Oxford
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The Economic Contribution of the Aviation Industry in the UK

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KEY POINTS

- The aviation industry directly contributed £11.4 billion to UK GDP in 2004 and employed 186,000 people.

- Over 520,000 jobs in the UK in total depend on the aviation industry.

- Visitors arriving by air contribute over £12 billion a year to the UK tourism industry, generating a further 170,000 jobs.

- 55% by value of the UK's manufactured exports to countries outside the EU are transported by air.

- Air services are particularly important for UK trade with fast-growing emerging economies, such as China, and for trade in high value goods and services.

- Air services are also very important for the growth sectors on which the UK's future economic success will depend, such as high-tech companies and financial & business services.

- Air services help to improve the competitiveness of almost all aspects of companies' operations, including sales, logistics and inventory management, production and customer support.

- By expanding the market in which firms operate, air services also act as a spur to innovation, increased sales and profits, and improved efficiency.

- A quarter of companies report that access to air services is important in determining where they locate their operations in the UK.

- Implementing the proposals in the government's airports White Paper would generate substantial wider economic benefits from improvements in productivity throughout the economy that would result from increased business use of air services.

- We estimate that the wider economic benefits of full implementation of the White Paper runway proposals would generate additional GDP of over £13 billion a year in today's prices by 2030, with a Net Present Value of £81 billion – equivalent to over £1,300 per head of the population.

- Congestion costs have been rising over the past decade as passenger numbers have grown more rapidly than the capacity of the air transport system to handle them. Costs to airlines and passengers from congestion are estimated to have been £1.7 billion in 2005, and could exceed £5 billion a year in today's prices by 2015 if current trends continue.

- The economic benefits of the White Paper runway proposals remain substantial even after allowance is made for the climate change costs of additional emissions.

The Economic Contribution of the Aviation Industry in the UK

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EXECUTIVE SUMMARY

Aviation is a substantial UK industry in its own right. But its key contribution to the UK economy is in helping other sectors to operate more efficiently and to compete in the global economy, supporting productivity and economic growth across UK plc as a whole.

Aviation is a substantial industry

- The aviation industry generated £11.4 billion value-added in 2004 – in other words, it contributed £11.4 billion to GDP, 1.1% of the overall economy.
- It directly employed 186,000 people (full-time equivalents) in 2004. And it helped to support over 520,000 jobs in total including those employed in its supply chain and in travel agents, and the jobs dependent on the spending of its employees.
- The industry generates much higher output per worker than the UK average, reflecting high levels of investment, thereby contributing to the government's aim of a high productivity, high income economy.
- On a conservative estimate, the industry contributed £3.6 billion to the Exchequer in 2004/05.

Aviation supports tourism…

- The tourist industry makes a large and growing contribution to the UK economy.
- Nearly three-quarters of international visitors to the UK arrive by air. Spending by visitors who arrive by air is equivalent to 1.1% of GDP and generates around 170,000 jobs in the UK.
- Air services also allow UK tourists to enjoy a much wider range of overseas holidays than would otherwise be accessible.
- Increased air services capacity is likely to be needed if the government is to achieve its objective for the tourism industry to grow by a third by 2010.

…and trade

- International trade promotes growth and raises living standards by allowing countries to specialise in producing the goods and services for which they have a comparative advantage.
- The aviation industry plays a central role in fostering UK trade. 55% of the UK's exports of manufactured goods to countries outside the EU are transported by air.
- Many key imports depend on air services too. More than 60% of imports of machinery, mechanical appliances and electric equipment from outside the EU are carried by air.
- Passenger services also play an important role in supporting trade - nearly two-thirds of companies report that passenger services are either vital or very important for sales and marketing.
- Air services are particularly important for the UK's trade with the fastest-growing regions of the world economy, such as India and China, and over time are likely to become even more important to the UK's ability to compete in the world economy.

Aviation influences where companies invest…

- Better air transport services encourage more businesses to locate in an area as well as affecting investment decisions by existing companies.
- A quarter of companies report that access to air services is an important factor in influencing where they locate their operations within the UK
- Nearly one in ten companies report that the absence of good air transport links has affected their organisation's decisions to invest in the UK. Of these, 30% chose not to make the investment in the UK.
- In addition, 10% of companies say they would relocate some operations from the UK if next day international express delivery services – which rely on night flights from selected UK airports – ceased to be available.

…and is particularly important for key growth sectors

- The government recognises "from experience that the best way – indeed the only effective way – to respond to globalisation is to build a strong, modern knowledge economy[1]."
- Many of the growth sectors on which the future of the UK economy depends are particularly dependent on air services for competing effectively in the global economy.
- London's successful cluster of international financial services is a key example of a knowledge-based sector that is heavily reliant on aviation. But high-tech sectors within manufacturing also report a much higher proportion of sales are dependent on air services than other manufacturers.
- The UK economy is therefore set to become increasingly dependent on aviation as the structure of the economy evolves.

Users depend on network connectivity

- Aviation users depend on a network of services providing connectivity to a wide range of destinations.
- Heathrow scores well on most measures of connectivity. But the range of destinations served has been narrowing as the need to meet demand on heavily used routes has crowded out less profitable routes with more limited demand.
- Nine out of every ten companies in London or counties close to Heathrow regard the airport as either vital or very important to their organisations.
- Elsewhere in the UK, Heathrow is still considered to be very important by more than 40% of companies, although regional airports are the airport of choice for many when feasible – they are used very frequently for direct short-haul flights by half of all companies.
- Passengers transferring between flights at a hub airport increase the viability of services that benefit direct passengers too, allowing a greater frequency and range of services.

[1] 'Creating Wealth from Knowledge', DTI November 2005.

Aviation supports business efficiency

- Air services help to improve the competitiveness of almost all aspects of companies' operations, including sales, logistics and inventory management, production and customer support.
- By expanding the size of the market that can be served, aviation acts as a spur to innovation, increases sales and profits, allows more scope to exploit economies of scale and enhances competition.
- Earlier econometric work[2] on the impact of business use of air services on productivity in the rest of the economy has been updated with new data and refinements to the estimation methodology. Unlike the previous study, a distinct effect on productivity from changes in air transport usage is now found rather than just an effect from transport usage in aggregate.
- The results imply that if growth in business use of aviation services (both passenger and freight) was held back by 1 percentage point a year over a thirty year period there would be loss in potential GDP of 1.8% a year by the end of the period.

Airport development would have wider GDP benefits…

- Our UK Industry-Aviation model allows us to use the results of the relationship we have estimated between business aviation use and the overall level of productivity in the economy in order to estimate the wider economic benefits of different scenarios for future airport development.
- Our results should be regarded primarily as illustrative of the possible wider economic benefits, since there is inevitably considerable uncertainty over some of the assumptions made – the model is particularly sensitive to assumptions about the scale of business use of aviation in the different scenarios.
- We estimate that mixed-mode operation at Heathrow would generate wider economic benefits of £2.5 billion additional GDP a year in today's prices by 2015 (0.2% of GDP). The wider economic benefits generated would have a total Net Present Value over the period to 2030 of £35 billion.
- A third runway at Heathrow would generate wider economic benefits estimated at £7 billion additional GDP a year in today's prices by 2030 (0.3% of GDP) with a total Net Present Value over the next 25 years of £27 billion. This is lower than the NPV calculated for mixed mode operation, reflecting the later date at which a new runway would be available and GDP benefits start to accrue. By 2030, though, the annual GDP benefits are nearly twice those of mixed mode operation – estimating NPVs over a longer period than to 2030 would therefore alter the comparison.
- Full implementation of the White Paper runway proposals would generate wider economic benefits of over £13 billion additional GDP a year in today's prices by 2030 (0.6% of GDP).
- The Net Present Value of the wider benefits from the full White Paper runway proposals is estimated to be £81 billion – equivalent to over £1,300 per person in the UK.

[2] 'The Contribution of the Aviation Industry to the UK Economy', OEF 1999 (available at www.oef.com/AviationUK.html).

… and reduce congestion costs

- Congestion imposes costs on both airlines - increasing the cost of providing planned services - and users, whether through the extra time taken to pass through airports or the time wasted when flights do not leave or arrive on time.
- Congestion costs have been rising over the past decade as passenger numbers have grown more rapidly than the capacity of the air transport system to handle them. Our estimates show congestion costs (to both airlines and passengers) have more or less tripled from nearly £600 million in today's prices a decade ago to £1.7 billion in 2005.
- If these trends continue, congestion costs could exceed £5 billion a year in today's prices by 2015, and approach £20 billion a year by 2030.
- There are a range of possible investments – eg introduction of mixed mode operations, improvements in air traffic control, new runway and terminal development – that would reduce congestion, with substantial potential benefits to the economy.

Environmental impacts are smaller than GDP benefits

- In addition to congestion, there are three other main environmental impacts arising from aviation: noise, local air quality, and climate, of which the last is by far the most important in quantifiable terms.
- The combined cost of CO_2 and the potential non-CO_2 climate impacts from UK aviation is estimated to have amounted in aggregate to £1.4 billion in 2000, and could reach £4 billion a year in today's prices by 2030.
- The growth in air services in the alternative scenarios for runway development we have analysed would have implications for emissions, with an estimated cost ranging from an additional £100 million a year for mixed mode operation at Heathrow to an additional £700 million a year in today's prices by 2030 for full implementation of the White Paper proposals.
- But the economic benefits of the White Paper runway proposals remain substantial even after allowance is made for the environmental cost of additional emissions.

1 Introduction

1.1 Purpose

Oxford Economic Forecasting was commissioned by a range of organisations from different parts of the aviation industry, together with DfT and VisitBritain, and working with the CBI, to update its 1999 study[3] on the economic contribution of the aviation industry in the UK, and to extend the analysis in a number of ways. This study therefore builds on our 1999 report and on a number of related studies undertaken since then to look in particular at the so-called 'catalytic' impacts of the aviation industry in more detail – ie the importance of the aviation industry in helping other sectors to operate more efficiently and to compete in the global economy, supporting growth across the UK economy as a whole. We are grateful for comments and assistance in putting the report together from several sources, but the views and analysis presented in the report remain those of OEF rather than those of the sponsoring organisations.

The opportunity to update and extend our analysis is timely for several reasons. First, the government is planning a progress report on the implementation of proposals contained in the Aviation White Paper, three years after it was produced. Second, the aviation industry has experienced considerable turmoil and change in the past few years. Third, a team under Sir Rod Eddington has been tasked with looking at the issue of the impact of the transport infrastructure on productivity and economic growth more widely, and our earlier study found that aviation contributes substantially to that impact. Finally, a variety of questions were raised in response to our 1999 study, and this update provides the opportunity to clarify and expand a number of key points.

1.2 Our approach

The current study reinforces the conclusions of the 1999 study about the size and importance of the aviation industry in the UK. In doing this, part of the analysis draws on existing datasets that contain relevant information on the aviation industry and on previous studies of the industry. The main developments in the analysis have been in looking more closely at the impact of the industry on productivity and growth. In order to get a better understanding of the ways and the extent to which other sectors of the economy use and depend on aviation, we have undertaken both an extensive survey of UK companies and more detailed case studies with a variety of organisations. And as in our earlier study we have used econometric evidence of the relationship between air transport usage and productivity in the wider economy in order to model the potential impact of alternative scenarios for runway development in the UK on overall economic performance.

Annex A contains more information on our approach to the study, including both the business survey we conducted and the model used for the scenario analysis.

1.3 Structure of report

The remainder of this report is structured as follows:

[3] 'The Contribution of the Aviation Industry to the UK Economy', OEF 1999 (available at www.oef.com/AviationUK.html).

- Chapter 2 looks at what aviation contributes to today's economy in terms of employment, output, investment, government finances, the balance of payments and social impacts.
- Chapter 3 discusses the impact of aviation in supporting tourism, both bringing foreign tourists into the UK and enabling UK residents to visit a wider range of destinations abroad;
- Chapter 4 covers the role of air services in supporting trade;
- Chapter 5 focuses on the impact of aviation in affecting company location and investment decisions;
- Chapter 6 looks specifically at the importance of aviation for sectors that are likely to be key to generating future growth in the UK economy;
- Chapter 7 discusses the importance of connectivity and the respective roles of hub and regional airports;
- Chapter 8 looks at evidence of the impact of aviation on productivity in the rest of the economy, including both survey and econometric evidence;
- Chapter 9 provides some quantification of the potential overall economic impact of airport development by analysing alternative scenarios using our UK Industry-Aviation Model;
- Chapter 10 discusses the costs of congestion in UK aviation;
- Finally, Chapter 11 covers aspects of the environmental impact of airport development, including the cost of carbon emissions associated with additional air traffic.

Some detailed tables have been included as Annexes to the report to avoid cluttering the main chapters, while the final Annex contains the questionnaire used in our survey and a summary of the answers to each question.

2 The Size and Scope of the Aviation Industry

Key points

- The aviation industry generated £11.4 billion value-added in 2004, 1.1% of the overall economy.
- It directly employed 186,000 people (full-time equivalents) in 2004, and helped to support over 520,000 jobs in total including those employed in its supply chain and in travel agents, and the jobs dependent on the spending of its employees.
- The industry generates much higher output per worker than the UK average, reflecting high levels of investment, thereby contributing to the government's aim of a high productivity, high income economy.
- On a conservative estimate, the industry contributed £3.6 billion to the Exchequer in 2004/05.

2.1 Introduction

The most important contribution that the aviation industry makes to the UK economy is as a facilitator of growth for the economy as a whole. This role is discussed in detail in this report. However, aviation is also an important industry in its own right and so this chapter looks at its overall size and significance. In aggregate, the results support our previous research about the contribution of aviation to the UK economy, despite the turmoil and change that the industry has been through since then. Indeed, the industry has emerged from a very difficult period significantly more productive than before, with many more passengers handled by a similar number of staff.

The aviation industry is defined as activities that are directly dependent upon transporting people and goods by air to, from or within the UK. This covers airline and airport operations and includes scheduled and charter flights for passengers and freight, general aviation, airport maintenance, air traffic control and regulation, and activities directly serving air passengers, such as check-in, baggage-handling, and on-site retailing and catering facilities. Not all of these activities necessarily take place at an airport – for example, some airlines have head office functions or ticketing centres at other locations.[4]

This definition of the aviation industry does not directly correspond to any definition in official UK statistics. The activities of airlines are covered under the Standard Industrial Classification heading division 62, called "air transport". Similarly the activities of airport operators, ground service personnel and air traffic control form SIC subclass 63.23, called "other supporting air transport activities". However, it is not possible to identify separately from the official statistics activities such as air cargo handling, retailing, catering and hotels at airports and surface transport links to airports. We have therefore used a range of sources to provide best estimates of these.

[4] This is the same definition as used in our 1999 report.

2.2 Output or Value-added

As the world economy becomes increasingly "global", the contribution of the aviation industry to the UK's transport infrastructure continues to grow in importance. In 2004 it handled 210 million passengers, of which around 35 million were business passengers. And it transported around 2.5 million tonnes of freight. Freight carried included an estimated £63 billion of UK exports in 2005, around 30% of all UK exports by value, and £60 billion of imports (about 22% of the total). Passenger numbers have grown by over 30% since 1998 (ie the data in our previous report), with very rapid growth in travel on low-cost airlines in particular.

The aviation industry represents a substantial part of the UK economy. However, calculating the exact size of the contribution to GDP is complicated by the fact that the National Accounts does not include a category that corresponds to the aviation industry as a whole.

There are three elements to our calculation of the contribution of aviation to GDP[5]:

- The output of airlines (ie SIC division 62) for 2003 is officially put at £5.4 billion in current prices and at £5.6 billion in 2002 prices. An estimate of the current price figure for 2004 can be made by using the returns to the Annual Business Inquiry (ABI), the main survey used to calculate the GDP figures. This suggests that value added in 2004 was £6.5 billion in current prices. Separately available figures put the level of real output at £6 billion in real terms.[6]
- National accounts estimates of value added for air transport supporting activities are not available. However, ABI figures are available and these suggest that value added in 2004 was £3.4 billion in current prices and £3.1 billion in real terms.
- We assume that value-added per employee in the rest of the aviation industry (covering employees in areas such as retail and catering concessions, or in hotels on airports) is equal to the value-added per employee in the national distribution, hotels and catering sector. This implies that value-added in this area was equal in 2004 to £1.5 billion in current prices or £1.4 billion in real terms.

Putting these figures together implies that total value-added by the aviation industry in 2004 was £11.4 billion in current prices[7] or £10.6 billion in real terms. This is equivalent to around 1.1% of GDP (Table 2.1).

It is worth noting that the calculation of the value-added of airlines in current prices has been based on official National Account statistics, which show little or no increase in value-added over the period 1998-2003. In contrast, other sources such as the ABI, the main original source for National Accounts data, show a substantial increase in both

[5] GDP is a measure of "value-added", that is to say it is the value of output net of the goods and services used up during the production process. All the numbers given here are measures of "value-added".
[6] All references to real terms refer to 2002 prices unless otherwise stated, ie the National Accounts reference year when this analysis was carried out (although this has since been moved on to 2003 under ONS's policy of annual changes to the reference year).
[7] The estimate of the aviation industry's value-added for 1998 is about £1 billion pounds lower in current prices than the estimate published in our 1999 report. About a third of this is explained by lower estimates for air transport and other supporting activities than in the previous figures. These changes are due to new and more accurate figures now being available to ONS. The other two thirds is due to a lower estimate for other activities, which has been proxied using the latest output and employment estimates of the distribution, hotels and restaurant industries nationally, weighted by airport employment in these areas. By its nature this particular calculation can only be an approximation, but we believe the assumptions made in calculating this are appropriate.

turnover and value-added. Moreover, figures for passenger numbers also imply a substantial increase in output, if not value-added, over this period. If we took account of this alternative evidence it is possible that the estimate of the value-added of the aviation industry would be significantly higher than £11.4 billion. In addition, the growth of low-cost airlines and the downward pressure on airfares in general in recent years has generated substantial benefits to consumers that are not fully captured in the National Accounts.

Table 2.1: Gross Value Added (GVA) of the Aviation Industry
(£ billion)

	1998	**2004**
Current Prices		
(1) GVA of air transport (SIC 62)	5.3	6.5
(2) GVA of other supporting air transport activities (SIC 63.23)	2.6	3.4
(3) GVA of other parts of aviation industry	1.2	1.5
GVA of Aviation Industry (1)+(2)+(3)	**9.0**	**11.4**
Aviation GVA as % of GDP	*1.2%*	*1.4%*
Volume Measure(2002 Prices)		
(1) GVA of air transport (SIC 62)	5.0	6.1
(2) GVA of other supporting air transport activities (SIC 63.23)	2.8	3.1
(3) GVA of other parts of aviation industry	1.3	1.4
GVA of Aviation Industry (1)+(2)+(3)	**9.1**	**10.6**
Aviation GVA as % of GDP	*1.1%*	*1.1%*

Source: ONS and OEF calculations

2.3 Employment

The aviation industry directly employed 186,000 people in 2004 (in terms of full-time equivalents), the same number as employed in manufacturing motor vehicles and parts, for example. This estimate, is based on airport surveys carried out for the Airport Operators Association (AOA)[8], which we believe provide the best available estimate of total employment in the industry (Table 2.2).

[8] Summarised in 'The Economic and Social Impact of Airports', AOA September 2005.

Table 2.2: Direct Employment in the Aviation Industry, 2004		
Airport	**Total terminal passengers (millions)**	**Direct employment**
Aberdeen	2.64	2,716
Belfast City	2.13	807
Birmingham	8.86	9,071
Bristol	4.65	4,747
Cardiff	1.89	1,932
East Midlands	4.38	4,512
Edinburgh	8.02	2,300
Gatwick	31.47	23,761
Glasgow	8.58	5,442
Heathrow	67.34	68,427
Luton	7.54	7,756
Manchester	21.25	18,000
Newcastle	4.72	4,855
Stansted	20.91	10,592
Other Airports	20.63	21,116
Total	**214.98**	**185,900**

Source: AOA, OEF calculations

Reassuringly, these figures look entirely consistent with such data as are available from ONS, which cover airlines and airports. If we were to assume that other aviation-related employment was in the same proportion to these sectors as in our previous study then the implied overall employment estimate for the aviation industry in 2004 would be within 3,000 of that derived from the AOA survey. In practice, we have estimated the breakdown of employment between different activities by using ONS data where available and constraining other parts of the industry to produce the total derived from the AOA survey (Table 3.3).

Table 2.3: Employment in the Aviation Industry (thousands)		
	1998	2004
Air transport (SIC 62)	81	71
Ancillary air transport services (SIC 63.23)	22	23
Other aviation-related employment	77	92
Total	**180**	**186**

Source: ONS, AOA & OEF estimates

There has been very little change in employment in the aviation industry since the 1998 estimates produced in our previous study, despite the 30%+ increase in passengers over this period, implying a substantial rise in passengers handled per person employed. In part this has been driven by the style of no-frills service provided by the low-cost carriers. But it also represents substantial efforts by traditional airlines to cut costs in the face of difficult market conditions.

As well as creating employment directly, the aviation industry also supports a substantial number of jobs elsewhere in the economy (Table 2.4):

- Indirect employment represents jobs created in the supply chain to the aviation industry; and we estimate that there were 167,000 such jobs supported by aviation in 2004. Examples include the jobs in the energy sector that are dependent upon airline purchases of fuel; construction workers building additional facilities at airports; the workers required to produce the meals served on airlines; or those who produce the goods sold at airport retail outlets. Our estimates are derived from a combination of survey data and calculations. For Heathrow, for example, our methodology implies that 0.57 indirect jobs are created for every 1 direct job, the same indirect multiplier as in our 1999 study. However, work carried out as background to our regional study following the 1999 report confirmed that the indirect multiplier for Manchester of 1.85 was high, partly as a result of extensive capital expenditure on the second runway and upgrading terminal facilities during the period the relevant survey was carried out. It was estimated that an equivalent multiplier for a more typical year would be 1.38, and that has been used in this study. For all other airports the calculations have been based upon weights derived from ONS 'input-output' tables. These imply a slightly lower multiple than the survey data used last time and this, along with the changed multiple for Manchester, explains why the estimate for indirect output is now lower than that published in the previous report.

- Induced employment is the employment created by employees in the aviation sector and those indirectly supported by the aviation industry using their income to purchase goods and services for their own consumption. We estimate that induced employment supported by aviation was 88,000 in 2004. The multiplier used here is the same (0.25) as in our previous study, derived from a simulation on OEF's macroeconomic model of the UK economy.

- The aviation industry is also critical to most of the work of the UK's travel agents - perhaps 80% of the work of employees in travel agents is associated with the arrangement of air travel or selling package holidays that include air travel. According to the ABI there were about 129,000 workers in travel agents or related activities in 2004, up from an estimated 110,000 in 1998. This implies that just over 80,000 such full-time equivalent jobs are supported by aviation after allowing for estimates of part-time jobs and the proportion of work that depends on aviation.

In total, we estimate that 523,000 jobs in the UK were dependent on the aviation industry in 2004, equivalent to 2.0% of total employment, and similar to our previous estimate for 1998.

Table 2.4: Jobs Supported by the Aviation Industry
(thousands)

	1998	2004
Direct employment	180	186
Indirect employment	200	167
Induced employment	94	88
Travel agents	75	82
Total	**549**	**523**

Source: AOA, ONS & OEF estimates

2.4 **Productivity**

Productivity is a key engine of economic growth, and raising the UK's productivity remains one of the key aims of the government's economic policies. As Chapter 8 discusses, the aviation industry plays a significant role in enabling other parts of the economy to be more productive. However, it is worth noting that the aviation industry itself remains a relatively high-productivity sector when compared with the rest of the UK economy (Table 2.5). Value-added per worker in airlines (SIC 62) in 2004 was around £66,000 in 2002 prices, while productivity in air transport supporting activities (SIC 6323) was almost £85,000. Productivity has therefore risen significantly since 1998, when it was £56,000 per worker for airlines and £80,000 per worker for airports[9]. As was the case at the time of our last report these numbers are well above the average level of productivity across all sectors of £22,600 per worker. Indeed, of the major divisions identified in the National Accounts, only the oil and gas extraction industry and utilities have higher levels of productivity. Productivity in the aviation sector is over three times that in the economy as a whole and close to double that of manufacturing. So, constraining the growth of aviation would be likely to hit the average level of productivity in the UK and reduce the living standards the economy could sustain.

Table 2.5: Relative Productivity in the UK Aviation Industry, 2004

	Value-added per worker (£'000s, 2002 prices)
Air transport (SIC 62)	65.8
Air transport supporting activities (SIC 63.23)	84.7
Aviation industry	56.0
Aerospace[10]	67.5
Extraction of oil and gas	295.7
Manufacturing	41.6
of which -	
Chemicals	72.7
Motor vehicles	44.7
Mechanical engineering	40.9
Electrical engineering	40.6
Electricity, gas and water	123.4
Construction	27.1
Post & communications	46.9
Distribution	20.7
Real estate and renting	48.6
Whole Economy	22.6

Source: ONS, OEF calculations

[9] The figures for 1998 differ from those quoted in the last report because of changes to official employment estimates

[10] Section 2.8 notes that the ONS measures of real and nominal output in the aerospace industry have showed a very substantial degree of divergence in recent years. An alternative measure of productivity for this industry using nominal output data shows output per worker of about £53,000 in 2004.

2.5 Investment

High productivity per employee is often a reflection of the capital stock available per worker and the aviation industry is highly capital intensive. This reflects not only the investment required in runways, airport terminals and aircraft but also in associated computer systems, maintenance facilities and offices. According to ONS data, over the five years between 2000 and 2004 UK airlines invested £21.2 billion in current prices, while airports invested £6.0 billion and the aerospace industry around £3.4 billion (Table 2.6). Together these figures are equivalent to around 3.5% of total UK business investment. It is worth noting, though, that the figures for investment by airlines appear to be rather high when compared with the known investment behaviour of major UK airlines. It appears likely that the total includes aircraft purchased by leasing companies and then leased to non-UK airlines.

Table 2.6: Investment in Aviation & Aerospace
(£ million)

	2000	2001	2002	2003	2004	2000-2004 (Annual average)
Airlines						
Current prices	3,380	4,172	5,751	4,493	3,392	4,238
Volume measure	3,423	4,192	5,751	4,462	3,364	4,239
Airports						
Current prices	918	884	1,312	1,515	1,336	1,193
Volume measure	964	919	1,312	1,495	1,302	1,198
Total Airlines & Airports						
Current prices	4,298	5,056	7,063	6,008	4,728	5,431
Volume measure	4,387	5,111	7,063	5,957	4,666	5,437
Aerospace						
Current prices	619	525	686	462	535	565
Volume measure	611	511	686	467	541	564

Source: ONS and OEF calc

This high rate of investment in aviation is likely to be one of the factors behind the relatively high level of productivity in the aviation industry. As Chart 2.1 illustrates there is some evidence in general that sectors with relatively high levels of capital also have relatively high levels of productivity. This is perhaps even clearer in Chart 2.2, which is based on the capital stock of each industry relative to its employment. By using high levels of capital equipment per worker, the aviation industry generates the high levels of output per worker that contribute to a high income, high productivity economy.

Chart 2.1: Productivity and Capital/Output Ratios, 2004

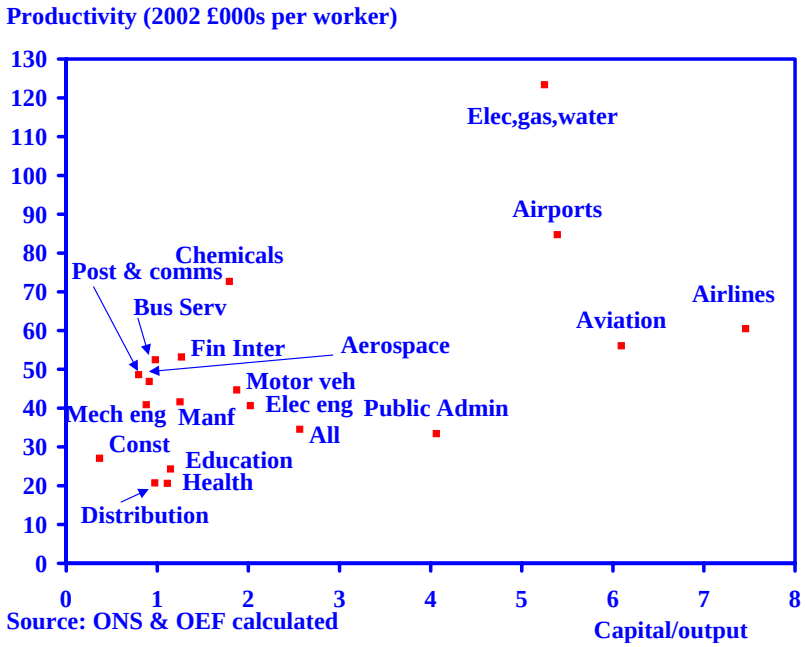
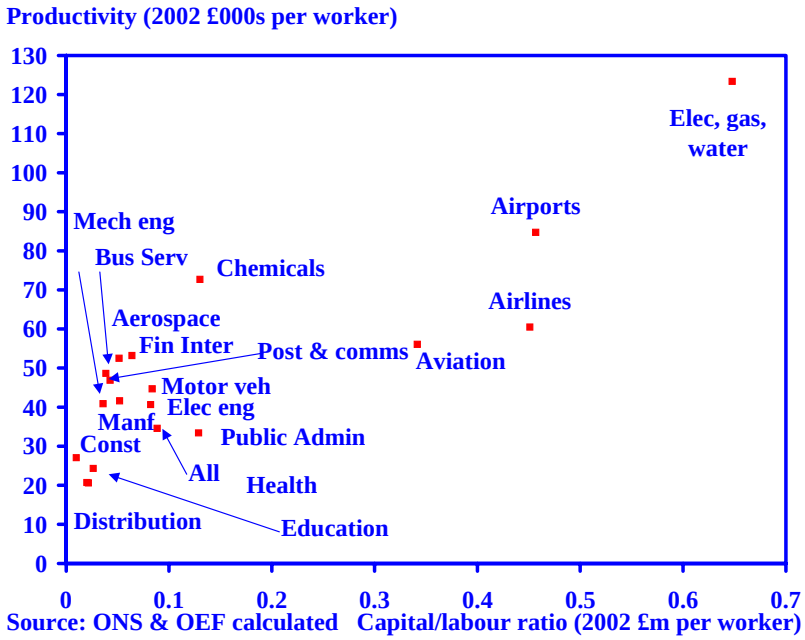


Chart 2.2: Productivity and Capital/Labour Ratios, 2004



2.6 **Profitability & Taxes**

We do not have accounts covering the total aviation industry. Table 2.7, for example, does not cover the activities of, amongst others, separate airport retailers and caterers or freight and baggage handlers. However, airline operating revenues were over £14.3 billion in 2004 compared with operating income of a little over £2.6 billion for airports in 2004/05. Total operating profits were around £900 million for airlines and around £800 million for airports. In both cases these totals are around £200 million higher than the corresponding profits in 1997 (1997/98 for airports) shown in our previous report.

Table 2.7: Profit & Loss Summary, Airports & Airlines
(£ million)

	Major UK Airlines 2004	*Major UK Airports 2004/05*
Traffic	14,333	1,227
Commercial		1,357
Total operating income	14,333	2,622
Total operating expenditure	13,407	1,789
Total operating profit	926	833
Interest payable (Net)	190	140
Other expenses, etc	60	
Profit on ordinary activities before taxation	676	693
Exceptional items	112	95
Taxation	180	197
Profit on ordinary activities after taxation	607	590
Dividends	99	292
Retained profit for the year	508	298

Source: CAA Airline Statistics & CRI, University of Bath "Airport Statistics 2004/2005"

The aviation industry directly contributed £3.6 billion to the Exchequer in 2004/05, equivalent to around 1p on the basic rate of income tax (Table 2.8):

- Income tax revenues from employees in aviation are estimated to have been £1.4 billion in 2004/05[11].
- National Insurance Contributions (both employees' and employers') are estimated to have been over £850 million in 2004/05.

[11] Income tax and National Insurance contribution receipts are estimated using figures from the ONS Annual Survey of Hours and Earnings (ASHE) for 2004. This is the replacement for the New Earnings Survey that was used in the last report. ASHE data show that average earnings in air transport services were 36% higher than the UK average, earnings in supporting airport activities were 47% higher than the UK average and earnings in retailing, hotels & catering were 45% below the UK average. Combining these figures with employment weights based on Table 3.2 suggests that average earnings in the aviation industry as a whole were 11% above average earnings in the UK. Estimates of income tax and NICs from aviation therefore represent a 11% higher share of total receipts from these taxes than would be suggested by aviation's share of total employment.

- Corporation tax revenues from airlines and airports are estimated to have totalled over £375 million in 2004/05. This understates total corporation tax revenues from the industry, since it excludes equivalent figures for other companies in the aviation sector, which are not readily available.

Table 2.8: Contribution of Aviation to UK Public Finances, 2004-2005
(£ million)

Income tax from aviation	1,410
National Insurance Contributions from aviation	863
Corporation tax revenue from airlines	180
Corporation tax revenue from airports	197
Air passenger duty	900
Total Contribution to Exchequer	**3,550**

Source: ONS, CRI and OEF calculations

These estimates imply that the aviation industry contributed about 0.8% of total tax revenues in 2004/05. However, they understate the total contribution to the Exchequer since we have not been able to include all taxes in the calculation, such as business rates, insurance premium tax on flights and VAT paid on either sales at airport shops or spending elsewhere in the country by households employed in the aviation industry. And we have not taken account of tax paid by workers in the aviation supply chain.

2.7 Balance of Payments

UK airlines sold £4 billion of tickets overseas in 2004 and earned £394 million in freight charges, while UK airports and other members of the industry generated £2.6 billion of exports, including costs incurred by overseas airlines in using UK airports (Table 2.9). Total exports generated by the aviation industry therefore totalled £6.9 billion in 2004, which accounted for 7% of the UK's overall exports of services and 3% of all exports.

UK airlines produced a net export surplus of £0.9 billion, after allowing for £3.4 billion of spending overseas on services such as airport charges, accommodation for flight crews, advertising and commission. However, overseas airlines are also significant export earners in their dealings with the UK and so the net result was that the UK had a balance of payments deficit in air transport services of around £3.3 billion. This deficit is more than double what it was at the time of our last report, reflecting the fact that exports have shown little or no growth over this period, while imports have continued to rise substantially. This deficit will in part reflect some reluctance on the part of foreigners to travel to the UK post 9/11 but may also be because the strength of the pound has made the UK a more expensive place to visit. Ironically, it also testifies to the relative strength of the UK economy. Freights imports represent the payments made on imports of goods that are carried by foreign airlines, which have risen strongly in recent years, while passenger revenue imports reflect the fact that more UK residents are travelling abroad.

Table 2.9: Air Transport Contribution to Balance of Payments, 2004 (£ million)	
Exports	6,913
of which:	
Passenger revenue	3,950
Freight	394
Disbursements	2,302
Other revenue	267
Imports	10,186
of which:	
Passenger revenue	6,088
Freight	681
Disbursements	3,417
Balance	-3,273
of which:	
Net exports by UK airlines	927
Exports by UK airports, etc	2,569
Imports by air users	-6,769

Source: ONS

2.8 Aerospace

The aerospace industry is not a direct component of the aviation industry as defined in this report. It is a very international business with the majority of its sales to foreign companies (Table 2.10). However, UK airlines are major customers of the aerospace industry and a successful domestic aviation industry provides a strong base from which the UK aerospace industry can compete in international markets. This section looks directly at the aerospace industry.

Table 2.10: Sources of Demand for Output of UK Aerospace Industry	
	% of total
Exports	88.5
UK investment in aircraft	6.3
Intermediate consumption	5.2

Source: ONS and OEF calculations (from input-output tables)

The aerospace industry had value-added of around £5.3 billion in current prices and £6.7 billion in real terms in 2004 (Table 2.11), equivalent to about 0.5% of GDP and 0.7% of GDP respectively.

The nominal figure for value-added has risen by 20% since 2002 but in real terms it has increased by only 0.2%. Moreover, there appear to have been substantial differences in the movements of the real and nominal series over time. For example, between 1998 and 2002 the volume data fell by around 16% whereas the nominal data rose by about 30%, implying very considerable rises in the industry's prices over this period. Then, between 2002 and 2003 the volume figure rose by almost 9% whereas the nominal series fell by about 7%, consistent with a very big fall in prices. In reality there is no evidence to suggest that prices in the aerospace industry have been anyway near as

volatile as this suggests and so some alternative explanation is required. One possibility is that it is simply very difficult to measure prices in this sector because of the differences in quality between various goods produced and so consequently it becomes difficult to produce an accurate price series that can be used to deflate the nominal data. Alternatively the difference could be explained by some discrepancy between data sources given that the real series is derived from a monthly inquiry whereas the nominal series is based upon the more comprehensive ABI. We would recommend that the volume numbers should be treated with caution and that more attention should be paid to the nominal data that are based upon a much larger and more comprehensive survey.

Table 2.11: Value-added and Employment in Aerospace Industry

	1998	2004
GVA in current prices (£ billion)	4.4	5.3
GVA volume measure (£ billion, 2002 prices)	6.7	6.8
Employment (thousands)	114	101

Source: ONS and OEF calculations

2.9 Social impacts

The indicators of the significance of the UK aviation industry presented so far are based on standard economic measures of its market contribution. However, such estimates do not capture the full contribution of the aviation industry because, like most industries, it also generates significant additional non-market benefits for its customers and because there are significant indirect welfare benefits to non-customers. For example:

- The availability of affordable and frequent flights from the UK to most of the world has brought foreign travel and holidays within reach of the majority of the population. In 2004 UK residents took 42.9 million foreign holidays, compared to 31.5 million in 1998 and 7 million in 1977, and about 80% of these trips were by air. A further 8 million people were able to visit friends or relatives abroad, an opportunity that in many cases would not be available without the existence of air transport.

- The aviation industry's role in maintaining contact between UK residents and their friends and relatives elsewhere in the world should not be underestimated. As the UK becomes an increasingly multicultural society such links become increasingly important. Around 7.9% of the UK's population, or about 4.6 million people, belonged to non-White ethnic groups at the time of the last Census in 2001 (Table 2.12). Of course not all of these people will have been born outside the UK but it is likely that most will still have extended family abroad. Moreover, some of the White population will also have originated from outside the UK. In 2001, 4.9 million or 8.3% of the total population of the UK was born overseas. This is more than double the 2.1 million (4.2%) in 1951. Amongst this foreign-born population, around 53% classified themselves as White.

Table 2.12: Population of the UK by Ethnic Group, April 2001 (% of population)	
White	92.1
Mixed	1.2
All Asian or Asian British	4.0
All Black or Black British	2.0
Chinese	0.4
Other ethnic groups	0.4

Source: 2001 Census

- Immigrant labour represents an important economic resource to the UK. It is estimated that in 2004 223,000 more people migrated to the UK than left to move abroad. These figures are much higher than those for even the previous year, of 151,000, primarily reflecting the impact of the expansion of the EU in May 2004. These people bring with them a range of skills that are beneficial to the UK. They are drawn because of the economic opportunities offered by a relatively vibrant UK economy but the figures would unlikely to be as a high as they are were it not for good air transport links. As the domestic population ages over the course of the next few decades, it is quite likely that the economy will become increasingly dependent on non-indigenous workers. If the UK is to remain an attractive place for such people to live and work it is vital that good air transport links are maintained.
- The aviation industry has also expanded the range of choices available to the consumer – such as a wider range of foods or other products on sale in our high streets, while the large number of overseas visitors has encouraged the provision of a broader range of cultural and leisure activities.
- Excellent air transport links have helped Britain beat stiff competition to host major international sporting events – such as the 2012 Olympics.

3 How aviation supports tourism

Key points

- The tourist industry makes a large and growing contribution to the UK economy, directly contributing nearly 4% of GDP.
- Nearly three-quarters of international visitors to the UK arrive by air. Spending by visitors who arrive by air is equivalent to 1.1% of GDP and generates around 170,000 jobs in the UK.
- Air services also allow UK tourists to enjoy a much wider range of overseas holidays than would otherwise be accessible.
- Increased air services capacity is likely to be needed if the government is to achieve its objective for the tourism industry to grow by a third by 2010.

3.1 The importance of tourism[12]

Tourism makes a major contribution to the UK economy. In 2005 the sector directly generated an estimated £46.8 billion of output, equivalent to 3.9% of GDP, according to OEF/World Travel & Tourism Council (WTTC) estimates. And this activity was responsible for 1.08 million jobs – 3.5% of total employment[13]. However, this is just the direct impact of travel and tourism in the UK. These 1 million+ workers – which covers those working at airports, in hotels and restaurants etc – do not reflect the full contribution of travel and tourism to the UK economy. The firms directly involved in providing travel and tourism goods and services spend money in their own supply chains that support more jobs in other industries. This spending filters through the economy into the sectors that provide the travel and tourism industry with the food provided in restaurants, the fuel required to move people around, and a range of business services. Allowing for the spending of the travel and tourism industry on bought-in goods and services, the total number of jobs directly and indirectly supported amounts to 2.9 million (9.3% of total employment).

Another way of looking at the significance of tourism to the UK economy is to look at the number of people employed in tourism-related industries. Compared with the OEF/WTTC estimates, the ONS definition of tourism-related employment includes some people whose jobs are supported by non-tourist spending (for example, by local people spending in bars and restaurants), but leaves out some of those in the supply chain supporting tourism activities. On this basis, tourism-related industries provided jobs for around 2.6 million people in 2004 (Table 3.1).

[12] Tourism is defined here in accordance with international conventions, based on visitors travelling outside their normal environment. As such, it includes visits for business purposes, as well as leisure visits and trips to see friends and family.

[13] These figures are derived from the most recent WTTC Tourism Satellite Accounts, for 2006 – there have also been other studies of employment generated by tourism in the UK that have produced different, although broadly comparable, estimates.

Table 3.1: Employment in Tourism-related Industries in the UK, 2004 (thousands)	
Hotels and other tourist accommodation	360
Restaurants	600
Bars	555
Travel agencies/tour operators/other transport	196
Libraries/museums and other cultural	88
Sport and other recreation activities	415
Total employees in tourism-related industries	**2,213**
Self-employment (estimated)	383
Total	**2,596**

Sources: ABI; OEF estimate for self-employment

3.2 Visits to the UK by air

Unsurprisingly, the aviation industry plays a major role in supporting the tourism industry. During 2005, there were 30 million visits to the UK by overseas residents. These visitors spent £14.3 billion. To put this in context, during 2004 (the latest year for which figures are available) there were 126.6 million trips/visits by UK residents within the UK, with a total spend of £24 billion. Although the numbers of trips made by UK visitors is over four times greater than their overseas counterparts, the longer duration and higher spending by overseas visitors means that these travellers account for over a third of all spending on trips involving a stay away from home (and an estimated 21% of total tourism spending in the UK if spending by day visitors is taken onto account as well).

Table 3.2: Overseas Visitors to the UK, 2005				
	Air	**Sea**	**Tunnel**	**All modes**
Visits				
Millions	22.0	4.7	3.3	30.0
%of total	73.5	15.7	10.9	100.0
Spending				
£ billion	12.3	1.1	0.9	14.3
% of total	86.1	7.6	6.3	100.0
£ per visit	557.0	231.0	277.0	476.0

Source: International Passenger Survey, ONS

Of the 30 million visitors to the UK in 2005, 73.5% arrived by air. And aviation has played a major role in boosting the UK's tourist sector in recent years, bringing in more passengers than ever. Since 1999, the number of overseas visitors to the UK has risen 18%, while the numbers arriving by air have jumped by over 27%. The growth of air travel in terms of routes, and its relatively low cost, allows people to travel large distances to visit the UK. Significantly, those travelling the furthest tend to be those who spend most; the bigger spenders from just three places – namely the US, Japan and Australia - provided 23% of all UK visitor spending in 2005, travelling into the UK almost exclusively by air, with the exception of a few travellers that visited other places in Europe first.

The vast majority of the visitors arriving by air do so through one of the UK's three London airports. As Table 3.3 shows, 62.2% of arrivals are at Heathrow, Gatwick or Stansted. Many of these arrivals stay in the South of England, with 78% visiting London. However, a sizeable proportion of overseas visitors also make their way to other regions and, when they get there, they spend significant sums.

Table 3.3: Overseas Visitors by Air, Arrival Airport, 2004

	Numbers (million)	% of total
Heathrow	8.93	44.7
Gatwick	2.20	11.0
Manchester	1.22	6.1
Stansted	3.30	16.5
Other England	3.55	17.8
Scotland	0.64	3.2
Wales	0.16	0.8
Total	**20.00**	**100.0**

Source: Travel Trends 2004, ONS

While the relatively limited range of international flights to regional airports means that most international visitors originally arrive at a London airport, the aviation industry nevertheless facilitates tourism throughout the UK - 2.5 million visitors to Scotland, 1.0 million to Wales, 4.1 million to the South East and 2.3 million to the North West, for example. And passengers visiting the regions who arrived by air typically account for 80-90% of all foreign tourism spending (Table 3.4). This reinforces the conclusion that air travel is bringing in relatively high-value tourists, who tend to give more of a boost to the local economy than other tourists.

Table 3.4: Overseas Tourism and Spending by Region in 2005

	Total visits (000s)	**% arriving in UK by air**	**Spend** (£mn)	**Spend** (% of UK total)	**% of spending contributed by air passengers**
North East	583	74	202	1.4	90
North West	2,317	78	877	6.2	90
Yorkshire and The Humber	1,130	73	387	2.7	87
East Midlands	1,101	76	377	2.6	87
West Midlands	1,718	72	556	3.9	91
East of England	2,157	73	699	4.9	82
London	13,835	79	6,863	48.1	88
South East	4,129	69	1,462	10.3	82
South West	2,091	67	831	5.8	79
Wales	959	62	305	2.1	77
Scotland	2,458	88	1,248	8.8	92
Northern Ireland	310		131	0.9	
Other/day trips			321	2.3	
Total UK	**29,972**	**73**	**14,259**	**100.0**	**84**

Source: International Passenger Survey, ONS

Notes: Sum of visits is greater than UK total, reflecting visits to more than one region.

3.3 Visits from the UK by air

Aviation has opened up the UK economy to international tourists, but the flow of UK citizens in the other direction is even more substantial. In the 2005 there were 66.5 million visits abroad by UK residents. This means the number of trips abroad is some 61% higher than in 1995, as cheaper airfares have made a much wider range of travel destinations available to the UK consumer, enhancing choice and consumer satisfaction. Of the visits taken in 2005, 44 million (66%) were holidays (the remainder being business and visits to relatives), of which 36 million were by air. Around 82% of overseas holidays involve air travel.

As growth in UK air travel abroad has outstripped that in overseas visitors' air travel to the UK, the gap between their spending has also grown – tourism spending abroad is now more than twice foreign spending in the UK, with the difference equivalent to around 1.5% of GDP (Table 3.5). Running a current account deficit is often portrayed as a sign of economic weakness or imbalance – or indeed a lack of competitiveness. But in this case, it is hard to argue that the UK tourism industry is at a disadvantage as a result of the availability of air services for UK tourists to travel overseas: according to the WTTC, the UK has the sixth largest tourism industry in the world. It seems more likely that the rise in the deficit mirrors the growth in choices available to UK consumers. In the past, a lack of options acted to constrain tourism. So, rather than a structural problem, the increasing number of UK outbound tourists is a reflection of the combination of improving living standards, the reduction in the cost of aviation travel and the expansion in the number of destinations served.

Table 3.5: UK Tourism and Travel Current Account (£million)		
	1995	**2005**
Exports	11,763	14,259
Imports	15,386	32,188
Balance	-3,623	-17,929
Balance as % of GDP	-0.5	-1.5

Source: International Passenger Survey, ONS

Having experienced these new opportunities, UK residents would be less likely to spend all of the money they now spend on foreign holidays on UK holidays instead if the availability of air services did not provide the opportunity to travel abroad - in many cases people are looking for very different things in taking a foreign holiday from what is available from a UK holiday. The weather is more reliable and often the cost of accommodation and eating out is cheaper. If there were less scope to travel abroad by air, the alternative might be to travel abroad some other way or to spend the money on something else which itself might be imported (eg a car or home cinema system), rather than to spend it on a holiday within the UK.

And having grown used to foreign holidays, it is easy to imagine that UK residents would still seek to travel overseas if aviation were constrained. Indeed, the two most popular holiday destinations for UK residents are France and Spain, both of which are accessible by a combination of ferry, road and rail, albeit at greater cost or longer journey times.

The desire of many UK consumers to travel abroad for a holiday reflects a number of factors. Would the likely determination of UK residents to enjoy foreign holidays be mirrored by those currently visiting Britain if air services were not available? These visitors have, literally, the whole world to choose from. If air travel to the UK was not possible, but other parts of the world were unaffected, then the majority of visitors would explore other possibilities. While visitors could still arrive from France (which provides 11% of visits to the UK), French people prefer in any case to holiday in their own country. The same is true of Italians. At the margin, restricting air travel to the UK would reinforce that trend. For long-haul travellers, who tend to spend the most money, the impact would likely be far more severe.

Table 3.6: Pattern of Visits to/from the UK in 2005		
	Outbound	**Inbound**
Short-haul	79%	72%
Long-haul	21%	28%

Source: International Passenger Survey, ONS

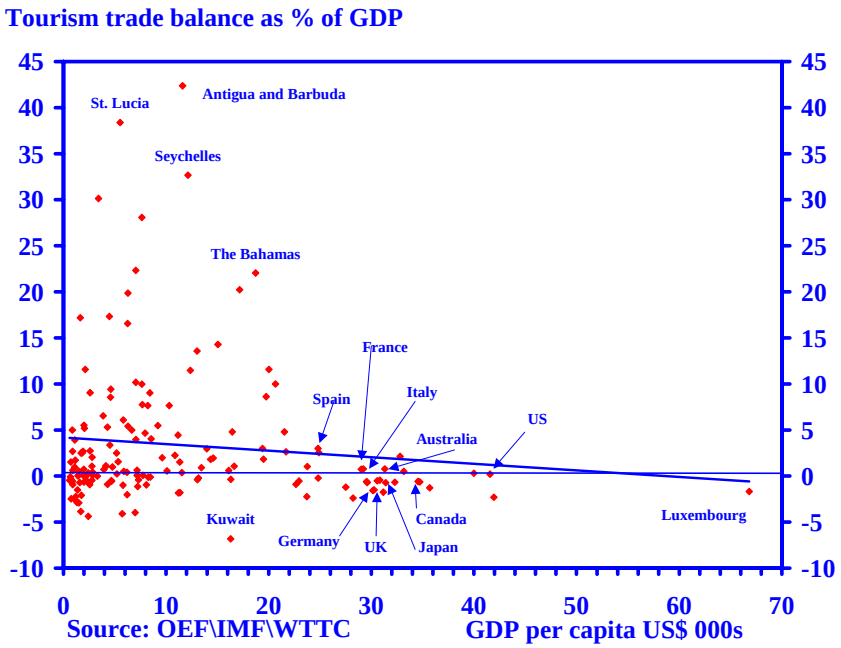
As Table 3.6 shows, UK incoming tourism is more dependent on long-haul trade than outgoing tourism. And if travellers from the UK did not have the option of long distance travel, they would have the choice of still travelling abroad by sea or rail. It is less clear that incoming long-haul visitors would still make the trip to the UK as it would involve a long flight presumably followed by a trip on the Eurostar or by ferry. Again, capacity constraints would probably be an issue.

For overseas tourists the concept of "abroad" is a vast one, with the UK just one more choice among many - they would find other places to visit if air travel were not possible. It is therefore more plausible that maintaining a vibrant UK tourism sector depends on good air services bringing visitors into the UK than hoping that reductions in air services would increase demand for UK tourism from domestic residents.

The difference between the amount UK residents spend abroad and the value of the spending on travel and tourism in the UK is itself the outcome of the choices made by millions of individual travellers. Reducing consumer choice to try to help "cure" the trade deficit would seem to be a strange prescription. Providing the UK is providing a quality product at an attractive price, and providing overseas visitors are not prevented from travelling here by inadequate transport links, then the gap is not a problem. Indeed, it merely reflects the wider benefits of open trade – opening markets up for consumers allows countries to specialise in areas where they have a comparative advantage, be it tourism in Spain, or financial & business services in the UK.

In part, the UK deficit also reflects the nation's relative wealth. Overseas tourism is the sort of service for which demand rises more than one-for-one in response to an increase in peoples' incomes. Indeed, recent CAA estimates suggest demand for overseas air travel rises by 1.5%-1.8% given a 1% rise in income. Chart 3.1 shows that the tourism surplus will tend to diminish as the income per head of population increases. (It is worth noting that it is of course impossible for all countries to have a tourism surplus.)

Chart 3.1: Tourism Trade Balance and GDP Per Head, 2005



Countries like Antigua, St Lucia and the Seychelles dominate the upper-left quadrant of Chart 3.1 – ie less well off countries with big tourism sectors. And in the bottom left corner there are a host of very poor countries that few people wish to visit. The UK is in a similar position to Germany and Japan – all rich countries with strong demand for tourism. But arguably, none of these countries is particularly resource rich (eg in terms of either weather or beaches or both) when it comes to tourism. The home tourist sector cannot satisfy local demand in terms of the characteristics that holidaymakers demand – hence the tourism deficit exists. But other countries, like the US, France and Italy, are

both relatively rich in terms of national income and also in tourism resources. So, not only are they attracting overseas tourists, but it is far more likely that their own residents will holiday at home. Hence they enjoy tourism surpluses.

Ultimately, the value of UK outbound tourism lies in the fact that the chance to travel overseas enhances peoples' lives. But, there are several other benefits that arise from UK tourism overseas. According to calculations made by PwC for the Federation of Tour Operators, each UK tourist travelling abroad contributes £50 in tax to the UK Exchequer. This includes the VAT paid on the holiday/flight, the tax on the air ticket and the income tax and national insurance contributions of the person selling the ticket. And of course not all the travel and tourism spending on a foreign holiday takes place abroad – there is also spending at the airport in the UK, maybe an overnight stay at a hotel in the UK near to the airport, travel to the airport, and so on.

The spending of UK holidaymakers also supports activity abroad. Although the spending of UK tourists is not broken down by mode of travel, the total contribution to foreign economies in 2004 was £32.2 billion. To put this figure into context, this represents 4.2% of total consumer spending in the UK domestic economy in the same year. And it is reasonable to assume, given the higher propensity to spend seen in the UK visitor numbers on the part of air travellers, that over 80% (£25.8 billion) of this spending is directly attributable to UK holidaymakers using air. Most of the spending by British visitors is in the US (11.4%) and the rest of Europe (63.0%). But given the small economic size of some destinations, and their dependence on tourism, the boost given by UK spending is very significant in areas like the Caribbean. In 2005, total spending by UK visitors (for all purposes) in Barbados was £132 million, equivalent to 7.6% of its GDP.

Air services are vital for the majority of more distant destinations visited by UK tourists, which are typically poor countries heavily dependent on tourism. Closer countries in western Europe that would still be accessible without air services, albeit at greater cost or inconvenience, are typically much richer countries with less dependence on tourism.

3.4 Tourism in the future

Tourism also brings more intangible benefits. As Tessa Jowell, Secretary of State for Culture, Media and Sport said in 2004: *"There is a close relationship between the successful development of tourism and the strengthening of the cultural assets of the country – our heritage, the vibrancy of our communities, the natural beauty of our landscapes, our attractive public spaces, and the openness and friendliness of our people.*[14]*"* Just as this applies to the UK tourism industry, it is also true for UK visitors abroad, who will learn and have their horizons broadened by exposure to other cultures. Visitors from the UK are travelling further afield than ever, and are more likely to combine their holidays with their hobbies – observing nature, walking or visiting sites of historic interest. So, tourism is playing a positive role in cultural exchange and education.

Although it is likely that virtually all tourism "broadens the mind", there has been a shift towards more sustainable tourism in recent years with greater emphasis on leaving a positive mark on local communities. The Association of British Travel Agents (ABTA) is a founding member of The Travel Foundation, which aims to ensure that travellers and the industry take steps to preserve the environments of the destinations they visit. At its best, this entails helping protect local culture and tradition, creating new excursions to support the local economy, helping suppliers produce local fresh food for the tourism industry, supporting local crafts and protecting the environment and wildlife. However,

[14] Introduction to 'Tomorrow's Tourism Today', DCMS 2004.

so-called “eco-tourism” is still a fairly small market at the moment, albeit one that is growing rapidly.

Looking to the future, the tourism industry will be key to the success of the hosting of the Olympic Games by London in 2012. “Tomorrow’s Tourism Today” was published by the DCMS in July 2004 to build on the Strategy document “Tomorrow’s Tourism” that was published in 1999. The Introduction by the Secretary of State suggested that *“if we are to keep pace with world travel forecasts, we must be aiming for an industry turnover of £100 billion as a minimum by 2010.”*

To meet this demanding aim, and then to hold a successful Olympic Games in 2012, the appropriate travel infrastructure will be a sine qua non. Tourism depends on transport for its fulfilment, and transport in turn depends on tourists to sustain its product.

The aviation industry is therefore key to the government’s tourism strategy and the aim of raising the industry’s turnover by a third by the end of the decade. Given that the 73% of overseas tourists arriving by air account for nearly a third of all tourism spending on visits involving an overnight stay away from home whether by overseas or domestic residents, this target will be very hard to meet unless there is the extra capacity in the aviation industry to facilitate a significant increase from the 22 million visitors a year that currently arrive by air.

4 Aviation supports trade

Key points

- International trade promotes growth and raises living standards by allowing countries to specialise in producing the goods and services for which they have a comparative advantage.
- The aviation industry plays a central role in fostering UK trade. 55% by value of the UK's exports of manufactured goods to countries outside the EU are transported by air.
- Many key imports depend on air services too. More than 60% of imports of machinery, mechanical appliances and electric equipment from outside the EU are carried by air.
- Passenger services also play an important role in supporting trade - nearly two-thirds of companies report that passenger services are either vital or very important for sales and marketing.
- Air services are particularly important for the UK's trade with the fastest-growing regions of the world economy, such as India and China, and over time are likely to become even more important to the UK's ability to compete in the world economy.

4.1 The benefits of trade

International trade is a key driver of global economic growth and rising living standards. It allows countries to specialise in producing the goods and services in which they have a comparative advantage and to exchange them for goods and services that are wanted by domestic consumers or producers but can be produced relatively more efficiently elsewhere. As a result, the overall value of goods and services available in an economy can be increased. The increasing globalisation of the world economy has allowed increasing specialisation to occur, with world trade persistently growing more rapidly than global GDP. In the period 1994-2004, there was only one year (2001) when world trade rose more slowly than GDP, and over the decade as a whole world trade doubled, more than twice the rate of increase in world GDP.

The growth of trade has been a key factor behind UK economic growth too – over the past 30 years UK exports have trebled in real terms and imports have quadrupled, compared with a doubling of the overall economy. As a result, the UK economy has become increasingly internationalised, with trade accounting for more than a quarter of GDP by 2004. The UK was the world's eighth biggest merchandise trade exporter in 2004, with a 3.8% share, and the second biggest services exporter, with an 8.1% share. Without the ability to sell goods and services abroad and to import other goods and services in return, the range of items available to UK consumers would be poorer and prices would be higher.

4.2 Air freight

Although air freight represents less than 1% of total UK visible trade in terms of tonnage, 30% of exports by value are transported by air. And 55% of exports of manufactures to destinations outside the EU are transported by air.

Exports by air amounted to an estimated £62.7 billion in 2005, 10.4% higher than in 2000 (Table 4.1)[15]. Of these exports, nearly three-quarters were to countries outside the EU, including nearly a fifth to the fast-growing markets in the Far East. Imports by air are comparable in size, and even more heavily focused on non-EU countries[16]. But with the value of airfreighted imports falling by 9% between 2000 and 2005, exports by air exceeded imports by air in 2005, the reverse of the position in 2000.

Table 4.1: Value of Trade Carried by Air Freight, 2000 and 2005

	2000		2005		% change
	£ billion	% of total UK airfreight	£ billion	% of total UK airfreight	2000-05
EXPORTS					
Total EU*	15.4	27.2	17.0	27.2	10.4
Total non-EU countries*	41.4	72.8	45.7	72.8	10.4
of which:					
Africa	1.4	2.5	1.8	2.9	28.6
Middle East	4.0	7.0	7.6	12.1	90.0
Far East	10.6	18.7	11.6	18.5	9.4
Latin America and Caribbean	1.1	1.9	1.1	1.8	0.0
Total all countries	**56.8**	**100.0**	**62.7**	**100.0**	**10.4**
IMPORTS					
Total EU*	7.5	11.4	9.7	16.3	30.2
Total non-EU countries*	58.1	88.6	49.9	83.7	-14.1
of which:					
Africa	3.4	5.2	4.2	7.0	23.5
Middle East	2.0	3.1	2.3	3.9	15.0
Far East	18.3	27.9	18.1	30.4	-1.1
Latin America and Caribbean	2.2	3.4	1.6	2.7	-27.3
Total all countries	**65.5**	**100.0**	**59.6**	**100.0**	**-9.0**

* Note: No adjustment has been made for the 2004 EU enlargement

Source: Business & Trade Statistics and OEF calculations

The volume of exports transported by air has risen by almost 50% over the last decade (Table 4.2). Heathrow continues to account for more than half of air freight handled by UK airports, even though it handles no dedicated freight-only flights – all the freight that passes through Heathrow is carried in the holds of passenger flights. This use of bellyhold for carrying freight is vital for the efficiency of general air freight operations, underlining the interdependence of passenger and freight services.

[15] Because the statistics stopped being collected when the customs-free Single Market was completed in the EU, we have made the assumption that the proportion of EU exports transported by air in the year 2005 was the same (14.5%) as in 2000 (the last year for which data were collected).

[16] Again we assumed an unchanged proportion (6.8%) of EU imports air freighted from 2000.

At the same time there has been a near-doubling in the share of Stansted in freight handling over the past ten years and a near-trebling in the share of East Midlands airport. These airports have not only developed significant general freight capabilities, but are also the two UK airports used as major hubs by the express freight industry, which depends on dedicated flights to provide door-to-door next day or time-dependent shipments.

Table 4.2: Air Freight Handled by UK Airports

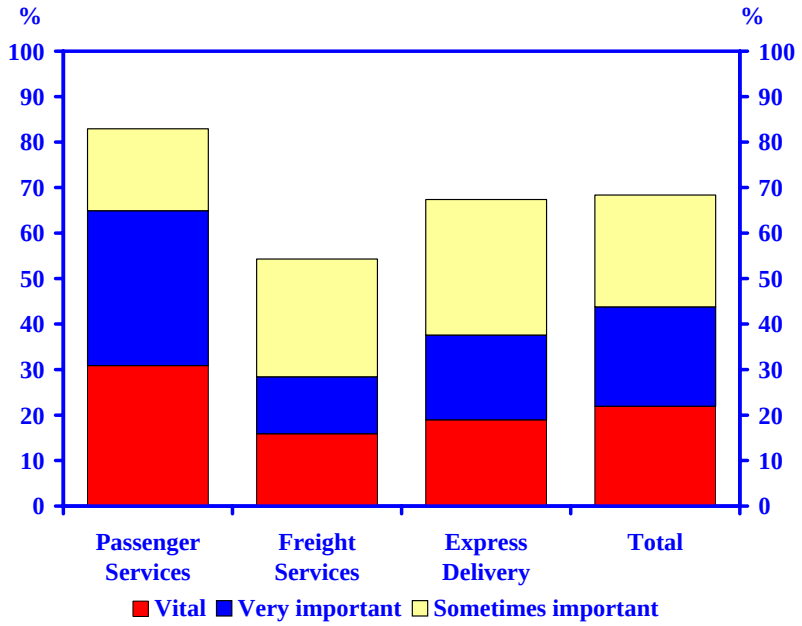
	1994		2004		% change
	mn tonnes	% UK total	mn tonnes	% UK total	1994-2004
Heathrow	962.7	60.6	1,325.2	55.9	37.6
Gatwick	222.3	14.0	218.2	9.2	-1.8
Stansted	83.4	5.2	225.8	9.5	170.7
Total London airports		**79.8**		**74.6**	
East Midlands	55.1	3.5	253.1	10.7	359.0
Manchester	91.1	5.7	149.2	6.3	63.8
Total UK airports	**1588.8**	**100**	**2371.0**	**100**	**49.2**

Source: CAA Statistics: 2004 Annual, Table 13.2

4.3 The importance of aviation for exports

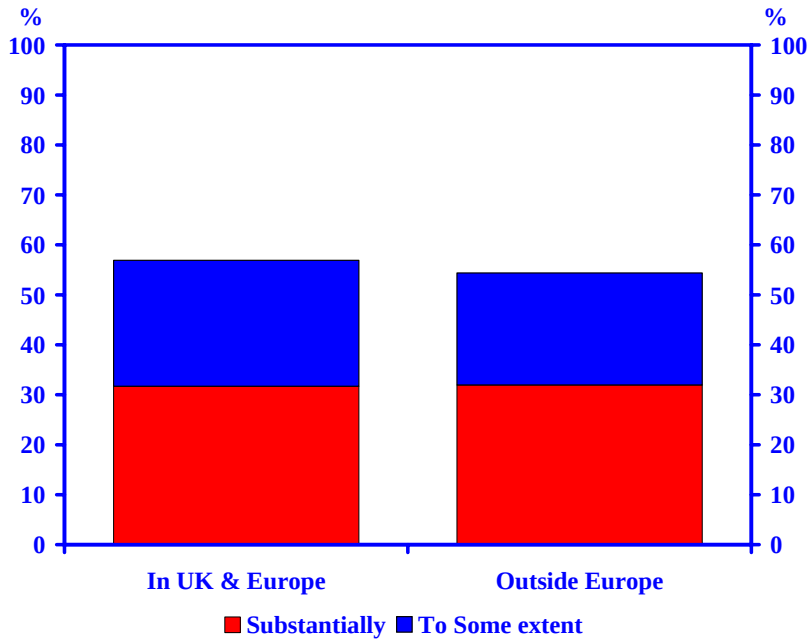
The importance of air services for trade is much wider than just for freighting the relevant goods, of course. Nearly two-thirds of companies (65%) in our survey, for example, report that passenger services are either vital or very important for sales and marketing (Chart 4.1), and a very similar proportion (64%) report that passenger services are either vital or very important for servicing or meeting customers. Looking at it another way, more than half of companies confirm that the availability of frequent air services to/from the UK means that they serve a wider market (Chart 4.2). Interestingly, it is not just for more distant markets outside the EU that this applies – as many companies report an impact on serving wider markets within the UK and the rest of the Europe as report an impact on serving wider markets outside Europe.

Chart 4.1: Importance of air services for sales and marketing



Source: OEF survey of UK companies (2006), Q7

Chart 4.2: Availability of frequent air services to/from UK on ability to serve a bigger market

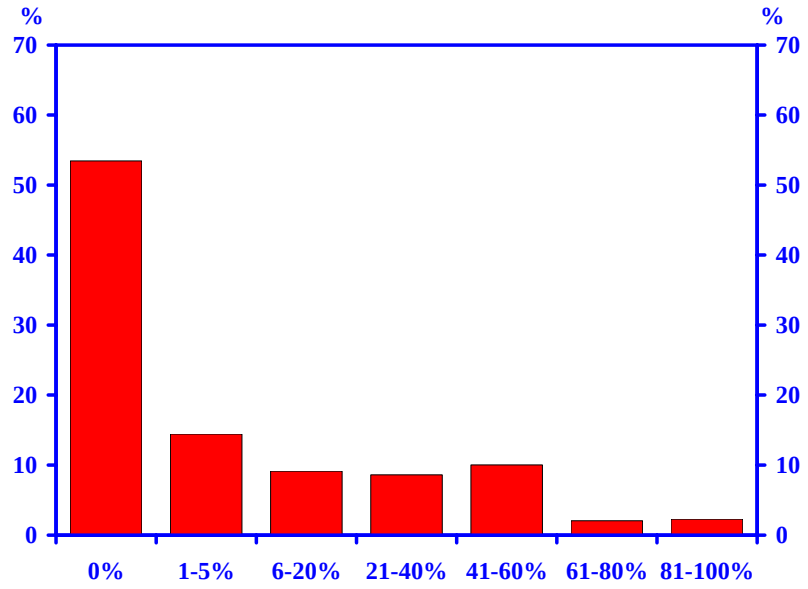


Source: OEF survey of UK companies (2006), Q11

Our survey suggests that on average companies consider that around 13% of their total sales (domestic and export) depend on air services. Air services are not considered significant for sales for around half of respondents. But there are a wide range of

companies who are very dependent on air services, with 5% reporting that 60% or more of their sales depend on air services and a further 10% reporting that 40% or more of their sales do so (Chart 4.3).

Chart 4.3: What proportion of your company's sales do you think depend on air services?



Source: OEF survey of UK companies (2006), Q8

Overall, the impact of air services on exports is substantial. But even these aggregate figures may understate the importance of aviation for supporting the future export performance the UK economy needs in an increasingly competitive global economy:

- Aviation is especially important for transporting UK exports to the fast-growing markets of the Far East, including China and India. These markets accounted for 18.5% of all air freighted exports in 2005, much the same as in 2000 (Table 4.2). But 69% of UK exports to India, for example, went by air in 2005, 45% of exports to the US were carried by air and 35% of exports to China (Table 4.3). While it might be expected that exporters to more distant markets would be more likely to use air, these proportions underline the importance of air freight if the UK is to retain and even grow its market share of exports to the fastest-growing economies in the world.

Table 4.3: UK Exports by Air to Selected Countries

(2005, £ billion)

	By Air	Total by all modes	% by air
China	1.0	2.8	34.8
India	1.9	2.8	69.0
USA	13.9	30.7	45.4

Sources: Business and Trade Statistics; UK Trade Info

- Not surprisingly, air transport is disproportionately used for high value/low weight traded goods such as gemstones, pharmaceuticals, precision engineering products and technology-intensive products, as well as for perishable goods, such as fresh fruit, bulbs and flowers. Table 4.10 shows the ten most important sectors (out of the 21 'sections' in the Harmonised System) in UK exports to the non-EU transported by air in 2005 - these 'top ten' sectors account for over 80% of all air freighted exports to the non-EU. Machinery, mechanical appliances and electrical equipment accounted for 40% of all exports by air to non-EU countries. Despite the relatively high weight of some of these products, their high value and the need for rapid delivery (eg when production lines are waiting for a spare part) meant that 60% of exports of these products to non-EU countries went by air. For precious stones and metals, over 90% of exports were carried by air. Within some of the categories shown in the table, there will, of course, be sub-sectors which rely more than the average on air freight. Within the chemicals sector, for example, 71.3% of exports of pharmaceuticals to non-EU markets are transported by air, and it is high value-added, low-weight sectors like this that are disproportionately important for the future of UK manufacturing. (See Chapter 6 for a more detailed discussion of the importance of air services for growth sectors.)

Table 4.4: The Ten Most Important Sectors in UK Air Freighted Exports to Non-EU countries, 2005

	£ billion	As % of all air freighted exports to non-EU	As % of all sector's exports to non-EU
Machinery, mechanical appliances and electrical equipment	18.3	40.0%	60.4%
Chemicals	5.9	13.0%	49.3%
Precious stones and metals	5.7	12.5%	92.7%
Optical, photographic, surgical instruments	3.7	8.2%	81.9%
Art, antiques	2.1	4.7%	74.8%
Base metals	0.7	1.5%	13.6%
Textiles	0.6	1.4%	31.4%
Pulp and paper	0.6	1.2%	27.3%
Vehicles, aircraft	0.5	1.1%	4.4%
Plastics, rubber	0.4	0.8%	15.4%
Total UK exports to non-EU transported by air	**45.7**	**100.0%**	

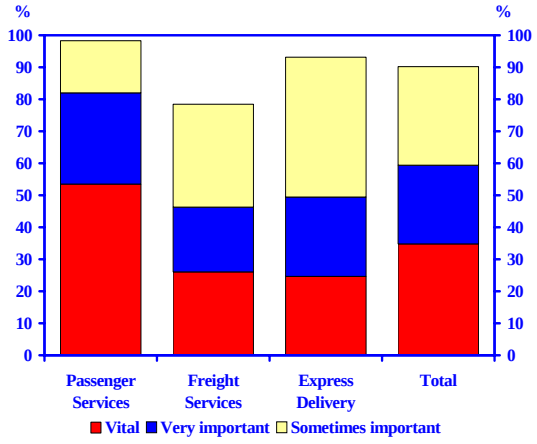
An increasing proportion of UK companies are reliant on very rapid delivery of goods to their customers or to production facilities abroad and so depend on deliveries using the air services offered by express delivery companies. The express industry is able to offer delivery from UK to countries representing 90% of the world's GDP in 24-48 hours, and research by OEF[17] estimates that it now carries around 5% of overall UK exports of goods by value, equivalent to about £10 billion of goods in 2004. As well as valuing the speed and guaranteed delivery times offered by the express industry, users also value

[17] The Economic Impact of Express Carriers for UK plc, Oxford Economic Forecasting, 2006

the ability to track the location of products en-route. Moreover, express services allow exporters to adopt international best practice in production, which increase companies' flexibility and ability to adapt to changes in demand. For example, many companies use express services to permit 'build-to-order', since time savings on delivery can be used to allow customisation to match particular client requirements. Similarly, express services allow the fast handling of returned goods, either saving on inventory time if they can be resold or protecting firms' reputations by allowing repairs to be made quickly to faulty products.

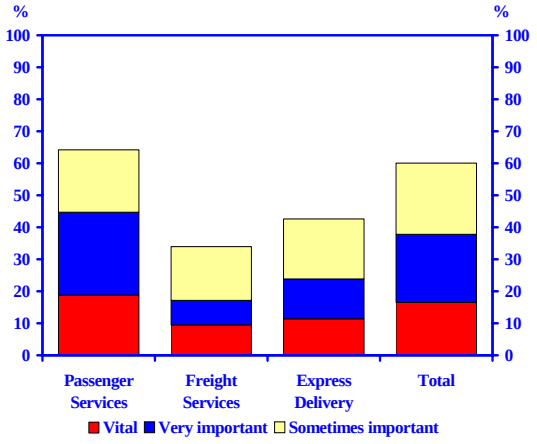
Although manufacturing companies will be the main users of air freight services, it is by no means just manufacturing companies that depend on air services for sales and exports – over 40% of companies in the service sectors report that air passenger services are vital or very important for sales and marketing (Chart 4.5).

Chart 4.4: Importance of air services for sales and marketing – manufacturers



Source: OEF survey of UK companies (2006), Q7

Chart 4.5: Importance of air services for sales and marketing - service companies



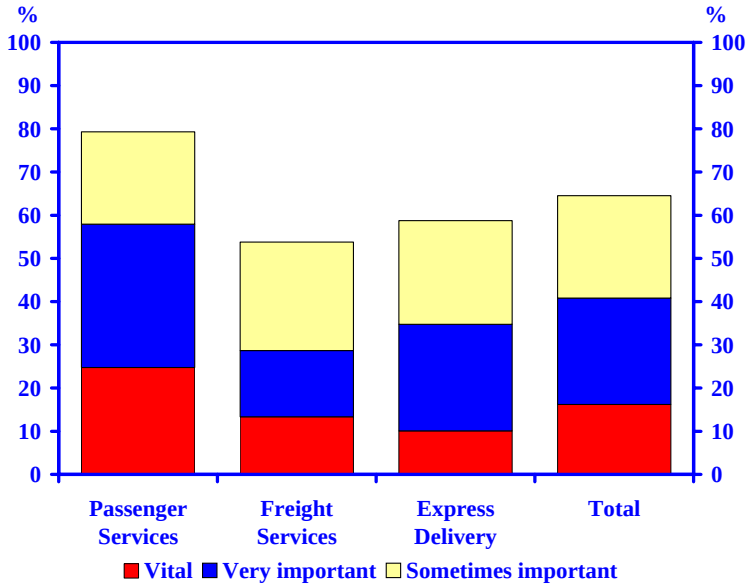
Source: OEF survey of UK companies (2006), Q9

4.4 The importance of aviation for imports

Imports are just as vital a component of UK trade as exports. While exports support jobs, imports provide goods and services that consumers wish to buy, capital equipment for investment, and raw materials and sub-components needed by UK manufacturers. The economic benefits of trade arise from selling to others products that the UK is relatively efficient at producing in exchange for buying products that others can produce relatively more efficiently than the UK, not from one side or other of the process in isolation.

It is not just consumers who benefit from the importing of cheaper products from elsewhere or the availability of a wider range of goods and services. The same applies to producers, who are able to operate more effectively if they can source inputs from a variety of places around the world according to where they are produced most efficiently – nearly 60% of companies in our survey report that air services are either vital or very important for the efficiency of their production and supplier relationships (Chart 4.6).

Chart 4.6: Importance of air services for efficiency of production & supplier relationships



Source: OEF survey of UK companies (2006), Q7

Table 4.5 shows the most important products imported into the UK by air from the outside the EU (corresponding to Table 4.4 for exports). As on the exports side, machinery, mechanical appliances and electrical equipment make up the largest proportion of air freighted imports, highlighting the importance of air freight for production and investment as well as consumption.

Table 4.5: The Ten Most Important Sectors in UK Air Freighted Imports from Non-EU Countries, 2005

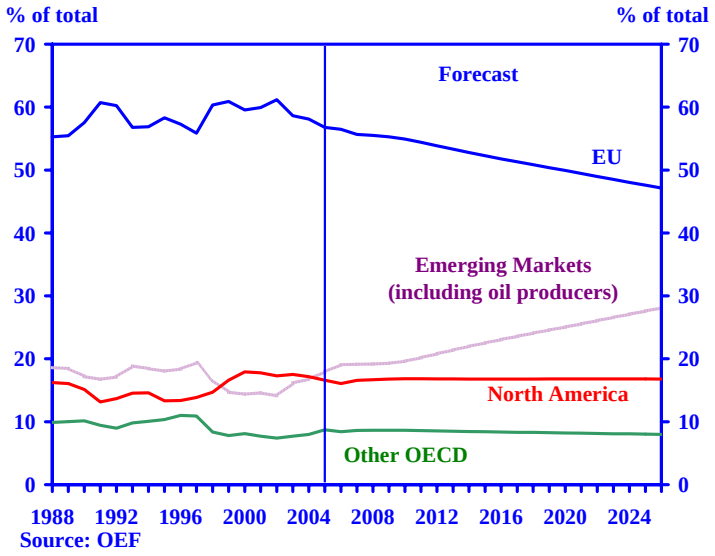
	£bn	As % of all airfreighted imports from non-EU	As % of all imports of sector from non-EU
Machinery, mechanical appliances and electrical equipment	19.5	39.2%	61.6%
Precious stones and metals	7.3	14.8%	95.7%
Chemicals	4.9	9.9%	52.6%
Optical, photographic, surgical instruments	3.8	7.5%	73.6%
Textiles	2.3	4.6%	22.4%
Art, antiques	1.4	2.8%	77.4%
Base metals	0.6	1.3%	11.6%
Miscellaneous manufactured goods	0.6	1.2%	13.0%
Live Animals, Animal Products	0.4	0.8%	22.5%
Vegetable Products	0.4	0.7%	14.0%
Total imports to UK from non-EU transported by air	**49.8**		

Source: Business and Trade Statistics

4.5 The future of UK trade

While the EU is currently the destination for the majority of UK exports of goods, this is set to change. Within twenty years we expect the share of emerging markets within UK goods exports to increase by a half, and the EU's share to fall below 50% (Chart 4.7). Given the much greater use of air services for trade outside Europe, this means that aviation is set to become ever more important for UK trade. If the proportion of exports carried by air from the UK to the main trading blocs around the world remains unchanged, the shifting importance of different markets for UK goods over time would on its own lead us to expect the current 30% of UK goods exports by value carried by air to rise to around 35% by 2025. In fact, the nature of goods traded is likely to change over time too, with a growing proportion of high-tech goods of relatively low weight to value-added which are more likely to be carried by air. So the actual proportion of UK exports by value carried by air could easily grow more rapidly than this. Similarly, air services are likely to become increasingly important for UK trade in services, especially as demand for financial & business services from China expands.

Chart 4.7: UK trade in goods by destination



5 Aviation supports investment

Key points

- Better air transport services encourage more businesses to locate in an area as well as affecting investment decisions by existing companies.
- A quarter of companies report that access to air services is an important factor in influencing where they locate their operations within the UK.
- Nearly one in ten companies report that the absence of good air transport links has affected their organisation's decisions to invest in the UK. Of these, 30% chose not to make the investment in the UK.
- In addition, 10% of companies say they would relocate some operations from the UK if next day international express delivery services – which rely on night flights from selected UK airports – ceased to be available.

5.1 Factors affecting where companies invest

Companies' decisions on where to locate investment depend on a wide range of factors. Although air services are only one component in the assessment firms make in choosing where to be based or to locate new investment, a wide range of studies confirm that they are one of the most important considerations.

Table 5.1, for example, summarises the evidence from the well-known Healey & Baker European Cities Monitor[18]. This consistently shows that the most important factors companies consider when deciding where to locate their business are easy access to markets and customers, followed closely by the availability of qualified staff. However, transport links with other cities and internationally are next in importance (closely followed by the quality of telecommunications), with 52% of companies reporting in 2005 that these transport links are an absolutely essential factor to consider when deciding where to locate their business.

[18] European Cities Monitor 2005, published by Cushman and Wakefield Healey and Baker, and based on surveying 501 companies from nine European countries.

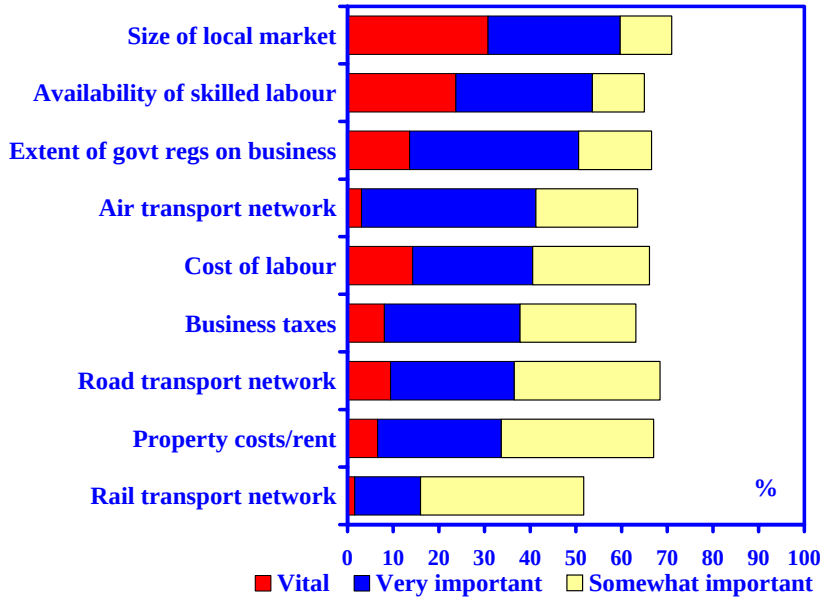
Table 5.1: Essential Factors for Locating a Business				
	% of respondents reporting factor as "absolutely essential"			
	2002	2003	2004	2005
Easy access to markets, customers or clients	57	58	61	60
Availability of qualified staff	59	57	56	57
Transport links with other cities and internationally	**51**	**56**	**50**	**52**
Quality of telecommunications	46	49	47	50
Cost of staff	32	35	39	35
Climate governments create for business through tax and the availability of financial incentives	34	33	36	32
Value for money of office space	30	31	29	31
Availability of office space	27	26	27	30
Ease of travelling around within the city	21	24	25	22
Languages spoken	20	24	28	24
Quality of life for employees	18	15	18	16
Freedom from pollution	12	14	16	13

Source: Healey and Baker European Cities Monitors

Given the importance attached to these factors, it is no surprise that, with London ranked first out of 29 European cities for its "transport links with other cities and internationally" as well as for "easy access to markets, customers and clients", it continues to be rated the best city in which to locate a business today - ahead of Paris, with an ever wider margin relative to Frankfurt, Brussels and Barcelona which together make the top 5 cities in Europe in this survey.

OEF's survey of UK companies shows similar patterns. Companies rate the size of the local market and the availability of skilled labour as the most important factors in determining the country in which they choose to invest (Chart 5.1). But the air transport network is still rated as vital or very important by more than 40% of companies, marginally ahead of the cost of labour and business taxes.

Chart 5.1: Importance of factors in determining the country in which organisation chooses to Invest



Source: OEF survey of UK companies (2006), Q14

The Healey & Baker survey reveals the importance of transport links in general in firms' location decisions, rather than air transport services in particular - although the specific emphasis on international links suggests that air services will often be the key component in companies' minds when responding to the survey. Our own survey reveals more companies regarding the air transport network as vital or very important than either the road or rail networks, although the road transport network is rated more highly if only factors regarded as vital are counted.

Other studies have looked more specifically at what characteristics of transport are important in affecting location decisions. A recent study by a team from Napier University[19] explores how firm characteristics affect the relative importance of transport in their location decisions. Perhaps not surprisingly, they find that the most important factor governing whether a company needs to be near an airport appears to be "the degree to which the company is involved in multinational trading or contacts", and suggest that "air is the most influential transport factor in the location decisions of most overseas-based business investing in the UK". They argue that rather than air transport in itself, related factors such as the "availability and efficiency of routes" and "perceived and actually interchange efficiencies" are more relevant.

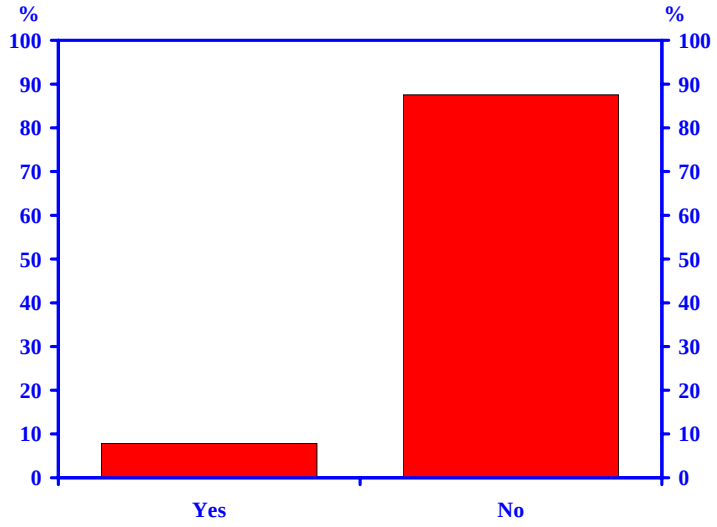
5.2 How much difference do good air transport services make?

Air transport is not just a factor that companies think is important in principle for location decisions. OEF's surveys of business suggest that it has also had a very important impact on actual investment decisions:

[19] Prof. McQuaid, Prof. Smyth and Cooper (2004) "The Importance of Transport in Business' Location Decisions"

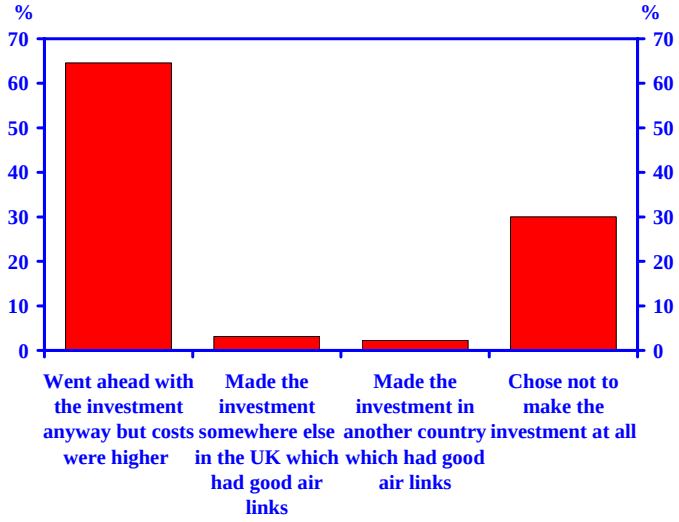
- In the UK, one in 12 companies (8%) report that the absence of good air transport links had affected their own organisation's investment here in the past (Chart 5.2). Of those affected, 30% chose not to make the investment at all, although the majority (65%) went ahead with the investment anyway but faced higher costs (Chart 5.3).

Chart 5.2: Has the absence of good air transport links ever affected your organisations's decisions to invest in the UK?



Source: OEF survey of UK companies (2006), Q15

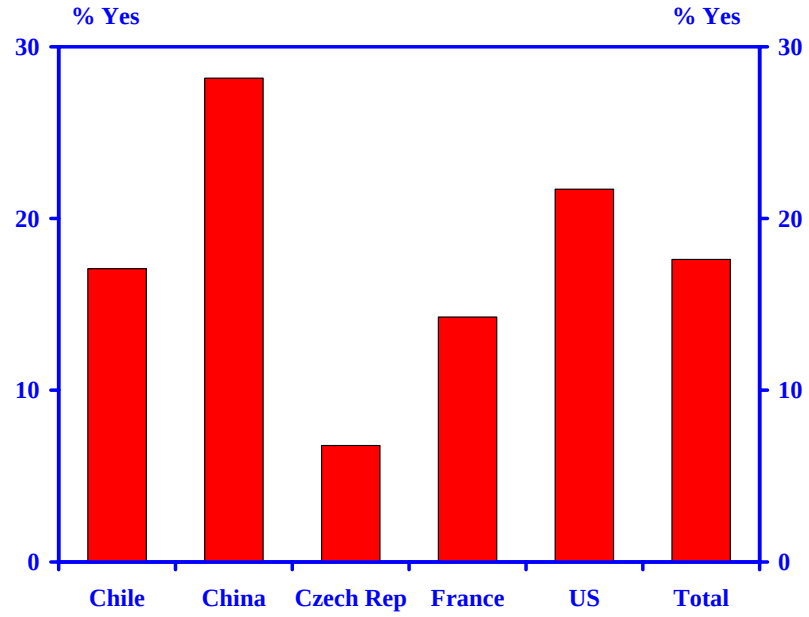
Chart 5.3: Effect of absence of good air transport links in the UK by those affected



Source: OEF survey of UK companies (2006), Q15

- This finding is confirmed by evidence from other countries - a survey OEF conducted in 2005 on behalf of IATA of businesses in Chile, China, the Czech Republic, France and the US[20] found an average of 18% of companies reporting that the absence of good air transport links had affected their own organisation's investment in the past (Chart 5.4).

Chart 5.4: Has the absence of good air transport links ever affected your organisation's investment?



Source: OEF survey of companies (2005)

- In some cases there are specific aspects of air services that are vital to companies - in our 2005 survey covering express services[21], 10% of companies reported they would relocate some operations from the UK if next day international express delivery services – which rely on night flights from selected UK airports – ceased to be available.

We have also found econometric evidence that air transport usage has an effect on the level of business investment. Research carried out last year for EUROCONTROL[22] was based on cross-country panel data covering 24 European countries (all except Luxembourg) for 10 years up to 2003, essentially involved looking for correlations between air transport usage and business investment, once we have controlled for the effects on business investment from its other key drivers. As in most models of business investment, our results showed that business investment is driven in large part by the relationship between the cost of capital and the return on capital. But the innovation in our research was to include air transport usage among the long-run drivers of business investment. The results imply that if air transport usage increases by 10% then business investment will tend to increase by 1.6% in the long run. For Europe as a whole, air transport usage increased by 5.1% a year over the last decade, compared with an increase of around 2% a year in GDP over the same period. Translating the relatively fast growth of air transport usage via our equation, we found that air transport usage

[20] OEF (2005), "Measuring Airline Network Benefits"
[21] The Economic Impact of Express Carriers for UK plc, Oxford Economic Forecasting, 2006.
[22] 'The Economic Catalytic Effects of Air Transport in Europe', Oxford Economic Forecasting, 2005

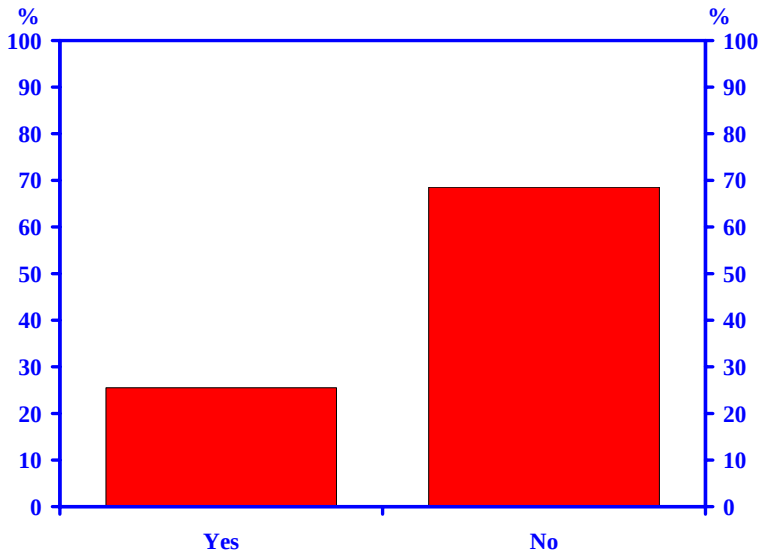
contributed just under one-third of the growth in European business investment over the last decade. Average annual growth in business investment was 0.6% points higher over the last decade than it would have been had air transport usage grown no faster than GDP.

A recently completed study by OEF for IATA[23] takes the analysis a step further by considering not just air transport usage but the contribution of aviation to the connectivity of companies. As explained in Chapter 7, this was done by constructing a measure of 'connectivity' for major airports across the EU based on the number of flights from a given airport weighted by the importance of each of the destinations served. The results of this research imply that a 10% increase in connectivity (relative to GDP) is associated with a 3.5% increase in the level of fixed investment in the long run.

5.3 The impact of air services on location within the UK

It is not just international location and investment decisions that are influenced by air transport. Access to air services also influences companies' decisions on where to invest within the UK. Indeed, this effect appears to be of even greater importance than the impact on the country in which firms choose to locate: more than one in four companies (26%) report that access to air services is an important factor in influencing where the company locates operations within the UK (Chart 5.5).

Chart 5.5: Is access to air services an important factor in influencing where your company locates its operations in the UK?



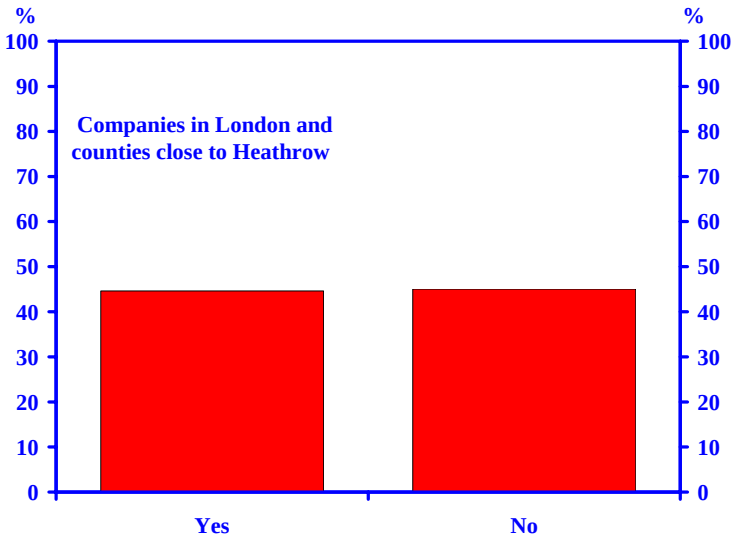
Source: OEF survey of UK companies (2006), Q16

Even more strikingly, for companies in London and counties close to Heathrow[24] almost half (45%) of companies report that access to air services is an important factor in influencing where their UK operations are located in the UK (Chart 5.6).

[23] 'Airline Network Benefits: measuring the additional benefits generated by airline networks for economic development', IATA Jan 2006

[24] We have included Berkshire, Buckinghamshire, Middlesex and Surrey in this category.

Chart 5.6: Is access to air services an important factor in influencing where your company locates its operations in the UK?



Source: OEF survey of UK companies (2006), Q16

Case studies

It is clear from a number of the interviews we carried out with companies and RDAs that the availability of air services or the lack of them can have a significant effect on what economic activity takes place in the UK and where it is located.

A **medical equipment supplier** based mainly at Inverness believes passenger services from the local airport are vital. They are very worried that Inverness could see a further deterioration in London air links, which could leave the site vulnerable.

The defence and electronics firm **Thales** regards air services as critical to the UK marketing effort in winning both defence and civil orders. If UK air services could not meet their needs then the business would be transferred from the UK back to France or other subsidiaries.

Foster Wheeler Energy Ltd is the UK arm of a US company which is now their prime business. Heathrow is a major factor in this development. Over 90% of the business is done overseas with the bulk outside of Europe. If UK air services were to deteriorate then much of this business could be lost.

The Reading office of **Ernst & Young** finds that many staff travel overseas for their work and over 50% of turnover involves overseas clients or work overseas for UK clients. This work could not be done without the varied services available from London airports, especially Heathrow.

In the **East Midlands**, there is evidence that the express freight role of NEMA does help attract key businesses - for example, two of the world's largest freight integrators have large facilities/investments based at the airport. For foreign-owned, and internationally competitive companies, EMDA would expect air access to rank fairly highly in influencing their investment location decisions, although they suspect that it is less important than labour supply/skills issues, and potentially the ease of route to market within the UK (surface transport access). The OEF Express Freight survey*, although based on a small sample, shows that around 10% of firms would relocate from the East Midlands region, and potentially from the UK, if international next day delivery services were no longer available. EMDA expects this figure to grow as the region's economy moves increasingly towards higher-value, higher-skill manufacturing and service sectors.

* The Importance of the Express Delivery Industry for the East Midlands Economy', OEF January 2006.

6 How aviation supports growth sectors

Key points

- The government recognises that building a strong, modern knowledge economy is the key to meeting the challenges of globalisation.
- Many of the growth sectors on which the future of the UK economy depends are particularly dependent on air services for competing effectively in the global economy.
- London's successful cluster of international financial services is a key example of a knowledge-based sector that is heavily reliant on aviation. But high-tech sectors within manufacturing also report a much higher proportion of sales are dependent on air services than other manufacturers.
- The UK economy is therefore set to become increasingly dependent on aviation as the structure of the economy evolves.

6.1 Growth sectors

A key theme of government industrial policy is that growth depends on building the so-called 'knowledge economy'. The 1998 DTI White Paper on Competitiveness defined this as sectors in which "the generation and exploitation of knowledge has come to play the dominant role in wealth creation". "Creating Wealth from Knowledge", the DTI's 5 year programme launched in November 2005, reiterated the theme: "We know from experience that the best way – indeed the only effective way – to respond to globalisation is to build a strong, modern knowledge economy."

The UK economy grew on average by 2.8% a year between 1995 and 2005. Within this strong performance, sectors which grew especially rapidly include pharmaceuticals (average growth 4.9% over the last decade); banking and finance (5.1% a year); communication services (8.3% a year); computer services (10.9%); and other business activities such as consultancy (5.9%). If the DTI's stress on the 'knowledge economy' is correct, these sectors – possibly among others – will be the main drivers of UK economic growth over the next ten years, and this is indeed what is implied by OEF's international industry forecasts. It will be crucial that the economic infrastructure is in place to allow these sectors to flourish.

Within manufacturing, 'knowledge-intensive' industries produce high value/low weight products where air freight is important. In addition 'just-in-time' inventory management has become the rule in these industries and this cannot be managed without air freight services to ensure rapid and reliable deliveries of components.

However, four of the five fastest-growing sectors in the last decade have been in the services sector. For these sectors, it is business travel rather than freight which is the critical element of the air transport infrastructure. And, of course, business travel also plays a key role in the success of manufacturing sectors (for example, enabling their staff to attend meetings with clients) and for R&D-intensive growth sectors such as pharmaceuticals where employees, for example, need to keep in touch with latest research internationally by attending professional research seminars.

6.2 Growth sectors and aviation

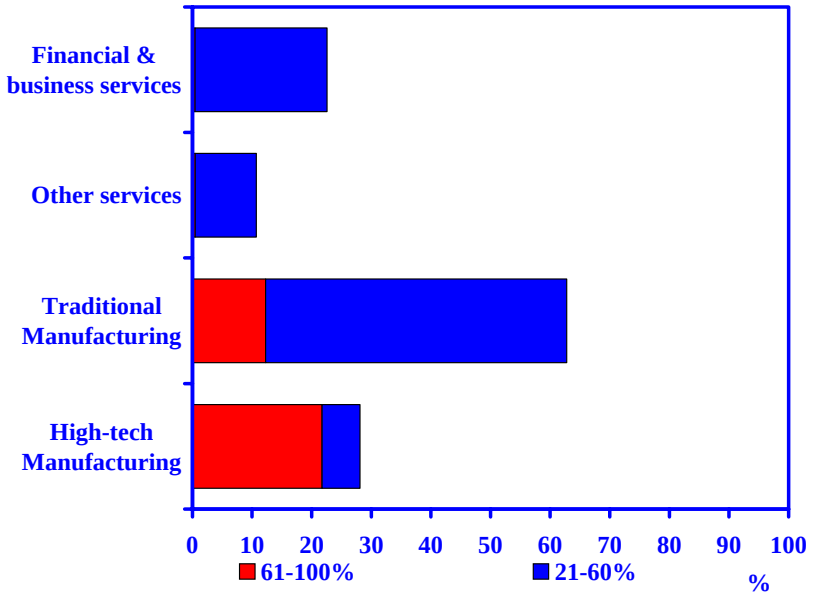
The importance of air services to growth sectors is reflected in the substantial amounts they spend on passenger, freight and express services. As in our 1999 report, we have ranked sectors of the UK economy both by their growth over the past ten years and by how much they spend on aviation (see Annex B for detailed tables):

- Looking at how much sectors spend on air transport services as a share of their total spending on transport services reveals that several fast-growing services sectors - communication; banking; computer activities; R&D; other business activities - are intensive users of aviation within their transport budgets. The correlation between the rankings for growth and for aviation use is 0.36, which is significant at the 5% level, and is very similar to the equivalent result in our previous study.
- As in our previous study, we have also looked at air transport usage in terms of each sector's spending on air transport services per employee. In this case, however, the relationship with sectors that have seen the most rapid growth over the past ten years is rather less clear than before, with a correlation coefficient of 0.17 compared with 0.35 in 1999.

The importance of air services to companies in sectors of the economy that are likely to be critical for the future growth on the UK economy is also highlighted by results from our latest survey of UK companies. Not surprisingly, a significant proportion of companies do not regard any of their sales as depending on air services - for example, because they serve only domestic markets. But for some sectors air services are vital:

- 23% of financial & business services companies regard more than 20% of sales as depending on air services, compared with 11% of other private services companies (Chart 6.1).

Chart 6.1: What proportion of your company's sales do you think depend on air services?



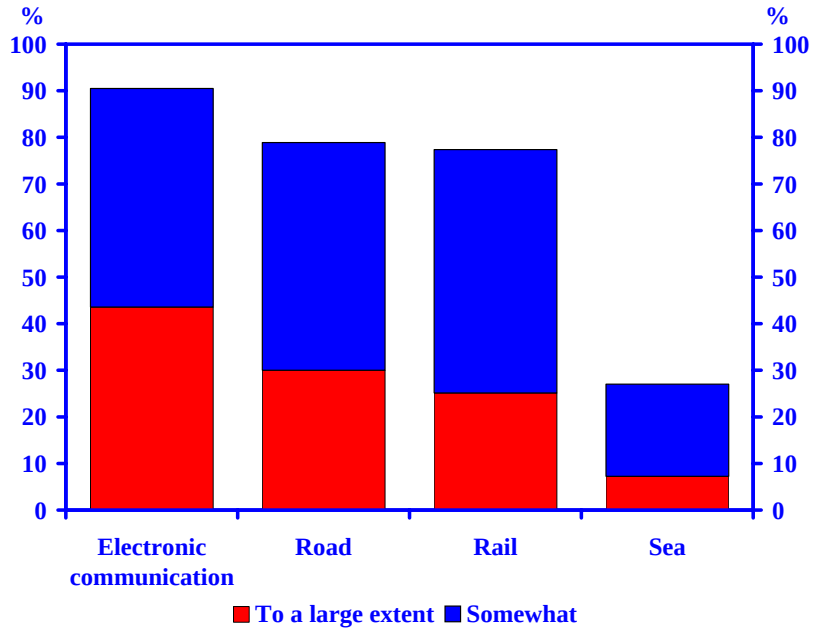
Source: OEF survey of UK companies (2006), Q8

- 22% of high-tech manufacturing companies report that 60% or more of their sales depend on air services, compared with 12% for other manufacturers.

It has been suggested that, while air services may have been an important factor in the success of growth sectors in the past, new technologies mean that air services will be less important to future growth. Firms are expected, for example, to make increasingly sophisticated use of electronic communication, video-conferencing, and other advanced technologies to reduce the need for staff to fly for meetings. Indeed, over 40% of companies in our survey reported that electronic communication could substitute for air services to a large extent, and 90% thought this to at least some extent (Chart 6.2). In addition, one of the companies we interviewed in more detail reported that it strongly encourages the use of electronic communication and video conferencing, and that this saves a large amount of European travel, especially for inter-functional meetings. Among the physical means of transport, as many companies thought there was scope for substituting road transport for air services if necessary as thought rail transport could be used instead.

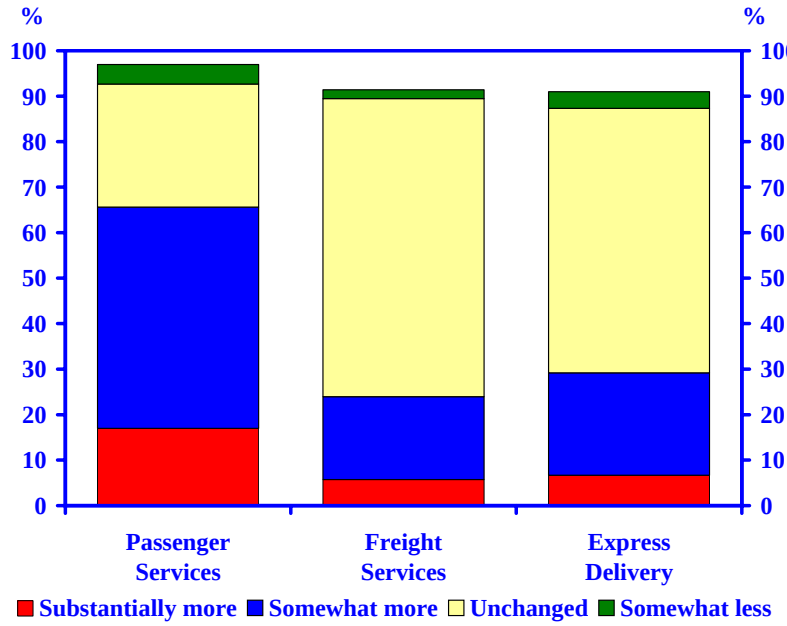
However, it would be a mistake to conclude from these survey responses that air services will become less important to economic growth in the future. Electronic communication and video-conferencing have been around for several years now and business use of aviation is still generally rising not falling. Most companies find that for some purposes there is still no substitute for face-to-face contact, and in an increasingly integrated world economy the need for international contact continues to rise. It is no surprise therefore that very few companies reported in our survey that they expected their dependency on air transport services to be less over the next 10 years than it is now, with two-thirds of companies still expecting their dependency on air passenger services to be somewhat or substantially more (Chart 6.3). Indeed, it is possible that electronic communication actually increases the need for air travel - for example, when initial contacts are made by e-mail but face-to-face contact is still needed to clinch a deal.

Chart 6.2: Extent to which other modes of transport or communication can be substituted for air services



Source: OEF survey of UK companies (2006), Q13

Chart 6.3: Dependency on air transport services over the next 10 years



Source: OEF survey of UK companies (2006), Q25

6.3 The City of London

London's successful cluster of international financial services, together with City-related business services, is a key example of a knowledge-based sector that is heavily reliant on aviation. Financial and business services have accounted for more than half of the overall net increase in employment in the UK in the past twenty years, during which time this area of the economy has changed from employing 40% fewer people than manufacturing to providing 80% more jobs than the whole of UK manufacturing. And this remains a key area for future growth – on our projections, financial and business services will employ more than three times as many people as manufacturing by 2015 as they continue to expand while manufacturers continue to shed labour. Within this key growth sector, the City of London occupies a unique position as a core wealth-generating component of the UK economy, generating high value-added jobs and competing successfully in the global economy.

A survey we conducted for an earlier study highlight the critical importance of air services to companies in the City and Central London Business District (CLBD)[25]:

- Almost 70% of firms considered air services to be critical for business travel by their staff.
- 50% of respondents considered air services to be critical for travel by their clients to meet with them.
- While new technology, such as video-conferencing, can be useful, companies considered flying for face-to-face meetings still to be vital to winning new business and developing client relationships.

Good air services appeared even more important for companies in the City and CLBD than in the rest of the UK, for two reasons:

- Business in London, and particularly in the City, is much more concentrated in the financial services sector than for the UK as a whole. Average spending per employee on air services by the financial services sector is six times the average for UK business as a whole.
- London-based organisations in the financial and business services sectors are typically much more international than their counterparts in the rest of the UK. This is especially true in investment banking, but also applies, for example, to the legal and accountancy professions. Moreover, some of the companies we interviewed emphasised that the international aspects of their business are becoming increasingly important.

This survey supported the widely held view that London's air service network currently provides a competitive advantage over the continent. For example, 48% of firms replying to the survey considered London to be the best served European hub and only 7% considered it worse than continental airports. London firms were generally very well satisfied both with the number of destinations and the frequency of service offered by London's airports.

Nevertheless, this survey of London businesses suggested that the government should make improvements to the air services network in the South East one of its priorities. In particular, London businesses want additional runway capacity to be developed in the South East more quickly than the government's current plans imply. For example, 60% of firms reported that additional runways will be needed within the next 10 years for the success for their business.

[25] 'Aviation Services for the City of London', Corporation of London 2002

Our survey suggested that there is some scope for improved rail travel to substitute for business travel by air. However, this was generally limited to journeys to Paris, Brussels and other parts of the UK. Strikingly, 22% of firms thought the train is hardly a good substitute at all for air travel within the UK, let alone to other continental destinations.

Case study: City Investment Bank

As part of our 2002 study of air services for the City of London, we interviewed the European Travel Manager from a leading investment bank with a large office employing a few thousand staff in the City of London. In 2001 the bank spent around £10 million on business travel by air, with the London staff making about 20,000 round trips, mainly to the US and continental Europe. Key points arising from that interview included:

- Good air services are vital to the bank: it is (as it has been for many years) a global firm, with offices and clients throughout the world. The recent improvements in audio-visual teleconferencing technology mean that – if anything – the need for good air services is slightly reduced, but it is still vital. That is because audio-visual technology can never replace meeting clients face-to-face, so it is really a complement rather than a substitute for air travel. Face-to-face meetings (and therefore air travel) are indispensable, especially in the early stages of a relationship with a client.
- If there are no improvements in the provision of air services into and out of London over the next several years, there is a significant risk that the bank (and/or other large City-based firms) will relocate their business abroad. In the case of the bank, the likely location would be Frankfurt, where it considered the provision of air services to be a lot better than London.

7 The importance of connectivity

Key points

- Aviation users depend on a network of services providing connectivity to a wide range of destinations.
- Nine out of ten companies in London or counties close to Heathrow regard the airport as either vital or very important to their organisations.
- Elsewhere in the UK, Heathrow is still considered vital or very important to more than 40% of companies, although regional airports are the airport of choice for many when feasible – they are used very frequently for direct short-haul flights by half of all companies.
- Passengers transferring between flights at a hub airport increase the viability of services that benefit direct passengers too, allowing greater a frequency and range of services.

7.1 Introduction

The value of air transport to a business clearly depends on air services being available that allow either passengers or freight to travel between the desired origin and destination for a trip. The ease with which this can be done will depend both on the range of destinations served by air services that can be accessed and on their frequency. In other words, it depends on how well connected a location is with other parts of the world by air services.

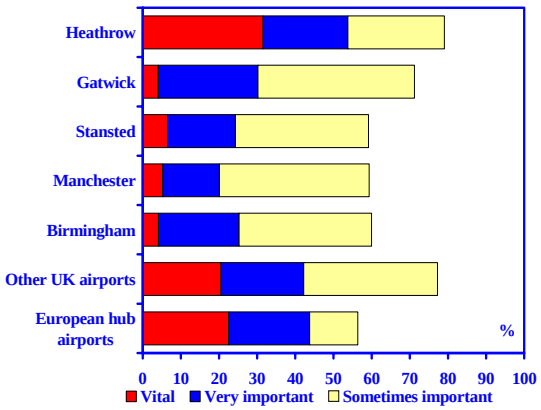
Research by OEF for IATA[26] has considered the impact of connectivity on the productivity performance of a range of countries over the last decade. This analysis used a connectivity indicator developed by IATA based on the number of flights from a given airport weighted by the importance of each of the destinations served. It considered the economic significance of aviation's role as a connected network as analogous to that of banking or telecoms networks. In broad terms, our econometric results (discussed in Chapter 8) suggested that a 10% improvement in connectivity (relative to GDP) increases both long-run productivity and GDP by 0.9%.

7.2 The importance of hub airports

Hub airports clearly play a key role in providing connectivity. Given its importance both as a hub airport and as a provider of direct flights to a large catchment area within the UK, it is no surprise therefore that our survey found that Heathrow is rated as of vital importance by more companies than any other UK or European airport (Chart 7.1). 32% of companies regard Heathrow as vital to their organisation and a further 22% consider it to be very important.

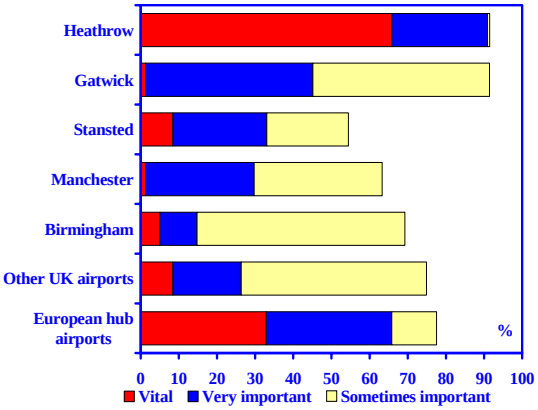
[26] 'Airline Network Benefits: measuring the additional benefits generated by airline networks for economic development', IATA Jan 2006

Chart 7.1: Importance of airports – all UK companies



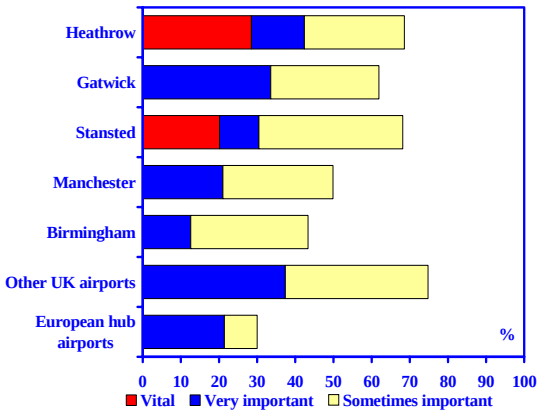
Source: OEF survey of UK companies (2006), Q9

Chart 7.2: Importance of airports - London & counties close to Heathrow



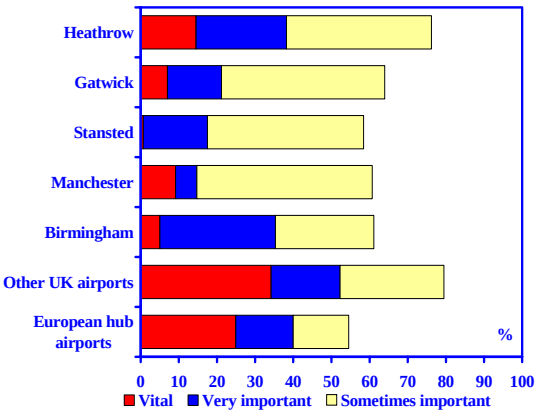
Source: OEF survey of UK companies (2006), Q9

Chart 7.3: Importance of airports - wider South East



Source: OEF survey of UK companies (2006), Q9

Chart 7.4: Importance of airports - other UK companies



Source: OEF survey of UK companies (2006), Q9

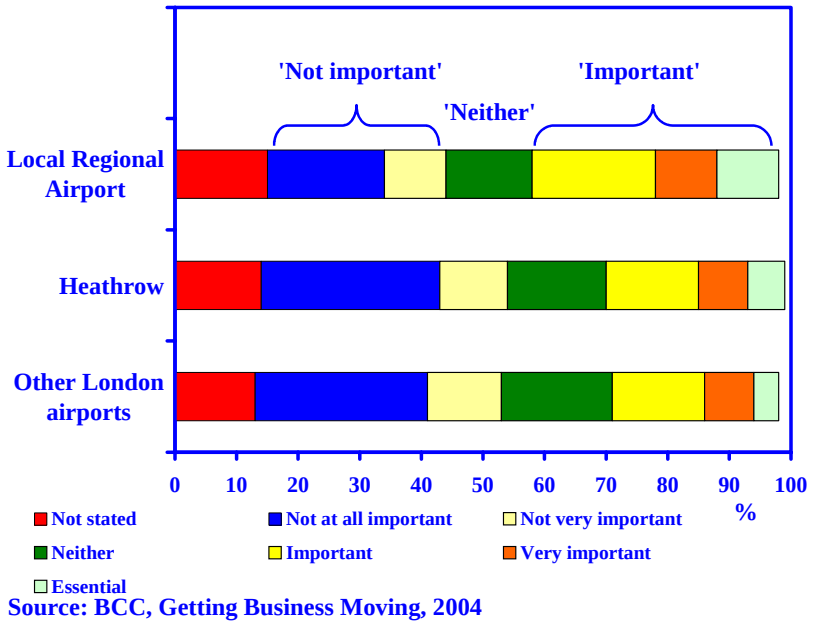
It is also no surprise that the importance of Heathrow is most strongly valued by companies based in London or counties close to Heathrow[27] (Chart 7.2). It is striking, however, that as many as nine out of every ten companies in this area responding to our survey regard Heathrow as either vital or very important to their organisations. In the wider south east of England[28], Heathrow is still regarded as vital or very important by more than 40% of companies, and the same applies to companies elsewhere in the UK.

[27] We have included Berkshire, Buckinghamshire, Middlesex and Surrey in this category.
[28] We have included the rest of the South East Government Office Region, and the Eastern region, together with neighbouring counties of Dorset, Wiltshire and Northamptonshire in this category.

7.3 The importance of regional airports

Although many trips require use of a hub airport, regional airports are more convenient for the majority of businesses. Access from regional airports to a hub is therefore important for providing companies throughout the UK effective connectivity. This point was reinforced in a large-scale survey by the British Chamber of Commerce in 2004[29] in which companies deemed access to a local/regional airport as of "prime importance", while accessing "Heathrow, Gatwick and the other London airports is not supported as strongly as regional access"[30] (Chart 7.5).

Chart 7.5: Importance of access to airports

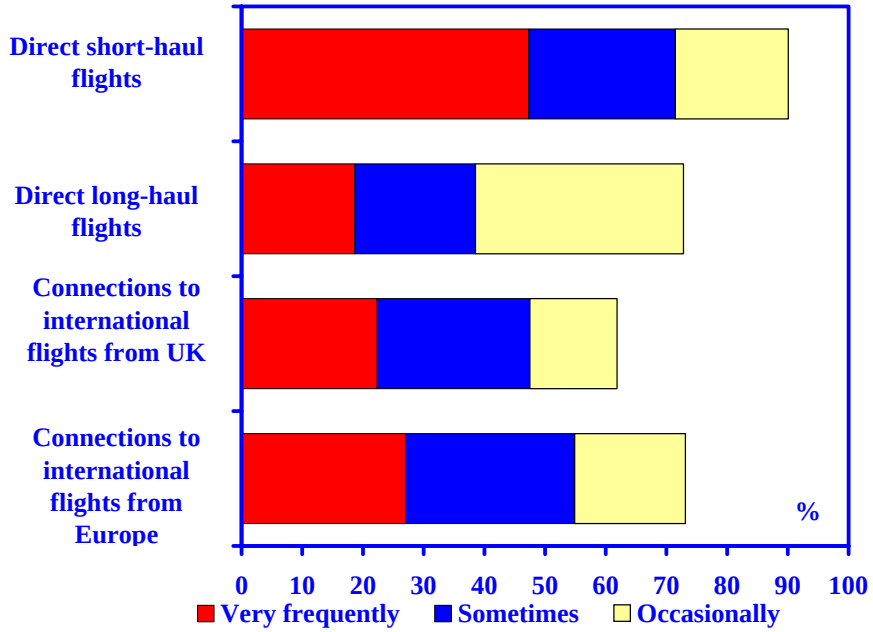


Source: BCC, Getting Business Moving, 2004

One way of interpreting this finding is simply that for most companies a local airport is a lot more convenient than a London airport and will therefore be used whenever possible. However, it is clear that the UK's hub airport is used by companies from all over the country. Airports outside the South East are used very frequently for direct short-haul flights by half of all companies, and used sometimes by a further 20%. But half of all companies also use regional airports for connections to international flights from elsewhere in the UK, which will be predominantly from London (Chart 7.6).

[29] Getting Business Moving (BCC, 2004) surveyed a total of 1,933 companies
[30] Ibid, p9.

Chart 7.6: Use of airports outside the South East of England



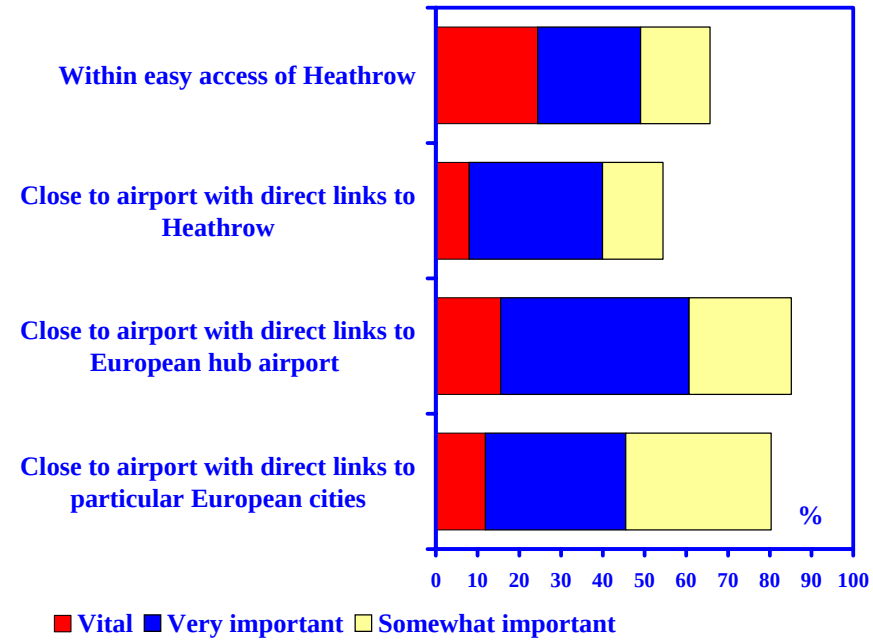
Source: OEF survey of UK companies (2006), Q10

7.4 The impact of interliners

Where connecting flights are required, businesses do not necessarily care whether they interline via a UK or continental hub – more companies use regional airports for connections to international flights from Europe than for connections to international flights from the UK (Chart 7.6). And of companies who report that access to air services is an important factor in affecting where they locate within the UK, 60% report that being close to an airport with direct links to a European hub airport is vital or very important, compared with 40% who consider being close to an airport with direct links specifically with Heathrow is important (Chart 7.7). Nevertheless, connecting via a UK hub is clearly preferred by respondents if that option is available – 30% of companies report that transferring between fights at a UK hub is very acceptable, whereas only 20% consider transferring between flights at a continental hub airport to be that acceptable (Chart 7.8).

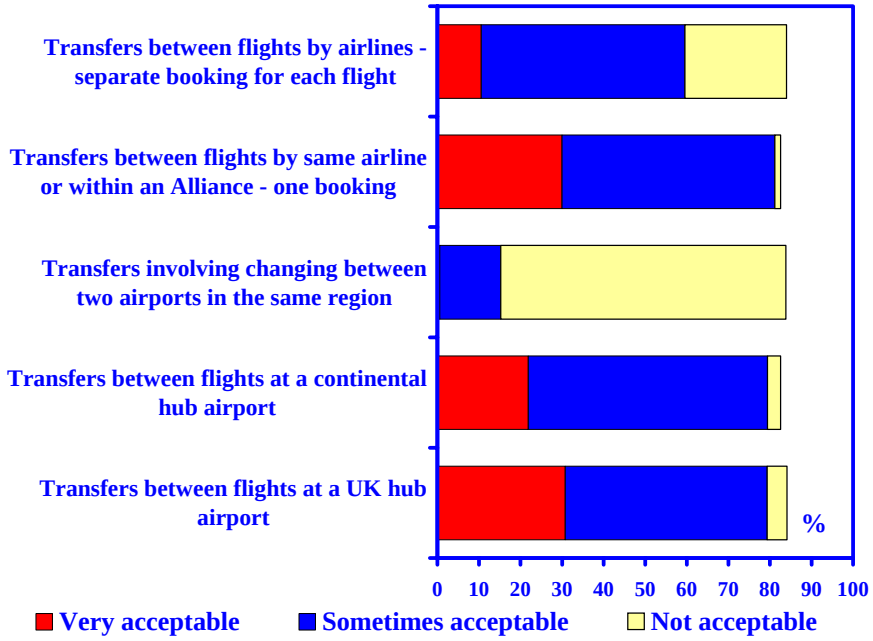
Despite this preference, it is clear that for many companies transferring between flights at a continental hub rather than Heathrow for long-haul connections is accepted when the resulting service matches travellers' needs more closely. Over 80% of companies report that transfers at a continental hub are either very or sometimes acceptable, almost exactly the same proportion as for transfers at Heathrow.

Chart 7.7: Importance of air services in influencing company location



Source: OEF survey of UK companies (2006), Q16

Chart 7.8: Acceptability of connection options between flights

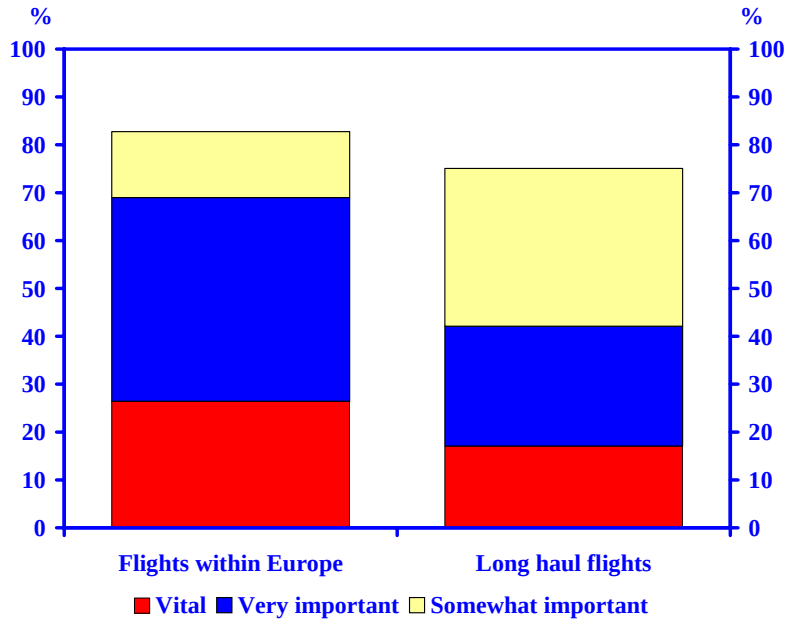


Source: OEF survey of UK companies (2006), Q20

Nevertheless, looking at this issue from a broader perspective than that of an individual company, there are factors that suggest these two options will not necessarily be equivalent. Most importantly, the existence of interlining passengers transferring onto a particular route has a major effect on the frequency of service that can be offered on that route. This higher frequency of service will be of benefit to direct passengers too, who will have a greater choice than otherwise of when to fly. Similarly, the use of a UK hub rather than a continental one can lead to a better hub connection itself since interlining demand for this connection is likely to be supplemented by more demand for point-to-point journeys on the same route. So there are spin-off benefits to other UK passengers from the use of a UK hub by interliners.

In some cases the higher frequency will itself allow passengers from within the catchment area of the hub to take advantage of direct flights rather than themselves transferring between flights elsewhere. The ability to fly directly rather than having to change to a connecting flight is seen as vital or very important by 40% of companies even for long-haul flights, and by 70% for flights within Europe (Chart 7.9).

Chart 7.9: Importance of being able to fly directly rather than having to change to a connecting flight



Source: OEF survey of UK companies (2006), Q19

From a UK-wide perspective, the level of connectivity provided by the hub will be enhanced not only by the presence of interliners but also by the existence of a greater number of services to regional airports around the country. Some of the more geographically peripheral areas of the UK sometimes consider that access to a continental hub is inferior to access to a UK hub because it affects the area's international 'prestige'. They fear knock-on impacts on inward investment if the lack of a link with Heathrow raises doubts in overseas investors' minds over the government's view of the region and commitment to the success of the local economy.

8 Aviation supports business efficiency and economic growth

Key points

- Air services help to improve the competitiveness of almost all aspects of companies' operations, including sales, logistics and inventory management, production and customer support.
- By expanding the size of the market that can be served, aviation acts as a spur to innovation, increases sales and profits, allows more scope to exploit economies of scale and increases competition.
- Earlier econometric work by OEF on the impact of business use of air services on productivity in the rest of the economy has been updated with new data and refinements to the estimation methodology. Unlike the previous study, a distinct effect on productivity from changes in air transport usage is now found rather than just an effect from transport usage in aggregate.
- The results imply that if growth in business use of aviation services (both passenger and freight) was held back by 1 percentage point a year over a thirty year period there would be loss in potential GDP of 1.8% a year by the end of the period.

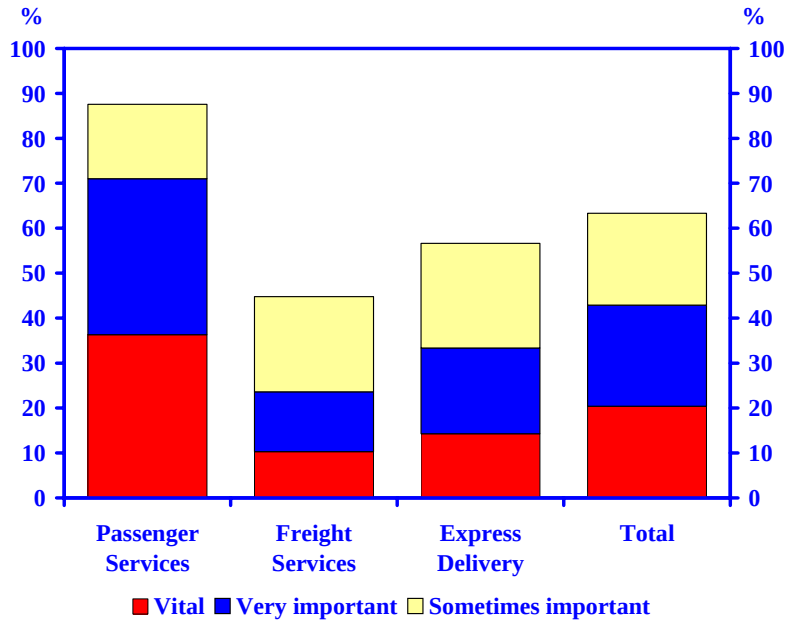
8.1 How aviation raises productivity

One of the key findings of our 1999 study was that improvements in the UK's transport infrastructure have an impact on the efficiency of business operations, boosting Total Factor Productivity (TFP)[31] and hence the economy's potential GDP. TFP is the key ingredient of economic performance over-and-above the input of labour and capital and is critical to achieving high and sustainable growth rates for the economy, and hence more wealth and higher living standards.

Many of the ways in which aviation contributes to business efficiency and productivity growth are clear from the discussion in previous chapters of this report. The role of aviation in facilitating international trade (Chapter 4), for example, allows companies to increase sales and to improve the efficiency of production and supplier relationships. Similarly, the role of aviation in supporting investment (Chapter 5) enhances productivity - inward investment has particular benefits as it can introduce new technologies or management techniques into the economy. Air travel also enables organisations to be managed more effectively - for example, by making it easier for senior executives to visit subsidiaries or parent companies in another country. 70% of companies in our survey report that passenger services are vital or very important for the management of their organisation (Chart 8.1), and this role in itself is likely to reinforce the impact of aviation on inward investment.

[31] TFP measures the contribution to GDP of intangible factors such as technology, R&D, management and efficiency to output, and is calculated by looking at how much output has increased after taking account of any increases in capital and labour used in production.

Chart 8.1: Importance of air services for management of organisation

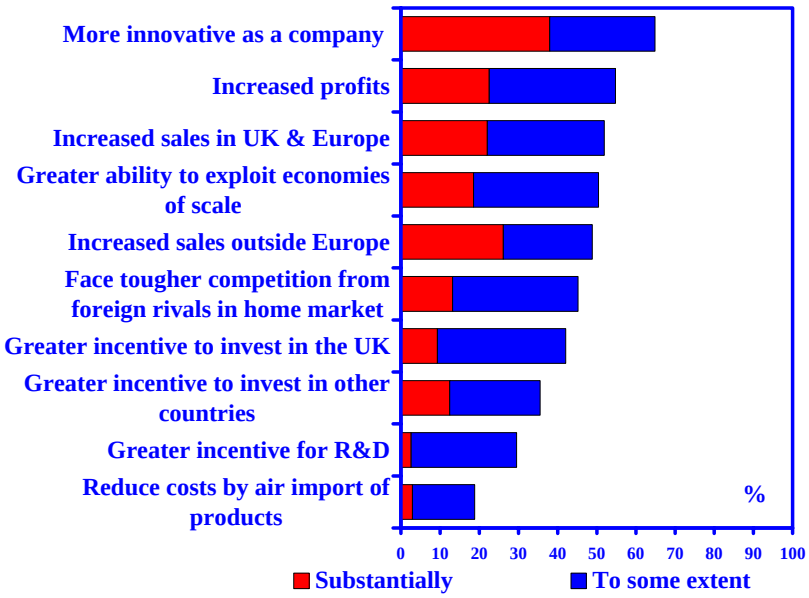


Source: OEF survey of UK companies (2006), Q7

Perhaps the most direct advantage which air transport brings to businesses, though, is that it allows them to serve a bigger market. Air transport means trade with distant markets is easier and cheaper, and that goods and services can be marketed on a global basis. The ability to serve a larger market has a number of consequences (Chart 8.2). The biggest effect according to our survey is as a spur to innovation, presumably because the costs of innovation can be spread across a greater number of potential sales. 40% of business report that air transport services had a substantial impact on incentives to be innovative, and 70% report that this is affected at least to some extent. Companies also report that the access air services gives them to a bigger market leads to increased sales and profits, more scope to exploit economies of scale and increased competition. While not necessarily viewed as positive by individual companies, increased competition is a significant benefit for consumers and economic performance more generally. It drives down prices and encourages improvements in the quality of goods as UK firms face increased pressure from foreign rivals.

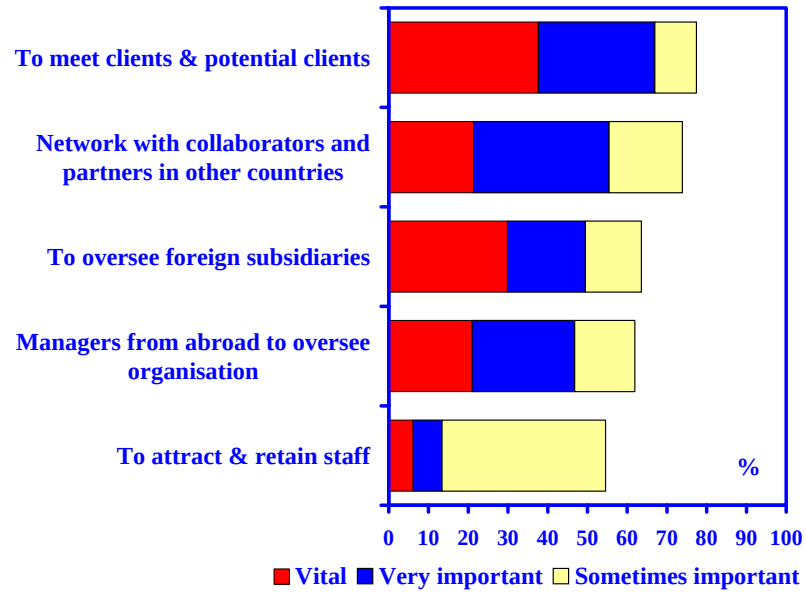
Looking specifically at passenger services, companies report that they are of greatest importance for meeting clients and potential clients, for management of foreign subsidiaries and/or their management of foreign owners, and for networking with potential collaborators and partners in other countries (Chart 8.3). All these factors have the potential to improve the efficiency of companies' operations.

Chart 8.2: Implications of being able to serve a bigger market



Source: OEF survey of UK companies (2006), Q11

Chart 8.3: Importance of passenger air services to organisation

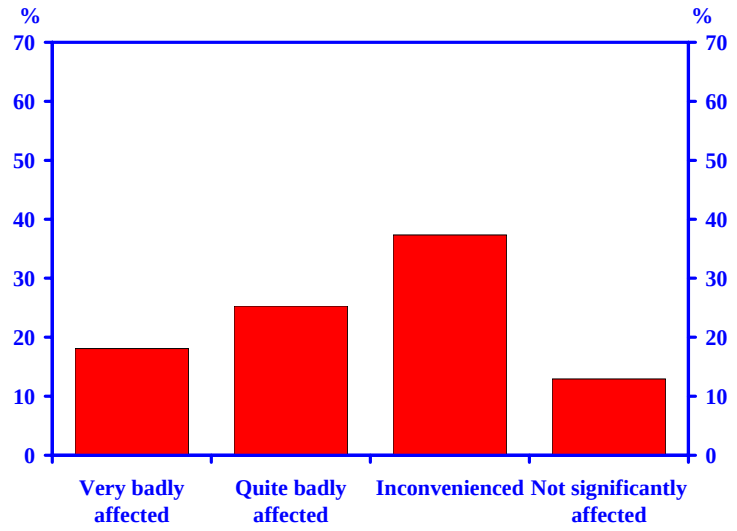


Source: OEF survey of UK companies (2006), Q21

8.2 How firms would be affected by a deterioration of air services

The importance of aviation for the efficiency of companies across the wider economy is also highlighted by their assessment of the impact that a deterioration in air services would have on their organisations (Chart 8.4). Nearly one in five report that they would be very badly affected; a further one in four would be quite badly affected; and most of the rest would be inconvenienced. Only one in eight companies report that they would not be significantly affected.

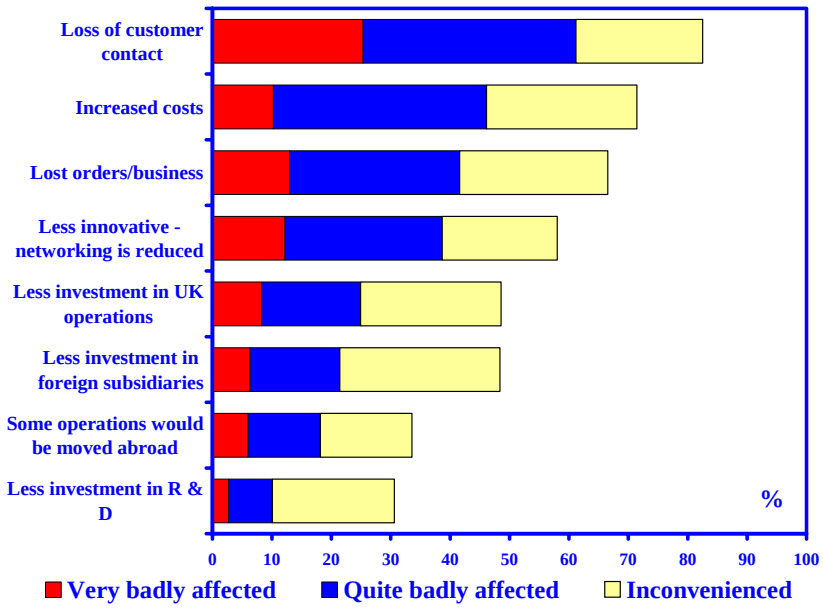
Chart 8.4: Effect of deterioration of air services on organisations



Source: OEF survey of UK companies (2006), Q27

These adverse effects would be felt in a variety of ways. The most widespread concern is the potential loss of customer contact, with 60% of companies reporting that they would be very badly or quite badly affected in this way, and just over 40% reporting the same with regard to lost orders (Chart 8.5). Particularly striking in the context of the efficiency of UK plc is that nearly half of companies (46%) report that they would be very badly or quite badly affected by increased costs, while 38% report that innovation would suffer.

Chart 8.5: Effects of deterioration of air services



Source: OEF survey of UK companies (2006), Q27

8.3 Estimating the impact on productivity econometrically

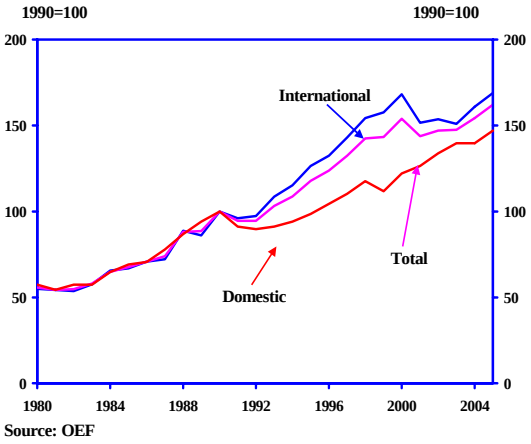
Given these effects, it is natural to look for quantitative evidence that business use of aviation has had an impact on productivity. The results presented here build on OEF's analysis of the contribution of the aviation industry made in 1999. That used disaggregated data for UK industry and services to explain the growth rate of TFP. The academic literature at the time found that a 10% increase in transport services would increase aggregate TFP by 0.5-4.0% - a rather broad range. OEF's study found a figure - 1.3% - towards the lower end of that range.

There are several reasons to revisit this work again. First, data for several more years are now available and might help refine our estimates. Second, one disappointment from the first exercise was the finding that a significant relationship only existed between the growth rates of the variables of interest. Finding a model where the **level** of output explained the **level** of TFP would increase confidence in the results and be more persuasive of the economic link. Finally, in the previous exercise, we were not able to find a relationship between TFP and aviation output alone - the only statistically significant relationship was given by using total transport output. Even though the avenues through which transport affects productivity clearly apply to air transport just as much, if not more, than other means of transport, the evidence would be clearer if we could identify the effect of aviation separately.

In undertaking our new econometric research, data from across 31 different industrial and service sectors have been pooled. This is more "efficient" in an econometric sense than just using data on the economy as a whole, since it allows the estimated effects to be based on a much richer sample of information, while common coefficients can still be imposed where appropriate across sectors.

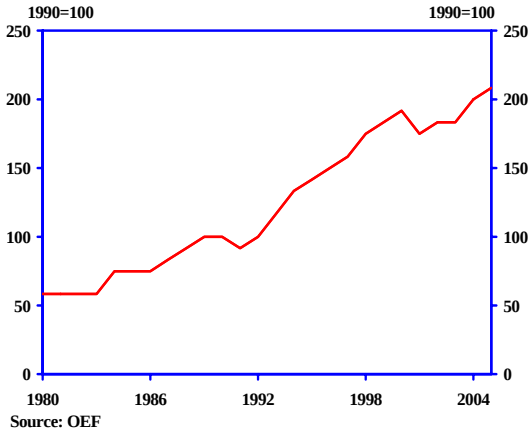
The use of air transport services by companies can be measured in several different ways. For example, we experimented with measures based on the Gross Value Added (GVA) of the aviation industry. However, our final results use a measure of air transport services that is more closely aligned to business use of aviation. This was constructed by combining the number of business passengers at UK airports[32] (Chart 8.6) with the volume of airfreight (Chart 8.7). The resulting indicator of business aviation use is shown in Chart 8.8 (and the underlying data are shown in Annex B). The TFP measures used for each sector were constructed by OEF from OECD data.

Chart 8.6: Business Passengers at UK airports



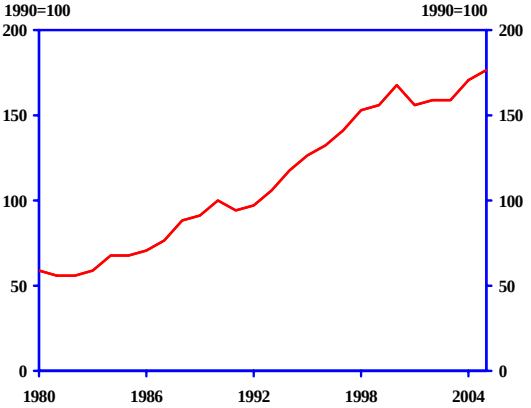
Source: OEF

Chart 8.7: Freight moved through UK airports



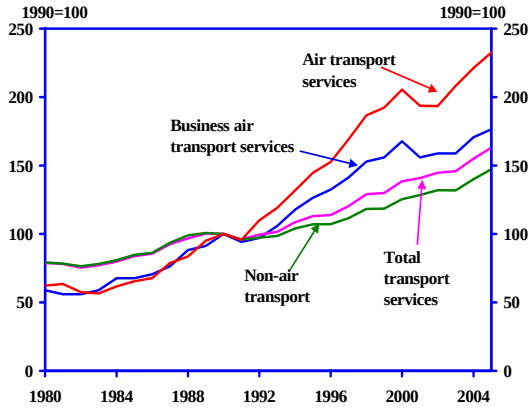
Source: OEF

Chart 8.8: Proxy for business air transport services



Source: OEF

Chart 8.9: Measures of air transport services



Source: OEF

[32] We have information on international air travel by purpose (business, leisure) from the International Passenger Survey. For domestic business trips, we are grateful to DfT statisticians for estimating a time series based on the incomplete results available from CAA airport surveys.

8.4 Results

Annex C contains the detailed results of our econometric research. In summary:

- Our equation models the relationship between the use of air services and TFP (ie the efficiency of producing output after taking account of labour and capital inputs).
- It is estimated on the basis of a 'panel' of data for 31 UK industries for 27 years.
- The equation allows the impact of air services on TFP to vary proportionately across sectors according to how important air services are within the purchases made by each industry.
- Air services are represented by a series combining business passenger numbers and freight tonnage, since these are the services that are likely to affect the efficiency of business operations. This business air usage is calculated relative to GDP to provide an indicator of the aviation-intensity of the economy.
- The equation implies that, other things equal, a 10% increase in business air usage would raise GDP by 0.6% (£9 billion) in the long run. Financial services account for the biggest share of the increase in GDP (£3.0 billion), followed by business services, and extraction (including oil) – the absolute size of the effects depending on both the size of the sector and the importance of air services within its costs.

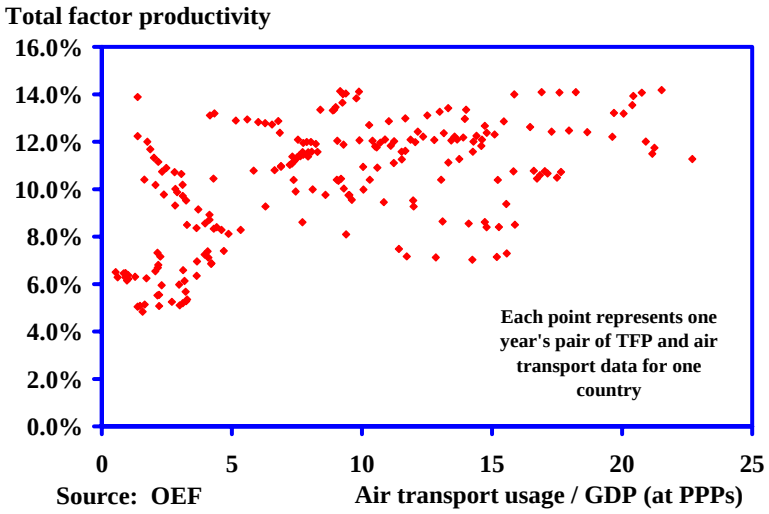
8.5 Other results

It is worth noting that this econometric evidence of the relationship between air services and the wider economy is supported by work OEF has undertaken in two other studies since our original 1999 UK report. (These studies have already been discussed in Section 5.2 in the context of the impact of aviation on investment) The research for EUROCONTROL[33] involved a cross-country panel of data from 24 EU countries over a 10 year period, looking at the relationship between air transport usage (defined as a combination of both passenger numbers and freight tonnes) and TFP. Chart 8.10 shows the positive relationship between TFP and air transport usage (scaled by GDP) across all 24 EU economies that was confirmed by this econometric research.

[33] The Economic Catalytic Effects of Air Transport in Europe', OEF 2005

Chart 8.10

Relationship between air transport usage and total factor productivity



The long-run relationship identified in that modelling implies that a 10% increase in output of air services would lift productivity and potential output by 0.56% in the long run – in line with our estimates for the UK. In terms of historical performance, the results imply that the rapid growth in air transport usage over the last decade has boosted long-run underlying productivity (ie TFP) by 2.0% across the EU25.

The study for IATA[34] comes to similar conclusions, but takes the analysis a step further by considering not just air transport usage but the contribution of aviation to the connectivity of companies. As explained in Chapter 7, this was done by constructing a measure of 'connectivity' for major airports across the EU based on the number of flights from a given airport weighted by the importance of each of the destinations served. The results of this research imply that a 10% increase in connectivity (relative to GDP) increases both long-run productivity and GDP by 0.9%.

The impact of aviation on TFP boosts the economy's potential output over-and-above any impact that improved air services have on investment – that is, TFP measures the impact on GDP for a given level of the capital stock (and labour). But OEF's work for both EUROCONTROL and IATA also identified a positive impact from air transport usage or connectivity on the level of business investment that occurs in the EU (see Chapter 5). The overall impact of increases in air transport usage on economic performance – ie on GDP and hence on wealth and living standards – will therefore be larger than the impact on productivity alone.

[34] 'Airline Network Benefits: measuring the additional benefits generated by airline networks for economic development', IATA Jan 2006

9 Quantifying the overall economic impact of airport development

Key points

- Our UK Industry-Aviation model allows us to use the results of the relationship we have estimated between business aviation use and the overall level of productivity in the economy in order to estimate the wider economic benefits of different scenarios for future airport development. We present results here for three specific scenarios. Because of the inter-dependency of passenger flows at different airports it is not generally possible simply to add the results of different scenarios together to produce a combined scenario.
- Our results should be regarded primarily as illustrative of the possible wider economic benefits, since there is inevitably considerable uncertainty over some of the assumptions made – the model is particularly sensitive to assumptions about the scale of business use of aviation in the different scenarios.
- We estimate that mixed-mode operation at Heathrow would generate wider economic benefits of £2.5 billion a year of additional GDP in today's prices by 2015 (0.2% of GDP). Over the period to 2030, the wider economic benefits generated would have a total Net Present Value of £35 billion.
- A third runway at Heathrow would generate wider economic benefits estimated at £7 billion a year of additional GDP in today's prices by 2030 (0.3% of GDP), with a Net Present Value of £27 billion. This is lower than the NPV calculated for mixed mode operation, reflecting the later date at which a new runway could come into operation and therefore the GDP benefits could start to accrue. By 2030, though, the annual GDP benefits are nearly twice those of mixed mode operation – estimating NPVs over a longer period than to 2030 would therefore alter the comparison.
- Full implementation of the White Paper runway proposals would generate wider economic benefits of over £13 billion a year of additional GDP in today's prices by 2030 (0.6% of GDP).
- The net present value of the wider benefits from the full White Paper runway proposals over the period to 2030 is estimated to be £81 billion – equivalent to over £1,300 per person in the UK.

9.1 Overall approach

Our 1999 report on the economic impact of the aviation industry provided a measure of the overall contribution by modelling the implications of constraining the future growth of aviation. This chapter follows a similar approach to modelling the impact of various runway proposals in the 2003 Aviation White Paper. The steps involved are summarised below.

(a) **Re-estimation**

The first stage involved re-estimating the econometric relationship between the availability of air services and the productivity of the rest of the economy (see previous chapter).

(b) **Updating the model**

Second, we have updated our UK Industry-Aviation model to reflect developments in the structure of the UK economy since 1999 and OEF's projections to 2030, as well as incorporating the re-estimated relationship between aviation and productivity. (Annex A(c) summarises the key routes through which aviation impacts on the rest of the economy in the model. A more detailed description of the equations in the model can be found in Annex G of the 1999 report.)

(c) **Defining the scenarios**

Third, the scenarios being modelled need to be defined by producing a set of assumptions to characterise the potential impact of the runway proposals being modelled in terms of usage of air services. The most obvious assumption needed is the impact on overall passenger numbers. But the model also requires assumptions on different types of passengers - the model splits the total into UK (terminating) business passengers, UK (terminating) leisure passengers, foreign (terminating) business passengers, foreign (terminating) leisure passengers, and transfer passengers. The model includes air freight usage in tonnes as well, but for simplicity and in order to avoid presenting what might otherwise be an overstatement of effects, all scenarios assume that there is no appreciable impact on freight.

Since the impacts on business efficiency and productivity that we are modelling depend on business use of aviation, the assumptions about additional business passengers are the most important for the model results. It is not usually clear what impact alternative runway developments will have on business use of aviation, however. Some estimates are available from DfT modelling work using their Air Passenger Forecasting Model[35], and we have taken these into account in developing the assumptions used here.

However, the DfT model is designed to look at a rather different question. It is based on fixed underlying demand, with actual passenger numbers being determined by a proportion of underlying demand being suppressed to match available capacity. Since business passengers on average place a higher value on being able to travel when they want to, it is mainly other passengers who are displaced by the model. Since business passengers therefore account for a relatively small proportion of suppressed demand, the model tends to show a significantly smaller proportion of business passengers using additional runway capacity than the average business usage of existing capacity. This is logical in the context of fixed underlying demand, but does not always reflect airport or airline expectations of the uses of additional capacity. For our purposes, the assumption of fixed underlying demand seems unnecessarily restrictive. Creating additional capacity where it is wanted is likely to do more than just attract a share of suppressed demand. Underlying passenger demand is also likely to be higher - by encouraging business investment and allowing businesses to operate more efficiently, appropriate additions to air service capacity could, for example, enable the UK to get a larger share of overall European business activity and associated use of air services. We have therefore typically assumed for our scenario modelling that the business share of additional passengers lies somewhere between that generated by a fixed demand model like DfT's and that which would result from assuming the same business share as for existing capacity.

(d) **Analysing the results**

Finally, the estimated impact of each scenario is analysed by comparing the results of model runs with and without the additional passengers associated with each runway proposal to estimate the impact on broader economic aggregates, in particular GDP.

[35] In particular, some of the proposals discussed in the 2003 Air Transport White Paper are analysed in 'Passenger Forecasts: Additional Analysis', DfT, December 2003

Results are presented both for the impact on annual GDP in today's prices in 2015 and 2030, and also for the Net Present Value (NPV) of overall additional GDP over the period to 2030 using a discount rate of 3.5% in real terms, in line with that set out in the 'Green Book' – the Treasury guide to appraisal and evaluation in central government. (Note that this is more conservative than much of the NPV analysis of transport options, which includes benefits up to 2060.)

9.2 Impact of mixed-mode operation at Heathrow

(a) Passenger assumptions

The extent to which the introduction of mixed mode operation at Heathrow would allow for greater passenger throughput clearly depends on the extent to which environmental limits at the airport act as a constraint. As an illustration of the potential effect, however, we have based our scenario on the understanding that if environmental constraints can be met then operationally mixed mode might allow an increase from a baseline of 480,000 Air Transport Movements (ATMs) a year to 540,000. Very approximately, this might allow an extra 12 million passengers a year at (in round numbers) 200 passengers per ATM.

In terms of passenger types, DfT's Air Passenger Forecasting Model suggests that on the basis of fixed underlying demand this sort of addition to capacity might lead to around 0.5 million extra business passengers in 2015, rising to 1.5 million extra by 2030 as UK aviation becomes more heavily constrained in the absence of additional capacity. On the other hand, business traffic is expected to make up nearly half of Heathrow's passenger traffic in 2015 under the assumption of maximum use of existing capacity, and somewhat more than half by 2030. If these proportions also applied to additional capacity, that would suggest in the region of 5.5 million additional business passengers might be serviced with mixed mode operation in 2015, rising to around 7 million additional business passengers by 2030. BA have told us that as well as allowing some improvements to frequency on existing routes, mixed mode operations would allow more destinations to be served from Heathrow, including long haul destinations not currently served from anywhere in the UK which might otherwise be operated from continental hubs instead. These new routes would be expected to have a mixture of business and non-business use, while additional frequency on existing routes is likely to make them more attractive to business passengers by adding flexibility in scheduling. We have therefore analysed the potential wider economic impact of mixed mode operation on the assumption that it generates significant additional business traffic as well as non-business use. In practice we have averaged the two approaches discussed above of using fixed underlying demand results or using the business share of existing capacity use, leading to an assumption of 3 million additional business passengers in 2015, rising to 4.3 million by 2030.

Timing is another potential source of uncertainty, but the results we present for 2015 are based on assuming that the full potential increase in passenger numbers is realised by then.

(b) Results

Comparing a baseline version of the model with one in which passenger numbers are able to increase by an additional 12 million by 2015 (and thereafter continue at 12 million a year more than in the baseline case) suggests that the spillover effects on the productivity of the rest of the economy could generate 0.2% higher GDP (£2.5 billion in today's prices) in 2015 than would otherwise be the case. By 2030 the estimated impact rises to over £4 billion in today's prices as the economy expands and the assumed

business share of the additional passengers rises. The total additional GDP generated over the period to 2030 has an estimated NPV in today's prices of £35 billion.

Table 9.1 Modelling the Impact of Runway Proposals - Mixed Mode Operation at Heathrow

	2015	2030
Assumed impact on passenger numbers (million)	12	12
Assumed impact on business passenger numbers (million)	3.0	4.3
Estimated impact on GDP (£bn, 2005 prices)	2.5	4.1
Estimated impact on GDP (%)	0.2	0.2
Estimated impact on GDP (NPV to 2030, £bn 2005 prices)	35	

Source: OEF Industry-Aviation Model

9.3 Impact of a 3rd Runway at Heathrow

(a) Passenger assumptions

There are, of course, a number of possibilities both for the impact of a 3rd Heathrow runway, if one is built, on capacity and for the timing of such an effect, and the DfT paper on 'Passenger Forecasts: Additional Analysis' includes a variety of options. The purpose here is simply to illustrate the potential impact of a 3rd runway, without making any judgements about whether a specific option is in any way a likely or preferred outcome. To do this, we have assumed an impact on passenger numbers on the same scale as the largest impact shown in the DfT projections for the various scenarios they modelled, in order to illustrate what the range of impacts might be. This means that we have assumed that a 3rd runway at Heathrow would lead to 31 million extra passengers by 2030[36]. In terms of the breakdown of passengers by purpose, we have assumed just under 10 million of these would be additional business passengers[37].

(b) Results

The baseline scenario we have used here is one in which an extra runway is assumed to be already operational at Stansted. Using the assumptions outlined above, comparing with this an alternative scenario with 31 million extra passengers by 2030 suggests that the spillover effects on the rest of the economy could lead to GDP in 2030 around +0.3% a year higher than it would otherwise have been (around £7 billion in today's prices). In NPV terms, the 3rd runway generates increased GDP of £27 billion over the period to 2030. This is lower than the Net Present Value calculated for mixed mode operation, but this simply reflects the later date at which a 3rd runway could become operational and the GDP benefits could start to accrue – by 2030 the annual GDP benefits are nearly twice those of mixed mode operation.

[36] This assumption is derived by comparing DfT Scenario 7 (STN+1) with Scenario 12s3 (STN+1; LHR+1 2020,655/700).

[37] This is equivalent to using the results of the DfT model as far as international passengers by purpose are concerned (5.3 million additional international business passengers), while for domestic passengers assuming that business usage accounts for around half the share of additional passengers that it makes up in the baseline scenario.

Table 9.2 Modelling the Impact of Runway Proposals - 3rd Runway at Heathrow		
	2015	2030
Assumed impact on passenger numbers (million)	0	31
Assumed impact on business passenger numbers (million)	0	9.7
Estimated impact on GDP (£bn, 2005 prices)	0	7.2
Estimated impact on GDP (%)	0	0.3
Estimated impact on GDP (NPV to 2030, £bn 2005 prices)	27	

Source: OEF Industry-Aviation Model

9.4 Impact of Full Implementation of White Paper Runway Proposals

(a) Passenger assumptions

In looking at the potential economic spillover effects of all the runway proposals in the White Paper, we have derived passenger assumptions by comparing projected passenger numbers in a base case incorporating no new runway development with a scenario[38] that incorporates one new runway at Stansted by 2015, and by 2030 also incorporates a 3rd runway at Heathrow. Outside the South East, it also includes additional runway capacity at Birmingham and Edinburgh by then. The net result is that full implementation of the runway proposals in the White Paper is assumed to lead to around 14 million extra passengers by 2015 and 58 million by 2030. Business passengers are assumed to make up a bit less than a third of these[39].

(b) Results

Comparing a model baseline assuming no new runway development with a scenario with this increase in passenger numbers suggests that full implementation of the White Paper runway proposals could lead to GDP in 2015 0.3% a year higher than it would otherwise have been and in 2030 0.6% a year higher than it would otherwise have been (over £13 billion in today's prices).

In NPV terms, we estimate that full implementation of the White Paper runway proposals would generate additional GDP over the period to 2030 valued at £81 billion in today's prices, equivalent to over £1,300 per person in the UK.

[38] Scenario S15s1 in the DfT paper.

[39] As with the scenario above looking at a 3rd runway at Heathrow, this is equivalent to using the results of the DfT model as far as international passengers by purpose are concerned, while for domestic passengers assuming that business usage accounts for around half the share of additional passengers that it makes up in the baseline scenario.

Table 9.3 Modelling the Impact of Runway Proposals - Full Implementation of White Paper Proposals		
	2015	2030
Assumed impact on passenger numbers (million)	14	58
Assumed impact on business passenger numbers (million)	4.4	17.5
Estimated impact on GDP (£bn, 2005 prices)	4.0	13.5
Estimated impact on GDP (%)	0.3	0.6
Estimated impact on GDP (NPV to 2030, £bn 2005 prices)	81	

Source: OEF Industry-Aviation Model

9.5 Conclusions

These simulations of the wider GDP effects of different scenarios for the aviation industry show substantial potential effects (which we also found in our previous study). In terms of orders of magnitude, one way of looking at these results is in terms of the wider economic benefit per additional business passenger. For the scenario looking at full implementation of the White Paper runway proposals, an impact of 0.6% of GDP would today be equivalent to around £7 billion.[40] For this scenario, £7 billion of wider economic benefits imply an impact of around £120 per additional passenger, or £400 per additional business passenger, since it is only business passengers that we expect to generate these wider benefits. This compares[41] with DfT estimates of perhaps £30 of user benefits per passenger derived by applying the 'rule of a half' to changes in shadow costs[42].

It is worth stressing that the DfT estimates are measuring something rather different. They are looking at the increase in user benefits ('consumer surplus') that arise as a result of travellers saving costs from things like being able to use their preferred airport if the range of services it has available improves. Our estimates are based on increases in GDP that are feasible if businesses are able to operate more efficiently and have the incentive to invest more in the UK.

So is it likely that wider economic benefits could amount to perhaps £400 per additional business passenger? A benefit of the order of magnitude of £400 per additional passenger appears a lot in comparison with the likely average fare, even for business passengers – while we do not have data on fares paid for business trips as such, we know that the typical business trip is short-haul rather than long-haul, and that a significant number of short-haul business trips are taken with no-frills carriers. It is worth bearing in mind, though, that the cost to a business of an employee making a business trip is much higher than just the price of the ticket itself, including most obviously the cost

[40] The impact in 2030 is a lot higher, even in today's prices, as a result of the real growth in the economy expected over the next 25 years. But for the purpose of thinking about how the impact compares with other per capita measures it is easier to look at the results in today's terms since it is easier to think about orders of magnitude in comparison with familiar values.

[41] This is a simplification, since benefits arise to existing passengers too, so it is not strictly meaningful to divide our estimated GDP effects just by the number of additional passengers, but that does not alter the general comparison between the two approaches.

[42] See Annex C of 'Passenger Forecasts: additional Analysis', DfT December 2003. The 'rule of a half' is based on the average willingness to pay of additional passengers assuming the demand curve is approximately linear over the relevant range.

of the time the trip takes. Compared with the generalised cost of travel rather than just the ticket cost, the higher estimate of wider benefit set out above does not appear so large.

It is not at all easy to estimate from the business perspective what the value of an employee making a trip might be. If the traveller was the CEO of a large corporation who was able to make a significant contribution to managing an overseas subsidiary by visiting the site in person then presumably the value could be very large. Similarly, if a key specialist was able to sort out a problem. On the other hand, if the trip was, for example, to attend a conference then the payoff would be much more nebulous. But presumably a company would not pay for an employee to make a trip - and pay his or her salary while on the trip - if they did not expect it to generate sufficient value to the company in some form or other.

Perhaps another way of thinking about the value to a company of a business trip is to regard a typical business passenger as a consultant to the business, and the overall value of what the passenger is doing as what a consultant would be paid to do it instead. Of course, consultancy fees vary, from several thousand pounds a day for top lawyers, management consultants, etc to perhaps a few hundred pounds a day for relatively junior consultants - an average of £1,000 a day is perhaps not an unreasonable assumption, which might equate to a reasonably senior consultant in a reasonably-rewarded field. The majority of this fee goes towards the consulting company's overheads and profits rather than the consultant's salary, and therefore might be regarded as the value-added of the trip from the employer's point of view – which might therefore somewhat exceed our estimate of £400, though the orders of magnitude are similar.

There is quite a tenuous link between this concept of value to the employer and the concept of the wider benefit of the aviation service, of course. It would be better, for instance, if we could measure the value to the employer over-and-above the contribution to overheads/profits that the consultant would be able to generate in the next best use of their time (ie on a project that did not involve air travel). This additional contribution could be anywhere from close to zero to the bulk of the gross contribution generated (ie up to £1,000 in our example) - perhaps in the absence of better information an assumption of a half would give an order of magnitude of the possible additional benefit derived. In any case, this sort of argument at least suggests that the wider economic benefit estimates from our model simulations are consistent with plausible analysis from other perspectives about the additional value of a business trip by air.

10 The costs of congestion in UK aviation

Key points

- Congestion imposes costs on both airlines - increasing the cost of providing planned services - and passengers, whether through the extra time taken to pass through airports or the time wasted when flights do not leave or arrive on time.
- Congestion costs have been rising over the past decade as passenger numbers have grown more rapidly than the capacity of the air transport system to handle them. Our estimates show congestion costs (to both airlines and passengers) have more or less tripled from nearly £600 million in today's prices a decade ago to £1.7 billion today.
- If these trends continue, congestion costs could exceed £5 billion a year (in today's prices) by 2015, and approach £20 billion a year by 2030.
- There are a range of possible investments – eg introduction of mixed mode operations, improvements in air traffic control, new runway and terminal development – that would reduce congestion, with substantial potential benefits to the economy.

10.1 Congestion in UK aviation

Congestion imposes costs on both airlines, increasing the cost of providing planned services, and users, whether through the extra time taken to pass through airports or the time wasted when flights do not leave or arrive on time. With the rapid rise in air traffic in recent years, congestion is a problem at a number of UK airports - both the average length of delay and the percentage of more serious delays, of 30 minutes or more, has risen substantially between 1995 and 2005 (Table 10.1). In the case of Heathrow, the average delay in minutes has gone up by 63% and the number of flights more seriously delayed has gone up from just under 11% to close to 14% of the total. However, the problems are not just confined to Heathrow. Indeed, some indicators of congestion now look almost as bad for some of the smaller airports.

Table 10.1: Delays at Major UK Airports (Scheduled Flights)						
	1995			2005		
	Passengers (millions)	Average delay (minutes)	Delays above 30 minutes (% of total)	Passengers (millions)	Average delay (minutes)	Delays above 30 minutes (% of total)
Heathrow	45	10.3	10.9	67.9	16.9	13.5
Gatwick	16	11.8	11.2	23.2	17.7	11.6
Manchester	8	6.2	7.6	13	13.1	11.7
Stansted	3.9	8.2	9.6	21	11.8	10
Birmingham	3.3	5.9		6.7	13.5	
Edinburgh	3.6	9.9		8.1	14.2	
Glasgow	3.9	7.5		6.7	12.9	
London City	0.7	12.6		2	11.5	
Luton	1.8	6.6		8.4	14.5	
Newcastle	1.3	5.9		3.6	13.4	

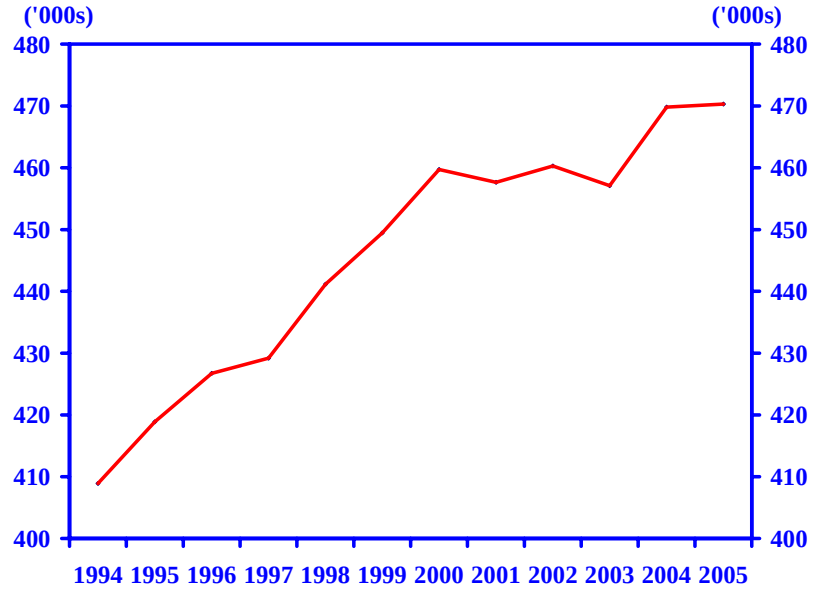
Source: CAA

In some ways it is not surprising that congestion has increased. Between 1995 and 2005, the number of flights in or out of Heathrow has increased by around 13% (Chart 10.1), while the numbers of passengers has risen by over 50%. At the same time, there has been no increase in runway capacity - Heathrow has to cope with all this traffic with only two runways whereas most of its rivals have 3, 4 or even 5 runways (Table 10.2). In terms of total passengers served, Heathrow still leads the way, but it is falling behind these other major airports in terms of total movements in and out. Of the other major airports listed here, only Munich has two runways and that is due to expand to three in 2010.

Table 10.2: European Airports Selected Statistics				
	Runways	Growth in routes served (% change 1996-2006)	Passengers (2005, millions)	Movements (2005, thousands)
Amsterdam	5	8	44.2	421
Frankfurt	3	13	52.2	490
Heathrow	2	3	67.9	478
Munich	2	52	52.0	399
Paris CDG	4	25	53.8	523

Source: FT, CAA, Airports Council International

Chart 10.1: Annual air transport movements at Heathrow



Source: CAA

Quantifying the costs of congestion in UK aviation is not straightforward. Estimates based on the total number of minutes lost, for example, take no account of the extent to which the costs of regular relatively limited delays are likely to differ from rarer substantial delays even if the total number of minutes lost is the same. Neither do they take account of any differences between delays that may be built into airline schedules as an expected part of their planning, compared with one-off unexpected delays. We have nevertheless produced partial estimates based on a number of strong simplifying assumptions, in order to provide an indication of the orders of magnitude that may be involved.

10.2 Costs for airlines

Delays impose a range of direct costs on the airline industry. These include the extra fuel used up as a result of extended flight times (eg circling while waiting for an opportunity to land), extra aircraft required to operate the schedule, extra wages for crews working longer hours, dealing with passengers who have missed connections etc. We have based our estimates of the cost of these effects on internal analysis by British Airways that puts the average direct cost to the airline of every minute that an aircraft was delayed at £21.80 in 2002. Assuming that the cost per minute was similar from one year to the next after allowing for inflation, this would imply costs per minute of £23.40 in 2005 prices. We have also assumed that other airlines face similar costs per minute to those BA estimate. Table 10.3 sets out the resulting assumptions and inputs into our estimates of the cost of delays to airlines at the four UK airports with the largest number of passengers, along with assumptions based on more limited data that we have made for the other airports.

Table 10.3: Assumptions Used to Calculate the Cost of Delay for Airlines			
	Average Delay (minutes)	No of flights ('000s)	Cost per minute (£, 2005 prices)
1995			
Heathrow	10.3	435	23.4
Gatwick	11.8	193	23.4
Manchester	6.2	140	23.4
Stansted	8.2	84	23.4
Other	6.9	542	23.4
2005			
Heathrow	16.9	470	23.4
Gatwick	17.7	204	23.4
Manchester	13.1	175	23.4
Stansted	11.8	166	23.4
Other	12.6	1025	23.4

These assumptions imply that the total direct costs to all airlines of delays at Heathrow in 2005 was £185 million compared with £105 million in today's prices in 1995 (Table 10.4). The total direct cost for airlines from congestion at all airports is estimated to have been £666 million in 2005 compared with £283 million in 1995.

Table 10.4: Estimated direct cost of delays for airlines (£ million, 2005 prices)		
	1995	2005
Heathrow	105	185
Gatwick	53	85
Manchester	20	53
Stansted	16	46
Other	89	297
Total	**283**	**666**

Source: CAA, BA and OEF calc

But there are also indirect costs of delays for airlines. For a single airline these will include such things as the loss of future business that arises as a result of customer frustration with delays. BA estimates that the additional indirect costs to it of delays were almost as great as the direct costs. However, this is not necessarily the case for the airline industry as a whole as some of the business lost by one airline is likely to have been picked up by others. We have therefore not included indirect costs to airlines in our aggregate calculations. As a result, they are likely, if anything, to underestimate the costs of congestion at airports.

10.3 Costs for passengers

It is also possible to estimate the cost of delays for passengers, using the information above on the scale of delays involved at UK airports. The estimates that follow cover scheduled passengers only.

The calculation is heavily affected by the proportion of business passengers at an airport, since (following the usual approach to valuing time) time lost through delay by a business passenger is valued using average earnings, which is much higher than the opportunity cost of lost time assumed for a leisure passenger. We have combined standard assumptions for these with figures for the total number of passengers and the average length of delay to produce figures for the total cost of delay.

The calculation that was made is -

*Total cost = Average delay * number of passengers * cost per minute of delay*

Table 10.5: Assumptions Used to Calculate Cost of Delay for Passengers

	Average delay on scheduled flights (minutes)	No of scheduled passengers (millions)	% of business passengers	% of other passengers	Cost per min – bus. passengers (pence, 2005 prices)	Cost per min – other passengers (pence, 2005 prices)
1995						
Heathrow	10.3	53	40	60	64	13
Gatwick	11.8	16	24	76	64	13
Manchester	6.2	8	24	76	64	13
Stansted	8.2	3.9	24	76	64	13
Other	6.9	28.1	24	76	64	13
2005						
Heathrow	16.9	67.9	40	60	89	18
Gatwick	17.7	23.2	18	82	89	18
Manchester	13.1	13.5	18	82	89	18
Stansted	11.8	21	18	82	89	18
Other	12.6	68.4	18	82	89	18

The assumptions used in the calculation are given in Table 10.5 and the results are displayed in Table 10.6. The value of time is assumed to rise over time with earnings, and all figures are presented in today's prices. The total cost of congestion to passengers at UK airports is estimated to have been about £1,050 million in 2005, up from £297 million in 1995. Heathrow is by far the largest single contributor to this, accounting for around 60% of the costs of congestion in 1995 and over 50% in 2005. This is due not only to Heathrow's dominance in terms of total number of passengers but also because a higher percentage of Heathrow passengers are travelling on business.

Table 10.6: Estimated Costs of Delays to Scheduled Air Passengers (£ million, 2005 prices)		
	1995	2005
Heathrow	181	530
Gatwick	47	126
Manchester	12	54
Stansted	8	76
Other	48	264
Total	**297**	**1049**

Source: OEF calc

10.4 Wider impacts of congestion

While this discussion has so far primarily been about the economic costs of congestion, there are also likely to be social and environmental costs to congestion:

- The delays caused by congestion eat into travellers' social time, delaying holidays and leading to frustrated tourists finding themselves stuck at airports (costs of leisure passengers on "charter" flights are not covered in the above estimates).
- Congestion also has negative environmental benefits as planes are forced to burn fuel for longer as they are delayed on runways or circling around airports, leading both to increased carbon emissions and also additional noise and lower air quality for local residents.
- Surface congestion around airports as both passengers and staff travel to or from the airport can have similar environmental impacts, as well as an economic cost[43].
- Severe delays at airports can also have knock-on negative effects on the reputation of the UK as a whole, which may leading to it being seen as a less attractive place to visit as a tourist or in which to do business.

10.5 Congestion costs in the future

Congestion costs have been rising over the past decade as passenger numbers have grown more rapidly than the capacity of the air transport system to handle them. Our estimates are likely, if anything, to understate the cost of congestion since they make no allowance for indirect costs to airlines, and no allowance for rising contingency costs for passengers if the increased possibility of severe delay means that more slack has to be built into travel schedules. Even so, they show congestion costs (to both airlines and passengers) having risen from nearly £600 million in today's prices a decade ago to three times that much today. If average delays continue to increase at the same rate as over the past decade then, after taking account of rising passenger numbers as well,

[43] Though it is worth noting that the econometric work discussed in Chapter 8 does take account of any negative impacts on business efficiency from growth in aviation adding to congestion around airports. Since our analysis estimates the net effect of growth in business aviation usage on productivity, the productivity data already reflect any disbenefits that adversely affect economic performance. This means that to the extent that increases in congestion around airports affect business travellers and thereby reduce their productivity, this is already allowed for in our modelling. So, even allowing for the fact that increases in air travel can increase congestion around airports and harm productivity as a result, our estimation shows that the overall effect is still to raise the average level of productivity in the economy as a whole.

congestion costs would be likely to exceed £5 billion a year (in today's prices) by 2015, and approach £20 billion by 2030.

Of course, there are likely to be several reasons why congestion costs do not grow at the same rate over the next twenty-five years as they have over the past decade. It is possible, indeed, that these could be a significant underestimate of the future costs of congestion since once congestion reaches a certain point then costs tend to increase exponentially as passenger numbers continue to rise. However, it is probably more likely that operational decisions would limit delays before they reach this point, since otherwise if congestion costs did reach these levels, this would probably choke off some of the predicted increase in passengers. Some of the increase in delays over the past decade is probably a result of a conscious decision by the industry to accept some increase in delays in order to put on more services. An equivalent trade-off may not be possible over the next decade where a runway reaches the upper limit on the number of services it can accommodate, but even where it is available it is not necessarily the case that the same decision would be taken to accept further increases in delays.

Whatever we might expect to happen to congestion costs in the next twenty-five years in the absence of future increases in runway capacity, however, it is likely that there are substantial potential benefits to the economy to be made by reducing the length of delays caused by congestion.

11 Climate change costs

Key points

- In addition to congestion, there are three other main environmental impacts arising from aviation: noise, local air quality and climate, of which the last is by far the most important in quantifiable terms.
- The combined cost of CO_2 and the potential non-CO_2 climate impacts from UK aviation is estimated to have amounted in aggregate to £1.4 billion in 2000, and could reach £4.0 billion a year in today's prices by 2030.
- The growth in air services in the alternative scenarios for runway development analysed in Chapter 9 would have implications for emissions, with an estimated cost ranging from an additional £100 million a year for mixed mode operation at Heathrow to an additional £700 million a year in today's prices by 2030 for full implementation of the White Paper proposals.
- But the economic benefits of the White Paper runway proposals remain substantial even after allowance is made for the climate change costs of additional emissions.

11.1 Introduction

This report primarily focuses on the economic impact of the aviation industry in the UK. However, aviation also has social and environmental impacts. Some of these have already been briefly discussed in previous chapters. For example, Chapter 2 discussed some elements of the social impact of aviation, while Chapter 10 looked at the issue of congestion, which has both social and environmental aspects.

In addition to congestion, there are three other significant environmental impacts arising from aviation:

- noise;
- local air quality;
- the emission of greenhouse gases, affecting climate change.

Earlier work on this subject, including the DfT's 2003[44] and 2004[45] papers, shows that greenhouse gas emissions are by far the most important of these in quantifiable terms, and these are therefore the main focus here. This is not to say that noise and air quality are not important issues – they can have a major impact in the vicinity of airports, and a lot of effort is being put into noise abatement and local mitigation measures. There are also restrictions and regulations in place for noise and air quality that mean airport development will not be allowed to lead to limits for these being breached. These are primarily local issues, however, and the main focus of this report is on the impact of the aviation industry on a national scale. The impact on climate change through greenhouse

[44] "Aviation and the Environment – Using Economic Instruments" Department for Transport, 2003
[45] "Aviation and Global Warming" Department for Transport, January 2004

gas emissions is potentially significant, and the industry has accepted that the costs it imposes in this way need to be met.

11.2 Potential impact on climate change

Aircraft engines emit carbon dioxide (CO_2), a greenhouse gas, and nitrogen oxide (NO_X), which is not in itself a greenhouse gas but which results in ozone which is. Both of these are estimated to contribute to global warming and climate change.

It is worth pointing out that at present the UK aviation industry is a fairly minor contributor to total UK CO_2 emissions. For instance, it is estimated that, in 2000, UK civil passenger aviation produced 30 million tonnes of CO_2, which was about 5% of total UK emissions. The biggest contributors were residencies and businesses, while transport as a whole accounted for about 24% of total emissions. Moreover, the UK's entire total of CO_2 emissions only accounts for around 2% of total global production. Consequently, carbon emissions by the UK aviation industry in 2000 amounted to less than 0.2% of total global emissions. So, even the complete disappearance of the entire UK aviation industry would have a negligible impact on total global CO_2 emissions.

However, the government is committed to reducing UK greenhouse gas emissions by 12.5% below 1990 levels by 2008-2012, and has goals of reducing CO_2 emissions by 20% below the 1990 figure by 2010 and 60% by 2050. Since current trends and policies suggest that CO_2 emissions due to UK domestic air transport and all international air transport departures from the UK could increase by 2.3 times between 2000 and 2030 to a level of around 70 million tonnes, such goals imply that the aviation industry will be under continued pressure to reduce its emissions. The industry, of course, recognises this and has committed itself to a set of sustainable development goals[46].

There are essentially three elements needed to assess the cost of greenhouse gas emissions by the UK's aviation industry[47]:

- An estimate of the amount of carbon or CO_2 emitted (1 tonne of carbon corresponds to approximately 3.67 tonnes of CO_2);
- An adjustment factor to reflect the potential additional climate change impacts of aircraft associated with NOx emissions and cirrus cloud formation. We have used the same factor of 2.5 used in the DfT work;
- An economic cost per tonne of carbon or CO_2.

For 2000, DfT base their calculations on annual CO_2 emissions of 30 million tonnes (8.2 million tonnes of carbon). This figure is purely for civil passenger aviation, so it excludes the contribution from air freight or from surface transport. UK emissions are defined as all emissions from domestic flights plus half of all emissions from international flights. The economic cost is illustrated using a cost of £70 per tonne of carbon. This assumption is taken from a range of estimates of £35 to £140, and we continue to present figures here based on this assumption for comparability. It is worth bearing in mind, though, that this is somewhat higher than the current cost of reducing carbon emissions elsewhere in the economy as implied by the price of permits under the European Trading Scheme – permit prices in the range 15-20 euros per tonne of CO_2 equate in broad terms to around £40-50 per tonne of carbon. In total, these assumptions imply that the cost of CO_2 emissions from UK aviation in 2000 amounted to £560 million. When the potential non-CO_2 impacts are included using the Government's adjustment

[46] See www.sustainableaviation.co.uk.
[47] This follows the approach used in the DfT 2003 and 2004 reports referred to earlier in the chapter.

factor, this implies that the total climate cost from UK aviation in 2002 amounted to up to £1.4 billion.

Calculations of the cost of future emissions are obviously open to a great degree of uncertainty, not least because of the assumptions that have to be made to produce estimates of future CO_2 emissions. Various factors need to taken into account in making the calculations. These include assumptions about demand for air travel, future airport development including the provision of extra runways, trends in aircraft development that could lead to increased fuel efficiency, other operational improvements and the possible introduction of various policy changes such as taxes which could increase the cost of air travel and so lower the demand. A DfT illustrative baseline calculation in 2004 showed that the cost of emissions could reach £4.0 billion a year in today's prices by 2030, based on emissions rising to 15.9 million tonnes of carbon and per unit costs rising £1 a year in real terms to £100 per tonne of carbon in 2030. Government policy, supported by the industry, is that any such increases in emissions should be offset by lower emissions elsewhere through emissions trading covering the aviation sector.

11.3 Impact on climate change of alternative development scenarios

Chapter 9 looked at the economic benefits that might flow from various alternative proposals to increase future runway capacity over-and-above that currently assumed in the base case. However, to get a full idea of the impact of such developments, it is worth looking also at the environmental impact of these various scenarios.

Table 11.1 Modelling the Impact of Runway Proposals

Description of scenario	Estimated cost of additional emissions (£2005bn)		Estimated GDP impact (£2005bn)		Estimated GDP impact *less* cost of additional emissions (£2005bn)	
	2015	2030	2015	2030	2015	2030
Mixed mode operation at Heathrow	0.1	0.1	2.5	4.1	2.4	4.0
3rd runway at Heathrow	0	0.4	0	7.2	0	6.8
Full implementation of WP runway proposals	0.1	0.7	4.0	13.5	3.9	12.8

Source: OEF calculations

Estimates of the additional environmental costs of each alternative scenario have been calculated using the methods outlined in the previous section. The results, which can be seen in Table 11.1, are derived by multiplying Defra's estimate of the environmental cost of carbon (£70/tc in 2000, rising by £1 per annum thereafter) by the adjustment factor of 2.5 assumed by the government and by the quantity of carbon emitted by the additional flights, assuming this is proportionate to the number of passengers. Everything else in these scenarios, apart from the additional passengers, is the same as in the base calculations. So, for example, no attempt has been made to take into account the impact

of any additional building work that might be required nor of the additional surface transport that would be needed to deliver these extra passengers. The results are given as changes from the base case figures. It is worth bearing in mind, though, that if the White Paper proposals were not implemented there would be some displacement of demand for air travel to airports in other, mostly EU, airports which, in turn, means that the net additional climate costs of airport development in the UK would be below those shown.

The biggest impact comes from the full implementation of the runway proposals in the White Paper, which is estimated to raise environmental costs from emissions by around £0.7 billion a year by 2030 in today's prices (compared with the wider economic benefit calculated of over £13 billion a year in today's prices). The other scenarios cover developments with rather smaller implications for the number of passengers, and therefore have corresponding smaller estimated impacts on the environmental impact of emissions from aviation: building a third runway at Heathrow is calculated to increase environmental costs by £400 million a year by 2030, while the implementation of mixed mode operation at Heathrow is calculated to have an impact of £100 million a year. In each case, this is only a fraction of the estimated wider economic benefit.

Annex A: Our approach to the study

(a) **Survey**

Questionnaires were sent out by OEF to around 6,000 companies and 165 replies were received (Table A.1). We are very grateful to those organisations who responded.

Table A.1 : Number of Replies to UK Aviation Survey

By Sector		By number of employees	
High Tech Manufacturing	17	<50	30
Traditional manufacturing	38	51-250	26
Financial & Business Services	29	251-500	37
Other Services	77	501-1000	26
Other	4	1001-5000	28
		5001+	18
Total	**165**	**Total**	**165**

Source: OEF Survey of UK companies, 2006

This represents a solid number of replies from which to draw conclusions - although the response rate of a bit less than 3% looks relatively low, statisticians generally regard 50 responses as representing a reasonable sample on which to base analysis, more or less regardless of the size of the population from which the sample is drawn. One danger with a low response rate, though, might be response bias – a possible tendency for those most affected by aviation to be most likely to reply to a survey on the impact of aviation. This is a potential problem with any response rate below 100%, but we have no reason to think it is a particular problem here. Respondents are widely spread across both sectors and company sizes, and we also know by inspection that our responses include some companies that have said they are little affected by air services but have still been kind enough to compete the survey. We therefore believe a good cross-section of effects is covered by the survey. Similarly, survey respondents cover a wide range of different degrees of internationalisation both in terms of organisation and trading relationships (Table A.2), so there is no reason to believe that responses are dominated by firms who are more dependent on aviation than the typical UK company or vice versa.

Table A.2 : Background Information on Respondents		
	Is global headquarters in the UK?	**Subsidiaries in other countries?**
Yes	127	60
No	37	-
	% of turnover of UK operations from overseas	**% of procurement spend for UK operations secured overseas**
<5%	69	67
5-10%	16	21
11-20%	10	24
21-50%	27	21
>50%	34	24

Source: OEF Survey of UK companies, 2006

(b) **Case studies**

To gain a deeper appreciation of the importance of air services to other parts of the economy than it was possible to cover in the survey, we held a total of 11 interviews with a variety of companies across a range of different sectors to discuss in more detail the uses they make of air services and how they were affected by different aspects of air services. At the same time, we also discussed (including by telephone or in writing) with a variety of English RDAs, together with corresponding bodies elsewhere in the UK, how aviation affects companies in their region. In all cases, we are very grateful to those organisations with whom we were able to discuss these issues.

(c) **Model**

The approach we have adopted here is based on the methodology developed in our 1999 study. The structure of our UK Industry-Aviation Model is described in more detail in that report, and for the current study we have simply updated it with more recent data and forecasts for UK industries, and with new equations that quantify the relationship between aviation and productivity elsewhere in the economy based on our latest econometric research. In summary, the Industry-Aviation Model is an expanded version of Oxford Economic Forecasting's well-established UK Industry Model. The main version of the model is used as an analytical tool to examine the implications of changes in the overall macroeconomic environment for different industrial sectors of the economy and the linkages that exist between the different sectors. As such, it already incorporates an input-output framework of links between different parts of the economy. The version of the model for our aviation work has been expanded to include the aviation sector of the economy explicitly rather than simply as part of the transport services sector, and to incorporate detailed linkages between aviation and other sectors reflecting the relationships identified in the studies.

Building the model then enables us to look at the potential impact of different scenarios for runway development in the UK by running different versions of the model with different projections for passenger numbers under the different scenarios, and looking at the implied differences that are generated elsewhere in the economy.

The version of OEF's UK Industry Model used here provides annual forecasts of output, employment, investment, prices and so on for the UK economy, disaggregated into 31

sectors. It incorporates a series of dynamic relationships between different parts of the model, which are solved simultaneously to generate the forecasts. The simultaneous nature of the relationships means that any one part of the forecast typically depends on all the other parts of it, but it is nevertheless possible to pinpoint certain key causalities within the model.

Output for each sector is estimated using a production function, which relates the level of output of the sector to the inputs used in the production process. This has three key elements:

- Employment in the sector. This is determined partly by the level of real wages (the higher the real wage an employer has to pay, the fewer people he will take on), and partly by the level of demand for the sector's output. Demand, in turn, depends partly on the output of other industries which use the sector's output as an input to their own output, and partly on final demand from consumers, exports, etc.
- The amount of capital equipment available, which depends on the industry's investment record.
- The sector's productivity after taking into account the amount of labour and capital used – ie Total Factor Productivity (TFP).

In the long run the overall level of employment is not determined so much by the level of demand from particular industries as by the supply of workers looking for a job. If an expanding industry increases the demand for labour sufficiently, this will, over time, put upward pressure on wages as firms compete for the available pool of workers. The resulting inflationary pressure will lead to higher interest rates, which will eventually choke off the extra demand for labour at a whole economy level. Conversely, if the demand for labour is below the available supply, over time there will be downward pressure on real wages and interest rates until the falling cost of employing people is sufficient to attract additional demand for labour. So, in the long run, it is the labour supply, investment and productivity that are the key to the economy's output.

There are four routes through which aviation enters into these relationships and affects other sectors in the economy, illustrated in Figure A.1:

a) Intermediate demand generates indirect effects on supply chain

Output and employment in aviation will automatically generate demand in sectors supplying aviation companies. This will in turn affect the level of employment in those industries, and the additional wages they pay will generate demand and jobs elsewhere in the economy.

But while the numbers of jobs generated are useful in assessing the contribution of an industry to a local area, or to the overall economy in the short run, in the long run the level of overall employment is not determined so much by the level of demand from particular industries as by the supply of workers looking for a job (as explained earlier). So, in the long run, employment does not give a reliable indication of the contribution aviation makes to the UK economy. Its significance lies more in the types of jobs and industries that the UK will attract in the future and the living standards they can support, rather than in the overall level of employment we are likely to see.

b) Changes in supply affect aviation prices which affect intermediate costs

The impact of changes in the supply of aviation services on their prices is discussed in more detail below. The principle, however, is that restrictions in the supply of air services put up costs for businesses, whether through directly higher fares, longer journey times as a result of lower frequency of service, or the need to find alternative ways to travel or

transport freight. This in turn leads to a loss of competitiveness for those UK industries which make significant use of aviation, reflected in lower demand for British goods and services.

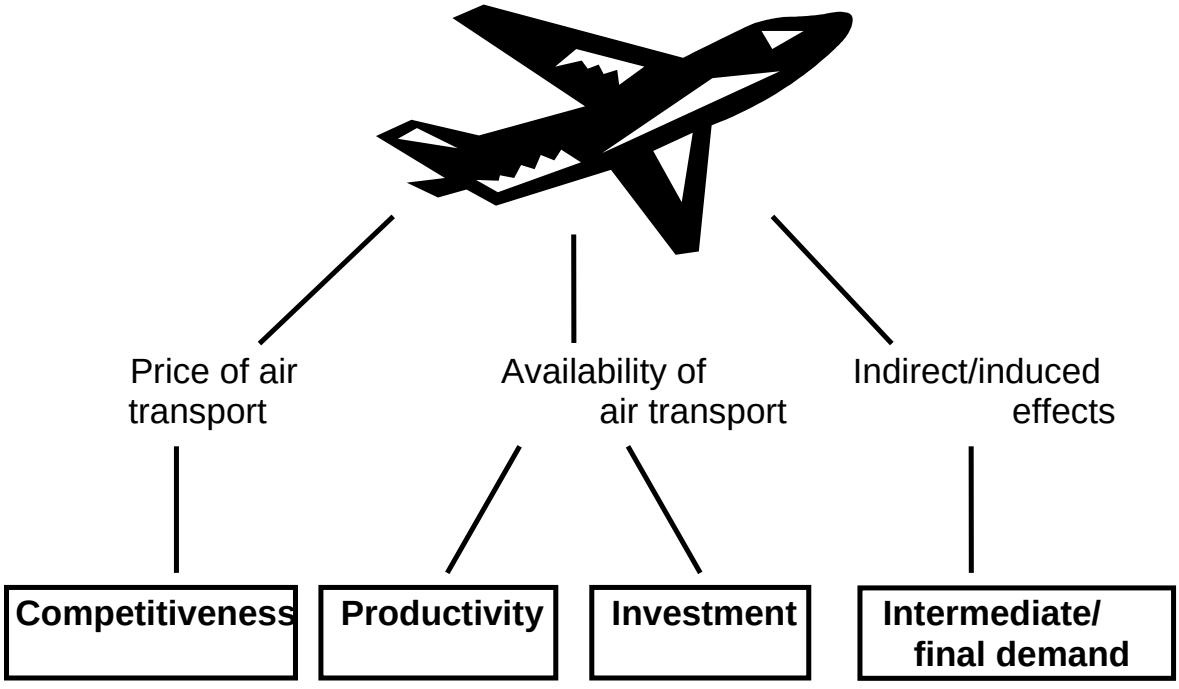
c) Aviation output facilitates productivity growth elsewhere

Chapter 8 discusses the relationship between aviation output and productivity growth elsewhere in the economy. Our estimation work shows an identifiable impact of changes in aviation output on productivity growth, which is incorporated into the model through the level of output each industry produces for given inputs. This is critical for the estimates of the long-run impact of aviation, given the way employment effects tend to be offset elsewhere in the economy.

d) Productivity also affects returns to capital and hence the level of investment

Chapter 5 looks at the impact aviation can have on the attractions of the UK as a destination for foreign direct investment. This is reflected in the model through the impact of changes in productivity back onto investment and hence the amount of capital equipment available for production.

Figure A.1: Impact of aviation industry on other sectors



The model identifies six separate components of air traffic which have potentially different effects on the economy: leisure (terminating) passengers, split into UK resident and non-UK resident; business (terminating) passengers, also split into UK resident and non-UK resident; transfer passengers; and freight carried. It also identifies three separate aviation prices: leisure fares; business fares; and freight charges. The traffic variables are not determined within the model - they are given by the nature of the scenario being studied.

But the price of different aviation services is allowed to vary within the model. The focus of the analysis is on the impact of restrictions in the growth of aviation services below baseline projections. The baseline is designed to represent the most plausible level of demand if the supply capacity of the industry does not impose constraints. Conversely, the alternative cases assume that restrictions on the capacity of the aviation industry to meet projected demand mean that demand has to be reduced, either by price increases or by rationing, or perhaps by increased congestion costs. This means that the price equations in the model are based on demand relationships rather than supply relationships. Prices for different types of aviation (business/leisure/freight) are therefore assumed to be negatively related to the corresponding traffic variables - a rise in price would mean that fewer passengers would want to travel and businesses would want to move less freight by air. In principle, each price could be affected by all the different traffic variables since the numbers of one type of passenger affect the amount of space available on aircraft for other types of passengers, and some relatively minor effects from the volume of one type of traffic on the price of another type are included in the model - but these have only a modest impact on the results.

Annex B: Sectoral use of air services

Table B.1: Sectoral growth and use of Air Transport

	Growth in value-added 1994-2004		Share of air in sector's total transport demand	
	% year	**Rank**	(%, 2003)	**Rank**
Computer activities	12.4	**1**	23.8	**4**
Communication	9.2	**2**	24.4	**3**
Computers and office equipment	8.8	**3**	6.6	**18**
Other business activities	6.7	**4**	21.7	**5**
R & D	6.3	**5**	17.6	**6**
Pharmaceuticals	5.7	**6**	3.0	**27**
Banking and finance	5.0	**7**	37.2	**1**
Distribution	3.7	**8**	2.4	**30**
Transport	3.7	**8**	5.2	**21**
Hotels & catering	2.7	**10**	10.1	**12**
Motor vehicles, parts & accessories	2.6	**11**	7.0	**17**
Construction	2.4	**12**	5.6	**20**
Electronic equipment	2.3	**13**	7.8	**16**
Non- market services	2.3	**13**	8.4	**15**
Other means of transport	2.2	**15**	14.6	**7**
Electricity, gas and water	2.0	**16**	1.4	**33**
Real estate and renting	1.9	**17**	10.9	**10**
Electrical engineering	1.5	**18**	6.6	**18**
Insurance	0.9	**19**	27.4	**2**
Precision and optical instruments	0.7	**20**	10.8	**11**
Non-metallic mineral extraction	0.6	**21**	2.8	**29**
Agriculture, forestry and fishing	0.5	**22**	2.2	**31**
Food, beverages and tobacco	0.5	**22**	2.0	**32**
Metal products n.e.c	0.5	**22**	3.7	**25**
Rubber and plastics	0.5	**22**	2.9	**28**
Extraction	0.4	**26**	11.8	**9**
Other manufacturing	0.4	**26**	5.0	**22**
Paper, printing, publishing	0.3	**28**	9.3	**14**
Other chemicals	0.2	**29**	4.3	**24**
Mechanical engineering	0.1	**30**	4.4	**23**
Wood and wood products	-0.2	**31**	0.0	**34**
Coke, petroleum & nuclear fuel	-0.8	**32**	9.6	**13**
Basic metals	-1.1	**33**	12.4	**8**
Textiles, leather and clothing	-4.9	**34**	3.6	**26**
Rank correlation:	0.36			

Table B.2: Sectoral growth and use of Air Transport

	Growth in value-added 1994-2004 % year	Rank	Spend per employee (£, 2003)	Rank
Computer activities	12.4	**1**	193	**14**
Communication	9.2	**2**	895	**5**
Computers and office equipment	8.8	**3**	193	**14**
Other business activities	6.7	**4**	257	**11**
R & D	6.3	**5**	133	**20**
Pharmaceuticals	5.7	**6**	121	**22**
Banking and finance	5.0	**7**	1694	**3**
Distribution	3.7	**8**	132	**21**
Transport	3.7	**8**	1211	**4**
Hotels & catering	2.7	**10**	74	**28**
Motor vehicles, parts & accessories	2.6	**11**	272	**9**
Construction	2.4	**12**	44	**31**
Electronic equipment	2.3	**13**	161	**18**
Non- market services	2.3	**13**	63	**30**
Other means of transport	2.2	**15**	219	**13**
Electricity, gas and water	2.0	**16**	17	**33**
Real estate and renting	1.9	**17**	229	**12**
Electrical engineering	1.5	**18**	165	**17**
Insurance	0.9	**19**	2238	**1**
Precision and optical instruments	0.7	**20**	176	**16**
Non-metallic mineral extraction	0.6	**21**	267	**10**
Agriculture, forestry and fishing	0.5	**22**	22	**32**
Food, beverages and tobacco	0.5	**22**	101	**24**
Metal products n.e.c	0.5	**22**	69	**29**
Rubber and plastics	0.5	**22**	98	**25**
Extraction	0.4	**26**	1998	**2**
Other manufacturing	0.4	**26**	110	**23**
Paper, printing, publishing	0.3	**28**	374	**7**
Other chemicals	0.2	**29**	372	**8**
Mechanical engineering	0.1	**30**	93	**26**
Wood and wood products	-0.2	**31**	0	**34**
Coke, petroleum & nuclear fuel	-0.8	**32**	543	**6**
Basic metals	-1.1	**33**	136	**19**
Textiles, leather and clothing	-4.9	**34**	89	**27**
Rank correlation:	0.17			

Annex C: Econometric tests

As explained in Chapter 8, our econometric research into the impact of aviation on the productivity of the UK economy uses a proxy for UK business use of air services derived from data both on business passengers at UK airports and air freight tonnage. The underlying data and constructed proxy are shown in Table C.1.

Table C.1: UK business use of air services

Business passengers at UK airports: 1980 - 2005

	International [1]	Domestic [2]	Total	Cargo freight loaded plus unloaded	Proxy for business air services
	(000s)			(million tonnes)	(000s of workload units)
1980	8.3	3.9	12.2	0.7	2.0
1981	8.2	3.7	11.9	0.7	1.9
1982	8.1	3.9	12.0	0.7	1.9
1983	8.7	3.9	12.7	0.7	2.0
1984	9.9	4.4	14.2	0.9	2.3
1985	10.1	4.7	14.8	0.9	2.3
1986	10.7	4.8	15.5	0.9	2.4
1987	10.9	5.3	16.2	1.0	2.6
1988	13.4	5.9	19.3	1.1	3.0
1989	13.0	6.4	19.4	1.2	3.1
1990	15.1	6.8	21.9	1.2	3.4
1991	14.5	6.2	20.7	1.1	3.2
1992	14.7	6.1	20.7	1.2	3.3
1993	16.4	6.2	22.6	1.4	3.6
1994	17.4	6.4	23.8	1.6	4.0
1995	19.1	6.7	25.8	1.7	4.3
1996	20.0	7.1	27.1	1.8	4.5
1997	21.6	7.5	29.0	1.9	4.8
1998	23.3	8.0	31.2	2.1	5.2
1999	23.8	7.6	31.4	2.2	5.3
2000	25.4	8.3	33.7	2.3	5.7
2001	22.9	8.6	31.5	2.1	5.3
2002	23.2	9.1	32.2	2.2	5.4
2003	22.8	9.5	32.3	2.2	5.4
2004	24.3	9.5	33.8	2.4	5.8
2005	25.5	10.0	35.5	2.5	6.0

1. Data derived from International Passenger Survey (IPS)

2. Data estimated using CAA survey data and UK airport statistics (adjusted for double counting).

Before estimating the model we need to establish carefully that each of the time series we use in the model has the appropriate statistical properties. The charts in Chapter 8 clearly show that the air services measures are trending over time and that implies that in statistical terms the series are “integrated”. The levels of dependent and explanatory variables should have the same order of integration for the results of any sort of “levels

only" regression model to be valid. For single time series we report Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) statistics (see Table C.2). Since we also estimate models using panel data techniques we report the panel equivalents of the single time series tests (see Table C.3). These tests conclude that the series for business air services and sectoral TFP contain a single unit root.

Table C.2 Unit roots tests for business air services intensity

BUSAIR/GDP	Statistic	P-value	Obs
Null Hypothesis: Unit root			
ADF	-0.09	0.94	26
PP	-0.14	0.93	26
Δ(BUSAIR/GDP)			
Null Hypothesis: Unit root			
ADF	-3.89	0.00	25
PP	-3.77	0.00	25

Table C.3 Panel Unit roots tests for TFP by sector

	Statistic	P-value	Panel members	Obs
ln(TPF_i)				
Null Hypothesis: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.45	0.93	31	796
Breitung t-stat	-1.51	0.07	31	765
Null Hypothesis: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	4.80	1.00	31	796
ADF - Fisher Chi-square	34.83	1.00	31	796
PP - Fisher Chi-square	37.37	0.99	31	806
Null hypothesis: No unit root (assumes common unit root process)				
Hadri Z-stat	21.5	0.00	31.0	837
Δln(TPF_i)				
Null Hypothesis: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-14.88	0.00	31	766
Breitung t-stat	-5.15	0.00	31	735
Null Hypothesis: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-16.209	0.00	31	766
ADF - Fisher Chi-square	353.38	0.00	31	766
PP - Fisher Chi-square	396.48	0.00	31	775
Null hypothesis: No unit root (assumes common unit root process)				
Hadri Z-stat	0.96	0.17	31	806

** Probabilities for Fisher tests are computed using an asympotic Chi-square distribution. All other tests assume asymptotic normality.

The models are estimated over the sample period 1979-2005. As the demand for air services varies across industry, we attempt to control for this by weighting the 'pooled' coefficients using various schemes. For each of our industry groupings we considered spending on air transport services, total transport (and transport excluding air services)

as a percentage of Gross Valued Added and as percentage of employment. Having explored the impact of using the various weighting schemes, the spending per head weights (expressed relative to the all industry average) gave the most plausible results.

The outcome from estimating the preferred model is shown in Table C.4. The model includes levels terms only and we conduct appropriate tests that increase our confidence the models are not simply spurious regressions. Our initial model included more lagged terms for the dependent and explanatory variables. Many of these terms were not significant. Indeed, a (joint) test of whether they add anything to the explanatory power of the model concluded that they could be dropped. We estimate separate intercepts (or fixed effects) and time trends for each sector, and 'pool' the long-term coefficient measuring the impact of business air services usage on sectoral productivity. The important point to be made is that there does seem to be a long-term relationship between productivity and air transport services across all the sectors. This conclusion is obtained from the alpha coefficient in the model, which is highly statistically significant and correctly signed. The long-run coefficient suggests that a 10% rise in business usage of air services raises TFP and hence GDP by 0.6% in the long run.

Table C.4: The impact of air transport services on sectoral TFP

MODEL - A: $LOG(TFP_{i,t}) = a_i + b_i*TIME + alpha*(w_{1b,i}*(BUSAIR_t/GDP_t))$ Sample: 1979 - 2005

United Kingdom	*ISIC Rev.3*	a_i	b_i	*alpha*
Agriculture, hunting, forestry and fishing	01-05	-0.02	0.0091	17.39
Mining and quarrying	10-14	0.07	-0.0037	(2.9)
Food products, beverages and tobacco	15-16	0.10	0.0067	
Fextiles, textile products, leather and footwear	17-19	-0.05	0.0119	
Wood and products of wood and cork	20	0.21	0.0038	
Pulp, paper, paper products, printing and publishing	21-22	0.05	0.0063	
Coke, refined petroleum products and nuclear fuel	23	0.25	-0.0001	
Chemicals and chemical products	24	-0.34	0.0196	
Rubber and plastics products	25	-0.01	0.0111	
Other non-metallic mineral products	26	0.04	0.0081	
Basic metals, fabricated metal products, except machinery and equipment	27-28	-0.10	0.0124	
Machinery and equipment, n.e.c.	29	0.09	0.0071	
Office, accounting and computing machinery	30	-1.43	0.0557	
Electrical machinery and apparatus, nec	31	0.06	0.0091	
Radio, television and communication equipment	32	-0.33	0.0198	
Medical, precision and optical instruments	33	0.01	0.0092	
Motor vehicles, trailers and semi-trailers	34	-0.22	0.0159	
Other transport equipment	35	-0.25	0.0196	
Manufacturing nec; recycling	36-37	0.33	-0.0007	
Electricity, gas and water supply	40-41	-0.15	0.0149	
Construction	45	0.08	0.0079	
Wholesale and retail trade; restaurants and hotels	50-52	0.11	0.0058	
Hotels and restaurants	55	0.41	-0.0028	
Post and telecommunications	64	-0.46	0.0193	
Financial intermediation	65-67	0.20	-0.0050	
Real estate, renting and business activities	70-74	0.57	-0.0092	
Public admin. and defence; compulsory social security	75	0.25	0.0014	
Education	80	0.34	-0.0002	
Health and social work	85	0.20	0.0029	
Other community, social and personal services	90-93	0.13	0.0050	

$w_{1b,i}$ is sector$_i$ spend on air transport services per head relative to industry average

As a final test on the validity of the model, we checked that the model residuals are not trended. As well as charting the residuals, we ran formal tests to look for co-integration between sectoral productivity and business air services (relative to GDP). These are reported in Table C.5. The tests do not find any evidence of unit roots in the panel model residuals, and so we conclude that there is a co-integrating relationship present. Importantly, this provides strong statistical evidence that the output of the air services industries is an important factor driving economy-wide productivity growth in the long-term.

Table C.5 Panel co-integration tests

	Statistic	P-value	Panel members	Obs
Null Hypothesis: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-14.48	0.00	31	761
Breitung t-stat	-4.86	0.00	31	730
Null Hypothesis: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-15.61	0.00	31	761
ADF - Fisher Chi-square	352.60	0.00	31	761
PP - Fisher Chi-square	402.84	0.00	31	775
Null hypothesis: No unit root (assumes common unit root process)				
Hadri Z-stat	1.03	0.15	31	806

** Probabilities for Fisher tests are computed using an asympotic Chi-square distribution. All other tests assume asymptotic normality.

Can we also find an extra significant impact from transport excluding air services? As Table C.6 shows, this was possible, but the coefficient was not as significant as that for business air services. The coefficient alpha measures the long-run impact of business air services usage. In this case, this is coefficient is slightly smaller than that in the first model (15.8). But since a 95% confidence interval contains the earlier figure, it is not significantly different. The beta coefficient measures the long-run impact on productivity of the usage of non-air transport services and this model implies a 1% increase in non-air services intensity raises long-run productivity by 0.4%. (The impact of total transport services was also found to have a to be positive, though not significant impact, on trend productivity – a conclusion that remained across many variants of this equation.)

Table C.6: The impact of non-air transport services on sectoral TFP

MODEL - B: $LOG(TFP_{i,t}) = a_i + b_i*TIME + alpha*(w_{1b,i}*(BUSAIR_t/GDP_t)) + beta*(w_{2b,i}*(TRANSX_t/GDP_t))$ Sample: 1979 - 2005

United Kingdom	*ISIC Rev.3*	a_i	b_i	*alpha*	*beta*
Agriculture, hunting, forestry and fishing	01-05	0.02	0.0091	15.78	12.09
Mining and quarrying	10-14	-0.07	-0.0027	(2.7)	(1.7)
Food products, beverages and tobacco	15-16	0.08	0.0069		
Fextiles, textile products, leather and footwear	17-19	-0.03	0.0120		
Wood and products of wood and cork	20	0.21	0.0038		
Pulp, paper, paper products, printing and publishing	21-22	0.05	0.0066		
Coke, refined petroleum products and nuclear fuel	23	0.24	0.0002		
Chemicals and chemical products	24	-0.39	0.0199		
Rubber and plastics products	25	-0.01	0.0112		
Other non-metallic mineral products	26	-0.03	0.0084		
Basic metals, fabricated metal products, except machinery and equipment	27-28	-0.14	0.0126		
Machinery and equipment, n.e.c.	29	0.12	0.0071		
Office, accounting and computing machinery	30	-1.41	0.0559		
Electrical machinery and apparatus, nec	31	0.07	0.0092		
Radio, television and communication equipment	32	-0.31	0.0199		
Medical, precision and optical instruments	33	0.04	0.0093		
Motor vehicles, trailers and semi-trailers	34	-0.19	0.0160		
Other transport equipment	35	-0.25	0.0198		
Manufacturing nec; recycling	36-37	0.37	-0.0007		
Electricity, gas and water supply	40-41	-0.13	0.0149		
Construction	45	-	0.0079		
Wholesale and retail trade; restaurants and hotels	50-52	-	0.0059		
Hotels and restaurants	55	-	-0.0027		
Post and telecommunications	64	3.50	0.0202		
Financial intermediation	65-67	4.52	-0.0044		
Real estate, renting and business activities	70-74	4.81	-0.0090		
Public admin. and defence; compulsory social security	75	4.53	0.0015		
Education	80	4.61	-0.0002		
Health and social work	85	4.48	0.0030		
Other community, social and personal services	90-93	4.42	0.0051		

$w_{1b,i}$ is $sector_i$ spend on air transport services per head relative to industry average

$w_{2b,i}$ is $sector_i$ spend on non-air transport services per head relative to industry average

SURVEY ON THE IMPORTANCE OF AIR SERVICES TO YOUR COMPANY

March 2006

Oxford Economic Forecasting is conducting this survey on behalf of the CBI, the Department for Transport, a consortium of airlines and airports, and VisitBritain in order to assess the contribution of air services to the UK economy and the competitiveness of UK business. The results of the survey will be presented to the Government to inform the 2006 progress report on its White Paper on airports policy.

Completing this survey should take no more than 20 minutes. Section A covers a few company details; Section B asks about your use of different types of air services and their importance to your business and investment decisions; Sections C and D ask more specific questions about your use of air passenger and freight/express delivery services respectively; and Section E asks for your views on changes to air services. **Please tick only one box per row in the questionnaire**. If you do not know the answer to a particular question, please leave all boxes on that row unticked.

Analysis of this survey will be undertaken by Oxford Economic Forecasting. The information supplied will be treated in strictest confidence and remain anonymous. **Please send your completed questionnaires by 14 March** to Aviation Survey Team, Oxford Economic Forecasting, Freepost, SCE15649, Oxford, OX1 1BR; or fax back on 01865 268906.

Thank you for taking the time to complete the questionnaire. If you have any questions about the survey, please contact: Adrian Cooper, Managing Director, Oxford Economic Forecasting - email acooper@oef.co.uk; tel. 01865 268902.

All values weighted by employment unless otherwise stated

A ABOUT YOU AND YOUR ORGANISATION

1 Company name……

Company address……

……..

……..

……..…Postcode……..

Your name……..…Job title……

Email address……Telephone number……

2a What is the principal activity of your business?

Manufacturing	Financial & Business Services	Other Services	Other
26%	16%	57%	2%

2b Is this a high tech business?

Yes	No
15%	85%

3 How many staff does your company employ in the UK? (unweighted numbers)

Less than 50	51-250	251-500	501-1,000	1,000-5,000	5,001+
18%	16%	22%	16%	17%	11%

4 Does your company have its global headquarters in the UK? (unweighted numbers)

Yes	No
77%	22%

If yes, does your company have subsidiaries in other countries? (unweighted numbers)

Yes	No
47%	52%

5 What proportion of your company's turnover from UK operations comes from overseas? (unweighted numbers)

Less than 5%	5-10%	11-20%	21-50%	Over 50%
42%	10%	6%	16%	21%

6 What proportion of your company's procurement spend for UK operations is sourced from overseas? (unweighted numbers)

Less than 5%	5-10%	11-20%	21-50%	Over 50%
41%	13%	15%	13%	15%

B ABOUT YOUR ORGANISATION'S USE OF AIR SERVICES

7 How important are the different types of air transport services to your organisation?

(a) For your marketing and sales?

	Vital	Very important	Sometimes important	Not important
Passenger Services	31%	34%	18%	17%
Freight Services	16%	13%	26%	42%
Express Delivery (as provided by DHL, FedEx, TNT , UPS etc)	19%	19%	30%	31%

(b) For servicing / meeting with customers?

	Vital	Very important	Sometimes important	Not important
Passenger Services	37%	27%	20%	16%
Freight Services	14%	12%	18%	51%
Express Delivery	18%	18%	21%	40%

(c) For efficient organisation of your production and supplier relationships across different geographic locations?

	Vital	Very important	Sometimes important	Not important
Passenger Services	25%	33%	21%	20%
Freight Services	13%	15%	25%	42%
Express Delivery	10%	25%	24%	37%

(d) For management of your organisation and your subsidiaries?

	Vital	Very important	Sometimes important	Not important
Passenger Services	36%	35%	17%	12%
Freight Services	10%	13%	21%	51%
Express Delivery	14%	19%	23%	39%

8 What proportion of your company's sales do you think depend on air services?

Please state approximate figure…….13%

9 How important are the following airports to your organisation?

	Vital	Very important	Sometimes important	Not important
a) Heathrow	32%	22%	25%	18%
b) Gatwick	4%	26%	41%	21%
c) Stansted	7%	18%	35%	29%
d) Manchester	5%	15%	39%	31%
e) Birmingham	4%	21%	35%	32%
f) Other UK airports	21%	22%	35%	12%
Which ones? (please specify)	……			
g) European hub airports	23%	21%	13%	27%
Which ones? (please specify)	……			

10 In what ways does your organisation use airports outside the South East of England?

	Very frequently	Sometimes	Occasionally	Never
a) For direct flights to other UK and European destinations	47%	24%	19%	8%
b) For direct long-haul flights (eg to US, Asia)	19%	20%	34%	25%
c) For connections to international flights:				
i) Connecting in the UK	22%	25%	14%	32%
ii) Connecting elsewhere in Europe (eg Amsterdam, Frankfurt, Paris)	27%	28%	18%	21%

11 Does the availability of frequent air services to/from the UK mean that your organisation serves a bigger market than it could otherwise?

	Substantially	To some extent	Not significantly
a) In the UK and Europe	32%	25%	43%
b) Outside Europe	32%	22%	45%

What implications does this have for your business?

	Substantially	To some extent	Not significantly
c) Increased sales in the UK and Europe	22%	30%	45%
d) Increased sales outside Europe	26%	23%	48%
e) Increased profits	23%	32%	42%
f) Greater ability to exploit economies of scale	19%	32%	42%
g) Greater incentive to invest in the UK	9%	33%	52%
h) Greater incentive to invest in other countries	12%	23%	57%
i) Greater incentive to undertake R&D	3%	27%	63%
j) We are more innovative as a company as a result of being involved in international networks of contacts	38%	27%	30%
k) We face tougher competition from foreign rivals in our home market	13%	32%	47%
l) We can reduce our costs by importing products by air	3%	16%	73%

m) Other effects (please specify) ……

12 How well does the UK air transport network meet your organisation's requirements?

	Very well	Quite well	Poorly	Very poorly
a) Ease of travelling to other locations in the UK	33%	50%	11%	3%
b) Ease of travelling to destinations in continental Europe	35%	49%	4%	0%
c) Ease of travelling to long-haul destinations (eg US, Asia)	38%	41%	5%	1%
d) Range of destinations available	41%	36%	17%	1%
e) Frequency of flights	35%	51%	8%	1%
f) Cost	12%	61%	18%	2%
g) Reliability	23%	60%	11%	0%
h) Punctuality	18%	67%	10%	0%
i) Road access to airports	15%	58%	22%	1%
j) Public transport to/from airports	11%	35%	33%	12%

13 To what extent can other modes of transport or communication substitute for your organisation's use of air services?

	To a large extent	Somewhat	Not at all
a) Road	30%	49%	19%
b) Rail	25%	52%	21%
c) Sea	7%	20%	64%
d) Electronic communication	44%	47%	4%

14 How important are the following factors in determining the country in which your organisation chooses to invest?

	Vital	Very important	Somewhat important	Not important
a) Availability of skilled labour	24%	30%	11%	18%
b) Cost of labour	14%	26%	26%	18%
c) Property costs/rent	7%	27%	33%	16%
d) Business taxes	8%	30%	25%	20%
e) Extent of government regulations on business	14%	37%	16%	17%
f) Size of local market	31%	29%	11%	14%
g) Road transport network	9%	27%	32%	17%
h) Rail transport network	2%	14%	36%	34%
i) Air transport network	3%	38%	22%	19%

j) Other (please specify) ……..

15 Has the absence of good air transport links ever affected your organisation's decisions to invest in the UK?

Yes 8% No 88%

If yes, in what way?

We went ahead with the investment anyway but costs were higher to overcome problems with air transport	We chose to make the investment somewhere else in the UK which had good air links	We chose to make the investment in another country which had good air links	We chose not to make the investment at all
65%	3%	2%	30%

Other (please specify) ……..

16 Is access to air services an important factor in influencing where your company locates its operations within the UK?

Yes 26% No 69%

If yes, how important are the following considerations?

	Vital	Very important	Somewhat important	Not important
a) We need to be within easy access of Heathrow	24%	25%	17%	34%
b) We need to be close to an airport with direct links to Heathrow	8%	32%	14%	46%
c) We need to be close to an airport with direct links to a European hub airport	16%	45%	24%	15%
d) We need to be close to an airport with direct links to particular European cities	12%	34%	35%	20%

C ABOUT YOUR ORGANISATION'S USE OF PASSENGER AIR TRAVEL

17 How important to your organisation's business are the different destinations for which it uses passenger air services?

	Vital	Very important	Sometimes important	Not important
a) Elsewhere in UK	9%	30%	48%	11%
b) Other European countries	18%	42%	20%	15%
c) North America	19%	23%	24%	29%
d) Asia Pacific	21%	23%	23%	28%
e) Other destinations (eg Latin America, Middle East, Africa)	9%	21%	25%	38%

18 To what extent do you expect your organisation to increase its use of passenger air services to the following destinations over the next 10 years?

	Substantially	Somewhat	No change expected	Use likely to decline
a) Elsewhere in UK	9%	33%	51%	4%
b) Other European countries	13%	41%	37%	4%
c) North America	14%	28%	48%	4%
d) Asia Pacific	25%	22%	43%	4%
e) Other destinations (eg Latin America, Middle East, Africa)	14%	24%	50%	4%

19 How important is it to your organisation to be able to fly directly rather than having to change to a connecting flight?

	Vital	Very important	Somewhat important	Not important
a) For flights within Europe	26%	43%	14%	12%
b) For long haul flights (eg US, Asia)	17%	25%	33%	18%

20 When making a journey that might require a connection from one flight to another, how acceptable are the following options to your organisation?

	Very acceptable	Sometimes acceptable	Not acceptable
a) Transfers between flights at a UK hub airport (eg Heathrow)	31%	49%	5%
b) Transfers between flights at a continental hub airport (eg Amsterdam, Frankfurt, Paris)	22%	58%	3%
c) Transfers involving changing between two airports in the same region (eg Heathrow and Gatwick)	1%	15%	69%
d) Transfers between flights by the same airline or within an Alliance arranged on one booking	30%	51%	1%
e) Transfers between flights by airlines that are not part of an Alliance requiring separate booking for each flight	11%	49%	24%

21 Why are passenger air services important to your organisation?

	Vital	Very important	Sometimes important	Not important
a) To meet clients and potential clients	38%	29%	10%	15%
b) To enable our management to oversee foreign subsidiaries	30%	20%	14%	28%
c) Managers from abroad need to travel to oversee our organisation	21%	26%	15%	30%
d) To network with collaborators and partners in other countries	21%	34%	18%	20%
e) To attract and retain staff	6%	7%	41%	39%

f) Other (please specify) .....

.....

22 Do you think that the quality of passenger air services available through UK airports is better or worse than in our European competitors?

Better [33%] Worse [10%] About the same [47%]

Do you think this affects your organisation's ability to compete in international markets?

Yes [13%] If so, in what way? (please specify)…….....

……

No [73%]

D **ABOUT YOUR ORGANISATION'S USE OF AIR FREIGHT AND EXPRESS SERVICES**

If you organisation does not use air frieght and/or express delivery services, please go to question 25

23 What are the advantages to your organisation of using air freight and/or express delivery services?

	Vital	Very important	Sometimes important	Not important
a) Ability to serve distant markets	14%	15%	13%	19%
b) Speed of delivery	19%	19%	10%	14%
c) Ability to source inputs from cheapest / best quality suppliers	7%	10%	22%	22%
d) Allows production to be organised in most cost-effective, efficient way across organisation's different operations	4%	13%	19%	27%

e) Other (please specify) ……

24 Do you think that the quality of air freight and express delivery services available through UK airports is better or worse than in our European competitors?

Better [5%] Worse [2%] About the same [52%]

Do you think this affects your organisation's ability to compete in international markets?

Yes [3%] If so, in what way? (please specify)…….....

……

No [45%]

E ABOUT YOUR ORGANISATION'S VIEWS ON CHANGES TO AIR SERVICES

25 Do you expect your organisation to become more or less dependent on air transport services over the next 10 years?

	Substantially more	Somewhat more	Unchanged	Somewhat less	Substantially less
a) Passenger Services	17%	49%	27%	4%	0%
b) Freight Services	6%	18%	66%	2%	0%
c) Express Delivery	7%	23%	58%	4%	2%

26 To what extent do you think that new technologies (eg video conferencing, internet) will affect your organisation's use of air services over the next 10 years?

Encourage more air travel	No effect	Reduce it somewhat	Reduce it significantly
3%	37%	51%	4%

27 If the air services available to you today deteriorated, how would your organisation be affected?

Very badly affected	Quite badly affected	Inconvenienced	Not significantly affected
18%	25%	37%	13%

If affected, in what ways?

	Very badly affected	Quite badly affected	Inconvenienced	Not significantly affected
a) Increased costs	10%	36%	25%	14%
b) Loss of customer contact	25%	36%	21%	2%
c) Lost orders / business	13%	29%	25%	17%
d) Less investment in UK operations	8%	17%	24%	36%

	Very badly affected	Quite badly affected	Inconvenienced	Not significantly affected
e) Less investment in foreign subsidiaries	6%	15%	27%	30%
f) Less investment in R&D	3%	7%	21%	45%
g) Less innovative as networking is reduced	12%	26%	19%	22%
h) Some operations would be moved abroad	6%	12%	15%	45%

28 To what extent would these effects damage your organisation's ability to compete internationally?

Very badly	Moderately	Slightly	No effect
14%	26%	16%	35%

29 Do you have any other comments you wish to make on the importance of air services to your organisation and changes you would like to see to the air transport network?

……..

……..

……

30 Would you be willing to be interviewed in more detail about the importance of air services to your organisation?

Yes	No
20%	76%

Thank you for your assistance

Please return by 14 March to:

Aviation Survey Team, Oxford Economic Forecasting, Freepost, SCE15649, Oxford, OX1 1BR

or fax back on 01865 268906