Innovation Policy Position Paper

A policy position paper prepared for *emda*

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A Report for the East Midlands Development Agency

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1. Introduction

The past decade has witnessed a renewed interest in innovation from both academics and policy makers alike. The growth in academic interest can be gauged by analysis of the number of scholarly articles that contain the word 'innovation' in the title. This figure rose from around 2 per cent in 1960 to over 20 per cent by 2002 (Fagerberg, 2005), with much of the growth occurring in the last 10 years. As a result, more than one fifth of the articles published in the social sciences are now about the nature, causes and effects of innovation. This increase in academic interest has been matched in the policy arena. In recent years, the number of policy measures to support innovation has grown significantly and innovation is increasingly being seen as a key determinant of productivity growth and competitiveness (DTI, 2003).

It could be argued that the growth of interest in all things to do with 'innovation' is part of a fad by researchers, management gurus and policy makers. However, there are compelling reasons to suggest otherwise. Prime amongst these is the growing challenge posed by competition from low wage economies. Unable to compete on labour costs alone, the advanced economies have had to seek other ways to protect and maintain their competitive advantage. Innovation is one means of staying ahead of the game. The creation of new products and processes is part of what Best (1990) called the new competition. The introduction of new products, processes and markets enables firms and economies to shift production away from mass-produced, standardised goods - that can be produced more cheaply in low wage economies - towards higher value-added goods that are knowledge and design intensive. Innovation is thus an important means by which high wage economies can preserve and enhance their competitive advantage. Competing via innovation, rather than by price alone, is advantageous as it is harder for competitors to imitate new products, processes and organizational techniques. It therefore offers firms a high road – high wage, high growth – strategy. In contrast, price cuts are often straightforward to match and over-reliance on price/wage competition has the disadvantage of reducing incomes, forcing firms down a low-wage, 'low-road' trajectory. Innovation is thus seen as an important means via which economies can attain targets on growth, productivity *and* income per capita.

The growth in theoretical, empirical and policy-based work on innovation has increased our understanding of the complexities of the innovation process. It has also raised a number of new research questions and posed new challenges to policy makers. Initially, work on innovation focused on the performance of firms and nation states. As a result most policies for innovation were implemented at these levels. However, more recently it has been recognised that a number of regional factors are important in explaining innovation. The growing recognition of the regional dimension is illustrated by the fact that within the innovation literature, the proportion of research papers covering regional innovation increased by 10 fold since 1985 (Driver, 2005). Similarly, there has been a growth in regional innovation policy measures, as illustrated by the introduction of the regional innovation fund and the development of regional innovation strategies by the Regional Development Agencies (RDAs).

Against this background, this paper has three main aims. Firstly, to review the latest research on the determinants and effects of innovation in a regional context. Secondly, to provide comprehensive evidence on the innovation performance of the East Midlands economy; and thirdly to draw out the implications of this analysis for the design and implementation of regional policies to promote innovation.

2. Recent research on regional innovation

Before reviewing the literature on innovation it is important to provide a definition of innovation and, in particular, to distinguish the distinct but inter-related processes of invention, innovation and diffusion.

2.1 Defining innovation

Innovation may be defined as the commercial exploitation of new ideas in the form of new products and processes, new organizational techniques, new markets and new sources of supply.[1] There is a more extensive literature on (tangible) product and process innovation than less tangible forms, such as: organizational innovation;[2] new sources of supply; and the creation of new markets. This is primarily because product and process innovations are more readily measured/proxied by data on patents and R&D. However, organizational innovation and the development of new markets and new sources of supply are significant in that they are important sources of innovation in their own right and may also aid the development and diffusion of product and process innovations.[3]

It is important to distinguish *innovation* from *invention*. The latter may be a necessary prerequisite for innovation but it is only when an invention is exploited commercially that it results in innovation and starts to yield economic benefits. Early work on innovation highlighted this distinction using the so-called 'linear model' which distinguished between research, development and the production of new products and processes as shown below.

Research ⟶ **Development** ⟶ **Innovation**

While often cited in the literature, the linear model is something of a straw man (Edgerton, 1993, Kline and Rosenberg, 1986) used more to illustrate the distinctiveness of invention and innovation and the complexity of the relationship between the two phenomena rather than to suggest the automatic and smooth transformation of scientific research into new products and processes. Most expositions of the model emphasise that while research and invention may be a necessary prerequisite for innovation,[4] innovation is neither an immediate nor an

[1] This definition can be traced back to Schumpeter (1934, 1962) and has been adapted more recently in the European Commission's (1995) Green Paper on innovation which defined innovation as, "[the] renewal and enlargement of the range of products and services and the associated markets, the establishment of new methods of production, supply and distribution, the introduction of changes in management, work organisation, and the working conditions and skills of the workforce."

[2] Adam Smith's analysis of the division of labour is an early example of organizational innovation and the study of its impact on productivity. For a more recent discussion see Pavitt (2005) and Lam (2005).

[3] For example, the creation of the pay-television market via subscription and pay-per-view has been important in the development of digital television.

[4] While this is true in a global sense, it is not the case for national and regional economies nor for individual firms, as technology and ideas may be licensed. It may be easier for firms and countries to grow via catch-up or diffusion rather than by invention and innovation. Both strategies offer benefits

inevitable outcome of research and invention. Many other factors interact with research and development to determine the speed, nature and extent of innovation activity. Thus, the linear model is normally introduced as a stepping-stone to be quickly passed over on the way to more complex explanations such as the evolutionary and systems approaches (Freeman, 1987) where the roles of technology transfer and commercialisation are considered more explicitly. Provided its limitations are understood, the linear model is a useful starting point in that it emphasises that research is an important source of innovation while at the same time recognising the distinction between research (and if successful, invention), development and innovation. Not all research will be successful and not all inventions will be commercialised as product and process innovations. As Edgerton (1993) has pointed out, this is perhaps obvious at the level of the firm but less so at the level of the nation state and region.

The literature draws a further important distinction between *radical* innovation and *incremental* innovation where the former represents a completely new product or process and the latter a significant improvement to an existing product or process. Radical innovations have the capability to result in significant and rapid transformation of production[5] whereas the effects of incremental innovation are felt more slowly, though their cumulative impact may be just as significant.

A further distinction is drawn between innovations that are new to the market – *novel innovations* - and those that are new to the firm. This reflects the *diffusion* of the innovation from a novel innovator to imitators or followers. The economic effects of innovation are strongly influenced by the speed of diffusion, that is the speed of adoption of an innovation by follower firms and/or consumers. Like the transformation from invention to innovation, the diffusion process is also one that takes place over time. There may be a considerable lead-time between invention and innovation. Similarly, the diffusion process from novel innovation to widespread adoption may also take years or decades. For example, the diffusion of electric motors in US manufacturing industry took around 40 years.[6] It is widely recognised that most of the benefits from innovation arise from the diffusion of the innovation rather than its introduction. The full economic benefits from research are only realised after the processes of invention, innovation and diffusion are complete. The speed of diffusion is determined by network effects, the costs of adopting the new technology, the availability of finance, proximity, cooperation between firms, market size and structure as well as, institutional, social and cultural factors (see Hall, 2004 for a survey).

2.2 Innovation and Economic Performance

A number of theories[7] predict a positive association between innovation activity, productivity and growth. Innovation can reduce costs of production, increase the quality of goods, raise market demand and increase efficiency. There is also evidence to suggest that there are spillover effects from R&D and innovation activity, so that

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and they are not mutually exclusive. The best strategy is one which offers the optimal combination of invention, innovation and diffusion.

[5] Paul Sweezy has also referred to these as 'epoch making innovations' citing the railway and the motor car. The microchip may also be considered a radical or epoch-making innovation that has transformed production.

[6] Hall (2004, p. 467).

[7] These include neoclassical theory, evolutionary theory and the related systems of innovation approach.

the social return exceeds the private return. The effects of innovation on the overall rate of growth are partly determined by the relationship between innovation and employment. Innovation both creates and destroys jobs as well as creating different types of jobs in terms of quality (as measured by pay and conditions); thus the employment effects are normally considered to be more ambiguous than the productivity effects.[8] Notwithstanding the possibility of a negative employment effect, a variety of theoretical approaches predict that innovation may raise the overall rate of growth and increase the wealth of nations and regions as measured by income per capita. Levels of productivity and income per capita are frequently used to capture the competitiveness of firms, regions and countries, since the levels reflect the cumulative effects of past growth performance. Convergence, that is, closing the income or competitiveness gap between regions, requires poorer regions/countries to grow faster than richer regions/countries.

2.3 Theories of Innovation

Theoretical work on innovation can be divided into four main approaches:

1. Endogenous growth theory;
2. Innovation processes, including Schumpeterian, evolutionary theory and the resource-based view of the firm;
3. Theories of economic geography and the spatial location of innovation; and
4. The systems of innovation approach, incorporating regional innovation systems and learning

There is a degree of overlap between these theories as discussed below.

2.3.1 Exogenous and Endogenous Growth Theory

Neoclassical[9] theories of economic growth attempted to explain output growth in terms of the rate of growth of investment in factor inputs, most notably, capital and labour. The precise nature of the relationship between input growth and output growth was shaped by the degree of increasing or decreasing returns to inputs in the production process. According to this theory, growth was determined by the investment decisions of firms in capital and labour, and by technological change. However, technological change was not modelled within the theory, it was simply assumed to proceed at a given rate, unrelated to investment in capital and labour. In short, technological change was *exogenous*, that is, it was not explained within the theory.[10]

A number of empirical studies employed the production function approach to estimate the contribution of investment in capital and labour to output growth. These studies adopted a growth accounting framework that decomposed growth in output (GDP) into growth in factor inputs (capital and labour). Empirical estimates of these models showed that, after accounting for investment in capital and labour, a large part of growth was unexplained. The unexplained growth or residual, was called total factor productivity (TFP) growth, that is, growth that cannot be attributed to the individual inputs of capital and labour, but is the consequence of all factors combined. This

[8] See Pianta, 2004 for a detailed discussion.

[9] These theories are referred to as 'neoclassical' because they were based on research that aimed to provide a mathematical formalisation of the growth theories of the classical economists, most notably, Adam Smith.

[10] As a result, these early or neoclassical theories have been referred to as *exogenous* growth theory.

raised the question of what determined TFP, or the residual? A key factor identified within the literature was technological change and innovation, however, as Nelson and others have noted in the absence of a theory of technological change and innovation, the residual was really 'a measure of our ignorance'.

The main limitation of neoclassical growth theory and empirical growth accounting models is that there was no explanation of the factors that determine the rate of technological change and innovation.[11] Innovation was treated as a residual, in the sense that any growth that is not attributed to specified factor inputs was interpreted as (exogenous) technological change, or innovation. More recently, *endogenous* growth models have specified firms' investment in knowledge (R&D and human capital) as additional factor inputs that determine the rate of technological change. In this way, the role of innovation in explaining growth started to be modelled endogenously.

Some studies have also included other, non-firm, or public investments in R&D, to capture spillover effects from the public to the private sector. Using this approach, empirical studies based on regional growth accounting models have shown that both investment in R&D and TFP growth vary significantly across regions, which raises the question of why there is this regional dimension to R&D and innovation activity? Before we go on to consider this question, it is important to note that empirical growth accounting models show that even after including investment in R&D and human capital, a significant part of growth is unexplained, which suggests that other factors, not specified by endogenous growth models determine the rate of innovation and growth. The issue of what determines the rate of innovation and growth has been addressed by a number of other theories, including Schumpeterian and evolutionary theories; economic geography; and systems of innovation.

2.3.2 The Resource-Based View of the Firm and Innovation as a Process

As we have seen from the above discussion, neoclassical theories of economic growth view growth as the outcome of investments in capital, labour and R&D, any unexplained growth that arises after these investments have been accounted for is put down to technological change. However, little or no attention is paid to the internal capabilities of the firm, in terms of: creativity; organizational ability and organizational innovation. In short, the innovation *process* is largely ignored. In contrast, work in the tradition of Schumpeter (1962), Penrose (1959) and Pavitt (2005) emphasises the fact that innovation is a process, much of which goes on inside large corporations.[12] The resource-based or capabilities view of the firm builds on this approach and examines how knowledge in created and utilised within the firm; how firms are able to assimilate and absorb ideas and knowledge from external sources; and how work and in particular, the innovation process, is managed and organised. This approach therefore sheds light on the question of why some firms are successful innovators while others in the same line of business, that may have made

[11] Other limitations are: firstly, neoclassical growth theory normally assumes that all markets were competitive markets and that production was subject to constant or decreasing returns to scale. In practice a number of empirical studies have shown that production was often subject to increasing returns to scale. Secondly, studies have shown that a large part of innovation is introduced as 'acquired knowledge' via investment in capital stock (Browning, 2004). Within growth accounting models this is attributed to growth in capital input rather than growth in TFP or innovation. Thirdly, this approach puts the focus on the firm and ignores wider system and infrastructure effects that are known to influence innovation.

[12] Note that Schumpeter's (1934) early work stressed the role of individual innovators and new firm formation.

similar investments in capital and labour are unsuccessful. The approach emphasises the fact that innovation is an uncertain process that evolves through time and the capability of firms to learn, (organisational learning) and manage the innovation process is a key factor shaping the extent and rate of innovation. More recently, the capabilities approach has been combined with the systems approach (see section 2.3.4 below) to explore the interaction of internal and external factors that determine the evolution of innovation (see, for example, Pavitt, 2005).

2.3.3 The Geography of Innovation

Early analysis of the spatial determinants of innovation can be found in Marshall's (1890) discussion of industrial districts. Almost a century later in the 1980s and 1990s there was a revival of interest triggered by a desire to enhance our understanding of the economic success of regional economies, such as, Emilia Romagna, Baden Württenberg, Silicon Valley and Route 128. Continuing interest in the topic is reflected in the growing literature on economic geography and regional innovation systems. Drawing on this literature it is possible to identify a number of theoretical explanations of the geography of innovation. These centre around different types of external economies, most notably:

- Pecuniary external economies;
- Agglomeration economies;
- Technological economies or pools of skilled labour;
- Knowledge spillovers; and
- Networking and collective external economies

External Economies

Marshall (1890) drew a distinction between internal economies – which depend on the internal organisation, capabilities and management of the firm – and external economies – which depend upon the overall progress and development of the industrial environment in which firms operate.[13] An important difference between the two types of economies is that internal economies accrue at the level of the firm, while external economies are available to all firms in an industry or region[14] and tend to be realised within a locality and may be sector specific.

Marshall identified a number of sources of external economies: these include: pecuniary external economies, agglomeration economies; pools of skilled labour and what Marshall termed 'industrial atmosphere' which is now referred to as R&D or knowledge spillovers. Only pecuniary external economies and some types of agglomeration economies are realised via market transactions, other types depend on proximity and location.

Pecuniary external economies

Pecuniary external economies arise as a result of the expansion of production and the realisation of internal economies of scale. Provided markets are competitive, internal economies are translated into pecuniary external economies as firms lower prices in response to reductions in costs of production. Pecuniary external economies can give rise to a process of cumulative causation whereby scale effects reduce costs and

[13] See Marshall (1890/1930) pp 226, 441 and 314-317.

[14] Marshall's notion of external economies was most extensively applied in his analysis of industrial districts. However, there are some external economies that are realised at national or even global levels e.g. telecommunications.

prices, which in turn reduce the costs of other firms and encourage higher output levels which lead to further scale effects.

There is no *a priori* reason to suggest that pecuniary external economies are associated with innovation, however, Marshall recognised that technological progress and organizational innovation often result in internal economies of scale and associated pecuniary external economies. Again, it is possible that innovation yields scale effects that lead to increases in production (agglomeration), further innovation and further spillover effects as explained below. While pecuniary external economies stem from economies of scale in production, the link with innovation suggests that pecuniary externalities will be associated with other types of external economies.

Agglomeration economies

Agglomeration economies have the effect of shifting the cost curve of individual firms downwards, lowering barriers to entry and facilitating new firm formation. Improvements in local transport and infrastructure, public investment in the research base and the growth and development of related trades, including finance and venture capital, can all give rise to agglomeration economies. For example, the existence of a well-developed local supply chain can lower transport costs. It can also lower the costs of improving and refining inputs, as this frequently involves repeated interaction between buyer and supplier and such interactions are easier and cheaper if they are local.

Pools of skilled labour and human capital

Marshall argued that the geographic concentration of industry and related infrastructure encourages the growth of pools of skilled labour. The concentration of employment in specific industries within a geographic proximity provides a pool of skilled employees for firms. At the same time, the existence of an extensive and geographically concentrated set of job opportunities attracts skilled labour into the area, as employees know there are significant employment prospects. As industry grows and develops, the capabilities of the workforce are enhanced via both formal and informal mechanisms. The Marshallian concept of pools of skilled labour was richly formulated to recognise the role of human capital and ingenuity in product and process innovation.

Industrial atmosphere and knowledge spillovers

Marshall also recognised the cumulative nature of knowledge creation, spillovers and diffusion, describing these processes using the concept of 'industrial atmosphere'. With regard to innovation, industrial atmosphere speeds up the diffusion process, facilitating continuous improvements in technology and organisation.

> Good work is rightly appreciated, inventions and improvements in machinery processes and in the general organisation of the business have their merits promptly discussed; if one man starts a new idea it is taken up by others and combined with suggestions of their own; and thus becomes the source of yet more ideas (Marshall, 1890/1930, p. 271).

This idea of knowledge spilling over in a cumulative manner has been embodied in contemporary analysis of the geography of R&D and innovation, and in the literature on the economics and sociology of knowledge.

Cooperation and networking

In his later work,[15] Marshall stressed the importance of constructive cooperation between firms that results in a further type of external economy realised via networking relationships between firms and firms and other organisations. Examples of constructive cooperation[16] cited by Marshall include cooperation via trade associations to provide technical services, testing and standardisation, purchasing of raw materials on favourable wholesale terms and the collective provision of marketing services for export trade.

This type of external economy, which requires joint investment or the pooling of costs within a network of cooperating firms, has been called cooperative or collective external economies (Oughton and Whittam, 1997). Collective external economies (CEE) have four distinguishing features: (i) unlike other agglomeration economies where firms act in an *individual* manner to take advantage of the benefits of locating next to particular resources, collective external economies are only realised via active cooperation between firms and organizations: the concept is therefore a relational one; (ii) CEE are realised within a network of cooperating firms, hence the economies are external to the firm but internal to the network; (iii) they depend crucially on the maintenance of effective cooperation between firms, and therefore require trust; and (iv) provided entry into the network is not restricted, they are pro-competitive, in that they reduce barriers to entry.[17]

Knowledge, the location of R&D and spillovers

Building on Marshall's work, the literature on knowledge and R&D spillovers has provided an explanation for the geographic concentration of innovation activity, including, but not confined to, innovation in high technology sectors. Central to this literature is the role played by knowledge. Knowledge is a crucial input into the innovation process yet it is an input that is difficult to define because it contains both explicit and tacit elements. Explicit or codified knowledge, is knowledge that can be encapsulated in formats - such as, language, text, blueprints, operating manuals, codes or guidelines - and transferred to users who are able to interpret and utilise it, independently from the context in which it was created. In contrast, tacit knowledge (Polyani, 1962) cannot be codified in this way and therefore its communication and transfer to users is more complex requiring shared experience, dialogue, interaction and learning. As Howells (2002) notes,

> Tacit knowledge concerns the direct experience that is not codifiable via artefacts. Thus, it represents disembodied know how that is acquired via the informal take-up of learned behaviour and procedures. Indeed, some tacit knowledge is associated with learning without awareness…scientific intuition …. and the development of craft knowledge within scientific disciplines. (Howells, 2002, p. 872)

The transfer of codified knowledge is not strongly dependent on geography as codified knowledge can be transferred across geographic regions fairly readily. Moreover, reductions in transport costs and improvements in communications have increased access to codified knowledge rendering it less important as a source of

[15] *Industry and Trade*

[16] Marshall defined constructive cooperation, as opposed to collusion, as 'cooperation without any apparent drift to use it as a means of maintaining prices' (Marshall, 1920, p. 604).

[17] See Oughton and Whittam (1997, p. 9) for a proof of this result.

competitive advantage. Tacit knowledge, on the other hand, does not travel well and this makes it a key source of 'the *geography* of innovation' for two reasons (Asheim and Gertler, 2004):

> First, because is defies easy articulation or codification (Polyani, 1958, 1966) tacit knowledge is difficult to exchange over long distances. It is heavily imbued with meaning arising from the social and institutional context in which it is produced, and this context-specific nature makes it sticky (Gertler 2003). The second [reason] relates to the changing nature of the innovation process itself and, in particular, the growing importance of socially organized learning processes. (Asheim and Gertler, 2004 p. 293).

These include knowledge flows between firms, research organisations, institutions and public agencies that are embedded in a regional context. The extent and speed of knowledge transfer between these different organisations reflects the ability of local and regional economies to learn and absorb tacit (and codified) knowledge. Since proximity facilitates the transfer of tacit knowledge transfer and learning - both of which are important determinants of innovation - innovation activity takes on a strong regional dimension that may be reinforced by agglomeration economies in production and pools of skilled labour/human capital. The ability of regional economies to generate, assimilate and transform knowledge reflects the learning capability of a region. Asheim (1996, 1998) defines a 'learning region'[18] as 'representing the territorial and institutional embeddednesss of learning organisations and interactive learning' (Asheim, 1998, p. 3) and goes on to argue that in such innovation supportive regions the inter-linking of co-operative partnerships ranging from work organisations inside firms to different sectors of society, understood as 'regional development coalitions', are of strategic importance.

The innovative capacity of the regional firm is related to the 'learning' ability of a region. That is, innovative capacity and the regional 'learning' ability associated with it are shaped by the density and quality of networking within the regional productive system. Inter-firm and public-private co-operation (particularly between research organisations, government and industry through complementary investment in R&D and innovation-related activity) and the institutional framework within which these relationships take place are assumed to be key sources of regional innovation. Innovation is viewed as the 'end-product' with regional learning dependent on the quality and density of the above relationships, being viewed as the 'process'.[19] The ability of a firm or region to learn is also shaped by its absorptive capacity, which may be defined as the ability of a firm or region to assimilate and utilise knowledge. Absorptive capacity depends on the internal capabilities of a firm and region and existing stocks of knowledge. Thus, absorptive capacity results in cumulative causation in learning and innovation.

The importance of inter-firm networking and of inter-organizational relationships that cut across the government, business and education sectors has been stressed by the regional innovation systems literature (Asheim, 1998, Cooke, 1998, Howells, 1999,

[18] For a discussion of learning economies and learning regions see: Lundvall and Johnson (1994); Asheim (1996, 1998); Morgan (1997) Lundvall and Borras (1999); Henderson and Morgan (1999) and Landabaso, Oughton and Morgan (2001, 2003).
[19] See Lundvall and Borras (1999)

Koschatzky, 1998) and by the related concept of the *triple helix* model of innovation (Etzkowitz and Leydesdorff, 1997, 2000 and Leydesdorff, 2000) which emphasises government-industry-university relationships and complementarities between public and private sector investment in R&D.

Although the geography of innovation literature does not explain what triggers the initial investment in R&D, the process of cumulative knowledge transfer and spillovers, networking and regional learning, combined with complementarities in public and private sector R&D, explain why R&D activity, knowledge transfer and innovation tend to be spatially concentrated.

2.3.4 Systems of Innovation

The geography of innovation literature focuses on the role of external economies in determining the spatial concentration of R&D and innovation activity. In the 1980s the role of public policy, including science and education policy, the legal and institutional environment and the financial system also came to be recognised as factors that determine innovation.

Analysis of these factors and external economies was integrated within the systems approach, first developed by Freeman (1987). The term system of innovation refers to interactions between different elements in the economy that combine to promote innovation. These include firms, infrastructure, institutions (including laws, regulations, rules and habits (Fagerberg, 2005)) and systems of finance, governance and education. Innovation performance is linked to inter-firm cooperation between firms and between firms and other institutions, policy and cumulative learning processes (Lundvall, 1992, 1999; Nelson, 1992). Systems are dynamic and evolving depending on interactions and networks, between players, sectors, regions and nations (Edquist, 1997). Freeman (1987: 1) defines a system of innovation as: "the network of institutions in the public and private sector whose activities and interactions initiate, import, modify, and diffuse new technologies." Lundvall identifies core elements driving the innovation process; the internal capabilities of a firm, inter-firm cooperation and the role of private and public R&D, education and the financial sector (Lundvall, 1992).

An important recent development in research on regional economic performance has been the identification of regional systems of innovation as an extension of the national systems approach (Howells, 1999, 2002, Morgan, 1997, Baptista and Swann, 1998). The national systems of innovation literature focuses on the central role that knowledge and innovation play in determining productivity and growth (Lundvall, 1992, Nelson, 1996) analysed within the context of a socio-economic system that encompasses an interlocking set of factors, including: industrial structure; institutions (North, 1990); the education and science system; business and management models; finance and governance (O'Sullivan, 1998), and, perhaps most importantly the nature and extent of inter-linkages between these different elements (Grabher, 1993, Granovetter, 1995, Leydesdorff, 2000, Oughton, Landabaso and Morgan, 2002). The systems of innovation approach has begun to enhance our understanding of the ways in which advances in knowledge, skills and technology are translated into improved business and economic performance. However, while national and global factors are important, there is now a growing body of evidence that points to the importance of a set of regional factors that determines the degree of individual and organisational learning, technology transfer, innovation and business performance both within the

regional systems of innovation literature (Saxenian, 1994, Brusco, 1982, 1990, Cooke, 1998, Cooke and Morgan, 1994a, Oughton, Landabaso and Morgan, 2002, Howells, 2002, Asheim and Gertler, 2004) and the related literatures on industrial milieux (Crevoisier and Maillat, 1991, Cooke and Morgan, 1994b).

The success of regional economies such as Silicon Valley, Route 128, Emilia Romagna and Baden Württemberg prompted researchers to attempt to identify the regional factors determining business and economic success (Brusco, 1982, Best, 1990, Howells, 2002). Explanations include the importance of various types of external economies, such as: agglomeration economies, pecuniary economies, technological economies (for example, pools of skilled labour, spillover effects) and collective external economies realised via collaborative agreements (Oughton and Whittam, 1997). However, these external factors also interact with internal business factors, such as, management and organizational structures, firm capabilities (for example, the stock of human capital) as well as the absorptive capacity of the firm, that is, the ability of the firm to absorb knowledge and resources from other firms and organisations, including resources made available under policy funding streams.

Clusters and Networks

Within parts of the literature on regional innovation systems the terms *clusters* and *networks* have come to be used inter-changeably. This has led to confusion over the different types of external economies that may arise in local and regional economies. Clusters are best thought of as geographic concentrations or agglomerations of resources – firms, human capital and knowledge. As we have seen above, pecuniary external economies and various types of agglomeration economies, such as pools of skilled labour and unintentional spillovers of knowledge may arise as a result of the geographic concentration of production. These economies do not require any non-market relationship between firms in the cluster or agglomeration other than geographic proximity.

In contrast, networks[20] are based on non-market, inter-firm and inter-organisational relationships dependent on the active rather than the passive involvement of firms/ organisations. They also depend to some degree on cooperation and trust (see Gambetta, 1988, Dei Ottati, 1994, Oughton and Whittam, 1997, Bachmann 2003). Networks give rise to a further set of external economies – collective external economies – associated with joint investment in activities such as training and R&D that reduce the (possibly pre-emptive) costs of innovation activity. For example, Freeman (1991, p. 501) points out that the cooperative Research Associations (networks) formed in the UK after World War I and shortly after in France and Germany, "were seen as a means of sharing the costs of acquiring technical information and of testing facilities, pilot plant and prototype development. They were thought to be mainly a device for overcoming market failure in industries where the threshold costs of R&D and other scientific and technical services were too high for small firms."

It is important to draw a distinction between clusters and networks since they lead to very different types of external effects and distinct policy actions are required to leverage these different effects. As Barca (2003, p 307) notes, "it is important to recognise that no direct, unavoidable relation exists between agglomerations [clusters]

[20] The use of the term clusters in the DTI clusters report (DTI, 1999) covers both cluster and network effects where the latter is described as cluster depth.

and agglomerations' externalities. For a given agglomeration, externalities can vary widely, depending on other factors". Formal and informal networks are a key factor affecting the range of externalities.

While clusters and networks are distinct phenomena, they are related because network formation is easier within an agglomeration or cluster. This opens up the possibility of identifying clusters and then formulating policies "aimed at empowering them with the conditions to develop cooperation and knowledge pooling" (Barca, 2003, p. 309). To do this it is important to understand how externalities are generated. One of the difficulties in much of the econometric work on the geography of innovation has been the problem of (empirically) identifying the mechanisms that lead to externalities within agglomerations or clusters.

3. Innovation in the East Midlands

3.1 Measures of Innovation

Two of the most commonly used measures of innovation are patents and R&D expenditure. Both of these variables have limitations. There are three main weaknesses of patent data. Firstly, patents do not capture innovation by firms that are Schumpeterian imitators, that is, firms that introduce products or processes that are new to their firm but not new to the market or industry. Secondly, not all innovations that are new to the market are patented. Moreover, the propensity to patent may vary significantly across industries and sectors, for example, between manufacturing and services. Thirdly, patents are often registered at the Head Office of an enterprise, thus there are regional distortions that arise as a result of administrative features of the patent system.[21]

In the absence of patent or other data on innovation 'outputs' many studies on innovation have used R&D expenditure as a proxy for innovation. R&D expenditure suffers from the drawback that it is an innovation input rather than a measure of innovation output. It is also sensitive to industrial structure/mix (Smith, 2004). A relatively small number of industries account for the bulk of R&D expenditure and differences in R&D intensity across countries or regions reflect differences in industrial structure. For a given industrial structure, the extent to which R&D is a good proxy for innovation depends on: the amount of 'unsuccessful' R&D expenditure that fails to result in an invention; the extent to which successful inventions are commercialised; and the degree of spillover effects. A further complication is that part of an organisation's R&D expenditure is 'acquired technology' or 'embodied R&D' reflecting the knowledge/R&D embodied in new capital equipment.[22] Thus, conventional measures of R&D understate the true level of knowledge/technology acquisition. Regional R&D figures also suffer from the fact that some R&D is not carried out in the same region as the reporting unit providing the data, thus the figures may be affected by 'head office bias'.[23] Despite these limitations R&D expenditure per employee is positively and significantly correlated with the number of patents per employee, suggesting that it is a reasonable proxy indicator. The advantage of R&D data is that they are widely available, over a long time period and for a large number of countries/regions.

[21] See Michie (1998) and Smith (2004) for a discussion of the various measures of innovation.
[22] See Smith (2004, p. 156) for a discussion of this.
[23] See Michie, Oughton and Frenz (2005).

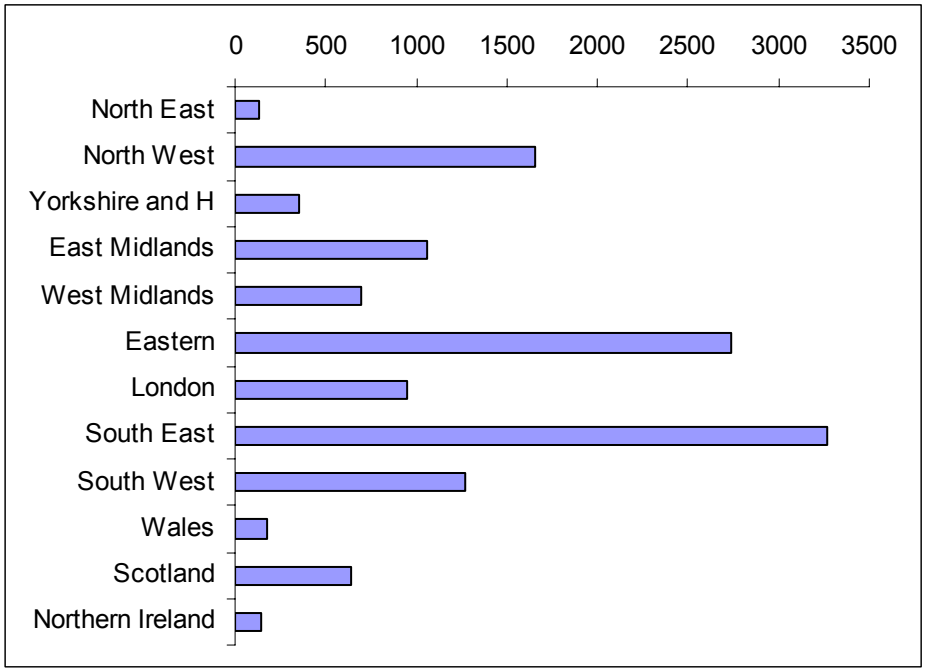
Conventional measures of innovation activity such as patents and R&D expenditure may also fail to capture a number of interactive features of research and innovation activity that have been highlighted by the systems of innovation literature. These include: non-pecuniary knowledge acquisition (accidental and deliberate knowledge spillovers); cooperative agreements between firms; networking between firms and research organizations. The Community Innovation Survey (CIS), which was based on advances and insights from the systems of innovation approach, attempts to fill these gaps. The CIS has the advantage of allowing researchers to measure innovation at the level of the firm, using a variety of indicators, including patent data and R&D expenditure, as well as more direct 'innovation' measures such as the number of new products and processes introduced by firms. It also allows us to distinguish between novel innovators, that have introduced products and processes that are new to the market, and Schumpeterian imitators who introduce products are processes that are new to the firm but not new to the market.

A limitation of the product and process innovation data from CIS is that they are based on binary data, that is, they ask firms to record whether or not they introduced a new product or process but there is no data on the *number* of innovations. So a firm that has introduced one innovation is recorded in the same way as a firm that has introduced 10 innovations over the same period. As a result, there is less variation (across firms and regions) in these measures as compared with other measures, such as, the proportion of sales from new products, the proportion of scientists and engineers employed or the amount of R&D expenditure per employee. Despite these limitations the CIS is the most comprehensive firm level innovation data base available and is one of the few data sources to provide measures of softer aspects of innovation activity, such as organizational innovation, cooperation and absorptive capacity which are known to be an important part of the innovation process.

Investment in R&D

Expenditure on R&D is heavily concentrated in the South East and Eastern regions – this is especially true for business and government expenditure; R&D expenditure in higher education is more evenly distributed – see Figures 3.1-3.3. The East Midlands region is ranked fifth highest in terms of business expenditure on R&D after the South East, Eastern, the North West and the South West. In terms of government and higher education expenditure on R&D the East Midlands is ranked 7th.

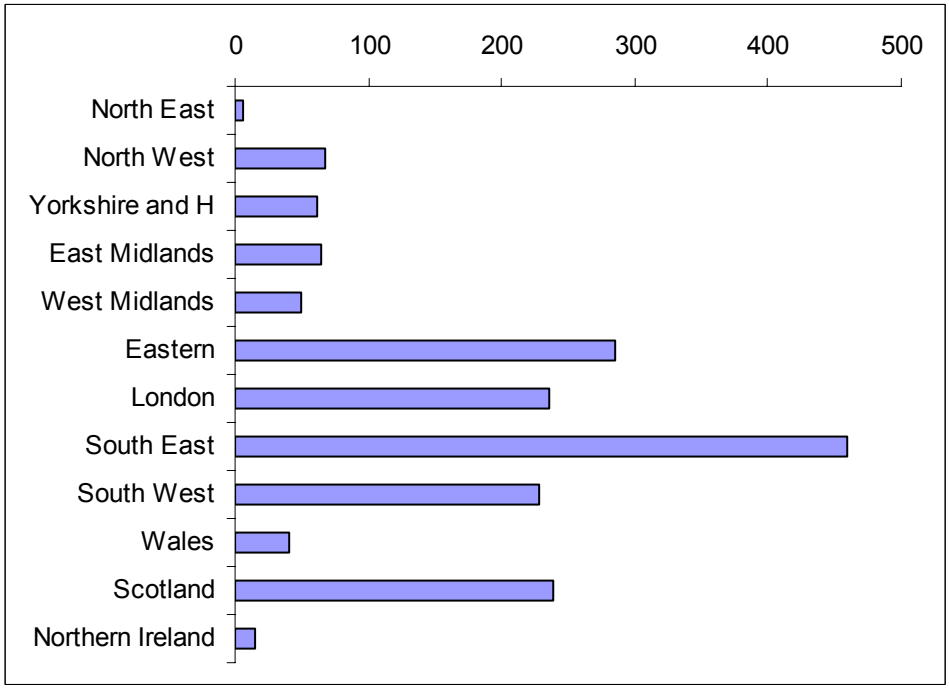
Figure 3.1 Business expenditure on R&D in 2002, £million



Source: Owen, 2004, *Economic Trends*, Table 14.

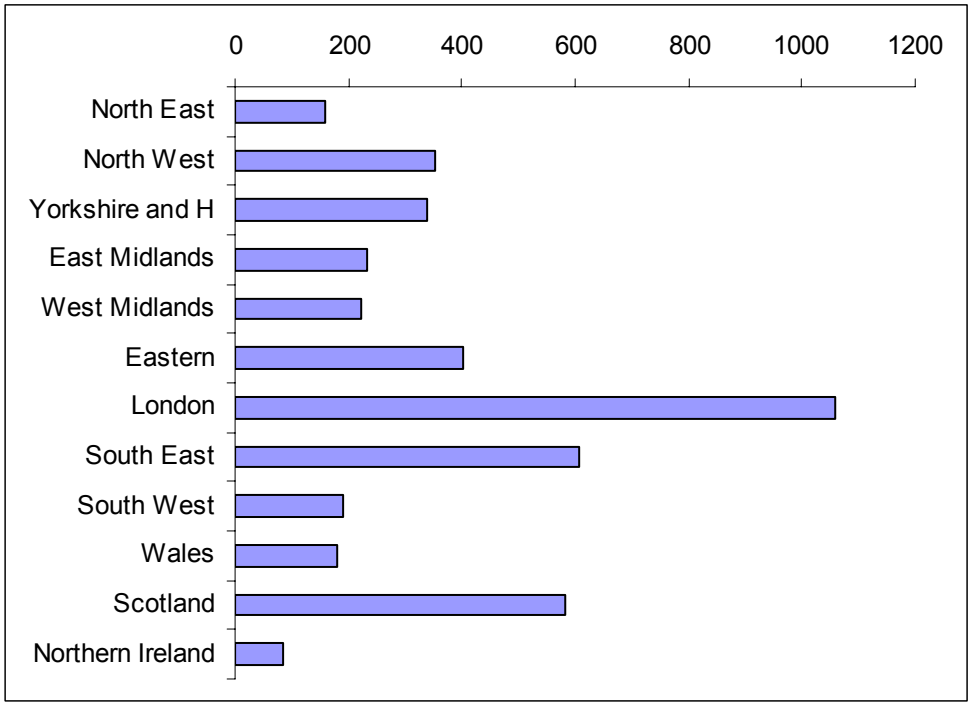
Figures 3.2 and 3.3 show that government and higher expenditure on R&D in the region is low.

Figure 3.2 Government expenditure on R&D in 2002, £m



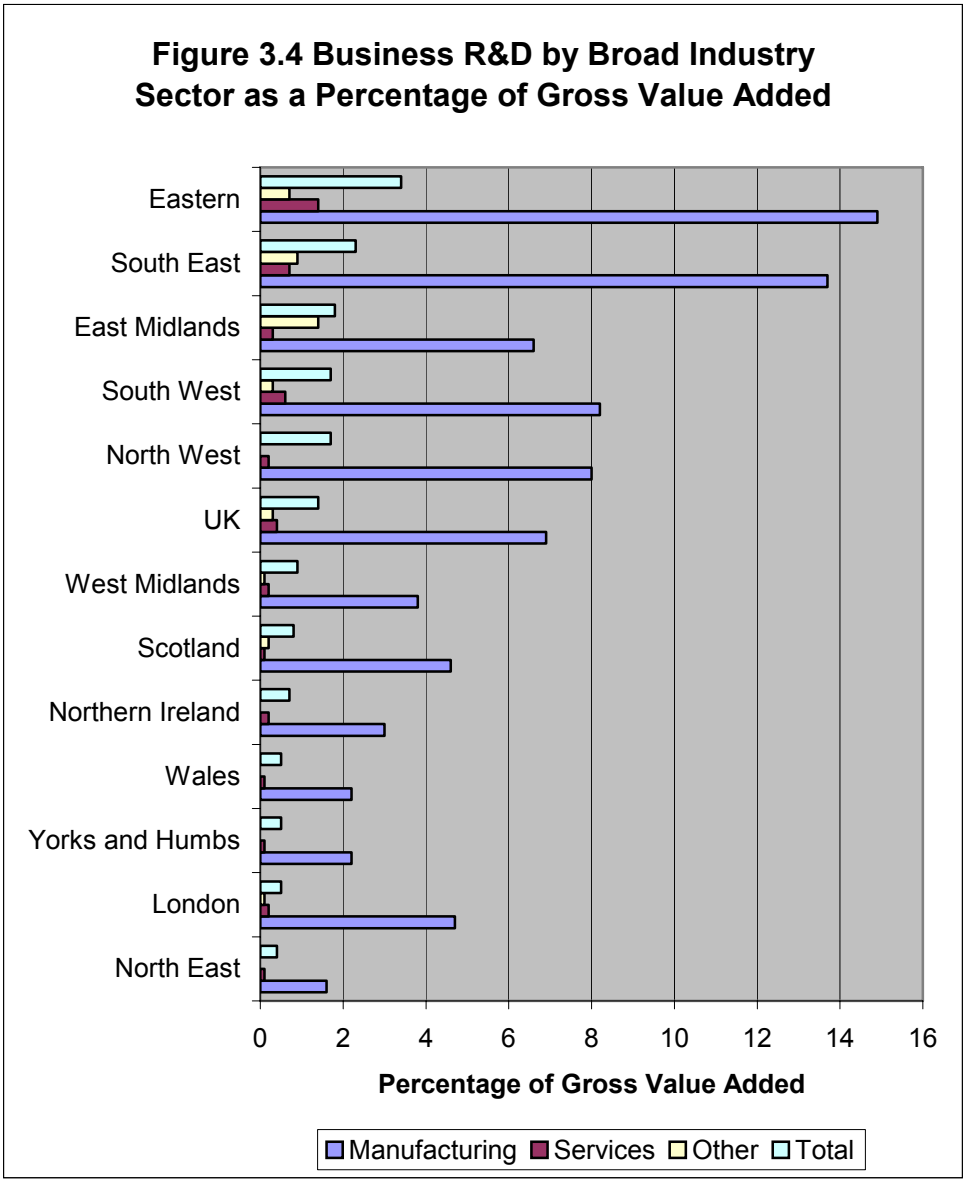
Source: Owen, 2004, *Economic Trends*, Table 14.

Figure 3.3 Higher education expenditure on R&D in 2002, £m



Source: Owen, 2004, *Economic Trends*, Table 14.

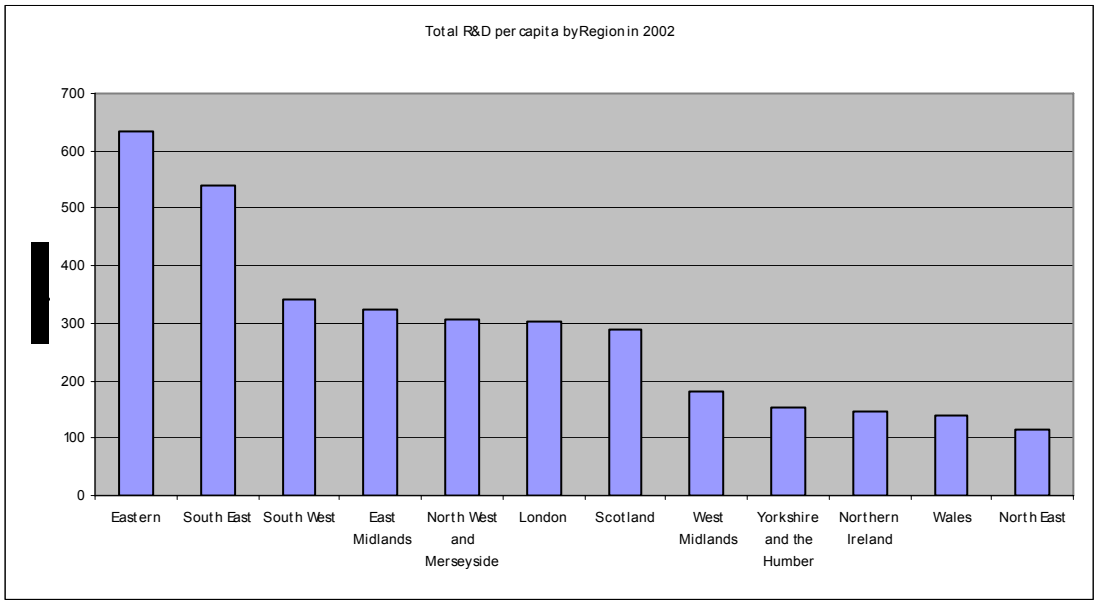
If we focus on Business R&D expenditure as a percentage of gross value added (GVA) - which is one way of adjusting the figures to 'correct' for differences in the size of regions - the East Midlands region is ranked third after Eastern region and the South East (see Figure 3.4). However, much of this relative performance is attributable to an exceptionally high rate of R&D as a percentage of GVA in the 'other', non-manufacturing, non-service sector of the economy. This sector comprises: agriculture forestry & fishing; oil and gas extraction; other mining; gas electricity & water; fuel refining; and construction. In terms of manufacturing which has the highest R&D as a percentage of GVA the East Midlands is ranked fifth, while in services, the East Midlands is ranked fourth.



Source: DTI (2005b) *Regional Competitiveness Indicators*, Table 14a.

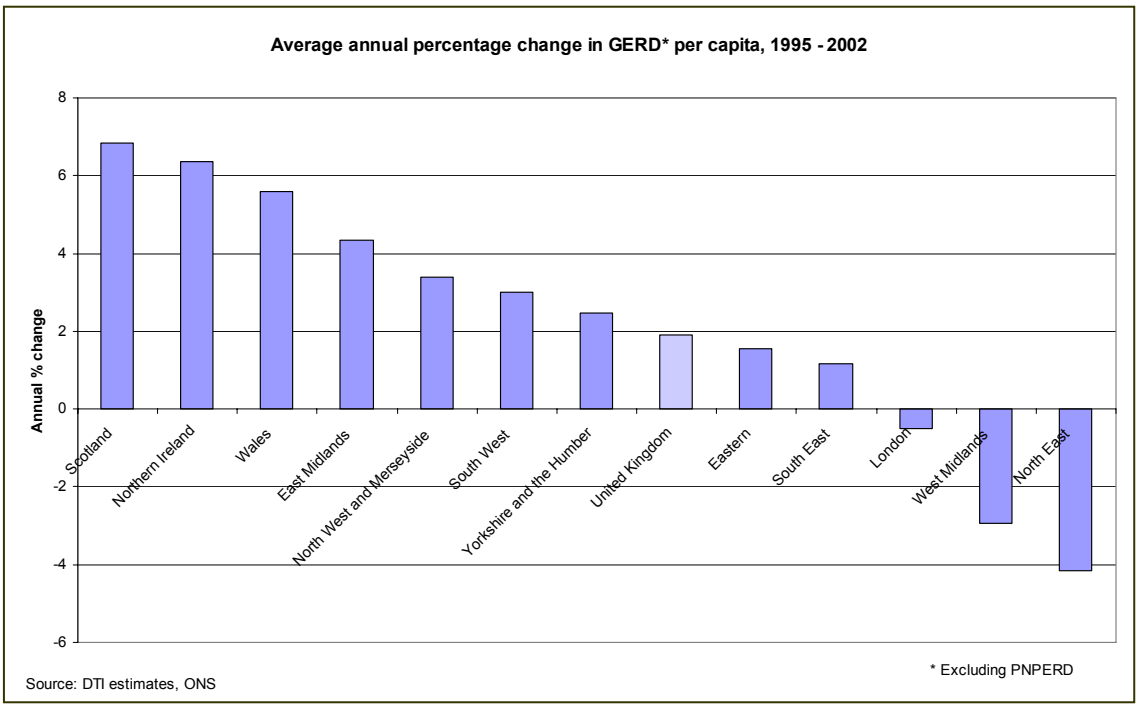
In terms of total R&D expenditure per capita (Figure 3.5) the East Midlands is ranked fourth. Figure 3.6 shows that the region has been catching up as the rate of growth in the R&D expenditure per capita between 1995-2002 was the third highest and above that of the three leading regions – Eastern, the South East and the South West.

Figure 3.5 Total expenditure on R&D per capita, 2002



Source: DTI (2005a) Regional Innovation Patterns – Summary Note.

Figure 3.6 Growth rates in per capita GERD



Source: DTI (2005a) Regional Innovation Patterns – Summary Note.

Part of the explanation for the regional concentration of R&D expenditure lies in the sectoral distribution of R&D activity. In the UK industrial R&D expenditure is heavily concentrated in one sector - pharmaceuticals - which accounts for over 38 per cent of the total industrial R&D expenditure (DTI, The 2004 R&D Scoreboard, p 56).

The regional pattern of R&D expenditure is mirrored in regional data on income per capita and productivity. Table 3.1 shows that the two richest *regions* (i.e. excluding London) as measured by gross value added per capita, are the East of England and the South East. These two regions also have the highest levels of productivity. The differences are greater in terms of income per capita than GVA per hour worked as a result of differences in employment rates across regions. The East Midlands is ranked fifth in terms of productivity (as measures by income per hour worked) and 7th in terms of income per capita. The difference between the two indicators is explained by differences in employment.

Table 3.1 Gross Value Added Per Capita and Regional Productivity, 2003

Region	**Gross Value Added per Head**	**Gross Value Added per Hour Worked**
East Midlands	90.8	96.9
Eastern	95.1	97.1
London	147.6	115.4
North East	79.7	95.1
North West	89.8	94.4
South East	109.9	106.5
South West	94.1	95.4
West Midlands	91.0	94.6
Yorkshire and Humberside	89.0	93.7
Northern Ireland	81.2	84.3
Wales	79.0	91.9
Scotland	96.4	98.1
UK	**100**	**100**

Source: DTI, Regional Competitiveness Indicators (2005b) Tables 1a and 2b.

There is *prima facia* evidence to show that there is a strong correlation between innovation and economic performance as measured by productivity and GDP per capita. Table 3.2 provides simple bi-variate correlations between different types of innovation activity and competitiveness. All of the correlations are positive and significant and therefore provide *prima facia* evidence to suggest that: (i) government R&D, business R&D and education sector R&D are complements, rather than substitutes; (ii) all three types of R&D expenditure are positively associated with patents per head (though this result is much stronger for business R&D); and (iii) regional innovation activity is positively correlated with regional competitiveness as measured by GDP per capita. It is important to note however, that these results are based on bi-variate methods and may not hold in a multi-variate framework. They also tell us nothing about causality. For example, the results are consistent with the view that innovative regions are more competitive, and with the view that richer regions spend more on R&D and are more innovative. The most likely possibility is

that innovation activity and competitiveness are jointly determined with innovation enhancing competitiveness and productivity, and competitiveness/productivity feeding back to improve innovation performance. The fact that differences in regional innovation performance and competitiveness are so persistent over time[24] suggests that some kind of cumulative causation mechanism is present.

Table 3.2 Matrix of correlation coefficients for indicators of innovation activity, R&D intensity and competitiveness, of 178 regions from 12 EU countries, 1999.

R&D Expenditure as a Percentage of GDP	1					
Patents Per Head of the Population	0.67*	1				
Government R&D Expenditure as a Percentage of GDP[1]	[n.a][1]	0.17*	1			
Business R&D Expenditure as a Percentage of GDP[1]	[n.a.][1]	0.75*	0.44*	1		
R&D Expenditure in Education as a Percentage of GDP[2]	[n.a][1]	0.25*	0.41*	0.29*	1	
Gross Domestic Product per capita (ppp)	0.52*	0.54*	0.18**	0.63*	0.27*	1
	R&D Expenditure as a percentage GDP	Patents Per Head of the Population	Government R&D Expenditure as a percentage of GDP[1]	Business R&D Expenditure as a Percentage of GDP[1]	R&D Expenditure in Education as a Percentage of GDP[2]	Gross Domestic Product per capita (ppp)[4]

1 Not applicable: these correlations are not included because the shares of government, business and education R&D expenditure in GDP are components of the total share of R&D expenditure in GDP. By construction the component shares would be positively correlated with the total share.
* denotes significance at the 1% level.
** denotes significance at the 5% level.
Source: Oughton, Landabaso and Morgan (2002). Data source: *Regions Statistical Yearbook 1999 CD ROM*, Eurostat, European Commission, April 2000.

[24] A study by Paci and Usai (2000) has ranked the top 20 innovative regions in Europe in 1980 and 1990 and found that the rank correlation between the two years is high (r = 0.92).

3.3 The Third Community Innovation Survey

More detailed information on various types of innovation activity is available from the UK Community Innovation Survey which provides data on product and process innovation, R&D investment, skills and interactive sources of knowledge and innovation activity, such as, knowledge sourcing and cooperative agreements between firms. The more third and most recent survey covers the period 1998-2000. A detailed discussion of the survey and the sample frame is provided in Appendix I. Results from the fourth survey will become available later in 2005.

Product Innovation

Table 3.3 provides data on product innovation across the UK regions. It can be seen that the extent of regional variation is far less than for the R&D data. Part of the reason for this is that the measure is based on a question that asks firms if they have introduced a new product or process between 1998-2000. This provides a binary (0, 1) variable. However, this question does not capture the extent of innovation and therefore a firm that has introduced many innovations is counted the same as a firm that has introduced just one innovation. Given that a high proportion of R&D activity and innovation are heavily concentrated in a relatively small number of firms this measure underestimates innovation activity in regions with a high prevalence of firms that are intensive innovators.

Moreover, the definition of product innovation includes products that are new to the firm but not new to the market; it is therefore a much broader measure than other measures such as those based on patent data as it picks up diffusion as well as novel innovation. CIS does allow us to distinguish products that are new to the market (novel innovations) and this measure exhibits greater variability across regions with enterprises in the South East and East Midlands and Eastern regions exhibiting a higher propensity to engage in new-to-market innovations (see Table 3.3). The regional differences in novel product innovation are statistically significant at the 10% level, and those for product innovation are bordering on significance at the 10% level (the p-value for the chi-squared statistic is 0.12).

It can be seen that in terms of the proportion of firms that introduced a new product, the East Midlands region is ranked fourth – a performance roughly in line with the UK average. This is confirmed by a statistical (Chi-square) test of independence[25] which shows that there is no difference between the East Midlands' performance and that of the rest of the UK.

In terms of the proportion of firms that introduced a *novel* product innovation, the region's performance (10.9 per cent) is above the UK average (and 9.4 per cent) and it is ranked second. However, if we test whether this difference is statistically significant we find that there is there is no significant difference in novel innovation performance at the 95% confidence level. It is normal to use 95% confidence intervals for statistical tests because it means we can be 95% sure of the reliability of the result of the test. The Chi-square test for novel innovation shows that the difference

[25] The Chi-square test of independence is useful in cases where we have binary (0, 1) data, as in the case of responses to these questions on the CIS survey. The Chi-square test of independence, tests the hypothesis: is the East Midlands' performance independent of that of the rest of the UK? If it is not independent, we can assume that statistically there is no difference in the spread of innovators and non-innovators in the East Midlands as compared with the rest of the UK.

between the East Midlands and the rest of the UK is only significant at the 83% level, which is therefore below the usual norm for statistical robustness.

Table 3.3 Number and per cent of *product innovators* and *novel product innovators*

	CIS 3 responses	which answered the relevant question	which were product innovators		which were *novel* product innovators		
				$\frac{(c)}{(b)}100$		$\frac{(e)}{(c)}100$	$\frac{(e)}{(b)}100$
Region	(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Count	*Count*	*Count*	*Per cent*	*Count*	*Per cent*	*Per cent*
England	6,826	6,799	1,475	21.7	641	43.5	9.4
East Mids	*699*	*696*	*152*	*21.8*	*76*	*50.0*	*10.9*
Eastern	*750*	*749*	*170*	*22.7*	*81*	*47.6*	*10.8*
London	*974*	*968*	*201*	*20.8*	*80*	*39.8*	*8.3*
North East	*444*	*442*	*92*	*20.8*	*34*	*37.0*	*7.7*
North West	*841*	*841*	*169*	*20.1*	*65*	*38.5*	*7.7*
South East	*1,012*	*1,011*	*252*	*24.9*	*116*	*46.0*	*11.5*
South West	*621*	*618*	*148*	*23.9*	*59*	*39.9*	*9.5*
West Mids	*732*	*729*	*141*	*19.3*	*65*	*46.1*	*8.9*
Yorks & Humbs	*753*	*745*	*150*	*20.1*	*65*	*43.3*	*8.7*
Northern Ireland	162	162	32	19.8	11	34.4	6.8
Wales	379	379	83	21.9	38	45.8	10.0
Scotland	805	801	155	19.4	83	53.5	10.4
UK	8,172	8,141	1,745	21.4	773	44.3	9.5

Source: Frenz, Oughton, Michie (2004).

Process Innovation

The CIS allows us to distinguish product and process innovation. Process innovation is defined as 'the use of new or significantly improved technology for the production or the supply of goods and services'. Purely organizational or managerial changes are not included. Table 3.4 provides data on the number and proportion of process innovators and novel process innovators across UK regions, where a novel process innovation is defined as a process innovation that is new to the industry.

The data in Table 3.4 indicate that the East Midlands' performance in terms of process innovation (19.2 per cent of firms introduced a new process) is marginally above the UK average (18.3 per cent), however, this difference is not statistically significant. However, compared with the UK, a lower proportion of East Midlands process innovators introduced novel processes (30.1 per cent in the East Midlands compared to 32.2 per cent in the UK as a whole), but again, this difference is not statistically significant at the 95% level. If we look at the proportion of all firms that were novel process innovators, the region has a figure of 5.8 per cent - more or less in line with the UK average.

Table 3.4 Number and proportion of process innovators and novel process innovators

	CIS3 responses	which answered the relevant question	which were process innovators		which were *novel* process innovators		
				$\frac{(c)}{(b)}100$		$\frac{(e)}{(c)}100$	$\frac{(e)}{(b)}100$
Region	(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Count	*Count*	*Count*	*Per cent*	*Count*	*Per cent*	*Per cent*
England	6,826	6,774	1,225	18.1	393	32.1	5.8
East Mids	*699*	*694*	*133*	*19.2*	*40*	*30.1*	*5.8*
Eastern	*750*	*746*	*135*	*18.1*	*41*	*30.4*	*5.5*
London	*974*	*965*	*160*	*16.6*	*63*	*39.4*	*6.5*
North East	*444*	*439*	*80*	*18.2*	*24*	*30.0*	*5.5*
North West	*841*	*838*	*137*	*16.3*	*40*	*29.2*	*4.8*
South East	*1,012*	*1,004*	*195*	*19.4*	*60*	*30.8*	*6.0*
South West	*621*	*616*	*127*	*20.6*	*42*	*33.1*	*6.8*
West Mids	*732*	*726*	*133*	*18.3*	*41*	*30.8*	*5.6*
Yorks & Humbs	*753*	*746*	*125*	*16.8*	*42*	*33.6*	*5.6*
Northern Ireland	162	161	32	19.9	10	31.3	6.2
Wales	379	374	83	22.2	24	28.9	6.4
Scotland	805	799	147	18.4	52	35.4	6.5
UK	**8,172**	**8,108**	**1,487**	**18.3**	**479**	**32.2**	**5.9**

Source: Own calculations from UK CIS3 survey.

Overall, the picture that emerges is that the innovation performance of the East Midlands region, in terms of product and process innovation is roughly in line with the UK average. The possible exception is *novel* product innovation where the region's performance is above the UK average and second only to that of the South East, though this difference is only significant at the 83% confidence level.

Turnover from new and improved products

Those enterprises which introduced new products between 1998 and 2000 were asked to estimate the share of turnover from these products as a percentage of total turnover in 2000. Table 3.5 gives the share of turnover from new and improved products by UK region.

Column (a) reports the total number of CIS3 participants in each region, column (b) the number of enterprises which reported having introduced technologically new or significantly improved products, and column (c) the count of enterprises that actually gave estimates for the share of turnover from new and from improved products. Finally, the last three columns of Table 3.5 give the average share of turnover as estimated by the enterprises counted in column (c).

Table 3.5 The share of turnover from new and improved products (goods and services)

Region	CIS3 responses (a)	which were product innovators (b)	which answered the relevant question (c)	share of turnover from new products (d)	share of turnover from improved products (e)	share of turnover from new and improved products (d) + (e) (f)
	Count	*Count*	*Count*	*Per cent*	*Per cent*	*Per cent*
England	6,826	1,475	1,448	16.7	14.6	31.3
East Mids	*699*	*152*	*151*	*15.6*	*14.7*	*30.3*
Eastern	*750*	*170*	*167*	*14.3*	*16.0*	*30.3*
London	*974*	*201*	*198*	*20.8*	*15.6*	*36.4*
North East	*444*	*92*	*89*	*14.9*	*16.4*	*31.3*
North West	*841*	*169*	*164*	*15.2*	*12.2*	*27.4*
South East	*1,012*	*252*	*246*	*18.3*	*15.5*	*33.8*
South West	*621*	*148*	*145*	*17.1*	*12.6*	*29.6*
West Mids	*732*	*141*	*139*	*15.5*	*13.4*	*28.9*
Yorks & Humbs	*753*	*150*	*149*	*16.0*	*14.6*	*30.7*
Northern Ireland	162	32	30	15.0	14.2	29.2
Wales	379	83	81	15.7	10.7	26.3
Scotland	805	155	150	17.6	14.8	32.4
UK	**8,172**	**1,745**	**1,709**	**16.7**	**14.4**	**31.1**

Source: own calculations from UK CIS3 survey.

In the case of Northern Ireland the number of observations is very small and results for this particular region are to be treated with caution. The share of turnover from new goods and services is highest in London and the South East. It is lowest in the North East and Eastern regions, where at the same time the proportion of turnover from significantly improved products is highest. Combining share of turnover from new and improved products (column d plus e), Wales with 26.3 per cent and the North West with 27.4 per cent reported the lowest share of turnover from product innovations. East Midlands firms performed marginally below the UK average in terms of the share of turnover from new products and marginally above the UK average in terms of the share of turnover from improved products. However, neither of these differences is statistically significant.[26]

Table 3.6 presents data on the share of turnover from *novel* product innovation. Column (a) shows the total number of CIS3 responses, column (b) the number of novel product innovators in each region and column (c) the number of novel innovators that answered the question regarding the share of turnover accounted for by novel product innovation. The final column gives the average share of turnover for all enterprises in column (c) by UK region.

Looking at column (c), the number of valid observations from Northern Ireland, the North East and Wales are small and these results have to be treated with caution. On average firms that introduced novel products derived 20.9 per cent of their turnover from products which were new to the market. In the East Midlands, novel product innovators generated 17.9 per cent of their turnover from novel products. Thus, while the East Midlands has a higher percentage of novel innovators, the proportion of turnover derived by East Midlands firms from novel innovations is below the UK average. However, this difference is not statistically significant at the 95% level.

[26] On the basis of a t-test for differences between means.

Table 3.6 The share of turnover from *novel* product innovation

Region	CIS3 responses (a)	which were novel innovators (b)	which replied to question on turnover share from novel innovation (c)	share of turnover (d)
	Count	*Count*	*Count*	*Per cent*
England	6,826	641	627	21.3
East Mids	*699*	*76*	*75*	*17.9*
Eastern	*750*	*81*	*79*	*21.1*
London	*974*	*80*	*80*	*24.1*
North East	*444*	*34*	*32*	*28.3*
North West	*841*	*65*	*61*	*17.5*
South East	*1,012*	*116*	*114*	*23.4*
South West	*621*	*59*	*58*	*20.3*
West Mids	*732*	*65*	*64*	*19.2*
Yorks & Humbs	*753*	*65*	*64*	*21.2*
Northern Ireland	162	11	11	9.7
Wales	379	38	36	24.9
Scotland	805	83	79	18.0
UK	**8,172**	**773**	**753**	**20.9**

Source: own calculation from UK CIS3 survey.

Organizational Innovation

CIS3 enquires into wider innovation activities, namely changes in the areas of business structures and practices of firms. In this section we consider the proportion of CIS3 respondents that have engaged in wider organizational innovation activities. Table 3.7 reports the number and proportion of enterprises that implemented new, or significantly changed, corporate strategies.

Table 3.7 Organizational innovation: enterprises implementing new or changed corporate strategies

Region	CIS3 responses (a)	which answered the relevant question (b)	which made changes in corporate strategies (c)	$\frac{(c)}{(b)}100$ (d)
	Count	*Count*	*Count*	*Per cent*
England	6,826	6,047	2,627	43.4
East Mids	*699*	*620*	*272*	*43.9*
Eastern	*750*	*657*	*287*	*43.7*
London	*974*	*830*	*341*	*41.1*
North East	*444*	*400*	*170*	*42.5*
North West	*841*	*754*	*317*	*42.0*
South East	*1,012*	*886*	*429*	*48.4*
South West	*621*	*561*	*245*	*43.7*
West Mids	*732*	*657*	*273*	*41.6*
Yorks & Humbs	*753*	*682*	*293*	*43.0*
Northern Ireland	162	131	54	41.2
Wales	379	340	138	40.6
Scotland	805	694	263	37.9
UK	**8,172**	**7,212**	**3,082**	**42.7**

Source: own calculation from UK CIS3 survey.

Column (a) of Table 3.7 gives the total number of CIS3 participants, column (b) the number of enterprises answering the CIS3 question related to changes in corporate strategy, column (c) is the number of enterprises that changed their corporate strategy and column (d) is the proportion of enterprises that changed their corporate strategy.

The South East (with 48.4 per cent) has the highest proportion of enterprises that implemented new or significantly changed corporate strategies, the East Midlands is ranked second with 43.9 per cent - slightly above the UK average of 42.7 per cent, but not significantly different at the 95% level.

Table 3.8 illustrates the count and proportion of CIS3 firms which implemented advanced management techniques between 1998 and 2000. It can be seen that on average 36 per cent of UK firms introduced new management techniques. The South East has the highest proportion of firms (39.8 per cent) that implemented advanced management techniques. The East Midlands performance of 37.7 per cent is above the UK average of 35.7 per cent, but this difference is not statistically significant at the 95% level

Table 3.8 Organizational innovation: enterprises implementing advanced management techniques

	CIS3 responses	which answered the relevant question	which implemented advanced management techniques	
				$\frac{(c)}{(b)}100$
Region	(a)	(b)	(c)	(d)
	Count	*Count*	*Count*	*Per cent*
England	6,826	6,024	2,195	36.4
East Mids	*699*	*618*	*233*	*37.7*
Eastern	*750*	*650*	*222*	*34.2*
London	*974*	*833*	*292*	*35.1*
North East	*444*	*400*	*147*	*36.8*
North West	*841*	*748*	*271*	*36.2*
South East	*1,012*	*881*	*351*	*39.8*
South West	*621*	*558*	*204*	*36.6*
West Mids	*732*	*656*	*244*	*37.2*
Yorks & Humbs	*753*	*680*	*231*	*34.0*
Northern Ireland	162	131	46	35.1
Wales	379	338	115	34.0
Scotland	805	688	209	30.4
UK	**8,172**	**7,181**	**2,565**	**35.7**

Source: own calculation from UK CIS3 survey.

Table 3.9 looks at the number of enterprises that implemented new or significantly changed organizational structures, such as Investors in People. The South East of England shows the largest proportion of firms that made major changes in their organizational structure with 46.2 per cent. The East Midlands performance is in line with the UK average.

Table 3.9 Enterprises implementing changes in organisational structures

Region	CIS3 responses (a)	which answered the relevant question (b)	which made changes in organisational structures (c)	$\frac{(c)}{(b)}100$ (d)
	Count	*Count*	*Count*	*Per cent*
England	6,826	6,046	2,414	39.9
East Mids	*699*	*620*	*243*	*39.2*
Eastern	*750*	*652*	*273*	*41.9*
London	*974*	*834*	*318*	*38.1*
North East	*444*	*406*	*160*	*39.4*
North West	*841*	*749*	*287*	*38.3*
South East	*1,012*	*884*	*408*	*46.2*
South West	*621*	*562*	*218*	*38.8*
West Mids	*732*	*657*	*250*	*38.1*
Yorks & Humbs	*753*	*682*	*257*	*37.7*
Northern Ireland	162	132	55	41.7
Wales	379	338	109	32.2
Scotland	805	698	253	36.2
UK	**8,172**	**7,214**	**2,831**	**39.2**

Source: own calculation from UK CIS3 survey.

A further measure of wider innovation introduced by CIS3 is to look at improvements in marketing strategies. Table 3.10 gives the number and proportion of enterprises which made significant modifications to their marketing concepts between 1998 and 2000. The South East has the highest proportion of firms (50 per cent) using new marketing techniques innovating in this area, followed by the East Midlands with 48.5 per cent. Again there is no statistically significant difference between the performance of East Midlands firms and those in the rest of the UK at the 95% level.

Table 3.10 Enterprises changing significantly their marketing concepts

Region	CIS3 responses (a)	which answered the relevant question (b)	Enterprises changing their marketing concepts (c)	$\frac{(c)}{(b)}100$ (d)
	Count	*Count*	*Count*	*Per cent*
England	6,826	6,036	2,822	46.8
East Mids	*699*	*617*	*299*	*48.5*
Eastern	*750*	*650*	*310*	*47.7*
London	*974*	*832*	*360*	*43.3*
North East	*444*	*398*	*181*	*45.5*
North West	*841*	*749*	*342*	*45.7*
South East	*1,012*	*886*	*443*	*50.0*
South West	*621*	*564*	*264*	*46.8*
West Mids	*732*	*655*	*309*	*47.2*
Yorks & Humbs	*753*	*685*	*314*	*45.8*
Northern Ireland	162	130	57	43.8
Wales	379	340	142	41.8
Scotland	805	694	294	42.4
UK	**8,172**	**7,200**	**3,315**	**46.0**

Source: own calculation from UK CIS3 survey.

To summarise, it can be seen that using a number of indicators of organizational innovation, East Midlands firms held there own in terms of organisational innovation activities and performed better than average on a number of indicators, though none of these differences was statistically significant at the 95% level.

Patents

Patents are one of the most commonly used measures of innovation activity, largely because historical time series of patent data are available from patent offices. Whilst this is an advantage, it is widely recognised that patent data have a number of disadvantages. For example, not all innovations are patented, while others are patented but never get beyond the prototype stage of production. Similarly, there appear to be differences across sectors and countries in the propensity to patent, reflecting differences in the nature of products across industries and cultural differences across countries.

Table 3.11 provides data from the CIS survey on the average number of patents per firm. It can be seen that the East Midlands' performance is slightly below the UK average, however, this difference is not statistically significant.

Table 3.11 Average Number of Patent Applications per Enterprise

Region	Total number of CIS3 responses (a)	which answered the relevant question (b)	average number of patents* (c)
	Count	*Count*	*Count*
England	6,826	5,805	0.8
East Mids	*699*	*595*	*0.6*
Eastern	*750*	*642*	*0.8*
London	*974*	*794*	*0.3*
North East	*444*	*384*	*0.7*
North West	*841*	*710*	*1.3*
South East	*1,012*	*878*	*1.4*
South West	*621*	*535*	*0.4*
West Mids	*732*	*619*	*0.6*
Yorks & Humbs	*753*	*648*	*0.7*
Northern Ireland	162	129	0.2
Wales	379	321	0.3
Scotland	805	665	0.7
UK	**8,172**	**6,920**	**0.7**

Source: own calculations from UK CIS3 survey.

* Note that firms were told to enter 'nil' if they had not patented during the period, thus this average includes zero returns

Human Capital

Research on innovation highlights three channels via which human capital - that is, the skills, qualification and experience of the workforce - affects innovation. Firstly, the more qualified the workforce, especially in science and engineering subjects, the greater its potential for conducting research and generating innovations within the firm. Secondly, the higher the level of human capital, the greater the firm's ability to absorb and assimilate knowledge from sources outside the firm. Thirdly, the higher the level of skills, qualifications and experience of the work force, the greater the capability of the firm to successfully implement and manage the innovation process.

Table 3.12 presents data on the proportion of the workforce educated to degree level, distinguishing science and engineering from other disciplines. It can be seen that the East Midlands has the lowest proportion of science and engineering graduates – 4.1 per cent compared to a UK average of 6.4 per cent - and one of the lowest proportions of graduates from other disciplines. These differences are statistically significant at the 99% level indicating that this is an area of significant weakness in the East Midlands region.

These results are reinforced by the analysis of responses to the CIS question that asked firms to identify factors that were hampering their innovation performance (see Figure 3.10 Table A1.6). Here, 83 per cent of East Midlands' innovators cited 'lack of qualified personnel' as an important factor, compared with 76 per cent for the UK as a whole, and just 66 per cent for London, which has the most highly qualified work force.

Table 3.12 Investment in human capital: the proportion of the workforce educated to degree level in science and engineering and other disciplines

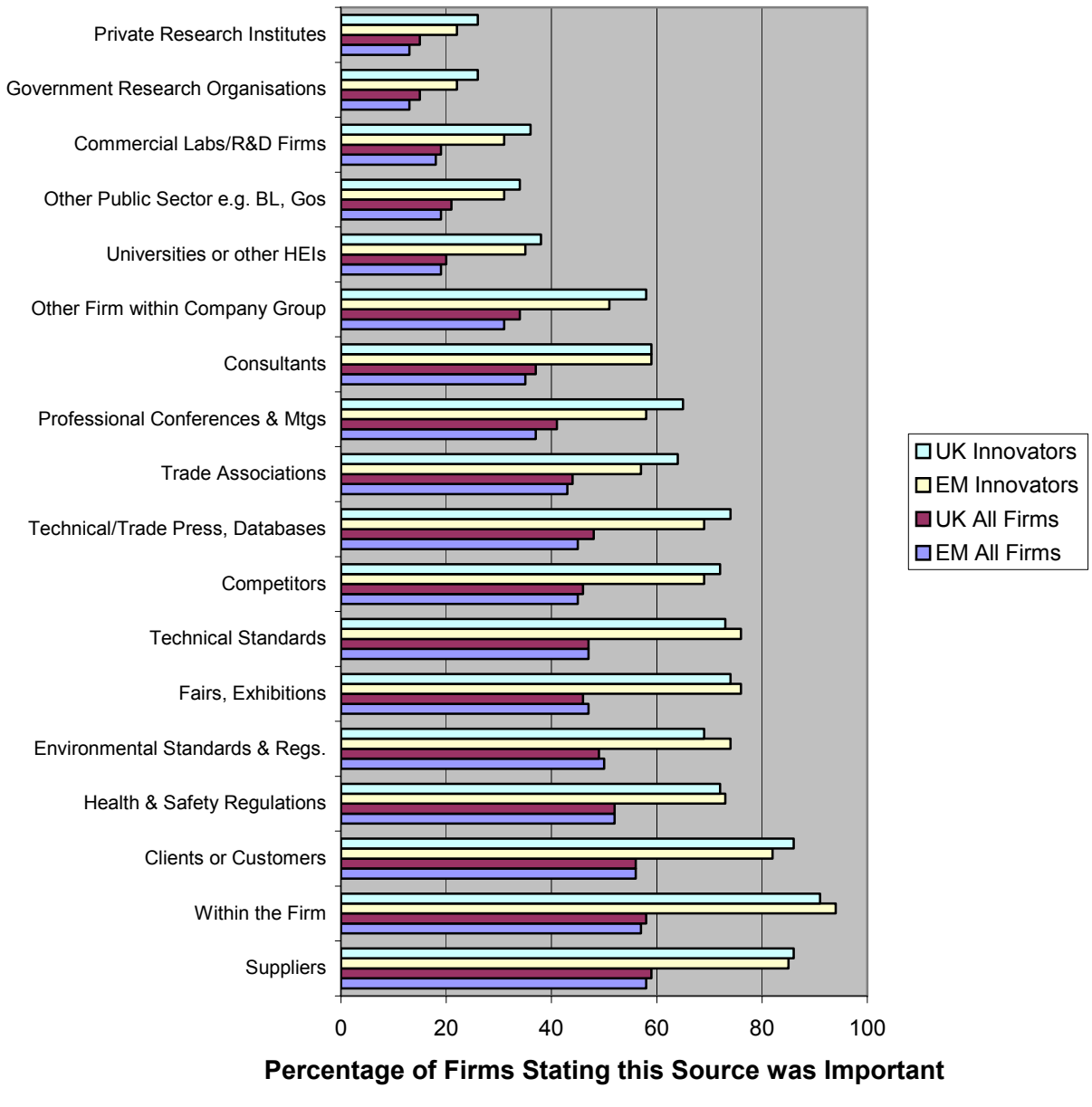
Region	Science and engineering degree	Other degree
	Percentage of total employees	Percentage of total employees
East Midlands	4.1	6.4
Eastern	7.3	6.5
London	9.7	18.3
North East	5.0	5.6
North West	6.0	7.7
South East	8.3	8.8
South West	5.2	7.3
West Midlands	4.3	6.1
Yorks and Humbs	5.1	6.5
Northern Ireland	7.1	10.7
Wales	5.4	5.8
Scotland	7.2	10.1
UK	**6.4**	**8.6**

3.4 Sources of Knowledge

Innovation involves the commercial exploitation of existing knowledge and the generation of new knowledge. A firm's ability to utilise knowledge generated externally is a significant factor affecting innovation performance. The CIS asked firms to state which sources of knowledge and innovation were important for innovation. Figure 3.7 provides a summary of these results: it shows the relative importance of different sources of knowledge, comparing all UK firms with all EM firms, and comparing product innovators in the UK with those in the East Midlands.

The first point to note is that for both the UK and East Midlands (and indeed all other regions, see Appendix Table A1.2) there is a significant difference in the use of knowledge by innovators as compared with all firms (innovators and non-innovators) with innovators making much higher use of knowledge and information. This holds for all the different sources of knowledge and information included in the CIS. The sources of knowledge that are most commonly cited as important are: internal sources, followed closely by sources within the supply chain (suppliers and customers).

Figure 3.7 Sources of Knowledge and Information for Innovation: All Firms and Product Innovators



The sources that are least frequently cited as important are research organisations/firms and universities. Arguably, this reflects the more specialist nature of the information provided by research-based organisations. In particular, knowledge generated by research organisations is more likely to be utilised by *novel* innovators (i.e. those firms that are introduced new products or processes that are *also* new to the market/industry) that comprised just 9.5 per cent of all UK firms in the case of product innovation and 5.9 per cent in the case of process innovation. In contrast, the other knowledge sources listed in Figure 3.7 are more likely to be important for firms that have introduced product and process innovations that are new to their firm but not new to the market.

The second point to note is that East Midlands firms make less use of virtually all sources of knowledge and information for innovation as compared with their UK counterparts, though the differences are generally small. There are four exceptions where East Midlands innovators make greater use of knowledge and information sources: environmental standards and regulations; technical standards; internal sources within the firm; and fairs and exhibitions. The largest positive difference occurs in the importance of environmental standards and regulations for East Midlands' product innovators. Explanations for this finding include the possibility that the East Midlands' CIS sample contains a greater number of firms subject to regulations and standards, and/or that East Midlands firms are more reactive (rather than proactive) in their innovation activities.

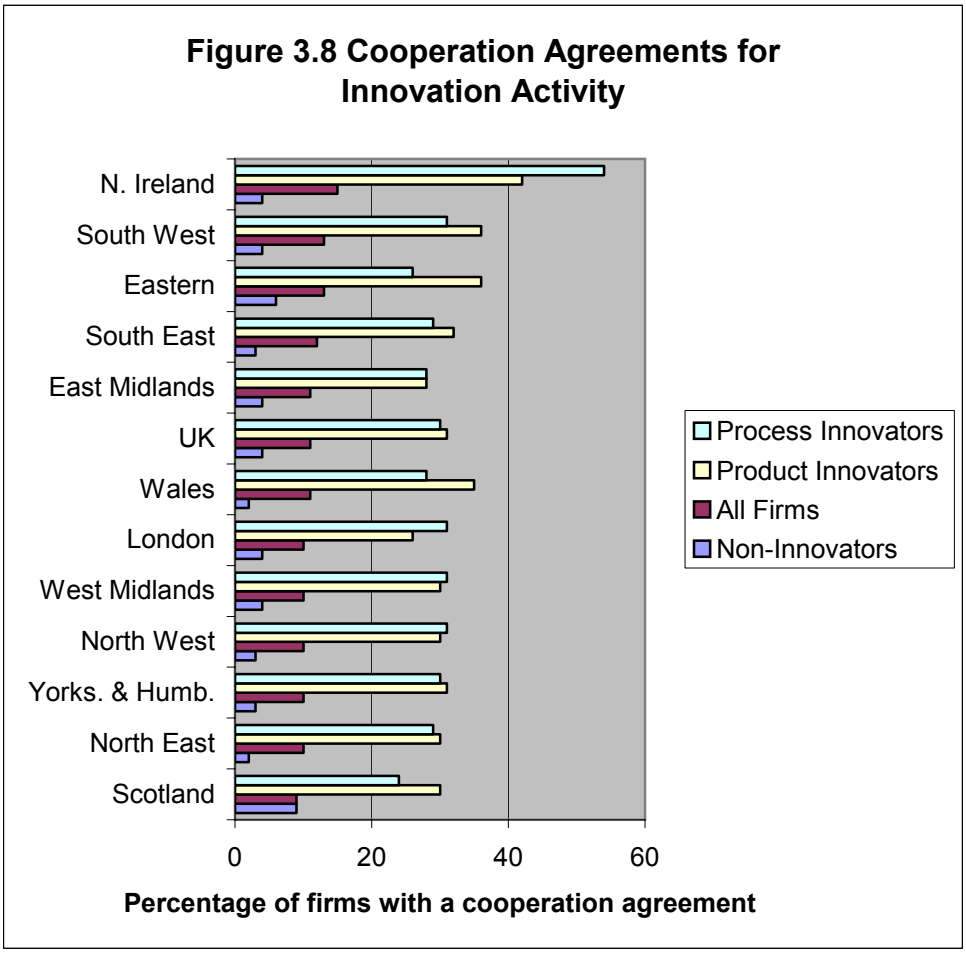
3.5 Cooperation Agreements for Innovation

There is now a large body of theoretical and empirical evidence to support the hypothesis that firms that cooperate with other firms and organisations have a higher chance of successfully innovating.[27] Few firms conduct all their research and development activity in-house and many do not have any R&D facilities. Cooperation with research organisations and other firms is therefore an important way of gaining access to R&D. The CIS asked firms whether they had a cooperation agreement for innovation activity with firms and other organisations. A summary of these results is presented in Figures 3.8 and 3.9; more detailed analysis is provided in Table A1.3.

It is important to note that the level of cooperation is low: only 843 firms or 11 per cent of the UK sample stated that they participated in a cooperation agreement for innovation. Cooperation activity by 'all firms' in the East Midlands is equal to the UK average. Cooperation by East Midlands' product and process innovators is slightly below the UK average.

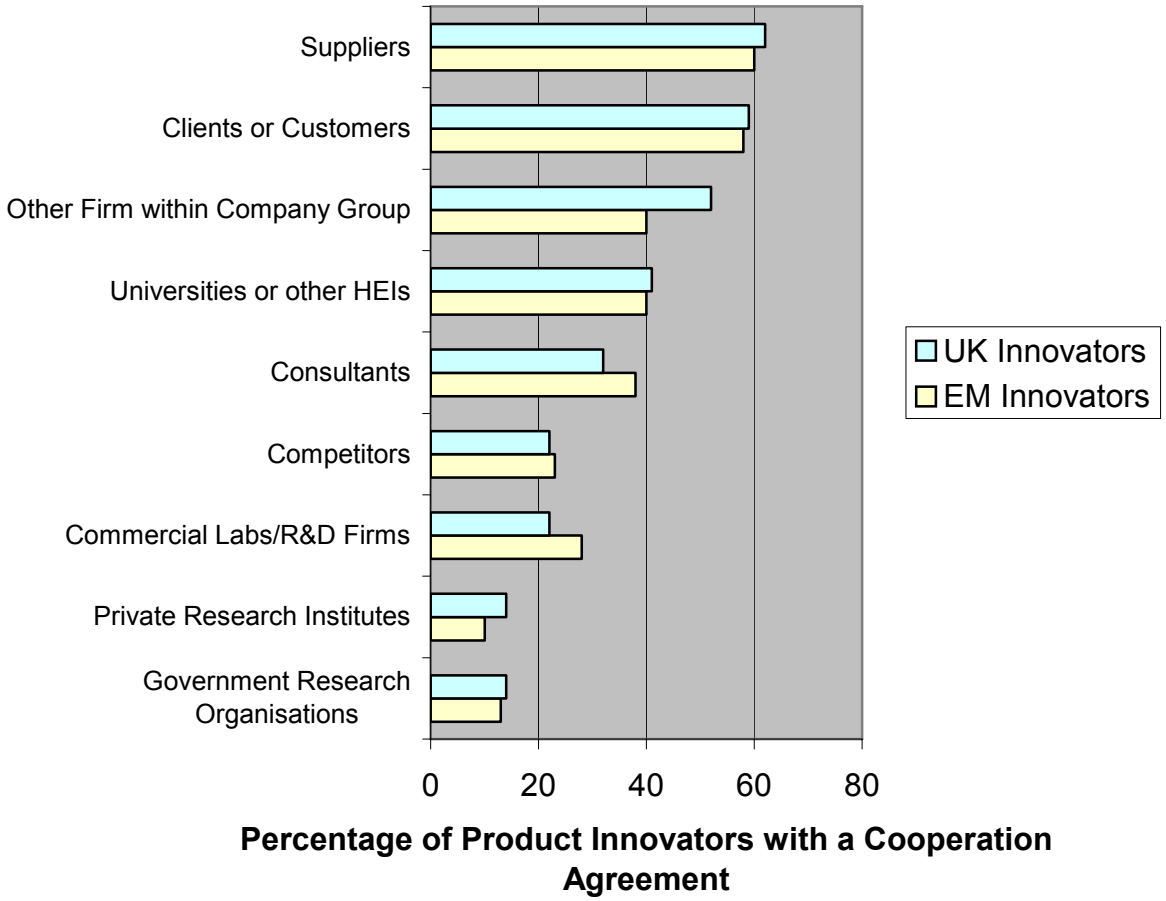
There is a marked difference in the extent of cooperation activity between innovators and non-innovators: only 4 per cent of non-innovators had a cooperation agreement, but this figure rises to 31 per cent for product innovators and 30 per cent for process innovators.

[27] See, for example, Frenz, Michie and Oughton (2005).



Looking at Figure 3.9 it can be seen that the pattern for cooperation by type of partner is similar to that observed for sources of knowledge and information by type of source: cooperation is more prevalent between firms, than between firms and research organisations. However, it is notable that amongst product innovators, 40 per cent or more of firms had cooperated with a university of higher education institute (HEI) and that after partnerships within a firm's company group or supply chain, universities and HEIs are the most important partners for cooperation over innovation.

Figure 3.9 Cooperation for Innovation by Type of Partner: Product Innovation



The overall pattern of cooperation for East Midlands firms is similar to that of the UK as a whole. Nevertheless, East Midlands' product innovators have a *marginally* higher propensity to cooperate with consultants, competitors, commercial laboratories/R&D firms.

It is also apparent that East Midlands' product innovators have a significantly lower level of cooperation within the company group. We looked at the proportion of firms in the CIS sample in each region that were part of a wider company group to see if this explained the difference observed in Figure 3.9. However, the proportion of firms in the East Midlands that are part of a wider company group (59.23%) is in line with the UK average (59.39%). Hence, the gap between the UK and East Midlands performance reflects a lower propensity to cooperate internally. As a result firms responding to the survey in the East Midlands do not appear to benefit to the same extent as UK firms from being part of a larger company group and cooperating within it.

Cooperation agreements for innovation do appear to be an important determinant of firms' innovation performance. Table 3.13 reports the number of firms that had or did

not have a co-operation agreement with a university, and in each case, the number of those that introduced either a product or process innovation.

Table 3.13 Firms that had a university co-operation agreement and innovated

	Innovators	Non innovators	Total
University co-operation agreement:	250	52	302
No university co-operation agreement:	2157	5636	7793
Total:	2407	5688	8095

Source: Frenz, Michie and Oughton (2005)

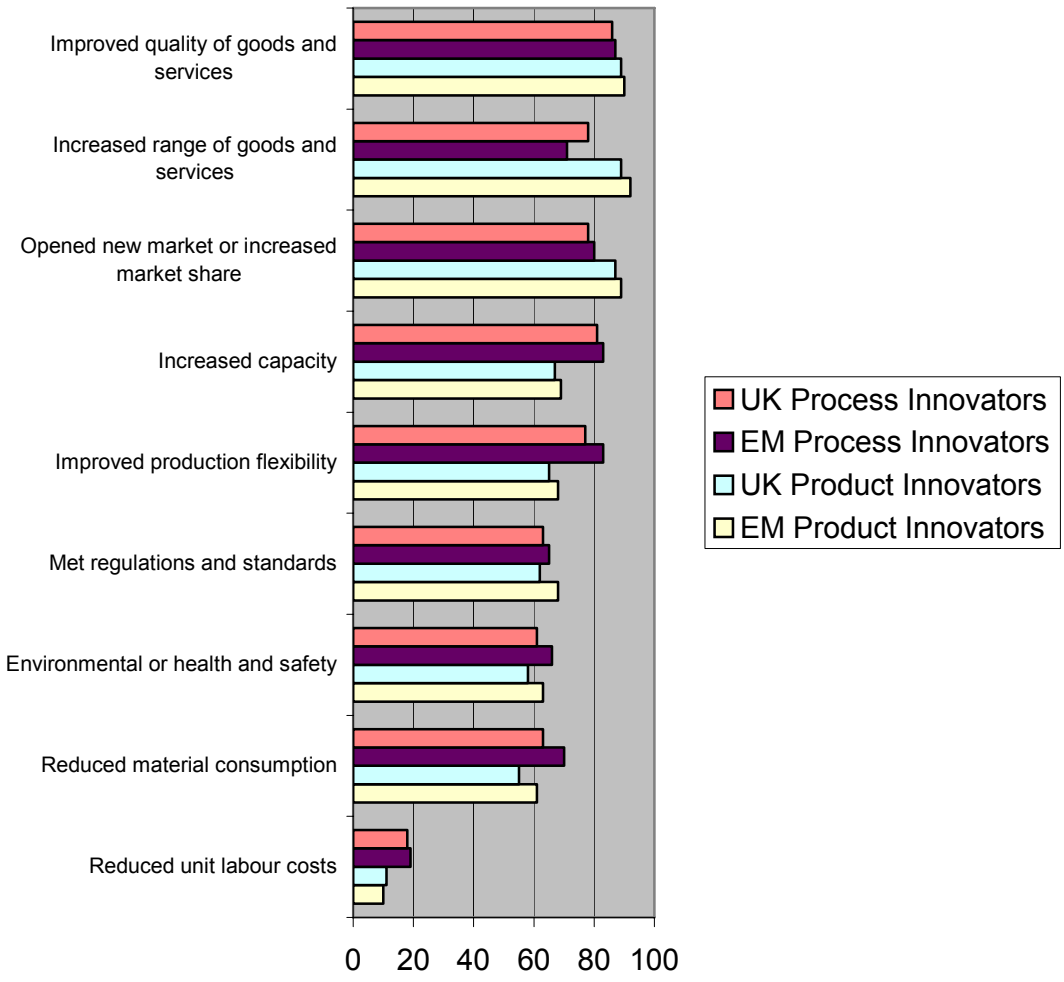
Of those firms that had a co-operation agreement, 83 per cent innovated. Of those firms with no such co-operation agreement, only 28 per cent innovated (Frenz, Michie and Oughton, 2005). This association between co-operation and innovation is highly significant statistically (in terms of a Chi-squared test). Research suggests that the relationship between cooperation and innovation is simultaneous, that is, cooperators are more likely to innovate and innovators are more likely to cooperate. This is because one of the factors shaping cooperation is the ability of the firm to absorb knowledge generated outside the firm – known as the absorptive capacity of the firm. Absorptive capacity is determined by the firm's capabilities especially, the amount of internal research and development expertise as measured by R&D spend and the extent of human capital, especially the proportion of science and engineering graduates employed in the firm.

The highest levels of cooperation for innovation are observed in the Easter and South West regions where the latter has had a long-standing policy to encourage business networking and cooperation.

3.6 Impact of Innovation Activities

Innovation is seen as an important means by which firms can maintain and enhance their competitive advantage, this is especially the case for advanced economies that cannot compete on price alone given the low level of labour costs in many newly industrialised countries. Analysis of the CIS results on the impact of innovation activity confirms this view. Figure 3.10 gives a picture of the impact of innovation activity on a range of business variables. It can be seen that innovation is used to increase the range and quality of goods i.e. it is primarily about non-price competition. Only about 10 per cent of product innovators and just under 20 per cent of process innovators stated that their innovation activity had an important impact on labour costs. In contrast, around 90 per cent of product and process innovators stated that innovation was important in terms of increasing the quality and range of goods and services they provide.

Figure 3.10 The Impact of Innovation Activity, 1998-2000



3.7 Factors Hampering Innovation

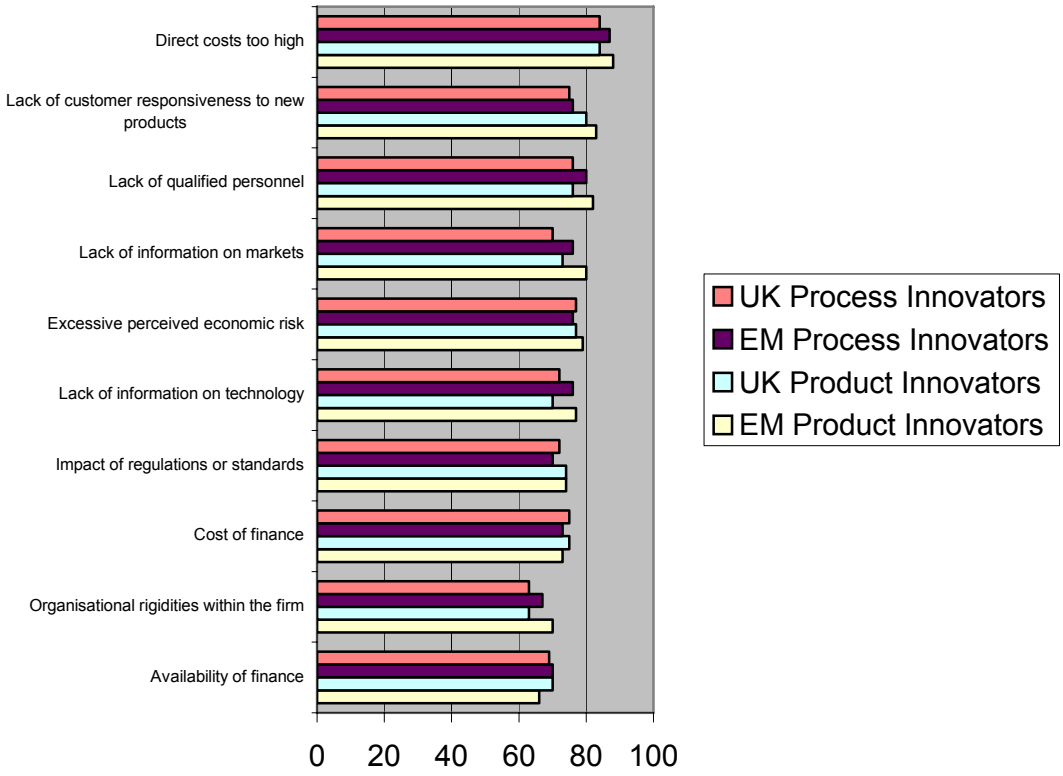
While cooperation and investment in R&D are widely viewed as important drivers of innovation, constraints in the availability of resources for innovation can hamper firms' innovation activity. Figure 3.11 shows the percentage of product and process innovators that stating that specific factors had constrained their innovation activity. The overall ranking of factors hampering innovation is similar for UK and East Midlands firms with 'cost' cited as the most important factor, however, there are a few important differences between the UK and East Midlands. In particular, there are six areas where a higher proportion of East Midlands' product and process innovators identify barriers to innovation, these are:

- Direct costs are too high
- Lack of customer responsiveness to new products
- Lack of qualified personnel
- Lack of information on markets
- Lack of information on technology
- Organizational rigidities within the firm

The largest differences are observed for the last four of these factors. These findings are consistent with the results which show that East Midlands firms employ fewer

staff qualified at graduate level and make less use of a number of sources of information as compared with the UK average.

Figure 3.11 Factors hampering innovation 1998-2000



4. Policy Analysis

Analysis of the results from the third Community Innovation Survey shows that the innovation performance of the East Midlands, as measured by product and process innovation is roughly in line with the UK average. The possible exception is *novel* product innovation where the region's performance is above the UK average and second only to that of the South East (though the difference between the East Midlands and the UK average is only significant at the 83% confidence level). However, Tables 3.1 to 3.12 and Figures 3.1-3.8 show that on a range of innovation indicators the East Midlands region lags behind the *leading* regions in the UK. Moreover, international comparisons of innovation performance (Lucking, 2004) show that the UK lags behind most European CIS countries in terms of product and process innovation. Thus, there would appear to be plenty of scope to improve the innovation performance of the East Midlands region. Given the relationship between innovation and productivity this should help to close the productivity gap, and the gap in GDP per capita provided that the rate of employment in the region is maintained or increased.

A review of the theoretical and empirical literature combined with analysis of results from the CIS suggests that there are four main areas where policy interventions might

be beneficial. First, it is apparent that the region is ranked fourth in terms of investment per capita in R&D – a long way behind the Eastern region and the South East and marginally behind the South West. There is therefore scope to increase R&D expenditure, especially by the public sector - government expenditure and expenditure by HEI establishments – but also in the business sector. In terms of business R&D expenditure as a percentage of gross value added, the East Midlands is ranked second after the South East. However, this ranking is boosted by an exceptionally high rate of R&D spend in the 'other' sector. In terms of manufacturing and services the region is ranked fifth and fourth respectively. Hence, there is scope to increase business R&D expenditure in manufacturing and services.

Second, a key area where the East Midlands' performance is significantly below the UK average is in the employment of graduates by business, especially, science and engineering graduates. Human capital is now widely understood to be an important determinant of innovation performance because it determines the internal capabilities of the firm *and* the ability of the firm to absorb knowledge, information and resources from external sources. This suggests that a regional strategy for innovation must be closely linked with the region's strategy for skills formation and employment i.e. that there should be an explicit, innovation-focused dimension to skills and labour market policies.

Third, there is evidence that East Midlands firms make less use of virtually all sources of knowledge and information for innovation as compared with their UK counterparts. This follows partly from the above point about human capital and the ability of firms to absorb knowledge from external sources. However, a further part of the explanation for this would appear to be that firms lack awareness of relevant knowledge/information sources: a larger proportion of East Midlands product innovators stated that they felt that lack of information on technology and markets was hampering their innovation activity. Policies to improve awareness and utilisation of knowledge and information for innovation are therefore likely to be beneficial.

Finally, it is evident that the level of cooperation agreements for innovation in the UK generally, and in the East Midlands, is low. International comparisons show that the UK is ranked 11th out of 16 countries in terms of the extent of cooperation agreements (Lucking, 2004). There is a growing body of empirical evidence which points to the importance of cooperation in determining innovation performance. Moreover, this is an area where public policy to help broker and facilitate cooperative agreements can be effective. There are therefore opportunities for further policy initiatives to enhance the level of cooperation for innovation. Given the central role of absorptive capacity in shaping the ability of firms to utilise knowledge from external organisations/sources, it is important to recognise the opportunities for linking such policies with labour market policies to encourage investment in human capital (including graduates), skills and training.

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Appendix 1

Table A1.1 Industrial Breakdown of the East Midlands CIS Sample by Industry/Sector

	Number of Firms	Percentage of total
Mining and quarrying	19	2.7
Food and beverages	32	4.6
Textiles	27	3.9
Apparel	16	2.3
Leather and footwear	2	0.3
Wood	12	1.7
Pulp and paper products	5	0.7
Publishing and printing	18	2.6
Chemicals	15	2.1
Rubber and plastic products	18	2.6
Other non-metallic mineral products	10	1.4
Basic metals	7	1.0
Fabricated metal products, except machinery and equipment	28	4.0
Machinery and equipment	23	3.3
Office, accounting and computing machinery	1	0.1
Electrical machinery	25	3.6
Radio, television and communications equipment	6	0.9
Medical, precision and optical instruments	18	2.6
Motor vehicles, trailers and semi-trailers	33	4.7
Other transport equipment	1	0.1
Building and repairing of ships and boats	4	0.6
Railroad equipment	2	0.3
Aircraft and spacecraft	9	1.3
Manufacturing n.e.c.	57	8.2
Recycling	1	0.1
Electricity, gas and water supply	2	0.3
Construction	66	9.4
Wholesale trade	73	10.4
Transport via railways	43	6.2
Supporting transport activities	18	2.6
Post and telecommunications	5	0.7
Financial intermediation	9	1.3
Activities auxiliary to financial intermediation	20	2.9
Real estate activities	5	0.7
Renting of machinery and equipment	11	1.6
Computer and related activities	8	1.1
Research and development	3	0.4
Other business activities	47	6.7
Total	**699**	**100**

Table A1.2 Sources of knowledge and information for innovation

Within the enterprise

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	322	0.57	351	130	0.37	147	138	0.94	128	117	0.91
Eastern	590	345	0.58	374	151	0.40	163	150	0.92	126	116	0.92
London	756	420	0.56	497	188	0.38	193	173	0.90	155	145	0.94
North East	365	214	0.59	238	96	0.40	87	82	0.94	76	70	0.92
North West	666	405	0.61	440	197	0.45	163	153	0.94	137	124	0.91
South East	795	477	0.60	466	183	0.39	243	217	0.89	188	174	0.93
South West	498	292	0.59	292	113	0.39	146	127	0.87	124	111	0.90
West Midlands	585	321	0.55	392	151	0.39	135	121	0.90	130	118	0.91
Yorks and Humbs	598	356	0.60	384	168	0.44	148	141	0.95	123	107	0.87
Northern Ireland	115	70	0.61	72	29	0.40	31	29	0.94	29	29	1.00
Wales	295	167	0.57	179	65	0.36	78	68	0.87	82	75	0.91
Scotland	615	332	0.54	396	137	0.35	146	133	0.91	143	126	0.88
UK	**6439**	**3721**	**0.58**	**4081**	**1608**	**0.39**	**1680**	**1532**	**0.91**	**1441**	**1312**	**0.91**

Table A1.2 Sources of knowledge and information for innovation, continued

Other enterprise within the enterprise group

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	173	0.31	351	68	0.19	147	75	0.51	128	62	0.48
Eastern	590	216	0.37	374	89	0.24	163	106	0.65	126	75	0.60
London	756	252	0.33	497	112	0.23	193	106	0.55	155	92	0.59
North East	365	121	0.33	238	55	0.23	87	45	0.52	76	42	0.55
North West	666	225	0.34	440	96	0.22	163	99	0.61	137	78	0.57
South East	795	290	0.36	466	107	0.23	243	138	0.57	188	113	0.60
South West	498	164	0.33	292	61	0.21	146	78	0.53	124	65	0.52
West Midlands	585	182	0.31	392	80	0.20	135	77	0.57	130	71	0.55
Yorks and Humbs	598	206	0.34	384	88	0.23	148	90	0.61	123	73	0.59
Northern Ireland	115	49	0.43	72	19	0.26	31	22	0.71	29	21	0.72
Wales	295	96	0.33	179	34	0.19	78	45	0.58	82	46	0.56
Scotland	615	197	0.32	396	74	0.19	146	86	0.59	143	87	0.61
UK	**6439**	**2171**	**0.34**	**4081**	**883**	**0.22**	**1680**	**967**	**0.58**	**1441**	**825**	**0.57**

Table A1.2 Sources of knowledge and information for innovation, continued

Suppliers of equipment, materials, components or software

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	324	0.58	351	143	0.41	147	125	0.85	128	111	0.87
Eastern	590	358	0.61	374	170	0.45	163	142	0.87	126	116	0.92
London	756	420	0.56	497	196	0.39	193	168	0.87	155	143	0.92
North East	365	215	0.59	238	106	0.45	87	76	0.87	76	69	0.91
North West	666	406	0.61	440	204	0.46	163	143	0.88	137	128	0.93
South East	795	488	0.61	466	207	0.44	243	202	0.83	188	170	0.90
South West	498	315	0.63	292	130	0.45	146	133	0.91	124	115	0.93
West Midlands	585	339	0.58	392	173	0.44	135	119	0.88	130	119	0.92
Yorks and Humbs	598	369	0.62	384	188	0.49	148	126	0.85	123	108	0.88
Northern Ireland	115	66	0.57	72	31	0.43	31	25	0.81	29	22	0.76
Wales	295	167	0.57	179	69	0.39	78	67	0.86	82	70	0.85
Scotland	615	332	0.54	396	143	0.36	146	125	0.86	143	131	0.92
UK	**6439**	**3799**	**0.59**	**4081**	**1760**	**0.43**	**1680**	**1451**	**0.86**	**1441**	**1302**	**0.90**

Table A1.2 Sources of knowledge and information for innovation, continued

Clients or customers

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	313	0.56	351	142	0.40	147	121	0.82	128	106	0.83
Eastern	590	342	0.58	374	160	0.43	163	145	0.89	126	104	0.83
London	756	401	0.53	497	190	0.38	193	165	0.85	155	129	0.83
North East	365	209	0.57	238	107	0.45	87	76	0.87	76	59	0.78
North West	666	393	0.59	440	202	0.46	163	146	0.90	137	111	0.81
South East	795	456	0.57	466	187	0.40	243	202	0.83	188	159	0.85
South West	498	280	0.56	292	122	0.42	146	123	0.84	124	93	0.75
West Midlands	585	324	0.55	392	157	0.40	135	121	0.90	130	113	0.87
Yorks and Humbs	598	344	0.58	384	175	0.46	148	128	0.86	123	94	0.76
Northern Ireland	115	66	0.57	72	31	0.43	31	27	0.87	29	22	0.76
Wales	295	155	0.53	179	68	0.38	78	64	0.82	82	62	0.76
Scotland	615	313	0.51	396	141	0.36	146	124	0.85	143	108	0.76
UK	**6439**	**3596**	**0.56**	**4081**	**1682**	**0.41**	**1680**	**1442**	**0.86**	**1441**	**1160**	**0.80**

Table A1.2 Sources of knowledge and information for innovation, continued

Competitors

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	253	0.45	351	115	0.33	147	102	0.69	128	80	0.63
Eastern	590	294	0.50	374	128	0.34	163	131	0.80	126	98	0.78
London	756	351	0.46	497	162	0.33	193	142	0.74	155	118	0.76
North East	365	172	0.47	238	82	0.34	87	63	0.72	76	58	0.76
North West	666	316	0.47	440	167	0.38	163	112	0.69	137	88	0.64
South East	795	379	0.48	466	151	0.32	243	172	0.71	188	132	0.70
South West	498	230	0.46	292	99	0.34	146	106	0.73	124	71	0.57
West Midlands	585	269	0.46	392	131	0.33	135	103	0.76	130	90	0.69
Yorks and Humbs	598	273	0.46	384	134	0.35	148	104	0.70	123	81	0.66
Northern Ireland	115	50	0.43	72	19	0.26	31	23	0.74	29	20	0.69
Wales	295	127	0.43	179	58	0.32	78	48	0.62	82	49	0.60
Scotland	615	257	0.42	396	112	0.28	146	106	0.73	143	93	0.65
UK	**6439**	**2971**	**0.46**	**4081**	**1358**	**0.33**	**1680**	**1212**	**0.72**	**1441**	**978**	**0.68**

Table A1.2 Sources of knowledge and information for innovation, continued

Consultants

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	196	0.35	351	79	0.23	147	86	0.59	128	71	0.55
Eastern	590	228	0.39	374	104	0.28	163	99	0.61	126	71	0.56
London	756	297	0.39	497	127	0.26	193	130	0.67	155	112	0.72
North East	365	130	0.36	238	57	0.24	87	54	0.62	76	46	0.61
North West	666	240	0.36	440	117	0.27	163	91	0.56	137	74	0.54
South East	795	318	0.40	466	126	0.27	243	138	0.57	188	120	0.64
South West	498	189	0.38	292	72	0.25	146	89	0.61	124	70	0.56
West Midlands	585	212	0.36	392	109	0.28	135	76	0.56	130	67	0.52
Yorks and Humbs	598	207	0.35	384	95	0.25	148	81	0.55	123	67	0.54
Northern Ireland	115	49	0.43	72	22	0.31	31	21	0.68	29	18	0.62
Wales	295	107	0.36	179	47	0.26	78	38	0.49	82	48	0.59
Scotland	615	215	0.35	396	92	0.23	146	87	0.60	143	82	0.57
UK	**6439**	**2388**	**0.37**	**4081**	**1047**	**0.26**	**1680**	**990**	**0.59**	**1441**	**846**	**0.59**

Table A1.2 Sources of knowledge and information for innovation, continued

Commercial laboratories/R&D enterprises

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	101	0.18	351	40	0.11	147	46	0.31	128	38	0.30
Eastern	590	125	0.21	374	50	0.13	163	66	0.40	126	43	0.34
London	756	121	0.16	497	49	0.10	193	57	0.30	155	47	0.30
North East	365	69	0.19	238	23	0.10	87	33	0.38	76	31	0.41
North West	666	135	0.20	440	57	0.13	163	61	0.37	137	44	0.32
South East	795	176	0.22	466	56	0.12	243	94	0.39	188	74	0.39
South West	498	99	0.20	292	33	0.11	146	54	0.37	124	37	0.30
West Midlands	585	105	0.18	392	41	0.10	135	52	0.39	130	39	0.30
Yorks and Humbs	598	107	0.18	384	43	0.11	148	47	0.32	123	41	0.33
Northern Ireland	115	27	0.23	72	9	0.13	31	14	0.45	29	13	0.45
Wales	295	56	0.19	179	19	0.11	78	28	0.36	82	30	0.37
Scotland	615	110	0.18	396	38	0.10	146	50	0.34	143	54	0.38
UK	**6439**	**1231**	**0.19**	**4081**	**458**	**0.11**	**1680**	**602**	**0.36**	**1441**	**491**	**0.34**

Table A1.2 Sources of knowledge and information for innovation, continued

Universities or other higher education institutes

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	109	0.19	351	39	0.11	147	51	0.35	128	46	0.36
Eastern	590	122	0.21	374	48	0.13	163	66	0.40	126	43	0.34
London	756	124	0.16	497	53	0.11	193	56	0.29	155	48	0.31
North East	365	83	0.23	238	33	0.14	87	38	0.44	76	29	0.38
North West	666	144	0.22	440	57	0.13	163	69	0.42	137	48	0.35
South East	795	164	0.21	466	51	0.11	243	92	0.38	188	65	0.35
South West	498	102	0.20	292	34	0.12	146	53	0.36	124	41	0.33
West Midlands	585	117	0.20	392	46	0.12	135	56	0.41	130	49	0.38
Yorks and Humbs	598	120	0.20	384	52	0.14	148	52	0.35	123	43	0.35
Northern Ireland	115	29	0.25	72	11	0.15	31	14	0.45	29	14	0.48
Wales	295	68	0.23	179	22	0.12	78	35	0.45	82	38	0.46
Scotland	615	125	0.20	396	42	0.11	146	64	0.44	143	57	0.40
UK	**6439**	**1307**	**0.20**	**4081**	**488**	**0.12**	**1680**	**646**	**0.38**	**1441**	**521**	**0.36**

Table A1.2 Sources of knowledge and information for innovation, continued

Government research organisations

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	75	0.13	351	30	0.09	147	33	0.22	128	30	0.23
Eastern	590	91	0.15	374	36	0.10	163	45	0.28	126	33	0.26
London	756	94	0.12	497	40	0.08	193	42	0.22	155	34	0.22
North East	365	61	0.17	238	29	0.12	87	27	0.31	76	17	0.22
North West	666	96	0.14	440	44	0.10	163	42	0.26	137	29	0.21
South East	795	123	0.15	466	45	0.10	243	66	0.27	188	44	0.23
South West	498	76	0.15	292	32	0.11	146	35	0.24	124	30	0.24
West Midlands	585	79	0.14	392	38	0.10	135	33	0.24	130	24	0.18
Yorks and Humbs	598	96	0.16	384	41	0.11	148	40	0.27	123	37	0.30
Northern Ireland	115	27	0.23	72	9	0.13	31	14	0.45	29	12	0.41
Wales	295	49	0.17	179	19	0.11	78	23	0.29	82	24	0.29
Scotland	615	87	0.14	396	35	0.09	146	38	0.26	143	36	0.25
UK	**6439**	**954**	**0.15**	**4081**	**398**	**0.10**	**1680**	**438**	**0.26**	**1441**	**350**	**0.24**

Table A1.2 Sources of knowledge and information for innovation, continued

Other public sector e.g. Business links, Government Offices

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	107	0.19	351	47	0.13	147	46	0.31	128	41	0.32
Eastern	590	119	0.20	374	53	0.14	163	54	0.33	126	39	0.31
London	756	129	0.17	497	54	0.11	193	58	0.30	155	48	0.31
North East	365	101	0.28	238	49	0.21	87	38	0.44	76	29	0.38
North West	666	137	0.21	440	66	0.15	163	52	0.32	137	43	0.31
South East	795	165	0.21	466	66	0.14	243	78	0.32	188	59	0.31
South West	498	108	0.22	292	46	0.16	146	49	0.34	124	34	0.27
West Midlands	585	134	0.23	392	63	0.16	135	52	0.39	130	49	0.38
Yorks and Humbs	598	133	0.22	384	65	0.17	148	50	0.34	123	45	0.37
Northern Ireland	115	29	0.25	72	12	0.17	31	13	0.42	29	12	0.41
Wales	295	65	0.22	179	25	0.14	78	28	0.36	82	30	0.37
Scotland	615	121	0.20	396	43	0.11	146	53	0.36	143	54	0.38
UK	**6439**	**1348**	**0.21**	**4081**	**589**	**0.14**	**1680**	**571**	**0.34**	**1441**	**483**	**0.34**

Table A1.2 Sources of knowledge and information for innovation, continued

Private research institutes

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	75	0.13	351	33	0.09	147	32	0.22	128	23	0.18
Eastern	590	88	0.15	374	34	0.09	163	47	0.29	126	29	0.23
London	756	98	0.13	497	40	0.08	193	47	0.24	155	34	0.22
North East	365	54	0.15	238	21	0.09	87	25	0.29	76	22	0.29
North West	666	91	0.14	440	42	0.10	163	37	0.23	137	29	0.21
South East	795	134	0.17	466	38	0.08	243	74	0.30	188	59	0.31
South West	498	67	0.13	292	29	0.10	146	29	0.20	124	25	0.20
West Midlands	585	81	0.14	392	39	0.10	135	32	0.24	130	28	0.22
Yorks and Humbs	598	92	0.15	384	36	0.09	148	41	0.28	123	35	0.28
Northern Ireland	115	24	0.21	72	9	0.13	31	12	0.39	29	9	0.31
Wales	295	42	0.14	179	15	0.08	78	22	0.28	82	20	0.24
Scotland	615	89	0.14	396	30	0.08	146	43	0.29	143	42	0.29
UK	**6439**	**935**	**0.15**	**4081**	**366**	**0.09**	**1680**	**441**	**0.26**	**1441**	**355**	**0.25**

Table A1.2 Sources of knowledge and information for innovation, continued

Professional conferences, meetings

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	208	0.37	351	93	0.26	147	85	0.58	128	70	0.55
Eastern	590	247	0.42	374	111	0.30	163	107	0.66	126	86	0.68
London	756	321	0.42	497	154	0.31	193	132	0.68	155	106	0.68
North East	365	153	0.42	238	71	0.30	87	58	0.67	76	50	0.66
North West	666	265	0.40	440	127	0.29	163	104	0.64	137	77	0.56
South East	795	351	0.44	466	134	0.29	243	164	0.67	188	134	0.71
South West	498	203	0.41	292	80	0.27	146	87	0.60	124	86	0.69
West Midlands	585	217	0.37	392	92	0.23	135	90	0.67	130	83	0.64
Yorks and Humbs	598	237	0.40	384	112	0.29	148	92	0.62	123	75	0.61
Northern Ireland	115	51	0.44	72	21	0.29	31	22	0.71	29	22	0.76
Wales	295	124	0.42	179	47	0.26	78	51	0.65	82	62	0.76
Scotland	615	238	0.39	396	99	0.25	146	97	0.66	143	94	0.66
UK	**6439**	**2615**	**0.41**	**4081**	**1141**	**0.28**	**1680**	**1089**	**0.65**	**1441**	**945**	**0.66**

Table A1.2 Sources of knowledge and information for innovation, continued

Trade associations

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	242	0.43	351	119	0.34	147	84	0.57	128	80	0.63
Eastern	590	263	0.45	374	129	0.34	163	108	0.66	126	79	0.63
London	756	316	0.42	497	158	0.32	193	119	0.62	155	101	0.65
North East	365	161	0.44	238	83	0.35	87	58	0.67	76	46	0.61
North West	666	293	0.44	440	151	0.34	163	105	0.64	137	83	0.61
South East	795	373	0.47	466	159	0.34	243	161	0.66	188	126	0.67
South West	498	219	0.44	292	100	0.34	146	84	0.58	124	77	0.62
West Midlands	585	261	0.45	392	134	0.34	135	89	0.66	130	85	0.65
Yorks and Humbs	598	258	0.43	384	132	0.34	148	92	0.62	123	73	0.59
Northern Ireland	115	46	0.40	72	21	0.29	31	20	0.65	29	17	0.59
Wales	295	122	0.41	179	51	0.28	78	52	0.67	82	53	0.65
Scotland	615	258	0.42	396	117	0.30	146	95	0.65	143	97	0.68
UK	**6439**	**2812**	**0.44**	**4081**	**1354**	**0.33**	**1680**	**1067**	**0.64**	**1441**	**917**	**0.64**

Table A1.2 Sources of knowledge and information for innovation, continued

Technical/trade press, computer databases

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	255	0.45	351	108	0.31	147	101	0.69	128	92	0.72
Eastern	590	291	0.49	374	140	0.37	163	120	0.74	126	92	0.73
London	756	345	0.46	497	160	0.32	193	144	0.75	155	120	0.77
North East	365	182	0.50	238	87	0.37	87	69	0.79	76	61	0.80
North West	666	318	0.48	440	164	0.37	163	116	0.71	137	92	0.67
South East	795	406	0.51	466	162	0.35	243	183	0.75	188	146	0.78
South West	498	250	0.50	292	102	0.35	146	109	0.75	124	91	0.73
West Midlands	585	266	0.45	392	127	0.32	135	103	0.76	130	95	0.73
Yorks and Humbs	598	288	0.48	384	143	0.37	148	107	0.72	123	85	0.69
Northern Ireland	115	55	0.48	72	23	0.32	31	24	0.77	29	23	0.79
Wales	295	134	0.45	179	55	0.31	78	54	0.69	82	59	0.72
Scotland	615	269	0.44	396	114	0.29	146	106	0.73	143	104	0.73
UK	**6439**	**3059**	**0.48**	**4081**	**1385**	**0.34**	**1680**	**1236**	**0.74**	**1441**	**1060**	**0.74**

Table A1.2 Sources of knowledge and information for innovation, continued

Fairs, exhibitions

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	262	0.47	351	107	0.30	147	111	0.76	128	96	0.75
Eastern	590	283	0.48	374	122	0.33	163	129	0.79	126	94	0.75
London	756	319	0.42	497	141	0.28	193	139	0.72	155	114	0.74
North East	365	158	0.43	238	69	0.29	87	64	0.74	76	54	0.71
North West	666	316	0.47	440	163	0.37	163	118	0.72	137	88	0.64
South East	795	380	0.48	466	148	0.32	243	179	0.74	188	133	0.71
South West	498	243	0.49	292	102	0.35	146	104	0.71	124	88	0.71
West Midlands	585	266	0.45	392	124	0.32	135	105	0.78	130	92	0.71
Yorks and Humbs	598	279	0.47	384	139	0.36	148	103	0.70	123	83	0.67
Northern Ireland	115	55	0.48	72	23	0.32	31	24	0.77	29	21	0.72
Wales	295	131	0.44	179	54	0.30	78	51	0.65	82	57	0.70
Scotland	615	261	0.42	396	109	0.28	146	112	0.77	143	94	0.66
UK	**6439**	**2953**	**0.46**	**4081**	**1301**	**0.32**	**1680**	**1239**	**0.74**	**1441**	**1014**	**0.70**

Table A1.2 Sources of knowledge and information for innovation, continued

Technical standards

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	265	0.47	351	115	0.33	147	112	0.76	128	87	0.68
Eastern	590	283	0.48	374	127	0.34	163	122	0.75	126	92	0.73
London	756	332	0.44	497	161	0.32	193	135	0.70	155	106	0.68
North East	365	180	0.49	238	82	0.34	87	70	0.80	76	59	0.78
North West	666	308	0.46	440	163	0.37	163	111	0.68	137	84	0.61
South East	795	387	0.49	466	163	0.35	243	174	0.72	188	127	0.68
South West	498	237	0.48	292	97	0.33	146	102	0.70	124	85	0.69
West Midlands	585	271	0.46	392	128	0.33	135	106	0.79	130	96	0.74
Yorks and Humbs	598	297	0.50	384	150	0.39	148	110	0.74	123	84	0.68
Northern Ireland	115	55	0.48	72	23	0.32	31	24	0.77	29	22	0.76
Wales	295	137	0.46	179	55	0.31	78	60	0.77	82	60	0.73
Scotland	615	279	0.45	396	122	0.31	146	107	0.73	143	107	0.75
UK	**6439**	**3031**	**0.47**	**4081**	**1386**	**0.34**	**1680**	**1233**	**0.73**	**1441**	**1009**	**0.70**

Table A1.2 Sources of knowledge and information for innovation, continued

Health and safety standards and regulations

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	291	0.52	351	137	0.39	147	108	0.73	128	97	0.76
Eastern	590	306	0.52	374	155	0.41	163	113	0.69	126	93	0.74
London	756	333	0.44	497	168	0.34	193	130	0.67	155	101	0.65
North East	365	207	0.57	238	111	0.47	87	65	0.75	76	57	0.75
North West	666	358	0.54	440	201	0.46	163	114	0.70	137	98	0.72
South East	795	414	0.52	466	195	0.42	243	160	0.66	188	128	0.68
South West	498	281	0.56	292	130	0.45	146	107	0.73	124	91	0.73
West Midlands	585	305	0.52	392	160	0.41	135	109	0.81	130	95	0.73
Yorks and Humbs	598	315	0.53	384	168	0.44	148	111	0.75	123	80	0.65
Northern Ireland	115	58	0.50	72	26	0.36	31	24	0.77	29	22	0.76
Wales	295	158	0.54	179	72	0.40	78	61	0.78	82	63	0.77
Scotland	615	316	0.51	396	155	0.39	146	112	0.77	143	108	0.76
UK	**6439**	**3342**	**0.52**	**4081**	**1678**	**0.41**	**1680**	**1214**	**0.72**	**1441**	**1033**	**0.72**

Table A1.2 Sources of knowledge and information for innovation, continued

Environmental standards and regulations

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of respondents	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*	*No of respondents*	*Number stating this source was important*	*Proportion stating this source was important*
East Midlands	561	280	0.50	351	128	0.36	147	109	0.74	128	93	0.73
Eastern	590	287	0.49	374	145	0.39	163	107	0.66	126	89	0.71
London	756	305	0.40	497	157	0.32	193	115	0.60	155	92	0.59
North East	365	197	0.54	238	104	0.44	87	64	0.74	76	57	0.75
North West	666	330	0.50	440	181	0.41	163	111	0.68	137	93	0.68
South East	795	397	0.50	466	184	0.39	243	158	0.65	188	126	0.67
South West	498	259	0.52	292	123	0.42	146	98	0.67	124	84	0.68
West Midlands	585	292	0.50	392	152	0.39	135	105	0.78	130	93	0.72
Yorks and Humbs	598	301	0.50	384	159	0.41	148	107	0.72	123	81	0.66
Northern Ireland	115	54	0.47	72	23	0.32	31	24	0.77	29	21	0.72
Wales	295	143	0.48	179	65	0.36	78	56	0.72	82	57	0.70
Scotland	615	301	0.49	396	143	0.36	146	111	0.76	143	106	0.74
UK	**6439**	**3146**	**0.49**	**4081**	**1564**	**0.38**	**1680**	**1165**	**0.69**	**1441**	**992**	**0.69**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	669	75	0.11	456	18	0.04	149	42	0.28	128	36	0.28
Eastern	708	95	0.13	485	27	0.06	168	61	0.36	131	34	0.26
London	921	92	0.10	658	25	0.04	195	51	0.26	156	48	0.31
North East	426	41	0.10	295	7	0.02	89	27	0.30	78	23	0.29
North West	808	82	0.10	581	18	0.03	164	50	0.30	136	42	0.31
South East	954	118	0.12	617	21	0.03	249	80	0.32	192	56	0.29
South West	595	77	0.13	387	14	0.04	146	52	0.36	125	39	0.31
West Midlands	696	73	0.10	499	20	0.04	141	43	0.30	132	41	0.31
Yorks and Humbs	724	70	0.10	510	14	0.03	148	46	0.31	122	37	0.30
Northern Ireland	148	22	0.15	105	4	0.04	31	13	0.42	28	15	0.54
Wales	367	39	0.11	246	5	0.02	82	29	0.35	82	23	0.28
Scotland	759	69	0.09	537	17	0.03	150	45	0.30	143	35	0.24
UK	**7775**	**853**	**0.11**	**5376**	**190**	**0.04**	**1712**	**539**	**0.31**	**1453**	**429**	**0.30**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

	Co-operation with other enterprise within the enterprise group			Suppliers of equipment, materials, components or software			Clients or customers			Competitors		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	28	0.39	72	45	0.63	72	39	0.54	72	16	0.22
Eastern	93	50	0.54	93	48	0.52	93	51	0.55	93	21	0.23
London	92	54	0.59	92	53	0.58	92	44	0.48	92	22	0.24
North East	40	20	0.50	40	22	0.55	40	21	0.53	40	8	0.20
North West	82	36	0.44	82	38	0.46	82	40	0.49	82	11	0.13
South East	115	59	0.51	115	68	0.59	115	51	0.44	115	25	0.22
South West	77	38	0.49	77	52	0.68	77	43	0.56	77	15	0.19
West Midlands	73	38	0.52	73	45	0.62	73	37	0.51	73	15	0.21
Yorks and Humbs	70	34	0.49	70	50	0.71	70	32	0.46	70	14	0.20
Northern Ireland	22	11	0.50	22	8	0.36	22	10	0.45	22	3	0.14
Wales	39	22	0.56	39	22	0.56	39	26	0.67	39	11	0.28
Scotland	68	38	0.56	68	38	0.56	68	38	0.56	68	15	0.22
UK	**843**	**428**	**0.51**	**843**	**489**	**0.58**	**843**	**432**	**0.51**	**843**	**176**	**0.21**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

	Consultants			Commercial laboratories/R&D enterprise			Universities or other higher education institutes			Government research organisations			Private research institutes		
Region	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
E. Mids	72	24	0.33	72	15	0.21	72	25	0.35	72	10	0.14	72	11	0.15
Eastern	93	28	0.30	93	21	0.23	93	25	0.27	93	14	0.15	93	10	0.11
London	92	33	0.36	92	14	0.15	92	24	0.26	92	6	0.07	92	8	0.09
North East	40	11	0.28	40	5	0.13	40	17	0.43	40	1	0.03	40	3	0.08
North West	82	25	0.30	82	14	0.17	82	32	0.39	82	8	0.10	82	15	0.18
South East	115	29	0.25	115	23	0.20	115	50	0.43	115	19	0.17	115	12	0.10
South West	77	24	0.31	77	17	0.22	77	27	0.35	77	13	0.17	77	13	0.17
W. Mids	73	21	0.29	73	19	0.26	73	28	0.38	73	9	0.12	73	11	0.15
Yorks & H.	70	21	0.30	70	13	0.19	70	21	0.30	70	13	0.19	70	11	0.16
N. Ireland	22	3	0.14	22	5	0.23	22	11	0.50	22	8	0.36	22	2	0.09
Wales	39	13	0.33	39	6	0.15	39	20	0.51	39	4	0.10	39	4	0.10
Scotland	68	20	0.29	68	18	0.26	68	26	0.38	68	8	0.12	68	9	0.13
UK	**843**	**252**	**0.30**	**843**	**170**	**0.20**	**843**	**306**	**0.36**	**843**	**113**	**0.13**	**843**	**109**	**0.13**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

	Local collaboration			**National collaboration**			**Europe**			**US**			**Other**		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	27	0.38	72	59	0.82	72	28	0.39	72	20	0.28	72	9	0.13
Eastern	93	28	0.30	93	65	0.70	93	43	0.46	93	31	0.33	93	17	0.18
London	92	37	0.40	92	69	0.75	92	33	0.36	92	28	0.30	92	13	0.14
North East	40	25	0.63	40	30	0.75	40	12	0.30	40	12	0.30	40	6	0.15
North West	82	28	0.34	82	62	0.76	82	39	0.48	82	20	0.24	82	13	0.16
South East	115	41	0.36	115	84	0.73	115	48	0.42	115	37	0.32	115	23	0.20
South West	77	26	0.34	77	67	0.87	77	30	0.39	77	19	0.25	77	9	0.12
West Midlands	73	39	0.53	73	53	0.73	73	22	0.30	73	19	0.26	73	9	0.12
Yorks and H	70	27	0.39	70	53	0.76	70	22	0.31	70	12	0.17	70	10	0.14
N. Ireland	22	13	0.59	22	13	0.59	22	9	0.41	22	10	0.45	22	2	0.09
Wales	39	18	0.46	39	33	0.85	39	21	0.54	39	12	0.31	39	8	0.21
Scotland	68	33	0.49	68	49	0.72	68	30	0.44	68	21	0.31	68	6	0.09
UK	**843**	**342**	**0.41**	**843**	**637**	**0.76**	**843**	**337**	**0.40**	**843**	**241**	**0.29**	843	125	0.15

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Other enterprise within your enterprise group

	All enterprises			Non-innovators			Product innovation			Process innovation		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	28	0.39	17	7	0.41	40	16	0.40	34	11	0.32
Eastern	93	50	0.54	25	16	0.64	61	30	0.49	34	19	0.56
London	92	54	0.59	25	16	0.64	51	32	0.63	48	28	0.58
North East	40	20	0.50	6	1	0.17	27	16	0.59	23	15	0.65
North West	82	36	0.44	18	8	0.44	50	22	0.44	42	19	0.45
South East	115	59	0.51	21	10	0.48	77	42	0.55	54	30	0.56
South West	77	38	0.49	14	7	0.50	52	26	0.50	39	19	0.49
West Midlands	73	38	0.52	20	8	0.40	43	25	0.58	41	26	0.63
Yorks and Humbs	70	34	0.49	14	6	0.43	46	23	0.50	37	24	0.65
Northern Ireland	22	11	0.50	4	1	0.25	13	8	0.62	15	8	0.53
Wales	39	22	0.56	5	3	0.60	29	15	0.52	23	14	0.61
Scotland	68	38	0.56	16	9	0.56	45	24	0.53	35	24	0.69
UK	**843**	**428**	**0.51**	**185**	**92**	**0.50**	**534**	**279**	**0.52**	**425**	**237**	**0.56**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Suppliers of equipment, materials, components or software

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	45	0.63	17	11	0.65	40	24	0.60	34	24	0.71
Eastern	93	48	0.52	25	7	0.28	61	37	0.61	34	23	0.68
London	92	53	0.58	25	11	0.44	51	34	0.67	48	31	0.65
North East	40	22	0.55	6	5	0.83	27	15	0.56	23	12	0.52
North West	82	38	0.46	18	4	0.22	50	25	0.50	42	22	0.52
South East	115	68	0.59	21	9	0.43	77	47	0.61	54	38	0.70
South West	77	52	0.68	14	8	0.57	52	36	0.69	39	28	0.72
West Midlands	73	45	0.62	20	10	0.50	43	28	0.65	41	28	0.68
Yorks and Humbs	70	50	0.71	14	4	0.29	46	39	0.85	37	31	0.84
Northern Ireland	22	8	0.36	4	2	0.50	13	5	0.38	15	6	0.40
Wales	39	22	0.56	5	5	1.00	29	15	0.52	23	13	0.57
Scotland	68	38	0.56	16	6	0.38	45	28	0.62	35	21	0.60
UK	**843**	**489**	**0.58**	**185**	**82**	**0.44**	**534**	**333**	**0.62**	**425**	**277**	**0.65**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Clients or customers

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	39	0.54	17	9	0.53	40	23	0.58	34	16	0.47
Eastern	93	51	0.55	25	7	0.28	61	41	0.67	34	23	0.68
London	92	44	0.48	25	9	0.36	51	26	0.51	48	24	0.50
North East	40	21	0.53	6	4	0.67	27	14	0.52	23	12	0.52
North West	82	40	0.49	18	4	0.22	50	30	0.60	42	24	0.57
South East	115	51	0.44	21	5	0.24	77	39	0.51	54	27	0.50
South West	77	43	0.56	14	7	0.50	52	32	0.62	39	22	0.56
West Midlands	73	37	0.51	20	7	0.35	43	26	0.60	41	22	0.54
Yorks and Humbs	70	32	0.46	14	3	0.21	46	23	0.50	37	20	0.54
Northern Ireland	22	10	0.45	4	2	0.50	13	6	0.46	15	8	0.53
Wales	39	26	0.67	5	3	0.60	29	21	0.72	23	16	0.70
Scotland	68	38	0.56	16	5	0.31	45	32	0.71	35	24	0.69
UK	**843**	**432**	**0.51**	**185**	**65**	**0.35**	**534**	**313**	**0.59**	**425**	**238**	**0.56**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Competitors

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	16	0.22	17	5	0.29	40	9	0.23	34	7	0.21
Eastern	93	21	0.23	25	3	0.12	61	17	0.28	34	14	0.41
London	92	22	0.24	25	4	0.16	51	14	0.27	48	13	0.27
North East	40	8	0.20	6	1	0.17	27	6	0.22	23	6	0.26
North West	82	11	0.13	18	1	0.06	50	7	0.14	42	8	0.19
South East	115	25	0.22	21	6	0.29	77	17	0.22	54	12	0.22
South West	77	15	0.19	14	4	0.29	52	8	0.15	39	9	0.23
West Midlands	73	15	0.21	20	4	0.20	43	9	0.21	41	8	0.20
Yorks and Humbs	70	14	0.20	14	1	0.07	46	11	0.24	37	11	0.30
Northern Ireland	22	3	0.14	4	1	0.25	13	2	0.15	15	2	0.13
Wales	39	11	0.28	5	2	0.40	29	8	0.28	23	8	0.35
Scotland	68	15	0.22	16	4	0.25	45	11	0.24	35	7	0.20
UK	**843**	**176**	**0.21**	**185**	**36**	**0.19**	**534**	**119**	**0.22**	**425**	**105**	**0.25**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Consultants

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	24	0.33	17	3	0.18	40	15	0.38	34	12	0.35
Eastern	93	28	0.30	25	7	0.28	61	18	0.30	34	11	0.32
London	92	33	0.36	25	7	0.28	51	24	0.47	48	18	0.38
North East	40	11	0.28	6	2	0.33	27	9	0.33	23	6	0.26
North West	82	25	0.30	18	7	0.39	50	15	0.30	42	14	0.33
South East	115	29	0.25	21	6	0.29	77	19	0.25	54	15	0.28
South West	77	24	0.31	14	5	0.36	52	16	0.31	39	13	0.33
West Midlands	73	21	0.29	20	7	0.35	43	11	0.26	41	11	0.27
Yorks and Humbs	70	21	0.30	14	1	0.07	46	17	0.37	37	13	0.35
Northern Ireland	22	3	0.14	4	1	0.25	13	1	0.08	15	2	0.13
Wales	39	13	0.33	5	3	0.60	29	9	0.31	23	8	0.35
Scotland	68	20	0.29	16	4	0.25	45	15	0.33	35	13	0.37
UK	**843**	**252**	**0.30**	**185**	**53**	**0.29**	**534**	**169**	**0.32**	**425**	**136**	**0.32**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Commercial laboratories/R&D enterprises

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	15	0.21	17	1	0.06	40	11	0.28	34	9	0.26
Eastern	93	21	0.23	25	3	0.12	61	18	0.30	34	12	0.35
London	92	14	0.15	25	3	0.12	51	10	0.20	48	7	0.15
North East	40	5	0.13	6	1	0.17	27	2	0.07	23	4	0.17
North West	82	14	0.17	18	4	0.22	50	7	0.14	42	8	0.19
South East	115	23	0.20	21	4	0.19	77	15	0.19	54	11	0.20
South West	77	17	0.22	14	3	0.21	52	12	0.23	39	10	0.26
West Midlands	73	19	0.26	20	5	0.25	43	12	0.28	41	9	0.22
Yorks and Humbs	70	13	0.19	14	1	0.07	46	9	0.20	37	8	0.22
Northern Ireland	22	5	0.23	4	0	0.00	13	3	0.23	15	5	0.33
Wales	39	6	0.15	5	1	0.20	29	3	0.10	23	4	0.17
Scotland	68	18	0.26	16	3	0.19	45	14	0.31	35	10	0.29
UK	**843**	**170**	**0.20**	**185**	**29**	**0.16**	**534**	**116**	**0.22**	**425**	**97**	**0.23**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Universities or other higher education institutes

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	25	0.35	17	5	0.29	40	16	0.40	34	14	0.41
Eastern	93	25	0.27	25	3	0.12	61	20	0.33	34	11	0.32
London	92	24	0.26	25	6	0.24	51	13	0.25	48	14	0.29
North East	40	17	0.43	6	3	0.50	27	11	0.41	23	8	0.35
North West	82	32	0.39	18	6	0.33	50	21	0.42	42	17	0.40
South East	115	50	0.43	21	9	0.43	77	35	0.45	54	24	0.44
South West	77	27	0.35	14	3	0.21	52	23	0.44	39	10	0.26
West Midlands	73	28	0.38	20	6	0.30	43	20	0.47	41	18	0.44
Yorks and Humbs	70	21	0.30	14	4	0.29	46	15	0.33	37	12	0.32
Northern Ireland	22	11	0.50	4	2	0.50	13	8	0.62	15	9	0.60
Wales	39	20	0.51	5	2	0.40	29	16	0.55	23	12	0.52
Scotland	68	26	0.38	16	3	0.19	45	21	0.47	35	15	0.43
UK	**843**	**306**	**0.36**	**185**	**52**	**0.28**	**534**	**219**	**0.41**	**425**	**164**	**0.39**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Government research organisations

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	10	0.14	17	3	0.18	40	5	0.13	34	5	0.15
Eastern	93	14	0.15	25	4	0.16	61	10	0.16	34	6	0.18
London	92	6	0.07	25	3	0.12	51	2	0.04	48	3	0.06
North East	40	1	0.03	6	0	0.00	27	1	0.04	23	1	0.04
North West	82	8	0.10	18	0	0.00	50	5	0.10	42	7	0.17
South East	115	19	0.17	21	1	0.05	77	16	0.21	54	12	0.22
South West	77	13	0.17	14	3	0.21	52	9	0.17	39	4	0.10
West Midlands	73	9	0.12	20	1	0.05	43	7	0.16	41	5	0.12
Yorks and Humbs	70	13	0.19	14	1	0.07	46	10	0.22	37	7	0.19
Northern Ireland	22	8	0.36	4	3	0.75	13	5	0.38	15	4	0.27
Wales	39	4	0.10	5	1	0.20	29	2	0.07	23	2	0.09
Scotland	68	8	0.12	16	2	0.13	45	5	0.11	35	5	0.14
UK	**843**	**113**	**0.13**	**185**	**22**	**0.12**	**534**	**77**	**0.14**	**425**	**61**	**0.14**

Table A1.3 Cooperation arrangements for innovation: the number and proportion of enterprises cooperating with other firms and organisations by type of partner and geographic proximity, 1998-2000, for all enterprises, product innovators, process innovators and non-innovators, continued

Private research institutes

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No of responses	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*	*No of responses*	*No. with a cooperation agreement*	*Proportion*
East Midlands	72	11	0.15	17	5	0.29	40	4	0.10	34	4	0.12
Eastern	93	10	0.11	25	3	0.12	61	7	0.11	34	2	0.06
London	92	8	0.09	25	2	0.08	51	5	0.10	48	6	0.13
North East	40	3	0.08	6	0	0.00	27	3	0.11	23	2	0.09
North West	82	15	0.18	18	3	0.17	50	10	0.20	42	8	0.19
South East	115	12	0.10	21	1	0.05	77	10	0.13	54	8	0.15
South West	77	13	0.17	14	4	0.29	52	9	0.17	39	5	0.13
West Midlands	73	11	0.15	20	3	0.15	43	7	0.16	41	6	0.15
Yorks and Humbs	70	11	0.16	14	1	0.07	46	8	0.17	37	9	0.24
Northern Ireland	22	2	0.09	4	1	0.25	13	1	0.08	15	1	0.07
Wales	39	4	0.10	5	1	0.20	29	3	0.10	23	1	0.04
Scotland	68	9	0.13	16	0	0.00	45	8	0.18	35	6	0.17
UK	**843**	**109**	**0.13**	**185**	**24**	**0.13**	**534**	**75**	**0.14**	**425**	**58**	**0.14**

Table A1.4 Enterprises that received public support for innovation related activities, 1998-2000

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. in receipt of support*	*Proportion*	*No. of responses*	*No. in receipt of support*	*Proportion*	*No. of responses*	*No. in receipt of support*	*Proportion*	*No. of responses*	*No. in receipt of support*	*Proportion*
East Midlands	661	52	0.08	449	18	0.04	147	29	0.20	129	25	0.19
Eastern	709	60	0.08	485	23	0.05	168	27	0.16	132	24	0.18
London	916	51	0.06	653	19	0.03	195	25	0.13	156	23	0.15
North East	426	46	0.11	295	14	0.05	89	20	0.22	78	23	0.29
North West	807	63	0.08	580	26	0.04	164	28	0.17	136	24	0.18
South East	949	65	0.07	616	19	0.03	244	39	0.16	192	27	0.14
South West	590	45	0.08	383	15	0.04	144	25	0.17	123	16	0.13
West Midlands	692	51	0.07	497	18	0.04	139	25	0.18	130	24	0.18
Yorks and Humbs	720	62	0.09	508	26	0.05	146	27	0.18	120	23	0.19
Northern Ireland	151	35	0.23	106	8	0.08	31	18	0.58	30	20	0.67
Wales	365	48	0.13	244	17	0.07	82	21	0.26	82	22	0.27
Scotland	753	87	0.12	530	21	0.04	150	50	0.33	142	41	0.29
UK	**7739**	**665**	**0.09**	**5346**	**224**	**0.04**	**1699**	**334**	**0.20**	**1450**	**292**	**0.20**

Table A1.5 The impact of innovation activities, 1998-2000

Increased range of goods and services

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	280	0.51	336	109	0.32	145	134	0.92	181	128	0.71
Eastern	580	277	0.48	362	101	0.28	164	144	0.88	174	130	0.75
London	725	321	0.44	470	120	0.26	189	164	0.87	200	155	0.78
North East	359	164	0.46	233	66	0.28	88	74	0.84	104	75	0.72
North West	639	296	0.46	418	120	0.29	161	149	0.93	201	134	0.67
South East	785	389	0.50	455	125	0.27	245	216	0.88	240	190	0.79
South West	475	244	0.51	273	87	0.32	142	126	0.89	156	122	0.78
West Midlands	559	268	0.48	368	107	0.29	134	119	0.89	155	129	0.83
Yorks and Humbs	591	267	0.45	381	107	0.28	148	132	0.89	180	120	0.67
Northern Ireland	112	58	0.52	67	17	0.25	31	31	1.00	31	31	1.00
Wales	283	133	0.47	167	47	0.28	78	69	0.88	71	82	1.15
Scotland	594	254	0.43	378	90	0.24	144	128	0.89	153	141	0.92
UK	**6246**	**2951**	**0.47**	**3908**	**1096**	**0.28**	**1669**	**1486**	**0.89**	**1846**	**1437**	**0.78**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Opened new market or increased market share

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	254	0.47	336	84	0.25	145	129	0.89	128	102	0.80
Eastern	580	282	0.49	362	98	0.27	164	148	0.90	130	108	0.83
London	725	310	0.43	470	111	0.24	189	162	0.86	155	118	0.76
North East	359	161	0.45	233	58	0.25	88	73	0.83	75	63	0.84
North West	639	292	0.46	418	114	0.27	161	147	0.91	134	99	0.74
South East	785	375	0.48	455	113	0.25	245	208	0.85	190	150	0.79
South West	475	240	0.51	273	77	0.28	142	125	0.88	122	95	0.78
West Midlands	559	266	0.48	368	113	0.31	134	109	0.81	129	107	0.83
Yorks and Humbs	591	260	0.44	381	99	0.26	148	130	0.88	120	86	0.72
Northern Ireland	112	59	0.53	67	19	0.28	31	30	0.97	31	27	0.87
Wales	283	128	0.45	167	44	0.26	78	67	0.86	82	58	0.71
Scotland	594	252	0.42	378	88	0.23	144	122	0.85	141	103	0.73
UK	**6246**	**2879**	**0.46**	**3908**	**1018**	**0.26**	**1669**	**1450**	**0.87**	**1437**	**1116**	**0.78**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Improved quality of goods and services

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	289	0.53	336	111	0.33	145	130	0.90	128	111	0.87
Eastern	580	308	0.53	362	120	0.33	164	147	0.90	130	112	0.86
London	725	359	0.50	470	138	0.29	189	168	0.89	155	142	0.92
North East	359	190	0.53	233	80	0.34	88	76	0.86	75	69	0.92
North West	639	325	0.51	418	138	0.33	161	143	0.89	134	110	0.82
South East	785	423	0.54	455	142	0.31	245	215	0.88	190	168	0.88
South West	475	253	0.53	273	90	0.33	142	121	0.85	122	102	0.84
West Midlands	559	301	0.54	368	128	0.35	134	122	0.91	129	121	0.94
Yorks and Humbs	591	306	0.52	381	138	0.36	148	132	0.89	120	94	0.78
Northern Ireland	112	57	0.51	67	15	0.22	31	31	1.00	31	28	0.90
Wales	283	149	0.53	167	55	0.33	78	69	0.88	82	68	0.83
Scotland	594	277	0.47	378	101	0.27	144	126	0.88	141	117	0.83
UK	**6246**	**3237**	**0.52**	**3908**	**1256**	**0.32**	**1669**	**1480**	**0.89**	**1437**	**1242**	**0.86**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Improved production flexibility

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Per cent*	*No. of Respondents*	*No. stating there was an impact*	*Per cent*	*No. of Respondents*	*No. stating there was an impact*	*Per cent*	*No. of Respondents*	*No. stating there was an impact*	*Per cent*
East Midlands	544	231	0.42	336	85	0.25	145	99	0.68	128	106	0.83
Eastern	580	233	0.40	362	84	0.23	164	113	0.69	130	97	0.75
London	725	263	0.36	470	98	0.21	189	116	0.61	155	124	0.80
North East	359	154	0.43	233	60	0.26	88	62	0.70	75	62	0.83
North West	639	246	0.38	418	104	0.25	161	103	0.64	134	97	0.72
South East	785	320	0.41	455	105	0.23	245	158	0.64	190	143	0.75
South West	475	198	0.42	273	69	0.25	142	86	0.61	122	94	0.77
West Midlands	559	227	0.41	368	96	0.26	134	90	0.67	129	98	0.76
Yorks and Humbs	591	236	0.40	381	99	0.26	148	100	0.68	120	93	0.78
Northern Ireland	112	50	0.45	67	12	0.18	31	26	0.84	31	27	0.87
Wales	283	104	0.37	167	34	0.20	78	49	0.63	82	55	0.67
Scotland	594	216	0.36	378	77	0.20	144	88	0.61	141	105	0.74
UK	**6246**	**2478**	**0.40**	**3908**	**923**	**0.24**	**1669**	**1090**	**0.65**	**1437**	**1101**	**0.77**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Reduced unit labour costs

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	42	0.08	336	14	0.04	145	15	0.10	128	24	0.19
Eastern	580	32	0.06	362	5	0.01	164	17	0.10	130	22	0.17
London	725	34	0.05	470	10	0.02	189	13	0.07	155	23	0.15
North East	359	29	0.08	233	11	0.05	88	9	0.10	75	13	0.17
North West	639	34	0.05	418	15	0.04	161	10	0.06	134	17	0.13
South East	785	59	0.08	455	11	0.02	245	27	0.11	190	39	0.21
South West	475	38	0.08	273	6	0.02	142	22	0.15	122	29	0.24
West Midlands	559	44	0.08	368	14	0.04	134	19	0.14	129	27	0.21
Yorks and Humbs	591	32	0.05	381	8	0.02	148	18	0.12	120	23	0.19
Northern Ireland	112	13	0.12	67	2	0.03	31	6	0.19	31	8	0.26
Wales	283	17	0.06	167	3	0.02	78	11	0.14	82	12	0.15
Scotland	594	34	0.06	378	8	0.02	144	14	0.10	141	23	0.16
UK	**6246**	**408**	**0.07**	**3908**	**107**	**0.03**	**1669**	**181**	**0.11**	**1437**	**260**	**0.18**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Increased capacity

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	235	0.43	336	88	0.26	145	100	0.69	128	106	0.83
Eastern	580	246	0.42	362	88	0.24	164	113	0.69	130	108	0.83
London	725	273	0.38	470	102	0.22	189	117	0.62	155	128	0.83
North East	359	166	0.46	233	63	0.27	88	68	0.77	75	68	0.91
North West	639	255	0.40	418	112	0.27	161	103	0.64	134	99	0.74
South East	785	329	0.42	455	105	0.23	245	162	0.66	190	148	0.78
South West	475	209	0.44	273	69	0.25	142	96	0.68	122	102	0.84
West Midlands	559	239	0.43	368	100	0.27	134	95	0.71	129	106	0.82
Yorks and Humbs	591	241	0.41	381	104	0.27	148	95	0.64	120	95	0.79
Northern Ireland	112	50	0.45	67	13	0.19	31	27	0.87	31	26	0.84
Wales	283	114	0.40	167	36	0.22	78	54	0.69	82	62	0.76
Scotland	594	223	0.38	378	76	0.20	144	95	0.66	141	113	0.80
UK	**6246**	**2580**	**0.41**	**3908**	**956**	**0.24**	**1669**	**1125**	**0.67**	**1437**	**1161**	**0.81**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Reduced material consumption

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	195	0.36	336	68	0.20	145	88	0.61	128	90	0.70
Eastern	580	194	0.33	362	70	0.19	164	98	0.60	130	77	0.59
London	725	192	0.26	470	69	0.15	189	89	0.47	155	90	0.58
North East	359	126	0.35	233	48	0.21	88	53	0.60	75	54	0.72
North West	639	218	0.34	418	94	0.22	161	93	0.58	134	85	0.63
South East	785	243	0.31	455	82	0.18	245	121	0.49	190	103	0.54
South West	475	161	0.34	273	60	0.22	142	69	0.49	122	77	0.63
West Midlands	559	190	0.34	368	79	0.21	134	81	0.60	129	82	0.64
Yorks and Humbs	591	197	0.33	381	83	0.22	148	81	0.55	120	76	0.63
Northern Ireland	112	47	0.42	67	13	0.19	31	25	0.81	31	24	0.77
Wales	283	98	0.35	167	31	0.19	78	49	0.63	82	53	0.65
Scotland	594	179	0.30	378	64	0.17	144	69	0.48	141	89	0.63
UK	**6246**	**2040**	**0.33**	**3908**	**761**	**0.19**	**1669**	**916**	**0.55**	**1437**	**900**	**0.63**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Improved environmental impact or health and safety aspect

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	201	0.37	336	75	0.22	145	91	0.63	128	84	0.66
Eastern	580	224	0.39	362	87	0.24	164	105	0.64	130	86	0.66
London	725	210	0.29	470	94	0.20	189	89	0.47	155	80	0.52
North East	359	127	0.35	233	53	0.23	88	47	0.53	75	50	0.67
North West	639	229	0.36	418	107	0.26	161	91	0.57	134	76	0.57
South East	785	276	0.35	455	103	0.23	245	128	0.52	190	109	0.57
South West	475	174	0.37	273	66	0.24	142	78	0.55	122	75	0.61
West Midlands	559	208	0.37	368	87	0.24	134	91	0.68	129	82	0.64
Yorks and Humbs	591	229	0.39	381	107	0.28	148	89	0.60	120	75	0.63
Northern Ireland	112	42	0.38	67	14	0.21	31	21	0.68	31	20	0.65
Wales	283	103	0.36	167	35	0.21	78	51	0.65	82	49	0.60
Scotland	594	212	0.36	378	88	0.23	144	85	0.59	141	87	0.62
UK	**6246**	**2235**	**0.36**	**3908**	**916**	**0.23**	**1669**	**966**	**0.58**	**1437**	**873**	**0.61**

Table A1.5 The impact of innovation activities, 1998-2000, continued

Met regulations and standards

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of Respondents	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*	*No. of Respondents*	*No. stating there was an impact*	*Proportion*
East Midlands	544	219	0.40	336	86	0.26	145	98	0.68	128	83	0.65
Eastern	580	233	0.40	362	90	0.25	164	111	0.68	130	86	0.66
London	725	238	0.33	470	105	0.22	189	100	0.53	155	86	0.55
North East	359	133	0.37	233	58	0.25	88	50	0.57	75	53	0.71
North West	639	239	0.37	418	116	0.28	161	94	0.58	134	72	0.54
South East	785	289	0.37	455	107	0.24	245	143	0.58	190	107	0.56
South West	475	198	0.42	273	77	0.28	142	88	0.62	122	81	0.66
West Midlands	559	228	0.41	368	101	0.27	134	94	0.70	129	89	0.69
Yorks and Humbs	591	246	0.42	381	113	0.30	148	97	0.66	120	80	0.67
Northern Ireland	112	47	0.42	67	14	0.21	31	24	0.77	31	24	0.77
Wales	283	108	0.38	167	43	0.26	78	48	0.62	82	49	0.60
Scotland	594	221	0.37	378	85	0.22	144	96	0.67	141	95	0.67
UK	**6246**	**2399**	**0.38**	3908	995	0.25	1669	1043	0.62	1437	905	0.63

Table A1.6 Factors hampering innovation

Excessive perceived economic risk

	All enterprises			Non-innovators			Product Innovators			Process Innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	379	0.61	409	220	0.54	145	115	0.79	127	97	0.76
Eastern	673	393	0.58	450	228	0.51	166	124	0.75	133	98	0.74
London	847	473	0.56	587	277	0.47	191	143	0.75	154	121	0.79
North East	396	235	0.59	269	137	0.51	90	71	0.79	73	59	0.81
North West	752	444	0.59	527	284	0.54	164	122	0.74	134	98	0.73
South East	899	548	0.61	570	285	0.50	243	200	0.82	190	155	0.82
South West	567	341	0.60	358	181	0.51	146	120	0.82	127	96	0.76
West Midlands	647	383	0.59	453	233	0.51	136	109	0.80	129	101	0.78
Yorks and Humbs	681	381	0.56	471	237	0.50	146	105	0.72	121	85	0.70
Northern Ireland	138	83	0.60	95	46	0.48	30	25	0.83	30	27	0.90
Wales	341	196	0.57	222	115	0.52	80	59	0.74	82	57	0.70
Scotland	689	414	0.60	469	248	0.53	148	112	0.76	144	113	0.78
UK	**7247**	**4270**	**0.59**	**4880**	**2491**	**0.51**	**1685**	**1305**	**0.77**	**1444**	**1107**	**0.77**

Table A1.6 Factors hampering innovation, continued

Direct innovation costs too high

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	410	0.66	409	232	0.57	145	128	0.88	127	111	0.87
Eastern	673	421	0.63	450	242	0.54	166	135	0.81	133	106	0.80
London	847	493	0.58	587	285	0.49	191	151	0.79	154	135	0.88
North East	396	249	0.63	269	143	0.53	90	78	0.87	73	63	0.86
North West	752	476	0.63	527	291	0.55	164	141	0.86	134	109	0.81
South East	899	574	0.64	570	292	0.51	243	217	0.89	190	165	0.87
South West	567	358	0.63	358	190	0.53	146	124	0.85	127	102	0.80
West Midlands	647	404	0.62	453	243	0.54	136	116	0.85	129	109	0.84
Yorks and Humbs	681	417	0.61	471	250	0.53	146	118	0.81	121	99	0.82
Northern Ireland	138	91	0.66	95	53	0.56	30	27	0.90	30	27	0.90
Wales	341	206	0.60	222	114	0.51	80	66	0.83	82	65	0.79
Scotland	689	419	0.61	469	243	0.52	148	118	0.80	144	118	0.82
UK	**7247**	**4518**	**0.62**	**4880**	**2578**	**0.53**	**1685**	**1419**	**0.84**	**1444**	**1209**	**0.84**

Table A1.6 Factors hampering innovation, continued

Cost of finance

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	385	0.62	409	236	0.58	145	106	0.73	127	93	0.73
Eastern	673	400	0.59	450	247	0.55	166	115	0.69	133	88	0.66
London	847	476	0.56	587	286	0.49	191	137	0.72	154	119	0.77
North East	396	249	0.63	269	153	0.57	90	70	0.78	73	59	0.81
North West	752	463	0.62	527	297	0.56	164	123	0.75	134	96	0.72
South East	899	551	0.61	570	295	0.52	243	191	0.79	190	151	0.79
South West	567	338	0.60	358	191	0.53	146	108	0.74	127	89	0.70
West Midlands	647	383	0.59	453	238	0.53	136	103	0.76	129	97	0.75
Yorks and Humbs	681	420	0.62	471	262	0.56	146	108	0.74	121	95	0.79
Northern Ireland	138	87	0.63	95	51	0.54	30	26	0.87	30	25	0.83
Wales	341	203	0.60	222	120	0.54	80	59	0.74	82	58	0.71
Scotland	689	438	0.64	469	269	0.57	148	113	0.76	144	112	0.78
UK	**7247**	**4393**	**0.61**	**4880**	**2645**	**0.54**	**1685**	**1259**	**0.75**	**1444**	**1082**	**0.75**

Table A1.6 Factors hampering innovation, continued

Availability of finance

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	349	0.57	205	136	0.66	145	96	0.66	127	89	0.70
Eastern	673	372	0.55	220	146	0.66	166	113	0.68	133	85	0.64
London	847	443	0.52	254	164	0.65	191	120	0.63	154	106	0.69
North East	396	221	0.56	123	83	0.67	90	65	0.72	73	52	0.71
North West	752	437	0.58	224	160	0.71	164	121	0.74	134	93	0.69
South East	899	513	0.57	326	238	0.73	243	182	0.75	190	143	0.75
South West	567	318	0.56	207	140	0.68	146	105	0.72	127	82	0.65
West Midlands	647	354	0.55	189	129	0.68	136	93	0.68	129	86	0.67
Yorks and Humbs	681	378	0.56	203	133	0.66	146	98	0.67	121	83	0.69
Northern Ireland	138	82	0.59	43	33	0.77	30	23	0.77	30	24	0.80
Wales	341	190	0.56	114	75	0.66	80	56	0.70	82	56	0.68
Scotland	689	403	0.58	215	154	0.72	148	105	0.71	144	102	0.71
UK	**7247**	**4060**	**0.56**	**2323**	**1591**	**0.68**	**1685**	**1177**	**0.70**	**1444**	**1001**	**0.69**

Table A1.6 Factors hampering innovation, continued

Organisational rigidities within the enterprise

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	325	0.53	409	182	0.44	145	101	0.70	127	85	0.67
Eastern	673	323	0.48	450	182	0.40	166	107	0.64	133	84	0.63
London	847	385	0.45	587	235	0.40	191	108	0.57	154	100	0.65
North East	396	188	0.47	269	113	0.42	90	51	0.57	73	49	0.67
North West	752	360	0.48	527	224	0.43	164	106	0.65	134	83	0.62
South East	899	459	0.51	570	239	0.42	243	164	0.67	190	130	0.68
South West	567	281	0.50	358	153	0.43	146	95	0.65	127	78	0.61
West Midlands	647	300	0.46	453	179	0.40	136	89	0.65	129	77	0.60
Yorks and Humbs	681	333	0.49	471	212	0.45	146	90	0.62	121	68	0.56
Northern Ireland	138	68	0.49	95	43	0.45	30	19	0.63	30	19	0.63
Wales	341	160	0.47	222	96	0.43	80	46	0.58	82	46	0.56
Scotland	689	329	0.48	469	198	0.42	148	90	0.61	144	89	0.62
UK	**7247**	**3511**	**0.48**	**4880**	**2056**	**0.42**	**1685**	**1066**	**0.63**	**1444**	**908**	**0.63**

Table A1.6 Factors hampering innovation, continued

Lack of qualified personnel

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	368	0.60	409	202	0.49	145	119	0.82	127	101	0.80
Eastern	673	403	0.60	450	231	0.51	166	131	0.79	133	103	0.77
London	847	447	0.53	587	269	0.46	191	127	0.66	154	118	0.77
North East	396	230	0.58	269	140	0.52	90	64	0.71	73	53	0.73
North West	752	431	0.57	527	271	0.51	164	118	0.72	134	98	0.73
South East	899	550	0.61	570	297	0.52	243	189	0.78	190	150	0.79
South West	567	345	0.61	358	181	0.51	146	120	0.82	127	102	0.80
West Midlands	647	379	0.59	453	234	0.52	136	108	0.79	129	96	0.74
Yorks and Humbs	681	391	0.57	471	246	0.52	146	102	0.70	121	85	0.70
Northern Ireland	138	87	0.63	95	52	0.55	30	25	0.83	30	23	0.77
Wales	341	200	0.59	222	110	0.50	80	63	0.79	82	63	0.77
Scotland	689	380	0.55	469	217	0.46	148	109	0.74	144	107	0.74
UK	**7247**	**4211**	**0.58**	**4880**	**2450**	**0.50**	**1685**	**1275**	**0.76**	**1444**	**1099**	**0.76**

Table A1.6 Factors hampering innovation, continued

Lack of information on technology

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	349	0.57	409	194	0.47	145	112	0.77	127	97	0.76
Eastern	673	366	0.54	450	204	0.45	166	123	0.74	133	95	0.71
London	847	421	0.50	587	249	0.42	191	122	0.64	154	117	0.76
North East	396	217	0.55	269	132	0.49	90	64	0.71	73	47	0.64
North West	752	401	0.53	527	249	0.47	164	113	0.69	134	92	0.69
South East	899	503	0.56	570	266	0.47	243	174	0.72	190	144	0.76
South West	567	304	0.54	358	162	0.45	146	101	0.69	127	87	0.69
West Midlands	647	348	0.54	453	211	0.47	136	102	0.75	129	92	0.71
Yorks and Humbs	681	365	0.54	471	224	0.48	146	99	0.68	121	83	0.69
Northern Ireland	138	68	0.49	95	42	0.44	30	18	0.60	30	19	0.63
Wales	341	197	0.58	222	110	0.50	80	61	0.76	82	63	0.77
Scotland	689	365	0.53	469	213	0.45	148	98	0.66	144	97	0.67
UK	**7247**	**3904**	**0.54**	**4880**	**2256**	**0.46**	**1685**	**1187**	**0.70**	**1444**	**1033**	**0.72**

Table A1.6 Factors hampering innovation, continued

Lack of information on markets

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	354	0.57	409	198	0.48	145	116	0.80	127	97	0.76
Eastern	673	359	0.53	450	204	0.45	166	120	0.72	133	89	0.67
London	847	415	0.49	587	244	0.42	191	126	0.66	154	107	0.69
North East	396	218	0.55	269	128	0.48	90	69	0.77	73	53	0.73
North West	752	393	0.52	527	246	0.47	164	114	0.70	134	85	0.63
South East	899	504	0.56	570	258	0.45	243	186	0.77	190	144	0.76
South West	567	315	0.56	358	168	0.47	146	112	0.77	127	84	0.66
West Midlands	647	349	0.54	453	207	0.46	136	102	0.75	129	96	0.74
Yorks and Humbs	681	363	0.53	471	216	0.46	146	109	0.75	121	85	0.70
Northern Ireland	138	76	0.55	95	45	0.47	30	22	0.73	30	21	0.70
Wales	341	187	0.55	222	105	0.47	80	60	0.75	82	59	0.72
Scotland	689	361	0.52	469	210	0.45	148	99	0.67	144	98	0.68
UK	**7247**	**3894**	**0.54**	**4880**	**2229**	**0.46**	**1685**	**1235**	**0.73**	**1444**	**1018**	**0.70**

Table A1.6 Factors hampering innovation, continued

Impact of regulations or standards

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	367	0.59	409	218	0.53	145	107	0.74	127	89	0.70
Eastern	673	400	0.59	450	235	0.52	166	126	0.76	133	99	0.74
London	847	444	0.52	587	258	0.44	191	142	0.74	154	113	0.73
North East	396	231	0.58	269	134	0.50	90	73	0.81	73	56	0.77
North West	752	421	0.56	527	269	0.51	164	113	0.69	134	94	0.70
South East	899	525	0.58	570	285	0.50	243	188	0.77	190	137	0.72
South West	567	351	0.62	358	188	0.53	146	123	0.84	127	96	0.76
West Midlands	647	369	0.57	453	235	0.52	136	96	0.71	129	88	0.68
Yorks and Humbs	681	400	0.59	471	252	0.54	146	101	0.69	121	88	0.73
Northern Ireland	138	73	0.53	95	44	0.46	30	21	0.70	30	21	0.70
Wales	341	187	0.55	222	107	0.48	80	60	0.75	82	56	0.68
Scotland	689	397	0.58	469	244	0.52	148	98	0.66	144	105	0.73
UK	**7247**	**4165**	**0.57**	**4880**	**2469**	**0.51**	**1685**	**1248**	**0.74**	**1444**	**1042**	**0.72**

Table A1.6 Factors hampering innovation, continued

Lack of customer responsiveness to new goods or services

	All enterprises			Non-innovators			Product innovators			Process innovators		
	No. of responses	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*	*No. of responses*	*No. citing factor as important*	*Proportion*
East Midlands	617	378	0.61	409	216	0.53	145	120	0.83	127	96	0.76
Eastern	673	395	0.59	450	224	0.50	166	133	0.80	133	99	0.74
London	847	458	0.54	587	268	0.46	191	144	0.75	154	114	0.74
North East	396	239	0.60	269	139	0.52	90	74	0.82	73	59	0.81
North West	752	449	0.60	527	284	0.54	164	128	0.78	134	96	0.72
South East	899	548	0.61	570	286	0.50	243	202	0.83	190	149	0.78
South West	567	345	0.61	358	195	0.54	146	115	0.79	127	89	0.70
West Midlands	647	396	0.61	453	240	0.53	136	114	0.84	129	102	0.79
Yorks and Humbs	681	416	0.61	471	256	0.54	146	119	0.82	121	90	0.74
Northern Ireland	138	86	0.62	95	48	0.51	30	26	0.87	30	26	0.87
Wales	341	196	0.57	222	113	0.51	80	62	0.78	82	58	0.71
Scotland	689	397	0.58	469	237	0.51	148	110	0.74	144	104	0.72
UK	**7247**	**4303**	**0.59**	**4880**	**2506**	**0.51**	**1685**	**1347**	**0.80**	**1444**	**1082**	**0.75**