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Specialised Markets and the Behaviour of Firms: Evidence from the UK's Regional Economies

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Specialised Markets and the Behaviour of Firms:Evidence from the UK's Regional Economies

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Abstract

A key feature of the South East regional economy in recent decades has been the development of several intermediate markets in specialised business services. This paper investigates whether the greater development of specialised markets in the South East is associated with different competitive and technological behaviours of innovative firms in this region when compared with firms in the Industrial Heartland regions of the West Midlands, North West England and Yorkshire and Humberside. We find greater buying and selling of technology by firms, and the presence of technological externalities in the South East, even when the services-intensive nature of the region's production is accounted for. Industrial Heartland firms, in contrast, more frequently collaborate with domestic suppliers who are also an important source of technology. They also have greater collaboration with Higher Education Institutes.

Keywords: Specialised intermediate markets, inter-firm division of labour, technological behaviour, regional development and regional advantages.

Historically, the industrial economy of UK has developed around two main centres of growth. One centre has developed in South East England, focused on London, and characterised during this century by the growth of numerous service industries. The second developed in the Midlands and north of Britain, focused on the coalfields and industrial areas of the West Midlands, North West England and Yorkshire, based on a strong manufacturing tradition. These areas are illustrated in Figure 1.[i] The evolution of the regional economies of the South East and Industrial Heartland has differed significantly, and debate on these differences has taken place in the context of the UK's so called North-South divide (Martin, 1988; Lewis and Townsend, 1989: Keeble and Bryson, 1996).

The SouthEast's economy is much larger, faster growing and more integrated than those of the Industrial Heartland. Its GDP is three to five times larger than that of the North West, West Midlands, or Yorkshire and the Humber, and rates of growth in the South East economy have been higher than in the Industrial Heartland for two decades now.[ii] The existing secondary evidence on regional development strongly suggests that the South East has many features that may characterise an economy growing with a greater division of labour and the emergence since the 1970s of several specialised markets in the services sector of the economy may be seen as an example of this tendency.

The development (or underdevelopment) of specialised markets, in our view, constitutes an important structural difference, reflecting previous histories and volume of economic growth, between the two regional economies. In this paper we explore if this difference in the structure of the two economies is associated with differences in the technological behaviour and competitive advantages of firms in the two regions. We examine this conjecture empirically, by using qualitative data from a unique innovation survey of UK small and medium sized enterprises (SMEs) conducted by the ESRC Centre for Business Research at the University of Cambridge, for the period 1992–95.

The remainder of the paper is organised in the following way. Section 1 outlines the arguments linking specialisation and innovative behaviour. Section 2 summarises the implication of the arguments in Section 1 for firm behaviour in the two regional economies and formalises testable hypotheses about the behaviour of firms in the two regions. Section 3 outlines the data and methods used in our analysis. Section 4 reports and discusses the empirical results and Section 5 concludes with some implications of our study.

1 Specialised Markets and their impact on firm behaviours: conceptual arguments

1.1 The emergence of specialised intermediate markets

Adam Smith linked the enlargement of demand to increasing division of labour and specialisation in 1776. As the exchange market for final goods grows, it becomes more efficient for firms to specialise both internally and within an industrial filiere. Among later economists both Young (1929) and Stigler (1951) recognised the importance of the scale of the market as the one factor, which ultimately determined the emergence of new industries through specialised markets and vertical disintegration. The industrial history of the last two centuries shows several instances of the growth of such markets: the emergence of a

specialised capital goods sector in the late nineteenth century, the emergence of specialised engineering firms for chemical plant designs in the immediate post-war period, and the more recent emergence of a specialised software and business services sector are some such instances.

Specialised intermediate markets that emerge due to vertical disintegration and give rise to arms-length markets are not a frequently observed economic process. This is because such specialised intermediate markets can only emerge when both the separability of a production process into smaller elementary components is possible (Scazzieri 1993) and the volume of demand becomes large enough to justify the specialised investment (Stigler 1951). The conjunction of the two factors happens uncommonly. Thus, specialisation due to vertical disintegration tends to be uneven both across industrial sectors and regions.

A more frequent occurrence is the development of intermediate markets due to outsourcing of parts of production by large firms, which can happen with moderate growth of exchange markets for final goods. Also known as externalisation, outsourcing is the contracting out of services previously performed within a large integrated firm to smaller firms that may be independent entities. Outsourcing allows the large firm to cut down on overheads and to overcome supervision costs that may arise due to the managerial complexity created by having to handle many different stages of production at large volumes of production.

Supplier firms in a situation of outsourcing behave very similarly to intermediate firms in the case of vertically disintegrated specialised markets. Nevertheless the two situations are different. The difference lies in the fact that vertically disintegrated markets are arms-length markets. The producers of intermediate goods in such markets are reasonably independent entities and not tied to the firms to whom they sell their output. They are independent with regard to their decisions about how to expand their growth and less constrained about the technological and production decisions they might have to take to achieve their growth. In contrast, outsourcing is often characterised by the dominance of a few large buying firms and the decisions of the several ancillary firms supplying almost exclusively to these firms are often constrained by the objectives of their large buyers. As a consequence outsourcing is often accompanied by the dominance of relational contracting between the large firms and their suppliers.

The extent to which final demands increase can thus influence the organisation of production in the economy. Where the growth of final demands has been relatively rapid and the scale of the market is large, arms length intermediate markets will characterise the organisation of production. Where the growth of final demands has been relatively constrained, intermediate markets develop due to outsourcing but in such markets a few large firms exert considerable market power. In turn, whether intermediate markets in production emerge as outsourced markets or as arms-length specialised markets also influences the sources of technological change, modes of technology transfer and acquisition used by firms and the competitive behaviour of firms in the economic system. To understand why, we need to consider what happens when arms length, specialised intermediate markets develop.

1.2 Vertical disintegration, outsourcing and their impact on technological behaviours

Even when they do develop, arms length intermediate markets develop on the basis of narrow demands. This is because the demand for any intermediate commodity is a derived demand from the demand for the final good. If 4 units of an intermediate good are used to produce 10 units of the final good, then an increase in final demand to 20 will still increase the demand for the intermediate good by only 4 units and not by 10. However, if the intermediate product could be used in several different sectors then this narrowness of demand can be overcome. Athreye (1998) and Breshnehan and Gambardella (1999) have shown that the emergence of specialised intermediate markets is based on several sectors of use rather than single sectors of use. The need to overcome the narrowness of demand makes such arms length specialised markets develop into general-purpose intermediate sectors even though each firm within the sector may be quite narrowly specialised in its particular application area. Thus, the capital goods sector served the textiles, iron and steel and automobile industry and not any one of these industries alone. Within this sector there was a clear difference between firms that made textile machinery or automobile machinery but the important feature was that both sorts of firms benefited from the expertise of each other in aspects of mechanical engineering and used a common pool of skilled labour.

The emergence of arms length specialised sectors thus creates a curious interdependence among producers in the economy at least three levels. Firstly, as Rosenberg (1963) pointed out the economy as a whole benefits from economies of specialisation, due to the presence of specialised intermediate sectors. Improvements in one area of mechanical engineering technology were transmitted across the industrial sector through product improvements to several manufactured capital goods that shared a common technological base, thus raising the rate of technological innovation.[iii] Secondly, the specialised intermediate sector draws on a common pool of trained labour that itself acquires expertise through its experience in various kinds of application areas. Groups of industries that draw upon the common intermediate sector may also cluster together to derive the first two advantages. All these types of interdependence are sources of positive externalities in regional and industrial growth.

Thirdly and most importantly, the existence of specialised sectors makes entry easier in the economy. The emergence of a machine tool sector meant that producers had the opportunity to search for the kind of machinery they wanted without having to incur all the costs of learning how to make the machinery themselves. This brings down the set-up cost of entry making the economy more competitive. Thus, the rapid growth of arms length markets within the economic system may be associated with amore competitive environment in the economy.

Where arms-length specialised markets do not emerge, or intermediate markets emerge only through outsourcing, regional economies tend to become more dependent on imports of these specialised inputs from other regions. Some benefits from the development of arms length specialised markets elsewhere will flow to these regions through trade and through the improvements embodied in the goods traded, but in the case of specialised services the lack of proximity may also impose substantial costs. Business services typically require considerable interaction and communication between the buying and selling firms.

At the firm level, additionally, there could be a marked tendency for vertically integrated production and internalisation of the missing arms-length markets. The locus of innovation in vertically integrated markets tends to be contained within firms and as a consequence of imitative entry, perhaps within particular industrial sectors. Vertically integrated firms and outsourced production are both associated with the market power of a few large firms. Economic environments in such a situation maybe less competitive

Science and technology are still harnessed by firms to enhance the productivity of industrial production, but this effort may be undertaken more consciously through created and less anonymous interactions. Institutions for knowledge sharing may also be important in spreading new technological information in the absence of specialised markets. This could take the form of more frequent formal linkages with Higher Education Institutes and public sector research laboratories. Equally, vertical collaborations between firms, such as suppliers and customers, along the production filiere may substitute for the missing specialised markets. Furthermore, research on innovation has shown that all these arrangements have an important role to play in explaining innovative behaviour indifferent countries and also in different industrial sectors.

1.3 The development of specialised markets in the UK

The development of specialised markets is very hard to measure empirically. Particularly difficult is the empirical distinction between outsourced markets and arms-length markets. Further, the development of specialised markets has historically been related to groups of industries making the economy wide effect of such markets difficult to separate from the sectoral or technology specific effects. Thus, the emergence of the capital goods and machine tools sectors was closely associated with the rise of mechanical industries, specialised engineering firms were closely associated with the rise of chemical industries, and the more recent emergence of software and business services has been associated with the emergence of microelectronics and digital industries and the growth of the so-called 'new economy'.

Several studies have indicated that the new economy based on information and communications technology is strongly concentrated in the Southeast region. Thus, Huggins (2000) computes an index of relative specialisation in knowledge-based industries and finds that the Southeast counties show a relative specialisation in these industries. Tether and Howells (2000) find a similar concentration of ICT employment in the Southeast relative to the Northwest region.

Since the 1980s the mushrooming growth of the business services industry (including software and computer services) is seen by many to be an important source of productivity improvement in OECD countries and a consequence of increasing specialisation (Antonelli 1998). Since business services are measured as a separate industrial category in the UK SIC, the relative size of this sector provides a rough (under) estimate of the extent of specialised market development in the regional economy.

The UK economy shows great regional variation in the distribution of business and professional services providing intermediate inputs to other firms in the economy. In 1998, advanced business and financial services as a whole (all financial, professional and business services) accounted for 23.7% of total employment in South East England, compared to

only 14.8% for the Industrial Heartland.[iv] The South East economy thus possesses a greater incidence of specialised markets as measured by the volume of business services available to the region's firms than the Industrial Heartland.

Wood *et al* (1993, 691-2) also argue that the South East also offers a much greater range of specialised intermediate business services than the Industrial Heartland. To quote: 'in the North West ...[with its] smaller and more diffuse market compared with London and the South East...many small business service companies project themselves as generalists. In contrast, the size and functional diversity of the southern market favour specialisation in the types of clients served and the forms of specialised expertise that small business service firms offer'.[v]

Finally, surveys by workers such as O'Farrell *et al* (1993a, p.390) have demonstrated that firms in the smaller regional markets of the United Kingdom 'are more likely than their counterparts in core regions (such as the South East) to import their service inputs from other regions', such as the South East, presumably because of the underdevelopment of specialised markets in business services in these regions.

An important difference between the two regional economies studied here is in the composition of industrial production. The industries that absorb most of the employment in the Industrial Heartland regions are manufacturing-based while the new economy, which is concentrated in the Southeast region, is predominantly service-based. A moot point in discussions of regional difference is thus whether we can isolate the effects of the regional environment from those that could be attributed to differences in industrial composition alone.

2 Specialised markets and their implications for firm behaviour: testable hypotheses

In this section we try and draw out the implication of the arguments presented in Section 1 for differences in firm technology acquisition and exploitation and competitive advantages of firms in the presence and absence of specialised (intermediate) markets. Since the extent of development of specialised services markets is a key difference between the two regions of the South East and the Industrial Heartland, these expected differences in behaviour carry over as expected differences in the behaviour of firms in these two regional economies.

Our conjectures in Section 1.2 were based upon the distinction between outsourced markets and arms-length markets. To simplify our analysis we assume that outsourced markets are likely to occur with the underdevelopment of intermediate markets. That is to say, as markets for intermediate goods become larger, firms supplying such products will not need to depend upon particular buyers and will begin to behave more like firms in an arms-length market. Available evidence suggests that the lesser development of specialised intermediate markets in the Industrial Heartland co-exists with a relatively higher incidence of outsourcing.[vi]

Our hypotheses implicitly assume that South East England and the regions of the Industrial Heartland represent different and distinct regional markets and that the SMEs in these regions are principally engaged in supplying their own regional market. The considerable distances between the South East and the Industrial Heartland regions support these

assumptions. In addition Curran and Blackburn (1994:77) found that small firms in different British localities on average sold almost two thirds of their output locally, within a radius of 10 miles. Treating regions, as regional markets may not be so wrong for our data-set which draws on a population of small and medium sized firms.

The existence of arms-length, specialised markets should favour a greater reliance on market modes in technological transfer by firms in such an economy. Thus we may expect a higher incidence of purchase and sales of R&D services between firms and a greater reliance on the use of technology transfer instruments like licenses and patents. Following the greater specialisation in the South East economy, we would expect such behaviour to be more frequent in the activities of innovative firms in the South East. We would also expect to see a greater preponderance of activities that co-ordinate segmented innovations across firms. This would mean the predominance of licensing instruments in technology acquisition activities.

Collaborative arrangements (such as outsourcing of supply) between firms may be instituted to overcome the deficiencies caused by underdeveloped arms length markets. Equally, the absence of specialised markets may favour the use of embodied forms of technology transfer such as equipment purchases. Firms may also resort to the use of consultancy services and bought in R&D (both of which are akin to outsourcing) to the extent that they are available regionally, or depend upon the buying in of such services, for technology acquisition, perhaps from outside the region. We would expect to observe all these behaviours by firms in the Industrial Heartland.

An important issue is the impact of specialised intermediate markets on the importance of firm specific sources of technology, i.e. through past learning and experience. It is not clear what we can expect here. On one hand, specialisation makes it possible for firms not to have to learn everything. On the other hand better firm capability may help them exploit expertise available in specialised markets in much better ways.

Arms length intermediate markets, we argued, are capable of generating technological externalities for firms in other sectors. The impact of this on firm behaviour is less easy to measure, as the meaning of an externality is that it is not attributable to any identifiable single source of technology. However, the effect of such externalities may show up in the sources of competitive advantage available to all firms in the regional economy, or a general lack of information on technology faced by innovating firms, in regions where such arms length specialised markets are less developed.

Lastly, we argued that the presence of arms-length markets is likely to be associated with a more competitive environment in the regional economy. The presence of arms length, specialised markets may also be associated with particular competitive advantages for firms (innovating and non-innovating) in the two regions. This could take the form of the possession of specialised expertise or the presence of better market knowledge and skills, among South East firms. Equally we might expect to find the expression of this externality in the barriers faced by firms to innovation. Information on technology may be less easily and widely available in the Industrial Heartland.

3 Data and Method

To assess our hypotheses empirically we use firm level survey data collected by the ESRC Centre for Business Research at the University of Cambridge from a large sample of SMEs in our two regions. Details about the data and how they were collected are contained in Cosh and Hughes (1996). Appendix A also describes some characteristics of our sample of firms. Table A1 reports the counties included in the Industrial Heartland and South East England.

In our analysis of technology acquisition and exploitation by firms we focus only on those firms that reported product or process innovations[vii], so that we can compare like with like in the two regions. Innovative firms are also more likely to be active in technology acquisition and exploitation. Where we expect general differences in behaviour we analysed these differences for all firms, innovators and non-innovators alike. This is the case when we compare the incidence of collaborative behaviour (due to an absence of specialised markets) and differences in the sources of competitive advantage (due to the existence of specialised markets).

The data on qualitative factors that we analyse come from two sorts of questions:

(1) Questions where firms were asked to tick the methods employed to transfer or acquire technology, or the type of partner with which they have formal or informal collaborative arrangements. Here the relative frequencies of firms reporting various categories is analysed and we employ a test of proportions to assess the greater or lesser incidence. These results are reported in Tables 1–3.

(2) Questions where firms were asked to rank a factor on a Likert scale from 1 to 5, with 1 indicating 'not very important' to 5, indicating 'extremely important'. Questions that employ this format are those that ask firms about the *importance* of objectives of innovation, barriers to innovation, the various sources of innovation, and sources of competitive advantage. To assess the differences in the two groups of firms we test for the statistical significance of a difference in mean scores based on a t-test. Additionally we report the results of the non-parametric Kruskall-Wallis test of a difference in the median ranks for the two regional groups.[viii] These results are reported in Tables 4–7.

An important caveat we need to bear in mind in interpreting the results is the different industrial composition, especially the mix of manufacturing and service activities, in the two regions. As noted earlier, and as is also evident from Appendix A, the Industrial Heartland has a larger share of manufacturing activity while the South East economy has a larger proportion of service sector firms. The simple univariate methods that we use do not enable us to control for this factor in an easy way.

We have, however, taken explicit account of this factor in our interpretation of results, by reporting earlier published results in Cosh and Hughes (1996) and Hughes and Wood (1999) that have analysed differences in the same variables pooled by sector (manufacturing versus services). If the regional effect were of any significance, we would expect to see an

alternative set of factors to show up as significantly different in the regional grouping of the data when compared to a grouping of the data by manufacturing or services sector.

4 Empirical results

Many of our hypothesised conjectures about the impact of specialised markets on the technological behaviour of firms receive strong empirical support. Further, we find that most of the observed differences in technological behaviours between the two regions are not reflections of the differing industrial compositions of the two regions. Rather these differences are in line with our conjectures about the effects of developed arms-length markets. However, the objectives of innovation are closely determined by technological opportunities and reflect industry specific opportunities. We find some support for greater new firm formation in the South East, but the regional differences in competitive environments and sources of competitive advantage largely reflect their different industrial compositions. In the following discussion, the differences in technological behaviours are reported first, followed by the differences in the competitive environment and sources of competitive advantage for SMEs in the two regions.

4.1 Regional differences in technological behaviours

As hypothesised, the most significant differences in the behaviour of innovating firms due to the existence or underdevelopment of specialised (technology) markets are in the methods used to buy and sell technology. Innovating firms in the South East show a significantly greater reliance on market modes of selling and acquiring technology than do similar firms in the Industrial Heartland. Thus as Table 1 shows, both product and process innovators in the South East are appreciably more likely to report the selling of technology by using licenses, the provision of technology or expertise to other firms through consultancy services, and the carrying out and selling of R&D services to other firms, than are their Industrial Heartland counterparts. In contrast, the most favoured method of technology transfer reported in the Industrial Heartland is through the sale of equipment. Moore (1996:69) reports that no strong relationships were found in the CBR SME dataset between modes of transferring technology and sectoral characteristics. This suggest that all the differences observed can be attributed to a 'regional' effect, perhaps due to the development of arms length specialised markets as we have argued.

Table 2 analyses the most frequently used modes for buying technology. Of the various methods considered here the buying-in R&D and the use of consultancy services can be taken as symptomatic of outsourcing behaviour by the buying firm. Here again we find important regional differences. The buying of rights to use other firms' or organisations' inventions dominates all other modes of technology acquisition for innovating firms in the South East and the frequency of this method of acquiring technology is far higher than that for similar firms in the Industrial Heartland. Product and process innovators in the Industrial Heartland however tend to make more use of bought-in R&D and consultancy services than do similar South East firms, with the one exception of process innovators' use of consultancies.

A comparison of these differences with those obtained by grouping SMEs according to whether they are manufacturing or service firms is also revealing. Service firms show a somewhat greater propensity to acquire technologies through licenses and through the

buying in of R&D. Manufacturing and service firms do not show any significant differences in the use of consultancy services. This suggests that while the dominance of licensing in acquiring technology in the South East is possibly a consequence of its services orientation, the greater use of bought-in R&D services and consultancy services by Industrial Heartland firms cannot be seen to be a consequence of its manufacturing bias. We would suggest that these results show the relatively greater dependence of the Industrial Heartland regions on technology imports due to the underdevelopment of these regions' specialised services markets.

Table 3 analyses the incidence of collaborative arrangements with different types of partners among all firms in the two regional economies. There is no overall difference in the extent of collaborative activity (percentage reporting no collaborations) between the two regions. The same data analysed for overall sector differences in Kitson and Wilkinson (1996) revealed that service firms in the UK show a greater propensity for collaboration compared with manufacturing firms.

In contrast, there are significant regional differences in frequencies of collaborative arrangements with different types of partners. Vertical collaborative arrangements (with suppliers and customers) are more frequently reported by Industrial Heartland SMEs. Furthermore, these collaborations are more frequently with other UK firms than with overseas firms. The same pattern characterises collaborations with higher education institutes.

In contrast, South East firms show a greater incidence of horizontal collaborations with firms in their own line of business. The difference is particularly great in the case of the minority of such collaborations that are with overseas firms. This finding probably reflects the greater international orientation of South East firms noted earlier.

The relative importance of the different external sources of technology for innovators in the two regions (Table 4) does appear to reflect the sectoral composition of SMEs in the two regions. Thus Table 4 shows that both product and process innovators in the Industrial Heartland rate suppliers of materials and components as a more important source of technology than do similar firms in the South East. Attendance at professional conferences is rated as a more important source of innovation by product innovators in the South East. Analysing the same data, Hughes and Wood (1999) found that manufacturing firms rated suppliers of materials and components and attendance at fairs and exhibitions as more important external sources of innovation than did firms engaged in the provision of business services. Business service firms on the other hand, ranked professional conferences, meetings and professional journals as more important external sources of innovation than did manufacturing firms.

However, put together with the importance of bought-in technology as a mode of acquisition of technology, the importance of suppliers of materials and components as a source of innovation emphasises the reliance of Industrial Heartland firms on the purchase of embodied innovation from other firms. Interestingly, local Chambers of Commerce are a significantly more important source of innovation for process innovators in the Industrial Heartland: a difference that cannot be explained by the industrial composition of the two regions.

The most interesting results revealed by Table 4, however, are in considering internal sources of innovation. Innovation sources within the group of which the firm is part are rated much more highly by product innovators in the Industrial Heartland than is the case with their counterparts in the South East. Although the number of firms involved is not large, this finding almost certainly reflects the lack of R&D facilities in Industrial Heartland subsidiaries, or the presence of associated companies whose main R&D centres are located in other parts of Britain. South East subsidiaries in contrast are more likely to possess their own internal R&D activity and therefore rate access to group R&D less highly.

Firm-specific sources of innovation are rated significantly more highly as a source of innovation by both product and process innovators in the South East. Indeed, firm-specific sources are ranked the highest of all sources of innovation by South East SMEs. Furthermore, this is not a result that is attributable to a manufacturing versus services composition of economic activity. Following the discussion in Section 2.1, we suggest that this finding reflects the importance of internal sources of technology in being able successfully to exploit the benefits of the South East's specialised markets and the regional technological externalities that emanate from their existence.

The objectives of innovation by firms in the two regions (reported in Table 5) show few differences, and those differences that are observed faithfully reflect differences in the industrial composition between the two regions. Both product and process innovators in the Industrial Heartland rate reducing production lead times significantly more highly as an innovation objective than do South East firms. Product innovators in the Industrial Heartland are also more concerned about reducing environmental damage and improving working conditions than their counterparts in the South East. Process innovators rate the objective of reducing energy consumption as more important in the Industrial Heartland. These differences reflect differences in industrial composition between the two regions. Industries like steel, paper and textiles that are concentrated in the Industrial Heartland are likely to explain most of these differences. In the South East goods production and manufacturing considerations apply to a lesser degree.

Analysing the barriers to innovation (Table 6), we find clear indications of the technological externality that we expect to characterise the South East economy. Both product and process innovators in the Industrial Heartland report lack of information about technology as a significantly more important barrier constraining their innovative activity than do South East firms. This is what we would expect if technological externalities on account of specialised markets did not exist or were much less available in the Industrial Heartland regions. Additionally, process innovators in the Industrial Heartland perceive innovation costs to be a greater barrier than do similar firms in the South East, possibly reflecting their lack of access to new forms of technology financing such as venture capital.

Interestingly, neither of these barriers is related to the industrial composition of the two regions. A comparison of barriers to innovation between manufacturing and services firms in Hughes and Wood (1999) reveals that they face similar barriers to innovation. Indeed the only statistically significant difference is that manufacturing firms rate the lack of skilled personnel significantly higher than do service firms.

4.2 Competitive environment and sources of competitive advantage

More rapidly growing markets and relatively greater competition are two distinctive characteristics of the South East regional economy. Thus between 1990 and 1997, the South East's GDP measured in constant prices grew by 15.5%, compared with 12.2%, 13.3 % and 13.6% in the North West, Yorkshire and the Humber, and West Midlands, respectively. For most of this period, new firm formation rates were also appreciably higher, the South East recording a net growth of 19,715 new firms between 1994 and 1997, compared with a decline of 14,035 in the stock of firms in the Industrial Heartland regions (DTI1998). This is not a trend confined to the 1990s. Keeble and Bryson, (1996) found that in the 1980s, the South East's annual firm creation rate averaged 9.2 new enterprises per 1000 of the labour force, compared with only 6.4 in the North West and Yorkshire /Humberside, and 6.6 in the West Midlands.

South East SMEs also face more intense competition and are relatively more outward looking compared to similar firms in the Industrial Heartland. The former has been documented by various studies (Keeble, 1996, 1998:O'Farrell *et al*, 1992, 1993b), the 1997 Cambridge CBR survey revealing a mean number of 'serious competitors' for South East SMEs (19.0) approximately double that (9.7) for their counterparts in the Industrial Heartland (Keeble, 1998). However, the CBR data also reveal that service firms on average face greater numbers of competitors compared to manufacturing firms. It is thus likely that at least part of this regional difference merely reflects the different industrial composition of the two regions.

Table 7 reports mean scores assigned to various sources of competitive advantage by firms in the South East and the Industrial Heartland in 1991 and 1995.[ix] The mean scores for each of the sources of competitive advantage are remarkably stable over time for both regional groupings. Particularly striking is the fact that in 1991 South East firms rated the possession of specialised products and expertise significantly more highly as a source of competitive advantage than did Industrial Heartland firms. In contrast, firms in the Industrial Heartland rated price advantages significantly more highly than did their South East counterparts. In 1995, South East firms continued to rank possession of specialised expertise more highly. However, in this period Industrial Heartland firms ascribed significantly higher scores to several other factors than price. These included cost advantages, speed of service and product quality. It is possible that these changes could reflect changes taking place in the manufacturing sector with the advent of IT technology. Overall, however, these regional differences in competitive advantage are likely chiefly to reflect the different industrial composition of the two regions.

5 Conclusions and Implications

The UK's regional economies vary in the extent to which arms length intermediate markets in business services have developed since the 1970s.Existing secondary evidence suggests that the South East region is the most advanced in this respect and the most recent trend towards the concentration of business and R&D services in the South East can be seen as indicative of the emergence of such specialised intermediate markets. If the existence of specialised markets has an impact on firm behaviour we may observe such differences in the

behaviour of firms in the two regional economies of the South East and the Industrial Heartland.

Specialised markets increase interdependence in an economy and this in turn can be a source of externality in production and innovation as well. Thus, we expected to see the dominance of market modes in the technology acquisition and exploitation activities of firms in the South East economy. We also hoped to see some indication of the presence of technological externalities and the economies of specialisation. Our results indicate that all these are observable for small and medium sized enterprises in the South East economy.

The absence or underdevelopment of specialised markets, we conjectured, would increase dependence on technology acquisition through created partnerships and would also make these economies depend more on the buying in of these services for technology acquisition, perhaps from other regions. We also expected to find signs of the absence of technological externalities in the regional economy. The absence of a technological externality was reflected in the fact that Industrial Heartland firms perceived the lack of information on technology to be an appreciably greater barrier to successful innovation than was the case with South East firms. This they appear to overcome by more frequent collaboration with UK universities and suppliers and customers.

We have also shown that most of the observed differences in technological behaviour between the two regions are not because of the impact of the different industry compositions of the two regions. This makes us more confident that these differences in technological behaviour in the two regions are principally a consequence of a different organisation of production and of technological change due to a deepening division of labour and the greater emergence of specialised intermediate markets in the Southeast regional economy.

Appendix A

The data-set used in our empirical analysis is a subset of a larger longitudinal survey of UK SMEs undertaken in three successive rounds by the ESRC Centre for Business Research of the University of Cambridge. The data were collected, in the main, by the use of a postal questionnaire and resulted in observations on 998 UK SMEs. Details about how the surveys were performed as well as an analysis of rates of attrition and non-response in the sample are contained in Bullock, Duncan and Wood (1996). In this section we will highlight some characteristics of the subset of firms that we analyse, i.e. the firms in two regional groupings of the South East and the Industrial Heartland.

We analysed a sample that contained 697 firms in all. This sample of firms was distributed as shown in Table A1 below and the counties included in the two regional groupings are detailed in Table A2.

Table A1 Distribution of sample of firms by region (% of all firms in a region)

	South East	Industrial Heartland
Number % of total sample	435	262
In manufacturing	43.8	68.0
In services	57.2	32.0
Size distribution		
0-9 employees	28.4	16.7
10-49 employees	39.6	41.0
50-99 employees	13.5	20.5
100-249 employees	17.1	20.5
250-499 employees	1.5	1.3

Table A2: Counties included in the two regional groupings

South East	Industrial Heartland
Greater London	Humberside
Bedfordshire	North Yorkshire
Berkshire	South Yorkshire
Buckinghamshire	West Yorkshire
East Sussex	Cheshire
Essex	GreaterManchester
Hampshire	Lancashire
Hertfordshire	Merseyside
Isle of Wight	Shropshire
Kent	Staffordshire
Oxfordshire	West Midlands
Surrey	Warwickshire
West Sussex	Hereford and Worcester

We separated firms into two groups, innovators and non-innovators, depending upon a firm's response to the following question included in the postal questionnaire. We quote from the questionnaire including the original emphasis and preface to the actual question:

> In this section we would like you to tell us about your innovative activity. We are interested in innovations in products and processes, which are **new to your firm.**
>
> In answering your questions, please count innovation as occurring when a new or changed product is introduced to the market (product innovation) or when a new or significantly improved production method is used commercially (process innovation), and when **changes** in knowledge or skills, routines, competence, equipment or engineering practices are required to make the new product or introduce the new process.
>
> Please do **not** count as product innovation, changes which are purely aesthetic (such as changes in colour or decoration), or which simply involve product differentiation (that is minor design or presentation changes which differentiate the product while leaving it technically unchanged in construction or performance).
>
> Has your firm introduced any innovations in products (goods or services) or processes during the last three years which were new to your firm? (Please tick only **one** box in **each** row)

	Yes	No
Products		
Processes		

> If you ticked NO for <u>both</u> products <u>and</u> processes please skip É.

Firms that answered yes to the first row were classified as product innovators and firms that answered yes to the second row were classified as process innovators.

Table 1 Regional differences in modes of technology transfer

MODES OF TECHNOLOGY TRANSFER	MEAN	PROPORTIONS (%)	Z TEST OF PROPORTIONS
	S E FIRMS	I H FIRMS	
A. PRODUCT INNOVATORS	N=162	N=91	
Right to use inventions (includes licenses)		40	***
R&D performed for others	40	34	*
Consultancy services for other firms	88	45	***
Through sale of part of firm	8	5.5	**
Sales of equipment	35	48	***
B. PROCESS INNOVATORS	N=137	N=93	
Right to use inventions (includes licenses)	57	40	***
R&D performed for others	55	32	***
Consultancy services for other firms	86	49	***
Through sale of part of firm	6.6	6.5	
Sales of equipment	29	27	
C. ALL FIRMS	N=309	N=176	
Right to use inventions (includes licenses)	39	21	***
R&D performed for others	30	18	***
Consultancy services for other firms	59	27	***
Through sale of part of firm	6.5	3.4	***
Sales of equipment	24	26	

Note: Levels of significance: *** 1%, ** 5%, * 10%.

Table 2 Regional differences in modes of technology acquisition

Modes of technology acquisition	MEAN	PROPORTIONS (%)	Z-TEST OF PROPORTIONS
	S E FIRMS	I H FIRMS	
A. PRODUCT INNOVATORS	N=162	N=91	
Right to use others inventions	64	53	***
Results of bought in R&D	23	37	***
Use of consultancy services	37	40	
Through purchase of another firm	31	35	
B. PROCESS INNOVATORS	N=137	N=93	
Right to use others inventions	69	49	***
Results of bought in R&D	26	31	*
Use of consultancy services	44	37	**
Through purchase of another firm	30	25	*
C. ALL FIRMS	N=309	N=176	
Right to use others inventions	45	34	***
Results of bought in R&D	17	23	***
Use of consultancy services	29	32	*
Through purchase of another firm	19	20	
D. ALL FIRMS	SERVICES N=321	MANUFACTURING N=176	
Right to use others inventions	11.5	6.1	*
Results of bought in R&D	7.2	3.9	*
Use of consultancy services	16.2	16.5	
Through purchase of another firm	5.0	6.1	

Note: Section D of the Table is reproduced from Moore (1996), Table 7.12. Levels of significance: *** 1%, ** 5%, * 10%.

Table 3 Regional Incidence of collaborative activity, by type of partner (% of firms)

TYPE OF PARTNER	S E FIRMS (N=308)	I H FIRMS (N=174)	TYPE OF PARTNER	S E FIRMS (N=308)	I H FIRMS (N=174)
No collaborations	58.1	59.2@	*With firms in same*		
With suppliers			*line of business*		
None	26.6	21.3	None	16.2	21.8
UK firms	8.8	15.5	UK firms	14.3	13.8@
Overseas firms	2.9	2.3	Overseas firms	6.8	3.4
Both	3.6	1.7	Both	4.5	1.7
With customers			*With HEIs*		
None	24.7	17.8	None	37.0	32.2
UK firms	9.8	13.2	UK firms	3.9	7.5
Overseas firms	3.2	4.6	Overseas firms	0.3	0.0
Both	3.2	5.2	Both	0.6	1.1

Note: All differences in proportions are significant at the 5% level except @ where the proportions are not significantly different between the two regions

Table 4 Regional differences in the importance of sources of innovation

SOURCES OF INNOVATION	MEAN		SCORES		T-	KW
	S E FIRMS	N	I H FIRMS	N	TEST	TEST
A. PRODUCT INNOVATORS						
Internal sources						
Within the firm	4.06	147	3.80	83	*	
Within the group	2.96	23	4.00	11	**	**
External sources						
Market/commercial sources	3.44	147	3.53	77		
Suppliers of materials & components	2.30	141	2.99	76	***	***
Clients or customers	3.69	148	3.86	81		
Competitors in own line of business	2.97	141	2.84	79		
Consultancy firms	1.65	136	1.68	74		
University & Higher education	1.43	134	1.52	73		
Technical institutes	1.43	133	1.59	73		
Patent disclosures	1.29	134	1.44	73		
Professional conferences	2.04	141	1.77	75	*	**
Fairs and exhibitions	2.13	139	2.29	78		
Trade Associations	1.79	137	1.93	75		
Chambers of commerce	1.28	135	1.51	74	*	
B.PROCESS INNOVATORS						
Internal sources						
Within the firm	4.08	121	3.81	84	*	*
Within the group	3.30	20	3.82	11		
External sources						
Market/commercial sources	3.43	120	3.56	81		
Suppliers of materials & components	2.41	117	3.17	81	***	***
Clients or customers	3.66	122	3.77	84		
Competitors in own line of business	3.11	120	3.01	81		
Consultancy firms	1.73	113	1.76	80		
University & Higher education	1.38	113	1.58	77		
Technical institutes	1.40	112	1.62	77		
Patent disclosures	1.15	111	1.42	77	**	
Professional conferences	2.18	116	1.93	81		
Fairs and exhibitions	2.22	117	2.28	82		
Trade Associations	1.83	115	1.96	79		
Chambers of commerce	1.26	112	1.47	79	*	
C. ALL FIRMS	SERVICES	N	MFG.	N	MW-W	TEST
External sources						
Suppliers of materials & components	2.41	117	3.17	81	**	
Professional conferences	2.18	116	1.93	81	**	
Fairs and exhibitions	2.13	139	2.29	78	**	

Notes:

(1) T-test of the difference in mean values assuming unequal variances.

(2) K-W test refers to the non-parametric Kruskall Wallis test on median ranks.

(3) Levels of significance: ***1%, **5%, *10%.

(4) Section C is reproduced from Hughes and Wood (1999): Table 3, page 19. Only statistically significant differences have been reported.

Table 5 Regional differences in objectives of innovating firms

OBJECTIVE	MEAN SCORES				T-TEST	KW TEST
	S E FIRMS	N	I H FIRMS	N		
A. PRODUCT INNOVATORS						
To replace products being phased out	2.65	145	2.89	83		
To extend product range	3.66	149	3.85	84		
To create new geographical markets	2.69	143	2.85	86		
To reduce share of wage costs	2.60	142	2.67	82		
To reduce materials consumption	2.21		2.40			
To reduce energy consumption	1.76		1.91			
To reduce product design costs	2.12		2.35			
To reduce production lead times	2.69		3.12		**	**
To improve output flexibility	3.06		3.16			
To improve flexibility in labour-use	3.03		2.78			
To improve flexibility in product-mix	2.81		2.83			
To improve product quality	3.67		3.81			
To reduce environmental damage	1.86		2.30		**	**
To improve working conditions	2.13		2.45		*	*
To maintain market share	3.95		3.85			
B. PROCESS INNOVATORS						
To replace products being phased out	2.58	117	2.75	85		
To extend product range	3.55	120	3.45	85		
To create new geographical markets	2.76	118	2.67	86		
To reduce share of wage costs	2.85	121	3.00	85		
To reduce materials consumption	2.31	115	2.59	86		
To reduce energy consumption	1.76	115	2.06	85	*	*
To reduce product design costs	2.15	112	2.46	84		*
To reduce production lead times	3.00	117	3.41	86	**	*
To improve output flexibility	3.29	119	3.55	85		
To improve flexibility in labour-use	3.10	118	3.13	85		
To improve flexibility in product-mix	2.97	115	2.85	84		
To improve product quality	3.90	120	3.95	86		
To reduce environmental damage	1.87	113	2.18	85		
To improve working conditions	2.27	118	2.54	85		
To maintain market share	4.01	122	3.88	86		

Notes:

(1) T-test of the difference in mean values assumes unequal variances.

(2) K-W test refers to the non-parametric Kruskall-Wallis test on median ranks.

(3) Levels of significance: ***1%, ** 5%, *10%.

Table 6 Regional differences in perceived barriers to innovation

BARRIER TO INNOVATION	MEAN		SCORES		T-TEST	KW TEST
	S E FIRMS	N	I H FIRMS	N		
A. PRODUCT INNOVATORS						
Excess perceived risk	2.65	146	2.50	86		
Lack of sources of finance	2.70	153	2.88	89		
Innovation costs to high	2.74	152	2.68	88		
Innovation pay-off period too long	2.45	151	2.38	88		
Innovation potential too small	2.55	149	2.66	87		
Lack of skilled personnel	2.53	152	2.50	86		
Lack of information on technology	1.84	150	2.12	85	*	*
Lack of information on markets	2.11	152	2.28	86		
Costs of innovation hard to control	2.24	150	2.41	85		
Resistance to change	1.82	147	1.65	85		
Deficit of external technology sources	1.74	144	1.81	84		
Lack of opportunity for cooperation	1.69	143	1.82	84		
Lack of technological opportunity	1.54	143	1.62	82		
No need to innovate	1.52	141	1.48	82		
Too easy to copy	1.88	145	1.81	81		
Legislation, norms etc.	2.02	141	1.95	81		
Lack of customer response	2.09	141	1.95	82		
Uncertainty in timing	2.01	141	1.90	79		
B. PROCESS INNOVATORS						
Excess perceived risk	2.66	122	2.76	87		
Lack of sources of finance	2.68	125	2.71	92		
Innovation costs to high	2.75	124	3.02	90	*	*
Innovation pay-off period too long	2.45	124	2.63	91		
Innovation potential too small	2.55	122	2.57	88		
Lack of skilled personnel	2.50	124	2.44	88		
Lack of information on technology	1.92	124	2.28	87	**	**
Lack of information on markets	2.19	124	2.30	87		
Costs of innovation hard to control	2.33	123	2.47	87		
Resistance to change	1.88	120	1.79	87		
Deficit of external technology sources	1.78	117	1.84	86		
Lack of opportunity for cooperation	1.79	117	1.72	86		
Lack of technological opportunity	1.54	118	1.61	84		
No need to innovate	1.49	115	1.52	84		
Too easy to copy	1.82	117	1.72	83		
Legislation, norms etc.	1.89	113	1.84	83		
Lack of customer response	2.02	113	1.93	84		
Uncertainty in timing	2.14	113	1.90	81		
C. ALL FIRMS	SERVICES	N	MFG.	N	M-W	TEST
rs Lack of skilled personnel	2.13	253	2.42	323	**	

Notes:

(1) T-test refers to the t-test of the difference in mean values assuming unequal variances. Levels of significance: ***1%, ** 5%, *10%.

(2) K-W test refers to the non-parametric Kruskall-Wallis test on median ranks.

(3) Section C is reported from Hughes and Wood (1999): Table 4, page 20. Only statistically significant differences have been reported.

Table 7 Regional differences in the sources ofcompetitive advantage

SOURCE OF COMPETITIVE ADVANTAGE	SE FIRMS		I H FIRMS		T TEST	
A. ALL FIRMS	1995	1991	1995	1991	1995	1991
Price	3.29 (297)	3.27 (302)	3.52 (172)	3.57 (173)	**	***
Marketing and promotion	3.14 (293)	3.17 (301)	3.13 (176)	3.03 (169)		
Speed of service	3.84 (303)	3.94 (307)	4.08 (177)	4.08 (176)	***	
Established reputation	4.14 (302)	4.21 (309)	4.19 (176)	4.12 (174)		
Cost advantages	2.91 (284)	2.99 (299)	3.25 (173)	3.01 (165)	***	
Product design	3.19 (267)	3.30 (263)	3.31 (173)	3.13 (160)		
Product quality	4.06 (282)	4.18 (290)	4.22 (172)	4.22 (172)	*	
Specialised product/ expertise	4.05 (292)	4.22 (299)	3.88 (176)	3.94 (170)	*	**
Range of products/expertise	3.63 (287)	3.53 (289)	3.54 (174)	3.62 (170)		
Flair and creativity	3.44 (290)	3.31 (293)	3.30 (173)	3.20 (165)		
Attention to client needs	4.40 (306)	4.49 (311)	4.47 (178)	4.45 (177)		
B. ALL FIRMS	SERVICES (N=302)		MFG (N=352)		F-TEST	
Price	3.2		3.5		**	
Established reputation	4.2		4.1		*	
Cost advantages	2.9		3.1		**	
Product quality	4.0		4.2		**	
Specialised product/ expertise	4.1		3.8		**	

Notes:
(1) Numbers in parentheses are the total number of valid responses in each region.
(2) The T test reported assumes unequal variances.
(3) Levels of significance: ***1%, ** 5%, *10%.
(4) Section B of the table is reproduced from Kitson and Wilkinson (1996): Table 3.5, page 26. Only statistically significant differences have been reported.

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Notes:

[i]Scotland, North-east England and Wales represent smaller manufacturing based regions and are not included in this analysis. The grouping of West Midlands, North West and Yorkshire and Humberside into a broad 'Industrial Heartland' category is employed and justified in Keeble (1997).

[ii] In 1997, regional GDP at factor cost in the South East (excluding East Anglia) was £246.9 billion, compared with only £51.6 billion inYorkshire and the Humber, £56.8 billion in the west Midlands, and£72.2 billion in the North West (Office for national Statistics, 1999, table 12.1). The integration of the South East market is evidenced by commuter patterns. By 1971, 10% of the local population was working in London up to a radius of 50 miles from London (Keeble 1980:121).

[iii] Further, the commonality of the intermediate good to a wide range of industries, due to what Rosenberg termed 'technological convergence' meant that the trajectory or direction of technological change in the entire economy was also affected and came to possess a capital saving bias.

[iv] Labour Market Trends, August 1998. The South East comprises the Eastern, London and South East (GOR) regions, while the Industrial Heartland includes the North West (GOR), Merseyside, Yorkshire and the Humber, andWest Midlands regions.

[v] The Wood et al study (1993) found that 48% of a random sample of 60 small South East management consultancy and market research companies reported providing specialised expertise to their clients, compared with only 25% of a similar sample of North West firms, most of whom regarded themselves as generalists. See O'Farrell et al (1993) for a similar finding comparing South East and Scottish firms.

[vi]This assumption receives some support from the CBR data that are used in this analysis. The mean value of subcontracted output from other firms was19.5% for South East firms compared to 24.1% for Industrial Heartland firms. This difference in mean values was statistically significant at the 10% level. About 50% of all South East firms and 43% of all Industrial Heartland firms reported no subcontracting from other firms. 9% of South East firms and 13% of Industrial Heartland firms reported that all of their output was subcontracted to other firms. The incidence of subcontracting is thus somewhat higher in the Industrial Heartland.

[vii] See Appendix A for the definition of product and process innovators.

[viii] Recoding extreme values of 4 and 5 into 1 and the lower scores of 1,2 and3 into 0, and then looking at the difference in frequencies is a common method of analysing Likert scale scores. We were unable to obtain mean values based on a recoding of the data. The non-parametric test however analyses similar information and is reported here.

[ix] Analysing the sources of competitive advantage for innovating firms alone reveals that Industrial Heartland firms perceive the speed of service and costs to be a greater source of competitive advantage compared toinnovating firms in the South East. The difference in mean scores is statistically significant.

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