use of cohesion policy" (CEC 2007a), partly due to the belief that "European regions vary considerably in their capacity to absorb and develop knowledge and technology" (CEC 2007b p.2).

The form and activities of the ERDF are set out in the General Regulation of the Structural Funds and a specific Regulation for the ERDF. During 2000-2006 the ERDF supported activities under Objective 1 and Objective 2 of the EU's Structural Funds; implemented through multi-annual programmes adopted for each eligible area. These

programmes were drawn up by partnerships of regional and national stakeholders, in negotiation with the European Commission, based on the provisions of the relevant Regulations.

Support for the promotion of R&D activities forms one of eight identified themes identified under the Scope of the ERDF (Art.2), which states that the ERDF shall support:

"research and technological development with a view to promoting the introduction of new technologies and innovation and the strengthening of research and technological development capacities contributing to regional development" (CEC 1999b p.3).

This extends the early provision set out in the previous ERDF Regulation (CEC 1993) where the ERDF could be used for "increasing capacity in the regions in the area of research and technological development to enable them to participate more fully in the Community's multiannual framework programmes" (CEC 1993 p.1) and permitted the financing of "measures contributing towards regional development in the field of research and technological development" (CEC 1993 Article 1 (e)).

Under the Structural Funds activities are recorded through the use of codes assigned to different FOI. For the period 2000-2006 one code (FOI 18) specifically covered actions in support of RTDI, which was, in turn subdivided into four types of activity. The relevant intervention codes for the period covered by this study are:

18	***Research, technological development and innovation (RTDI)***
181	*Research projects based in universities and research institutes*
182	*Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes*
183	*RTDI Infrastructure*
184	*Training for researchers*

In practice, during the period 2000-2006 it is estimated that some €10-11bn were allocated to RTDI initiatives through the Structural Funds, approximating to around 7.6%

of programme funds (Healy and Roy 2006, Technopolis 2006). Almost three-quarters of this was focused on regions eligible for support under Objective 1, although in relative terms Objective 2 programmes planned to allocate a higher proportion of their ERDF allocations towards RTDI activities (10.7% compared to 7.1%). Technopolis concludes from these figures that "RTDI measures, particularly in Objective 1 zones….., have not been a central plank of EU regional policy interventions" (2006 p.i), although as these funds are an important contributor to national R&D efforts they may contribute over time to a convergence of Gross Expenditure on R&D in Europe. They also contend that "national policy and national innovation systems strongly influence the RTDI strategy in the Structural Funds programmes" (p.i): a contention which this research shall go on to explore more fully later.

Whilst the Structural Funds are widely recognized to have been "a crucial element in contributing to capacity building of local, regional and even national authorities in managing RTDI policy" (Technopolis 2006 p.30) the same report also argues that "many regions … proved to lack the capacities and know-how to manage RTDI funds" (P.30), limiting their effectiveness. In particular, the following four bottlenecks are seen as particular issues:

- An administrative rather than strategic management of RTDI measures leading to a lack of synergies with other initiatives
- Lack of expertise at national and regional levels in managing RTDI measures
- A continuing dominance of supply-side measures with poor linkages to regional innovation systems; and
- Limited interest for many 'softer' 'demand-side' measures aimed directly at enterprises.

Overall, the evidence of the impact of Structural Fund RTDI interventions on research and innovation performance of the EU's regions remains elusive, with Technopolis concluding that "limited time series and incomplete or poor source materials (mid-term evaluations) made difficult any real appraisal of impact" (2006 p.29).

4.6.3 Synergies between Structural Funds and the Framework Programmes

A final feature of the instruments is the increasing calls for the synergies between the Structural Funds and the Framework Programmes to be more fully exploited. Again, this is not a new call, with the Commission in 1998 arguing that "the complementary use of Community instruments – the Structural Funds and the Framework Programme for RTD – can contribute to cohesion and competitiveness" (CEC 1998 p.3).

The attention given to this topic is strongly illustrated by the raft of publications promoting synergies between the Structural Funds and the Framework Programmes around 2007. In that year the EU's Competitiveness Council; the Scientific and Technical Research Committee of the EU (CREST) and the ITRE Committee of the European Parliament all adopted conclusions on more efficient support to research and innovation through co-ordinating the use of the research Framework Programmes and the Structural Funds.

One of the key conclusions of these various documents was that co-ordination was about more than developing common projects, as the European Commission highlights: "synergy should not be reduced simply to complementary project funding. It is also relevant in the building and development of research and innovation capacity (CEC 2007b p.5). How this should be achieved though depends upon the actions of individual regions, as the Commission does not have the responsibility to act in this area: "regions and Member States can use the Structural Funds in a flexible manner to help meet their specific needs and exploit the synergies with FP7" (CEC 2005b p.12).

4.7 EU R&D instruments in the UK

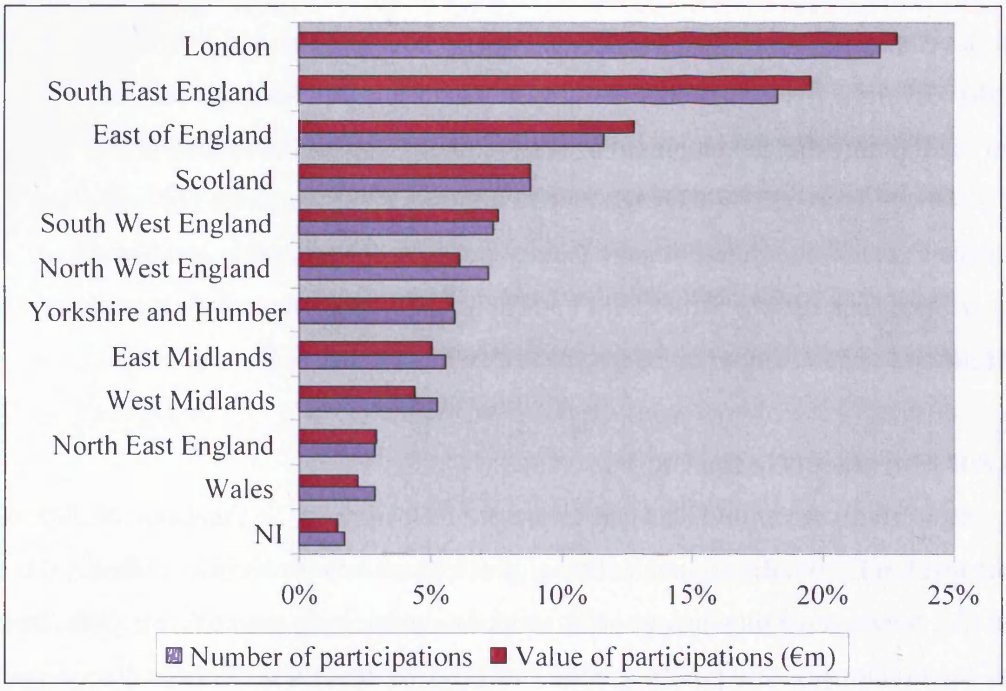
Despite the level of EU funding which is being directed towards the support of R&D within the UK, the regional dimension to this remains significantly under-researched. In the case of the Framework Programmes, what analysis that does exist has been undertaken either at the national level, both in the UK (DTI 2004a) and in other Member

States (Charlet 2001, Archimedes Foundation 2002), or for particular programmes. In the case of the Structural Funds there has also been limited research undertaken into the R&D aspects of the funds with the focus usually tuned to the use of the funds more generally. This study fills that gap. The following section sets the context for the following analysis of regional case studies by examining the distribution of EU R&D instruments across the UK's regions.

4.7.1 Framework Programme activity in the UK regions

The UK reflects many of the wider participation patterns discerned at the European level whereby the larger, more wealthy regions receive the bulk of the available funds (Figure 4.2). Three regions – London, South East England and East of England - account for more than half of all Framework Programme funded activity in the UK, both by value and by the number of participants. In contrast, three regions – Northern Ireland, Wales and North East England- account for less than 10% of the activity in the UK.

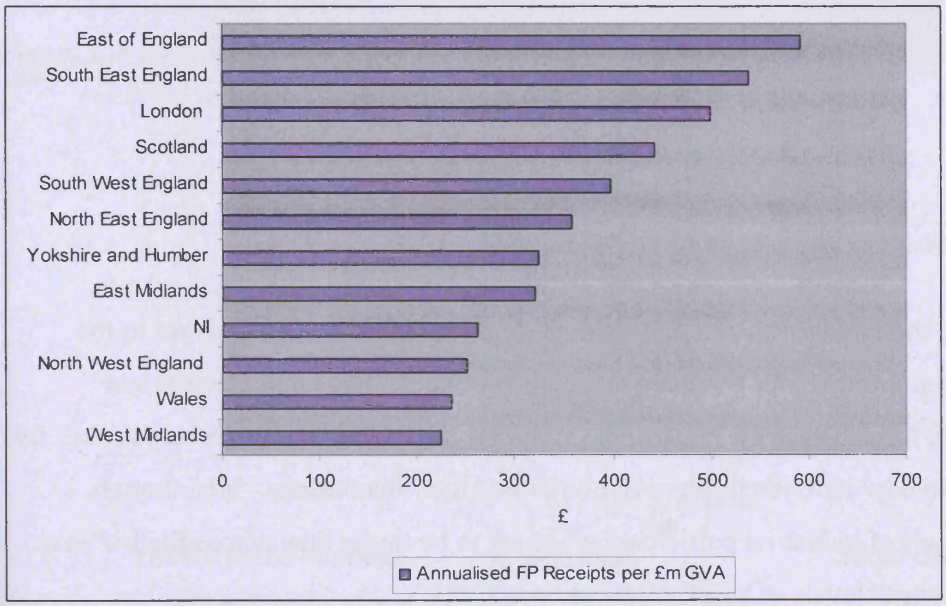
Figure 4.2 FP5 and FP6 activity within UK regions



Source: Adapted from data provided by OSI

However, as in the wider analysis of Framework Programme activity reported above, when GVA and levels of R&D expenditure are controlled for a slightly different picture emerges (Figures 4.3 and 4.4). In the former case a small number of regions perform more strongly than the absolute figures suggest, particularly the North East, whilst others, such as the North West, do less well. Overall though the ranking of regions remains similar to that reported in Figure 4.2. The situation is very different when we control for overall levels of R&D expenditure in each region. This can be assumed to provide a reasonable measure of the overall level of R&D capacity and activity in any single region.

Figure 4.3 Framework Programme receipts by region controlling for GVA

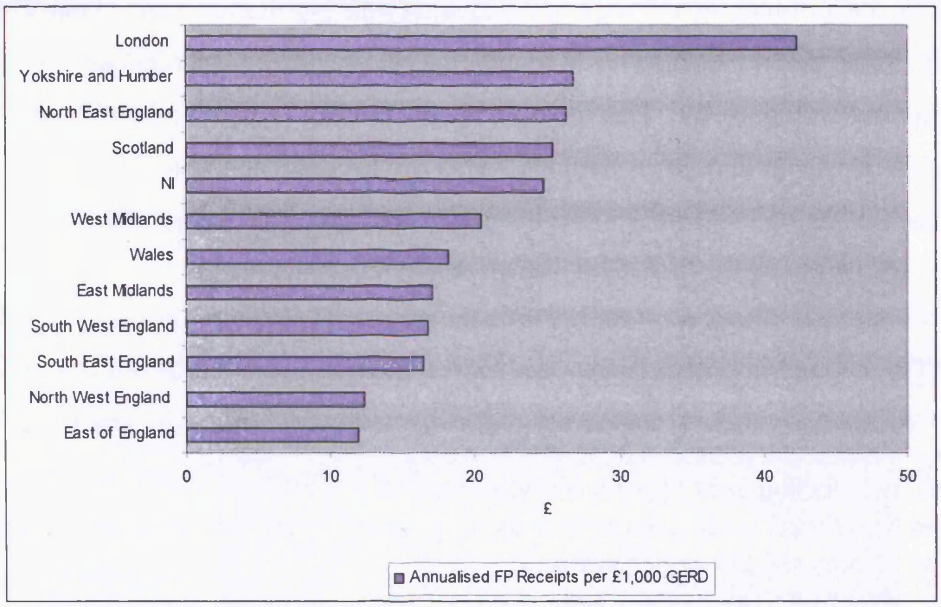


Source: Adapted from data provided by OSI, GDP data 2003

As Figure 4.4 illustrates Framework Programme activity is a much more significant proportion of overall R&D activity in Yorkshire and Humber and the North East of England than is the case in the East of England and South East England, even though the latter regions receive a far higher level of funding from the Framework Programmes overall. In regions such as the North East of England and Yorkshire and Humber it might be anticipated that the Framework Programmes will have a stronger influence on policy thinking than in those regions where the proportionate level of activity is less. Even Wales, our third case study region, creeps towards a mid-ranking position in this analysis,

suggesting that the Framework Programmes could play a more important role in the region than a simple analysis of the financial value of programme activity might suggest.

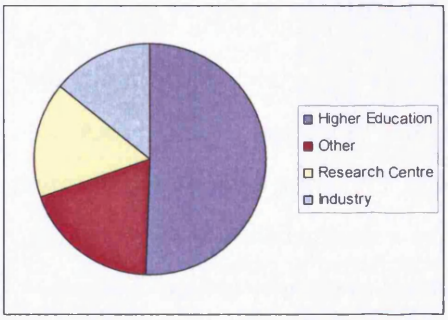
Figure 4.4 Framework Programme receipts by region controlling for GERD



Source: Adapted from data provided by OSI; GERD data 2003

Across the UK, the Higher Education Sector is the most significant participant in the Framework Programmes, followed, at a distance, by Others, Research Centres and Industry (Figure 4.5). These are self-completion categories and so there is some room for uncertainty as to how individuals have characterized their institutions. It is, though, notable that levels of industrial participation appear to be lower than across the EU as a whole, with stronger levels of Higher Education activity.

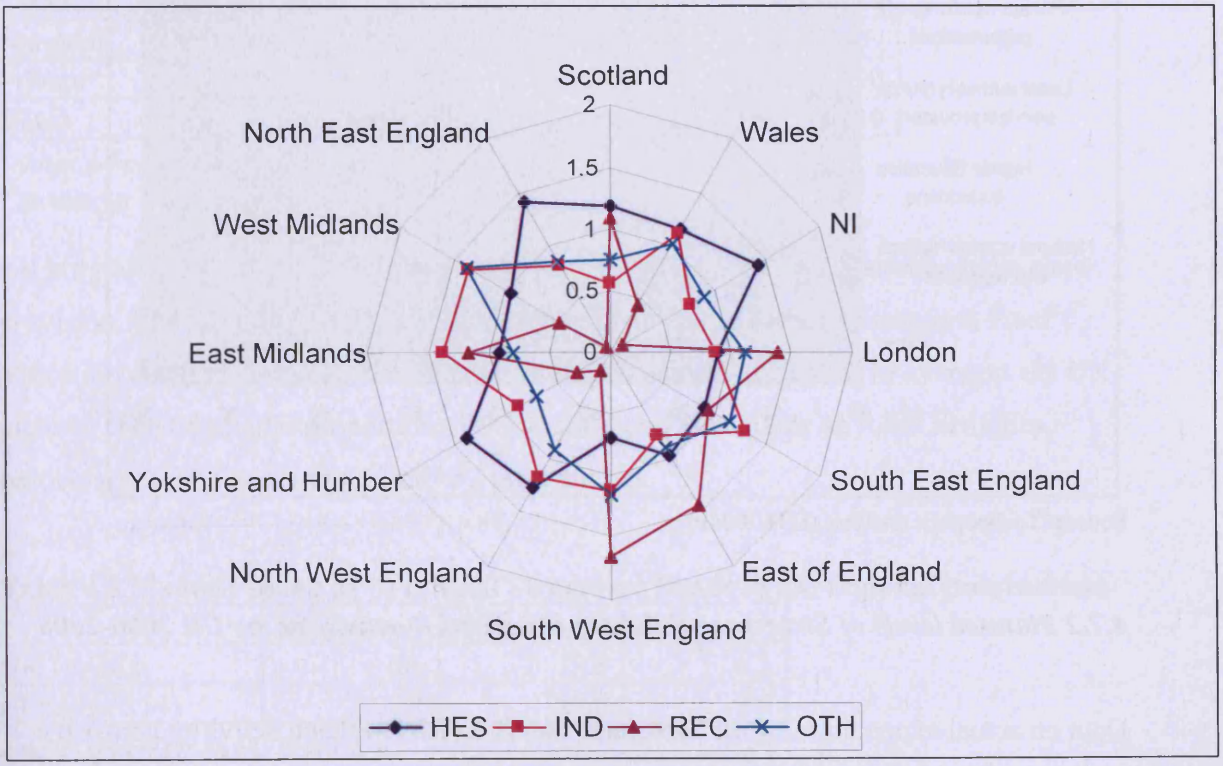
Figure 4.5 Participants in FP5 and FP6 (%)



Source: Adapted from data provided by OSI

Regional variation is also visible in the mix of participating institutions. In Figure 4.6 the relative mix of activity in each region is compared, based on the UK average for each sector (where the UK average = 1). It is apparent that the greatest diversity is in the level of activity undertaken through the Research Centre sector, which relates strongly to the presence, or otherwise, of Research Centres, particularly Public Sector Research Establishments (PSRE), within particular regions. The strong performance of the South West under this heading is likely to be something of an anomaly as it relates to the presence of the Research Council Headquarters in Swindon. In some regions, such as Yorkshire and Humber or North East England, there is a strong reliance on a single sector, whilst in others, such as Wales, activity reflects the national pattern more closely.

Figure 4.6 Relative levels of activity by institutional sector (FP5 and FP6, UK=1)

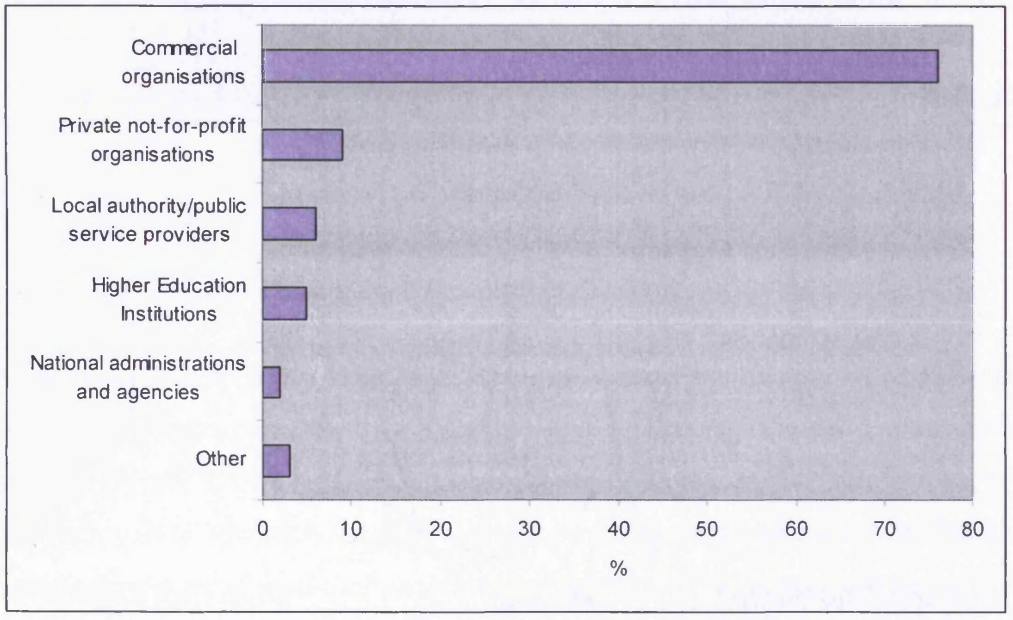


Source: Adapted from data provided by OSI

In work for the UK Government, Technopolis note that on-going participation in the Framework Programmes is dominated by a small number of organizations – the 'core oligarchies' noted by Breschi and Cusmano (2002) above. They note that just 16% of

organizations participated in both the 4th and 5th Framework Programmes, but that these organizations accounted for three-quarters of all UK participations across the two programmes. When participation is examined on the basis of discrete organizations (Figure 4.7), three-quarters of participating organizations are commercial organizations and just 5% are from the Higher Education Sector (DTI 2004a). What this suggests is that individual HEIs participate in multiple projects whilst commercial firms tend to be engaged in just one project. A not unsurprising finding, but one with implications for regional strategic thinking.

Figure 4.7 Engagement in FP projects by individual organizations (UK, FP5)



Source: Technopolis analysis (DTI 2004b)

4.7.2 Planned levels of Structural Fund supported R&D activity in the UK 2000-2006

Data on actual expenditure by the Structural Funds on R&D-related activities across the UK is not yet available for the period 2000-2006 without undertaking original research in each region. In contrast, robust data is available from the European Commission relating to the expenditure plans of each regional programme. Use of this data enables us to examine the levels of R&D-related activity planned in each regional programme at the outset of the programmes. This provides a valuable indication of the importance attached

to supporting R&D-related activities at this time. Comparison of this data with figures for all programmes across the EU also illustrates some important distinctions.

At the outset of the 2000-2006 programming period the UK planned to invest some €1.5 billion (Table 4.2) in support of R&D activities through Structural Fund programmes in areas eligible for support under Objective 1 and Objective 2 of the Structural Funds. On average the level of support provided from the Structural Funds, excluding other contributions, amounted to around €66m in each Objective 1 programme and €20m in each Objective 2 programme.

Table 4.2 Planned levels of investment 2000-2006 (€)

	Objective 1	*Objective 2*	*Total*
Structural Funds	398,925,221	243,275,890	642,201,111
National	295,728,629	278,022,780	573,751,409
Private*	175,966,000	104,489,590	280,455,590
Total	**870,619,850**	**625,788,260**	**1,496,408,110**

Source: adapted from DG Regio data

** no data for one programme*

All programmes in the UK, bar the East of England Objective 2 programme, make some provision for supporting R&D activities, with around 6% of the total Structural Fund allocation devoted to this (Table 4.3). However, in comparison to EU15 averages the UK plans to spend a smaller proportion of Structural Fund allocations on R&D activities, particularly with respect to Objective 2 programmes.

Table 4.3 Planned spend as % of total Structural Funds in EU regional programmes

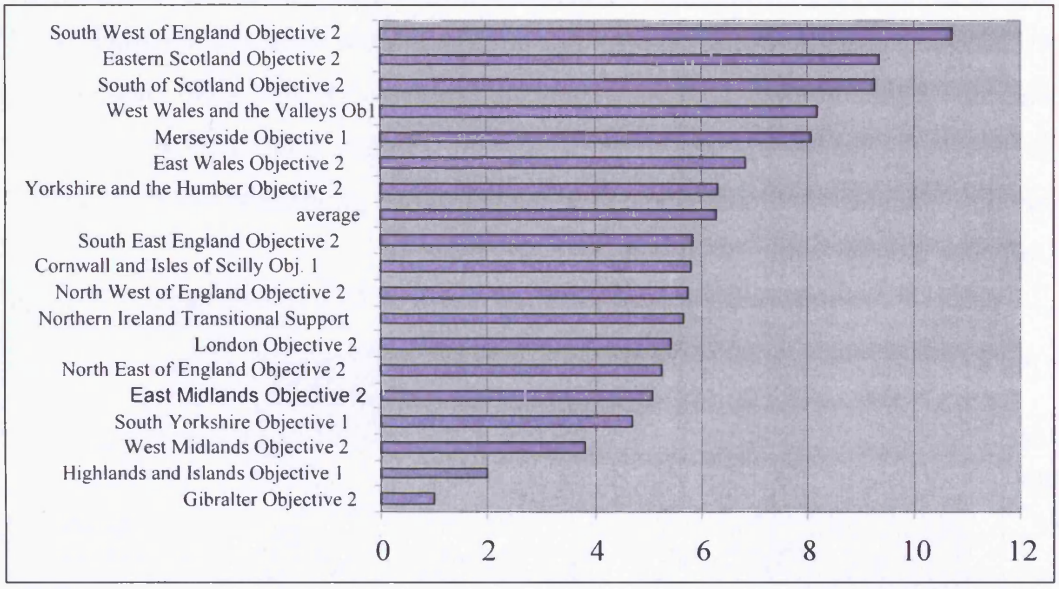
	Objective 1	*Objective 2*	*Total*
UK (n=18)	6.6	5.8	6.3
EU15 (n=154)	8.1	10.8	8.5

Source: adapted from DG Regio data

The proportion of programme funds allocated to R&D activity shows a strong variation across the UK (Figure 4.8), with no significant pattern in terms of Objective 1 or Objective 2 eligibility. On the whole, programmes in Scotland and in Wales are likely to

allocate higher proportions of Structural Funds to R&D, although the Highlands and Islands Objective 1 programme has the lowest allocation in the UK.

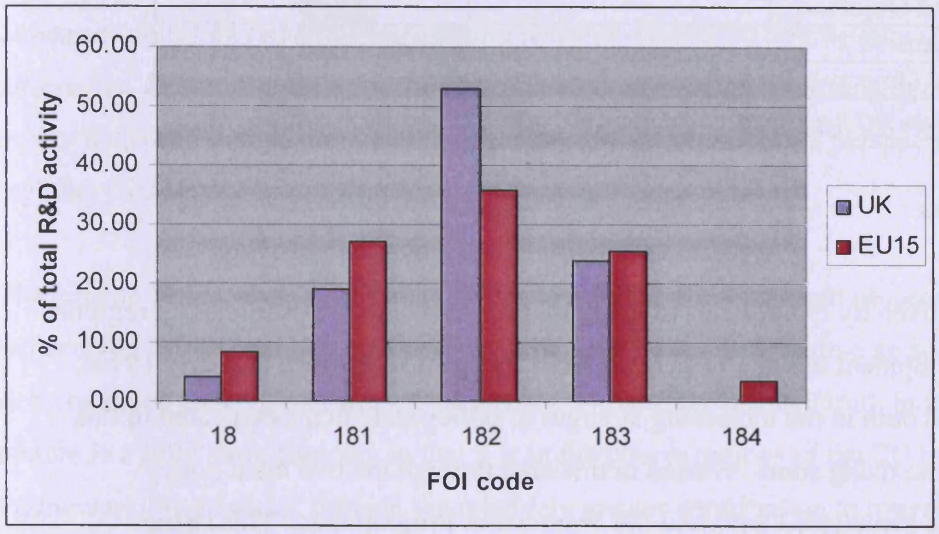
Figure 4.8 Planned expenditure on R&D (% programme funds)



Source: adapted from DG Regio data

Most activity planned in the UK, particularly under Objective 2, falls under the heading of FOI 182 (supporting innovation and technology transfers, the establishment of networks and partnerships between businesses and/or research institutes). The emphasis on this is significantly higher in the UK than elsewhere in the EU (Figure 4.9). As Figure 4.9 also demonstrates, financing for research infrastructure (FOI 183) accounts for around a quarter of planned expenditure, similar to European averages. Support for research projects based in universities and research institutes (FOI 181) is less significant than the average for the EU at around a fifth of planned expenditure, but nevertheless remains important. The training of researchers (FOI 184) does not feature in any UK programme, unlike in some other parts of the EU. One programme (the West Midlands Objective 2 Programme) does not differentiate between the sub-categories of FOI 18.

Figure 4.9 Comparative importance of different FOI codes



Source: adapted from DG Regio data

Around one-third of the programmes consider only one of the four possible themes for eligible R&D activities, limiting the variety of actions that can be undertaken in a particular programme area (Table 4.4). Nearly all programmes allocate funds to support technology transfer and networking (FOI 182); half allocate resources to invest in RTDI infrastructure (FOI 183), and just one-third plan to support research projects (FOI 181).

Table 4.4 Programme coverage

	18	*181*	*182*	*183*	*184*
Cornwall and Isles of Scilly Objective 1			X	X	
Merseyside Objective 1		X	X	X	
South Yorkshire Objective 1			X	X	
West Wales and the Valleys Objective 1		X	X	X	
Highlands and Islands Objective 1			X	X	
Northern Ireland Transitional Support Objective 1		X	X		
Gibraltar Objective 2			X		
West Midlands Objective 2	X				
Yorkshire and the Humber Objective 2			X		
East Midlands Objective 2			X	X	
North East of England Objective 2			X		
North West of England Objective 2		X	X	X	
South East England Objective 2			X		
London Objective 2		X	X	X	
South West of England Objective 2			X	X	

South of Scotland Objective 2			X		
Eastern Scotland Objective 2			X		
East Wales Objective 2		X	X		
East of England Objective 2					

Source: adapted from DG Regio data

4.8 Conclusions

The emphasis given by EU policies to R&D investments, aimed at stimulating regional economic development within the EU, has been rising steadily since the early 1990s. This is reflected both in the increasing strength of policy statements dedicated to this subject and to the rising sums invested in this area through the two main policy instruments: the Structural Funds and the Framework Programmes. This rising importance of R&D-led economic development reflects the emergence of a new policy discourse in the EU - which is the pursuit of a more competitive economy able to provide economic growth and more and better jobs.

The regional scale features strongly within this discourse. On the one hand it is anticipated that increasing the level of R&D activity in the EU's regions will help to secure the growth and employment targets established at the EU level. On the other it is believed that investments in the R&D capacity and capability of EU regions will help to secure economic convergence and promote the EU's goals of economic and social cohesion. The review of the policy context demonstrates a strong framing narrative based around models of endogenous economic growth and the role of regional innovation systems in securing this dual objective. The influence of this narrative on policy and practice within the EU's regions will be a crucial question for the case-study research.

For legal reasons the two principal policy instruments have distinct and separate aims and objectives but are increasingly united around a common goal, as recognized by the calls to promote their potential synergies. Having said this, there remain tensions as to the balance of effort to be provided to the research-orientated objectives as represented by the Framework Programmes and the stronger economic cohesion and convergence objectives of the Structural Funds. One of the underlying reasons for this is that, unlike

the Structural Funds, the Framework Programmes have never had an explicit regional dimension focusing rather on sectoral and research-orientated objectives. This differential focus provides a fruitful research environment for exploring questions of policy focus and imagination, and the challenge of different spatial perspectives, within a regional context.

The tension between regional policy objectives and sectoral research objectives is represented by the common description of the Framework Programme as dominated by rich countries, rich regions and big business. Whilst there is much truth in this, the picture is a little more complex in that it is in the poorer regions of the EU that the Framework Programmes provide the relatively greater contribution to overall levels of R&D activity, a pattern that is reflected in the UK as well. This suggests that it is in these regions that the influence of Framework Programme activity might be most keenly felt and where policy attention could usefully be directed. Whether this is true in practice remains to be seen and is one of the questions to be considered in the case-study analysis.

For the Structural Funds, it is clear that there is a strong variation in the extent to which programmes in the UK have planned to make R&D-related investments and in the types of investment envisaged. In comparison with other EU countries the UK as a whole has also planned to spend a lower proportion of available funds on R&D investments and has concentrated these funds more strongly on supporting technology transfer networks and business-university linkages. There is limited evidence as to how funds have been used in practice available from secondary sources and so the case-study analysis will play a crucial role in identifying how these funds are being used in the UK.

5. THE CASE STUDY REGIONS: CONTEXT, POLICY GOVERNANCE AND EU PROGRAMMES

5.1 Introduction

The following chapter sets a context for the forthcoming analysis. It draws out the salient features for each case study region; the principal strategies for economic development in each, and the use of the EU's R&D instruments. The aim of the chapter is both to provide a background for the reader and to reflect on the points this raises for later analysis.

It is comprised of five principal components. There is an initial description of the main social and economic features of each region. This provides a basic level of comparison between the three regions as, clearly, each region differs in terms of its physical scale; resident population of people and businesses; economic structure, and level of employment and prosperity. This is followed by a brief assessment of the R&D capacity of each region, focusing on the principal actors and levels of expenditure. This has been included owing to the importance of pre-existing capacity for assimilating knowledge and the influence that it can have on future development paths. Together these two components illustrate the socio-economic context in which EU R&D policy development and practice is set in each region.

The chapter then moves into a description of the governance features for each region. Again this highlights the similarities and differences between the three regions and is a useful reference point for analysis in later chapters of this study. This is followed by a description of the principal economic strategies within each region with an analysis of their content and how this has developed over the period covered by this study. This provides a framework for considering the policy context in which the EU R&D instruments operate in each region.

Finally, the chapter considers the various EU R&D instruments operating which each of the case study regions. This has a strong focus on the various Structural Fund

programmes owing to their particular geographic focus. This examines the framing discourse of each programme and the extent to which each programme planned to support R&D activities in the period 2000-2006. A short description of the various governance arrangements applying to the EU's R&D instruments, for both the Structural Funds and the Framework Programmes, concludes this aspect.

The chapter concludes with some reflections on the main points raised by the assessment and how these relate back to the theoretical considerations emerging in this field. It highlights both the value of the case study regions as a setting for analysis and the emergent role of conceptions of space, narrative and the perceived relevance of different instruments to the policy process.

5.2 The regional context

The three regions selected as case studies for this research offer a rich comparative environment in which to explore the role that EU R&D instruments play in shaping regional economic development policy and practice. As the following descriptions illustrate they differ in their economic strengths, the level of existing R&D activity, and related institutions, and their governance structures. But there are also similarities. It is important to remember when comparing absolute statistics that the three regions differ in their physical size and the number of people and businesses located within each. These descriptions provide a context for what follows and help to situate the various strands of the research. Each region is comprised of between two and four NUTS 2 territories, which is of significance for EU Structural Fund policies. For information, the respective location of each region in the UK is set out in Map 5.1.

Map 5.1 The UK's regions and devolved administrations

5.2.1 The East of England

Formed in 1994, the East of England region covers six Counties (Essex, Hertfordshire, Bedfordshire, Cambridgeshire, Norfolk and Suffolk) and four Unitary Authorities (Peterborough, Luton, Thurrock and Southend on Sea). East of England is the 4th largest NUTS I territory in the UK. The region is not densely populated, with around 5.6 million people living in the area, but population growth, at 3.8% between 2001-06, is above the UK average of 2.5% (ONS 2007a). The region accommodates some 9% of the UK population and 10% of all businesses in the UK.

Most of the population, and economic activity, is to be found within an arc extending along the south-west boundary of the region, benefiting from proximity to London. The largest urban areas are Peterborough and Luton. Other major centres are Cambridge, Norfolk and Ipswich. The region is highly accessible containing good links to London, and to the European mainland by land and sea. It also benefits from good air links with two international airports; at Stansted, London's 3rd international airport, and Luton.

The East of England is divided into three NUTS 2 areas based around different groupings of local authority districts. The three areas are East Anglia; Essex, and Bedfordshire and Hertfordshire. East Anglia itself is an historical entity which, in this instance, comprises an amalgamation of local authority areas based around Cambridge, Peterborough and Norwich.

5.2.2 Yorkshire and the Humber

Yorkshire and Humber, located in the north of England (Map 5.1) is the 7th largest region in the UK. In 2006 its population stood at 5.1 million persons, and was growing faster than the UK average, at the rate of 3.3% between 2001 and 2006 (ONS 2007a). About 7% of UK business stock (2003) and 8.4% of UK population (2006) are to be found within the region.

The northern parts of the region are predominantly rural whilst the majority of the population live in a band of urban conurbations running broadly northwards from the Sheffield/Rotherham conurbation through Barnsley, Doncaster, Wakefield, Huddersfield and Halifax to Leeds/Bradford. York, located to the north east of Leeds, together with Hull and Grimsby, on the Humber, are the other major urban centres. Traditionally, the economy was very strongly based around traditional extractive and manufacturing industries, many of which have undergone substantial decline and transformation since the 1980s. The economy is now moving towards a broader mix of manufacturing and service activities, including financial and legal services.

Yorkshire and Humber is divided into four NUTS 2 areas (North Yorkshire; South Yorkshire; West Yorkshire, and the East Riding and North Lincolnshire (formerly known as Humberside)) which are traditionally recognized sub-regional divisions.

5.2.3 Wales

Wales is the third largest NUTS 1 territory in the UK, but is one of the smallest by population. Its 3 million residents account for just 5% of the UK's total population and its 80,300 VAT-registered businesses are just 4.5% of all businesses in the UK. The rate of population growth (1.9% between 2001-2006) is also one of the lowest in the UK. The majority of the population live in the southern and eastern parts of Wales, in an arc stretching from Swansea, through the Welsh Valleys to Cardiff and Newport.

Economic activity is concentrated in the south and north east of the country with west and mid-Wales predominantly rural in nature. The Welsh economy has been in a long process of transition from one based on primary and heavy industries, such as agriculture, coal and steel, to a broader base of manufacturing and service sectors. The legacy of the past remains strong however, particularly in terms of the limited presence of higher value added sectors and activity (WAG 2002a, 2005).

Wales is divided into two NUTS 2 areas (East Wales and West Wales and the Valleys). These NUTS 2 areas have no other significance in Wales. The current NUTS 2 configuration marks a substantial change from the situation prior to 1997. In agreement with EUROSTAT, the statistical agency for the EU, the present arrangement replaced the previous NUTS 2 areas of Industrial South Wales (Gwent, mid-south-west-Glamorgan) and the remainder of Wales. One of the direct consequences of this administrative change was that, in 1999, the West Wales and the Valleys became eligible for support under Objective 1 of the Structural Funds for the first time.

5.2.4 Levels of economic prosperity

The legacy of the economic restructuring of the economies of Wales and Yorkshire and Humber can be seen in the low levels of economic prosperity in these regions. Levels of GVA per person are significantly below the UK average, unemployment rates approach or are above the UK average and a smaller proportion of the labour force is in

employment. In both Yorkshire and the Humber and in Wales, extensive pockets of deprivation also exist, as recognized with the designation of 'Objective 1' status by the EU for West Wales and the Valleys and South Yorkshire between 2000 and 2007. In contrast, the general level of prosperity in the East of England is reflected in the high levels of employment, low rate of unemployment and relatively high average incomes in the region. However, owing to the impact of relatively greater prosperity in London and the South East, levels of GVA (a measure of productivity and prosperity) are a little below the UK average. Within the East of England, pockets of deprivation can also be identified around Luton owing to the decline of traditional automotive assembly in the town, and in the more remote rural and coastal areas.

Table 5.1 Headline economic comparisons

	UK	*East of England*	*Yorkshire and Humber*	*Wales*
Employment rate (Winter 2006)	74.5%	77.1%	73.8%	71.8%
Unemployment rate (Q4 2006)	5.5%	4.5%	6.0%	5.2%
GVA compared to UK average (2005)	100%	95.6%	87.2%	78.1%

Source: Employment rate is % of population of working age in employment, Winter 2006 (LFS reported in ONS 2007b); Unemployment rate is average for Quarter 4 2006 (LFS reported in ONS 2007b); GVA is workplace based (reported in ONS 2007b)

5.2.5 Levels of innovation and entrepreneurship

On the basis of accepted indicators, the East of England economy is one of the most entrepreneurial in the UK. In 2005, VAT registrations, a typical indicator for new business start-ups, were almost 10% above the UK average for that year (ONS 2007a), whilst levels of innovation were similarly high. In contrast levels of entrepreneurship and innovation in both Wales and Yorkshire and Humber are below the UK average. This is particularly the case in Wales where VAT registrations were around 73.5% of the UK average in 2005 and the proportion of turnover attributable to the introduction of new or improved products is exceptionally low.

Table 5.2 Headline business statistics

	UK	*East of England*	*Yorks. and Humber*	*Wales*
VAT Registrations per 10,000 population (2005)	36.6	39.9	31.1	26.9
Proportion of turnover attributed to the introduction of new or improved products (2002-2004)	11%	14%	10%	2%

Source: ONS (2007b)

5.3 R&D in the regions

In considering the role of EU R&D instruments within the case study regions it is useful to have an understanding of the existing level of R&D capacity within each region. This is done in two ways. Firstly, through a description of the institutional R&D capacity in each region, from the private sector to the Higher Education sector and, secondly, through a broad review of the extent of R&D activity in the region as measured by levels of R&D expenditure.

5.3.1 Institutional research capacity

5.3.1.1 The East of England

The East of England has a very rich and varied research infrastructure with a strong presence of private sector research facilities, public sector research establishments and university research facilities. Perhaps best know as the location of Cambridge University, the region also includes Cranfield University, with two campuses in Bedfordshire, the University of East Anglia (UEA) and the University of Essex, alongside the less traditionally research active institutions of the University of Hertfordshire, University of Bedfordshire and the Anglia Polytechnic University. UEA and the University of Essex also collaborate to operate University Campus Suffolk to provide Higher Education provision from various locations in Suffolk, including Ipswich and Lowestoft.

The East of England also contains nine PSREs, the largest number in any region of England (House of Commons 2007), ranging from research institutes, such as the John Innes Centre, Institute for Food Research or the Babraham Institute through to standards agencies such as the National Institute for Biological Standards and Control. The region is also home to a range of private or charitable research facilities ranging from the Building Research Establishment and the Sainsbury Research Laboratory through to major research facilities of multinational corporations such as Unilever, GlaxoSmithKline, BT, Toshiba Research and Microsoft Research.

5.3.1.2 Yorkshire and Humber

The region is home to a strong academic research base with 8 universities with significant levels of research activity, including two Russell Group Universities (which represents the 19 most research-intensive universities in the UK) – the University of Leeds and the University of Sheffield. The principal universities in the region are:

- University of Bradford
- University of Huddersfield
- University of Hull
- University of Leeds
- Leeds Metropolitan University
- University of Sheffield
- Sheffield Hallam University
- University of York

The region also contains a small number of public sector research establishments and Research Council research institutes located within the region's universities and leading hospitals. The most notable of these is the Central Science Laboratory (CSL), an agency for the Department for Environment, Food and Rural Affairs (DEFRA), based in York. Private sector R&D is largely concentrated in a small number of major companies in the pharmaceuticals sector, personal and household products, and the metals sector.

5.3.1.3 Wales

The research infrastructure of Wales is dominated by the Universities of Cardiff, Swansea, Aberystwyth and Bangor. Important, but more modest, contributions are also made by institutions such as the University of Glamorgan, University of Wales Institute Cardiff and Glyndŵr University[13]. The University of Cardiff is a member of the Russell Group of Universities. In seeking to strengthen this infrastructure the WAG has encouraged the formation of collaborative agreements between universities in particular research areas. This stems from a recognition that it is only through joint action that a 'critical mass' of research expertise can be achieved (WAG 2002).

There is a very limited presence of dedicated research facilities operated by the private sector in Wales and just two Public Sector Research Establishments. The Institute for Grassland and Environmental Research (IGER), funded by the Biotechnology and Biological Sciences Research Council (BBSRC), is located in Aberystwyth, and the Centre for Ecology and Hydrology (CEH), funded by the Natural Environment Research Council (NERC) is located in Bangor. These are both closely related to particular universities - IGER merged with Aberystwyth University in April 2008 and CEH is located in the Environment Centre Wales, a research centre operated in partnership between NERC and Bangor University, which opened in 2007 - reinforcing the dominance of the HE sector in the R&D landscape of Wales.

5.3.2 Levels of R&D activity

The East of England has the highest level of R&D activity in the UK, with total expenditure on R&D of £4,201m in 2003 (ONS 2006), primarily due to very high levels of R&D within businesses and strong levels of research within the Government sector (Table 5.3). This stands in marked contrast to that of Wales and Yorkshire and the Humber. In 2003 total expenditure on R&D in Yorkshire and Humber was some £863m (ONS 2006), the lowest proportion of GVA for any region in the UK, bar one; and in

[13] Formerly known as North East Wales Institute of Higher Education

Wales the position was not significantly stronger with total expenditure on R&D in 2003 of some £482m, around 1.2% of GVA which is a third less than the UK average.

Table 5.3 Gross Expenditure on R&D as a % of GVA (2003)

	Business R&D	*Government R&D*	*Higher Education R&D*	*Total*
East of England	2.9	0.4	0.5	3.8
Yorkshire and Humber	0.4	0.1	0.5	1.0
Wales	0.6	0.1	0.5	1.2
UK	1.2	0.2	0.4	1.8

Source: ONS 2006

The most significant factor underpinning the differences in levels of R&D activity is the level of business expenditure on R&D and, to a lesser extent, differences in levels of Government funded research (Table 5.3). In part this is due to the institutional and industrial structures of the different regions illustrating their influence on future development paths. In the case of differences in levels of Government expenditure on R&D the significantly lower numbers of PSREs in Wales and Yorkshire and Humber account for at least part of the recorded differences whilst a lack of large firms and limited activity in key research sectors, such as pharmaceuticals, are both given in explanation for the low level of business-related R&D activity in Wales (WAG 2006). Put simply it appears that the East of England simply has a larger number of firms which undertake R&D activity. For example it is estimated that more than 28% of R&D expenditure by the UK's top-200 R&D firms occurs in the East of England, in comparison to 1% in Wales and 2.6% in Yorkshire and Humber (Adams and Smith 2005).

However, closer analysis of the data suggests that wider issues exist in both Wales and Yorkshire and Humber as levels of R&D within businesses are substantially less than what one would expect based upon the stock of VAT-registered businesses in the region *per se*. Whether this is due to cultural factors or inefficiencies in the wider system is not clear but a desire to overturn the lack of business-led R&D activity has played a strong role in justifying public-sector interventions in these regions.

In Wales and in Yorkshire and Humber the low levels of R&D activity in other sectors places a strong onus on capacity for R&D within the Higher Education Sector. This has led some in Wales to describe HE as 'the only game in town' (correspondent interviews). Here, levels of expenditure on R&D, as a proportion of GVA, are consistent across all three regions, although the monetary value of this activity is clearly very different.

Equally, the composition of activity within this sector also differs. Within the Higher Education sector in the East of England the role of the Research Councils as a source of R&D funds is significant (Table 5.4), particularly in comparison to the UK average. In Yorkshire and Humber, contract research, undertaken primarily for industry, forms a very significant proportion of research activity undertaken by Universities in the region, whilst in Wales, there is a stronger reliance on funding from the Research Councils, and from Government more generally. In relation to the current study it is useful to note that the proportion of funds received from the EU appears to be relatively consistent, except in Yorkshire and Humber.

Table 5.4 Proportion of funds by source for collaborative and contract research funding (2004-2006)

	Collaborative research				*Contract research*
	OST Research Councils	*Other Government*	*EU Government*	*Other*	
East of England	24%	12%	11%	7%	48%
Yorkshire and Humber	9%	15%	7%	2%	68%
Wales	20%	30%	11%	7%	31%
UK	15%	14%	12%	6%	53%

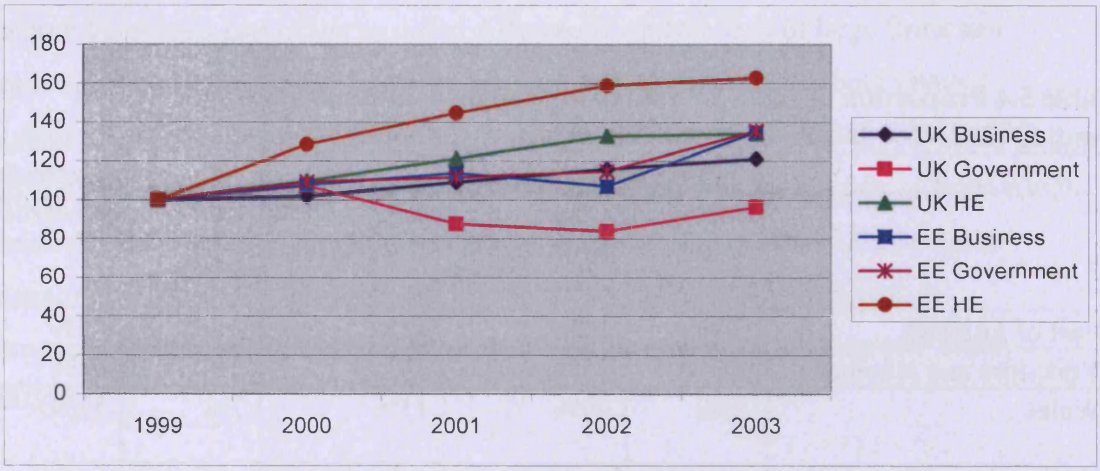
Source: adapted from HEFCE 2006

Moving away from a simple snapshot analysis demonstrates some distinctive patterns in R&D expenditure trends in the three regions (Figures 5.1 to 5.3). In each of the regions there has been an overall increase in the level of R&D expenditure, albeit with a decline and then a recovery in the case of Wales. The increase has, proportionally, been the greatest in Yorkshire and Humber and the East of England (+38% and +37% respectively

between 1999 and 2003) and least in Wales (+29%). The composition of these changes varies slightly between regions.

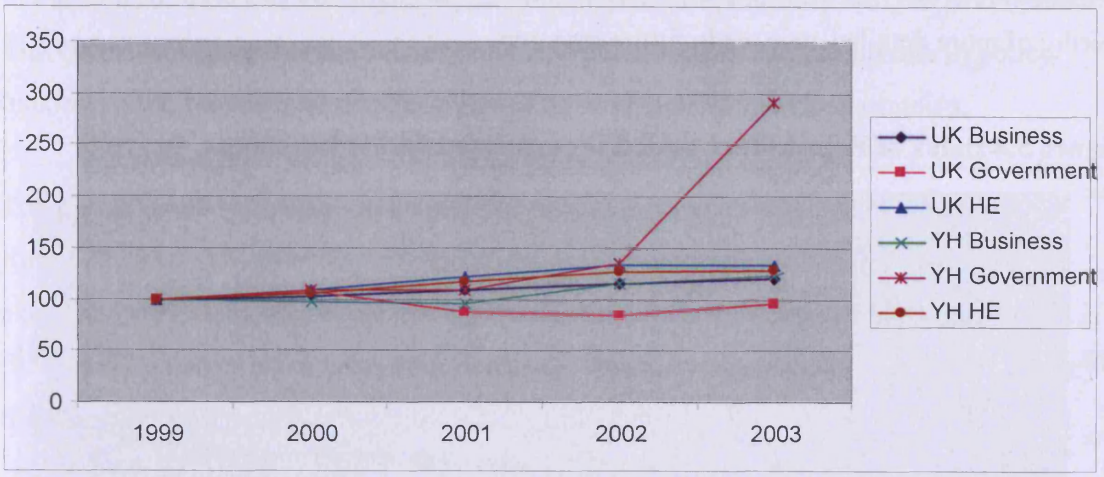
In the case of Yorkshire and Humber and East of England, levels of Government expenditure on R&D have outstripped the average rate of growth for the UK as a whole, compared to Wales where there has been a decline in levels of Government expenditure. In the case of Higher Education, the trend in all three regions has been for an increase in expenditure, but whilst this has broadly followed the national average in Wales and Yorkshire and Humber, it has been significantly above the average in the East of England. Finally, levels of expenditure on R&D in the business sector have proved to be more volatile. In the East of England, the level of activity has broadly fluctuated around the, rising, national average; in Yorkshire and Humber the level of activity has remained consistently below the UK average, whilst in Wales a sharp decline in the level of expenditure has been followed by a sharp recovery since 2001.

Figure 5.1 Index of East of England R&D expenditure by performer 1999-2003



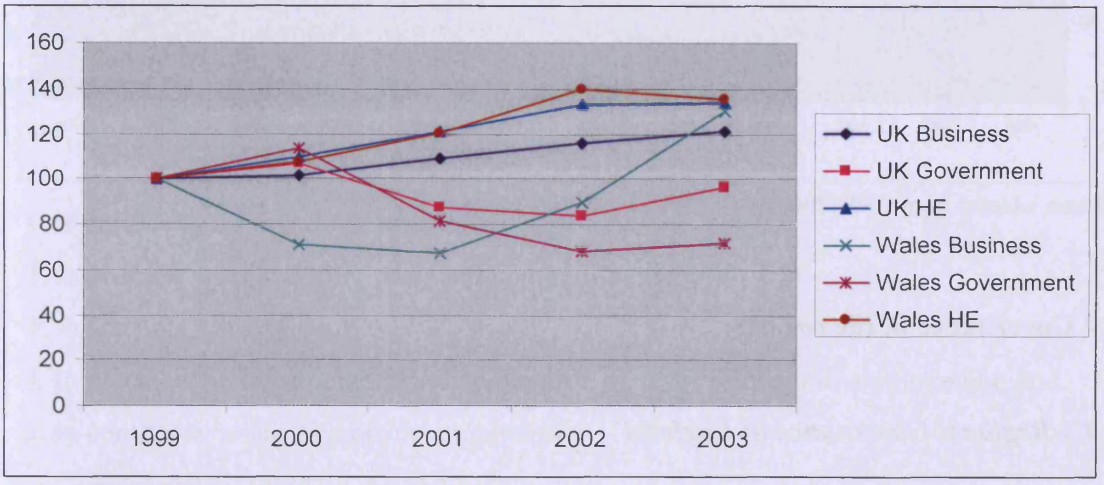
Source: adapted from ONS 2006

Figure 5.2 Index of Yorkshire and Humber R&D expenditure by performer 1999-2003



Source: adapted from ONS 2006

Figure 5.3 Index of Welsh R&D expenditure by performer 1999-2003

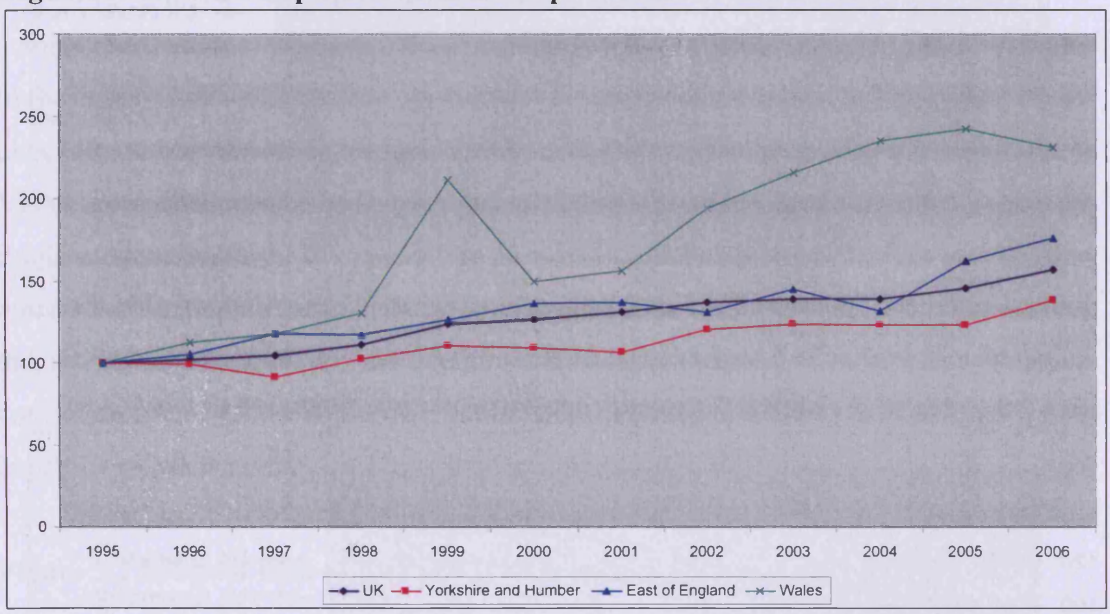


Source: adapted from ONS 2006

The volatility in levels of expenditure on R&D by businesses makes it worthwhile to examine this in a little more detail. Figure 5.4 illustrates contrasting fortunes. Whilst in the East of England levels of R&D undertaken within businesses have tended to fluctuate around the national trend, in Yorkshire and Humber there has been something of a widening of the relative gap with the UK average since 1995, and particularly since 1999. In contrast, in Wales levels of R&D expenditure within Welsh businesses has been increasing steadily since 1995 and outstripping the UK average; albeit from a very low base. However, the rate of increase has tailed off in recent years, with signs of an

incipient downturn beginning to become apparent. That this, relative, increase in business R&D activity has coincided with strong Structural Fund support in this area is worthy of more detailed analysis in future research.

Figure 5.4 Index of Expenditure on R&D performed within businesses



Source: adapted from ONS (2007c)

5.4 Governance in the regions

5.4.1 Regional Governance in England

In 1999 RDAs, together with a Regional Assembly, were established for each of the English regions outside of London. For London a directly elected mayor was established, together with an elected Assembly and a regional development agency. Since this date there have been three principle arms of governance in each of England's regions:

- A Government Office
- A Regional Assembly (outside of London)
- A Regional Development Agency

Each Government Office has some responsibilities for delivering Government functions in the areas of industry, employment, training, agriculture, transport and the environment. The Office is responsible for delivery of Government policy and has no role in policy making which remains the responsibility of Central Government Departments.

The powers of the Regional Assemblies are also limited, with the East of England Regional Assembly describing its role as helping to "co-ordinate public sector expenditure and activity within the region"(EERA 2008). Their principal strategic role is the preparation of a Regional Spatial Strategy. Following changes to Government policy the Regional Assemblies will cease to exist from 2010.

RDAs have devolved responsibility for the economic development of their region. Each RDA is led by a Chair and a Board of 15 people. Board members, including the Chair, are appointed by Government Ministers with the exception of London, where appointments are made by the Mayor. Each RDA has five statutory objectives (OPSI 1998):

1. to further economic development and regeneration;
2. to promote business efficiency and competitiveness;
3. to promote employment;
4. to enhance the development and application of skills relevant to employment, and
5. to contribute to sustainable development.

As the RDAs are relatively new institutions there has been a period of bedding in, particularly in the years immediately following their introduction. As their experience has grown, so too have their responsibilities. Following their introduction their activities were largely constrained to legacy actions related to the various programmes which they inherited. These have gradually been replaced by funds channeled through a 'Single Pot' which the RDA is able to use at its own discretion. The powers of the RDAs have also gradually increased since 1999 with a wider range of responsibilities being devolved or transferred from other Government departments. Each RDA produces a Regional

Economic Strategy (RES) for their region, which sets out the focus for activity in the region over the coming years (see Section 5.5).

Whilst responsibility for economic development has been placed firmly in the hands of the RDAs in England, science policy remains a national responsibility. However, the task of stimulating R&D activity and knowledge transfer activity is shared between the RDAs and other national bodies including the Research Councils, Higher Education Funding Council for England and Central Government Departments.

In 2004, Regional Innovation and Science Councils were established in England, in response to a review of the Government's support for innovation, commissioned by the then Science and Industry Minister Lord Sainsbury. Comprised of representatives from universities, research centres, businesses and governance bodies the role of the Councils is to provide strategic direction to the work of the RDAs by advising on the approach being taken to stimulate research-led innovation in the region. The approach taken to these Councils, varies. In Yorkshire and the Humber for example a separate body has been established, known as 'Yorkshire Science' with a dedicated Director and published strategy (Yorkshire Science 2007). In contrast, in the East of England the Council acts as an advisory body but has no separate identity; instead it forms part of the 'Enterprise Hubs' stream of activity supporting innovation in the region. Further levels of responsibility for promoting R&D-related economic development activities in England have also been established through a partial strengthening of the city-level with the identification of six 'Science Cities' by the UK Government in 2005, including York; which is the only science-city in the areas covered by this study.

5.4.2 Governance in Wales

1999 marked a watershed in Wales. In that year, a National Assembly for Wales with devolved powers from the UK Government was elected to govern Wales. The Welsh Assembly Government itself is made up of the First Minister, usually the leader of the party with the majority of seats in the Assembly, and a cabinet appointed by the First

Minister. The Assembly Government is supported by a civil service. Prior to 1999 Government functions were administered through the Welsh Office, a department of UK Government headed by the Secretary of State for Wales who was a member of the UK Cabinet. It is hard to understate the significance of this change, both in terms of policy making but also the implications this has had for the 'bedding-in' of new institutional structures.

The upheaval of governance structures in Wales continued with the announcement by the First Minister in 2004 of the abolition of much of the traditional landscape of arms-length agencies responsible for the economic development of Wales. In what has commonly come to be known as 'the bonfire of the quangos', the functions of the Welsh Development Agency (WDA); the Welsh Tourist Board, and the Council for Education and Training in Wales were brought into the Assembly Government on the 1st April 2006. Not only did this decision concentrate economic development responsibilities and financial control in the Assembly Government, it also injected a further degree of uncertainty and upheaval into economic development policy activity in Wales just five years after the Assembly itself was formed.

As a consequence of devolution, most economic development powers have been devolved to the Welsh Assembly Government, and this was a strong impetus for devolution itself (Morgan 2007). Economic development and economic policy has consequently become an intensely political activity in Wales (Morgan 2006, 2007), more so perhaps than in most other regions of the UK. In contrast science policy and its funding are not devolved powers and remain the responsibility of the UK Government. Consequently, where the Welsh Assembly Government wishes to intervene in the matter of research and scientific activity it does so from the standpoint of economic development objectives rather than scientific concerns. This difference in governance responsibilities between science and economic policy domains emerges as a crucial consideration throughout this study and it considered further later.

5.5 The R&D content of regional strategies

Since 1999 there has been a regional economic development strategy published for each of the case study regions. Over time these have undergone a number of revisions and modifications reflecting the adoption of new strategy themes and priorities. These regional economic strategies have also been complemented by the publication of separate strategies designed to promote innovation in the region.

The content of these regional economic strategies, and related documents, provides a strong insight into the philosophy underlying the approach to economic development within each of the regions. As these strategies set out and guide the actions of the sponsor bodies, such as the RDAs and the Welsh Assembly Government, and influence the actions of others, they are also indicative of the types of activities that are likely to be pursued within the region. For each of these reasons it is instructive to consider the extent to which such regional strategies have considered the role of R&D interventions in order to gauge the influence that this might have had on the level of activity undertaken through EU R&D instruments in our case study regions.

Despite the differences in regional contexts each strategy is founded on a strong competitiveness logic. This is currently a common feature of all such strategies in the UK, as North comments on the basis of a wider review: "The dominant aim of regional economic strategies in England and national economic strategies in Scotland and Wales has been to promote economic growth and competitiveness and to create a 'knowledge economy', based on high-skilled, high value-added sectors." (North *et al* 2007 p.3). Within this logic the role of R&D as a driver of economic development receives a clear emphasis.

The East of England's economic development strategies lay great store by the region's strengths in R&D, innovation and the knowledge economy more generally. There are strong and consistent references to the opportunities that this capacity provides and the importance of making connections to the research base and on further strengthening the

competitiveness of this sector as a whole. A Shared Vision (EEDA 2004) clearly identifies the importance of this when it highlights 'global leadership in developing and realising innovation in science, technology and research' as one of the 8 goals around which the regional economic strategy is organised, a priority which is maintained in EEDA's own Corporate Plan for 2005-08.

During the years following the publication of A Shared Vision the region, as represented by the RDA and other regional bodies, embraced the notion of the East of England as 'the Ideas region' and of open-innovation. This characterisation of the region has flowed into the revised regional economic strategy, the consultation draft of which was published in 2007. Innovation (or 'Realising the value from innovation by bringing ideas to market' (EEDA 2007 p.33)) is now one of the 4 themes that focus on developing the 'Ideas economy' (enterprise, innovation, digital economy and resource efficiency). R&D is strongly emphasised within this theme of innovation and the approach, as described by EEDA, is "to exploit and develop the region's R&D capacity, strengthen the links between the public and private sector organisations working in that field; support the commercialisation of activity through incentive schemes; address access to finance at key stages of the process; and foster an innovation culture" (EEDA 2007 p.33).

Similarly, in Yorkshire and the Humber, the region's economic strategies place a strong emphasis on the role of research in regional economic development, particularly the linkages between businesses and HEIs. For example the 2003 RES sought to encourage innovation and improve business and higher education links as one set of key actions towards 'growing the region's businesses' (Yorkshire Forward 2003). In doing so it set the scene for many of the region wide activities that were later supported through the EU Structural Fund programmes, particularly the Centres of Industrial Collaboration. Similarly the 2006 RES (Yorkshire Forward 2006) also highlighted the role that the region's research base could play in supporting regional economic development, continuing the practical emphasis on the role of universities, particularly in stimulating knowledge transfer. In 2007 the region published its Regional Innovation Strategy, the

result of the work of Yorkshire Science, which, as one might expect, highlights the importance of innovation in the economic development of the region.

There has been a long-standing acknowledgement amongst policy-makers in Wales that an 'innovation deficit' is hampering economic development in the country (RTP 1996, WAG 2002b). This perspective underpins the strong commitment in both "Wales: A Vibrant Economy" (WAG 2005) and its predecessor "A Winning Wales" (WAG 2002a) to promote levels of innovation within Wales. The innovation policy objectives of A Winning Wales were developed in more detail in Wales for Innovation: The Welsh Assembly Government's Action Plan for Innovation, published in 2003, which has come to form the foundation document for innovation support policies in Wales; constituting the reference document underpinning the innovation dimensions of W:AVE. The foundations of the Regional Technology Plan (RTP) can be discerned running through all of these documents, with at least one official of the then WDA commenting in 2001 that by 2000 the RTP was completed and its priorities had been mainstreamed (Jones 2001).

Uniquely, amongst the UK's sub-national authorities, Wales has also published A Science Policy for Wales (WAG 2006), which draws together current policy initiatives and examples of existing practice. This is ground-breaking in that for the first time there is an explicit acknowledgement that Wales has an inherited science 'deficit' to go alongside its innovation deficit, with both innovation and science now seen jointly as "driving forces in economic growth" in Wales (WAG 2006 p.12). Implicitly at least these are understood to be closely inter-related, with weak levels of R&D having an adverse impact on levels of innovation and thus on economic development.

This perspective is symbolically reflected in the First Minister's preface to A Winning Wales, which opens with a recognition of the need to "increase the knowledge, research and development, and innovation capacity in all parts of the Welsh economy" (WAG 2002a); the theme is continued in W:AVE and more particularly through the Innovation Action Plan and culminates in A Science Policy for Wales. As Rhodri Morgan, First Minister, states in his opening to A Science Policy for Wales:

"*The time is now ripe for a Science Policy for Wales. Wales cannot compete in the global economy on the basis of low wages and low value added goods and services. Our future lies in a knowledge economy, enriched by scientific, technological and engineering knowhow. Although science policy and funding is not devolved, a science policy tailored to Wales' needs will help to accelerate the development of a knowledge economy as well as enhance the quality of our higher education system, health service, environment, agriculture and evidence-based government in general*" (WAG 2006 Preface).

Throughout all of the case study regions there is a strong recognition of the role of innovation in stimulating regional economic growth, and the contribution that research can make to this. It is equally apparent that the recognition of this role has strengthened over the period considered by this study. In principle this should establish fertile ground for the operation of EU R&D instruments within each of our regions. However, although the role of the R&D in the regions receives consideration, the role of EU R&D instruments themselves receives less attention.

5.6 Regional strategies and EU R&D instruments

Inter alia, regional economic strategies are intended to both set an agenda and provide leadership, promoting concerted and coordinated actions towards the agreed aims and objectives set out in the strategy. Over recent years they have taken an increasingly strong line on the importance of research-led economic development which might have an influence on levels of activity initiated through the EU's R&D instruments. In considering this matter further it is valid to consider the extent to which these strategies have explicitly made reference to the role of EU R&D instruments in delivering the R&D-relevant objectives.

Within all of the strategies reviewed links were made to the Structural Funds. This was particularly so in Wales where A Winning Wales makes strong reference to the role of the Structural Funds in supporting innovation in Wales; W:AVE devotes a whole section to the role of the Structural Funds, with an emphasis on the potential provided by future eligibility for the Convergence Objective, and A Science Policy for Wales draws

extensively on the EU dimension. An exception to this is the Innovation Action Plan which makes no reference to the EU dimension, beyond an explicit assurance that the mid-term review of Structural Fund programmes would determine the extra level of support available for innovation from the programmes identified in the Action Plan.

In the case of the strategies for Yorkshire and Humber links to the Structural Funds were also strong, although initially there was little explicit consideration as to how these might support research-led economic development. This is perhaps reflected in the view expressed by one interviewee that "if the Structural Funds get a mention it would be about attaching disadvantaged communities to economic opportunity" (RG4). In more recent editions of the Regional Economic Strategy (Yorkshire Forward 2006), the contribution that the Structural Funds might make to enhancing the R&D capabilities of the region is included more fully. An example of this can be seen in the manner in which the 2006 RES highlights the importance of using the Structural Funds to build the capacity for future engagement with, *inter alia*, the Framework Programmes, stating that "this is the last round of structural funding the region can expect, and should therefore be used to build capacity in the region to access other EU funds for economic development, such as the Framework Programme for Research and Development" (Yorkshire Forward 2006 p.38). This has led one respondent to suggest that the RES puts a strong premium on bringing the Structural Funds and Framework Programmes together (PM3).

Whilst the Structural Funds do also feature in the regional economic strategies for the East of England it is fair to say that their inclusion does not have much visibility in the region. This is summed up by the comments of three respondents when asked about the extent to which regional strategies considered the Structural Funds, or the Framework Programmes:

"I don't know that there's a huge amount in the RES around the EU" (RG9).

"Not enough is the short answer" (LA7).

"Virtually none because never heard it mentioned" (HE12).

Turning to the Framework Programmes, a slightly different picture emerges. As with the Structural Funds there are limited references to these in the East of England strategies, and visibility remains low. They feature more heavily however in Yorkshire and Humber, with quite significant references in the regional economic strategies and the Corporate Plans of Yorkshire Forward. These gradually strengthened from initially limited references in early publications to more significant inclusion by 2007 by which time the Corporate Plan was referring to the Framework Programmes in the context of increasing co-operation between Yorkshire and other EU regions (Yorkshire Forward 2007a p.51) as well as "Improving access to European FP7 programmes and regional involvement in European networks" (Yorkshire Forward 2007a p.52) as one of four specific actions to deliver the region's newly published Regional Innovation Strategy (RIS). Interestingly, all references to the EU Framework Programmes have been lost in the most recent draft Corporate Plan for 2008, although the wider objective of promoting *EU and International Engagement* by engaging with the region's universities in order to access links to overseas academic and research institutions remains (Yorkshire Forward 2007b para. 4.7).

In contrast, there are no references to the Framework Programmes in A Winning Wales; Wales: A Vibrant Economy; the Innovation Action Plan or even Reaching Higher, which sets out the Welsh Assembly Government's strategy for the development of the HE sector in Wales to 2010 (WAG 2002a, 2005, 2002b, 2002c). In the words of one respondent, from the Welsh Assembly Government, the Framework Programmes "don't hit as high up the (policy) horizon" (RG2). It is only with the development of A Science Policy Wales that there emerge a series of explicit reference to the EU's RTD Framework Programmes. These identify the wider benefits the Programmes can bring to the region: "Winning a higher proportion of EU Collaborative Research 7th Framework Programme funds" it says, "would not involve the same level of improved revenue streams (as increased funds from the UK Research Councils) but carries other global awareness benefits" (WAG 2006 p.5) as well as acknowledging that "There are opportunities too for synergy between use of Convergence Funds and FP7" (WAG 2006 p.15).

The recognition of wider benefits through engaging with EU R&D instruments is an important development as, previously, one of the hallmarks of the treatment of both the Structural Funds and the Framework Programmes in most strategy documents has been their depiction in terms of the funding that they bring into the regions. In A Shared Vision (EEDA 2004), the EU is seen as "an important source of funding for economic regeneration through the Structural Funds, R&D budgets or the Common Agricultural Policy (CAP)" (EEDA 2004 p.108) and it acknowledges that European policy directly affects the East of England economy through "providing a wide range of funding opportunities for research and innovation" (EEDA 2004 p.108). Similarly the consultation draft of the regional economic strategy (EEDA 2007) emphasises the financial opportunities offered by EU funds rather than any other attributes. Under Priority 3 of the Innovation theme the 7th Framework Programme is identified as one of several targets for a single access point which is intended to "increase the uptake of finance for innovation programmes" (EEDA 2007 p.37). In Yorkshire and Humber both instruments were described as being regarded as "just another source of funding to be added to the pot" (Int3), whilst in Wales, there is a suggestion that the regional strategies themselves were designed around the Structural Funds, particularly Objective 1 as described in Box 5.1.

Box 5.1 illustrates another common feature across the three case study regions. There has been a gradual evolution in the extent to which domestic strategies both consider and imagine EU R&D instruments. It seems that there has been a strong learning process at work here. In all three regions, regional authorities were established in 1999 at the outset of the new Structural Fund programming period. Since then the organisations have learnt, developed and generally matured: a contention which is supported by most respondents and explicitly referred to by several. This maturing process is regarded as an important aspect in the increasing attention given to particular policy agendas and the more sophisticated treatment of underlying issues.

Box 5.1 EU R&D instruments lying at the heart of domestic strategies

The suggestion that Wales effectively built its strategy around European funding is not denied by Assembly Government officials who acknowledge that "W:AVE was written with the Structural Funds in mind. It is a skeleton for an application for Structural Funding"(RG3). The importance of the Structural Fund programmes to Welsh innovation support policies is readily apparent when one considers that of the nine key instruments highlighted in A Science Policy Wales (WAG 2006) six have been supported through the Objective 1 programme and one of the remaining three is a UK national programme which a Structural Funds project has mimicked. This has led to some debate around the direction of influence between EU and Welsh policy initiatives; with some arguing that EU policies actually had a more significant influence on Welsh policies: "All the programmes that they wanted and that they delivered to move the Welsh economy forward were all based on programmes funded by the European funds" (HE3).

However, officials in Wales also contend that although this was the case in the past it is now expected that the Structural Funds will be strategy-led and follow the policy of the Assembly, albeit within the confines of the relevant Regulations. In this respect it is argued that A Science Policy for Wales has been influential in shaping the actions of the Strategic Framework and the Convergence Programme.

The influence of EU R&D instruments on regional economic strategy thinking is certainly evident, although it has been slow in emerging and exhibits a degree of ebb and flow. Most respondents would agree with the observation that "the Structural Funds are now more embedded than they were right at the beginning" (PM1). A sentiment which might also be extended to the Framework Programmes. Equally, the use of these instruments to support the R&D objectives of our case study regions has strengthened over time, with a particular emphasis in recent years. As another respondent commented: "It's a late player, a realisation that we need to build the Structural Funds into R&D" (RG2).

It is difficult to identify any particular causality here in terms of the direction of influence. For some, the increasing R&D focus of regional strategies has developed in parallel with that of the EU, with many actions already underway prior to publication of the Lisbon agenda. Here, regional respondents feel that they use the Lisbon agenda to provide an added legitimacy, demonstrating how their actions fit within a wider policy context: "What we have said is the RES is the response to the Lisbon agenda" (RG10).

For others though the importance of the European policy agenda in driving forward the R&D dimension to the Structural Programmes in the regions is unquestioned, reflected in statements such as "Lisbon really raised the game" (HE1) and "prior to (the Lisbon agenda) R&D was not given the same priority" (RG3). What is undisputable is that EU instruments have had a significant impact on practice in all three case study regions, although the EU itself is not always evident as the source, as suggested by one respondent from Wales: "The EU had a huge influence on policy, partly in terms of money, in terms of setting key agendas, targets and influences....(but) you take it for granted by the time it reaches Wales level thinking" (RG1).

5.7 The planned use of EU R&D instruments in the regions

Of the two instruments that are the focus for this study, it is only the Structural Funds that has an explicit territorial dimension. Consequently, the manner in which the Structural Funds are used in each of the case study regions varies depending upon the choices made by a partnership of stakeholders within each region. The Framework Programmes apply in a common format across all three regions. The following section briefly outlines the principal content of the Structural Fund programmes operating in each of the three case study areas between 2000 and 2006, with a focus on the planned level activity in the field of RTDI. Not only does this indicate the level of importance attached to such activities at the outset of the programming period, it also sets the scene for the following chapters which examine what actually occurred in each area over this period.

5.7.1 R&D in the EU SF programmes in the East of England

5.7.1.1 History

Owing to the general economic well-being of the region, the East of England has not benefited substantially from support from the EU's Structural Funds. Prior to 2000 some rural parts of the region were eligible for support from Objective 5b, in order to support restructuring of the rural economy. The area eligible for support was extended in 2000 to

include parts of Luton on the basis of the levels of unemployment and economic deprivation in the city. The resulting Objective 2 programme area was extremely diverse in terms of its characteristics and was also geographically disjointed. The region had some experience of previous EU RTD initiatives through its participation in the RIS/RITTS Innovative Actions programme of the EU between 1994 and 1999, developing a RITTS strategy for the region which reported in 1999.

5.7.1.2 The 2000-2006 programme

The Objective 2 programme provided around £101m of grant support through the ERDF marshalled around three priorities:

1. Support for SME Creation, Growth and Development
2. Developing Key Locations, Clusters and Sectors
3. Community Economic Regeneration

The Programme was unique in the UK, and distinctive across the EU, in that it contained no provision for expenditure on RTDI (FOI 18) in the original programme document or subsequent revisions. That is not to say that R&D issues were not recognised in the programme. One of the issues identified for the programme area, in supporting the RES aim to be the 'Innovation Capital of Europe' was that links with the Region's R&D base and growth areas were underdeveloped (GO East 2004 p146). The Programme also identifies that "Technology transfer could be actively strengthened as could R&D partnerships" (GO East 2004 p.140) and that such actions are of 'high relevance' to the programme area. It was anticipated that Priority 1 would help to address this including access to the research and science base through developing "links between SMEs and colleges, universities and research and innovation centres in the region" (GO East 2004 p.167), but this was not carried through in practice.

References to the EU's Framework Programmes are restricted to standard tables listing EU and national programmes which might be of relevance to the Objective 2 programme.

Tellingly, in the 2005 revision of the Programme, these tables continue to refer to FP5 (1998-2002) rather than FP6 (2002-06).

5.7.1.3 Other related programmes in the Region

Between 2002-03 an innovative actions programme was undertaken in the region. Known as CRISS (Creating Regional Identity by Sharing Success), the project secured some €2.3m of ERDF grant for the region from DG Regio. In practice CRISS focused on stimulating business-led innovation through seeking to:

- Link business in the region's Objective 2 area to the region's 'centres of excellence'
- Connect businesses in the Objective 2 area to sources of advice and support
- Promote business to business networking

This focus met the needs identified in the SPD to bring knowledge into the Objective 2 area but which were not carried through into the activities of the programme in practice. The CRISS programme is not considered further in this research but it is interesting to note that it had no profile in the regional interviews undertaken for this study.

5.7.2 R&D in the EU SF programmes in Yorkshire and Humber

5.7.2.1 History

The region has had a long history of support from the EU's Structural Funds owing to its legacy of industrial restructuring and rural development needs. However, the 1999 programme was the first occasion that part of the region was eligible for support under Objective 1, reserved for the most disadvantaged regions in the Union, following a steady decline in its economic prosperity since 1979. Prior to 1999 the region received support under Objective 5b and Objective 2 of the Structural Funds.

The region was also one of three in the UK (and 26 across the EU) to participate in the RIS/RITTS pilot actions programme which sought to pilot the development of Regional Innovation Strategies/Regional Innovation and Technology Transfer Strategies across the EU. Developed in 1995 the Yorkshire RIS aimed "To create a region where individuals and organisations are prepared, and able, to be innovative" (Yorkshire Forward n.d).

5.7.2.2 The 2000-2006 programmes

Between 1999 and 2006 the region was eligible for support under both Objective 1 and Objective 2 of the Structural Funds. South Yorkshire, with an average GDP per capita of less than 75% of the EU average qualified for support under Objective 1, whilst a swathe of West Yorkshire and of Humberside qualified under Objective 2 owing to high levels of unemployment and economic difficulties.

The South Yorkshire Objective 1 Programme planned to invest more than £770m of ERDF and ESF grant support between 2000 and 2007 through 6 widely ranging priorities (Table 5.5). The region's Objective 2 programme was valued at some £350m of EU grant support. It was strongly orientated towards supporting entrepreneurship and business development, with three of the five Priorities emphasising this dimension (Table 5.5).

The Objective 1 programme places a relatively strong emphasis on supporting investment to stimulate levels of R&D and innovation. Support for R&D activities is largely focused within Measures 1 and 4 of Priority 1 and, to a lesser extent, Measure 7 in Priority 2 (Figure 5.5) although there was provision for RTDI support to be included in two other Measures of the programme as well. Measure 1.4 was focused upon attracting inward investment and was intended to support investments in large companies, a provision for which the programme had to obtain a derogation from the EU in order to comply with State Aid regulations. It was the only programme in the UK to seek to support large companies in this manner.

Table 5.5 Yorkshire and Humber Programme Priorities

Objective 1	Objective 2
1. Stimulating the emergence of new growth and high technology sectors 2. Modernising businesses through enhancing competitiveness and innovation 3. Building a world leading learning region which promotes equity, employment and social inclusion 4. Developing economic opportunities in targeted communities 5. Supporting business investment through strategic spatial development 6. Providing the Foundations for a Successful Programme	1. A new entrepreneurship agenda 2. Bringing down barriers to competitiveness 3. Supporting community-led economic and social renewal 4. Capturing the employment benefits of diversity 5. An Objective 2 Investment Partnership

Source: adapted from Objective 1 SPD and Objective 2 SPD

Figure 5.5 Measures with RTD coverage in the Objective 1 Programme (2000-06)

P1 M1	Exploiting a business centred research capacity
P1 M4	Attracting growth sector champions
P2 M7	Accelerating the adoption and transfer of new technologies, products and processes
P4 M20	Building neighbourhood strength
P4 M23	Regenerating targeted coalfield and steel areas

Source: Objective 1 SPD South Yorkshire

The programme built strongly on past experience. It sought to mainstream the lessons emerging from the RIS and also took into account the findings of the ex-post evaluation of the 1994-96 and 1997-99 Structural Fund programmes in the region, which found the low proportion of funds allocated to technology and innovation to be 'surprising' (cited in the SPD). The programme documentation makes strong reference to the role of R&D in economic development and the need to take advantage of the opportunities offered by the strong levels of university R&D undertaken with South Yorkshire: "Within South Yorkshire there is a need to unlock the strong research potential our universities have and create a platform for market-led/oriented research and innovation" (GOYH 2003 p.350). The emphasis is on exploiting the R&D capacity within the region (GOYH 2003 p.13) and to develop a competitive and dynamic knowledge based economy through sector-

specific innovation by "enhancing take up and embedding innovation and through industrially-based R&D in terms of commercialization of new R&D and exploitation of intellectual property" (GOYH 2003 p.350). Within the programme document there is just one reference to the EU's Framework Programmes, although this does recognize the need to "include efforts to fully exploit.... participation in the EU RTD programmes" (GOYH 2003 p.14).

Within the Objective 2 programme there is a recognition of the region's weak level of investment in research, technological development and innovation. In seeking to address this, the ex ante evaluation states that the SPD has sought to build on the lessons of the 1994-1999 programmes and integrate technology and innovation throughout the programme. In consequence there is no single measure dedicated to RTDI although the SPD does state that the programme has drawn heavily from the EU theme of investment in research, technology and innovation (GOYH 2004 p. 260) and acknowledges the importance of creativity, innovation and technology in stimulating economic development in the programme area.

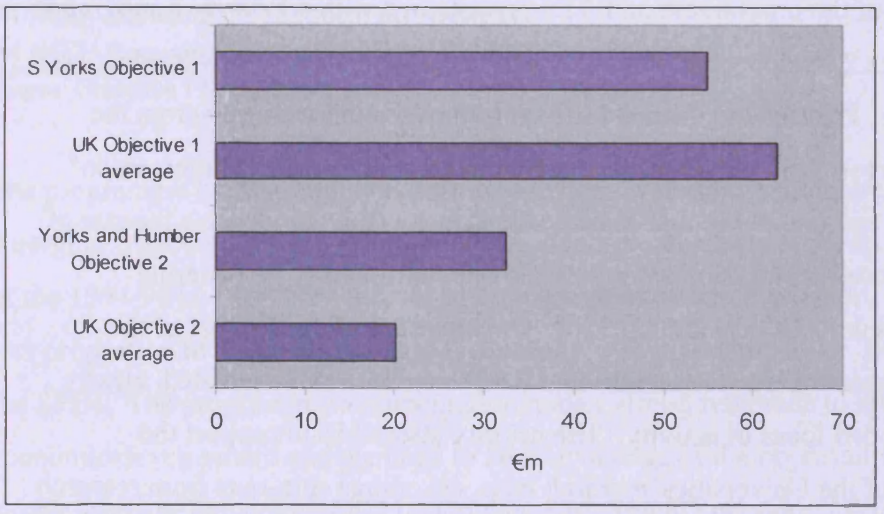
The principal focus of the programme on RTDI is contained within Priority 2 and, more particularly, Measure 2 (Helping Businesses Adapt to the demands of New Product and Process Innovation). Priority 2 is intended to "act to turn around what is, across the region as a whole, a low (and reducing) investment in business R&D and innovation" (GOYH 2004 p.12) and one of the four aims of the Priority is to "to increase the rate of new product and process innovation among employers, particularly by fostering academic/industry links" (GOYH 2004 p.356). One measure of the success of the Priority will be the amount (£) of net additional R&D spend in SMEs assisted, clearly illustrating the intended focus of activity. The priority also seeks to support the commercialization of the Universities' research base, encourage spin-outs from research establishments in the region and improve business and higher education links (GOYH 2004 p.350). The programme also recognises that existing technology transfer in the region is rarely through HEIs or research institutes (GOYH 2004 p.59) but contains no explicit element to address this. There is no mention in the SPD of the EU's Framework

Programme, even in the widely ranging policy context, nor in the Programme Complement.

5.7.2.3 FOI expenditure plans

Across Yorkshire and the Humber, some €90m of ERDF grant was planned to be invested in RTDI activities under the various codes covered by FOI 18. Almost two-thirds of this (€58m) was planned to be invested through the Objective 1 programme, an increase of some 5% on the original amount planned at the outset of the programme in 1999. This was a little less than the average for UK Objective 1 programmes as a whole, both in value (Figure 5.6) and as a proportion of overall activity (4.7% of total programme activity compared to the UK average of 6.2%). In contrast, the €33m planned in the Objective 2 programme was higher than the UK average for Objective 2 programmes, both by value and as a proportion of overall programme activity (6.3% vs 5.8%).

Figure 5.6 Planned levels of expenditure on RTDI in Yorkshire and Humber (2000-2007)



Source: Adapted from EU data sources (2005)

As Table 5.6 illustrates, planned investments in both programmes focused on supporting innovation and technology transfer activity, and the establishment of networks and partnerships between businesses and/or research institutes (FOI 182), with the Objective

1 programme also planning to make investments in support of RTDI Infrastructure (FOI 183). There were no investments planned under FOI 181 (research projects based in universities and research institutes) under either programme.

Table 5.6 Planned investments by FOI 18 code (€m)

FOI	*Objective 1*	*Objective 2*
181		
182	36.9	32.6
183	20.9	

Source: Adapted from EU data sources (2005)

5.7.3 R&D in the EU SF programmes in Wales

5.7.3.1 History

Wales has a long history of support from the European Structural Funds. Between 1988-1993 and 1994-1999 the area known as Industrial South Wales, broadly an area encompassing Cardiff, the Valley communities and Swansea, was eligible for support to overcome the problems of industrial decline and restructuring (from Objective 2 of the Structural Funds), whilst rural Wales was eligible for support (from Objective 5b) to promote rural development and the restructuring of the agricultural economy.

There is also a long history of support for the promotion of innovation through EU programmes in Wales. In 1993 Wales was one of four regions from across the EU initially selected to undertake a pilot project Regional Technology Plans in support of regional development. The initiative was launched in 1994 and an Action Plan was published in 1996. Several of the ideas proposed in the Action Plan were included within the Industrial South Wales Objective 2 Programme for the period 1997-1999, although a lack of funding for the implementation of the Action Plan was seen as a problem both by those involved at the time and subsequent evaluators (Boekholt et al 1998).

5.7.3.2 The 2000-06 programmes

The change in the NUTS 2 boundaries in 1998 brought significant changes to the Structural Fund landscape in Wales. For the programming period 2000-2006 West Wales and the Valleys was eligible for support under Objective 1 of the Structural Funds, owing to the fact that its GDP was less than 75% of the EU average. This brought some £1.28bn of European funds into the region. Parts of East Wales were also eligible for ERDF support from Objective 2 of the Structural Funds, owing to their high levels of unemployment and the economic restructuring underway. The programme area itself was discontinuous, connecting eligible wards throughout the NUTS 2 area. The Programme was also quite small totalling some £90m in EU grant support.

The Objective 1 programme identified 6 Priority areas for investment through the ERDF (Table 5.7) and the smaller Objective 2 Programme focused on 3 Priorities.

Table 5.7 Wales Programme Priorities

Objective 1	Objective 2
1. Expanding and developing the SME base 2. Developing innovation and the knowledge-based economy 3. Community economic development 4. Developing people 5. Rural development and the sustainable use of natural resources 6. Strategic infrastructure development	1. Developing sustainable and competitive SMEs 2. Sustainable rural development 3. Urban community regeneration

Source: WEFO (adapted from Objective 1 SPD and Objective 2 SPD)

Whilst both programmes contained the provision to support activities in the area of research, technology, development and innovation only the Objective 1 Programme contained a specific Priority dedicated to this (Priority 2 in Table 5.7); with the stated objective of increasing investment in R&D in Wales. In contrast, in the Objective 2 Programme, R&D support was part of more general business support measures; leading to some confusion as to the extent to which R&D was included, as demonstrated by one

official of the WAG who stated with conviction: "Objective 2 doesn't have any R&D" (PM1). When challenged on this, given the monitoring returns, the official agreed that there were pockets of activity scattered throughout the programme, but no particular focus on R&D. Rather the emphasis was held to be on innovation.

Within Priority 2 of the Objective 1 Programme, two Measures specifically targeted R&D and innovation (Measure 3 (ERDF) and Measure 4 (ESF)), although RTDI investments were not restricted to just these Measures. The relative importance attached to R&D and innovation can be ascertained from Figure 5.7 below and by the fact that Measure 3 was the highest value Measure in the whole Objective 1 Programme (PM1).

Figure 5.7 Priority 2 Measures of the Objective 1 Programme

Measure	*ERDF £m (2000-06)*
1. ICT Infrastructure	16
2. Stimulate and support demand for ICT (also known as 'Developing the knowledge-driven economy')	58
3. Support for the development of innovation and R&D	92
4. Skills for innovation and technology	26 (ESF)
5. Clean energy sector development	36

Source: adapted from WWV Objective 1 Programme Complement

Low levels of R&D in the region lie at the heart of the rationale for Priority 2 of the Objective 1 programme. This it argues, based on the Wales Regional Technology Plan (WDA 1996), is one of the factors underlying disparities in prosperity between regions in Europe. The programme thus sees a strong R&D base as an "essential feature in the development of a successful and modern economy" (WEFO 2004a p. 206) with the challenge being "to use Objective 1 to increase the region's innovation capacity and R&D base" (WEFO 2004a p.207). In meeting this challenge Priority 2 seeks to diversify the economic base by growing more technology and knowledge driven firms and improving the links to the knowledge base. The approach taken in Measure 3, which builds on the original RTP framework (WEFO 2004a p.295), emphasises the need to "build on the successful work underway at HEIs and FE colleges and develop wider networks and leading edge research activity in the region to provide a world class technology support

framework" (WEFO 2004a p.295). Amongst the aims of the Measure the following three are particularly pertinent:

- Develop long term R&D capacity in the region.
- Increase competitiveness through improved linkages between the academic base (HE & FE Sectors) and businesses and enable academic institutions to fully integrate themselves into the economic life of the region.
- Support the development of networks and clusters of technology based companies and allow further exploitation of research.

Although Measure 3 is intended to primarily be a revenue measure (WEFO 2004a p.295), the range of possible activities to be supported across the programme is comprehensive, with a strong focus on increasing levels of R&D expenditure, particularly when the additional actions highlighted in the policy context update for technology/innovation following the mid-term review of the programme are included. The updated Programme is also unusual in that it contains two very explicit references to the Framework Programmes stating that (on pages 128 and 296) "There is additionally a need to consider the co-financing of Research and Technological Development projects part financed by the 6th FP" (WEFO 2004a). This refers to the Bonus arrangements introduced for Objective 1 programmes (European Parliament and Council Decision No1513/2002/EC). However, this is the only reference to the Framework Programmes in the SPD.

The Objective 2 programme also stresses the importance of a strong R&D base, echoing the Objective 1 programming in describing it as an "essential feature in the development of a successful and forward thinking economy" (WEFO 2004b p.156). In acknowledging the current low level of R&D activity in Wales, and the weaknesses that contribute to this, the strategy recognises the importance of investing in R&D (WEFO 2004b p.156) and seeks to promote the use of innovation and R&D and to support the creation of technology based businesses in the R&D sector (WEFO 2004b p.142). This leads to the stated aim of Priority 1 to "embed a culture of innovation, R&D and technology transfer to enhance the competitiveness of the region" (WEFO 2004b p.9). However, whilst the strategy quotes the need to "increase knowledge, research and development and

innovation capacity in all parts of the Welsh economy" (WEFO 2004b p.156) as part of the rationale for Priority 1 a reading of this Priority indicates that the focus of activity is clearly intended to be on SMEs. There are no references in the SPD to the EU's Framework Programmes.

5.7.3.3 FOI 18 expenditure plans

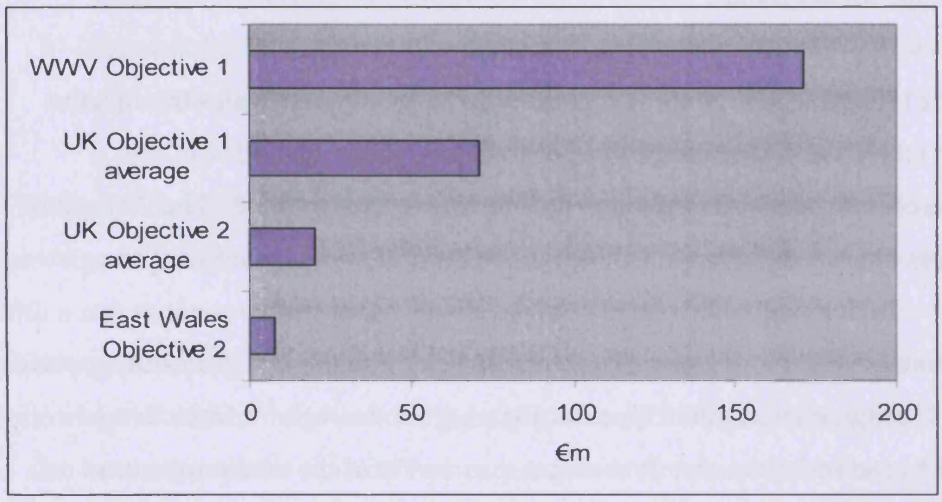
Overall, almost €180m of ERDF grant was planned to be invested in Wales through the Objective 1 and Objective 2 Structural Fund programmes. More than 95% of this (€171m) was planned to be invested through the Objective 1 programme. The Objective 2 programme was much smaller, approaching some €8m.

The €171m planned expenditure under the Objective 1 Programme is significantly greater than other ERDF programmes in the UK, even allowing for the region's Objective 1 status (Figure 5.8) and relative scale. It constitutes some 8% of the total programme value which comfortably exceeds the average for other ERDF programmes in the UK (6%). This proportion further increased as revisions to the programme led to the amount of funds planned to be spent on RTDI rising by 13% by 2005, comfortably exceeding the average increase for UK ERDF programmes of 3%. Similarly the proportion of the East Wales Objective 2 programme intended for R&D, technology and innovation also exceeded the UK average (7%) although the overall amounts were relatively low owing to the small size of the programme as a whole. However, by 2005 planned levels of expenditure had been reduced by around 6%, compared to a corresponding increase of some 3% across UK ERDF programmes as a whole.

As Table 5.8 illustrates, the Objective 1 programme planned to make investments under all three of the primary FOI 18 codes, with the Objective 2 programme planning investments in two of these. Unusually for the UK both programmes planned relatively strong levels of support for research projects (FOI 181). This was matched by an equivalent value in both programmes targeted towards the establishment of networks and partnerships between businesses and/or research institutes (FOI 182). The Objective 1

programme also planned to support investments in RTDI infrastructure (FOI 183). Whilst the values planned were lower than the other two categories of assistance it was proportionately greater than was generally the case across the UK. The Objective 2 programme made no provision for such investment.

Figure 5.8 Planned levels of expenditure on RTDI in Wales (2000-2007)



Source: Adapted from EU data sources (2005)

Table 5.8 Planned investments by FOI 18 code (€m)

FOI	*Objective 1*	*Objective 2*
181	63.7	38.9
182	63.6	38.9
183	44.0	

Source: Adapted from EU data sources (2005)

5.8 Governance of EU programmes in the regions

Four sets of actors are crucial in the governance of European programmes. There is the European policy dimension, comprised of the European institutions, most notably the European Commission and the European Parliament. There is the national policy dimension, comprised of relevant departments of UK central Government. There is the regional scale, comprising the Devolved Administrations and the regional governance

bodies of England. And, finally, there are the institutions that implement the projects funded by the different instruments.

Within the UK, different governance arrangements prevail for the Structural Funds and the Framework Programmes. Whilst the latter is managed directly by the European Commission, through DG Research, the former has a more decentralized governance structure, with a stronger role for regional and local authorities and other regional partners.

5.8.1 Structural Fund governance arrangements

The Structural Funds are delivered through multi-annual strategies known as Single Programming Documents (SPD) or Operational Programmes (OP). Within the UK these are territorial strategies, with one SPD being written for each area eligible for support from a particular Objective within a region. The strategies are written by regional partners and reflect regional objectives within limits set by national and European regulations and guidelines with respect to the types of actions that are eligible for support.

At the European level, responsibility for the ERDF lies with DG Regio of the European Commission. DG Regio leads on the negotiation of the Regulations governing the content of the Structural Funds. Within the UK, these negotiations were led by the DTI (now known as BERR) which, in consultation with other Government Departments, is responsible for co-ordinating UK policy on the Structural Funds. DG Regio also negotiates on the content of the individual programming documents prepared by regional partnerships and submitted to the Commission by the UK Government.

Responsibility for the day-to-day administration of the ERDF is delegated to the Devolved Administrations in Wales, Scotland and Northern Ireland and, up to 2007, to the Government Offices for the Regions in England. From the beginning of 2008 responsibility for the day-to-day administration of the Funds in England was transferred

to the RDAs, although the Department for Communities and Local Government (CLG) retains overall legal responsibility for the dispersement of the ERDF in England. Within Wales the Assembly Government is able to negotiate directly with the European Commission on matters relating to the implementation of the Structural Funds in Wales, although the UK Government retains overall responsibility for EU policy.

Each programme is managed by a Programme Monitoring Committee (PMC) which monitors the delivery of the programme according to the strategy set out in the SPD, particularly the expenditure plans. The PMC is chaired by the Government Office (RDA post 2007) and consists of individuals drawn from relevant bodies within the programme area. In general this includes those with experience of local authority and regional government, environmental and social bodies and the private sector.

The PMC is supported by a full-time secretariat. In Wales one secretariat, WEFO, was responsible for the delivery of both the Objective 1 and Objective 2 programmes. Since 1999 WEFO has been part of the Welsh Assembly Government and prior to this it was part of the Welsh Office. In Yorkshire and Humber a separate secretariat operated for the Objective 1 and Objective 2 programmes. Whilst both were part of the Government Office of Yorkshire and the Humber the Objective 1 secretariat was located in a separate office within the Objective 1 area and the Objective 2 secretariat was located in the main Government Office accommodation in Leeds. Similarly, in East of England the secretariat for the region's Objective 2 programme was based in the Government Office building in Cambridge, even though Cambridge itself did not form part of the area eligible for support.

Finally, eligible organizations are able to apply to the programme secretariat for funding to undertake projects that help to deliver the aims of the SPD. Project applications are assessed by the secretariat and approved or rejected by the PMC. The actual approval process is one of competitive bidding with no projects guaranteed to receive funding. The actual implementation of the programme is, though, firmly within the control of the

regional partners, within the constraints set by EU rules and regulations and any relevant national criteria applied.

5.8.2 Framework Programme governance arrangements

The Framework Programmes are managed directly by the European Commission through DG Research. DG Research publishes calls for proposals and eligible bodies apply directly to the Commission in response to these calls. Within the UK, there are a series of National Contact Point funded by the UK Government to support prospective applicants and, in some regions, additional support is also offered, or has been in the past. Within Wales the Wales Innovation Relay Centre (WIRC), part of the Welsh Assembly Government is able to offer advice and support to organizations based in Wales. Within the English case study regions there has been no comparable structure for advice or support, although, in the East of England, some advice is offered by the relevant Innovation Relay Centre located at St. Johns Innovation Centre in Cambridge. Companies and research bodies can also make use of the specialist advisory services funded by DIUS (formerly the DTI).

5.9 Conclusions

Although this has been a highly descriptive chapter, setting the scene for the analysis of material in later chapters, it is worth reflecting on some of the messages emerging. Certainly, the case study regions provide a good mix of different circumstances through which to explore the practical and theoretical aspects of the use of EU R&D instruments in the UK's regions and their influence on policy thinking. Together the three regions offer rich opportunities for comparison and contrast across a range of different variables. On the one side the three regions cover a broad spectrum of economic conditions from the strengths of the East of England economy through to the weaker performance of Wales and, to a lesser extent, Yorkshire and Humber. Each of the regions also exhibits the importance of historical economic structures in shaping their present performance, suggesting that the role of path dependency highlighted in Chapter 3 is indeed significant.

This enduring legacy of past investment decisions can also be witnessed in the level of existing R&D activity in each region, where the stronger institutional capacity of the East of England, particularly in terms of Public Sector Research Establishments, is a clear factor in the stronger level of activity in this region. Yet, the figures also suggest that the weaker level of business expenditure on R&D in Wales and Yorkshire and Humber is not only due to their industrial structure but that wider factors are also at work. This raises an important question as to how to policy makers may choose to address this question.

Finally, strong comparisons and contrasts can also be drawn at the governance level. The two English regions have benefited from the devolution of economic responsibility but with no devolution of political power, resulting in a complex mix of responsible authorities. In contrast, Wales has an elected Assembly with a limited devolution of political power to complement the long-standing responsibilities for economic development devolved to national authorities. This variety, coupled with the variations in EU governance arrangements, across both the Structural Funds and the Framework Programmes, together with the differential responsibilities regarding the science and economic development policy fields suggests that there is much mileage in the Type II model of multi-level governance proposed by Hooghe and Marks (2003).

The influence of these arrangements on the shaping and delivery of policies on the ground is a central question for this study. The gradual devolution of responsibilities and, in some instances, power for particular policies to the regional level throws this question into sharp relief especially where it is the process of governance that is emphasized rather than the particular institutions, where governance is taken to be the "process through which public and private sector actions and resources are co-ordinated and are given common directions and meanings" (Peters and Pierre 2002 p.6). How such co-ordination comes about what provides common direction and meaning are thus important considerations for this study. This is not to underplay the role of institutions, but instead stresses that their importance is due to their role as actors in the process rather than due to any intrinsic value of particular institutional forms.

The different economic contexts and governance responsibilities are visible within the economic strategies developed for each region. Yet these strategies also display strong similarities suggesting that the different contexts play a modest role in the strategy development process. Not least is the centrality of the narrative emphasising a competitive economy and the role that R&D investment can play in securing this for the future. This narrative is strongly based in the literatures of new economic growth theory outlined in Chapter 3 and, at least implicitly, theories of evolutionary economics. It provides a strong framing discourse for the strategies and the practices espoused.

Within the East of England the narrative is expressed in terms of playing to the identified strengths of the region, whilst in the less-prosperous economies of Wales and Yorkshire and Humber the need to stimulate higher levels of R&D within their regional economies receives a strong emphasis. There is a clear assumption that this will assist in delivering long-term economic growth, although the mechanisms through which this will occur is not made clear. The language of the various strategies is instructive, particularly those of Wales, which speak of innovation and science 'deficits', suggesting that there is a certain level of activity to be secured within the region but which is yet to be realised. This same narrative is equally firmly embedded within each of the Structural Fund programme documents considered.

As the various regional strategies have developed over time there has also been a strengthening of the inclusion of different European themes which reflect the broader narrative of competitiveness with an emphasis on innovation, enterprise and business development. In particular this relates to the so-called 'Lisbon strategy', to which there are a myriad of references. On first sight this might be seen to suggest a rising influence of EU policy making. However, whether this is so, or simply reflects the use of a particular rhetoric to gild the actions to be undertaken in practice remains to be seen. As Chapter 3 identified, there is a difference between the shaping of policy in practice and the design of policy frameworks: a topic to be explored further in the coming chapters. Furthermore there appears to be something of a trend in the degree to which certain

themes are recognised within different policy documents suggesting that at particular times certain policy areas are more visible than others, or that a degree of rent-seeking behaviour may be at play. A particular example of this can be seen in the case of Structural Fund financing allocations in Wales, whereby a national strategy was apparently developed primarily as a framework for future Objective 1 activity in a sub-national area.

The consideration of particular EU instruments within different strategy documents varies, both by instrument and by region. On the whole references to the Structural Funds are relatively common, although rarely with specific reference to their use for R&D purposes. Perhaps naturally, these references tend to be strongest in those areas where Structural Fund receipts are the greatest. In contrast the Framework Programmes have very little visibility, with explicit references notable as an exception rather than a rule and, generally, only making an appearance in more recent documents. It appears that the Framework Programmes do not have the same political capital as the Structural Funds, or that they are not regarded as an instrument related to economic development activity in the region. Certainly, the fact that the region does not have an allocation of funds, as is the case with the Structural Funds, appears to be one reason for their invisibility. What this tells us about the policy making process will be explored further in the forthcoming chapters.

What is also noticeable is that this invisibility extends into the EU Structural Fund programmes developed in each region. Where linkages are made these emphasise the opportunity to draw-down additional funds, rather than other potential benefits. There appear to be two parallel worlds of EU-financed R&D activity which may (or may not) complement each other but are not consciously drawn together in policy thinking. This apparent policy divide offers rich potential for further analysis, and may support Healey's contention (2007) that the search for policy integration involves 'imagining' what to link, integrate and join up. Where policies or instruments are not seen to be relevant or their role cannot be imagined then they are, perhaps, more likely to be overlooked or ignored.

This challenge to the imagination may also be supported by the apparently different perceptions as to what constitutes R&D and what constitutes innovation, with the Framework Programmes seen as addressing the former and the Structural Funds the latter. This certainly seems to be the case for the Objective 2 Structural Fund programmes and may reflect a focus by Structural Fund programmes on the knowledge using circuits of regional innovation systems rather than those which are knowledge producing (Cooke 2005). If this is the case then it suggests that the manner in which policy concepts and issues are 'imagined' (Healey 2007) is fundamental to the manner in which policy is shaped and delivered. If so this raises the question as to how actors 'see' the relevant territorial spaces and policy concerns; again this shall be explored in the forthcoming chapters.

In exploring the notion of policy imagination and the role of perceived spaces in shaping this (Healey 2007) the Structural Fund programme areas provide a valuable testing ground. It is readily apparent though that these are artificial spaces based around particular statistical criteria rather than any functional reality. In the case of Wales, where the NUTS 2 area defining the Objective 1 programme has no other political, administrative or cultural significance, this is even more so. How such spaces influence behaviour, attitude and the perception of territorial areas provides a rich vein for exploration. This is even more so when the Framework Programmes are considered, which on the one hand transcend these defined spaces but on the other are embedded within them.

Finally, the case studies provide a certain insight into the process of policy learning and how this can be spatially and temporally defined. The development of the different Structural Fund programmes illustrate the importance of past experience, suggesting that a degree of learning is occurring within the policy communities but that this is contingent on other factors and that policy documents evolve incrementally. In Wales, the Objective 1 programme clearly built upon the experience gained through the preceding Regional Technology Programme and which was embedded in national policy thinking. This provided a strong impetus to the inclusion of R&D-related activities in the new

programme for 2000-2006. In contrast there was a less embedded tradition of such policy activity in Yorkshire and Humber with the consequence that activity in the South Yorkshire Objective 1 programme was less focused on RTDI measures than was the case in West Wales and the Valleys.

The following chapter provides the basis for subsequent analysis by identifying the pattern of activity actually realised through the EU's R&D instruments in each of the case study regions. This also serves to answer the very particular question as to 'who gets what?'.

6. EU FUNDED R&D ACTIVITY IN THE REGIONS: PATTERNS AND PROCESSES

6.1 Introduction

This chapter addresses the central research question of 'who gets what and why?'. This is the first time that this question has been examined at the regional level in the UK for both the EU's Framework Programmes and the Structural Funds. The approach adopted has been to examine the broad pattern of actual expenditure within each region, to identify the principal activities undertaken through these programmes and which organisations were the main recipients of funds.

The approach taken divides into two main parts. Sections 6.2, 6.3 and 6.4 compare the level of actual expenditure in each region on R&D activities; identifies the types of projects undertaken using these funds, and sets out which organisations have received the funds available. This is followed by a short assessment of the extent to which actions funded through the Structural Funds and the Framework Programmes have been used to complement each other, as is advocated by the policy frameworks introduced in Chapter 4.

Section 6.6 then takes a more reflective stance and addresses the question of why this is so. It considers the reasons for the similarities and differences observed: both between the three regions but also by type of Structural Fund programme. It is instructive that there are as many similarities and differences arising in practices between the Objective 1 and Objective 2 programmes as there are between the case study regions. These observed patterns provide a strong basis on which to construe the role of policy spaces and imagined narratives in shaping behaviour, as well as the nature of regional innovation infrastructures.

6.2 Overall level of activity

Overall, in the programming periods 2000-2006 (Structural Funds) and 1998-2006 (Framework Programmes), EU instruments have invested significant resources in RTDI capacity in our three case study regions. On best estimates these range from more than £400m in the East of England to almost £200m in Wales (Table 6.1). This difference is partly related to the relative scale of each region, per capita receipts are more similar equating to around £72 per person in the East of England and £65 per person in Wales, although at £45 per person Yorkshire and Humber has benefited much less. It also reflects the existing R&D capacity of the region, particularly with respect to receipts from the Framework Programmes and the choices made in each region, especially with respect to the use of the Structural Funds. How these choices come about is an underlying theme throughout this thesis.

Table 6.1 Estimated actual grant receipts for R&D-related activities

	*Structural Funds (2000-06)**	*Framework Programmes (1998-2006)***	*Total*
Wales	£125m	£70.4m	£195.4m
Yorkshire and Humber	£48m	£185.5m	£233.5m
East of England	£3m-£12m	£401.7m	c.£408m

Sources: *Estimated (see Section 2.7.4.3), **DIUS 2008

As Table 6.1 demonstrates, the balance between the level of activity financed by the Framework Programmes and the Structural Funds in these three regions is very different. The Framework Programmes are dominant in the East of England and Yorkshire and Humber but the Structural Funds are most significant in Wales. It can be anticipated that this will influence the nature of the activity undertaken in each region. The dominance of Framework Programme receipts in the East of England and Yorkshire and Humber is also notable given the limited recognition accorded to this instrument, in comparison to the Structural Funds, in the respective economic strategies of these regions.

6.2.1 Structural Fund activity

In terms of actual practice it is apparent that there is a strong variation in the level of expenditure recorded between different programmes, with a distinction to be drawn between the Objective 1 programmes and the Objective 2 programmes. It is also clear that levels of actual expenditure on RTDI activities are very different from those initially planned.

In Wales the Objective 1 programme dominates the landscape, providing some £123m of grant investment into 59 projects. As Table 6.2 shows, this approximates to some 10% of overall programme spend (and 15% of ERDF spend) and is remarkably close to the level of activity planned at the outset of the programme; representing a significant level of investment into the R&D capacity of the Objective 1 region. The support provided by the Objective 1 Structural Fund programme in Wales is widely acknowledged and is credited with being of significant value to the region, as reflected in comments such as: "In our region, hugely, hugely, hugely significant" (HE4) and "I think they're probably crucial" (Int1).

In contrast, there has been much less activity under the Objective 2 programme, the reasons for which are more fully explored in Section 6.5 below. Approximately six projects, totalling some £1.8m (€2.5m) of EU grant funding, were focused on R&D related activities. This is just a quarter of the amount anticipated at the outset of the programme.

Within Yorkshire and Humber the Objective 1 programme is again the more significant source of activity, although it is less commanding than was the case in Wales. In total at least 48 R&D-related projects with an overall grant value of some £36.6m (€51.2m) were financed between 2000 and 2006. This is close to the planned level of expenditure on RTDI reported in Chapter 5 (Table 6.2) and Chapter 7 will examine the factors influencing this. At around 5% of programme value this is somewhat less, both in

relative and absolute terms, than in Wales but equates to the proportion planned at the outset of the programme.

In the case of the Yorkshire and Humber Objective 2 programme some 18 projects have at least partly addressed aspects of R&D-related activity, although in only eight cases is the project entirely focused on RTDI activities. The value of the recorded ERDF grant on RTDI-related activity is some £11.4m, which is just half the planned level of €33m. Again, there is a similar picture here to the Objective 2 programme in Wales which will be explored further in Chapter 7. Whilst there is some evidence that RTDI expenditure was an important component of the Objective 1 programme this is less clear in the case of the Objective 2 programme. As the Objective 2 secretariat acknowledges R&D-related expenditure was not a significant feature in the programme: "They play a very, very minor role in Objective 2" (PM2).

The East of England Objective 2 programme differs from that of Wales and Yorkshire and Humber in that no spend was planned on R&D-related activities under the programme and none has been officially recorded. However, some six projects have been identified which are potentially R&D-related; suggesting that the programme has invested between £3m and £12m on RTDI actions (Table 6.2), placing it somewhere between Wales and Yorkshire and Humber in terms of the level of actual grant invested.

Table 6.2 ERDF grant investments in RTDI by programme

	Estimated Actual	*Planned*
Wales Objective 1	£123m	£122m
Wales Objective 2	£1.8m	£5.7m
South Yorkshire Objective 1	£36.6m	£41.4m
Yorkshire and Humber Objective 2	£11.4m	£23.6m
East of England	£3m-£12m	£0

Source: study calculations

6.2.2 Framework Programmes

The most robust records of regional levels of activity financed through the Framework Programmes are available from GO-Science. Whilst there is some debate as to the completeness of these records (see discussion in Chapter 2 Methodology), they are based upon data provided by the European Commission and, if not definitive, can be considered to be strongly representative of the general picture. The data relates to the number of organisations in each region that participated in Framework Programme projects. As many projects involve multiple organisations from the UK, or even the same region, this over-counts the total level of project activity.

Overall, there is a strong regional variation in the level of activity undertaken through the Framework Programmes, with the strongest activity in the East of England and the least in Wales (Table 6.3). A pattern that is consistent during both Framework Programme 5 and Framework Programme 6. From Table 6.3 it can also be seen that, on average, the scale of individual projects in Wales are smaller than the UK average, in contrast to the East of England where they tend to be slightly larger. It is only possible to speculate on the reasons why this might be so but it may reflect the particular type of research projects in which Welsh Universities are engaged (see Section 6.3.3) or, alternatively, it could suggest that the capacity of Welsh universities to engage in large-scale research projects is less than that of the universities located in the other regions.

Table 6.3 Level of Framework Programme activity in the case study regions

	Number of Framework Programme participations (FP5 and FP6)	*Total EC contribution (€m)*	*Average size of participation (€m)*
Wales	576	€98.57m	0.17
Yorkshire and Humber	1183	€259.75m	0.21
East of England	2303	€562.39m	0.24
UK	19819	€4393.8m	0.22

Source: adapted from GO-Science data (provided February 2008)

Levels of activity alone are less informative than if we understand this in the context of overall levels of R&D activity in the region, and other measures of relative scale. As Table 6.4 below indicates, when compared to the stock of businesses in the region, and population size, both Wales and Yorkshire and Humber appear to be slightly under-represented in terms of Framework Programme activity, in contrast to the East of England. This lends credence to the suggestion that it is the absorptive capacity of the economy which underpins overall levels of activity and supports the contention that there is a science 'deficit' within the economically weaker regions.

However, the picture is a little more complex. A comparison of Framework Programme (FP) receipts with levels of R&D expenditure (GERD) illustrates the better than anticipated performance of Wales and Yorkshire and Humber, and the relative underperformance, on this measure, of the East of England. There is clear indication here of the relative importance of EU Framework Programme activity to overall levels of R&D within Wales and Yorkshire and Humber, and, particularly in the case of Wales, the limited level of R&D within the region as a whole.

Table 6.4 Framework Programme activity and other indicators as a proportion of UK totals (% UK)

	FP participations	*FP receipts*	*Business stock*	*Population*	*GERD*
Wales	2.9	2.2	4.5	5.0	2.4
Yorkshire and Humber	6.0	5.9	7.0	8.4	4.3
East of England	11.6	13.0	10.0	9.0	20.1

Source: FP data adapted from GO-Science (op cit); other data sourced from ONS (2007b)

From the research undertaken it is apparent that there is a general lack of appreciation of the value of Framework Programme activity, outside of the East of England. This is particularly true in Wales where there is a broad perspective that "the amount of research funding coming into Wales (through the FP) is abysmal" (HE5). As one WAG official commented, "there is some activity, but it's never been huge" (RG1), a perspective with echoes of the figures produced by GO-Science of the comparative value of FP activity in

different regions (see Chapter 4). Equally, within Yorkshire and Humber there is a perception that the region does not receive a 'fair share' of resources from the Framework Programmes "we don't draw down our fair share of European funds and never have" (RG5). Yet, when viewed against the regions' overall levels of R&D activity (Figure 4.4) this perspective is more difficult to sustain.

Within the East of England there is a stronger recognition of the importance of the Framework Programmes, at least in terms of levels of investment in the region. However, whilst most of those interviewed felt that the Framework Programmes were important to the region, particularly, but not only, with regard to the funds that they bring into the region, one actor counselled caution. He argued that the take-up of funds in the region is not, in relative terms, particularly high, a fact which is borne out in Table 6.4 above, and that where it is taken up by companies or other institutions with existing large levels of R&D expenditure it will serve only to increase the overall level of activity at the margin rather than induce additional benefits.

It is widely recognised that FP activity is very patchy, strong for universities but weak in businesses, a point which is explored further in Section 6.4.2 below. This is particularly because of the low levels of activity by firms – which is ascribed to the time involved and the low chances of success. Even within universities there is a recognition that levels of activity remain below par, with one Welsh official commenting: "They are incredibly important, but it's an area where we can do much, much better" (HE4). Whether this is a sign of weakness in the design of the Framework Programmes is a moot point.

6.3 What has been funded

Typically, EU R&D interventions through the Structural Funds differentiate between support for: investment in research infrastructure (FOI 183); investment in innovation and technology transfer networks (FOI 182); investments in actual research projects (FOI 181); and investments in training actions (FOI 184). In the case of the Framework

Programmes, most grants are for individual research projects or human resource actions linked to researcher mobility programmes.

Through an analysis of what has been funded it is possible to construe what is perceived to be important in each region: providing an insight into the narrative imagination of the various agents involved in the practical delivery of the two instruments at the heart of this study. It also provides a framework through which to explore differences between setting policy and shaping practice - the difference between design and delivery (Morgan 2004a). The following section explores the nature of project activity in each of the three case study regions to assess the pattern of financial intervention in practice, taking each instrument in turn.

6.3.1 RTDI activities in the Structural Fund programmes

The focus of Structural Fund activity in all three regions has been heavily orientated towards building the hard and soft infrastructure for R&D-led innovation in the region. Although the details vary the approaches appear to have been heavily influenced by a desire to overcome perceived gaps in the supply of knowledge to regionally-located firms and are suggestive of the influence of the innovation systems literature. In practice, there appears to be a split between those programmes that have focused resources on activity that is directed towards supporting innovation and technology transfer networks and those focusing more strongly on investing in R&D-related infrastructures.

According to official returns (Table 6.5), the Objective 2 programmes of East Wales and Yorkshire and Humber have only financed investments in innovation and technology networks, whilst the Objective 1 programmes have balanced this with investments in R&D infrastructure. This is particularly so in the case of the West Wales and the Valleys Objective 1 programme. Whilst it has not been possible to make the same assessment for the East of England Objective 2 programme it would appear that all the funds directed towards R&D related activities have been used to finance infrastructure investments. No programme has invested resources in training actions related to R&D activities. This

may reflect the traditional view that training is an activity to be financed through the European Social Fund rather than the ERDF. Evidence from the West Wales and the Valleys Objective 1 programme would appear to support this.

Table 6.5 Focus of Structural Fund programmes, by intervention code

	FOI 181	*FOI 182*	*FOI 183*
WWV Objective 1*	7%	31%	62%
SY Objective 1**		64%	36%
EW Objective 2*		100%	
YH Objective 2**		100%	

Sources: *data accessed from WEFO website; ** data provided by GOYH

The strong infrastructure orientation of the West Wales and the Valleys Objective 1 programme was not envisaged at the time of the programme's preparation and launch. As we saw in Chapter 5, the programme planned stronger levels of support for research projects based in universities and research institutes and for technology transfer activities, with relatively limited levels of investment in research infrastructures. The out-turn has been very different. Similarly, the investments in research projects planned under the East Wales Objective 2 programme have not been realised in practice. In contrast the formal profile of the Yorkshire and Humber programmes has been much closer to that initially planned. Possible explanations for this are drawn out later but it is worth noting here that this is likely to relate to differences in the level of influence of the different programme secretariats relative to individual programme applicants.

Although the Structural Funds differentiate between investments in research projects (FOI 181), innovation and knowledge transfer networks (FOI 182) and R&D-related infrastructure (FOI 183) it is more difficult to discern this differentiation in practice. In fact, in the South Yorkshire Objective 1 Programme there has been no project which solely involved investment in R&D-related infrastructure. All the significant infrastructure investment projects that received funding under FOI code 183 also received a matching amount of funds under FOI 182 (which in itself casts doubts on the distinctions drawn between these codes), demonstrating that such projects sought to put

in place the infrastructure to undertake knowledge transfer activities and then to progress these activities once the infrastructure was in practice.

However, the break-down does provide a useful indication of whether the focus of activity was on the development of new infrastructures for R&D and its commercialisation in the region, or was on the development of new networks utilizing existing capacity. In the following the broad distinction between the three different 'types' of investment is maintained, with the understanding that this is a somewhat artificial distinction.

6.3.1.1 Investment in RTDI infrastructure

Much of the investment in R&D-related infrastructure has focused on support for facilities that assist in the commercialisation of R&D activities or provide facilities for 'experimental' development, that is activities which are related to product and process development. Investments include support for the Advanced Manufacturing Research Park in South Yorkshire and associated activities such as the Advanced Manufacturing Research Centre (Box 6.1). Together these both significantly enhance the region's capacity for advanced research in materials technologies but also co-locate a number of advice and support facilities providing a strong concentration effect.

Box 6.1 The AMRP and the AMRC

The Advanced Manufacturing Research Park (AMRP) is a 100 acre manufacturing technology park located on the boundary of Sheffield and Rotherham in South Yorkshire. Developed as a focus for advanced manufacturing the Park currently houses a number of key tenants which have been supported through funding from the Objective 1 programme.

The flagship use is the Advanced Manufacturing Research Centre (AMRC), developed as a partnership between the University of Sheffield and the American aerospace giant Boeing, and part funded by the Objective 1 programme. As well as undertaking research into novel and new materials related to the interests of Boeing the Centre also provides advice and support to companies which wish to make use of its technological capabilities to improve their own manufacturing capabilities. The Centre is also now part of the National Composites Network, a network of 4 centres across the UK launched by the DTI in 2004. A second phase of the Centre, a partnership between the University of Sheffield and Rolls Royce and known as the "Factory of the Future", has also been completed on the site with the support of the Objective 1 programme. It is argued that the AMRC would not exist in its current form if ERDF had not been available, as there would have been less physical capacity to house equipment, equally the neighbouring space being developed as the "Factory for the Future" would not have occurred.

Other users on the AMRP include The Welding Institute and Castings Technology International. Both are private sector, member-based organisations which undertake research and provide technical support in the area of welding and casting respectively. As member-based organisations they act as intermediaries in promoting technology transfer and supporting product and process innovation. Both have received substantial support from the Objective 1 programme to establish modern facilities on the AMRP.

Source: study interviews supplemented by material from AMP (2008)

Establishing sectorally focused innovation and incubation facilities has been a strong theme in all the three case study regions. Most notable is the Technium network in Wales (Box 6.2) but a similar focus is also apparent in Yorkshire and Humber where, in the words of one respondent, there has been "quite a lot of business incubation" (HE6) As well as a bioscience incubator in Leeds, with a linked proof of concept fund, the ERDF has also funded a similar facility in Bradford and in Sheffield, as well as a low-carbon energy incubator in Sheffield.

Box 6.2 Technium concept

Described as a "pan-Wales business incubation network that nurtures young technology businesses and provides the relevant knowledge, support and physical facilities to help them succeed" by the UK Science Park Association (UKSPA 2008), Technium consists of nine centres located in West Wales and the Valleys. There are none located outside of the Objective 1 programme area. Technium was initiated by the University of Swansea and each Technium is associated with University research activities. All were constructed with support from the Objective 1 programme, which also contributes towards their running costs. Through the provision of high quality space and advice the aims of Technium are to:

- Assist in the creation of new spin-out businesses from Welsh academia
- Help develop existing indigenous businesses in Wales
- To attract R&D inward investment opportunities

Some Technium are geographic in description, such as Technium Aberystwyth, whilst others are associated with particular fields, such as Technium Digital in Swansea, Technium Sustainable Technologies at the Baglan Energy Park, and Technium OpTIC (Optoelectronics Technology Incubation Centre), at St. Asaph in North Wales. The perceived geographic dimension of the Technium approach is relatively strong as demonstrated by the comment of one respondent who has been closely involved in the concept that "I would have said there is no person more than 15-30 mins drive from a Technium" (HE4).

Technium recently received endorsement from DG Regio when Technium OpTIC received one of its five inaugural RegioStars awards for regional innovation. Launched in 2007 the RegioStars are awarded for good practice in regional innovation initiatives across the EU.

Source: Study interviews plus additional material from WDA (2008)

Equally, in the East of England, alongside more generic innovation and incubation facilities, the Structural Funds have been used to establish the Offshore Renewable Energy Centre. Based in Lowestoft, this is intended to provide flexible accommodation for businesses in the offshore energy sector and to foster greater co-ordination and collaboration amongst businesses, academic and research institutions. This forms part of a suite of projects with EU-support which are clearly directed at strengthening the energy sector in the East of England, focused on the Lowestoft area. The East of England programme has also sought to invest in university infrastructure, either to promote

knowledge transfer as in the case of the Knowledge Hub at the University of Bedfordshire (Box 6.3), or to bring university facilities to areas where these were not previously to be found. For example, investment in Essex University Southend Campus, which includes a business incubation/innovation centre for start-up companies and technology-focused businesses related to the academic research undertaken with the university; as well as academic departments and a business development centre brings Higher Education facilities to the town of Southend on Sea for the first time.

Box 6.3 Knowledge Hub

The Knowledge Hub is located at the University of Bedfordshire. It has been funded jointly through the Higher Education Innovation Fund (HEIF), an initiative of the DTI and now managed by DIUS, and the Structural Funds. It is one of the few examples identified by this study whereby HEIF and Structural Fund activities have been drawn together. The project is intended to enhance the exploitation of the university's knowledge base to the benefit of the regional and national economy by the creation of a centre which will enable:

- knowledge transfer - learning from the innovation success at St John's Innovation Centre, Cambridge and developing products appropriate to Luton
- knowledge management - through the regional HEIF projects working with other universities in the Eastern region via i10, the region's route for businesses to access expertise in HEIs
- knowledge networks - improving how the University interacts with the local economy
- knowledge exploitation - developing processes to encourage and reward the exploitation of ideas

Source: Luton Borough Council (2007)

There has also been investment in the development of new R&D facilities. This has been most strongly the case in the West Wales and the Valleys Objective 1 Programme. Examples includes the Institute of Life Sciences at Swansea University (Box 6.4), the Gas Turbine Combustion Research and Test Centre, which is part of the University of Cardiff but located at Port Talbot in West Wales, and the Centre of Excellence of Visualisation in Wales, located at the University of Aberystwyth.

Box 6.4 Institute of Life Sciences

The Institute of Life Sciences is a collaboration between Swansea University, IBM and the Welsh Assembly Government, with investment from the Boots Centre for Innovation. The Institute provides a space in which to house inter-disciplinary research in the field of life sciences and includes dedicated supercomputer facilities provided by IBM. Home to the University's School of Medicine interdisciplinary research enterprise the Institute also includes Business Incubator Suites to promote commercialization activities.

The commercial focus of the investment is clear. A core part of the approach is to promote opportunities for research collaboration, intellectual property licensing, spinout companies and inward investment. To this end organizations may associate with the ILS as strategic partners – these currently include AstraZeneca, Alliance Boots plc, IBM and Morvus. Alternatively, SMEs that do not wish to become clients or investors in the Institute can benefit from access to some of the Business Development facilities, including hot-desk space and advice.

Source: adapted from Swansea University (2008)

6.3.1.2 Investment in university-business collaborations and technology transfer networks

Supporting innovation through knowledge exchange and the commercialisation of research outputs is, in many ways, the key feature of the Structural Fund programmes in the case study regions. All have laid great emphasis on this, and most of the infrastructural investments have been designed to facilitate it. The range of activities financed in support of this are extensive, with a number of strong 'flagships' such as the Centres of Industrial Collaboration promoted by Yorkshire Forward in Yorkshire and Humber (Box 6.5) and the Centres of Expertise for Technology and Industrial Collaboration (CETIC), promoted by the Welsh Assembly Government, in Wales, which, like the CICs are a pan-regional initiative.

Box 6.5 CICs: Promoting collaborative working within the region

The Centres of Industrial Collaboration (CICs) were set up to help businesses by transferring skills and technology from universities to small and large companies, encouraging greater levels of industrial innovation, research & development. 14 CICs have been accredited by Yorkshire Forward, with expertise from local universities covering the Region's priority industrial sectors. The main criterion for the centres was scientific excellence, as evaluated by the Research Assessment Exercise (5 or 5* RAE score), or potential (3a or 4 RAE), coupled with a good track record in knowledge transfer to, and engagement with, the region's industrial base. Host universities for each CIC received £600k (approximately €880k) over three years, to build sufficient commercial income to become self-sustaining. The funding included a package of support drawn from Yorkshire Forward and the Objective 1 and the Objective 2 programmes in the region. Whilst most CICs are not collaborative ventures, in a few cases they involve collaboration between universities within the region.

ERDF funds have generally been used to fund a commercial manager, an administrator and marketing expertise, some have brought out time of post-doctoral researchers to respond to queries immediately if the appropriate academic is not available. No subsidies are provided to companies to enable them to work with the research groups, and no funding is provided to the academic research groups to fund technical work. The funds cover the incremental costs of providing a professional business – university interface and promoting their services to business.

Source: Yorkshire Forward (personal communication)

Similar projects, which seek to make university expertise available to companies, have also been operated independently by many universities, including the University of Cardiff which, through the SUPERMAN project brings the knowledge within the Manufacturing Excellence Centre to companies located within the area covered by the West Wales and the Valleys Objective 1 programme. Others, are managed by public intermediary bodies, such as the National Metals Technology Centre (NAMTEC) and Business Link South Yorkshire, or private providers such as The Welding Institute (TWI), Castings Technology International (CTI) and PERA. Each of these seeks to promote innovation in companies through making expertise, advice and information available in different forms. Other initiatives, such as the South Yorkshire Bioscience Network, are more sector based, or, as in the case of SportsPulse (Box 6.6), seek to

combine different knowledge sets in order to promote the development of new innovative products.

Box 6.6 Sportspulse

Sportspulse is described as a unique public-private partnership tasked with developing the sports business sector of South Yorkshire. Based at Sheffield Hallam University. It works to exploit the business opportunities that are available through sport. Its activities include R&D, business network development and the attraction of international training camps.

In the area of R&D Sportspulse works to connect local SMEs with the Department of Sports Engineering at Sheffield Hallam University. Working at the cutting edge of materials technology, design and high-performance sports, notable partnerships have been developed in fields as diverse as winter sports, cycle racing and golf. Describing the work of Sportspulse in the area of winter sports Creative Sheffield, the economic development agency for the city, states:

"Working with Professor Kristan Bromley, GB's No.1 skeleton bobsleigh athlete, and his brother Richard, SportsPulse has secured the relocation of their company, Bromley Performance Sports, to Sheffield. SportsPulse continues to support their business, helping to develop world-beating technologies for their Pro Ice Team (an initiative supporting the technology needs of leading GB athletes)." (Creative Sheffield 2008)

Source: adapted from Creative Sheffied (2008)

A final form of support for knowledge exchange networks is in the form of brokerage services. This is apparent in Yorkshire and the Humber in the form of the region's 'Knowledge Rich' website, a free brokerage service which can connect businesses to a network of experts in the region's leading universities. Again this is a region-wide initiative which has received support from the Structural Fund programmes as part of a wider package of business support measures.

6.3.1.3 Investment in research projects based in universities and research institutes

There are very few examples of such activity from the case study regions. The most significant investment was the use of funds from the West Wales and the Valleys Objective 1 programme to expand the scale of the national SMARTCymru programme,

which is designed to support innovation and R&D in businesses across Wales. A small number of other more specific projects have also been funded through the Objective 1 programme ranging from alternative crop research for eco-energy through to the development of sustainable heat and power. Reportedly, the South Yorkshire Objective 1 programme has also included a small proportion of collaborative research; modeled on the UK's Link programme. This was in the form of Yorkshire Forward's 'Large Company R&D Grant' to which the Objective 1 programme contributed around 5% (c.£1m) of its total value. However, this activity is formally recorded as being funded under FOI code 182 (technology transfer and networks between businesses and/or research institutes) in the official programme returns.

6.3.2 RTDI activity in the Framework Programmes

The Framework Programmes are almost entirely directed towards the support of Research and Development activities. The two primary areas of activity supported by the Framework Programmes have always been thematic research projects and, broadly specified, skills development projects (formally known as Mobility and Human Potential but more often called 'Marie Curie'). Other areas of activity, including international co-operation projects and SME actions account for only a small part of the Framework Programmes (Section 4.5.1). The following results are based upon the analysis of the number of projects underway in each of the case study regions (for the methodology please refer to Chapter 2) and so the numbers and proportions vary from the participation-based data reported previously as there may be more than one partner involved in a project in each region. Equally, totals across regions will exceed the total for the UK as a whole.

From Table 6.6 it is clear that under Framework Programme 5 activity in all three case study regions was more strongly orientated towards Thematic Research Projects than across the UK as a whole, particularly in the case of Wales. In contrast, only the East of England recorded significant levels of activity under the Mobility programmes, a position

which was reversed with respect to international co-operation programmes where activity levels in Wales were significant, especially in relation to other regions.

Table 6.6 Relative focus of project activity, UK and case study regions

	Thematic research		*Training and mobility*		*International Cooperati*	
	FP5	*FP6*	*FP5*	*FP6*	*FP5*	*FP6*
Wales	81%	63%	12%	6%	7%	6%
Yorks. and Humber	78%	68%	16%	12%	4%	1%
East of England	75%	66%	24%	13%	1%	2%
UK	73%	62%	23%	14%	4%	3%

Source: data accessed from CORDIS website

Examining the balance of activity between the different aspects of the Framework Programmes (Table 6.7) simply highlights the sheer difference in scale of FP engagement in our three case study regions previously identified in Table 6.1. Whilst Welsh institutions have participated in around 5% of all Framework Programme projects occurring in the UK, those in Yorkshire and Humber have participated in a tenth of all projects and institutions in the East of England have been involved in around one-fifth of all projects occurring in the UK.

This pattern continues across most of the research themes supported under FP5 and FP6 illustrating that the levels of engagement are not solely due to different research areas but in practice are much deeper rooted. The range of activity in the East of England is clearly apparent when one considers the range of programmes in which the region has had extensive involvement. The region consistently participates in around a fifth of projects undertaken in the UK under each programme strand. Indeed in some strands under FP6 the region was represented in more than a quarter of all projects in the UK, particularly in strands such as food, aerospace and SME. It is clear that in the East of England there is strength in breadth as well as depth in terms of levels of participation in Framework Programme activity, a strength which Wales finds impossible to emulate but where institutions in Yorkshire and Humber perform more strongly. One advantage of this more detailed analysis of project-level activity is that it provides a strong indication of the relative international research strengths of particular regions. However, there is no

evidence that such an analysis has been undertaken to inform the development of EU Structural Fund programmes in these regions.

Table 6.7 Project distribution by Programme, UK and case study regions

	UK	*Wales*		*Yorkshire and Humber*		*East of England*	
		Total	% UK	Total	% UK	Total	% UK
FP5							
EESD	961	55	6%	85	9%	176	18%
Growth	1148	54	5%	165	14%	229	20%
IST	1209	41	3%	88	7%	165	14%
Life Quality	1497	79	5%	135	9%	321	21%
Human Potential	1500	33	2%	99	7%	280	19%
Innovation SME	26	3	12%	9	35%	3	12%
INCO 2	237	19	8%	24	10%	17	7%
Total	*6578*	*284*	*4%*	*605*	*9%*	1191	*18%*
FP6							
Aerospace	120	8	7%	16	13%	35	29%
Citizens	90	9	10%	11	12%	12	13%
Food	84	7	8%	14	17%	27	32%
IST	703	27	4%	85	12%	135	19%
Lifescience	228	11	5%	26	11%	55	24%
NMP	210	17	8%	33	16%	52	25%
Sustainable Development	276	11	4%	28	10%	55	20%
Research and innovation	54	4	7%	6	11%	7	13%
SME	150	15	10%	23	15%	42	28%
NEST	45	1	2%	0	0%	5	11%
Society	58	4	7%	7	12%	2	4%
Infrastructure	79	1	1%	10	13%	14	18%
Coordination	54	0	0%	2	4%	0	0%
Policies	150	12	8%	14	9%	36	24%
Mobility	377	8	2%	36	10%	75	20%
INCO	78	8	10%	2	3%	11	14%
Total FP6	*2756*	*143*	*5%*	*313*	*11%*	*563*	*20%*

Source: data accessed from CORDIS website

One other area where Welsh organisations have tended to be more strongly involved in Framework Programme projects, although the overall numbers are very small, is with respect to those actions targeted at SMEs and the support of SMEs. Here, activity in

Wales is approximately twice the UK average, despite the evidence of low levels of R&D activity within businesses in Wales. However, activity levels in the other case study regions are equally strong, with organisations in Yorkshire and the Humber participating in more than one-third of such projects under FP5. This was largely due to the activities of an intermediary support company called Betatechnology, which was involved in seven of the nine projects operating in the region in support of SMEs under FP5.

The importance of individual institutions and their strategies is a crucial element in determining levels of Framework Programme activity. Within each region, Framework Programme participation is driven by individual institutions applying for funding, rather than through any strategic guidance. This can lead to very different experiences across a region, depending upon the stance taken by different institutions. The importance of key institutions is illustrated by the case of the University of Sheffield which is not only notable for the fact that it led one Coordination project and participated in a second, a unique position in the UK as it is normally only departments of Central Government which participate in such projects but also that it took a strategic approach to engaging with the Marie Curie mobility programmes. "We had a policy under FP6 for using Marie Curie as a strategic recruitment tool. In terms of identifying and bringing in top-class postdoctoral researchers for two years using the Marie Curie networks" (HE9). The university also took a strategic decision to engage with the European Commission's integrated infrastructures initiative in order to take part in the design studies for the infrastructures that they hoped might emerge in FP7 in recognition that funding from the UK is becoming scarcer and so European funds are becoming more attractive.

6.3.3 The focus of activity

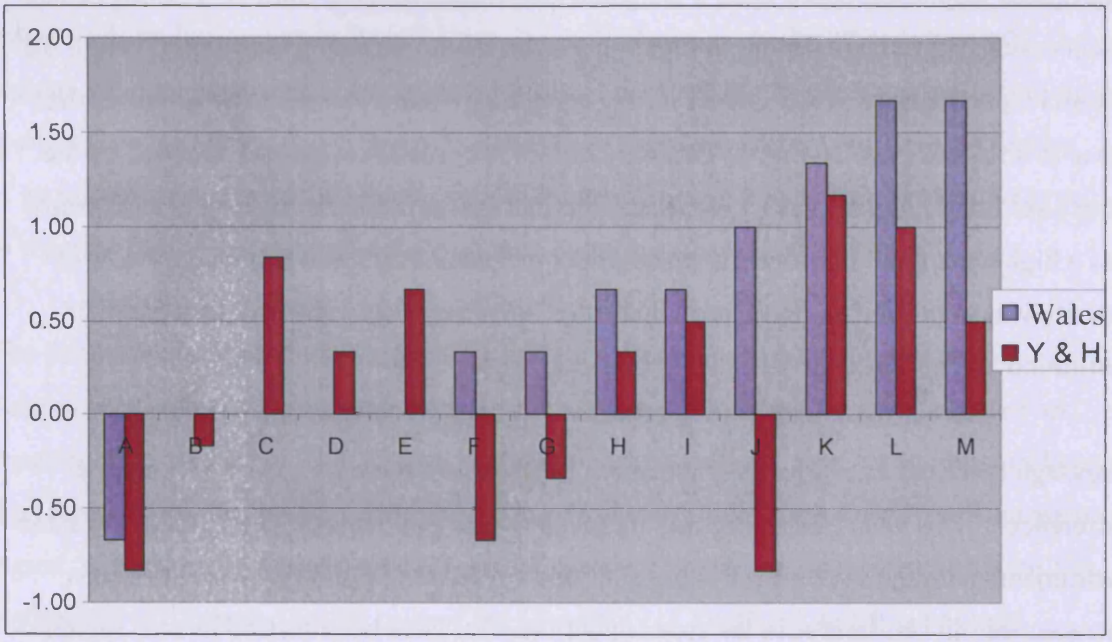
To better ascertain the thrust of the EU R&D programmes in Wales and in Yorkshire and Humber interview respondents were asked to gauge the extent to which the EU R&D instruments have supported different types of activity. Although weighted to a certain extent towards the Objective 1 programmes in each region, taken as a whole these responses provide a useful perspective on the focus of activity in each region. The

aggregated responses, based upon a weighted calculation ranging from very strong (2.00) to very weak (-2.00), are set out in Figure 6.1 below, with the key following. Overall, the Welsh respondents generally appear more positive across a wider range of activities than those in Yorkshire and Humber. This may reflect the greater resources expended by the Structural Fund programmes in Wales and the fact that activities in Wales have generally had a higher profile. Significantly, the number of respondents who had an overview of activity was very limited, particularly in Wales, most were only able to speak for their institution and so were not included in this assessment.

Although there are similarities in the pattern of responses there are also some notable differences. This is an interesting finding given that respondents are referring to the same instruments with the same overarching aims and objectives. Equally, as we have seen, there are strong similarities in the types of activity that have been funded in each region. This suggests that in each region a certain 'outlook' prevails (Granovetter 1985), which may influence how policy is conceived. Equally, though, the responses in Wales appear to be related to what the Structural Funds are actually financing, whilst in Yorkshire and Humber there is a slightly stronger emphasis on what the funding is intended to achieve. These are points we return to when we examine the perceived benefits of the actions undertaken in Chapter 7. The responses given also shed light on the assumptions held regarding the role these particular public policies can play in stimulating research-led economic development at the regional level.

In both regions it is felt that the EU's R&D instruments have been used to stimulate the links between firms and between firms and universities within the region (K) and to invest in knowledge infrastructure (L). These are traditional aims of policies aimed at stimulating R&D-led innovation. The signs of this traditional conception are equally visible in the limited extent to which EU instruments are believed to have been aimed at stimulating links with firms and universities located elsewhere in Europe (F). This is a clear indication of the perceived lack of involvement with the Framework Programmes in the region and of the lack of attention given to this by Structural Fund programmes.

Figure 6.1 Focus of Structural Fund R&D-related activities



Source: interview findings. n = 3 in Wales and 6 in Yorkshire and Humber

Key to Figure 6.1

A	To bring individuals from different backgrounds together
B	To strengthen the capability of local and regional authorities to develop research and innovation initiatives themselves.
C	To introduce new ways of working into the region
D	To introduce new techniques into the region
E	To introduce new ideas into the region
F	To stimulate links with firms and universities located elsewhere in Europe
G	To help encourage groups of individuals with similar interests to share their experience, knowledge and learning.
H	To strengthen the amount of advice available to firms in the region
I	To strengthen the level of supporting services available in the region for the commercialisation of research ideas
J	To invest in training courses (to train researchers, research staff or other workers)
K	To stimulate the links between firms and between firms and universities within the region
L	To invest in knowledge infrastructure (such as university research facilities; science parks; research centres etc)
M	To invest in collaborative research projects (between firms, universities etc)

Source: respondent interviews

Although the similarities in perspective outweigh the differences there is one area where respondents in Yorkshire and Humber differed from those in Wales, being much stronger in their view that EU R&D programmes were helping to introduce new ways of working

and new ideas into the region than was the case in Wales. Although this may suggest a slightly more outward looking perspective the general tenor of the responses is clearly focused on strengthening the internal capacity and linkages within the region, including levels of support services available (H and I). Given much of the literature on the importance of bringing different sources of knowledge together in the stimulation of innovation (see for example Amin and Cohendet 2004), it is worth noting the lack of importance attached to this by the respondents (A).

Another area of dissonance was in the importance attached to developing collaborative research projects (M). In Wales there is a perception that much support has been directed to this whilst this was not seen as such a strong focus in Yorkshire and the Humber. In practice it would appear that the difference is one of emphasis, with a number of projects in Wales addressing this topic directly, whilst in Yorkshire and Humber the emphasis has been on developing the infrastructure to enable such collaborations, rather than financing them directly. Interestingly, whilst there was a feeling in Wales that EU R&D investments had focused quite strongly on investments in training courses there was a strongly opposing view in Yorkshire and the Humber. However, whilst the Wales Objective 1 programme did contain a measure which nominally addressed this activity it is less clear how targeted it was on R&D-related activities in practice, as a rudimentary assessment of the project titles and descriptions suggests the vast majority were targeted at higher-level operative skills.

This exploration of what has actually been funded, through the Structural Funds and the Framework Programmes, within each of the regions, coupled with the perceived focus of programme activities, demonstrates the complex and interactive worlds of policy formulation and delivery which Healey highlights in her work on relational policy governance (Healey 2007). The research highlights the extent to which certain activities have visibility to particular organizations and so are realized in practice but not to others with the result that they do not occur: the mobility actions of the Framework Programmes being a case in point. Delivery of policy is strongly influenced by the individual actions of a host of organizations that choose to engage with the programmes concerned, within a

framework established by other governance actors. These frameworks may be region-specific, as in the case of the Structural Fund programmes, or be external to the region, as in the case of the Framework Programmes. The following section examines the question of 'who benefits' from the available funds in order to explore the role of individual organisations further.

6.4 Recipients of EU R&D funding

One of the principal research questions that this study set out to address was to consider which types of organisations were in receipt of funding from EU R&D-related instruments. A clear picture emerges from both the Structural Fund programmes and the Framework Programmes, with some small differences between the case study regions which merit exploration later (Section 6.5 below). Turning first to the Structural Fund programmes.

6.4.1 Structural Fund programmes

The main beneficiaries of funding for R&D-related activities have been regional governance bodies, such as the Welsh Assembly Government and Yorkshire Forward, and the Higher Education sector. This is clearly demonstrated in Table 6.8 which identifies the number of projects and ERDF grant value (for R&D related actions) for the West Wales and the Valleys Objective 1 Programme, South Yorkshire Objective 1 Programme and the Yorkshire and Humber Objective 2 Programme. Together, projects initiated by regional governance bodies and the HE sector have accounted for around 90% of all R&D-related projects by value in West Wales and the Valleys Objective 1 and Yorkshire and Humber Objective 2. In the South Yorkshire Objective 1 Programme the share falls to around 67% owing to the stronger involvement of intermediary bodies in this programme; notably NAMTEC and South Yorkshire Business Link, together with private intermediaries such as The Welding Institute and Castings Technology International both of whom located branches within the South Yorkshire Objective 1 Programme area. It is notable that in Wales there has not been the same involvement of

intermediary bodies, principally as since the disbanding of the WDA such delivery agencies now largely form part of the Welsh Assembly Government.

Table 6.8 Institutional breakdown of SF R&D projects (number and grant value)

Sector	*WWV Obj. 1*		*SY Obj. 1*		*Yorks. and Humber Obj. 2*	
	Number	*£m*	*Number*	*£m*	*Number*	*£m*
Regional governance	18	56.0	10	11.8	2	7.2
HE sector	24	53.3	16	12.8	8	3.1
Private intermediary	6	6.0	10	8.7	5	0.9
Intermediary	0	0	7	2.8	1	0.1
Local Authority	5	5.4	2	0.1	0	0
Private sector	1	0.3	1	0.1	0	0
Other	5	1.3	5	0.5	0	0

Source: adapted from material provided by GO-YH, WEFO website

The strong engagement of the Higher Education sector in these programmes is in itself potentially underestimated given that many of the regional governance projects have also been used to the benefit of Universities. In particular it is worth noting that Yorkshire Forward's flagship Centres of Industrial Collaboration – funded from both the Objective 1 and 2 programmes – have invested in university-based technology transfer facilities. Similarly in Wales, programmes such as CETIC (Centres of Excellence for Technology and Industrial Collaboration) have also been used to invest in university based facilities, whilst other investments, such as aspects of the Technium programmes have been closely linked to universities.

The small value of the East Wales Objective 2 Programme and the lack of formal R&D-related activity under the East of England Objective 2 Programme limit comparison in a similar manner. However, it is clear that in the case of East Wales a similar pattern emerges, with the Higher Education sector and the Government as the key actors. Cardiff University leads four of the six projects identified (worth some £1.1m in grant), most notably the 'Micro Tooling Centre' project, part of the MEC which operates the Objective 1 SUPERMAN project, with a grant value of £789,000, whilst the University of Glamorgan manages the 'Help^{2}Wales' project (£233,000 grant) which is intended to

increase collaboration between SMEs and Higher Education (HE). In addition, the 'Technology Exploitation Programme – East Wales' project, led by WAG, was awarded some £444,000 in grant support.

In the case of the East of England there is a very different picture. Here, most of the limited relevant Structural Fund activity in the region has been led by the local authority sector, with one project led by EEDA and one by the University of Bedfordshire. This is the only University to lie within the area eligible for support under the Structural Funds. The differences, and similarities, across the three regions point to a number of possible explanations which are explored later: these include perceptions of 'who' certain funds are aimed at and the role of the spatial boundaries of geographic programmes in influencing behaviour.

Whilst the data demonstrates who benefits directly from R&D-related investments through the Structural Funds, it also illustrates who does not. There is very limited involvement of local authorities, traditionally a strong participant in Structural Fund programmes, limited involvement of Public Sector Research Establishments located within the eligible programme areas, notably IGER in Wales and CEFAS in the East of England, and only limited direct involvement by private sector firms, perhaps reflecting the focus on technology transfer networks and infrastructure investment by the programme, with firms benefiting subsequently and indirectly through the facilities and services offered.

6.4.2 Framework Programmes

As might be anticipated, the HE sector is also the primary beneficiary under the Framework Programmes, accounting for between half and two-thirds of the participations in our three case study regions, although the precise proportion does vary strongly by region (Table 6.9). Levels of Higher Education participation (HES) are strongest in Yorkshire and Humber and weakest in the East of England, where strong levels of participation by research centres (REC), particularly PSREs create a very different

picture of activity. It is interesting to note that the proportion of industrial participants (Ind) is lowest in the East of England and highest in Wales. Whilst this research does not have the resources to explore the reasons for this further the salient point is that this runs counter to the accepted wisdom, certainly in Wales, which holds that in Wales research in the HE sector is the only game in town. However, it is well to remember that the absolute numbers in the East of England dwarf those of Wales.

Table 6.9 Participation in FP5 and FP6 by sector (%)

	HES	*Ind*	*REC*	*Other*
Wales	58	15	7	19
Yorkshire and Humber	68	12	5	15
East of England	47	10	24	19
UK average	49	13	17	21

Source: adapted from DIUS (2008) data

6.4.3 Concentration effects

One of the striking features of the pattern of activity within the programme areas is the concentration of funding on a small number of institutions. In the West Wales and the Valleys Objective 1 programme grant assistance is concentrated on four institutions which account for three-fifths of the R&D related projects identified under the Objective 1 programme, and more than four-fifths of the total value of such grants awarded (Table 6.10a). In the case of the South Yorkshire Objective 1 programme, two institutions have led almost half (46%) of the projects identified as R&D relevant, and account for two-thirds of all such grants awarded under the RTDI Field of Intervention code. Adding in three other institutions raises the proportion of grant value to 92% of all R&D relevant activity (Table 6.10b).

Table 6.10a Principal Structural Fund beneficiaries, Objective 1 Wales

Institution	*No. Projects*	*RTDI Grant (£m)*	*% of all RTDI grants*
WAG	17	55.1	45%
University of Wales Swansea	7	20.1	16%
Cardiff University	7	18.3	15%
University of Wales Bangor	5	6.9	6%
Combined total	*36*	*100.4*	*81%*

Source: data accessed from WEFO website

Table 6.10b Principal Structural Fund beneficiaries, Objective 1 South Yorkshire

Institution	*No. Projects*	*RTDI Grant (£m)*	*% of all RTDI grants*
University of Sheffield	11	12.6	34%
Yorkshire Forward	11	11.8	32%
Castings Technology International	2	4.2	12%
The Welding Institute	3	3.1	9%
NAMTEC	3	2.0	6%
Combined total	*30*	*33.7*	*92%*

Source: Adapted from data provided by GOYH

Similar pictures, albeit on a smaller scale, can be seen in both the East Wales and the Yorkshire and Humber Objective 2 programmes. In the former the principal beneficiaries of committed RTDI funds were Cardiff University (61% of committed funds), Welsh Assembly Government (24%) and the University of Glamorgan (13%); whilst in the latter, Yorkshire Forward took some 63% of all RTDI funds and the University of Hull took a further 16% for its Design Enterprise Centre.

Within the Framework Programmes also there is clear evidence of the concentration of activity in a small number of institutions from the Higher Education and Research Centre sectors. Tables 6.11a-c clearly demonstrate the dominance of a small number of leading institutions in each of the case study regions, supporting the contention by Breschi and Cusmano (2002) of the existence of "core oligarchies". These Tables also illustrate the absolute advantage of the East of England in terms of the overall capacity of institutions located within the region to participate in transnational R&D programmes. It is not just that individual institutions undertake more activity there are also more of them, with even some of the smaller universities such as Hertfordshire and Bedfordshire, which are

traditionally seen as non-research orientated, participating in a modest number of Framework Programme projects.

Tables 6.11a-c also further demonstrate the reliance of both Yorkshire and Humber and Wales on University-led research institutions, particularly in Wales since IGER has merged with the University of Wales Aberystwyth. In contrast, participation in the Framework Programmes in the East of England is driven both by the University sector, particularly Cambridge University and Cranfield University, and by research centres, such as CEFAS in Lowestoft, the Building Research Establishment near Luton, and the John Innes Centre and the Institute of Food Research based in Norwich.

Table 6.11a Number of FP projects by Institution (Yorkshire and Humber)

	FP5	*FP6*
University of Leeds	157	139
University of Sheffield	127	135
University of York	68	101
University of Bradford	23	11
University of Hull	22	24
Sheffield Hallam University	20	13
University of Huddersfield	4	0
Central Science Laboratory	0	14

Source: adapted from CORDIS

Table 6.11b Number of FP projects by Institution (Wales)

	FP5	*FP6*
Cardiff University	69	84
University of Wales Bangor	48	23
University of Wales Swansea	28	20
Institute of Grassland and Environmental Research	21	8
University of Wales Aberystwyth	16	11
University of Glamorgan	8	7

Source: data adapted from CORDIS

Table 6.11c Number of FP projects by Institution (East of England)

	FP5	*FP6*
Cambridge University	365	341
Institute of Food Research	117	127
University of Cranfield	103	60
University of East Anglia	56	49
John Innes Centre	49	30
University of Essex	47	34
Building Research Establishment	44	8
CEFAS	17	38
University of Hertfordshire	15	20
University of Bedfordshire	7	5
Babraham Institute	4	5

Source: data adapted from CORDIS

It is worth noting that of the Framework Programme participations recorded in Tables 6.11a and 6.11b, a very strong proportion have been located within the areas eligible for support under Objective 1. In the case of Wales this was more than half (at 51%) and in the case of Yorkshire and Humber it amounted to just over one-third (34%). Whilst these figures can only be partial, considering as they do only the HES and REC categories, they do cover the greatest proportion of FP activity in the regions concerned and so can be considered to demonstrate a reasonable picture of the location of overall activity. Equally, in Wales; East of England, and Yorkshire and Humber the broad geographic distribution of research activities financed through the Framework Programmes is apparent. Clearly, institutional concentration need not imply geographic concentration.

6.5 Combined use of Structural Funds and Framework Programmes

Although at one level the Structural Funds and the Framework Programmes both work to boost research capacity within a region there is no evidence of any systematic combining of activities supported through these two funding instruments. As one prominent observer pithily commented "Come on, get real!" (HE12). In the words of others involved in these programmes: "for the past 5 years there has been very little connection between the two" (PM3) partly because combining these "was not on anybody's agenda... not on the radar at all" (RG4).

One reason for the lack of combined actions has been a belief that the Framework Programme and the Structural Funds have different objectives. As one WAG official says "I find the kind of argument of complementarity between FP7 and the Structural Funds quite difficult at times because they have such completely different objectives....that we talk a lot about them working together but they're very different" (RG1).

This is not to say that there have been no linkages between these programmes at all within out case study regions. There are examples of organizations that receive funding from both the Structural Funds and from the Framework Programmes, but these are examples of activities happening in parallel at the project level and are the exception. For example, the MEC at Cardiff University has successfully attracted funding from both the West Wales and the Valleys Objective 1 Programme and the Framework Programmes. Whilst there is no direct link between these projects, staff at the MEC believe that the knowledge they gain through participation in Framework Programme projects ultimately benefits Welsh companies through their technology transfer activities funded through the Objective 1 programme. Similarly, within the AMRC the Framework Programmes fund around 20% of all research posts (Int3). But again, this is recognized as an exception: "I don't think there are many areas where that does happen. The AMRC is probably an exception" (RG6).

One reason there has not been any systematic approach towards a greater degree of co-ordination is that this has not fallen within the remit of any one individual or organization As one official in WEFO put it: "unless they (Framework Programme applicants) come forward with specific requirements for Structural Funds, my resources are to manage the Structural Fund programme" (PM1). Once again, the important role that individuals play is worth stressing "These things are always about the individual... people don't actually think about how to bring these things together" (RG6).

At present, the potential links between the Framework Programmes and the Structural Funds are mostly seen as sequential, and possibly indirect, with potential links more to do with training and awareness raising than joint projects or support for project applications. However, this sequential view is not universal with at least one senior official in WAG commenting that ideally "you'd have to bring them alongside, in a perfect world you'd be able to match fund FP" (RG3).

In practice, during the 6th Framework Programme it was possible to use funds from Objective 1 Programmes to co-finance thematic research projects funded through the Framework Programmes. The arrangement was known as the 'Bonus'. However, this opportunity was not taken up in either the West Wales and the Valleys programme or the South Yorkshire programme.

One reason for this was due to a general lack of awareness that this opportunity existed. A few individuals in the respective regions were aware of the opportunities to bring together the Framework Programmes and the Structural Funds, but these were the exception rather than the rule, although some of them assumed that it was 'common knowledge'. In South Yorkshire the Objective 1 Secretariat was certainly aware they were "theoretically, able to apply a Structural Fund Bonus to participants in Framework Programmes in Objective 1 areas" (PM3). However, they never did this as they were uncertain as to how to go about this. "We've never done it. We've been looking for a mechanism for doing it – although not tried very hard – and haven't yet found it" (PM3). It is interesting that this was not regarded as a significant matter by the Secretariat, nor did they seek to make others aware of the opportunity. Sheffield Hallam University for example, expressed surprise that this Bonus had existed. The Secretariat had chosen not to make the Universities aware of this as, in their words, they felt that universities were already strongly engaged in the Framework Programme and that the Structural Fund resources would be better employed elsewhere.

Equally, in Wales there was limited knowledge of the 'Bonus', particularly in the Welsh Assembly Government and amongst officials in the HE sector. Where officials had been

aware of the opportunity there was a view that their own awareness of this had emerged late in the day and that there was no strong knowledge as to how the Bonus might have operated in practice. It is instructive that in considering this matter one WAG official highlighted the difficulty of staying in touch with such opportunities, and their reliance on informal networks in order to do so, reflecting that he is "whole floors of the OSI" and "I'm surprised that *XXX* (speaking of HE5) didn't know that, he's normally very sharp about these things" (RG3). These pathways to knowledge may be an important message here, particularly given as another official argued that one reason economic development officials remained unaware of the opportunity of the Bonus may have been due to the fact that the steer for its use came from DG Research rather than DG Regio.

6.6 Reflections on the patterns identified

From the research undertaken the patterns of activity within the three case study regions can clearly be identified. These exhibit strong levels of comparability, enabling some common threads to be discerned, but also some clear areas of difference, which again provide valuable pointers to underlying trends. The following section seeks to examine those similarities and differences in more detail to arrive at a fuller understanding at the factors influencing levels of activity within the case study regions.

6.6.1 Different levels of engagement between Objective 1 and Objective 2 programmes

The strong differences in the extent to which R&D related activities have been supported between the Objective 1 and Objective 2 programmes in Wales and in Yorkshire and Humber are clear from the above analysis. Leaving to one side the greater resources available to the Objective 1 programmes it is noticeable that whilst these programmes have, broadly achieved their planned levels on RTDI-related activities, the latter have tended to fall short. This provides an interesting comparator through which to explore the reasons for this.

One reason may be the greater use of project bundling in Objective 2 programmes, or a greater tendency to utilise alternative FOI codes for broadly similar activities between different programmes. However, in practice there was little evidence that this was the primary cause of the differences. Rather, a combination of the following five factors seems to account for much of the difference.

6.6.1.1 Scale of the funds available

The amount of funds available to the Objective 1 programmes have made these a more attractive proposition to potential project applicants. All other things being equal, applicants have focused their attention on those programmes from which greater returns might be realised. In the words of one potential project manager the limited level of funds in the East Wales Objective 2 programme made it "irrelevant" (HE2). In the context of other barriers to access, potential applicants were less likely to devote time and attention to seeking to overcome those barriers where the potential returns were limited.

6.6.1.2 Contiguity of programme area

Objective 1 programme areas are contiguous spaces defined at the level of NUTS 2. In contrast, Objective 2 programme areas tend to be made up of a patchwork of wards and local authority districts grouped together into a single programme. In many cases the isolated and discontinuous nature of the programme area has impeded the development of effective knowledge transfer activities owing to the difficulty of identifying, or demonstrating, whether a firm is located within an eligible ward. This was particularly the case in East Wales. Large scale regional programmes, with only a small part of their activities financed through the Structural Fund programmes, are able to sidestep this difficulty through establishing programme level targets which enable firms from throughout the region to be supported, and apportioned between geographical target groups retrospectively. For activities solely targeted on the areas eligible for support under Objective 2, such as those operated by individual universities, this challenge was more difficult to address, leading some organisations to avoid developing projects

targeted on these areas. Similarly in the East of England one practitioner commented that the Objective 2 areas "blobby area is very problematic for regional networking... (with) lots of activities declared ineligible" (PM4).

6.6.1.3 Target-led behaviour

From discussions with the Objective 2 secretariat for the Yorkshire and Humber programme it is apparent that behaviour has been influenced by the targets established for the programme. Support for R&D activities have been limited in the Objective 2 programme because, in their words, of "very strict requirement put upon us by European Commission for tangible outputs in terms of economic drivers" (PM2).

An official goes on to explain that the "Aim of Objective 2 programmes is to create jobs, Objective 1 has more of a GDP aim but for objective 2 productivity, business sales is more of a secondary output to job creation, and that doesn't fit terribly well with what a lot of universities want to do in terms of pure research. But we do contribute where we can particularly to technology transfer projects" (PM2). In short, the focus of the programme is on achieving employment outcomes, which R&D projects are not felt to deliver. As a consequence, "we have struggled in the past when we have been approached (to fund research activities)" (PM2). The individual goes on to point out that "universities, who we look to develop most of our R&D type projects, find it difficult to fit with the requirements of the programme in terms of hard output delivery" (PM2).

Such target-led behaviour is not a new finding; indeed the role of targets in promoting, or curtailing, certain activities is well recorded in the evaluation literature. However, the implications of this in terms of leading to differential levels of support for R&D activities between Objective 1 and Objective 2 programmes may not be fully recognized.

6.6.1.4 Style of approach

One factor that has been identified by many respondents is the difference in the style of approach between the Objective 1 programmes and the Objective 2 programmes in the case study areas. It is interesting to note that these cultural features appear to be common to Objective 1 and Objective 2, rather than to the geographical regions.

The first difference identified is that the Objective 1 programmes are seen as more focused on driving forward R&D-related activities, which may reflect the fact that each includes specific Measures directed at supporting such activities. "There is a stronger focus on R&D elements in the Objective 1 programme" (Int3). In contrast, Objective 2 is seen as being more generic in its approach - in that the programmes provide funding to universities to provide support to SMEs for example but does not direct this in any way. It is for the universities and the SMEs to determine their priorities (Ind3). Similarly, the Objective 1 programmes have also been portrayed as being more demand driven, whilst Objective 2 remains very supply-side orientated.

The second difference noted by respondents is that "in the Objective 1 area they tend to take a more proactive approach in encouraging certain types of activity to come forward. The Objective 2 programme is much more reactive." (RG4) As one Objective 2 Secretariat comments "we don't actively go out to develop projects" (PM2). "Our concern is the amount of help and assistance that we can give to business development. If that involves an element of R&D then it involves an element of R&D, but we don't go out of our way. The only way we would say it was driven in any way by that is that we are looking for matchfunding." (PM2). In contrast there are a number of examples, such as NAMTEC and Sportspulse, where the Objective 1 secretariat has actively engaged in the development of significant project activity in South Yorkshire. Similarly in Wales, there has been a very active strategy to promote the development of R&D capacity within the Objective 1 eligible area; the Technium programme being just one case in point. In contrast, it has been argued, there has not been an effective push, or strategy, to stimulate

R&D activities in Wales as a whole, leading to a lack of activity in the Objective 2 programme.

A final consideration in this area, which is a more general observation, is a tendency for responsible officials to be reactive, rather than seeking to explore new opportunities. This was highlighted in both Wales and in Yorkshire and Humber. One official acknowledges that "We're not very good at going back to the Regulations and seeing what might be possible. We tend to be very conservative in our approach". (RG1). Whilst in another instance a practitioner complained that "GO did quite a lot of work when we first got HEIF to encourage us to do it (match with Structural Funds), but they were perpetually telling us what the problems were and not what the solutions were" (HE6); an approach which simply reinforced the perception that funding R&D activities through the Structural Funds was too difficult.

6.6.1.5 Perception as to what Structural Funds are 'for'

One crucial factor influencing levels of R&D-related activity is also the perception as to what Structural Funds are for. One recurring theme is that Structural Funds are not there to finance R&D-related activities but are there to support the development of the economy. For many, the Structural Funds have been seen as an instrument to support local economic development and regeneration activity. As one interviewee put it "my understanding of the Structural Funds is that they are about economic development and basically creating jobs" (Int5). For another, what the Structural Funds have been very good at is to provide funds for restructuring of the local economy, for physical regeneration, for the provision of incubator units and to stimulate local industry "which is not R&D" (LA6). The fact that the Objective 2 programmes were constructed on the basis of very localised pockets of weak economic performance and high levels of deprivation and unemployment undoubtedly reinforced this perception.

This attitude appears to be more prevalent in the Objective 2 programme areas than in the Objective 1 programme areas and has a close relationship to the relative levels of Local

Authority engagement in a programme. On the whole, it has been the universities and regional bodies that have driven forward R&D-related actions. Objective 2 programmes, for many of the reasons already highlighted, have tended to be more strongly influenced by the activities of local authorities, and these have been less likely to promote R&D-related initiatives over local economic development activities. The importance of different 'mindsets' in determining the overall shape of a programme is dealt with in more detail later. For the present it is sufficient to note the implications of the differences in perceptions as to what the Structural Funds are for and, as one respondent succinctly puts it "don't forget that the Structural Funds are seen by a lot of local authorities as rightly theirs" (RG6).

6.6.1.6 Experience of individuals

One further area where discernable differences may account for the differential focus given to R&D-related activities is the experience of those involved in the programme. This is not just in the programme secretariats but also in the wider partnership. It is clear that in drawing up the original programme documentation, much of the strategy in Wales built on the experience gained through the RTP providing a firm base for the actions planned. Similarly, the development of the Objective 1 programme in South Yorkshire benefited from the inputs of key individuals involved in the promotion of innovation and R&D.

Within the South Yorkshire Objective 1 Secretariat there were also individuals who had experience of the Welsh RTP and who were able to bring this knowledge and expertise to bear. In contrast the Yorkshire and Humber Objective 2 secretariat was perceived as having a less technical background in terms of R&D-led economic development. A fact that some believe underpins the differences in approach between the two programmes. Similarly, in the East of England, a lack of capacity, at a practitioner level, to reflect on the issues has been held up as one reason that R&D-related actions have not been pushed forward through the region's Objective 2 programme: "There is a dearth, or at least a very tight level of supply, of expertise to assist in that process" (LA7). For this individual,

knowledge is not difficult to access if you know where to look, but it's knowing where to look that is the issue and, whilst there are pockets of expertise in the region, there are not the networks to bring this knowledge together, nor the incentives to be proactive.

6.6.2 The institutional imperative

From the above analysis certain features of the different regional innovation systems, and the approaches taken to the development of these systems, can be discerned. In the first case the importance of the authority responsible for economic development within the region – Welsh Assembly Government or Yorkshire Forward is clear. This has ensured that there is a close link between the Structural Fund programme and regional policy agendas. In this respect the Structural Fund programmes might be portrayed as supporting a strategic model of R&D governance. In both Wales and Yorkshire and Humber public bodies with region-wide responsibilities took a large proportion of the available funds, unlike in the East of England. The funds tended to be used to support pan-regional initiatives, rather than initiatives specific to the eligible area. In contrast, these same bodies have not regarded the Framework Programmes as a policy area in which they are engaged.

Secondly the importance of the Higher Education sector as a whole, and specific universities in particular, in the development of that system is apparent, both through the Framework Programmes and the Structural Funds. Most notably this includes the Universities of Cardiff and Swansea in Wales and the University of Sheffield in South Yorkshire. The reciprocal importance of universities and the use of EU R&D instruments in our case study regions is explored further in Box 6.7. EU funds are certainly important sources of income for individual universities, but not all. The lack of engagement of some universities in the Structural Fund programmes is also notable, Sheffield Hallam University in South Yorkshire - which led just 6 RTDI projects with a combined grant value of less than £141,000 – being a case in point, and, arguably, some of the universities and research institutes in the East of England.

Box 6.7 Universities and EU Programmes

It is readily apparent that universities in Wales and in South Yorkshire have been at the centre of efforts to stimulate 'experimental development' in their respective regions. Infrastructure investments have been located on their premises or with an explicit connection; business-academic collaborations have been promoted and knowledge transfer from universities to business encouraged. For many, universities have been seen 'as the only game in town'; particularly for the immediate future and a natural focus of attention given the few companies within the eligible areas with a strong R&D basis. However, the downside of this approach is that it is very supply-side driven. Arguably, this makes the R&D dimension to the Structural Funds important to the HE sector but less so to SMEs. On the plus side, universities are regarded by many as forming the bridge between large corporations and SMEs, in that they have a critical mass that SMEs do not possess and can take a longer perspective on investment than many SMEs are able to.

At the same time Universities have also made strong use of EU R&D instruments in support of their research activities. It is certainly the case that for universities in Wales, EU programmes, particularly the Framework Programmes and the Structural Funds, are an important source of research funds. For Cardiff University it is estimated that more than 20% of the University's annual research funds come from EU sources; for University of Wales, Aberystwyth the figure is around 17% and at University of Wales, Swansea it is 10% (personal communications). Each of the Universities has a strong strategic focus on supporting staff to access these funds, with access to specialised resources.

For some universities, not amongst the research intensive elites, there is a feeling that "EU Structural Funds may well have helped us to maintain a research base that would otherwise have disappeared" (HE5). They maintain that this is because other sources of funds, particularly from the UK's Research Councils are becoming more and more concentrated on a limited number of institutions. One university argued that it was treated more equally in its applications to the FP than was the case with the UK's Research Councils; which, they felt, took into account the reputation of the University not just the research project itself. The FP was, it was felt, an easier source of funding to break into as it was judged on the merits of the particular research project.

The third feature is the difference in certain features of the sectoral structure of the regional innovation systems. The importance in South Yorkshire of private and public intermediary bodies such as CTI, TWI and NAMTEC is apparent from the Structural Fund programme activities. All three organisations were established in South Yorkshire through the use of Objective 1 funds, demonstrating the capacity building approach

adopted to the development of the regional innovation system in this programme. There is not a similar identifiable role for intermediary bodies in the case of Wales, although TWI has also established a presence within the West Wales and the Valleys Objective 1 programme area benefiting from grants worth more than £3m. Similarly, the East of England is distinguishable by its significant resource of research institutes, the Public Sector Research Establishments, located within the region. Yet, as with their counterparts in Wales and Yorkshire and Humber, these appear to have a limited propensity to engage with the region's Structural Fund programme.

Finally, local authorities have not engaged strongly with EU R&D instruments as, apart from a few examples in the East of England, they have generally prioritized urban regeneration activities over investments in R&D and innovation capacity. This does not imply that they are unaware of these, merely that they do not initiate such activities themselves. In correspondence with one authority in South Wales, they were able to identify all the R&D-related activities funded by the Objective 1 programme in their area, but were not directly involved in any of these. An exception to this is seen as Sheffield City Council which has managed at least one project (Knowledge Starts) which involved the city's two universities, and has been encouraging of the AMRC.

The striking feature of the programmes is the lack of direct engagement of private sector businesses. Reasons for this in the Framework Programmes are well rehearsed (DTI 2004c, Arnold 2005). It is though worth noting that in the Framework Programmes private sector partners do make up around 10-15% of project participants in each region (Table 6.9). Somewhat counter-intuitively, in the three case study regions, the proportion of project participants from industry are highest in Wales and lowest in the East of England; reflecting the role of public research centres in the latter case. Whilst we should remember that this is only a relative measure, absolute levels of participation are clearly stronger in the East of England, it does suggest that there is an existing capacity on which Structural Fund programmes might build in both Wales and Yorkshire and Humber. The lack of engagement of the private sector as drivers of Structural Fund projects in these

regions is doubly unfortunate given that a strong aspect of the rationale for these programmes was to boost business expenditure on R&D (BERD).

From the research it is clear that the capacity, and willingness, of individual institutions to engage with EU R&D instruments has played a strong role in determining the level of activity within the programmes as a whole. This is the case for both the Structural Funds and the Framework Programmes. This stretches from the regional agencies through individual universities to individuals within those universities. Yet, there is also an element of influence in how policy-makers view the research capacity of their region.

Institutional choices can also have more direct effects. In the case of Yorkshire and Humber respondents have suggested that in the early years of the programme individual programme managers within Yorkshire Forward, the RDA, were hesitant to apply for funds from the Structural Fund programmes. Rather there was a preference to make use of Yorkshire Forward's own funds, the Single Pot, as this was simpler – particularly for pan-regional projects - and had fewer monitoring requirements associated with it. It was only with the realisation in the middle years of the programme that EU funds were not being utilised and that money might need to be paid back to the EU that, as a consequence, this habit changed.

The limited engagement of Sheffield Hallam University is a consequence of concerns that projects funded through the Structural Funds would not fully recoup their costs, owing to rules on the recovery of overhead costs. As a respondent from the University commented: "the terms and conditions of Objective 1 have been very difficult, its down to recovery of our overheads" (HE7). This concern does not appear to have been shared by universities in Wales or the University of Sheffield. Furthermore, the University was reportedly reluctant to engage in activities that were limited to the South Yorkshire region. The University sees itself as a regional institution but wants to make sure that is growing its relationships with 'customers' outside of what it perceives to be a very narrow area.

In the case of Cardiff University extensive efforts were made by University officials in order to enable the university to engage in the Objective 1 programme, even though it was located outside of the eligible area. As one official comments: "We spent a lot of time sorting out Rule 12[14]. Because we're adjacent to the (Objective 1) area we can go for it. We just need to demonstrate that the beneficiary firm is located in the Objective 1 area" (HE2).

What is also apparent is that individual institutions regard the Structural Funds and the Framework Programmes as very different instruments. For many the Structural Funds are regarded as something over which they have greater control in the use and distribution of, which is not the case for the Framework Programmes. This is most clearly indicated in the following, recent, statement taken from the Regional Innovation Strategy for Yorkshire and Humber:

"*In the **Framework** programme it is the role of YF (Yorkshire Forward) to act as a **facilitator** to ensure that organisations (universities, businesses and others) are well placed to participate in all aspects of the programme. ..... Finally, in the use of **Structural Funds** it is the role of YF to act as an **influencer** in the utilisation of these funds in response to the directives from both the UK Government and the EC*" (Yorkshire Science 2006 p.23, emphasis in original).

The role of individual initiative is also apparent, both in the Structural Funds and, more especially, the Framework Programmes. It is noticeable that in discussion with many university officials, actions through the Structural Funds and the Framework Programmes are led by the same small group of individuals. Equally, whilst some universities do have a strategy of supporting activities, the impetus for these often comes from personal initiative. A comment made by one university official in response to a query of the extent to which the university has promoted the Marie Curie programme highlights this.

---

[14] Rule no. 12 on the eligibility of expenditure states that "As a general rule, operations part-financed by the Structural Funds should be located in the eligible region. Exceptions can be made in cases where a region concerned by a measure will benefit wholly or partly from an operation located outside that region. In such cases, the operation must be located in a NUTS III area immediately adjacent to the eligible region. The maximum eligible expenditure is then calculated pro rata to the expected benefits (at least 50%), but may not exceed 10% of total expenditure on the measure or 5% of the total expenditure on assistance" (COMMISSION REGULATION (EC) No 1685/2000 of 28 July 2000).

"Not a great deal to be honest. It will be driven by how the academics are networked and linked into other colleagues. It's publicised by my office" (HE3). What is clear is that there is no active support for the development of contacts or strategic push for stronger levels of engagement.

In practice then the majority of activities undertaken through the Structural Fund programmes have been the result of individual initiatives, set within the strategic framework of the Structural Funds programming document (the SPD). In this respect activity is very much 'bottom-up', providing much scope for variation in the likelihood of individual institutions to engage with the opportunities available. Related to this, there is a recognition that much of the activity supported through the Structural Funds has been relatively 'piecemeal', owing to the competitive bidding approach adopted. It has been opportunistic and bottom-up rather than being driven by a strong strategic imperative, although in some, significant, areas - such as the Technium Programme in Wales - it was felt that quite a "well-planned, longish-term commitment" (Int1) was present.

Yet, despite the similarity in practice, there is a difference in how these two instruments are perceived by regional policy actors. The Structural Funds are seen as a strategic programme around which to build the R&D capacity of the region. In contrast, the Framework Programmes are viewed as something over which practitioners and policy officials have little control, almost as if the Framework Programmes are a source of windfall gains to the region rather than a means for developing the R&D capacity of the region.

This view was prevalent across all of the case study regions. One prominent official in Yorkshire and Humber noted that "Framework Programmes are seen as very much opportunistic rather than strategic and that if any individual organizations benefit from it then great, but it's very much their call" (PM3). Whilst in Wales, there is a clear view amongst WAG officials that the Framework Programme is outside of their control; that the approach has been opportunistic rather than strategic and that it is difficult to plan for at a regional level. This is summed up by one in Wales commenting that it is "Difficult

to plan at a regional level for FP... (we are) still opportunists rather than strategists... play to (our) strengths if something comes up" (RG2); a view that is echoed by many university officials.

6.6.3 Unbundling R&D, innovation and enterprise support: is it important?

The difficulty of identifying the level of RTDI-related activity undertaken through the Structural Fund programmes has been a recurrent theme for this study. This is partly because in some cases RTDI codes have not been used. In other cases it has been due to the fact that RTDI activities are 'bundled' up with other enterprise support actions in packages of more-or-less related activities.

For some of our respondents the fact that activities are rarely focused solely on RTDI means that it would be inappropriate to use such codes: "R&D codes aren't used because activities are rarely pure R&D" (PM2). For example, according to the Secretariat for the Yorkshire and the Humber Objective 2 programme, incubator space has often been included under the FOI codes for infrastructure investment, even when it has been used to fund the technology transfer element of projects. Similarly, in the East of England, research-led innovation activity is categorized under the enterprise codes, as illustrated in Box 6.8. This has also been the case in the Yorkshire and Humber Objective 2 programme. This contrasts sharply with DG Regio's view which is that "there is just one innovation code for the Structural Funds – RTDI (FOI 18)" (EU1).

The attitude towards this is that such administrative issues are not particularly important. As one respondent put it in discussing the FOI codes:

"*It's a line in the programme complement that I'm aware of but I don't really attach much importance to it..... (you shouldn't) get too hooked up on definitional issues around programme complements and SPDs because I think that you need to look at the spirit of what we're doing. Because we've put £7m into the AMRP, that is a research park yet none of that will show under those fields of intervention, yet it is a significant investment in R&D capacity.*" (PM3).

Box 6.8 The practice of project 'bundling'

The tendency to include R&D-related activities within wider projects is illustrated by the Building an Enterprise Culture project. Following the mid-term review of the programme Priority 1 was amended to allow capital expenditure as part of what the Government Office terms 'holistic business support packages' (GO-EAST 2005). This led to the financing of projects such as the Building an Enterprise Culture project which included finance for the Essex University Southend Campus, which, in turn, will include a business incubation/innovation centre for start-up companies and technology-focused businesses related to the academic research undertaken with the university; as well as academic departments and a business development centre. Yet this can only be discerned from detailed project level investigation.

In Yorkshire and Humber, for both the Objective 1 and Objective 2 programmes, Yorkshire Forward submitted single project applications designed to cover a range of support activities. The Yorkshire Forward Business Support Scheme was approved under the Objective 2 programme, of which around a third was judged to be related to RTDI activities, and the Cluster Development Scheme was approved under the Objective 1 programme, of which just 10% was allocated to RTDI activities. Each of these funding packages was a source of funds for the organisation's flagship programme: Centres of Industrial Collaboration.

This perspective is summed up in the view that FOI coding is "nominal. We attach no importance to it whatsoever. It's irrelevant" (PM3), a member of another secretariat felt that if this was important then they could go back and reallocate funds to different categories. In fact, in the case of at least one programme it is evident that project appraisers are allocating grant awards to FOI categories on the basis of the planned split between different codes as set out in the SPD, making a mockery of the use of FOI codes as a tool for monitoring RTDI interventions in any precise manner.

Whilst it is impossible not to have some sympathy with the view that this is just an administrative nicety, the corollary of this is that representatives of the regions, who are based in Brussels, report that DG Regio's desk officers are then unaware of all of the work that is going on within the region. As a consequence, it is then more difficult, they feel, to justify providing additional resources to support RTDI actions in the future. What

this highlights is the challenge facing those setting policies when confronted with individual and institutional behaviour which is directed towards realizing alternative immediate goals and strategies. It suggests that the 'organised anarchy' described by Peters and Pierre (2002) may be nearer to the mark than first imagined.

6.7 Conclusions

EU R&D instruments are making significant contributions to the level of research capacity and activity within all three case study regions. The balance varies between the Structural Funds and the Framework Programmes depending upon wider economic conditions and the level of existing research activity in the region. There is a strong emphasis within the Structural Fund programmes on strengthening the research-based infrastructure within the programme area, particularly that which is innovation-related, and, more especially, to make the knowledge generated within the universities located in the programme area available to local firms. In contrast the Framework Programmes, despite the significant levels of funds invested in research projects within the three case study regions, have a very low visibility amongst regional policy makers.

Overall, the actions financed in practice through the Structural Funds appear to have been influenced by the ideas emanating from theories of regional innovation systems and of endogenous economic growth. Much of the emphasis has been on building new institutional structures as well as strengthening those that were already present. There is a clear belief here that improving the innovation performance of local business rests not only on stimulating levels of private-sector research but also on opening up new channels for the transmission of knowledge. The research has revealed a strong presumption within each region towards promoting knowledge spillovers, and strengthening absorptive capacity, within the programme area, rather than looking towards the wider region. This preferencing of the programme area as an alternative to the administrative region emerges as an important theme within this research and supports the contention of Paasi (2004) that spaces can have power. A second recurring theme is the differentiation made between developing the research and innovation capacity of an area and supporting

actual research projects. The former is seen as a valid activity in the pursuit of regional economic development, whilst the latter is not.

The choice of activities to promote and support, and the narrative reasoning underpinning these choices, also suggests that actors give very little practical consideration to stimulating, tapping or developing the linkages between the regional and extra-regional spaces. This is most clearly apparent in the case of the HE sector, where much effort is focused on stimulating the linkages of universities to firms within a given area, but very limited support is available for them to build their own external linkages. This resonates with Healey's contention that practitioners find it difficult to visualise complex relational dynamics and revert to more traditional ways of 'seeing' spaces (Healey 2006).

The balance of funding recipients provides a pointer to the nature of the regional innovation structures within the UK's regions. The primary beneficiaries of EU R&D funding has been the HE sector, both through the Framework Programmes and the Structural Funds. From the research it is apparent that much of this investment has been concentrated in a very limited number of core institutions. The decisions taken by individuals in these institutions have played a significant role in shaping the nature of the R&D outturn of these programmes in all three regions. Outside of the HE sector there are distinct differences in the pattern of Structural Fund recipients between Wales, with its more centralist (or 'statist') approach; Yorkshire and Humber, where there is a stronger reliance on intermediary bodies, and the East of England, where the local authority scale is more prevalent. This balance is also influenced by perceptions as to 'who' the Structural Funds are intended to 'benefit' demonstrating the complexity of action in this field and bringing us back to the web of complex interactions referred to by Healey (2007). In contrast, the pattern of activity in the three regions with respect to the Framework Programmes is more consistent.

In understanding the patterns of EU-financed R&D activity recorded within the case-study regions a number of factors have emerged as significant. Individually these all have an explanatory power and are worthy of further consideration. Together they

suggest that there exists a common regional narrative of economic development which underpins patterns of policy activity; that there exists a strongly imagined narrative as to what different EU R&D instruments are to be used for; that individuals and institutions have significance in determining the shape of policies on the ground, and that public policies are able to create spaces which have power of their own. In the following chapter these considerations are explored in further detail.

7. PERCEIVED BENEFITS, DIFFERENTIAL SPACES AND DIVIDED COMMUNITIES: THE SEARCH FOR A COMMON NARRATIVE

7.1 Introduction

Building on the findings of Chapter 6, this chapter moves to consider the additional research questions posed for this study. It focuses on identifying the perceived benefits of the EU's R&D instruments, exploring what this tells us about how research-led economic development is conceived, and considers what light the results shed on knowledge transfer networks and regional innovation structures in the UK.

The chapter divides into three sections. The first section considers the perceived benefits and added value of EU R&D instruments. The evidence available reinforces the findings of Chapter 6 that there exists a common overarching narrative, but suggests that the two instruments are 'seen' in very different ways. Whilst this can help to explain the patterns of activity identified in Chapter 6 it also provides potential insights into how policies and issues are imagined.

The second section then considers the territorial dimension of the two instruments. That they have very different geographies is self-evident. It is the combining of these different geographies in practice which is the novel dimension of this research. This has implications not only for what happens where but also how actors engage with these funds. This begins to raise questions as to the role of public policy in creating 'powerful' spaces and how conceptions of such spaces influence patterns of activity in practice. The exploration of these geographies also throws up some interesting findings as to the reach of knowledge transfer networks. These findings suggest that existing theories of regional innovation may need to be extended to consider relational attributes more strongly.

Finally, the chapter addresses the issue raised in the previous chapter of the role of individuals and institutions in shaping policy actions on the ground. It finds that different, and distinct, communities of practice can be identified which influence the

pattern of activity identified in Chapter 6. These communities share a common imagination as to the role of the EU R&D instruments in economic development which limits the alternative possibilities. Once again, the findings suggest that a relational perspective might prove valuable in understanding the nature of these communities and that this might offer a mechanism for reconciling the complex interplay of functional and geographic spaces.

7.2 The perceived benefits and added value of EU R&D actions

The following section explores the perceived benefits of the actions supported through the EU's R&D instruments in the three case study regions. A strong economic narrative is identifiable in all three regions, although the precise tone of this varies between East of England, with a stronger orientation towards open-collaboration and research, and the other two regions, where an emphasis on economic development and capacity-building is more evident. The section also highlights the challenges facing any assessment of the impact of the EU's R&D instruments and suggests that this may have implications for the acceptance of the potential of R&D instruments to promote economic development in some quarters raising the question of the influence that this may have on accepted narratives. Finally, the section examines where EU R&D instruments are perceived to 'add value' and what this may itself suggest in terms of the way the instruments are 'seen'.

7.2.1 An economic narrative

In Chapter 5 it was identified that a strong narrative emphasizing the role of R&D investments in promoting economic competitiveness runs through the various economic strategy documents in each region. In Chapter 4, a similar emphasis was identified as underpinning EU policy statements in this area. It is, then, perhaps not surprising to find these same arguments prominent in the perception of the benefits that EU R&D instruments bring to individual regions. These perceptions provide a valuable window as to how research-led economic development is conceived in the UK and, more particularly, the perceived role that EU R&D instruments play in this.

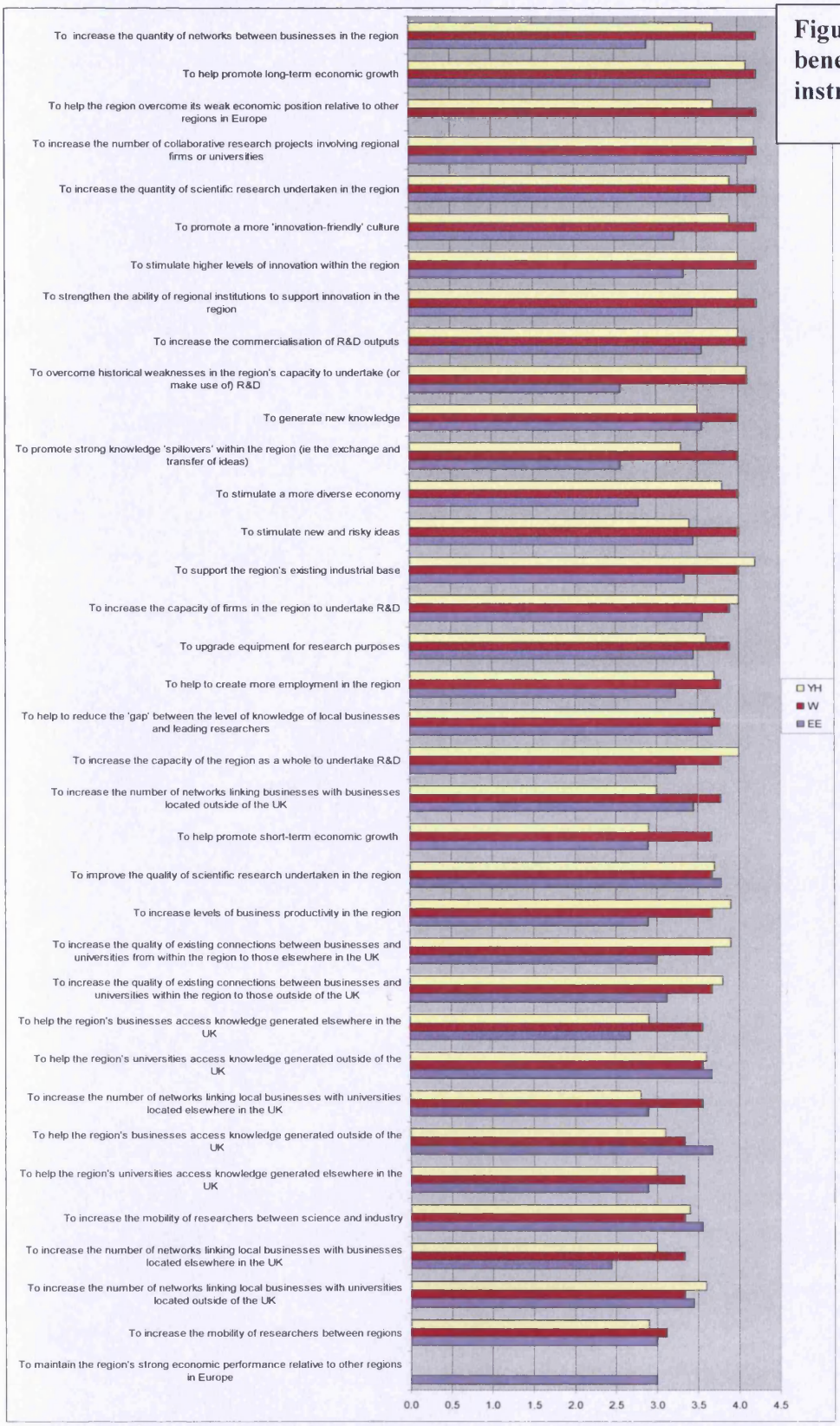


Figure 7.1 Perceived benefits of EU R&D instruments by region

Source: interview respondents n = 9 in Wales, 10 in Yorkshire and Humber and 9 in East of England

To ascertain the nature and the extent of the perceived benefits interview respondents were asked to score the extent to which they felt that EU funded R&D investments in their region, both Structural Funds and Framework Programmes, had realised named benefits to date; with a score of '5' given to strongly agree and a score of '1' given where there was strong disagreement with the statement. The results of this exercise are set out in Figure 7.1. Overall, respondents from Wales tended to be more positive about the perceived benefits of EU R&D instruments operating in the region and those from the East of England were least positive. This broadly reflects the scale of Structural Fund resources directed towards investment in R&D related activity in each region, suggesting that perceptions of benefit are strongly influenced by the quantity of activity undertaken within a region. Analysis of Figure 7.1 illustrates the similarity in the benefits perceived to flow from these investments, although a number of telling differences can also be discerned.

These differences and similarities are drawn out more clearly in Figure 7.2 and Figure 7.3. The former sets out the leading benefits identified by respondents in each region, whilst the latter sets out those that were perceived as the weakest outcomes. In each case the top (or bottom) ranking five responses have been selected, except where responses scored equally. In these cases all equal scoring responses have been included. In one case only four ranking responses have been selected as to move to the next scoring band led to the inclusion of too many additional responses.

From Figure 7.2 it is apparent that two themes consistently rank amongst the most significant perceived benefits of EU R&D instruments within the three case study regions. One of these relates to actions actually supported through the funds available - increasing the number of collaborative research projects involving regional firms or universities; the other to the expectation that all the activities funded will help promote long-term economic growth. Both attributes might be seen as underpinning the logic of the EU's Framework Programmes and the approach taken to R&D-related development through the Structural Funds, as identified in Chapter 4. These themes reflect the

prevailing economic narrative associated with the EU's R&D instruments, identified in Chapter 4, and highlight the assumed belief of regional policy actors that supporting R&D activities will result in economic growth (as set out in Chapter 5). It also demonstrates the strong emphasis placed upon the value of knowledge transfer between universities and businesses within a region.

Figure 7.2 Highest ranking perceived benefits of EU R&D instruments

East of England	*Wales*	*Yorkshire and Humber*
To increase the number of collaborative research projects involving regional firms or universities	To strengthen the ability of regional institutions to support innovation in the region	To support the region's existing industrial base
To improve the quality of scientific research undertaken in the region	To stimulate higher levels of innovation within the region	To increase the number of collaborative research projects involving regional firms or universities
To help the region's businesses access knowledge generated outside of the UK	To promote a more 'innovation-friendly' culture	To overcome historical weaknesses in the region's capacity to undertake (or make use of) R&D
To help the region's universities access knowledge generated outside of the UK	To increase the quantity of scientific research undertaken in the region	To help promote long-term economic growth
To help to reduce the 'gap' between the level of knowledge of local businesses and leading researchers	To increase the number of collaborative research projects involving regional firms or universities	To increase the capacity of the region as a whole to undertake R&D
To increase the quantity of scientific research undertaken in the region	To help the region overcome its weak economic position relative to other regions in Europe	To increase the capacity of firms in the region to undertake R&D
To help promote long-term economic growth	To help promote long-term economic growth	To increase the commercialisation of R&D outputs
	To increase the quantity of networks between businesses in the region	To strengthen the ability of regional institutions to support innovation in the region
		To stimulate higher levels of innovation within the region

Figure 7.2 also illustrates the differences between the case study regions, in particular the differences between those regions where a 'scientific' logic is predominant and those where the rationale has a stronger economic focus. The over-riding economic logic underpinning the perceived role of EU R&D instruments is particularly apparent in the significance ascribed to 'improving the quality of scientific research undertaken in the region'. Whilst this is ranked very highly in the case of the East of England, where EU R&D interventions are dominated by the Framework Programmes, it is perceived to be much less significant in both Wales and Yorkshire and the Humber. It is useful to note however that in Wales, as in the East of England, increasing the quantity of scientific research undertaken in the region is regarded as one of the key benefits of the activities funded in the region, suggesting that actors in Wales are concerned with the region's perceived 'science deficit' highlighted in Chapter 5.

In the case of the East of England the perceived benefits relate very much to the connections that these instruments enable outside of the region and demonstrate the strong and open 'science' orientation of activities. In this respect the influence of the Framework Programmes can clearly be seen. In contrast respondents from both Wales and Yorkshire and Humber demonstrate a more regionally-focused perspective marked by the relatively low ranking given to the achievement of benefits related to connections outside of the region (Figure 7.3). This provides a strong indication of the internal orientation of the programmes operating within these regions and reflects an emphasis on building regional capacity for R&D.

The strong territorially-bounded approach revealed by respondents from Wales and Yorkshire and Humber is also apparent in the importance attached to benefits relating to a stimulation of higher levels of innovation within the region and the strengthening of the ability of regional institutions to support innovation in the region. There are some subtle differences between the two regions however, perhaps indicative of a differential approach in the thinking and strategy of each. Welsh respondents have emphasised the innovation benefits of the supported actions, whilst respondents in Yorkshire and Humber have instead stressed R&D focused benefits over those related to innovation.

In a further sign of the general logic of the approach taken, both in Wales and Yorkshire and Humber, there was felt to be very limited attention given to stimulating the mobility of researchers, either between regions or between science and industry. The lack of such activity has been remarked on previously in Chapter 6 and this simply reinforces that point.

Again, the benefits which were perceived as least strong in the East of England (Figure 7.3), also give a strong indication of the nature of the actions being undertaken within the region, and those which have not been taken. Alongside a feeling that connections were not being made between businesses in the region and those outside of the region, other areas where effects were felt to be weak all related to economic rationales for R&D interventions. These included limited effectiveness in stimulating spillovers, overcoming historical weaknesses in R&D capacity (a rationale for action in the Objective 2 SPD it may be recalled) and stimulating a more diverse economy.

Doubts about the benefits of the approach adopted were also voiced by interview respondents. Two particularly stand out. The first questions whether the actions taken have really reached out and stimulated business expenditure on R&D, particularly in the case of SMEs. There is a feeling that the emphasis is yet to reach this key group. As one individual suggested in Wales: "The Technium focus was good for universities but had little impact on business expenditure on R&D" (HE1). The second is that the Structural Fund programmes tend not to have supported the generation of new knowledge, despite initial plans to do so in some programmes. Rather they have focused on developing the infrastructure in which knowledge might be generated, or the infrastructure for the dissemination of knowledge. In that respect the Structural Funds were criticized for "only helping universities to spread the knowledge that they have" (Ind3) rather than seeking to help universities to develop their knowledge base at the same time. Arguably, the Framework Programmes (alongside other UK instruments) have played the role of knowledge generation. If one accepts the original criticism then the question becomes one of how well these actions have worked together and the extent to which the benefits

of the knowledge generated have been realized in the region as a whole, a question that is revisited in Section 7.3.4 below when the issue of knowledge spillovers is considered.

Figure 7.3 Lowest perceived benefits of EU R&D instruments

East of England	*Wales*	*Yorkshire and Humber*
To increase the number of networks linking businesses with businesses located elsewhere in the UK	To increase the mobility of researchers between regions	To increase the number of networks linking businesses with universities located elsewhere in the UK
To promote strong knowledge 'spillovers' within the region (ie the exchange and transfer of ideas)	To increase the number of networks linking businesses with universities located outside of the UK	To increase the mobility of researchers between regions
To overcome historical weaknesses in the region's capacity to undertake (or make use of) R&D	To increase the number of networks linking businesses with businesses located elsewhere in the UK	To help the region's businesses access knowledge generated elsewhere in the UK
To help the region's businesses access knowledge generated elsewhere in the UK	To increase the mobility of researchers between science and industry	To help promote short-term economic growth
To stimulate a more diverse economy	To help the region's universities access knowledge generated elsewhere in the UK	
	To help the region's businesses access knowledge generated outside of the UK	

7.2.2 Estimating the value of the benefits realised

Although there is a general consensus that EU R&D instruments have brought benefits to the regions concerned, as illustrated by the positive ranking granted to all of the benefits listed in Figure 7.1, the scale of these is not known. There has, as yet, been no systematic evaluation of the impact of R&D investment through either the Structural Funds or the Framework Programmes in any of the three case study regions. In the case of the

Framework Programmes there is no mechanism for this and, on the basis of the information derived through this study, no noticeable consideration of undertaking such an evaluation at present. This is largely because the Framework Programmes are not 'seen' as being a regional responsibility, suggesting that evaluation is undertaken more for reasons of audit and management than to promote policy-learning and development.

For the Structural Funds, there is an assumption that evaluation is the responsibility of the programme management authorities. However, the practice tends to be towards programme-level evaluations, where the impacts are assessed at the programme level, rather than thematically-orientated approaches. Alternatively, where R&D-led interventions are evaluated this tends to be part of wider European evaluations of the Structural Fund instruments (see for example DTI 2008). Within both Wales and Yorkshire and Humber there have been evaluations of individual projects part-financed by EU funds, often undertaken by sponsor bodies such as Yorkshire Forward in the case of CICs and the Welsh Assembly Government for Technium, but there has been no attempt to undertake a similar exercise at the programme level.

In part this is due to the recognised challenges of evaluation in this area, as considered in Box 7.1. But it is also due to the fact that this has not been a priority in the regions to date. This is particularly the case for the Framework Programmes where one regional observer comments that they've: "Never asked questions beyond how much money is coming into the region" (RG11) with the result being that little is known of what Framework Programme activity really brings to the region. For, as another commentator holds, "we don't really know why the FP are important for stimulating R&D capacity in the region" (RG8)

Box 7.1 The Evaluation Challenge

It is widely agreed that one of the major impediments to effective evaluation is developing robust indicators to measure the economic impacts of investment in projects to stimulate R&D and innovation. Typically traditional measures such as new company formations; job creation, and quality of job, coupled with an assessment of multiplier effects will be utilised. However, there is a feeling that these are not appropriate. "Science, research is all about growth...at best it is job neutral...Structural Funds are designed to give you x number of jobs and x number of sales improvement...which isn't something that science, technology and R&D will give you in the short-term, or even in the medium-term you could argue" (RG6).

The fact that many of the benefits are perceived to lie in the future causes it's own difficulties "so the true impact of these (projects) we won't know, because we're not measuring them in those timeframes and how could we? You cannot keep going back to businesses, it's almost impossible to do" (RG1). Equally, the wider benefits to firms from securing licensing and manufacturing agreements are felt to be not well recognised. There is a feeling that only the direct and immediate benefits of investments in R&D-related activities are really valued in evaluations of such interventions.

In an effort to address these concerns, alternative indicators have been suggested, such as the introduction of new products and processes or increases in levels of productivity or turnover. In some instances these are now being built into the current Structural Fund programming documents, such as the Strategic Framework developed for the Structural Funds in Wales (WAG 2008). But there is no certainty that these are appropriate either, and some common indicators, such as the number of patents registered are derided as meaningless as it is the value that is derived from a patent that is significant for regional economic growth. As one university official comments "there is a major piece of work to be done to measure innovation and knowledge...and I think we have chosen some of them (indicators) unwisely and missed others" (HE4).

However as one regional government official comments "it's easy to knock (the indicators used), but what else can you put in their place that you can measure, realistically, with businesses, and that you can realistically get that information out of them? That's quite tricky" (RG1).

The consequence for many of those involved in supporting the development of R&D-related projects is a feeling that these projects get undervalued, indeed that a strong emphasis on short-term returns can act as an hindrance to future investment. For example, when the cost-per-job created in a Technium over three years is compared unfavourably to the cost of job-creation in a standard factory unit. As one practitioner commented "we take as read the long-term benefits but look for short-term returns" (Int1). This is creating evaluative challenges as well as philosophical ones.

In fact many of the respondents to this study have argued that the scale of the benefits is not substantial. In the words of one respondent "I'm sure that it has had an impact, but it hasn't been as focused on that as perhaps it should have been" (RG1). For another, the EU instruments have led to: "Nothing bad but generally mediocre benefits. No radical change has resulted" (HE1). This is a feeling that is reflected in the other case study regions too.

One of the reasons for this is that the Structural Funds, in particular, are not seen to be promoting activities significantly different from that which would take place anyway as there is very little difference between EU and UK priorities in this area: "I don't think there is that much benefit....because I don't think that the policies have been driven in any way by the EU policies. I think that the UK is pretty much ahead of the game... in terms of recognizing the value of R&D" (PM2). "Everything that we do chimes with EU policy... (but) I think that it would have happened anyway" (PM2). This raises the question as to what additional benefit the EU dimension to these instruments brings over and above that available through domestic policy initiatives.

7.2.3 Identifying the added value of EU R&D instruments

There is now a burgeoning literature considering the added value of EU Structural Funds to the UK (ECOTEC 2003, EPRC 2003). This builds upon early work by DG Regio (Mairate 2006) considering their view as to the potential added value of such programmes, notably: influencing policy content; influencing practices; leveraging additional funds; influencing management and administration practices, and raising the profile of the EU. To date, the Framework Programmes have not been considered within a similar analytical frame, a gap which this study begins to redress.

In the past, it is argued, EU funds added value in the form of policy and practice in the UK. EU funds brought you things that the UK government (and more recently the RDA) wouldn't do. But the research demonstrates that these are less powerful factors today. There is a strong similarity between EU and UK policies and objectives and people are

doing things that they feel are important and would try to do anyway – it would appear that EU instruments are merely adding extra money to things that would have gone ahead anyway.

If this is the case then where do EU R&D instruments actually add value? In the eyes of the respondents to the survey, the additional funds that EU programmes bring to the region is one significant area and, in the case of the Framework Programmes, the other is the international collaboration that this promotes. As one respondent put it, referring to relevance of the Framework Programmes: "for 2 reasons: cash in and international partners" (RG8).

7.2.3.1 Additional funds

The benefit of the additional funds available owing to the EU R&D instruments was a recurring theme of the study. There is a very strong consensus amongst those interviewed that the Structural Funds have enabled more R&D related investments to take place in the Objective 1 regions than would otherwise have been the case. The Funds have enabled the size of domestic programmes to be increased and for many investments to be made sooner than would otherwise have occurred. In the words of one respondent from Yorkshire and Humber, the Structural Funds "Brings you more cash... it allows you to do things quicker and bigger (sic)" (HE7). Officials in Wales echo these sentiments, using very similar language, describing the Structural Fund inputs as: "(a) small amount of money but it does allow things to be brought forward, or things to be enhanced...." (PM1).

In Wales there is a very strong feeling that the EU funds have enabled tangible investments of a scale which would not have occurred in their absence, with one official in the Welsh Assembly Government reflecting that "we might have been doing the work, but in the existing buildings" (RG3). Certainly, there is a strong view that various projects "would never have got off the ground without the Structural Funds" (HE4) Examples given include the Wales Energy Research Centre; the Gas Turbine Research

Centre; the Institute for Life Sciences; various Techniums, and the Institute for Advanced Telecommunications. Such a list provides a real perspective on the scale of activity realised as a consequence of the EU's funding programmes. Again, similar sentiments are expressed in with respect to the South Yorkshire Objective 1 programme. However, whilst there is strong agreement on the effect of the available funding on physical R&D-related capacity in particular regions there is also a consensus that the available funds have not had a significant impact on the quality of what has been undertaken: "Benefits tend to be an increase in quantity rather than quality" (RG2), supporting the analysis associated with Figure 7.2. This may be one reason that only modest benefits are ascribed to the programmes suggesting that in many cases funds allow desired activities to be scaled up rather than causing wholly-new approaches to be initiated within a region.

One of the crucial features of the additional funds provided is that these have been regarded as expanding the amount of discretionary funding available, which has also encouraged a slightly more risk-orientated attitude. There is a sense that the availability of the Structural Funds has enabled "us to take a risk in certain areas that you would not otherwise be able to do" (RG1), for "things to be tried and tested that universities or the WDA (*sic*) would not necessarily have put their resources to. So it does stimulate all those things and certainly it allows the engagement of HE with the private sector, perhaps more so than would otherwise happen" (PM1). This is a view that is also supported by those linked to the universities. For the universities, Structural Fund monies are regarded as supplementary funds which can deliver additional activities without the opportunity cost of reducing any existing activity of the university.

The significant resources available under Objective 1 have also acted to engage senior management levels in the universities, which has led to a more strategic approach within institutions; whereas previously engagement was stimulated by individual academics. Without the additional funds that these instruments have made available it is unlikely that this would have been the case, although the fact that UK policies are stressing the importance of such activities at the same time means that it is not possible to draw simple causal relationships.

The undoubted importance of the available funding does lead to considerations of the motivation of actors engaging in this field. The suggestion by some that "there is a huge amount of money and if that is going to go somewhere then we would probably prefer for that to go to this region than to any other region" (RG10) does lead to a suggestion that the motivation might be one of rent-seeking behaviour as opposed to using the funding as a tool to help develop the regional economy. This perspective is granted further credence by university officials who, as one puts it, have "crafted our initiatives in light of EU objectives, priorities and strategies" (HE4). However, given that one aim of EU policies is to 'bend' mainstream policies and influence behaviours then this may not be a bad thing.

What is certainly true is that many regional actors appear to view the EU's R&D instruments largely in terms of the amount of resources that they bring into a region. This is captured by the frequent references to the regional take and the importance of maximising the amount of funds that the region 'draws down'. Certainly, one regional official regarded the main focus of attention of the region's development agency as being to consider how they can help businesses and universities access the funds that are available and increase the value coming into the region. Such rent-seeking behaviour is perhaps now more clearly manifest in the increased attention being given to the Framework Programmes within the case study regions.

7.2.3.2 Collaborative international working

For university officials the benefits of the European and international connections engendered by the Framework Programmes are seen as a clear area of added value, together with the potential that the Programmes offer for researcher mobility. As one says, "it gives you a much broader perspective in terms of partnerships and collaborative research relationships" (HE3). The potential offered to universities by European funds was summed up succinctly by one university official who noted "academics don't come here because we have access to EU funding, but (we) have had some success recently in

attracting young up-and-coming academics in fields like energy and environment, possibly because EU funds have enabled us to build capacity and profile in this area" (HE5).

The Framework Programmes are credited with having increased the total level of activity in a region, for example supporting more researchers than would otherwise be the case. It is worth recalling that in Chapter 6 it was been suggested that the Framework Programmes are funding almost a fifth of the posts in the AMRC. In the case of the Framework Programmes however, the funding is also judged to boost the overall quality of activity being undertaken in so far as the EU funding gives an opportunity for small groups of task-orientated researchers to apply their own discrete expertise and to boost their reputation through working with other European research groups: "it's about growing reputations" (HE12).

The benefits of collaborative working at a European level to individual researchers and individual universities are generally seen as a given. It helps to build critical mass (*inter* alia providing scientific benefits through the development of more robust data sets; the combining of technological capacity; access to diverse knowledge and experience) and introduces external thinking into a region, creating the space for learning (LA7). In this respect the real advantage is having access to other organizations, research bodies, companies etc in other countries. The benefit to the region is that the Framework Programme allows the development of partnerships with a wider range of companies/researchers and is regarded as allowing firms and universities to do research they might not otherwise do.

Clearly the benefits of this to a region vary, depending upon the extent to which organizations in the region participate in the Framework Programmes, but also the extent to which the accrued benefits spillover from the participating organization. As one university official put it: the Framework Programme brings benefits to the university but does the university then "drill down into the region"? (HE7), a question which is considered in Section 7.3 below.

7.2.3.3 Other aspects of added value

Two areas where EU programmes, particularly the Structural Funds, are commonly believed to add value are in terms of the multi-annual strategy approach adopted and the sharing of good practice across regions of the EU (see for example ECOTEC 2003). The evidence for either in the context of this study is limited and suggests a certain degree of reappraisal is required.

The fact that the Structural Fund programmes set out a long-term strategy is not disputed. There is clearly value in this in so far as it provides for an integrated approach across the region. However, in practice it appears that the approach is rather more piecemeal than the strategy-led argument suggests. For many the current approach "relies upon people on the ground bringing these things together" (HE4). There is a sense that the approach has been rather 'piecemeal' to date, because anyone has been able to bid into the programme. Projects that were "seen as good projects but linked to the bigger agenda of industry academic links" (RG1) were likely to gain support regardless of their more specific focus. Similarly, the advantages of a 7-year programme were felt to be dissipated by the fact that many individual projects were more short-lived than this. The 4-year cycle of the Framework Programme, which was out of step with the Structural Funds programming period was also viewed as problematic, with some commentators arguing the programme was ending before lessons learnt had time to be assimilated and acted upon, the Bonus arrangement being given as a case in point.

There is a very strong feeling that there is a separation of activity, both between the Structural Funds and the Framework Programmes and in efforts to stimulate levels of R&D and innovation more generally, with one respondent commenting that there has been "a pepperpot approach to developing centres, like spin-out company centres and these sort of things for universities, there's been some general business support delivered but it doesn't really help the region to get to grips with the bigger regional issues around innovation and R&D" (RG4). As others similarly observe: "It's all woven together at the

grass-roots level" (Int3). "It's not really a strategic process it's been about identifying what match happens to be there" (PM3), which means that there has been "very little integration" (PM3) between policies.

The learning effect that that EU instruments can facilitate is certainly not in dispute either. For many, "it brings policy thoughts and ideas into the arena which might not otherwise come in" (RG1). One of the roles of the programme secretariat in this instance is viewed as a node for the gathering together of valuable lessons of what works, and what does not: the "Objective 1 secretariat can act as a collecting point for these lessons from different projects – both into RDA and DG Regio" (HE7). However, the extent to which this is truly valuable for regions in the UK is contested as there is uncertainty over what effect this really has had: "I guess we would have moved in this direction, it's probably allowed us to move faster and its probably allowed us to build more in terms of the existing infrastructure than we would otherwise....but I think we'd have been doing this anyway" (RG3). This plays to the argument that the UK is at the forefront of thinking in this field, a contentious argument, but one which is lent superficial support by the fact that three out of the five inaugural RegioStar awards awarded by DG Regio for regional innovation went to UK organisations (Box 7.2).

Box 7.2 Inaugural RegioStar winners (2007)

- ENERGIVIE, Alsace, France
- Øresund Science Region, the cross-border Øresund region, Sweden and Denmark
- OpTIC Technium, Wales, UK
- EnviroINNOVATE, West Midlands, UK
- Centres for Industrial Collaboration, Yorkshire and the Humber, UK

Source: Europa Press Release RAPID IP/08/294 (25/02/2008)

What is apparent is that Structural Fund support leads to a greater visibility for actions underway in a region than does support through the Framework Programmes. It is telling that the AMRC has an exceptional visibility amongst regional innovation actors throughout Yorkshire and Humber, as do the CICs, whilst the centre for Natural Language Processing (NLP) at Sheffield University, for example, is largely unremarked.

"Oh, (Yorkshire Forward) wouldn't know about that because it's a research group within the Department of Computer Science. Yet the NLP group are coordinating two Integrated Projects, so that's an overall budget of €22m, they're coordinating a STREP (Specific Targeted Research Project), that's another €4m, and they're partners in another 10 (Framework Programme) projects" (HE9).

One of the benefits of the connections established through the Framework Programmes that is not often highlighted is that it has allowed some participants to gain experience as to how Structural Funds are being used in other parts of the EU, which they are able to bring back into the region and pass onto others. The onus though is then on others to follow that up and the flow of that information is very much based around both personal contacts and interest.

7.2.4 Split imaginations

Analysis of the perceived benefits and added value of the EU's R&D instruments in practice has an intrinsic value for those interested in the delivery of public policy objectives, and addresses one of the research questions established at the outset of this study. It also raises some practical concerns, particularly around the evaluation challenge for further work in this field. With further reflection it is also apparent that the analysis reveals much about conceptions of research-led economic development and the way in which certain ways of thinking are embedded in practice.

There is a clear divide in the benefits that the Structural Funds and the Framework Programmes are perceived to deliver. The focus of the former is on economic growth, economic structures and building capacity for research and innovation. The latter is more about research and building scientific knowledge. This divide gives some credence to Cooke's suggestion that the generation of knowledge and the utilization of that knowledge are twin dimensions of regional innovation systems (Cooke 2005). This perceived difference in the underlying logic of different instruments is self-reinforcing in

that it feeds through into perceptions of what each can be used for, which, in turn, shapes the realized outcomes.

It is also apparent that the spatial logic of the two instruments is seen very differently. Whilst the Structural Funds clearly have a very strong territorial focus, the Framework Programmes are viewed as more international in their activities. This aspect is explored more fully in the following section. Again though, this raises the question of how policy governance engages with and understands the complex interplay of the relational webs that these patterns illustrate. Whilst the centrality of regional innovation systems thinking is very evident in the policy imaginations relating to the Structural Funds it is less apparent that the role of external knowledge flows are equally considered. Indeed the relative 'invisibility' of the Framework Programmes to regional economic policy actors raises important questions as to the imagined narratives embedded in practice.

The research findings also illustrate that although the role of international linkages for building capacity and profile in research in particular areas is well-recognised in the case of the Framework Programmes, this does not appear to have the same profile in the Structural Funds. Yet, the role of external knowledge, and the importance of relational assets is a strong aspect of the literatures around regional innovation systems, suggesting that understanding of the relational complexity evident in this area is, as Healey suggests, only weakly-developed (Healey 2006) and that policy-actors do find it difficult to imagine what to link and what to join up.

In part this difficulty in making the wider linkages may also be influenced by the important role played by institutional strategies in shaping the form that policy takes in practice. From the research it is equally evident that the actions of various institutions, from policy governance bodies through to universities, have been influenced by a differentiated desire to attract funds from the EU instruments and shaped by the requirements of these instruments. Whilst this may be regarded as rent-seeking behaviour it also demonstrates that effective power lies at many levels within the system. This provides support for the contention by Peters and Pierre (2002) that the multi-level

nature of governance in this field simply increases the potential for segmented decision-making and limits the extent to which policies will join up in practice.

7.3 The territorial dimensions

The preceding section identified the strong territorial dimension perceived for R&D actions undertaken through the Structural Funds. This section explores this dimension further for both the Structural Funds and the Framework Programmes and considers what this can tell us about the role of particular spaces in shaping both actions and attitudes. It begins by considering the distributional effects that programme spaces may induce and then considers the nature of the spaces established by the Structural Funds and the Framework Programmes. The different geographies of these spaces are outlined before the section turns to considering how this is, or is not, reconciled on the ground.

7.3.1 Distributional effects

Structural Fund programme areas are bounded spaces. Areas within the defined boundaries are eligible for support, and those located outside are not. In practice, this applies equally to the individuals and entities known as the 'final beneficiaries' ie those individuals, firms or organizations that the funds are intended to support. In practice, the designation of Objective 1 status for West Wales and the Valleys does appear to have led to a redistributive effect on the location of R&D activities within Wales. A similar, but arguably weaker, effect is also visible within Yorkshire and Humber.

Most visibly this can be seen in the pattern of Technium investment, which has been entirely focused within the Objective 1 programme area and other significant investments such as the Gas Turbine Combustion Research and Test Centre. As one observer commented "it does have a distinct impact, which is the whole Objective 1 aim" (Int1). Of the major investments in R&D related infrastructure in Wales in the past 10 years the majority of this has arguably occurred in the Objective 1 programme area. Similarly within Yorkshire and Humber, a significant proportion of R&D-related infrastructure

investments have been associated with the Objective 1 region. The Programme has also attracted inward investment into the region, one example of which is the firm Metalysis, as illustrated in Box 7.3.

The programme boundaries have also exerted an influence on the geography of activity through rewarding activities that take place within the Objective 1 area. In some cases this has had a considerable effect, with Aberystwyth University reflecting that the Objective 1 boundaries have caused them to seek to engage with local businesses much more significantly than was previously the case. This has broadened and enlarged the portfolio of companies that academics deal with rather than displacing activities with large companies. University staff admit that initially there was some scepticism as to the benefits of this but that in practice "it's given more benefits to researchers than they initially thought" (HE5).

Box 7.3 Securing inward investment: the case of Metalysis

2001: FFC Ltd is spun out of Cambridge University with funding from the Cambridge University Challenge Fund to commercialise the FFC Cambridge process for the production of tantalum and other high value metals.

2002: The Company acquires the worldwide rights to the process for the exploitation of all metals, other than titanium above 40% by weight.

2003: The Company name is changed to Metalysis Ltd.

2004: Metalysis secures funding and support from South Yorkshire Objective 1 programme and Yorkshire Forward and relocates to Rotherham.

Source: adapted from Metalysis company website (www.metalysis.com)

Similarly, in South Yorkshire, it is argued that Structural Fund support has led to an increased targeting of attention on local firms. One example given is NAMTEC, where the DTI's funding was not linked to geographical targeting but that from the Structural Funds was. Similarly, the geographical targets associated with the CICs are hoped to promote benefits for local SMEs, who might not otherwise engage with such programmes. Such a geographical focus will, it is anticipated, reduce the likelihood of R&D investments turning into the celebrated 'cathedrals in the desert' so colourfully

characterised by the regional innovation studies literature. It is also hoped that this will cause potentially mobile investment to become rooted in the region through embedding it in networks of local SMEs.

In short, the very presence of Objective 1 funds has had a distributional effect on the location of R&D-related activity within Wales and, to a lesser extent the same is true of South Yorkshire, although in both cases the impacts of this remain intangible. As one WAG official comments: "It enables projects to take place that in other regions do not happen" (RG1). Similarly one official from Swansea University feels that the funds have "allowed Swansea University to accelerate the way that it works with the economy in a way that arguably Cardiff University has not been able to do because it does not have access to these funds" (HE3). These contribute to changing geographies of engagement, as also witnessed in the case of Aberystwyth University's links to SMEs. It has also been suggested by some interview respondents that the Structural Funds have offered a mechanism for developing collaborative projects and joint ventures between universities in Wales which would not otherwise have been possible under existing policy structures. The reason given is that the funds available were not earmarked for the university sector and so this engendered collaborative rather than competitive behaviours around common goals.

Arguably, the Objective 1 programme in West Wales and the Valleys has also redirected the efforts of Cardiff University; encouraging the University to make its knowledge available to firms located in the Objective 1 area and to invest in research facilities and capacity in the Objective 1 area itself. Using the provisions of Rule 12 (see Chapter 6) the University is able to receive support to provide advice to beneficiary firms located in the Objective 1 area. Paradoxically, Cardiff University has found it harder to engage with Objective 2 because of the difficulty of demonstrating whether a firm was located in an eligible ward. Similarly, the development of the Turbine Research facility at Baglan Energy Park in the Objective 1 area is the result of a collaboration between Cardiff University and Qinetiq, neither of which were previously based in the vicinity. In this respect, the Objective 1 programme has certainly established a number of direct

connections between Cardiff University and its neighbouring 'Less Favoured Region'. The same cannot be said of the South Yorkshire Objective 1 programme however, as there is little evidence of organisations lying outside of the eligible area providing substantial levels of support within the region. As one official in Leeds University commented: "We in Leeds could go and deliver benefits in South Yorkshire using Objective 1 money: we don't. Equally, they could come and work with us. We are both missing a trick because of this, and as such the region is a weaker place" (HE6).

7.3.2 Structural Fund spaces

As has already been established, the Structural Fund programme areas are largely artificial spaces. This is particularly the case for the Objective 2 programme areas, but also for West Wales and the Valleys given the origins of this NUTS 2 'region'. Even in the case of South Yorkshire, this is arguably an administrative space rather than a social or economic entity. The designation of certain areas as eligible for support from the Structural Funds has a profound influence on the shape of the programme; as much in the approach taken overall as in the pattern of activity across the region as a whole. As one Objective 2 programme manager put it: "partners are all locally-based and are looking at local priorities" (PM4, emphasis as originally given). These local priorities have traditionally not included R&D as these needs were not apparent in the areas concerned. "The need in the designated area has been much less about R&D and about more fundamental needs. The R&D tends to happen in places like the Norwich Research Park...but that's not a designated area for Objective 2" (LA6). As another local authority officer explains "for most Local Authorities, R&D is not on their radar" (LA7), at best local economic development teams might have some responsibility for innovation in businesses but even here expertise is often limited. Implicitly the shape of the programme has encouraged a local needs approach, or as one practitioner put it "you don't see the bigger picture" (LA6).

This division of the region into eligible areas and non-eligible areas, and areas eligible for Objective 1 and those eligible for support under Objective 2 has led to an artificial

dividing of the regional 'space', creating tangible barriers to co-operation, where none existed previously. We have already seen that Universities located outside of the South Yorkshire region did not engage with the Objective 1 programme. This has led to the observation that activities are being corralled into these artificial spaces with very little collaboration between Objective 1 and Objective 2 programmes and precious few truly cross-regional projects. In the words of one actor: "Sheffield and SHU deliver Objective 1, Leeds, Bradford, Huddersfield and Hull deliver Objective 2" (HE6) and another observes that "All that Objective 1 has done is to simply reinforce that boundary around the region" (HE7).

For others, the division of the region has implications for how to interact with other activities elsewhere in the region. The fact that the economic (and R&D) centres of Wales both lie outside of the Objective 1 region - in north east Wales and around Cardiff - has posed challenges in itself. As one official in WAG commented "it's an abiding difficulty that the real powerhouse, the only Russell Group university, Cardiff, can't benefit from Objective 1. It would be useful to tow the whole thing down the road and make it the University of Bridgend" (RG3). The point being that by doing so Cardiff University would then lie within the area designated as eligible for support from Objective 1 of the Structural Funds.

This division of space in ways that influence behaviour is not unique to the Structural Funds, but is clearly apparent here. A further example was given in discussions surrounding this study. It was suggested that in developing a proposal for one of the 14 Centres of Industrial Collaboration, consideration had been given to submitting a partnership involving Leeds University and Lancaster University, located in the neighbouring region of the North West. But "the nod came from somewhere that (this) was not a runner. In the end (the University) partnered with Bradford (University)" (HE6). In the field of Biomaterials there is also a suggestion that intra-regional partnerships were favoured owing to the funding package and that "when (the participating Universities) are free from Yorkshire Forward funding, and the constraints that go with it, (then) they will seek partners from outside of the region to help them

deliver their services" (HE6). Yorkshire Forward does not disagree with the sentiments expressed here, noting that in general external links are only encouraged when specific expertise is required that is not available within the region. As one of their officials acknowledges in terms of developing external linkages "again, there's not really the encouragement to do that sort of thing" (RG5).

What these examples illustrate is not just the artificial bounding of Structural Fund spaces for the purposes of R&D-related activity, but also the differential geographies facing different institutions. For local authorities and regional bodies, such as Yorkshire Forward, the territorial space, however that might be constructed, of the Objective 1 and Objective 2 programmes is clear. For other institutions, such as universities, this is less obviously the case. Universities, it is repeatedly emphasized, have a much broader spatial cognition than is bounded by Structural Fund programme areas. "The way that Yorkshire is fragmented into sub-regions, particularly the division into Objective 1 and Objective 2, means that an awful lot of activity goes on at a sub-regional level. From the university perspective we're interested in the local economy, we're interested in the region, we've got an international agenda. When you look at our strategy you will find the word international in far bigger letters than regional. We're driven by the regional agenda in as far as we have to deal with Yorkshire Forward as the regional body. We deal with the sub-regional level in so far as they divvy up the money in this way. The city-region is growing in importance and Northern Way, if it gets off the ground, will be important" (HE6).

7.3.3 Framework Programme spaces

If Structural Fund projects take place within an artificially defined region, and do not tend to make external connections in any direct manner, then the Framework Programmes exhibit a very different spatiality. They also take place within a region but are located in a much greater space, with an international reach which extends well beyond the immediate region. This is one reason that the Framework Programmes are, universally, seen as being very important to the universities: as universities are regarded

to have a tradition of working internationally. "Universities tend to have the habit of working internationally in particular areas so in some ways it is far more natural for them to lean towards that funding stream, whereas for businesses, especially parochial Yorkshire ones, the idea of having to speak to someone in France or Spain or something, about the research they are doing is a bit strange" (RG4).

For firms, particularly SMEs, this is, as the previous commentator makes clear, regarded as less commonplace. A point reinforced by others. "The (Framework) Programme encourages you to collaborate with other European countries, it favours new countries. So why should a small business in Doncaster want to work with Leeds University and the University of Tallin and some tractor company in Greece. Why would they want to do that? It's just completely nightmare (sic), isn't it?" (HE6). In contrast, however, others felt that the larger projects promoted by FP6 might serve to extend the space of individual SMEs, in ways that the SME orientated CRAFT programme of FP5 had not. As one individual put it, universities find it more difficult to engage regional SMEs in smaller Framework Programme projects owing to the transnational requirements, such as having at least three partners in three countries. In contrast, the larger integrated projects promoted under FP6 were more suited to universities drawing regional SMEs into European research activities. "So if you think of the CRAFT Programme, it's neither use nor bloody ornament because by definition you're not dealing with SMEs in the Lower Don valley or the Selby Coalfield. They're in Poland and Italy. So in terms of the University using the CRAFT Programme to help R&D development in Yorkshire, it doesn't happen" (HE9).

The notion that the Framework Programmes act to connect regions to wider spaces merits deeper consideration. This is, after all, seen as one of the key aspects where EU R&D instruments are able to add value to regional and national interventions. The role of universities as pipelines connecting regions to global knowledge resources is also gaining greater attention in the literature (Benneworth and Hospers 2007). To what extent though is this truly the case? And what might this tell us about the nature of the regional innovation systems in each of the case study regions? In examining the distribution of

project partners two dimensions can be usefully considered: firstly, the location of lead partners for those projects with partners in each of the case study regions, and, secondly, the location of partners for those projects led by partners located in each of the case study regions. Each sheds light on the connections, and reputation, that partners have across the wider knowledge community.

In the first case we find that there is a consistent pattern across the three case study regions. Under FP5, around a quarter of lead partners were located within the case study region itself, falling to slightly over a tenth in FP6. However, when we consider lead partners located elsewhere in the UK and those located overseas the differences between the East of England and the other two regions are more marked. Projects with partners in the East of England are more likely to be led by partners located outside of the UK than from within the UK, compared to the other regions (Table 7.1). This is particularly the case under FP6, and suggests that the connections of institutions within the East of England with overseas research bodies may be slightly stronger, or that they have a stronger reputation.

Table 7.1 Location of lead partners of projects undertaken in each region (%)

	Within region		***Elsewhere in UK***		***Overseas***	
	FP5	*FP6*	*FP5*	*FP6*	*FP5*	*FP6*
Wales	26%	11%	16%	17%	57%	70%
East of England	25%	13%	14%	12%	59%	74%
Yorkshire and Humber	25%	12%	14%	18%	59%	69%

Source: adapted from CORDIS data. Percentages will not add to 100% owing to proportion of 'unknown' locations

The particular shift between regional and international leads is likely to be a function of the increasing scale of FP6 projects and the expansion in the EU, although why this is not also reflected in a fall in the proportion of projects led by partners from elsewhere in the UK is an interesting consideration. It seems plausible to suggest that this is due to the increase in the number of partners in each project under FP6, with a fall in the number of UK lead partners being compensated for by an increase in the number of partners from the UK in each project. There is some support for this by looking at the average number of UK partners located in each project, as illustrated in Table 7.2.

Table 7.2 Average number of project partners

	All partners		*UK partners*	
	FP5	*FP6*	*FP5*	*FP6*
Wales	12	19.5	2.7	3.5
East of England	13.5	19.2	3.1	3.4
Yorkshire and Humber	11.8	19.5	2.6	3.5

Source: adapted from CORDIS data

It is instructive to note from this that, under FP5, in each of the case study regions almost two-fifths of all project leads were located in the UK, falling to around 25%-30% under FP6 (Table 7.1) and that almost a quarter of all partners of projects located in each of the case study regions under FP5 were located in the UK and approached a fifth under FP6 (Table 7.3). The consistency of this proportion across the case study regions is quite remarkable. This suggests that the UK linkages achieved through the Framework Programmes are often overlooked.

Table 7.3 Proportion of projects' partners based in the UK

	FP5	*FP6*
Wales	23%	18%
East of England	23%	18%
Yorkshire and Humber	22%	18%

Source: adapted from CORDIS data

A final consideration in examining the broad spatial distribution of project partners is the extent to which lead partners look to their own region in search of partners, or seek them elsewhere in the UK as opposed to overseas. On the one hand this can provide an indication of the strength of the respective research and innovation systems, and an indication of the level of international 'connectivity' of local institutions. From Table 7.4 it is apparent that whilst the overall patterns between the three regions are similar there are some important differences. In the case of Wales, it is clear that under FP6 there has been a much reduced tendency to seek partners from within Wales, particularly in comparison to the other case study regions. Similarly, under FP5 projects led from the East of England were relatively less likely to have partners from elsewhere in the UK, demonstrating a relative preference for regional or international partners. Alternatively, this might evidence a less international outlook on the part of Wales and Yorkshire and

Humber at the time. There are signs that this has now changed, perhaps as a consequence of the changes to FP6 which appear to privilege the more 'research-orientated' institutions and which might be expected to be more internationally connected, or because institutions are building stronger international networks as their level of experience in this area grows.

Table 7.4 Location of partners of projects led by institutions based within each region (%)

	Within region		*Elsewhere in UK*		*Overseas*	
	FP5	*FP6*	*FP5*	*FP6*	*FP5*	*FP6*
Wales	3%	1%	29%	24%	68%	75%
East of England	4%	3%	26%	22%	70%	75%
Yorkshire and Humber	3%	3%	30%	21%	67%	76%

Source: adapted from CORDIS data

7.3.4 Securing regional benefits from EU R&D investments

Whilst EU R&D instruments are undoubtedly contributing to the development of R&D capacity and activity in the three case study regions, there remains the question as to what effect this is having on the development of the region as a whole? Much of the economic benefit of investment in R&D and R&D capacity is assumed to flow from spillovers of economic activity. These benefits may be in the form of spinout companies; the commercialisation of research outputs, or engagement with local firms through procurement activities and knowledge exchange. Yet many of the respondents found it difficult to envisage how the benefits of R&D activity did accrue to the region, summed up by one comment that it is "hard to envisage how the benefits would flow into the rest of the region" (Int5), a sentiment shared by others. The question then is the approach taken to securing such spillover benefits.

It is readily apparent that little explicit attention is given to directly assisting knowledge spillovers emanating from EU R&D-related investments. What activity does happen has been described by one as "almost accidental" (HE12), whilst others argue that this does not happen with "we don't" and "it doesn't" being common responses. There is an

assumption that the economic benefits of R&D investments will be realised through the economic supply chain, with the responsibility for this resting with the grant recipient. "I'm not sure that the region does much to ensure that...the assumption is made that somehow the organisation will use whatever it has gained in an appropriate way" (Int5).

One reason for this approach is that there is some doubt as to the validity of public sector intervention in this area, reflecting a strong belief in the appropriateness of market mechanisms for managing spillover benefits and the realization of economic gains. As one official in EEDA commented "(I'm) not sure that this is essential... if (we) are helping businesses and universities to develop IPR then sharing is the last thing that you should do" (RG8). As another official comments "shouldn't you just let the market do its job?" (Int5). The philosophy is very strongly based on a belief that funding pre-market research is all very well, but after that it is for the market to determine how (and where) this knowledge is utilised.

The assumption is that demand for these linkages will be driven either by individual firms or by the research unit in a particular university. As one WAG official commented: "I guess it's by the team....we can direct and HEFCW can direct but it very much rests with the universities" (RG3). There is a sense that the government does not have the levers to influence engagement more directly, particularly because it is not able to force businesses to engage with universities, it can only encourage. As another WAG official remarks "a lot of it is about making the SME recognise the benefits it will get by engagement, and that it has the expertise to engage. There's a bit of a culture change required" (PM1).

Equally, there is a sense that several respondents feel that spillover benefits will emerge naturally from the actions undertaken. "If we have one Department, or group of academics, who are becoming stronger, world class and so on, then there would, by definition be spillovers...we have to build those strengths in the region" (RG6). Similarly in Wales, the Manufacturing Expertise Centre in Cardiff University is held up as an example by programme officials at WEFO "because of their reputation they've been able to secure these pieces of very expensive equipment (from industry)" (PM1) which

are then made available to SMEs in the Objective 1 programme area through the SUPERMAN project. In many ways this supports the suggestion that spillovers are driven by particular individuals and 'teams', in that this was a project devised and developed by the MEC itself and raises questions as to what happens in the absence of such 'bottom-up' initiatives. These findings not only echo the 'naïve policy implications' claim made by Breschi and Lisssoni (2001) but also highlight the truth in Peters and Pierre's (2002) comments on our reliance on the strategies of individual institutional actors.

The notion that the public sector cannot directly engage in the stimulation of spillovers is pervasive. There is a very strong belief that the scope for intervention is restricted to building the capacity of firms and universities to actually share and absorb knowledge. "I don't know how much you can hope to do that or how far you can just encourage organizations to develop their own capacities in that way" (RG4). This underpins many of the actions being taken in the regions studied. In Wales, schemes such as KEF, KTP and CETIC encourage firms to engage with universities where, as we have seen, the bulk of R&D investment occurs and such knowledge is situated. In Yorkshire and Humber the CICs, Knowledge Rich and Yorkshire Science and Technology Network perform a similar role. And that, as one practitioner commented is "about as good as we've got" (Int1).

Not all such schemes are funded by the Structural Funds, in the East of England for example the regional Enterprise Hubs programme funded by EEDA (Box 7.4) and i10, funded by the Higher Education Innovation Fund (HEIF), both act to stimulate the exchange of knowledge to promote innovation. At a project level, Structural Fund grants will also often have conditions attached to promote the capacity for deeper regional engagement, as one programme manager in Yorkshire and Humber explained, beneficiaries are tied in with contract conditions. And the secretariat has also tried to use the region's cluster approach to embed the linkages further an approach that they feel has worked reasonably well although they acknowledge that the jury is still out. More specific examples include the AMRC which operates a model whereby firms can be

partners, pay for one-off research projects, or be associate members. Similar models operate through intermediary bodies such as TWI and CTI, albeit on a global rather than regional scale.

Box 7.4 Enterprise Hubs

EEDA has established a number of branded Enterprise Hubs across the East of England, each focusing on a particular sector or cluster. The hubs aim to give small and medium enterprises the support they need to grow rapidly and to contribute towards increasing entrepreneurship within the region. The activities of each Hub vary but can include encouraging the development of networking groups in identified sectors and clusters; assisting small business members through technology collaboration, market information, business support, training opportunities and supply chain information, and supporting the development of a number of incubators, innovation centres and science parks.

Source: adapted from EEDA (2008)

Yet, although various efforts can be identified to connect regional firms to knowledge being generated in the region, often through the Structural Funds, it is acknowledged that the Framework Programmes do not feature in this. "(We) have not really engaged, we have not felt any real ownership, within Yorkshire Forward, as far as the Framework Programmes are concerned, we haven't really come to terms with where we can add value and therefore no-one has any particular responsibility to ensure that the maximum use is made of this. Which is entirely the opposite with what we do with the grants that we provide to business and to commercialise our university research work." (RG5). Within Wales it is a similar story, as also in the East of England, where the Enterprise Hubs "haven't made the connection yet because (they) haven't taken a strategic approach to FP5 and FP6" (RG9). Representatives of research bodies reflect that there is not much experience of taking the outputs of funded research into the region, although the Framework Programmes are increasingly asking applicants to demonstrate that the knowledge and benefits are moving outwards. For most, this remains reliant on encouraging start-up companies and spin-out businesses from the research undertaken.

Many universities, it is widely acknowledged, are now acting in a more pro-active manner "the difference now is that we pro-actively go out in search of companies whereas in the past we would have relied on people popping by, and they don't pop by"

(HE5). As we have seen, in several cases this proactive search is now also targeting those located in the Objective 1 regions, so securing a geographically focused distribution of the knowledge resources available. However, as another official points out, whilst the universities do put a lot of effort into building work with companies, particularly disseminating information on research undertaken within the University – whatever its funding source; the dilemma is that Universities work in the global market rather than the regional market. There is, argues this individual, a need within the region for appropriate networks to help SMEs to recognize the benefits of R&D.

A final consideration brought into play in this area relates to the question of proximity. As one respondent asked – do you want to build the capacity of particular areas or do you just want to link them better? Whilst the former is certainly occurring in the Objective 1 regions, there is mixed evidence for the latter. As outlined above, the focus has been on forging linkages within programme areas rather than on fostering external links but even here the extent to which this promotes beneficial spillovers across the wider region is open to question. There is a strong, but implicit, perspective that the benefits of R&D-related activity are inherently localised. Support for this concern is provided by various comments made by respondents, including the fact that "no-one is more than 15-30 minutes drive from a Technium" (HE4), and that a Bioincubator was required in Leeds because university spinouts would not consider locating in existing facilities at Bradford University or in York, both of which lie between 20-45 minutes from Leeds. The role of proximity and local context in realising the effective value of potential spillovers remains a powerful concern.

7.3.5 Considerations of scale

The suggestion that defined spaces, and people's conceptions of these spaces, can influence behaviour and patterns of activity (Paasi 2004, Healey 2007) is borne out by the findings of this study. This is not only due to the boundaries that defined spaces can establish, but is also strongly related to how people then imagine the scale at which they are operating. That behaviour can be influenced by the imagined scale of activity –

whether it is local or international for example – offers further support for the contention that differential geographies are all operating – and interacting - simultaneously within any single space.

That this simultaneity of differential, but interconnected, spatial relationships is not yet fully appreciated by many policy actors is equally evident from the findings of the research. This is clearly summed up in the suggestion that there is a polar choice between building capacity at the local level and linking the available capacity. The policy narrative conceives of the role of available relational assets as pipelines of knowledge and of the (privileged) importance of local knowledge spillovers but fails to make explicit connections between these two elements. This is exemplified by the assumption that local knowledge spillovers will naturally occur through the actions of the Framework Programme, despite the explicit, but entirely separated, focus of the Structural Funds on establishing mechanisms to support the development of local knowledge spillovers.

In part this owes much to preconceptions as to what certain instruments are for, as we have seen in the preceding section, but also to how different instruments are imagined. What is striking is the strong regional and UK linkages present through the Framework Programmes. These go largely unrecognized amongst the policy community, which highlights instead the received wisdom that these linkages are all about international connections. This is notable not simply for how it can inform our view of the connectivity of different regional innovation systems to external knowledge sources, but also for the fact that such an analysis has not previously featured in policy-making.

7.4 Communities of practice and accepted wisdom

Established customs and practices have played a significant role in shaping the approach taken to EU R&D instruments in each of the three case study regions. In examining the practices revealed in each region three messages emerge. The first is that there is a clear belief as to what different instruments are 'for', often shaped, in the case of the Structural

Funds, by the interests of those organisations which are most closely involved in the planning of programme activities. The second is the strong distinctions evident between different groups of practitioners and the lack of connections between these – vividly described by one respondent as 'valleys of death'. Overcoming these valleys relies on certain individuals, and it is the role of individuals which is the third message emerging from the study. Each of these points is dealt with further below.

7.4.1 Mindsets and awareness

The relevance of the Structural Funds and Framework Programmes to research-led economic development within each of the case study regions was acknowledged by all of those interviewed for this study. However, there was also a general belief that this view was not shared by all, and, more particularly, had been even less prevalent only a few years ago. As one individual put it: "I think that there is a particular mindset and awareness of this type of funding" (HE2).

The Framework Programmes in particular are not always regarded as relevant to the building of direct intra-regional university-business linkages or to regional economic development strategies. For the regional development agencies the emphasis is more on supporting businesses to develop their own R&D activities; to connect to universities, and to work with partners responsible for knowledge transfer, such as i10 in the East of England. In this respect, as one RDA official puts it, "I don't see how it (FP) directly affects us at the moment" (RG9).

Similarly, in Wales, when asked about the relevance of the Framework Programmes to Wales' economic development strategies the response of one WAG official is illuminating, with the suggestion that they are regarded as something for the HE sector rather than economic development: "They're there but I suspect that they weren't high in their minds because W:AVE is an economic development strategy and not a Higher Education strategy, and, because we have not done particularly well in the past, it may rather have been out of sight and mind" (RG3).

This statement also contains a second truth. That the value of the Framework Programmes, and arguably other EU policy instruments, is largely seen in terms of the amount of resources that they bring into the country, as also reflected in the comment that they are "not basing lots of hopes on them because our track-record has not been great" (RG3).

Yet, as the same official acknowledges, if you look at the 11 areas that the FP are looking at and the 10 sectors identified by the WDA "the overlap is stunning" (RG3). The issue then is one of what the region's needs are perceived to be. For those involved in research FP projects are seen as strategic and international "and that is the future" (HE9), as the same individual continues: "Europe is useful for building a profile in a very strategic way" (HE9). For others the Framework Programmes are merely one funding source amongst others targeted at supporting R&D activities. In this respect Framework Programme activity is not perceived to be of direct relevance to economic development, rather it is seen as an environment which is apart from mainstream economic development activity.

As the Framework Programmes are not universally regarded to be relevant to economic development, so there is a widely held perception that Structural Funds are not regarded as relevant to R&D investment: "Not in terms of R&D.....I don't know why that is but Structural Funding tends to be targeted in some other way" (RG5). As a consequence the extent to which support is forthcoming is more limited. "I think that there are certainly linkages when you look at the social side of things, the ODPM[15] side of things,.... I don't think that you will find many (linkages between) the R&D arena and the economic development arena" (HE6).

This is partly a legacy of the past actions funded by the Structural Funds, the fact that there is no tradition of support for R&D-related actions makes establishing support for such activities that much more challenging. "...but it is always difficult when you shift

[15] Office of the Deputy Prime Minister, the predecessor to CLG.

from the mindset of using Structural Funds for building physical regeneration stuff: roundabouts, bypasses, roads... and all of a sudden you say, actually we don't want any of that capital investment. What we want to do is to invest in our high level skills, we want to spend it on enabling and building the infrastructure for our research capacity etc. It is a challenge" (RG6).

Like the Framework Programmes, it has also partly been the consequence of the association of the Structural Funds with particular organizations and their agenda. "...and don't forget that the Structural Funds are seen by a lot of local authorities as rightly theirs" (RG6). The fact that few local authorities currently have a strong role in stimulating science and innovation means that these opportunities have often been overlooked. Once again this presents its own challenges: "That's what you've got to break down, that's how people see it 'well it's our funding, it's our right to have Structural Funds, that's what it's there for'" (RG1). This is equally an issue in terms of the Framework Programmes, the relevance of which local authorities find difficult to relate to their own agendas.

The case of the East of England draws out this point very clearly. Here, it is most strongly argued, the SPD reflected the aims and objectives of the local authorities. At the time the programme was developed in 1999, these were more focused on local economic development activities and rather less on R&D-led interventions. As one of those involved in the development of the programme reflected "nobody wanted to do technology transfer" (PM4). There was an assumption that this would be the role of the existing business advisory and support functions. In this respect the gradual development of a stronger RTDI element in the programme might be seen as symbolic of changing attitudes to what constitutes economic development and regeneration.

This highlights a final dimension which has been identified in the research; the importance of perceptions of what interventions are needed in a region. This is most clearly the case in the East of England where economic development actors in the region have traditionally perceived the region as having a strong record of R&D activity.

Consequently they have not felt the need for interventions that seek to stimulate R&D. "The cultural assumption is that we have amazing figures for R&D...(stimulating R&D) is not our job" (PM4). This has the practical effect of removing instruments such as the Framework Programmes from the agenda of these organizations. "The mental set here is that they're (FP) not directly relevant to what we're really delivering" (PM4) as "R&D is academic and private sector" (PM4). Others in the region provide support for this perspective, with one local authority practitioner commenting that they were not engaged with the Framework Programmes "because universities do not need my help" (LA6) and another regional official commenting that his organisation was "comfortable that HE institutions are fairly clued up and doing reasonably well" (RG11). Comments such as this also reinforce the sense of a 'drawdown' mentality, whereby the pursuit of funding is regarded as the key objective, rather than considering means of stimulating wider benefits.

7.4.2 Silos of activity

From the interviews undertaken it is apparent that there is a very strong divide in terms of knowledge of the different EU R&D instruments. This is strongly influenced by the institutional remit of different organisations. This becomes clear if we divide the institutions into broad categories relating to programme responsibilities, regional responsibilities and grant beneficiaries. It is apparent that there are very different levels of knowledge and awareness, and that there are few connections between the different knowledge communities identified, although efforts are being made to resolve this in some cases. What is also apparent is the importance of particular individuals in bridging these communities.

Amongst the officials responsible for Structural Fund programmes there was very limited awareness of the Framework Programmes. In the words of one programme manager "we don't deal with those" (PM2). This lack of awareness of the Framework Programmes, and the wider R&D agenda, has been ascribed by some in the English regions' Government Offices (GO) to the limited DTI presence in the GO with much of the

relevant activity having been transferred to the RDA. This served to sever the contacts between GO staff responsible for the Structural Funds and their opposite numbers previously responsible for R&D policy within the region. The assumed role of the RDA in this regard was also highlighted by other regional agencies who regard the Framework Programmes as "principally the responsibility of the RDA" (RG11) – a view which the RDAs have not shared to date.

The fact that R&D-related policy has largely been a national responsibility was also seen to act as a barrier to building knowledge of R&D-related activity within a region. Again, this can serve to sever connections between those developing regionally-focused actions financed through the Structural Funds and those driving R&D-relevant agendas. However, the joint development of NAMTEC in South Yorkshire, financed by the DTI and the Objective 1 Structural Funds programme, demonstrates that these gaps need not be insurmountable.

Amongst the regional governance authorities there is, almost universally, a good knowledge of the Structural Funds, but only a general awareness of the Framework Programmes. The only individual working for such a body who felt able to admit to a good knowledge of the Framework Programmes was based in the region's Brussels office and had been posted to Brussels to develop the region's European Innovation Unit charged with developing the European dimension to innovation initiatives within the region. Tellingly, perhaps, another official commented that they used to have knowledge of the Framework Programmes "when I worked at the university" but now they are responsible for the development of the Structural Fund programmes for the region this knowledge is no longer up to date. Where knowledge of the Framework Programmes is held the focus tends to be on supporting organizations to access the funds available. In the words of one individual the question is "how can I help businesses and universities access the funds that are available" (RG1).

Within beneficiary organisations the level of knowledge, perhaps understandably, is broadly related to the activities that individuals were directly engaged in, with limited

knowledge of the wider regional picture and few connections between what are perceived to be R&D programmes and those aimed at economic development. Universities, the single largest recipients of EU R&D funding highlight this point well, with one official noting that within their university they have the research office which deals with the Framework Programme, but that this is largely regarded as a research programme driven by research needs, and the office of Corporate Partnerships, whose job it is to tie university research up with industry, either in the region or more widely. As an official in another university, responsible for promoting knowledge transfer linkages to business, acknowledged: "I'm certainly comfy with the Structural Funds and how they're working. I am less comfy with the Framework Programmes. I'm conscious of the change from FP6 to FP7 but I'm not aware of what we do on FP6" (HE6).

Recently there have been efforts in some institutions to bring different functions together such as in the above example through co-locating the office of Corporate Partnerships and the Research Office "so now there's more joining together as a single institution here – and can use Structural Funds to support research capacity" (HE9), along with efforts to more strongly embed their activity with the RDA through the co-funding of posts. In the absence of such regional linkages there is a danger that even where the structures promote knowledge of both the Structural Funds and the Framework Programmes this will be restricted to how the instruments are being used within a single institution; with limited knowledge of the wider regional picture. As a respondent in a different university put it: "I know broadly what the Structural Funds are doing for us and broadly what the Framework Programmes are doing for us....I know bits and pieces from other universities and some elements of what Yorkshire Forward has funded (through the Objective 1 programme)" (HE7).

The division of the region into distinct programme areas has also had an impact on general levels of awareness of activity. As one university official based with the Objective 1 region of South Yorkshire commented "of course the Objective 1 region is quite small – only the sub-region – so I am far less aware of what is going on elsewhere in the region" (HE7), whilst for another located in the Objective 2 eligible area: "I should

stress that when I'm talking about Structural Funds I'm talking about Objective 2 and not Objective 1" (HE6).

One of the clear messages emerging from this study is the presence of different policy communities in the field of R&D and economic development with limited levels of communication. The presence of these different communities and the lack of joined up thinking between them is widely recognized as problematic within all of the case study regions. One university official commented that "My experience is that in the past they probably didn't (link up) and this has been a real issue in terms of isolated silos of activity..... What historically has happened is that you get the three components (of scientist, politician and businessman) with these great 'death valleys' between them" (HE9), with a business leader also commenting on the problems created by "compartmentalization in Government" (Ind3), referring to a separation between OST and DTI.

These 'valleys of death' can form a real barrier to effective research-led regeneration. As one R&D practitioner commented in response to a question as to the importance of the Structural Funds in stimulating R&D capacity and activity in the region:

"My feeling is that yes they would be. I can't say that they have done much yet... Part of that is because although we have a nodding acquaintance with one another we've never really sat down and said 'well, what are the opportunities?'. I suppose that's because we're all rushing around doing our own bit... and we haven't really done that. We ought to" (HE14).

As another local authority practitioner also put it reflecting on why there is an apparent disjuncture between the Structural Funds - which deal with local authorities and other public sector bodies - and the Framework Programmes - which involve the Higher Education sector:

"It's strange isn't it? You'd think there was quite an overlap there but it's almost as if we turn our backs on each other. We do our economic development with small local businesses and they do their research and are trying to spin off businesses but we don't

really talk to each other very much. It's odd. You'd think we'd be able to talk to each other" (LA6).

What is even more telling is that these two respondents are located in the same local authority area and are based in the same city.

The need for more 'joined up' governance is not a new concern. However, what this research has found is that the linkages between governance bodies are generally good, the issue is rather that "R&D is not often on our joint agenda" (RG11). To counter this there has been a tendency to establish specific fora which are intended to bring together key individuals and help make the links between R&D and economic development agendas. A notable development in England has been the establishment of Science and Industry Councils, which might act to bring together awareness of the linkages between R&D investments and economic development within the region. There are signs that this has occurred within Yorkshire and Humber, but is less evident in the East of England. In the words of one prominent individual within that region: "It would be very helpful if the Science and Industry Council could get to be more functional because then it could act as the advocate for an understanding that R&D investment should lead into economic regeneration and the ways in which that might happen, but, at the moment, there are a series of separate boxes" (HE13).

There are also many examples of sub-regional partnerships being developed to serve a similar purpose. In Yorkshire and Humber the existence of a South Yorkshire Partnership for Innovation and Technology was positively remarked upon in so far as it brought together all the major players to give a steer as to overall strategy and direction. The fact that such a body did not exist for the Objective 1 programme was judged by at least one commentator to have been a retrograde step, as its reintroduction post-2006 appears to acknowledge. In Wales, sub-regional innovation partnerships have also been developed, although there is no evidence that these have considered relationships between the different elements of EU R&D instruments within their areas.

The over-riding sense of the research in this area of practice and knowledge is the importance of individuals in making linkages between different communities and areas of knowledge. This is most clearly the case in Yorkshire and Humber, where, in the case of the South Yorkshire Objective 1 programme there was a coming together of a few individuals who had developed an awareness of the potential of research-led economic development, partly from experience gained through working on the Wales RTP, and, in the case of the promotion of the research-led agenda through the region's Science and Industry Council (Yorkshire Science), the pivotal role played by its first Director, Trevor Gregory, in emphasising the importance of EU R&D instruments is widely acknowledged. In the absence of such experienced individuals developing new approaches is that much more difficult, as acknowledged by some in the East of England where the lack of any emphasis on R&D is now regarded as having been the 'blind spot' in the Structural Funds by those responsible for the programme at the GO. The legacy of this is that there has been little awareness of R&D interventions and no contact with those responsible for this.

The importance of individuals is equally true in terms of knowing where appropriate knowledge might lie. As one researcher commented in relation to the Enterprise Hub network in the East of England: "It's only recently that they've started working quite well, partly because someone we know has started working there. There seem to have been lots of channels that weren't being used. You need to know which of these channels is the best for different things" (HE14). Developing such routes can take time. What is apparent is that levels of mutual awareness of the different policy communities encompassed by the EU's R&D instruments are very low. Respondents frequently pointed to the North East where they felt that such awareness was better, chiefly owing to the activities of one or two key individuals.

Similarly, at a practical level the development of projects under the Structural Funds and the Framework Programmes, is often dependent on individual's knowledge and existing levels of experience. It is for this reason that project development is often concentrated in the hands of a limited number of individuals, as is widely acknowledged. In

explaining the strong level of participation in both instruments by two of his staff members one respondent simply remarked: "they have a history of engagement with the Structural Funds, they have a history of engagement with the Framework Programmes." (HE2). Where there is a reliance on a 'bottom-up' process to joining up Structural Fund and Framework Programme activity it places a real premium on that level of knowledge, a level of knowledge which is not widely available, as we have seen.

7.4.3 Familiar narratives

The importance of how places, policies and issues are imagined has been a recurrent theme in this study and is reinforced by the strong findings on the mindsets and awareness relating to the role of R&D in regional economic development. This is apparent both in the rising (but not universal) importance attached to aspects of 'innovation-related' R&D investments and in the attitude revealed towards the Framework Programmes – most notably that these are 'for' the HE sector.

The extent to which R&D-related investments are regarded as relevant to economic development appears to be influenced by the previous history of activity in the region, suggesting that there is a degree of path-dependency here; the strength of the narrative espoused at other scales of activity, with the role of national and EU policy-setting agendas seemingly important, and the particular role of individuals acting as transmitters of new ideas.

It is also apparent that awareness is very dependent upon what individuals and institutions are 'familiar' with, again raising the question of path-dependency in policy-shaping activities, and suggesting that imaginations are constrained by experience. This reveals itself in distinct 'silos' of activity with clear divisions between different policy communities which are fragmented both by subject-focus and in space. This spatial fragmentation is most clearly evident in the division of policy responsibility between science-policy at a UK level and economic development policies at a regional level. The role of individuals in bridging these communities recurs and suggests that relational

geographies offer a means of reconciling the apparent divides in our understanding of the processes at work.

7.5 Conclusions

From the analysis it is evident that, despite the lack of evaluative material, the EU's R&D instruments are perceived to secure numerous benefits to the three case study regions. From the evidence available it would appear that the scale of the perceived benefit is related to the level of funds invested in each region, but that this relationship is not linear. It appears that receipts of Structural Funds count higher in the minds of respondents than is the case for the Framework Programmes. The lower visibility of the Framework Programmes in the minds of those concerned with economic development is a recurring theme of this study.

Analysis of the perceived benefits illustrates that the dominant narrative underpinning actions through the EU's R&D instruments is one of economic growth. Within those regions in receipt of strong Structural Fund investments this is manifested in actions which are influenced by notions of regional innovation systems, absorptive capacity and the role of local knowledge spillovers. In particular the need to overcome perceived 'weaknesses' in the existing infrastructural capacity looms large. In contrast, in the East of England, where Framework Programme activity is dominant, the benefits are conceived in terms of improving access to knowledge and the quality of research undertaken. Again, this suggests a difference in the way in which the two instruments are perceived, based upon their accepted patterns of activity. The Framework Programmes are seen as being trans-national in nature and about scientific research, whilst the Structural Funds are seen as being regionally-bounded and about economic development.

The different spatial geometries at play highlight the importance of individual institutional agendas in the practical outcome of policy on the ground. It is apparent from the research that effective power does indeed lie at the institutional level underlining the difference between the design of policies and their delivery (Morgan 2004a). One of the

apparent benefits of the research design is that it may offer pointers to understanding the governance complexities of policy-making in this field. In particular it may offer insights into one of the earlier challenges identified for the multi-level governance literature, namely the tensions facing individuals who are simultaneously operating in differentiated functional and geographic spaces. This is a point that is dealt with more fully in the following chapter.

The research also highlights the existence of different policy communities, reflecting the different focus of the two instruments. These communities are divided by subject and by geography in complex ways. It is clear that these communities occupy different worlds which rarely interact even when located in close geographical proximity. Whilst limited learning is apparent across these communities, this is the exception rather than the rule and is highly dependent upon the influence of particular individuals. From the material available it would appear that there is scope to extend Amin and Cohendet's relational model of the firm as a community of communities (Amin and Cohendet 2004) to the region. In this guise the role of regional governance actors would be to draw the various communities together in pursuit of common goals.

Finally, the research suggests the existence of distinct spaces which are partially created by public policies and which create powerful geographies of their own. That these geographies have power is evidenced by the manner in which Structural Fund spaces have influenced behaviour. This provides strong support for the assertions by Morgan and Paasi that local spaces remain the locus for activity (Morgan 2004a, 2004b, Paasi 2004). But, from the evidence, Healey is correct in her observation that policy makers are challenged by the interplay of different spatial scales (Healey 2007). Indeed, from the evidence assembled here it would appear that the reaction of territorial governance bodies is to systematically overlook, or at least undervalue, the role that sectoral policy initiatives acting at alternative scales may play within their territory.

From this it is possible to suggest that how issues and spaces are imagined can play a strong role in policy governance. It is also possible to suggest that our understanding of

innovation processes and the role of R&D in economic development would benefit from a more relational perspective. Taken together, these twin concepts might offer a common narrative and a means by which to better understand the multiple and complex geographies which our analysis of the EU's two primary R&D instruments has revealed. This challenge is addressed in the following chapter.

8. CONCLUSIONS

8.1 Introduction

This research study set out to explore the role and rising importance of EU R&D instruments in regional economic development in the UK since 1999. To do so it posed the simple question of 'who gets what, and why?'. It sought to understand this in terms of existing innovation theory, particularly drawing on the literature surrounding regional innovation systems. The approach was unusual in that it combined an analysis of the EU's Structural Funds and the Framework Programmes, two instruments which are rarely considered together at the regional level.

This chapter draws together the overall findings of the study, addressing the original research questions posed for the study (set out in Section 2) as it does so. It begins by summarising who gets what and then moves on to consider the reasons underlying the revealed patterns. The chapter considers the insights presented by the work for a better understanding of regional innovation practices and the implications of this for theories of spatial innovation. It suggests that existing innovation theory requires a reworking in order to accommodate ideas of relational geographies. The chapter considers the implications of this for the policy process before concluding with reflections on the research process itself and areas where further research is strongly merited.

8.2 What pattern of activity has been revealed: who gets what?

The question of 'who' gets 'what' lay at the heart of the original research question. Three distinctive patterns of activity have been revealed; one related to the Framework Programmes, one related to Objective 1 of the Structural Funds and one related to Objective 2 of the Structural Funds. The patterns of activity are instructive as to the nature of regional innovation structures, demonstrating the strong 'statist' orientation in some regions, the ubiquitous importance of the Higher Education sector and the influence of the discrete distribution of Public Sector Research Establishments.

Although relatively substantial sums are invested in all three regions through the EU's R&D instruments, the overall distribution of Structural Fund and Framework Programme financed activity conforms to patterns established in the more general literature (Vence et al 2000, Musyck and Reid 2007). Broadly, the least prosperous regions in the UK are in receipt of fewer funds from the Framework Programmes than more prosperous regions, but benefit from greater receipts of Structural Fund financing. The influence of the Objective 1 programmes in both Yorkshire and Humber and Wales have been instrumental in securing strong levels of EU R&D activity in both regions, raising questions as to what will be the situation once these particular funding streams are reduced, as has occurred in Yorkshire and Humber since 2007.

In terms of the proportionate effect, the East of England remains the strongest beneficiary, judged in respect of receipts per capita, although the difference between it, Wales and Yorkshire and Humber is reduced. Similarly, examination of the value of Framework Programme activity in each region, compared to overall levels of expenditure on R&D (GERD), suggests that the Framework Programme may be relatively more influential in the less prosperous regions, a suggestion that is supported by at least one interview respondent. However, from the evidence available, it is clear that the policy perspective is dominated by considerations of the absolute value of each of these instruments within each region.

The similarities in approach between regions with similar Objective status outweighs their differences, and eligibility for Objective 1 or Objective 2 appears a more significant influence on who gets what than wider regional characteristics. In contrast, Objective 1 and Objective 2 status (and non-eligible status) does not provide a strong explanation for receipts of Framework Programme funds. Around 50% of FP activity in Wales occurs in the Objective 1 area, whilst in Yorkshire and Humber the respective figure is around 33%. This owes more to prevailing institutional structures than to overall economic prosperity.

The importance of the institutional dimension in determining the pattern of activity on the ground is clearly demonstrated by the research. That participation in the Framework Programmes depends upon the choices made by individuals and

institutions was well-known, but it is now clear that this is also the case for the Structural Funds. In no case did planned programme profiles, as set out in the Single Programming Documents, accurately predict actual R&D-related activities funded by the Structural Funds.

The single most important institutional beneficiary has been the Higher Education sector, both through the Framework Programmes and, in many cases, the Structural Funds. Moreover, support from both instruments tends to be concentrated in a small number of, often common, institutions. In Wales and in Yorkshire and Humber, the other significant beneficiary of the Structural Funds has been the regional governance bodies. This evidence base, identified for the first time through this study, provides strong support for the existence of 'core oligarchies' (Breschi and Cusmano 2002) not just in the Framework Programmes but throughout EU R&D policy instruments. Despite the prominence given to increasing levels of private-sector R&D in the various strategies, industry is not a significant direct beneficiary of Structural Fund expenditure in any region and accounts for only a small proportion of participations under the Framework Programmes. That the private sector accounts for a larger share of Framework Programme activity in Wales than in the East of England goes against received wisdom and is, in itself, worthy of further investigation.

There are also some variations in the revealed regional patterns. These tell us much about the innovation structure within each region, one of the subsidiary questions posed originally for the research. Firstly it demonstrates the significance of the substantial number of PSREs located in the East of England to the region's participation in the Framework Programmes, and the lack of a comparable infrastructure in Wales and Yorkshire and Humber. It also demonstrates the importance attached in Yorkshire and Humber and, to a much lesser extent, in Wales to building a structure of specialist intermediary bodies able to offer advice and support for innovation to regional firms. Finally, based on the nature of participating institutions and the actions they have supported, it suggests that innovation support through the Structural Funds has been seen as primarily a local endeavour in the East of England, a sub-regional endeavour in Wales and that in Yorkshire and Humber there has been something of a tension between the regional and sub-regional

perspective. This raises interesting questions as to how policy-makers perceive the scale of the territory in which they operate and how this then influences their actions.

There is a distinct divide between the types of activity financed through the Framework Programmes and the Structural Funds. These are common to all three regions and few substantive differences emerge between the practices in each. The perceived differences between the activities undertaken in Objective 1 and Objective 2 programme areas also proved to be less substantive in practice than official figures suggest, being more a question of scale.

Across the Structural Fund programme areas, with the exception of East Wales, there has been a strong emphasis on developing RTDI infrastructure, most particularly in the Objective 1 regions. In Wales this has tended to have a stronger focus on supporting HE-related activity than in Yorkshire and Humber, partly owing to different perceptions of need and capabilities in the wider economy. Similarly, support for technology transfer and innovation networks features strongly in all programme areas. The focus of these actions tends to be on securing the means to make the expertise of local universities or intermediary bodies available to local businesses. This represents a strong supply-side orientation to the approaches taken, which runs counter to much of the literature emphasising the importance of stimulating the demand for innovation in firms and, also, the targets of the programmes themselves which stress the need to stimulate business expenditure on R&D.

There is very little evidence of the Structural Funds being used to support actual research activities, despite this being planned in the Welsh programmes at least. Instead, it is the Framework Programmes that provide EU funding for collaborative research activities involving partners from the case-study regions. It is evident that participation rates between the regions vary quite strongly, but that there is strong consistency in the degree of variation across all forms of research supported by the Framework Programmes.

One area where strong differences do emerge is in the extent to which institutions in the case study regions are involved in the Framework Programmes' mobility actions.

Whilst institutions in the East of England are substantial participants this is less so in Yorkshire and Humber and significantly less in Wales. This appears to be, at least in part, due to differences in institutional strategies. The lack of attention given to training in the field of R&D-related actions is also apparent in the Structural Funds, where no programme includes activities coded under this Field of Intervention Code.

Although on first sight there may appear to be potential complementarities between the Structural Funds and the Framework Programmes, in terms of the types of activities financed, few synergies could be identified in practice. Indeed, there was a general feeling expressed, particularly by policy-makers involved in regional innovation and economic development, that it would not be appropriate to seek to promote such synergies owing to the different objectives perceived for each instrument. This is rather disappointing given the strong encouragement at an EU level for securing such synergies. Where potential complementarities have been identified through this research these are the result of isolated individual initiative. In recent regional programming and strategy documents there has been a recognition of the potential for achieving greater synergies between the Framework Programmes and the Structural Funds (WAG 2008, Yorkshire Forward 2006). Whether this bears fruit in practice remains to be seen. However, it is instructive to note that in many cases the value is seen to be in terms of securing increased funds for the region rather than a consideration of the benefit this might bring. This provides support for the European Commission's concern that its actions in these areas are merely leading to the creation of local rent-seeking alliances (EC 2008).

In considering who gets what the importance of particular sectors, and even individual institutions, has come to the fore. It is also apparent that within the Structural Funds differences between regions appear to count for less than programme area definitions in determining who gets what. Whether this is simply down to the scale of funding and similarities in the characteristics of these sub-regional entities is explored in the following sections.

What is evident is that the activities that are undertaken through the Structural Funds are, almost universally, focused on strengthening ties within the region. This lends credence to the suggestion that the Structural Funds are in danger of promoting

'closed' regional innovation spaces (see for example Soete 2008). This region-centric viewpoint is further exacerbated by the lack of visibility accorded to the Framework Programmes, and the activities funded through these within a region, by regional policy-makers and the economic development community more widely. This has led to the potential contribution of Framework Programme activities, such as through the spillovers from collaborative projects embedded in a region or the attraction of skilled knowledge through the mobility programmes, to go largely unrecognised.

8.3 Exploring the 'why?'

The second dimension to the original research question was to explore the reasons underlying the revealed patterns of activity, and to examine the extent to which this conforms to existing theories of innovation and the light it sheds on how research-led economic development is conceived.

Outwardly, the findings accord with existing innovation theory, particularly those rooted in the regional innovation systems literature. The importance of existing institutional innovation structures, the path-dependent nature of activity and the significance of local knowledge spillovers and absorptive capacity, or the lack thereof, all help to explain the prevailing patterns of activity, particularly under the Framework Programmes. This accords with the findings of other research which argues that less prosperous regions fall into a 'low R&D trap' (Vence et al 2000). Indeed, arguably, the presence of an active research infrastructure is more significant than the actual level of R&D expenditure, given the limited engagement of much of the private sector within the Framework Programmes and the inverse relationship demonstrated between Framework Programme receipts and gross expenditure on R&D.

The choice to direct discretionary Structural Fund expenditures towards building regional R&D capacity would equally appear to support the path-dependent perspective in that it illustrates the efforts of policy makers to create new paths for regional development. Whether this is fully justified or merely reflects what "may be a planners' conceit that institutional thickness is always necessary for successful innovation" (Morgan 2004b p.17) is difficult to assess given the poorly developed

standards of evaluation in this field. What is certainly true is that existing innovation structures have strongly influenced the nature of R&D-related Structural Fund activity in each of the regions considered. The particular combination of governance structures, Higher Education capacity and intermediary bodies, both across each region and within the areas eligible for Structural Fund support, has led to a notable differentiation in the approach taken between each of the regions.

Whilst regional innovation structures and existing economic and innovation performance offer a partial explanation for who gets what in terms of EU R&D instruments, they fail to explain the different spatial patterns observed between programme areas *within* the case study regions, nor the differences in practice between the Framework Programmes and the Structural Funds. To begin to explain these differences we must turn to two other factors which have been inadequately considered in the past. The first is the role played by different policy spaces in shaping patterns of activity and the second, related, factor is that of the decisions made by individual institutions – both those governing the public policy process and those involved in its practical realisation.

The Structural Fund programme areas create strongly bounded non-porous spaces. This exerts a strong influence on the location of Structural Fund activity within a region and acts to limit the relationships created with other places. The evidence for this is substantial, particularly in terms of the distribution of investment within a region, such as the balance of activity between West Wales and the Valley and the rest of Wales. In the East of England, the programme intent to develop links with areas of research strength elsewhere in the region was not realised; in Yorkshire and Humber institutions regard the South Yorkshire Objective 1 programme as largely the preserve of the Universities of Sheffield and Sheffield Hallam; whilst in Wales the participation of Cardiff University in the Objective 1 programme can be seen as the exception that proves the rule. The fragmented territory of the Objective 2 programmes was held up by some as reasons for not engaging with these programmes and it would seem that institutions need to be located within an eligible area in order to participate. In contrast, Framework Programme activities typically create relational spaces that are not territorially defined and span multiple regions and countries. This

non-territorial dimension has led to their being 'over-looked' by territorially-focussed policy-makers interested in the economic development of a particular region.

From the evidence it is apparent that Structural Fund spaces do have power in that they frame the scope, location and nature of the activities undertaken. This accords with the observations of Paasi (2004) identified in Chapter 3. It is also notable that this strong bounding of territories runs counter to the largely accepted wisdom that regional innovation systems are open and porous (Howells 1999, Simmie 2002) and suggests that the trap of 'spatial fetishism' identified by Morgan (2004a) may indeed have been sprung.

Yet this is not the whole picture. In Yorkshire and Humber and, to a lesser extent, in Wales, region-wide programmes have been partially funded through the Structural Funds even though these cover both eligible and non-eligible areas. These have been instigated by institutions responsible for the development of the wider regional economy: the RDA and the WAG respectively. Here the boundaries are those of the administrative region, not the eligible area, although the funding mix is tightly monitored to ensure that Structural Funds are not 'used' in non-eligible areas. Power here lies at a spatial scale greater than the eligible area, and demonstrates the importance of the spatial perspective held by different institutional actors. The importance of these spatial imaginations is underlined by the Framework Programmes. The very fact that these operate in a relational, non-geographically bounded, space leads to their being overlooked by territorial policy makers who feel that they lie outside of their control, or 'gift' as one tellingly described it. By way of contrast, it can also account for their being embraced by HEIs, and internationally-orientated businesses, which have an outlook beyond the regional or national scale.

It is a paradox that, despite this 'invisibility' in policy, the relational value of the Framework Programmes is widely recognised, with international collaborations consistently identified as one of the primary areas of added value from EU R&D instruments owing to the knowledge and capacity this brings to the region. It would appear that policy-makers find it difficult, in practice, to combine the territorial with the relational, a finding which is reinforced by the existence of multiple relational spaces within regions, consisting of discrete networks of institutions and individuals.

These findings provide strong evidence not just supporting the contention that places consist of complex layerings of multiple relationships that span a multiplicity of scales (Healey 2007, Morgan 2004b) but also that how these relationships are collectively imagined can influence patterns of policy-shaping activities (Healey 2007).

The significant role of institutional decision-making in shaping the pattern of activity of EU R&D instruments emerges as a crucial consideration. It is also one that has not, perhaps, received sufficient attention previously in the literature. That institutions, and individuals, choose whether to engage, or not, with the various instruments is beyond question. The contrasting examples of the University of Sheffield and Sheffield Hallam University in terms of their engagement with the South Yorkshire Objective 1 programme throw this into stark relief, as does the example of Cardiff University, which expended significant efforts to determine the mechanism through which it could engage with the West Wales and the Valleys Objective 1 programme area, despite lying outside of the eligible area. Underpinning these decisions are choices based on the extent to which engagement could serve to promote wider institutional objectives, set against the cost of engagement.

These choices are not made in a vacuum. They are shaped by what is possible. In the case of public policies the possibilities are often constrained by the particular objectives of institutional policy-makers. This can most clearly be seen in the case of the Structural Funds, where some types of activity are favoured over others and some areas are eligible for support and others are not. The decisions of actors such as Universities or other public sector institutions are constrained by the boundaries these rules and frameworks set, as Peters and Pierre (2002) suggest decisions are taken in the context of a bounded rationality. What then determines the pattern of activity realised through the EU R&D instruments at a regional level is the particular balance of effective power within each region, which is asymmetrically distributed. This is partly due to differences in the background economic conditions and pre-existing innovation structures but also owes much to the different governance structures demonstrating the significance, and complexity, of the multi-level governance process. In practice, regional policy-actors have focused on the Structural Funds, rather than the Framework Programmes, for it is here that they feel they have

effective power. And the exceptions to this, such as the East of England, prove the rule.

The power of the adopted narrative is significant in influencing policy outcomes through shaping the actions promoted, and supported in practice. It is apparent that a common narrative underpins the thinking of policy-makers at both a regional level and at the European level centred on the perceived positive relationship between levels of R&D activity and subsequent economic growth; although they remain divided by the territorial scale at which this applies. In practice, this has been interpreted by those responsible for regional economic development as sanctioning support for actions that promote innovation-related knowledge generation and dissemination. This new orthodoxy of competitive knowledge-based economies is particularly prevalent at the level of regional and programme strategies (see also North *et al* 2007).

The framework for these actions has been influenced by notions of endogenous growth, with the new economic geography literature particularly prominent. The influence of the literature on regional innovation systems in shaping the actions of policy-makers is also visible, although it appears that the interpretation of this literature is partial, emphasising the local capacity dimensions of regional systems of innovation but underplaying the open and fuzzy boundaries of such systems. The entwined nature of theory and policy is remarkable in the extent to which it now provides a core of accepted wisdom. The influence of knowledge transmission within the European policy community, from that initiated at the level of the Commission through to its realisation in mainstream Structural Fund programmes and the interplay with wider regional strategies, is also highly apparent. The evolution of programmes, over time and space, to focus more strongly on a research and innovation-orientated narrative is reminiscent of the 'generative dance' of Cook and Brown (1999), but called to a different beat.

Knowledge of what is possible has clearly shaped the decisions taken, and so the patterns of activity realised. Awareness of the opportunities available is not evenly distributed, favouring some actors over others. The strongest example of this was with the 'Bonus' arrangement whereby in Objective 1 areas the Structural Funds could

be used to support Framework Programme applications. This opportunity was not taken up in either of the two case study areas primarily because potential applicants were not aware of it. This example, along with other evidence, vividly demonstrates that the literature on knowledge acquisition and use developed in the context of the firm, and set out in Section 3.4, could equally be applied to the public policy process. Not only does knowledge of how to make use of a new 'innovation' such as the Structural Funds' Bonus take time to be assimilated, awareness of the opportunity also relies upon the presence of informed individuals – the so-called 'go-betweens' or 'knowledge enablers'. Similarly, individuals who hold knowledge choose whether to make that public, or to retain it as private knowledge.

What also emerges as an explanation of the pattern of activity is the role of particular policy and epistemic communities in the formation of knowledge. Whilst some communities are primarily territorially-bounded, for others the relational aspect is more significant and territorial ties are less prominent. At present these distinct communities fail to combine within the territory, despite having geographic proximity, leading to failures in knowledge formation. This is a crucial explanatory factor, particularly in understanding the lack of realised synergies between the Structural Funds and the Framework Programmes.

Finally, one cannot discount the importance of rules, habits and norms of behaviour as an influence on the pattern of activity realised in the regions through the EU's R&D instruments. The most striking example of this is to be found in the case of the Yorkshire and Humber Objective 2 programme where the primacy given to realising short-term employment targets has served to restrict the level of R&D-related activity owing to comparatively lower forecasts of potential employment creation. Similarly, across the Structural Fund programmes it is claimed that there has often been a strong notion of what the Structural Funds are 'for', based upon traditional patterns of activity. It is argued by some interviewees that this has privileged local economic initiatives, led by local authority actors, over more regionally-focused R&D and innovation-related projects. Certainly, a recurrent comment was that R&D is not what the Structural Funds are 'about'. Similarly, regional policy actors have found it difficult to see the Framework Programmes as something that is directly relevant to their interests. This has led to a focus on what has been characterised as 'experimental

development' but lies rather more around seeking to realise the commercial benefit of existing knowledge resources.

Habit, or in this case received wisdom, also plays a strong part in shaping the types of activity undertaken. From the evidence collected a small number of relatively 'typical' actions, sharing common characteristics, have emerged as being common across the different Structural Fund programme areas. These are strongly related to prevailing economic narratives as to what constitutes the foundations of a well-functioning regional innovation system and tend to focus on building regional capacity for innovation-related infrastructures, the commercialisation of R&D spin-offs and stimulating university and business collaborations within a defined territorial area. Where conceptions of research-led economic development differed, at a regional level, this tended to be due to differences in the balance of activity between the Framework Programmes and the Structural Fund programmes, as illustrated in Chapter 7. As Granovetter (1985) suggests, certain ways of thinking and doing have become embedded in accepted practices and whilst there are signs that these are changing this is a slow and gradual process.

Of the various explanations identified above as underpinning the patterns of activity revealed by this study three features are particularly noteworthy. The first is the significance of distinctive institutional objectives and strategies, whether explicit or implicit, in determining the shape of policy programmes in practice, rather than the published strategy itself. This serves to emphasise the distinction between policy making and the actions which result (Morgan 2004a, Peters and Pierre 2002). The second is the importance of the mindsets and belief systems of the different actors concerned in shaping the actions they take. There is an evident fracture between the framing structures of those involved with regional economic development when compared with those involved in science and research, even when joined around a common, overarching, narrative framework. The third is the different spatial dimensions in which the Structural Funds and the Framework Programmes appear to operate. Whilst the former is territorially embedded, both in practice and perceptions, the latter relates to relational spaces transcending territorial boundaries – what Hooghe and Marks have referred to as 'functional spaces' (2003) – and where its territorial dimensions go largely unrecognised.

These three points are inter-related and highlight the challenges for policy-making in situations where institutions simultaneously occupy, potentially conflicting, functional and geographical spaces. It also highlights how particular territorial areas form the setting for where such dynamic processes are realised, and suggests that the existing literature on regional innovation has yet to fully engage with the complexity of such multiple spatial identities. It is this challenge which the following section seeks to approach.

8.4 Reflections on policy design and implementation

This study has explored the policy and practice of EU-financed R&D related activity in the UK, from the perspective of regional economic growth and development. In considering who has got what, and the reasons for this, a number of conclusions can be drawn relating to the policy approach adopted. This section draws out these conclusions and makes recommendations as to how the EU's R&D instruments might be used in a more effective manner on the basis of the empirical evidence derived through this study. The section falls into two parts. The first part considers how the existing EU instruments might be utilised more effectively at a regional level. The second part takes a more exploratory line and considers whether a new approach is required at the EU level itself.

From the evidence established in this study it is apparent that EU financial instruments are making a substantial contribution to overall investments in R&D-related activities at a regional level. In the case of the Structural Funds this is focused on physical capital formation and, to a significant extent, the promotion of collaborative working and network development. In the case of the Framework Programme investment has focused on supporting collaborative research activity and, to a lesser extent, human capital formation. The amounts invested in these areas in the present programming period have increased relative to previous programming periods, reflecting an increasing emphasis on the role of R&D and innovation-related activity in regional economic development. Levels of R&D activity financed by the EU's Structural Funds tend to have been higher in areas eligible for support under Objective 1 compared to those eligible for support under Objective 2, particularly

when planned levels of activity are compared to those actually realised. The reasons for this have been explored earlier. What is apparent is that the Objective 1 programmes have caused a degree of redistribution of R&D and innovation-related activity towards areas eligible for such support, a finding which can be considered to mark a degree of success in the objectives of these programmes.

However, whilst there are many reasons to applaud the achievements of the programmes in their own rights, the analysis of activity across both the Structural Funds and the Framework Programmes, uniquely undertaken by this study, has illuminated five crucial areas which are worthy of further policy consideration.

Firstly, mechanisms are required to bring together those working in the field of research policy and those engaged in economic development and practice; as the study has found clear evidence that geographical proximity does not necessarily lead to the forming of fruitful connections. Only where individuals had knowledge of both elements did well-rounded approaches to R&D led regional economic development emerge. Yet, all too often, these are two parallel worlds operating in separate dimensions and resulting in limited understanding of the opportunities, or even the potential, for research-led economic development. Bridging these 'silos' of activity both within regions and between national and regional levels is crucial and requires a positive policy approach as these relations do not naturally occur of their own volition.

Secondly, greater consideration should be given as to how investments in R&D-related innovation infrastructures and networks might mutually support investments in actual research activities and vice versa. At present the policy ambition to realise synergies between activities financed through the Structural Funds and those financed through the Framework Programmes is, at best, poorly articulated at the regional level and, at worst, is seen to be irrelevant. The relative 'invisibility' of the Framework Programmes in the lexicon of regional economic development practice and strategy making is a telling example of this. It is crucial that regional policy makers consider how to maximise the effectiveness of these related programmes of activity within their regions rather than relying on serendipity and the actions of committed and knowledgeable individuals to achieve some degree of synergy on the ground. Given

that the emerging policy-rhetoric often focuses simply on the need to 'draw down' additional funds, rather than the benefits that might accrue from this there appears to be some distance to go in this, admittedly complex, area.

Thirdly, efforts to build R&D capacities and capabilities in a region should more fully consider the role of the public sector research institutions, such as universities, as both anchors and channels for knowledge-led innovation and economic development within a region. These are the primary beneficiaries of funds from EU R&D-related funding instruments yet current strategies and approaches within regions often focus on stimulating private sector R&D expenditure and on the commercialisation of existing research capacity within universities. This fails to acknowledge the potential to take a stronger strategic approach to the development of public sector R&D capacities as a catalyst for sustained longer-term economic development, particularly in the context of a globalising knowledge economy. Examples from the case study regions in this study demonstrate the opportunities which are available from taking such an approach, but also the challenges in realising this in practice.

Fourthly, there is a clear and pressing need for an assessment of the aims, objectives and achievements of the EU's R&D related financing activities in practice. In the first instance it is, perhaps, surprising that this study has found no evidence of evaluations being undertaken at the regional level of the economic impact of the EU's RTD Framework Programme. Equally, it is disappointing that there has been no substantive evaluation of the impacts of R&D-related activities financed through the EU's Structural Funds at a regional level. Assessments in this area would also enable potential disparities in policy objectives and actual practice to be discerned. One of the findings of this study has been the fracture created between the medium-term aspiration of Structural Fund programmes to stimulate R&D capabilities and capacities with short-term imperative of meeting established targets for job creation within the regions eligible for support under Objective 2. Whilst policy aims and ambitions may be specified at the EU level in a range of Communications and high-level reports these are not being fully carried through in practice owing to the weak translation of these into daily activity due to the existence of powerful competing priorities.

Fifthly, one of the significant findings of the research is the tendency for the EU's regionally-focused cohesion policies, such as Objective 1 and Objective 2 programmes in the present study, to establish bounded spaces through encouraging activities concentrated within the eligible area and discouraging external linkages. Founded in the notion of regional innovation systems, current efforts focus on strengthening the internal capacity for R&D-led innovation within a region. Whilst this may be appropriate with respect to, what might be termed, 'traditional' forms of regional policy, such as physical and human capital formation, it is questionable whether it remains appropriate in the context of efforts to stimulate learning and innovation, particularly in the light of emerging evidence as to the value of inter-regional knowledge flows, as set out in Sections 3.4.4 and 4.5. To offset this tendency towards spatial closure, future strategies must be more outward looking. In taking forward future initiatives in this area actors must be aware of the relational dimension to territorial innovation systems as well as the role of geographical proximity in encouraging localised knowledge spillovers. The research suggests a need to extend existing approaches to actively consider the role of wider innovation systems, particularly an emergent European system, a proposition which is considered further below. In practice we should be seeking to promote research-led innovation strategies that are regionally embedded, globally aware and ERA-connected.

One of the benefits of such an approach is that it would serve to bridge the divide between the polarised arguments surrounding the pursuit of 'excellence' or 'cohesion' identified in Section 4.5. However, whilst such an approach might enable the more balanced territorial development of the European territory it is unlikely that it will suffice to achieve social and economic cohesion across the territory as a whole, particularly if more prosperous regions continue to reap the most significant benefits. As various commentators have noted, seeking to achieve territorial cohesion in the context of pervasive policies is challenging[16] (Soete 2008, House of Commons 2003). A more differentiated approach might thus be warranted. Despite the benefits of the EU's R&D-related instruments identified through this study the debate continues as to

[16] This was put most forcefully by Michael Ward, then Chief Executive of the London Development Agency, who, in evidence to the House of Commons Inquiry on Reducing Regional Disparities in Prosperity, commented that the UK Government's Public Sector Agreement (PSA) target to grow all regions whilst reducing the gap between them was "arithmetically, a fairly challenging concept" (House of Commons 2003, p.12).

whether the current approach is appropriate and how its overall effectiveness might be improved. Official recognition of this is to be found in an expert hearing held by DG Regio, in September 2008, on the EU Cohesion Policy and regional innovation. From the findings of this research, whilst incremental improvements can be made at a regional level in the current context, as set out above, this would retain one of the significant weaknesses of the present approach – that of the increasing regionalisation of the policy instruments, with a corresponding failure to grasp the benefits available from adopting a stronger inter-regional dimension.

From the evidence derived from the case studies, supported by the findings of the wider literature, this work concludes that a new approach is required at the European level, if the aims of territorial cohesion are to be achieved over the coming years. Whilst this thesis has focused on the operation of the EU's R&D-related instruments at the regional level in the UK rather than the operation of these policies more generally, the evidence derived through the study, combined with wider literatures, enables some suggestions to be made as to the form that such an approach might take.

Before doing so it is worth recapping on certain features relating to the spatial dimension of research and innovation. Firstly, it is acknowledged that agglomerations of R&D and innovation activity can be advantageous for reasons of scale and knowledge generation, however, the fear is that these concentrations, if stimulated or otherwise allowed to develop unchecked, will lead to an unequal core-periphery model of prosperous and non-prosperous regions. Yet, as Krugman notes (1998b), the agglomeration pressures which economic modelling predicts appear to be less strong in practice. It appears that other pressures, be they political, social or cultural act to balance agglomeration pressures leading to a more polycentric model of R&D activity across the EU territory, albeit with identifiable 'hot' and 'cold' spots based on concentrations of activity and a lack of activity.

Secondly, it is also worth recalling that there is an array of evidence emerging which suggests that a focus overly centred on individual regions is inappropriate, rather regions should be seen as elements in a wider system of research and innovation. The evidence ranges from economic studies demonstrating that investment in R&D activity in less prosperous regions is not sufficient on its own to stimulate economic

growth, instead highlighting the importance of social and cultural factors in appropriating and using available knowledge; through to firm-level studies identifying that innovative firms in rural and less-prosperous regions are more 'open' in that they tend to draw on knowledge generated from outside of their locality, in comparison to firms located in urban and prosperous regions where knowledge resources are more readily available close to hand. The findings of the case studies set out in this study in the context of the Framework programmes for both Higher Education Institutes and firms, begin to bear this out. Evidence from the organisational-literature also suggests that firms gain through combining knowledge drawn from different sites owing to the spatiality of knowledge, a finding which chimes with suggestions from the regional innovation literature that the inter-regional dimension of knowledge exchange remains under-theorised and under-researched.

Taking these features into account, alongside the regional-level findings of this research, suggests that a future EU approach in this area should combine 4 key features:

Firstly, efforts should continue to build the capacity and capability of regions to engage in R&D and innovation activity. EU support can provide an important stimulus here, particularly in less prosperous regions, as the evidence relating to Objective 1 regions in this study demonstrates.

Secondly, initiatives aimed at reinforcing the ability of firms and organisations within a region to take advantage of knowledge generated, within the region and outside of the region, should be enhanced. There are signs that initiatives of this form are beginning to be developed in the best cases, although too often, as the research for this study demonstrates, a more parochial view is taken.

Thirdly, and most significantly, the EU should place a considerable emphasis on promoting and supporting inter-regional learning, in order to make the knowledge generated in centres of substantive R&D activity available to support innovation in other regional spaces. A mechanism for this is readily available in the form of the 'Territorial Cooperation' Objective of the Structural Funds.

Finally, the EU should continue to support the best co-operative research proposals regardless of location. It should not seek to subvert this to other purposes. However, in considering the location of significant research infrastructures objectives related to the balanced development of the European territory as a whole arguably should be taken into consideration.

In terms of implementing such an approach consideration also needs to be given to the appropriate delivery instruments. In practice, the European Institutions appear to have an appropriate mix of instruments to hand, although whether these are capable of delivering the policy approach identified is beyond the remit of this study. The key aspects of the instrument mix would be:

- Convergence Objective of the Structural Funds – stimulating both R&D capacity and regional learning capabilities for innovation
- Competiveness Objective of the Structural Funds – stimulating regional learning capabilities for innovation
- Territorial Cooperation Objective of the Structural Funds – stimulating inter-regional learning and supporting R&D capacity of a European significance. This represents a key development in the EU policy mix in support of R&D, innovation and balanced territorial development. Whilst potentially based around existing INTERREG trans-regional programme areas it would need to take a distinct focus on developing the research and innovation capacity of the European Research Area.
- RTD Framework Programmes – supporting excellence in collaborative frontier science and technology research.

8.5 Theoretical Reflections: rethinking the regional innovation space

The empirical evidence assembled for this work provides a powerful lens through which to reflect on various theoretical dimensions linked to spatial development processes. In the first instance it is readily apparent that regional innovation policies are strongly influenced by prevailing economic narratives of endogenous economic growth and the perceived relationship between investment in R&D and subsequent levels of economic growth. These narratives are prevalent at the regional, national

and EU level. It is also apparent that there is a significant emphasis on the regional level as a scale of activity, both in EU policy circles and, perhaps understandably, at the regional level. The approaches taken reflect strands of academic theorising rooted in territorial models of innovation and learning. Although these are contested strands, they have a remarkable resonance within regional policy circles. In each of these regards the evidence suggests that observed patterns and processes broadly conform to existing innovation theory.

In understanding the processes at work however, the evidence developed through this study suggests that existing theories of spatial innovation could be strengthened through a stronger consideration of the emerging literature on relational geographies, both to explain patterns of activity within a region and those between regions. Equally, the empirical evidence demonstrates that there is an explanatory power in the developing literature on the importance of policy imaginations in governing activities on the ground. In this respect it is indeed useful to distinguish between the setting of policies and the actual delivery of such policies in practice. In combination, the relational turn and the role of policy imaginations suggest some merit in rethinking the scope and nature of regional innovation spaces. Taking each of these key points in turn.

That the region is a problematical concept is evident from the academic literature (McLeod 2001), yet it remains a focus for policy-making approaches at the European scale, often seen as something of a 'natural' space for activity by the European Commission. Yet, even where, apparently, common interests exist, distinct cleavages are present, as witnessed within the regional case studies. The empirical evidence suggests that these cleavages exist at four levels: at an institutional level, whereby different rules, norms of behaviour and cultures of activity co-exist within a common space, epitomised by the divide between those focusing on economic development and those focused on research activities; at an organisational level, whereby different organisations located within the same space fail to engage and interact owing to differential strategies despite, seemingly, common objectives; at the cognitive level, whereby groups and individuals have different backgrounds and so do not have a shared understanding, the lack of visibility of the Framework Programmes amongst regional policy makers is a case in point, and, finally, at a spatial level, whereby

public policies act to divide and separate territories that might otherwise form integrated units, a phenomena which might be termed as 'bounded separation'.

These four forms of separation are the converse of the forms of proximity identified by authors such as Boschma (2005) and Gertler (2008). This highlights the paradoxical nature of relational proximity - what serves to unite relationally can also divide geographically - making regions fragmented loci of activity rather than a locus of activity. This provides strong substance to Morgan's assertion that geographically proximate interactions have to be actively constructed "like any other relational asset" (Morgan 2004b p.11). Whilst the evidence developed for this study is supportive of the forms of proximity identified by the literature it does suggest that the concept of geographical proximity remains under-theorised, both in terms of scale and in terms of its attributes.

The importance of place – the territorial turn – has been a key development in the spatial innovation literature, founded on 'best practice' models of regional innovation systems and the experience of industrial districts. Yet the evidence from this study suggests that regional innovation systems are far more relational than is typically imagined and, indeed, that the word 'regional' appears to wield a powerful symbolism, suggestive of self-standing structures. It would be more correct to speak of relational systems of innovation, which have territorial loci. These loci may occupy a common geographic homebase but we should not assume that geographical proximity will necessarily cause collaborative relationships to be forged in some 'natural' manner. The evidence suggests that regional innovation systems are formed of a complex spatial geometry of overlapping and interlocking interests which act to influence behaviour, in ways which are difficult to foretell. Through their actions policy-makers both shape and create these spaces, in ways which are not always simple to foretell. In the face of such a complex geometry it is, perhaps, ill-advised to assume that the regional space forms a natural arena for collaboration.

Similarly, it may be ill-advised to assume that stated strategies will be realised in practice. As various authors emphasise, the setting of policy does not predetermine its eventual outturn (Morgan 2007, Peters and Pierre 2002). The delivery of policy depends upon the interplay of a myriad of decisions taken by interdependent

organisations, all striving towards their own objectives, and with different spatial outlooks and reach. The research demonstrates that, whilst the outcomes of EU R&D instruments may be a shared responsibility, the Commission is wrong to presume that this can be reduced to a common, ordered, interest, such as that encapsulated in the title of the 4th Cohesion Report: "Growing Regions, Growing Europe" (CEC 2007c), rather a complex geometry of governance is present, which resembles Hooghe and Marks' Type II model of multi-level governance (Hooghe and Marks 2003). Untangling the, potentially conflicting, functional and spatial dimensions of the multi-level governance model is remains an open research theme.

One dimension to emerge from the research as influencing the governance decisions taken was the importance of accepted beliefs, past experience and existing structures in guiding behaviour of individuals and institutions. This accords with, and substantiates, the starting premise for this study that embedded practices and framing structures influence both how individuals perceive the world and so how they choose to act (Bordieu 1979, Granovetter 1985, Healey 2006). The influence of competing discourses – of spatial scale, of the primacy to be given to short-term employment outcomes, of the role of support for basic and applied collaborative research – are all evident in the shaping of the activities supported through EU R&D instruments and, more particularly, the choices made by governing institutions such as the Structural Fund programme authorities.

That territorially-focused policy makers are challenged by the practice of relational systems of innovation is evident from the findings of this research. They struggle to combine the 'local' with the 'global', concentrating on that which they feel they are able to influence most directly reverting to "traditional ways of seeing place/space and governance processes" (Healey 2006 p.525). The evidence demonstrates that the importance of the policy-imaginary of place and issue identified by Healey (2007) in the context of planning practice applies just as to forcefully in the worlds of research and innovation. As Scott (1998) observes, governance authorities seek to simplify issues in order that they might then be 'legible' and more susceptible to government intervention. But this process of "heroic simplification" (Scott 1998 p.8) is inherently artificial, ignores the reality of actual practices and "are disciplined by a small number of objectives" (Scott 1998 p.23). In seeking to achieve these objectives, Jessop

(2005) argues that the state creates discursive constructs or 'economic imaginaries' which become hegemonic, as the drive towards research-led economic development in EU policy documentation might be construed.

Yet some imaginaries remain contested. Most notably, in this research, this is apparent in the scalar debate over the appropriate focus of research-led interventions. As this research also demonstrates, within such an overarching 'imaginary' there are many possible positions and interpretations. The importance of the imagined narrative and the imagined space of activity is that it not only shapes the responses of institutional actors but, in so far as it has been constituted through policies as a material form, it also establishes patterns of activity in practice. These imaginaries may be mutually reinforcing, or represent competing practices. The research suggests that the emergent literature on the role of image, imaginaries and ways of 'seeing' (Scott 1998, Jessop 2005, Healey 2007) offers strong potential for a better understanding of how policy outcomes are shaped in practice and why their delivery can differ from their design. Adopting such a relational understanding of governance practices might also serve to correct the misapprehension in some quarters of the Commission that the reason policy objectives are not being met is simply due to the unreasonable actions of 'local rent-seeking alliances' (EC 2008).

8.6 Reflections on approach: limits and potential

This research project originally set out to identify, and understand, the pattern of EU R&D-related activities at a regional level in the UK, as financed through the EU Structural Funds and the EU Framework Programmes. This was captured by the simple question of "who gets what, and why?". The research then sought to explore the theoretical insights that the observed patterns revealed, particularly with regard to theories of regional innovation policy and practice.

The focus of the study was selected because it sheds light on an important – but largely unexplored – policy area. The practical value of this was recognised through the involvement of the DTI as CASE partners in the study. The study has been distinctive, certainly in the UK, in that it not only covers both the Framework

Programmes and the R&D-related aspects of the Structural Funds, but it also covers multiple regions and does not restrict itself to either Objective 1 or Objective 2 eligible areas. Previous studies have either focused on individual instruments (DTI 2004, Vence et al 2000); particular Objectives of the Structural Funds (Eskelinen et al 1997, Dabinett and Gore 2001), single regions (Kaufman and Wagner 2005) or taken a broader EU-wide perspective (Musyck and Reid 2007). This ambition has created its own challenges but has led to a rich vein of material.

The findings of the study have demonstrated the value in taking this focus. It has offered a unique opportunity to explore whether the observed patterns do conform to existing innovation theory, across a variety of regional contexts in the UK, and, more especially, the relationship between these theoretical conceptions and the public policy process. The research has also offered a valuable framework in which to explore the new relational literatures which are currently being developed. This was a dimension which, at the time of embarking on the research, I perceived to be potentially significant but lacked the concepts and knowledge to fully articulate. Through the course of this research and engaging with the emergent literatures in this field the relational dimension has emerged as being particularly significant.

The approach chosen has proven to be very effective. The case study approach has enabled a depth of exploration which provides a strong explanation for the patterns revealed by the analysis of programme data from the Structural Funds and the Framework Programmes. The nature of the three regions chosen for the case studies also provided a good range of comparisons and contrasts, from economic context, through programme structures and levels of EU-funded R&D activities, to governance arrangements. Initially, consideration had been given to including an English region other than Yorkshire and Humber, such as the North East, as the need to include a second Objective 1 programme was debated. The choice to include two regions with Objective 1 programme areas has proved a good one. It has demonstrated certain similarities in approach and certain differences that could not have been discerned from one case only.

In practice, the approach also overcame the methodological difficulties encountered during the study, notably problems with existing aggregate datasets appertaining to

the Structural Funds and the Framework Programmes. The case study approach enabled the construction of new datasets for the three regions involved, which provided a strong indication of the types of activity that had been undertaken and the overall level of that activity.

The decision to include both the Framework Programmes and the Structural Funds within the scope of the study was ambitious. In practice the study has involved three regions, two instruments and, in the case of the Structural Funds, two Objectives. It has proved challenging to structure this material in a coherent manner owing to the separation of these instruments in practice and imagination. Yet, the dual focus has provided a rich vein of material that would not otherwise have been available. In particular, it has allowed the study to explore the shared space of interlocking geographical and functional perspectives. This has opened up the relational world and demonstrated the significance of how individuals 'see' particular themes, places and instruments in a way which a more traditional focus on one instrument alone would not have been able to. However, in the interests of breadth it has sacrificed a certain amount of depth in coverage in each of the case study regions.

The approach taken has served to drive the study in a particular direction. Whilst this has proven effective in tackling the research questions set out for the study it has established limitations in other respects. In particular, the approach was unable to fully explore the nature of the policy imaginations which have proved to be so central to the findings of the study. A stronger ethnographic element to the research would be required to have examined this further. In addition, the multiple case study approach adopted limited the depth to which the study was able to explore the situation in any single region. Whilst this offered benefits in terms of the overall approach it does limit the extent to which the particular nuances of each region are able to be explained. Finally, and as already highlighted, the lack of evaluative evidence, together with the paucity of robust programming data, has limited the ability of the study to present a definitive picture of exactly how much goes to whom for what, and the wider benefits that this has realised.

8.7 Suggestions for further research

The principal area where further research can be considered is in exploring the relational dimensions of regional economies. This can be undertaken through analysis of Framework Programme data and deeper examination of linkages of projects funded through the Structural Funds. The Framework Programme data set for this research was collected as part of the present study but was not utilised. The research challenge is two-fold. Firstly to identify the nature of any external relations, such as a recently announced collaboration between the OpTic Technium and Cranfield University, and secondly, to explore how these external relations spillover to the benefit of development within the region.

A second area of research would be to further extend thinking around multi-level governance to incorporate the institutional dimension identified by Peters and Pierre (2002). This research would engage with the ideas of policy imaginations (Healey 2006) and explore the role individuals and institutions can play in developing policy learning and the embedding of particular narratives. Building on the 'architectures of knowledge' material developed by Amin and Cohendet (2004) the research would apply this to the arena of public policy and consider the role of different forms of proximity in the dissemination and uptake of policy innovations, and the level of path-dependency exhibited in the policy field. This would contribute to an enrichment of the literature around 'learning regions'.

The third area of research is to meet the evaluation challenge identified in Chapter 7. There is a pressing need for research into the range of impacts which result from research-led public sector interventions. This research would need to cover what measures might be appropriate, and over what timescale, as well as the scale of the resultant benefits. A new evaluation methodology may also be required in order to assess the location of benefits, given the potential for non-local knowledge spillovers, which means that traditional means of estimating deadweight, substitution and displacement effects are unlikely to be appropriate.

8.8 Concluding remarks

Overall, this study has provided a robust empirical evidential base to the pattern of policy and practice running through the EU's R&D instruments in the UK. The evidence base appertaining to who gets what and why has been sorely lacking in the past and provides a strong benefit from the study. More significantly the study has shed new light on the 'territorial' debate which is prevalent both in EU policy circles and academic theorising. It suggests that current thinking on patterns of spatial innovation underplay the importance of the territorial dialectic between the geographically proximate and more relational spaces; and highlights the perverse practice whereby regional policy-makers develop bounded spaces rather than more open geographies. The complex and interlocking geography of territorial and sectoral interests, cast through with fractures and fissures, is clearly demonstrated by the interplay of the Framework Programmes and the Structural Funds.

The research presents a strong case for adopting a more relational approach when exploring systems of innovation. However, whilst the territorially-situated relational dynamics of innovation and knowledge acquisition are recognised in abstract terms by those policy-makers with geographic responsibilities their actions tend to reinforce notions of bounded spaces and return to more traditional conceptions of regional economic development. The research demonstrates that far from being simply a world of flows, as the globalisation literature can contend, spaces do matter and that the boundaries of these spaces can exert power. These spaces can also form influential learning environments. Yet, by the same token, the regional innovation literature understates the significance of relational connections and overstates the 'regional' attributes of these shared spaces. The work illustrates the divided spaces which form administrative regions and identifies how policy-makers shape these spaces through their actions. It also highlights how policy-makers fall back on powerful regional narratives extolling local capacity, local knowledge spillovers and the need for locally-orientated networks, particularly when conflicts of identity emerge between the functional and geographic spaces which they inhabit. Above all, the work demonstrates the importance of understanding how ways of 'seeing' serve to shape the outcome of policies in practice and suggests that recent writings on the significance of policy imaginaries offers a fruitful line of future enquiry.

Bibliography

Acs, Z. and Varga, A. (2002) 'Geography, Endogenous Growth and Innovation' *International Regional Science Review* 25 pp. 132-148

Acs Z., Fitzroy, F. and Smith, I. (1994) *High Technology Employment and University R&D Spillovers: Evidence from US Cities*. Paper presented at the 41st North American Meetings of the Regional Science Association International, Niagara Falls.

Acs, Z, Fitzroy, F., and Smith, I. (1999) 'High Technology Employment, Wages and University R&D Spillovers: Evidence from US Cities' *Economic Innovation and New Technology* Vol 8 pp. 57-78

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

Aghion, P. and Howitt, P. (1993) 'A Model of Growth Through Creative Destruction' in Foray D. and Freeman C. (eds) *Technology and the Wealth of Nations: The dynamics of constructed advantage* London Pinter

Agrawal, A., Cockburn, I., and McHale, J. (2006), "Gone but not forgotten: knowledge flows, labor mobility, and enduring social relationships," *Journal of Economic Geography* Vol. 6 pp. 571-91.

Allen, J. (2000) 'Power/Economic Knowledges: Symbolic and Spatial Formations' in Bryson J., Daniels P. W., Henry N. and Pollard J. (eds) *Knowledge, Space, Economy* London: Routledge

Allen, J., Massey, D. and Cochrane, A. (1998) *Rethinking the Region* Routledge London

Amable, B. (2000) 'Institutional Complementarity and Diversity of Social Systems of Innovation and Production' *Review of International Political Economy* Vol 7 4 pp. 645-87

Amin, A. (2002) 'Spatialities of Globalisation' *Environment and Planning A* Vol 34 pp. 385-399.

Amin, A. (2004) 'Regions Unbound: towards a new politics of place' *Geografisker Annaler 86B* pp. 33-44

Amin, A. and Cohendet, P. (2004) *Architectures of Knowledge: firms, capabilities, and communities* Oxford University Press

Amin, A. and Thrift, N. (1992) 'Neo-Marshallian Nodes in Global Networks' *International Journal of Urban and Regional Research* Vol 16 4 pp. 571-87

Amin, A. and Thrift, N. (2002) *Cities. Reimagining the Urban* Polity Press Cambridge

Amit, R. and Schoemaker. P. J. (1993). 'Strategic assets and organisational rent'. *Strategic Management Journal* Vol 14 (January) pp. 33-46

AMP (2008) Website of Advanced Manufacturing Park Waverley http://www.ampwaverley.com accessed March 2008

Anselin, L., Varga, A. and Acs, Z. (1997): 'Local Geographic Spillovers Between University Research and High Technology Innovations'. *Journal of Urban Economics* Vol 42 3 pp. 422-448

Archimedes Foundation (2002) *Estonian Participation in the European Union Fifth RTD Framework Programme (FP5)* Tartu

Argyris, C. and Schön, D. (1978) *Organisational Learning: A theory of action perspective* Reading MA: Addison-Wesley

Arnold, E. (2005) *What the Evaluation Record Tells Us About Framework Programme Performance.* Technopolis

Arrow, K. (1962) 'Economic Welfare and the Allocation of Resources for Invention' in Universities National Bureau Committee for Economic Research *The Rate and Direction of Inventive Activity* Princeton: Princeton University Press p 609-25

Audretsch, D. (2003) 'Innovation and Spatial Externalities' *International Regional Science Review* Vol 26 pp. 167-174

Audretsch, D. and Feldman, M. (1996) 'R&D Spillovers and the Geography of Innovation and Production' in *The American Economic Review* Vol. 86, pp. 630-640

Bache, I. and Flinders, M. (eds) (2005) *Multi-Level Governance* Oxford: Oxford University Press

Baily, M. N. and Chakrabarti, A. K. (1988) *Innovation and the Productivity Crisis* Washington Brookings Institution

Banchoff, T. (2002) 'Institutions, Inertia and European Union Research Policy' *Journal of Common Market Studies* Vol. 40 1 pp. 1-21

Bania, N., Eberts, R.and Fogarty, M. (1993) 'Universities and the Startup of New Companies: Can We Generalise from Route 128 and Silicon Valley?' *The Review of Economics and Statistics* Vol 75, 761-766.

Barthelt, H., Malmberg, A. and Maskell, P. (2004) 'Clusters and Knowledge: local buzz, global pipelines and the process of knowledge creation' *Progress in Human Geography* Vol. 28 pp. 31-56

Bauman, Z. (1998) *Globalization: The human consequences* Cambridge Polity Press

Baumol, W., Blackman, S. and Wolff, E. (1989) *Productivity and American Leadership: The long view* Cambridge MA MIT Press

Benneworth, P. and Hospers, G-J. (2007) 'The New Economic Geography of Old Industrial Regions: Universities as global-local pipelines' *Environment and Planning C: Government and Policy* Vol. 25 pp. 779-802

BERR (2007) 'Science, Engineering and Technology Statistics'. Internet only. http://www.berr.gov.uk/files/file38816.xls accessed January 2008

Best, M. (2001) *The New Competitive Advantage: The renewal of American industry* Oxford University Press

Bhaskar, R. (1978) *A Realist Theory of Social Science* 2nd edition Harvester Brighton

Bhaskar, R. (1989) *Reclaiming Reality* Verso London

Bilbao-Osorio, B. and Rodríguez-Pose, A. (2004) 'From R&D to Innovation and Economic Growth in the EU'. *Growth and Change* Vol. 35 4 pp. 434-455.

Bode, E. (2004) 'The Spatial Pattern of Localised R&D spillovers: An empirical investigation for Germany' *Journal of Economic Geography* Vol. 4 pp. 43-64.

Boekholt, P., Arnold, E. and Tsipori, L. (1998) *The Evaluation Of The Pre-Pilot Actions Under Article 10: Innovative Measures Regarding Regional Technology Plans*. Technopolis

Bordieu, P.(1979) *Distinction: A Social Critique of the Judgement of Taste* repr. London Routledge 1984 (original publication in French)

Boschma, R. (2005) 'Proximity and Innovation: A critical assessment' *Regional Studies* Vol. 39 1 pp.61-74

Boschma, R., and Frenken, K. (2003) 'Evolutionary Economics and Industry Location' *Review for Regional Research* Vol 23 pp.183-200

Braczyk, H-J. and Heindenreich, M. (1998) 'Regional Structures in a Globalised World' in Braczyk, H-J. et al. (Eds) *Regional Innovation Systems* London: UCL Press

Brenner, N. (2004) *New State Spaces Urban Governance and the Rescaling of Statehood* Oxford OUP

Breschi, S. and Cusmano, L. (2002) 'Unveiling the Texture of a European Research Area: Emergence of Oligarchic Networks Under EU Framework Programmes' *CESPRI Working Paper* no 130 July

Breschi, S. and Lissoni, F. (2001) 'Knowledge Spillovers and Local Innovation Systems: A critical survey' *Industrial and Corporate Change* Vol 10 4 pp. 975-1005

Brooks, H. (1994) 'The Relationship Between Science and Technology' in *Research Policy* Vol 23 pp.477-486.

Brouwer, M. (1991) *Schumpterian Puzzles: Technological Competition and Economic Evolution* London Harvester Wheatsheaf

Brown, J. S. and Duguid, P. (1991) 'Organisational Learning and Communities of Practice: Towards a unified view of working, learning and innovation' *Organization Science* Vol 2 1 pp. 40-57

Brown, J. S. and Duguid, P. (1998) 'Organizing Knowledge' *California Management Review* Vol 40 3 pp. 90-111

Brown, J. S. and Duguid, P. (2000) *The Social Life of Information* Boston: Harvard Business School University Press

Cairncross, F. (1997) *The Death of Distance* Boston HBS Press

Camagni, R. (1991) *Innovation Networks: Spatial Perspectives* London Bellhaven Press

Caniëls, M. (2000) *Knowledge spillovers and economic growth: regional growth differentials across Europe*, Cheltenham Edward Elgar

Cantwell, J. and Piscitello, L. (2005) 'Recent location of foreign-owned research and development activities by large multinational corporations in the European regions: The role of spillovers and externalities', *Regional Studies* Vol 39 1 pp. 1-16

Caragliu, A. and Nijkamp, P. (2008) The Impact of Regional Absorptive Capacity on Spatial Knowledge Spillovers, *Tinbergen Institute Discussion Papers* 08-119/3, Tinbergen Institute.

Carlsson, B. and Jacobsson, S. (1997) 'Diversity Creation and Technological Systems: a technology policy perspective' in Edquist, C. *Systems of Innovation* London Pinter

Castells, M. (1996) *The Information Age: Economy, Society and Culture i: The rise of the network society* Oxford Blackwell

Castells, M. (1998) *The Information Age: Economy, Society and Culture ii: The power of identity* Oxford Blackwell

Castells, M. (2000) *The Information Age: Economy, Society and Culture iii: End of Millenium* Oxford Blackwell

Charlet, V. (2001) *Analyse des participations françaises au cinquième PCRD* Etude réalisée pour le Ministère de la Recherche

Christiansen, J. L., Rogaczewska, A. P. and Vinding, A. L. (1999) *Synthesis Report of the Focus Group on Firms and Networks*. OECD Paris Available at http://www.oecd.org.dsti/sti/s_t/inte/inex.htm

Co, C. (2004) 'Evolution of the Geography of Innovation: Evidence from Patent Data', *Growth and Change* Vol 33 4 pp. 393-423

Cohen, W. and Levinthal, D. (1990) 'Absorptive Capacity: A New Perspective on Learning and Innovation' in *Administrative Sciences Quarterly* Vol. 35 pp. 128-152

Cohendet, P. and Llerena, P. (1997) 'Learning, Technical Change and Public Policy: How to create and exploit diversity' in Edquist, C. *Systems of Innovation* London Pinter

Commission of the European Communities (1993) 'Council Regulation (EEC) 2083/93 (ERDF)' published in the *Official Journal of the European Communities*, No L 193 of 31 July 1993

Commission of the European Communities (1998) 'Reinforcing Cohesion and Competitiveness Through Research, Technological Development and Innovation'. *COM(1998) 275 Final* Brussels

Commission of the European Communities (1999a) 'Council Regulation (EC) No 1260/1999 of 21 June 1999 laying down general provisions on the Structural Funds' CEC Brussels

Commission of the European Communities (1999b) 'Council Regulation (EC) No 1783/1999 Of The European Parliament And Of The Council of 12 July 1999 on the European Regional Development Fund' CEC Brussels

Commission of the European Communities (2000a) 'Commission Regulation (EC) No 1685/2000 of 28 July 2000 Brussels' CEC Brussels

Commission of the European Communities (2000b) 'Towards a European research area' *COM(2000) 6 final* CEC Brussels

Commission of the European Communities (2001) *Enhancing Democracy: A White Paper on Governance in the European Union* CEC Brussels

Commission of the European Communities (2001) 'The Regional Dimension of the European Research Area' *COM(2001) 549 final* Brussels

Commission of the European Communities (2002) 'The European Research Area : Providing New Momentum. Strengthening - Reorienting - Opening Up New Perspectives' *COM(2002) 565 final* Brussels

Commission of the European Communities (2003a) 'European Competitiveness Report 2003: Staff Working Paper' *SEC(2003)1299* Brussels

Commission of the European Communities (2003b) 'The role of the universities in the Europe of knowledge' *COM(2003) 58 final* Brussels

Commission of the European Communities (2005a) 'Working together for growth and jobs: A new start for the Lisbon Strategy' *COM (2005) 24* Brussels

Commission of the European Communities (2005b) 'More Research and Innovation - Investing for Growth and Employment: A Common Approach' *SEC(2005) 1253* Brussels

Commission of the European Communities (2006a) *Creating An Innovative Europe.* Report of the Independent Expert Group On R&D And Innovation Appointed Following The Hampton Court Summit Luxembourg: Office for Official Publications of the European Communities

Commission of the European Communities (2006b) 'Putting knowledge into practice: A broad-based innovation strategy for the EU' *COM(2006) 502 final* Brussels

Commission of the European Communities (2007a) *Growing Regions, growing Europe – Fourth report on economic and social cohesion.* Luxemburg OPEC

Commission of the European Communities (2007a) 'Regions Delivering Innovation Through Cohesion Policy' *SEC(2007) 1547* Brussels

Commission of the European Communities (2007b) 'Competitive European Regions Through Research And Innovation' *COM(2007) 474 final* Brussels

Cook, S. and Brown, J. (1999) 'Bridging epistemologies: the generative dance between organisational knowledge and organisational knowing' *Organisation Science* Vol10 4

Cooke, P. (1996) 'Policy Networks, Innovation Networks and Regional Policy: A review of the literature and an example from South Wales' in Heinelt, H. and Smith, R. (eds) *Policy Networks and European Structural Funds* Aldershot Avebury pp 26-45

Cooke, P. (2005) 'Regionally Assymetric Knowledge Capabilities and Open Innovation: Exploring 'Globalisation 2' – a new model of industry organization' *Research Policy* Vol 34 pp. 1128-1149

Cooke, P. and Leydesdorf, L. (2006) 'Regional Development in the Knowledge-Based Economy: The Construction of Advantage. Introduction to the Special Issue'. *Journal of Technology Transfer,* Vol 31 1 pp. 5-15

Cooke, P. and Morgan, K. (1993) 'The network paradigm: new departures in corporate and regional development' *Environment and Planning: Society and Space* Vol 11 pp. 543-564

Cooke, P. (1998) 'Introduction: Origins of the concept', in: Braczyk, H-J., Cooke, P, and Heidenreich, M. (eds) *Regional Innovation Systems; The Role of Governances in a Globalized World,* London: UCL Press Cooke and Willis 1999

Cooke, P. & Morgan, K. (1998) *The Associational Economy* Oxford: Oxford University Press

Creative Sheffield (2008) *Sportspulse: Where Sport Means Business* accessed from http://www.creativesheffield.co.uk/NR/rdonlyres/5412D028-112B-40E3-ADB3-ABACC23DA6CB/0/SportsPulseAll.pdf March 2008

Dabinett, G. & Gore, T. (2001) 'Institutional influences on EU funded regional technology development in the UK: A study of the Yorkshire and East London regions in the 1990s', *European Planning Studies*, Vol 9 8, pp. 995–1010.

Dahlman, C. and Nelson, R. (1995), 'Social absorption capability, national innovation systems and economic development', in Perkins, D. H. and B.H. Koo (eds.), *Social Capability and long-term growth*, Basingstoke: Macmillan Press.

Dasgupta, P., David, P. (1994) 'Toward a new economics of science' *Research Policy* Vol 23 pp. 487-521.

David, P. A. and Foray, D. (1995) 'Accessing and Expanding the Science and Technology Knowledge Base' *STI Review* Vol 16 pp.13-68

David, P. A. and Foray, D. (1996) 'Information Distribution and the Growth of Economically Valuable Knowledge: A rationale for technological infrastructure policies' in Teubal, M. et al (eds) *Technological Infrastructure Policy: An international perspective* Dordrecht and London: Kluwer Academic Publishers

David, P., Mowery, D., Steinmueller, W. (1994) 'Analysing the Economic Payoffs from Basic Research' in Mowery, D. *Science and Technology Policy in Interdependent Economies* Kluwer Academic Publisher

Department for Innovation, Universities and Skills (2008) *Innovation Nation* London

Doloreux, D. and Parto, S. (2004) 'Regional Innovation Systems: A Critical Synthesis'. *INTECH (Institute for New Technologies) Discussion Paper Series.* Maastricht, The Netherlands, United Nations University

Döring, T. and Schnellenbach, J. (2004) 'What Do We Know About Geographical Knowledge Spillovers and Regional Growth? A Survey of the Literature'. *Research Notes Working Paper* 14 (Oct) Deutsche Bank Research

Dosi, G. (1984) *Technical Change and Industrial Transformation* London Macmillan

Dosi, G. (1988) 'The Nature of the Innovative Process' in Dosi, G., Freeman, C., Nelson, R., Silverberg, G. and Soete, L. (eds) *Technical Change and Economic Theory* London Pinter

Dosi, G., Marsili, O., Orsenigo, L. and Salvatore, R. (1995) 'Learning, Market Selection and the Evolution of Industrial Structures' *Small Business Economics* Vol 7 pp 411-36

Dosi, G., Pavitt, K. and Soete, L. (1990) *The Economics of Technical Change and International Trade* Hemel Hempsted Harvester Wheatsheaf

Drejer, I. and Vinding, A. L. (2005) *Searching Near or Far: How location influences innovative firms' abilities to collaborate across geographical distances* DRUID ACE Aalborg University

DTI (2004a) *Science & innovation investment framework 2004 – 2014* London DTI

DTI (2004b) *The Impact of the EU Framework Programmes in the UK.* An independent report for the Office of Science and Technology by Technopolis Limited

DTI (2004c) *Targeted Review of Added Value Provided by International R&D Programmes* London DTI

DTI et al (2008) *Ex Post Evaluation of Cohesion Policy Programmes 2000 – 2006 co-financed by the ERDF (Objective 1 and 2). Work Package 6: Enterprise environment and innovation. Final inception report* for European Commission accessed (August 2008) from http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2006/wp6report.pdf

East of England Development Agency (2004) *A Shared Vision*

East of England Development Agency (2005) *Corporate Plan 2005-2008*

East of England Development Agency (2007) *Regional Economic Strategy for the East of England 2008-2031 Consultation Draft*

East of England Development Agency (2008) *Enterprise Hubs – bringing together the region's knowledge based industries.* Accessed at http://www.eeda.org.uk/280.asp June 2008

Eberlein, B. and Kerwer, D. (2004) 'New Governance in the European Union: A theoretical perspective' *Journal of Common Market Studies* Vol 42 1 pp. 121-142

ECOTEC (2003) *Evaluation of the Added Value and Costs of the European Structural Funds in the UK* Final report for the Department of Trade and Industry and the Office of the Deputy Prime Minister London

EERA (2008) *Regional Governance* downloaded from http://www.eera.gov.uk/category.asp?cat=556 June 2008

Edquist, C. (1997) *Systems of Innovation: Technologies, institutions and organizations* Abingdon Routledge

EPRC (2003) 'The Added Value of the Structural Funds: A regional perspective'. *IQ-Net Report.* University of Strathclyde

Eskelinen, H., Kokkonen, M. & Virkkala, S. (1997) 'Appraisal of the Finnish Objective 2 programme: Reflections on the EU approach to regional policy', *Regional Studies*, 31 2, pp. 167–192.

Etzkowitz, H., and Leydesdorf, L. (2000) 'The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University-Industry-Government Relations', *Research Policy* Vol 29 22 pp. 109-123.

Etzkowtiz, H. and Leydesdorf, L. (1997) *Universities in the Global Economy: A Triple Helix of Government-Industry and Government Relations.* London, Croom Helm

European Commission (2008) *Cohesion Policy And Innovation.* A paper prepared for discussion at the European Commission (DG Regio) hearing with academic experts on Cohesion Policy and Innovation in Brussels, September 15th, 2008

Fagerberg, J. (1994) 'Technology and International Differences in Growth Rates' *Journal of Economic Literature* Vol 32 pp. 1147-75

Feldman, M. (1999) 'The new economics of innovation, spillovers and agglomeration: a review of empirical studies' *Economic Innovation and New Technology*, Vol 8 pp. 5-25

Feldman, M. (1994) 'The University and Economic Development: the case of Johns Hopkins University and Baltimore' *Economic Development Quarterly* Vol 8 pp. 67-76

Fleck, J. (1992) 'Configurations: crystallizing contingency' *The International Journal of Human Factors in Manufacturing*, Autumn

Florida, R. (1995) Towards the Learning Region. *Futures* 27 (5) pp.527-536

Foray, D. (1997) 'Generation and Distribution of Technological Knowledge: Incentives, Norms and Institutions' in Edquist, C. (ed.) *Systems of Innovation: Technologies, Institutions and Organizations*, London Pinter pp. 65-85.

Fransman, M. (1990) *The Market and Beyond: Cooperation and competition in information technology development in the Japanese system* Cambridge: Cambridge University Press

Freeman, C. (1987) *Technology Policy and Economic Performance: Lessons from Japan* London Pinter

Freeman, C. and Soete, L. (1997) *The economics of industrial innovation* (3rd edn) London Frances Pinter

Frenz, M. and Oughton, C. (2005) *Innovation in the UK regions and devolved administrations: a review of the literature* Final report for Department of Trade and Industry and the Office of the Deputy Prime Minister, London

Frenz, M., Michie, J. and Oughton, C. (2005) 'Innovation and cooperation: the role of absorptive capacity', *Birkbeck Working Paper Series* Birkbeck University of London

Fritsch, M., (2004) 'R&D-cooperation and the efficiency of regional innovation activities' *Cambridge Journal of Economics* Vol 28,

Gaffard, J. L., Bruno, S., Longhi, C. and Quéré, M. (1993) 'Coherence and Diversity of Innovation Systems in Europe: Synthesis Report' *FAST Dossier Continental Europe: Science, Technology and Community Cohesion* 19 Brussels

Gertler, M. (2008) 'Buzz Without Being There? Communities of Practice in Context' A paper presented to the 2007 *Annual Meeting of the Association of American Geographers* San Francisco 17-21 April. (Forthcoming in Amin, A. and Roberts, J. (eds) Community, Economic Creativity and Organization Oxford Oxford University Press)

Gertler, M., Wolfe, D. and Garkut, D. (2000) 'No Place Like Home? The embeddedness of innovation in a regional economy' *Review of International Political Economy* Vol 7 4 pp. 688-718

Gibbons, M., Limoges C., Nowotny, H., Schwartzman S., Scott P., and Trow M. (1994): *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*, London: Sage.

Giddens, A. (1979) *Central Problems in Social Theory: Action , structure and contradiction in social analysis* London Macmillan

Giddens, A. (1998) *The Third Way: The renewal of social democracy* Cambridge Polity Press

Glass, A. and Saggi, K. (1998) 'International Technology Transfer and the Technology Gap' *Journal of Development Economics*, Vol 55 pp. 369-98.

Government Office Yorkshire and Humber (2003) *South Yorkshire Objective 1 Programme 2000-2006 Single Programming Document*

Government Office Yorkshire and Humber (2004) *Yorkshire and the Humber Objective 2 Programme 2000-2006 Single Programming Document (revised Dec 2004)*

Government Office East of England (2004) *European Union Objective 2 Programme for the East of England Single Programme Document 2000 – 2006 (Revised July 2004)*

Government Office East of England (2005) *Annual Implementation Report*

Grabher, G. (ed) (1993) *The Embedded Firm* London, Routledge

Granovetter, M (1992) Problems of Explanation in Economic Sociology in N. Nohia and R. Eccles *Networks and Organisations: Structure, Form and Action* Boston MA, Harvard Business School Press pp. 25-56

Granovetter, M. (1985) 'Economic Action and Social Structure: the problem of embeddedness'. *American Journal of Sociology* Vol 91 pp. 481-510

Granovetter, M. (1973) 'The Strength of Weak Ties'. *American Journal of Sociology* Vol 78 pp.1360-80.

Gregerson. B., Johnson, B. and Kristensen, A. (1994) 'National Systems of Innovation and European Integration' Quoted in Caracostas, P. and Soete, L. (1997) in Edquist C. *Systems of Innovation* London Pinter

Griliches, Z. (1992) 'The Search for R&D Spillovers' in *Scandinavian Journal of Economics*, Vol 94, supplement, pp. 29-47.

Grossman, G. M. and Helpman, E. (1991) *Innovation and Growth in the Global Economy* Cambridge MA MIT Press

Haas, P. (1992) 'Introduction: Epistemic Communities and International Policy Coordination' *International Organisation* Vol 1 Winter pp.1-35

Hajer, M. (2003) 'Policy Without Polity: Policy analysis and the institutional void'. *Policy Sciences* Vol 36 pp. 175-195

Haraway, D. (1988) Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14 (3) pp. 575-599

Harhoff, D. (1999) 'Firm formation and regional spillovers - evidence from Germany', *Economics of Innovation & New Technology*, Vol 8 pp. 27-55

Hauser, C., Tappenier, G. and Walde, J. (2007) The Learning Region: The impact of social capital and weak ties on innovation. *Regional Studies* 41 (1) pp.75-88

Harvey, D. (1996) *Justice, Nature and the Geography of Difference* Oxford Blackwell

Hassink, R. And Lagendijk, A. (2001) The Dilemmas of Interregional Institutional Learning. *Environment and Planning C: Government and Policy* 19 pp.65-84

Healey, P. (2006) 'Relational Complexity and the Imaginative Power of Strategic Spatial Planning' *European Planning Studies* Vol 14 4 pp. 525-546

Healey, P. (2007) *Urban Complexity and Spatial Strategies: Towards a relational planning for our times* London Routledge

Healy, A. and Roy, S. (2006) 'Where Does the Budget Go? Exploring the territorial dimension of EU R&D policy' *Scienze Regionali: Italian Journal of Regional Science* Vol 5 2 pp. 111-134

HEFCE (2007) *Higher Education-Business and Community Interaction Survey* 2004-5 and 2005-6

HEFCW (2006) *Third Mission Funding Arrangements 2007/08-2009/10* Published Circular Sept.

Heinelt, H. and Smith, R. (eds) (1996) *Policy Networks and European Structural Funds* Aldershot Avebury

Henderson, D. (2000) 'EU Regional Innovation Strategies: Regional experimentalism in practice?', *European Urban and Regional Studies*, Vol 7 4 pp. 347–358

HM Treasury (2001) *Productivity in the UK 3 – The Regional Dimension*

Hodgson, G. M. (1993) *Economics and Evolution: Bringing life back into economics* Cambridge Polity Press

Hollingsworth, R. (2000) 'Knowledge, Innovation and Location' in Bryson, J., Daniels, P. W., Henry, N. and Pollard, J. (eds) *Knowledge, Space, Economy* London Routledge

Hooghe, L. (ed) (1996) *Cohesion Policy and European Integration: Building multi-level governance* Oxford OUP

Hooghe, L. and Keating, M. (1994) 'The Politics of European Union Regional Policy' *Journal of European Public Policy* Vol 3 pp.367-393

Hooghe, L. and Marks, G. (2003) 'Unraveling the Central State, But How? Types of Multi-level Governance' *Political Science Series* 87. Institute for Advanced Studies Vienna

House of Commons (2003) Reducing Regional Disparities in Prosperity: Ninth Report of Session 2002-2003 ODPM: Housing, Planning, Local Government and the Regions Committee. London, The Stationery Office Limited

House of Commons (2007) *Select Committee on Science and Technology Fourth Report.* London, The Stationery Office Limited

Howells, J. (1999) 'Regional Systems of Innovation?' in Archibugi, D. et al (eds) *Innovation Policy in a Global Economy*. Cambridge: Cambridge University Press pp. 67-93

Iammarino, S. (2005) An Evolutionary Integrated View of Regional Systems of Innovation: Concepts, measures and historical perspectives

Ichigo K., Krogh, G. von and Nonaka, I. (1998) 'Knowledge Enablers' in Krogh, G. von, Roos, J. and Kleine, D. (eds) *Knowing in Firms* London Sage

Jaffe, A. B. (1989) 'Real Effects of Academic Research' *American Economic Review* Vol 79 5 pp. 957-70

Jaffe, A., Trajtenberg, M. and Henderson, R. (1993) 'Geographical Localization of Knowledge Spillovers as Evidenced by Patent Citations', *Quarterly Journal of Economics* Vol 58 pp. 577-598.

Jensen, O. B. and Richardson, T. (2004) *Making European Space* London Routledge

Jessop, B. (2005) 'Cultural Political Economy, the Knowledge-based Economy and the State' in Barry, A. and Slater, D. (eds) *The Technological Economy*. London Routledge pp.144-166.

John, P. (1996) 'Europeanization in a Centralizing State: Multi-level Governance in the UK' *Regional and Federal Studies* Vol 6 2 pp.3-19

Jones, M. (1998) 'Reconstructing the Local State: economic governance or social regulation?' *Political Geography* Vol 17 pp. 959-988

Jones, M., MacLeod, G. and Harrison, J. (2006) 'In What Sense a Regional World? Institutional Legacies, Territorial Fixes, Network Topologies' Paper presented to 2006 *Annual Meeting of the Association of American Geographers* Chicago

Jones, S. (2001) 'Wales For Innovation'. *A presentation to IRE workshop Cyprus*

Kaldor, N. (1934) 'A Classificatory Note on the Determinateness of Equilibrium' *Review of Economic Studies* Vol 1 1 pp 122-36 Reprinted in Targetti, F. and Thirlwall, A. P. (eds) (1989) *The Essential Kaldor* New York Holmes and Meier

Kaufman, A. and Wagner, P. (2005) 'EU regional policy and the stimulation of innovation: The role of the European Regional Development Fund in the objective 1 region Burgenland' *European Planning Studies* Vol. 13 4 pp. 581-99

Keller, W. (2001) 'Knowledge Spillovers at the World's Technology Frontier' *CEPR Discussion Paper* No. 2815. (May) accessed: http://ssrn.com/abstract=271703

Kelley, M. R. and Helper, S. (1999) 'Firm size and capabilities, regional agglomeration, and the adoption of new technology' *Economics of Innovation and New Technology* Vol 8 pp. 79-103.

Klette, T., Mřen, J. and Griliches, Z. (2000) 'Do Subsidies to Commercial R&D Reduce Market Failures? Microeconometric Evaluation Studies' *Research Policy* Vol 29 April pp.471-495

King, A. (2005) 'Structure and Agency' in Harrington, A. *Modern Social Theory: An Introduction* Oxford University Press Oxford

Kinoshita, Y. (2001) 'R&D and Technology Spillovers through FDI: Innovation and Absorptive Capacity' *CEPR Discussion Papers* no.2775

Kline, S. and Rosenberg, N. (1986) 'An Overview of Innovation' in Landau, R. and Rosenberg, N. (eds) *The Positive Sum Strategy* Washington, National Academy Press, pp. 275-305

Kohler-Koch, B. (1996) 'Catching up with Change: The transformation of governance in the EU' *Journal of European Public Policy* Vol 3 pp. 359-381

Kok, W. (2004) *Facing the Challenge. Report of the High Level Group.* European Commission Luxembourg : EUR-OP

Kokko, Ari. (1994) 'Technology, market characteristics, and spillovers' *Journal of Development Economics* Vol. 43 2 pp. 279-293

Krugman, P. (1991a) *Geography and Trade* Cambridge MA MIT PRess

Krugman, P. (1991b) Increasing Returns and Economic Geography. *Journal of Political Economy* 99 (3) pp.483-499

Krugman, P. (1998a) The Role of Geography in Development

Krugman, P. (1998b) What's new about the new economic geography? *Oxford Review of Economic Policy* 14 (2) pp.7-17

Krugman, P. (2005) 'Second Wind for Industrial Regions' in Coyle, D., Alexander, W. and Ashcroft, B. (Eds) *New Wealth for Old Nations: Scotland's Economic Prospects*, Princeton University Press pp. 35-47.

Kuznets, S. (1963) *Economic Development and Cultural Change*, University of Chicago Press, Chicago

Lagendijk, A. and Oinas, P. (2005) 'Proximity, External Relations and Local Economic Development' in Lagendijk, A. and Oinas, P. *Proximity, Distance and Diversity, Issues on Economic Interaction and Local Development* Ashgate

Landabaso, M. and Mouton, B. (2002) 'Towards a different regional innovation policy: eight years of European experience through the European Regional Development Fund innovative actions' in van Geenhuizen, M., Gibson, D. and Heitor, M. (eds) *Regional Development and Conditions for innovation in the Network Society* Quorum Books

Lawson, C. And Lorenz, E. (1998) Collective Learning, Tacit Knowledge and Regional Innovation Capacity *Regional Studies* 33 (4) pp.305-317

Lewontin, R. C. (1982). *Organism and Environment. Learning, Development and Culture.* H. C. Plotkin. New York, Wiley pp. 151-170.

Linder, S. B. (1961) *An Essay on Trade and Transformation* New York: John Wiley and Sons

Lissoni, F. (2001) 'Knowledge Codification and the Geography of Innovation: The case of Breshia Mechanical Cluster' *Research Policy* Vol 30 9 pp 1479-1550

Lord, C. (2004) *A Democratic Audit of the European Union* London Palgrave

Lorenzen, M. and Foss, N. J. (2002) 'Cognitive Coordination, Institutions and Clusters: An exploratory discussion' in Brenner, T. and Fornahl, D. (eds) *Cooperation, Networks and Institutions in Regional Innovation Systems* Aldershot: Edward Elgar

Lovering, J. (1999) 'Theory Led by Policy: The inadequacies of the 'new regionalism' (illustrated from the case of Wales)' *International Journal of Urban and Regional Research* Vol 23 2 pp.379-395

Lundvall, B-Å. and Johnson, B. (1994) 'The Learning Economy' *Journal of Industry Studies* Vol 1 2 pp. 23-41

Lundvall, B-Å. (ed.) (1992) *National System of Innovation. Towards a Theory of Innovation and Interactive Learning* Pinter Publishers, London and New York.

Lundvall, B-Å., (1988) 'Innovation as an Interactive Process: from User-Producer Interaction to the National System of Innovation' in Dosi, G., Freeman, C., Nelson, R., Silverberg, G., Soete, L. (eds.) *Technical Change and Economic Theory*, London: Pinter.

Luton Borough Council (2007) *European Funded Projects Luton 2006* (publicity flyer)

MacKinnon, D., Cumbers, A. And Chapman, K. (2002) Learning, innovation and regional development: a critical appraisal of recent debates *Progress in Human Geography* 26 pp. 293-311

Mairate, A. (2006) 'The 'added value' of European Union Cohesion policy' *Regional Studies* Vol 40 pp.167-177

Malecki, E. J. (1997) *Technology and Economic Development* Harlow Addison Wesley Longman

Mansfield, E., Rapoport, J., Romeo, A., Wagner, S., Beardsley, G. (1977) 'Social and Private Rates of Return from Industrial Innovation' *Quarterly Journal of Economics* Vol 77 pp. 221-240.

Marks, G. (1993) 'Structural Policy and Multi-level Governance in the European Union' in Cafruny, A. and Rosenthal, G. (eds) *The State of the European Community* Lynne Rienner Boulder Co. pp. 491-511

Marsh, D. and Rhodes, R. A. W. (1992) (ed.) *Policy Networks in British Government* Oxford: Clarendon Press

Marshall, A. (1920) *Industry and Trade* London Macmillan

Martin, R. and Sunley, P. (1998) 'Slow convergence? The new endogenous growth theory and regional development' *Economic Geography* Vol 74 pp. 201-27.

Martin, R. and Sunley, P. (2006) 'Path Dependence and Regional Economic Evolution' *Journal of Economic Geography* Vol 6 4 pp. 395-438

Massey, D. (1999) 'Space-Time, 'Science' and the Relationship Between Physical Geography and Human Geography' *Transactions of the Institute of British Geographers* Vol 24 3 pp.261-276

Massey, D. (2005) *For Space* Sage London

Mazey, S. and Richardson, J. (eds) (1993) *Lobbying in the European Community* Oxford OUP

McCombie, J. S. (1988) 'A Synoptic View of Regional Growth and Employment: II - the post-Keynesian theory' *Urban Studies* Vol 25 pp. 399-417

McKelvey, M. (1997) 'Using Evolutionary Theory to Define Systems of Innovation' in Edquist, C. *Systems of Innovation* London Pinter

McLeod, G. (2001) 'New Regionalism Reconsidered: Globalisation and the remaking of political economic space'. *International Journal of Urban and Regional Research* Vol 25 4 pp. 804-829

Metcalfe, S. (1988) .Innovation as a Policy Problem: New perspectives and old on the division of labour in the innovation process' *Mimeo Centre for Research and Innovation University of Manchester*

Metcalfe, J. S. (1992) 'Variety, Structure and Change: an evolutionary perspective on the competitive process' *Revue d'Économie Industrielle* Special Issue: Technological Diversity and Coherence in Europe vol 59: 1 pp 46-61

Metcalfe, J. S. (1995) 'Technology Systems and Technology Policy in an Evolutionary Framework' *Cambridge Journal of Economics* Vol 19 pp. 25-46

Metcalfe, J. S., Foster, J. and Ramlogan, R. (2005) 'Adaptive Economic Growth' *Cambridge Journal of Economics* Vol 30 pp. 7-32

Morgan, K. (1997) The Learning Region: Institutions, Innovation and Regional Renewal *Regional Studies* 31 (5) pp. 491-503

Morgan, K. (2002) 'The English Question: Regional perspectives on a fractured nation' *Regional Studies* Vol 36 7 pp.797-810

Morgan, K. (2004a) 'Sustainable Regions: Governance, Innovation and Scale' *European Planning Studies* Vol 12 6 pp.871-889

Morgan, K. (2004b) 'The Exaggerated Death of Geography: Learning, proximity and territorial innovation systems' *Journal of Economic Geography* Vol 4 1 pp. 3-21

Morgan, K. (2006) 'Devolution and Development: Territorial Justice and the North-South Divide' *Publicus: The Journal of Federalism* Vol 36 1 pp 189-206

Morgan, K. (2007) 'The Polycentric State: New Spaces of Empowerment and Engagement?' *Regional Studies* Vol 41(9) pp1237-1251

Moulaert, F. and Sekia, F. (2003) 'Territorial Innovation models: a critical survey' *Regional Studies* Vol 37. 3 pp 289-302

Muldur, U., Corvers, F., Delanghe, H., Dratwa, J., Heimberger, D., Sloan, B. and Vanslembrouck, S. (2006) *A New Deal for an Effective European Research Policy: The design and impacts of the 7th Framework Programme* Springer Dordrecht

Musyck, B. and Reid, A. (2007) 'Innovation and Regional Development, Do European Structural Funds make a Difference?' *European Planning Studies* Vol 15 7 pp. 961 – 983

Myrdal, G. (1957) *Economic Theory and Underdeveloped Regions* London Duckworth

Nadiri, I. (1993) 'Innovations and Technological Spillovers' *NBER Working Paper Series*, Working Paper No. 4423.

Narula, R. (2003) *Globalization and Technology: Interdependence, Innovation Systems and Industrial Policy,* Cambridge, UK: Polity Press

Nelson, R. (1981) 'Research on Productivity Growth and Productivity Differences: Dead ends and new departures' *Journal of Economic Literature* Vol 19 pp. 1029-64

Nelson, R. (ed) (1993) *National Innovation Systems* Oxford, OUP

Nelson, R. (1994) 'The Role of Firm Difference in an Evolutionary Theory of Technical Advance' in Magnusson, L. (ed) *Evolutionary and neo-Schumpterian Approaches to Economics* Dordrecht Kluwer

Nelson, R. (1995) 'Recent Evolutionary Theorising About Economic Change' *Journal of Economic Literature* Vol 33 pp 48-90

Nelson, R. and Winter, S. (1982) *An Evolutionary View of Economic Change* Cambridge MA Belknap Press of Harvard University Press

Nelson, R. and Rosenberg, N. (1993) 'Technological Innovation and National Systems' in Nelson, R. (ed) *National Innovations Systems: A Comparative Analysis* Oxford: Oxford University Press pp. 3-21

Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating Company* Oxford, OUP

Nooteboom, B. (1999) *Inter-firm Alliances* London Routledge

North, D. (1993) 'Economic Performance Through Time' in Persson, T. (ed) 1997 *Nobel Lectures, Economics 1991-1995*World Scientific Publishing Co., Singapore, sourced from internet: http://nobelprize.org/nobel_prizes/economics/laureates/1993/north-lecture.html on 12 September 2007

North, D., Syrett, S. and Etherington, D. (2007) 'Devolution and regional governance: Tackling the economic needs of deprived areas' Joseph Rowntree Foundation *Findings* October Ref 2155

OECD (2000) *Analytical Report on High Tech Spin-Offs*, Paris.

OECD (2002) *Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development* Paris OECD

OECD (2005) *Science, Technology and Industry Scoreboard*

ONS (2006) *Economic Trends* no. 636 (November)

ONS (2007a) *Population Trends* no. 130 (Winter)

ONS (2007b) *Regional Competitiveness and State of the Regions*

ONS (2007c) *Dataset RDBD7* accessible from http://www.statistics.gov.uk/statbase/tsdataset.asp?vlnk=572&More=N&All=Y Updated 26/11/07

OPSI (1998) *Regional Development Agencies Act 1998*

Oughton, C. et al. (2002) 'The Regional Innovation Paradox: Innovation Policy and Industrial Policy' *Journal of Technology Transfer* Vol 27 pp. 97-110

Outhwaite, W. (1987) *New Philosophies of Social Science: Realism, Hermeneutics and Critical Theory* Macmillan London

Paasi, A. (2004) 'Place and Region: Looking through the prism of scale' *Progress in Human Geography* Vol. 28 pp.536-546

Paasi, A. (1996) *Territories, Boundaries and Consciousness. The Changing Geographies of Finnish-Russian Border*. New York: John Wiley&Sons.

Patel, P. and Pavitt, K. (1994) 'National Innovation Systems: Why they are important, and how they might be measured and compared' *Economics of Innovation and New Technology* Vol 3 pp 77-95

Pavitt, K. (1991) 'What makes basic research economically useful?' *Research Policy* Vol 20 pp. 109-119.

Pavitt, K. (1997) 'The Social Shaping of the National Science Base' *SPRU Electronic Working Papers Series*, Paper No. 5.

Peters, B. and Pierre, J. (2002) 'Multi-level Governance: A view from the garbage can' *Manchester Papers in Politics*: EPRU series 1/2002

Peterson, J. (1995) 'Decision-making in the EU: Towards a framework for analysis' *Journal of European Public Policy* Vol 12 1 pp.69-93

Pierre, J. and Stoker, G. (2000) 'Towards Multi-level Governance' in Dunleavey, P. Gamble, A., Holliday I. and Peele, G. (eds) *Developments in British Politics* (6th edn) London Macmillan pp. 29-46

Polanyi, M. (1967) *The Tacit Dimension* New York Doubleday

Pollack, M. (1995) 'Regional Actors in an Intergovernmental Play: The making and implementation of EC Structural Policy' in Rhodes, C. and Mazey, S. (eds) *The State of the European Union Vol 3: Building a European Polity?* Lynne Rienner Boulder Co. pp.361-390

Polt, W., Rammer, C., Gassler, H., Schibany, A. and Schartinger, D. (2001) 'Benchmarking Industry Science Relations: the Role of Framework Conditions' *Science and Public Policy* Vol 28 4 pp. 247-258

Powell, R. (2007) Geographies of Science: Histories, localities, practices, futures. *Progress in Human Geography* 31 (3)

Prigione, I. and Stengers, I. (1984) *Order Out of Chaos: Man's new dialogue with nature* London Heinemann

Rallet, A. and Torre, A. (1999) 'Is Geographical Proximity Necessary in the Innovation Networks in the Era of Global Economy' *Geojournal* Vol 49 4 pp.373-380

Roberts, P. (2003) 'Partnerships, Programmes and the Promotion of Regional Development: An evaluation of the operation of the Structural Funds and regional programmes' *Progress in Planning* Vol 59 1 pp.1-69

Robson, C. (2002) *Real World Research* 2nd edition Blackwell Oxford

Rodríguez-Pose, A. (2001) 'Is R&D Investment in Lagging Areas of Europe Worthwhile? Theory and empirical evidence' *Papers in Regional Science* Vol 80 3 pp. 275-295

Rodriguez-Pose, A. and Crescenzi, R. (2008) Research and Development, Spillovers, Innovation Systems and the Genesis of Regional Growth in Europe *Regional Studies* 42 (1) pp.51-67

Romer, P. (1994) 'The Origins of Endogenous Growth' *Journal of Economic Perspectives* Vol 8 pp 3-22

Rosenberg, N. (1982) *Inside the Black Box: Technology and Economics* Cambridge University Press.

Rosenberg, N. and Nelson, R. (1994) 'American Universities and Technical Advance in Industry' *Research Policy* Vol 23, pp. 323-348.

Sabatier, P. (1987) 'Knowledge, Policy-orientated Learning and Policy Change' *Science Communication* Vol 8 4 pp.649-692

Salter, A.J., Martin, B.R. (2001) 'The economic benefits of publicly funded basic research: a critical review' *Research Policy* Vol 30 pp. 509-532.

Sapir, A. et al. (2004) *An Agenda for a Growing Europe* Oxford University Press,

Saviotti, P.P. (1998) 'On the dynamics of appropriability of tacit and codified knowledge' *Research Policy* Vol 26 pp. 843-856.

Sayer, A. (1992) *Method in Social Sciences: A realist approach* (2nd edn) London Routledge

Sayer, A. (2000) *Realism and Social Science* Sage London

Schartinger, D., Schibany, A., Gassler H. (2001) 'Interactive Relations Between Universities and Firms: Empirical Evidence for Austria' *Journal of Technology Transfer* Vol 26 pp. 255-268.

Scott, A. (1988) *New Industrial Spaces* London Pion

Scott, J. (1998) *Seeing Like a State* New Haven Yale University Press

Shaw, B. (1994) 'User/Supplier Links and Innovation' in Dodgson, M. and Rothwell, R. (eds) *The Handbook of Industrial Innovation* Aldershot Edward Elgar

Silverberg, G. and Verspagen, B. (1994) 'Learning, Innovation and Economic Growth: A long-run model of industrial dynamics' *Industrial and Corporate Change* Vol 3 pp. 199-223

Simmie, J., Sennet, J., Wood, P. and Hart, D. (2002) 'Innovation in Europe: A Tale of Networks, Knowledge and Trade in Five Cities' *Regional Studies* Vol 36 1 pp. 47-64

Simon, H. (1947) *Administrative Behaviour* New York Free Press

Sjostrand, S-E. (1993) *Institutional Change, Theory and Empirical Findings* New York M.E.Sharpe

Smith, K. (1997) 'Economic Infrastructures and Innovation Systems' in Edquist, C. *Systems of Innovation* London Pinter

Soete, L. (2008) *EU Cohesion policy for regional innovation: some preliminary comments* A paper prepared for discussion at the European Commission (DG Regio) hearing with academic experts on Cohesion Policy and Innovation in Brussels, September 15th, 2008

Soja, E. (1989) *Postmodern Geographies: The reassertion of space in critical theory* New York Verso

Sole, D. and Edmondson, A. (2002) Situated Knowledge and Learning in Dispersed Teams. *British Journal of Management* 13 pp. S17-S34.

Solow, R. S. (1957) 'Technical Change and the Aggregate Production Function' *Review of Economics and Statistics* Vol 39 pp. 312-20

Spender, J. C. (1997) 'Making Knowledge the Basis of a Dynamic Theory of the Firm' *Strategic Management Journal* Special Issue NORDREFO 17 pp. 45-62

Storper, M. (1995) 'Regional Technology Coalitions: an essential dimension of national technology policy' *Research Policy* Vol 24 pp. 895-911

Swansea University (2008) *Institute of Life Science*. website material from www.ils.swan.ac.uk accessed March 2008

Technopolis (2004) *Survey of knowledge transfer between NERC-funded researchers and the users of their outputs*: A report to the NERC Director of Knowledge Transfer and the NERC Knowledge Transfer Advisory Group

Technopolis (2006) *Strategic Evaluation on Innovation and the knowledge based economy in relation to the Structural and Cohesion Funds, for the programming period 2007-2013*: A report to DG Regional Policy

Thrift, N. (2000) *Everyday Life in the City* in Bridge, G. and Watson, S. (eds) 'A Companion to the City'. Blackwell, Oxford pp.398-409

Todtling, F. and Trippl, M. (2005) 'One size fits all? Towards a differentiated regional innovation policy approach', *Research Policy*, Vol. 34 8 pp.1203-1219

Trend Chart on European Innovation (2006) *2006 European Regional Innovation Scoreboard (2006 RIS)* European Commission

Trend Chart on European Innovation (2002) *2002 European Innovation Scoreboard: Technical Paper No 3 EU Regions* European Commission

UKSPA (2008) *Technium* http://www.ukspa.org.uk/sciencepark.aspx/a0cd7f85-15fe-4434-85a7-6ccd0b1cd5c8 accessed March 2008

van Ark, B. & Piatkowski, M., (2004) 'Productivity, innovation and ICT in Old and New Europe' *International Economics and Economic Policy* Vol 1 2 pp. 215-246

Varga, A. and Schalk, H. (2004) 'Knowledge Spillovers, Agglomeration and Macro-economic Growth' *Regional Studies* Vol 38 8 pp. 977-989

Veblen, T. (1919) *The Place of Science in Modern Civilization and Other Essays* New York Huebsch

Vence, X., Guntin, X. & Rodil, O. (2000) 'Determinants of the uneven regional participation of firms in European technology programmes. The 'Low R&D Trap'' *European Planning Studies* Vol 8 1 pp. 29–42.

Verspagen, B. and Schoenmakers, W., (2004) 'The spatial dimension of patenting by multinational firms in europe' *Journal of Economic Geography* vol. 4 1 pp. 23-42.

von Hippel, E .(1988) *The Sources of Innovation* New York Oxford University Press

WDA (1996) *Wales Regional Technology Plan*

WDA (2008) *Technium Innovation Centres* website address www.wda.co.uk/index.cfm/technium/about_technium/en4424?TechniumFlush=1 accessed March 2008

WEFO (2004a) *West Wales And The Valleys Objective 1 Single Programming Document. Including Mid Term Review Changes*

WEFO (2004b) *East Wales Objective 2 & Transitional Programme 2000-2006 Single Programming Document Incorporating Mid Term Review Changes*

Welsh Assembly Government (2002a) *A Winning Wales: The National Economic Development Strategy Of The Welsh Assembly Government*

Welsh Assembly Government (2002b) *Wales for Innovation: Action Plan*

Welsh Assembly Government (2002c) *Reaching Higher. Higher Education and the Learning Country: A strategy for the higher education sector in Wales*

Welsh Assembly Government (2005) *Wales: A Vibrant Economy*

Welsh Assembly Government (2006) *A Science Policy for Wales. The Welsh Assembly Government's Strategic Vision for Sciences, Engineering and Technology*

Welsh Assembly Government (2008) *EU Convergence Programme 2007-13 Innovation, R&D and Technology Strategic Framework*

Windhoff-Héritiér, A. (1993) 'Policy Network Analysis: a tool for comparative political research' in Kerman, H. (ed) *Comparative Politics: New directions in theory and method* Amsterdam VUP

World Bank (2009) World Development Report 2009: Reshaping Economic Geography World Bank Washington DC

Yeung, H. (2002) 'The Limits to Globalisation Theory: a geographic perspective on global economic change' *Economic Geography* Vol 78 pp. 285-305

Yin, R.K. (2003) *Case Study Research: Design and Methods*. 3rd Edition Sage London

Yorkshire Forward (2003) *Regional Economic Strategy: Ten Year Strategy for Yorkshire & Humber 2003-12*

Yorkshire Forward (2006) *The Regional Economic Strategy for Yorkshire & Humber 2006-2015*

Yorkshire Forward (2007a) *Corporate Plan 2007/10*

Yorkshire Forward (2007b) *Corporate Plan 2008/11 Consultation draft December 2007*

Yorkshire Forward (n.d) *Regional Innovation Strategy Final Report*

Yorkshire Science (2006) *Regional Innovation Strategy*

Annex 1

Institutions interviewed for study

Individuals from the following institutions were interviewed in the course of the study. For reasons of anonymity the names of the individuals are not given here. Where more than one individual was interviewed, such as in the case of the Welsh Assembly Government and the Regional Development Agencies, the organisations are named just once. Private individuals interviewed for the study are not identified here.

Wales

ECM^2
BIC Bangor
University of Bangor
University of Cardiff
University of Swansea
University of Aberystwyth
Wales Innovation Relay Centre
Welsh European Funding Office
Cardiff City Council
Neath Port Talbot Borough Council

Yorkshire and Humber

University of Leeds
Sheffield Hallam University
University of Sheffield
White Rose Universities Consortium
University of York
Government Office Yorkshire and Humber – Objective 2 Programme Secretariat
Government Office Yorkshire and Humber – Objective 1 Programme Secretariat
Yorkshire Forward
Yorkshire Science
AMRC
Creative Sheffield
York Science City
Doncaster MBC

East of England

University of Hertfordshire
University of Bedfordshire
Institute of Food Research
Government Office East of England
East of England Development Agency
East of England Regional Assembly
East of England Innovation Relay Centre
St. Johns Innovation Centre
i10
Norfolk County Council
Cambridgeshire County Council

Other

CBI
DG Regio, European Commission
DIUS

Annex 2

Base questionnaire

Introduction

Preamble
My name is Adrian Healy. Thank you for taking the time to meet with me. This interview will take around 1 hour to complete. It is based around a semi-structured questionnaire. As this is a standard framework for all the interviews being undertaken you may find some of the questions are less relevant to you than others.

Who I am
I am a researcher undertaking PhD studies at the University of Cardiff. The PhD is sponsored by the DTI and the ESRC.

What is the study
The study seeks to understand how EU R&D policies – that is R&D-related actions supported through the EU's Structural Funds or Framework Programmes – influence regional economic development in the UK. It is not seeking to assess directly the economic impact of these policies but rather to understand how they are being used in practice, the reasons for this and why this is seen as valuable. The study is exploring all dimensions of EU R&D policies, from the stimulation of individual research projects through to actions that seek to enhance the capacity of a region to undertake R&D.

How will the findings be used
This is an increasingly important area of policy making and one in which our level of knowledge is currently at a very low level. The findings from the research will have a wide relevance and I would, of course, be very happy to make these available to you later if you so wished. The research will contribute towards my PhD studies but we would also hope to use the results in a small number of workshops to be organised on completion of the research and in a small number of academic articles.

Questionnaire

Establish awareness

A. Are you aware of the Structural Funds or the Framework Programmes being used to promote R&D activity, or the capacity to undertake R&D in the region? Yes No

If no move to Sheet 2
If Yes continue

Establish importance

1. How important do you feel the Structural Funds are in stimulating R&D capacity or activity in the region?
5 = Very imp 4 = Imp 3 = some imp 2= low imp 1=Very low

Scale: 5 4 3 2 1

2. Is this because of the amount of money they represent?
5 = Very imp 4 = Imp 3 = some imp 2= low imp 1=Very low

Scale: 5 4 3 2 1

3. Is this because of other reasons? Yes No

Explore answer

4. Are you aware of the Framework Programmes being used to promote R&D activity, or the capacity to undertake R&D in the region?

5. If yes, how important do you feel the Framework Programmes are in stimulating R&D capacity or activity in the region?
5 = Very imp 4 = Imp 3 = some imp 2= low imp 1=Very low

Scale: 5 4 3 2 1

6. Is this because of the amount of money they represent? Yes No
5 = Very imp 4 = Imp 3 = some imp 2= low imp 1=Very low

Scale: 5 4 3 2 1

7. Is this because of other reasons? Yes No

Explore answer

The strategic role of EU R&D policies

8. What level of importance do you feel that the region's development strategy attaches to EU R&D policies for the purposes of stimulating regional economic development?

5 = Very high 4 = high 3 = some 2= low 1=Very low 0= no knowledge of this

8a. Structural Funds	5	4	3	2	1	0
8b. Framework Programmes	5	4	3	2	1	0
8c. Combined	5	4	3	2	1	0

9. How relevant to the region's development strategy do you feel the Framework Programmes are? 5 4 3 2 1 0

5 = Very relevant 4 = relevant 3 = some relevance 2= low relevance 1=no relevance 0= no knowledge of this

10. How relevant to the region's development strategy do you feel the R&D elements of the Structural Funds are? 5 4 3 2 1 0

11. Can you give any examples to illustrate your answer? ie what do you base this view point on?

12. Are you aware of any links between EU R&D policies (Structural Funds or Framework Programmes) and other national or regional policies in the region? Yes No

12a. If Yes: What are these please?

12b. If No: who might know this please?

How are EU R&D related funds being used in the region?

13. Are you aware of how EU R&D policies are being used in the region? Yes No If yes then go to sheet A.

14. Do you know why the choice has been made to use EU R&D instruments in this way? Yes No

14a. If yes, what are the reasons this choice has been made?

14b. How was this choice made?

15. To the best of your knowledge, what sort of actions are being supported through the Structural Funds in support of R&D-related activities in the region

15a. Can you provide any examples of good projects?

16. To the best of your knowledge, what sort of actions are being supported through the Framework Programmes in support of R&D-related activities in the region

16a. Can you provide any examples of good projects?

17. Are there any differences in the way that the Framework Programmes or the Structural Funds are being used between Objective 1 and Objective 2 programme areas?

17a. What if any influence do the respective programme areas have on patterns of regional activity

18. Are you aware of ways in which the Framework Programmes and the Structural Funds are being used **together** in the region (either in combination or in complementary ways)?

18a/18b. Do you know of any factors that might be facilitating or preventing this (no prompt)

- Knowledge and awareness
- Institutional capacity
- Institutional structures in the region
- European rules
- Complex bureaucracy
- National (UK) institutions
- Other.....

18c. If no knowledge on one (or all) of above then ask who might know this

Regional benefits

19. What are the benefits to the region of EU R&D policies? No prompt

20. Sheet B contains a list of statements relating to the potential benefits of EU R&D policies. They have been compiled from a range of sources and may or may not be true. Could you please spend the next 10 minutes judging each statement.

21*. How does the region make sure that the benefits gained through EU R&D-related investments are felt by the whole of the region and not just the recipient individuals, firms, universities or organisations?

22. In your opinion are there any differences between the benefits provided by the Objective 1 programme in the region and the Objective 2 programme in the region?

Yes – please list No – Why not Don't know

23. How is the region evaluating the socio-economic impact of actions supported by EU R&D policy instruments?

23a. Can you explain what was measured and how? (Can we get copies of reports etc)

24. Does this differ from how the impact of similar UK-funded actions are evaluated?

24a. Are you aware of any other research tackling this?

Added value of EU R&D policies

25. Do you believe that EU policies play an important role in stimulating research and development activities in the region?

26. What are EU R&D policies doing that are different from that which is being done by national or regional policies?

27. What is the added value of using EU R&D funding instruments to support R&D-related activities in the region?

Support for the Framework Programme

Questions for officials in GO's and RDAs

28. How does your regional promotion and support for the Framework Programmes fit into wider business/innovation support?

29. Does your region have a single contact point for i) policy towards Framework Programmes and ii) support for Framework Programmes participants?

30.To what extent does your region collaborate with the UK's Framework Programmes National Contact Points and Programme Managers?

31. In what ways could your region improve its Framework Programmes promotion and support effort?

FP questions for S&T community

32. How do regional bodies (GOs/RDAs) promote and support participation in Framework Programmes and how well does it do this?

33. How have you benefited from assistance from regional bodies and what was the impact on your participation on Framework Programmes?

34. In what ways could your region improve its Framework Programmes promotion and support effort?

Snowball questions

35. Can you suggest the most important organisations in the region for me to speak to…

36. Who would be a good person to talk to….

Thank you for your time.

Sheet A

To the best of your knowledge, how are EU R&D policy instruments currently being used in the region?

	V. strong focus	**Strong focus**	**Some focus**	**Ltd focus**	**Very little/none**
To invest in knowledge infrastructure (such as university research facilities; science parks; research centres etc)	5	4	3	2	1
To bring individuals from different backgrounds together	5	4	3	2	1
To invest in training courses (to train researchers, research staff or other workers)	5	4	3	2	1
To invest in collaborative research projects (between firms, universities etc)	5	4	3	2	1
To strengthen the amount of advice available to firms in the region	5	4	3	2	1
To strengthen the level of supporting services available in the region for the commercialisation of research ideas	5	4	3	2	1
To strengthen the capability of local and regional authorities to develop research and innovation initiatives themselves.	5	4	3	2	1
To introduce new ways of working into the region	5	4	3	2	1
To introduce new techniques into the region	5	4	3	2	1
To introduce new ideas into the region	5	4	3	2	1
To stimulate the links between firms and between firms and universities within the region	5	4	3	2	1
To stimulate links with firms and universities located elsewhere in Europe	5	4	3	2	1
To help encourage groups of individuals with similar interests to share their experience, knowledge and learning.	5	4	3	2	1

Sheet B

To the best of your knowledge, what have the actual benefits to the region of EU R&D policy activity

	Strongly agree	Agree	No view	Disagree	Strongly disagree
To help promote short-term economic growth	5	4	3	2	1
To help promote long-term economic growth	5	4	3	2	1
To help the region overcome its weak economic position relative to other regions in Europe	5	4	3	2	1
To maintain the region's strong economic performance relative to other regions in Europe	5	4	3	2	1
To increase in levels of business productivity in the region	5	4	3	2	1
To help to create more employment in the region	5	4	3	2	1
To increase the quantity of scientific research undertaken in the region	5	4	3	2	1
To improve the quality of scientific research undertaken in the region	5	4	3	2	1
To increase in the quantity of networks between businesses in the region	5	4	3	2	1
To increase the number of networks linking businesses with businesses located outside of the UK	5	4	3	2	1
To increase the number of networks linking businesses with universities located outside of the UK	5	4	3	2	1
To increase the quality of existing connections between businesses and universities within the region and outside of the UK	5	4	3	2	1
To generate new knowledge	5	4	3	2	1
To increase the number of networks linking businesses with businesses located elsewhere in the UK	5	4	3	2	1
To increase the number of networks linking businesses with universities located elsewhere in the UK	5	4	3	2	1
To increase the quality of existing connections between businesses and universities within the region and elsewhere in the UK	5	4	3	2	1
To help the region's businesses access	5	4	3	2	1

knowledge generated elsewhere in the UK					
To help the region's universities access knowledge generated elsewhere in the UK	5	4	3	2	1
To help the region's businesses access knowledge generated outside of the UK	5	4	3	2	1
To help the region's universities access knowledge generated outside of the UK	5	4	3	2	1
To stimulate a more diverse economy	5	4	3	2	1
To support the region's existing industrial base	5	4	3	2	1
To stimulate new and risky ideas	5	4	3	2	1
To promote a more 'innovation-friendly' culture	5	4	3	2	1
To stimulate higher levels of innovation within the region	5	4	3	2	1
To promote strong knowledge 'spillovers' within the region (ie the exchange and transfer of ideas)	5	4	3	2	1
To increase the capacity of firms in the region to undertake R&D	5	4	3	2	1
To increase the capacity of the region as a whole to undertake R&D	5	4	3	2	1
To strengthen the ability of regional institutions to support innovation in the region	5	4	3	2	1
To increase the commercialisation of R&D outputs	5	4	3	2	1
To upgrade equipment for research purposes	5	4	3	2	1
To increase the mobility of researchers between science and industry	5	4	3	2	1
To increase the mobility of researchers between regions	5	4	3	2	1
To increase the number of collaborative research projects involving regional firms or universities	5	4	3	2	1
To help to reduce the 'gap' between the level of knowledge of local businesses and leading researchers	5	4	3	2	1
To overcome historical weaknesses in the region's capacity to undertake (or make use of) R&D	5	4	3	2	1

Sheet 2

The assumption is that all interviewees will have awareness of EU R&D policies (either Structural Funds or Framework Programmes) in their region. However, where they do not the following questions should be used to close the interview.

B. Who might have a better awareness?

C. Do you believe that EU R&D policies might have a role to play in the economic development of the region?

Yes – explore

No – explore