Department for Transport

Aviation, Core Cities and Regional Economic Development

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The Potential Contribution of Aviation to Improved International Connectivity, Competitiveness and Regional Economic Prosperity
Connectivity and the Core Cities

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APPENDICES

1 Overview

1.1 Core cities and the potential role of aviation

1.1.1 This report summarises the findings from an initial review of the relationship between the relative position of core cities and their connectivity, internationally and inter-regionally. The report is produced in the context of the Governments PSA2 Objective, which is to:

"Make sustainable improvements in the economic performance of all English regions and over the long term reduce the persistent gap in growth rates between the regions, defining measures to improve performance and reporting progress against these measures by 2006".

1.1.2 With the exception of the East of England, and possibly the South West, the economies and fortunes of most UK regions are tied heavily to the fortunes of the major cities, which dominate their respective economies. When this perspective is combined with emphasis on existing urban areas as the location of new growth and development (apparent from National Planning Policy and other sources), it becomes clear that the major cities have a highly significant role in meeting the PSA objective. Put simply, the PSA target will only be met if the future position of the major cities can be secured. This, in turn, means that the competitiveness issues of these major cities will need to be addressed.

1.1.3 The challenges facing the UK's major cities were largely recognised in the course of the late 1960s and 1970s. Many were struggling to maintain their economic standing and were facing a decline of both population and jobs. By the early 1970s the largest cities had begun to decline in a way that had not previously been seen in the UK. By the 1980s it had become clear, first, that the problems involved whole areas of cities and not just the "inner city" and second, that no single or simple problem existed to address the problem. By the 1990s, it was also clear that the problems were both structural and locational. The distinction here being that not only were cities declining because they were dominated by traditional industries that were now in long term decline, but that the cities were no longer necessarily competitive locations to do business, particular for modern economic sectors. Moreover, in the context of increasing globalisation, the actions necessary to secure the future role of cities largely comes down to making them more competitive- making them attractive places to work, live and do business.

1.1.4 Competitiveness generally relies on structural and characteristics and locational advantage built up over long periods of time, particularly as a consequence of infrastructure development and it is suggested connectivity. The most recent research into the roles and characteristics of post-industrial cities provides further evidence of how successful cities can also deliver policy goals on a broader social and environmental scale. The term 'ideopolis' has been coined to express this concept:

"Ideopolis represents a 21st century metropolitan version of what we first saw in Italian renaissance city-states. The key elements are the ***airport,*** *the university and the capacity to create new ideas – either within or outside existing companies – that buoyant demand, intellectual capital and business self-confidence help to sustain"* (Will Hutton, 2002).

1.1.5 Aviation is a major sector of the UK economy in its own right. Oxford Economic Forecasting[1] estimate that in 1998 aviation directly employed 180,000 people, 0.8% of the

[1] The Contribution of the Aviation Industry to the UK Economy, Oxford Economic Forecasting 1999

UK total, a figure that they suggest may rise to 242,000 by 2030. A further 50,000 to 80,000 jobs are supported in related industries. Moreover, the effect of this employment is even more significant given that it will always be concentrated in a limited number of locations, i.e. those locations with airports. This is especially evident if the contributions of existing airport operations on their localities are examined.

1.1.6 But, perhaps more interestingly, aviation makes a highly significant contribution to the economy of areas by delivering travel time savings and through broader catalytic effects.

1.1.7 Most of the travel time benefits are captured through transport benefit appraisal techniques. Traditionally, these are presented as a single national figure and are calculated by putting a monetary value on the travel time saved as a consequence of supporting a particular increase in aviation services, typically through airport or route development projects. These benefits typically run to several millions, or tens even hundreds of millions and are compared with real costs, in a normal cost benefit framework to inform public policy decisions about whether the scheme should go ahead. Conceptually, they are generally regarded as benefits to the economy as a whole an approach that very much reflects the tradition of addressing such issues through national policy frameworks.

1.1.8 From the perspective of this report the important question is of who benefits from time savings. Common sense suggests that in the first round it is largely the passengers using the service that are typically drawn from a local or regional catchment area of the airport or have “business” in that same area. This means that if the anticipated benefit of a scheme are, say, £10million in travel time saving then a the most concentrated proportion of these benefits will accrue to passengers and business from the region in which the scheme is located. Thus, regions may benefit not just from the normal direct and indirect effects of the aviation sector itself, but also a substantial proportion of the effective and real value of the travel time saving which will act as a cost “subsidy” to businesses in the regions. Such benefits also represent an (measurable) improvement to regional competitiveness.

1.1.9 Beyond these travel time benefits there will also be wider catalytic effects. These are sometimes regarded controversially in terms of conventional appraisal frameworks, but can nonetheless be accepted as real and tangible in terms of market realities. In essence they are based the reality that the absence of a particular location factor acts as a “barrier to entry” for a particular sector or economic activity and in this respect have a long relationship with transport. At the extreme historically for example, shipbuilding could only ever have developed where there was access to a deep water port. For modern industries the relationships with transport are, of course, more subtle, but a similar example would be that an international headquarters would not generally locate in an area where it did not have access to a major airport. The point is also that in the context of an increasingly global economy the issues are of relative not absolute advantage. Thus, the presence of international air services, or even “better” international services may tip the balance in favour of a particular location being suited to modern economic activity because it offers a relative competitive advantage, all other factors being equal.

1.1.10 The above is not to suggest that international connectivity is the “be all and end all” panacea for regional economic success in all circumstances, but it is suggested that there is a strong causal relationship between core city aspirations in terms of the development of modern economic sectors and improved international connectivity by air. It is also suggested that there is a strong scope to develop policy measures designed to improve international connectivity and to demonstrate potential benefit within target regions. There are some precedents for this in the route development funds established in Scotland and the assistance to strategic transport infrastructure, e.g. rail already provided through the current EU Objective 1 and 2.

1.2 The importance of aviation policy

1.2.1 Aviation is a major UK industry, carrying over 180 million passengers a year and over 2.1 million tonnes of freight. Demand for air travel is growing. The Government's aim is to develop a long-term framework that will maximise the beneficial aspects of aviation and minimise the negative ones.

1.2.2 The civil aviation industry in the UK, as elsewhere in Europe, has reached an important stage in its development. Demand for air travel has been growing rapidly in recent years, not only in the South East and East of England but also in many other parts of the UK. As a result it now faces the prospect of rising demand and increasing environmental impacts that need to be addressed if that growth is to continue.

1.2.3 The aviation industry is widely recognised as making a substantial contribution to the UK's national, regional and local economies in terms of productivity, competitiveness and employment. It is also an important factor in encouraging inward investment, inbound tourism and regeneration. It brings foreign travel and holidays within reach of a broad cross-section of the population. However, the growth of air transport brings with it a range of environmental impacts at a global and local level, including noise and air pollution, pressures on the natural and built environment and congestion on supporting road networks. Defining a long term sustainable policy framework that will enable the beneficial effects of air transport to be maximised, particularly in the regions, while addressing negative impacts and allowing those concerned to plan with greater certainty, will not be easy but is the important challenge which the Government faces.

1.3 The on-going airports policy review

1.3.1 The global nature of air transport requires the industry to operate in a complicated web of international agreements, and in the UK's case, European legislation. Given the many changes that have happened in the industry over the last 30 years, a major review of air transport policy has been required.

1.3.2 The Government recognised this, when announcing in its Integrated Transport White Paper (ITWP) "*A New Deal for Transport: Better for Everyone*", published in 1998, that it would prepare a UK airports policy looking 30 years ahead, which would consider aviation's effect on:

- consumers,
- the economy,
- the environment,
- regional development,
- urban regeneration,
- policies on integrated transport, and
- policies of Local Authorities and Regional Development Agencies (RDAs).

1.3.3 The Government undertook to bring forward new policies on civil aviation that would reflect the Government's commitment to sustainable development, integrated transport and regional growth. The ITWP went on to specify that amongst its key aims, a future Air Transport White Paper would need to:

"…reflect our strategy for sustainable development. This means aviation should meet the external costs, including environmental costs, which it imposes" and

"…encourage the growth of regional airports to meet local demand for air travel where consistent with sustainable development principles", in order to "maximise the contribution they make to national and regional economies; relieve pressure on congested airports in the south east of England; and reduce the need for long surface journeys (particularly by road) to south east airports."

1.3.4 Selected projects under consideration are summarised in Table 1.1(a) below. These projects were set out in "The Future Development of Air Transport in the United Kingdom" consultation documents for Midlands and Scotland.

Table 1.1(a): Benefits and costs of selected projects under consideration

	Total Benefits	Costs	Net Benefits
Birmingham: Close Spaced (RASCO)	1.88	0.69	1.20
Birmingham: Wide Spaced (RASCO)	3.14	1.12	2.02
East Midlands: Wide Spaced (RASCO)	0.41	0.85	-0.44
Edinburgh: New Close Spaced Runway in 2013: Glasgow 14 mppa	3.02	1.22	1.81
Edinburgh: New Close Spaced Runway in 2023: Glasgow 14 mppa	2.44	0.98	1.46
Edinburgh: Phased New Close Spaced Runway in 2013: Glasgow 14 mppa	3.02	1.13	1.89
Glasgow: New Close Spaced Runway in 2029: base capacity 14 mppa	1.33	1.28	0.05
Glasgow: New Close Spaced Runway in 2033: base capacity 23 mppa	0.29	0.50	-0.21
Manchester: New Terminal (Base)*	1.15	0.69	0.46

1.3.5 For comparative purposes the benefits and costs of illustrative Sout East airport development packages are shown in table 1.1(b) below. These projects were set out in the South East and East of England consultation document.

Table 1.1(b)

	Total Benefits	Costs	Net Benefits
Heathrow and Stansted: One New Runway Each	26.04	7.5	18.53
Heathrow, Stansted and Gatwick: One New Runway Each	34.62	8.99	25.63

1.4 This report

1.4.1 The aim of the remainder of the report is to demonstrate the role that connectivity can play as a catalyst for the economic renaissance of cities. It also explores the role of supporting improving connectivity, through public policy intervention, as a tool for supporting the economic renaissance of core cities.

1.4.2 The remainder of this paper is structured as follows. **Section 2** introduces the concept of core cities. **Section 3** provides a review of the role of aviation infrastructure in city or regional economic development.

1.4.3 **Section 4** then presents a summary of the key themes from existing studies and literature on core cities. This review generally lends supports to the importance and potential effects of improved international accessibility or “connectivity” in securing the existing economic roles or the renaissance of identified core cities. **Section 5** then considers more empirically based evidence on the role and connectivity of core cities drawing on existing work and original work looking specifically at the accessibility of core cities to one another. This section uses the more theoretical perspective of sections 2 and 4 to evaluate much of the existing work. **Section 6** considers the relationship between aviation connectivity and city hierarchy and development. **Section 7** then draws together conclusions on the importance of aviation in promoting connectivity and economic renaissance.

2 Core Cities

2.1 Introduction

2.1.1 The idea of the core city is a recent concept, reflecting policy concerns for the position of cities, particular the major regional centres and to some extent the opportunities offered by the “capitals” of Scotland and Wales. The term “core cities” stems from the efforts of the key regional centres in the UK to take the lead in their own regeneration and development. In 2000, Birmingham, Manchester, Leeds, Newcastle Liverpool and Sheffield clubbed together in partnership with public and private sector groups to form the core cities group. They were subsequently joined by Nottingham. The purpose of the ‘movement’ is to forward the interests and prosperity of these regional centres through cooperation and coordinated policy action.

2.1.2 The joint Working Group on "Cities, Regions and Competitiveness" was set up by ODPM in April 2002 with the following terms of reference:

"To make recommendations for policy changes and practical actions to enable the major regional cities to fulfil their potential as drivers of the urban renaissance and the economic competitiveness of their regions - and thereby strengthen the national economy's capacity for growth."

2.1.3 The Working Group's core membership is drawn from Government Departments (ODPM, HM Treasury, DTI, DfT), the Regional Development Agencies (including London), Government Offices and the English Core Cities Group of local authorities. Other Government Departments are involved when their policy areas are under examination.

2.1.4 The focus of the Group has been to identify and analyse the key factors that work for and against regional competitiveness. Each Core City has taken the lead in exploring a specific topic and offering policy proposals for the Group to consider.

2.1.5 The Core Cities Group of authorities currently comprises the 8 major `regional cities' in England - Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield. Each City has prepared an individual Prospectus setting out its long term vision for sustainable economic growth and how it can contribute to enhancing regional competitiveness.

2.1.6 An Interim Report of the Group's work was launched at the Urban Summit on 1 November 2002. A Second Report of the Working Group was issued on 6 June 2003 at the Core Cities Summit in Newcastle. The report contains an action plan for strengthening productivity and the urban renaissance in major regional cities as the essential foundation for improving regional economic performance.

2.1.7 The Group's work is central to efforts underway to identify the 6 - 10 key policy measures likely to be most effective in achieving the PSA2 Target to reduce the "persistent gap in growth rates between regions". The Group's initial set of 10 key "success" factors for city competitiveness is contributing to this.

2.1.8 There is relatively little academic literature in the social sciences (regional studies, human geography, urban studies) that refers to the core city concept specifically. However, the concept has quite clear roots in a longer standing literature concerned with regional cities and regional economic development.

2.1.9 The core cities group original definition of core cities focused very much on regional cities as cultural centres. The definition and movement in the UK context stems from comparisons and experiences drawn from the Eurocities network – a local government based international network of cooperation and regeneration based experience sharing. Much of the existing focus on core cities is therefore centred on culture-based urban regeneration in a variety of forms. For example:

- cultural events (e.g. arts / drama festivals);
- major building projects (museum or gallery sites, heritage development);
- strategies of city / culture association e.g. European city of culture; and
- creating a wider cultural synergy of economic development through ideas, entrepreneurship & creativity.

2.1.10 However, this central theme of core city thought has recently started to shift towards a greater emphasis on more 'economic' elements and the wider agenda of economic development around the potential of core cities to contribute to the wider knowledge economy. A number of points can made in this respect relation to the significance of these core cities to the future development of the UK economy:

- cities / city-region are the places where innovation takes place which is crucial to indigenous economic development;
- the 'core city' conceived as an 'Ideopolis' – agglomerations of people lead to the exchange of ideas and creative synergy. This is especially important in an informational & high technology dominated economy such as the UK;
- core cities are key if there is to be a redressing of London's domination in the UK space economy;
- globalization offers opportunity for regional economic development driven by international business. Core cities can be nodes in the formation of transnational economic linkages in their own right;
- core cities are key locations of major universities, also crucial engines of innovation / entrepreneurship in information economy; and
- regional core cities are also potential ongoing centres for the focus of cultural based urban regeneration. This includes not only the tourist industry by also other forms including the new media and culture / creative industries.

2.1.11 The core city idea is thus the latest phase of ideas about the place of regional UK cities in economic development. The concept is policy practice-led but is drawing upon wide ranging contemporary debates about the nature of the global economy, the nature of international business and the best policy framework to adopt for engendering growth in these city-regions.

2.2 Core cities: findings to date

2.2.1 The Core City Group's initial report laid out the research evidence showing the pivotal role of cities in advanced economies – where the creation and application of unique knowledge is of greater significance than exploitation of natural resources or mass production. The most recent research into the roles and characteristics of post-industrial cities provides further evidence of how successful cities can also deliver policy goals on a broader social and environmental scale. The term 'ideopolis' has been coined to express this concept:

"Ideopolis represents a 21st century metropolitan version of what we first saw in Italian renaissance city-states. The key elements are the airport, the university and the capacity to create new ideas – either within or outside existing companies – that buoyant demand, intellectual capital and business self-confidence help to sustain." (Will Hutton, 2002).

2.2.2 Proponents of the 'ideopolis' concept draw attention to the potential chain reaction that can follow from a high level commitment to strengthen a city's knowledge base and connectivity as the launch pad for stronger economic performance and a distinctive external profile.

2.2.3 Although the UK regional cities have made significant advances over the past decade the evidence shows that they are still under performing by comparison with their counterparts in competitor countries – having less competitive economies, lower international accessibility, lower international profiles, and more challenging social and environmental agendas. The evidence about the 'powerhouse' role of cities in advanced economies makes it clear that these are hurdles UK regional policy has to overcome as a prerequisite for developing a national economy in which all regions make distinctive and significant contributions.

2.2.4 The Regional Economic Strategies, produced by the English Regional Development Agencies focus heavily on 'knowledge driven' and high added value industries, all of which have a high propensity to fly. Similar aspirations are evident in Scotland. By comparison there is less reliance on slower growing/lower productivity older industries – low PTF. Many also stress that global accessibility is the key issue to overcome the peripherality of the UK's regions in Europe and increase competitiveness. Global connectivity one of three key pillars of Scotland's economic strategy; skills and innovation the others.

2.2.5 Economic Strategies focus on cluster development including sectors heavily dependent upon air accessibility, such as:

- aerospace;
- advanced Engineering and Metals;
- digital Industries;
- energy;
- tourism;
- pharmaceuticals and Speciality Chemicals;
- biosciences;
- digital;
- creative Industries;
- environment & Environmental Technology;
- financial & Professional Services;
- advanced Materials;
- bioscience & Technology;
- aviation; and
- electronics.

2.2.6 Each region typically wants a competitive air service offer defined as:

- direct business related services to key UK and European cities from the main regional airports;
- connections to London and other hubs;
- more direct global links from Manchester, Birmingham, Edinburgh;
- better leisure services from local airports to meet social needs.

2.2.7 In the RDA strategies each region also seeks direct job impacts important locally, particularly in support of regeneration priorities, recognising the significant potential added value and GDP contribution from the sector.

3 The wider role of aviation infrastructure in economic development

3.1 Introduction: aviation as a major "engine" of economic growth

3.1.1 Aviation infrastructure can have an important role to play in contributing to Core City or regional economic growth, not only is the aviation industry a major employer and business in its own right but aviation infrastructure (unlike other regional economic inputs such as land or capital) has an additional facilitative or catalytic economic role. Examples of catalytic aviation infrastructure economic impacts upon the regional economy include imports and exports and investment decisions.

3.1.2 Developing a framework to assess the economic contribution of aviation infrastructure as well as opportunities to enhance or extend that contribution, therefore needs to take into account a range of direct and indirect economic impacts. This section outlines the three main areas of economic contribution or impact of aviation infrastructure upon the regional economy (see Figure 3.1 below):

- the direct employment and GDP/GVA impacts of the aviation sector including indirect and induced impacts;
- the impacts on business competitiveness (both regional and non-regional) of regional aviation infrastructure through the reduction in transport costs; and
- the wider impacts on regional productivity and investment patterns of aviation infrastructure.

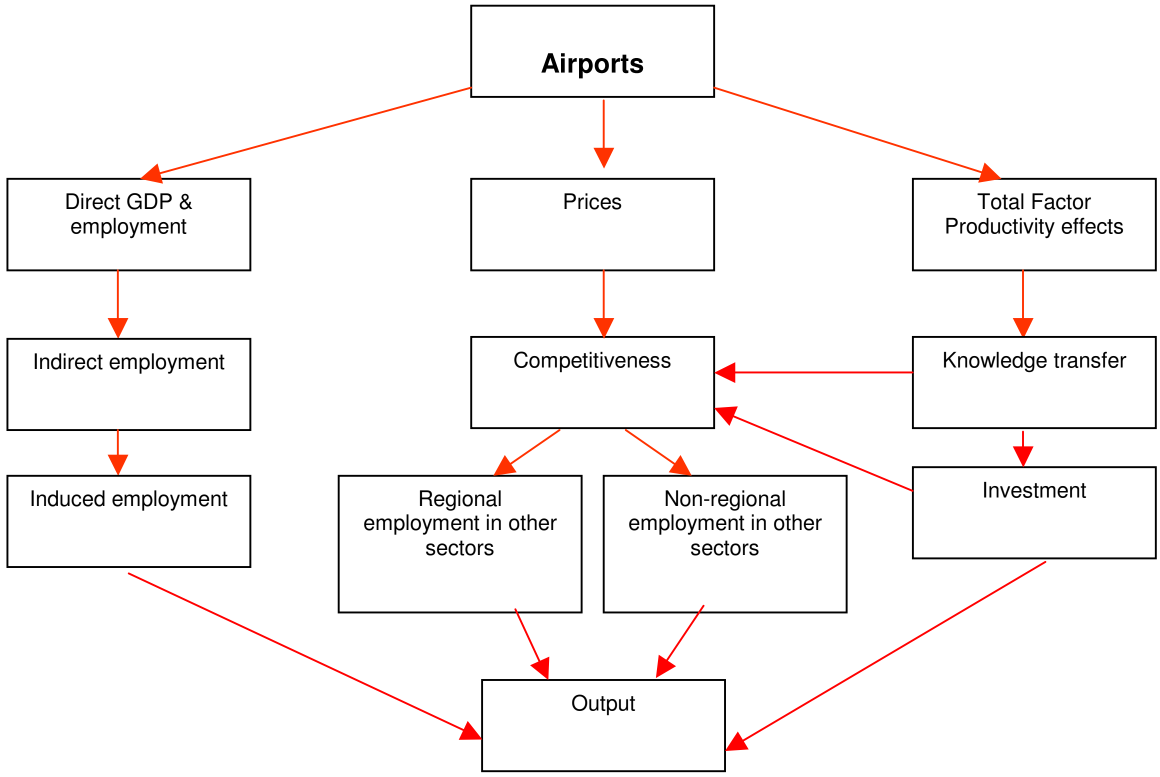
3.2 Direct, indirect and employment impacts

3.2.1 A fully functioning airport is a major contributor to regional employment both directly through on-site employment and indirectly through the creation of indirect and induced employment opportunities in supply chain and support services activities. Oxford Economic Forecasting[2] estimate that in 1998 aviation directly employed 180,000 people, 0.8% of the UK total.

3.2.2 Assumptions about productivity trends at individual airports are very important to projections of the contribution aviation is expected to make to future employment in each region, OEF project that across the UK direct employment in the aviation sector will grow to 242,000 by 2030.In addition to direct employment created by aviation, the sector also supports indirect and induced employment in businesses that supply products to the industry and in businesses that benefit from the spend of aviation workers wages in their local economies. The SERAS study estimated that the indirect and induced employment multiplier for the aviation was 1.3. Employment supported by the aviation sector through indirect and induced activities can therefore be estimate to be equivalent to 54,900 jobs in the UK in 1998 and be projected to increase to 72,600 jobs by 2030

[2] The Contribution of the Aviation Industry to the UK Economy, Oxford Economic Forecasting 1999

Figure 3.1: Wider economic impacts of investment in aviation infrastructure



3.2.4 Some of the main aviation-specific economic impacts are summarised below in Tables 3.1 to 3.4 derived from work by Oxford Economic Forecasting. This includes the regional significance of aviation value added, employment in 1998 and projected employment in 2030, assuming that the broad distribution of aviation services remains constant. The tables particularly show the (current) significance of aviation to Scotland and the North West of England.

Table 3.1: Value Added in Aviation and Regional Significance

	£billion, 1995 Prices		% of GDP	
	1998	**2030**	**1998**	**2030**
S. East	1.8	5.2	1.8	2.0
G. London	3.8	8.1	3.3	3.4
Eastern	0.9	4.6	1.6	3.1
S. West	0.2	0.9	0.3	0.6
W. Mid.	0.3	1.4	0.5	1.4
E. Mid.	0.2	1.1	0.5	1.1
Yks. & Hum.	0.1	0.5	0.2	0.5
Nw. & My.	0.9	3.6	1.4	2.7
N. East	0.2	0.7	1.0	1.6
Wales	0.2	0.5	0.7	1.1
Scot.	0.6	1.7	1.2	1.6
N.I.	0.2	0.5	1.4	1.3
UK	9.4	28.9	1.4	2.0

Source: OEF

Table 3.2 Direct Employment 1998 by workplace

	Direct	% of total regional employment	% of UK direct aviation employment
South East	34400	1.0	18.8
Greater London	73860	2.1	40.3
Eastern	18270	0.9	10.0
South West	3050	0.2	1.7
West Midlands	5370	0.3	2.9
East Midlands	4110	0.2	2.2
Yorks and Humber	2120	0.1	1.2
North East	4240	0.5	2.3
North West	18100	0.7	9.9
Scotland	12620	0.6	6.9
Wales	3180	0.3	1.7
N. Ireland	3860	0.6	2.1
UK	183170	0.8	100.0
Of which:			
Greater South East	126530	1.4	69.1
Midlands	9480	0.2	5.2
Northern Regions	24460	0.4	13.4
Scotland, Wales & NI	19660	0.5	10.7

Source: OEF

Table 3.3: Direct Employment in Aviation to 2030

(Assuming productivity growth of 3% pa falling to 2% pa)

	'000s		% of Total	
	1998	**2030**	**1998**	**2030**
S. East	34.4	43.3	1.0	0.9
G. London	73.9	68.0	2.1	1.9
Eastern	18.3	38.6	0.9	1.8
S. West	3.0	7.2	0.2	0.4
W. Mid.	5.4	11.9	0.3	0.6
E. Mid.	4.1	9.5	0.2	0.6
Yks. & Hum.	2.1	4.6	0.1	0.2
Nw. & My.	18.1	30.5	0.7	1.2
N. East	4.2	5.7	0.5	0.7
Wales	3.2	4.2	0.3	0.4
Scot.	12.6	14.4	0.6	0.7
N.I.	3.9	4.0	0.6	0.7
UK	183.2	242.1	0.8	1.0

Source: OEF

Table 3.4: Total Aviation Related Employment

	'000s		% of Total	
	1998	2030	1998	2030
S. East	111.6	148.8	3.3	3.2
G. London	127.9	147.9	3.6	3.5
Eastern	47.8	101.4	2.3	3.5
S. West	18.0	33.4	0.9	1.2
W. Mid.	22.7	44.0	1.1	1.8
E. Mid.	18.3	35.5	1.1	1.7
Yks. & Hum.	17.0	32.2	0.9	1.4
Nw. & My.	47.2	84.9	1.8	3.2
N. East	12.6	20.0	1.4	1.9
Wales	10.0	15.5	1.0	1.3
Scot.	28.8	39.8	1.4	1.7
N.I.	8.9	11.4	1.5	1.5
UK	470.7	714.9	2.0	2.4

Source: OEF

3.2.5 Oxford Economic Forecasting also suggest the following breakdown of skills for the aviation industry.

- Skill Group A 8.5%
- Skill Group B 14.0%
- Skill Group C1 18.0%
- Skill Group C2 28.5%
- Skill Group D/E 31.0%

3.3 Business competitiveness

Accessibility, Efficiency, Pricing and Productivity

3.3.1 The HM Treasury & DTI Report Productivity in the UK, the Regional Dimension[3] identifies five drivers of regional productivity and economic performance, one of which infrastructure investment. Investment in infrastructure (road, rail, airports) has a direct economic effect by reducing transportation costs for firms, workers and consumers creating new growth opportunities for companies and encouraging efficiency and innovation.

3.3.2 Aviation infrastructure has the potential to reduce travel times overcoming the constraints of distance important for:

- Ability to sustain clusters of economic "base" activity
- command and control functions
- Outsourced and advanced producer services
- high order inward investment

[3] Productivity in the UK: The Regional Dimension, November 2001 HM Treasury & DTI

3.3.3 Accessibility is also an important contributor to export performance. OEF estimate that 20% of exports of all goods travel by air. Export success is considered by Simmie[4] to be a key indicator of regional competitiveness.

3.3.4 The CBI Survey *Business Attitudes to Aviation* also suggests the following:

- 53% say international competitiveness linked to access to aviation;
- 46% say air links key to UK investment decisions;
- 56% plan increased aviation use; and
- 50% say increased airport capacity (87% with accompanying measures) needed.

3.3.5 "Air Intensive" Sectors are identified as follows:

- insurance;
- banking and finance;
- other means of transport;
- coke, petroleum and nuclear fuel;
- printing and publishing;
- extraction;
- transport;
- communication;
- other business activities;
- basic metals;
- computer activities;
- precision and optical instruments; and
- research and development.

3.3.6 Key sectors that all have high propensities to fly include:

- financial services;
- energy and chemicals;
- biotech;
- electronics and other hi-tech engineering;
- tourism;
- aerospace and MRO;
- creative industries;
- business services;
- higher order and internationalised elements of the public sector.

[4] J. Simmie, J. Sennett, P. Wood & D. Hart (2002) Innovation in Europe: A tale of networks, knowledge and trade in five cities

Location & Inward Investment

3.3.7 Global accessibility and proximity to an internationally linked aviation hub can have a major impact upon inward investment or reinvestment location decisions. Recent evidence includes:

- ‘**Western Sunrise’ study, University of Reading, 1987**examined the location decisions of 40 companies in Berkshire. It found that for both single and multi site firms, access to Heathrow was the most important location factor.
- **Hillingdon Business Survey 1990**, 27% of respondents mentioned Heathrow as a reason for locating in the area.
- **Gatwick Airport Company survey**, 75% of the 250 companies surveyed rated Gatwick as either ‘critically important’ or ‘important’ to the local economy.
- **‘An Economic Strategy for Surrey**Roger Tym & Partners’, interviewed 23 major office/HQ firms all of whom considered access to an airport to be important and 18 of whom stated it was ‘critical’.
- **Survey of 250 Japanese companies located in the UK in 1990,** put the transportation network including airports as their fifth most important locational requirement, after use of the English language, the physical distribution environment, infrastructure and the presence of other Japanese companies.
- **Locationally Sensitive Businesses,** In Cheshire and Gordon’s study of in 1993 covering the Thames Valley and London, Multi-national businesses ranked access to an airport as the most important location factor.
- **Location factors for mobile investment in Europe**, NEI/Ernst & Young, found that 46% of European head office operations ranked proximity to a major airport as critical.

Inbound tourism

3.3.8 Statistical evidence indicates that there is a strong relationship between international connectivity and overseas tourism arrivals. Improved international connectivity not only provides improved accessibility for tourists but improved connectivity is also likely to increase competition and drive down costs.

3.3.9 OECD research on the demand for air travel suggests that leisure travel is price elastic. They estimate that the elasticity of demand for air travel is ‘most likely’ to be in the range of –1.1 to –2.7, i.e. a 10% fall in prices would typically boost demand for air travel by between 11% and 27%.

Maintenance

3.3.10 Heavy maintenance is focused on airports where aircraft are based; this is fairly widespread. Heavy maintenance clusters are of two types:

- Major Airports:

  South East – LHR, LGW, STN, LUT

  North of England – MAN, LIV

- Component design and overhaul proximity:

  Scotland: GLA, PIK

  Wales: CDF, St Athan

3.3.11 There are also important non-cluster operations at Norwich, Exeter, East Midlands and Cambridge

3.3.12 Generally, development of maintenance facilities are an option for regional airports as airline Requirements are for:

- fast turnaround time;
- good quality work/reliability;
- low cost – labour & rents;
- flexibility and minimal use hub slots – on network.

3.3.13 Additionally desirable MRO Attributes are for:

- sufficient runway length;
- 24hr opening;
- plenty of land available;
- low ground rents;
- access to component services;
- hanger infrastructure; and
- plenty of skilled labour.

3.4 Total factor productivity effects

Connectivity & knowledge transfer

3.4.1 Connectivity is a key component of Core City or regional competitiveness. The exchange of information supports high level command and control functions and associated advanced producer services. In recent years it has become generally recognised that ICT will not fully replace face-to-face interaction focus of improving connectivity is now increasingly returning to conventional people-moving transport networks.

3.4.2 Knowledge transfer and international access are only one element of the connectivity effect. Parkinson[5] points out "Connectivity is not simply physical there is a cultural dimension to it as well. For example, a significant feature of our successful continental cities is the importance they attach to internationalisation…. Munich, Rotterdam, Lyon, Helsinki, Barcelona, Stuttgart in their different ways have invested significant time and effort in international networking to raise their profile, gain new allies, expand market share, influence decision making, learn new strategies and practices".

Investment: Implications for regional and Core City growth

3.4.3 Improved connectivity and accessibility provide the required environment and infrastructure for the development or clustering of high order, largely producer services – finance, management consultancy, real estate, law, advertising, headhunting, etc. These higher order services:

- are an indicator and determinant of global or European city success;
- require proximity to headquarters and high order command and control centres;
- need face to face contact and city-based sourcing;

[5] Urban Renaissance Characteristics of EU Non-Capital Cities, Parkinson, Hutchins, Simmie and Clark, July 2003

- are increasingly international, reflecting the businesses they serve;
- are much in evidence in world cities, but not so much in UK core cities; and
- Have scope for European networks based on internationally accessible core cities.

3.5 The changing role of cities and the importance of transport

3.5.1 Many of the larger UK cities owe their current scale and status to the industrial revolution of the 19th and 20th centuries, or to specific trading patterns associated with these changes. As is well known major cities such as Leeds, Manchester, Newcastle upon Tyne, Birmingham etc owe their existence to the agglomerative effects of particular industrial technologies, while major ports such as Liverpool, Glasgow or Bristol additionally benefited from their ability to both source and tranship the major resources associated with these activities. As is equally well known this left behind a generation of older *pre-industrial* "core" cities, such as York, Exeter, Chester and Norwich, which, lacked the resources to feed the new industrial processes. Nevertheless with de-industrialisation, especially in the second half of the 20th century, this position had clearly changed.

3.5.2 Reflecting these circumstances, the process of city formation and change is generally regarded in literature as a reflection of **changing constraints on spatial organisation**, particularly from transport. Thus, it is conventionally suggested that the constraints of transport created the first generation of regional cities as the locations of major markets, and subsequently the industrial city as a reflection of constraints on the movements of the mass of people needed to work in the new industries and the movements of raw materials and manufactured goods. The later arrival of the core central business district, with its offices accommodating a growing service sector was in turn a reflection of the needs for face-to-face communication.

3.5.3 In summary, the characteristics of the current core cities evolved within constraints with these features:

- step-change improvements in the speed and capacity of transport systems (horse to canal to train to urban public transport, to road then air);
- initially slow but gradually improving communications infrastructures (mail, then telephone, and television and radio, then Internet);
- initially insignificant environmental constraints, but growth of these in the 20th century (public health acts, planning controls, pollution legislation);
- minimal restrictions on land use until the mid 20th century (mostly following comprehensive nationalisation of development rights in the 1947 Planning Act).

3.5.4 However, above all, once the need for basic resources in the form of raw materials, water and energy and labour were met, it was overwhelmingly, the changes in transport technology that were the key factors that underwrote the expansion and rise of the major cities. This is true for the growth of major cities throughout the world.

3.5.5 It is suggested that this basic pattern has extended from the mid 19th century to the present day, despite the much-suggested influence of information and communication technologies. The point often made here is that ICTs have the potential to decentralise economies, as superficially speaking they have the potential to render space and location factors such as transport costs irrelevant. In practice most potential advanced business locations now have embedded and complex ICT systems and it has not proved to provide the key spatially differentiated factor that was often claimed in the past. Moreover, and perhaps more importantly, face-to-face contact and tacit knowledge necessary for key decision-making have helped to retain the importance of space. Essentially ICT reduces distances but it also widens the parameters of activity, which in turn generates further global interaction, which needs to be fortified by personal face to face contact. Transport, particularly international transport, thus becomes more important than ever in order to support ever-increasing spheres of influence.

3.5.6 As is well known transport improvement are largely provided or controlled through public policy. The implication is that transport is a necessary condition for city success.

3.6 Transport and other determinants of successful and core cities

3.6.1 Nevertheless, while transport is necessary for city growth it is not a sufficient condition for overall success. Put another way it is an *enabler* of city growth, but needs other ingredients to create the recipe for success. A review of the literature, much of which can be drawn from exercises in the ranking of cities suggests that success will, most likely be determined by five inter-related and mutually reinforcing groups of economic sectors which typically dominate their centres and their economies:

- finance and business services;
- power and influence;
- tourism;
- creative and cultural industries; and
- connectivity.

3.6.2 As determinants of success one or more of these factors may predominate and drive change, but there seems to be a consensus that successful core city will have advanced features of each as a reflection and mutually reinforcing condition of success. In practice this make it difficult to estimate the actual effect. Analogies are often drawn in this respect with ecological systems, where the removal of one keystone species hampers the degree to which the system can support itself. There are limits to this metaphor, because with cities there is scope for a step change improvement of any of the sectors, which may be of benefit to the whole. This particularly refers to the key role of innovation, which is outside the “natural” scope of ecological process.

3.6.3 From a public policy perspective, the concern here is with the potential of transport as a catalyst for city change and development.

3.7 The City as a “cluster”

3.7.1 The idea of the economic cluster has become increasingly dominant in economics, geography and urban studies. Michael Porter is the key proponent arguing that the competitiveness of ‘national economies’ is in fact driven by clusters of key leading industries that are successful in the global economy (Porter 1998). Economic geographers have long argued that locational proximity is important in competitiveness of industries within regions. Porter and others have developed this idea and brought it back into fashion, suggesting that it is a defining element of competitiveness and success for many of the key industries (both service and manufacturing) in today’s global economy.

3.7.2 Academic research in the last ten or fifteen years has set about seeking to identify as well as theorise the nature of clusters in different industry sectors. Clusters are argued to have a number of features (Atherton 2003):

- concentrations of businesses in similar industry sector in a defined geographical area;
- collaboration and / or cooperation between firms leading to innovation & competitiveness;
- exchange of knowledge, experiences and staff between firms in a skilled labour market;
- innovation & creative synergy (e.g. high-technology corridor of M4);
- 'Embeddedness' in wider social and institutional context providing support for the cluster – 'institutional thickness in a city/ region'; and
- significant opportunity for stimulating economic development.

3.7.3 Much current academic work on clusters has thus become focused around mapping clusters, investigating the nature of linkages between firms in a cluster and assessing the effectiveness of policy intervention on cluster development.

3.7.4 Cluster support and development has been a major focus of research in the policy sector. The 1998 Competitiveness White Paper (DTI 1998) led to the formation of a Policy Steering Group on Clusters. Most of the work undertaken by this group has focused on identifying clusters in the UK (Trends 2001) although there has been some work considering how government might intervene.

3.7.5 However, within the academic literature there is disagreement about to what extent clustering itself (i.e. geographical proximity) is a key factor in creating prosperity and competitiveness. Some argue that wider connectivity, national commercial environments and other factors are more significant than local geographical proximity *per se*. This kind of criticism has pushed researchers towards a focus on the nature of relationships between actors within firms and also to try to investigate how clusters develop in a step-by-step manner. In a policy context, top-down policy aspirations from central government concerning the creation of new local clusters have been criticised for ignoring the complexity of factors that lead to their formation, connectivity and the increasing internationalisation of enterprises.

3.7.6 Clusters are often associated with key cities at the national or regional level, but this is not always the case (i.e. Boston 128 or M4 high-tech corridors are associated with strip development along transport arteries containing major airports). The state of the debate in this sense is that the international interaction of clusters and cities / city regions is accepted as a key engine of economic growth. At the European scale, evidence shows clearly that city-based clusters can be directly related to new firm formation and employment growth.

3.7.7 A key concept that has developed from research into the interactions between firms and institutions in clusters is the notion of connectivity. With the idea that economic activity in cities and regions is 'embedded' in institutions and wider society, research has begun to examine the linkages between firms. This has produced investigation into the linkages at the institutional level between cities themselves in terms, for example, of the links between city authorities and development agencies. The Eurocites programme, and subsequently the core cities project in the UK, represents an example of this. There is also study of the linkages between firms within regions and between firms and other institutions such as local government, universities or regulation. All of these issues are captured by the academic literature in the concept of connectivity.

3.7.8 At the Core Cities Summit in 2002 it was argued that core cities needed distinctiveness by becoming "ideopolises" - places where strengths in infrastructure and knowledge-based industries combine to create a booming competitive economy that benefits from the globalisation of markets. In short, the ideopolis links the idea of the character of urban areas for producing social interaction with the rise of knowledge-based UK service economy.

Again, the argument refers back to the view that future economic development in UK regional cities will need to focus on the knowledge economy as a means of generating wealth and employment.

3.7.9 In summary, the concepts of the economic cluster, connectivity and the ideopolis have all fed strongly into the rationale underlying the core city project. Core cities are argued to be regional growth engines, as the UK economy becomes ever more service-sector dominated since they are the locations for knowledge-industry clusters and other service firms. Core cities are seen as potential indigenous growth nodes in the UK to combat the dominance of London and the south-east. To date, however, there is only limited evidence of this having occurred in reality as the next section considers.

3.8 Command and control, corporate hierarchies, producer services and core cities

3.8.1 A longstanding and mainstream stand of the literature provides evidence that links corporate hierarchies with urban hierarchies. The thesis is that the internal spatial division of labour within large corporations, typically trans-national corporations (TNCs), reflects a close correspondence with city hierarchies. As early as 1972 Hymer described the nature of this relationship as follows:

> *The multinational corporation tends to create a world in its own image by creating a division of labour between countries that corresponds to the division of labour between various levels of the corporate hierarchy. It will tend to centralise high-level decision-making in a few key cities (surrounded by regional sub capitals) in advanced countries thereby confining the rest of the world to lower levels of activity and income.*

3.8.2 A further article by John Friedman in 1986 set out his “world city” hypothesis that provided a set of propositions about how the world’s major cities have become the “command centres” of global capital.

3.8.3 Since 1972 (and indeed 1986), the World has obviously moved on, particularly in terms of the hierarchy of activities and sectors that determine this position. For Hymer it was largely the headquarters of global production. But more recently the literature asserts the strong role of finance and advanced producer services. Sassen’s (1991) *The Global City* focused upon attempting to delineate the convergence of the very largest “World Cities” as locations for advanced producer services. This in turn reflects the, the importance of global finance and the increased outsourcing of advanced and specialised or bespoke services including law, management, ICTs, real estate and accountancy (although accountancy and ICTs are increasingly about standardised products) and the role of such centres as special knowledge complexes.

4 The role of connectivity in business services

4.1 Introduction

4.1.1 Having identified the importance of leading edge services this section considers their emerging relationships with core cities and needs for international accessibility or "connectivity". The discussion in this section is based on two elements. First, it draws upon 5 years of research into the internationalization of two key business services sectors in the UK undertaken by Dr Andrew Jones of Birkbeck College, London. These two sectors are management consultancy and investment banking. This covers over 75 interviews with senior managers in those sectors since 1998. Second, drawing on work from the same source very recent data from current ongoing research into internationalization and regionalization in the law sector in the UK economy is presented. At the present stage of work, the majority of the top ten largest Law firms in the UK have been involved in the study.

4.2 Core Cities and the growth of European services

4.2.1 The UK economy is becoming increasingly service-sector dominated with a continued dominance of London and south east England. However, in the last two decades there has been consistent service sector growth across the UK economy (Coe & Townsend 1998). Other regions have also seen a shift in employment from manufacturing towards services. However, there are marked regional differences in the nature of service-sector activity in different parts of the UK (Keeble & Nachum 2002).

4.2.2 Within the academic literature on regional economic development, a number of studies have shown that the 'high-order' service sector jobs and business activity remain heavily concentrated in London and the greater south-east. Conventionally, regional scientists have highlighted this as a problem in that high order service activity provides the greatest wealth-generating effects in a regional economy. High order services as a category include business services such as investment banking, management and strategy consultancy, law, advertising and IT services. In contrast, the growth of service sector activity in regional cities in the UK has had a far greater proportion of lower order service activities. The 1990s, for example, has seen the growth of several thousand call-centres in the UK many of which are located in or around regional cities (e.g. Glasgow, Newcastle, Liverpool etc). In conjunction with this, core cities have also seen a growth in retail and leisure services along with tourist-related growth. Since the mid 1980s much of this latter tourist growth can be related to culture-led regeneration projects.

4.2.3 However, since the early 1990s, there is some evidence of a more substantial high-order service growth in core cities. There are three major forces behind this shift:

- a context of wider economic growth in the UK economy;
- globalisation-led regional city growth; and
- decentralization of high order services out of the London & the South-East.

4.2.4 During the 1990s, all three of these forces have produced growing numbers of firms and employment in higher order business services in core cities.

4.2.5 An important point is that high order services are largely 'producer services' insofar as the market for business services contains a high proportion of non-service sector firms. High order service growth in core cities is therefore dependant on wider linkages with manufacturing and other industries. It follows that regional core city service-led growth will rely on patterns of connectivity with client firms in other economic sectors. Given the current trends in patterns of business the UK and Europe, this is likely to involve increasing numbers of international linkages.

4.2.6 In the later 1990s, there is evidence that core cities in the UK have thus benefited from a growth in high-order services. The UK Labour market now is service-sector dominated with over 20% of the workforce employed in business and financial services by July 2003. (ONS 2003).

4.2.7 Overall, from the core cities perspective, growth in high order services reflects wider linkages associated with Europeanisation. Europe remains the UK's main region of foreign trade and in that sense core city globalisation corresponds most to business activity with Europe. Core cities are not providing the global order services that endow London with global city status in the world economy. Business services in core cities are more localised, focused on serving clients in core city regions and regional-scale clients operating in a European context. The factor driving this in services such as consultancy, law and ICT is cost. Medium sized firms in the UK and European market cannot afford the charges of the largest service sector TNCs and nor do they need that 'global service'. Core cities represent the location for regional not global-scale services. Consequently, there is a strong argument for the economic benefits of linkage with other core regional cities at the European city as globalization occurs at regional scale in a manner bypassing the global market for business services in London. Quantitative evidence for this kind of 'similar size' regional city linkages is evident in the research of the 'Globalisation and World Cities' (GaWC) group at Loughborough in attempts to map a hierarchy of world cities (Taylor *et al* 2000; Beaverstock *et al* 2002). The research in section 5 supports this from a qualitative perspective.

4.3 Core cities versus global cities – a comparison

4.3.1 As a consequence of the business-service linkages discussed, it is worth outlining the similarities and difference between the case of UK core cities and the requirements of London as a global city in relation to aviation.

4.3.2 London is one of the highest order 'world cities', identified as one of the three key cities in the global economy (the other two being New York and Tokyo). As such, it represents the location of a dense cluster of high order business and financial service sector firms as well as the major international offices of the world's largest corporations. These firms constitute a major proportion of the market for business-services in London and the greater South East. In this sense, London as a global city has more in common with New York or Tokyo in many ways than with core cities elsewhere in the UK. The firms located in London are serving a global market and provide services to global players in a variety of industries.

4.3.3 In terms of air travel demand, there are a series of implications. London has several major international airports with Heathrow being the key hub in Europe and the world's busiest airport. Business air travel from London therefore includes a significant proportion of long-haul transcontinental travel as international firms send employees out for managerial, client business and training purposes.

4.3.4 In contrast, UK core cities such as Bristol or Birmingham are not fulfilling the kind of global city functions that London does in the global economy. There is only limited demand from firms in these city region economies for long-haul intercontinental travel. Business-service growth is based around demand from local regions and from international business from clients who are mainly elsewhere in Europe. For example, a medium-sized web design agency or law firm in Birmingham will seek business in the UK midlands and may also seek mid-level client business from organisation in the European market. Such firms thus represent a potential growing demand for European air linkages that are also likely to facilitate their ability to pitch to clients across the EU. Such firms are not direct competitors of the global business service firms located in London as they are seeking business from smaller clients who cannot afford the charges of the big business-service providers. Likewise global business-service firms in London do not pitch for small contracts with medium-sized clients in the UK regions as the revenues involved are unattractive.

4.3.5 In summary, core city aviation needs in relation to business and financial services are similar to global cities in terms of the purposes for travel – the importance of social contact in terms of acquiring international business being the primary point. However, they differ in that firms in core cities are largely focused on the European scale rather than the global. They are unlikely to offer the demand that exists in London for long-haul air travel and when required, are likely to simply use the main London airports via overland or air connections, the latter choice depending on cost and time considerations. Furthermore, they do not operate the global training practices (sending new recruits to New York for example) nor have the international management needs of global firms situated in London.

4.4 In depth case research – Business Services

4.4.1 Business-services in UK core cities have a strong regional hinterland focus. There is strong linkage between core city offices and offices in London with travel being driven by client activity and managerial functions. Business-services such as law and management consultancy involve heavy travel loads on professional employees as 'travel-to-client' is a common form of business practice. Firms in the law sector show strong evidence of strategic internationalization in an attempt to capture market share at the European level. This includes the formation of alliances with European firms.

Examples:

We are a different kind of firm to the magic circle City firms. We have grown up in a different way…I mean we have no head office but big offices here [Birmingham] and in Liverpool, Manchester, Sheffield, Glasgow…and we are serving clients locally from each of those offices.
(Director, Law Firm7, Birmingham, July 2003)

Yes, we are internationalizing at the moment… the focus is on Europe. We have offices in Brussels, Paris and Copenhagen. And we have more in terms of our 'best friend' relationship with [GermanLawFirm1] . I mean, we don't have an office as such but we have people working in their offices and they have people over here… So we doing more and more business in Europe…
(Director, LawFirm2, London, May 2003)

Key Points

- core city business service activity serve local hinterland markets;
- internationalisation is occurring in UK core cities in business services with linkages to other European core cities; and
- there are other models of globalisation than ownership-based ones , networking and cooperation between practices operating in different legal systems, including is occurring and is an alternative lower cost model.

4.4.2 The Role of Air Travel

I think the growth in air travel is a marvellous thing. It is now so cheap and of course this has changed the way we work. It is much easier to get to Europe from here [Birmingham] and that can only be helpful….face-to-face contact is of course key in Law as much an investment bank.
(Director, Human Resources, LawFirm7, Birmingham, July 2003) [paraphrased]

We travel for clients. That is to pitch to clients, to service their needs…we will follow the clients in that sense. But that can be anywhere of course. Our focus on internationalisation is Europe and Asia, and for the moment Europe is most important….a lot of people spend time a lot of time travelling in this firm. And that is set to increase as we move into Europe.
*(Partner, UK C*onsultancy3, London, June 2001)

Key Points:

- Core city business services have a growing need for air travel; and
- Business services travel is central to business activity, primarily around pitching for new work, building relationships and managing existing projects.

4.4.3 National and International Air Linkages

One problem we have is getting to London to get places. In UKConsultancy8 our European practice is growing and that obviously means travel. But it can be tough when you have to get a train to London or Manchester so you can get on a plane…so obviously we be are in favour of better air services.
(Manager, UK IT Consultancy, Birmingham, May 2002)

A lot of client work does involve UK travel, yes. We have smaller offices in most of the major UK cities…a lot of people will end up with the client for a period of time….for example, I am managing a big contract that involves a team being based in Glasgow. I must say that one gap in my view are the shuttle services. There aren't enough and the expense of the trains would certainly mean we prefer flying these days just from a cost viewpoint.

Key Points:

- existing demand centres around European connection although there is some long haul travel; and
- long haul travel is more compatible with overland connections to major international airports.

5 Aviation Infrastructure & Core City growth

5.1.1 The objective of this section is to examine in more detail and test the relationships between city economic ‘success’ and aviation connectivity discussed in the sections above.

5.2 Aviation connectivity and global city rankings

5.2.1 A high level comparison of the relationship between aviation connectivity and global city status or ranking can be established by comparing the recent work by Globalisation & World Cities Study Group (GAWC) who have ranked Global and European cities on the basis of their respective concentrations of advanced producer services (accountancy, advertising, banking & legal services) and the work by rdc who have undertaken a schedule analysis using OAG of European Cities and developed a ‘connectivity’ ranking based upon weekly frequency of flights (see Table 5.1 below). A comparison of the two datasets would appear to indicate that:

- there is some linkage between connectivity and Global City status – the top three GAWC ranked Alpha Global Cities are also the top ranked cities for connectivity;
- It would also appear however that cities could achieve Alpha or Beta Global City status without particularly high ranking connectivity (for example Moscow and Zurich);
- connectivity also however appears to be necessary but not sufficient, cities such as Munich perform well from a connectivity perspective but are only Gamma ranked as Global Cities; and
- It would appear that Madrid and Amsterdam may have the greatest potential to attain Alpha city status given the strength of their respective transport links.

GAWC Gamma ranked cities score 6,7 or 8 on the advanced producer services index, the highest ranking UK Core Cities are Birmingham and Manchester (rank 2), Edinburgh, Glasgow and Leeds (rank 1). Drawing upon the evidence discussed above, it could be argued that the lower concentration of advanced producer services and thus the lower GAWC rankling for UK Core Cities can be explained by poor international connectivity as advanced producer services - Administration (HQ) type functions rank air access important more than other types of functions. However, an initial review of connectivity indicates that this argument does not appear valid as Manchester (ranked 19), Birmingham (28) and Glasgow (34) out perform equivalent ranked GAWC cities for ‘connectivity’ (e.g. Prague (33), Hanover (40)).

5.2.2 A more detailed review of connectivity however indicates that the relative attractiveness of a location for inward investment or advanced producer services may be as more to do with the pattern of connectivity or frequency and type of flights.The rdc work on schedule frequency identified two key areas of weakness for UK Core City aviation connectivity:

- underconnected Regional airports reliant upon interlining through London - for example, Glasgow, Edinburgh and Belfast. These airports perform well in terms of overall frequencies but poorly in terms of a range of frequencies (especially when compared to similar European airports) – 11% of Glasgow’s frequencies are European, 18% of Edinburgh’s and only 2% of Belfast’s. Edinburgh has 164 weekly direct connections to Europe; Toulouse in contrast for example has 228.
- low cost focus airports with second tier European connections – for example, Bristol, East Midlands and Liverpool – all of which have large numbers of European connections, but connections that are predominantly focussed upon the low cost tourism industry.

5.2.4 Two other factors must also be taken into account when comparing global or European city competitiveness and international connectivity:

- First, international connectivity may be necessary but not sufficient – aviation links while considered important - are only one of a number of factors that investors take into account;
- Second, maintaining or improving connectivity competitiveness may take a number of years to effect a change in city performance and start to attract investment flows.

5.3 Relationship between Core city performance and aviation connectivity

5.3.1 We have undertaken a quantitative analysis to test linkages between city or regional economic performance and connectivity using the following datasets for cities in the UK and EU:

- **UKGDP:** The Gross Domestic Product by NUTS region levels 1-3, at current basic prices, £m,
- **UKGDPCAP:** Gross Domestic Product per person by NUTS region levels 1-3, at current basic prices, £,
- **UKEUGDP:** The Gross Domestic Product of a city in €, bn, 2001,
- **UKEUGDPCAP:** The Gross Domestic Product per person of a city in €, 2001
- **EMP:** Employment in Air Intensive Industries
- **FREQUENCY:** Number of ATMs at an airport annually
- **CAPACITY:** Annual passenger capacity at an airport annually
- **DESTINATIONS:** Number of all destinations served by an airport
- **INTERNATIONAL DESTINATIONS:** Number of international destinations served by an airport

5.3.2 A correlation coefficient was produced for each combination of data to show the strength of the linear relationship between the two variables. The closer this correlation coefficient is to +1, the stronger the positive linear relationship between the variables.

5.3.3 The data were analysed using the Least Squares method of regression analysis to fit a line through the series of observations. This 'line of best fit' is presented in figures y.a to y.b. The R^2 value (coefficient of determination) shows the explanatory power of the regression. The closer this value is to 1, the greater the explanatory power.

5.3.4 Both the UK and the EU tests show a strong explanatory relationship between the economic indicators (particularly GDP) and air service provision. However they do not provide an indicator of causality (whether higher GDP is caused by good air service provision or whether air services are more likely to be of a high standard where GDP is high).

5.3.5 Similarly, aviation infrastructure is likely to be a necessary factor in growth in employment in air intensive sectors but not sufficient to generate growth on its own.

5.3.6 The datasets behind each analysis are provided in appendix A4.

UK Cities and Aviation Connectivity

5.3.7 At a UK Core City level, the analysis indicates that there is a close correlation between the GDP of UK Core Cities and air route frequency, capacity and range of air destinations (both domestic and international).

5.3.8 There is a weaker relationship between GDP per capita of UK Core Cities and air route frequency, capacity and range of destinations. This suggests that catchment population may be a more important factor than economic prosperity in determining air service provision. One explanation for the stronger relationship between GDP and aviation activity than GDP per head would be the falling costs of aviation in recent years, which have opened up air transport as an economic option for a greater percentage of the population.

5.3.9 The UK cities data also indicates a close correlation between employment in air intensive sectors and air capacity, frequency and range of destinations.

5.3.10 The correlation between employment in air intensive sectors and range of destinations is slightly stronger than the correlation between employment in air intensive sectors and capacity and frequency of flights. However, the relationship between international destinations and GDP for UK Cities is weaker than the relationship for all destinations and GDP for UK Cities.

5.3.11 One interpretation of this analysis would be that the majority of UK Core Cities are yet to truly develop internationally focussed Air intensive sector activities and that the Air intensive employment activities that have developed are UK focussed (albeit still using aviation infrastructure) or able to function effectively by maximising links to hub airports.

5.3.12 This interpretation is similar to the findings of a recent York consulting report which suggested that:

"for regeneration areas seeking to attract new economy businesses from a low base, the priority would be to secure good access to hubs providing the key global and European links until such time as a wider range of direct services can be supported by the local business base'[6]

Table 6.1: Summary of UK Regression Results

Regression Number	Independent Variable	Dependent Variable	Correlation Coefficient	R^2 Value
UK1	***UKGDP***	***FREQ***	***0.993***	***0.986***
UK2	UKGDPCAP	FREQ	0.469	0.220
UK3	***UKGDP***	***CAP***	***0.997***	***0.994***
UK4	UKGDPCAP	*CAP*	0.461	0.213
UK5	***UKGDP***	***DEST***	***0.983***	***0.967***
UK5a	UKGDP	INTDEST	0.980	0.961
UK6	UKGDPCAP	*DEST*	0.435	0.006
UK7	EMP	FREQ	0.896	0.803
UK8	EMP	CAP	0.835	0.698
UK9	EMP	DEST	0.908	0.825
UK9a	EMP	INTDEST	0.898	0.825

[6] The Future Development of Air Transport in the UK, Aviation and Airport Strategy Study, York Consulting November 2002

Figure 1.1: Regression of Flight Frequency on GDP £m

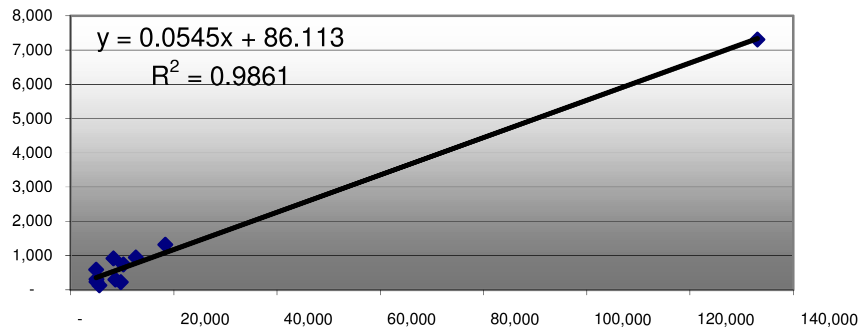


Figure 1.2: Regression of Flight Frequency on GDP per Capita, £

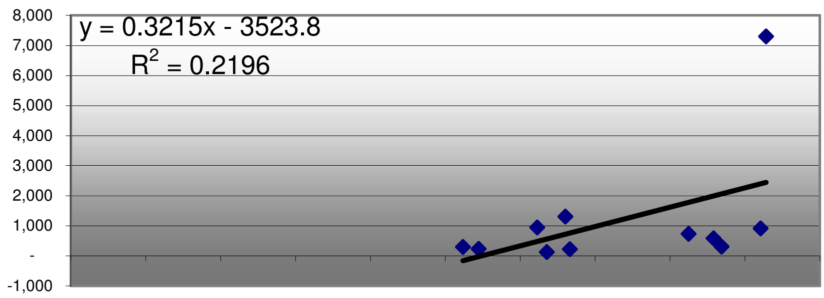


Figure 1.3: Regression of Capcity on GDP £m

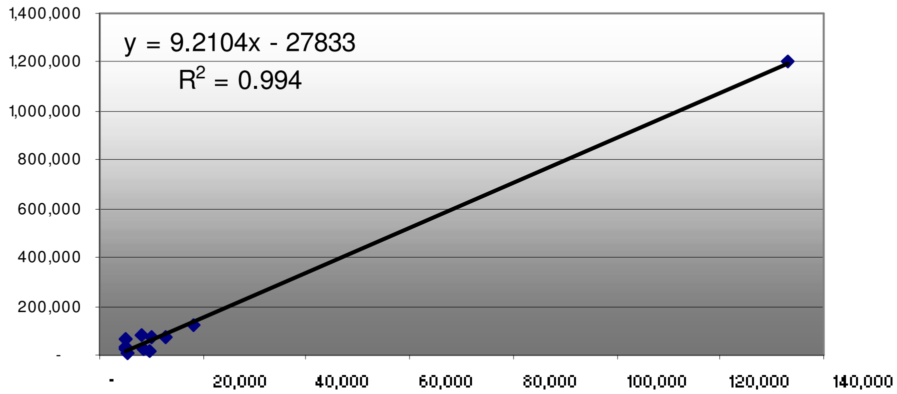


Figure 1.4: Regression of Capacity on GDP per capita, £

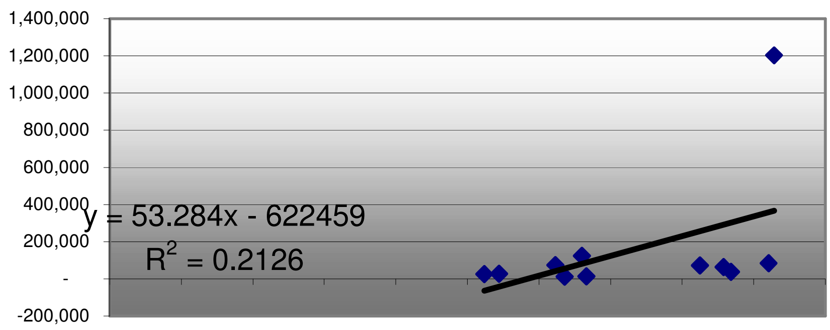


Figure 1.5: Regression of Destinations on GDP £m

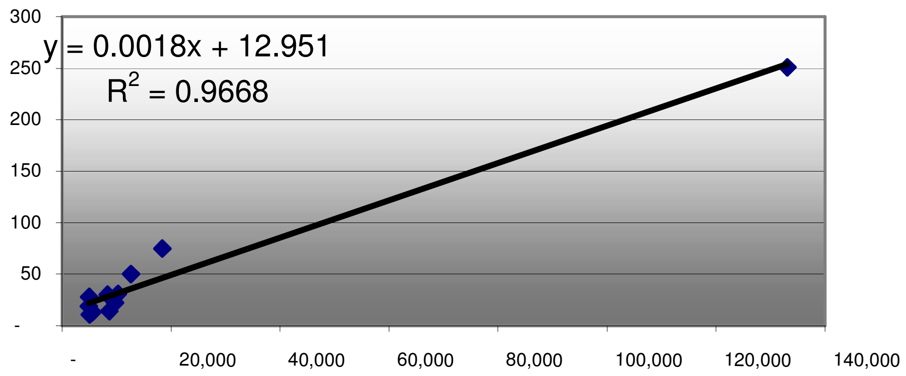


Figure 1.5a: Regression of International Flight Frequency on Tourism Arrivals

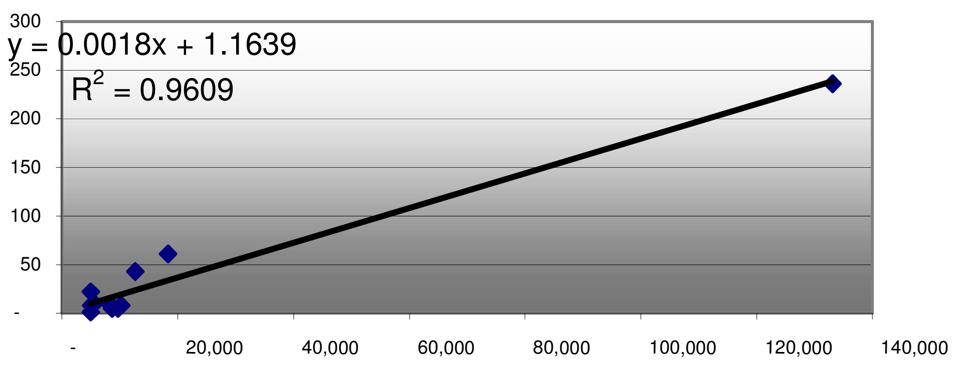


Figure 1.6: Regression of Destinations on GDP per capita, £

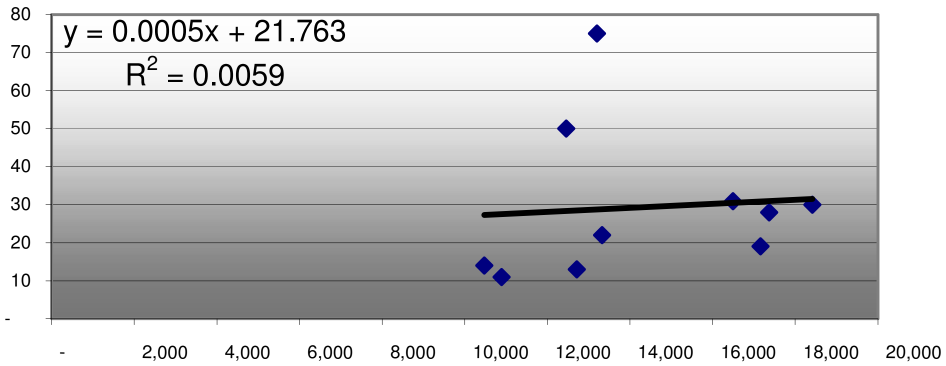


Figure 1.7: Regression of Flight Frequency on Employment in 'Air Intensive' Sectors

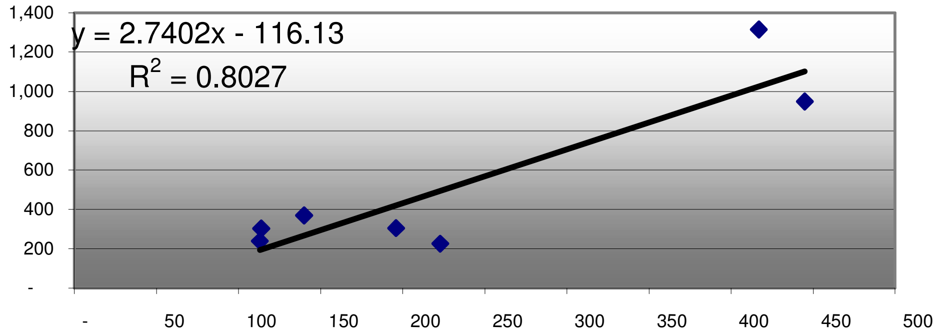


Figure 1.8: Regression of Capacity on Employment in 'Air Intensive' Sectors

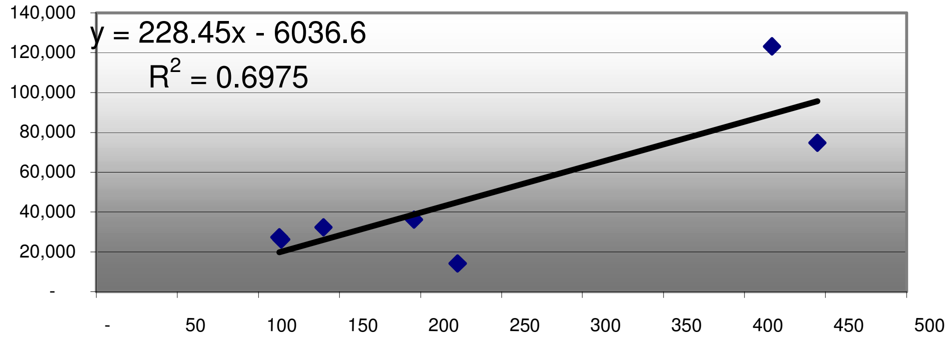


Figure 1.9: Regression of Destinations on Employment in 'Air Intensive' Sectors

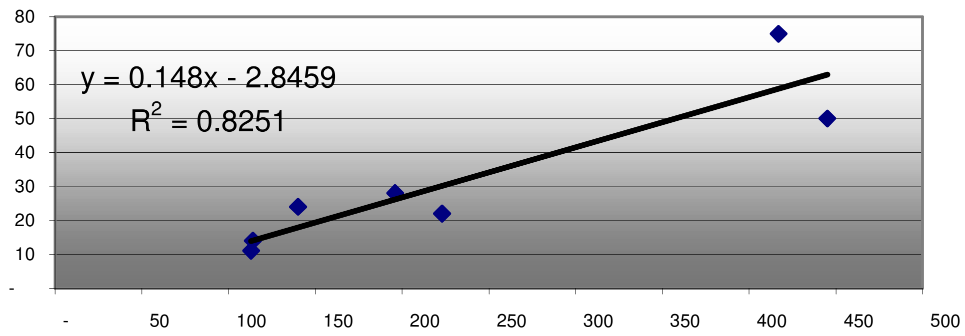
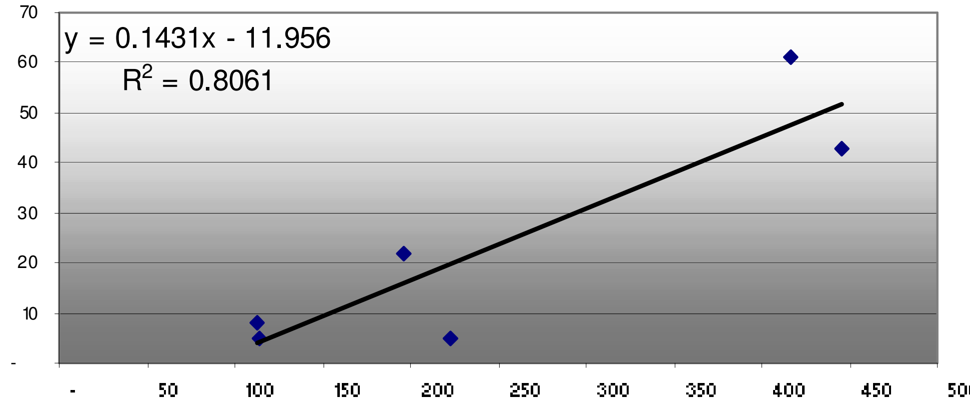


Figure 1.9a: Regression of International Destinations on Employment in 'Air Intensive' Sectors



EU Cities and Aviation Connectivity

5.3.13 As with the correlation analysis for the UK Cities above, there is a stronger correlation between EU Cities GDP and aviation route frequency and capacity than between EU Cities GDP per capita and aviation route frequency and capacity.

5.3.14 However, the relationship is stronger between EU GDP per head and range of destinations, than frequency or capacity indicating that there may be some evidence that wealthier cities or regions have a better range of destinations and services.

5.3.15 There is a strong correlation between numbers of visitors to EU cities and aviation capacity and frequency. This relationship is likely to become more pronounced over the next few years as the tourism industry anticipates continued growth of the short break and city break market. Interestingly the relationship between tourism arrivals and range of air route destinations is not as strong as that between tourism arrivals and aviation frequency and capacity possibly indicating that while connectivity is important visitors are prepared to travel via aviation hubs to destinations. The correlations for tourism arrivals indicate that Regional and Core City economic strategies which focus upon growing their share of tourism sector may need to focus as much upon upgrading their aviation infrastructure and accessibility as upon improving their local "offer".

Table 5.2: Summary of UK and EU Regression Results

Regression Number	Independent Variable	Dependent Variable	Correlation Coefficient	R^2 Value
UKEU1	UKEUGDP	FREQ	0.814	0.623
UKEU2	***UKEUGDP***	***CAP***	***0.850***	***0.722***
UKEU3	UKEUGDP	DEST	0.665	0.443
UKEU4	UKEUGDPCAP	FREQ	0.491	0.241
UKEU5	UKEUGDPCAP	CAP	0.427	0.182
UKEU6	UKEUGDPCAP	DEST	0.638	0.407
UKEU7	***TOUR***	***FREQ***	***0.857***	***0.739***
UKEU8	***TOUR***	***CAP***	***0.894***	***0.800***
UKEU9	TOUR	DEST	0.743	0.552

Figure 1: Regression of Flight Frequency on GDP, €bn

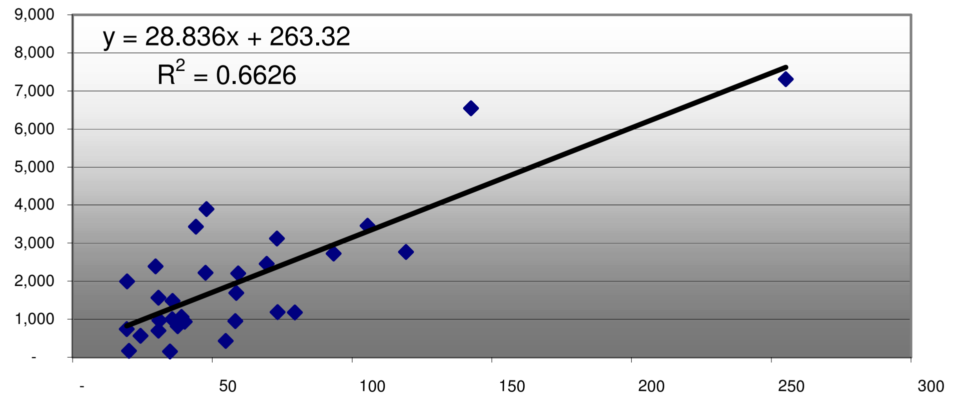


Figure 2: Regression of Capacity on GDP, €bn

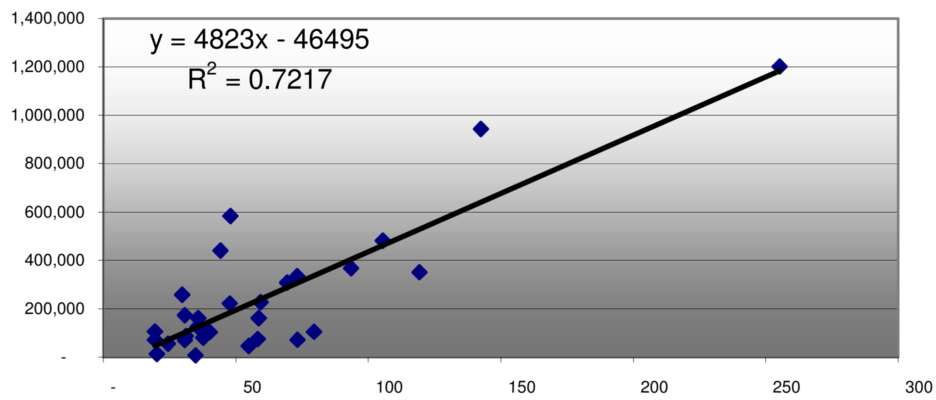


Figure 3: Regression of Destinations on GDP, €bn

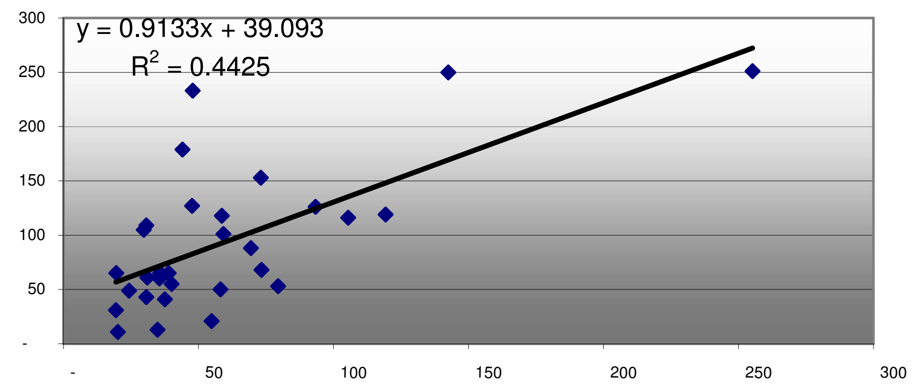


Figure 4: Regression of Flight Frequency on GDP per capita, €

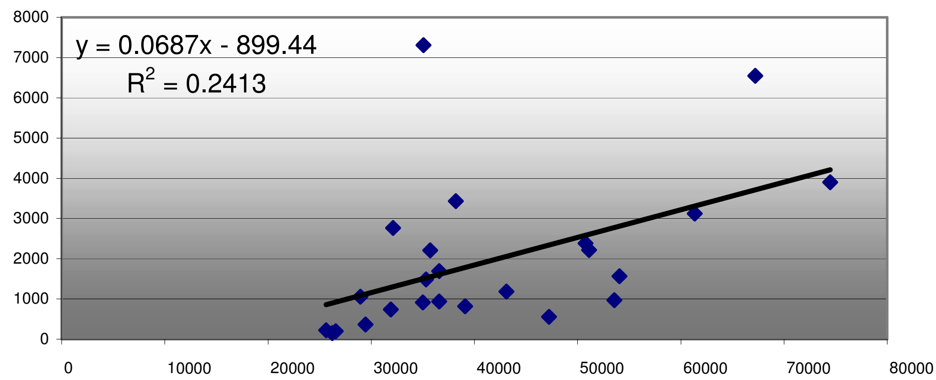


Figure 5: Regression of Capacity on GDP per capita, €

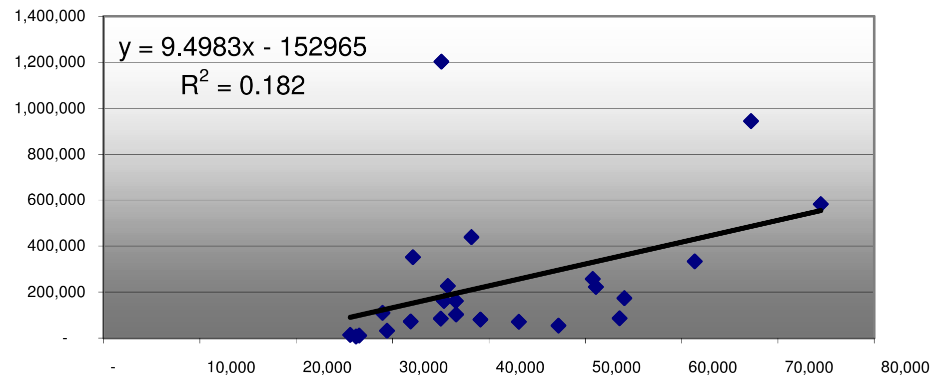


Figure 6: Regression of Flight Frequency on GDP per capita, €

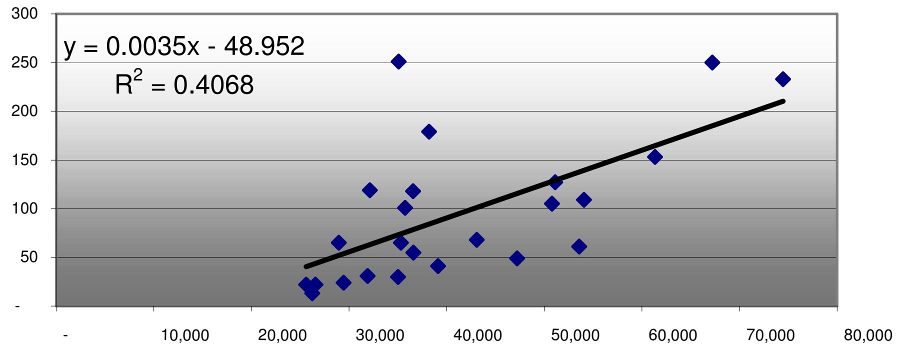


Figure 7: Regression of Flight Frequency on Tourism Arrivals

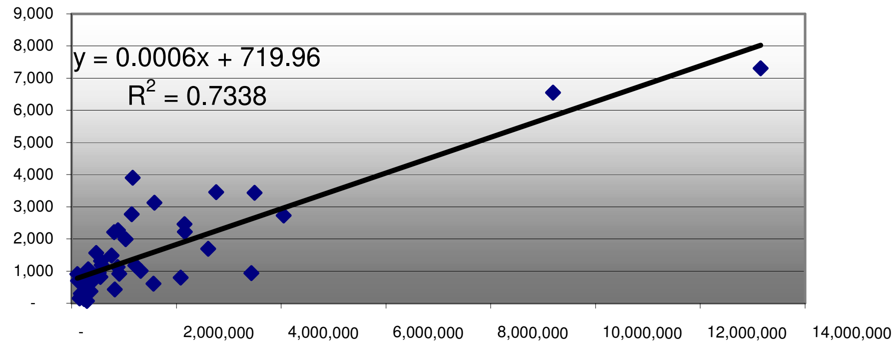


Figure 8: Regression of Capacity on Tourism Arrivals

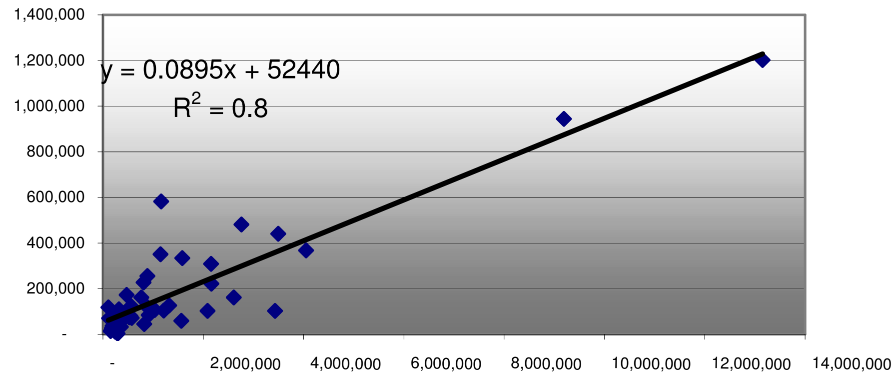
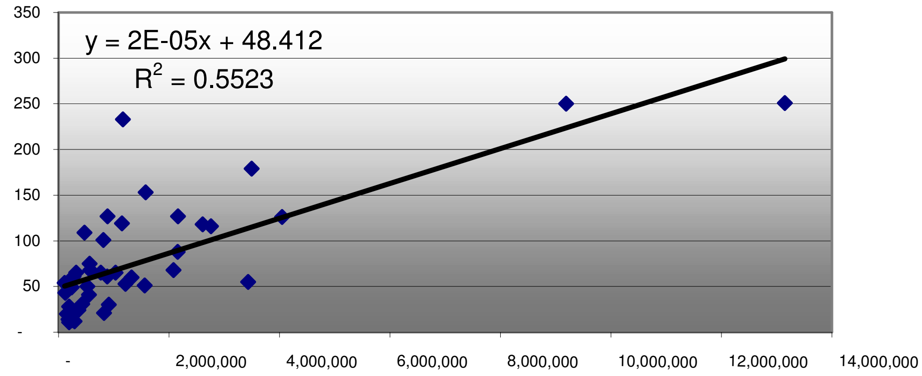


Figure 9: Regression of Destinations on Tourism Arrivals



UK Core City performance

5.3.16 The UK Core City analysis above would appear to support the findings of the York Consulting study indicating that a two-stage strategy approach may be required to understanding the relationship between air intensive sector and aviation connectivity. The first stage of air intensive sector development can function effectively with a hub and spoke type model as long as there are appropriate linkages to the hub but further development of aviation intensive sectors requires an improved set of linkages and range of destinations.

5.3.17 This conclusion raises three important issues:

- Is there current aviation capacity and capability at UK Core Cities to move to the second stage of Air intensive sector development?
- Are UK Core Cities lagging behind their equivalent European counterparts in terms of aviation connectivity and will this in the longer term impact upon their ability to attract and retain air intensive sector activities? (Table 3.3 below indicates that the level of connectivity of UK Core Cities may be less than their EU equivalents, this is especially the case for range of destinations once you consider that of Edinburgh's 30 destinations, only 9 are international routes, of Glasgow's 31 destinations only 8 are international routes, Newcastle has 5 international routes and Belfast 1).
- Is the essential hub and spoke structural nature of the UK's aviation services with a major London focus detrimental to the longer term competitiveness of the UK's Core Cities when compared with the more diversified EU model of services?

Table 5.3: European and UK City Connectivity

	DESTINATIONS		DESTINATIONS
Amsterdam	179	Liverpool	11
Barcelona	88	Ljubljana	20
Berlin	53	London	251
Birmingham	50	Lyon	65
Bratislava	12	Madrid	116
Bristol	24	Manchester	75
Brussels	127	Marseilles	43
Budapest	51	Milan	119
Cardiff	13	Munich	153
Cologne	41	Newcastle	14
Dublin	55	Nice	65
Dusseldorf	109	Palma De Mallorca	54
East Midlands	28	Paris	250
Edinburgh	30	Prague	68
Frankfurt	233	Rome	126
Geneva	61	Stockholm	101
Glasgow	31	Stuttgart	61
Hamburg	68	Turin	21
Hanover	49	Vienna	118
Helsinki	65	Zagreb	21
Leeds	22	Zurich	127

6 Conclusions

6.1 This section

6.1.1 This section draws together conclusions that may be draw from the data reviewed and very broadly presented above in terms of general overall conclusions, specific conclusions and conclusions regarding the future related roles of UK core cities.

6.2 General conclusions

6.2.1 A number of general conclusions can be drawn from the above analysis:

- air-travel routes from UK regional (core) cities are likely to be a facilitating factor in economic development in a variety of ways;
- economic growth attributable to new aviation linkages will be city specific and core cities needs should be assessed on a city-by-city basis;
- core cities are increasingly dominated by knowledge economy industries where demand for international travel is significant and growing; and
- direct air roots to other European cities are also likely to produce significant growth in the tourism sector in core cities.

6.3 More detailed conclusions

6.3.1 In the increasingly service-dominated UK economy, many sectors have increasing international components their business:

- in all three business service sectors studied, business strategy is one geared to internationalization and this is likely to produce greater demand for direct air linkages with European centres;
- growth in core cities will derive from both assisting existing firms and clusters of firm as well as creating new growth opportunities;
- in core cities, business internationalisation will be dominated by Europeanisation in the foreseeable future as global cities (London) continue to be the main locus for transcontinental business;
- culture-based regeneration projects in core cities are likely to benefit significantly from direct air links to other European core city regions;
- usage of core city air travel is likely to be highly dependant on good quality overland connections with airports. The existence of direct flight routes itself is not necessarily sufficient, especially where there are expensive or time-consuming connections between city centres and airports; and
- research suggests that business-service firms in the UK see a need for much better shuttle flight linkages between core city airports and major international airports (e.g. Heathrow, Gatwick, Manchester etc) to facilitate business internationalisation.

6.3.2 New flight routes as with all transport infrastructure investment are likely to produce unforeseen growth benefits, as firms in elsewhere in the UK and Europe perceive new opportunities for the organisation and conduct of their business.

6.3.3 Development of maintenance facilities also provides a further mechanism for increasing the "cluster" or aviation related activity at airports.

6.4 Quantitative analysis and conclusions

6.4.1 Quantitative analysis indicates that:

- for both UK Cities and EU Cities there is a strong correlation between regional or city GDP and aviation connectivity;
- there is a strong correlation between employment in Air intensive sectors and aviation connectivity; and
- there is a strong correlation between incoming visitors and aviation connectivity amongst EU Cities.

6.4.2 The benefits of aviation to meeting the PSA2 target are potentially as follows:

- high impact quickly (high profile, strong benefits, early wins);
- cost effective – relatively small sums of public money, high leverage;
- differential targeting – peripheral or under-performing regions;
- reduce pressures on South East System in short term – complementary;
- international competitiveness; and
- foreign direct investment.

6.4.3 The analysis also suggest that business needs from regional air services are as follows:

- an increase in destinations and frequencies;
- more direct routes;
- better schedules;
- letter links to London and the south east – (especially Heathrow);
- an emphasis on quality and price.

A1 MAIN REFERENCES

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A2 REVIEWS OF WORK ASSOCIATED WITH CORE CITIES

This section considers the empirical evidence base to support the importance of connectivity. It comprises three sub sections. The first considers some of the existing research work that has been undertaken by the core cities group, the second considers the role of connectivity in advanced business services, the third presents some detailed evidence on the connectivity of major cities in Europe drawing on original work by the consultancy the Route Development Company (RDC).

A2.1 Existing work in connection with the core cities group

Much of the most relevant work here is concerned with the classification and/or effective benchmarking of cities. Three particular papers have been identified:

- "*A Roster of Major Cities"* (Beaverstock, Smith and Taylor, for Globalisation and World Cities Studies Group and Network based in Loughborough)
- *"World Cities: A First Multivariate Analysis of their Service Complexes"* (Taylor and Walker for Globalisation and World Cities Studies Group and Network)
- *"The Urban Rennaissance Characteristics of EU Non-Capital Cities"* (Parkinson, Hutchins, Simmie and Clark for the core cities working group)

As may be noted the first two articles derive from a group of academics – the Globalization and World Cities Study Group and Network centred on Loughborough University. The two articles reviewed are best considered together since they are usefully representative of the work of this important group and seem to represent how their thinking is evolving.

In a **"Roster of Major Cities"** the group seeks to classify cities according to their representation of accountancy, advertising, banking, finance and law to produce a roster of 55 cities at three levels Alpha, Beta and Gamma, as follows:

Alpha	Beta	Gamma
London Paris New York Tokyo	San Francisco Sydney Toronto Zurich Brussels Madrid Mexico City Sao Paulo Moscow Seoul	Amsterdam Boston Caracas Dallas Dusseldorf Geneva Houston Jakarta Johannesburg Melbourne Osaka Prague Santiago Taipei Washington Bangkok Beijing Montreal Rome Stockholm Warsaw Atlanta Barcelona Berlin Buenos Aries Budapest Copenhagen Hamburg Istanbul Kuala Lumpur Manila Miami Minneapolis Munich Shanghai

Overall the exercise is interesting, although a number of comments can be made.

First, despite the clear tendency to assume the importance of producer services (narrowly defined), the continuing significance of this as a clear criteria is not really considered – a deficiency that is both highlighted and addressed by their later work. Associated with this is also the tendency to assume the predominance of UK and UA based institutions.

Second, some of the data appears dubious, even within its own terms. For example no account is taken of tendency to trade under different names in different geographies. Some of the data on banking also looks out of date, Nat West listed as Nat West not RBS! While the data on lawyers only relates to US and English headquartered law firms, no account is taken of the influence of other legal jurisdictions and the list is incomplete as some major networked lawyers (such as Herbert Smith) appear to be missing.

Third, the use of accountancy sector seems outdated given that the sector is highly mature and now arguably in long term decline – the more significant sector here is management consultancy, which has now largely de-merged from former accountancy-based parent practices.

Fourth, as reviewed in section 3, the defining characteristics of world cities, should based on estimation be based on five inter-related and mutually reinforcing groups of economic sectors which typically dominate their centres and their economies:

- finance and business services,
- power and influence,

- tourism,
- creative and cultural industries, and
- transport and access.

As we suspect that these better reflect the factors that drive major cities.

Trends in key indicators would also be considered alongside absolute values. As is well know, many cities, especially the largest ones have/are in long-term decline, reflecting counter-urbanisation trends that have prevailed throughout the post war period. To use absolute values alone reflects just a snapshot in time. This is thought to be particularly significant when one moves beyond the very leading global cities.

Furthermore, we suspect that beyond the handful of global cities in the very top tier, we suspect that may more relevant to classify cities according to the functions performed (or potential performed by the groups of economic sectors listed above.

The second paper ***World Cities: A First Multivariate Analysis of their Service Complexes*** presents a more interesting and advanced analyses. In simple terms, the works seeks through statistical means to identify similarities in the sectoral and command and control structures of major global cities and the major producer services firms within them. In other words it explores whether advanced producer services are all following similar patterns of location. It aim is to explore whether much the conventional thinking on globalisation, reflected in their previous work is actually in practice empirically challengeable.

The overall conclusion, which is important, is of great variability in profiles and firm behaviours. In other words there is a strong degree of uniqueness to each of the cities. As a result they advocate the need for a more evolutionary approach that is place sensitive – an approach that they term geo-historical. The point is that the different service sectors have different degrees of globalization and have different information needs – banks and financial firms operate in largely trans-state markets, whereas advertising is still largely bound to national markets, and lawyers to the zones of influence of particular legal systems (although English Law and New York State law dominate in financial sectors, hence the logical globalisation of the firms that service this specific sector).

The major apparent constraint faced by the work is the paucity of comparable data, meaning that only certain aspects of the major cities can be explored empirically. Nevertheless, this is not to the detriment as the findings. Indeed one suspects that the diversity of experience would be the greater, the greater the empirical variables explored.

The third paper ***Urban Renaissance Characteristics of EU Non-Capital Cities*** takes a broader and more intuitive, pragmatic and local policy-orientated view of the characteristics of successful cities, partly reflecting its focus on non-capital cities, defined as:

- strategic transport and IT connections to markets;
- a city centre of European distinctiveness;
- nationally and internationally recognised facilities for events;
- reputation for advanced research;
- reputation for effective governance;
- sophisticated cultural infrastructure;
- wide range of residential choices;
- reputation for environmental excellence and responsibility;
- an inclusive and diverse society;
- a highly skilled workforce;

- vision, leadership and strategic decision-making capacity;
- innovation in firms and organisational behaviour in cities;
- fiscal incentives available to cities; and
- the impact of national governments policies including strategic support for national urban development and the powers and resources given to cities.

Some of these factors are more significant than others. We suspect that regarding the first, prime characteristic that strategic transport connections are more distinctive than IT, since most cities now have appropriate strategic IT connectivity.

The study uses GDP per capita, primarily to rank cities. As it acknowledges this is a rather specific indicator, that probably reflects issues of income distribution, age structure and diversity as much as true wealth generation. A number of indicators of well being are also used. The results are interesting but ultimately inconclusive. Connectivity is measured through passengers through "airports" which is confusing given that some cities have several airports (listed separately). Some data is given by city, but a number of cities with major airports are not included such as Glasgow and Edinburgh. Sheffield is included despite its very limited use.

The work also draws on some results of Healey and Baker' European Cities monitor are included.

Overall the work is interesting, but patchy in terms of coverage. For possibly legitimate reasons of data availability, the definition of characteristics is not really fully followed through into the analysis. The research is helpful in providing an overview of the characteristics of the non capital cities and in raising some methodological issues relating to data. But ultimately from a policy perspective, we suggest that the major achievement is to highlight the role of air services to city success.

A3 CONNECTIVITY OF SELECTED MAJOR EUROPEAN CITIES

As part of this exercise we have been provided with an extensive and in-depth analysis undertaken by the Route Development Company of the origins and destinations served by major cities on scheduled services per week throughout the world including low cost in terms of numbers of services and capacity measured in terms of passenger seats. We have sought to summarise this work and a separate table is attached showing illustrating in matrix form selected destinations served by a number of European and UK airports. A number of familiar conclusions can be drawn from the matrix and a broader analysis.

- London dominates, but mostly in terms of capacity (number of seats) rather than pure connectivity. Paris, Frankfurt and Amsterdam in particular have regular services to much the same destinations outside the UK. This tends to us to suggest that London connections are not in reality so much better than its immediate European competitors unless it is able to retain its capacity advantage.
- The core cities of the UK currently have lower connectivities than the major and capital cities of Europe, even where they are of similar scale in airport size and population. This is a reflection of the absence of the higher order producer service functions or cultural attractions in these centres that seem to support and reflect greater connectivity
- Other UK cities dominate the profiles of many of the core city airports of the UK, with connections only to a selected number of European destinations such as Amsterdam and Paris – presumably in part to take advantage of interline opportunities.
- In some cases the level of scheduled services is particularly poor given the scale of the airport, Glasgow is especially notable given its emphasis on other UK destinations and in comparison with the theoretically smaller airport at Edinburgh. This is probably a reflection of market demand and the concentration of higher order service functions in Edinburgh. Belfast is a further example of poor connectivity.
- Manchester, Birmingham and Edinburgh offer the best scheduled connections outside the London system.

We have contemplated the possibilities of undertaking some more formal analyses of these data, perhaps seeking to identify statistical correlations between connectivity and measures of city success. However, leaving aside our constraints of time and budget a number of factors suggest that this is not necessarily the best way forward.

- Even a rough inspection based on knowledge of the cities confirms that such a positive relationship probably exists.
- We suspect that the relationship between connectivity with success is symbiotic, that is to say neither factor necessarily drives the other. Air services are both a determinant and consequence of success. This does not however remove the public policy case for breaking the circle and intervening in air services as in another sense air services are also an enabler, a necessary but not sufficient condition. Thus put another way in the future a cities economic success in higher level functions will depend on a suitable level of connectivity.
- The overall nature relationships are also city specific reflecting cities unique histories and opportunities beyond aviation.

A4 Regression Datasets

Regression UK1 – GDP/FREQ

Correlation Coefficient – 0.993

Table A1

	UKGDP	FREQ
London	133,081	7,308
Birmingham	12,652	949
Nottingham	4,993	305
Leeds	9,708	225
Liverpool	5,045	238
Manchester South	18,363	1,315
Newcastle	8,663	302
Edinburgh	8,306	914
Glasgow	10,240	738
Cardiff	5,605	128
Belfast	4,942	592

Regression UK2 – GDPCAP/FREQ

Correlation Coefficient – 0.469

Table A.2

	UKGDPCAP	FREQ
London	18,566	7,308
Birmingham	12,456	949
Nottingham	17,373	305
Leeds	13,322	225
Liverpool	10,886	238
Manchester South	13,204	1,315
Newcastle	10,469	302
Edinburgh	18,417	914
Glasgow	16,495	738
Cardiff	12,714	128
Belfast	17,159	592

Regression UK3 – GDP/CAP

Correlation Coefficient – 0.997

Table A.3

	UKGDP	CAP
London	133,081	1,202,014
Birmingham	12,652	74,857
Nottingham	4,993	36,110
Leeds	9,708	14,312
Liverpool	5,045	27,328
Manchester South	18,363	123,105
Newcastle	8,663	26,162
Edinburgh	8,306	84,623
Glasgow	10,240	72,191
Cardiff	5,605	11,572
Belfast	4,942	62,580

Regression UK4 – GDPCAP/CAP

Correlation Coefficient – 0.461

Table A.4

	UKGDPCAP	CAP
London	18,566	1,202,014
Birmingham	12,456	74,857
Nottingham	17,373	36,110
Leeds	13,322	14,312
Liverpool	10,886	27,328
Manchester South	13,204	123,105
Newcastle	10,469	26,162
Edinburgh	18,417	84,623
Glasgow	16,495	72,191
Cardiff	12,714	11,572
Belfast	17,159	62,580

Regression UK5 – GDP/DEST

Correlation Coefficient – 0.983

Table A.5

	UKGDP	DEST
London	133,081	251
Birmingham	12,652	50
Nottingham	4,993	28
Leeds	9,708	22
Liverpool	5,045	11
Manchester South	18,363	75
Newcastle	8,663	14
Edinburgh	8,306	30
Glasgow	10,240	31
Cardiff	5,605	13
Belfast	4,942	19

Regression UK5a – GDP/DEST

Correlation Coefficient – 0.980

Table 1.5a

	UKGDP	INTDEST
London	133,081	236
Birmingham	12,652	43
Nottingham	4,993	22
Leeds	9,708	5
Liverpool	5,045	8
Manchester South	18,363	61
Newcastle	8,663	5
Edinburgh	8,306	9
Glasgow	10,240	8
Cardiff	5,605	10
Belfast	4,942	1

Regression UK6 – GDPCAP/DEST

Correlation Coefficient – 0.435

Table A.6

	UKGDPCAP	DEST
London	18,566	251
Birmingham	12,456	50
Nottingham	17,373	28
Leeds	13,322	22
Liverpool	10,886	11
Manchester South	13,204	75
Newcastle	10,469	14
Edinburgh	18,417	30
Glasgow	16,495	31
Cardiff	12,714	13
Belfast	17,159	19

Regression UK7 – EMP/FREQ

Correlation Coefficient – 0.896

Table A.7

	EMP	FREQ
Birmingham	445	949
Bristol	140	369
East Midlands	196	305
Leeds	223	225
Liverpool	113	238
Manchester	417	1,315
Newcastle	114	302

Regression UK8 – EMP/CAP

Correlation Coefficient – 0.835

Table A.8

	EMP	CAP
Birmingham	445	74,857
Bristol	140	32,354
East Midlands	196	36,110
Leeds	223	14,312
Liverpool	113	27,328
Manchester	417	123,105
Newcastle	114	26,162

Regression UK9 – EMP/DEST

Correlation Coefficient – 0.908

Table A.9

	EMP	DEST
Birmingham	445	50
Bristol	140	24
East Midlands	196	28
Leeds	223	22
Liverpool	113	11
Manchester	417	75
Newcastle	114	14

Regression UKEU1 – UKEUGDP/FREQ

Correlation Coefficient – 0.814

Table A2.1

	UKEUGDP	FREQ		UKEUGDP	FREQ
Amsterdam	44	3,435	Lisbon	36	1,001
Barcelona	69	2,459	London	255	7,308
Berlin	80	1,175	Lyon	39	1,060
Birmingham	58	949	Madrid	106	3,459
Brussels	48	2,218	Marseilles	31	694
Cologne	38	820	Milan	119	2,765
Copenhagen	30	2,386	Munich	73	3,124
Dublin	40	934	Nice	20	1,992
Dusseldorf	31	1,567	Paris	143	6,547
Frankfurt	48	3,898	Rome	93	2,728
Glasgow	19	738	Rotterdam	35	151
Hamburg	73	1,183	Stockholm	59	2,206
Hanover	24	560	Stuttgart	31	968
Helsinki	36	1,483	Turin	55	429
Lille	20	172	Vienna	59	1,689

Regression UKEU2 – UKEUGDP/CAP

Correlation Coefficient – 0.850

Table A2.2

	UKEUGDP	CAP		UKEUGDP	CAP
Amsterdam	44	439,893	Lisbon	36	125,647
Barcelona	69	308,387	London	255	1,202,014
Berlin	80	104,064	Lyon	39	109,929
Birmingham	58	74,857	Madrid	106	480,868
Brussels	48	222,087	Marseilles	31	70,626
Cologne	38	80,096	Milan	119	351,270
Copenhagen	30	256,823	Munich	73	334,329
Dublin	40	102,748	Nice	20	106,205
Dusseldorf	31	173,228	Paris	143	943,702
Frankfurt	48	582,706	Rome	93	367,436
Glasgow	19	72,191	Rotterdam	35	7,447
Hamburg	73	71,255	Stockholm	59	227,116
Hanover	24	54,872	Stuttgart	31	86,686
Helsinki	36	160,647	Turin	55	45,394
Lille	20	12,496	Vienna	59	160,666

Regression UKEU3 – UKEUGDP/DEST

Correlation Coefficient – 0.665

Table A2.3

	UKEUGDP	DEST		UKEUGDP	DEST
Amsterdam	44	179	Lisbon	36	60
Barcelona	69	88	London	255	251
Berlin	80	53	Lyon	39	65
Birmingham	58	50	Madrid	106	116
Brussels	48	127	Marseilles	31	43
Cologne	38	41	Milan	119	119
Copenhagen	30	105	Munich	73	153
Dublin	40	55	Nice	20	65
Dusseldorf	31	109	Paris	143	250
Frankfurt	48	233	Rome	93	126
Glasgow	19	31	Rotterdam	35	13
Hamburg	73	68	Stockholm	59	101
Hanover	24	49	Stuttgart	31	61
Helsinki	36	65	Turin	55	21
Lille	20	11	Vienna	59	118

Regression UKEU4 – UKEUGDPCAP/FREQ

Correlation Coefficient – 0.491

Table A2.4

	UKEUGDPCAP	FREQ		UKEUGDPCAP	FREQ
Amsterdam	38203	3435	Hanover	47223	560
Bristol	29437	369	Helsinki	35321	1483
Brussels	51106	2218	Leeds	25619	225
Cologne	39108	820	London	35072	7308
Copenhagen	50775	2386	Lyon	28960	1060
Dortmund	26548	201	Milan	32122	2765
Dublin	36591	934	Munich	61360	3124
Dusseldorf	54053	1567	Paris	67200	6547
Edinburgh	35018	914	Rotterdam	26217	151
Frankfurt	74465	3898	Stockholm	35733	2206
Glasgow	31893	738	Stuttgart	53570	968
Hamburg	43098	1183	Vienna	36572	1689

Regression UKEU5 – UKEUGDPCAP/CAP

Correlation Coefficient – 0.427

Table A2.5

	UKEUGDPCAP	CAP		UKEUGDPCAP	CAP
Amsterdam	38,203	439,893	Hanover	47,223	54,872
Bristol	29,437	32,354	Helsinki	35,321	160,647
Brussels	51,106	222,087	Leeds	25,619	14,312
Cologne	39,108	80,096	London	35,072	1,202,014
Copenhagen	50,775	256,823	Lyon	28,960	109,929
Dortmund	26,548	11,156	Milan	32,122	351,270
Dublin	36,591	102,748	Munich	61,360	334,329
Dusseldorf	54,053	173,228	Paris	67,200	943,702
Edinburgh	35,018	84,623	Rotterdam	26,217	7,447
Frankfurt	74,465	582,706	Stockholm	35,733	227,116
Glasgow	31,893	72,191	Stuttgart	53,570	86,686
Hamburg	43,098	71,255	Vienna	36,572	160,666

Regression UKEU6 – UKEUGDPCAP/DEST

Correlation Coefficient – 0.639

Table A2.6

	UKEUGDPCAP	DEST		UKEUGDPCAP	DEST
Amsterdam	38,203	179	Hanover	47,223	49
Bristol	29,437	24	Helsinki	35,321	65
Brussels	51,106	127	Leeds	25,619	22
Cologne	39,108	41	London	35,072	251
Copenhagen	50,775	105	Lyon	28,960	65
Dortmund	26,548	22	Milan	32,122	119
Dublin	36,591	55	Munich	61,360	153
Dusseldorf	54,053	109	Paris	67,200	250
Edinburgh	35,018	30	Rotterdam	26,217	13
Frankfurt	74,465	233	Stockholm	35,733	101
Glasgow	31,893	31	Stuttgart	53,570	61
Hamburg	43,098	68	Vienna	36,572	118

Regression UKEU7 – TOUR/FREQ

Correlation Coefficient – 0.857

Table A2.7

	TOUR	FREQ		TOUR	FREQ
Amsterdam	3,494,000	3,435	Liverpool	190,000	238
Barcelona	2,157,978	2,459	Ljubljana	150,689	152
Berlin	1,213,983	1,175	London	13,150,000	7,308
Birmingham	520,000	949	Lyon	318,629	1,060
Bratislava	292,592	74	Madrid	2,760,523	3,459
Bristol	360,000	369	Manchester	560,000	1,315
Brussels	2,161,341	2,218	Marseilles	123,788	694
Budapest	1,560,056	607	Milan	1,149,796	2,765
Cardiff	240,000	128	Munich	1,578,757	3,124
Cologne	548,364	820	Newcastle	180,000	302
Dublin	3,433,000	934	Nice	1,031,817	1,992
Dusseldorf	472,212	1,567	Palma De Mallorca	108,838	907
East Midlands	190,000	305	Paris	9,191,238	6,547
Edinburgh	910,000	914	Prague	2,083,203	792
Frankfurt	1,163,381	3,898	Rome	4,048,756	2,728
Geneva	878,332	1,121	Stockholm	809,090	2,206
Glasgow	430,000	738	Stuttgart	270,129	968
Hamburg	574,205	1,183	Turin	825,909	429
Hanover	238,866	560	Vienna	2,608,915	1,689
Helsinki	764,282	1,483	Zagreb	180,109	196
Leeds	260,000	225	Zurich	884,438	2,266

Regression UKEU8 – TOUR/CAP

Correlation Coefficient – 0.894

Table A2.8

	TOUR	CAP		TOUR	CAP
Amsterdam	3,494,000	439,893	Liverpool	190,000	27,328
Barcelona	2,157,978	308,387	Ljubljana	150,689	13,328
Berlin	1,213,983	104,064	London	13,150,000	1,202,014
Birmingham	520,000	74,857	Lyon	318,629	109,929
Bratislava	292,592	3,480	Madrid	2,760,523	480,868
Bristol	360,000	32,354	Manchester	560,000	123,105
Brussels	2,161,341	222,087	Marseilles	123,788	70,626
Budapest	1,560,056	58,836	Milan	1,149,796	351,270
Cardiff	240,000	11,572	Munich	1,578,757	334,329
Cologne	548,364	80,096	Newcastle	180,000	26,162
Dublin	3,433,000	102,748	Nice	1,031,817	106,205
Dusseldorf	472,212	173,228	Palma De Mallorca	108,838	118,020
East Midlands	190,000	36,110	Paris	9,191,238	943,702
Edinburgh	910,000	84,623	Prague	2,083,203	103,101
Frankfurt	1,163,381	582,706	Rome	4,048,756	367,436
Geneva	878,332	120,481	Stockholm	809,090	227,116
Glasgow	430,000	72,191	Stuttgart	270,129	86,686
Hamburg	574,205	71,255	Turin	825,909	45,394
Hanover	238,866	54,872	Vienna	2,608,915	160,666
Helsinki	764,282	160,647	Zagreb	180,109	20,499
Leeds	260,000	14,312	Zurich	884,438	255,623

Regression UKEU9 – TOUR/DEST

Correlation Coefficient – 0.743

Table A2.9

	TOUR	DEST		TOUR	DEST
Amsterdam	3,494,000	179	Liverpool	190,000	11
Barcelona	2,157,978	88	Ljubljana	150,689	20
Berlin	1,213,983	53	London	13,150,000	251
Birmingham	520,000	50	Lyon	318,629	65
Bratislava	292,592	12	Madrid	2,760,523	116
Bristol	360,000	24	Manchester	560,000	75
Brussels	2,161,341	127	Marseilles	123,788	43
Budapest	1,560,056	51	Milan	1,149,796	119
Cardiff	240,000	13	Munich	1,578,757	153
Cologne	548,364	41	Newcastle	180,000	14
Dublin	3,433,000	55	Nice	1,031,817	65
Dusseldorf	472,212	109	Palma De Mallorca	108,838	54
East Midlands	190,000	28	Paris	9,191,238	250
Edinburgh	910,000	30	Prague	2,083,203	68
Frankfurt	1,163,381	233	Rome	4,048,756	126
Geneva	878,332	61	Stockholm	809,090	101
Glasgow	430,000	31	Stuttgart	270,129	61
Hamburg	574,205	68	Turin	825,909	21
Hanover	238,866	49	Vienna	2,608,915	118
Helsinki	764,282	65	Zagreb	180,109	21
Leeds	260,000	22	Zurich	884,438	127

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