Developing Indicators to Inform Local Economic Development in England

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[Paper first received, August 2001; in final form, January 2002]

Summary. Based on a conceptual framework of 11 factors that are widely perceived to be the major determinants of local economic development (LED), 29 indicators were identified to measure these factors. Principal component analysis was first used to examine the structure of relationships among the compiled LED indicators for local authority districts in England and to explore the spatial patterns that emerge from the analysis. A series of multiple regression models were then calibrated to investigate the relative strengths of relationship between the LED indicators and various performance variables. The final section concludes with the key issues revealed by the findings of these multivariate analyses.

Introduction

The spatial inequality of local development has stimulated local actors to rediscover place identities and to react by formulating economic and marketing strategies to enhance the competitiveness of the locality in the national and global economies (Levy, 1990; Eisenschitz and Gough, 1993; Kearns and Philo, 1993). The holistic and complex nature of the local economic development (LED) process, however, makes it a difficult task to grasp the logistics of the relationships between different socioeconomic factors in the development process. Porter (1990, 1991) has developed a diamond system of four self-reinforcing determinants (i.e. factor conditions; firm strategy, structure and rivalry; demand conditions; and related and supporting industries) to explain the competitive advantage of cities, regions and nations. In his theory, the central role of government is to provide a favourable environment by creating and upgrading the factor conditions in which firms are propelled to achieve increasingly sophisticated competitive advantages in their industries. He, nevertheless, emphasises that these are generalised factors and that they are too broad to provide a sufficiently complete explanation of economic success. Chisholm (1990) also argues that enhancing the quality of local factors of production rather than direct state intervention is the most appropriate way to redress the relative economic decline of regions.

The theory of competitiveness is very much derived from the empirical studies of US cities which operate in a free market system. There has been much debate over the ways in which competitiveness can be defined and measured (see Begg, 1999; Deas and Giordano, 2001; Kresl and Singh, 1999).

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0042-0980 Print/1360-063X On-line/02/101833-31 © 2002 The Editors of Urban Studies
DOI: 10.1080/0042098022000002984

In spite of the lack of agreement on the precise meaning of competitiveness, its conceptual ideas have been influential within the international policy community—as is evident from the publication of competitiveness White Papers by the European Commission (CEC, 1993) and the UK government (HM Government, 1993; DETR, 1997). The drive to be competitive and efficient is, therefore, widely seen as the path to LED. Although the role of the state is not necessarily as restrictive as that suggested by Porter and Chisholm, there is a general consensus that one of the most important tasks of government is to create and upgrade the resources of the local area and to exploit their potential benefits in the most efficient manner (Coombes *et al.*, 1992; Blakely, 1994).

A list of 11 generic factors considered to be important to LED was identified by the author after a comprehensive review of recently published US, British and other European literature (Wong, 1996). The identified list was subsequently confirmed by practitioners in two English regions to include all the key elements of LED (Wong, 1998). The aim of this paper is, therefore, to develop further these previous research studies by identifying a set of indicators to measure the 11 factors to inform local economic planning. The analysis is based on data compiled between 1997 and 1998, as part of a wider research project funded by the Economic and Social Research Council. Multivariate statistical methods were used to perform two major analytical tasks.

(1) The structure of relationships among the compiled LED indicators for local authority districts in England were examined and summarised via principal component analysis.[1] The spatial patterns that emerged from the analysis were then mapped to highlight different factor conditions across different parts of England.
(2) A series of multiple regression models were calibrated to explore the relative strengths of relationship between different LED indicators and performance variables, and the extent to which these LED indicators contribute to the explanation of variations in local economic performance.

Indicators are defined as proxy measures to provide operational definitions to the multidimensional concept of LED. The scope of indicators in this paper adopts an inclusive framework (MacRae, 1985, p. 9) to embrace social, economic and physical dimensions of LED. The measurement of LED factors is firmly grounded in the valuative-theoretical approach, the emphasis of which is on the importance of the practical policy value of indicators (Miles, 1985; Landis and Sawicki, 1988; Innes, 1990; Innes and Booher, 2000) and of integrating theory and measurement (Fox, 1974; Innes, 1990). Indicators measuring the 11 factor conditions are 'input' rather than 'output' measures and they are expected to serve the function of defining policy problems and informing policy formulation. The purpose of developing these LED indicators is to extract ideas from the complex phenomenon of LED to provide a basis for policy discussion and planning. The selection of indicators is guided by previous research and theories in order to provide linkage between theory and measurement.

The paper is structured as follows. The next section provides an overview of the 11 generic factors considered to be important to LED and their theoretical and empirical groundings. It then discusses the indicators identified for the measurement of the LED factors and provides an evaluation of the availability and quality of different data sources and their impact on measuring different dimensions of LED. Section 4 describes the findings of the principal component analysis on the structure of relationships among different LED indicators and their spatial distribution patterns across England. The fifth section discusses the relationships between different LED indicators and LED performance variables. The final section concludes with the key issues revealed by the findings of the multivariate analyses.

Determining Factors for LED

A typology of 11 generic LED factors was derived from a comprehensive review of recently published literature (detailed in Wong, 1998). These studies range from general LED research, through statistical studies of economic conditions, to specific sectoral studies. The LED factors listed in Table 1 are intended to be comprehensive, although the definition and the fineness of classification of these factors do vary from one study to another. Given that all these factors can be defined differently under different contexts, Table 1 provides the study definition of the LED factors to guide the selection and measurement of indicators. The boundaries of some factors such as human resources, capital and finance, physical factors and industrial structure are somewhat more watertight and easier to handle than the intangible factors of quality of life, business culture, community identity/image and institutional capacity. There is a certain degree of fuzziness over the definition of location and infrastructural factors. Due to the relational and relative nature of locational attributes, the interface between infrastructural development and locational accessibility can potentially create a grey area for classification. This leads on to the difficulty in defining infrastructure, as it could be an all-embracing category (Biehl, 1986; Coombes *et al.*, 1993) including some physical factors and knowledge and technology. The focus here is then to define infrastructure as the add-on fixed production factors to a physical site to enhance its development value and potential. It is due to these definitional grey areas and the theoretical fuzziness of different classification schemes, that an empirical exploration of the underlying relationships among the 29 LED indicators forms the central concern of this study.

The 11 factors can be broadly classified as 'traditional' and 'intangible'. Traditional factors are defined as those generic factors that have received academic attention, especially from the neo-classical economists (for example, Ricardo, 1817) and the industrial location geographers (for example, Weber, 1909), over a substantial period of time. Technological change, reduced communication costs and the facilitation of intercountry flows have increasingly led to less emphasis being placed on the quantity and abundance of traditional economic factors, but more on their qualities and distinctive features. The classification of traditional factors here very much emphasises the qualitative dimension of production factors. The grouping of traditional factors should not, therefore, be interpreted as a dichotomy relative to the grouping of intangible factors. Due to the failure of traditional factors to capture the large amount of unexplained variation in local growth rates (Doeringer *et al.*, 1987; Bovaird, 1993), there has been a recent shift of attention to examine the influence on LED of more intangible factors such as business culture, quality of living, community image and institutional capacity (see, for example, Bosman and de Smidt, 1993; Cooke and Morgan, 1994; Johnson and Rasker, 1995).

Recent literature shows the co-existence of competing theories and rival explanations of the significance of the 11 factors to the LED process (Wong, 1996, 1998). On the whole, there are relatively stronger theoretical and empirical groundings in explaining the contribution of traditional factors to LED. Nevertheless, the nature of the relationship between LED and factors like infrastructure, industrial structure and knowledge and technology is not that well understood. This is partly due to the lack of appropriate data and methodological difficulties in verifying such relationships. There has been more contentious debate with regard to the importance of the intangible factors. The theories and empirical research of these soft factors are less well-established because the causal relationships between them and the LED process are usually not straightforward (Myers, 1987; Castells and Hall, 1994). There is also an inherent difficulty in grasping the concept of these factors because their contribution is not measurable. All these findings naturally lead to the conclusion that the contribution

Table 1. Definition of LED factors

LED factor	Study definition
Locational factors	Refer to attributes external to an area; the accessibility advantage gained from the spatial interplay between an area and its partners in the production and consumption process—for example, the markets, the suppliers, major business centres
Physical factors	Refer to the availability and cost of suitable sites, premises and other built environment resources for development
Infrastructural factors	Embrace the more immobile and long-term fixed production factors of an area; they are public goods as well as capital goods which facilitate the development of other economic development activities
Human resources	Include the availability, participation level, quality, attitude, cost and other characteristics of the workforce
Capital and finance	Are the financial resources (such as money and credit) available for investment in local businesses and for economic development purposes
Knowledge and technology	Include frontier activities in research, knowledge development and technological innovation
Industrial structure	Is the mix of industrial sectors in an economy; the degree of concentration of a few industrial sectors may affect its growth potential or vulnerability to economic changes
Quality of life	Refers to the desirability of a place for living in terms of its non-marketable public goods which include the quality of the natural and built environment, public amenities and cost of living
Business culture	Refers to the entrepreneurship and the dynamics of indigenous business activities such as the ability of business start-ups and the capacity to innovate and adapt
Community identity and image	Include the degree of mutual co-operation and social responsiveness of the residents to their daily living in a community, their attitude to business development and how this 'character' is being perceived by the outside world
Institutional capacity	Refers to the coherence of local policies and the co-operation among local actors to provide support and assistance to economic development activities

of different factors to LED is circumstantial and diffused, and much more empirical work is required to explore their logistical relationships.

Empirical research was carried out by the author to ascertain the perceptions of policy-makers concerning the importance of different factors to the success of LED. Key public- and private-sector actors in LED organisations in the North West and the Eastern regions were asked in a survey to rank the 11 factors according to their relative importance to LED. This was then followed up by 22 in-depth, semi-structured interviews with selective participants (Wong, 1998). Table 2 provides a summary of the survey findings. The empirical study revealed that deciding locational factors could be either 'traditional' or more 'intangible'. However, those participating in the study consistently saw traditional factors such as land, labour, capital, infrastructure and location as the ingredients most likely to result in successful LED. It is only after these basic factors are considered that attention may turn to the more intangible factors such as business cul-

Table 2. Mean rank of LED factors: North West and Eastern regions

LED factors	North West region	Eastern region	Both regions
Traditional factors			
Physical	2.82 (1)	3.39 (1)	2.66 (2)
Location	3.37 (1)	2.97 (0)	3.05 (1)
Human resources	3.50 (0)	4.16 (2)	3.83 (2)
Finance and capital	4.07 (4)	4.67 (1)	4.23 (5)
Infrastructure[a]	4.85 (1)	3.88 (5)	4.30 (6)
Knowledge and technology	6.07 (4)	5.57 (8)	6.04 (12)
Industrial structure	6.75 (8)	6.08 (14)	6.69 (22)
Intangible factors			
Institutional capacity	5.56 (4)	6.09 (8)	5.69 (12)
Business culture	5.68 (12)	6.22 (9)	6.74 (21)
Community identity and image	6.77 (11)	6.72 (11)	7.09 (22)
Quality of life[b]	6.84 (5)	5.63 (12)	5.88 (17)
Total response (n)	73	64	137
Response rate (percentage)	70	80	75

Notes: the mean rank of LED factors was calculated according to the importance given by the respondents in the survey; low value of mean rank implies greater importance of the factor.

The values in parenthesis are the number of respondents who identify that factor as not important at all.

The Mann–Whitney U test was used to test the difference in regional rankings: [a] $Z = -1.98$, $p < 0.05$; [b] $Z = -2.01$, $p < 0.05$.

Source: adapted from Wong (1998, p. 711).

ture, image and quality of life as means of increasing the competitive edge of an area. This prioritisation of traditional concerns was similar between the two regions. Human resources emerged as the most common factor which is highly valued by actors holding different perspectives of LED.

Measuring LED Factors

Data were compiled for over 60 potential indicators to measure the 11 LED factors. However, after examining the statistical properties and the reliability of data sources in the initial analysis, only 29 of them were retained in the final data-set.[2] The definition and data sources of the 29 LED indicators are detailed in Table 3. It should be noted that, due to the lack of suitable and reliable data sources, the variables used in this analysis do not provide a complete coverage of some LED factors and no appropriate indicator can be identified to measure the qualitative nature of institutional capacity. The discussion in this section first focuses on the theoretical underpinning of the selection of indicators, then on the choice of an appropriate spatial unit of analysis and the problems encountered in the process of data collection.

Selection of Indicators

Locational accessibility. Accessibility to potential markets and suppliers is one of the most frequently cited factors for LED (Begg and Cameron, 1988; Debbage and Rees, 1991; Taylor, 1993). Location is related to attributes external to an area rather than its internal characteristics. Locational advantage is the result of the interplay between physical location (which is supposedly unchanged) and the dynamics of other changes such as accessibility, communication networks and infrastructure. Recent research highlights spatial inequality in intermetropolitan accessibility in Europe in terms of the key road, rail and air networks (Bruinsma and Rietveld, 1993). In this study, the accessibil-

Table 3. Indicators measuring LED factors

LED indicators	Definition	Data sources
Location		
AIRINDEX	Accessibility to main airports in England, weighted by the passenger carrying capacity to overseas destinations	Civil Aviation Authority (1997) *UK Airport Annual Statements of Movements, Passengers and Cargo*. London: CAA
ACCBCEN	Accessibility to the eight largest business service centres by car	1996 Annual Survey of Employment data, extracted on-line from National On-line Manpower Information System (NOMIS) at Durham University; road accessibility was calculated with Androute software
INDRAIL	Railway journey time to London index	1998 Rail Track On-line Timetable (http://www.railtrack.co.uk)
Physical		
EFACTORY	Factory floorspace per 1000 economically active persons	Department of the Environment (1995) *Commercial and Industrial Floorspace Statistics*. London: HMSO
EOFFICE	Office floorspace per 1000 economically active persons (highly correlated with shopping and restaurant floorspace)	Department of the Environment (1995) *Commercial and Industrial Floorspace Statistics*. London: HMSO
SDERELIC	Hectares of derelict land	Department of the Environment (1995) *Survey of Derelict Land*. London: HMSO
EMPLAND	Urban land per 1000 economically active persons	1991 data, supplied by the Department of the Environment on request
Infrastructural		
PWCAR	Car-owning households used public transport to work	1991 Population Census (10 per cent sample), extracted on-line from Manchester Information and Associated Services (MIMAS) at Manchester University
AVTRAF	Average distance of one-way car trips in weekday	DETR (1996) *Tempro 3.1 National Trip End Model* (http:www.roads.detr.gov.uk/roadnetwork)
TRAFCAR	Average journey length per local car in weekday	DETR (1996) *Tempro 3.1 National Trip End Model* (http:www.roads.detr.gov.uk/roadnetwork)
Human resource		
RECOACT	Economic activity rate	1991 Population Census data, extracted on-line from MIMAS
ROVQUA	Supply-side overqualification index	1991 Population Census (10 per cent sample), extracted on-line from MIMAS
EHSKILL	Workforce in high-skill socioeconomic groups	1991 Population Census (10 per cent sample), extracted on-line from MIMAS
RYUNEMP	Long-term youth unemployment rate	1997 unemployment data, extracted on-line from NOMIS
Finance and capital		
VENTURE	Accessibility to venture capital firms	Department of Trade and Industry (1996) *Venture Capital in the UK: A Report and Guide to the Venture Capital Industry*. London: HMSO

Knowledge & technology		
OULQHTEG	Location quotient of high-technology employment, including both manufacturing and service employment (against England)	1996 Annual Survey of Employment data, extracted on-line from NOMIS
ITRAE	Accessibility to quality science and engineering research in higher education institutes	Higher Education Funding Council for England (1996) *Research Assessment Exercise* database extracted on-line (http://hefce.ac.uk)
Industrial structure		
LQBEG	Location quotient of information-based business service employment (against England)	1996 Annual Survey of Employment data, extracted on-line from NOMIS
STRUCT	Structural component of shift–share analysis	1981 and 1991 Censuses of Employment data, extracted on-line from NOMIS
Business culture		
DEATH	Death rate of small firms	1994–96 value added tax data (excluding agriculture), extracted on-line from NOMIS
VITAL	Vitality rate of small firms (birth and survival rates)	1994–96 value added tax data (excluding agriculture), extracted on-line from NOMIS
Community identity		
INDCOM	Index of commuting independence (core resident workers as a ratio of inward and outward commuters)	1991 Population Census Special Workplace Statistics (10 per cent sample), extracted on-line from MIMAS
Institutional capacity	No suitable indicator has ben found to measure this qualitative factor	
Quality of life		
WPREMIUM	Home contents insurance premiums (proxy measure for crime risks)	Insurance premium data, supplied by three insurance companies in 1998
INDEARN	Index of earnings	Office for National Statistics (1997) *New Earnings Survey*. London: TSO
WHPRICE	Average house price	1997 data, purchased from HM Land Registry *Residential Property Price Bespoken Report*
PAONB	Percentage of local area designated as Area of Outstanding Natural Beauty	Data supplied by the Department of the Environment on request
SMR	Standardised mortality rate	Office for National Statistics (1998) *Regional Trends 1997*. London: TSO
PGCSE	Percentage of secondary school students with 5 or more GCSE passes	Department of Education and Employment (1997) GCSE examination results, extracted on-line (http://www.dfee.gov.uk/statistics)
RCTAX	Council tax rate	Office for National Statistics (1998) *Regional Trends 1997*. London: TSO

ity to major airports (*AIRINDEX*) and the quality of railway service (*INDRAIL*) indicators were used to measure air transport capacity to overseas countries and accessibility to the capital city of London respectively. With the rapid development of distance-shrinking technology, it is argued that spatial proximity becomes less of a locational requirement (Chisholm, 1995). However, many still regard business travel as necessary in order to maintain critical face-to-face contacts with clients and business partners especially in the service sector (Malecki and Bradbury, 1992; Marshall *et al.*, 1992; Bosman and de Smidt, 1993). This aspect of accessibility was measured by the road accessibility to major business service centres indicator (*ACCNCEN*).

Physical factors. The provision of suitable sites and buildings is regarded as a prerequisite (Blakely, 1994) and a universal initiative of LED (Herrschel, 1995). Physical factors are crucial to the development process of manufacturing industries because modern production technologies require more machinery which is usually space-consuming. The availability of land and premises can also ensure adequate space for deliveries, car-parking and possible expansion (Townroe, 1976). The average factory floorspace (*EFACTORY*), office floorspace (*EOFFICE*) and total amount of urban land per 1000 economically active persons (*EMPLAND*) were used to measure the physical capacity for economic production. Besides production functions, the built environment is found significant in influencing investment confidence and projecting place image. Bennett and Krebs (1991) suggest that large-scale physical regeneration is often the only way to break into the spiral of decline in inner cities and older industrial areas because businesses tend to hold back from investment in declining areas to avoid exploitation by free-riders. The presence of derelict land in an area (*SDERELIC*) was used to capture the physical image of an area.

Infrastructure. This term embraces the more immobile and long-term features of an area and is polyvalent in terms of its multiple use for different activities (Nijkamp, 1986). The dual nature of infrastructure as both public goods and capital goods (Biehl, 1986) plays a central role in facilitating the development of other enterprises and economic activities. Diamond and Spence's (1989) survey of 190 business establishments shows that an efficient and up-to-date transaction-facilitating infrastructure is vital to a growth-oriented economy. In recent years, telecommunication facilities are increasingly seen as a vital tool for business administration as they can handle massive flows of information and transactions concurrently (Graham, 1992; Bosman and de Smidt, 1993) to provide spatial integration of different sectors of economic activity (Gillespie and Hepworth, 1986). Due to the lack of reliable and complete data on the capacity of public utilities and telecommunications, three indicators that focus on the quality of public transport (*PWCAR*) and on road traffic capacity (*AVTRAF*, *TRAFCAR*) were used to measure transport infrastructure.

Human resources. These are widely perceived as pivotal to business success and LED. Labour market performance is no longer simply related to its overall outcome but also to the underlying labour market dynamics (Steiner, 1990). The changing labour market structure in Britain can be witnessed in the continued decline of manufacturing employment and a contraction in full-time jobs especially in the industrial north, while employment in the service sector continues to grow mainly in the south and east of England (Champion and Townsend, 1990). Economic activity rates (*RECOACT*) and the supply-side overqualification index (*ROVQUA*) were used to ascertain the supply and demand of labour force in an area. New forms of business organisations, subcontracting strategies and 'flexible' forms of internal work practices (Atkinson, 1985; Pollert, 1988) all require new workforce skills and the ability to perform multiple

tasks (Meegan, 1988). The importance of a skilled manual labour force is declining, whereas the highly trained technical and scientific workers, professionals and managerial staff are of increasing locational significance (Massey, 1995). These skill issues are captured by the workforce in high-skilled socioeconomic groups (*EHSKILL*) and the level of long term youth unemployment rate (*RYUNEMP*).

Finance and capital. The availability of finance and capital is vital to both inward investment and the growth of indigenous businesses. The 'globalisation' of finance (Harvey, 1989), enhanced by information technology, has led to the rise of transnational corporations which operate on a world-wide scale (Dicken, 1992). Financial flows are, therefore, no longer subject to any local economic control (Rozenblat and Pumain, 1993). The growth of venture capital is, however, increasingly seen as an important propellant for LED. Unlike other traditional lenders, venture capitalists provide risk equity finance as well as business skills to help set up and manage the development of embryonic high-technology companies and entrepreneurial ventures (Florida and Kenney, 1988). Due to its active nature of investing, the industry in North America favours areas with high concentrations of financial institutions and technology-intensive enterprises and is characterised by a distance decay function from large urban centres (McNaughton and Green, 1989). The spatial segmentation of the industry is also evident in Britain as three-quarters of venture capital organisations were found in London and the industry is overwhelmingly skewed towards the southern part of the country (Martin, 1989). This aspect of finance and capital is captured by the measure of accessibility to venture capital firms (*VENTURE*).

Technological innovation and knowledge infrastructure. The dynamics of technological innovation and entrepreneurship as a powerful competitive force in economic development had long been advocated by Joseph Schumpeter (1934) and has been extended and refined by Freeman and Parez (1988). The success stories of high-tech milieux like Silicon Valley, Route 125 and Cambridge have stimulated the burgeoning development of science parks and technopoles as a fashionable instrument to generate economic growth poles (Masser, 1990; Glasson, 1992). Although the relationship between technological change and economic performance is not that clear-cut (Monck *et al.*, 1988), the capacity of technological absorption and diffusion is firmly believed to be a critical basis for the creation of local economic growth in the long run (Castells and Hall, 1994; European Commission, 1994; HM Government, 1993). High-tech activities were measured by the employment location quotient in these sectors (*OULQHTEG*).

The knowledge infrastructure of a place is closely associated with research and innovations, especially the presence of universities and research institutions (Hall *et al.*, 1987; Castells, 1989). Malecki and Bradbury (1992), however, emphasise that the value of local universities is to up-grade skills and provide continuous training opportunities for scientific personnel, rather than for access to research information and employee recruitment. Knowledge infrastructure was measured by the accessibility to science and engineering research in higher education institutes indicator (*ITRAE*).

Industrial structure. An area's long-term strengths or vulnerabilities are highly influenced by its industrial structure which implies the level of skills and inertia embedded in the local area and its ability to adapt to changing technological and economic conditions. Doeringer *et al.* (1987) find that industrial mix interacting with national trends is the most significant influence on a state's short- and long-term economic performance in the US. Due to the relative improvement in regional industrial composition in the past two decades, the impact of industrial structure on regional development has declined relatively in Britain (Fothergill and Gudgin, 1979; Rhodes, 1986). However, areas with a favourable industrial structure still gain com-

petitive advantage (Taylor, 1993). The growth of business services (Howells and Green, 1988) is widely regarded as having significant impact on LED. They do not only offer high-quality professional employment, but also support the competitiveness of other firms and businesses in the area, all of which create strong multiplier effects on local development. The location quotient of information-based business employment (*LQBEG*) was used to inform this aspect of industrial structure and the structural component of shift–share analysis (*STRUCT*) was used to indicate the overall health of an area's industrial structure.

Quality of life. Factors such as good environmental quality and desirable working and living conditions are believed to be vital to foster economic growth and job creation by retaining local businesses and attracting inward investment (Schmenner, 1982; Hall *et al.*, 1987; Bosman and de Smidt, 1993; Johnson and Rasker, 1995). The causal relationship between LED and quality of life is, however, a difficult and controversial topic. Castells (1989, p. 52) regards quality of life as a *result* of the characteristics of the high-tech industry in Silicon Valley (its newness and highly educated workforce) rather than the determinant of its location pattern. Findlay *et al.* (1989) also fail to find any significant correlation between their quality of life index and the local prosperity index (Green and Champion, 1989) in British cities. Despite its common usage, the concept of quality of life is very difficult to define (Myers, 1988). The urban livability approach adopted by journalists and geographers tends to define quality of life as purely non-marketable public goods such as climate, environmental amenities, crime, traffic and public services (Liu, 1974; Findlay *et al.*, 1989; Boyer and Savageau, 1985), whilst economic studies tend to include income levels and house prices in their measurement (Rosen, 1979; Roback, 1982; Stover and Leven, 1992). Seven indicators covering home contents insurance premiums (*WPREMIUM*), earnings (*INDEARN*), house prices (*WHPRICE*), area with outstanding natural beauty (*PAONB*), standardised mortality rates (*SMR*), secondary school examination performance (*PGCSE*) and council tax rates (*RCTAX*) were used to cover different dimensions of quality of living in an area.

Business vitality. This was included in the measurement of *The 1991 Development Report Card for the States* (CFED, 1991) to look at the competitive edge and diversity of business activities, the ability of new business start-ups and the capacity of older firms to innovate and adapt. Entrepreneurial culture is found to be related to the differential performance between small and medium-sized enterprises (SMEs) in the south-east and elsewhere in Britain (Wynarczyk *et al.*, 1993; Thwaites and Wynarczyk, 1996). The rapid growth of SMEs and their contribution to the large proportion of total job creation (Birch, 1979; Storey and Johnson, 1987; Daly and McCann, 1992) has strongly influenced economic development policies in Britain and the European Union. In spite of the differential spatial conditions, research findings show that some SMEs in the less advantageous industrial north can still be innovative and competitive (Storey *et al.*, 1988; Vaessen and Keeble, 1995). On the negative side, several research studies show that new enterprise creation may not be a big problem in deprived urban areas, but that it is their subsequent development, the constraints on their growth and survival that have been neglected (Turok and Richardson, 1991; Keeble and Walker, 1994). The death rates (*DEATH*) and vitality rates (*VITAL*) of small firms were used to explore business culture in this study.

Community action. The character of a place is intimately related to mutual co-operation and social responsiveness which then help to generate community action (Wiewel *et al.*, 1993). The support of local residents can contribute greatly to area-based rehabilitation initiatives, as was evident in the Glasgow Eastern Area Renewal initiative (Leclerc and Draffan, 1984). However, there are expressed

concerns that the notion of community identity can be used in regressive ways as the boundaries of community are narrowly defined (Christopherson, 1994) and bear a sense of social exclusiveness (Harvey, 1994). The image or perception of a place is one of the abstract resources of an area. The local population's sense of belonging to an area is important because their concerns can convert into enthusiasm and help to restore confidence. However, unlike local residents, outsiders' perceptions of a place are relative to those of other places. These comparative images can affect potential investors' location decisions (Premus, 1984). Due to the subjective, qualitative nature of this factor, only one indicator was measured to examine the independence of a community from the commuting culture (*INDCOM*).

Institutional capacity. This is increasingly regarded as one of the key factors affecting LED. 'Partnership' and 'synergy-building' have been repeatedly emphasised by official documents such as the *competitiveness White Paper* (HM Government, 1993) and the European Commission's (1995) regional policy on local development. The policy-intervening capacity of organisations such as local authorities, chambers of commerce and other agencies is found influential to the process of LED (Blakely, 1994; Bennett and Krebs, 1991). Several other studies also suggest that the 'welcome mat' effect of financial incentives, relocation packages and other activities of local development agencies is critical to attract foreign inward investment (Munday, 1990; Young *et al.*, 1994). Phelps (1996), however, argues that the basic supply-side factors play a more pivotal role in determining the quality of inward investment in Wales than the effectiveness of institutional capacity. More importantly, the conceptualisation of local institutional capacity is criticised as inadequate. Clarke (1995) challenges the presumption that more capacity tends to be associated with better and more progressive decisions as there are no thresholds to determine when these conditions are met. Due to the qualitative nature of institutional capacity, it is not possible to devise any reliable and valid measure for this factor.

Spatial Unit of Analysis

The selection of an appropriate spatial unit of analysis for the identified LED indicators is not an easy task. The term 'local' is a relative and relational concept and its meaning varies as the context changes. Since this study aims to develop quantitative indicators to assist the planning of LED in England, the unit of analysis should be sub-national. This opens up a range of possibilities: regions, local communities, local labour market areas and local authority areas.

There is an argument for having a regional framework for research studies. However, Bovaird (1992, pp. 357–358) comments that a regional framework does not seem relevant for LED in Britain because: most regional statistics are also available at local authority level; regional industrial structure is becoming relatively less important; and most economic strategies and activities are actually planned and implemented by local authorities. Turning to the opposite end, local communities are the obvious units upon which to focus. The advantage of concentrating on local communities is to yield very detailed information concerning the interactions of local actors and the causal relationships between different factors in the development process. However, the answers to the question 'what is a community?' have been controversial and varied (Bell and Newby, 1972). It is also very difficult to find a wide range of socioeconomic data sources at this very localised level. The local labour market area (LLMA) is frequently identified as the case-study area in locality studies. LLMAs are dynamic functional units which take into account the overall commuting patterns of individuals and highlight the sphere of territory where other economic activities and socio-cultural developments in association with this economic function are taking place. However, there are conceptual problems in defining a uniform LLMA across different

social and occupational groups. The 'locality' of LLMA does not necessarily coincide with territorial identity which comprises a diverse range of interests from different social groupings (Urry, 1990, p. 189). There are also problems of seeking relevant data sources for the analysis, with the exception of employment and unemployment data.

The final candidate to be considered is the local authority district (LAD) area. These constitute the basic political and administrative units where social and political activities take place (Glasson, 1978), where central funding is allocated for local social and economic development. More importantly, the local actors involved, such as local councillors, community leaders and council officers, legitimately represent the territorial interest of the local area (Pickvance, 1990, p. 11). The other advantage of choosing LAD areas is partly for pragmatic purposes. For political and administrative reasons, most of the data in the public domain are compiled at the LAD level to serve policy needs. LAD areas also provide the flexibility of aggregating data to higher spatial levels for sub-regional (for example, counties, Learning Skills Council areas) and regional (for example, Government Office regions) analyses. There are, however, obvious conceptual shortcomings that cannot be resolved at this spatial level. Beauregard (1993, p. 273) rightly points out that there are incompatibilities between economic development practice and the political partitioning of economic space.

After considering the pros and cons of using these different spatial units in the analysis, LAD areas were selected as, on balance, the best choice. LED indicators were, therefore, compiled for 366 local authority districts (before the 1996 local government re-organisation boundary change) in England. The pre-1996 boundaries were used because they provide a more consistent basis to compare local areas with similar population size and most data sources are available at that spatial level. The study, however, excluded three island districts (Medina, South Wight and Isles of Scilly) from the statistical analysis because of their special geographical context. Hence, 363 local authority districts were included in the final analysis.

Data Availability and Quality Issues

Finding appropriate data to measure a number of LED indicators was found to be a major obstacle. There is a paucity of data with regard to both infrastructural and financial factors. This is partly due to the fact that information in relation to telecommunications, public utilities and financial institutions is guarded as a commercial secret and is not available in the public domain. Other infrastructural data such as road-carrying capacity tend to be collected on a very *ad hoc* and selective sample basis. There is also a lack of appropriate quantitative data to measure satisfactorily intangible issues such as community identity and institutional capacity.

The quality of different data sources poses another major concern in the process of measuring the LED indicators. Many data used in the study are based on infrequent or one-off initiatives of government departments. The obvious examples are the Department of the Environment's 1993 *Derelict Land Survey* (DoE, 1995a) and 1994 statistics of *commerical and industrial floorspace* (DoE, 1995b) and the Department of Trade and Industry's report on *venture capital in the UK* (DTI, 1996).[3] The time series of these data-sets creates uncertainty over the possibility of updating the indicators in the future. Some LED indicators could be measured with large-scale government survey data such as the New Earnings Survey and the Labour Force Survey. The problem of using survey data is that the sample size may not be large enough to provide complete spatial coverage of all local authorities. For example, the information gap in the Labour Force Survey makes it impossible to use confidently the training and qualification data at the LAD level. Similarly, the earnings data are only available for England at county level and the new unitary authorities, but not for the

metropolitan authorities. The measurement is also complicated by some important definitional changes in certain data-sets. For example, the bi-annual Census of Employment became the Annual Survey of Employment after 1991 and the new 1992 Standard Industrial Classification has been used since then. In 1996, the basis on which the survey was conducted was altered further to include both value-added tax (VAT) and non-VAT-registered firms. The most recent change has been the replacement of the Annual Survey of Employment by the Annual Business Inquiry in 2001.

On the positive side, the widespread use of the Internet has resulted in a very useful gateway giving access instantly to many data sources (for example, GCSE examination results, rail timetables). However, a substantial amount of manual processing is still required to convert the data into usable formats. New data-sets such as postcode house price and vehicle car count data are now available in electronic format at a reasonable price. Again, the aggregation of data from postcode to LAD level requires the availability of useful weighting factors (for example, average house price weighted by the number of households) and an accurate spatial geography look-up file. This means that the data compilation process is very lengthy and researchers have to possess sufficient technical and conceptual skills to handle these complicated tasks.

On the whole, it is encouraging to find that less than 10 per cent of the data in the data-set were derived from the now rather dated 1991 population census. This study demonstrates the potential of exploiting routine administrative data collected for other purposes to create a more updated picture of LED. The obvious examples are the school performance data, planning application data and the annual UK airport statistics. However, there is a need to improve the compilation practice of certain data series, especially in relation to the frequency and spatial scale of publications. It is also worth mentioning that it is extremely difficult to obtain comparable data for Great Britain as many data sources are only available for England and Wales.

Underlying Dimensions of LED Indicators

Five principal components extracted from the data-set have eigen-values of over 1 and together they account for 70.3 per cent of the variance among the variables (see Table 4). These 5 factors represent very different characteristics and socioeconomic profiles in the LED process. Preliminary findings of the first 3 factors were discussed in another paper to explore the relationship between quality of living and LED (Wong, 2001). The analysis here focuses on the interpretation of factor patterns of all 5 factors and then explores the spatial patterns of different LED trajectories across England by mapping these factor scores.

Interpretation of Factor Patterns

The factor loadings of the first principal component strongly identify with the traditional LED factors. This component is associated with the endowment of good infrastructure support, such as public transport networks, and the locational advantage of having easy access to the rail network, international air transport, the knowledge and information bases of higher education institutions and the financial resources of major business centres. It is also related to the favourable industrial structure that specialised in information-based business services. This component, however, highlights a very polarised process of development with respect to the quality of life factor and human resource development. On the one hand, there is a supply of quality workers with high earning power; and local residents tend to have shorter commuting journeys. On the other hand, it is associated with the negative characteristics of high house prices, lack of skills of young people, high crime risk and lack of community identity. In summary, it focuses on the endowment of traditional LED factors of infrastructure, locational advantage and industrial structure, and the less desirable

Table 4. Factor loadings of the five principal components

Indicator	Component 1	Component 2	Component 3	Component 4	Component 5
AIRINDEX	***0.73526***	*0.34624*	0.23691	0.05197	− 0.00417
ACCBCEN	*0.47187*	***0.75889***	0.01772	− 0.04673	0.04767
INDRAIL	*− 0.48274*	***− 0.70303***	− 0.20292	0.03697	0.02929
EFACTORY	− 0.25092	− 0.08546	***− 0.71291***	− 0.02717	0.12020
EOFFICE	0.19721	0.02537	0.07761	***0.91520***	0.11461
SDERELIC	− 0.04241	***− 0.44070***	*− 0.34299*	0.02059	0.01964
EMPLAND	− 0.23847	0.25161	− 0.00988	***0.47968***	*− 0.43307*
PWCAR	***0.91228***	0.07470	− 0.05141	− 0.02222	− 0.16445
AVTRAF	***− 0.74744***	− 0.09151	0.12537	0.10733	0.17973
TRAFCAR	− 0.28949	− 0.00650	0.06045	***0.89707***	0.14278
RECOACT	0.17862	***0.74310***	− 0.16959	0.06140	0.28873
ROVQUA	***0.66918***	− 0.10753	*0.40558*	0.00269	*0.37503*
EHSKILL	0.03387	*0.56863*	***0.57122***	0.17854	*0.31150*
RYUNEMP	***0.55334***	*− 0.53588*	− 0.23730	0.03197	*− 0.30423*
VENTURE	*0.39995*	− 0.06323	0.08081	***0.74616***	0.19669
OULQHTEG	− 0.05573	***0.60922***	0.11211	0.01797	− 0.11178
ITRAE	***0.89440***	0.09138	0.09854	− 0.00767	− 0.05152
LQBEG	***0.52274***	*0.41478*	0.18008	0.15446	0.05782
STRUCT	*0.38451*	− 0.00891	***0.67384***	0.18638	− 0.05822
DEATH	0.19515	− 0.13795	− 0.11286	− 0.20436	***− 0.87584***
VITAL	− 0.19515	0.13794	0.11285	0.20436	***0.87583***
INDCOM	***− 0.49628***	*− 0.41063*	0.28195	− 0.19434	*0.40393*
WPREMIUM	***0.86894***	− 0.11723	− 0.24445	0.03767	− 0.18262
INDEARN	***0.69735***	*0.40563*	0.16947	*0.39097*	0.05505
WHPRICE	*0.45350*	*0.43374*	***0.59299***	0.02324	0.27513
PAONB	− 0.16911	− 0.21707	***0.56031***	− 0.10904	0.08101
SMR	0.18997	*− 0.34757*	***− 0.70979***	− 0.06478	− 0.22360
PGCSE	− 0.28424	*0.34913*	***0.63113***	0.23361	0.27617
RCTAX	0.08884	*− 0.40036*	***− 0.46610***	− 0.06707	− 0.12650
Eigenvalue	7.94357	5.81614	2.64618	2.28271	1.70702
Percentage of variance explained	27.4	20.1	9.1	7.9	5.9

Notes: Indicators with significant factor loadings (± 0.3) are printed in italics; the highest loading for each factor is shown in bold.

aspects of quality of living. This combination of factor conditions tends to highlight the development process in the metropolitan areas in England and is thus labelled as the 'big city syndrome'.

The second principal component measures the traditional factors of locational advantage, industrial structure and human resources, as well as the more intangible factors of quality of life. Similar to the first component, this component highlights easy access to business service centres, the rail network and international airports., However, it also features strongly the quality of human resources such as a high level of economic activity rates, a concentration of high-skilled socioeconomic groups and a low level of youth unemployment. It is also associated with the concentration of employment in the growing industrial sectors of high-technology and information-based business services. Unlike the previous component, it is positively associated with quality of life factors such as good secondary school examination performance, low council tax, low standardised mortality rates and a low level of physical dereliction. However, the high quality of living also results in higher house

prices and a strong commuting culture. On the whole, this component captures the positive aspects of locational factors, favourable economic structure and a healthy labour market as well as a good quality of living. This mix of factor conditions tends to capture the economic development process in the wider hinterland area of the London conurbation and the rest of South East England, and is therefore called 'buoyant suburbia'.

The third component measures all the desirable living conditions and positive qualities of human resources. It is associated with a favourable industrial structure, a lack of industrial activities and the supply of a skilled workforce. It also features strongly on high house prices, good access to scenic beauty spots, good school examination performance, low levels of dereliction, low standardised mortality rates and low council tax rates. This component encapsulates the characteristics of areas with a high-quality environment for both production and re-production activities, and is named as the 'desirable living environment'.

The fourth principal component is somewhat more difficult to interpret than the previous three. It is associated with the availability of a large amount of urban land, office, restaurant and retail floorspace per capita, easy access to financial institutions and heavy car traffic flows. This, nevertheless, picks up areas that are genuinely providing a central function as major employment and service centres that serve a wider hinterland area, as well as those sluggish areas with an excess supply of employment floorspace. Rather than showing the combination of LED factor conditions, this component in many ways highlights the spatial function as well as the logistic development process of areas. In the light of these characteristics, it is named as the 'local service centres'.

The indicators featured highly on the final principal component are those measuring the dynamic business culture. This component is strongly associated with high birth rates and high survival rates of small firms, as well as low death rates of existing small enterprises. It also highlights the availability of a quality workforce. It is related to areas in either non-urban localities that have a high level of community self-containment, or pressurised urban areas in terms of urban land available per capita. This final component captures the characteristics of areas with a strong 'small business culture'.

The findings of the principal component analysis lend empirical support to the theoretical conceptualisation of different dimensions of LED among the 29 indicators in the data-set. The first component is widely related to the traditional factors of infrastructure, different types of locational advantage and positive industrial structure. The second component provides a balanced combination of the positive aspects of locational advantage and industrial structure, as well as the favourable labour market and quality of life factors. The third component largely measures the quality of life factors and human resources. The fifth component associates strongly with the measurement of the intangible factors of business culture and community independence. The fourth component, however, provides a spatial dimension as it measures the economic and social functions of the local area for its wider catchment area. The large amount of variance (47.5 per cent) explained by the first two components, in many ways, echoes the views expressed by the majority of practitioners (Wong, 1998) that traditional factors are more important in the process of LED in England. However, the statistical analysis tends to lend more support to academics like Doeringer *et al.* (1987) who stress the importance of having a favourable industrial structure, and less to the practitioners in the two English regions. It is also interesting to note that the factor of human resources tend to be flexibly combined with high earnings in less attractive locations, but is frequently associated with the intangible factors of quality of life and business culture. This again, mirrors the findings of the in-depth interviews with practitioners (Wong, 1998) that skills and qualifications of human resources are widely perceived as important despite their

very different views of the importance of traditional and intangible factors.

Mapping the Spatial Patterns of LED Trajectories

The spatial distributions of the principal components' factor scores are presented in Figures 1–5. A list of the top and bottom 20 ranked local authorities for each principal component is also given in Table 5. From the general spatial patterns that emerge in the maps, it is clear that different localities have particular strengths and weaknesses in respect of different bundles of factor conditions in the LED process.

For the 'big city syndrome' component, London boroughs consistently hold the top 22 rankings and the first 13 are found in inner London. Outside London, many main cities in England score highly on this component—for example, Manchester (23rd), Liverpool (27th), Birmingham (34th), Newcastle upon Tyne (36th), Oxford (39th), Brighton (40th), Bristol (41st), Sheffield (42nd), Leeds (43rd) and Nottingham (45th). Towards the bottom end of the spectrum, it is not surprising to find that the positions are largely occupied by small rural districts especially in the more peripheral localities of Cornwall, Devon, Dorset, Lincolnshire, Somerset and Suffolk. A number of small towns in northern England are also found within the bottom ranks, for instance, Fylde (361st) and Ribble Valley (349th) in Lancashire, Easington (344th) and Sedgefield (353rd) in County Durham and Castle Morpeth (343rd) and Blyth Valley (336th) in Northumberland.

As expected, areas with the top rankings on the 'buoyant suburbia' component are largely concentrated in the south-east of England. The top 20 areas are clustered around the home counties of Berkshire, Hampshire, Hertfordshire and Surrey, as well as the wider south-east commuting areas of Avon in the south-west and Cambridgeshire in East Anglia. Other areas that score highly on this component include the affluent outer London suburbs of Hillingdon (38th), Hounslow (44th), Kingston-upon-Thames (49th) and Richmond-upon-Thames (50th). Those areas at the bottom end of the scale are peripheral rural areas such as Penwith, Kerrier, Carrick, North Cornwall, Berwick-upon-Tweed, West Somerset and Allerdale; and inner-city areas such as Hartlepool, Liverpool, Manchester, Newcastle upon Tyne, Middlesbrough, Sunderland, Knowsley and Sefton. The rural areas probably lose out due to their remoteness, whereas the inner-city areas suffer from their poor quality of living and lack of economic dynamics.

Areas in the top rank of the 'desirable living environment' component include a mixture of urban and rural townships, and affluent areas in London and the South East. As expected, places with a high quality of living are found in rural townships and scenic coastal areas, especially in the West Country of Hampshire, Dorset, Somerset, Devon and Cornwall. The more affluent areas in London (for example, Kensington and Chelsea, Barnet, City of Westminster and City of London) and in the South East (for example, Chiltern, Waverley, Tunbridge Wells, Chichester and Wealdon), nevertheless offer a different style of urban living and also feature highly on this component. Areas at the bottom of the ladder tend to be industrial towns in the Midlands and northern England. They include Corby, Sandwell, Knowsley, Stoke-on-Trent, Sedgefield, Walsall, Oldham, Hyndburn, Coventry and North Warwickshire. Some major British cities, such as Liverpool, Salford, Nottingham, Sheffield and Manchester, are also found within the bottom quintile of this component.

As explained earlier, the interpretation of the 'local services centres' component is not as straightforward as the other components. It highlights areas that are genuinely serving as the major employment and business centre in their wider hinterland areas. These include major cities such as the City of London, the City of Westminster, Manchester, Leeds and Newcastle upon Tyne, as well as some market towns such as Cambridge, Castle Morpeth, Norwich, Ipswich, Carlisle and Christchurch. However, the component also includes areas with a more sluggish economy

Table 5. Top 20 and bottom 20 ranked local authority districts on the principal components

'Big city syndrome'	'Buoyant suburbia'	'Desirable living environment'	'Local service centres'	'Small business culture'
Top 20 local authority districts				
Islington	Bracknell Forest	Rother	City of London	Eden
City of Westminster	Surrey Heath	West Somerset	City of Westminster	Selby
Camden	Stevenage	Torbay	Scunthorpe	Ryedale
Hackney	Runnymede	Chiltern	Cambridge	Camden
Kensington and Chelsea	Wokingham	West Dorset	Langbaurgh-on-Tees	Derbyshire Dales
Lambeth	Rushmoor	Waverley	Elmbridge	Berwick-upon-Tweed
Southwark	South Cambridgeshire	Tunbridge Wells	Stockton-on-Tees	Alnwick
Hammersmith and Fulham	Hart	Chichester	Forest Heath	Kensington and Chelsea
Haringey	Northavon	Wealden	Castle Morpeth	City of Westminster
Tower Hamlets	Spelthorne	East Devon	Middlesbrough	Harrogate
Lewisham	Windsor and Maidenhead	Epsom and Ewell	Hartlepool	Craven
Wandsworth	Elmbridge	Purbeck	Darlington	South Shropshire
Newham	Hertsmere	Penwith	Surrey Heath	City of London
Brent	Woking	Kensington and Chelsea	Norwich	Tynedale
Greenwich	Basingstoke and Deane	Cotswold	Great Yarmouth	Mid Suffolk
Ealing	Broxbourne	Weymouth and Portland	Manchester	Cotswold
City of London	South Buckinghamshire	Kennet	Reigate and Banstead	South Lakeland
Waltham Forest	Kingswood	Brighton	Durham	Oxford
Barnet	Slough	West Devon	Leeds	Melton
Merton	Welwyn Hatfield	South Hams	Carlisle	North Cornwall
Bottom 20 local authority districts				
Easington	Torridge	The Wrekin	Leominster	Barrow-in-Furness
South Norfolk	Tynedale	Pendle	Harrow	Worthing
South Lakeland	Hackney	Tamworth	Barnet	Hastings
East Devon	Wear Valley	Redditch	Kennet	Christchurch
Boston	Restormel	Rossendale	South Northamptonshire	Great Yarmouth
Ribble Valley	Middlesbrough	Blackburn	Enfield	Newham
Restormel	Caradon	Cannock Chase	Newham	Southend-on-Sea
Torbay	Alnwick	Bolsover	Ealing	Gosport
North Norfolk	West Devon	Easington	Derbyshire Dales	Blackpool
Tewkesbury	Copeland	Ashfield	Kensington and Chelsea	Dover
South Somerset	Newcastle-upon-Tyne	North Warwickshire	Redbridge	Plymouth
Sedgefield	Manchester	Coventry	South Shropshire	Redbridge
South Holland	Allerdale	Hyndburn	Merton	Fylde
East Lindsey	West Somerset	Oldham	Brent	Hartlepool
North Kesteven	Berwick-upon-Tweed	Walsall	Waltham Forest	Bournemouth
Suffolk Coastal	Liverpool	Sedgefield	Hammersmith and Fulham	Weymouth and Portland
East Dorset	North Cornwall	Stoke-on-Trent	Lambeth	Barking and Dagenham
Fylde	Carrick	Knowsley	Lewisham	Shepway
Christchurch	Kerrier	Sandwell	Haringey	Thanet
Forest Heath	Penwith	Corby	Wandsworth	Torbay

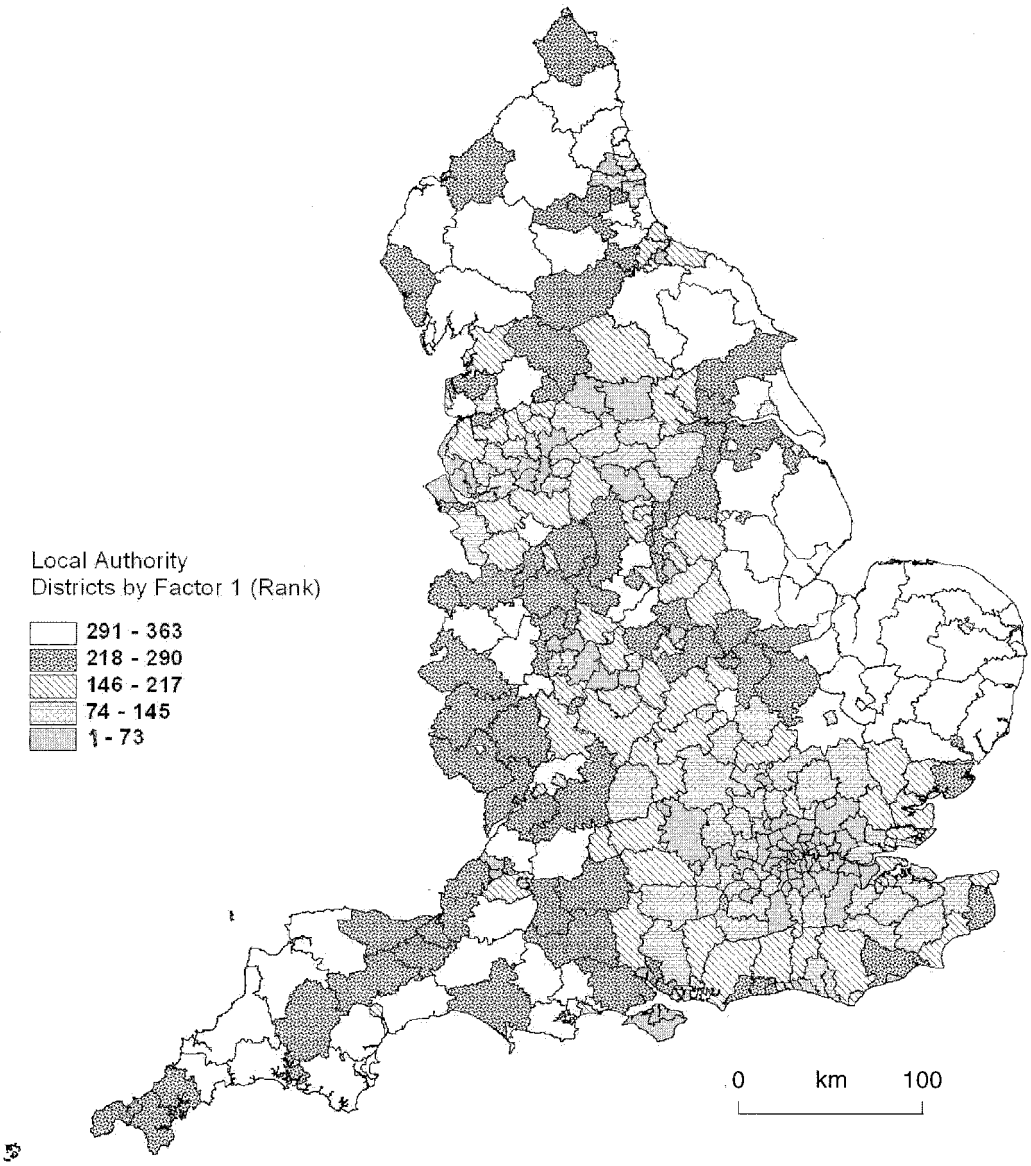

Figure 1. 'Big city syndrome' (Factor 1).

and an excess supply of employment floorspace per capita. Areas such as Stockton-on-Tees, Langbaurgh-on-Tees, Hartlepool, Great Yarmouth, Ellesmere Port and Neston, Halton, Barrow-in-Furness, Copeland and Blyth Valley fall into this category. It is, however, interesting to note that many London boroughs cluster around the other end of the spectrum. This is probably due to the fact that they are dominated by the major socioeconomic functional role played by the City of London and the City of Westminster. Other areas occupying the bottom-end positions include some rural areas such as South Shropshire and Derbyshire.

Areas that score highly on the 'small business culture' component include many small enterprise-driven rural localities. Examples of successful rural economies include Eden, Selby, Ryedale, Derbyshire Dale, Berwick-

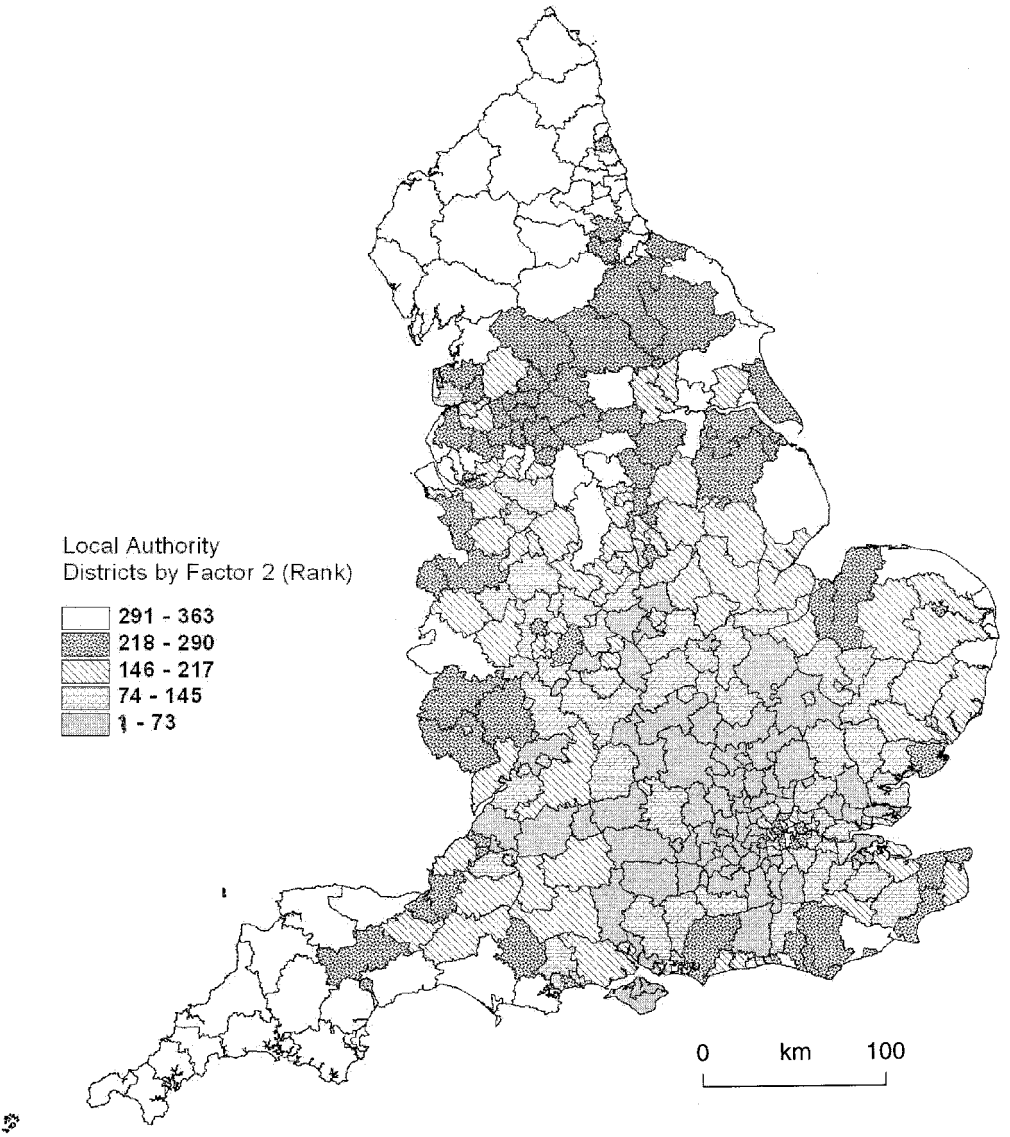

Figure 2. 'Buoyant suburbia' (Factor 2).

upon-Tweed, Alnwick, Cotswold and South Lakeland. The entrepreneurial culture is also strongly featured in many London boroughs (for example, Kensington and Chelsea, City of Westminster, City of London, Hammersmith and Fulham, Islington and Wandsworth), as well as in the South East and East Anglia (for example, Oxford, Winchester, West Oxfordshire, Cambridge, East Cambridgeshire and South Cambridgeshire). As expected, areas at the bottom end tend to be peripheral coastal localities (such as Weymouth and Portland, Great Yarmouth and Barrow-in-Furness), retirement towns (such as Eastbourne, Torbay, Southend-on-Sea, Bournemouth and Hastings), declining industrial areas (such as Shepway, Thanet and Wansbeck) and metropolitan areas (such as Barking and Dagenham, Stockton-on-Tees, Sunderland, Middlesborough, Wirral and Wolverhampton). These areas share the common charac-

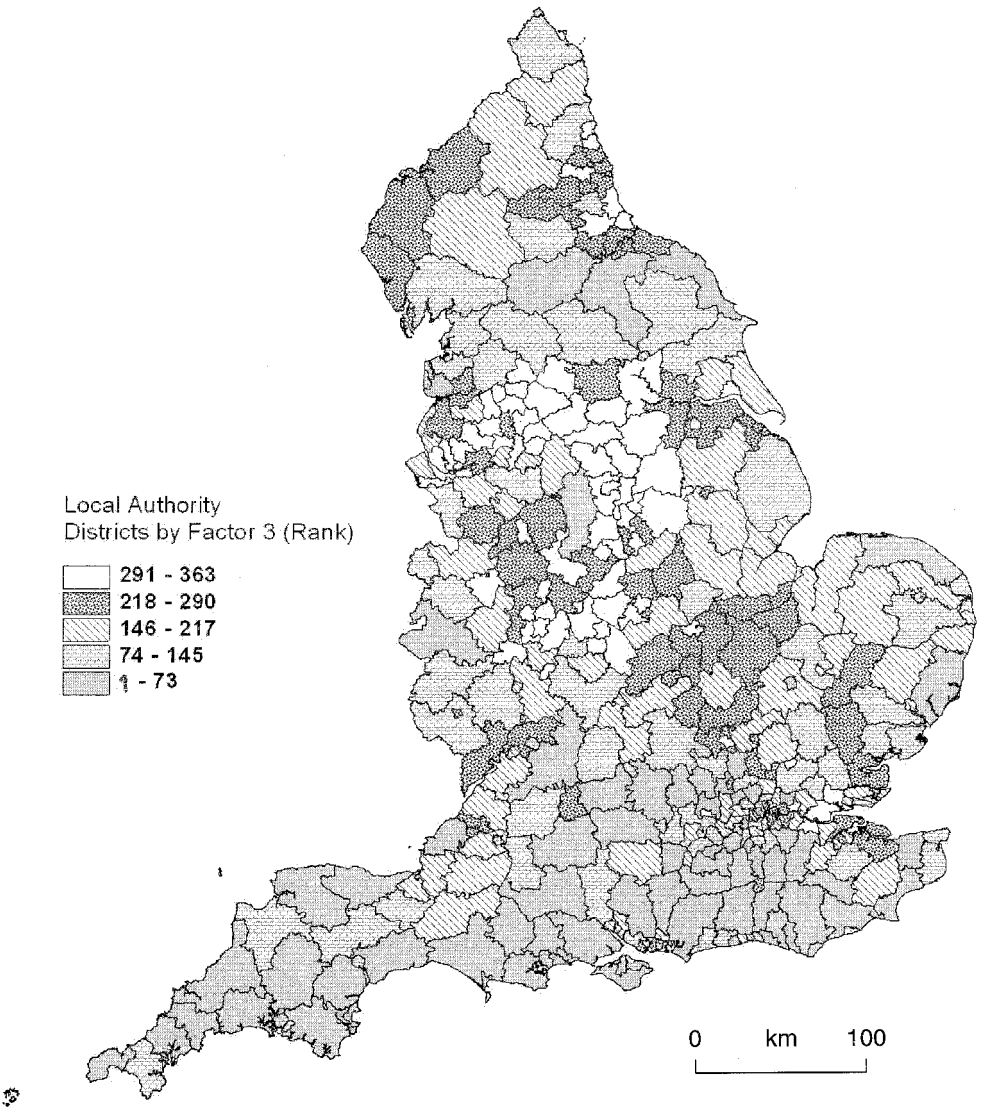

Figure 3. 'Desirable living environment' (Factor 3).

teristics of having a sluggish economy and a lack of small enterprise dynamics.

LED Factors and LED Performance

This section of the paper turns to explore the relationship between different LED factors and a number of LED performance variables. LED indicators, rather than the composite factor scores, were used in the analysis for two main reasons. The first is to focus the analysis on the empirical attributes of individual indicators to enhance our understanding of the relationship between individual LED indicators. The second reason is to keep simple and transparent the interpretation of the regression model findings. The technique of factor analysis is notorious for its involvement of a high level of professional judgement from the analyst who performs the task. The use of factor scores in the regression models will inevitably make the interpretation of the model findings less intuitive. Since this research study aims at improving

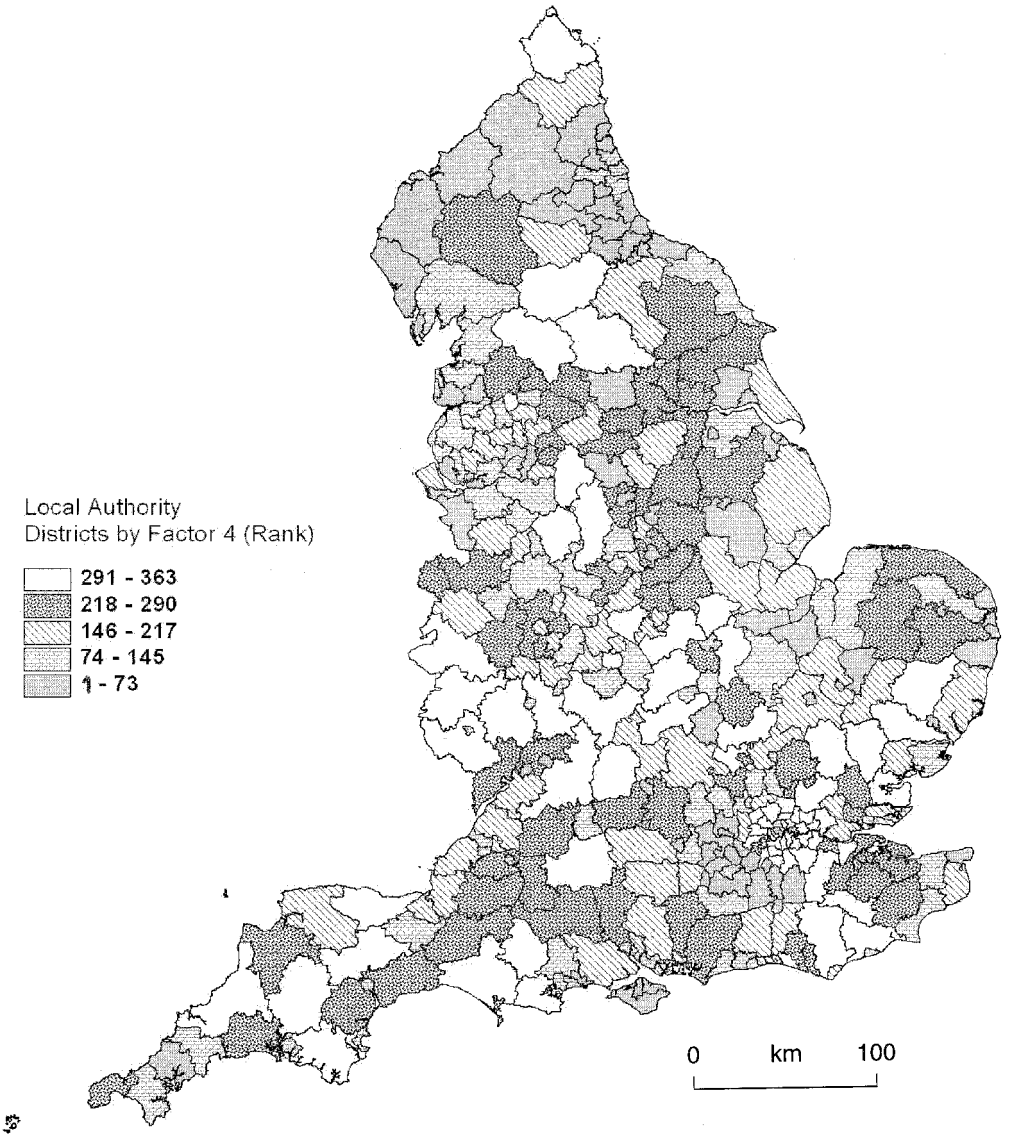

Figure 4. 'Local service centres' (Factor 4).

the methodological and theoretical development of LED indicators, the use of individual indicators in the regression models was considered to be more relevant.

A review of literature shows that there is not a single identified indicator that can provide an adequate measure of LED performance. However, a number of indicators are widely used by researchers to capture economic performance and they can be broadly classified as

—productivity measures such as gross domestic product per head (see, for example, Lever, 1993; Dunford, 1995; DTI, 2000) and gross value added in manufacturing per employee (for example, PA Cambridge Economic Consultants, 1990; Lever, 1993; Pieda, 1995);
—employment level and change (for example, Green and Champion, 1989; Pieda, 1995);
—unemployment level, change and duration

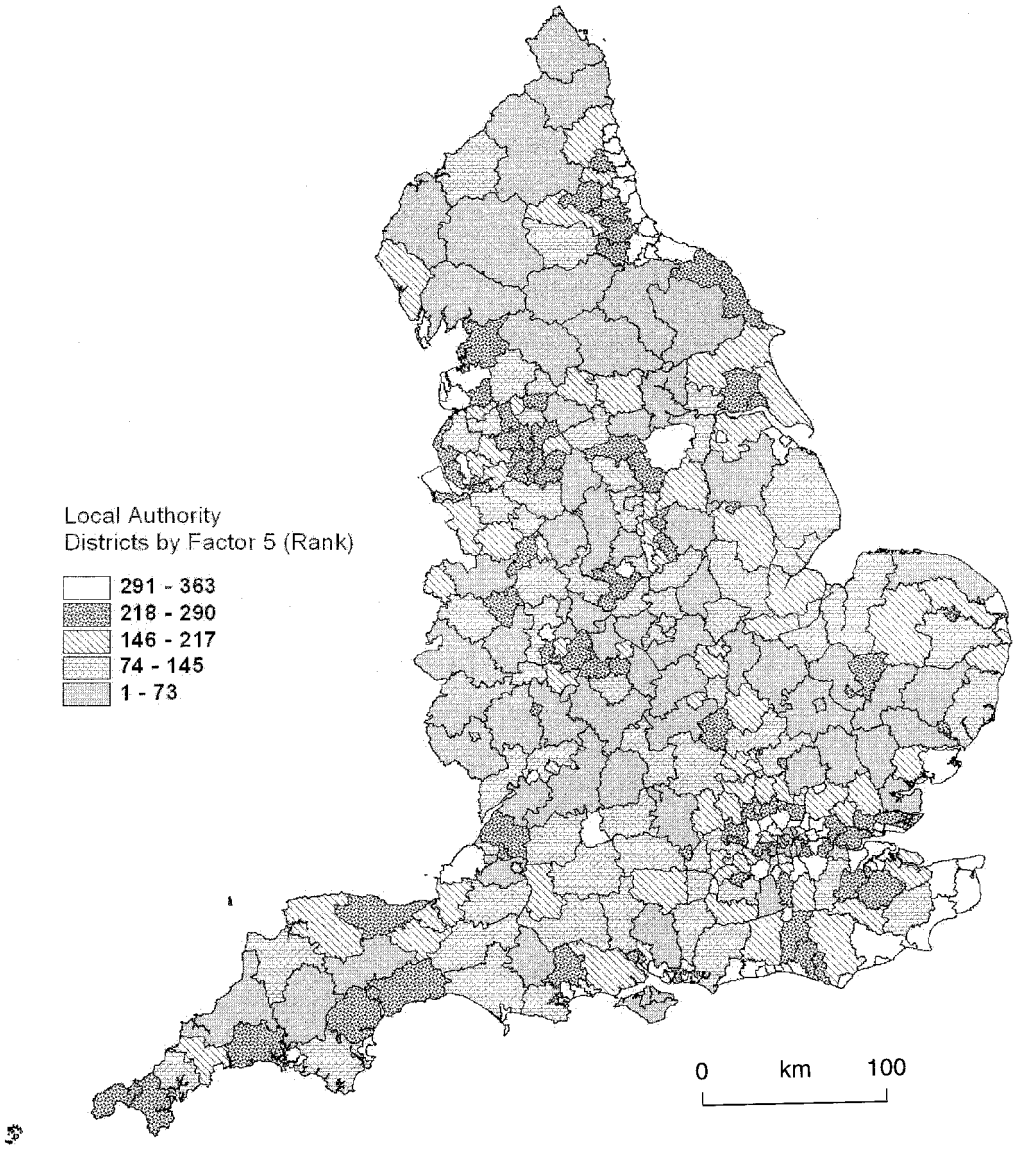

Figure 5. 'Small business culture' (Factor 5).

(for example, Cheshire *et al.*, 1986; Breheny et al, 1987; Green and Champion, 1989; Steiner, 1990);

—demographic variables such as population change (for example, Coombes and Raybould, 1989) and net in-migration level (for example, Gould and Keeble, 1984; Cheshire *et al.*, 1986); and

—property-market-related indicators such as planning applications (for example, PA Cambridge Economic Consultants, 1990) and mean house prices (for example, Green and Champion, 1989).

After considering the availability and reliability of data sources, employment and property-market-related indicators were included in the regression analyses. Rather than just examining the overall employment level, it was decided that information-based

business employment and high-tech employment were better measures of cutting-edge economic growth. Employment change was not included in the analysis due to various changes made to the definition and methodology used in compiling the data (as discussed in the earlier section). The property market indicator, planning applications per thousand local residents, was used because it is more robust in gauging the general economic buoyancy at local and regional levels. Productivity and demographic measures were excluded due to the lack of reliable data at small-area level. In spite of the availability of data, unemployment indicators were not used because of their precarious relationship with economic growth. As evidence for this, in many large cities in Britain, employment growth and unemployment can occur concomitantly in the same locality (Wong *et al.*, 1999).

The regression models were all rigorously tested to avoid multicollinearity and autocorrelation. Table 6 shows the results of the three models. Of the two employment models, the regression analysis of business services jobs provides a stronger explanation than the high-tech employment model. The 6 independent variables included in the business services employment model together account for 45 per cent of the variance. The model results reinforce the findings of other research that business employment tends to concentrate in competitive locations with good access to major business service centres characterised by high earnings and high house prices. These areas tend to be supported by a favourable industrial mix and a high level of labour market participation. It is, however, interesting to note that long-term youth unemployment is included as one of the determinants. This may be related to the fact that locations with a high concentration of information-based business services employment tend to be large cities which also suffer from the problems of unemployment and skills shortage.

With regard to the high-tech employment analysis, the 7 independent variables only explain 29 per cent of its spatial variation. The nature of the determinant factors in the high-tech model is somewhat different from that of the business employment model. Rather than favouring good access to major business centres, high-tech employment growth tends to concentrate in locations with a large amount of commuting flows. They also tend to be found in locations that are within a short rail journey to London. Human resources such as the presence of skilled labour and high economic activity rates, together with a high level of earnings, are the key determinants of the model. Nevertheless, one unexpected finding is that the vitality of small businesses is negatively related to the level of high-tech employment.

The regression analysis of planning applications is more successful than the two employment models. Table 6 shows that the 7 independent variables in the model account for 76 per cent of the spatial variation in planning applications. It is interesting to note that the accessibility to venture capital is the dominant factor in explaining the variations. As over three-quarters of venture capitalists are found in London and the South East and their distribution very much follows a distance-decay function, this variable may act as a proxy measure of the buoyant South East factor. The other key determinants of the model include the degree of self-containment and the availability of urban land. Human resource factors such as the skills and qualification of the workforce and the level of earnings also contribute to the explanation of the variations in planning applications. All these factors very much characterise locations either under strong development pressure or that have strong development potential. It is, however, surprising to find that house price has a weak negative relationship with the level of planning applications. Again, this may be an indication of areas that have strong development potential rather than high development pressure.

The regression analyses here highlight the fact that the explanatory power of LED factors varies significantly when different performance measures are used. The factor variables tend to be more successful in

Table 6. The determinants of variations in LED performance

Business services		High-tech		Planning applications	
Independent variables	Regression model	Independent variables	Regression model	Independent variables	Regression model
Constant	− 6.344*** (− 3.890)	Constant	18.091* (2.496)	Constant	− 14.004*** (− 9.486)
ACCBCEN	0.213** (3.000)	*INDCOM*	− 0.148** (− 2.976)	*VENTRUE*	1.782*** (21.000)
INDEARN	0.318*** (3.564)	*INDEARN*	0.043* (2.314)	*INDCOM*	0.260*** (8.656)
RECOACT	0.069** (2.645)	*RECOACT*	0.155** (2.957)	*EMPLAND*	0.034** (3.214)
WHPRICE	0.00001*** (3.789)	*VITAL*	− 0.347*** (− 3.440)	*INDEARN*	0.081*** (5.836)
STRUCT	0.035** (2.629)	*PWCAR*	− 17.361*** (− 5.709)	*WHPRICE*	− 0.00004*** (− 6.248)
RYUNEMP	0.320** (3.128)	*INDRAIL*	− 0.010* (− 2.535)	*EHSKILL*	0.136*** (4.112)
		EHSKILL	0.129*** (3.967)	*PGCSE*	0.109*** (5.972)
Adjusted R^2	0.452***		0.285***		0.761***
F-statistics	50.778 (6356)		21.618 (7355)		165.428 (7355)

Notes: T-statistics shown in parenthesis.
* indicates significant at the 5 per cent level; ** indicates significant at the 1 per cent level; *** indicates significant at the 0.1 per cent level.

explaining variations in planning application levels than the distribution of high-tech employment. This may be related to the fact that, rather than just explaining employment performance, the planning application model tends to capture different types of development dynamics—areas already under strong development pressure (i.e. the buoyant South East and areas with a strong degree of self-containment) as well as areas with development potential (i.e. those with a good supply of urban land for development and areas with less pressurised housing markets). The use of three independent performance measures also allows comparison of contributions made by different factor combinations to different forms of economic outcome. Although the combination of determinants in the regression models is different, some common characteristics of LED determinants are found. First of all, the human resource factors of a high economic participation rate and high earnings are strongly featured in all three models, and the importance of skills and qualifications are also found in two of them. This very much echoes the views of practitioners and the findings of the principal component analysis discussed in the earlier section. The other striking result is the dominance of the London/South East factor in all three models. Despite the fact that a specific location variable is not included in the analyses, three variables with a strong London and South East bias—proximity to business services centres, short rail journey time to London and accessibility to venture capitalists—emerge as the key determinants in the analyses.

More importantly, the findings of the regression analyses emphasise the fact that there are different trajectories and pathways to economic success. It is clear that the fastest-growing sector of business services employment tends to cluster around locations with close proximity to large business and financial centres. However, these tend to be found in main cities where there is a concomitant problem of social polarisation in the same production space. The location characteristics of high-tech employment are, however, following the trend of spatial decentralisation across the South East in car-based commuting locations. Areas with strong property market dynamics in terms of a high level of planning applications include those locations that are subject to strong development pressure as well as those with development potential.

Conclusion

Given that there is a lack of relevant or robust data to measure some LED indicators and performance measures, the empirical analyses reported here are limited in terms of developing a fully established theoretical model of LED. The paper, however, provides a systematic method of measuring different LED factors grounded on a strong conceptual framework derived from theoretical literature and empirical interviews with practitioners. The intention of this paper was to explore the underlying dimensions of the LED indicators and to establish their relationships with a number of performance measures. The empirical analysis of the compiled LED indicators has produced a number of interesting findings that have implications for the LED decision-making process.

The use of principal component analysis highlights the underlying structure and multi-dimensionality of the 29 LED indicators. The characteristic patterns that emerge from the constellations of indicators define different trajectories of the LED process. The strong emphasis on traditional factors of infrastructure and different types of locational advantage in the first two components of ‘big city syndrome’ and ‘buoyant suburbia’ very much reiterates the views expressed by policy-makers in the North West and Eastern regions. The ‘buoyant suburbia’ component is the only one which encapsulates the balance between traditional hard factors, quality human resources and quality of living concerns. The remaining three components, however, tend to capture the more intangible dimension of LED factor resources. The third component, ‘desirable living environment’, largely measures the good quality environ-

ment for both production and re-production activities that can be found in a mixture of urban and rural townships. The fourth component, 'local services centres', provides a spatial dimension to development by emphasising the socioeconomic functional role of the local area relative to its wider catchment. The fifth component, 'small business culture', strongly associates with the small business culture and self-containment of many rural communities. The mapping of the factor scores shows that different localities have their strengths and weaknesses over different bundles of factor conditions. It is clear that areas commanding a variety of factor resources tend to perform very well, as illustrated by the advantageous positions enjoyed by some affluent London suburbs and the rest of the South East. At the opposite end of the spectrum, a sluggish economy tends to be found in areas at peripheral locations where quality of living is also poor. Other areas tend to perform very well on certain factor conditions, but are vulnerable on others. This problem tends to be found in most metropolitan cities, northern townships and some rural communities. The implication is that their LED potential will be limited if they do not overcome the constraints imposed on them by some factor conditions.

The varying combinations of determinants found in the regression models emphasise that there are different pathways to achieve different aspects of economic performance. However, it is very clear that the two main factors that are commonly found across the three models are location advantage in relation to a particular activity and quality human resources. The findings in essence make it explicit that there are significant advantages to being in London and the South East, whether this is because of easy accessibility to the financial hub of London or to the decentralised car-based locations in the rest of South East. It is somewhat depressing for practitioners elsewhere in the country to learn this, as it is not an easy task to create the synergy and cluster effect enjoyed by the London/South East region within a very short period of time. However, it is more encouraging to find that the skills and qualifications of the workforce are a key driver behind the performance variables. This is not only because of the more mobile nature of human factors, but also because it raises the possibility of devising strategy to improve the skills and training of the workforce within a relatively short period of time. This signifies that there is a very important role to be played by the newly established Learning Skills Councils to improve the skills and qualifications of their local workforce. At the regional level, there is a need for Regional Development Agencies and Regional Planning Bodies to devise appropriate economic development and planning strategies to help to attract and retain a suitably qualified population in their respective regions. The regression analyses also highlight the fact that the 29 input LED indicators do not provide a full explanation of the variations in the performance variables. This partly reflects the dynamic and complex nature of the LED process which is not that easy to deconstruct. However, it is also due to the fact that the analysis here only aims at investigating the relationship between factor conditions of local areas and their economic performance. As suggested by Porter (1990, 1991), in order fully to explain local economic performance, the inclusion of the demand-side conditions, the performance of private business sectors and of supporting industry will also be required.

The findings from both the principal component analysis and the regression models point to the dilemma of devising appropriate spatial strategies for LED. The presence of the hard traditional factors in the first principal component and the importance of gaining access to major business centres in London and other main cities largely reflect the development trajectories of major cities and metropolitan areas in England. Whilst these areas enjoy locational advantage and development infrastructure, there are concomitant social problems of crime and unemployment and a strong commuting culture with an outside workforce taking up high-quality and high-paid jobs in these cities. This means

that unemployment, social exclusion and rapid economic growth may co-exist within the same space. Hence, it is not only the location of new production that is important, but also the availability of reproduction opportunities (that is, through retraining and education) as a means of combating both the skills gap and the forward drive of exclusionary processes. A further policy implication of the findings is that the success of the London/South East region and the increasingly reliance of car-based locations and commuting make it difficult to strike a balance between economic development and the need to preserve a sustainable living environment. In global terms, the issues of unequal spatial development and the north–south divide no longer simply point to the matter of improving the quality of living and economic performance of the peripheral regions. It is also a concern of the capacity of the buoyant regions like the South East to cope with the pressure of economic and population growth without damaging their environmental quality. The interconnection between sustainable development and economic growth and the need to address uneven regional development no doubt pose a major challenge to policy-makers in the LED field.

Notes

1. Principal component analysis is one of the two basic models to obtain factor solutions. It attempts to explain the total variance of the indicators in terms of a linear combination of them all. There is no assumption of a common underlying concept relating the indicators but instead of an indication which might summarise their joint variations succinctly.
2. A full data-set containing 61 LED indicators and the associated explanatory documentation have been deposited in the ESRC Data Archive. However, only 29 of these indicators were included in the final analysis after an initial exploration of their statistical properties. This was due to a number of concerns over the robustness and validity of some indicators to provide satisfactory measurement of the concept of LED. First of all, the correlation coefficients show that a number of indicators—for example, *VAT registration per head of economically active population*, *office floorspace per head of economically active population*, *shopping and restaurant floorspace per head of population* and *the ratio of in-commuters to out-commuters* are all highly intercorrelated with $R > 0.98$. The high correlation among these variables suggests that the indicator that is most frequently updated should be used to represent the others. Secondly, in spite of the fact that data were compiled to measure specific factors, some indicators do produce unexpected outcomes that make meaningful interpretation difficult. For example, *science and engineering research capacity, the provision of good public transport and a wide range of housing tenure*, were used to measure R&D development and quality of living respectively; but they all act as a proxy measure of inner-city locations. The new high-tech definition adopted by the DTI (which excludes the service sector) simply picks up the manufacturing industrial structure of an area. The statistical results of some indicators also provide counter-intuitive outcomes. For instance, *self-employment rates* were found to be negatively related to *economic activity rates*—which probably reflects LED problems in rural areas; *science park floorspace* was also negatively related to other R&D indicators—which poses a fundamental policy question of the function of science parks in fostering LED. The final issue concerns the ambiguous relationship between some indicators and the process of LED. For example, it is difficult to ascertain whether residents involved in *long-distance commuting* is good or bad to the quality of life factor—it may be good because the workforce can choose to live in decent suburban environments, but it may also be bad as it is tiresome to spend too much time travelling. Such interpretation problems were also encountered with indicators measuring *commuting flows* and *industrial specialisation*. Hence, many of these problematic indicators were excluded from further statistical analysis, as their conceptual meaning to LED was not all that clear.
3. The infrequent collection of the derelict land data could potentially be overcome by the new National Land Use Database of the Department for Transport, Local Government and the Regions. However, the new land-use database currently suffers from the problem of inconsistent definitions applying to different categories of land use in the submissions made by local authorities.

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